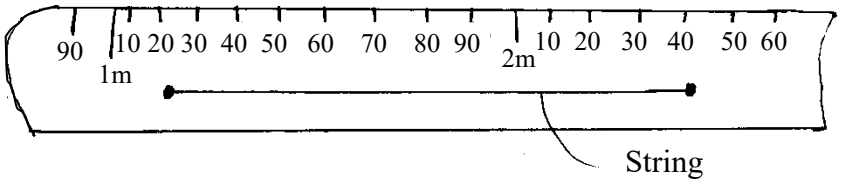
IMENTI SOUTH EXAMINATION, 2023
Kenya Certificate of Secondary Education
232/1
PHYSICS
PAPER 1
TIME: 2 Hours

SECTION A: *25 marks*
Answer ***all*** *the questions in this section*

1. The figure below shows a section of a tape measure used for measuring the circumference of a cylindrical water tank.



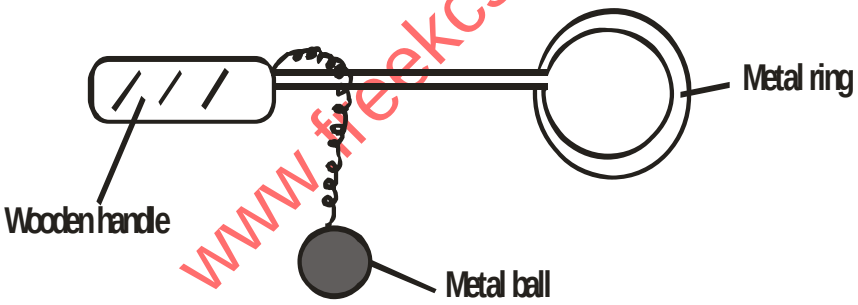
i) State the accuracy of the tape. (1 mark)
ii) Determine the diameter of the tank. (2 marks)

2. A student carried out an experiment and recorded the following measurements
Height of the rod = 160cm
Length of the shadow of flag post = 1400cm
Length of the shadow of rod = 140cm
Use the above measurements to estimate the height of the flag post. (3 marks)

3. Sketch a displacement = time graph for a body moving with a uniform velocity. (2 marks)

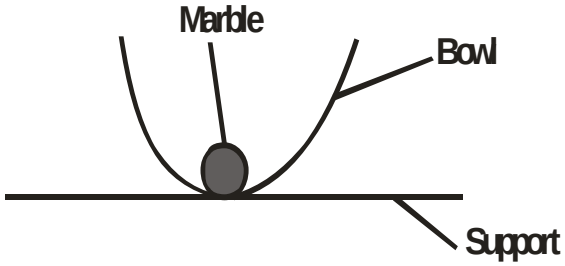
4. A student wearing a sharp pointed shoe is likely to damage a soft wooden floor. Explain. (2 marks)

5. The figure below shows a simple apparatus for demonstrating expansion in solids. It consists of a metal ball that just slips through the metal ring when both are at room temperature.



Explain how the apparatus can be used to show that solids expand when heated. (3 marks)

6. The figure below shows a solid marble in a stable equilibrium. On the space provided sketch the same marble in a neutral state of equilibrium. (1 mark)



7. a) State the Bernoulli's principle. (1 mark)
b) The figure below shows a Bunsen burner.

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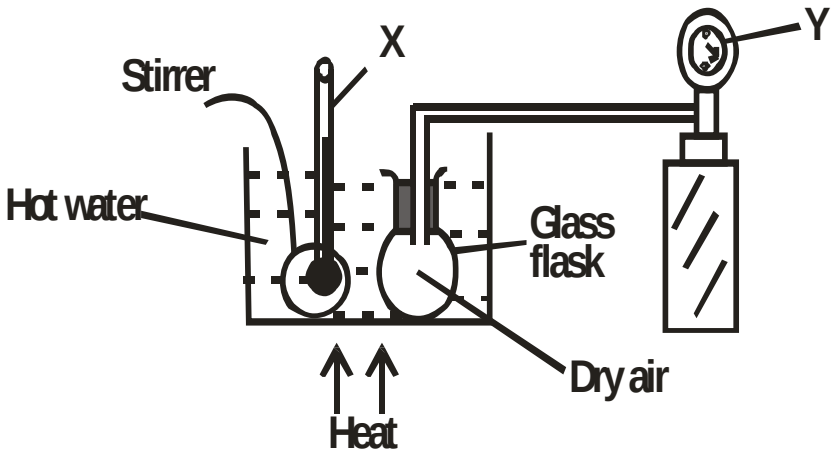
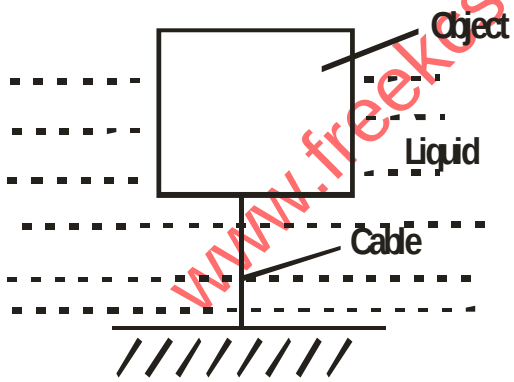
14. The diagram below shows a set up that a student used to investigate the pressure law.



a) Name the parts
X _____ (1 mark)
Y _____ (1 mark)
b) What are the functions of
i) The stirrer (1 mark)
ii) Part Y (1 mark)
c) State the measurements that should be taken in the experiment. (2 marks)
d) Explain how the measurement in (c) above may be used to verify pressure law. (4 marks)
e) Name **one** limitation of the gas laws. (1 mark)
f) A gas is put into a container of fixed volume at a pressure of 2.1×10^5 N/m^2 and temperature 27°C. The gas is then heated to a temperature of 327°C. Determine the new pressure. (2 marks)

15. a) State the law of floatation. (1 mark)
b) The figure below shows a floating object of volume 40.000cm^3 and mass 10g. It's held in liquid of density 1.25g/cm^3 by a light cable at the bottom so that $\frac{3}{4}$ of the volume is below the water surface. (Assume that the upthrust due to air is negligible)



i) I. Calculate the volume of the object under water. (1 mark)
II. Calculate the weight of liquid displaced. (2 marks)
ii) Determine the tension in the cable. (2 marks)
iii) Calculate the density of the object. (2 marks)
c) A stone of mass 5kg is attached to a string 3m long and made to revolve in a horizontal circle of radius 1m at 5 revolutions per second. Find:
i) Angular velocity. (2 marks)
ii) Linear velocity. (2 marks)
iii) Acceleration of the stone. (2 marks)

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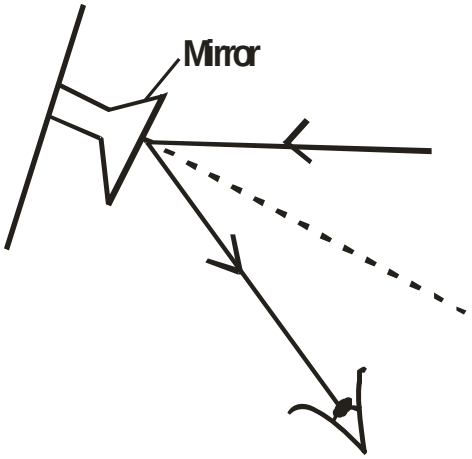
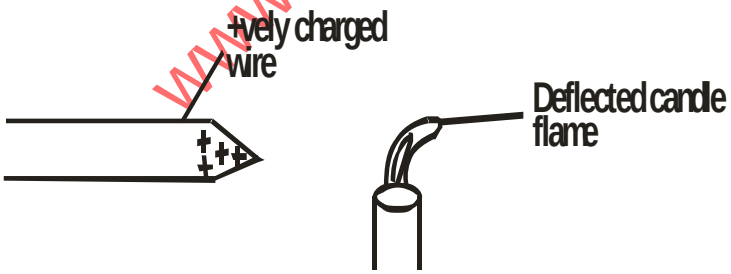
IMENTI SOUTH EXAMINATION, 2023
Kenya Certificate of Secondary Education
232/2
PHYSICS
PAPER 2
TIME: 2 HOURS

SECTION I (25 MARKS)
Answer ALL the questions in this section.

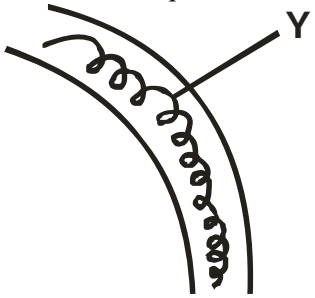
1. The diagram below shows a motorist looking into his driving mirror.



i) Mark on the diagram:
Letter 'I' to show the incident ray and letter r to show the angle of reflection. (2 marks)
ii) Name the dotted line shown in the diagram. (1 mark)
2. A pendulum bob takes 0.05 seconds to move from its mean position to maximum displacement. Calculate its frequency. (2 marks)
3. Describe how you would charge a gold leaf electroscope by induction method. (2 marks)
4. State any **two** maintenance practices for accumulators. (2 marks)
5. A man standing at the middle of two parallel walls fires a gun. He hears an echo after 1.5 seconds. Determine the distance of separation of the walls. (Velocity of sound is 340 m/s) (3 marks)
6. The figure below shows a candle flame being deflected by a positively charged sharp wire brought near it.



Explain the observation. (2 marks)
7. The figure below shows part of electric cooker coil.



i) Why is the material labelled Y coiled? (1 mark)
ii) State the property of material Y that makes it suitable for its use. (1 mark)

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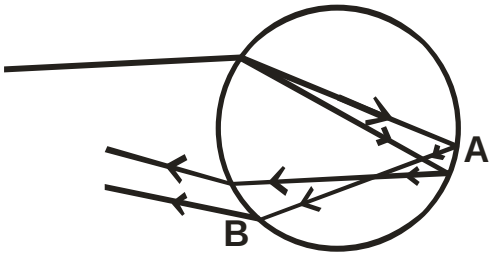
8. The figure below shows part of a rainbow.



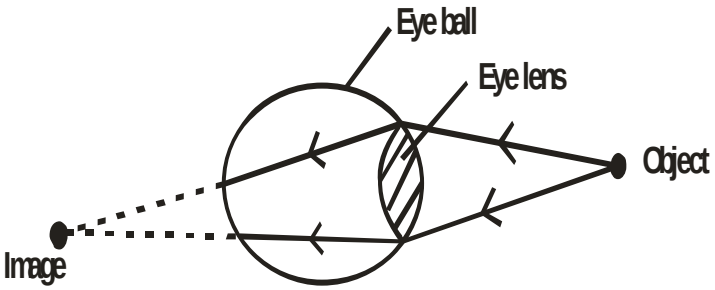
State what happens at part

A (1 mark)

B (1 mark)

9. One method of magnetization is by single stroking. State the disadvantage of this method. (1 mark)

10. The figure below shows human eye with a defect.

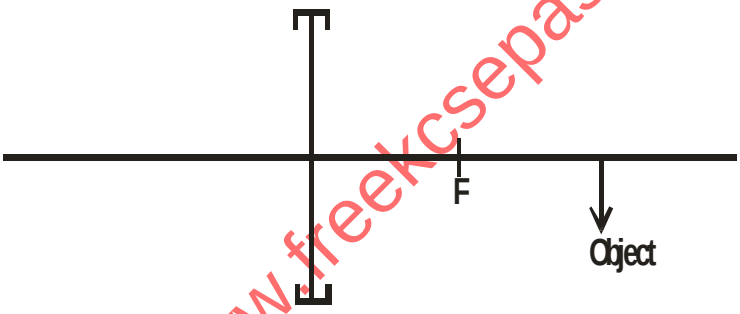


i) Identify the defect. (1 mark)

ii) State **one** possible cause of the defect. (1 mark)

iii) Identify the lens used to correct the defect. (1 mark)

11. The sketch below shows an object placed some distance from a biconcave lens.



Draw rays to locate the image on the diagram. (3 marks)

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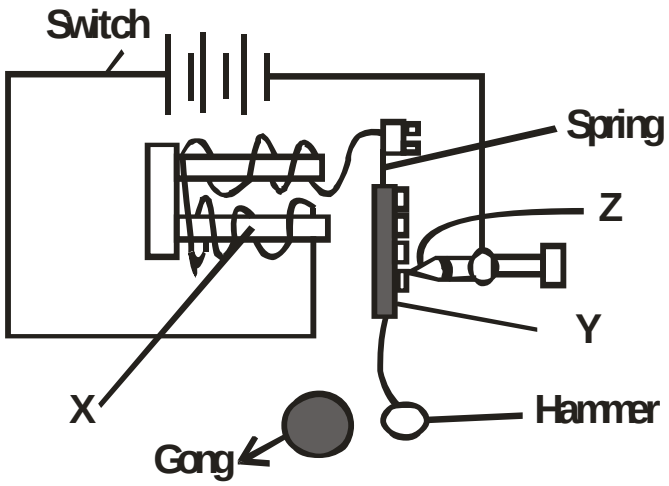
***SECTION B** (55 MARKS)*

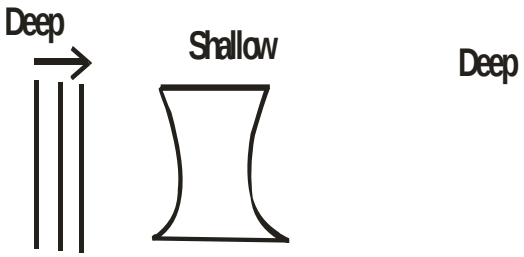
*Answer **All** questions*

12. a) The figure below shows a simple electric bell circuit.

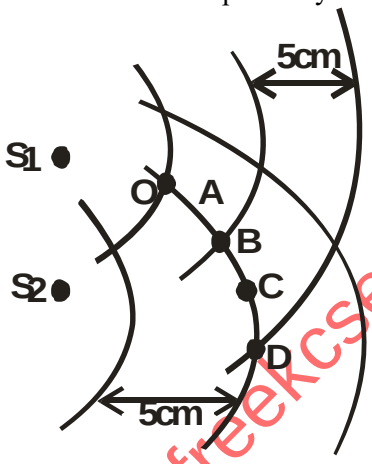


i) Name the parts labelled X, Y, Z (3 marks)
ii) When the switch is closed, the hammer hits the gong repeatedly. Explain why:
I. The hammer hits the gong. (2 marks)
II. The hammer hits the gong repeatedly. (2 marks)
iii) State and explain what would happen if the armature is made of steel metal. (2 marks)
iv) What adjustment should be done to the system to make it operate effectively with a lower voltage battery? (1 mark)

13. a) State **one** use of echoes. (1 mark)
b) i) Explain why there is gradual decrease in amplitude of a progressive wave. (1 mark)
ii) Distinguish between refraction and reflection of waves. (1 mark)
iii) In the figure below complete the diagram to show how plane wave move in the shallow and deep region below. (2 marks)



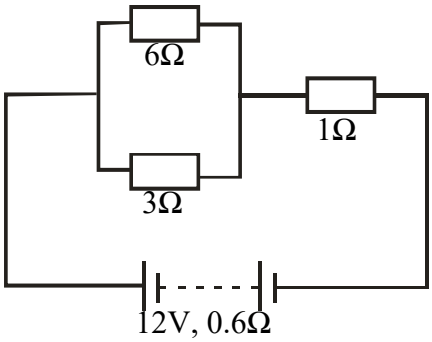
iv) The figure below shows how water waves interfere in a ripple tank. The amplitude and wavelength of each wave is 8cm and 5 cm respectively.



Determine the amplitude of the water wave at:
A (1 mark)
B (1 mark)
v) If the vibrator S_1 and S_2 in part (iv) above produces coherent waves at a frequency of 40Hz, determine the speed of water wave. (2 marks)

c) A radio station transmits a wave frequency of 120MHz. Calculate
i) The wavelength of the transmitted waves. (2 marks)
ii) Time taken for the waves to travel a distance of 50km. (2 marks)

14. The figure below shows a simple circuit consisting of resistor networks and a power source of internal resistance of 0.6 ohms



a) Calculate
i) The total effective resistance. (3 marks)
ii) Current flowing through the 3Ω resistor. (3 marks)

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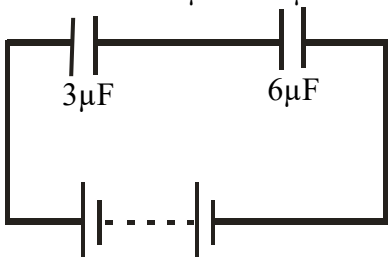
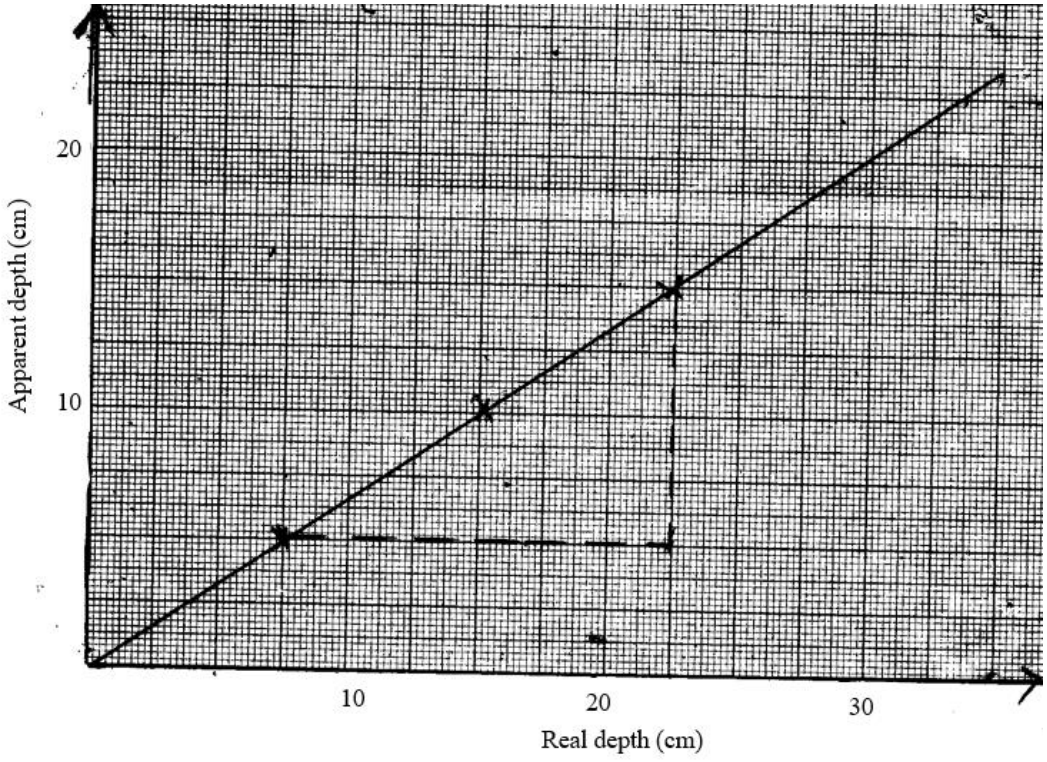
b) Two capacitors of values 3μF and 6μF connected in series to a 120V d.c supply as shown below.



i) Calculate the total energy stored in the capacitor. (3 marks)
ii) The capacitors are then reconnected in parallel. Determine
I. Potential difference across each capacitor. (1 mark)
II. Total energy stored in both capacitors. (3 marks)
iii) Comment of the energy difference in I and II above. (3 marks)

15. a) State the Snell's law of refraction. (1 mark)
b) In an experiment to determine refractive index of a liquid, the liquid was poured into a measuring cylinder, a pin was placed at the bottom of the cylinder and another pin was used to locate the apparent position of the first pin. The values of real and apparent depth were used to plot a graph as shown below.



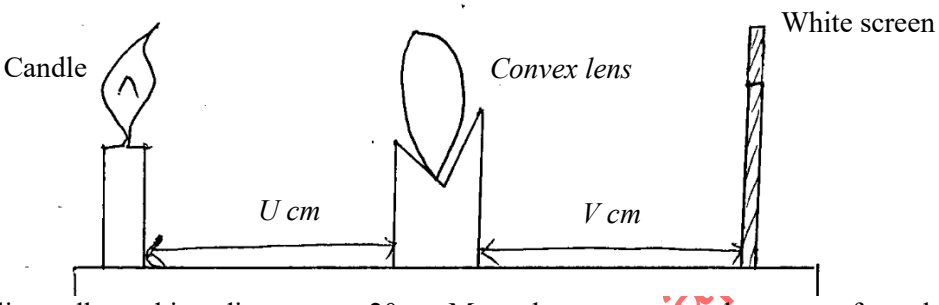
i) From the graph determine the refractive index of the liquid. (3 marks)
ii) Given that the velocity of light in vacuum is 3.0×10^8m/s, what would be the velocity of light in the liquid above? (3 marks)

16. a) i) Define the term principal focus as used in convex lens. (1 mark)
ii) State **two** differences between the human eye and camera (2 marks)
b) An object is placed 20cm in front of a concave lens of focal length 16cm.
Determine
i) The image distance from the lens. (3 marks)
ii) The magnification. (3 marks)

IMENTI SOUTH EXAMINATION, 2023
Kenya Certificate of Secondary Education
232/3
PHYSICS
PAPER 3
(PRACTICAL)
TIME: 2½ HOURS

QUESTION ONE
You are provided with the following
- A concave lens
- A lit candle
- A white screen
- A lens holder
- A metre rule

Procedure
a) Set the apparatus as shown below.



b) Place a lit candle at object distance u = 20cm. Move the screen towards or away from the lens until a sharp image of the candle flame is obtained on the screen. Measure the distance V and record the results in the table.
c) Repeat the same for other values of U as shown in the table and fill their respective values of V.

Object distance U (cm)	Image distance V (cm)	U + V (cm)	UV (cm^2)
20			
30			
45			
60			
75			
90			

(5 marks)
d) Plot a graph of UV (cm^2) against (U + V) cm on the grid provided. (5 marks)
e) Determine the slope of the graph. (2 marks)
f) Determine the power of the lens used in the experiment. (2 marks)

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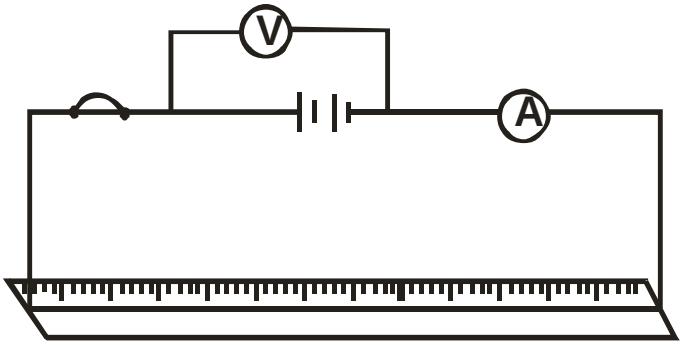
QUESTION TWO
You are provided with the following
- 2 new dry cells
- A cell holder
- Switch
- A resistance wire mounted on a mm scale
- Six connecting wires each with a crocodile clip at one end
- An ammeter
- A voltmeter
- Micrometer screw gauge

Procedure
a) Measure the diameter of the mounted wire at two distinct points.
d_1 = _____ mm (½ mark)
d_2 = _____ mm (½ mark)
Average diameter _____ (1 mark)

b) Connect the circuit as shown below.



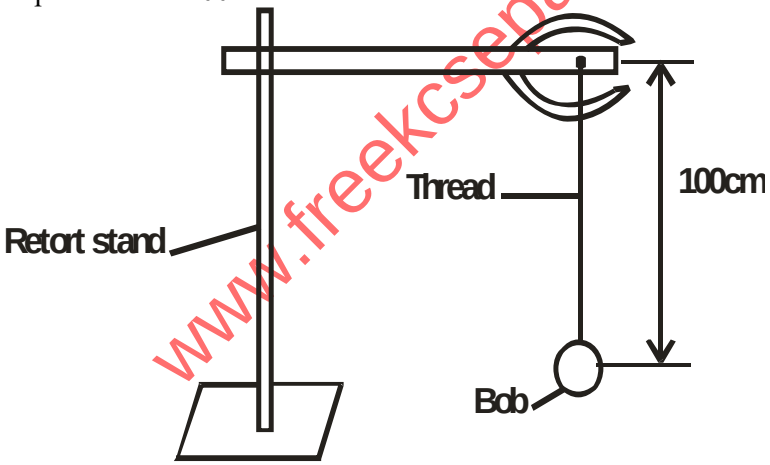
i) Close the switch and measure the p.d, V_o across the 1M length of resistance wire and current I_o.
V_o = _____ V (1 mark)
I_o = _____ A (1 mark)
ii) Calculate the resistance R_o of the wire. (2 marks)
iii) Calculate the cross-section area A of the wire in S.I units. (2 marks)
iv) Determine the resistivity ρ of the wire, given that $\rho = \frac{R_o A}{L"}$, where L is the length of the wire. (2 marks)

QUESTION 3

You are provided with the following
A pendulum bob
A cotton thread 110cm long
A complete retort stand
A metre rule
A stop watch

Procedure

a) Tie the pendulum bob with the thread provided as shown below. Clamp the end of the thread on the boss, so that the length of pendulum is 100cm.



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b) i) Give the bob a slight vertical displacement and release it. Record time for 10 oscillations and record in the table.
ii) Repeat b(i) for the other values of length L (cm) of the pendulum. Complete the table. (6 marks)

Length L (cm)	100	80	60	40		20
Time t(s) for 10 oscillations						
Periodic time T (s)						
T^2 (S^2)						
Log T^2 (S^2)						
Log L (m)						

I. i) Plot a graph of log L (m) against Log T^2 (S^2) on the grid provided. (5 marks)
ii. Determine the slope of the graph. (2 marks)
iii. Given that the relationship between L and T^2 is given by

$$\log L = \log T^2 - \log\left[\frac{39.44}{g}\right]$$

Where g is a constant. Use the graph to determine the value of g. (3 marks)

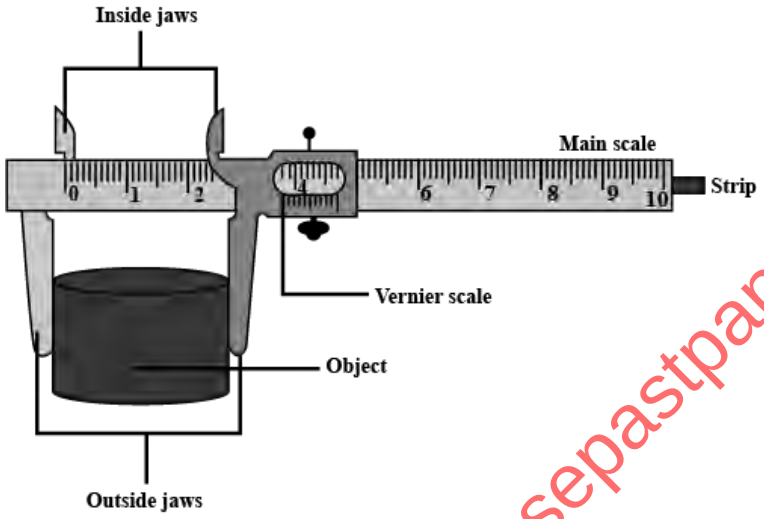
CHOGORIA - MURUGI JOINT EXAMINATION
232/1
PHYSICS
PAPER 1
Time: 2 Hours

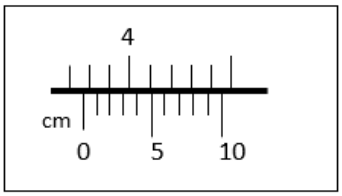
Instructions to candidates

- *Answer **all** the questions in the two sections.*
- *All working **must** be clearly shown.*
- *Electronic calculators, mathematical tables may be used.*
- *All numerical answers **should be expressed** in the **decimal** notations.*
- *You may use 'g' as 10m/s^2*

SECTION A (25 MARKS)

1. Figure 1, shows a Vernier caliper of zero error 0.02 cm being used for measuring the diameter of a cylindrical container of height 10 cm. The scale reading of the Vernier is as shown alongside.

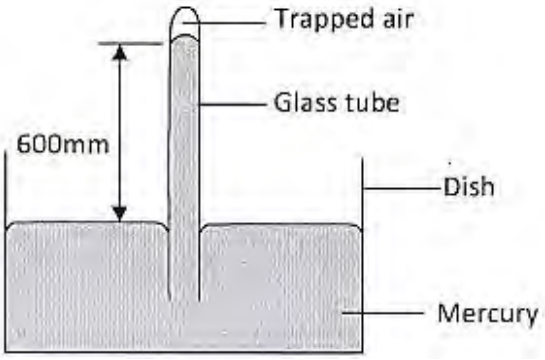




a. Determine the diameter of the container (2 marks)
b. Estimate the volume of a liquid which can completely fill the container (2 marks)

2. State **one** factor that affects the turning effect of a force on a body. (1 mark)

3. **Figure 2** shows some air trapped by mercury in a glass tube. The tube is inverted in a dish containing mercury.



Given that the atmospheric pressure is 760 mmHg and the height of mercury column in the tube is 600 mm, determine the pressure of the air trapped in the tube in mmHg. (2 marks)

4. Figure 3 shows drops of mercury and water on a glass surface, Explain the difference in the shapes of the drops. (2marks)

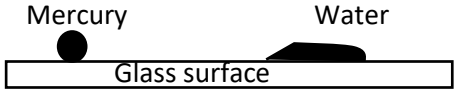


Figure 1

5. A ball is thrown from the top of a cliff 20m high with a horizontal velocity of 10ms^{-1}. Calculate the distance from the foot of the cliff to where the ball strikes the ground. (3 marks)

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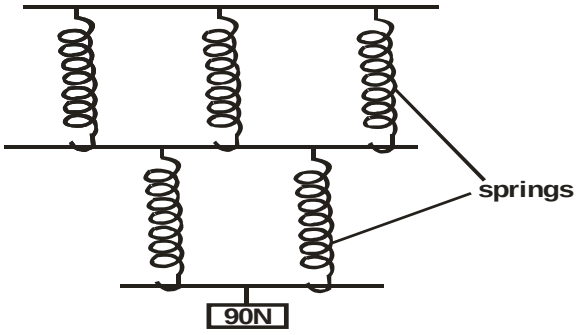
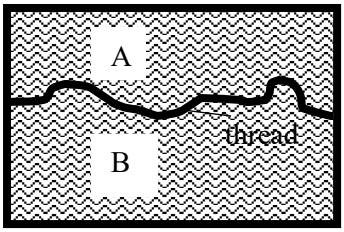
6. Explain one advantage of mercury over alcohol as a thermometric liquid. (1mark)
7. A body of mass **M** is allowed to slide down an inclined plane. State **two** factors that affect its final velocity at the bottom of the inclined plane. (2marks)
8. A stopwatch reads 08:10:84 and 09:10: 90 before and after an experiment respectively. Determine the duration of the event in SI units. (2marks)
9. Explain the meaning of thermodynamics as a branch of physics. (1 mark)
10.
a. State the Hooke's Law. (1mark)
b. **Figure 4** shows identical spiral springs supporting a load of 90N. Each spring has a spring constant k = 200N/m



Determine the total extension of the system (take the weight of the cross bars and springs to be negligible) (2 marks)

11. **Figure 5** shows a rectangular loop with a thin thread loosely tied and dipped into a soap solution.



Draw on the space provided what is observed when point **A** is punctured. (1mark)

12. Two horizontal strings are attached to a block, resting on a frictionless surface, as shown in figure 6.

A force of 100N pulls on one string. The block does not move. Find the value of the force, F on the other string. (1 mark)

13. A wooden bench feels neither warm nor cold when touched by your bare hands. Explain this observation. (2 marks)

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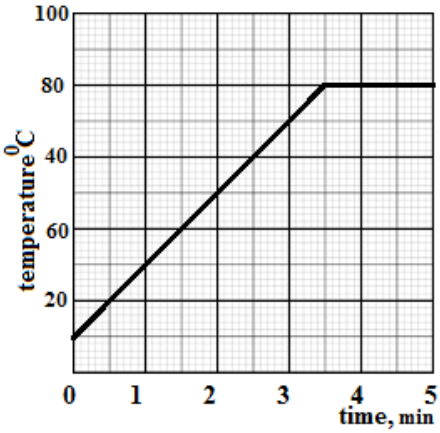
SECTION B (55 MARKS)

14. (a) State the principle of conservation of linear momentum. (1 mark)
(b) Distinguish between elastic and inelastic collision. (1 mark)
(c) A striker kicks a ball of mass 200g initially at rest with a force of 78N.Given that the foot was in contact with the ball for 0.30s; determine the takeoff velocity of the ball. (3 marks)
(d) A high jumper usually lands on thick soft mattress. Explain how the mattress helps in reducing the force of impact. (2 marks)
(e) A ball is thrown horizontally from the top of a vertical tower of height 75m and strikes the ground at a point 80m from the bottom of the tower. Determine the:
(i) Time taken by the ball to hit the ground. (*Acceleration due to gravity=10m/s^2*) (3 marks)
(ii) Initial horizontal velocity of the ball. (3 marks)

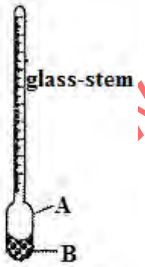
15.
a) State two factors that affect the boiling point of a liquid (2 marks)
b) 100g of a liquid at a temperature of 10^0 C is poured into a well lagged calorimeter. An electric heater rated 50W is used to heat the liquid. The graph in figure 7 shows the variation of the temperature of the liquid with time.



(i) From the graph, determine the boiling point of the liquid (1 mark)
(ii) Determine the heat given out the by the heater between the times t = 0.5 minutes and t = 5.0 minutes (3 marks)

c) From the graph determine the temperature change between the times t = 0.5 minutes and t = 5.0 minutes, hence determine the specific heat capacity of the liquid (3 marks)
d) 1.8 g of vapor was collected from above the liquid between the times t= 3.5 minutes and t= 4.5 minutes. Determine the specific latent heat of vaporization of the liquid (4 marks)

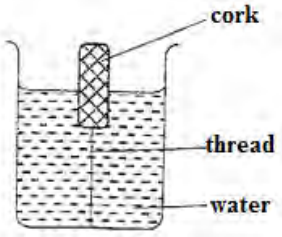
16.
a) State the law of floatation (1 mark)
b) Figure 8 below shows a simple hydrometer



A .....

B .....

Figure 2
i) Identify the parts labelled A and B (2 marks)
ii) State the purpose of the part labelled B (1 mark)
c) How would the hydrometer be made more sensitive? (1 mark)
d) Describe how the hydrometer is calibrated to measure relative density (3 marks)
e) Figure 9 shows a cork floating on water and held to the bottom of the beaker by a thin thread.



i) Name the forces acting on the cork (3 marks)
ii) Describe how each of the forces mentioned in (i) above changes when water is added until the container is completely filled (3 marks)

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17.

a) Figure 10 shows a graph of pressure against volume for a fixed mass of a gas at constant temperature.

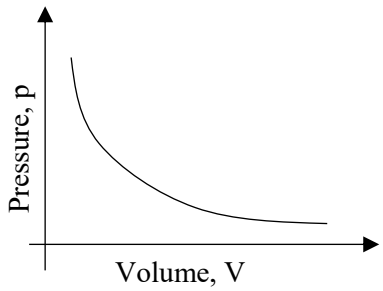

Figure 3

In the space provided, sketch a graph of pressure, p against $\frac{1}{v}$ (1 mark)

b) Explain the pressure law using the kinetic theory of matter (3 marks)

c) $20cm^3$ of a gas exerts a pressure of 760mmHg at 25^0C. Determine the temperature of the gas when the pressure increases to 900mmHg and the volume decreases to 15 cm^3. (3 marks)

18.

a) Define the term velocity ratio of a machine (1 mark)

b) The figure 11, below shows part of the hydraulic lift system. State any **one** property of the liquid under which the hydraulic system works. (1 mark)

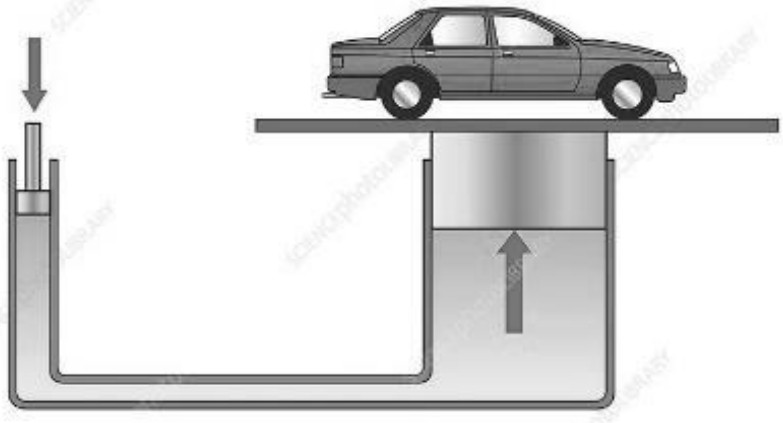

Figure 4

c) The hydraulic lift machine above has velocity ratio 45 and it overcomes a load of 4500 N when an effort of 135 N is applied. Determine:

i) The mechanical advantage of the machine (2 marks)

ii) Efficiency of the machine (3 marks)

iii) The percentage of work that goes to waste (1 mark)

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CHOGORIA-MURUGI JOINT EXAMINATION, 2023
Kenya Certificate of Secondary Education (K.C.S.E)
232/2
PHYSICS
Paper 2 (Theory)
Time: 2 Hours

Instructions to Candidates
- *Answer **all** the questions in section **A** and **B**.*
- *All working **MUST** be clearly shown .*
- *Non programmable silent electronic calculators and KNEC mathematical tables may be used except where stated otherwise.*
  Take: Speed of light in vacuum C = 3.0 x 10^8m/s
  Acceleration due to gravity g = 10N/S^2

SECTION A (25 MARKS)
Answer all the questions in the spaces provided.

1. Figure 1 below shows a ray of light incident to the first of the two mirrors placed at an angle of 60^0

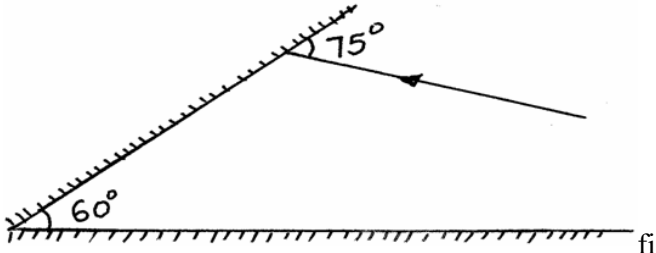

fig 1

Complete the path of the ray after reflection from the mirrors. **(1mk)**

2. Figure 2 below shows a positive charge near a plate carrying negative charge.

fig 2

Draw the electric field between them. **(2mks)**

3. Two pins are hanging from a magnet as shown in the diagram below (figure 3)

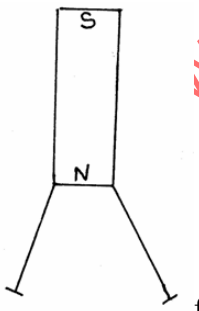

fig 3

Explain why they do not hang vertically downwards. **(2mks)**

4. Draw the diagrams to illustrate what happens when plane waves are incident on a slit.

i) When the width of the slit is large compared with the wavelengths of the waves. **(2mks)**

ii) When the width of the slit is small compared with wavelength of the waves. **(2mks)**

5. What energy conversion occurs in a photocell? **(1mk)**

6. i) Arrange the following waves in order of decreasing wavelength; infrared, X-rays, micro-waves and visible light **(1mk)**

   ii) State one application of visible light. **(1mk)**

7. State two advantages of an alkaline battery over lead acid battery. **(2mks)**

8. A girl shouts and ears an echo after 0.6 seconds later from a cliff. If velocity of sound is 330m/s, calculate the distance between her and the cliff. **(3mks)**

9. What is dispersion of light? **(1mk)**

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10. Determine the reading of an ammeter in figure 4 below **(2mks)**

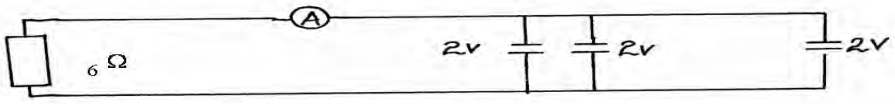


fig 4

11. A ray of light is incident on a glass oil interface as shown in figure 5 below.
Determine the value of r (Take refractive index of glass and oil as 3/2 and 6/3 respectively) **(3mks)**

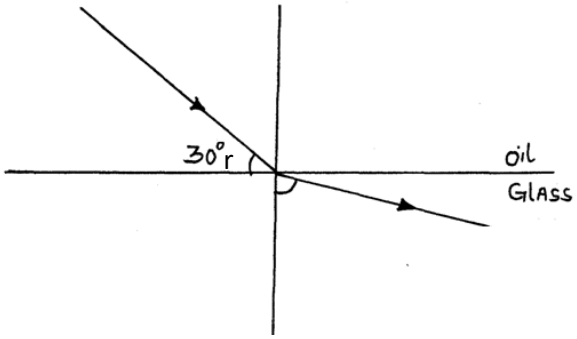


fig 5

12. State two factors that affect the capacitance of a parallel plate capacitors. **(2mks)**

SECTION B (55 MARKS)

13. (a) State Ohm's law. **(1 mk)**

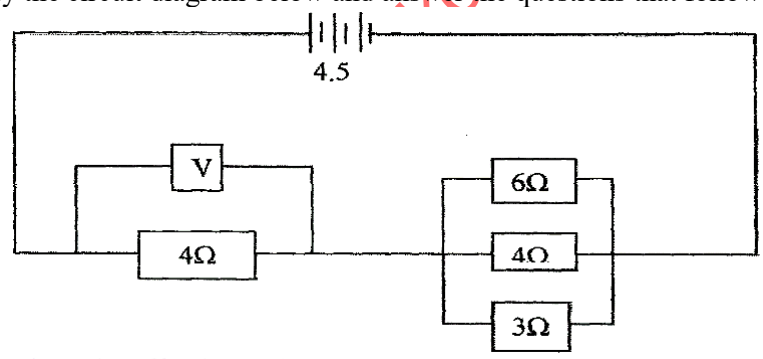
(b) You are provided with the following apparatus:

- Connecting wires
- An ammeter
- Fixed resistor
- A voltmeter
- A variable resistor
- Switch
- 2 dry cells in a cell holder

(i) In the spaces below, draw the circuit that can be used using the apparatus above to verify Ohm's Law. **(3 mks)**

(ii) Briefly explain how you can obtain the results to verify Ohm's law. **(4 mks)**

(c) Study the circuit diagram below and answer the questions that follow.



(i) Calculate the effective resistance of the circuit. **(3mks)**

(ii) Find the voltmeter reading. **(2mks)**

14. a) A Girl stands some distance from a high wall and claps her hands

i) What two measurements would need to be made in order to determine the speed of sound? **(2mks)**

ii) **Describe** how you would make use of these measurements **(3mks)**

iii) The speed of sound in air is 330m\s. How far from the wall would you stand? Choose an answer from the following distances .10m, 200m, 500m.

iv) Give reasons why you did not choose each of the other two distances **(2mks)**

v) The frequency of the sound emitted by the loud speaker is 1020Hz. **Calculate** the wavelength of the sound wave in air where its velocity is 340m\s (2mks)

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b) Figure 15 shows the set up used to demonstrate interference of sound

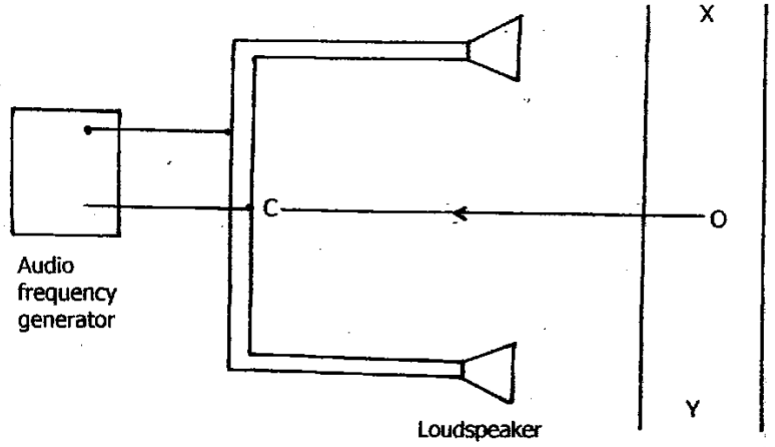


Fig 15

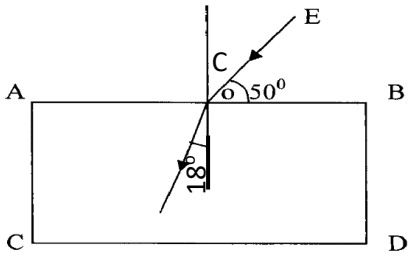
i) An observer O, moves along XY.
State the observation(s) made. (1 mark)

ii) State what would be observed if a cathode ray oscilloscope is moved along line XY. **(1 mk)**

iii) What will a student hear if he moves along the line OC? **(1 mk)**

15. a) State the conditions to be satisfied for total internal reflection to occur. **(2mks)**

b) A ray of light traveling in the direction EO in air enters a rectangular block as shown in the diagram. The resulting angle of refraction is 18°.

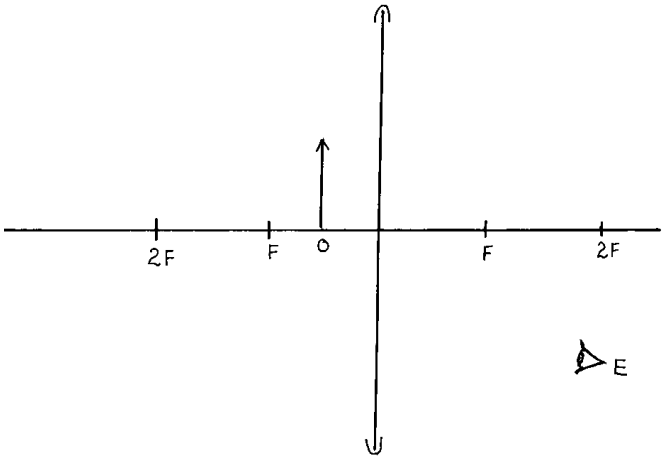


Find:

i) The refractive index of the block. **(2mks)**

ii) The critical angle C of the block. **(3mks)**

16. a) The figure below shows an object in front of lens.



i) Using rays locate the image as seen by observer, E. **(2 mks)**

ii) Give **one** application of such a lens as used above. **(1 mk)**

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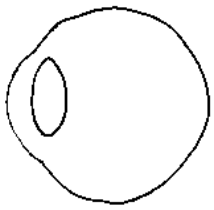
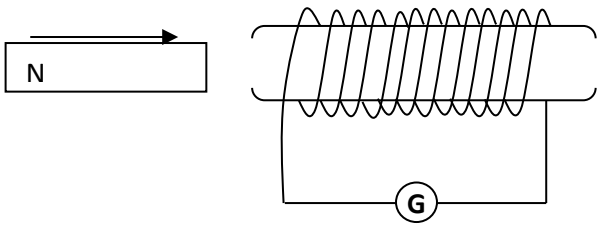
(b) Figure below shows a diagram of the human eye. Sketch a ray diagram showing how lens is used to correct long sightedness. **(2 mks)**



(c) An object of height 10.5cm stands before a diverging lens of focal length 20cm and a distance of 10cm from the lens. Determine;
(i) image distance. **(3 mks)**
(ii) height of the image. **(3mk)**
(iii) magnification. **(2 mk)**

17. (a) State the Lenz's law of electromagnetic induction. (1 mk)
(b) A bar magnet is moved into a coil of an insulated copper wire connected to a zero centre galvanometer as shown below



(i) Show on the figure above the direction of the induced current in the coil (1 mark)
(ii) State and explain what is observed on the galvanometer when the south pole of the magnet is moved into and then withdrawn from the coil. (2 marks)
(c) A transformer has 800 turns in the primary and 40 turns in the secondary winding.
The alternating voltage connected to the primary is 240V and current of 0.5.A. If 10% of the power is dissipated as heat within the transformer, determine the current in the secondary coil. (3 marks)

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CHOGORIA - MURUGI JOINT EXAMINATION, 2023
Kenya Certificate to Secondary Education
232/3
PHYSICS
PAPER 3
CONFIDENTIAL

Question 1

Each candidate to have the following apparatus

- 2 new dry cells
- Cell holder
- Ammeter (0-1A)
- Voltmeter
- 6 connecting wires (at least 3 with crocodile clips)
- Nichrome wire SWG 28 (d = 0.38mm) mounted on a mm scale with the ends labeled (A and B)
- A switch
- Micrometer screw gauge (may be shared)
- Jockey key.

Question 2

PART A

Each candidate to have the following apparatus

- Retort stand, clamp and boss
- A piece of thread (1.2 metre)
- Two small pieces of wood blocks
- Pendulum bob
- Meter rule
- Stop watch

PART B

Each candidate to have the following apparatus

- A concave mirror (Focal length = 16 cm)
- Mirror holder
- White screen
- Metre rule
- A candle

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CHOGORIA -MURUGI JOINT EXAMINATION, 2023
Kenya Certificate to Secondary Education
232/3
PHYSICS
Paper 3
Practical
TIME: 2 ½ HRS

- *Answer **all** the questions.*
- *You are supposed to spend the first 15 minutes of the 2 ½ hours allowed for this paper reading the whole paper carefully before your start.*

QUESTION ONE.

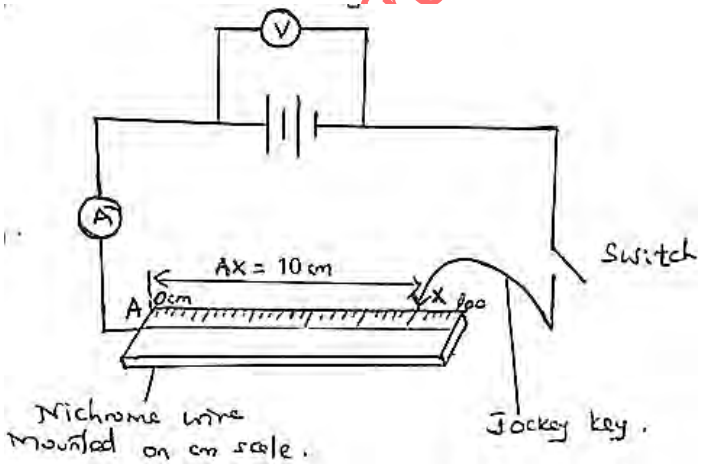
You are provided with the following;

- 2 new dry cells
- Cell holder
- Ammeter (0-1A)
- Voltmeter
- 6 connecting wires (at least 3 with crocodile clips)
- Nichrome wire mounted on millimeter scale
- Micrometer screw gauge (may be shared)
- Jockey.

Proceed as follows;

a) Using micrometer screw gauge, measure the diameter, D of the nichrome wire.
   i) D = _____ mm
   ii) D = _____ m (1mark)
   iii) The cross sectional area A is obtained by;
   $A = \pi r^2$ Where r = D/2
   Determine the cross sectional area (A) in SI units. (2marks)

b) Set up the apparatus as shown below.



c) Record the e.m.f across the terminals of the dry cells when the switch is open.
   Emf = _____

d) Adjust the position of jockey key such that length AX= 10cm.
   Close the switch and record the voltmeter and ammeter reading on the table given.

e) Repeat step d) above for the other lengths shown on the table.

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f) Complete the table. (5 marks)

Length, L AX (cm)	10	20	30	50	70	80
Voltage (V)						
Current (A)						
Resistance(V/I) (Ω)						

g) Plot a graph of resistance (Ω) against Length (cm) on the graph provided below. (5 marks)

h) i) Determine the slope of your graph. (3marks)

ii) The relationship between L and R is given by the equation; $\boldsymbol{R = \frac{\rho L}{A}}$, determine the value of ρ. (2marks)

iii) Suggest what constant ρ represents. (1mark)

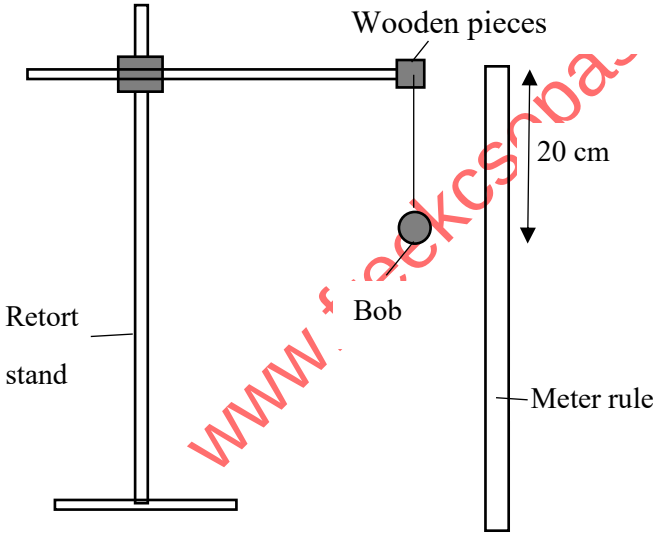
QUESTION TWO (A)

You are provided with the following apparatus;

- Retort stand, clamp and boss
- A piece of thread
- Two small pieces of wood blocks
- Pendulum bob
- Meter rule
- Stop watch

Procedure;

Tie the bob to one end ***20cm length*** of the thread and suspend it from the retort stand with the help of the wooden blocks as shown in the diagram.



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Displace the bob by a small angle say 10^0; start the stopwatch simultaneously and allow it to swing to make **ten** oscillations. Stop the clock and record the time taken in the table below.

Length L (m)	**0.20**	**0.40**	**0.60**	**0.80**
Time t for 10 oscillations (s)				
Period T (s)				
T^2 (s^2)				
$Q = \frac{4\pi^2 L}{T^2}$				

Repeat the same procedure for different lengths of thread 40cm, 60cm, 80cm and record the corresponding times t taken in the table above.

Fill in the table above by determining the various values of T, T^2 and Q as stated in the table. (8marks)

Determine the average value of quantity **Q** and state its SI units (2 marks)

Name the physical quantity represented by Q (1 mark)

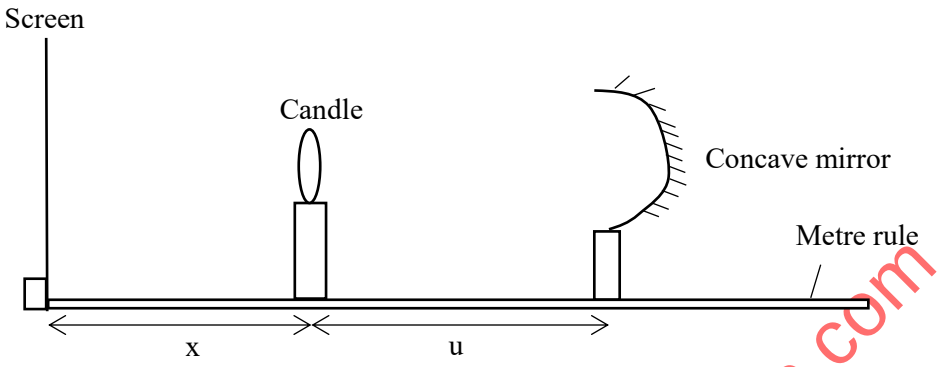
QUESTION TWO (B)

You are provided with the following apparatus.

- ✓ A concave mirror
- ✓ Mirror holder
- ✓ White screen
- ✓ Meter rule
- ✓ A candle

Procedure

i) Set the apparatus as shown in the diagram below



ii) Place a candle at a distance of x = 10 cm from the screen. Move the mirror to and fro to focus a clear, sharp image of the candle flame on the screen.

iii) Measure the distance u between the mirror and the candle and the distance v between the candle and the screen.

iv) Repeat the experiment for x = 15 cm and 20 cm. Complete the table below. (6 marks)

x (cm)	10	15	20	25
u (cm)				
$V = (u + x)$(cm)				
$Z = \frac{uv}{u+v}$ (cm)				

v) Determine the average value of Z. (2marks)

vi) What is the significance of Z? (1mark)

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FORM IV CLUSTER EVALUATION, TRIAL 2, 2023
Kenya Certificate of Secondary Education
232/1
PHYSICS
Paper 1
(Theory)
TIME: 2 HOURS

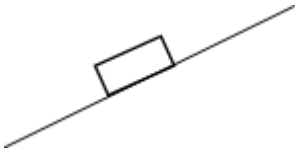
INSTRUCTIONS TO CANDIDATES

- *Answer all the questions.*
- *All working must be clearly shown.*
- *Mathematical tables and electronic calculators may be used*
- ***Take g = 10ms^{-2}***
- ***Density of mercury = 13600 kg/m^3***

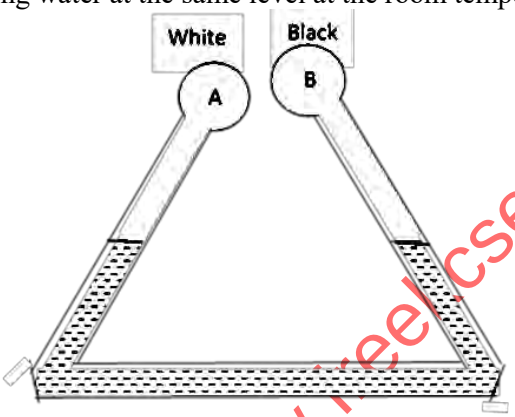
SECTION A (25 MARKS)

Answer **all** *the questions.*

1. The figure below shows a body resting on an inclined plane. Indicate the normal reaction (1 mark)



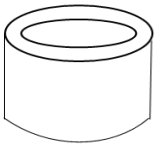
2. The figure below shows two identical bulbs A and B painted white and black respectively connected with a pipe containing water at the same level at the room temperature.

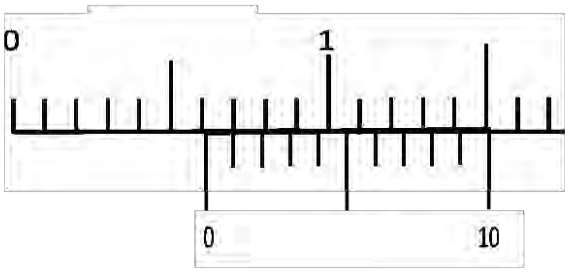


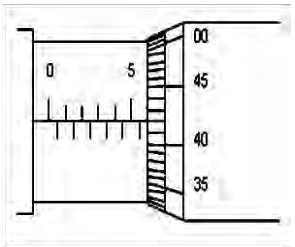
State and explain the observation made when ice cold water is poured on the bulbs (2 marks)

3. A boy blows through the mouth of a hollow vuvuzela as shown below. A light cork is suspended freely by a string as shown. Giving reason indicate the path taken by the cork (2 marks)

4. The figure below shows a hollow metal cylindrical tin. A student used a vernier caliper and a micrometer screw gauge to determine the external and internal diameter of the tin respectively. The readings of the instruments are as shown below







Determine the thickness of the metal used to make the tin in SI unit leaving your answer in standard form (3 marks)

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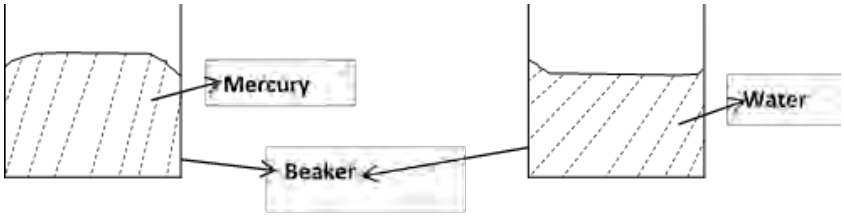
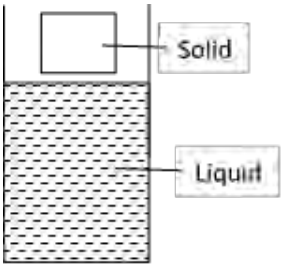
5. The figure below shows the level of mercury and water in a beaker.



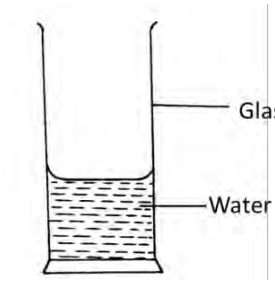
Explain the difference in the shape of the meniscus (1 mark)

6. When an inflated balloon is placed in a refrigerator, it is noted that its volume reduces.
Use kinetic theory to explain this observation (2 marks)

7. The figure below shows a solid just before being released into a liquid of the same density as the solid.
On the same diagram draw the observation made when the solid is released (1 mark)

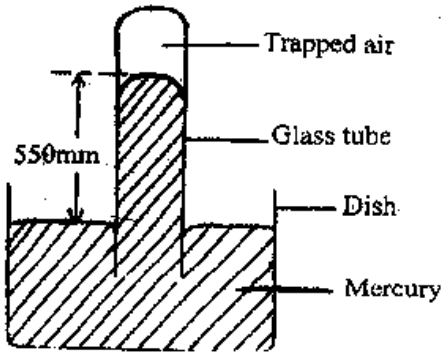


8. The figure below shows a glass tumbler partly filled with water at room temperature.



Briefly explain what happens to the stability of the tumbler when the water is heated (2 marks)

9. The figure below shows some air trapped in a glass tube, the tube is inverted in a dish containing mercury.



Given that the atmospheric pressure is 760 mmHg and the height of mercury column in the glass is 550 mm determine the pressure of the air trapped in the tube in mm Hg. (2 marks)

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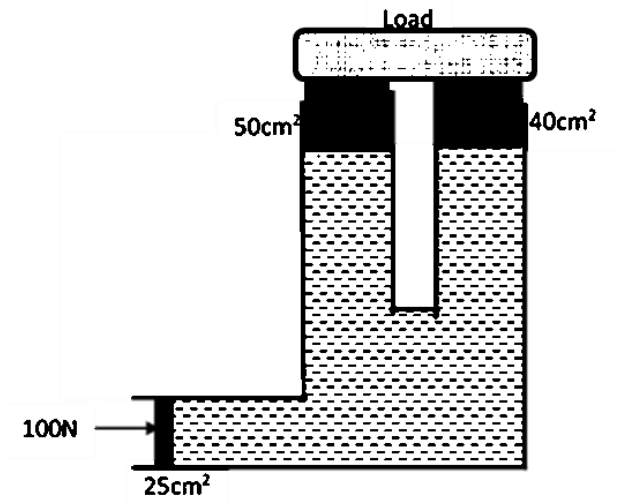
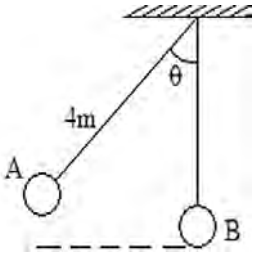
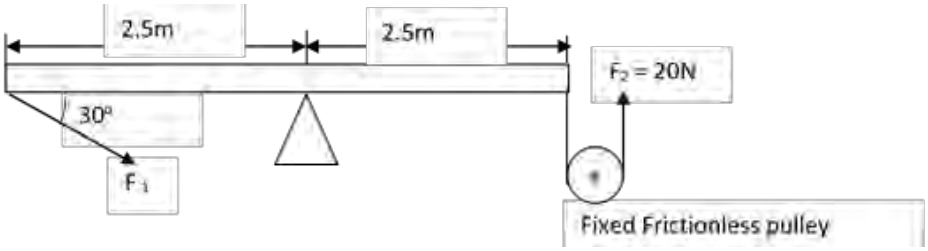
10. The figure below shows a hydraulic machine in equilibrium while supporting a load when a force of 100N is applied one of the pistons. The cross-section area of the pistons are as shown. Determine the weight of the load (3 marks)



11. A metal ball suspended vertically with a light string of length 4m is displaced through an angle θ as shown in the diagram below. The body is released from A and swings past the lowest point B. Given that its velocity at point B is 4 m/s, determine angle Θ (3 marks)



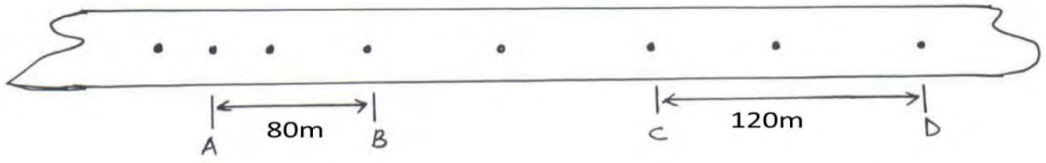
12. The figure below shows a uniform bar balanced by forces F_1 and F_2. Determine the value of F_1 (3 marks)



SECTION B (55 MARKS)

Answer ALL the questions in the spaces provided

13. (a) An object of mass 50g is dropped from a height of 80m to hit the ground below
    i) For the motion, on the same axes, sketch and label the graphs of : (3 marks)
    I. Kinetic energy against time
    II. Potential energy against time
    ii) Determine how long it takes to reach the ground (2 marks)
    iii) Determine the momentum as it hits the ground (3 marks)
    (b) Engine oil licks on the ground from a lorry as it decelerates uphill. The oil drops are shown below as black dots. The time between any two drops is constant at 2sec.



    i. On the same diagram indicate the direction of the lorry with an arrow. (1 mark)
    ii. Determine the acceleration of the deceleration of the lorry. (3 marks)

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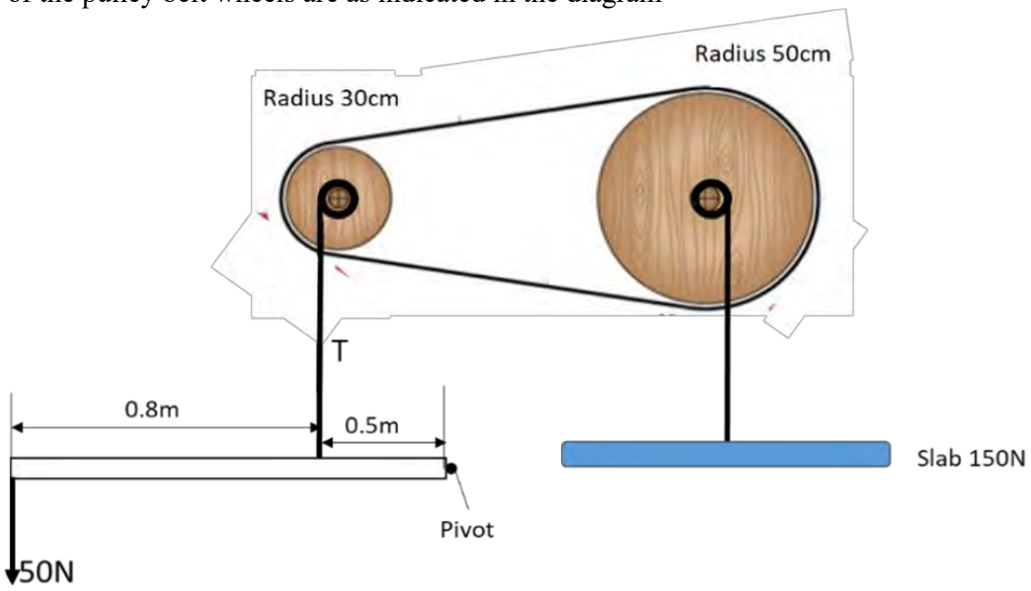
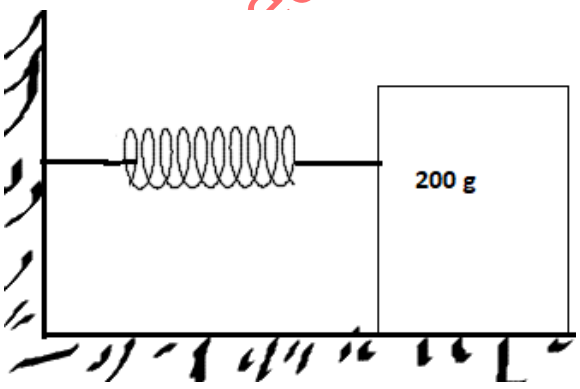
14. The figure below shows a system used to lift a septic slab of weight 150N by applying a force of 50N on a light bar as shown. The radii of the pulley belt wheels are as indicated in the diagram



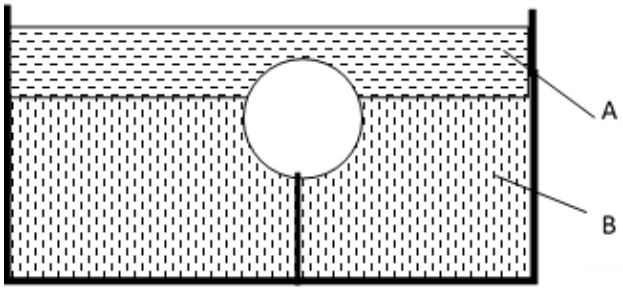
Determine

a. Tension T of the vertical string (3 marks)
b. MA of the system (2 marks)
c. VR of the system (3 marks)
d. Efficiency of the system (2 marks)

15. a) State **three** factors that affect the toughness of a spring (3 marks)
b) When a mass of 120g is applied to a spring the pointer reads 6cm. A pan, in which a mass of 210g is placed, is now suspended from the spring and the pointer reads 14cm. When the 210g mass is removed from the pan the pointer reads 4cm.
i. Draw a diagram or diagrams to represent the information above (1 mark)
ii. Determine the mass of the pan. (3 marks)
c) The figure below shows a mass 200g placed on a frictionless surface and attached to a spring. The spring is compressed and released. Given that the elastic potential energy of the compressors spring is 2.7×10^{-2}J. Determine the maximum speed with which the blocks moves after released. (3 marks)



16. The sphere below has a volume of 0.1 litres. It is held with a tight string at the base with ¼ of its volume in liquid A of density 380kg/m^3 while the rest is in Liquid B of density 700kg/m^3. The tension of the string is 0.32N.



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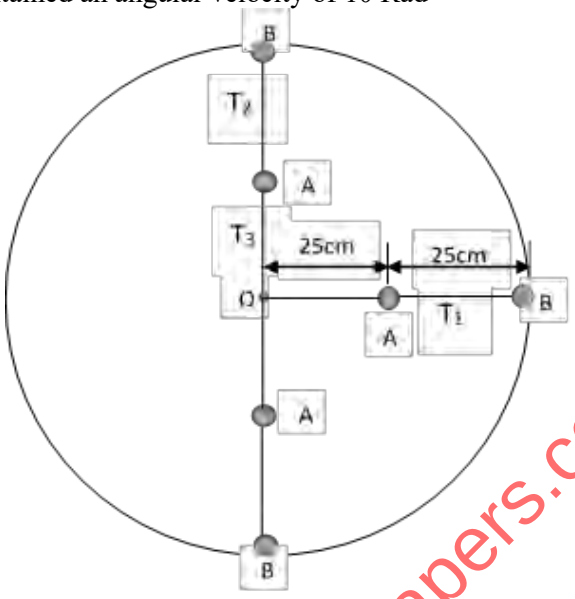
Find:

a. Mass of liquid A displaced (2 marks)
b. Mass of liquid B displaced (2 marks)
c. Upthrust experienced by the sphere (2 marks)
d. Mass of the sphere (3 marks)
e. Density of the sphere (3 marks)

17. A girl joins two 20g masses A and B on a string and whirls them in a vertical circle Centre O of radius 50cm as shown below. The bodies maintained an angular velocity of 10 Rad^{-s}



Determine:

a. The linear velocity of body A (2 marks)
b. Centripetal acceleration of Body B (2 marks)
c. The tension of the string
i. T_1 (2 marks)
ii. T_2 (2 marks)
iii. T_3 (3 marks)

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FORM IV CLUSTER EVALUATION, TRIAL 2, 2023
Kenya Certificate of Secondary Education
232/2
PHYSICS
Paper 2
TERM 2, 2023
Time: 2 Hours

SECTION A (25 MKS)

1. a) Figure 1 shows a ray of light incident on a plane mirror at point X.

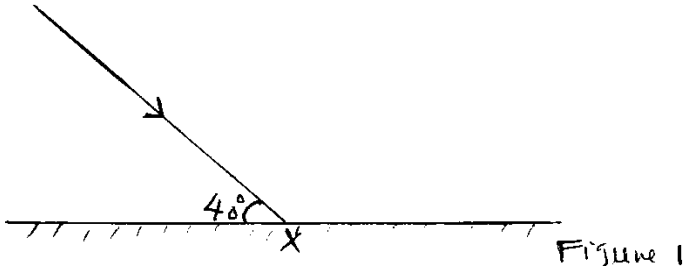
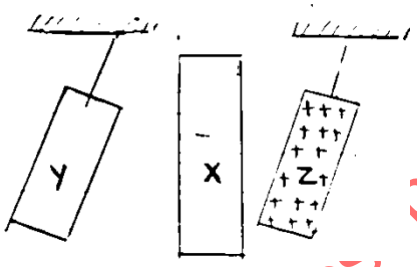


Figure 1

Complete the diagram indicating the angle of reflection. (2mks)

b) State **one** characteristic of the image formed on plane mirror, (1mk)

2. a) Figure 2 shows a stationary charged rode (X) placed between two freely suspended charged rods, Y and Z. The charge on rod Z is indicated.



Identify the type of charge on rods X and Y. (1mk)

b) State one use of a charged gold leaf electroscope. (1mk)

3. State the reason why current produced by a simple primary cell decreases rapidly when the cell is in use. (1mk)

4. a) State the reason why a freely suspended magnet always settles facing a particular direction. (1mk)

b) Figure 3 shows poles of two bar magnets placed close to one another.

Figure 3

Sketch the magnetic field pattern in the space between the poles. (1mk)

5. Figure 4 shows the cross section of a conductor carrying some current and held between magnet field.

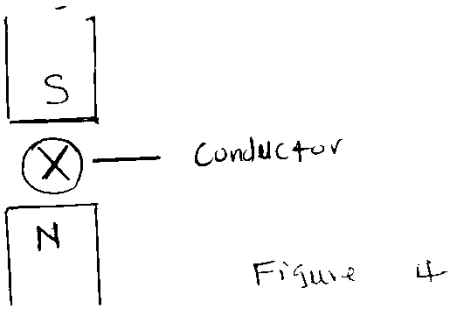


Figure 4

Indicate using an arrow on the diagram the direction the conductor moves when released. (1mk)

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6. a) What is meant by the term echo? (1mk)

b) Compare the speed of sound in air and in steel. (1mk)

c) State **one** difference between stationary wave and progressive wave. (1mk)

7. a) State one difference sound waves and radio waves. (1mk)

b) Figure 5 shows how displacement varies with distance of a certain wave. (1mk)

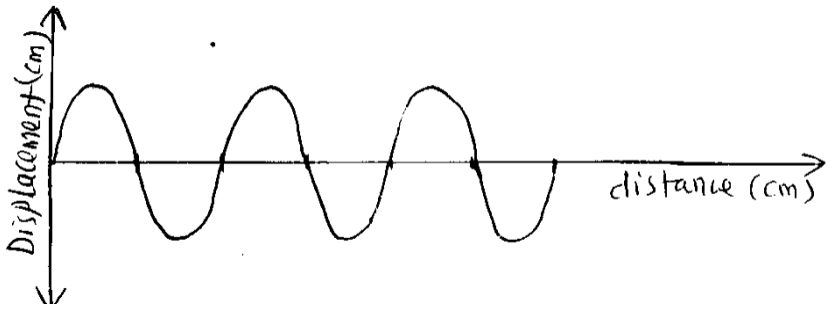


Figure 5

On the same diagram, indicate the wavelength (λ) of the wave using the symbol. (1mk)

8. a) State **one** characteristic of images formed by a concave mirror. (1mk)

b) Figure 6 shows a concave mirror of focal length 10cm and an object O, placed 15cm infront of the mirror.

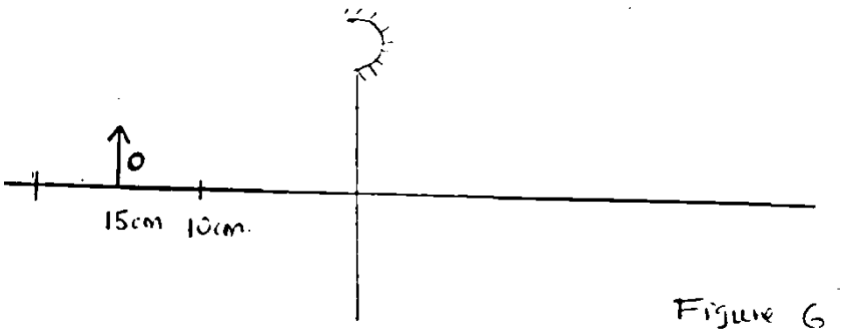
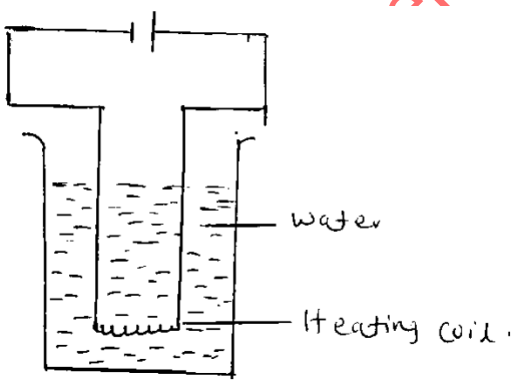


Figure 6

Using a ray diagram, complete the diagram to locate the image, I, formed. (2mks)

9. Figure 7 shows an immersion heater used to heat some water initially at 25^0C to boiling point.



State two factors that determine the time taken for the water to boil. (2mks)

10. A radioactive substance initially has a mass of 0.4g and decays to 0.05g in 75 minutes.
Determine the half-life of the substance. (2mks)

11. State one difference between X-rays and infrared waves. (1mk)

12. Figure 8 (a) and (b) shows P – n junctions, each connected to a cell and a lamp.

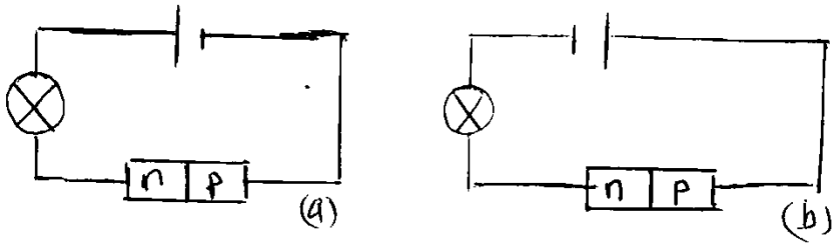


Figure 8

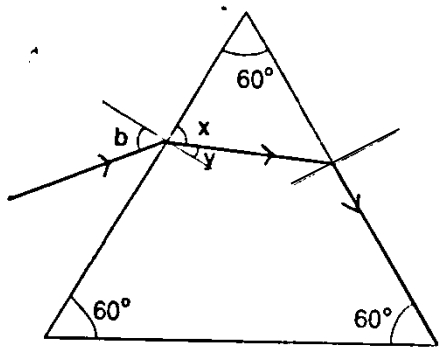
It is observed that the bulb in (a) does not light while the bulb in (b) lights.
Explain the reason for these observations. (2mks)

SECTION B (55 MARKS)

13. a) Define the term critical angle of a refracting media. (1mk)

b) One of the conditions necessary for total internal reflection to occur is that the critical angle must be exceeded. State the other condition. (1mk)

c) The figure below shows a ray of light travelling from air and through a prism made of glass of refractive index 1.7



i) On the diagram show the critical angle. (1mk)

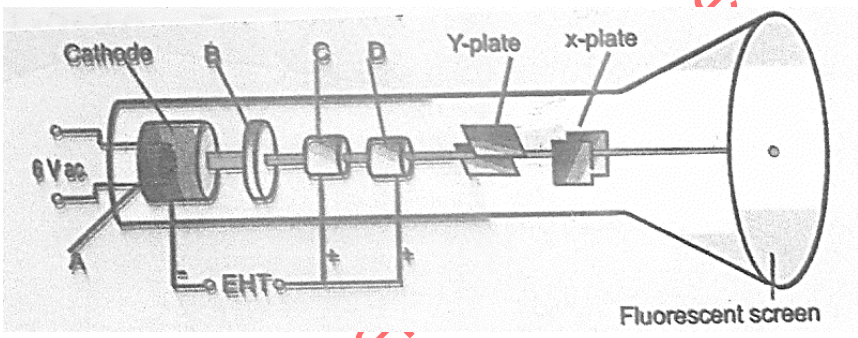
ii) Determine the

I. Critical angle (2mks)

II. Angle x and y (2mks)

14. a) Define the term **"Thermionic emission"** (1mk)

b) The figure below shows the sketch of a cathode ray Oscilloscope.



i) Label the parts marked A and C. (2mks)

ii) State the functions of the parts labeled B and D. (2mks)

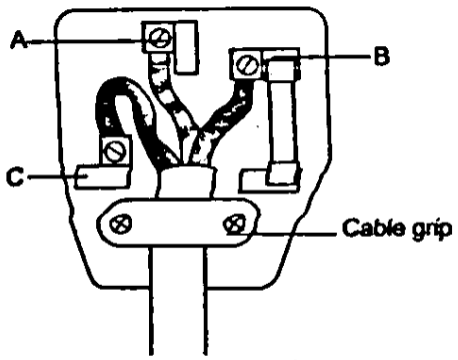
iii) Explain briefly how the C.R.T works. (2mks)

15. When a radiation of wavelength 1.8×10^{-9} m falls on a photo emissive surface, the photoelectrons can be stopped when a positive terminal of 400V is applied on the surface.
Given that the electronic charge = 1.6×10^{-19} C, mass of the electron = 9.1×10^{-31} kg,
Planck's constant = 6.62×10^{-34} Js, C = 3.0×10^{8}m/s, calculate the;

i) the work function of the surface. (2mks)

ii) the threshold frequency. (2mks)

16. The figure below shows a 3- pin plug with the wires connected.



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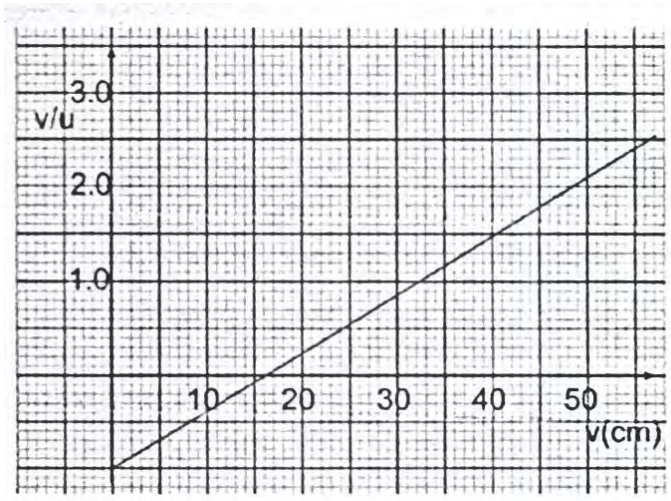
a) i) Identify the pins A, B and C and give the colour code of each. (3mks)
ii) State the pin to which a switch should be connected to. (1mk)

b) The table below shows appliances connected to the power supply system in a house. Their power rating and duration of use per day is shown.

Appliance	Rating (Watts)	Number	Duration/day (hours)
Light bulbs	18	10	4
Radio	20	4	12
TV	120	1	6
Heater	1300	1	1

Given that the cost of a KWh of power is Ksh. 22.19, calculate the cost of power for the house for 30 days. (3mks)

17. The figure below shows values of $^{v}/_{u}$ plotted against v, for a convex lens, where v = image distance and u = object distance.

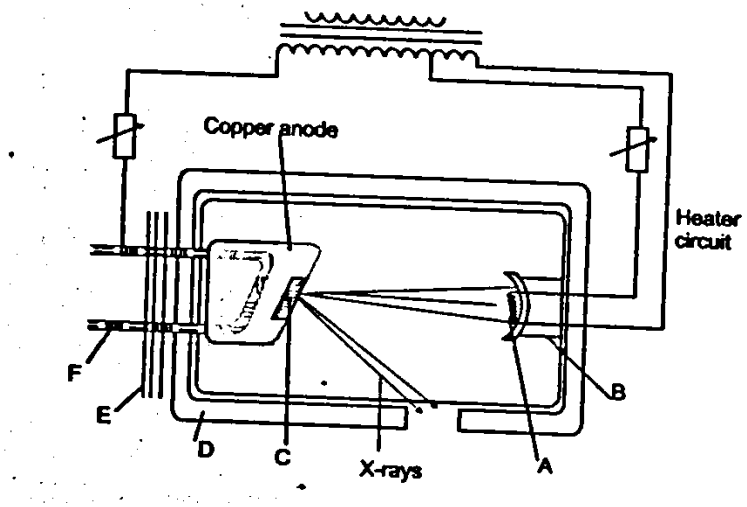


a) What quantity is represented by the values v/u plotted on the vertical axis? (2mks)
b) Determine the slope S of the graph. (1mk)
c) Determine the x-intercept of the graph. (1mk)
d) Given that

$$\frac{v}{u} = \frac{v}{k} + c$$

Determine the values of
i) k (1mk)
ii) c (1mk)

18. a) Give one difference between x-rays and cathode rays. (1mk)
b) The figure below shows a sketch of an x-ray tube.



i) Label the parts A, B and C. (3mks)
ii) State the purpose of E and F. (1mk)
iii) What physical characteristics are used to decide on the choice of C. (1mk)
b) i) State the function of the part labeled D. (1mk)

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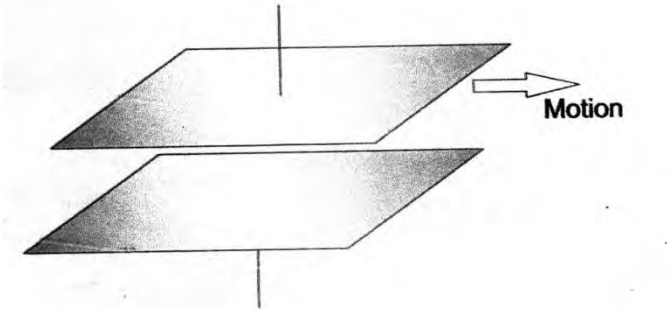
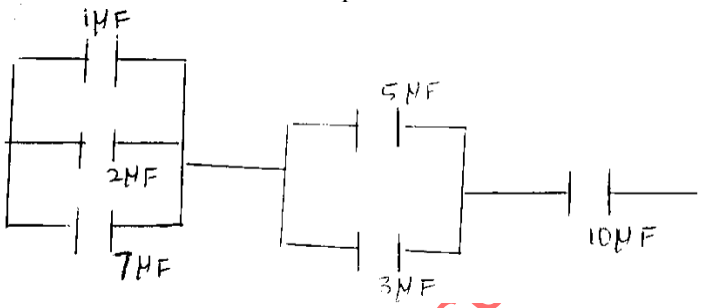
c) Electrons from a cathode ray gun are accelerated in an X-ray tube by a potential of 10kV and used to produce X-rays. Only 0.5% of the electron energy converts into X-rays.
Determine the
i) Maximum energy contained in the cathode electrons. (1mk)
ii) Wavelength of the x-rays produced. (2mks)
(Take h = 6.62 x 10^{-34}Js, C = 3.0 x 10^{8} m/s)

19. The figure below shows two capacitor plates held parallel to each other.

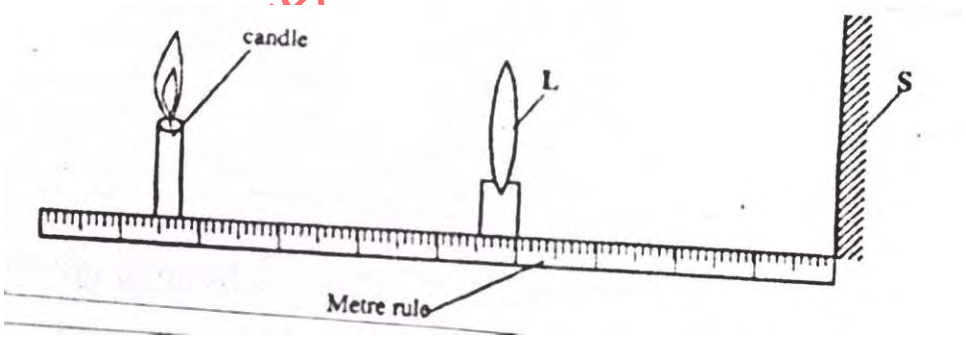


a) State and explain what happens to the capacitance of the plates if the top plate is moved as shown. (2mks)
b) Show that if three capacitors in parallel have capacitances C_1, C_2 and C_3, then the network capacitance is given as follows.
$C_N = C_1 + C_2 + C_3$ (2mks)
c) The figure below shows a network of capacitors.



Determine the network capacitance. (2mks)

20. a) The figure below shows an experimental set-up consisting of a mounted lens L, a screen S, a metre rule and a candle.



i) Describe how the set-up may be used to determine the focal length, f, of the lens. (4mks)
ii) State the reason why the set-up would not work if the lens was replaced with a diverging lens. (1mk)
b) An object placed 15cm from a convex lens is magnified two times.
Determine the focal length of the lens. (3mks)

FORM IV CLUSTER EVALUATION, TRIAL 2, 2023
Kenya Certificate of Secondary Education
232/3
PHYSICS
Paper 3
PRACTICAL

CONFIDENTIAL

Please provide the following for the physics practical paper.

QUESTION 1

- 2 dry cells
- A cell holder
- A switch
- An ammeter *(with a scale range of 0-1A)*
- Six connecting wires
- Wire mounted on the metre rule labelled X ***(SWG 28 or 0.37mm in diameter)***
- A micrometer screw gauge *(to be shared)*
- A Voltmeter

QUESTION 2

- a metre rule
- knife edge raised at least 20 cm above bench
- one 50 g mass and one 100 g mass
- a beaker or any container
- 2 pieces of thread *(around 15 cm each)*
- some water in a beaker
- Liquid L in a beaker *(Paraffin)*
- Some tissue paper.
- A triangular **glass** prism
- A piece of soft board
- Four optical pins
- Four office pins
- A sheet of plain paper

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FORM IV CLUSTER EVALUATION, TRIAL 2, 2023
Kenya Certificate of Secondary Education
232/3
PHYSICS
Paper 3
(PRACTICAL)
Time: *2¼ Hours*

Instructions to candidates:

- *You are supposed to spend the first **15** minutes of the **2½** hours allowed for this paper reading the whole paper carefully before commencing your work.*
- *Marks are given for a clear record of the observation actually made, their suitability, accuracy and the use made of them.*
- *Candidates are advised to record their observations as soon as they are made*
- *Non-programmable silent electronic calculators **may be** used.*

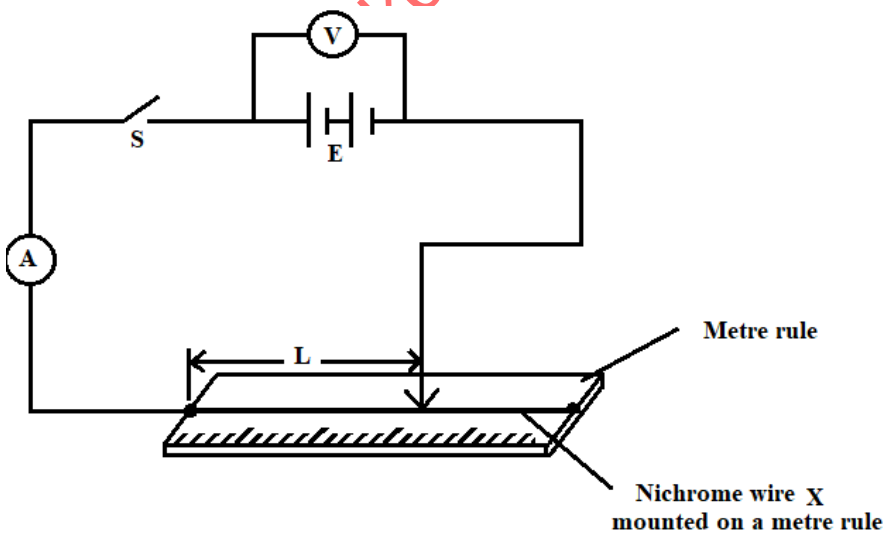
QUESTION 1

You are provided with the following:

- 2 dry cells
- A cell holder
- A switch
- An ammeter
- Five connecting wires
- Wire mounted on the metre rule labelled x
- A micrometer screw gauge [to be shared
- A Voltmeter

Proceed as follows

(a) Measure the diameter of the wire three times and determine the average diameter,
(b) D ……. m (2 marks)
(c) Determine the cross-section area of the wire, A……. m^2 (1 mark)
(d) Connect the circuit as shown in the figure below.



(e) **Measure** the voltage E from the Voltmeter, before closing the switch.
E = ... (1 mark)
(f) Adjust the length, ℓ of the wire to 0.2m, close the switch, S and read the value of current and record in the table below.

Length, ℓ (m)	0.2	0.3	0.4	0.5	0.6	0.7
Current, I (A)						
$\frac{1}{I}$ (A^{-1})						

(g) Repeat the procedure in (c) above for the values of lengths given. (5 marks)

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(h) **Calculate** the value of $^1/_I$ and record in the table above. (1 mark)

(i) On the grid provided **plot** a graph of $\frac{1}{I}$ (y- axis) against l (5 marks)

(j) **Determine** the gradient of the graph. (2 marks)

(k) Given that, $\frac{1}{I} = \frac{\delta}{EA} l + \frac{r}{E}$, determine the value of δ *and* r. (3 marks)

QUESTION 2

You are provided with the following:

- a metre rule
- knife edge raised 20 cm above bench
- one 50 g mass and one 100 g mass
- a beaker or any container
- some thread
- some water in a beaker
- Liquid L in a beaker
- tissue paper
- A triangular glass prism
- A piece of soft board
- Four optical pins
- Four office pins
- A sheet of plain paper

PART A

Proceed as follows:

(a) Balance the metre rule edge and record the reading at this point

Balance point = ... cm (1 mark)

For the rest of this experiment the knife edge must be placed at this position

(b) Set up the apparatus as shown in the figure below.

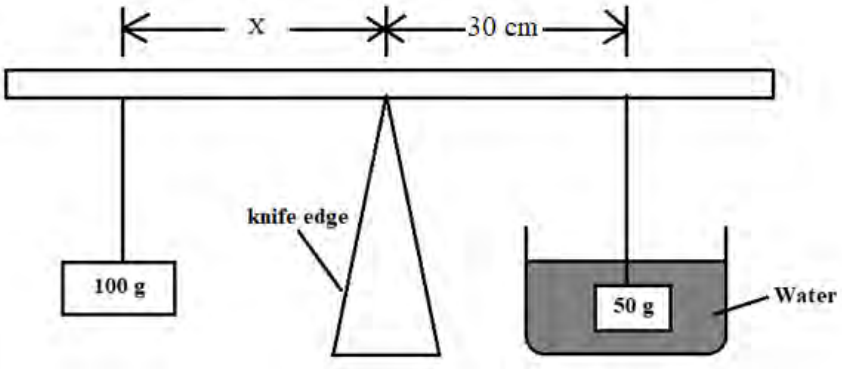
Use the thread provided to hang the masses such that the positions of support can be adjusted. The balance is attained by adjusting the position of the 100g mass.

Note that the distances X is measured form the knife edge and the 50g mass is fully submerged in the water.

(c) Record the value of X .

$X =$ cm ..... (1 mark)

(d) Apply the principle of moments to determine the weight W_w of the 50 g mass in water and hence determine the up thrust U_w in water



W_w N ..... (2 marks)

U_w N ..... (1 mark)

(e) Remove the 50 g mass from the water and dry it using tissue paper.

(f) Maintaining the distance of 30cm in step (d), now balance the metre rule when the 50 g mass is fully submerged in the liquid L Record the value of the distance X.

$X =$ cm ..... (1 mark)

(g) Apply the principle of moments to determine the weight W_L of the 50 g mass in the liquid L and hence determine the upthrust U_L in the liquid

(i) W_L= (2 mark)

(ii) U_L= (1 mark)

(iii) RD of liquid L (2 marks)

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PART B

Proceed as follows:

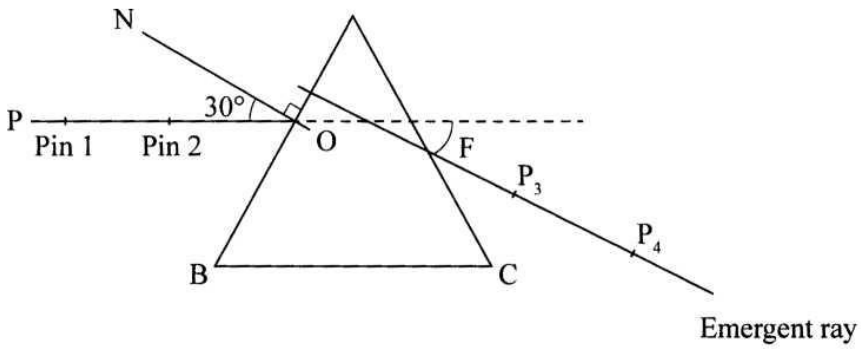
(a) Place the plain sheet of paper on the soft board and pin it using the office pins at the comers. Trace the triangular prism outline of the prism on the sheet of paper (use the upper part to leave space for two other outlines on the same page). Label the vertices of the outline at A, B and C. Remove the prism from the paper.

(b) On the outline at a point O near the centre of side AB draw a normal ON.

(c) Draw a line PO at an angle of 30° to the normal ON as shown in **the figure below.**

(d) Replace the prism accurately on the outline. Fix two optical pins vertically on line PO at different points **(see the figure below).**

(e) View the images of the two pins through side AC of the outline. Fix a third and fourth pin vertically such that they are in line with the images of the first and second pin. Remove the prism and the pins. Draw a line joining the marks made by the third and fourth pins and extend it to join line PO (also extended) as shown below.



Measure F, the angle of deviation of the emergent ray. (2 marks)

(f) Repeat part (e) for other angles of incidence shown in the table below.
(Draw a fresh outline of the prism for each angle of incidence)
Complete table 1 (3 marks)

Angle of incidence	30°	50°	70°
Angle of deviation			

(g) Determine:

(i) E the angle of emergence (between the emergent ray and the normal at the point of emergence) at the least angle of deviation. (2 marks)

(ii) K given that $K = 2\sin\left(30 + \frac{F_0}{2}\right)$ (where F_0 is the least angle of deviation) (2 marks)

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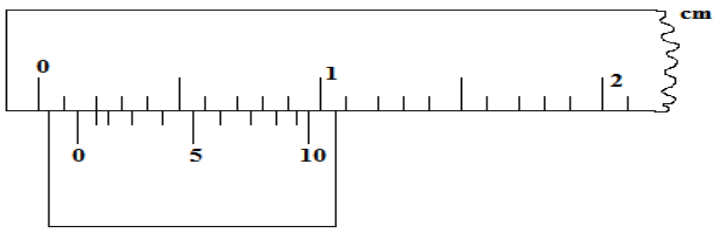
LUGARI JOINT MOCK EXAMINATION, 2023
Kenya Certificate of Secondary Education
232/1
PHYSICS
PAPER 1
TIME: 2HRS

INSTRUCTIONS TO CANDIDATES

*i) Answer **ALL** the questions in section **A** and **B.***
*ii) All working **MUST** be clearly shown.*
iii) Non programmable silent calculators may be used.
Constant: g =10N/kg or 10m/s^2

SECTION A: (25 MARKS)

1. The figure below shows part of a vernier calipers when the jaws are closed without an object in between the jaws.

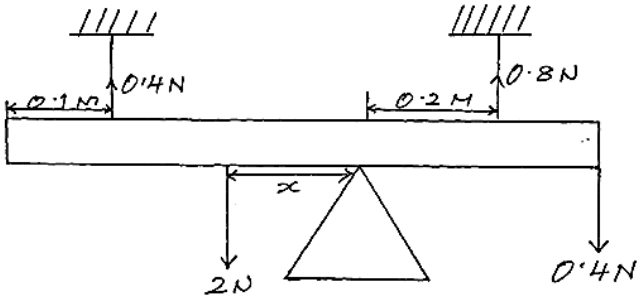


a) State the zero error of the vernier callipers. (1mark)
b) A student used the same vernier calipers to measure the diameter of a test tube of actual diameter 2.15cm. What was the reading shown by the vernier callipers? (1mark)

2. State a reason why a burn from steam at 100^0C is more severe than a burn from boiling water at the same temperature (1 mark)
3. Apart from temperature difference between the ends of a material, state any other two factors that determines rate of heat flow in a material (2marks)
4. A point in the rim of a wheel has a linear velocity of 5.6 m/s. if the rim has a radius of 40cm determine the angular velocity of the point (2marks)
5. A wooden block of mass 2kg is placed on a horizontal surface. A horizontal force of 12N is exerted on it makes it to accelerate at 5ms^{-2}. Find the coefficient of friction between the surfaces. (3marks)
6. Explain briefly how the temperature in a green house is kept higher than outside. (2 marks)
7. The figure below shows two inflated balloons hanging vertically on light threads.

State and explain the observation that will be made when a stream of air is blown in the space between the balloons. (2 marks)

8. Explain why a hole in a ship near the bottom is more dangerous than the one near the top (1mark)
9. The diagram bellow shows a uniform meter rule pivoted at its center and balanced by the forces shown. (3marks)



Determine the value of x.

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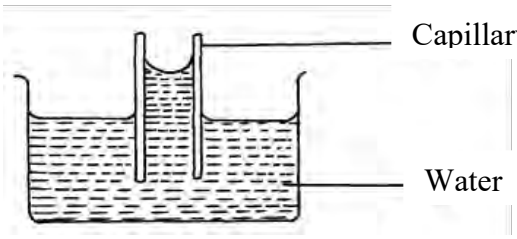
10. The figure shows a capillary tube dipped in water.

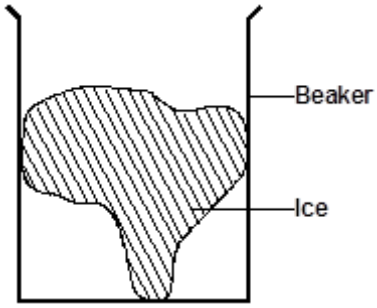


State **two** differences that will be observed when water is replaced with mercury in the set up above. (2 marks)

11. Give the transducer used to convert mechanical energy to electrical energy. (1 mark)

12. A body is uniformly accelerated from rest to a final velocity of 100m/s in 10seconds. Calculate the distance covered. (2marks)

13. The figure below shows beaker containing a block of ice.



State and explain the change in stability when the ice melts. (2marks)

SECTION B (55 MARKS)

14. a) Define the term heat capacity. (1 mark)

b) A metal block of mass 2.0kg is heated electrically. The voltmeter read 12 volts and ammeter 4.0A. The temperature of the metal block increased from 25^0C to 75^0C in 10 minutes. Assuming no heat is lost to the surrounding. Determine:

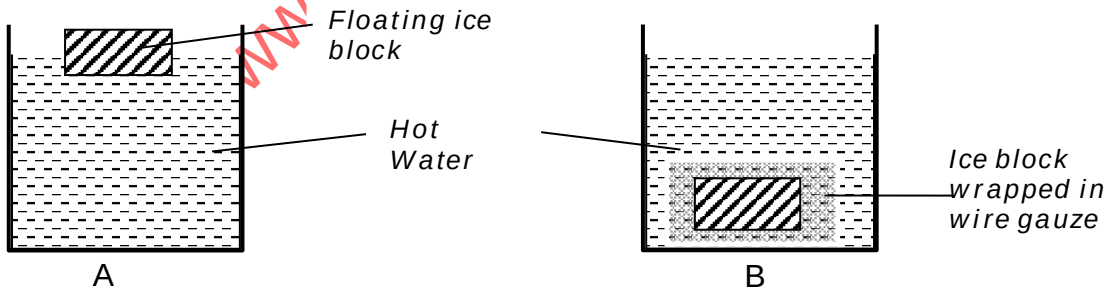
i) Heat supplied by the heater. (2marks)

ii) Heat gained by the metal cylinder (1mark)

iii) Specific heat capacity of the metal block. (2marks)

c) Explain why food cooks faster in a pressure cooker than in an open sufuria (2marks)

d) The figure below shows two identical containers A and B containing hot water and ice block.



State with reason which water cools faster assuming that the wire gauge absorbs negligible heat. (2marks)

15 a) State Newton's second law of motion in terms of in momentum. (1mark)

b) (i) A bullet of mass 20.0 g is fired with a velocity of 300m/s into a wooden block of mass 4.98 kg suspended from a long in extensible string. The bullet sticks into the wood and the two moves together. Find the velocity of the block and bullet immediately after collision took place. (2marks)

(ii) Calculate the height to which both swings upwards. (2marks)

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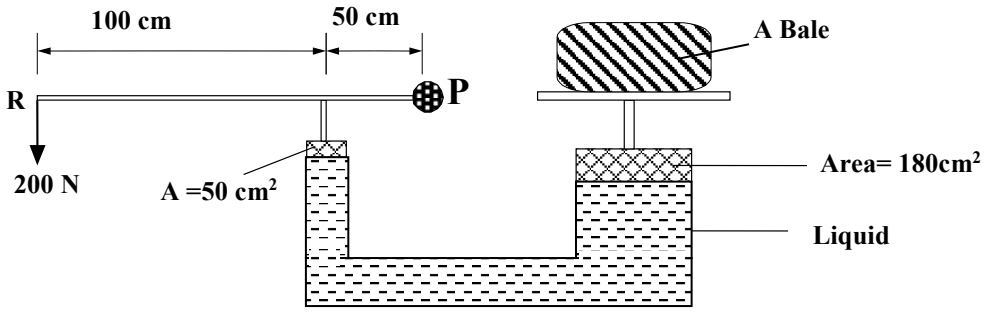
c) Figure shows a hydraulic press system using a lever of negligible mass on the side of a small piston pivoted at point **P**. A force of 200N is applied at **R**.



Calculate;

(i) The force **F** exerted by small piston on the liquid. (2marks)

(ii) The weight of the Bale supported by the large piston (2marks)

(iii) Efficiency of the system. (3marks)

16. (a) State Archimedes principle (1mark)

(b) A cylinder of length 5.0 cm and uniform cross section area 50.00 cm^2 is suspended from a spring balance and totally immersed in water. If the density of the material of the cylinder is 1.25g/cm^3 and density of water is 1g/cm^3determine:

i) The up thrust on the cylinder (2marks)

ii) Weight of the cylinder (2marks)

iii) The reading on the spring balance (2marks)

(c) (i) State the reason why lead shots are fixed at the bottom of hydrometer. (1 mark)

(ii) A hydrometer of mass 30.0 g floats in water of density 1.0g/cm^3. If the bulb of the hydrometer had a volume of $2.8x10^{-5}$ m^3 and stem has a cross – section area of 1.0 cm^2, what length of the stem would be submerged in the water. (3marks)

17. a) Define the term angular velocity. (1mark)

b) The graph below was obtained from an experiment to investigate the variation of the centripetal force, F with the radius, r of the circle on which a body rotates was performed.

From the graph, determine the angular velocity, ω of the body given that m = 100g and $\mathbf{F = m\omega^2 r + c}$ where c is a constant. (3 marks)

c) A stone of mass 40g is tied to the end of a string 50cm long and whirled in a vertical circle at 2 revolutions per second. Calculate the maximum tension in the string. (3marks)

d) A stone is thrown horizontally with a velocity of 45m/s from the top of a vertical tower 50m high. Determine:

i) The time taken by the bullet to reach the ground (2marks)

ii) The maximum horizontal distance covered by the bullet (2marks)

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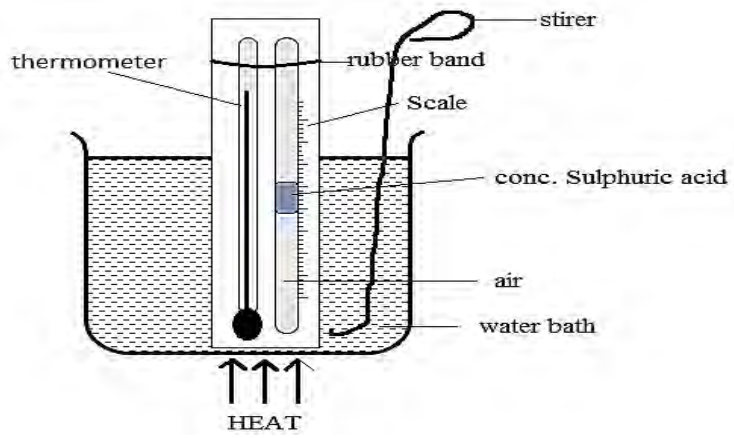
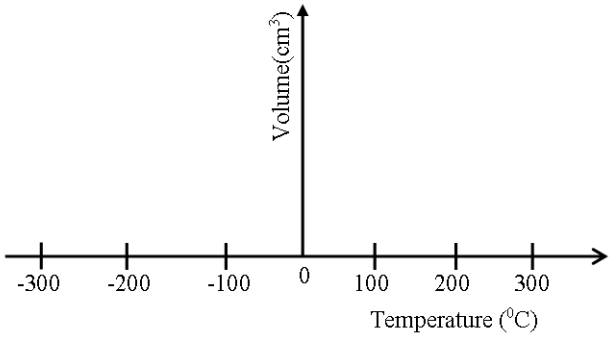
18. a) Define the absolute zero of the Kelvin temperature scale. (1 mark)

b) The diagram below shows an experiment to investigate the relationship between volume and temperature of a fixed mass of gas at constant pressure



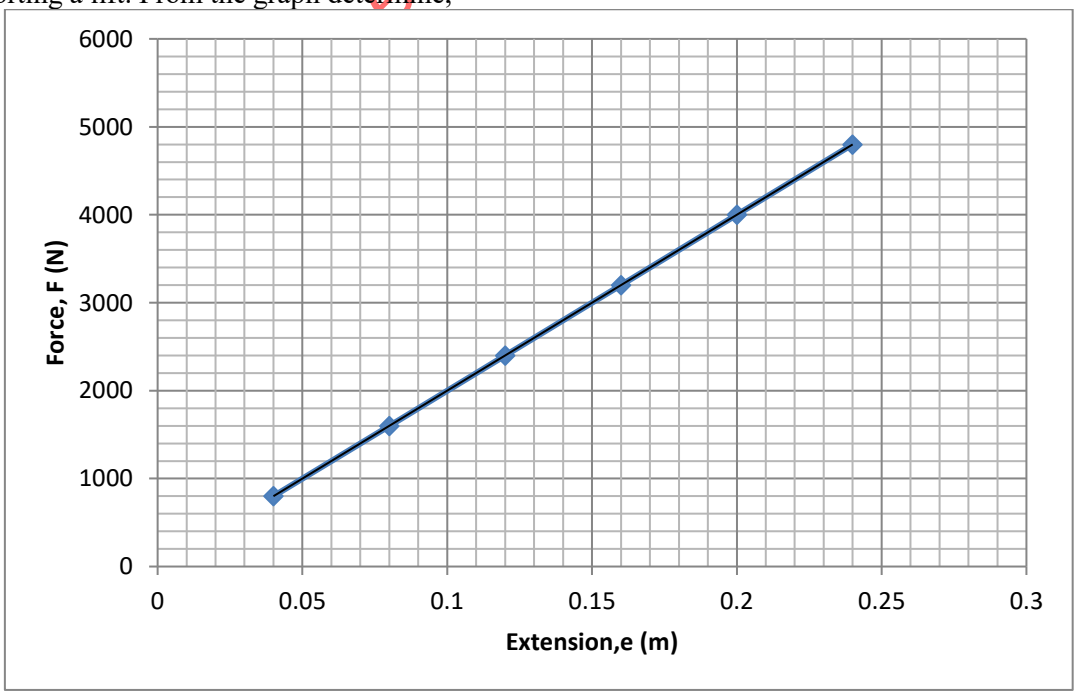
(i) While stating any measurements to be made, explain how the set up would be used to verify Charles law. (3marks)

iii) On the grid shown in the figure below sketch a graph of volume (cm^3) against temperature (^0C) for the experiment above. Clearly mark with the letter T the absolute zero temperature. (1 mark)



c) A mass of air of volume $750cm^3$ is heated at constant pressure from 10^0 C to 100^0 C. determine the final volume of the air. (2marks)

d) The figure below shows a graph of weights of persons entering a lift against the extension of four similar springs supporting a lift. From the graph determine,



(i) The spring constant of the springs (3marks)

(ii) The spring constant of a single spring (1mrk)

LUGARI JOINT MOCK EXAMINATION, 2023
Kenya Certificate of Secondary Education
232/2
PHYSICS
Theory
Paper 2
TIME: 2 HOURS

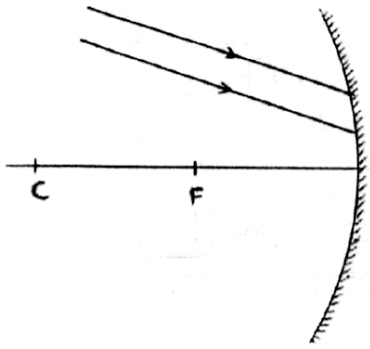
INSTRUCTIONS:

- Answer ***all*** questions in section **A** and **B.**
- All working ***must*** be clearly shown.
- Mathematical tables and electronic calculators may be used.

SECTION A (25 MARKS)

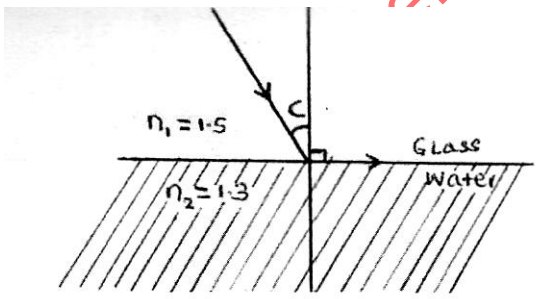
*Answer **ALL** the questions in this section.*

1. Two plane mirrors are inclined at an angle of 120° to each other such that their reflecting surfaces face each other. An object pins stands midway between the mirrors. Draw a ray diagram to show all the images (3mks)
2. State **two** conditions necessary for the occurrence of an annular eclipse (2mks)
3. The figure below shows two parallel rays incident on a concave mirror. F is the focal point of the mirror.

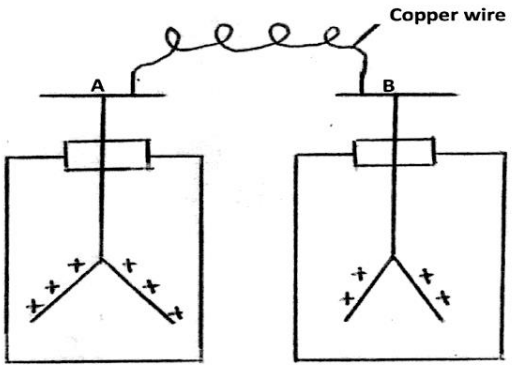


Sketch on the same diagram the path of the rays after striking the mirror. (2mks)

4. State the class of waves to which sound belongs (1mk)
5. Calculate the value of the critical angle C shown in the figure below (2mks)



6. In the diagram below, two electroscopes A and B carry same type of charges as shown. The two are then connected with a copper wire as shown



State and explain the observations (2mks)

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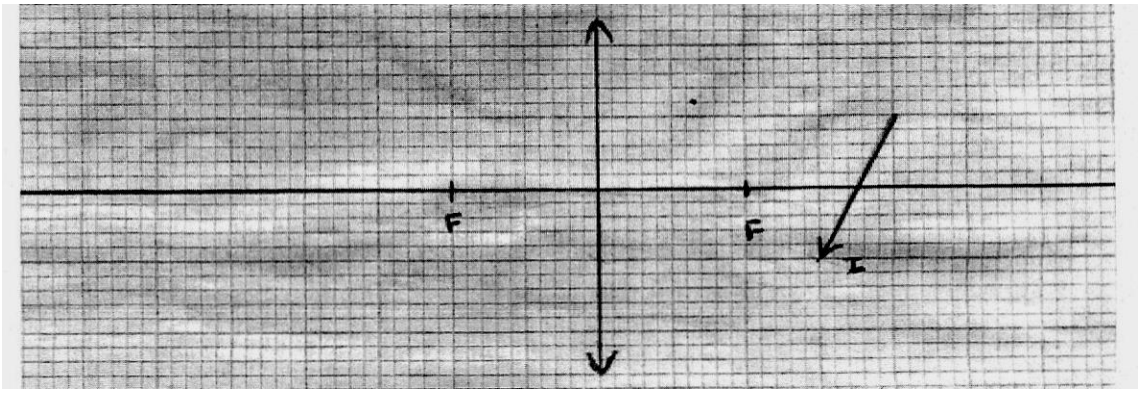
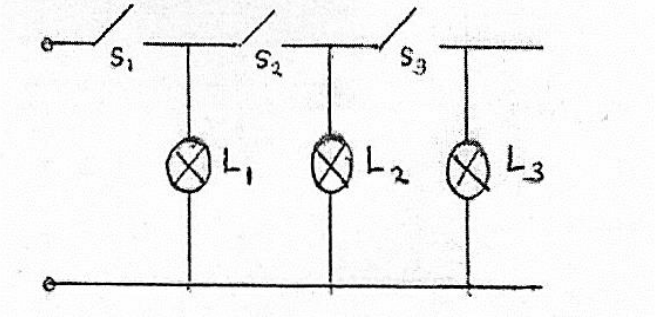
6. The figure below shows a real image I formed by a convex lens



On the same grid, construct a ray diagram to locate the position of the object (2mks)

7. State a property of electromagnetic wave on which the operation of a radar system is based (1mk)

8. The figure below shows an attempt to supply each of the three lamps L1, L2 and L3 with a switch



(i) Explain why this is a poor connection (1mk)

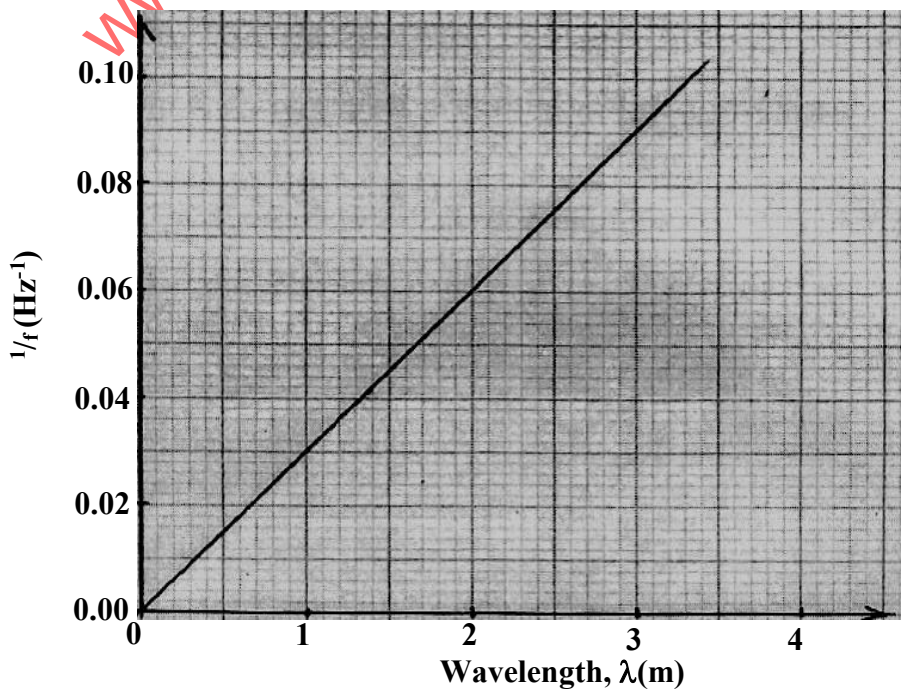
(ii) Redraw an adjacent diagram to show the best positioning for the switches (1mk)

9. State one use of x-ray in medicine and one use in industry (2mks)

10. Draw the magnetic field lines due to the configuration shown below (1mk)

11. Sketch the current –voltage characteristic of a junction diode in a forward bias mode (1mk)

12. The graph below represents values of $^1/_f$ and corresponding values of wavelength for waves transmitted in a certain medium



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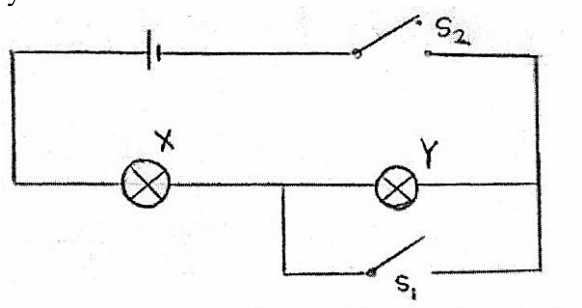
From the graph, determine the speed of the waves (3mks)

13. State one causes of power loss in long distance transmission wires and how these loses can be minimized (1mk)

SECTION B (55 MKS)

*Answer **all** questions.*

14. a) Study the circuit shown below.

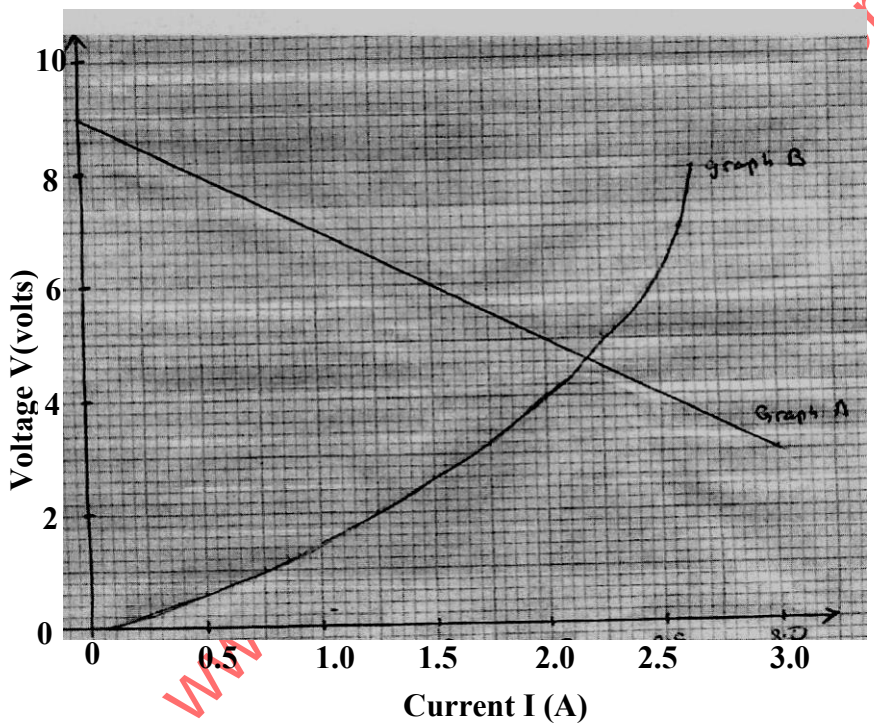


State and explain what happens to the identical lamps **X** and **Y** in the circuit shown when

(i) Switch S_2 only is closed (2mks)

(ii) Switches S_1 and S_2 are closed (2mks)

(b) Graph **A** shows how potential difference across a battery varies with the current supplied. Graph **B** shows how the current in a filament lamp varies with potential difference across it



(i) Use graph A to determine

I. e.m.f of the battery (1mk)

II. The internal resistance of the battery given V = -Ir + E (3mks)

III. Calculate the resistance of the filament lamp when current through it is 1.5A (2mks)

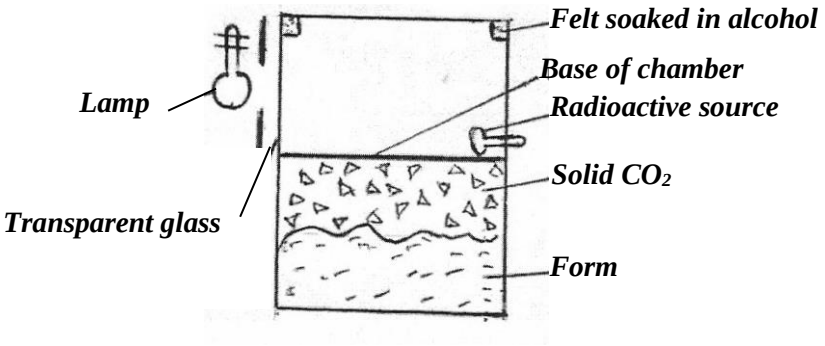
15. (a) (i) The following nuclear reaction is part of a radioactive series

$$^{210}_{82} \xrightarrow{\beta} {}^{210}_{\ \ X} \xrightarrow{r} {}^{210}_{84} \xrightarrow{s} {}^{206}_{\ \ Y}$$

I. Name the radiation represented by **r** and **s** (1mk)

II. Determine the number represented by **x** and **y** (1mk)

(ii) The figure below shows the features of diffusion cloud chamber used for detecting radiations from radioactive sources



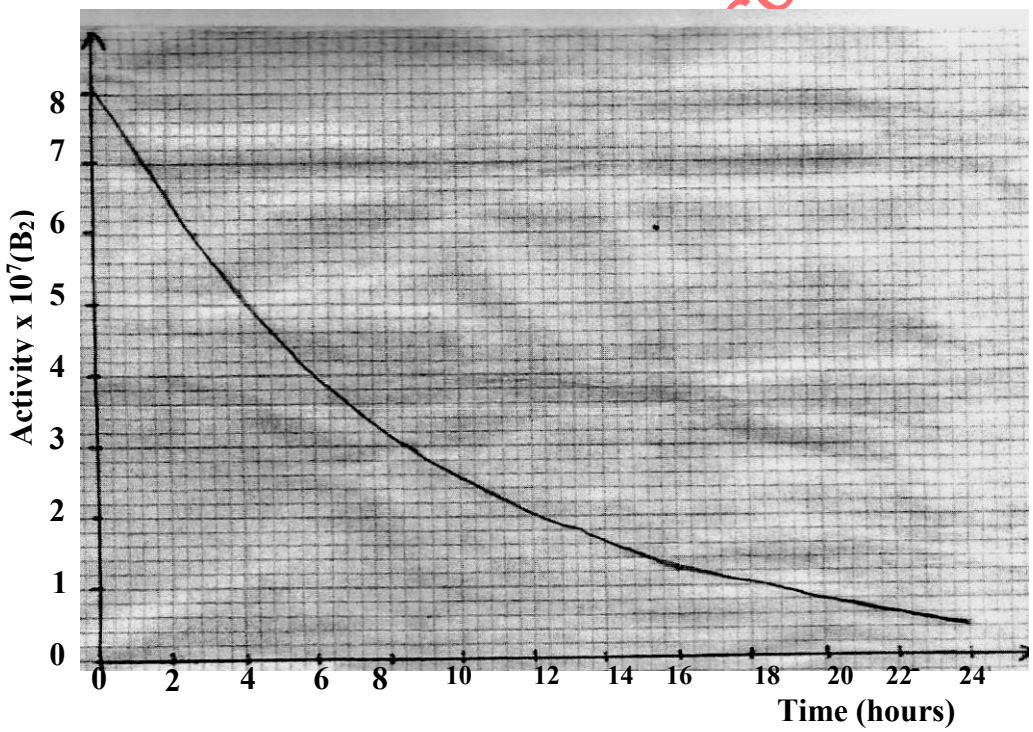
I. State the property of alcohol that makes it suitable for use in the chamber (1mk)

II. What is the purpose of the solid CO_2? (1mk)

III. Explain how the radiation from the radioactive source is detected in the chamber. (2mks)

IV. State one advantage of the cold chamber over a charged gold leaf electroscope when used as detectors of radiation (1mk)

(b) The graph below shows how the activity of a sample of the radioisotope technetium which is used extensively in medicine, varies with time.

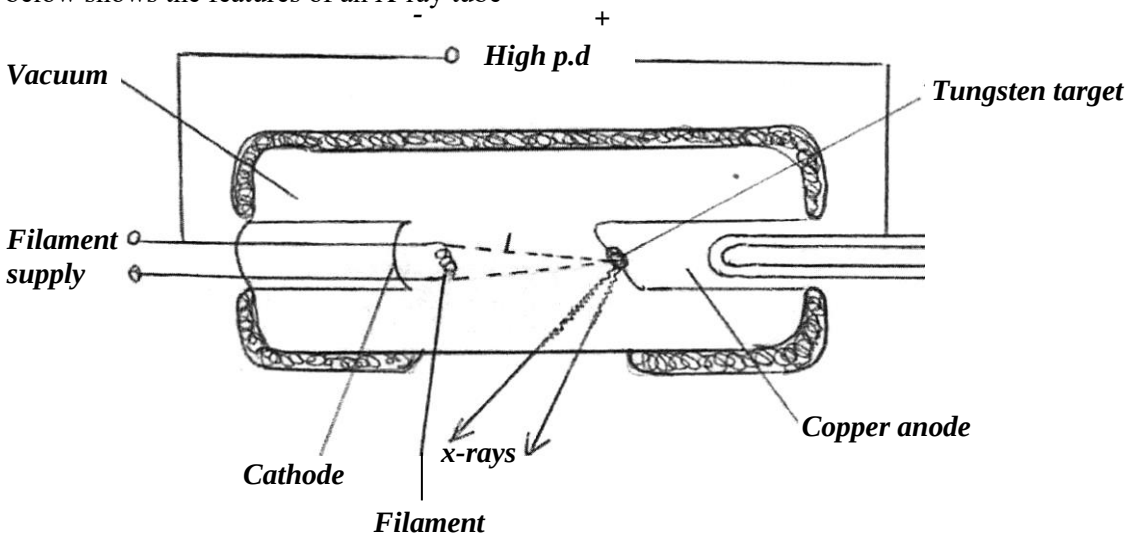


I. Use the graph to determine the half-life, T ½ of technetium (1mk)

II. Hence calculate the decay constant for technetium given that $T_{\frac{1}{2}} = \frac{0.6931}{\lambda}$ where λ is the decay constant. (1mk)

III. Determine the number of technetium atoms remaining in the sample after 24 hours (1mk)

16. The figure below shows the features of an X-ray tube



(a) (i) What is the purpose of the oil going in and out of the anode (1mk)

(ii) State with reason the property of tungsten that makes it suitable as a target (1mk)

(b) An X-ray tube operates with a potential difference of 100kv and filament current is 20mA. Calculate;

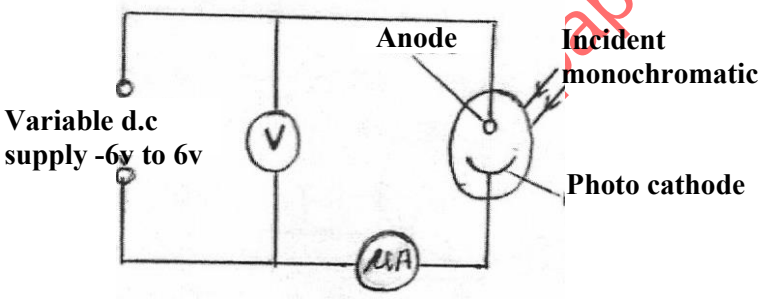
I. The power transferred to the target of X-ray tube (2mks)

II. The number of electrons hitting the target per second (2mks)

III. The maximum energy of X-ray produced

(Take charge of an electron $=1.6\times10^{-19}$C, mass of an electron $=9.1\times10^{-31}$kg, $f_{max} = 3 \times 10^{19}$ Hz) (2mks)

(c) The diagram shows monochromatic radiation falling on a photocell connected to a circuit



The incident radiation has a wavelength of 2.15×10^{-7}m. The metal surface of the photocell has a work function of 2.26 eV

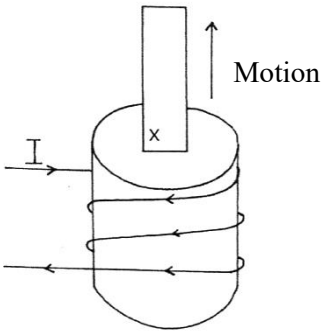
I. Calculate the energy in eV of a proton of the incident radiation *(Take speed of light $C=3.0\times10^{8}ms^{-1}$, Planck's constant, $h=6.63\times10^{-34}JS$ and electronic charge, $e=1.6\times10^{-19}C$)* (3mks)

II. What is the maximum kinetic energy of the emitted electrons (2mks)

III. Write down the value of the stopping potential (1mk)

17. (a) State Lenz's law of electro-magnetic induction (1mk)

(b) In the figure below, the bar magnet is moved out of the coil



(i) If the current, I is induced in the coil in the direction shown, what is the polarity of x of the magnet? (1mk)

(ii) Explain briefly the source of electrical energy in the circuit (1mk)

(c) A hydro-electric power station produces 500KW at a voltage of 10KV. The voltage is then stepped up to 150KV and the power is transmitted through cables of resistance 200Ω to a step-down transformer in a sub-station. Assuming that both transformers are 100% efficient. Calculate;

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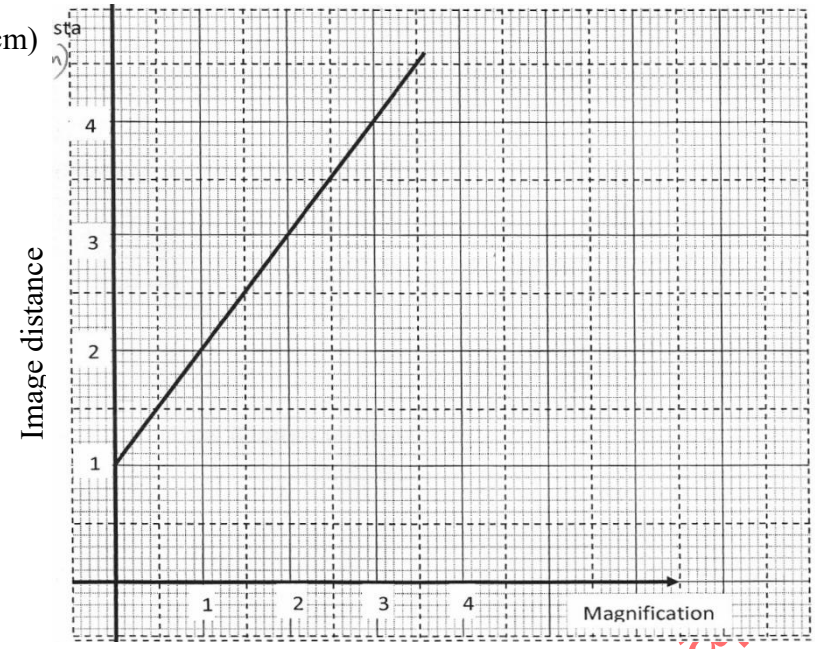
(i) The current produced by the generator (2mks)
(ii) The current that flows through the transmission cables (2mks)
(iii) The voltage drop across the transmission cables (2mks)
(iv) The power loss during transmission (2mks)
(v) The power that reaches the sub-station (2mks)

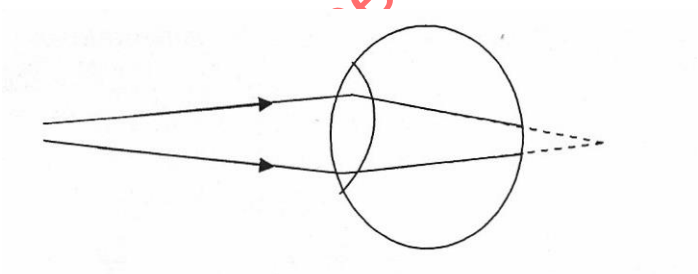
18. (a) The following graph shows the variation of image distance, v, with magnification, for a converging lens.



Using the graph and the equation $\frac{v}{f} = M + 1$ determine:

(i) The object position when the image position is 45 cm (2mks)
(ii) The focal length of the lens (2mks)
(iii) The power of the lens (2mks)

(b) The following figure shows an eye defect



Name the defect and illustrate on the same diagram how the defect could be corrected. (2mks)

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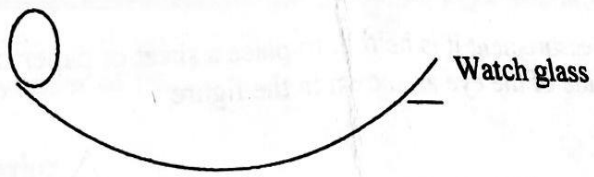
LUGARI JOINT MOCK EXAMINATION
Kenya Certificate of Secondary Education 2023
232/3
PHYSICS
PAPER 3

Answer all the questions.

i) You are provided with the following:
ii) A watch glass
iii) A small piece of plasticine
iv) A marble
v) A stop watch
vi) Vernier calipers
vii) Triangular glass prism
viii) Four optical pins
ix) Some cello tape
x) A soft board
xi) A plain sheet of paper
xii) An electronic balance (for sharing)

(i) Record the mass of the marble.
……m (1mk)



(a) Place the watch glass flat on the table with a small piece of plasticine to fix it firmly to the bench at the one place it touches. Release the marble from one end of the watch glass and time 10 complete oscillations with a stop watch. Repeat these three times.

	Time for 10 oscillation	Periodic time T(s)
1		
2		
3		

(2mks)

Find the average periodic time (2mk)

(b) Measure the diameter of the marble with vernier calipers and hence find its radius.

Diameter…… (1mk)
Radius (r) …… (1mk)

(c) Determine the volume of the marble given that V = $\frac{4}{3\pi r^3}$ (2mks)

(d) Calculate the radius of curvature of the watch glass R from the formula

R-r = $\frac{5gT^2}{7(2\pi)^2}$ (2mks)

Where g=9.8m/s^2 , π=3.142

(e) Determine the density of the marble (2mks)

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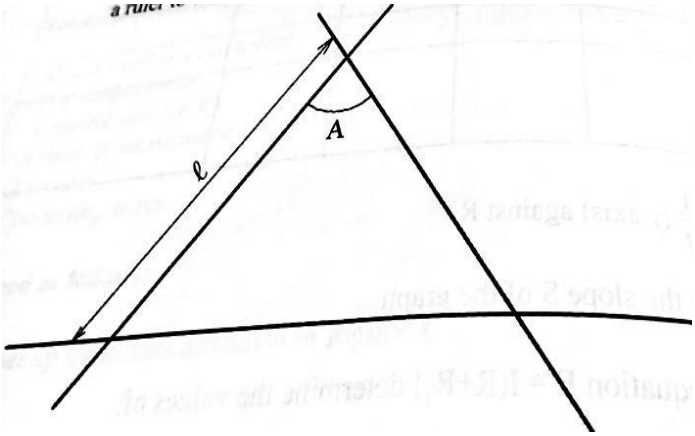
PART B

(f) Fix the plain sheet of paper on the soft board using some cello tape. Place the triangular prism on the paper and trace its outline on the sheet of paper. Remove the prism and use a ruler to extend the three side of the outline.



Measure angle A and the length l

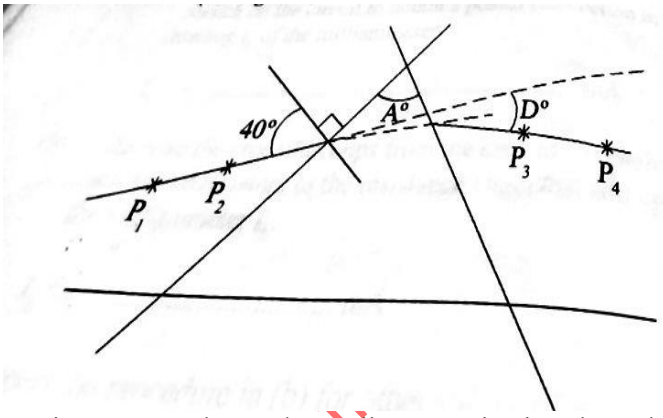
A = ... (1 mk)

l = ... (1 mk)

NB: The plain sheet of paper must be submitted together with the question paper.

(g) At a point about a third way along one side of the outline from angle A, draw a normal.

(h) Draw a line at angle i = 40^0 to the normal. Stick two pins P_1 and P_2 vertically on this line as shown below.



Place the prism accurately on the outline. By viewing through the opposite side, stick two other pins P_3 and P_4 vertically such that they are in line with the two images of pins P_1 and P_2. Measure angle D

(i) For two other values of angle I shown in the table 2 locate and measure the corresponding angles of deviation. Complete table 2 (2mks)

Table 2

I	40^0	50^0	60^0
D			

(j) Determine the average value D_m of D (1 mk)

(k) $K=\frac{Sine\frac{(A+D_m)}{2}}{sine\frac{A}{2}}$ (2 mks)

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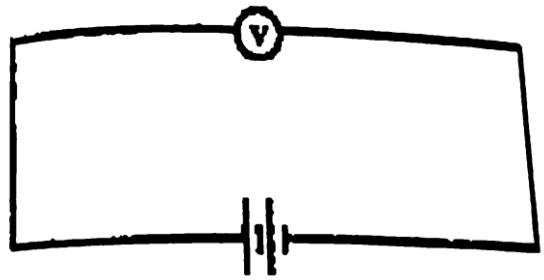
QUESTION II

You are provided with the following:

1) A wire W mounted on a mm scale
2) 2 dry cells and a cell holder
3) A voltmeter
4) Five connecting wires (some with crocodile clips)
5) A Switch

Proceed as follows:

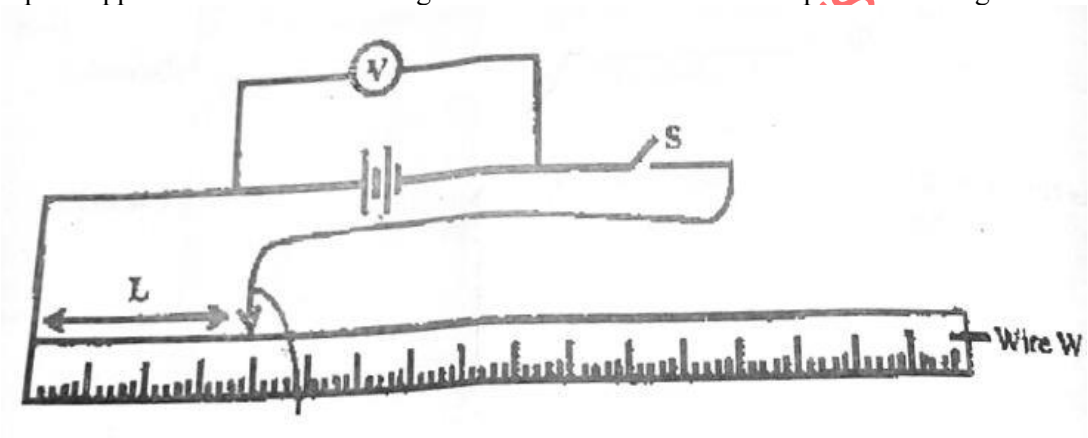
(a) Set up the apparatus as shown in the figure below:



Determine the voltmeter reading E

E =…… volts (1mk)

(b) Set up the apparatus as shown in the figure below. Use the crocodile clip to fix the length L of wire W at 10cm.



(c) Close the switch. Record the voltmeter reading (V) in the table.

(d) Adjust the length L to 20cm and repeat step (c) above. Repeat for other values L in the table. Complete the table below:

L (cm)	V(cm)	E-V (volts)	$\frac{V}{(E-V)}$
10			
20			
30			
40			
50			
60			

(e) (i) Plot a graph of $\frac{V}{(E-V)}$ against L (5mks)

(ii) Determine the slope of the graph (3mks)

(f) The equation of the graph is given by $\frac{V}{(E-V)} = K_1L + K_2$ determine the value of :

(I) K_1 (2 mks)

(II) K_2 (2 mks)

(g) Given that $4K_2r = 10$, where r is the internal resistance of the cells. Determine the value of r. (2mks)

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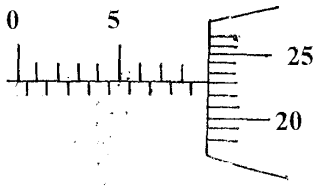
CEKENA MOCK EXAMINATIONS, 2023
Kenya Certificate of Secondary Education (K.C.S.E)
232/1
PHYSICS
PAPER 1
TIME: 2 Hours

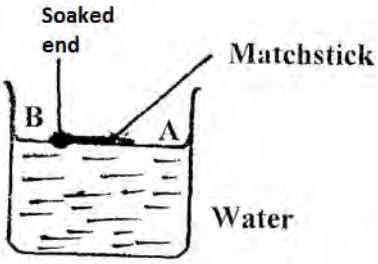
Instruction to The Candidates
*a) Answer **all** the questions in sections **A** and **B**.*
b) All working must be clearly shown.
*c) Mathematical tables and electronic calculators **may be** used.*

SECTION A (25 MARKS)

1. The figure shows the reading of micrometre screw gauge that has a zero error of -0.25mm.
What is the actual length of the object being measured (2 marks)

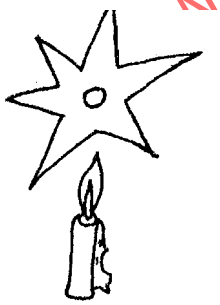


2. The figure below shows a matchstick soaped on one end and placed on the surface of clean water as shown.



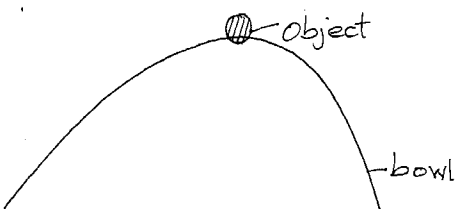
The matchstick is observed to move towards a certain direction
i) State the direction (A or B) (1mark)
ii) Explain (1mark)

3. Two liquid X and Y have density 1.25g/cm^3 and 1.5g/cm^3 respectively. Calculate to 2d.p the density of the mixture containing 40% by mass of X the rest being Y (3marks)
4. A uniform meter rule pivoted at its 15cm mark is balanced by a 200g mass suspended at the 5cm mark. Determine the weight of the meter rule (3marks)
5. A paper windmill in a horizontal axis was placed about a candle as shown in the figure.



When the candle was lit the paper windmill began to rotate. Explain this observation. (2marks)

6. An object was placed on an inverted bowl as shown.



i) State the type of stability above. (1mark)
ii) Define the type stability above. (1mark)

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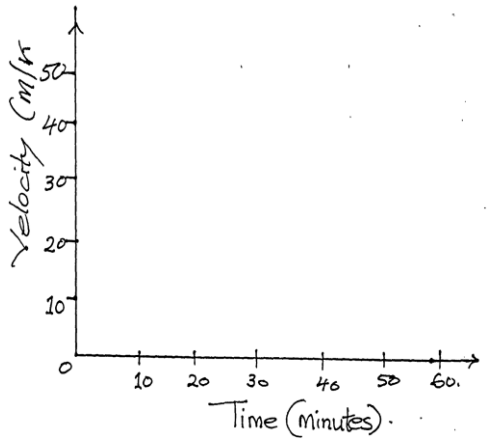
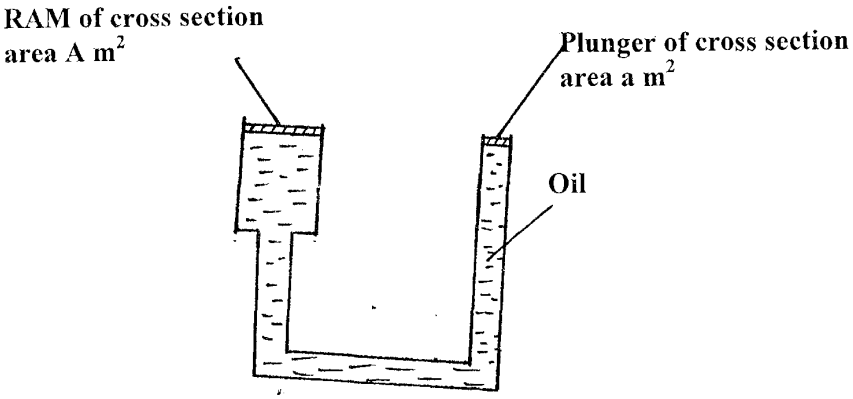
7. A pipe of diameter 12mm is connected to another pipe of radius 9mm. if water flows in the wider pipe at the speed of 2m/s what is the speed in the narrow pipe. (3marks)
8. A car starting from rest accelerates uniformly for 5minutes to reach 30m/s. It continues at this speed for the next 20minutes and then decelerates uniformly to come to stop in 10 minutes. On the axes provided sketch the graph of velocity against time for the motion of the car (1mark)



9. A diver was swimming in a swimming pool of uniform depth of 0.8m from the surface of water. If atmospheric pressure acting on the surface of water is 103000pa calculate the total pressure experienced by the diver. (Density of water = $1g/cm^3$, g= $10m/s^2$) (2marks)
10. The boiling point of water is known to be at 100°C. A student heated some water and noticed that it boiled at 101°C state two possible reasons for this observation. (2marks)
11. Explain the difference between a liquid and a gas in terms of intermolecular distance and force. (2marks)
12. State the source of energy for gases in the atmosphere. (1mark)

SECTION B 55 MARKS

13. a) Define the term velocity ratio of a machine (1mark)
    b) Figure below shows part of a hydraulic press. The plunger is the position where effort is applied while the ram piston is the position where load is applied. The plunger has a cross-section area a m^2 while the ram piston has a cross-section area Am^2.



When the plunger moves down a distance d, the ram piston moves up a distance d.

i) State the property of liquid on which the working of the hydraulic press works (1mark)
ii) Derive an expression for the velocity ratio (V.R) in terms of A and a (3marks)

c) A machine of velocity ratio 45, overcome a load of 4.5×10^3N, When an effort of 135N is applied. Determine

i) The efficiency of the machine (3marks)
ii) The percentage of work that goes to waste (1mark)

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14. a) Define specific latent heat of fusion of a substance (1mark)

b) Water of mass 200g at a temperature of 60°C is put in a well lagged copper calorimeter of mass 80g. A piece of ice at 0°C and mass 20g is placed in the calorimeter and the mixture stirred gently until all the ice melts. The final temperature T of the mixture is then recorded. (Take; specific latent of fusion of ice=334000J/kg, s.h.c of water = 4200j/kg^{-1}k^{-1}, s.h.c of copper = 900J/kg^{-1}k^{-1}

Determine:

i) The heat absorbed by the melting ice at 0°C (1mark)

ii) The heat absorbed by the melted ice (water) to rise to temperature T. (answer may be given in terms of T) (2marks)

iii) The heat lost by the warm water and the colorimeter (answer may be given in terms of T) (2marks)

iv) The final temperature of the mixture (3marks)

15. a) State Newton's second law of motion (1mark)

b) A matatu starts from rest and accelerates to cover a distance of 49m in 7seconds. Determine its acceleration. (2mks)

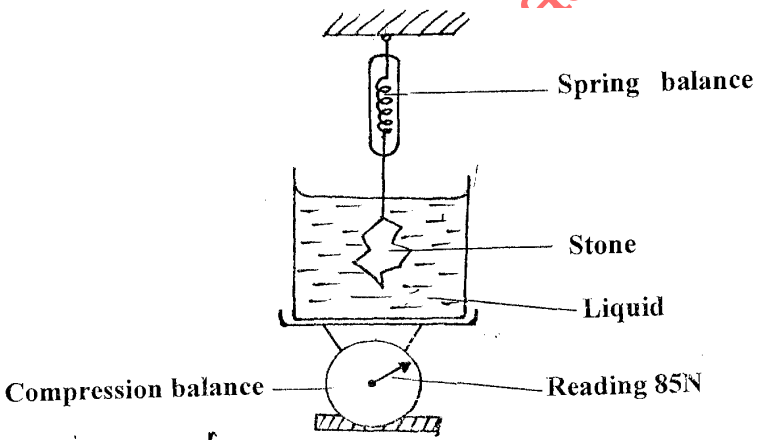
(c) A trolley moving on a horizontal bench of height 1.2m strikes a barrier at the edge of the bench. The brass mass on the top of the trolley flies off on impact and lands on the ground 2.5m from the edge of the bench. Determine

i) The time taken by the brass mass to reach the ground. (2marks)

ii) The speed at which the trolley struck the barrier (2marks)

d) A passenger dropped a coin held at his hands in a stationary bus and it landed at his feet. State and explain the position it will land if he repeat it once again and the bus was assumed to be moving in a straight line at constant speed (2marks)

16. Figure below shows of mass 4kg immersed in liquid and suspended from a spring balance with a string. The beaker was placed on a compression balance and shown the reading of 85N. The density of the stone was 3000kg/m^3 while the density of the liquid was 800kg/m^3.



a) State Archimedes principle (1mark)

b) Determine

i) Volume of the liquid displaced (2marks)

ii) Up thrust on the stone (2marks)

iii) Reading of the spring balance (2marks)

c) Find the volume of hydrogen gas filled balloon that will carry a 300kg load in air (Density of air =1.3kg/m^3 while that of hydrogen =0.9kg/m^3) (3marks)

17. a) State Boyles law (1mark)

b) State the measurements taken in verifying the law above (2marks)

c) Explain how measurement above are used to verify Boyles law. (3marks)

d) At 30°C, pressure of a gas is 60cmHg. At what temperature would the pressure of the gas rise to 100cmHg if the volume is kept constant. (3marks)

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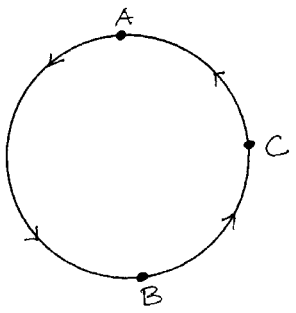
18. a) A car of mass 1500kg moves round a circular track of radius 1200m at a constant speed of 20m/s what is the centripetal force action on the car. (3marks)

b) The figure below shows a stone of mass 10kg being whirled using a rope in a vertical circle of radius 2.5m



State what provides the centripetal force at points.

i) A (1mark)

ii) B (1mark)

iii) C (1mark)

c) Calculate the maximum tension on the body if it was moving ate a linear velocity of 10m/s ($g=10m/s^2$) (3marks)

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CEKENA MOCK EXAMINATIONS, 2023
Kenya Certificate of Secondary Education (K.C.S.E)
232/2
PHYSICS
PAPER 2
TIME: 2 hours

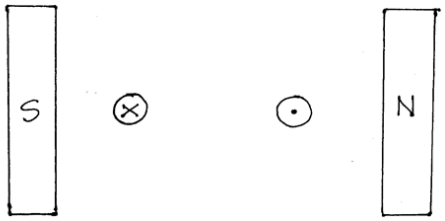
Instruction to The Candidates

*a) Answer **all** the questions in sections **A** and **B**.*
b) All working must be clearly shown.
*c) Mathematical tables and electronic calculators **may be** used.*

SECTION A (25 MARKS)

Answer all the question in this section.

1. Sketch the magnetic field pattern given by a current carrying conductor in the magnetic field shown in the figure below. Also show the direction of the forces produced on the conductor (2 mks)

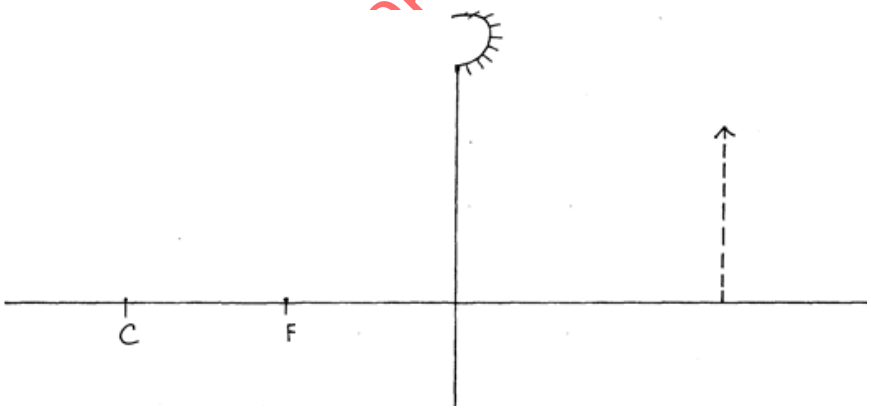


2. State any two ways in which energy is lost in a transformer, and briefly explain each loss can be minimised. (2 mks)
3. Below is part of the electromagnetic spectrum in order of increasing wavelength.

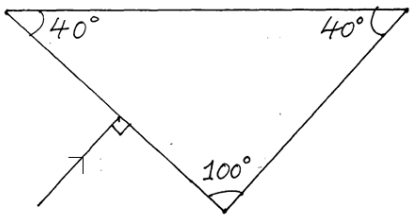
A	B	C	Visible light	infrared	D	C

How are waves A produced (1 mk)

4. a) State one similarity and one difference between a camera and a human eye. (2 mks)
   b) The figure below is a concave mirror used to form a virtual, magnified image. Complete the ray diagram to show the position of the object (3 mks)



5. The figure below shows a ray of light incident on a glass prism.



Given that the critical angle of the glass is 39^0, sketch on the diagram the path of ray through the prism until it exits the prism (2mks)

6. A sharp point of a pin is held over a positively charged electroscope. State and explain the observation made on the electroscope (2mks)

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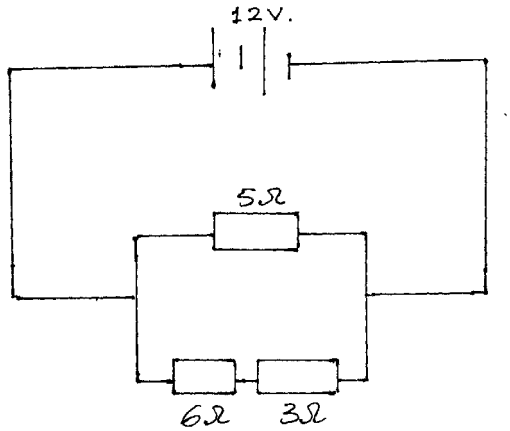
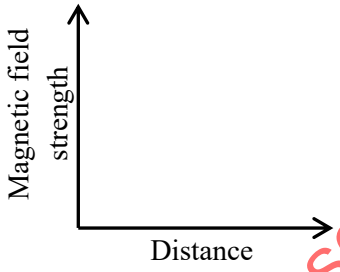
7. The figure below is a circuit of 3 resistors connected to a 12v battery.



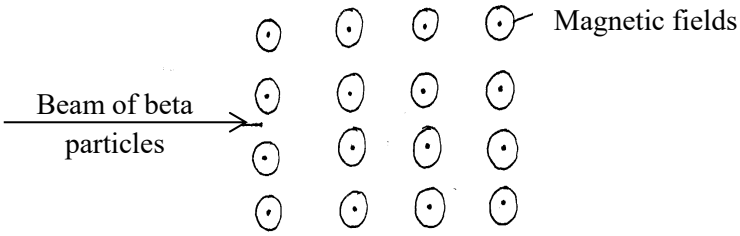
Determine the P.d across the 3 Ω resistor (3mks)

8. The figure below shows a magnet. Point A and B are in front of the magnet.

On the axis provided sketch a graph showing how the magnetic field strength changes the A to B (2mks)

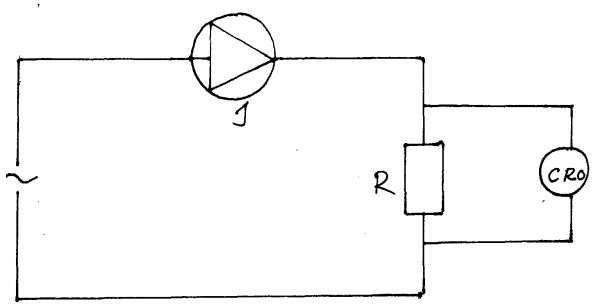


9. The figure below shows a beam of beta particles entering a magnetic field whose direction below.



Complete the diagram to show the path of the beta particles as they pass through magnetic field and out of it (1mk)

10. A girl standing 400m from the foot of a high cliff claps her hand and the echo reaches her 2.32 seconds later. Calculate the velocity of sound in air using this observation. (2mks)
11. Explain two of ways of dealing with defect of polarisation in a simple cell (2mks)
12. The figure below shows an a.c source connected across diode D and Resistor R.



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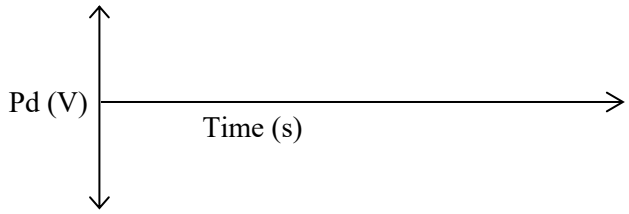
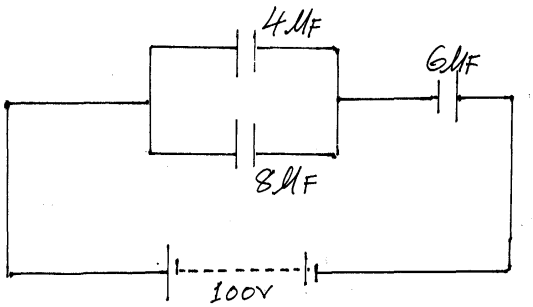
On the axis provided sketch the output voltage as observed in the CRO (1mk)



SECTION B (55 MARKS)

13. a) The figure below shows a system of capacitor connected to a 100v d.c supply.



From this circuit determine:

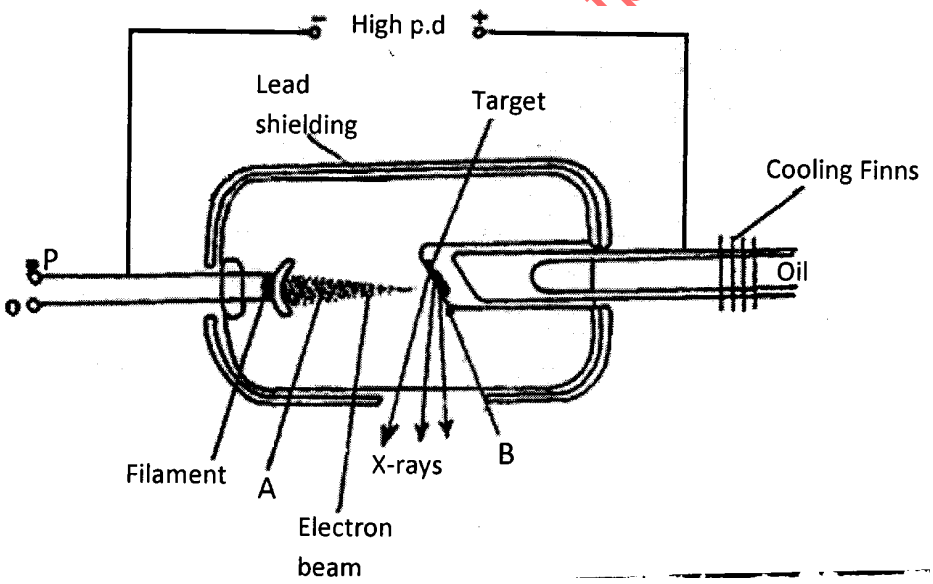
i) Its effective capacitance (2mks)

ii) The charge through the $6\mu F$ capacitor (2mks)

iii) The p.d across $8\mu F$ capacitor (2mks)

b) State any two factors that affects the capacitance of a parallel plate capacitor (2mks)

14. a) The figure below shows the features of an x-ray tube



i) Name the parts labelled A and B (2mks)

ii) Explain the effect of increasing the potential P on x-rays produced (2mks)

iii) During the operation of the tube, the target become very hot. Explain how this heat is caused (2mks)

b) In a certain x-ray tube, the electrons are accelerated by a p.d of 12kv. Assuming that all energy goes to produce x-rays, determine the frequency of x-ray produced ($h=6.62\times10^{-34}$Js and $e^{-}=1.6\times10^{-19}$C) (3mks)

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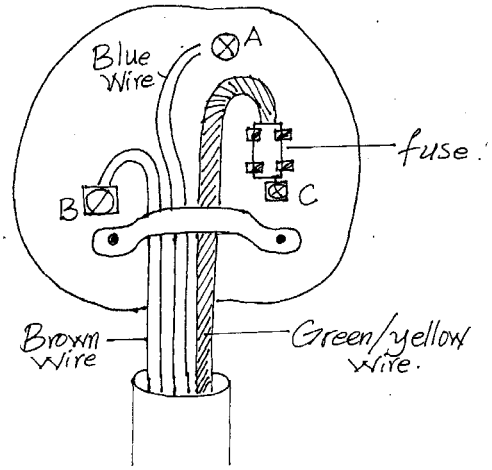
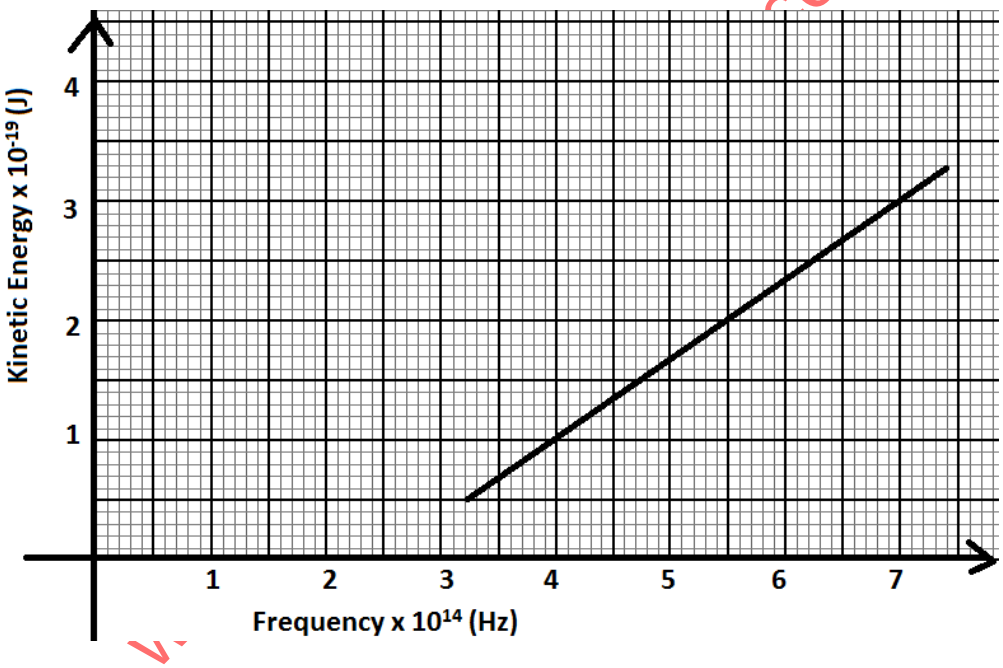
15. The figure below shows a connection to a 3-pin plug as viewed from its back

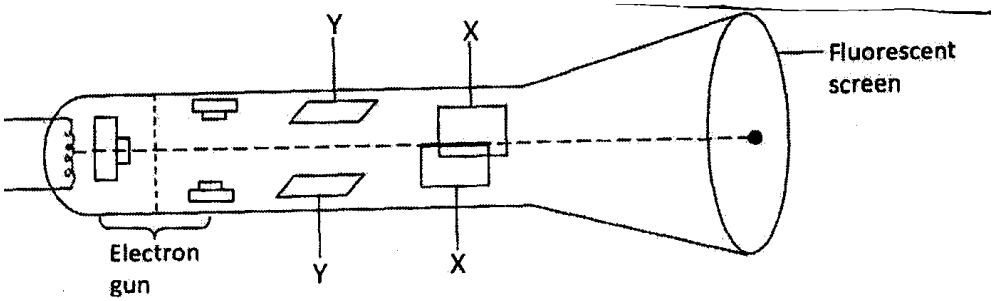


i) Name the terminal pin labelled A (1mk)
ii) State any two mistakes with wiring of his 3pin plug (2mks)
iii) Give any two reasons why the earth pin is normally longer than the other two pins (2mks)
b) The figure below is graph of K.E of electrons against frequency of radiation in photo – electric effect in cathode metal plate



From the graph, determine
i) Threshold wavelength (λ)of the cathode metal surface (2mks)
ii) Planck's constant (h) of cathode (2mks)
iii) Work function of cathode in ev (2mks)

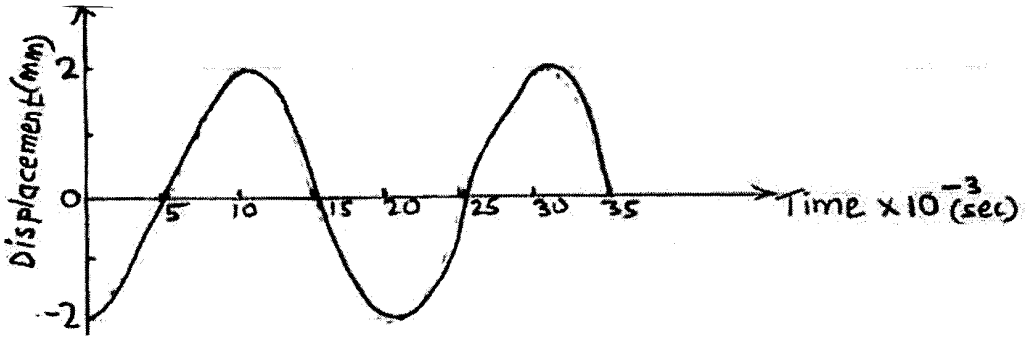
16. a) The figure below shows a simple cathode ray tube



i) Explain how the electrons are produced in the tube (2mks)
ii) State one function of the anode (1mk)

iii) At what part of the cathode tube would the time base be connected? (1mk)

b) The figure below represents a displacement time graph for a wave moving with a velocity of 80cm/s

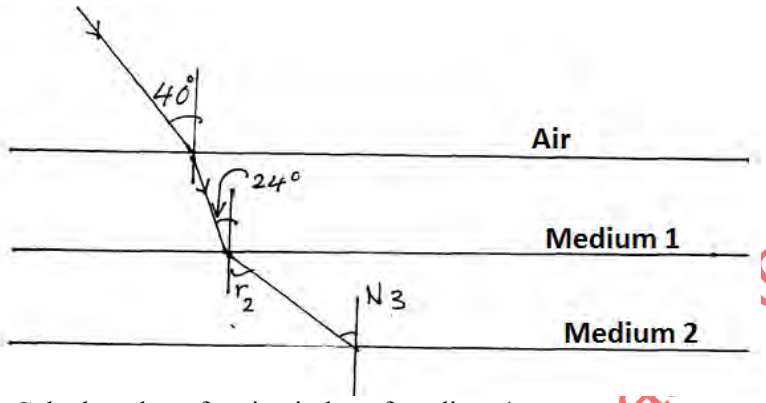


Determine the wave

i) Frequency (f) (2mks)

ii) Wavelength (λ) (2mks)

c) A ray of light traveling through air in to medium 1 and 2 as shown in the figure below.

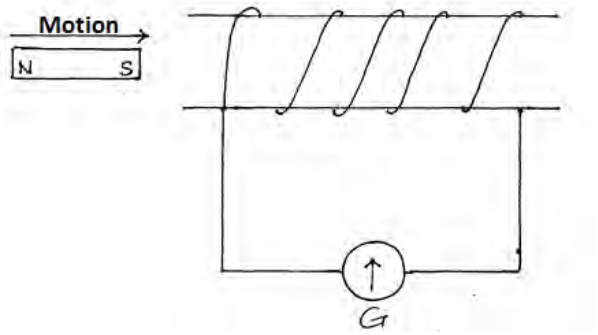


i) Calculate the refractive index of medium 1 (1mk)

ii) Angle of refraction r_2 in medium 2 (2mks)

17. a) State the Lenz's law of electromagnetic induction. (1mk)

b) A bar magnet is moved into a coil of insulated copper wires connected to a centre zero – galvanometer (G) as shown in the figure below.



i) With arrows show the direction of induced current in the coil (1mk)

ii) Explain clearly what is observed on the galvanometer when the south pole of a magnet is moved into the coil and then withdrawn (2mks)

c) A transformer has 1600 turns in the primary coil and 80 turns in the secondary coil. If the transformer is 80% efficient and its primary coil is 240v with a current of 0.75A, determine

i) The secondary e.m.f of its coil (2mks)

ii) The output power in its secondary coil (2mks)

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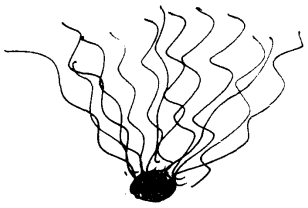
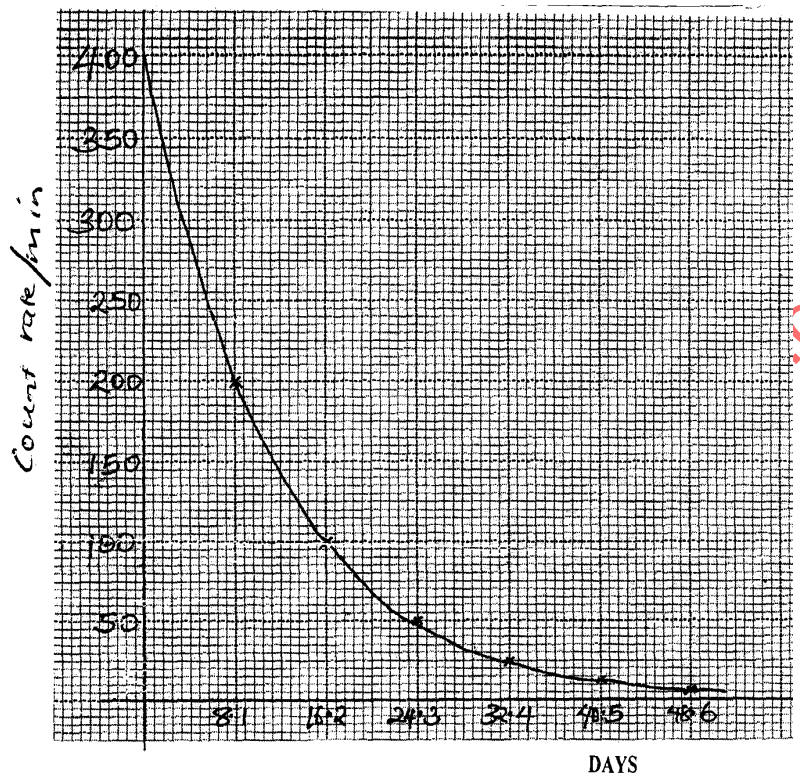
18. a) Define the term radioactivity (1mk)

b) The figure below shows tracks formed in a diffusion cloud chamber given by a certain radioactivity sample



State the type of radiations emitted by this sample, explain your answer (2mks)

c) i) The figure below shows radioactive decay of iodine.



ii) What fraction of this iodine will have decayed after 3 half – lifes (2mks)

d) The average count rate of a radioactive material sample is 92 counts per second. After 420 seconds, the count rate had dropped to 29 counts per second. Given that the background count rate was 20 counts per second, determine the half-life of this sample. (3mks)

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Kenya Certificate of Secondary Education (K.C.S.E)
232/3
PHYSICS
Paper 3

CONFIDENTIAL

1. - Two biconcave lenses 1st and 2nd (f =10cm)
   - Two lens holder
   - A white screen, I (with cross – wire)
   - A white screen, II without cross wire
   - A meter rule
   - A plane mirror
     (with ≥ surface area of the lens)
   - A piece of cellotape
   - A lit candle/ source of light

2. A) Voltmeter
   Ammeter (0 -1) A
   Switch
   2 – dry cells
   Cell holder
   Resistor R=10Ω
   Nichrome wire 0.3±0.02mm
   7 connecting wire
   Micrometer screw gauge (to be shared)

   B) Measuring cylinder at least 40cm
   Glycerine to fill the cylinder to 37cm
   Two rubber bands
   Tissue paper
   One ball bearing (diameter 6mm ±1)
   A magnet (any permanent magnet)
   A micrometer screw gauge
   A stop watch (digital)

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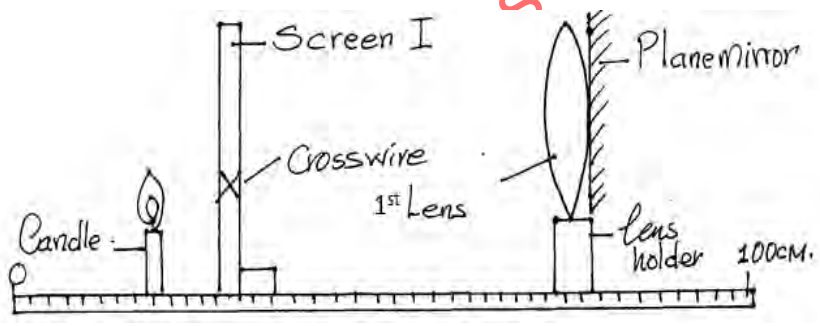
CEKENA MOCK EXAMINATIONS, 2023
Kenya Certificate of Secondary Education (K.C.S.E)
231/3
PHYSICS
PAPER 3
(PRACTICAL)
TIME: 2½ hours

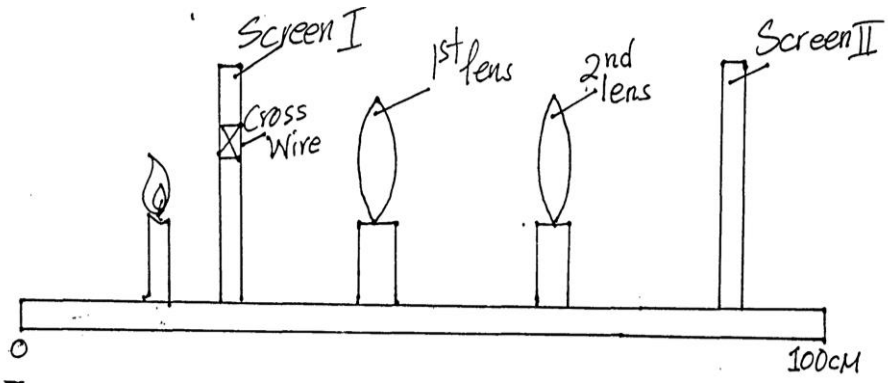
(a) Answer all questions
(b) You are supposed to spend the first 15 minutes of the 2½ hours allowed for this paper reading the whole paper carefully before commencing your work.
(c) Marks are given for clear record of the observation made, their suitability accuracy and the use made of them.
(d) Candidates are advised to record their observation as soon as they are made.
(e) Non-programmable silent calculators and mathematical tables may be used.

1 You are provided with the following:
a) Two biconcave lenses,
b) Two lens holders
c) Lit candle
d) White screen, I (with cross-wire)
e) White screen (II)
f) A meter rule
g) A plane mirror
h) Cellotape

Procedure
i) Mount 1st lens in the lens holder. Fix the plane mirror at the back of the lens using cellotape
ii) Arrange the setup as shown in figure below.



iii) Adjust the position of the lens with the mirror using a sharp image of the cross-wire is formed on the screen I beside the cross-wires, measure the distance L_1 between screen I and lens A
L_1 …… (1mk)
iv) Remove the mirror from the lens. Re-arrange the candle, screen I, screen II 1st lens and 2nd lens as in the figure below.



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v) Set the distance between screen I and 1st lens to be 40cm ensure this distance is maintained throughout the rest of the experiment. Set the distance between 1st and 2nd lens to be 30cm. Adjust the position of the screen II to obtain a sharp image of the cross – wire on it. Measure the distance V between 2nd lens and screen II. Record values in the table below.

d(cm)	30	35	40	45	50	55	60	65	70
V(cm)									

(6mks)

vi) Plot a graph of V against d (5mks)

vii) From the graph, at d=50cm, determine

I) The slope s of the graph (3mks)

II) The value of k, given that $K(s-60)^2 = -590$ (3mks)

2. A) You are provided with the following:

- A voltmeter
- An ammeter
- A switch
- 2 dry cells
- Cells holder
- Resistor R
- A nichrome wire mounted on mm scale
- 7 connecting wires
- Micrometer screw gauge

Proceed as follows

a) Measure the E.M.F, **E** of a cell (1mk)

E =……..

b) Draw the set up you have used to measure the E.M.F. (2mks)

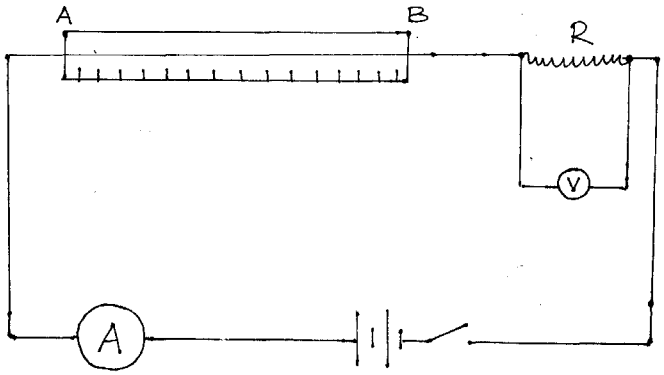
c) I Using micrometer screw gauge provided measure the diameter d of the nichrome wire

d=……mm (1mk)

II Determine the radius r of the nichrome wire (2mks)

r=……..m

d) Arrange the apparatus as shown below



e) Close the switch and record V_R, the pd across resister and I_R, the current in the circuit

V_R…… (1mk)

I_R…… (1mk)

f) Connect the voltmeter across nichrome wire AB and record the pd, V_N

V_N…… (1mk)

g) Determine the value of resistance R (3mks)

h) Calculate the value of constant Q given that $\frac{QRL_0}{V_N} = 100$ (3mks)

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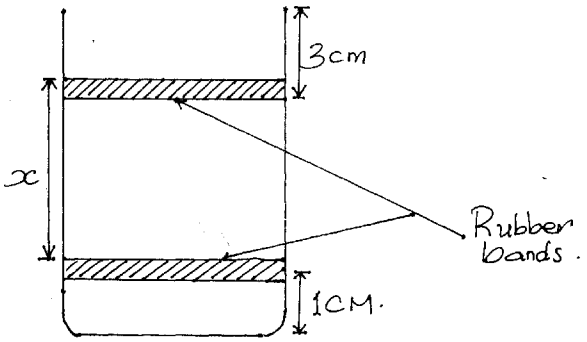
B) You are provided with the following set of apparatus.

- measuring cylinder
- Glycerine
- Two rubber bands
- One meter rule
- Steel ball bearing
- A magnet
- A micrometer screw gauge
- A stop watch
- A piece of tissue paper

a) Set the apparatus as shown.



b) Adjust the lower rubber band so that x =25cm.

c) Release the steel ball from the surface of the liquid and obtain the time, t it takes to travel the distance x =25cm

t_1…… (1mk)

d) Use The magnet provided to remove the steel ball from the liquid.

e) Repeat procedure b, c and d for x= 15cm to obtain t_2

t_2 =…… (1mk)

f) Measure the diameter, D of the steel ball using micrometer screw gauge.

D =……..m (1mk)

g) I Calculate the average value of x and t

t_{av} = (1mk)

x_{av} = (1mk)

II) Using the average value obtained above, determine the viscosity of the glycerine using the equation below

$$n = \frac{D^2 tg(\rho - 6)}{18x}$$ (3mks)

Where g = acceleration due to the force of gravity =10m/s^2

ρ = density of steel bell = 7.0×10^3kg/m^3

D = density of glycerine =1.26×10^3kg/m^3

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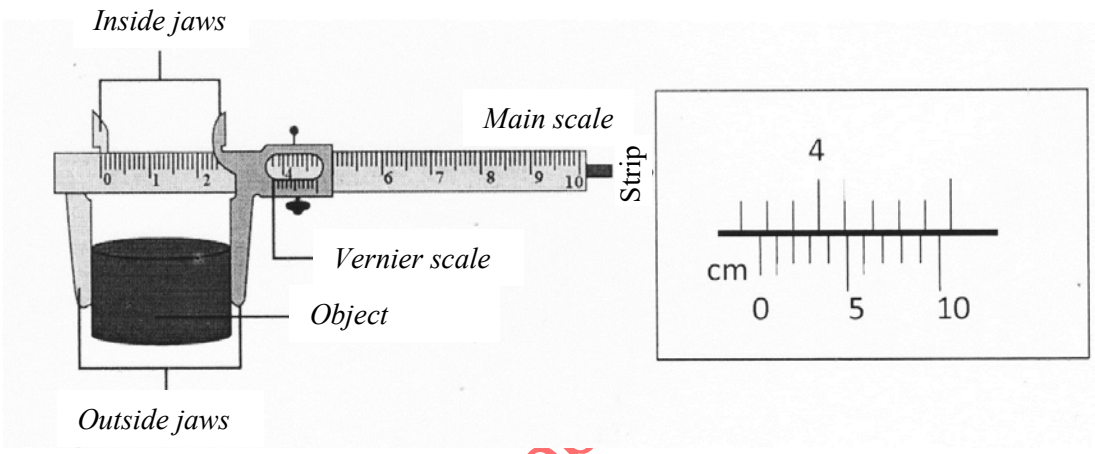
KAKAMEGA FORM IV JOINT EXAMINATION, 2023
Kenya Certificate of Secondary Education
232/1
PHYSICS
PAPER 1
TIME: 2 hours

Instructions to candidates

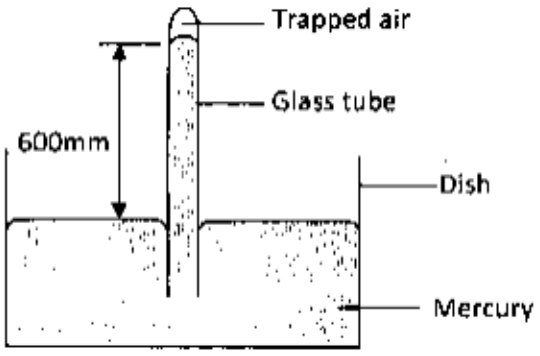
- *Answer **all** the questions in the two sections*
- *All working **must** be clearly shown.*
- *Electronic calculators, mathematical tables may be used.*
- *All numerical answers **should be expressed** in the **decimal** notations.*
- *You may use 'g' as 10m/s^2*

SECTION A (25 MARKS)

1. Figure 1, shows a Vernier caliper of zero error -0.05 cm being used for measuring the diameter of a cylindrical container of height 10 cm. The scale reading of the Vernier is as shown alongside.



a. Determine the diameter of the container (2 marks)
b. Estimate the volume of a liquid which can completely fill the container (2 marks)
2. Explain why a person carrying a jerrycan of water has to lean on one side. (1 mark)
3. **Figure 2** shows some air trapped by mercury in a glass tube. The tube is inverted in a dish containing mercury.



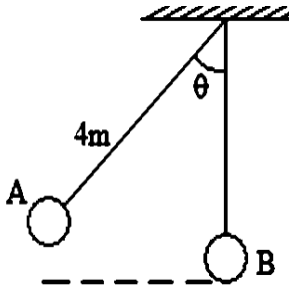
Given that the atmospheric pressure is 760 mmHg and the height of mercury column in the tube is 600 mm, determine the pressure of the air trapped in the tube in mmHg. (2 marks)

4. Figure 3 shows drops of mercury and water on two glass beakers, Explain the difference in the shapes of the drops. (2marks)

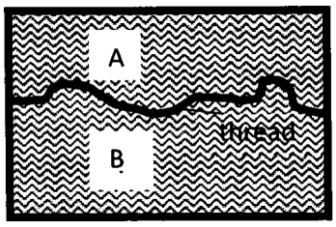
5. A ball is thrown from the top of a cliff 20m high with a horizontal velocity of 10ms^{-1}. Calculate the distance from the foot of the cliff to where the ball strikes the ground. (3 marks)

6. Explain why a clinical thermometer is not sterilized using boiling water. (1mark)
7. A boy blows through the mouth of a hollow vuvuzela as shown below. A light cork is suspended freely by a string as shown. Giving reason indicate the path taken by the cork (2 marks)

8. A stopwatch reads 08:10:84 and 09:10: 90 before and after an experiment respectively. Determine the duration of the event in SI units. (2marks)
9. Explain the meaning of thermodynamics as a branch of physics. (1 mark)
10. A metal ball suspended vertically with a light string of length 4m is displaced through an angle θ as shown in the diagram below. The body is released from A and swings past the lowest point B. Given that its velocity at point B is 4 m/s, determine angle Θ (3 marks)



11. **Figure 5** shows a rectangular loop with a thin thread loosely tied and dipped into a soap solution.



Draw on the space provided what is observed when point **A** is punctured. (1mark)

12. Two horizontal strings are attached to a block, resting on a frictionless surface, as shown in figure 6.

A force of 100N pulls on one string. The block does not move. Find the value of the force, F on the other string. (1 mark)

13. A wooden bench feels neither warm nor cold when touched by your bare hands. Explain this observation. (2 marks)

SECTION B (55 MARKS)

14.

a) A body going round a uniform circular path at constant speed undergoes acceleration. Explain this observation. (1mark)

b) A particle moving along a circular path of radius 8cm describes an arc of length 2cm every second. Determine:

i) Its angular velocity. (1mark)

ii) Its periodic time. (2marks)

c) A stone of mass 150g is tied to the end of a string 80cm long and whirled in a vertical circle at 2rev/s. Determine the maximum tension in the string. (3marks)

d) State **one** factor affecting centripetal force (1mark)

e) State the principle of conservation of linear momentum (1 mark)

f) A bullet of mass 60g is fired horizontally with a velocity of 200 m/s into a suspended stationary wooden block of mass 2940g. Determine:

i) Common velocity of both the bullet and the block, if the bullet embedded into the block. (2 marks)

ii) Height to which the block rises. (2 marks)

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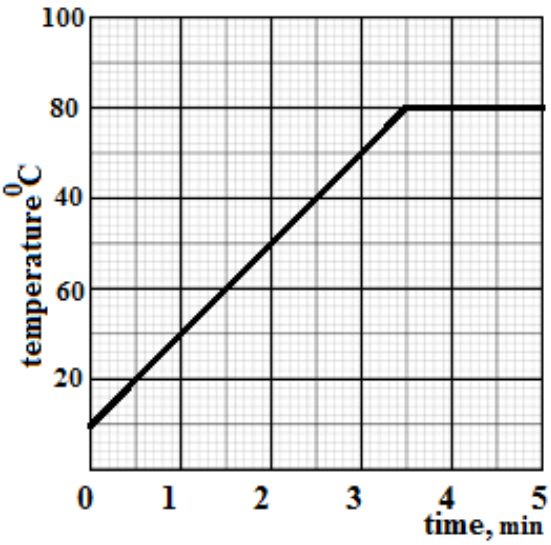
15.

a) State **two** factors that affect the boiling point of a liquid (2 marks)

b) 100g of a liquid at a temperature of 10^0 C is poured into a well lagged calorimeter. An electric heater rated 50W is used to heat the liquid. The graph in figure 7 shows the variation of the temperature of the liquid with time.



(i) From the graph, determine the boiling point of the liquid (1 mark)

(ii) Determine the heat given out the by the heater between the times t = 0.5 minutes and t = 5.0 minutes (3 marks)

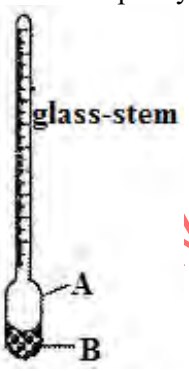
c) From the graph determine the temperature change between the times t = 0.5 minutes and t = 5.0 minutes, hence determine the specific heat capacity of the liquid (3 marks)

d) 1.8 g of vapor was collected from above the liquid between the times t= 3.5 minutes and t= 4.5 minutes. Determine the specific latent heat of vaporization of the liquid (4 marks)

16.

a) State Archimedes' principle. (1 mark)

b) Figure 8 below shows a simple hydrometer



i) Identify the parts labelled A and B (2 marks)

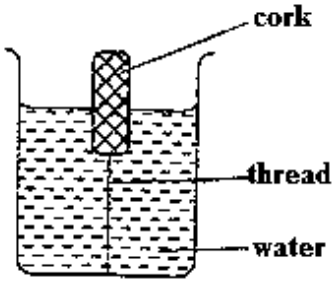
ii) State the purpose of the part labelled B (1 mark)

c) How would the hydrometer be made more sensitive? (1 mark)

d) Describe how the hydrometer is calibrated to measure relative density (3 marks)

e) Figure 9 shows a cork floating on water and held to the bottom of the beaker by a thin thread.

i) Name the forces acting on the cork (3 marks)



ii) Describe how each of the forces mentioned in (i) above changes when water is added until the container is completely filled (3 marks)

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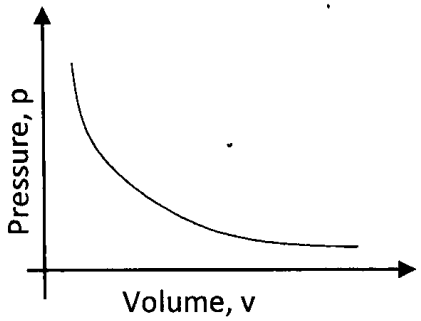
17.

a) Figure 10 shows a graph of pressure against volume for a fixed mass of a gas at constant temperature.



In the space provided, sketch a graph of pressure, p against $\frac{1}{v}$ (1 mark)

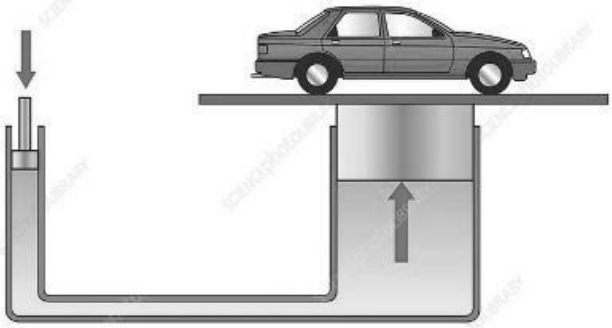
b) Explain the pressure law using the kinetic theory of matter (3 marks)

c) $20cm^3$ of a gas exerts a pressure of 760mmHg at 25^0C. Determine the temperature of the gas when the pressure increases to 900mmHg and the volume decreases to 15 cm^3. (3 marks)

18.

a) Define the term velocity ratio of a machine (1 mark)

b) The figure 11, below shows part of the hydraulic lift system. State any **one** property of the liquid under which the hydraulic system works (1 mark)



c) The hydraulic lift machine above has velocity ratio 45 and it overcomes a load of 4500 N when an effort of 135 N is applied. Determine:

i) The mechanical advantage of the machine (2 marks)

ii) Efficiency of the machine (3 marks)

iii) The percentage of work that goes to waste (1 mark)

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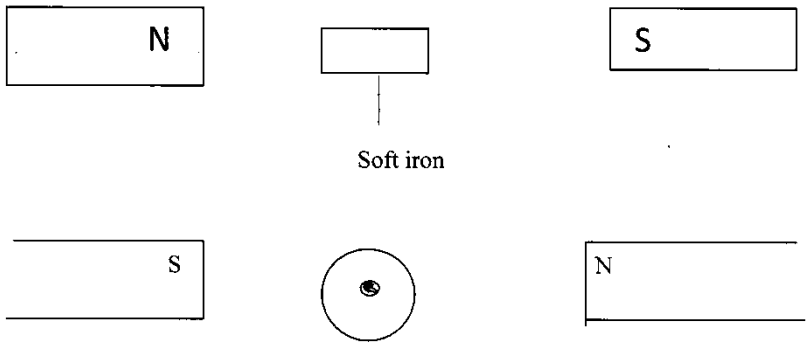
KAKAMEGA FORM IV JOINT EXAMINATION, 2023
Kenya Certificate of Secondary Education
232/2
PHYSICS
PAPER 2
Time 2 hours

INSTRUCTIONS TO CANDIDATES.

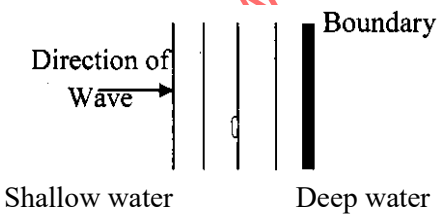
- *Answer **ALL** the questions.*
- ***ALL** working must be clearly shown.*
- *Non-programmable silent electronic calculators and KNEC mathematical table may be used*

SECTION A (25 MKS)

1. State two differences between images formed by a plane mirror and a pinhole camera. (2mks)
2. You are provided with connecting wires, 2 dry cells, a switch and two bulbs. Draw a circuit diagram to show; cells in parallel and controlled by one switch. (2mks)
3. When an ebonite rod is rubbed using dry cloth it acquires negative charge. Explain how the negative charge is acquired (1mk)
4. The diagram below shows a soft iron bar placed when poles of a magnet.
   Draw the magnetic field pattern produced. (2mks)



5. The diagram below shows a conductor in a magnetic field
   Indicate on the diagram the direction of motion (1mk)
6. State two applications of total internal reflection (2mks)
7. You are provided with resistors 3.052, 4.052 and 6.052. Draw a circuit diagram to show how the three resistors can be connected together to give an effective resistance of 652. (2mks)
8. The diagram below shows plane waves moving from shallow to deep end of a pond.



a) Complete the diagram to show the waves on the deep end (1mk)
b) State what happens at the boundary to
(i) The frequency of the waves (1mk)
(ii) The speed of the waves (1mk)

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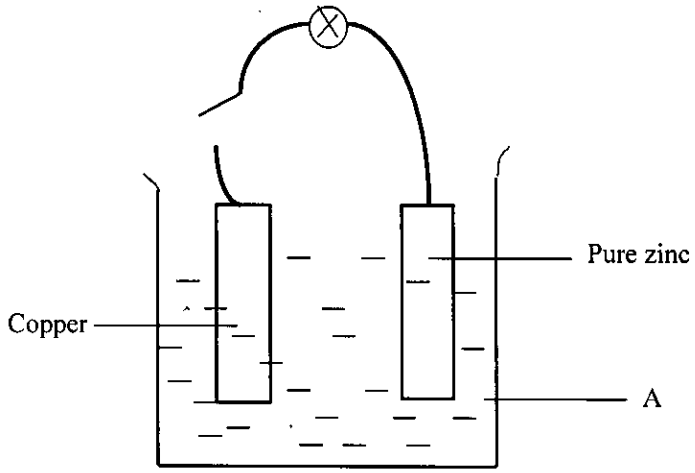
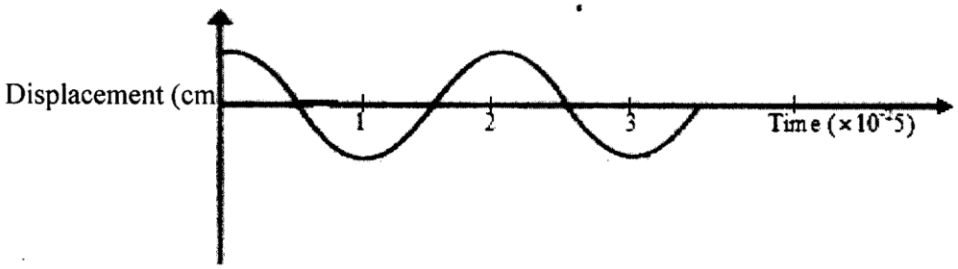
9. The figure below shows a simple cell.



a) When switch K is closed, the bulb lights brightly initially, but grow dim and dimmer until it goes off;
(i) State the possible cause of this behaviour. (1mk)
(ii) State the remedy for the behaviour (1mk)

10. The diagram below shows a wave profile



Determine the frequency of the wave (3mks)

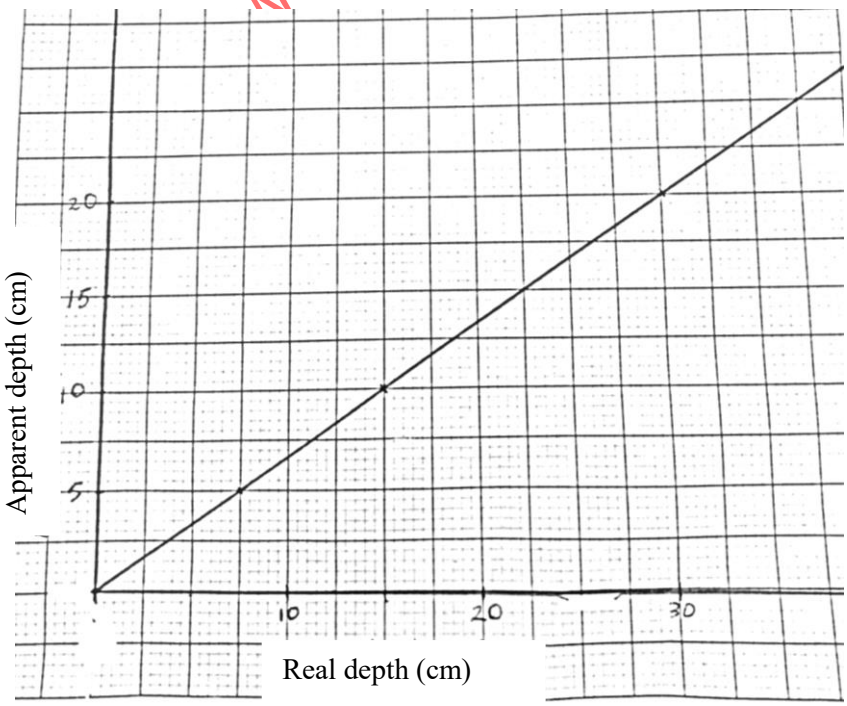
11. State two ways of increasing the capacitance of a parallel plate capacitor (2mks)

12. A driver was given tow mirrors-a plane mirror to choose from. He chose convex mirror as his driving mirror. Give two reasons why? (2mks)

SECTION B (55 MKS)

13. (a) State Snell's law of refraction (1mk)

(b) In an experiment to determine the refractive index of a liquid, the liquid was poured into a measuring cylinder, a pin was placed at the bottom of the cylinder and another pin used to locate the apparent position of the first pin. The values of real and apparent depth were used to plot a graph as shown below.



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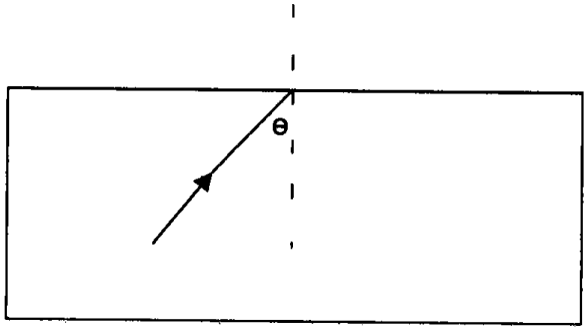
(i) From the graph determine the refractive index of the liquid (3mks)

(ii) Given that the velocity of light in vacuum is 30x 10^8m/s, what would be the velocity of light in the liquid above? (2mks)

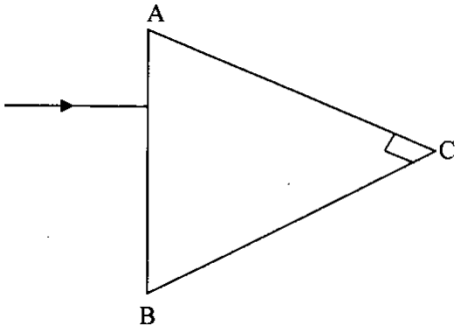
(c) The diagram below shows a ray of light incident on a glass-air interface



Given that the refractive index of glass is 1.4, determine the value of ø (3mks)

(d) State two condition necessary for internal reflection to occur (2mks)

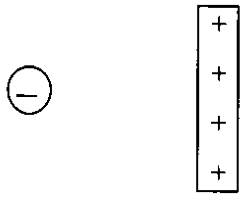
(e) The diagram below shows a ray of light incident at glass prism ABC at 90°



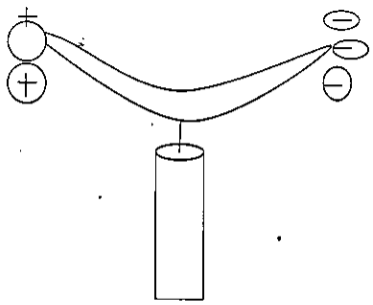
Complete the ray to show how it emerges from the prism given the critical angle of the glass is 42°

14. a) What is meant by the term capacitance? (1mk)

b) The figure below shows a point placed near a positively charged rod. Draw on the diagram the resulting electric field patterns



c) When a positively charged conductor is brought close to a candle, the flame is diverted as shown in the figure below. Explain this observation (2mks)



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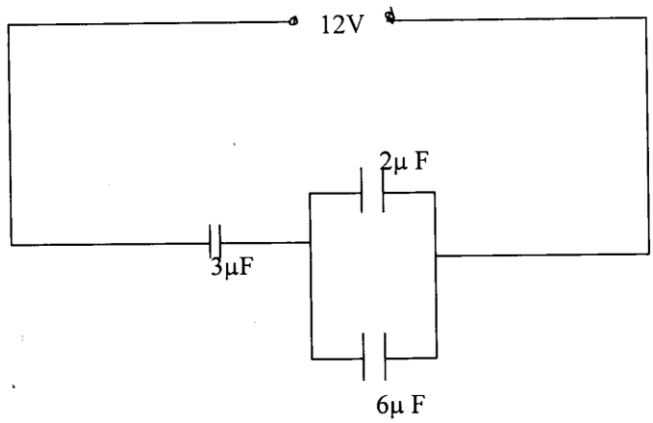
d) The figure below shows three capacitors of capacitance 3μF, 2MF and 6μF connected to a 12V supply circuit.



Calculate:

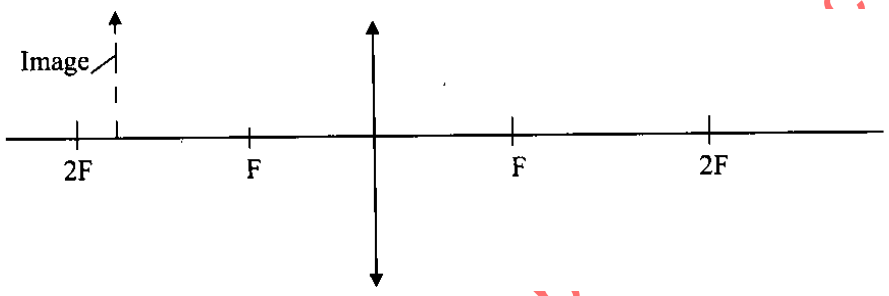
(i) The total capacitance of the circuit (3mks)

(ii) The total stored in the circuit (3mks)

(iii) The potential differences across 2μF capacitor (2mks)

15. (a) Define principal focus of a biconcave lens (1mk)

(b) The diagram below shows a virtual image of an object placed in front of a biconvex lens.



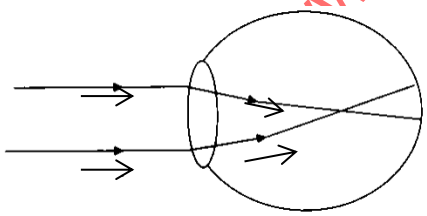
Draw appropriate rays to locate the object.

(c) A convex lens forms a real image five times the size of the object on a screen. If the distance between the object and the screen is 120Cm, determine;

(i) image distance (2mk)

(ii) Focal length of the lens (2mks)

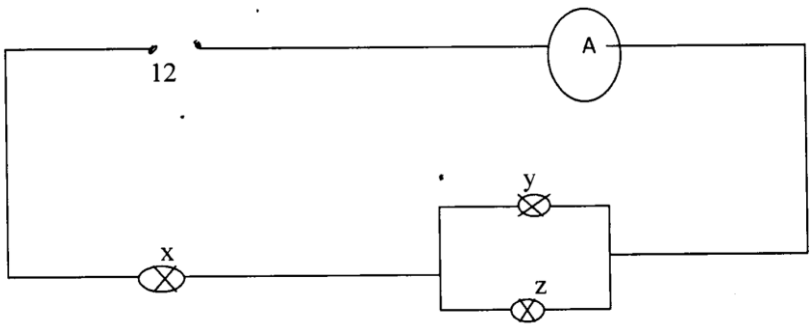
(d) The diagram below shows a defect in human eye.



(i) Name the defect (1mk)

(ii) State two causes of the defect (2mks)

16. (a) figure below shows how a student set up and circuit using three identical bulbs x, y and z each rated "12V, 2.0A"



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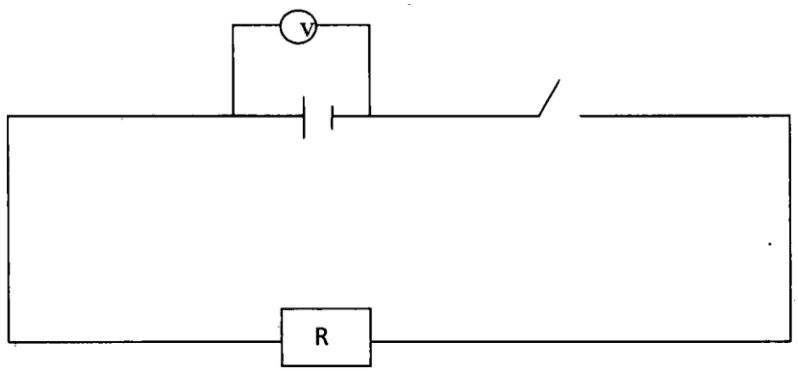
(i) When operating normally, calculate the resistance of one of the bulbs (2mks

(ii) Calculate the effective resistance of the three bulbs (2mks)

(iii) What will be reading of the ammeter? (2mks)

(iv) Draw a circuit diagram showing the three bulbs connected in such a way that they would all work at the same brightness especially if they are not identical (2mks)

(b) When the switch S is kept open in the circuit shown below the voltmeter reads 1.5V. When the switch is closed, the reading drops to 1.3V and the current through the resistor is 0.5A.

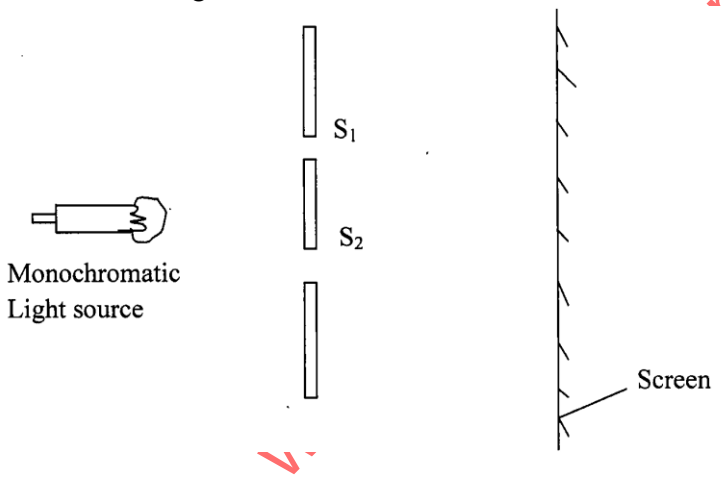


(i) What is the e.m.f of the cell? (1mk)

(ii) What is the terminal voltage of the cell (1mk)

(iii) Calculate the value of R (2mks)

17. In the experiment to observe interference of light waves a double slit is place close to the source of monochromatic light as shown below.



(a) (i) State the function of the double slit (1mk)

(ii) State and explain what is observed on the screen (3mks)

(b) State what is observed on the screen when:

(i) The slit separation S_1S_2 is reduce (1mk)

(ii) White light source is used in place of monochromatic source (1mk)

(c) Distinguish between stationary waves and progressive waves in terms of their Propagation (1mk)

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KAKAMEGA FORM IV JOINT EXAMINATION, 2023
Kenya Certificate of Secondary Education
232/3
PHYSICS
Paper 3
(PRACTICAL)
2½ hours

INSTRUCTIONS

- *Answer **all** questions.*
- *You are supposed to spend the first 15 minutes of the 2 ¼ hours allowed for this paper reading the whole paper carefully.*
- *Marks are given for a clear record of the observation actually made, their suitability, accuracy and the use made of them.*
- *Candidates are advised to record their observations as soon as they are made.*
- *Mathematical tables, slide rules and calculators may be used.*
- *Take $\pi = 3.14$ and gravitational acceleration $g = 10m/s^2$*

Question 1

You are provided with the following:

- An ammeter
- A voltmeter
- A switch
- A cell holder and two dry cells.
- A wire mounted on a mm labeled AB.
- Six connecting wires, at least three with crocodile clips.

a) Set up the apparatus as shown in the circuit diagram below in figure 2.

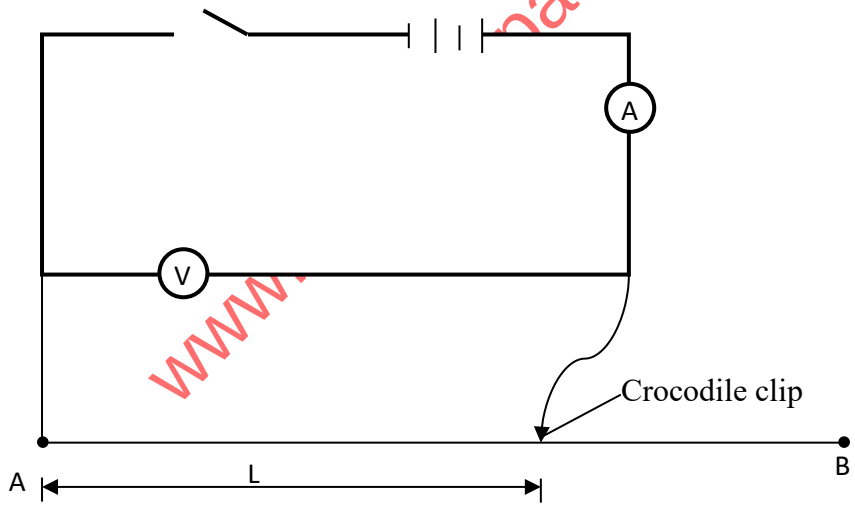

Figure 2

Close the switch, using the voltmeter and ammeter measure the voltage and current when the distance L is approximately 100cm.

V_1……volts (1mark)

I_1 ……..amperes (1mark)

Hence determine the constant R given that;

$R = \frac{V_1}{I_1}$

R = ……..Ω (1mark)

b) Adjust the position of the crocodile clips on the wire AB to a point such that the length L of the wire in the circuit is 10cm. Close the switch. Read and record the voltmeter and ammeter readings.

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c) Repeat the procedure in b) above for other values of L shown in the table below. Complete the table.
TABLE 2.

(6marks)

Distance L (Cm)	10	20	30	40	50	60
V (volts)						
I (Amperes)						
$R = \frac{V}{I}$						
$\frac{1}{I}$						

d) On the grid provided, plot a graph of $\frac{1}{I}$ (y- axis) against R. (5marks)

e) Determine the slope of the graph. (3marks)

f) Given that E= v + Ir. Use the graph to determine;

I. The e.m.f E of the battery. (2marks)

II. The internal resistance r of the battery. (1mark)

Question 2

PART A

You are provided with the following;

- Spring balance
- Solid A
- Water in a 100ml beaker
- Liquid L in a 100ml beaker
- Sewing thread about 20 cm
- Tissue paper

Proceed as follows;

a) Tie solid A on one end of the string and tie the other end of string to the lower part of the spring balance. Suspend the solid freely from the spring balance. Read and record the weight of the solid in air w_1

w_1 = …… (1 mark)

b) Fully immerse the solid in water. Let it be suspended in water without touching the sides or bottom of beaker. Read and record the weight of the solid in water w_2.

w_2 = …… (1 mark)

c) Remove solid from water and wipe it dry using tissue paper. Fully immerse solid in liquid L and let it be suspended in the liquid without touching sides or bottom of beaker. Read and record the weight w_3 of the solid in liquid L.

w_3 = …… (1 mark)

d) Using values of w_1, w_2 and w_3 Determine;

i) Upthrust in water U_W (2 marks)

ii) Upthrust in liquid U_L (2 marks)

iii) Relative density of liquid L (3 marks)

iv) Relative density of solid (3 marks)

PART B

You are provided with the following apparatus:

- A convex lens and a lens holder
- A concave lens and a lens holder
- A screen
- A meter rule
- A cross wire object
- A source of light.

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Proceed as follows:

e) Set up the apparatus as in figure 1. The screen should be 80cm from the object.

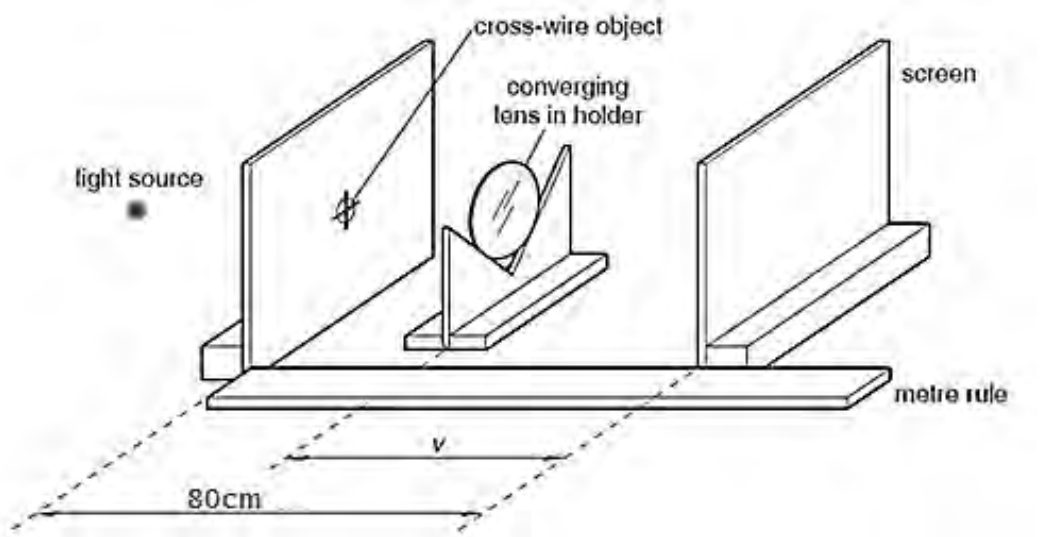

Fig. 1

f) Adjust the position of the convex lens until a sharply-focused magnified image of cross-wire object is formed on the screen. Measure the distance v between lens and screen. v = _____ (1 mark)

The distance between the cross-wire object and the convex lens must remain constant for the remainder of the experiment.

g) Move the screen away until it is 100.0cm from the object. Place the concave lens between the convex lens and screen. See figure 2

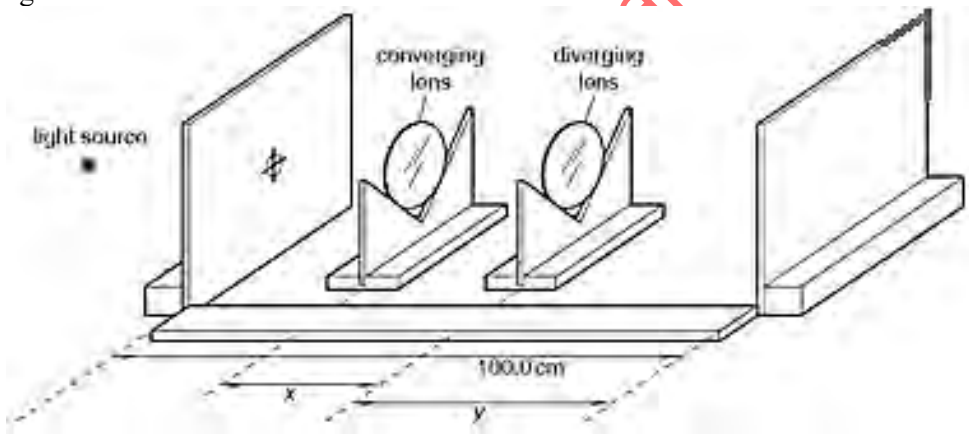

Fig. 2

h) Adjust the position of the concave lens until a sharply-focused image of the cross-wire object is focused on the screen.

i) State one difference between this image and the initial image formed by the convex lens alone. (1 mark)

ii) Measure and record the distance x between the two lenses and the distance y between the concave lens and the screen. (2 marks)

x = …….

y = …….

i) Find the focal length f of the diverging lens using the relationship,

$$f = \frac{(v-x)y}{x+y-v}$$ (3 marks)

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KAKAMEGA FORM IV JOINT EXAMINATION, 2023
Kenya Certificate of Secondary Education
232/3
PHYSICS
Paper 3
(PRACTICAL)

CONFIDENTIAL

Question 1
You are provided with the following:
- An ammeter (0 – 1A)
- A voltmeter (0 – 3V)
- A switch
- A cell holder and two dry cells.
- A nichrome wire swg 28 (diameter 0.37mm) mounted on a mm labeled AB to a length of 1m.
- Six connecting wires, at least three with crocodile clips.

Question 2
Each student to be provided with the following;
– Spring balance
– 100g mass labeled Solid A
– Water in a 100ml beaker
– About 100ml of glycerin in a 100ml beaker labeled Liquid L.
– Sewing thread about 20 cm
– Piece of tissue paper
– A convex lens of focal length 15cm and a lens holder
– A concave lens of focal length 15 and a lens holder
– A screen
– A meter rule
– A cross wire object
– A lit candle

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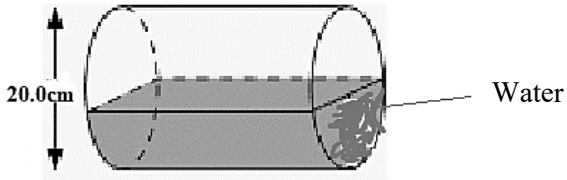
MUMIAS WEST JOINT EVALUATION, 2023
Kenya Certificate of Secondary Education
232/1
Physics
Paper 1
Time: 2hours

Instructions to the candidates;

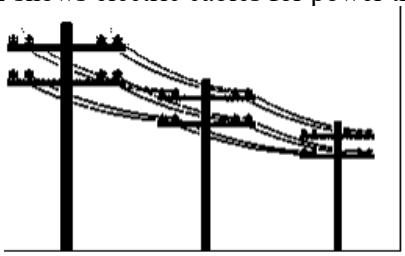
- *Answer ALL the questions in sections **A** and **B***
- *ALL working MUST be clearly shown.*
- *KNEC Mathematical tables and Non-programmable electronic calculators may be used.*
  Take; g= 10N/kg

SECTION A (25 MARKS)

1. State **two** precautions to be observed when using a micrometer screw gauge. (2marks)
2. The formula for determining weight of an object is given by **w=mg.** Give the physical quantity represented by the letter **g** and state its S.I unit. (2marks)
3. Figure 1 shows water in a tank.



   Determine the pressure exerted on the ground due the weight of the water. (3marks)
   (Take density of water to be 1000 kgm^{-3})
4. A part from size of molecule, State two other factor that affect the rate of diffusion of a gas. (2marks)
5. Figure 2 shows electric cables for power transmission.



   Explain why they are not fixed tightly. (2marks)
6. A half-filled thermos flask is less likely to keep a liquid hot for a longer time than one which is completely filled. Explain. (2marks)
7. a) Define the moment of a force and state the S.I unit. (2marks)
   b) A uniform metre rule is balanced at the 30 cm mark when a load of 0.8N is hung at the zero mark as shown in figure 3 below.

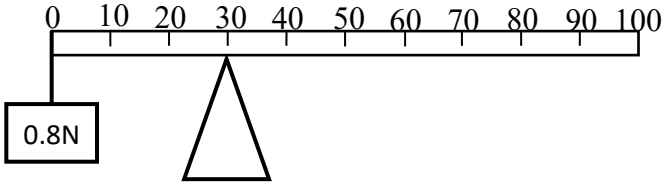


Fig 3

   Determine the weight of the metre rule. (2marks)
8. Figure 4 shows ice in a beaker.

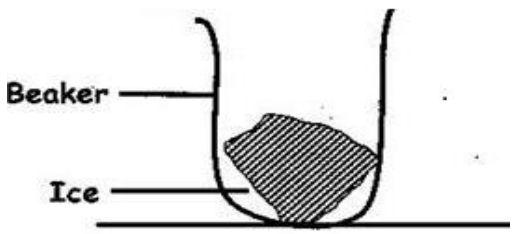


Fig.4

   State and explain the effect of raising temperature on the overal stability of the beaker and its contents.(2marks)

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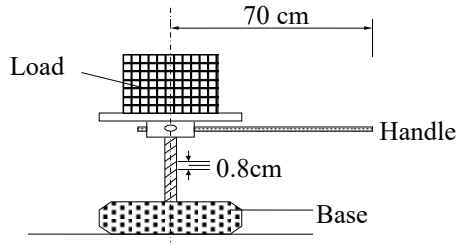
9. The pointer of an unloaded spring reads **20 cm**. when a mass of **120g** is applied to the spring, the pointer reads **28cm**. a pan in which a mass of **200g** is placed is now hang from the spring and the pointer reads **35cm**. Determine the mass of the pan. (3marks)
10. Sketch a displacement-time graph for a body thrown upwards and falls back to the ground. (2marks)
11. State **one** property of a fluid that obeys Bernoulli's effect. (1mark)

SECTION B (55 MARKS)

12. a) Show that, for an inclined plane, its velocity ratio is given by, $\frac{1}{sin\theta}$ where θ is the angle of inclination. (3marks)

    b) Sketch a block and tuckle system of pullies with a velocity ratio of 4. (3marks)

    c) Figure 5 shows a cross-section of a handle of a screw jack **70 cm** long and pitch of the screw is **0.8 cm**.



Given that the efficiency is **60%,** determine:

i) The velocity ratio of the system. (2marks)

ii) If an effort of **50N** is applied calculate the load that can be lifted. (3marks)

13. a) Define specific heat capacity and state its S.I unit. (2marks)

    b) Equal masses of water and paraffin are heated for same length of time. The final temperature of paraffin was found to be greater than the final temperature of water. Explain the observation. (2marks)

    c) A hot-water tank for a house contains 150kg of water at 15^0C. the tank itself has a heat capacity of 6000 JK^{-1}. An immersion heater is used to heat the water to 50^0c. the tank is well insulated and the power of the heater is 2500W (specific heat capacity of water =4200 $JKg^{-1}K^{-1}$)

(i) Find the amount of heat transferred to the water. (2marks)

(ii) Find how much heat is absorbed by the tank. (2marks)

iii) Determine the time it will take the heater to raise temperature to 50^0C. (3marks)

14. a) Explain the meaning of an ideal gas. (1mark)

    b) Sketch a graph of volume against the inverse of pressure at a constant temperature. (2marks)

    c) On the same axis of the sketch in 14 b) above, sketch the graph when temperature is raised for the same gas (1mark)

    d) A bubble of air of volume $1cm^3$ is released by a deep-sea diver at a depth where the pressure is 30 atmospheres. Assuming its temperature remains constant. Determine its volume just before it reaches the surface where the pressure is 1.5 atmosphere? (3marks)

    e) Figure 6 shows apparatus used in investigating a gas law. Study it and answer the questions that follow.

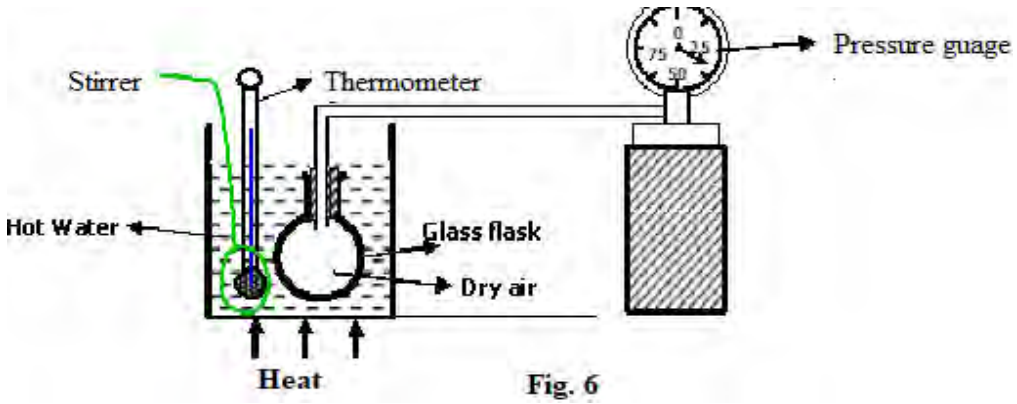


Fig. 6

i) State the law under investigation. (1mark)

ii) Describe how the set up can be used to verify the law stated in (i) above. (4marks)

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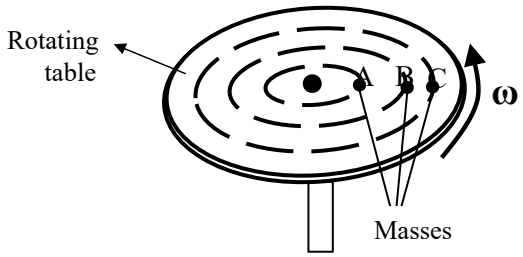
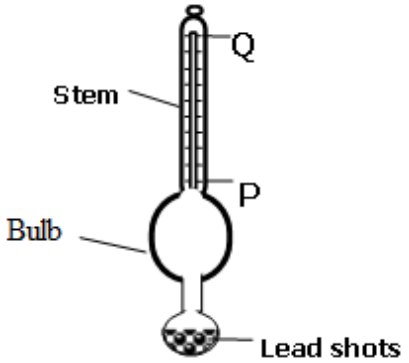
15. a) Define the radian as applied in circular motion. (1marks)
b) A body in circular motion with constant speed is said to be accelerating. Explain this observation. (1mark)
c) **Figure below** shows masses A, B and C placed at different points on a rotating table. The angular velocity of the table can be varied.



i) State two factors that determine whether a particular mass slides off the table or not. (2marks)
ii) State the mass that slides off last. Give a reason for your answer. (2marks)
iii) A ball of mass 100g tied to a light to a light string is being whirled in a vertical circle of radius 0.5m with uniform speed. At the lowest position the tension in the string is 2.8N. Calculate
i) The angular velocity of the ball. (3marks)
ii) The tension in the string when the ball is at the upper most position of the circular path. (2marks)

16. a) State two factors affecting the upthrust experienced by an object immersed in a fluid. (2marks)
b) Explain how a submarine is made to float and sink in water. (2mark)
c) Figure 8 shows a simple hydrometer.



i) Explain why the bulb is made wide. (2mark)
ii) State the purpose of the lead shots in the glass bulb (1mark)
iii) Describe how the hydrometer can be made more sensitive. (1mark)
iv) Describe how the hydrometer is calibrated to measure relative density. (2marks)

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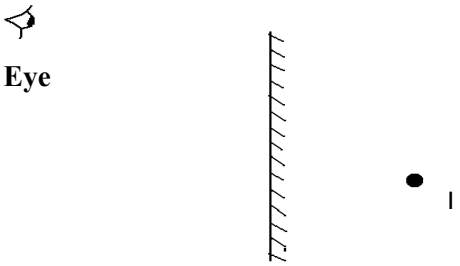
MUMIAS WEST JOINT EVALUATION, 2023
Kenya Certificate of Secondary Education
232/2
PHYSICS
PAPER 2 (THEORY)
TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

- *Answer **all** questions in section **A** and **B**.*
- *All working **must** be clearly shown.*
- *Scientific calculators and KNEC Mathematical tables may be used.*
- *Take $g = 10m/s^2$*

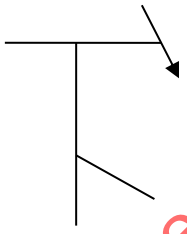
SECTION A (25 MARKS)

1. The figure 1 below shows the image in front of a mirror M.



By ray diagram construction, locate the position of the object. (2mks)

2. Figure 2 below shows a sharp pin fixed on a cap of leaf electroscope. The electroscope is highly charged and then left for some time.



Explain why the leaf collapses. (1mk)

3. Explain how polarization reduces current in a simple primary cell. State how it can be reduced. (2mks)
4. Fig 3 below shows a ray incident on a converging lens.

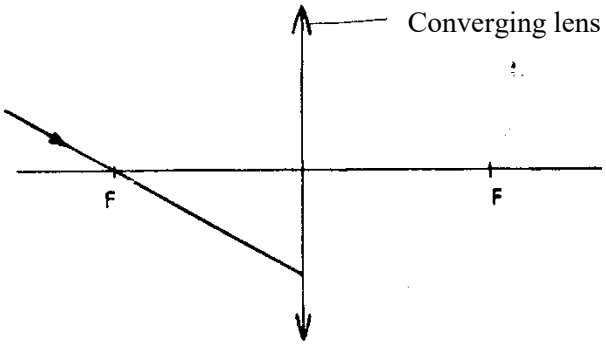


Fig. 3

Complete the ray diagram by showing the emergent ray. (1mk)

5. The chart **below** shows an arrangement of different parts of the electromagnetic spectrum.

Radio	A	Infrared	Visible	B	X-Rays	Gamma Rays

(i) Name the radiation represented by **B**. (1mk)
(ii) Name a device that can be used to detect radiation **A**. (1mk)

6. An object is placed in between two parallel mirrors. How many images can a student see? (2mks)

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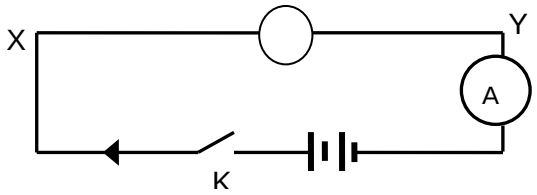
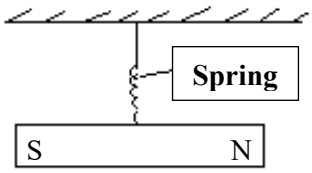
7. A car battery requires topping up with distilled water occasionally. Explain why this is necessary and why distilled water is used (2mks)
8. What causes electrical resistance in conductors? *(1mk)*
9. In determining the depth of an ocean, an echo sounder producing ultrasonic sound is used. ***Give one*** reason why this sound is preferred. *(1 mk)*
10. State the conditions necessary for a wave incident on a slit to be diffracted. *(2mks)*
11. Figure represents a long horizontal insulated wire XY connected in an electric circuit. The circle represents where a plotting compass is placed on the wire.

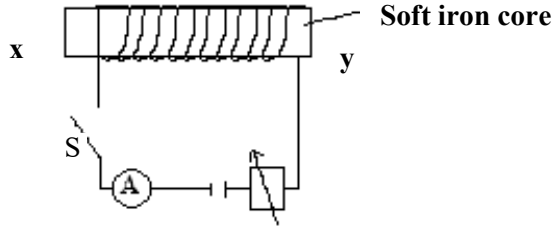


i) In the circle put an arrow to show the direction the N pole of the compass will deflect when switch k. is closed. (1mk)

ii) Mention any two ways of reversing the direction captured in (i) above. (2mk)

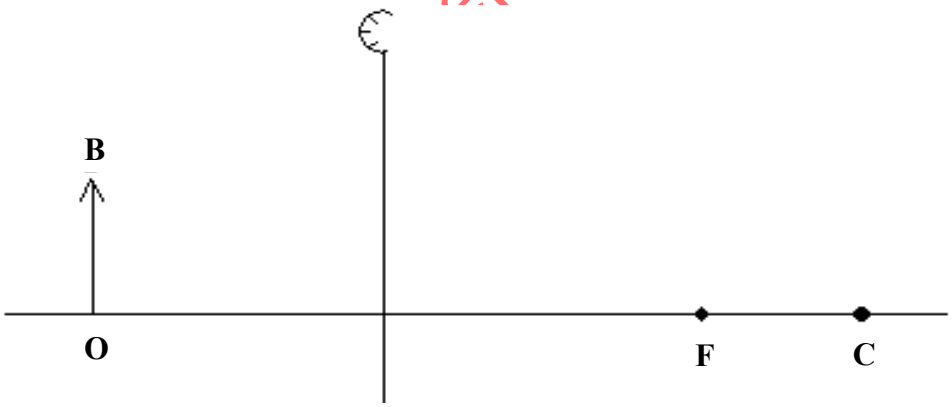
12. The diagram below shows a permanent magnet suspended by a spring. State with a reason the behavior of the magnet when the switch is closed. (2mks)





13. a) Define principal focus as used in curved surfaces. (1mk)

b) An object OB is placed in front of a convex mirror as shown below drawn to scale.

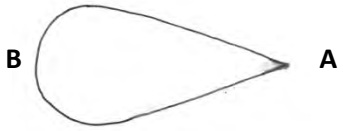


i) Draw a ray diagram to show the position of the image formed. (3mks)

SECTION B (55 MARKS)

14. a) State the basic law of electrostatics. (1mks)

b) Figure 3 shows a pear shaped conductor with positive charged on its surface.



A proof plane is used to touch side B of the conductor and then the cap of an uncharged electroscope. This is then repeated with side A.

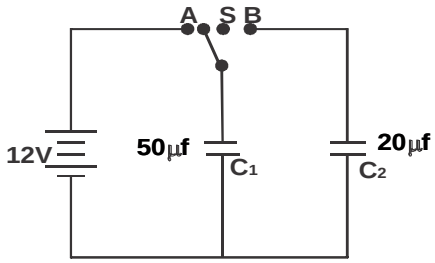
(i) Give the observation made on the electroscope in each case. (2mks)

(ii) What conclusion is drawn from the observation in (i) above (1mk)

(iii) Draw on the diagram above the illustration of your conclusion in (ii) above. (1mk)

(iv) Name one application of such a conductor. (1mk)

c) The figure below shows an arrangement which may be used to charge a capacitor of capacitance 5µ0F and then to connect it to a capacitor of capacitance 20µF.

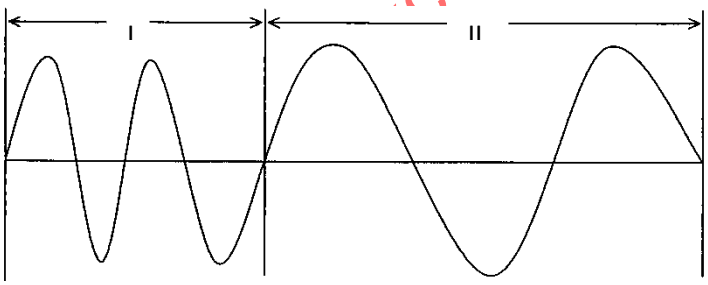


i) The switch S is first placed at position A, so that the capacitor C is connected to the 12V dc supply. Calculate the charge stored in the capacitor. (3mks)

ii) The switch S is now changed to position B. Calculate the final potential difference across the capacitors. (3mks)

15. a) Distinguish between transverse and longitudinal wave (2mks)

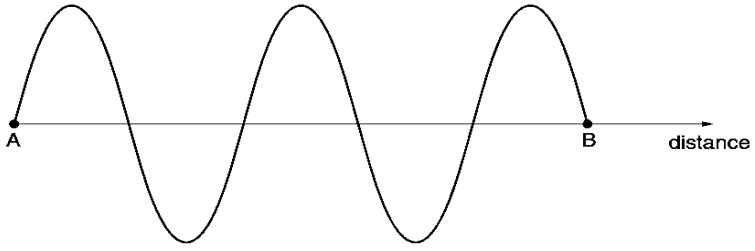
b) The diagram below shows a transverse wave traveling in different media.



(i) Name any two changes that the waves undergo in moving from medium I to medium II. (2mks)

(ii) State with reason which of the two media is denser (2mks)

(c) The diagram below represents a microwave travelling in air through points A and B.



The distance between A and B is 40 cm.

Determine the wavelength of the microwave shown in the figure. (1mk)

(d) Sketch on the same figure another wave with half amplitude and double frequency (1mk)

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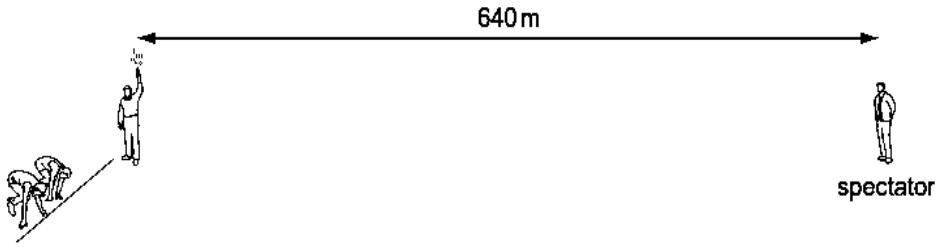
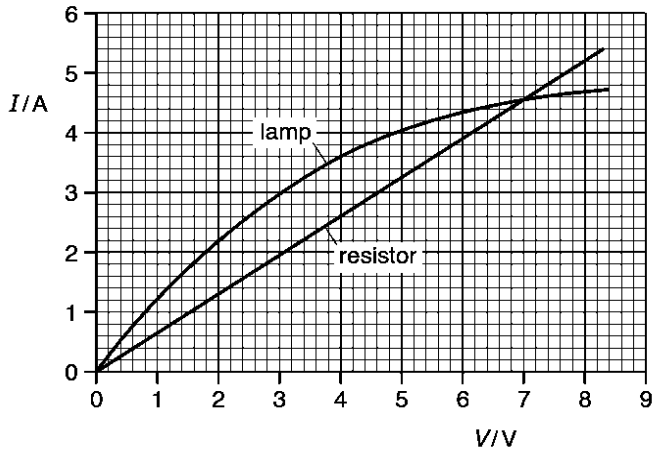
(e) A starting pistol is fired 640 m away from a spectator.



The spectator hears the sound of the starting pistol two seconds after seeing the flash from the gun. What is the speed of sound in air? (2mks)

16. The graphs in the figure below show the relation between the current *I* and the potential difference V for a resistor and a lamp.

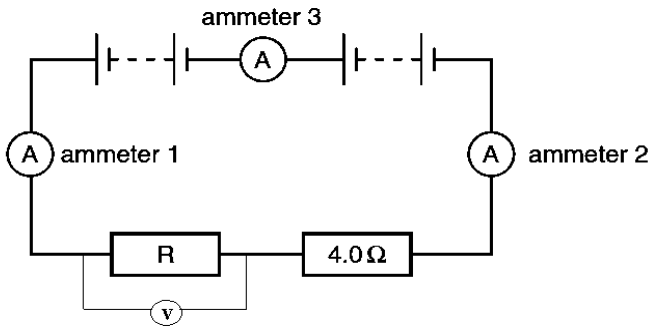


(a) (i) Describe how, if at all, the resistance varies as the current increases in (2mks)
- The resistor,.....
- The lamp. .....

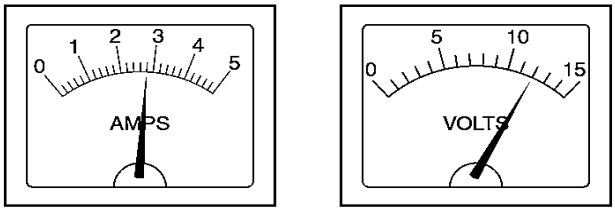
(ii) State the value of the potential difference when the resistor and the lamp have the same resistance. (1mk)

(b) The two components are connected in parallel to a supply of e.m.f. 4.0 V. Calculate the total resistance of the circuit. (1mk)

(c) The circuit below is connected. The potential difference across resistor R is measured.



The ammeter reading and voltmeter reading are shown on the scales below



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i) Record these two readings. (2mk)
ammeter reading = ... A
voltmeter reading = ... V

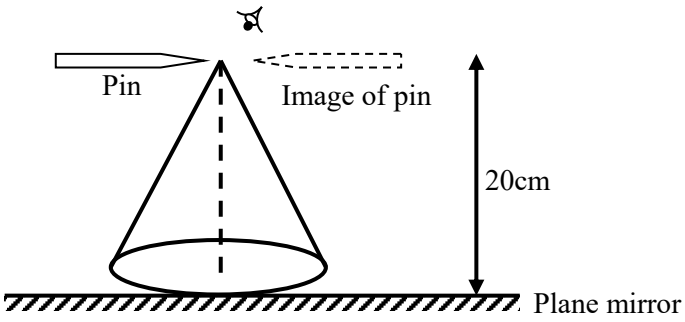
(d) Using the values above calculate

(i) the resistance of R, (2mks)

(ii) find the total resistance of the circuit (2mks)

(e) Which two indicators guide one on when to recharge a lead acid accumulator? (2mks)

17. (a) Some students wish to determine the focal length of a convex lens of thickness 0.6cm using an optical pin and a plane mirror. Figure 6 shows the experimental set up when there is no parallax between the pin and the image.



Determine the focal length of the lens (2mks)

(b) An optician in Eldoret Hospital examined an eye of a patient and made the following observations:
Eye too short and the focal length of the eye lens short

(i) State the eye defect the patient could be having. (1mk)

(ii) Use a diagram to describe how the defect could be corrected. (2mks)

(c) The graph below shows the variation of 1/v and 1/u in an experiment to determine the focal length of a lens.

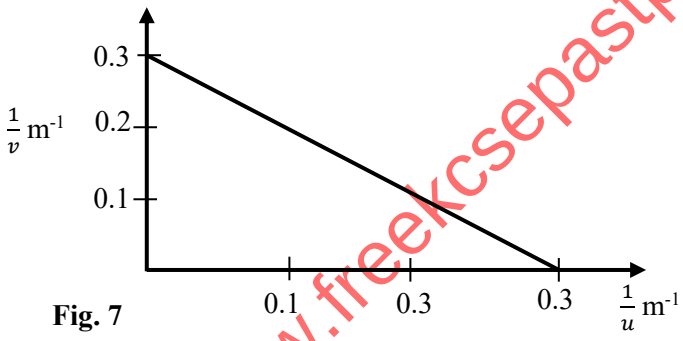


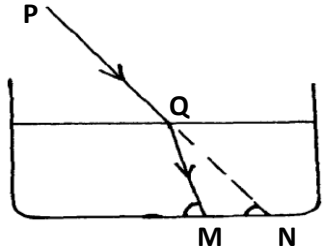
Fig. 7

(i) Use the graph to determine the focal length (3mks)

(ii) What is the power of the lens used? (2mks)

(d) A converging lens forms an image which is three times the object. Determine the focal length of the lens if the distance between the object and the screen is 80cm. (3mks)

18. (a) The figure below shows a ray of light **PQ** incident on air-water interface. The ray strikes the bottom surface at M instead of N



The ray makes an angle of 40° at **N** and 54° at **M** with the horizontal

i) Determine;

I. the angle of incidence. (1mk)

II. the angle of refraction. (1mk)

ii) Calculate the refractive index of water. (2mks)

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(b) The figure below shows a beam of white light incident on a glass prism. A thermometer with a blackened bulb is placed as shown. After some time, the thermometer reading was observed to rise steadily.

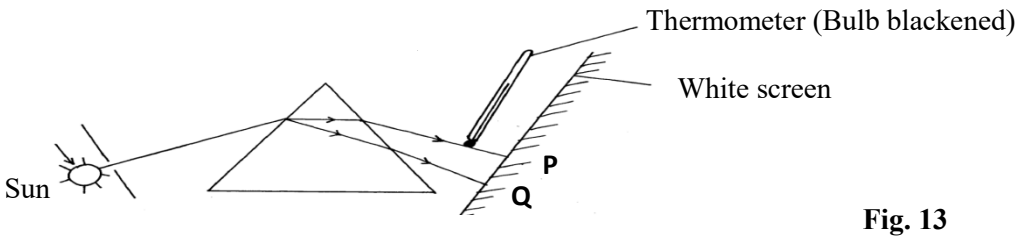

Fig. 13

(i) Why is the bulb of the thermometer blackened? (1mk)
(ii) Identify the colour that forms on the screen at points **P** and **Q** (2mks)
(iii) Why did the reading of the thermometer rise? (1mk)

MUMIAS WEST JOINT EVALUATION, 2023
Kenya Certificate of Secondary Education
232/3
PHYSICS
PAPER 3

CONFIDENTIAL

Question 1

- A milliammeter(0-100 mA).
- A voltmeter(0-5V).
- A nichrome wire mounted on a mm scale. (diameter 0.22 mm)
- A switch.
- A long wire with a crocodile clip at one and (crocodile clip to be used as a slider or jockey).
- A new dry cell (size D) and a cell holder.
- A micrometer screw gauge (may be shared).
- 5 connecting wires, two with crocodile clips at the end.

Question 2

- A white screen with crosswires
- A Mounted lens f=10±1 cm
- A White screen
- A Candle
- A Metre rule
- A watch glass
- A piece of plasticine
- A marble
- A Stopwatch
- An electronic balance (*to be shared*)
- Vernier calipers (*to be shared*)
- Geometrical set

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MUMIAS WEST JOINT EVALUATION, 2023
Kenya Certificate of Secondary Education
232/3
PHYSICS
PAPER 3
Practical
TIME – 2½ HRS

INSTRUCTIONS

- *Answer ALL the questions.*
- *You are NOT allowed to start working with the apparatus for the first 15 minutes of the 2¼ hours allowed for this paper.*
- *This time is to enable you to read the question paper and make sure you have all the apparatus that you may need.*
- *Electronic calculators may be used*
- *All working must be clearly shown where necessary.*

Question 1

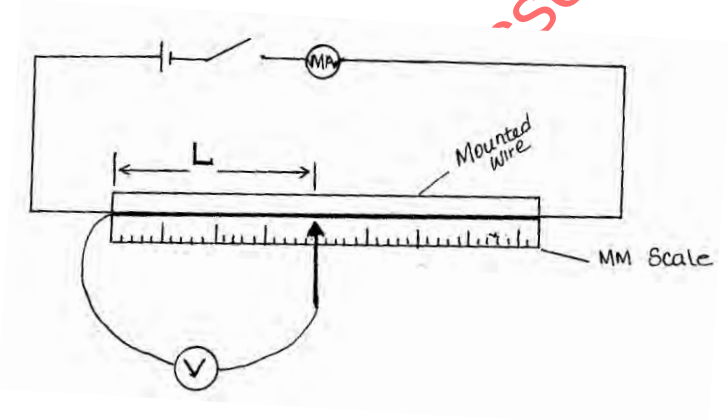
1. You are provided with the following:

- A milliammeter.
- A voltmeter.
- A wire mounted on a mm scale.
- A switch.
- A long wire with a crocodile clip at one and (crocodile clip to be used as a slider or jockey).
- A new dry cell (size D) and a cell holder.
- A micrometer screw gauge (may be shared).
- 5 connecting wires, two with crocodile clips at the end.

Proceed as follows:

(a) Measure the diameter, d of the mounted at three different points.
Average diameter d = _____mm (1mk)

(b) Set up the apparatus as shown in the circuit diagram in the figure **below**.



(c) Close the switch and tap the mounted wire with the crocodile clip as shown in the circuit. Ensure that both meters show positive deflection. Open the switch.

(d) Tap the wire at **L = 20cm.** Close the switch read and record in the time provided the milliammeter and voltmeter reading.

(e) Repeat the procedure in (c) for other values of L, shown in the table below and complete the table. (8mks)

L(cm)	L(m)	V (Volts)	I (mA)	I (Amps)	$R = V/I$
20					
30					
40					
50					
60					
80					

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(f) (i) Plot the graph of R (Y-axis) against L(m). (5mks)
(ii) Determine the slope of the graph. (3mks)
(iii) Given that $R = PL/A$ were A is the cross-sectional area of the wire and P is a constant for the material of the wire, determine the value of the constant P. (3mks)

QUESTION 2

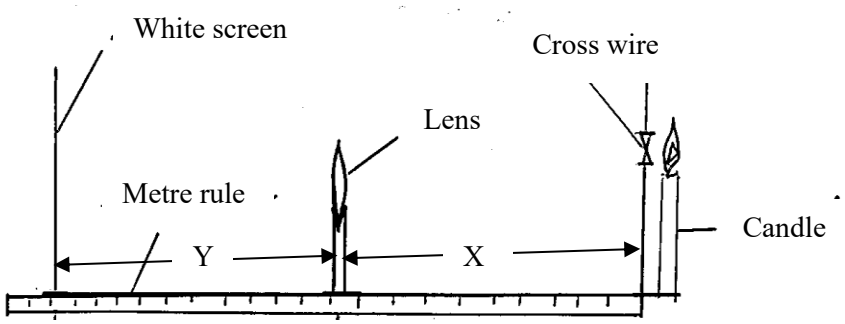
PART A

You are provided with the following:
1. A white screen with crosswires
2. A Mounted lens
3. A White screen
4. A Candle
5. A Metre rule

Proceed as follows:

(f) Estimate the focal length of the lens by focusing the image of a distant object on the screen provided e.g. distant window.
f_o = _____cm (1mark)

(g) Arrange the apparatus as shown.



With the object (cross-wires) illuminated using a candle flame placed at $x = 15cm$, move the screen until a sharp magnified image of the object is formed on the screen.
Measure and record the corresponding value of y in the table.

(h) Repeat step (g) for the value of $x = 18\ cm$.
Table (3 marks)

$x\ (cm)$	15	18
$y\ (cm)$		
$\frac{x+y}{xy}$ (cm^{-1})		

(i) Determine the average of $\frac{x+y}{xy}$ (2marks)

(j) Compare the average $\frac{x+y}{xy}$ and $\frac{1}{fo}$ (2marks)

(k) Given that $\frac{1}{fo} = \frac{y}{(\frac{y}{x})+1}$ $and\ x = 25\ cm. Determine\ the\ value\ of\ y.$ (2marks)

PART B

You are provided with the following:
A watch glass
A piece of plasticine
A marble
A Stopwatch
An electronic balance (*to be shared*)
Vernier calipers (*to be shared*)
Geometrical set

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Proceed as follows:

(a) Measure the mass, **m** of the marble.

m = ……g (1 mark)

b) Place the watch glass on the table. Cut the plasticine into two pieces and use them to hold the watch glass firmly on the table as shown in **Figure 1**.

c) Release the marble from one end of the watch glass and time 5 complete oscillation with the stopwatch. Repeat this one more time.

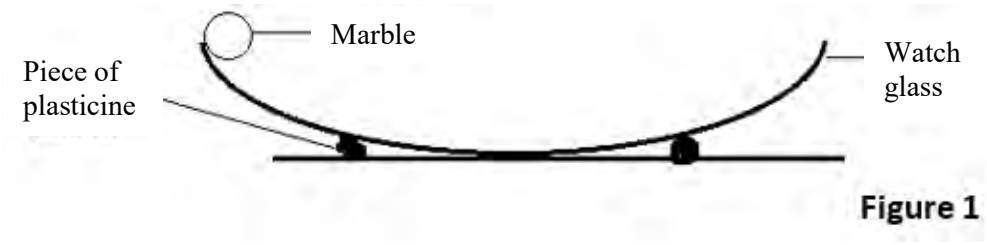

Figure 1

d) Record your values in the **Table 1** (2 marks)

Attempt	Time for **5** oscillations (seconds)	Periodic time, **T**(s)
1st		
2nd		

Table 1

e) Find the average periodic time **T** (1 mark)

f) (i) Measure the diameter of the marble with the Vernier calipers, hence find its radius

Diameter, **d** = …… (1 mark)

Radius, **r** = ……m (1 mark)

(ii) Determine the volume of the marble given that $V=\frac{4}{3}\pi r^3$ where $\pi=3.142$ (2 marks)

(iii) Calculate the radius of the curvature of the watch glass R from the formula $R - r = \frac{5gT^2}{7(2\pi)^2}$

Where $g=10m/s^2$ and $\pi=3.142$ (2 marks)

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NAKURU – FORM IV JOINT EVALUATION, 2023

Kenya Certificate of Secondary Education

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PHYSICS

PAPER 1

(Theory)

2 HOURS

Instructions to candidates:

*a) Answer **ALL** the questions in section **A** and **B**.*

*b) **ALL** working **MUST** be clearly shown.*

c) Mathematical tables, electronic calculators and slide rules may be used.

Take g = $10m/s^2$

Specific heat capacity of water is $4200JKg^{-1}K^{-1}$

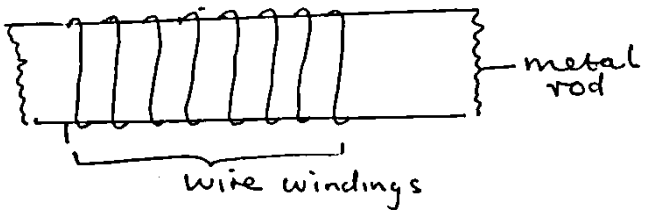
Density of water = $1000kgm^{-3}$

Density of mercury = 1.36×10^{-4} kgm^{-3}

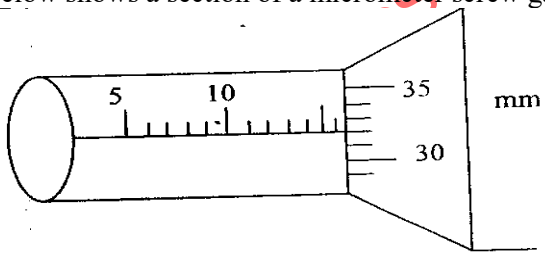
SECTION A: (25 MARKS)

Answer ALL questions this section.

1. The figure below shows a wire wound on a metal rod. The windings just touch each other. If the total number of complete loops was found to be 25 and the distance covered by the windings on the rod is 0.6 cm, find the radius of the wire giving your answer in standard form. (2 marks)



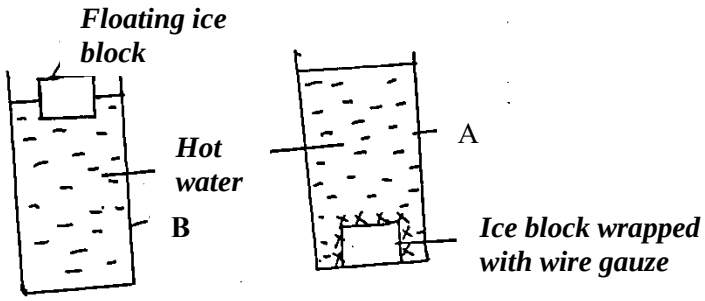
2. The diagram below shows a section of a micrometer screw gauge.



a) State the smallest measurement that can be made by the micrometer screw gauge. (1 mark)

b) The thimble of the micrometer screw gauge is rotated through 2½ revolution in the clockwise direction in order to measure the diameter of a marble. State the diameter of the marble. (1 mark)

3. The figure below shows two identical containers A and B containing hot water and ice block.



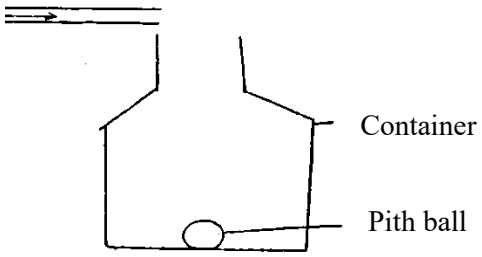
State with reason which water cools faster assuming that the wire gauge absorbs negligible heat. (2 marks)

4. A bus that carries goods in the under seats carrier is more stable than one that carries goods in the carrier at the top. Explain why this is so. (1 mark)

5. A turntable of radius 16 cm is rotating at 960 revolution per minute. Determine the angular speed of the turntable. (2 marks)

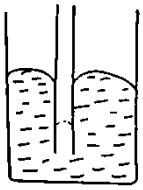
6. Sketch a velocity – time graph for a body initially moving at a velocity u before a force F is applied to it for 5 seconds and there after the force F is withdrawn. (2 marks)

7. The figure below shows a pith ball in a container. (2 marks)



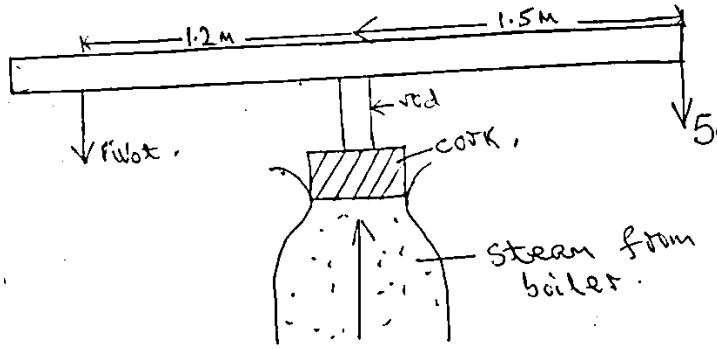
State and explain what would happen if air is blown over the mouth of the container. (2 marks)

8. The figure below shows a capillary tube placed in a trough of a mercury.



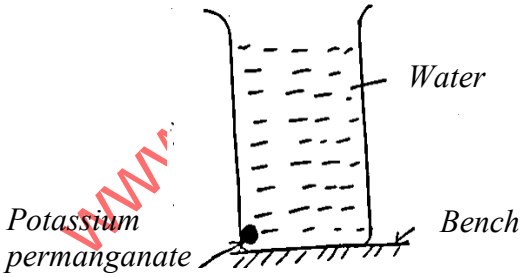
Give a reason why the level of mercury in a capillary is lower than in the beaker. (1 mark)

9. A cork enclosing steam in a boiler is held by the system below.



If the area of the cork is 15 cm^2 and a force of 500N is needed to keep the cork in place, determine the pressure of the steam in the boiler. (3 marks)

10. In an experiment a crystal of potassium permanganate was placed in water as shown below.

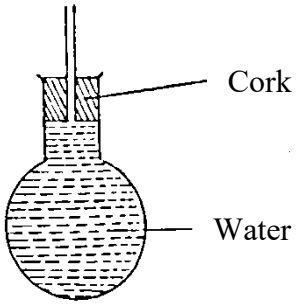


After sometime, it was observed that the water turned purple. Explain the observation. (1 mark)

11. An aircraft 300m from the ground traveling horizontally at 400m/s releases a parcel. Calculate the horizontal distance covered by the parcel from the point of release. (Ignore air resistance) (2 marks)

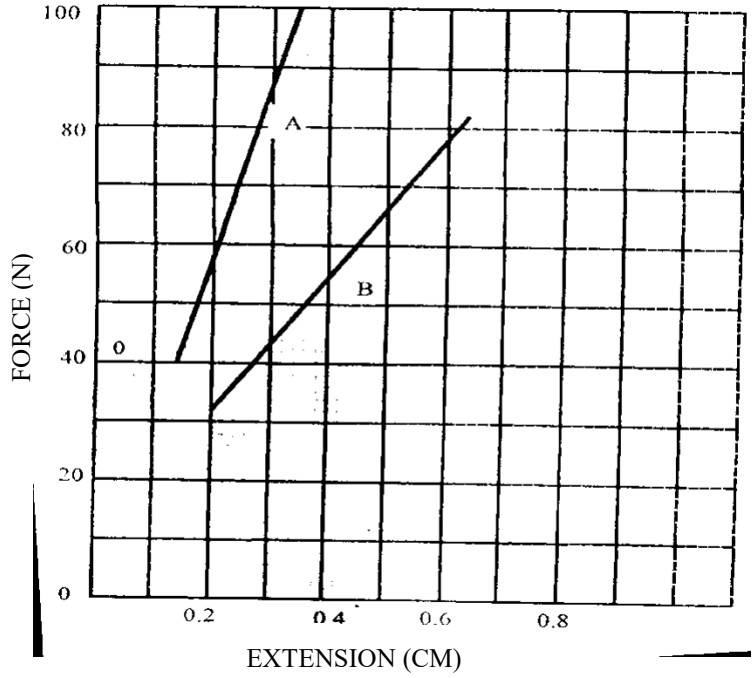
12. A 20kw immersion water heater is used to heat 5.0 x 10^{-3} m^3 of water from 23^0C to 100^0C.
Given that 30% of heat is lost to the surroundings, determine the time used in heating the water. (2 marks)

13. When the flask is placed in iced water the level on water rose and then fell.
Explain the observation. (1 mark)

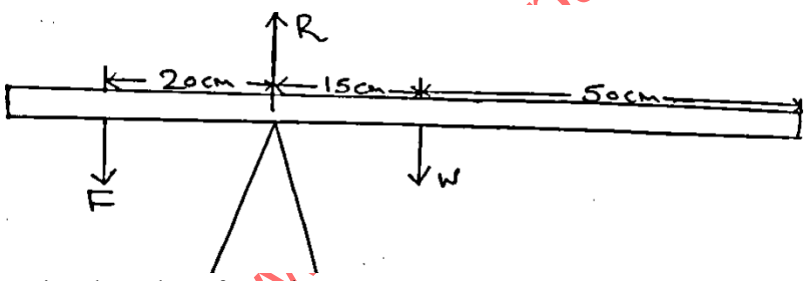


SECTION B. (55 MARKS)

14. The graph (curve) below show the variation of force against extension (cm) of the spiral springs of the same material, same wire thickness length but of different diameters (one large and the other small).
Identify which graph (A or B) represents which spring. (2 marks)

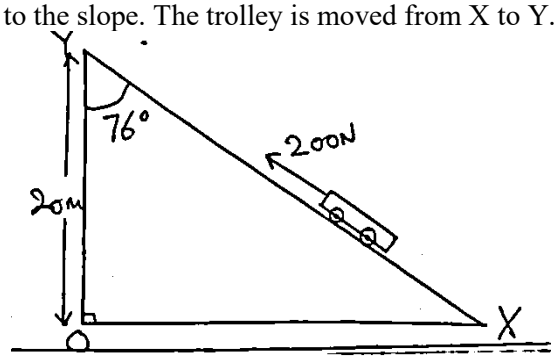


15. a) State the principle of moments. (1 mark)
b) A uniform metal strip is 3.0cm wides 0.6cm thick and 100cm long. The density of the metal is 2.7g/cm^3.
(i) Determine the weight of the metal strip. (3 marks)
(ii) The strip is placed on a pivot and kept in equilibrium by forces as shown.



Determine the value of F and R. (3 marks)

16. The figure below shows an inclined plane, a trolley of mass 60kg being pulled up the slope by a force of 200N parallel to the slope. The trolley is moved from X to Y.



Determine the,
i) Work output of the system. (2 marks)
ii) Work input of the system. (2 marks)
iii) The frictional force between the wheels of the trolleys and the inclined plane. (2 marks)
iv) The efficiency of the system. (2 marks)
v) The velocity ratio of the system. (2 marks)

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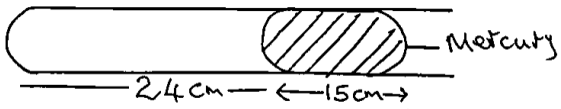
17. a) A glass capillary contains enclosed air by a thread of mercury 15cm long when the tube is horizontal, the length of the enclosed air column is 24 cm as shown.



i) What is the length of the enclosed air column when the tube is vertical with the open end the uppermost if the atmospheric pressure is 750mmHg? (2 marks)

ii) What is the length of the enclosed air column when the tube is vertical with the closed end upper most if the atmospheric pressure is 750mmmHg? (2 marks)

iii) Explain why the mercury does not run out when the tube is vertical with the closed end uppermost. (1 mark)

b) Explain why an air bubble increase in volume as it rises from the bottom of a lake to the surface. (2 marks)

c) When an inflated balloon is placed in a refrigerator it is noted that its volume reduces, use the kinetic theory of gases to explain this observation. (2 marks)

d) A certain mass of hydrogen gas occupies a volume of $1.6m^3$ at a pressure of 1.5×10^5 N/M^2 and a temperature of 27^0C. Determine the volume when the temperature is 0^0C at a pressure of $8.0\ 10^4$ N/M^2. (3 marks)

e) State the pressure law. (1 mark)

18. a) State Archimedes Principle. (1 mark)

b) A block of wood measuring 0.8m by 0.5m by 2m floats in water. 1.2m of the block is submerged.

(i) Determine the weight of the water displaced. (2 marks)

(ii) Find the force required to just make the block fully submerged. (3 marks)

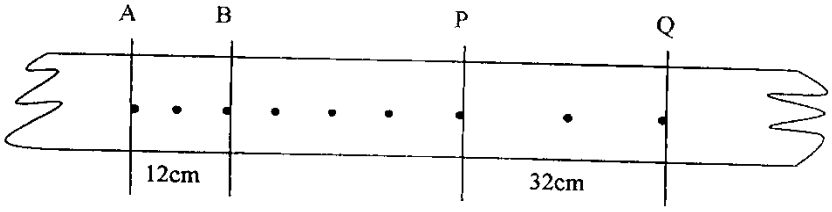
c) A block of glass of mass 250g floats in mercury.
What volume of the glass lies under the surface of mercury. (3 marks)

d) A piece of sealing wax, weighs 3N in air and 0.22N when immersed in water, calculate the density of the wax. (3 marks)

e) A balloon weighs 10N and has a gas capacity of $2m^3$. The gas in the balloon has a density of $0.1kg/m^3$.
If the density of air is $1.3kgm^{-3}$, calculate the resultant force of the balloon when it is floating in air. (3 marks)

19. a) Distinguish between speed and velocity. (1 mark)

b) The figure below shows the motion of a ticker tape through a ticker timer whose frequency is 100Hz.



Determine

(i) Velocity at AB and PQ. (2 marks)

(ii) Constant acceleration of the tape. (2 marks)

c) State Newton's second law of motion. (1 mark)

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PHYSICS

PAPER 2

(THEORY)

2 HOURS

INSTRUCTIONS TO CANDIDATES

a) Answer ALL the questions in Section A and B.
b) All working MUST be clearly shown
c) Non-programmable silent electronic calculators and KNEC Mathematical tables may be used for calculations

SECTION A (25 MKS)

1. a) Figure 1 shows a ray of light incident on a plane mirror at point X.

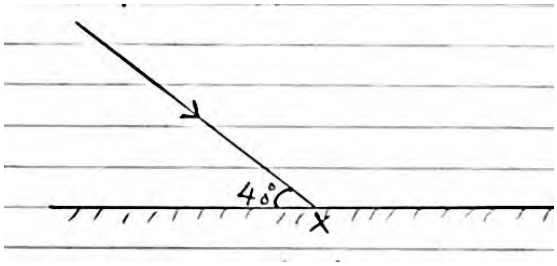


FIGURE 1

Complete the diagram indicating the angle of reflection. (2mks)

b) State one characteristic of the image formed on plane mirror. (1mk)

2. a) Figure 2 shows a stationary charged rode (X) placed between two freely suspended charged rods, Y and Z. The charge on rod Z is indicated.

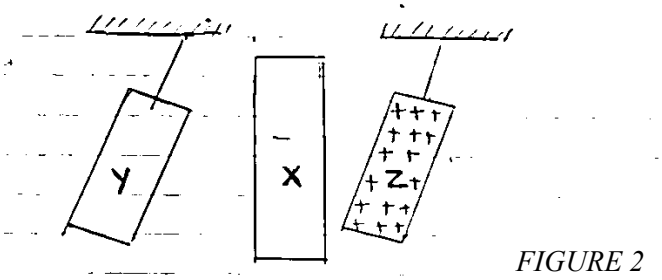


FIGURE 2

Identify the type of charge on rods X and Y. (1mk)

b) State one use of a charged gold leaf electroscope. (1mk)

3. State the reason why current produced by a simple primary cell decreases rapidly when the cell is in use. (1mk)

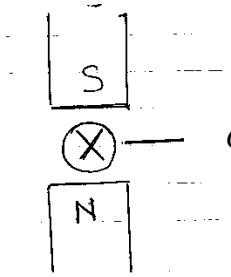
4. a) State the reason why a freely suspended magnet always settles facing a particular direction. (1mk)

b) Figure 3 shows poles of two bar magnets placed close to one another.

FIGURE 3

Sketch the magnetic field pattern in the space between the poles. (1mk)

5. Figure 4 shows the cross section of a conductor carrying some current and held between magnet field.



Conductor

FIGURE 4

Indicate using an arrow on the diagram the direction the conductor moves when released. (1mk)

6. a) What is meant by the term echo? (1mk)

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b) Compare the speed of sound in air and in steel. (1mk)
c) State one difference between stationary wave and progressive wave. (1mk)

7. a) State one difference sound waves and radio waves. (1mk)
b) Figure 5 shows how displacement varies with distance of a certain wave. (1mk)

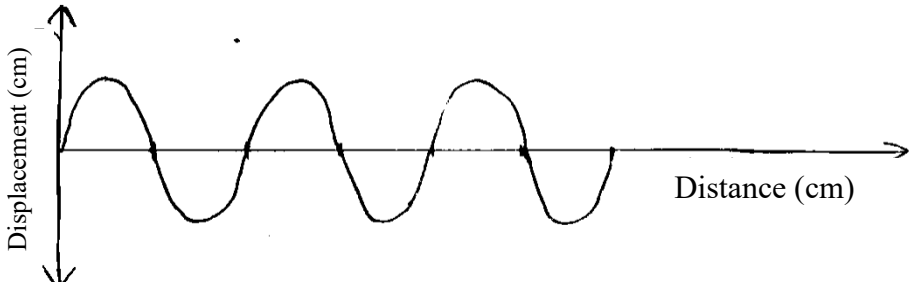
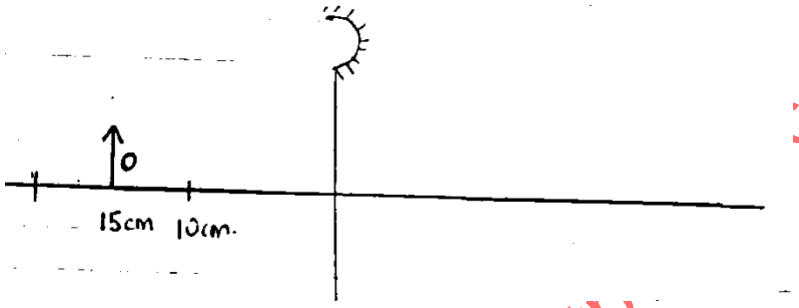


FIGURE 5

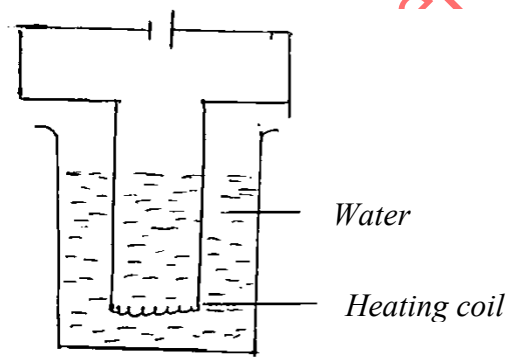
On the same diagram, indicate the wavelength (λ) of the wave using the symbol. (1mk)

8. a) State one characteristic of images formed by a concave mirror. (1mk)
b) Figure 6 shows a concave mirror of focal length 10cm and an object O, placed 15cm in front of the mirror.



Using a ray diagram, complete the diagram to locate the image, I, formed. (2mks)

9. Figure 7 shows an immersion heater used to heat some water initially at 25^0C to boiling point.

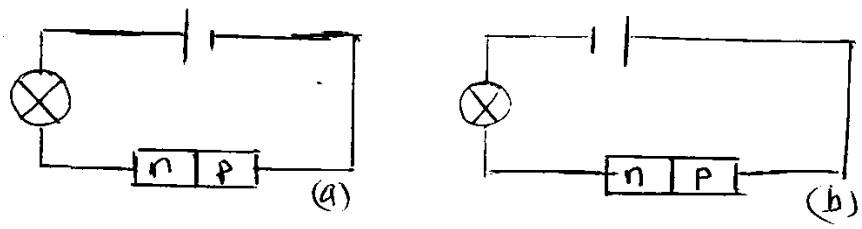


State two factors that determine the time taken for the water to boil. (2mks)

10. A radioactive substance initially has a mass of 0.4g and decays to 0.05g in 75 minutes.
Determine the half-life of the substance. (2mks)

11. State one difference between X-rays and infrared waves. (1mk)

12. Figure 8 (a) and (b) shows P – n junctions, each connected to a cell and a lamp.



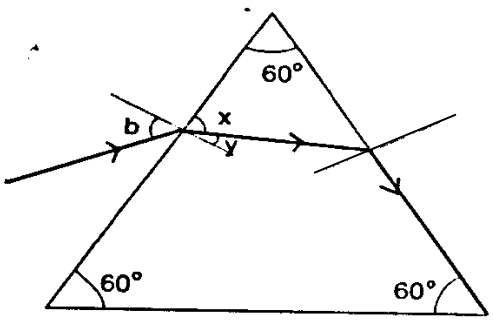
It is observed that the bulb in (a) does not light while the bulb in (b) lights.
Explain the reason for these observations. (2mks)

SECTION B (55 MARKS)

13. a) Define the term critical angle of a refracting media. (1mk)

b) One of the conditions necessary for total internal reflection to occur is that the critical angle must be exceeded. State the other condition. (1mk)

c) The figure below shows a ray of light travelling from air and through a prism made of glass of refractive index 1.7.



i) On the diagram show the critical angle. (1mk)

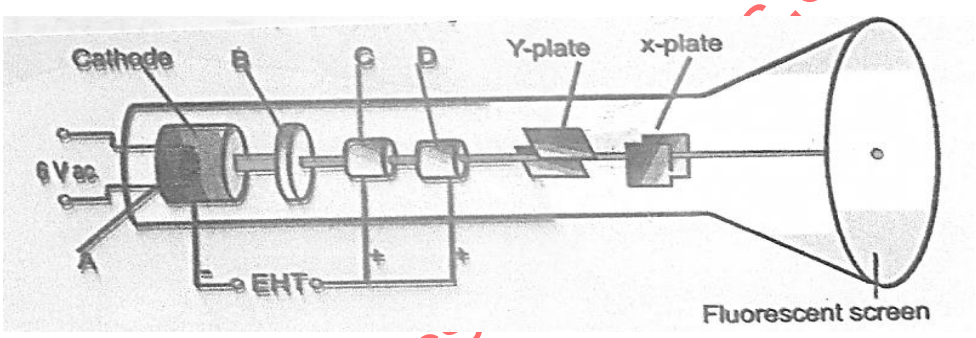
ii) Determine the

I Critical angle (2mks)

II. Angle x and y (2mks)

14. a) Define the term **"Thermionic emission"** (1mk)

b) The figure below shows the sketch of a cathode ray Oscilloscope.



i) Label the parts marked A and C. (2mks)

ii) State the functions of the parts labeled B and D. (2mks)

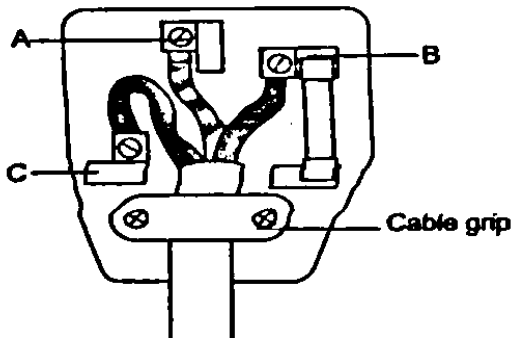
iii) Explain briefly how the C.R.T works. (2mks)

15. When a radiation of wavelength 1.8×10^{-9} m falls on a photo emissive surface, the photoelectrons can be stopped when a positive terminal of 400V is applied on the surface.
Given that the electronic charge = 1.6×10^{-19} C, mass of the electron = 9.1×10^{-31} kg,
Planck's constant = 6.62×10^{-34} Js, C = 3.0×10^{8}m/s, calculate the;

i) The work function of the surface. (2mks)

ii) The threshold frequency. (2mks)

16. The figure below shows a 3- pin plug with the wires connected.



a) i) Identify the pins A, B and C and give the colour code of each. (3mks)

ii) State the pin to which a switch should be connected to. (1mk)

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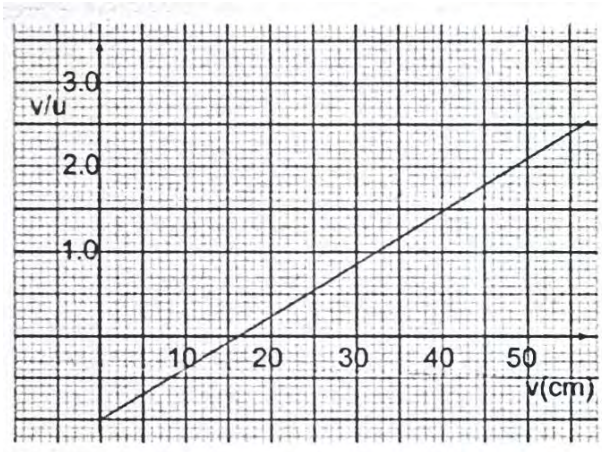
b) The table below shows appliances connected to the power supply system in a house. Their power rating and duration of use per day is shown.

Appliance	Rating (Watts)	Number	Duration/day (hours)
Light bulbs	18	10	4
Radio	20	4	12
TV	120	1	6
Heater	1300	1	1

Given that the cost of a KWh of power is Ksh. 22.19, calculate the cost of power for the house for 30 days. (3mks)

17. The figure below shows values of $^{v}/_{u}$ plotted against v, for a convex lens, where v = image distance and u = object distance.

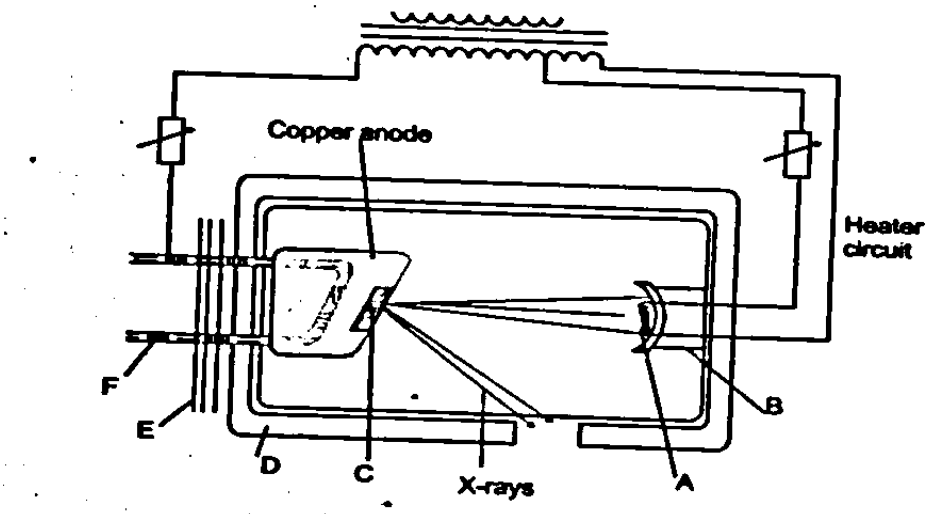


a) What quantity is represented by the values v/u plotted on the vertical axis? (2mks)
b) Determine the slope S of the graph. (1mk)
c) Determine the x-intercept of the graph. (1mk)
d) Given that

$$\frac{v}{u} = \frac{v}{k} + c$$

Determine the values of
i) k (1mk)
ii) c (1mk)

18. a) Give one difference between x-rays and cathode rays. (1mk)
b) The figure below shows a sketch of an x-ray tube.



i) Label the parts A, B and C. (3mks)
ii) State the purpose of E and F. (1mk)
iii) What physical characteristics are used to decide on the choice of C. (1mk)
b) State the function of the part labeled D. (1mk)

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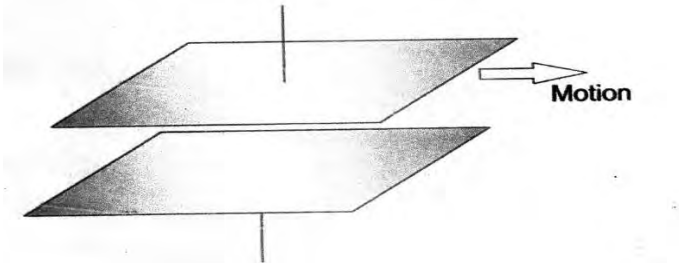
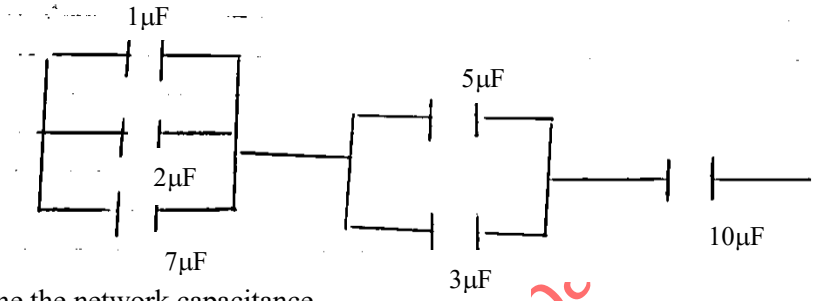
c) Electrons from a cathode ray gun are accelerated in an X-ray tube by a potential of 10kV and used to produce X-rays. Only 0.5% of the electron energy converts into X-rays.
Determine the
i) Maximum energy contained in the cathode electrons. (1mk)
ii) Wavelength of the x-rays produced. (2mks)
(Take h = 6.62 x 10^{-34}Js, C = 3.0 x 10^{8} m/s)

19. The figure below shows two capacitor plates held parallel to each other.

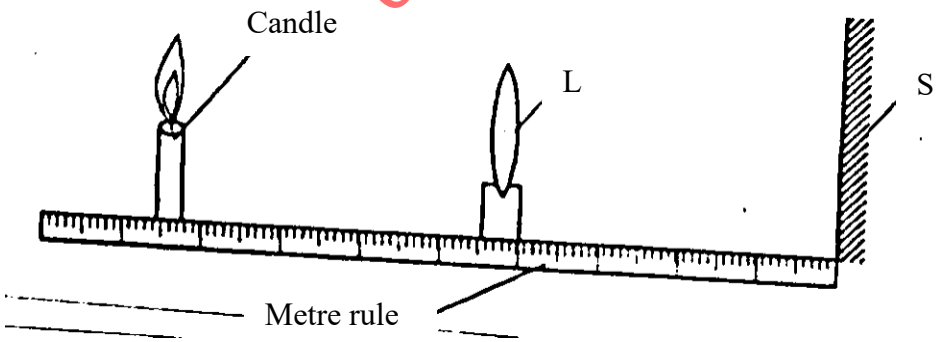


a) State and explain what happens to the capacitance of the plates if the top plate is moved as shown. (2mks)
b) Show that if three capacitors in parallel have capacitances C_1, C_2 and C_3, then the network capacitance is given as follows. $C_N = C_1 + C_2 + C_3$ (2mks)
c) The figure below shows a network of capacitors.



Determine the network capacitance. (2mks)

20. a) The figure below shows an experimental set-up consisting of a mounted lens L, a screen S, a metre rule and a candle.



i) Describe how the set-up may be used to determine the focal length, f, of the lens. (4mks)
ii) State the reason why the set-up would not work if the lens was replaced with a diverging lens. (1mk)
b) An object placed 15cm from a convex lens is magnified two times.
Determine the focal length of the lens. (3mks)

NAKURU – FORM IV JOINT EVALUATION, 2023
Kenya Certificate of Secondary Education
232/3
PHYSICS
Practical
PAPER 3
CONFIDENTIAL

Question 1

- A 100 cm nichrome wire mounted on a millimeter A B – S.W.G 28.
- An ammeter (0 – 1A).
- A voltmeter (0 – 5 V).
- 2 dry cells (1.5V each).
- A cell holder.
- A torch bulb and a bulb holder.
- Eight connecting wires at least 4 with crocodile clips.
- A switch.
- A micrometer screw gauge.

Question 2.

PART A

- A coin (20 Shillings coin)
- Metre rule (labelled with its mass which is rounded off to a whole number).
- Knife edge.
- Measuring cylinder, 100ml.
- Container with water (any volume from 20 cm^3).

PART B.

- A triangular glass prism.
- A metre rule.
- A 50g mass.
- Boiling water.
- Some cold water
- Some threads – 2 pieces 100cm.
- A thermometer (0^0 – 110^0c)
- One stand, one boss and one clamp.
- A beaker – 100ml.

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NAKURU – FORM IV JOINT EVALUATION, 2023

Kenya Certificate of Secondary Education

232/3

PHYSICS

Practical

PAPER 3

TIME: 2 ½ HOURS

INSTRUCTIONS TO THE CANDIDATES:

1. Answer **all** the questions.
2. You are supposed to spend the first **15 minutes** of the 2 ½ hours allowed for this paper reading the whole paper **carefully** before commencing.
3. Marks are given for **a clear record of the observation** actually made, their suitability, accuracy and the use of them.
4. Candidates are advised to **record** their observations as soon as they are made.
5. **Non-programmable silent electronic calculators** and **KNEC** mathematical tables may be used.

Question 1

1. **You are provided with the following:**
   - 100cm nichrome wire mounted on a millimeter scale AB.
   - An ammeter
   - A voltmeter (0-5V)
   - 2 dry cells (1.5V each)
   - A cell holder
   - A torch bulb and a bulb holder
   - Eight connecting wires at least 4 with crocodile clips.
   - A switch
   - A micrometer screw gauge (to be shared)

a) Measure the diameter, d of the mounted wire at two different points.
d1 = _____ d2 = _____ (1mk)
Average of d1 and d2 = _____ mm (1mk)

b) Connect the apparatus as shown below.

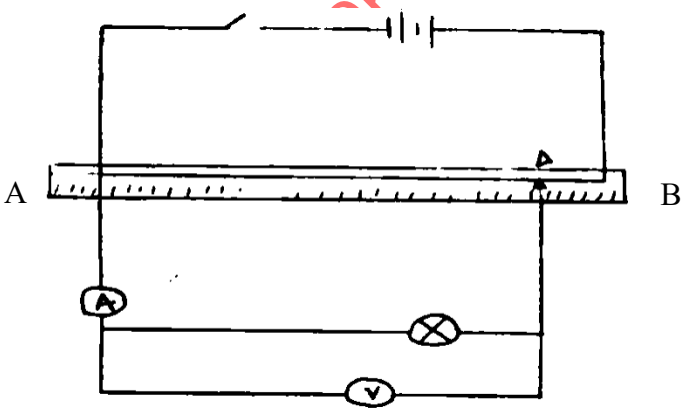

Fig 1

c) Place the sliding contact at P = 20cm from A and then close the switch. Record the readings of both the current and voltage in the table below.

d) Repeat the above experiment by placing P at 40cm, 60cm, 70cm, 80cm and 100cm from A. Record your readings in the table below. (5 mks)

i)

Length (cm)	Ammeter reading (I) (A)	Voltmeter reading P.d (V)
20		
40		
60		
70		
80		
100		

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ii) What happens to the bulb as L increases? (1mk)

e) i) Plot a graph of I(A) against P.d(V) on the grid provided. (5mks)

ii) Determine the slope of the graph at V = 0.6V, stating its SI units. (3mks)

iii) Determine the cross section area (A) of the wire in m^2. (2mks)

iv) Given that $V = \frac{eIL}{A}$ find e at L = 0.70M. (2mks)

Question 2

Part A

You are provided with the following:

- A coin (20 shilling coin)
- Metre rule (labeled with its mass)
- Knife edge
- Measuring cylinder, 100ml
- Container with water

Procedure

i) Record the mass of the rule Mr.

Mr = _____ g (1mk)

ii) Balance the rule on the knife edge.

C.O.G = _____ cm (1mk)

iii) Put the rule on the knife edge d1 cm from the centre of the rule.

iv) Place the coin as shown in the figure below and adjust it until it gain balances horizontally.

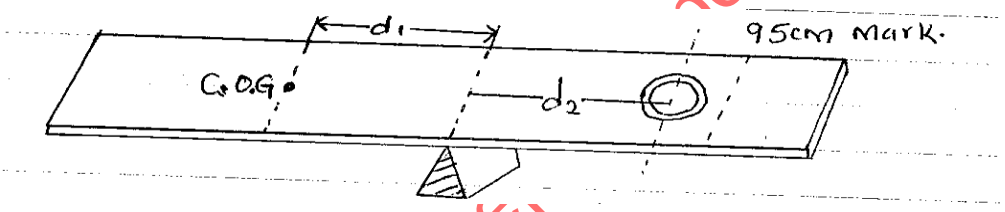

Fig 2.

v) Measure d1 = _____ cm ($^1/_2$mk)

d2 = _____ cm ($^1/_2$mk)

vi) Determine mass of coin M_C in grams. (2mks)

$$M_C = \left(\frac{M_r \times d_1}{d_2 - 1.3}\right)$$

vii) Using the measuring cylinder, estimate the volume of the coin.

V_C = _____ cm^3 (1mk)

viii) Calculate the density of the material of the coin.

ρ_c = _____ g/cm^3 (1mk)

PART B

You are provided with the following

- a triangular glass prism
- a metre rule
- a 50 g mass
- some hot water
- some cold water
- some thread
- a thermometer
- one stand, one boss and clamp
- a beaker

Proceed as follows

a) Using a piece of thread suspend the metre rule from the clamp on the stand and adjust the position of the thread until the metre rule balances horizontally. Note this position, O of the thread. **(This position of the thread must be maintained throughout the experiment)**

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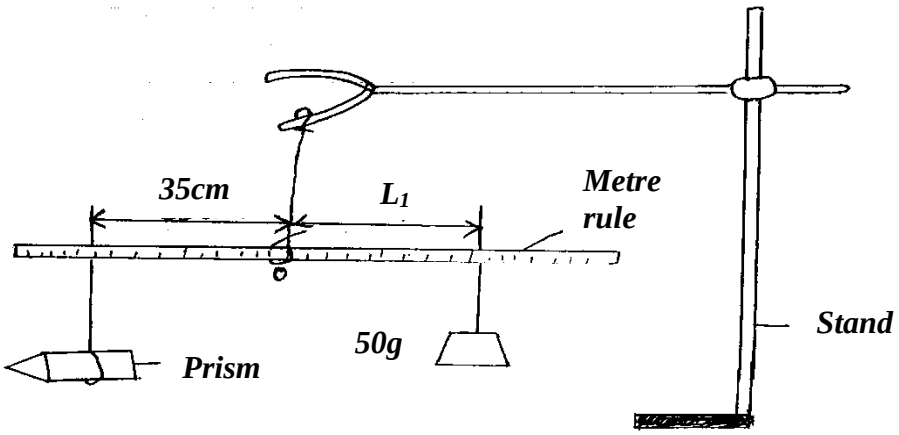
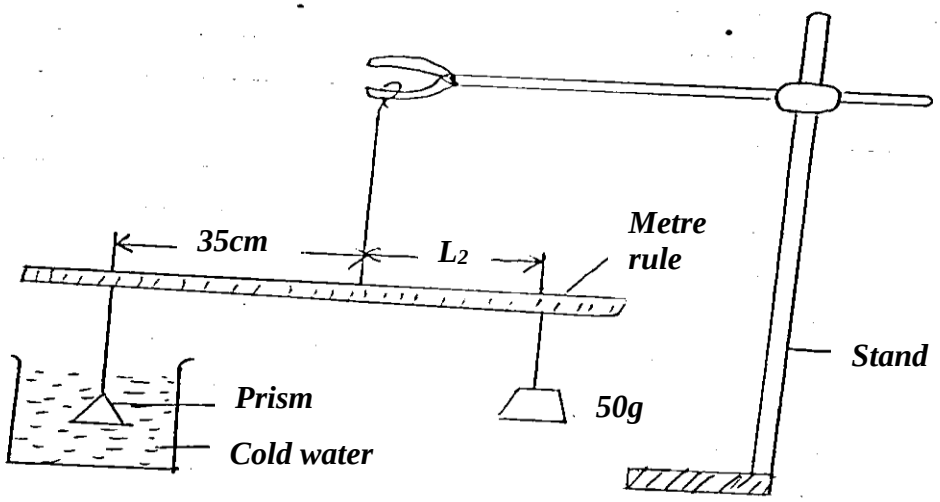
b) Using another piece of thread suspend the glass prism from the meter rule at a point 35cm from O. Suspend the 50g mass on the opposite side of O using another piece of thread. Adjust the position of the thread attached to the 50g mass until the metre rule balances once more.



i) Determine the distance L_1 between O and the point of support of the 50g mass.
L_1 = _____ cm (1mk)

ii) Use the principle of moments to determine the weight W_1 of the prism in air. (take g = 10N/kg) (2mks)

c. Put cold water into the beaker (approximately three quarter ¾ full). With the glass prism still at 35cm from O, determine the distance L_2 of the 50g mass at which the rule balances when the prism is fully submerged in the cold water.



I) L_2 = _____ cm (1mk)

II) Determine the weight W_2 of the prism in the cold water. (2mks)

d) Measure and record the temperature T_1 of the cold water when the system is balanced.
T_1 = _____ ^{0}C (1mk)

e) Now pour out the cold water and replace it with hot water. Balance the metre rule with the prism fully submerged in hot water. **Ensure that the prism is still supported at 35cm from O.**

i) Determine the distance L_3 of the point of support of the 50g mass when the prism is submerged in hot water.
L_3 = _____ cm (1mk)

ii) Measure and record the temperature T_2 of the hot water.
T_2 = _____ ^{0}C (1mk)

iii) Determine the weight W_3 of the prism in hot water. (2mks)

f) Determine the constant k for the water given that: (2mks)

$$k = \frac{(W_1 - W_2) - (W_1 - W_3)}{(W_1 - W_3)(T_2 - T_1)}$$

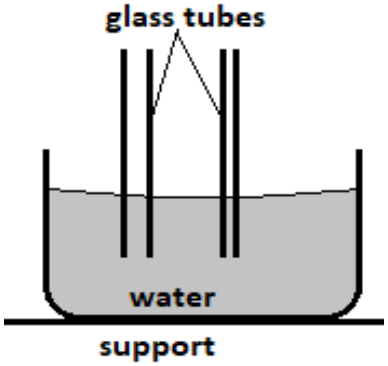
EASTERN CLUSTER EVALUATION, 2023
Kenya Certificate of Secondary Education (KCSE)
232/1
PHYSICS
PAPER 1
TIME: 2 HOURS

Instructions to candidates

*i) Answer **ALL** the questions in section **A** and **B**.*
*ii) **ALL** working **MUST** be clearly shown.*
iii) Non programmable silent calculators may be used.

SECTION A (25 MARKS)
Answer all the questions in this section.

1. A stopwatch reads **01:10:84** and **02:26:90** before and after an experiment respectively. Determine the duration of the event in SI units. (2 marks)



2. Explain the meaning of thermodynamics as a branch of physics. (1 mark)
3. Two glass tubes are dipped into a beaker of water as shown in figure 1 below:
   Indicate on the diagram, the level of water in the glass tubes (1 mark)

a) Explain your answer in 3(a) above (2 marks)

4. A body is vertically projected upwards from the ground at a velocity of 5m/s and takes 1 seconds to return to the ground. Draw a velocity-time graph of the body for its entire duration of flight. (2 marks)
5. Motor vehicles such as tractors which work on swampy areas have wide tyres fitted on them.
   Explain. (1 mark)
6. The figure 2 below shows a uniform metre rule which is pivoted at **30.0cm** mark. The spring balance is fastened at the **100cm** mark and it is at equilibrium when the spring balance records **1.2N**.

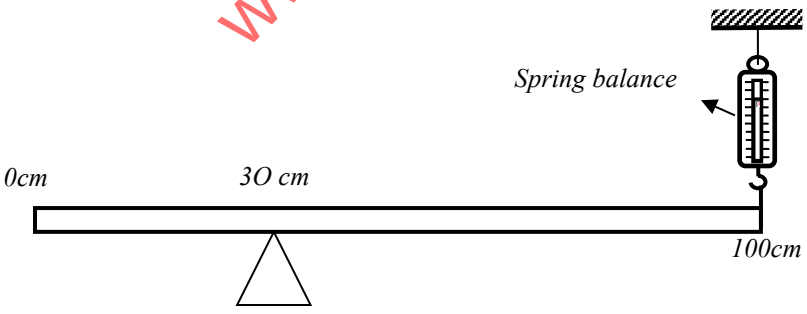


Figure 2

   Determine the weight of the metre rule. (3 marks)
7. In the determination of size of an oil molecule, lycopodium powder is sprinkled on the water surface before oil drop is introduced onto the surface of the water. Give reason for this. (1 mark)
8. In a hydraulic lift, a force, F_1, is applied on the effort piston of cross sectional area, A_1. A force F_2, is experienced on the load piston of cross sectional area, A_2 applying the principle of transmission of pressure in liquids derive an expression for the force F_2 in terms of F_1, A_1 and A_2. (2 marks
9. Alcohol and mercury are the two most used thermometric liquids. Give a reason why one would prefer alcohol to mercury for a particular measurement of temperature (1 mark)

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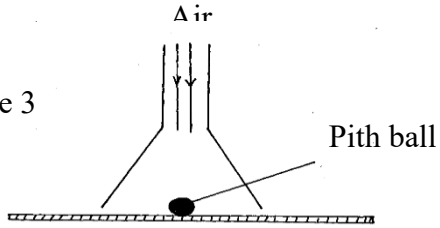
10. The figure 3 below shows a funnel inverted over a light pith ball on a table. Air is blown into the funnel as indicated on the diagram.

Figure 3



Give a reason why the pith ball rises. (2 marks)

11. A trolley of mass 20kg moving at 0.8m/s on frictionless horizontal surface was acted upon by a force of 2.5N. After impact the body moves at 4.8m/s. Determine the time of impact of the force. (3 marks)

12. The figure 4 below shows two identical thermometers **A** and **B** placed near and at equal distances on either side of a hot metal plate painted black on the side **A** and silvery on side **B**.

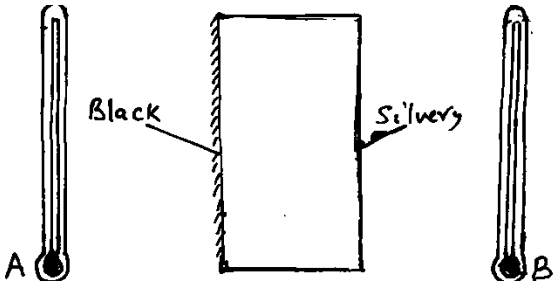
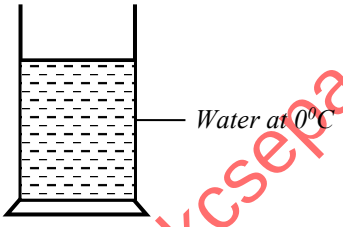


Figure 44

State and explain the observation made on the reading of the thermometers after some minutes. (2 marks)

13. The figure 5 below shows beaker containing water at $\mathbf{0^0}$. The beaker is placed on a bench.

Figure 5



State and explain the changes in stability of beaker when water freezes. (2 marks)

SECTION B (55 Marks)

Answer all questions in this section.

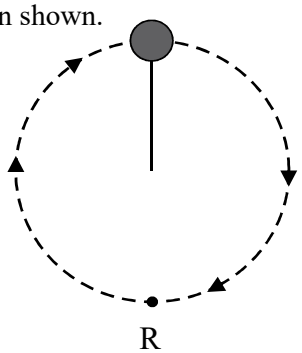
14. A pulley system having a velocity of 3 is used to raise a load of 800N through a height of 0.6m at a constant speed using an effort of 300N in a time of 15 seconds.

a) Draw a diagram in the spaces provided below to show the pulley system and on it mark the direction of tension on all the string sections (Label the load and effort) (2marks)
b) Calculate the mechanical advantage of the pulley system; (2marks)
c) Find the efficiency of the pulley system; (3marks)
d) Calculate the power developed by the effort. (3 marks)
e) Give ***two*** reasons why the efficiency of the pulley system is less than 100%. (2 marks)

15. a) State two ways in which the centripetal force on a body of mass M can be increased. (2 marks)

b) Figure 7 below shows an object of mass 200g at the end of a string 120cm long being whirled round a vertical circle in the direction shown.

Figure 7



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i) State ***two*** forces acting on the object at any instant as it continues to move in the vertical circle. (2 marks)

ii) Indicate with an arrow on the figure the direction of the Centripetal force (F) and theVelocity (V) at the position of the object shown. (2 mark)

iii) State the reason why the object is accelerating while its speed remains constant. (1 mark)

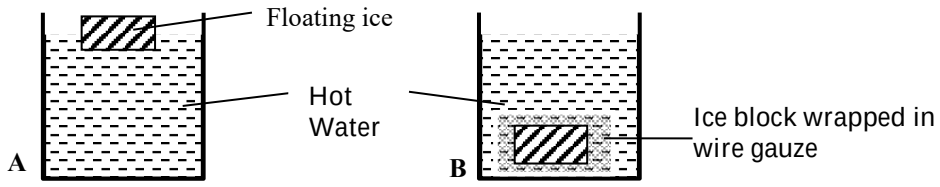
iv) Given that the angular velocity of the body is 5 rad s^{-1}, find the:

I. linear velocity (2 marks)

II. Tension of the string at point R, the lowest point. (3 marks)

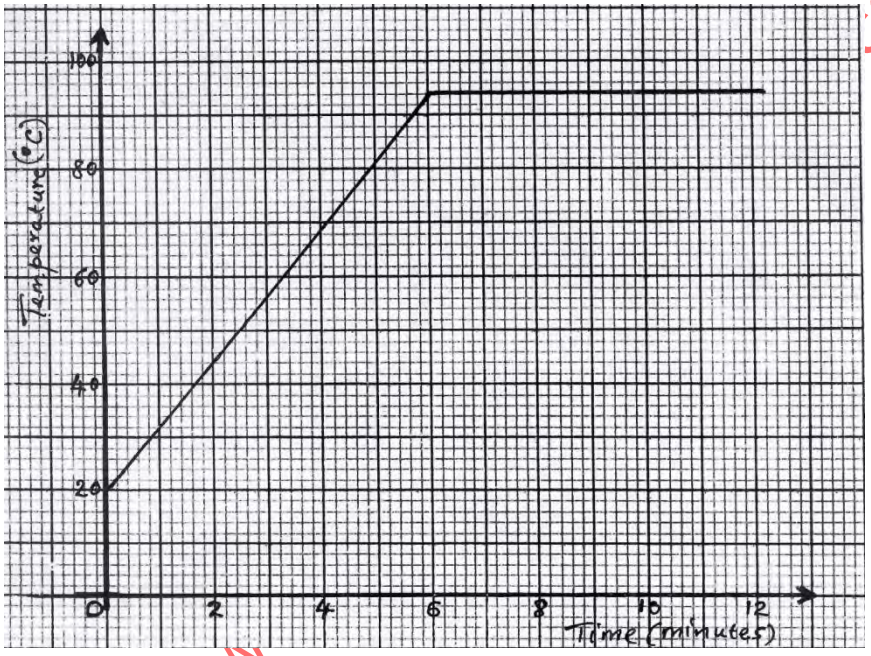
16. a) State ***two*** differences between boiling and evaporation. (2mks)

b) The figure 6 below shows two identical containers A and B containing hot water and ice block.



State with reason which water cools faster assuming that the wire gauge absorbs negligible heat. (2mks)

(c) 1200 g of a liquid at 20^0C is poured into a well-lagged calorimeter. An electric heater rated 1 kW is used to heat the liquid. The graph below shows the variation of temperature of the liquid with time.



Use the graph below to answer the following questions:

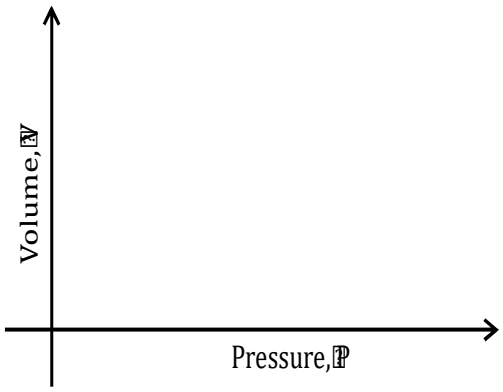
(i) What is the boiling point of the liquid? (1 mark)

(ii) How much heat is given out by the heater to take the liquid to the boiling point? (2marks)

(iii) Determine the specific heat capacity of the liquid. (3marks)

(iv) If 50 g of the liquid vapour was collected by the end of the 10 minutes, determine the specific latent heat of vaporization of the liquid. (3 marks)

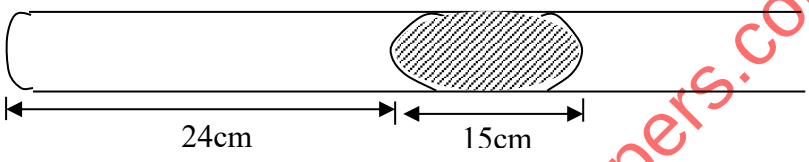
17. a) Sketch a graph of volume of a fixed mass of a gas against pressure on the axes below. (1 mark)



b) Explain why an air bubble increase in volume as it rises from the bottom of a lake to the surface. (2 marks)

c) When an inflated balloon is placed in a refrigerator it is noted that its volume reduces, use the kinetic theory of gases to explain this observation. (2marks)

e) A glass capillary contains enclosed air by a thread of mercury 15cm long when the tube is horizontal, the length of the enclosed air column 24cm as shown.

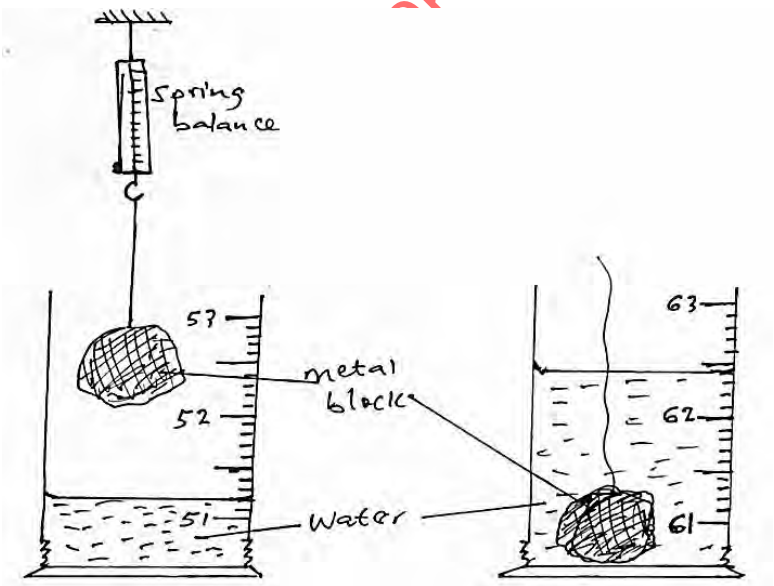


i) What is the length of the enclosed air column when the tube is vertical with the open end uppermost if the atmosphere pressure is 750mmHg? (3 marks)

ii) Explain why the mercury does not run out when the tube is vertical with the closed end uppermost. (1mark)

18. a) State Archimedes principle. (1mark)

b) Figure below shows an experiment used to determine the density of an irregular piece of metal. The mass of metal in air is 200g.



i) Determine the volume of the stone in cubic metres. (2marks)

ii) Calculate the density of the metal to 3 significant figures. (2marks)

c) Given that the density of water is 1g/cm^3, determine;

i) The mass of water displaced. (2marks)

ii) The up thrust acting on water. (take acceleration due to gravity, g, as 10ms^2) (2marks)

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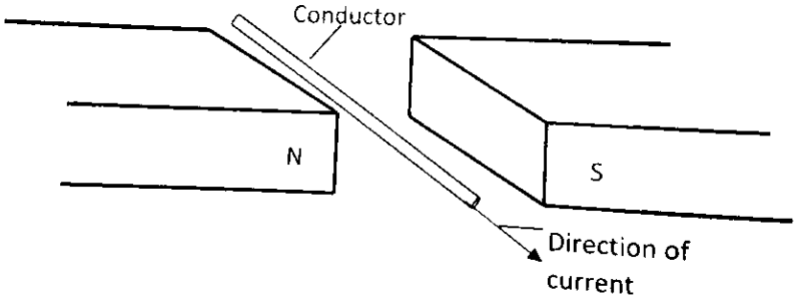
EASTERN CLUSTER EVALUATION, 2023
Kenya Certificate of Secondary Education
232/2
PHYSICS
PAPER 2
(THEORY)
TIME: 2 HOURS

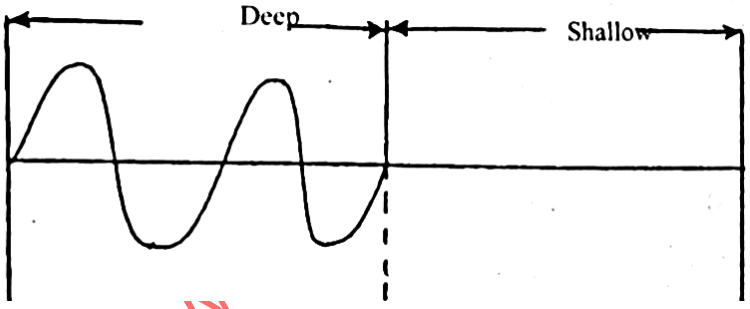
SECTION A (25 MKS)

1. State the effect on the image on the pinhole camera when more holes are added to the first hole. (1mk)
2. Explain why it is necessary to leave the caps of a lead –acid accumulator open while charging. (1mk)
3. A current carrying conductor AB is in a magnetic field as shown below.



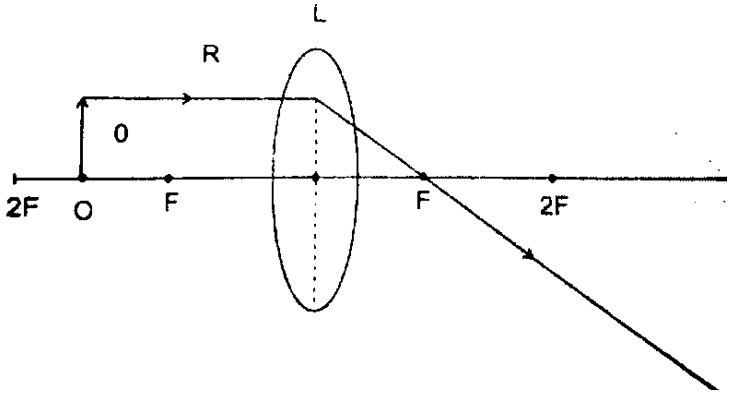
(a) Indicate on the diagram the direction of the force F acting on the conductor. (1mk)
(b) State ***two*** factors that determine the direction of the force F. (2mks)

4. A boy stands some distance from a high wall and claps his hands. What ***two*** measurements would need to be made in order to determine the speed of sound. (2mks)
5. The depth of water in a pond is d1 cm. A point at the bottom of the pond appears raised by d2 cm when viewed from the surface. Determine the refractive index of water in terms of d1 and d2. (2mks)
6. The figure below shows a displacement of a progressive water wave incident on a boundary between deep and shallow regions.



(i) Complete the diagram to show what is observed after the boundary. (1mk)
(ii) What change occurs in the speed of the waves after the boundary? (1mk)

7. An electric bulb is rated 75 W, 240v. Determine the resistance of the bulb. (3mks)
8. The figure below shows a convex lens L an object O and a ray R passing through the lens and the possible path of the ray after passing through the lens. Complete the diagram and locate the position of the image I. (2mks)



I

9. The chart below shows an arrangement of different parts of the electromagnetic spectrum.

RADIOWAVES	A	INFRARED	VISIBLE LIGHT	B	X-RAYS	GAMMA RAYS

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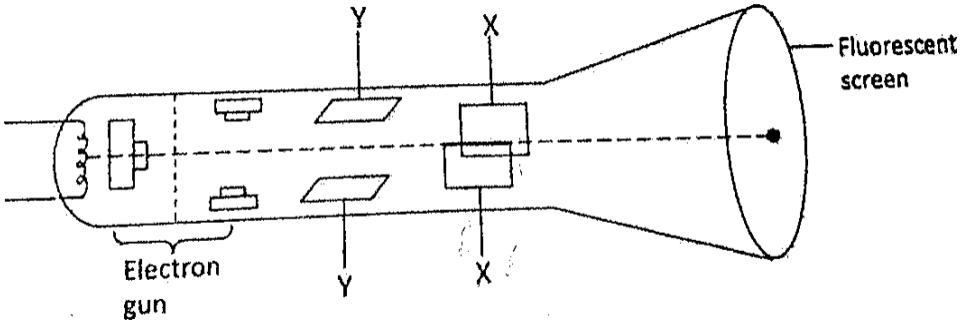
(i) Name the application of the radiation represented by B. (1mk)
(ii) Name a device that can be used to detect radiation A. (1mk)

10. The figure below shows the main components of a cathode ray oscilloscope.



(i) Name the part labelled A. (1mk)
(ii) What is the function of part labelled C. (1mk)
(iii) Explain how electrons are produced in a CRO. (1mk)

11. The following reaction is part of a radioactive series.

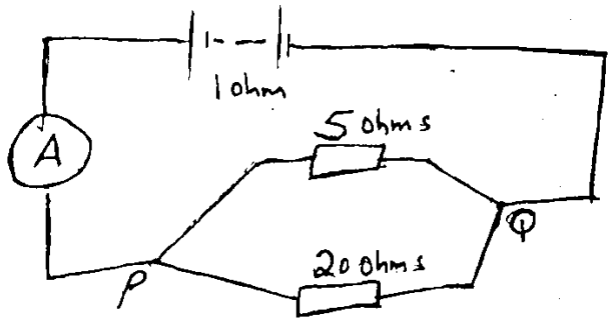
$$^{210}_{83}X \xrightarrow{r} {}^{210}_{84}Y \xrightarrow{\infty} {}^{c}_{b}Z$$

(i) Identify the radiation r. (1mk)
(ii) Determine the value of C. (1mk)

12. Explain briefly the doping process involved in making n-type semiconductor. (2mks)

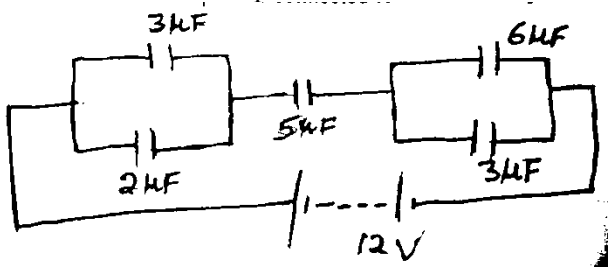
SECTION B: 55MKS

13. (a) State Ohm's law. (1mk)
(b) Differentiate between ohmic and non –ohmic conductors. (1mk)
(c) A battery of 12 v and an internal resistance of 1 ohm is used in the circuit below.



Determine:
(i) The ammeter reading. (3mks)
(ii) The reading on a voltmeter placed across the terminals of the battery. (2mks)
(iii) The reading on the voltmeter placed across PQ. (3mks)

14. (a) Define capacitance of a capacitor. (1mk)
(b) State the effect on the capacitance of increasing the distance of separation of a parallel plate capacitor (1mk)
(c) The circuit below shows a capacitor connected to a 12v battery.



(i) Find the combined capacitance. (3mks)
(ii) Find the total charge stored in the circuit. (3mks)
(iii) Find the charge stored on the 2uf capacitor. (2mks)
(iv) Find the total energy stored. (3mks)

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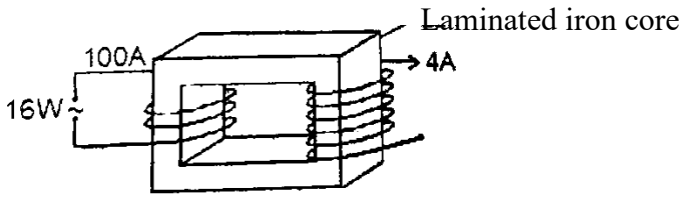
15. (a) State Faraday's law of electromagnetic induction. (1mk)

(b) The figure below shows a step-up transformer commonly used at a power station.



(i) What is meant by a step-up transformer? (1mk)

(ii) Why does a transformer work with a.c only? (1mk)

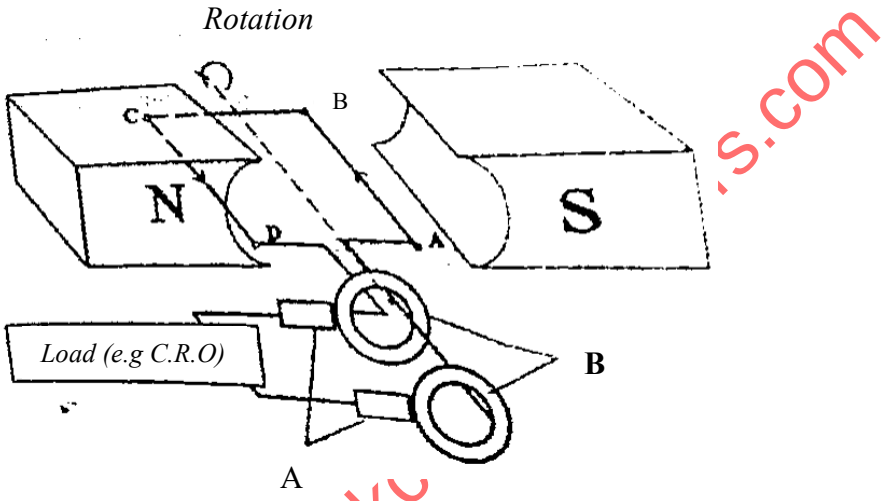
(iii) What is the purpose of the laminated soft iron core? (1mk)

(iv) From the information, determine:-

I) Voltage in the primary circuit. (2mks)

II) Voltage in the secondary circuit. (2mks)

(c) The figure below shows a coil being rotated in a clockwise direction in a magnetic field. The set up produces an alternating current. Initially the coil lies in the plane of the field as shown below.

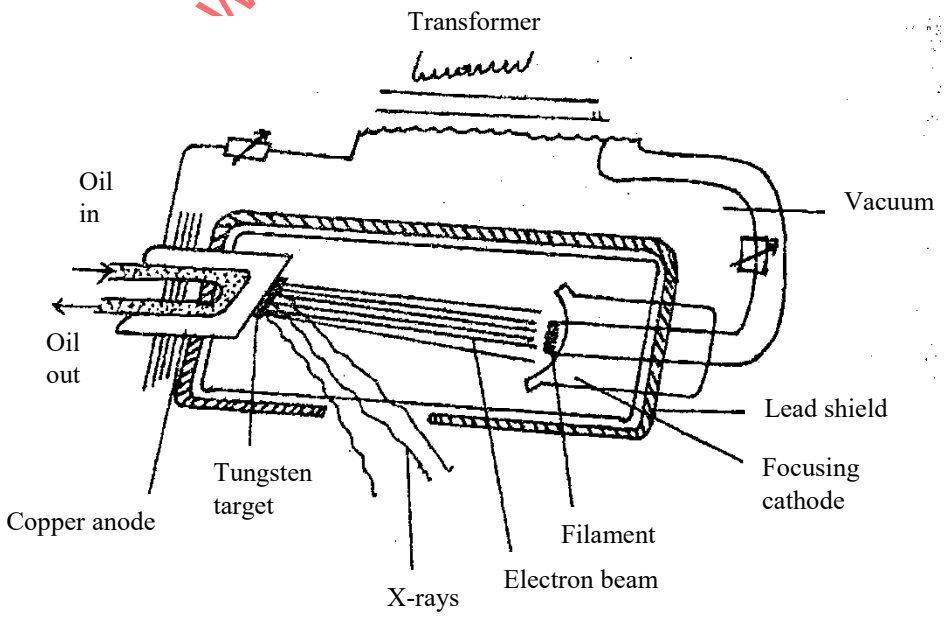


(i) Name the parts labelled A and B. (2mks)

(ii) On the axis provided in the diagram below, sketch the output as seen on the screen of a CRO when the armature is rotated starting at the position shown. (1mk)

(iii) The same set up can be used to produce a varying direct current. What changes needs to be made on the set up? (1mk)

16. The figure below shows the essential component of an x ray tube.



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(a)

i) How are the produced electrons accelerated toward the anode? (1mk)

ii) Why is the target made of tungsten? (1mk)

iii) How is cooling achieved in this kind of x ray machine? (3mks)

iv) Why would it be necessary for the target to rotate during operation of this machine? (1mk)

v) Why is the machine surrounded by lead shields? (1mk)

(b) If the accelerating voltage is 200kv.

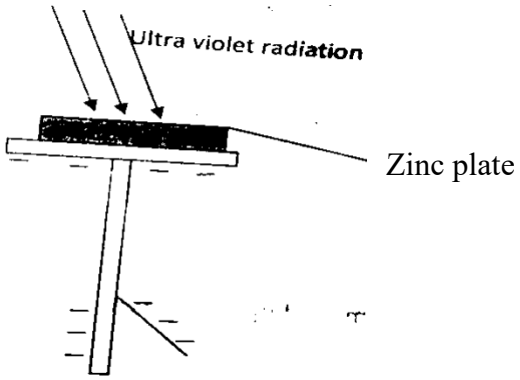
Calculate:-

(i) Kinetic energy of the electron arriving at the target (e=1.6 x10 $^{-19}$ C). (2mks)

(ii) If 0.1% of the electron energy is converted into x rays, determine the minimum wavelength of the emitted x-rays (h = 6.63 x10 -34 js and c =3.0 x10 8 m/s). (3mks)

(iii) Why adjustments will be made if x-ray of lower intensity were to be produced (1mk)

17. (a) The figure below shows zinc plate placed on the cap of a negatively charged electroscope. Ultraviolet radiation is made to fall on the plate as shown on the diagram.

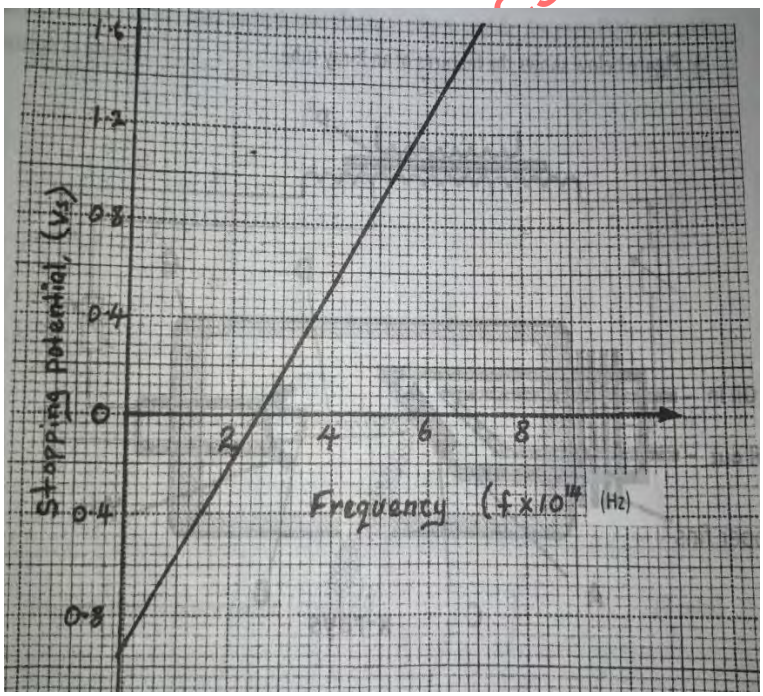


(i) What happens to the leaf of the electroscope? (1mk)

(ii) What would happen if radiation was red light? (1mk)

(iii) How is the cooling achieved in this kind of x ray machine? (3mks)

(c) In an experiment to find the relationship between frequency of a radiation and kinetic energy of the photoelectrons in a photoelectric device the following graph was obtained.



Use the graph to determine

(i) The Planck's constant h. (3mks)

(ii) The work function (2mks)

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EASTERN CLUSTER EVALUATION, 2023
Kenya Certificate of Secondary Education
232/3
PHYSICS
Paper 3
PRACTICAL
CONFIDENTIAL

Question One

- Two dry cells of 1.5V each.
- Nichrome wire labeled W mounted on a metre rule.
- An ammeter (0-1.5A) or (0-2.5A)
- A cell holder.
- Voltmeter.
- 8 connecting wires atleast 4 wash crocodile clips (or a Jockey)
- A switch.
- A metre rule.

Question Two

- A metre rule.
- 10cm long cotton thread.
- Two masses of 10g.
- Two masses of 20g.
- Knife edge, 20cm high.
- A candle.
- A lens holder.
- A white screen.
- Converging len of focal length 15cm.

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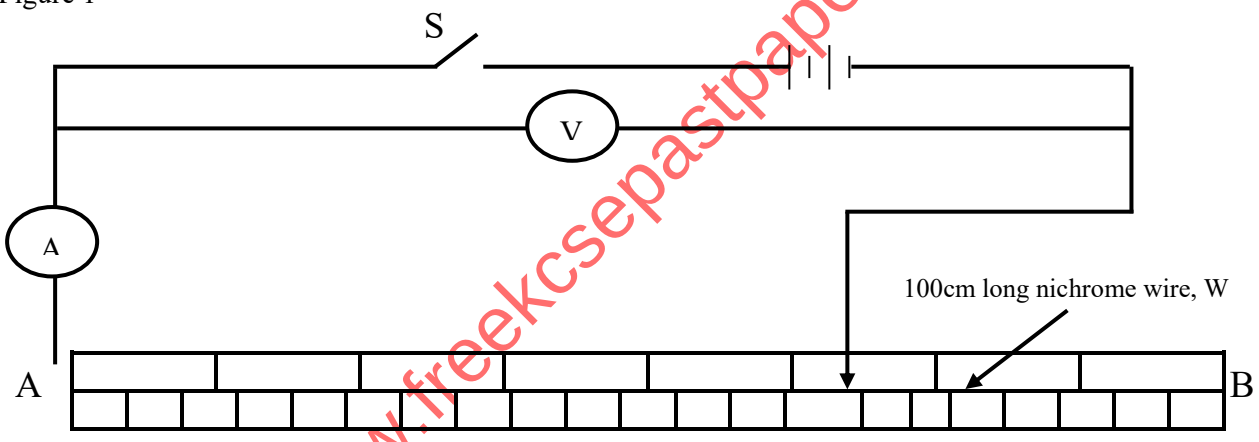
EASTERN CLUSTER EVALUATION, 2023
Kenya Certificate of Secondary Education (KCSE)
232/3
Physics
Paper 3
PRACTICAL
$2\frac{1}{2}$ Hours

Answer all the questions.

Question One
You are provided with the following:
- Two cells of 1.5V each
- Nichrome wire labeled W mounted on a metre rule
- An ammeter (0 – 1.5A) or (0 - 2.5A)
- A cell holder
- Voltmeter (0 – 5V)
- 8 connecting wires at least 4 with crocodile clips (or a jockey)
- A switch
- A metre rule

Proceed as follows:
(a) Connect the circuit as shown in the figure 1 below.
Figure 1



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(b) (i) Connect the end of A and point B when AB = 100cm across the terminals as shown in the figure 1 above. Close the switch and measure both current I and p.d, V across the wire AB
Current I _____A
P.d, V _____V
(ii) Measure the emf of the cell, E = _____ V
(c) Reduce the length AB as shown, 100cm, 70cm, 60cm, 50cm, 40cm, 30cm and 20cm. In each case record the current (I) and the corresponding values of p.d (V)
(d) Enter the length as shown in the table 1 below:
Table 1

Length AB (cm)	100	70	60	50	40	30	20
Current I (A)							
p.d (V)							
E – V (V)							

(e) Complete the table
(i) Plot a graph of (E – V) against I (A)
(ii) Determine the gradients of the graph
Given the equation, E = V =Ir, determine the internal resistance of each cell (3mks)

Question Two

Part A

You are provided with the following apparatus

- A wooden metre rule
- 10cm long cotton thread
- Masses, two of 10g and two of 20g
- Knife edge – 20cm high

Proceed as follows

(a) Arrange the apparatus as shown in figure 2 below

(b) Balance the metre rule on the edge and adjust the metre rule until it balances horizontally when there is no mass on it. The knife edge is now at the position of (cog)

(c) Record the position of (cog)

Position of c.o.g = _____ cm

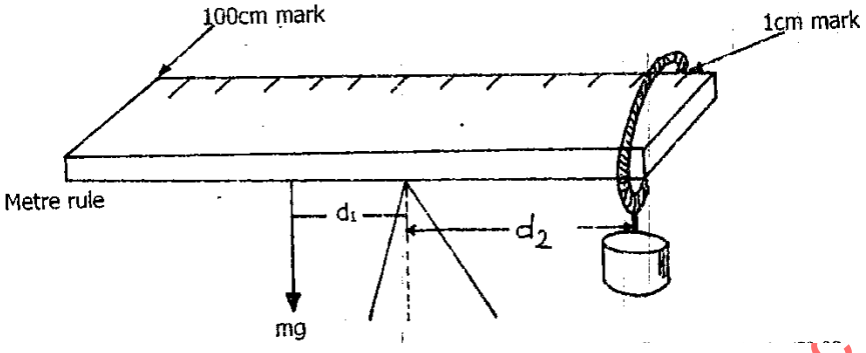


Figure 2

(d) Now hang a mass on the metre rule by use of the thread at 1cm mark. Adjust the knife edge until the metre rule balances again at new mark. Record the length d_1 and the corresponding length d_2.

(i) Repeat the procedure for different masses and complete the table 2 shown below.

Table 2

Mass, m(g)	10	20	30	40	50	60
Distance d_1 (cm)						
Distance d_2(cm)						
Mass (m) x distance d_2 = md_2						

(ii) Plot a graph of md_2 against d_1 (5mks)

(iii) Calculate the slopes of the graph (2mks)

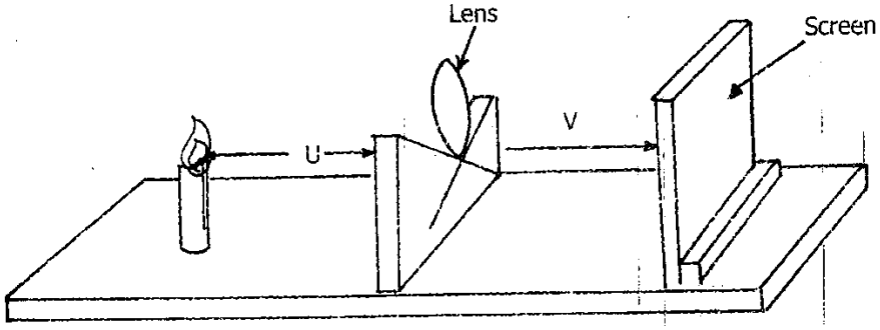
Part B

You are provided with the following apparatus

- A lens
- A candle
- A metre rule
- A lens holder
- A white screen

Procedure

(e) Set up the apparatus as shown in the figure 3 below:



(f) Starting with u = 30cm adjust the position of the screen to obtain a sharp image of the candle. Record value of V in the table shown below:

(g) (i) Repeat the procedure above for u = 20cm and complete table below: (2mks)

Table 3

u (cm)	**v (cm)**	**M = v/u**
20		
30		

(ii) Given that the focal length of the lens satisfies the equation, $f = \frac{v}{1+m}$ determine the average value of the focal length.

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IGAMBA NG'OMBE
Kenya Certificate of Secondary Education (K.C.S.E)
232/1
PHYSICS
Paper 1
Time: 2 Hours

INSTRUCTION TO CANDIDATES

- *Answer ALL Questions in sections A and B.*
- *ALL workings MUST be clearly shown*
- *Mathematical tables and electronic calculators may be used.*

SECTION A (25 MARKS)
Answer ALL questions in this section in the spaces provided

1. A student used the apparatus shown in figure 1 below to determine the diameter of a cylinder.

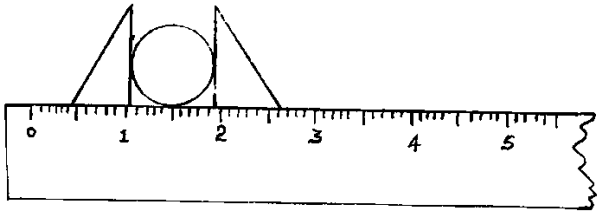

Fig. 1

What is the diameter of the cylinder? (1mk)

2. An old man warming himself next to a jiko receives heat mostly by radiation. Explain why. (2mks)
3. A hole of area 200mm^2 at the bottom of a tank 4.0m deep is closed with a cork. Determine the force due to water (Density of water is 1000kg/m^3, and acceleration due to gravity is 10m/s^2 (3mks)
4. Give a reason why the scale of a hydrometer is calibrated downwards. (1mk)
5. A fisherman jumping a shore from a boat may fall into water even if the boat is very close to the shore. Explain. (3mks)
6. Explain why unboiled egg stops faster than a boiled egg when both are rolled together on a flat horizontal surface with same velocity. (2mks)
7. An air bubble was released at the depth of 45m in a sea. The initial volume of the bubble at this depth was 3.0 x 10^{-5}m^3 and the temperature of water was 13^{0}C. What was its volume on reaching the surface of the water where the temperature was 23^{0}c. (Atmospheric pressure = 101Kpa and density of sea water = 1020kgm^{-3})(3mks)
8. The diagram fig. 2 below shows a system of four pulleys.

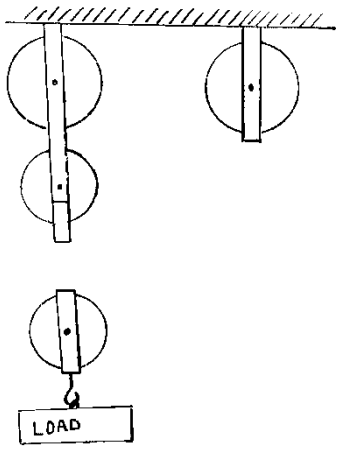

Fig. 2

Show on the diagram how the string can be fixed so that the pulley has a velocity ratio of 3. (2mks)

9. In the smoke cell experiment to show Brownian motion in gases, white specks in constant random motion are seen in the cell. What changes would be observed if the same set up is viewed at room temperature of about 25^{0}C and the then at a temperature of 14^{0}C. Explain your observation. (3mks)
10. When two pieces of ice blocks are squeezed together once they form one block. Explain. (1mk)
11. State **two** factors affecting centripetal force of a body moving in a circle. (2mks)
12. Differentiate between streamline flow and turbulent flow. (1mk)
13. Give one advantage of alcohol over mercury as a thermometric liquid. (1mk)

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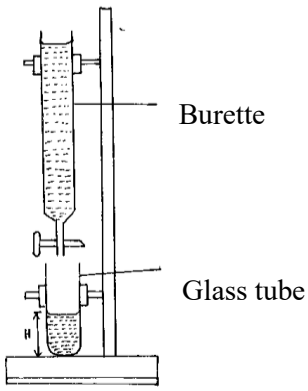
SECTION B (55 MARKS)
Answer ALL questions in this section.

14. The diagram fig. 3 below shows an arrangement that a certain student set up in a physics lab without the consent of the teacher. He allowed some volume of water into the glass tube and measured the corresponding height h of water in the tube using a ruler. He tabulated his data as below.

Fig. 3

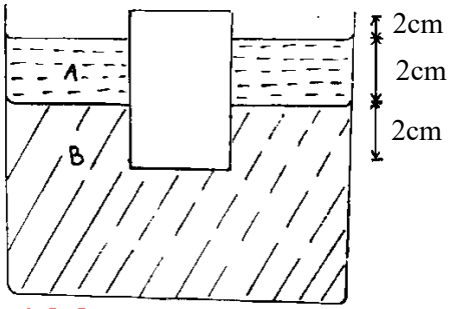


Burette reading cm^3	5.1	8.2	15.4	21.5	28.0	35.6
Height h, cm	3.8	5.8	10.5	14.5	18.7	23.2

(a) i) Draw a graph of the burette reading against height h of the water in the glass tube. (5mks)
ii) Use your graph above to determine the area of cross section of the glass tube. (3mks)
iii) Use your graph to determine how far the zero mark of the ruler is from the end placed on the base of the stand. (2mks)

15. (a) (i) State the law of floatation. (1mk)
(ii) Explain why a hollow metal sphere floats on water while a solid metal sphere of the same material sinks in water. (2mks)
(b) The diagram fig. 4 below shows a uniform block of uniform cross-sectional area of $6.0cm^2$ floating on two liquids A and B. The lengths of the block in each liquid are shown. Given that the density of liquid A is $800kg/m^3$ and that of liquid B is $1000kgm^{-3}$ determine the:

Fig. 4



(i) Weight of liquid A displaced. (2mks)
(ii) Weight of liquid B displaced. (2mks)
(iii) Density of block (3mks)

16. The diagram fig. 5 below shows apparatus used to investigate how pressure of some trapped air varies with temperature.

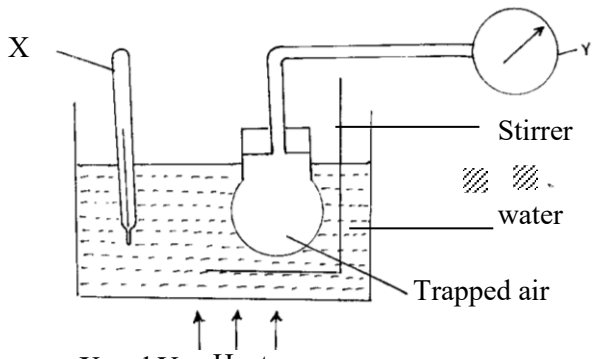


Fig. 5

a) Name the parts X and Y. (2mks)
b) What are the functions of (2mks)
(i) The stirrer
(ii) Part Y.
c) At what Kelvin temperature will the pressure of the air theoretically be zero? (1mk)
d) What name is given to this temperature? (1mk)
e) A certain mass of helium gas occupies a volume of $1.6m^3$ at a pressure of 1.5×10^5pa at 12^0C. Determine its volume when the temperature is 273k at 1.0×10^5pa. (3mks)

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f) Using the kinetic theory of gases, explain how a rise in temperature of a gas causes a rise in the pressure of the gas. If the volume is kept constant. (3mks)

17.

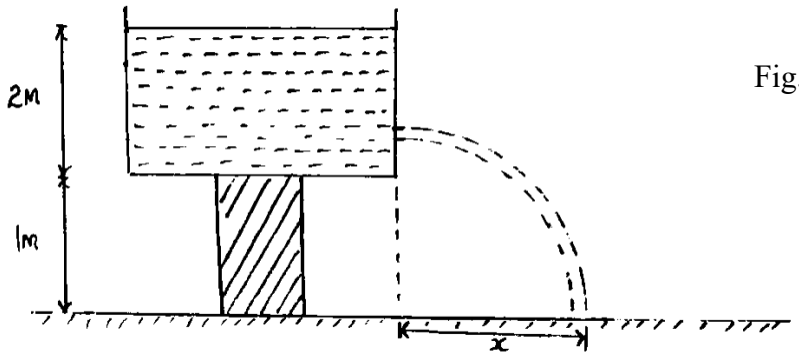


Fig. 6

a) A large tank contains water to a depth of 2m. Water emerges from a small hole on the side of the tank 50cm above the bottom of the tank as shown in fig. 6 above.
Calculate

(i) The speed at which water emerges from the hole. (2mks)

(ii) The time taken for water to reach the ground. (2mks)

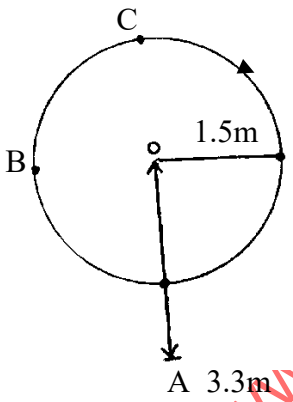
(iii) The value of x. (2mks)

b) A stone is allowed to fall freely from the top of a tower 60m high. At exactly the same moment a second stone is thrown vertically upwards with a velocity of $20ms^{-1}$ from the ground. Find:

(i) the time taken for the two stones pass each other. (3mks)

(ii) the height at which the two stones will pass each other. (2mks)

18. A stone of mass 450g is rotated in a vertical circle of radius 1.5m at a frequency of 2 revolutions per second. The centre of rotation is 3.3m above the ground.



a) i) Determine the speed of the stone in ms^{-1} (3mks)

ii) Determine the tension in the string at positions B and C respectively. (4mks)

b) The speed of rotation is now doubled and the string breaks.

i) Show on the diagram the direction in which the stone flies when the string breaks and the position at which it breaks. (2mks)

ii) Determine the speed at which the string breaks. (3mks)

c) State **one** application of uniform circular motion. (1mk)

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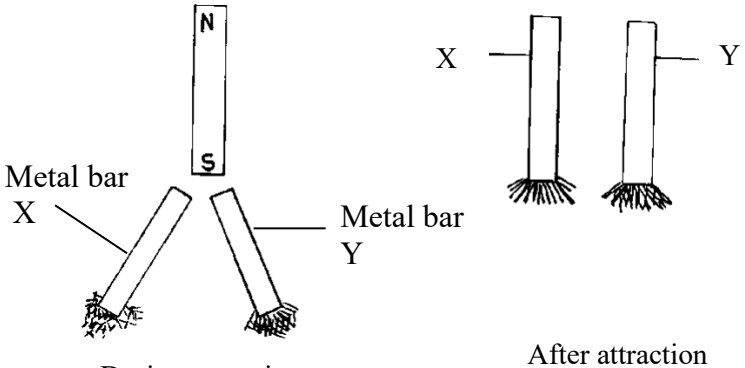
IGAMBA NG'OMBE
Kenya Certificate of Secondary Education (K.C.S.E)
232/2
PHYSICS
Paper 2
Time: 2 Hours

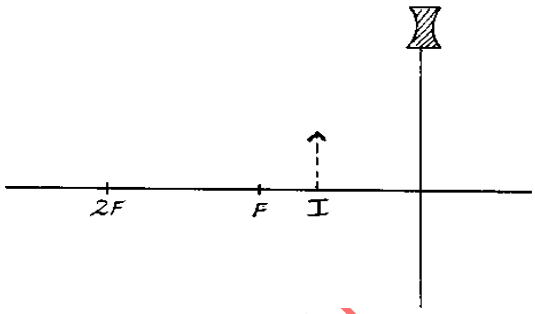
SECTION A (25 MARKS)
Answer all questions.

1. What property of light is illustrated by formation of shadows? 1mk
2. Other than local action state another defect of a simple cell and explain how it reduces the current produced. 2mks
3. The figure below shows a simple experiment using a permanent magnet and two metal bars X and Y.



State, with reason, which bar is a soft magnetic material. 2mks

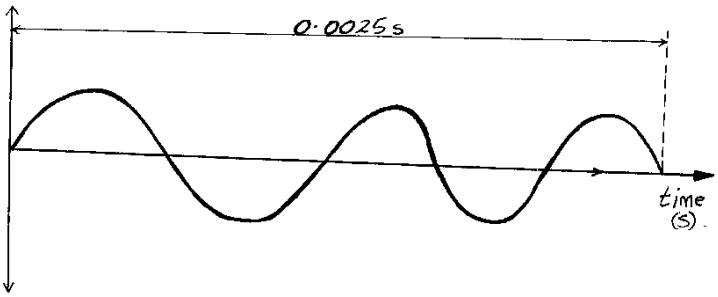
4. The figure below shows the image formed when an object is placed in front of a concave lens.



Using suitable rays locate the position of the object. 3mks

5. Sketch the magnetic field pattern between the two poles of the magnet shown below.
The wire carrying current is in between the poles. 2mks

6. The figure below shows a displacement time graph for a wave.



Determine the frequency of the wave. 3mks

7. A mine worker stands between two vertical cliffs 500m from the nearest cliff. The cliffs are x metres apart. Every time he strikes the rocks, he hears the echos. The first one comes after 2.5s while the other comes 3s later. Calculate the distance between the cliffs. 3mks

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14. a) Define radioactivity. 1mk

b) Four nuclides are represented by the following symbols.

$^{234}_{89}W$ $^{235}_{92}X$ $^{234}_{90}Y$ $^{238}_{92}Z$

(i) Which nuclides are isotopes and which ones are isobars of the same element? 2mks

(ii) Name the nuclides one of which could be produced from the other by emission of a beta particle. Write the equation of the reaction 2mks

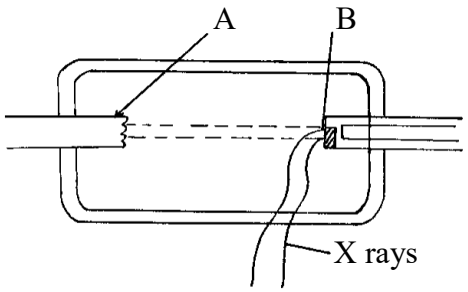
(iii) A manufacturer wishes to check on the thickness of steel sheets he produces. Describe how this could be done using radioactive source and a counter. 3mks

c) Explain how N-type and P-type semi-conductors are obtained. 3mks

d) Sketch a graph below of voltage against time for full wave rectification using 4 diodes. 2mks

15. a) Name any two electromagnetic waves whose wavelength is shorter than visible light. 2mks

b)



(i) The diagram above shows part of x-ray tube. Name parts A and B 2mks

(ii) Why is part B preferred 1mk

c) (i) State two differences between x-rays and cathode rays. 2mks

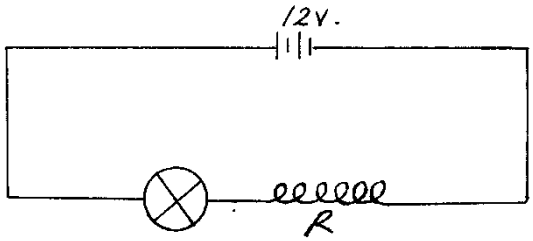
(ii) What is the effect on the wavelength of x-rays if the number of electrons hitting metal target are increased. 1mk

(iii) What is the effect on wavelength of x-rays when p.d across the tube is decreased? 1mk

d) Calculate the maximum velocity of electrons that would produce x-rays of frequency 8.0×10^{8}Hz if only 20% of kinetic energy is converted to x-rays. 3mks

Take Planks constant = 6.63×10^{-34}JS

e) The circuit diagram below was used to light 3v 0.5A bulb from 12.0v d.c supply.



Determine the rate at which electrical energy is converted into heat energy in appliance R. 3mks

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IGAMBA NG'OMBE
Kenya Certificate of Secondary Education (K.C.S.E)
232/3
PHYSICS
PAPER 3

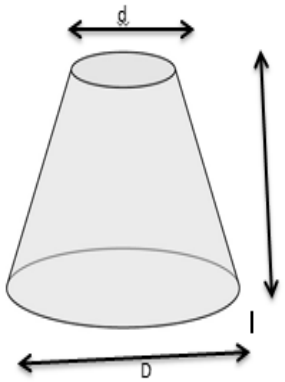
CONFIDENTIAL

QUESTION 1
PART A
You are provided with the following;

- Metre rule
- Complete stand
- A spring with a pointer
- Three masses (one 100g mass and two 50g mass)
- Stop watch

PART B

- A rubber bung (Approximately: D = 2.53cm, d = 2.00cm, h = 2.81cm)



- Vernier caliper
- Beam balance

QUESTION 2
You are provided with the following;

- An ammeter (0-3A)
- A voltmeter (0-5V)
- 2 Dry cells
- A resistance wire mounted on mm scale
- 6 connecting wires
- A torch bulb in a bulb holder
- A cell holder
- A switch
- A jockey

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IGAMBA NG'OMBE
Kenya Certificate of Secondary Education (K.C.S.E)
232/3
PHYSICS (PRACTICAL)
PAPER 3
TME: 2 ½ Hours

INSTRUCTIONS TO CANDIDATES

a) Answer all questions.
b) You are supposed to spend the first 15 minutes reading the whole paper carefully before commencing your work.
c) Candidates are advised to record their observations as soon as they are made.
d) Marks are given for observation actually made, their suitability, accuracy and the use made of them.

QUESTION 1

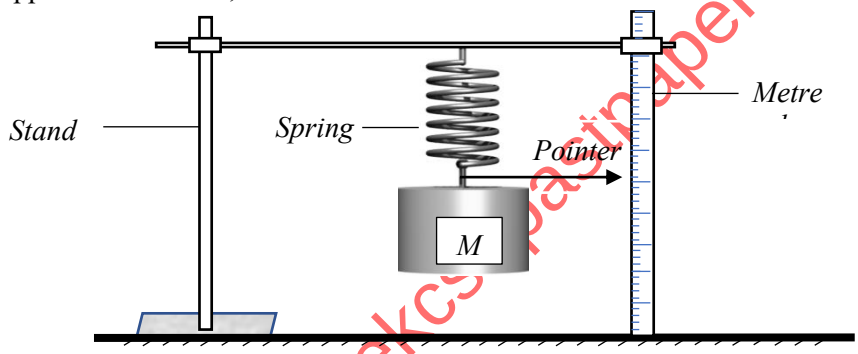
PART A

You are provided with the following;

- Metre rule
- Complete stand
- A spring with a pointer
- Three masses (one 100g mass and two 50g mass)
- Stop watch

Proceed as follows;

a) Set up the apparatus as shown;



b) Hang the unloaded spring and record the pointer readings.
X_0 …… m (1 mk)

c) i) Load a mass of 150g and determines the extension of the spring
e_1 …… m (1mk)
ii) Displace the 150g mass slightly downwards and release it to oscillate vertically.
Time 20 oscillations and obtain t_1. t_1 …… s (1mk)
iii) Find the periodic time T_1. T_1 …… s (1mk)
iv) Use the equation $T_1 = 2\pi\sqrt{\frac{e}{p}}$ to find the value of P_1. (2mks)

d) i) Load a mass of 200g and determines the extension of the spring
e_2 …… m (1mk)
ii) Displace the 200g mass slightly downwards and release it to oscillate vertically.
Time 20 oscillations and obtain t_2.
t_2 …… s (1mk)
iii) Find the periodic time T_2. T_2 …… S (1mk)
iv) Use the equation $T_2 = 2\pi\sqrt{\frac{e}{p}}$ to find the value of P_2. (2mks)

e) Find the average of p. (2mks)
$p_{av} = \frac{p1+p2}{2}$

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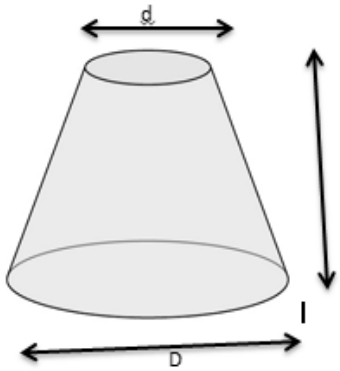
PART B

You are provided with the following;

- A rubber bung
- Vernier caliper
- Beam balance

Proceed as follows

a) Using the vernier caliper, measure the length D, d and h the height of the rubber band as shown in the figure.



D…… m (1mk)

d……..… m (1mk)

h……..… m (1mk)

b) Measure the mass M, of the rubber bung using the beam balance.

M = …… Kg (1mk)

c) Given that Q = $\frac{d+D}{4}$, determines the value of Q. (1mk)

d) Determines the value of " r " given that (2mks)

$\pi rQ^2 = M/h$

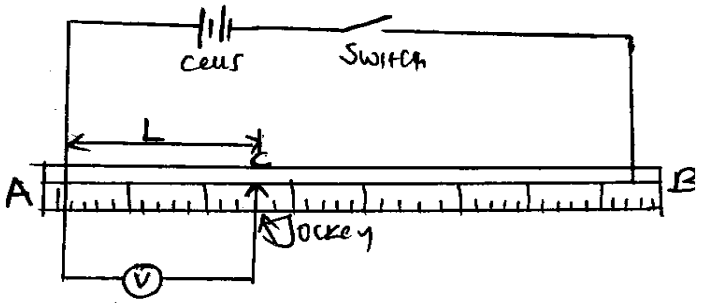
QUESTION 2

You are provided with the following.

- An ammeter (0-3A)
- A voltmeter (0-5V)
- 2 Dry cells
- A resistance wire mounted on mm scale
- 6 c0nnecting wires
- A torch bulb in a bulb holder
- A cell holder
- A switch
- A jockey

Proceed as follows.

a) Connect the apparatus as shown in the diagram below.



b) With AB= 100cm and jockey at C, 10cm from A, close the switch and record the voltmeter reading, V, in the table below.

c) Repeat the experiment in (b) above for the following lengths L= 20cm, 30cm, 40cm, 50cm, 60cm, 70cm, and 80cm. (4mks)

Length L (cm)	10	20	30	40	50	60	70	80
Pd V (v)								

d) Plot a graph of Pd v against length L (5mks)

e) Determine the slope S of the graph (2mks)

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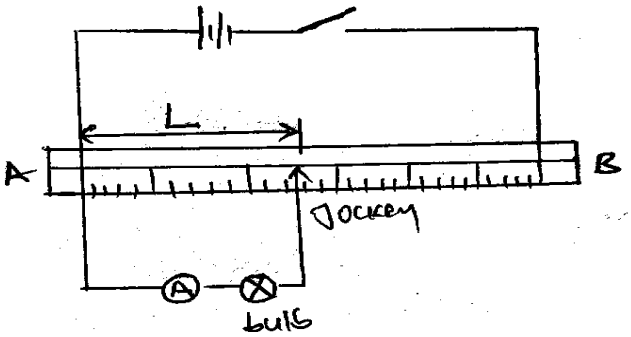
f) Connect the circuit as shown in the circuit diagram below.



g) Close the switch and record the ammeter readings I_1, I_2, and I_3 for the corresponding values of lengths

L_1= 30cm I1=…… (1mk)

L_2= 50cm I2=…… (1mk)

L_3= 70cm I3=…… (1mk)

h) Given that V = LS, where V is the Pd across the length AC of the wire, S is the slope of the graph in (d) above and L is the length of the resistance wire. Determine the potential difference V1, V2, V3 across the length AC of the wire for length L1, L2 and L3in (g) above.

L_1= 30cm V1 =…… (1mk)

L_2= 50cm V2 =…… (1mk)

L_3= 70cm V3 =…… (1mk)

i) Using the values V1, V2 and V3 and the corresponding currents I1, I2 and I3, calculate the corresponding resistance R1, R2 and R3.

L_1= 30cm R1=…… (1mk)

L_2= 50cm R2=…… (1mk)

L_3= 70cm R3=…… (1mk)

j) Compute the average value of the resistance R of the bulb. (2mks)

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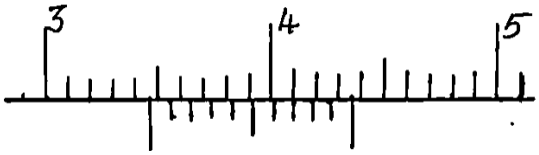
MURANG'A SOUTH MULTILATERAL EXAMS I, 2023
Kenya Certificate of Secondary Education (K.C.S.E)
232/1
PHYSICS
PAPER 1
TIME: 2HRS

INSTRUCTIONS TO CANDIDATES
i) Answer all questions in section A and B in the spaces below each question.
ii) For numerical questions, show all your working
iii) Maths table and calculators may be used for calculation

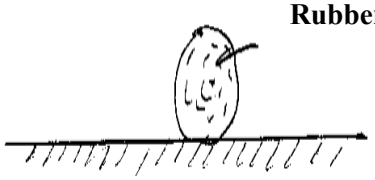
SECTION A

1. A salt solution of volume $30cm^3$ and density 1.1 g/cm^3 is mixed with $25cm^3$ of pure water of density $1g/cm^3$. determine
a. Total mass of the mixture (1mk)
b. Density of the mixture (2 mks)
2. The figure below shows a section of a Vernier callipers to measure the thickness of a wooden block.

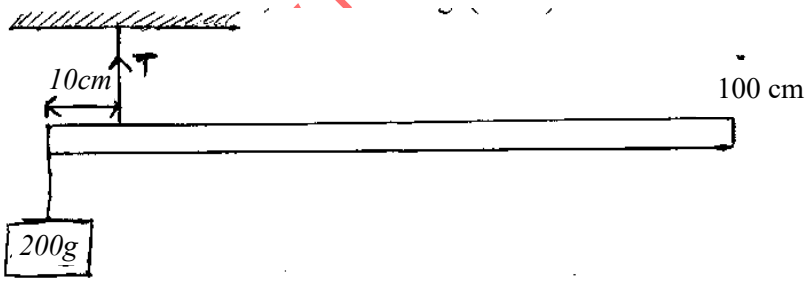


If the vernier calliper has zero error of. What is the actual reading of the vernier callipers (2mks)
3. State the type of equilibrium for a rubber ball placed on a horizontal table as shown below (1mks)

Rubber ball



4. A ball is thrown vertically upwards and return to its starting point after 6 seconds.
Calculate the maximum height reached ($g=10m/s^2$) (3 mks)
5. A piece of paper is held in front of the mouth and air is blown horizontally over the paper.it is observed that the paper get lifted up. Explain this observation. (2mks)
6. The figure below shows a uniform metre rule balancing when a mass of 200g is hung at one end.
Determine the tension, T in the string. (3mks)



7. A diver is 12m below the surface of water in a dam. If the density of the sea water is $1000kg/m^3$.
Determine the pressure due to the water on the diver. (g =10N/kg) (2mks)
8. A crystal of potassium permanganate was carefully introduced at the bottom of water column held in a gas jar. After sometime the whole volume of water was coloured. Explain this observation. (1mks)
9. Define absolute zero temperature for an ideal gas. (1mk)
10. A substance of mass 2kg and specific heat capacity $400jkg^{-1}k^{-1}$ initially at 80°c is immersed in water at 19°c.
If the final temp is 20°c. Calculate the mass of water specific heat capacity of water = 4200jkg-1k-1. (3mks)
11. The cover of a ball point has a small hole on the stem as shown below
Explain its function (1mk)

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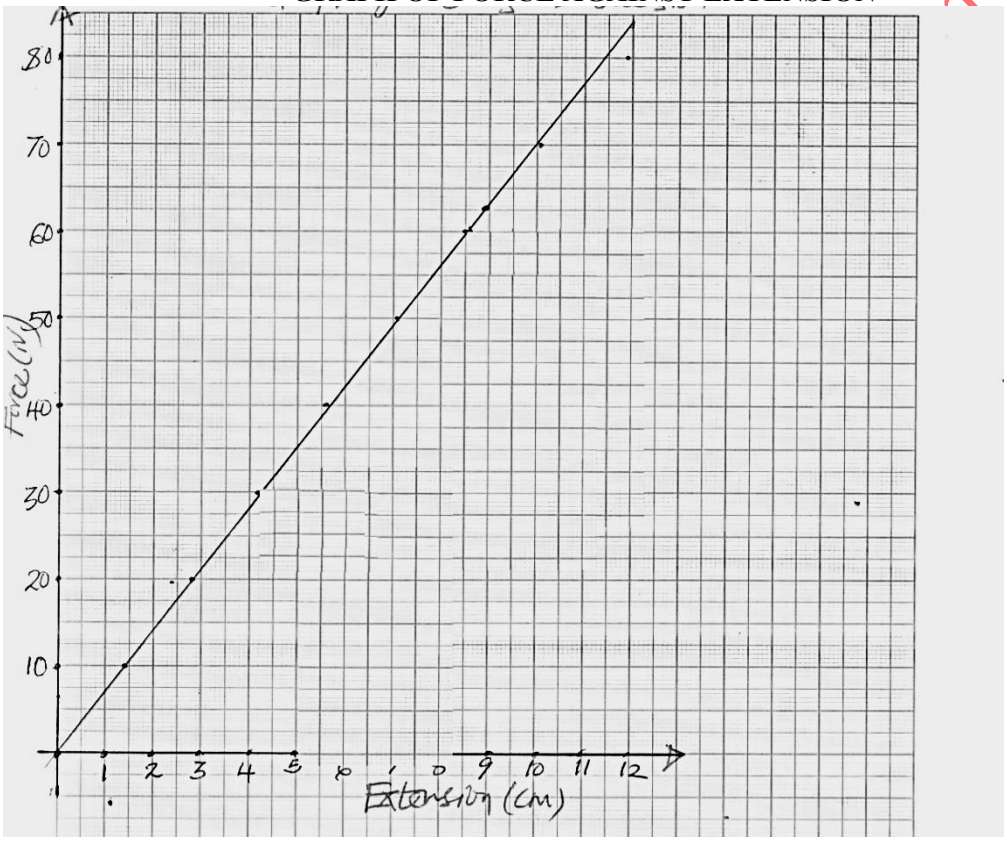
12. Give a reason why hot water put in a sufuria covered with a blackened aluminium foil cools faster than one covered with a shiny foil . (1mks)
13. A mass of 7.5kg has a weight of 30N on a certain planet.
Calculate the acceleration due to gravity on this planet (2mks)

SECTION B (55 MARKS)

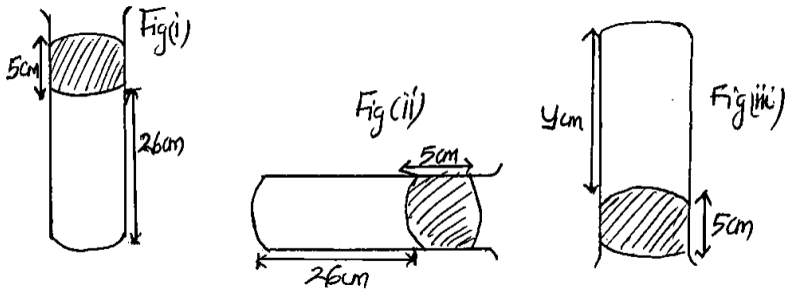
14. (a) Define **angular velocity** and state its SI unit (2mk)
(b) A stone of mass 500g is whirled in a vertical circle at 5 revolutions per Second. If the length of the string used is 1.5m, determine
i) The angular velocity (3mks)
ii) The maximum tension of the string (3mks)
(c) State three factors that will make the stone to remain in a state of vertical motion (3mks)
(d) A glass block of mass 300g is placed on a frictionless rotating table while fixed 10cm from the centre of the table by a light thread. The string can withstand a maximum tension of 6.6N.
Determine the maximum velocity that the table can attain before the string cuts. (3mks)

15. (a) State Hooke's law (1mk)
(b) A form 4 student did an experiment on Hooke's law and from his data drew the following graph.

GRAPH OF FORCE AGAINST EXTENSION



From the graph,
i) Determine the spring constant. (2mks)
ii) Work done in producing an extension, e of 8cm. (2mks)
c) State the factors which affect the spring constant calculated in b (i) above (2mks)
d) A column of air 26cm is trapped by mercury thread 5cm long as shown in the diagram below.



e) When the tube is laid horizontally as in figure (ii) the air column is now x cm long. When inverted as shown in figure (iii), the length of the column is y cm. Find

(i) The values of x (2mks)

(ii) The values of y (2mks)

(Take atmospheric pressure to be 70cmHg)

16. (a) State Newtons third law of motion. (1mk)

(b) A car of mass 900kg is initially moving at 20m/s, calculate

i) Acceleration of the car (2mks)

ii) The force required to bring the car to rest over a distance of 15M. (2mks)

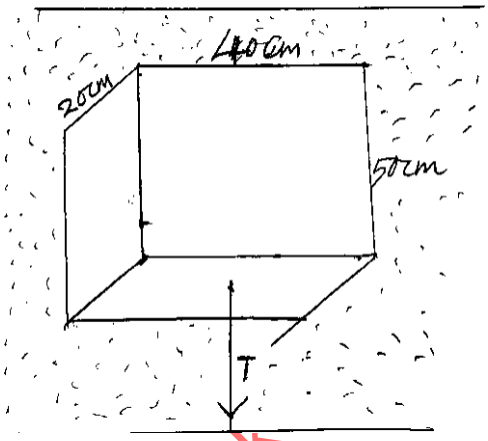
(c) Two trolleys of masses 2.0 kg and 1.5kg travelling towards each other at 0.20m/s and 0.35m/s respectively combine head on. The trolleys combine on collision. Calculate the velocity of the combined trolleys. (3mks)

(d) A stone is projected vertically upwards with a velocity of 30m/s from the ground. Determine the maximum height reached. (3mks)

17. (a) State the law of floatation (1mk)

(b) The diagram below shows a wooden block of dimensions 50cm by 40cm by 20cm held in a position by a string attached to the bottom of a swimming pool.

(Density of block is 600kg/m^3, density of water = 1000kg/m^3)



The three forces acting on the block are tension (T) in the string, the weight (W) of the block and the up thrust (U) due to water.

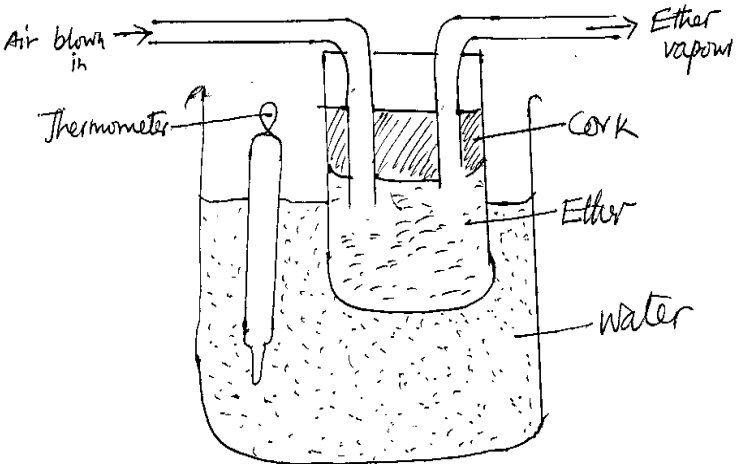
i) Write an equation relating T, W and U when the block is at stationery position. (1mk)

ii) What is the weight of the block? (3mks)

iii) What is the weight of the water displaced by the block? (2mks)

iv) Determine the tension (T) on the string. (2 mks)

(c) Some ether is put in a combustion tube and two glass tubes inserted into the tube through a cork as shown in the figure below. The combustion tube is then put into a smaller beaker containing some water and a thermometer dipped in the water.



When air is blown into the ether, the reading in the thermometer lowers. Explain this observation (2mks)

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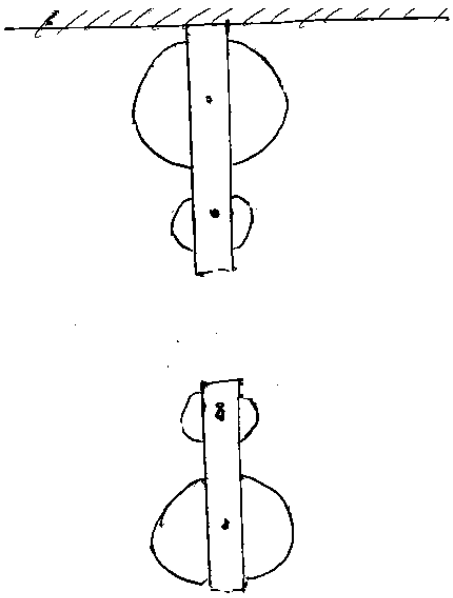
18. (a) Complete the diagram below to show how the pulleys can be used to raise a load, L by applying an effort, E (2mks)



(b) The pulley system above has a mechanical advantage of 3. Determine

i) The velocity ratio of the system (2mks)

ii) The efficiency of the system (2mks)

iii) The effort when a load of 60N is raised (2mks)

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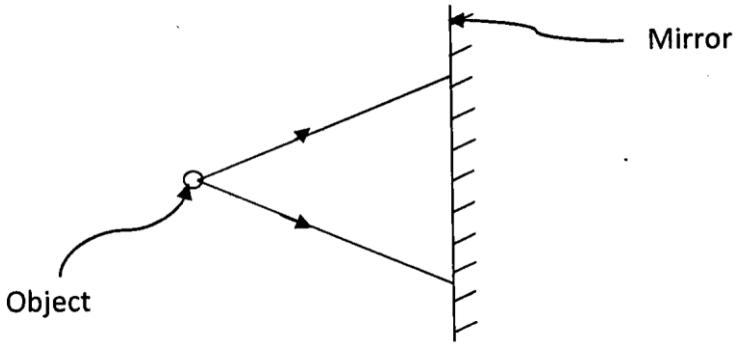
MURANG'A SOUTH MULTILATERAL EXAMS I, 2023
Kenya Certificate of Secondary Education (K.C.S.E)
232/2
PHYSICS
PAPER 2
TIME: 2HRS

INSTRUCTIONS TO CANDIDATES:

1. *Answer **ALL** the questions in section **A** and **B**.*
2. *All working **MUST** be clearly shown.*
3. *Non-programmable silent electronic calculators and KNEC mathematical tables may be used.*

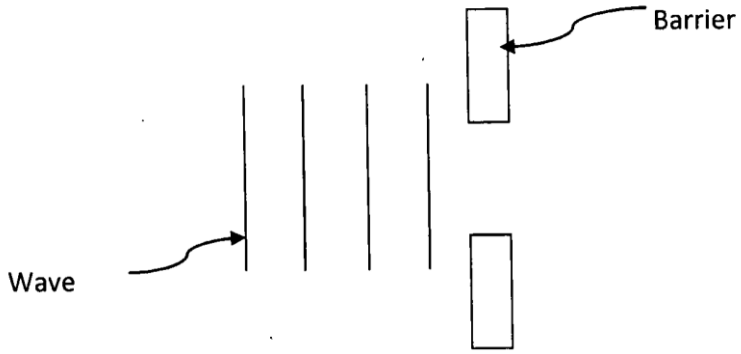
SECTION A (25 MARKS)

1. The figure below shows two rays drawn from an object on to the mirror.

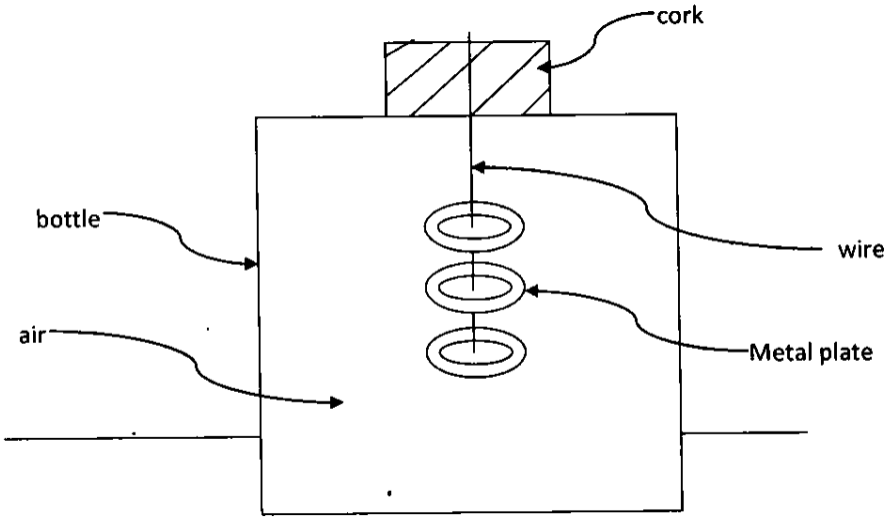


Complete the ray diagram to show the position of the image. (2 marks)

2. A small chain is often seen hanging at the back of a petrol carrying lorry.
State and explain its significance. (2marks)
3. (a) Define diffraction with respect to waves. (1 mark)
(b) The diagram below show consecutive wave fronts. If the waves are moving towards the barrier, draw the wave fronts as they appear after passing through the aperture. (2 marks)



4. State what determines the carrying capacity of an accumulator. (1mark)
5. Sketch a displacement time graph of a wave of frequency 4HZ and amplitude 3.0cm over a time interval of 1.5 seconds (3mks)
6. The figure below shows a set up used to study sound waves.



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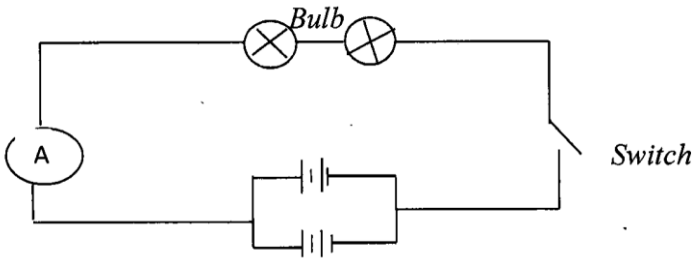
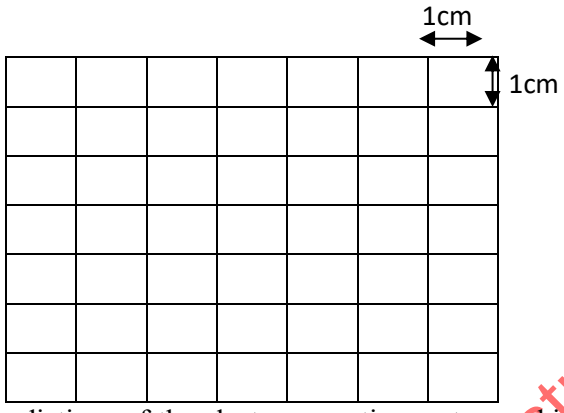
It is observed that when the bottle is shaken sound from the metal plates is heard. State and explain the observation that would be made if a little hot water is poured into the bottle and after sometime the cork is tightly replaced and the bottle shaken. (2 marks)

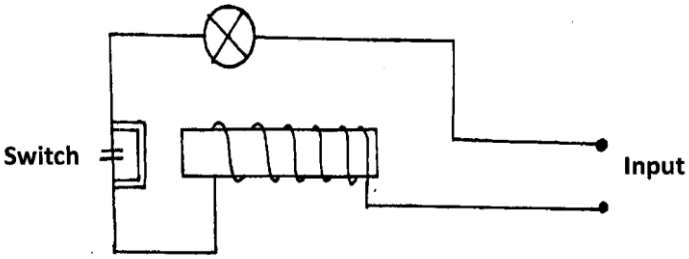
7. The figure below shows a circuit diagram with cells in parallel. Each cell has e.m.f of 1.5V and internal resistance of 0.5Ω and the resistance of the bulb is 6Ω each. Determine the ammeter reading when the switch is closed. (3marks)



8. An alternating voltage of peak value 15v and frequency 25Hz is applied to the terminals of a Cathode ray oscilloscope. The Y-gain is set at 5 v/cm and the time base at 10 ms/cm. Draw the trace observed on the screen. (2 marks)



9. Name all the radiations of the electromagnetic spectrum which have higher wavelengths than the visible light in their increasing wavelengths. (1 mark)
10. The figure below shows a diagram of circuit breaker.

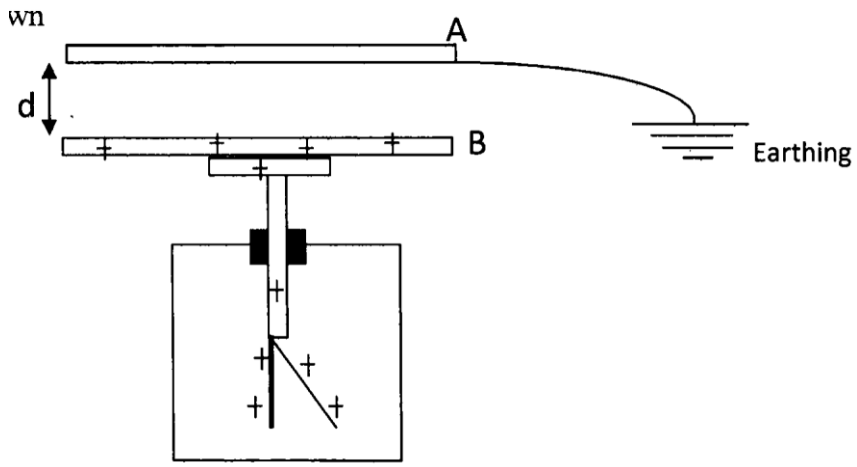


Explain how it operates (3mks)

11. A resistance wire is 2 m long and has a cross-sectional area of 0.50 mm^2. If its resistance is 2.6Ω, calculate its resistivity. (3 marks)

SECTION II (55 MARKS)

12. (a) The figure below shows a charged electroscope and two aluminum plates A and B arranged as shown.



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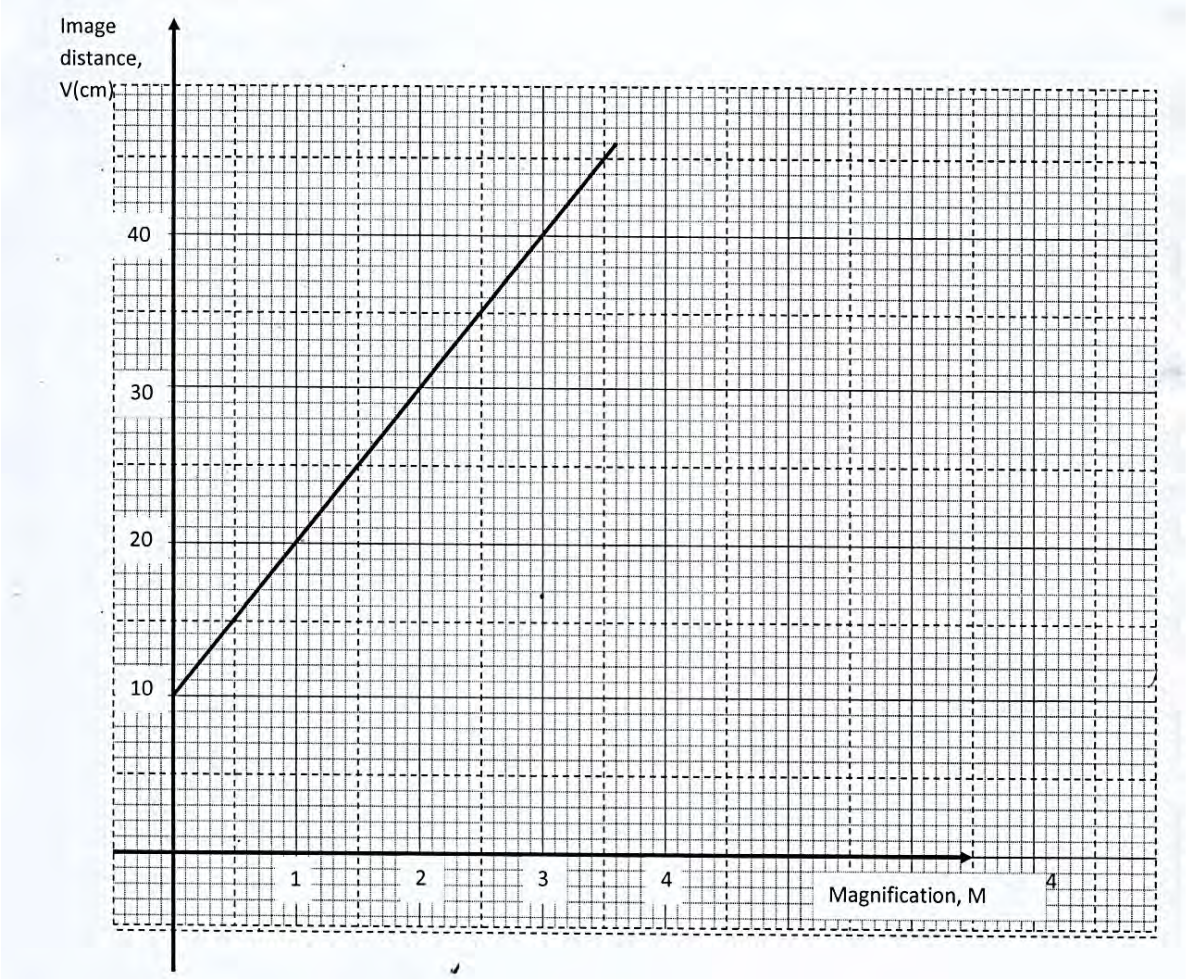
14. (a) (i) What do you understand by the term accommodation? (1mk)

(ii) An object is placed 40cm in front of a concave lens of focal length 20cm; determine the position of the image. (3mks)

(b) The following graph shows the variation of image distance, v, with magnification, m, for a converging lens.



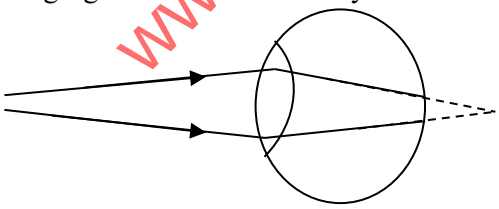
Using the graph and the equation $\frac{V}{f} = M + 1$ to determine:

(i) The object position when the image position is 45cm. (3marks)

(ii) The focal length of the lens. (1 mark)

(iii) The power of the lens. (2 marks)

(c) The following figure below shows an eye defect



Name the defect and show on the same diagram how the defect could be corrected. (3 marks)

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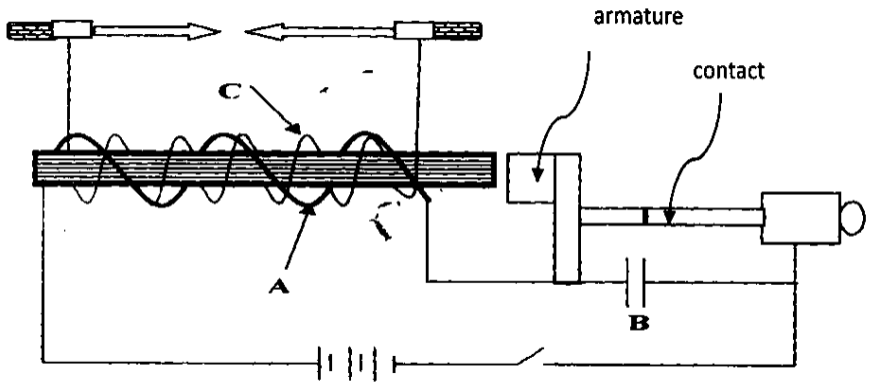
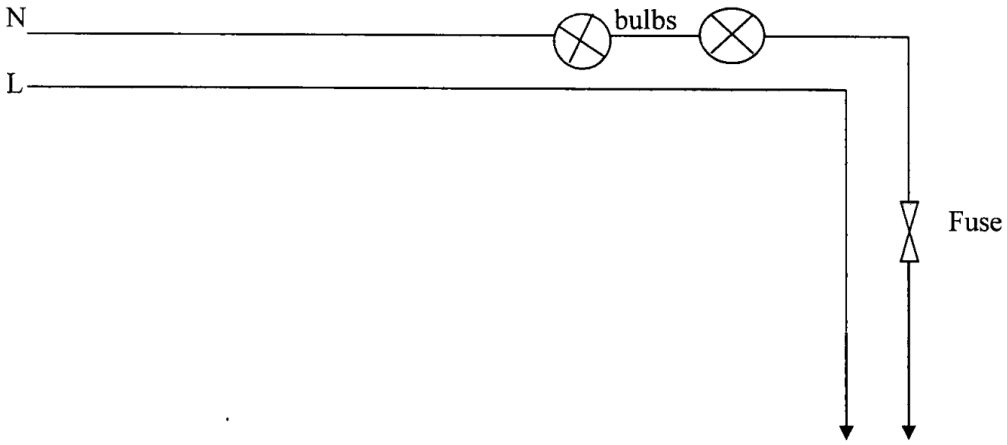
15. a) What do you understand by the term mutual induction? (1 mark).
b) State **two** factors that determine magnitude of e.m.f induced in a coil. (2 marks).
c) The diagram below shows an induction coil used to produce sparks.



(i) Name parts labeled A and B. (2marks)
(ii) Briefly explain how the induction coil works. (3 marks)
b) A transformer has 800 turns in the primary and 40 turns in the secondary winding. The alternating e.m.f connected to the primary is 240V and the current is 0.5A. Determine
I the secondary e.m.f (2marks)
II the power in the secondary if the transformer is 95% efficient. (2mks)

16. a) The mains electricity is transmitted at high voltages. State two dangers of this high voltage transmission. (2marks)
b) What is a fuse? (1mark)
c) The figure shows a section of a domestic wiring.



i) Identify two serious mistakes in the circuit. (2marks)
ii) Explain why the circuits in domestic wiring should be connected in parallel with the main supply. (1mark)
iii) Mrs. Sitima has two 2.5KW electric heater, 2.0KW electric stove, two 60W electric bulbs, 500W electric fan and 1.0Kw electric pressing box. Her power supply is 240V and main fuse 30A.
I) Can she connect all the appliances to her power supply at the same time? (2marks)
II) If the cost of electricity is Ksh.6.50 per unit, calculate the cost of using electric stove and electric pressing box for 3 hours a day in the month of June. (3marks)

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MURANG'A SOUTH MULTILATERAL EXAMS I, 2023
Kenya Certificate of Secondary Education (K.C.S.E)
232/3
PHYSICS
PAPER 3
PRACTICALS

CONFIDENTIAL INSTRUCTIONS TO SCHOOLS

Question 1

- Metre rule
- Knife edge
- 10 microscope slides
- A 50g mass
- A piece of cello tape
- A Vernier caliper (can be shared)
- Resistance wire fitted on a millimeter scale labeled MN,(Nichrome wire G=32mm)
- Switch
- Voltmeter (0-5V)
- Ammeter (0-2.5A)
- Two dry cells in a cell holder
- 8 connecting wires ,atleast 4 with crocodile clips
- Micrometer screw gauge (To be shared)

Question 2

- A retort stand, boss and clamp.
- Test tube
- Piece of duplicating paper
- A thermometer (-10^0-110^0)
- A (200ml) beaker containing some water
- A tripod stand and wire gauze
- A cardboard/ carton with a hole in the middle with the size of the thermometer.
- A burner
- A rubber band
- A stop watch

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MURANG'A SOUTH MULTILATERAL EXAMS I, 2023
Kenya Certificate of Secondary Education (K.C.S.E)
232/3
PHYSICS
(PRACTICAL)
TIME: 2 ½ Hours

INSTRUCTIONS TO CANDIDATES

(a) Answer ALL the questions.
(b) You are supposed to spend the first 15 minutes of the 2½ hours allowed for this paper reading the whole paper carefully before commencing your work.
(c) Marks are given for a clear record of the observations actually made, their suitability, accuracy and the use made of them.
(d) Candidates are advised to record their observations as soon as they are made.

QUESTION ONE
PART A

You are provided with the following

- Metre rule
- Knife edge
- 10 microscope slides
- A 50g mass
- A piece of cellotape
- A pair of Vernier callipers

Proceed as follows

(a) Using the vernier calipers provided measure the length L and the width, W of the microscope slide
L=_____ (1mk)
W=_____ (1mk)

(b) Stack ten (10) slides together using a cello tape as shown below fig 1.

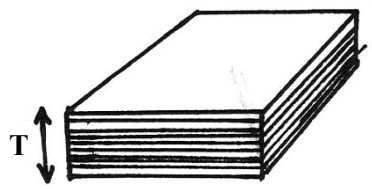
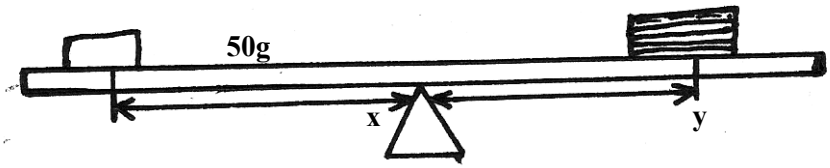


Figure 1

(i) Measure the thickness T of the stack of microscope slides. (1mk)
T =_____

(ii) Determine the volume v of the stack (2mk)
V = (LWT)
=_____

(c) Balance the metre rule at its centre of gravity and maintain the position of the fulcrum on the centre of gravity throughout the experiment
Place the 50g mass and the stack of slides as shown in figure 4 below



Adjust the position of both the50g mass and stacked slides until the rule is again balanced making the distances x and y as large as possible

(i) x = _____ (1mk)
y = _____ (1mk)

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(ii) Calculate the mass '*m*' in grams of the stacked slides given that (2mk)

$$m = 50\frac{x}{y}$$

(iii) Determine the density of glass given that $density = \frac{m}{v}$ (2mk)

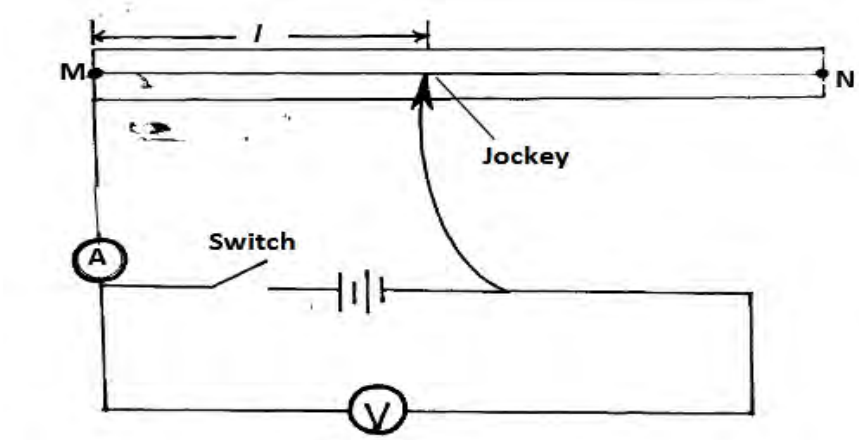
PART B

You are provided with the following apparatus:

- Resistance wire fitted on a milliameter scale labelled MN
- Switch
- Voltmeter
- Ammeter
- Two dry cells in a cell holder
- Six connecting wires
- Micrometer screw gauge

Proceed as follows;

i. Set –up the apparatus as shown in the Figure 3 below;



ii. Remove the crocodile clip from the resistance wire MN and close the switch. Record the voltmeter reading V0.
V0 = ... (1mark)

iii. Attach the Jockey to the resistance wire such that l = 50cm

iv. Record the voltmeter and ammeter readings as V1 and Z respectively
V1 =..... (1mark)
Z =..... (1mark)

v. Determine the value of X given that (1mark)

$$X = \frac{V1}{Z}$$

vi. Use the equation below to determine the value of k , where m = 2.549Ω (2marks)

$$\frac{V_1}{V_0 - V_1} = \frac{mX}{5} + k$$

vii. Measure the diameter d of the of the wire on the milliameter scale using the micrometer screw gauge
d = ...mm =.....m (1mark)

viii. Determine the resistivity ƒ of the wire used in this experiment given that (2marks)

$$X = \frac{fl}{A}$$

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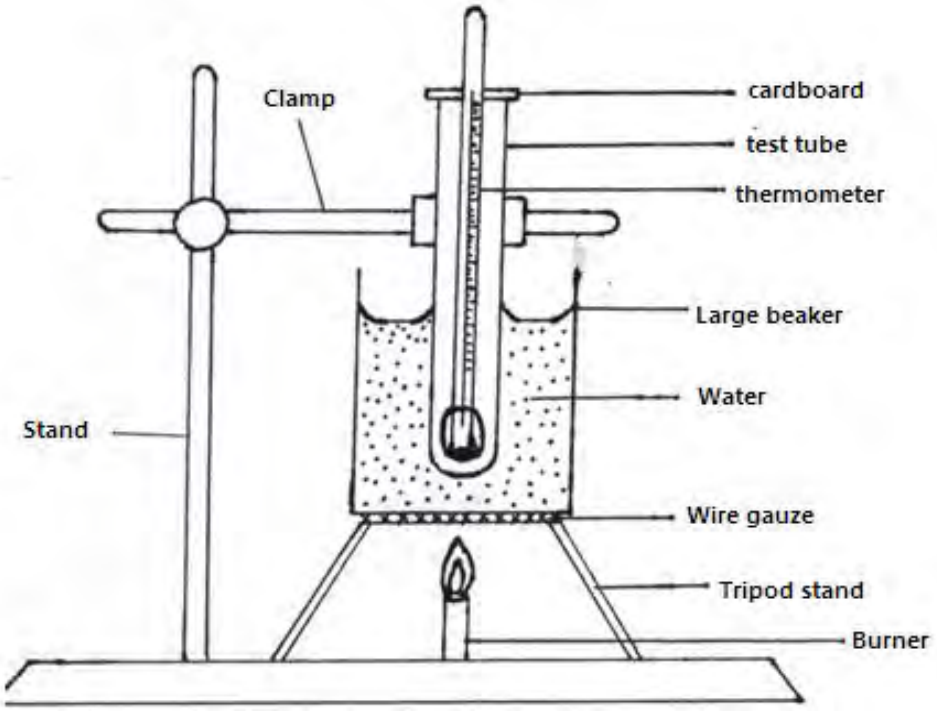
Question two

You are provided with the following;

- A retort stand, boss and clamp.
- Test tube
- Piece of duplicating paper
- A thermometer
- A large beaker containing some water
- A tripod stand and wire gauze
- A cardboard with a hole in the middle
- A burner
- A rubber band
- A stop band
- A stop watch

Proceed as follows;

a) Set up the apparatus as shown in figure 4 below.



b) Heat the water in the beaker provided and leave it to boil

c) Wrap the given piece of duplicating paper round the bulb of the thermometer. Use rubber band to hold the paper in place.

d) Place the thermometer inside in the dry test tube.

e) Place the test tube in the water as shown in the diagram above. Make sure that the water does not enter the test tube. Leave the test tube in the boiling water until the thermometer indicates a steady temperature.

f) Remove the thermometer and immediately start the stop watch.
While holding the thermometer in air record the readings of the thermometer T_1 at intervals of 30seconds for 10 minutes. (10marks)

Time in minutes	0	0.5	1.0	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5
T_1 (^{0}c)											
T_2(^{0}c)											

Time in Minutes	6.0	6.5	7.0	8.0	8.5	9.0	9.5	10.0
T_1 (°C)								
T_2 (°C)								

g) Place the wrapped thermometer directly into boiling water. Leave the thermometer in the boiling water until it indicates a steady temperature.

h) Repeat procedure (f) and (g) and record the reading T_2 of the thermometer in the table at half minute intervals for 5minutes.

i) Using the same axes on the grid provided, plot a graph of temperature (y-axis) against time for result obtained in (g) and (i) (label the graph T_1 and T_2) (8mrks)

j) From the graphs determine;

   i. For each graph the time for temperature to fall from 60^0C to 40^0C. (1mrk)

   ii. Find the ratio of the two times in k (i) above (1mrk)

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MBORANU FORM IV JOINT EVALUATION EXAMINATION, 2023

Kenya Certificate of Secondary Education

232/1

PHYSICS

PAPER 1 (THEORY)

Time: 2 HOURS

INSTRUCTIONS

- Answer all the questions
- All workings must be clearly shown.
- Mathematical tables and silent electronic calculators may be used.

SECTION A (25 MARKS)

Answer all the questions in this section.

1. The figure 1 below shows a section of a micrometer screw gauge when used to measure the diameter of a cylindrical rod of mass 2.5g.

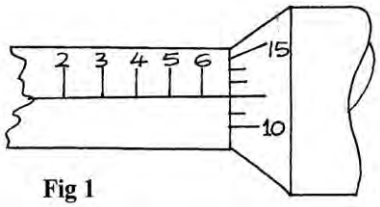

Fig 1

a) What is the diameter of the rod? (1mark)

b) If the length of the rod is 14cm, determine its density. (3marks)

2. The density of a solid decreases after heating. Explain. (2marks)

3. When a drop of oil is placed on the surface of water it spreads out forming a circular patch. Explain this observation. (2marks)

4. A uniform meter rule is balanced as shown in the figure 2 below.

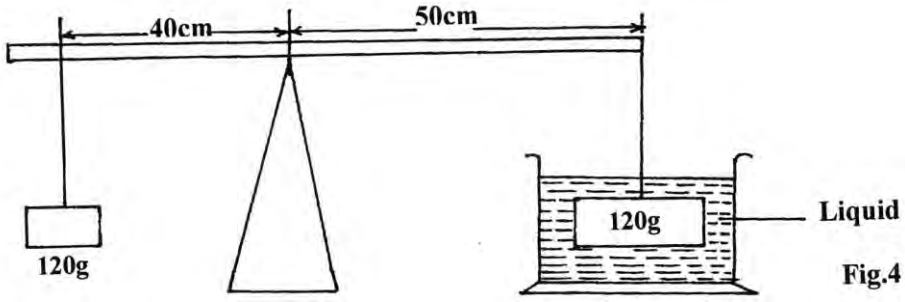

Fig.4

The volume of the immersed object is 13. 5cm^3. Determine the relative density of the liquid. (3marks)

5. Give a reason why a person may nose bleed after ascending a high mountain. (1mark)

6. A turntable of radius 10cm is rotating at 42 revolutions per second. Determine the linear speed of a point on the circumference of the turntable. (3marks)

7. Figure 3 below shows a glass filled with hot liquid placed on a table immediately after wiping with water. State and explain what is observed when one tries to lift the glass after a few minutes. (2marks)

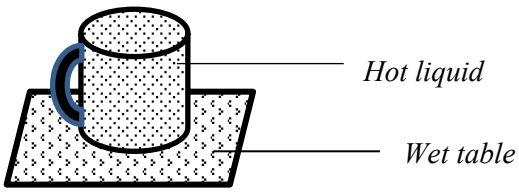

Fig. 3

8. In using the lift pump to raise water from a bore hole. It is observed that practically the height the water is raised cannot be 10m and more. Give two reasons for this observation. (2marks)

9. When a mass of 2kg is hang from a single spring, the spring extends by a distance 10cm. Determine the total extension in the set up in Figure 4 below given that the springs are identical (2marks)

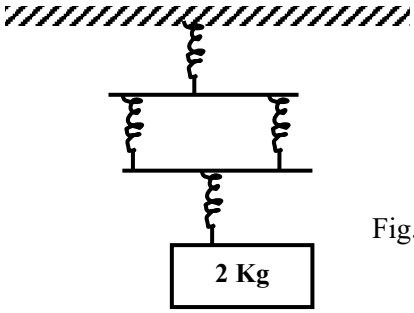

Fig. 4

10. Define the term viscosity. (1mark)
11. State one reason why the efficiency of a machine is always less than 100% (1mark)
12. State two factors that determine the critical speed for a car moving along a curved road. (2marks)

SECTION B (55 MARKS)

Answer all the questions in this section

13. (a) State the law of Floatation. (1mark)
    (b) A submarine made of iron was observed to float in water while a piece of iron rod sinks in water. Explain this observation (2marks)
    (c) A solid displaces 5.0cm^3 of liquid when floating and 20cm^3 when fully immersed in it. Given that the density of the solid is 1.2g/cm^3. Calculate
    i) The weight of the solid (2marks)
    ii) Upthrust on the solid when floating (1mark)
    iii) The density of the liquid (3marks)
    iv) The upthrust when the body is fully submerged (3marks)
    (d) Define the term relative density as used in liquids (1mark)

14. (a) Define specific latent heat of fusion of a substance (1mark)
    (b) Water of mass 400g at a temperature of 60^{o}C is put in a well lagged copper calorimeter of mass 160g. A piece of ice at 0^{o}C and mass 40g is placed in the calorimeter and the mixture stirred gently until all the ice melts. The final temperature, T, of the mixture is then measured. (*Specific latent heat of fusion of ice = 334000J/kg, specific heat capacity of water = 4200J/kgK specific heat capacity of copper = 400J/kgK*)
    Determine:
    (i) The heat absorbed by the ice during melting. (2marks)
    (ii) Total heat gained by the melted ice (*Give your answer in terms of T*) (2marks)
    (iii) Total Heat lost by the water and Calorimeter (3marks)
    (iv) The final temperature T of the mixture. (2marks)
    c) Figure 5 below shows a block of ice with two heavy weights hanging such that the copper wire connecting them passes over the block of ice block resting on wooden support.

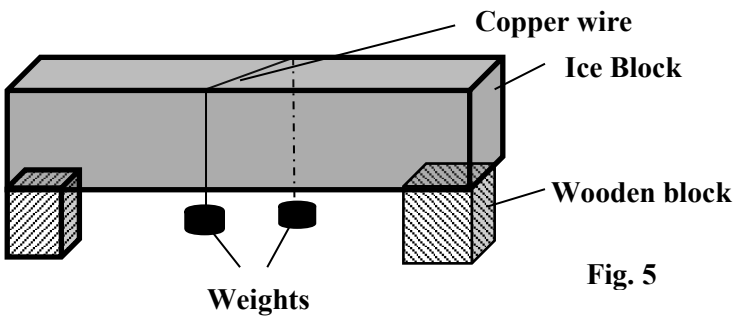

Fig. 5

It is observed that the wire gradually cuts its way through the ice block, but the ice is left as one piece. State the factor behind the observation. (1mark)

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15. a) (i) Define the Impulsive force in terms of momentum. (1mark)

(ii) A striker kicks a ball of mass 250g initially at rest with a force of 75N. If the foot was in contact with the ball for 0.10sec. Calculate the take-off velocity of the ball. (3marks)

b) A bullet of mass 20g moving at 400 m/s strikes a block of wood of mass 3.5kg initially at rest. The bullet sticks into the block and the two move off together on a horizontal surface, where a frictional force of 4N is acting between the block and surface.

(i) Determine the initial common velocity of bullet and wooden block. (3marks)

(ii) What distance does the block move before coming to rest? (3marks)

c) Explain why a paratrooper flexes his legs as he lands. (2marks)

16. The figure 6 **below** shows an inclined plane, a trolley of mass 30kg is pulled up a slope by a force of 100N, parallel to the slope. The trolley moves so that the centre of mass C travels from points A to B.

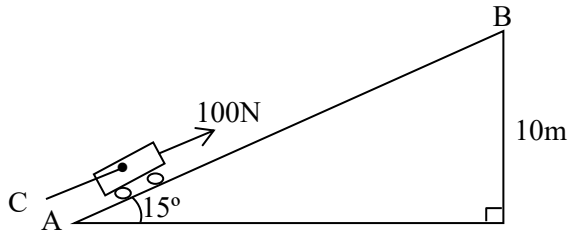


Fig. 6

(i) What is the work done on the trolley against the gravitational force in moving from **A** to **B**.? (2marks)

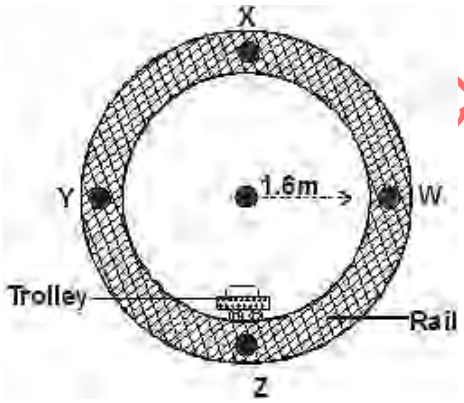
(ii) Determine the work done by the force in moving the trolley from **A** to **B**. (2marks)

(iii) Determine the efficiency of the system. (3marks)

(iv) Determine the work done in overcoming the frictional force. (1mark)

(v) Determine the mechanical advantage of the system. (2marks)

17. Figure 7 below shows a trolley moving on a circular rail with a vertical plane, given that the mass of the trolley is 250g and the radius of the rail is 1.6m.



i) Determine the minimum velocity at which trolley passes point X. (3marks)

ii) Find the angular velocity at point Z (2marks)

iii) The force exerted on the rail at this point Z. (3marks)

iv) State one application of circular motion in daily life. (1mark)

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MBORANU FORM IV JOINT EVALUATION, 2023
Kenya Certificate of Secondary Education (K.C.S.E)
232/2
PHYSICS
PAPER 2
2 HOURS

INSTRUCTIONS TO CANDIDATES

- *Attempt **ALL** questions in sections A and B.*
- *All working must be clearly shown*
- *Non programmable silent electronic calculators and KNEC mathematics table may be used except where stated otherwise*

SECTION A (25 MARKS)
Answer ALL questions

1. The figure 1 below shows a positively charged metal plate with an earthing connection.
   Using an arrow to show the direction of charges through the earth connection and explain the final charge of the plate. (2marks)

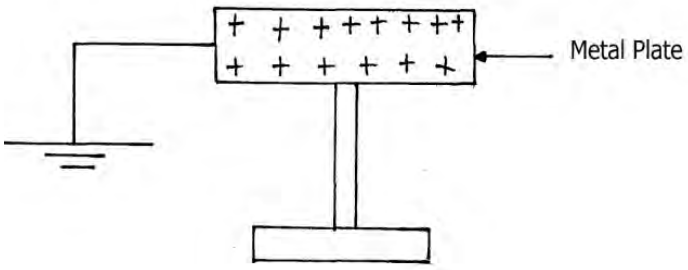

Fig. 1

2. Figure 2 below shows a metre rule in equilibrium balanced by the magnet. The iron core is fixed to the bench

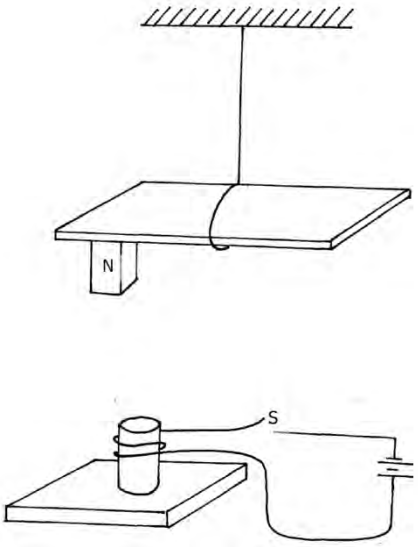

Fig. 2

   State and explain the effect on the metre rule when the switch S is closed. (2marks)
3. State **two** factors affecting the type of shadow formed by an object placed infront of a source of light. (2marks)
4. Distinguish between intrinsic and extrinsic semi – conductors. (1mark)
5. Figure 3 shows a galvanometer connected to a coil with a south pole of a permanent magnet approaching the coil.

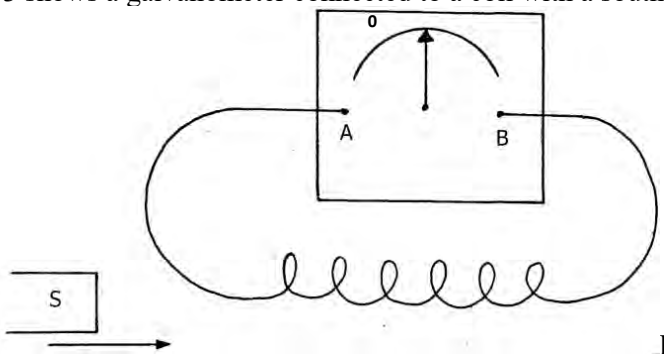

Fig. 3

   Indicate the direction of the pointer on the galvanometer when the bar magnet is moved as shown. (1mark)

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6. What are the characteristics of the image formed when;
   a) An object is placed beyond the centre of curvature of a concave mirror? (1mark)
   b) An object is placed between the principal focus and the pole of a concave mirror? (1mark)
7. a) A coin is placed beneath a transparent block of thickness 10cm and refractive index 1.50. Calculate the vertical displacement of the coin. (3marks)
   b) Kenya launched the use of optical fibres in communication recently. State why optical fibres are preferred to ordinary cables. (1mark)
8. A radiation of frequency 8.5×10^{14} Hz is incident on a metal emitting photoelectrons. Determine the threshold wavelength if electrons accelerate to the anode at a velocity of 7.2×10^{5} m/s (3marks) (Planck's constant = 6.63×10^{-34} Js, $m_e = 9.11 \times 10^{-31}$ Kg)
9. Figure 4 shows an electromagnet in an electric circuit.

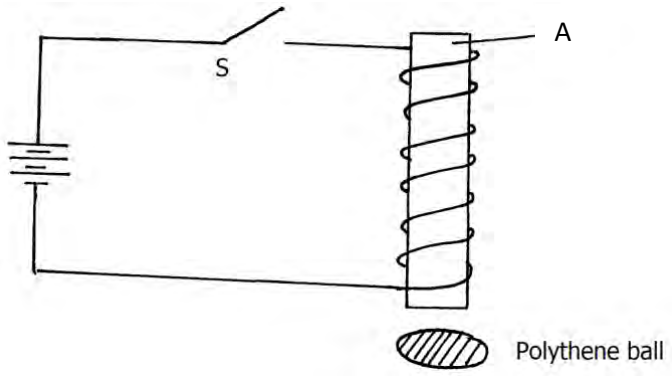

Fig 4

a) State what happens to the polythene ball when the switch S is closed. (1mark)
b) Why soft iron is preferred for material A than steel? (1mark)
10. Explain why the cathode of a CRO is coated with oxides of metals such as barium and strontium. (1mark)
11. Distinguish between hard and soft X – rays. (2marks)
12. Figures 5 shows a simple water heater.

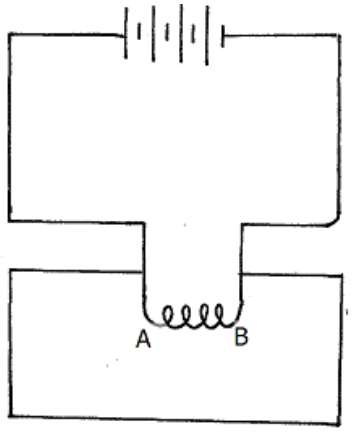

Fig 5

Give a reason why AB is coiled. (1mark)
13. Arrange the following radiations in order increasing wavelength:
Ultra violet, microwaves, blue light, yellow light. (2mk)

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SECTION B (55 MARKS)

Answer ALL the questions.

14. a) Some students wish to determine the focal length of a convex lens of thickness 0.6cm using an optical pin and a plane mirror. Figure 6 shows the experimental set up when there is no parallax between the pin and the image.

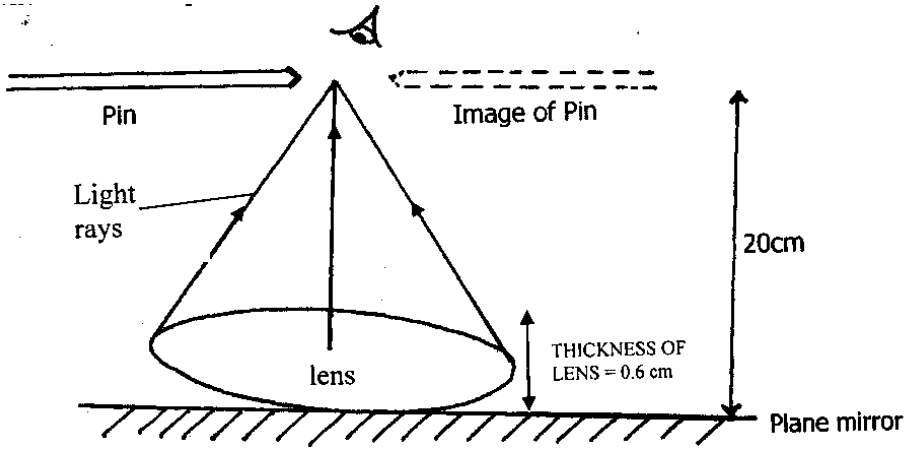


Fig 6

(i) Determine the focal length of the lens. (1mark)

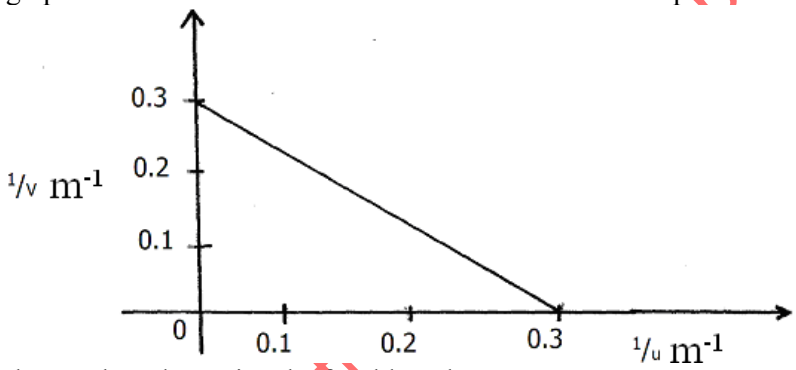
(ii) Explain how you arrive at your answer. (2marks)

b) An optician in Eldoret Hospital examined an eye of a patient and made the following observations:
Eye ball too small and the focal length of the eye lens too short.

(i) State the eye defect the patient could be having. (1mark)

(ii) Use a diagram to describe how the defect could be corrected. (2marks)

c) The graph below shows the variation of 1/v and 1/u in an experiment to determine the focal length of a lens.



(i) Use the graph to determine the focal length. (3marks)

(ii) What is the power of the lens used? (1mark)

15. a) Define electric resistance. (1mark)

b) Figure 7. shows three resistors connected as shown.

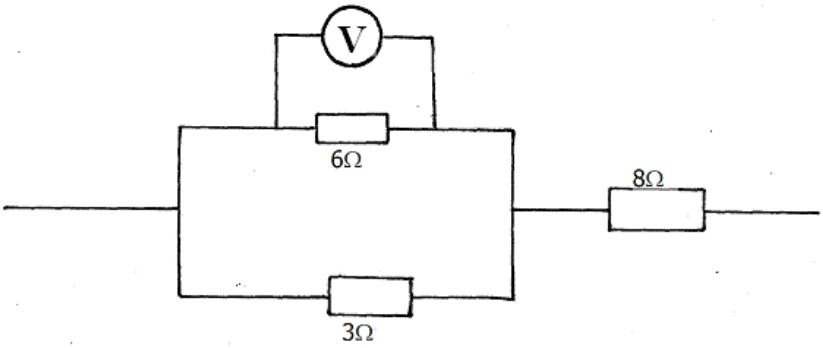


Fig 7

If the voltmeter reads 4V, find the

(i) Effective resistance. (2marks)

(ii) Current through the 3Ω resistor. (2marks)

(iii) Potential difference across the 8Ω resistor. (2marks)

c) i) What is meant by the term "lost volts"? (1mark)

ii) A cell supplies a current of 0.5A when connected to a 2Ω resistor and 0.25A when connected to a 5Ω resistor.
Find the e.m.f and the internal resistance of the cell. (4marks)

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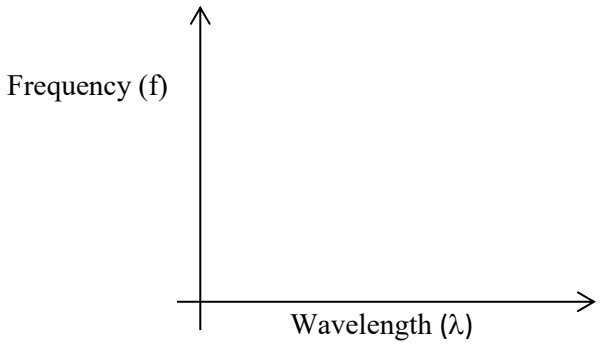
16. a) On the axes provided below, sketch a graph showing the variation of frequency with wavelength at constant velocity. (1mark)



b) Tv waves of frequency 6MHz travels with a speed of 3.0×10^8 m/s. What is the wavelength? (2marks)

c) Figure 8. shows circular waves approaching a concave reflector.

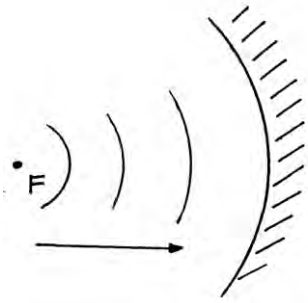


Fig. 8

Show the reflected waves and the missing part of incident wave (2marks)

d) State **two** conditions necessary for two progressive waves traveling in opposite directions to form stationary waves. (2marks)

e) Figure 9 shows the set up used to demonstrate interference of sound.

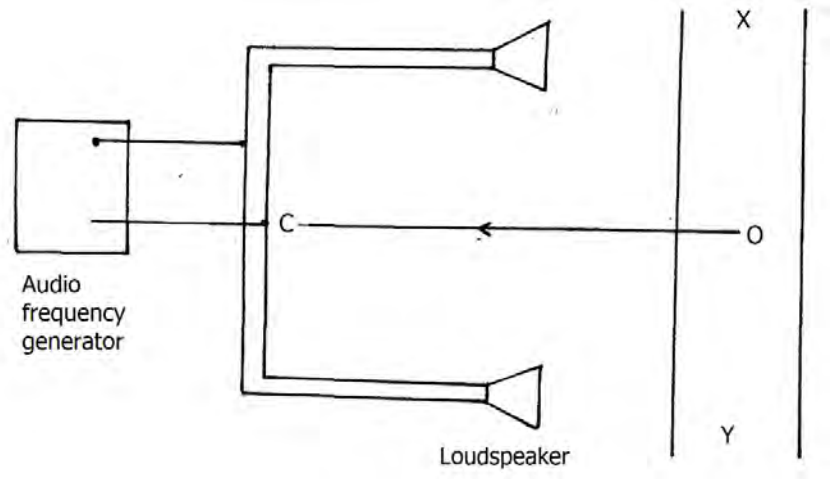


Fig 9

(i) An observer O, moves along XY. State the observation(s) made. (1mark)

(ii) State what would be observed if a cathode ray oscilloscope is moved along line XY. (2marks)

(iii) What will a student hear if he moves along the line OC? (1mark)

(iv) Why are the loudspeakers connected to the same audio – frequency generator? (1mark)

17. a) State **one** factor that affects the capacitance of a capacitor. (mark)

b) Figure 10 shows a circuit diagram with three capacitors.

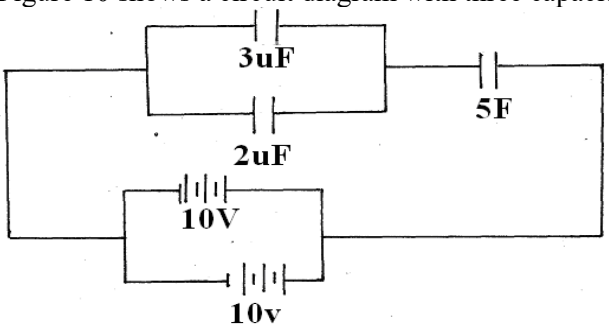


fig 10

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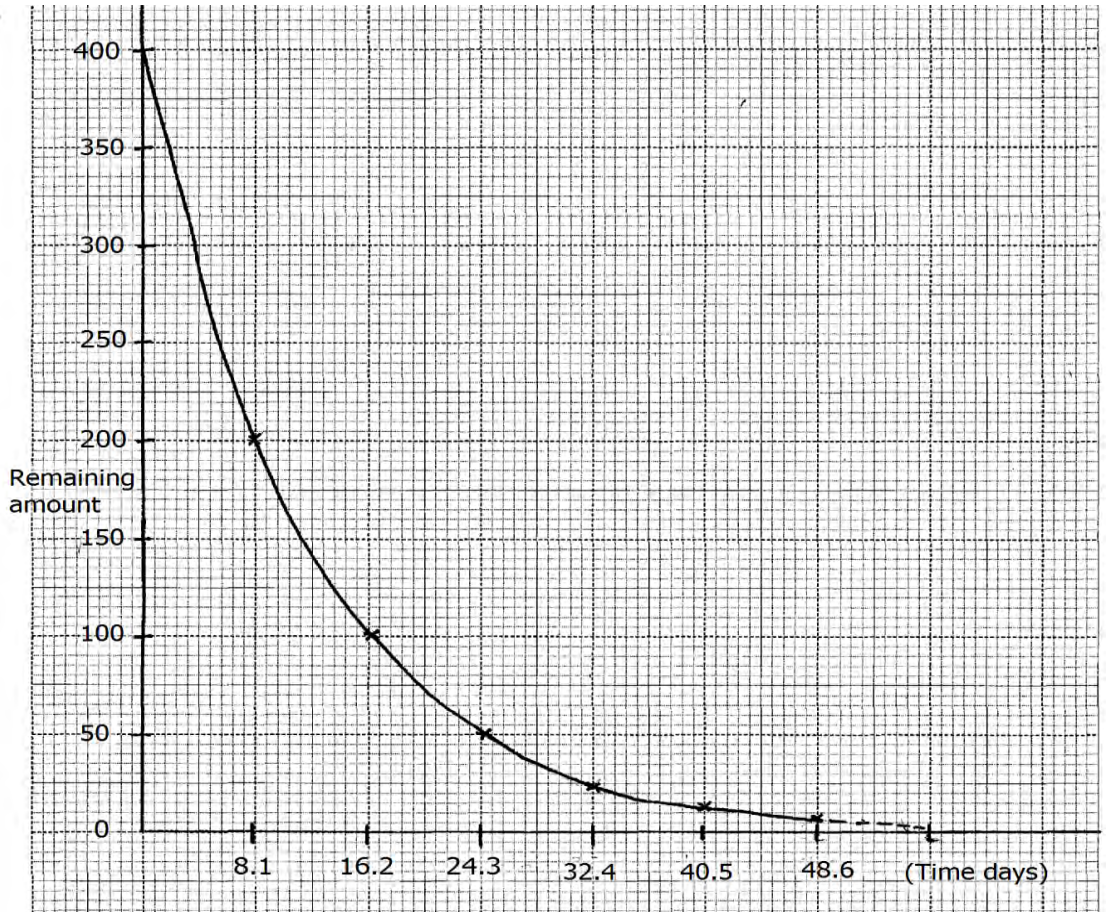
(i) Determine the effective capacitance of the arrangement. (2marks)
(ii) Find the energy stored in the combinations of capacitors. (3marks)
c) Explain why it is not advisable to shelter under a tree when it is raining. (1mark)

18. a) State **two** dangers of high voltage transmission. (2marks)
b) A generator produces 150KW at a voltage of 5 kV. The voltage is stepped up to 60kV and transmitted through cables of resistance 150Ω to a step – down transformer in a substation. If both transformers are 80% efficient, Calculate the:-
(i) Current through the transmission cables. (3marks)
(ii) Power lost during transmission. (3marks)

19. a) The half – life of cobalt – 60 is 5years.
How long will a sample take for the activity to decrease to $^{1}/_{16}$ of its original value? (3marks)
b) The graph below shows radioactive decay of iodine.



Use the graph to determine the:-
(i) Fraction of the amount remaining after 16.2 days. (1marks)
(ii) Determine the half – life of iodine. (1marks)
(iii) Mass remaining after 17 days. (1mark)

MBORANU FORM IV JOINT EVALUATION, 2023
Kenya Certificate of Secondary Education (K.C.S.E)
232/3
PHYSICS
(PRACTICAL)
PAPER 3
TIME: 2½ HOURS

CONFIDENTIAL

Each candidate should be provided with the following:

QUESTION 1

- Resistance wire fitted on a scale labeled MN (SW 28)
- Switch
- Voltmeter (0-3v) or (0-5V)
- Ammeter (0-2.5A) OR (0-3A)
- Two dry cells
- Six connecting wires at least 4 with crocodile clips

QUESTION 2

- A concave mirror Focal length 15 cm
- Mirror holder.
- A screen
- A meter rule
- A candle
- A match box (to be shared)
- A boiling tube
- A measuring cylinder (50ml)
- A half metre rule
- Water in a beaker about 100ml
- A stand complete with boss and clamp
- Vernier callipers (may be shared)

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MBORANU FORM IV JOINT EVALUATION, 2023
Kenya Certificate of Secondary Education (K.C.S.E)

232/3
PHYSICS
PAPER 3
(PRACTICAL)
July/Aug, 2023
TIME: 2 ½ HOURS

INSTRUCTIONS TO CANDIDATES:

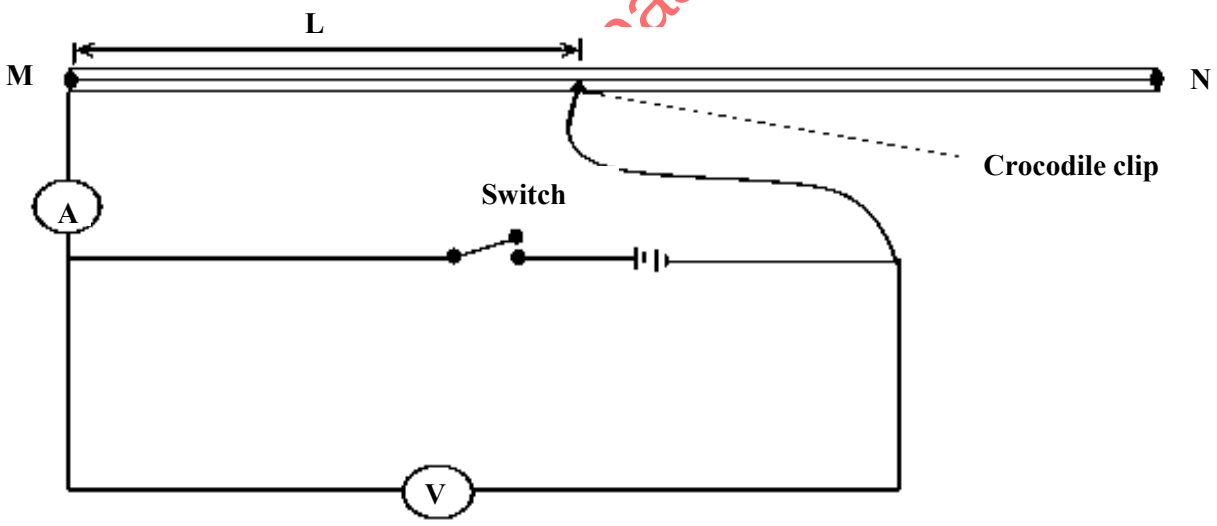
- Answer **all** the questions
- You are supposed to spend the first **15 minutes** of 2 ½ hours reading the whole paper carefully before commencing your work.
- Marks are given for a clear record of the observations actually made, their suitability, accuracy and the use of them
- Record your observations as soon as you make them.
- Mathematical tables, slide rules and silent non-programmable electronic calculators may be used.
  Take g = $10ms^{-2}$

QUESTION 1

a) You are provided with the following apparatus:

- Resistance wire fitted on a millimeter scale labeled MN
- Switch
- Voltmeter (0-3V) or(0-5V)
- Ammeter (0-2.5) or(0-3)
- Two dry cells
- Six connecting wires

i) Set up the apparatus as shown in the fig 1 below.



ii) Remove the crocodile clip from the resistance wire MN and close the switch. Record the voltmeter reading.
V_0 = ……V (1mk)

iii) Attach the crocodile clip to the resistance wire such that L=0.
Read and record the ammeter reading at L= 0
I_0 = …… A (1mk)

iv) Repeat the procedure in (iii) and for L=10cm, 20 cm, 30 cm, 40 cm, 50cm, 60 cm, 70cm and 80 cm and record the voltmeter and ammeter reading in the table below.

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v) Complete the table below. (7marks)

Length L(cm)	10	20	30	40	50	60	70	80
Current I(A)								
p.d V(V)								
V_0-V								
$\frac{V}{V0-V}$								
$\frac{V}{I}$ = R (Ω)								

vi) a) Plot the graph of $\frac{V}{V0-V}$, vertical axis against R (5marks)

b) Determine the slope of the graph (3marks)

c) Given that $\frac{V}{V0-V} = \frac{MR}{5} + d$

Where M and d are constants, Determine the values of M and d from the graph. (3marks)

QUESTION 2

PART A

You are provided with the following.

- A concave mirror
- A mirror holder.
- A screen
- A meter rule
- A candle
- A match box (to be shared)

Proceed as follows:

a. i) Using the concave mirror provided focus a sharp image of a distant object (a laboratory window) on the screen. Measure the distance (X) between the mirror and the screen at which a sharp image is obtained repeat this three times, and record your readings in the table below 3marks

TRIAL	Distance (X) (cm)
1	
2	
3	

ii) Calculate the average value of X. (2 marks)

iii) What is the physical significance of the result obtained in (ii) above? (1 mark)

b) Set up the apparatus as in figure 2 below.

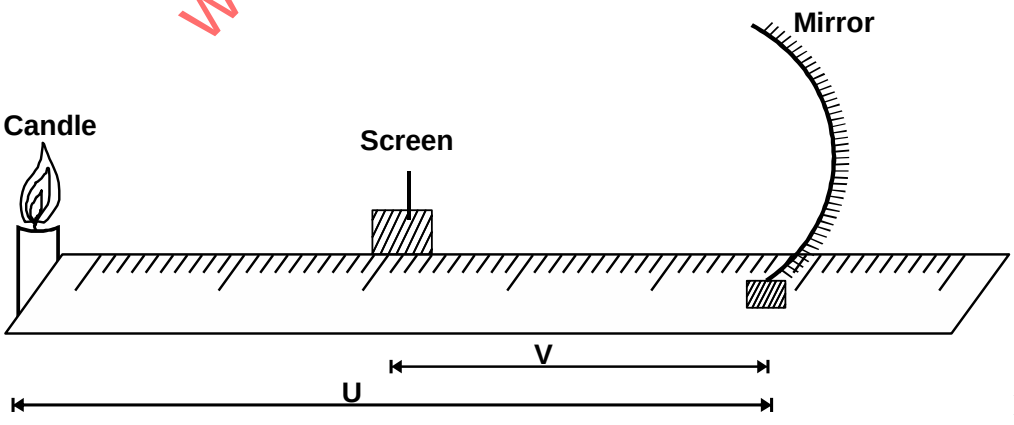

Fig 2

c) Put the object at a distance u = 30cm and from the concave mirror. Adjust the position of the screen until a sharp image is formed on the screen. Record the distance V

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d) Repeat procedure (c) above for the distance u = 40cm and record the new distance V, in the table below
e) Complete the table below.

U(cm)	V (cm)	m =V/U	(m + 1)
30			
40			

3 marks

f) Given that $f = \frac{v}{(m+1)}$, calculate the values of f in each case; (3 marks)

2. PART B

You are provided with the following:

- a boiling tube
- a measuring cylinder
- a half metre rule
- water in a container
- a stand complete with boss and clamp
- Vernier callipers (may be shared)

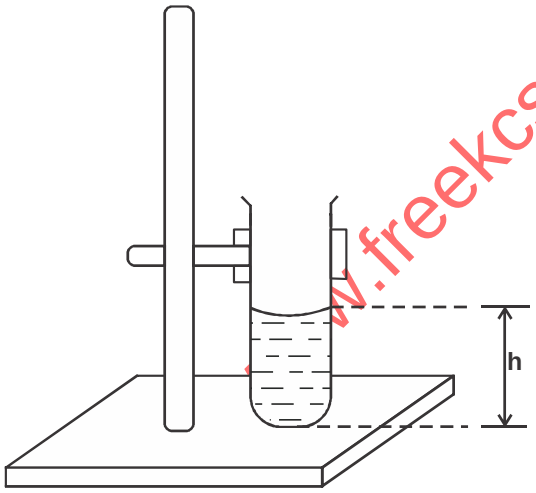
Proceed as follows:

a) i) Using the Vernier callipers measure the internal diameter, (d), of the boiling tube provided
d =..... cm (1/2 mark)

ii) Using the half meter rule measure the height of the boiling tube provided
h=……cm (1/2 mark)

iii) Calculate the volume of boiling tube (2marks)

b) i) Clamp the boiling tube vertically as shown in the figure 1 below.



ii. Using the measuring cylinder pour 25cm^3 of water into the boiling tube. Measure and record in the table below the height h, of water in the boiling tube.

iii) Repeat the procedure in b (ii) for other volumes of water, V, shown in the table. 3marks

Volume, **V**, of water (cm^3)	Height, **h**, of water (cm)	S =**V/h**
25		
35		
45		

iv) Calculate the average value of **S** and state what it represents 2marks

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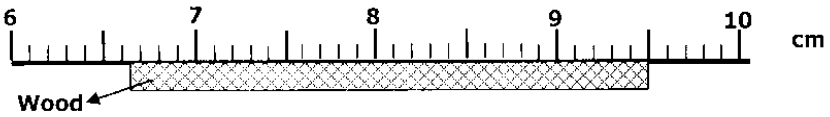
MECS II CLUSTER EXAMINATION, 2023
Kenya Certificate of Secondary Education.
232/1
PHYSICS
Paper 1
TIME: 2HRS

Instructions to candidates

*i) Answer **ALL** the questions in section **A** and **B**.*
*ii) All working **MUST** be clearly shown.*
iii) Non programmable silent calculators may be used.
Constant: g =10N/kg or 10m/s^2

SECTION A: (25 MARKS)

1. The figure below shows a section of a meter rule used to measure length of a piece of wood.



Find the length of the wood (2marks)

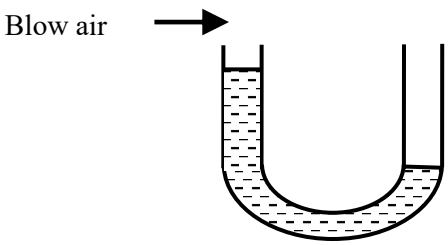
2. The diagram below shows a capillary tube immersed in water.

(a) Make a sketch on the figure alongside (b) to show the appearance of the capillary tube if it was inserted in mercury. (1 mark)
(b) Explain the difference if any between figure (a) and (b) above (2 marks)

3. Explain why a partially inflated balloon released at sea level would become fully inflated at a higher altitude. (1mark)

4. A catapult is used to project a stone of mass 40.0g vertically upwards to a height of 50.0m.
Calculate the amount of elastic potential energy initially present in the catapult. (2marks)

5. A turning effect of force depends on the magnitude of the force. State any other factor that determines the moment of a force (1mark)
(i) Mercury is usually preferred over water for use as a barometric liquid. Give a reason for this. (1mark)
(ii) State the property of Freon that makes it suitable for use as refrigerant. (1mark)
(iii) Other than the mass of ice, State another physical quantities that remain constant while pure ice is being converted to water. (1mark)
6. Giving a reason, explain why it's advisable for luggage carrier compartment to be put under the seats than at the roof tops of the buses. (1 mark)
7. Other than angle of banking, state any other factor that affects the critical velocity of a vehicle negotiating a bend. (1 mark)
8. A balloon filled with argon gas of volume 200 cm^3 at the earth's surface where the temperature is 20^{0}C, and the pressure 760mm of mercury. If it is allowed to ascend to a height where the temperature is 0^{0}C and the pressure 100mm of mercury, calculate the volume of the balloon. (2marks)
9. It is a common behavior for a high jumper to slightly flex their knees just before landing. Explain the importance of this behavior from your knowledge of physics. (1mark)
11. The figure below shows a manometer containing water. Air is blown across the mouth of one tube and the levels of the water changes as shown.



Explain why the level of water in the left limb of manometer is higher. (2 marks)

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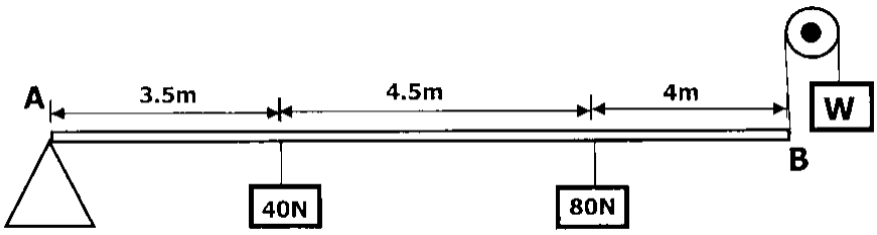
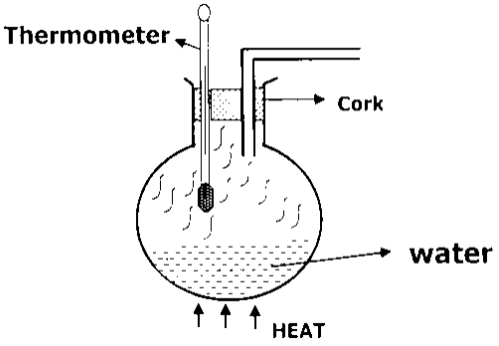
12. The figure below shows a uniform rod AB of weight 20N pivoted at A.



If the system is in equilibrium, determine the weight W shown. (3marks)

13. A cemented floor feels cold to the feet, but a woolen carpet on the same floor feels warm. Explain this. (1mark)

14. The diagram below shows an arrangement used to determine the upper fixed point of ungraduated thermometer.



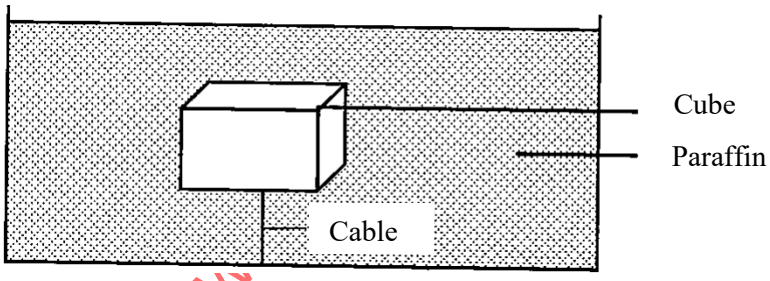
(i) Why is the bulb of thermometer not dipped in the water? (1mark)

(ii) Explain how the sensitivity of a thermometer can be improved. (1mark)

SECTION B (55 MARKS)

15. (a) State Archimedes' principle . (1 mark)

(b) The figure shows a cube of side 2.0 m block and of mass 4,800 kg attached to the base of a tank containing paraffin of density 800 kgm^{-3} by means of an inextensible and light weight cable.



Determine:

(i) The density of the block. (2marks)

(ii) The upthrust acting on the block. (3 marks)

(iii) The tension in the cable. (2 marks)

(iv) The cable is then released, and the block rises to the surface where it subsequently floats. Calculate the fraction of the block which is beneath the surface of the paraffin. (2 marks)

16. a) Give **two** ways of increasing the boiling point of a liquid. (2 marks)

b) A lagged copper calorimeter of mass 0.8 kg contains 0.6 kg of water at 22.0^0 C. A metal nut of mass 0.4 kg is transferred quickly from an oven at 300^0 C to the calorimeter and a steady temperature of 52^0 C is reached by the water after stirring. Given that the specific heat capacity of copper is 400 $Jkg^{-1}K^{-1}$ and that of water is 4200 $Jkg^{-1}K^{-1}$, calculate:

(i) Heat gained by the calorimeter and water. (3 marks)

(ii) Energy lost by the metal nut. (1 mark)

(iii) The specific heat capacity of the material making the nut. (3 marks)

(c) An electric kettle rated 120 V, 60 W is used to melt 20 g of ice at 0^0C to water at 0^0C in 112 seconds, calculate the specific latent heat of fusion of ice. (3 marks)

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17. a) A stone is thrown vertically upwards from the top of a tower 30m high, with an initial velocity of 20m/s. Determine:

i) The time it takes to reach maximum height. (2marks)

ii) The total time which elapses before it hits the ground. (2marks)

b) A string of negligible mass has a bucket tied at the end. The string is 60cm long and the bucket has a mass of 45.0g. The bucket is swung horizontally making 6 revolutions per second. Calculate

i) The angular velocity (2marks)

ii) The angular acceleration (2marks)

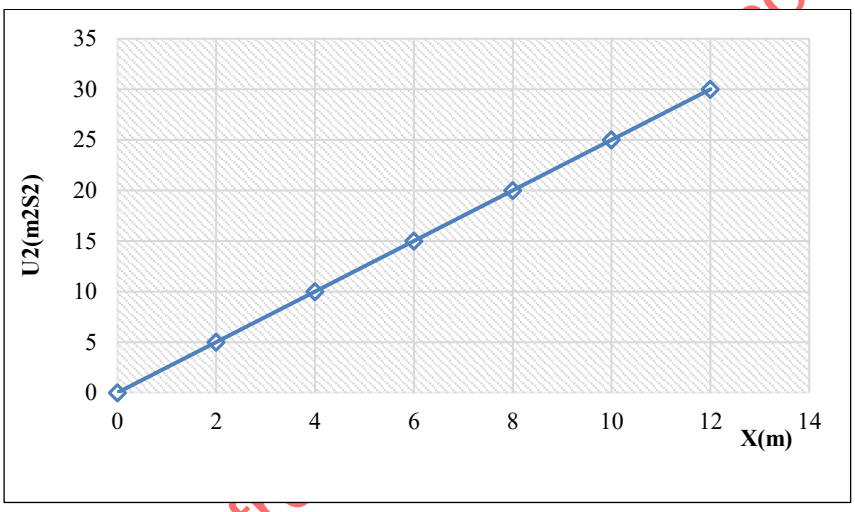
iii) The tension on the string. (2marks)

18. a) i) During the construction of dams, the base of the dam is widened and curved. Explain. (2 marks)

ii) A block of density 1.60 g/cm^3 and measures 3.0cm by 5.0cm by 7.0cm was placed on the ground. Determine the difference between the maximum and minimum pressure that would be exerted on the ground by the block. (3 marks)

b) i) State Newton's second law of motion (1 mark)

ii) A wooden block resting on a horizontal bench is given an initial velocity U so that it slides on the bench for a distance X before it stops. Various values of X are measured for different value of the initial velocity. The figure below shows a graph of U^2 against X.



i) Determine the slope S of the graph (3 marks)

ii) Determine the value of k given that $U^2 = 20kX$ where k is a frictional constant for the surface (2marks)

iii) State with a reason what happens to the value of k when the roughness of the bench surface is reduced (2 marks)

19. a) (i) State the kinetic theory of gases. (1 mark)

(ii) State the reason why it is easier to separate water into drops than to separate a solid into smaller pieces. (1mark)

b) (i) State Hooke's law (1mark)

(ii) Two identical helical springs are connected in series. When a 50g mass is hang at the end of the springs, it produces an extension of 2.5 cm. Determine the extension produced by the same mass when the springs arc connected in parallel. (3marks)

c) (i) State Boyle's law. (1mark)

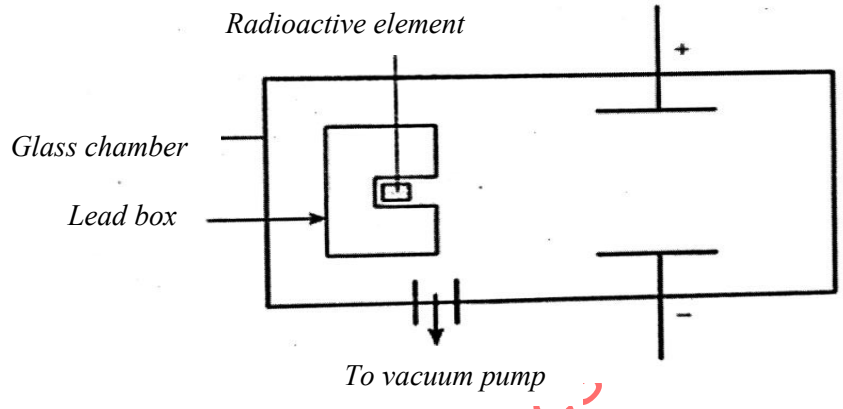
(ii) Draw a suitable set up that can be used to verify Charles's law. (3marks)

MECS II CLUSTER EXAMINATION, 2023
Kenya Certificate of Secondary Education.
232/2
PHYSICS
Paper 2
TIME: 2HRS

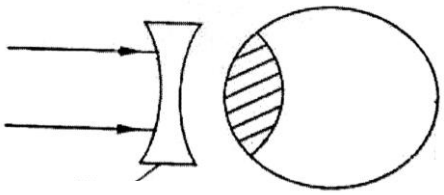
Answer all the questions in sections A and B.

SECTION A: (25MARKS)

1. State one property of image formed by a pinhole camera. (1mk)
2. Other than density, state another factor that affect the speed of sound in a solid. (1mk)
3. A radio wave has a frequency of 3MHz and travels with a velocity of 3.0×10^8 m/s.
   Calculate its wavelength. (2mks)
4. Draw a circuit diagram to show P-N junction diode in the reverse biased mode. (2mks)
5. Explain why the walls of studio are padded with woolen materials (1mk)
6. (a) Define the term ''radioactivity'' (1mk)
   (b) The figure below shows a radioactive element placed in an evacuated glass chamber. The element produces alpha, beta and gamma emissions. The three-emission pass through an electric field



   Complete the diagram to show the path of each of the emissions. (3mks)
7. Explain why radio waves signals are easier to receive in a place surrounded by hills. (2mks)
8. State two ways of minimizing electrical power losses during transmission of electric power. (2mks)
9. Give a reason why convex mirror is preferred to a plane mirror for use as a driving mirror (1mk)
10. State two ways of minimizing local action in a simple cell. (2mks)
11. The figure below shows a defect of vision being corrected by concave lens placed infront of the eye.



Diverging lens

(i) Name the defect. (1mk)
(ii) Complete the rays to show the effect of the lens. (2mks)
12. State one use of microwaves. (1mk)
13. Determine the speed of light in water given that the speed of light in air is 3.0×10^8 m/s and the refractive index of water is 1.33 (3mks)

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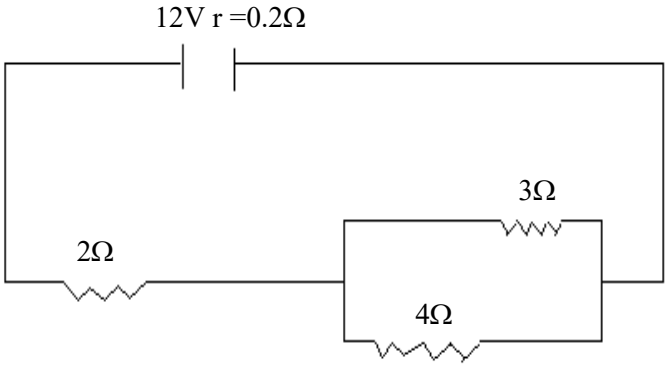
SECTION B (55 MARKS)

Answer all questions in this section.

14. a) State the Ohm's law (1 mk)

b) Give one factor that affect the resistance of a metallic conductor. (1mk)

c) The figure below shows three resistors connected to 12V supply of internal resistance of 0.2Ω.



Calculate

i) The effective resistance. (3mks)

ii) The total current in the circuit. (2 mks)

(d) (i) Define the term 'doping' (1 mk)

(ii) Briefly explain how silicon is used to make an p-type semi-conductor. (3 mks)

(iii) State one application of a diode. (1mk)

15. (a) Why is the cap of the gold leaf electroscope circular? (1mk)

(b) A match stick is lit near the cap of a charged electroscope. State and explain the observation made. (2mks)

(c) State one factor that affects the capacitance of a parallel plate capacitor. (1mk)

(d) A 10μF capacitor is charged to potential difference of 300V and isolated. It is then connected in parallel to a 5μF capacitor. Calculate:

(i) The resultant potential difference. (3mks)

(ii) The total energy in the two capacitors after connection. (3mks)

16. (a) State the Faraday's law of electromagnetic induction. (1mk)

(b) Give two factors that affect the magnitude of the induced em.f (2mks)

(c) A transformer with primary coil of 400 turns and secondary coil 200 turns is connected to 240 V a.c mains.

(i) Calculate the secondary voltage. (2mks)

(ii) If the primary current is 3.0 A and secondary is 5.0A. Calculate the efficiency of the transformer. (3mks)

(d) State how the following are minimized in a transformer. (2mks)

(i) Hysteresis loss

(ii) Eddy currents

(e) Explain why the alternating voltage is used in a transformer. (1mk)

17. (a) Define the term 'work function' (1mk)

(b) Distinguish between thermionic emission and the photoelectric emission. (1mk)

(c) State one factor that determines the velocity of photoelectrons produced on the metal surface when light shine on it. (1mk)

(d) The threshold wavelength of a photo emissive surface is 5.55×10^{-7} m.(Take speed of light C=3.0×10^{8} m/s, Planck's constant h=6.63×10^{-34} Js and mass of an electron Me=9.1×10^{-31}kg.) Calculate:

(i) Its threshold frequency (3mks)

(ii) The work function of the surface (3mks)

(e) The maximum speed with which a photoelectron is emitted if the frequency of the radiation is 6.2×10^{14} Hz (3mks)

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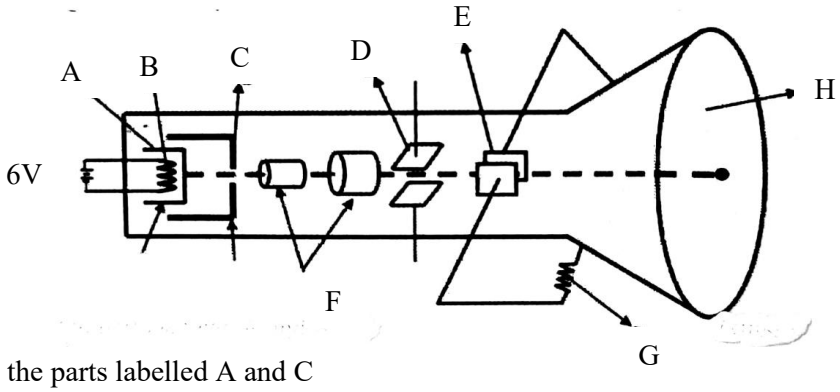
18. (a) State one similarity between cathode rays and X-rays. (1mk)

(b) Give two uses of X-rays in medicine (2mks)

(c) In a T.V set magnetic fields are preferred for use as deflection system instead of the electric field. Explain (1mk)

(d) The figure below represents a cathode ray oscilloscope (C.R.O).



i) Name the parts labelled A and C (2mks)

ii) What is the function of part labelled D (1mk)

iii) Explain how electrons are produced in the C.R.O. (1mk)

iv) State the reason why the part labelled F has variable potential difference. (1mk)

v) Give a reason why the tube is evacuated. (1mk)

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MECS II CLUSTER EXAMINATION, 2023
Kenya Certificate of Secondary Education.
232/3
PHYSICS
PAPER 3
$2\frac{1}{2}$ hours

INSTRUCTIONS TO CANDIDATES

*(a) Answer **ALL** questions.*
*(b) You are supposed to spend the first **15 minutes** of the $2\frac{1}{2}$ hours allowed for this paper reading the whole paper carefully before commencing the work.*
(c) Marks are given for a clear record of the observations actually made, their suitability, accuracy and the use made of them.
(d) Candidates are advised to record their observation as soon as they are made.

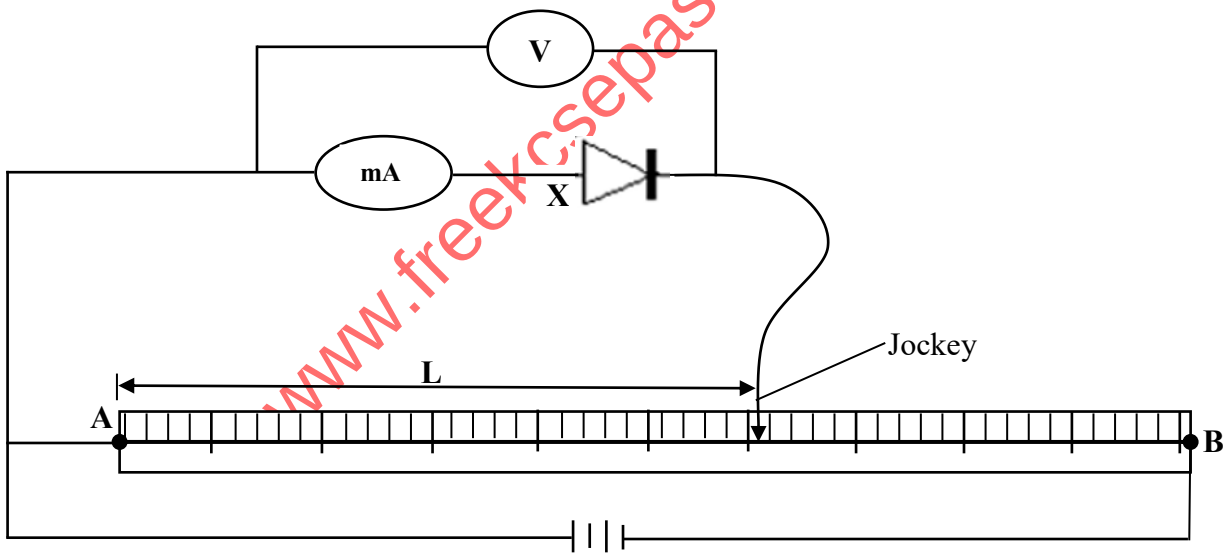
QUESTION 1 (20 marks)

You are provided with the following apparatus;

- Two dry cells (**size D**) and a cell holder
- A milliammeter **(0 – 100 mA)**
- A voltmeter (**0 – 5 V**)
- A resistor wire mounted on a millimeter scale labelled **AB**
- A diode (Anode labelled X)
- Jockey
- Eight connecting wires at least 6 with crocodile clips

Proceed as follows:

a) Set up the circuit as shown below.



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b) Connect Jockey to **L = 50cm** mark. Record the value of current and its corresponding voltage.
I ……. (1mk)
V…… (1mk)

c) Now, connect the jockey to L = 0 cm, 10 cm, 20 cm, 30 cm… and fill the values of current and their corresponding values voltage in the table below. (8mks)

L (cm)	0	10	20	30	40	50	60	70	80
I (mA)									
V(v)									

d) Plot graph of volume, I (y-axis) against **V**. (5mks)
e) From the graph, determine
(i) the slope at **V = 0.65 V.** (3mks)
(ii) the resistance, **R** of the diode at **V = 0.65** V in **SI unit**. (3mks)

QUESTION 2

PART A

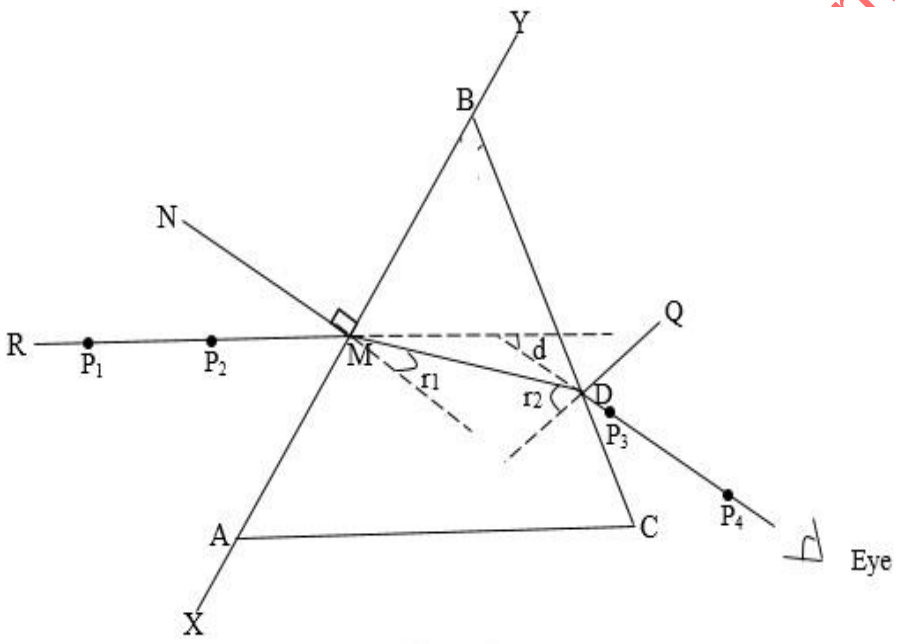
You are provided with the following:

- ✓ Retort stand
- ✓ Geometrical set
- ✓ Four optical pins
- ✓ Thermometer
- ✓ A 100 ml plastic beaker
- ✓ Plain paper
- ✓ Soft board
- ✓ Stopwatch
- ✓ Source of boiling water
- ✓ Four thumb tucks
- ✓ Equilateral triangular glass prism

Proceed as follows

a) Fix the plain paper on the soft board using the office pins.

b) On the plain paper, draw line XY. Mark a point M on its midpoint. Draw a normal N at M to XY. Draw line RM such that angle RMN = 50°.
(This paper will be collected at the end of the experiment). (1mk)



c) Place the glass prism such that one edge AB of the prism is in line with XY. Accurately draw the outline ABC of the prism

d) Place optical pins $\mathbf{P_1}$ and $\mathbf{P_2}$ on the line RM

c) Through edge BC observe the images of $\mathbf{P_1}$ and $\mathbf{P_2}$. Fix $\mathbf{P_3}$ and $\mathbf{P_4}$ so that $\mathbf{P_1}$, $\mathbf{P_2}$, $\mathbf{P_3}$ and $\mathbf{P_4}$ lie on straight line.

d) Remove the pins; construct straight line from $\mathbf{P_4}$ through $\mathbf{P_3}$ to meet side BC at D, join M to D.

i) Measure angle $\mathbf{r_1}$. (1mk)

$\mathbf{r_1}$ = ……..

ii) Produce $\mathbf{P_4P_3}$ to meet RM produced. Measure angle **d**. (1mk)

d……..

iii) Draw the normal at D and measure the angle $\mathbf{r_2}$. (1mk)

$\mathbf{r_2}$ …….

e) Given that R= $\mathbf{r_1}$+ $\mathbf{r_2}$. Calculate **R.** (2mk)

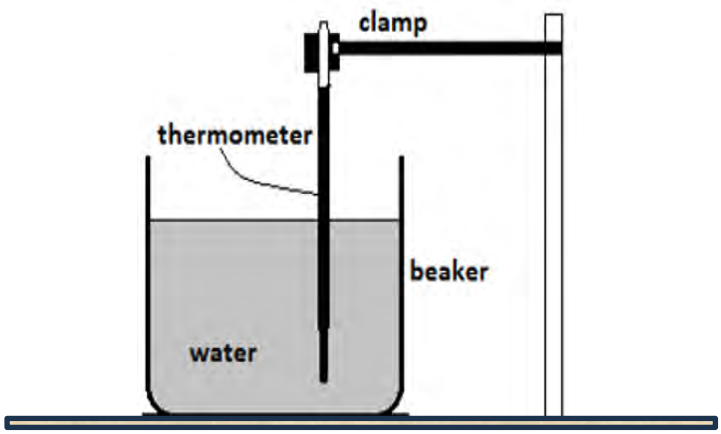
f) Given that $\mathbf{n} = \frac{\sin\left(\frac{R+d}{2}\right)}{\sin\left(\frac{R}{2}\right)}$, find the value of n. (3mks)

g) Given that $\boldsymbol{n \sin k = 1}$, find the value of **k.** (2mks)

h) What Physical property does **n** represent? (1mk)

PART B

g) Measure **100 ml** of hot water and pour it into the beaker. Place the beaker on the bench. Clamp the thermometer vertically and insert it into the beaker with hot water.



h) Start the stop-watch when the temperature is **80^0 C**. Record the temperature, **θ** after 4 minutes.

(a) **θ** = ……^{0}C. (1mk)

Convert to **θ** in degrees Celsius to temperature T, in kelvin.

(b) **T** = ……..K. (1mk)

i) Find the mass, **m** (in kg) of water in the beaker given that the density of water is 1000kg/m^3. (2mks)

j) Given that: $\boldsymbol{\gamma = \frac{mc(353-T)}{240}}$ where; m is the mass of the water used and the specific heat capacity of water, **c = 4200J/kg/K**, determine the value of γ. (3mks)

k) State the significance of γ. (1mks)

MECS II CLUSTER EXAMINATION, 2023
Kenya Certificate of Secondary Education.
232/3
PHYSICS
Paper 3
CONFIDENTIAL

QUESTION 1

You are provided with the following apparatus;

- Two dry cells (**size D**) and a cell holder
- A milliammeter **(0 – 100 mA)**
- A voltmeter (**0 – 5 V**)
- A resistor wire mounted on a millimeter scale labelled **AB**
- A diode with **anode** labelled x (preferable **6A10 MIC** or any other available)
- Jockey
- Eight connecting wires at least 6 with crocodile clips

QUESTION 2

Each student should have the following

- Four optical pins
- Plain paper (A4 size)
- Soft board
- Four thumb tucks
- Equilateral triangular glass prism
- Complete geometrical set
- Thermometer
- Retort stand
- Access to hot water (above 85°C)
- 100 ml plastic beaker
- Stop watch.

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MECS II CLUSTER EXAMINATION, 2023
Kenya Certificate of Secondary Education.
232/1
PHYSICS
Paper 1
MARKING SCHEME

SECTION A: (25 MARKS)

1. 9.5-6.7=2.8cm correct readings√, final answer√
2. a) Convex meniscus, level below level in the beaker
   b) In (a) the adhesive forces between the water and glass molecules are stronger than cohesive forces between the water molecules while in (b) in the cohesion forces between the mercury molecules are greater than adhesion forces between mercury and glass.
3. Pressure outside the balloon reduces below the pressure inside leading making it to increase in size/expansion
4. Elastic potential=potential energy gained by the stone
   $= 0.04\times10\times50$
   $= 20J$
5. Perpendicular distance away from the point √
   Angle at which the force is applied√
6. (i) Mercury has a higher density than water and therefore a shorter tube/length is required.
   (ii) Highly volatile/easily evaporates.
   (iii) Temperature of the ice✓1
7. Makes the buses more stable by lowering the position of cog
8. - Radius of the curve✓1
   - Nature of road surface/ wheels ✓1
9. $P_1V_1/T_1 = P_2V_2/T_2$
   $V_2 = P_1V_1T_2/P_2 = 760 \times 200 \times 273/293 \times 100 = 1{,}416.25cm^3$
10. Increases the time of impact hence reduces the fatal impulsive force ✓1
11. When air is blown at high velocity, pressure above it is reduced below atmospheric pressure√
    Atmospheric at the other limb is greater and therefore pushes the liquid to the left.√
12. Clockwise moments=anticlockwise moment
    $(40x3.5) + (80x8) + (20x6) = Wx12$
    $140 + 640+120 = 12W$
    $W = 900/12 = 75N$
13. The cemented floor is a good conductor of heat and therefore conducts heat away from the feet.
14. i) Upper fixed point is the temperature of pure steam.
    ii) Making the bulb walls thinner.

SECTION B (55 MARKS)

15. a) When a body is partially or fully submerged in a fluid, it experiences an up thrust force equal to the weight of the fluid.
    b) i) The density of the block.
    $P = m/v = 4{,}800/2^3 = 600kg/m^3$
    ii) The upthrust acting on the block.
    Upthust = weight of fluid displaced
    $=\rho gV = 800\times10\times2^3 = 64{,}000N$
    iii) The tension in the cable.
    $W= mg = 4{,}800\times10 = 48{,}000N$
    $T= U-W$
    $= 64{,}000-48{,}000 = 16{,}000N$
    iv) Up thrust= weight of the object = 64,000N
    $U = \rho gV$
    $V=U/\rho g = 64{,}000/800X10 = 8m^3$ (the block is just submerged.)

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16. a) - Increasing pressure
- Addition of impurities

b) i) Heat gained by the calorimeter and water. (3 marks)

$Q = mc\Theta$ $Q = Mc\Theta$

$= 0.8x400x30$ $= 0.6x4200x30$

$= 9,600$ J $= 75,600$J

Total $= 9,600 + 75,600$

$= 85,200$J

ii) Energy lost by the metal nut. (1 mark)

85,200J

iii) The specific heat capacity of the material making the nut. (3 marks)

$Q = mc\Theta = 85,200$J

$C = 85,200/0.4x\ 248 = 85,200/99.2 = 858.87$J/kg/K

c) $Pt = mL_f$

$60x112 = 0.02L_f$

$L_f = 60\times112/0.02 = 336,000$J/kg

17. a) i) The time it takes to reach maximum height. (2mks)

$u=20$

$V=0$

$a=-10$

$V=u+at$ $t=V-U/a = 0-20/-10 = 2s$

ii) The total time which elapses before it hits the ground. (2mks)

$U=20$ $S=30$

$a=10$ $t=?$

$V^2=u^2+2as = 20^2+(2x10x30) = 400+600 = 1,000$

$V = \sqrt{1,000} = 31.63$m/s

$V=u+at$

$31.63 = 20 + 10t$ $t = 31.63-20/10 = 1.163s + 4s = 5.163s$

b) i) 6rev/s $= 6x2\pi$ rad/s $= 12\pi$ rds/s

ii) $a = \omega^2 r$

$= 12\pi^2 x0.6 = 852.734$rad/s^2

iii) $T = m\omega^2 r = 0.045x852.734 = 38.37$N

18. a) i) Wider base counters the greater pressure at the bottom √

Curved wall ensures even distribution of the pressure due to water√.

ii) $P_{max}=F/A_{min} = \rho Vg/A_{min}$ $P_{min} = F/A_{max} = 1.6x3x5x7x10x10,000 /35x1000$

$= 1.6x3x5x7x10x10,000/3/15x1000$ $= 480$Pa

$= 1,120$Pa

Difference $= 1,120-480 = 640$Pa

b) i) The rate of change of momentum is directly proportional to the resultant force and take place in the direction of the force.

ii) i) $m=25 - 10/10-4 = 15/6 = 2.5$ m/s^2

ii) $m=20k$, $k = m/20 = 2.5/20 = 0.125$m/s^2

iii) K would reduce since friction has reduced

19. a) i) Kinetic theory of gases. (1 mark)

Gases are made of tiny particles which are in a continuous state of motion

ii) Cohesive forces of attraction between a liquid are weaker than those between solid particles.

b) (i) Hooke's law (1mark)

For a helical spring or any other elastic material, the extension produced is directly proportional to the applied force provided the elastic limit is not exceeded.

(ii) $K=F/e = 0.5/0.0125 = 40$N/m

$K_p=20/2 = 20$N/m

$e=F/K_p = 0.5/20 = 0.025$m

c) (i) Boyle's law. (1mark)

Volume of a fixed mass of a gas is directly proportional to pressure provided the temperature is kept constant.

(ii) Measurement of volume and temperature

Maintenance of constant volume

Workability.

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232/2
PHYSICS
PAPER 2
MARKING SCHEME

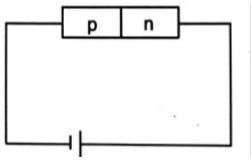
SECTION A: (25MARKS)

1. - real
- inverted/ upside down

2. Temperature

3. $V=f/\lambda$ $\lambda=3.0 \times 10^8/3.0 \times 10^6 = 100m$
$\lambda = V/f$

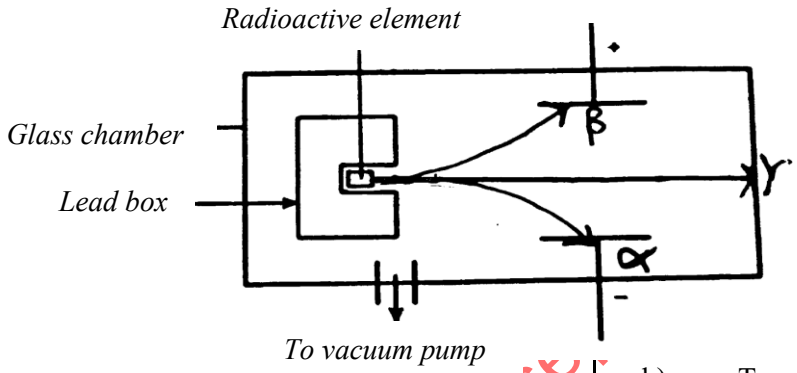
4.



5. Woolen materials absorb most of the energy of incident sound waves preventing reflection of sound waves (echoes)

6. (a) It's the spontaneous random emission of particles from the nucleus of an unstable nuclide

(b)



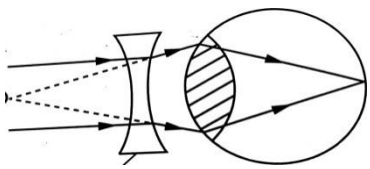
7. Radio waves have longer wavelengths hence easily diffracted around the hills.

8. Stepping up the voltage
Using thick wires

9. Provide wide field of view
Forms upright images

10. Use of pure zinc metal plate
Coating zinc plate with mercury

11. i) Shortsightedness/Myopia
ii)



12. Cooking/heating in micro ovens
Radar communication

13. Refractive index =Velocity in air/ Velocity in water = $3.0 \times 10^8/V_w = 1.33$
$V_w = 2.256 \times 10^8 m/s$

SECTION B (55 MARKS)

14.

a) Ohms law (1mk)
States that the current flowing through a conductor is directly proportional to the p.d across it provided the temperature and other physical conditions are kept constant

b) - Temperature
- Cross-sectional area of conductor
- Length of the conductor

c) i) The effective resistance. (3mks)

$R = \frac{4X3}{4+3} = 2+0.2$

$= \frac{12}{7} + 2.2 = 3.914\Omega$

ii) The total current in the circuit. (2 mks)

$V=IR$

$I = \frac{V}{R} = \frac{12}{3.914} = 3.066A$

d)

i) Addition of impurities to a pure semi-conductor to improve its electrical conductivity.

ii) - Silicon is doped with boron/trivalent atom.
- three electrons bond covalently leaving a hole.
- holes are the majority charge carriers and electrons the minority charge carriers.

iii) Rectification.

15.

a) To ensure uniform distribution of charges

b) The leaf of the electroscope falls/collapses/leaf divergence decreases.
The flame ionizes the air around the cap. The opposite charges to the one on the electroscope are attracted neutralizing the charges hence discharging.

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c) - Area of overlap
- Distance between the plates
- Dielectric material between the plates

d) i) The resultant potential difference. (3mks)

Q =CV
=10x 10^{-6} x300
=3.0x 10^{-3}C

$(10x\ 10^{-6} + 5x10^{-6})V_2 = 3.0\ x10^{-3}$
$1.5x10^{-5}\ xV_2 = 3.0x10^{-3}$
$V_2 = \frac{3.0x10-3}{1.5x\ 10-5} = 200V$

$C_1V_2+C_2V_2=3.0x10^{-3}$

ii) The total energy in the two capacitors after connection. (3mks)

$W = \frac{1}{2}\ xCV^2$

$W = \frac{1}{2}x\ 10x10^{-6}x200^2 + \frac{1}{2}x5x10^{-6}x\ 200^2$

$= 0.2+0.1 = 0.3J$

16. a) States that the magnitude of induced em.f is directly proportional to the rate of change of magnetic flux linkage.

b) - strength of the magnetic field
- Number of turns in the coil
- Rate of change of magnetic flux

c) (i) Calculate the secondary voltage. (2mks)

$\frac{Ns}{Np}\ \frac{Vs}{Vp}$ $\frac{400}{200}\ \frac{Vs}{240}$ $Vs = \frac{400x240}{200} = 480V$

(ii) Power output=240x3=720W Efficiency= $\frac{\text{power output}}{\text{power input}}$ x100%

Power input =480x 5=2400W $=\frac{720}{2400}x100\% = 30\%$

d) (i) Hysteresis loss - using a core of a soft magnetic material eg soft iron
(ii) Eddy currents - laminating the core

e) It can be stepped up or stepped down.

17. (a) Minimum amount of energy of radiation/light required to dislodge an electron from the surface of a metal

(b) Thermionic emission is the process of emitting electrons from the metal surface due to heat energy while photoelectric effect is the process of emitting electrons from the metal surface by electromagnetic radiation of sufficient frequency/energy.

(c) Frequency/wavelength/energy of the radiation

(d) i) threshold frequency (3mks)

$f_o = \frac{C}{\lambda O}$ $f_o = \frac{3.0x108}{5.55x10-7}$ $f_o = 5.405\ x10^{14}Hz$

ii) The work function of the surface (3mks)

Wo =hf_o
$=6.63x10^{-34}\ x\ 5.405x10^{14}$
$=3.584\ x10^{-19}\ J$

(e) $hf = hf_o + \frac{1}{2}M_eV^2$ $\frac{1}{2}MeV^2 = (6.63x10^{-34}x6.2x10^{14}) - 3.584x10^{-19} = 5.266x10^{-20}J$

$\frac{1}{2}M_eV^2 = hf - hf_o$ $V = \sqrt{\frac{5.266X10-20X2}{9.1X10-31}} = 3.402X10^5 m/s$

18. (a) Both travel in straight line at the speed of light.

(b) Sterilize surgical equipment
Killing cancerous cells/radiotherapy
Radiography

(c) Magnetic fields provide a wider deflection compared to electric fields.

(d) i) **A**-Cathode **C**-Grid

ii) Used for vertical deflection of the electron beam

iii) Thermionic emission-when the cathode is heated electrons on its surface gain enough energy to enable them break loose from the force of attraction from the nuclei. /the filament heats up the cathode, causing the electrons to boil off or be emitted from surface.

iv) To <u>focus/converge</u> the electron beam on the screen.

v) To <u>prevent electrons from losing energy</u> due to collision with air particles.

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MECS II CLUSTER EXAMINATION, 2023
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232/3
PHYSICS PRACTICAL
PAPER 3
MARKING SCHEME

QUESTION 1

b) I ……**45 mA**…… (atleast awhole number figure)
V…….. **0.9 v**…… (1dp a must) (1mk)

c)

L (cm)	0	10	20	30	40	50	60	70	80
I (mA) **±5**	**0**	**0**	**0**	**7**	**24**	**45**	**64**	**78**	**96**
V(v) **±0.2**	**0**	**0.2**	**0.4**	**0.6**	**0.8**	**0.9**	**1.0**	**1.1**	**1.2**

d)

e) i) the slope at **V = 0.65 V.** (3mks)
tangent on the curve at v = 0.65 V **(Clearly drawn on graph = 1mk)**

$$S = \frac{(40-6)\text{mA}}{(1.00-0.58)\text{V}} = \frac{(34)\text{mA}}{(0.42)\text{V}}$$ **(Correct substitution = 1mk)**

$$= 80.95\ {}^{mA}/_{V}$$

ii) $R = \frac{V}{I}$, therefore, $R = \frac{1}{s}$

$$R = \frac{1}{80.95}$$ **(Correct substitution = 1mk)**

$$= 0.01235\ {}^{V}/_{mA}$$ **(Correct evaluation = 1mk)**

Hence,

$$R = 0.01235 \text{ x } 1000\ {}^{\text{V}}/_{\text{A}}$$

$$= 12.35\ \Omega$$ **(Correct evaluation = 1mk)**

QUESTION 2

b) Outline sketch of the triangular glass prism with rays and relevant angles drawn **(1mk)**

d) i) $r_1 = 28°$ **(Penalize $\frac{1}{2}$mk for unit not given i.e degrees in all angles)** **(1mk)**

ii) $d = 37°$ **(1mk)**

iii) $r_2 = 30°$ **(1mk)**

e) $\boldsymbol{R} = 28° + 30°$ **(Correct substitution = $\frac{1}{2}$mk)**

$$= 58°$$ **(Correct evaluation = $\frac{1}{2}$mk)**

f) $\mathbf{n} = \frac{\sin\left(\frac{58+37}{2}\right)}{\sin\left(\frac{58}{2}\right)}$ **(Correct substitution = 1mk)**

$$= \frac{\sin 47.5}{\sin 29}$$ **(Correct evaluation = 1mk)**

$$n = 1.521$$ **(unitless $4sf$ = 1mk)**

g) $n \sin k = 1$

$$1.521 \sin k = 1$$ **(Correct substitution = 1mk)**

$$\sin k = \frac{1}{1.521}$$

$$k = \sin^{-1}\frac{1}{1.521}$$

$$= \mathbf{41.11°}$$ **(Correct evaluation = 1mk)**

h) Refractive index of glass (1mk)

PART B

h) a) **θ** = ……68. 0 ± 2.0…….^{0}C. (1dp a must)

b) T =273 + 68
= 341……..K.

i) $m = \rho v$
= 1000 x 0.0001
= 0.1 kg

j) $\gamma = \frac{0.1\text{x}4200(353-341)}{240}$

$$= \frac{5040}{240}$$

$$= 21\ \text{Js}^{-1}$$

k) Rate of energy loss by water / power loss by water

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A man pulls on the rope with a horizontal force T. The piece of metal has a weight of 2000 N and is freely pivoted at A. The system is in equilibrium. By taking moments about A, calculate the value of T. (3marks)

6. Explain why an aeroplane is likely to take off much earlier than expected when the speed of the wind blowing in the opposite direction to its motion on the runway suddenly increases. (2 marks)
7. An aircraft 300m from the ground traveling horizontally at 400m/s releases a parcel. Calculate the horizontal distance covered by the parcel from the point of release. (Ignore air resistance) (3 mks)
8. A body of mass 4.0kg held at a vertical height of 500cm is released to travel a long a frictionless curved path as shown in figure 8

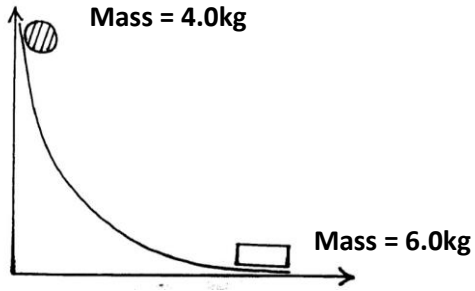


Fig 8

The 4.0kg mass strikes another body of mass 6.0kg at rest. Immediately it reaches the horizontal, the two bodies stick together and move in the same direction. Determine the velocity of the bodies immediately after collision. (3marks)

9. A tin with a hole is filled with water to a certain height. Water jets out as shown in figure 9(a) below. A second identical tin is filled with water to the same height and a block of wood floated as shown in figure 9(b).

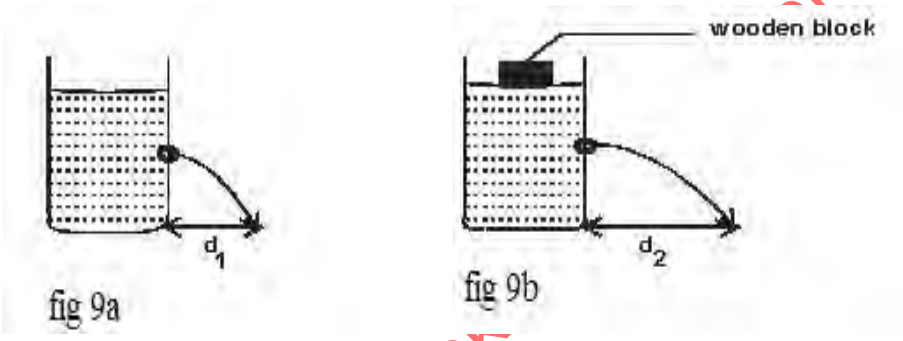
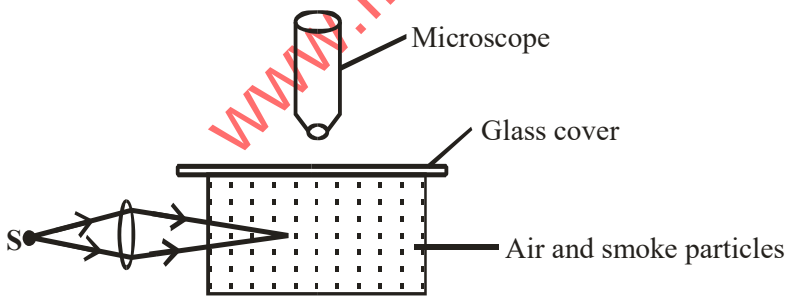


Fig 9

State the reason why the maximum distance of jet d_2 is greater than d_1. (1 mark)

10. The figure 2 below shows the apparatus used to observe Brownian motion using a smoke cell.



i) State the observation made in the smoke cell. (1 mark)
ii) Explain the observation made when the temperature in the smoke cell is increased. (1 mark)

11. When a mercury in a glass thermometer is used to measure the temperature of hot water, it is observed that the mercury level first drops before beginning to rise. Explain. (2 marks)

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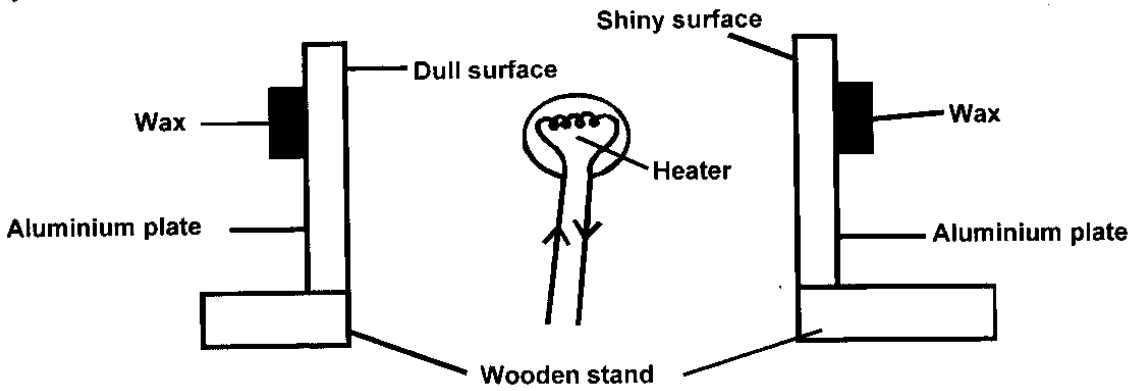
12. Figure 3 shows an arrangement of apparatus to study properties of different surfaces.

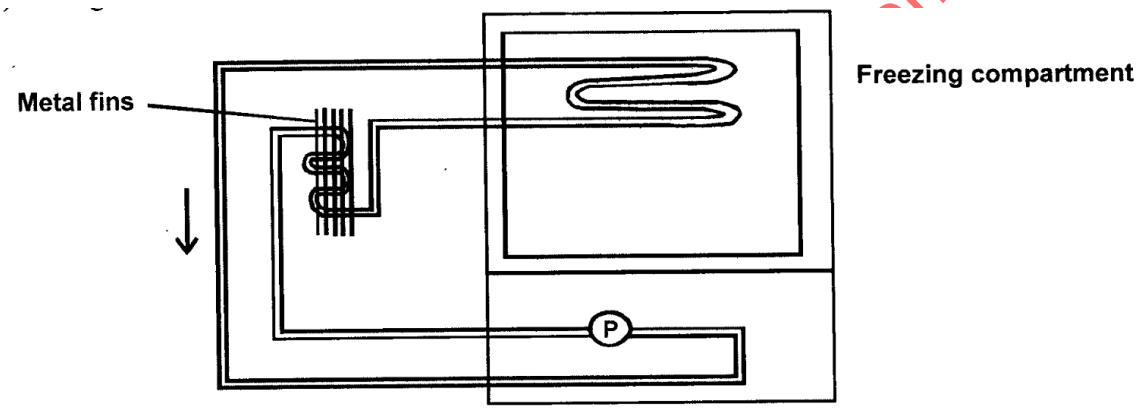


The heater is placed equidistant from the two plates. State what happens when the heater is switched on for some time. (1 mark)

13. Explain your answer in question 12 above (1mark)

SECTION B: 55 marks

14. a) The figure below shows the features of a refrigerator.



i) What is the function of the pump P? (1 mark)
ii) What is the function of the copper fins at the back of the refrigerator? (1 mark)
iii) Explain briefly how cooling takes place in the refrigerator. (3 marks)
iv) What is the purpose of the double wall in a refrigerator? (1 mark)

b) i) Define the term latent heat of fusion of a substance. (1 mark)
ii) The figure below shows an apparatus that could be used to determine the specific latent heat of fusion of ice.

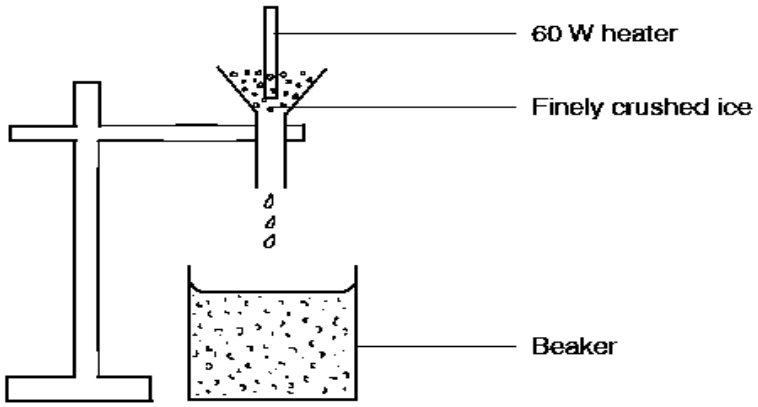


Fig 12

In order to obtain results that are as accurate as possible, state why it is important to:
I. Wait until water is dripping into the beaker at constant rate before taking readings. (1 mark)
II. Use finely crushed ice rather than larger ones. (1 mark)

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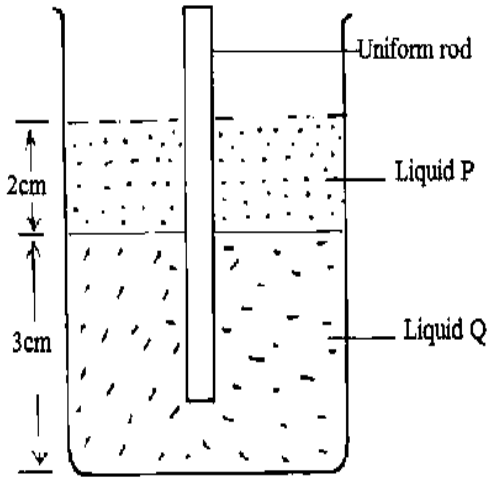
15. (a) State the law of flotation. (1 mark

(b) Figure 13 below shows a uniform rod of height 8cm floating vertically in a beaker containing two immiscible liquids P and Q. The densities of the liquids are 800kg/m³ and 1200kg/m³ respectively the cross-sectional area of the rod is 2cm².



Determine

(i). the weight of liquid P displaced by the rod. (3 marks)

(ii) The weight of liquid Q displaced by the rod. (2 marks)

(iii) The mass of the rod. (1 mark)

(iv) The density of the rod. (2 mks)

(c) Figure 14 below shows a block of volume 50 cm³ and density 2 000 kg/m³ submerged in a liquid and suspended from a uniform horizontal beam by means of a thread. The beam is balanced by a spherical mass of 40 g, which is suspended from it on the other side of the pivot as shown.

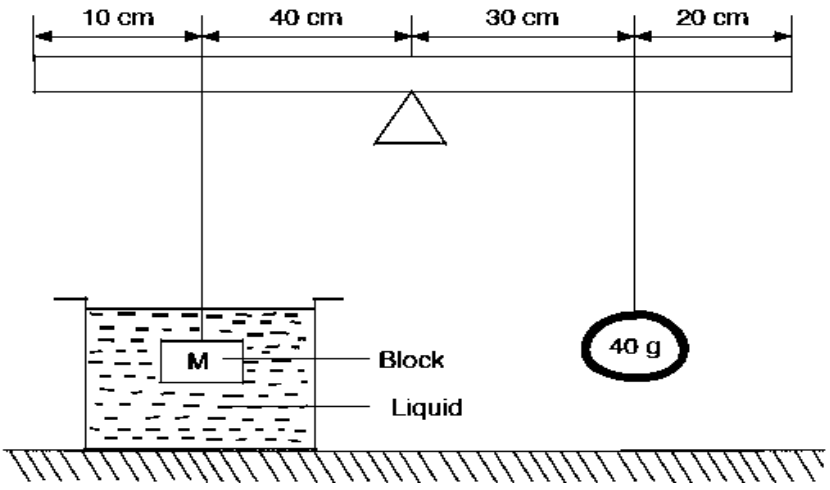
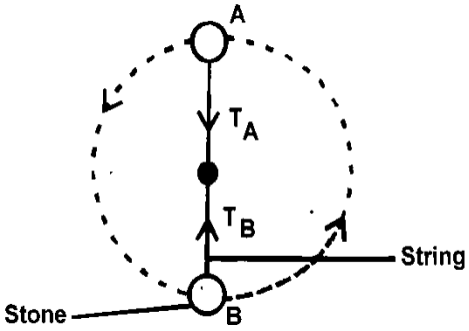


Fig 14

Determine the upthrust force acting on the block. (3 marks)

16. a) State two condition necessary for a driver to negotiate a bend on a banked road at a relatively high speed (2 marks)

(b) The figure shows stone of mass 100g whirled in a vertical circle using a thread of length 56cm. (Take g 10N/Kg)



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If the stone is whirled at a speed of 8m/s. Calculate;

i) The centripetal force experienced by the stone. (3 marks)

ii) Tension force on the string at :

I) A (2 marks)

II) B (2 marks)

iii) calculate the angular velocity of the stone. (1mark)

(d) Figure 15 shows a centrifuge that is used to separate particles suspended in a liquid.

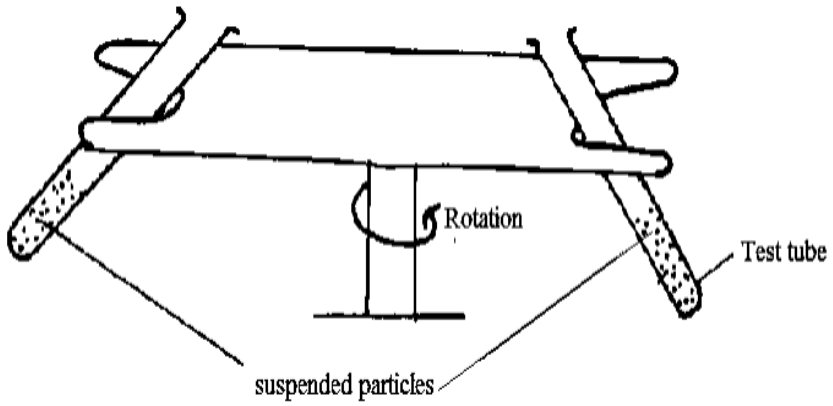


Fig 15

Particle of different mass M_1, M_2 and M_3 are suspended in a liquid which they do not dissolve. The system is then rotated in the direction shown.

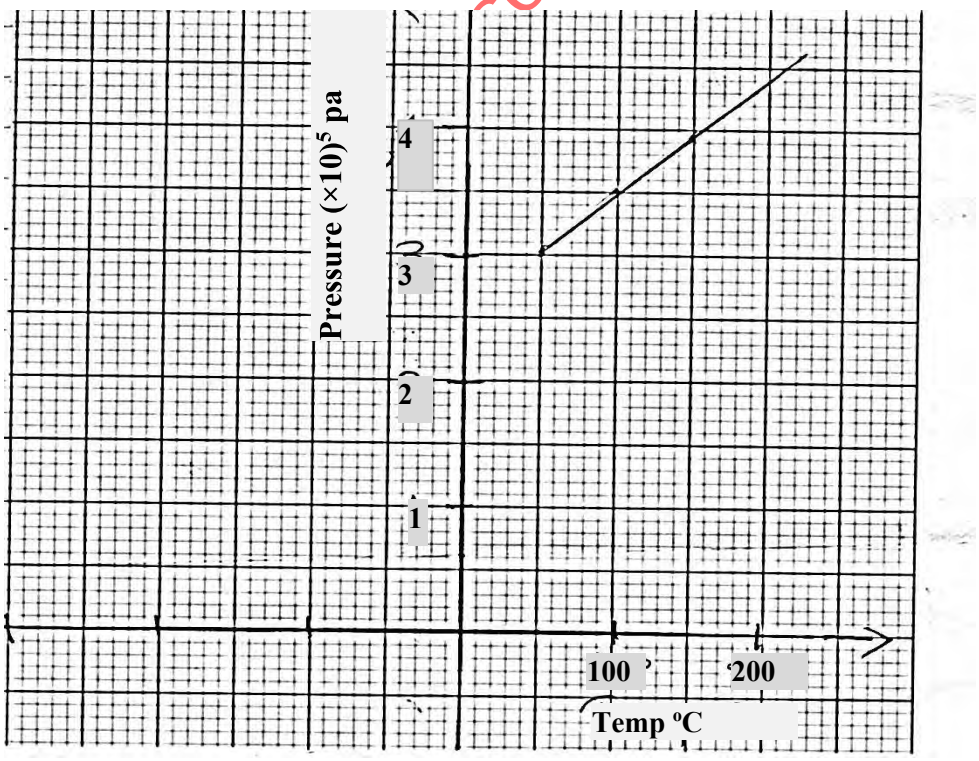
(i) State why the particles of different masses will acquire different radii as the system is rotated. (1 mark)

(ii) If $M_3 > M_2 > M_1$, arrange the particle in increasing radii when the centrifuge is rotated for some time. (1 mark)

17. a) State one condition necessary for pressure law to hold. (1 mark)

b) A bubble at the bottom of a pond expands as it rises to the top of the liquid. Explain. (1 mark)

c) The graph below represents a graph of pressure against temperature, °C.



From the graph, determine;

i) The absolute zero temperature. (1 mark

ii) The pressure at 373K (1 mark)

Explain why temperature in (i) above cannot be achieved (2 marks)

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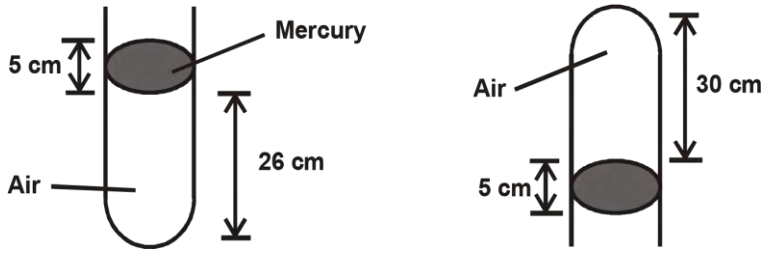
d) A column of air 26cm long is trapped by mercury thread 5cm long. When the tube is inverted, the air column becomes 30cm long. What is the value of atmospheric pressure? (3 marks)

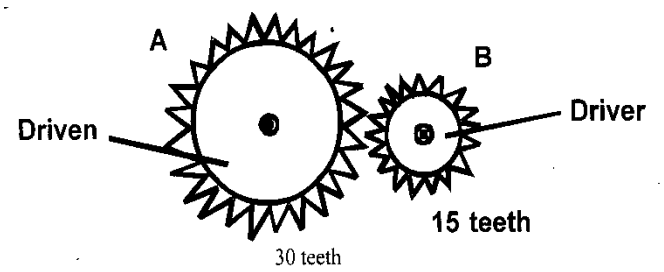


Explain using kinetic theory of gases why pressure of gases increases as temperature of the gas is increased. (3 marks)

18. a) Differentiate between work and energy. (2 marks)

b) Describe the energy transformation that takes place when a car battery is used to light a bulb. (1 mark)

c) The figure shows a machine.



Gear wheel A with 30 teeth is driven by gear wheel B with 15 teeth.

i) Determine the velocity ratio of the machine. (2 marks)

ii) If the machine has a mechanical advantage of 0.375, determine the efficiency of the machine. (2 marks)

d) A cart of mass 30kg is pushed along horizontal path by a horizontal force of 8N and moves with a constant velocity. The force is then increased to 14N.

Determine:;

i) The resistance to the motion of the cart. (1 mark)

ii) The acceleration of the cart. (2 marks)

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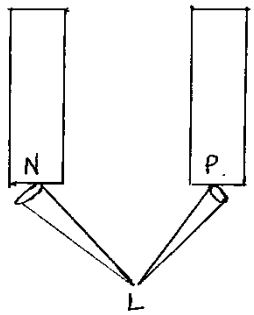
MURANGA SOUTH FORM 4 JOINT EVALUATION TEST, 2023
Kenya Certificate of Secondary Education (K.C.S.E)
(232/2)
PHYSICS
PAPER 2
TIME: 2HRS

INSTRUCTIONS TO CANDIDATES
1) Answer all questions in section A and B.
2) All workings must be clearly shown
3) Mathematical tables and non-programmable calculators may be used.

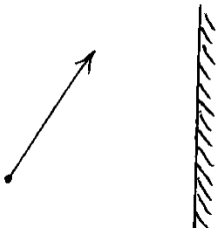
SECTION A

1. The diagram below shows two steel pins held at the poles of two magnets.



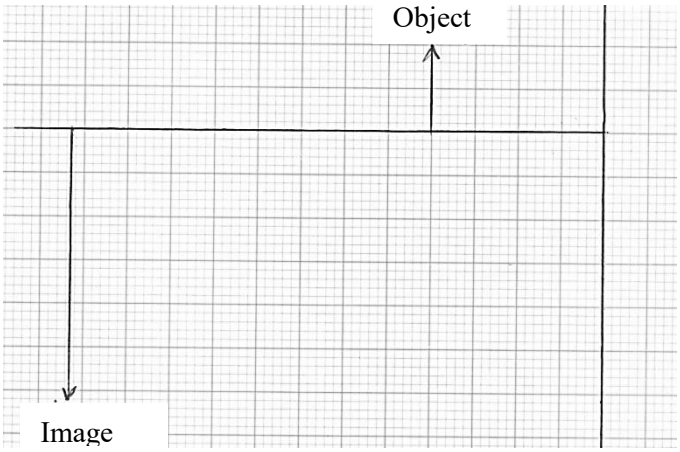
(i.) State the polarity at P _____ (1mk)
(ii.) By what process are the pins magnetised? (1mk)
(iii) State the law illustrated by the two pins (1mk)

2. The figure below shows an object in front of a plane mirror.



Sketch the image of the object using the mirror shown (2mks)

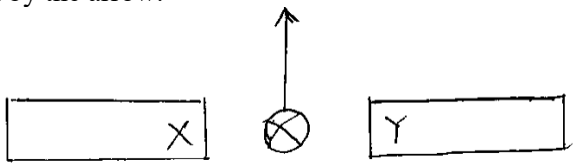
3. The figure below shows an object in front of a concave mirror and its image.



Locate the position of its principal focus (2mks)

4. State the use of Manganese (Iv) Oxide in dry cell (1mk)

5. The figure below shows conductor carrying current in a magnetic field and the conductor moves in the direction shown by the arrow.



i) Identify polarities X and Y (1mk)
ii) State the law used to determine the direction of movement of the conductor (1mk)

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6. A man standing between two parallel walls fires a gun. He hears the first echo after 1.5 seconds and the second echo after 2.5 seconds and the third echo after 4 seconds since firing the gun respectively.
Determine the separation of the walls. (take velocity of sound to be 340m/s (3mks)
7. A positively charged rod is brought near the cap of a leaf electroscope. The cap is then earthed momentarily by touching with the finger. Finally the rod is withdrawn. The electroscope is found to be negatively charged. Explain how this charge is acquired. (2mks)
8. A wire is stretched between two fixed points such that when it is plucked, it produces sound.
Explain why the pitch of the sound produced may become lower when the temperature of the surrounding rises. (2mks).
9. The chart below shows an arrangement of different parts of the electromagnetic spectrum.

RADIO	INFRARED	VISIBLE LIGHT	A	X-RAYS	GAMMA RAYS

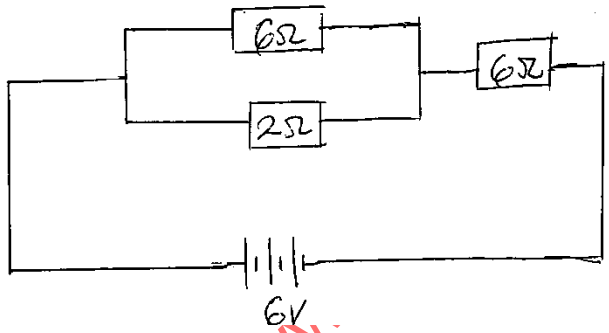
Name the radiation represented by A. (1mk)
10. State two differences between X - rays and gamma rays in the way in which they are produced. (2mks)
11. (a) A nuclear reaction is represented by the following reaction.

$$^{a}_{86}X \longrightarrow {}^{220}_{b}Y + \text{Beta particles}$$

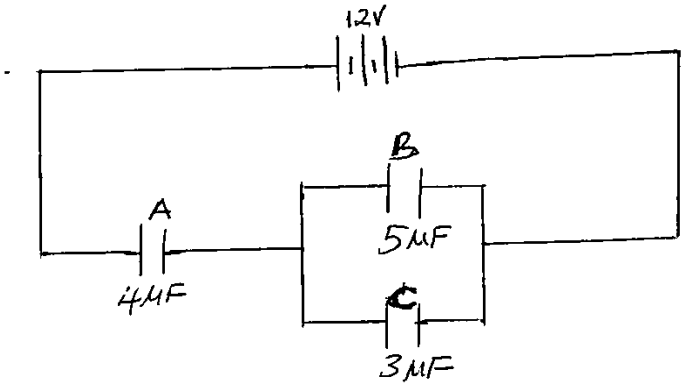
(i.) Determine the values a and b (2mks)
A is _____
B is _____
(ii.) What is meant by the term work function as used in photo electricity (1mk)
12. An electrostatic generator sets up a current of 20mA in a circuit. Calculate the charge flowing through the circuit in 15 seconds. (2mks)

SECTION B

13. (a) State Ohm's law (1mk)
(b) The figure below shows a 6v battery connected to an arrangement of resistor.



Determine the current flowing through the 2Ωresistor. (3mks)
(c) The figure below shows an electronic circuit with three capacitors A, B and C of Capacitance 4μF, 5μF and 3μF respectively connected to a 12v battery.



Determine:
i) The combined capacitance of the three capacitors. (2mks)
ii) The charge of the capacitor A (2mks)
iii) The potential difference across capacitor B (2mks)

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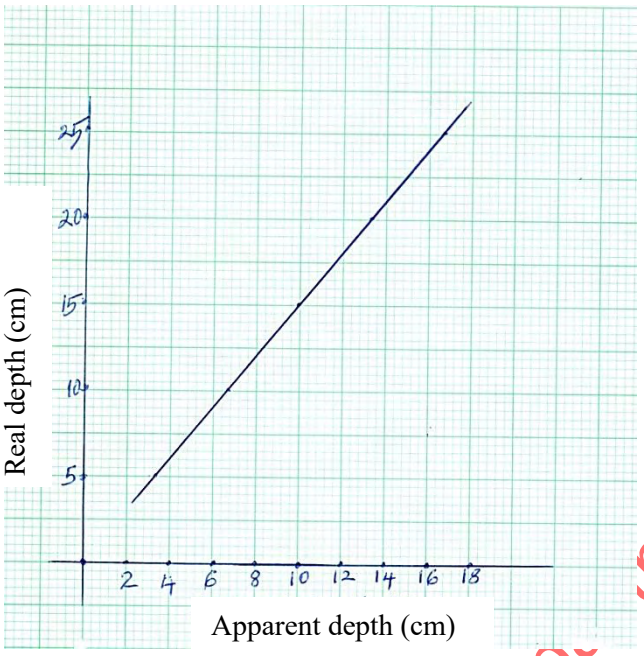
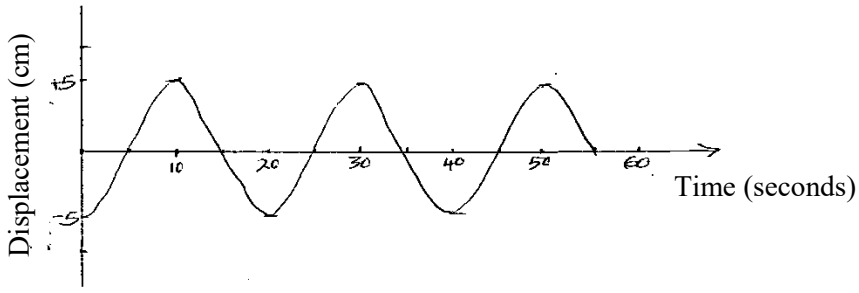
14. (a) A vertical object is placed 20cm in front of a convex lens of focal length 5cm.
Determine
i) The image distance (2mks)
ii) The magnification (2mks)

(b) In an experiment to determine the refractive index of a liquid, the liquid was poured into a measuring cylinder. A pin was placed at the bottom of the cylinder and another pin was used to locate the apparent position of the first pin. The real depth and apparent depth were measured and recorded. The experiment was repeated with other values of real depth. For the tabulated measurement of real and apparent depths the following graph was drawn.
From the above graph, determine the reflective index of the liquid (3mks)

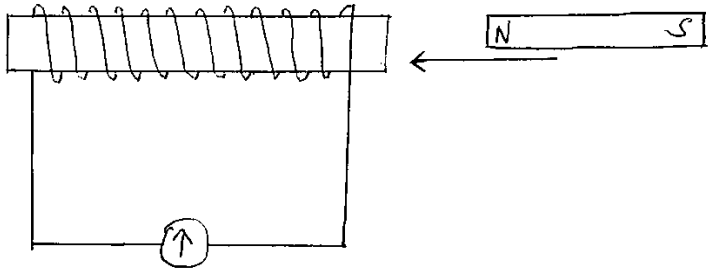


(c) The figure below shows a displacement – time graph for a progressive wave



i) Determine the frequency of the wave (3mks)
ii) Given that the velocity of the wave is 20m/s determine its wavelength. (2mks)

15. (a) The figure below shows a magnet being moved towards a stationery solenoid. It is observed that the pointers of the galvanometer deflect.



i) Give a reason for the deflection of the pointers of the galvanometer (1mk)
ii) State two ways that can be used to increase the magnitude of the deflection of the pointer of the galvanometer (2mks)

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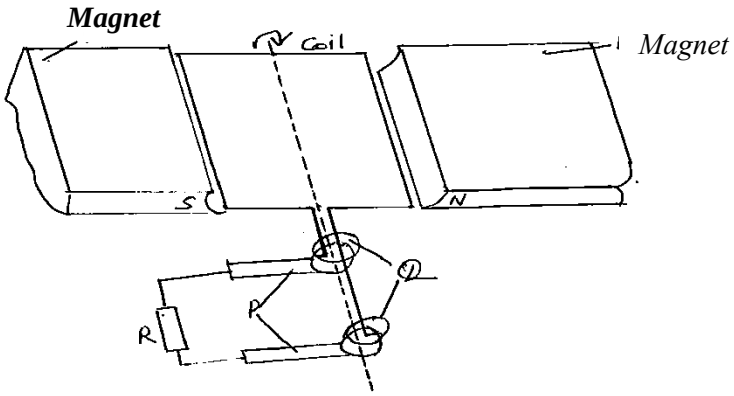
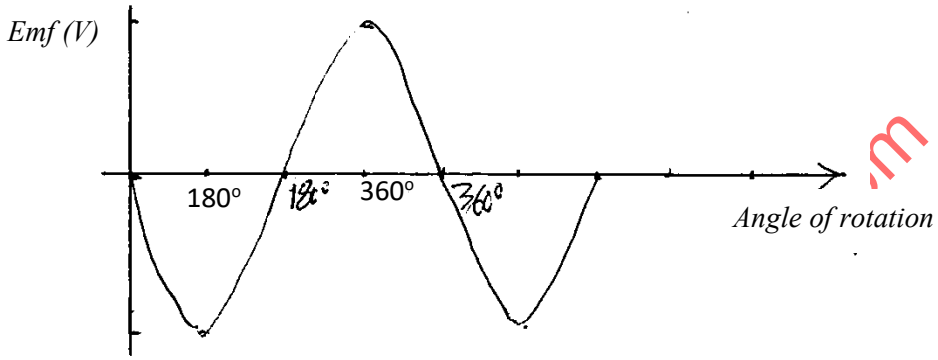
(b) The figure below shows a simple electric generator.



1) Name the parts labelled P and Q (2mks)
2) The emf generated as the coil rotates is represented in the graph below.

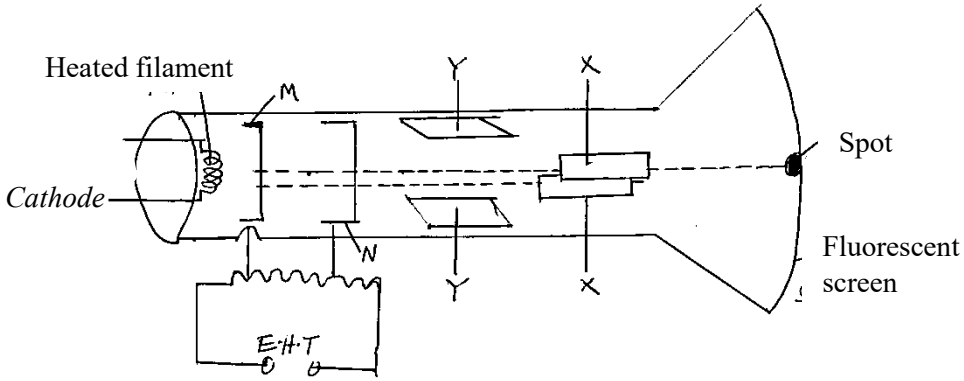


Give a reason for the changes in the emf as the coil rotates from 0 to 90 and 90 to 180. (2mk)

(c) The primary coil of the transformer has 1200 turns and the secondary coil has 60 turns.
The transformer is connected to a 240V a.c source
Determine

i) The output voltage (2mks)
ii) The output current when the primary coil has a current of 0.5A. (assume there are no energy losses) (2mks)

16. (a) State the differences between cathode rays and electromagnetic radiations (2mks)
(b) The figure below shows the main features of a cathode ray oscilloscope (CRO)



i) Name the parts labelled M and N (2mks)
ii) State how electrons are produced in the tube (1mk)
iii) When using CRO to display wave fronts of voltages. State where the following should be connected
I. Voltage to be displayed on the screen. (1mk)
II. Time base voltage (1mk)
III. State why the tube is highly evacuated (1mk)
(c) An x ray tube operating at 12KV delivers a current of 8 mA per seconds. Calculate the number of electrons hitting the target per second (Take = 1.6×10^{-19} C) 3mks.

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17. (a) State two ways of minimizing power losses during the transmission of electric Power (2mks)

(b) An electronic cooker is rated 2.5kw, 250v. state the meaning of these values (1mk)

(c) A consumer has the following appliances in the house

Electronic iron rated 1500v

A water heater rated 500w

An electric cooker rated 2500w

Three bulbs each rated 60w

The house is filled with 12A fuse.

Determine the resistance of the heating element used in the electric cooker (3mks)

(d) State how heating is achieved in a resistance wire (1mk)

(e) The lighting in a house has 20 lamps each rated 60w, 240 v. Determine the rating of the fuse that maybe used in the circuit. (4mks)

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MURANGA SOUTH FORM 4 JOINT EVALUATION TEST, 2023
Kenya Certificate of Secondary Education (K.C.S.E)
(232/3)
PHYSICS
(Practical)
PAPER 3

CONFIDENTIAL INSTRUCTIONS TO SCHOOLS

Question 1

Provide each candidate with the following apparatus.

- A metre rule
- A spring balance (RANGE ABOVE 2.5 N)
- A mass of 200g (2N) with a hook or (two 100g masses) labelled M
- A complete retort stand
- Knife edge support at least 7 cm high
- Two light strings about 10cm long.

QUESTION TWO

- ✓ A nichrome wire mounted on a millimetre scale labelled AB (use a wire of diameter 0.36mm)
- ✓ A galvanometer.
- ✓ Jockey
- ✓ A carbon resistor labelled X .(10 ohm carbon resistor)
- ✓ 8 Connecting wires, 4 with crocodile clips at both ends.
- ✓ A resistance wire labelled R mounted on a half meter rule(use a wire of diameter 0.36mm fixed on half metre rule) using cello tape.
- ✓ Ammeter (range 0-1)
- ✓ Voltmeter (range 0-5 or 0-2.5)
- ✓ One dry cell in a cell holder
- ✓ Micrometre screw gauge
- ✓ Soft board
- ✓ Vernier callipers.
- ✓ Rectangular Glass block of width 6.50 cm
- ✓ Four optical pins.
- ✓ Plain sheet of paper.
- ✓ Two thumb tacks
- ✓ Protractor

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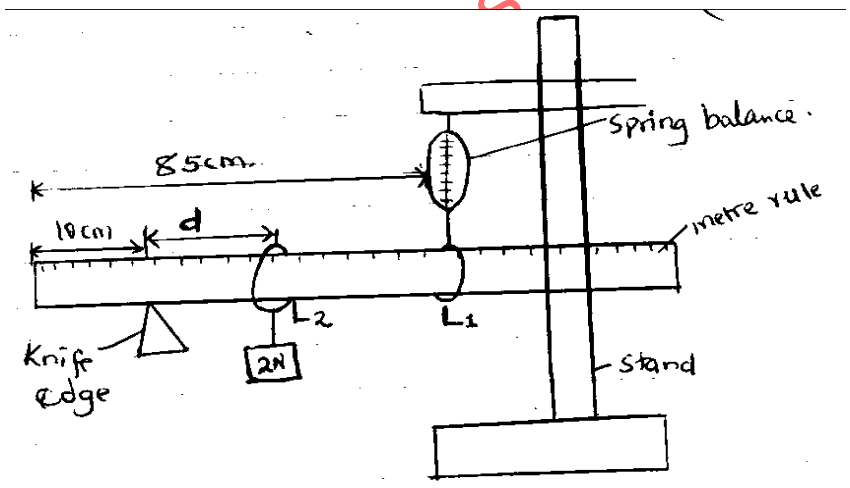
MURANGA SOUTH FORM 4 JOINT EVALUATION TEST, 2023
Kenya Certificate of Secondary Education (K.C.S.E)
232/3
PHYSICS
(PRACTICAL)
Paper 3
TIME 2 ½ Hours

INSTRUCTIONS TO CANDIDATES

(a) Answer ALL the questions in the spaces provided in the question paper.
(b) You are supposed to spend the first 15 minutes of the 2½ hours allowed for this paper reading the whole paper carefully before commencing your work.
(c) Marks are given for a clear record of the observations actually made, their suitability, accuracy and the use made of them.
(d) Candidates are advised to record their observations as soon as they are made.
(e) Non-programmable silent electronic calculators may be used.

QUESTION 1
You are provided with the following:
- ✓ A metre rule
- ✓ A spring balance
- ✓ A mass M
- ✓ Stand
- ✓ Knife edge support.
- ✓ Two light strings about 10cm long.

Proceed as follows:
a) Use the spring balance to determine weight of mass M ……N. (1mk)
b) Using the string provided make two loops to be used as hooks L1 and L2 in the diagram.
c) Suspended the spring balance from a clamp and using one loop to support the rule from the spring so that the loop L2 is on 85cm mark.
d) Support the other end of the rule with a knife edge at the 10cm mark so that the rule is horizontal.



e) Using loop 1 suspended the mass M at a distance d=10cm from the knife edge as shown and take the reading of the spring balance, record the results in table 1.
f) Adjust the distance, d, to 20cm, 30cm e.t.c and each time recording the reading of the balance to complete the table.

Table 1

Distance (d)cm	10.0	20.0	30.0	40.0	50.0	60.0	70.0
Distance (d) m							
Force (N)							

(3marks)
g) Plot a graph of force F against distance d(m) (5 marks)
h) From your graph determine:
i) The slope (3mks)
ii) The value of F when d=0 (2mks)

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i) Using the information from your graph, determine the constant k and n in the equation below and indicate their units, F = **2nd + 40k.**

i) N (3mks)

ii) K (3mks)

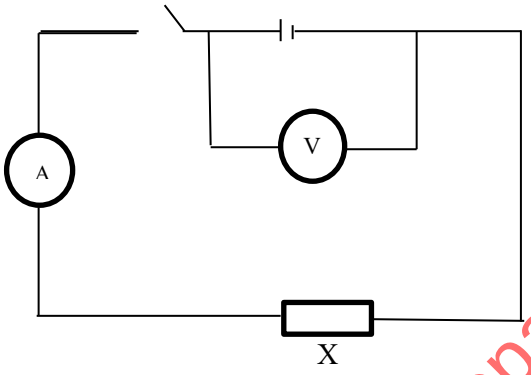
QUESTION 2

You are provide with the following

- A nichrome wire mounted on a millimeter scale labelled AB
- A galvanometer.
- Jockey
- A carbon resistor labelled X.
- 8 Connecting wires, 4 with crocodile clips at both ends.
- A resistance wire labelled R mounted on a half meter rule
- Ammeter
- Voltmeter
- One dry cell in a cell holder
- Micrometer screw gauge

Proceed as follows:

(a) Set up the circuit as shown below.



i) Record the voltmeter reading when the switch is open.

E = …… (1mark)

ii) Close the switch and record the voltmeter and ammeter readings V and I.

V = …… (1mark) I = …… (1mark)

iii) Explain why V is less than E. (1mark)

iv) Now connect the voltmeter across the carbon resistor X and record voltmeter reading V_1 when the switch is on.

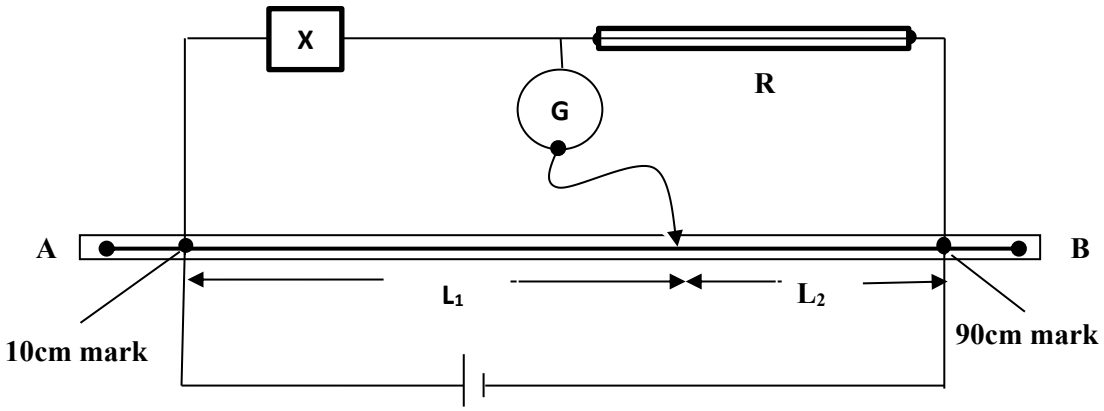
V_1 = …… (1mark)

v) Determine X given that $X = \frac{V_1}{I}$ (1mark)

(b) Using the micrometre screw gauge, measure and record the diameter D of the resistance wire R provided

D =……m (1mark)

(c) Now connect another circuit as shown in the figure below.



Touch the 10cm mark and the 90 cm mark and see that the galvanometer deflects in opposite direction in each case.

(i) Move the sliding jockey along the resistance wire AB and note the length L_1 and L_2 where the galvanometer pointer points at the zero mark. Record the values of L_1 and L_2.

L_1 =……m (1mark) L_2 =…… m (1mark)

(ii) Determine the resistance of the resistance wire R using the relationship, (2marks)

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$$\frac{R}{L_1} = \frac{X}{L_2}$$

(iii) Determine the resistance of the wire R per metre. (1 mark)

(iv) Given that, $R = \frac{0.1114S}{D^2}$ determine the value of S, where R is the resistance per metre. (3mark)

PART B

You are provided with the following;

- Soft board
- Vernier callipers.
- Rectangular Glass block
- Four optical pins.
- Plain sheet of paper.
- Two thumb tacks
- Protractor

Procedure;

(a) Measure and record the width t of the glass block using the Vernier callipers provided.
t = …… (m) (1 mark)

(b) Fix the white plain paper on the soft board using the two thumb tacks.

(c) Place the glass bock on the paper, trace its outline and label it ABCD, as shown.

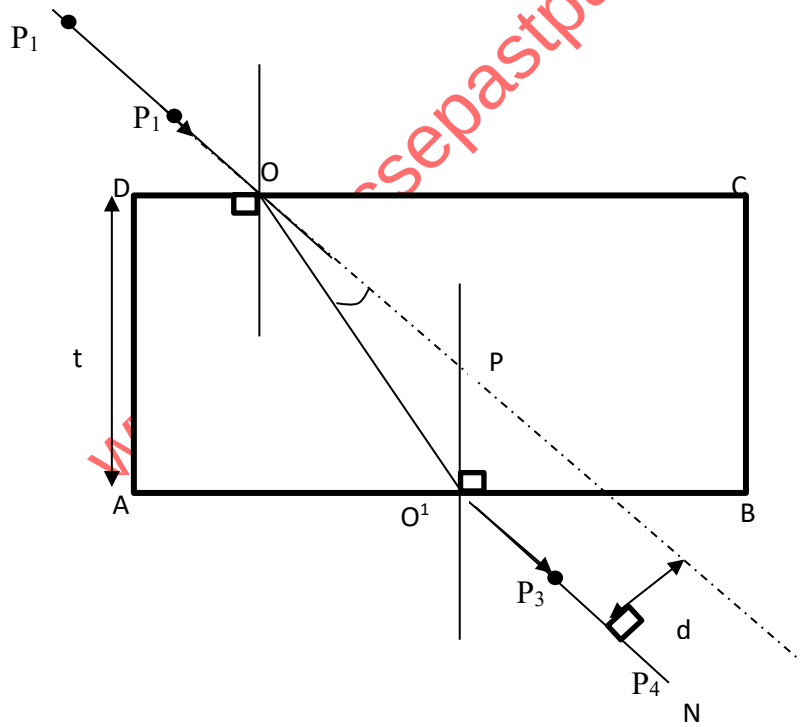
(d) Remove the glass block and draw a normal, say at point O.

(e) Draw a line making an angle of 30^0 with the normal to represent the incident ray.

(f) Replace the glass block carefully to its original position.

(g) Fix two pins P_1 and P_2 on the line in such a way that they are vertical and at least 4cm apart.

(h) Looking through the glass block through face AB, fix two pins P_3 and P_4 so that they are exactly in line with the P_1 and P_2. Mark the positions of P_3 and P_4



i) Join P_3 and P_4 and produce the line to meet face AB of the block at O^1. Join O and O^1.
Measure angle O^1OP.
Also, Measure angle OO^1P.
O^1OP = …… (1mark)
OO^1P = …… (1mark)

ii) Measure the perpendicular distance d from the line O^1N to OP produced.
d = …… (m) (1mark)

iii) Determine t_1 given that, $t1 = \frac{\mathbf{d\cos angle(OO^1P)}}{\mathbf{\sin angle(O^1OP)}}$. (3marks)

iv) How do the values of t and t_1 compare? (1mark)

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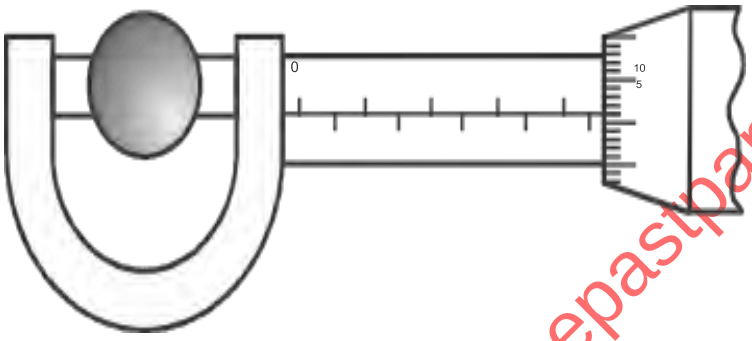
MWAKICAN/MJET FORM 4 JOINT EVALUATION TEST, 2023
Kenya Certificate of Secondary Education (K.C.S.E)
232/1
PHYSICS
PAPER 1
TIME: 2 HOURS

INSTRUCTION TO CANDIDATES

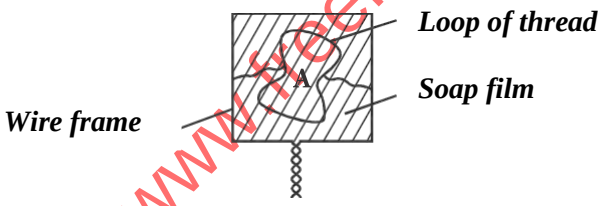
1. *Answer ALL the questions in section A and B.*
2. *ALL working MUST be clearly shown.*
3. *Mathematical tables and silent electronic calculators may be used*
   Take: Acceleration due to gravity g=10m/s

SECTION A: (25 MARKS)
Answer all the questions in this section.

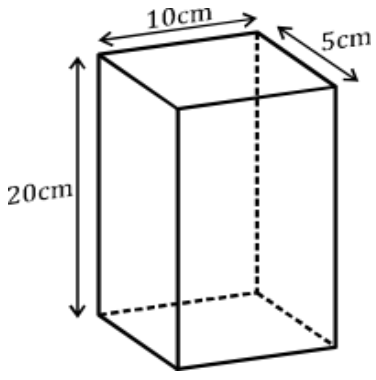
1. A stop watch started 0.36s after the start button was pressed. The time recorded using a stopwatch for an athlete running from point A to B was 12.86s. Determine the actual time taken by the athlete. (2mks)
2. Fig1.0 shows a spherical ball held between the anvil and the spindle of a micrometer screw gauge.



   Determine the diameter of the spherical ball. Give your answer in **SI** units. (2marks)
3. Figure 2.0 shows a loop of cotton thread tied onto a wire frame. The figure is dipped into a soap solution and withdrawn.



   Illustrate and explain what happens to the shape of the loop of thread when part A is broken by touching it with a hot needle. (2marks)
4. Figure 3.0 shows a brick of mass 8.0kg standing upright on the ground as shown.
5.



   What is the pressure it exerts on the ground? ($g = 10Nkg^{-1}$) (3marks)

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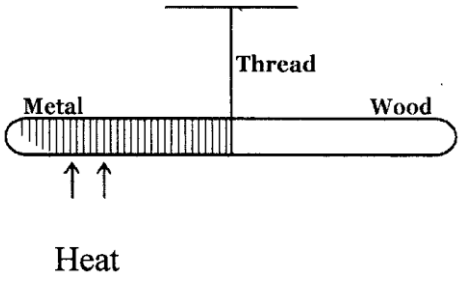
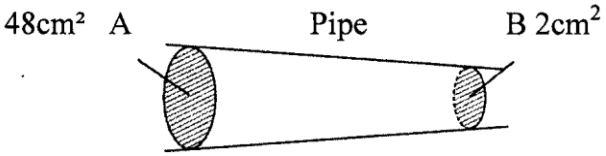
6. The figure 4.0 shows a rod made of wood on one end and metal on the other end suspended freely with a piece of thread so that it is in equilibrium.



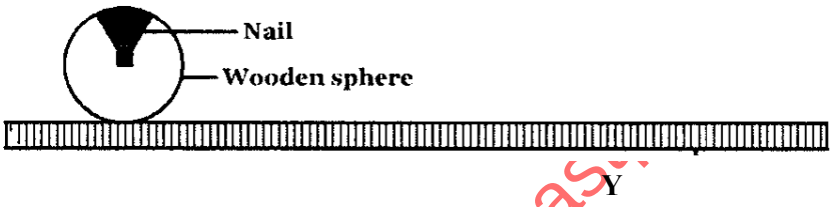
The side made of metal is heated with a Bunsen - burner flame. State with a reason, the side to which the rod is likely to tilt. (2mks)

7. State the relationship between Physics and Mathematics. (1mk)
8. The diagram in fig 5.0 shows a section of a pipe with different cross-sectional area



If water flows with a velocity of 10m/s in section A, what would be the velocity of water in section? (3marks)

9. Determine the spring constant of a spiral spring whose length changes from 10 cm to18 cm when a load of 10.0 N is suspended from its lower end. (3marks)
10. Figure 6.0 below shows a wooden sphere with a nail hammered into it as shown.



The sphere is rolled on a horizontal ground and comes to rest after sometime at point Y. Draw the sphere after it comes to rest at point Y. (1mark)

11. When the temperature of an enclosed gas at constant pressure is raised, the volume of the gas increases. Explain how the molecules of the gas cause the increase in volume. (2marks)
12. It is easier to stop a saloon car than a bus when both are moving with the same velocity. Explain. (2mrks)
13. Figure7.0 (a) shows a displacement-time graph. Sketch a velocity-time graph on fig.7.0 (b) (1mk)

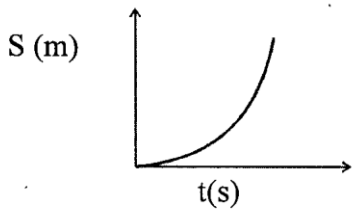


Figure 7.0(a)

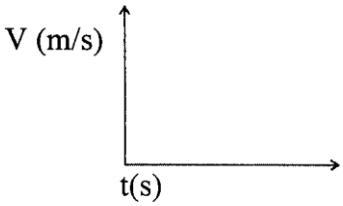


Figure7.0(b)

14. State the law of conservation of energy. (1mk)

SECTION: (55 MARKS)

Answer all the questions in this section.

15. a) Explain why it is advisable to use a pressure cooker at high altitude. (2marks)
    b) Water of mass 3.0 kg initially at 20^0C is heated in an electric kettle rated 3.0kW. The water is heated until it boils at 100°C (take specific heat capacity of water = 4200Jkg^{-1}k^{-1}, heat capacity of the kettle =450Jkg^{-1} and specific latent heat of vaporization of water =2.3MJkg$^{-1.}$
    Determine:
    i) The heat absorbed by the water. (2marks)
    ii) The heat absorbed by the electric kettle. (2marks)
    iii) The time taken for the water to boil. (2marks)
    iv) How much longer it will take to boil all the water. (3marks)

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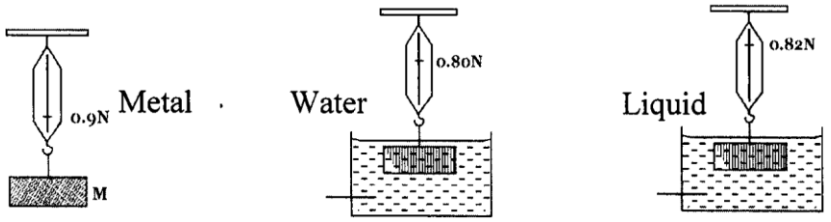
16. a) Figure 8.0 shows the same block weighted in air, water and liquid. Given that the reading of the level of water becomes 150cm^3 when the metal is fully immersed. (Density of water = 1000kgm^{-3})



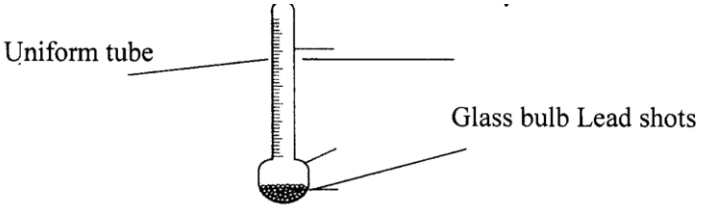
Determine the,

i) Density of the metal (3marks)

ii) How would you determine the water level before the solid was immersed? (2marks)

iii) Explain why the spring balance gives different reading in fig 8 (ii) and 8 (iii) with the same metal block. (2marks)

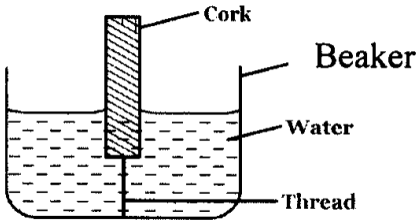
b) Figure 9.0 below shows a simple hydrometer.



i) State the purpose of the lead shots in the glass bulb. (1mark)

ii) How would the hydrometer be made more sensitive. (1mark)

c) Figure10.0 shows a cork floating on water and held to the bottom of the beaker by a thin thread.



Name the forces acting on the cork. (3marks

17. a) When a bus goes around a bend on a flat road, it experiences a centripetal force. State what provides the centripetal force (1 mark)

b) State the purpose of banking roads at bends (1 mark)

c) A student whirls a stone of mass 0.2 kg tied to a string of length 0.4 m in a vertical plane at a constant speed of 2 revolutions per second. (Take acceleration due to gravity as 10 ms^{-2})

State two forces acting on the stone when the stone is at the highest point (2 marks)

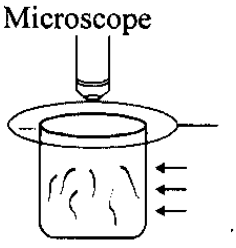
Determine the;

i) Angular velocity of the stone (3 marks)

ii) Tension in the string when the stone is at the highest point (3 marks)

iii) Brownian motion of smoke particles can be studied by using the apparatus shown in figure11.0.

To observe the motion, some smoke is closed in the smoke cell and then observed through the microscope.



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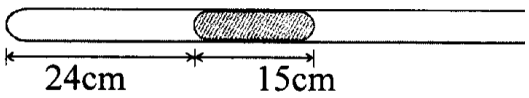
a) Explain the role of the smoke particles and microscope in the experiment.
i) smoke cell (1 mark)
ii) microscope (1 mark)
b) Why are smoke particles suitable for use in this experiment? (1 mark)
c) State and explain the nature of the observed motion of the smoke particles. (2 marks)
d) What will be observed about the motion of the smoke particles if the temperature surrounding the smoke cell is lowered slightly? (1mark)

18. a) A glass capillary contains enclosed air by a thread of mercury 15cm long when the tube is held horizontally.



What is the length of the enclosed air column when tube is vertical with the open end uppermost if the atmospheric pressure is 750 mm Hg? (3marks)
b) Explain why an air bubble increase in volume as it rises from the bottom of a lake to the surface. (1 mark)

19. a) A boy throws a tennis ball vertically upwards from a truck moving at a constant velocity.
Give a reason why the ball lands back exactly the same point where it was projected. (1mark)
b) Define impulse in terms of momentum. (1mark)
c) A trailer of mass 30 tonnes travelling a t a velocity of 72km/h rams on to a stationary bus of mass 10 tonnes. The impact takes 0.5 seconds before the two vehicles move off together at a constant velocity for 15 seconds. Determine:
i) the common velocity (3 marks)
ii) the distance moved after the impact (2 marks)
iii) the impulsive force on the trailer on impact (3 marks)
d) Give reasons why a safety seat belt used in a vehicle:
i) should have a wide surface area (1 mark)
ii) should be slightly extensible (1 mark)

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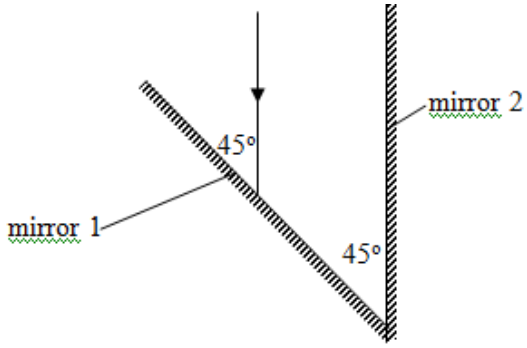
MWAKICAN/MJET FORM 4 JOINT EVALUATION TEST, 2023
Kenya Certificate of Secondary Education (K.C.S.E)
232/2
PHYSICS
PAPER 2
2 HOURS

Instructions to candidates.
Answer all questions in both sections **A** and **B**.
KNEC Mathematical tables may be used.
Silent, non-programmed, electronic calculators may be used where necessary.
All working MUST be clearly shown.
Where necessary, take g = 10N/Kg, speed of light c = 3.0×10^8 ms^1

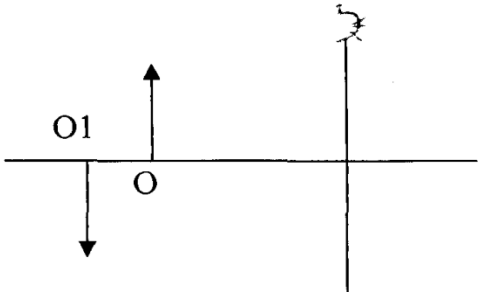
SECTION A (25 MARKS)
Answer ALL questions in this section.

1. The figure shows two plane mirrors placed at an angle of 45° to each other. An incident ray strikes mirror 1 at 45°.

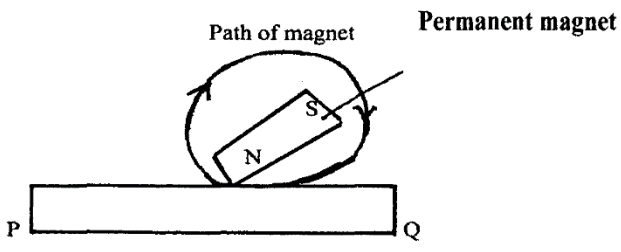


Complete the figure to show the path that is followed by the ray after reflection by the two mirrors. (2 marks)

2. The figure below shows the object O and its image O1formed by a concave mirror. Locate the position of the principle focus. (2marks)



3. State **two** major defects of a simple cell. (2mks)
4. An electromagnet is made by winding insulated copper wire on an iron core. State two changes that could be made to increase the strength of the electromagnet. (2 marks)
5. i) The diagram below shows a ferromagnetic material being magnetized by the method shown.



Identify the polarity of P (1mk)

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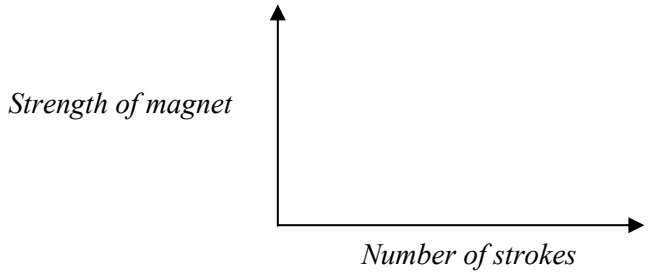
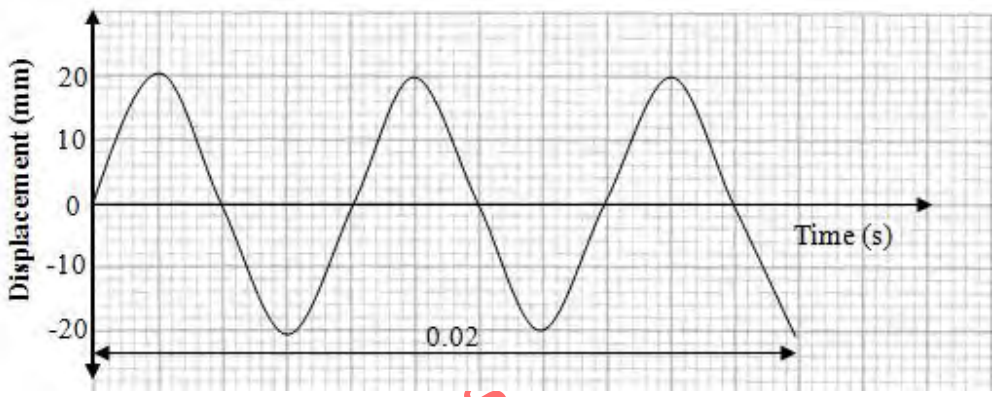
ii) On the axes given below, sketch a graph to show how the strength of the magnet being created varies with the number of strokes. (1mk)

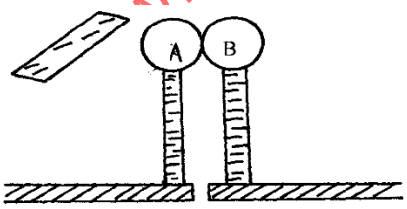


6. A current of 13A flows through a heating element of resistance 8.5Ω for 1.5 minutes. Calculate the quantity of heat supplied. (3marks)
7. Give a reason why it is not advisable to smoke a cigarette near a charging battery. (1mark)
8. A soldier standing between two cliffs fires a gun. He hears the first echo after 2 seconds and the next after 5 seconds. Determine the distance between the two cliffs. (**Velocity of sound in Air = 340m/s)** (3mks)
9. i) Distinguish between transverse and longitudinal waves. (1 mark)
   ii) The figure below shows a wave profile.



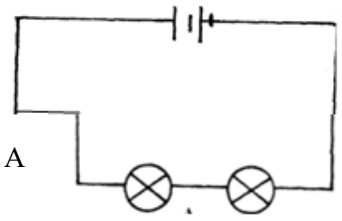
State the amplitude in **SI** units…… (1 mark)

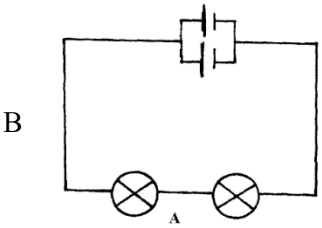
10. Two identical sphere A and B each standing on an insulated base are in contact. A negatively charged rod is brought near sphere A as shown below.



In what way will **A** differ from **B** if separated while the rod is held close to A? (2mks)

11. A student was investigating the brightness of bulbs when set up in circuits. He used identical bulbs and cells. He set up circuit A and B consisting of two bulbs and two cells as shown below.





State and explain which set – up had the bulbs brighter (2mks)

12. (a) State one condition necessary for total internal reflection to occur (1mk)
    (b) State **one** application of total internal reflection. (1mks)

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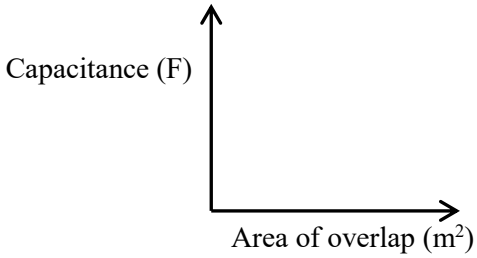
SECTION B (55 MARKS)

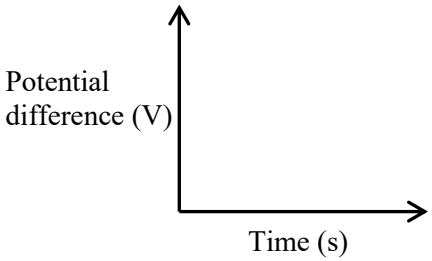
Answer ALL questions in this section.

13. a). On the axes provided, sketch a graph of capacitance against area of overlap of a parallel plate capacitor. (1 mark)

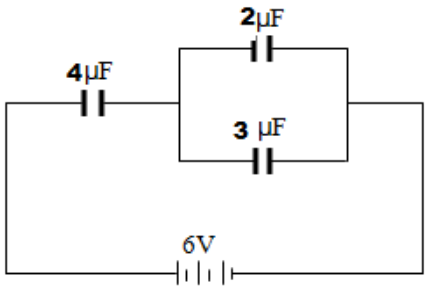


b) i) Draw a circuit diagram that may be used to investigate the discharging process of a capacitor. (2 marks)

ii) On the axes provided sketch the graph of potential difference between the plates against time for discharging process. (1 mark)



c) The figure below shows three capacitors connected to a 6V battery.



Determine;

i) effective capacitance, (3 marks)

ii) total charge stored, (3 marks)

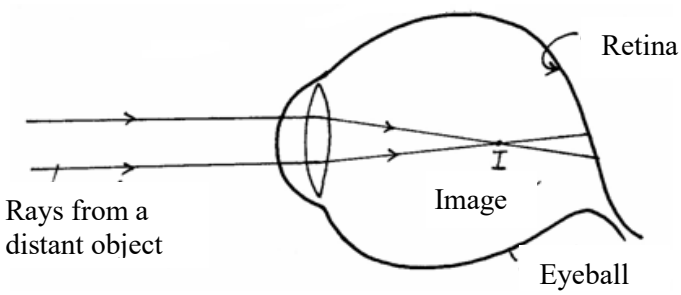
iii) potential difference across the 4μF capacitor (3 marks)

d) Three resistors of resistances 2.0Ω, 4.0Ω and 6.0Ω are connected so as to obtain the least effective resistance.

i) Sketch an appropriate circuit diagram for the arrangement. (1 marks)

ii) Determine the effective resistance of the circuit. (2 marks)

14. a) The figure below shows a human eye with a certain defect.



(i) State **one** cause of this defect. (1 mark)

(ii) On the same diagram, sketch the appropriate lens to correct the defect and sketch rays to show the effect of the lens. (2 marks)

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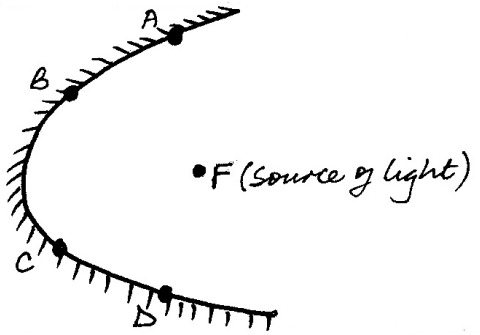
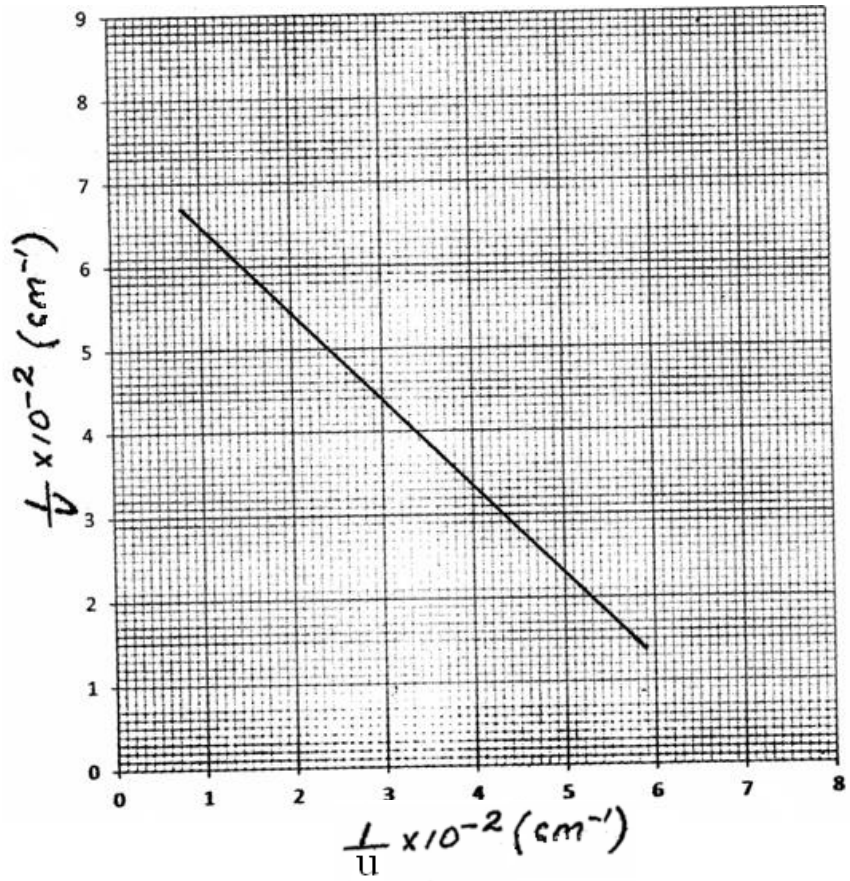
(b) The figure below shows a parabolic surface with a source of light placed at its focal point F.



Draw rays to show reflection from the surface when rays from the source strike the surface at points A, B, C and D. (1 mark)

(c) State why convex mirrors are used in supermarkets to check shoplifters. (1 mark)

(d) The figure below shows a graph of $\frac{1}{V}$ against $\frac{1}{U}$ for a convex lens of unknown focal length.



Use the graph to determine the average focal length f_o of the lens, given that $f_o = \frac{f_1 + f_2}{2}$

When f_1 and f_2 are the values of the focal lengths at of $\frac{1}{V}$ and $\frac{1}{U}$ intercepts respectively. (3 marks)

15. a) The figure below shows a simplified pin hole camera that was drawn to scale and the image of the object shown on the screen.

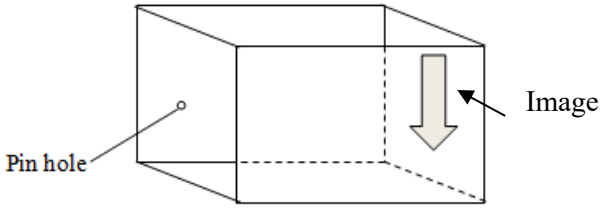


Figure 8

The image formed was half the height of the object.

(i) Complete the figure to show the object using a ray diagram. (4 marks)

(ii) State other **two** characteristics of the image. (2 marks)

(iii) State **one** effect on the image when;

I. the pin hole was enlarged (1 mark)

II. the length of the camera was made shorter (1 mark)

III. the object was taken closer to the pin hole. (1 mark)

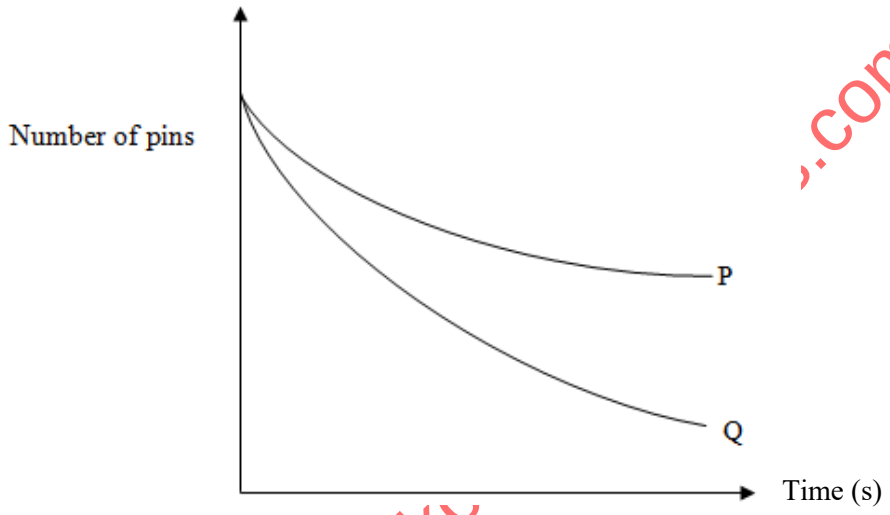
16. (a) State the basic law of magnetism. (1 mark)

(b) Given a bar magnet, unmagnetised iron bar and a cotton thread;

(i) describe a simple experiment that can be used to distinguish between a magnet and an iron bar. (4 marks)

(ii) State with reasons the observations that would be made in the experiment. (4 marks)

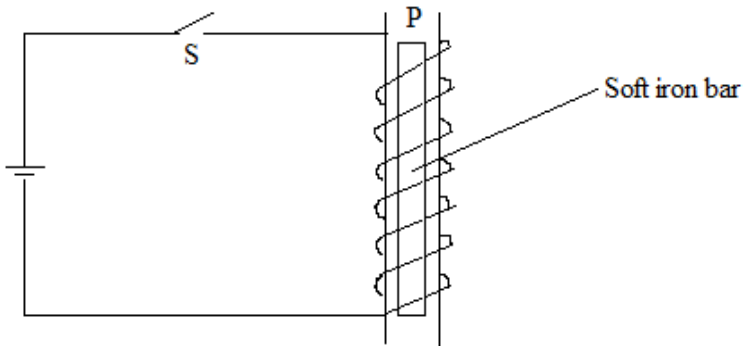
(c) While demagnetizing two bar magnets that were initially magnetized using electric current the number of identical pins that remained attracted by each magnet at different times was noted and a graph of the number of pins against time was obtained as shown in the figure below for the two magnets, P and Q, one from soft iron the other one steel.



(i) With a reason, identify which graph represented soft iron (2 marks)

(ii) Use domain theory to explain demagnetization process. (2 marks)

17. (a) Use the figure below to answer the questions that follows.



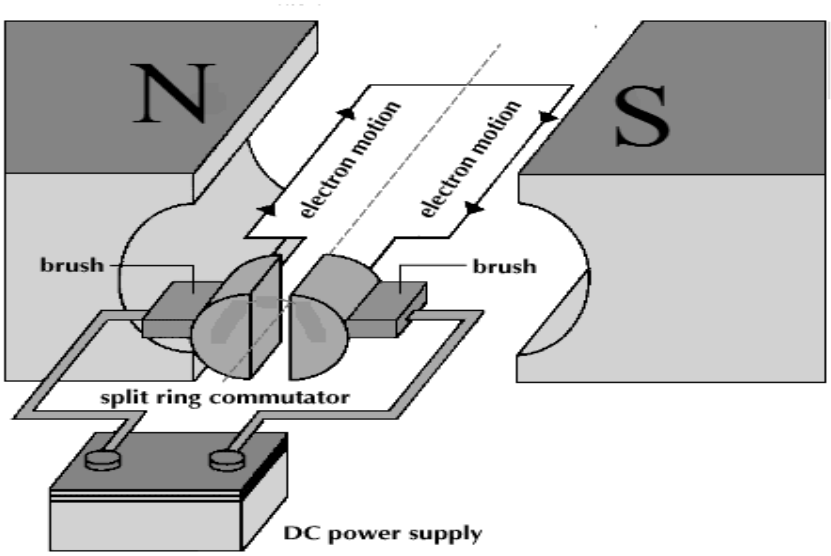
(i) Show the direction of the current on the turns when the switch S is closed. (1marks)

(ii) State the polarity at P (1marks)

(iii) Explain using domain theory what happens on the soft iron bar. (1marks)

(iv) If a steel bar was used instead, what could be the difference? (1mark)

(b) The following diagram shows a part of an electric **D.C.** motor.



(i) On the diagram above show the direction of rotation of the coil. (1marks)

(ii) State the effect of increasing the number of turns of the rotating coil of an electric motor. (1marks)

(c) Sketch the magnetic field pattern around the conductor carrying current on figures a and b shown below. (2marks)

Fig a

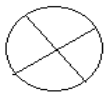
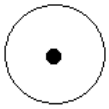


Fig b



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MWAKICAN/MJET FORM 4 JOINT EVALUATION TEST, 2023
Kenya Certificate of Secondary Education (K.C.S.E)
232/3
PHYSICS
PAPER 3
(Practical)
TIME: 2 ½ HRS

INSTRUCTIONS TO CANDIDATES

1. *Answer all questions*
2. *All working must be clearly shown where necessary.*
3. *Non-programmable silent electronic calculation may be used.*

Question 1

You provided with the following

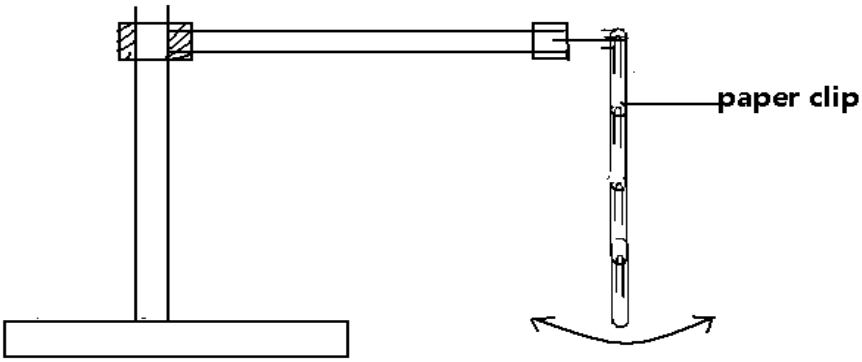
- 35 paper clips
- Optical pin from which the pendulum of a chain of paper clips may be suspended
- 2 small pieces of wood or a cork to support the pin or the wire
- A complete retort stand and clamp
- A stop watch
- Half metre rule

Proceed as follows

(a) Make a chain to consist of 10 paper clips ensuring that the links are all free to move. Make sure that the paper clips are all the same way up. Using the rule measure the length of one clip.

ℓ = ----------cm **(1mk)**

Set up the pendulum of the chain of paper clips as shown in figure below.



(b) Keeping the chain straight, displace the bottom link of the chain through a small amplitude and release. When the chain swings smoothly in a vertical plane, time 20 oscillations and determine the periodic time T. Enter your results in the table below

Number of links (N)	Time for 20 Oscillations(t)	Periodic time (T)	T^2	L (m)
10				
15				
20				
25				
30				
35				

(9mks)

(c) Make up the chain of paper clips to be 15 links long. Measure and record the new time for 20 complete oscillation.

(d) Repeat the procedure in (c) above by increasing the number of paper clips by 5 links each time to a maximum of 35 clips. Enter your results in the table above and complete the values of T^2

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(e) (i) On the grid provided, plot a graph of T^2 against L **(5mks)**

(ii) **Determine** the slope of your graph. **(3mks)**

S = ----------

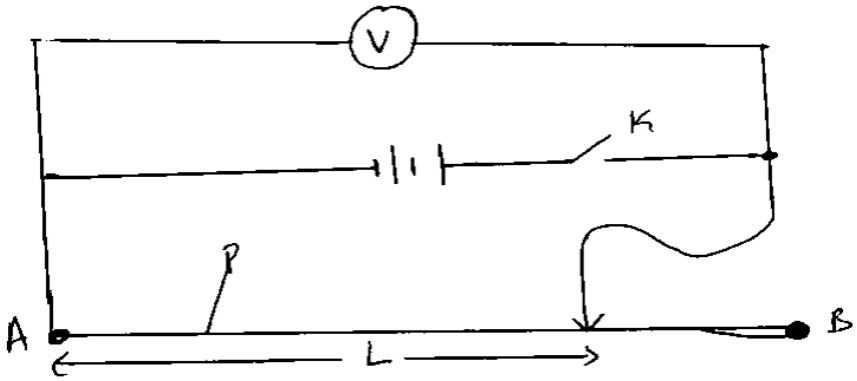
(iii) Given that $S = \frac{10\pi^2}{3g}$ **find** the value of the acceleration due to gravity. **(2mks)**

Question 2

PART A

1. You are provided with the following;
   - One resistance wire mounted on a mm scale
   - Two dry cells
   - Switch K
   - A voltmeter
   - Three connecting wires with crocodile clips
   - 3 connecting wires

(a) **Set up** the apparatus as shown in the diagram below



Take off the crocodile clip from the wire AB and close the switch K. Record the reading E of the voltmeter

E = _____ **(1mk)**

(b) Keeping the crocodile clip attached to the wire AB at a distance L 10cm from A record the reading V of the voltmeter in the table below. Repeat for other values of L shown in the table. **Complete** the table. **(6mks)**

Length L cm	Voltage (V)	(E -V)	$\frac{V}{E-V}$
10			
20			
30			
40			
50			
60			

(c) **Plot** a graph of $\frac{V}{E-V}$ against L. **(5mks)**

(d) **Determine** the slope S, of the graph. **(3mks)**

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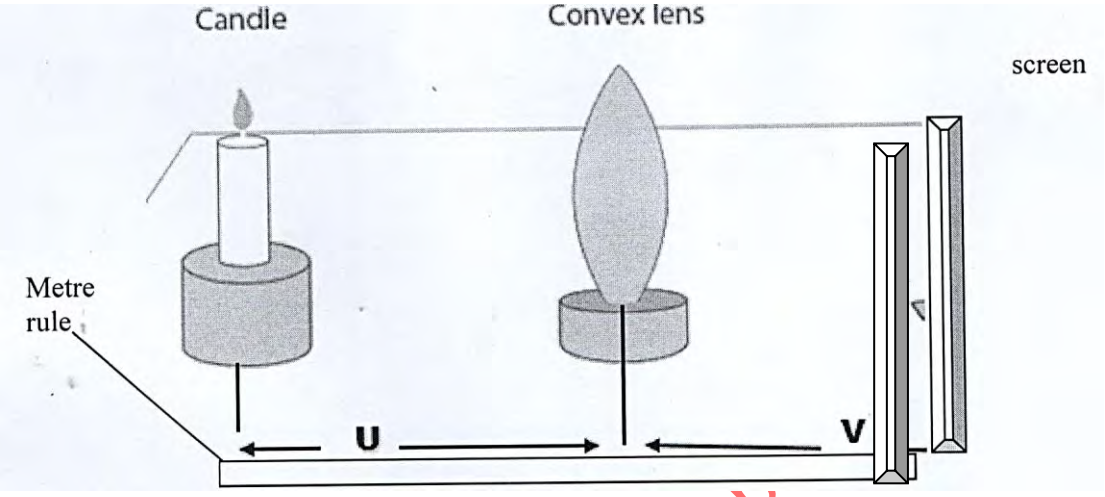
PART B

1. **Question one**

You are provided with the following

- A candle
- A lens and a lens holder
- A screen
- A meter rule

a) Set up the apparatus shown in the figure below. Ensure that the candle flame and the lens are approximately the same height above the bench.



b) Set the position of the lens so that it is 0.3m from the candle (u= 0.3m). Adjust the position of the screen until a sharp image of the candle flame is obtained. Measure the distance V between the lens and the screen. Record the value of v in the table below.

c) Repeat the procedures in (b) above for the other values of u in the table **(2mks)**

U (m)	0.30	0.35	0.40
V(m)			
$m = \frac{v}{u}$			

d) Given that $P = \frac{V}{m+1}$ Use the results in the table above to determine the average value of P.**(3mks)**

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KAPSABET FORM FOUR EXAMINATION, 2023.
Kenya Certificate of Secondary Education (K.C.S.E)
232/1
PHYSICS
PAPER 1
THEORY
TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES

- Answer **ALL** the questions in section **A** and **B**.
- **ALL** answers and working **MUST** be clearly shown.
- Mathematical tables and electronic calculators **may be** used.
- Take acceleration due to gravity, g = 10m/s^2

SECTION A

1. Figure 1 below shows a micrometer screw gauge being used to measure the diameter of a metal rod. The thimble scale has 50 divisions.

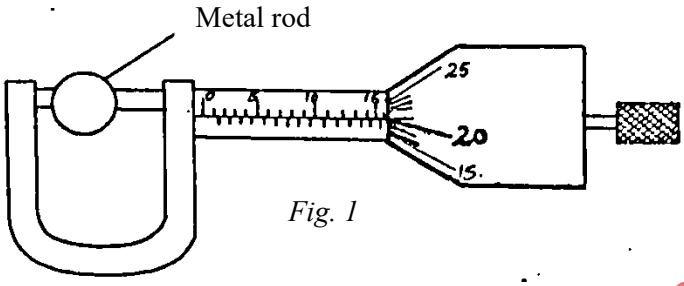

Fig. 1

Find the diameter of the metal rod. (1 mark)

2. Explain briefly how the temperature in a green house is kept higher than outside. (2 marks)

The diagram shown in figure 2 below is an arrangement of three pulley wheels used to help in lifting loads. Use it to answer questions 3 and 4.

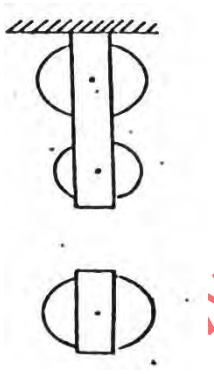

Fig. 2

3. Complete the diagram to show how the rope goes round the wheels, position of the load and the effort. (2 marks)
4. Write down the velocity ratio (VR) of the system. (1 mark)
5. State how temperature affects the speed of sound in air. (1 mark)
6. State **two** facts which show that heat from the sun does not reach the earth surface by convection. (2 marks)
7. The diagram in figure 3 below shows water with negligible viscosity flowing steadily in a tube of different cross-section area. If at a point A, the cross section area is 120cm^2 and the velocity of water is 0.40ms^{-1}, calculate the velocity at B where cross section area is 4.0cm^2? (3 marks)

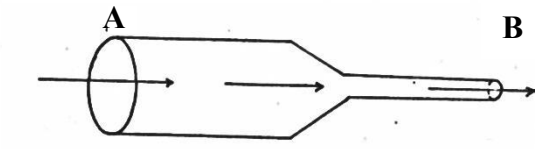

Fig. 3

8. A motor uses an electrical energy at a rate of 200W and raises a mass of 25kg through a vertical distance of 20m in 0.5 minutes. Determine the efficiency of the motor. (3 marks)
9. Name **three** types of forces that act between bodies not in contact. (3marks)
10. How long will it take 240V, 3000W electric immersion heater to raise the temperature of 150 litres of water in a well-lagged calorimeter made of copper of mass 20kg from 15^0 to 70^{0}C? (3 marks)

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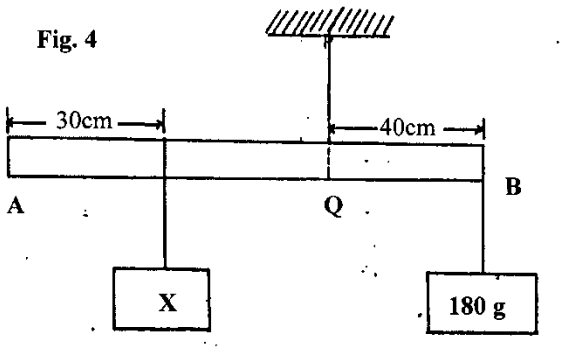
11. The diagram shown in the Figure 4 below shows a system in equilibrium with the rule horizontal.
AB is a uniform rule of length 1.0m and weight 1.8N. Calculate the weight of the block X. (3 marks)

Fig. 4

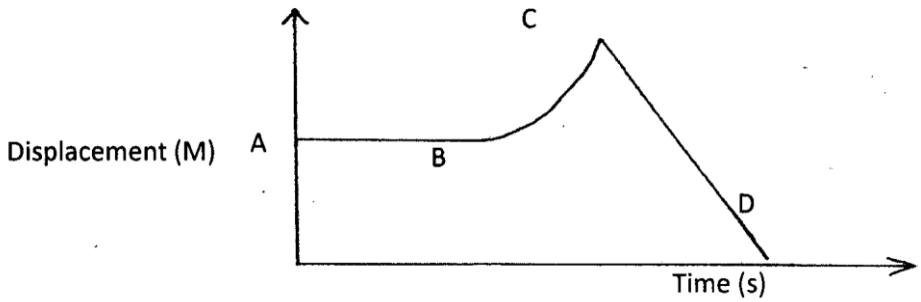


12. State the reason why a trailer carrying heavy loads has many wheels. (1 mark)

SECTION B (55 MARKS)

Answer ALL the questions

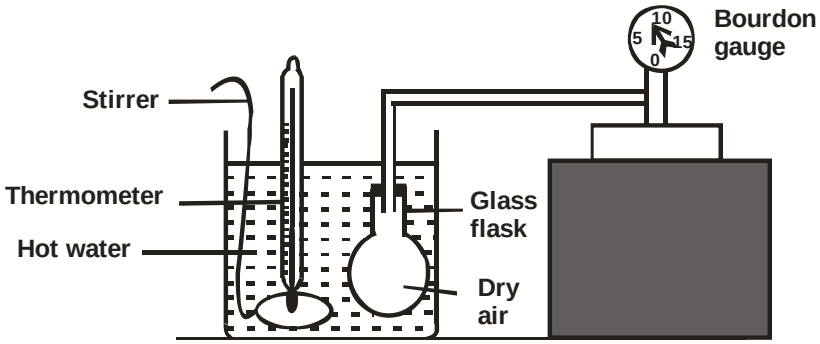
13. (a) The **figure** 5 below shows the displacement – time graph of the motion of particle.



(a) State the nature of the motion of the particle between
(i) A and B (1mk)
(ii) B and C (1mk)
(iii) C and D (1mk)

(b) A ball is thrown horizontally from top of a vertical tower and strikes the ground at a point 50 m from the bottom of the tower. Given that the height of the tower is 45m, determine the
(i) Time taken by the ball to hit the ground. (2mks)
(ii) Initial horizontal velocity of the ball (2mks)
(iii) Vertical velocity of the ball just before striking the ground. (2mks)
(Take acceleration due to gravity gas 10m/s)

14. a) State the pressure law; (1 mark)
b) Explain how a gas exerts pressure. (2 marks)
c) The figure below shows a set up used to verify pressure law.



i) State the measurement that may be taken in the experiment. (2 marks)
ii) Explain how the measurement in (i) above may be used to verify pressure law. (2 marks)
iii) A car tyre is at pressure of 5.0×10^5 Pa at a temperature of 37°C. While it is running the temperature rises to 75°C. What is the new tyre pressure? (Assume the tyre does not expand) (3 marks)

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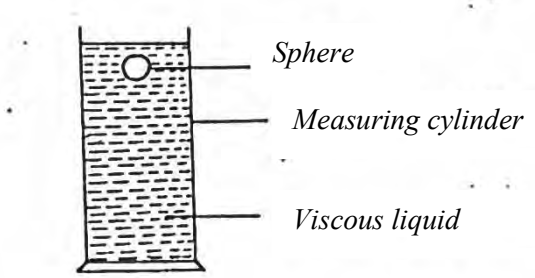
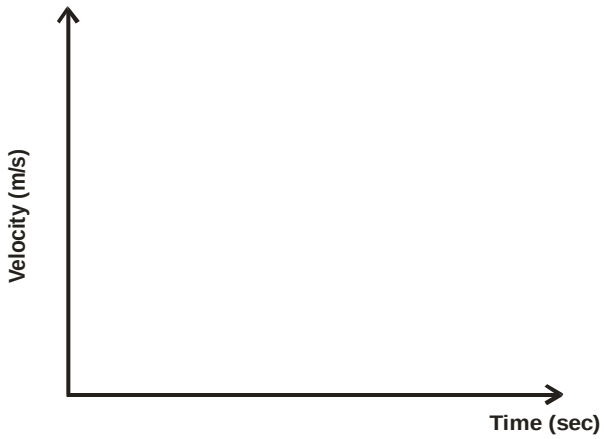
15. a) Distinguish between inelastic and elastic collisions. (2 marks)

b) The diagram in Figure 6 below shows a sphere moving in a viscous liquid in a tall measuring cylinder.

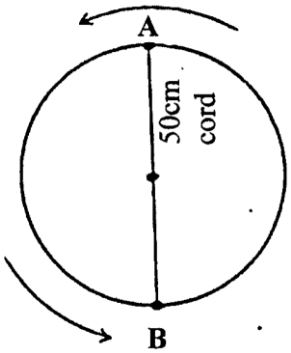


i) Show on the diagram the forces acting on the sphere. (3 marks)

ii) Sketch a graph showing the variation of velocity with time in figure 7 below.
Show on the graph the terminal velocity, V_T. (2 marks)



16. A mass of 1kg is attached to a cord of length 50cm. It is whirled in a circle in a vertical plane at 10 revolutions per second as shown in the **figure** 8 below.

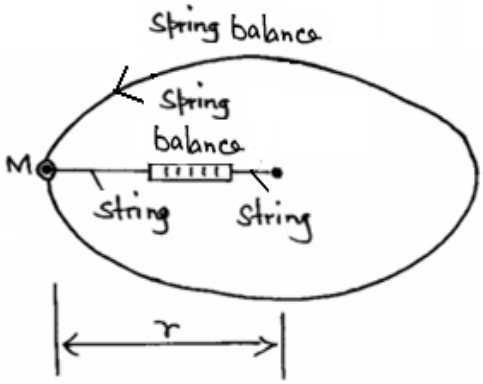


a) Find the tensions in the cord when the mass is at:

i) Highest point of the circle A. (2 marks)

ii) Lowest point of the circle B. (2 marks)

b) The diagram below shows a spring tied to an object, m, and rotated in a circular path of radius, r.



i) What provides the force that keeps the object moving in a circular path. (1 mark)

ii) The speed of the object is constant but the body is accelerating. Explain. (1 mark)

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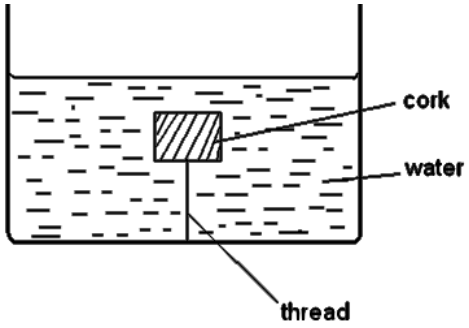
iii) If the object is whirled faster, what would happen to spring balance reading? (1 mark)
iv) Give a reason for your answers in b(iii) above. (1 mark)
v) As the object is whirled round the string snaps and cuts off.
Describe the subsequent path of the object. (1 mark)

17. (a) State the law of floatation. (1 mark)
(b) **Figure 9** shows a piece of cork held with a light thread attached to the bottom of a beaker.
The beaker is filled with water.



i) Indicate and label on the diagram the forces acting on the cork. (1 mark)
ii) Write an expression showing the relationship between the forces above. (1 mark)
c) A solid displaces 8.5cm^3 of liquid when floating in a certain liquid and 11.5cm^3 when fully submerged in the same liquid. The density of the solid is 0.8g/cm^3. Determine:-
i) The upthrust on the solid when floating. (2 marks)
ii) The density of the liquid. (2 marks)
iii) The upthrust on the solid when fully submerged. (2 marks)

18. The following results were obtained in an experiment to verify Hooke's law when a spring was extended by hanging various loads on it.

Load (N)	0.00	1.00	2.00	3.00	4.00	5.00	6.00
Length of spring in cm	10.00	11.50	13.00	14.50	16.00	18.00	24.00
Extension	0.00						

I) Complete the table for the extension e above. (2mk)
II) Plot a graph of load (y-axis) against extension (5mks)
III) From the graph determine the spring constant. (2mks)
IV) Calculate the energy stored when the spring is stretched to 16 cm. (2mks)

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KAPSABET FORM FOUR EXAMINATION, 2023.
Kenya Certificate of Secondary Education (K.C.S.E)
232/2
PHYSICS
PAPER 2
THEORY
TIME: 2 HOURS

Instructions to Candidates

(a) Answer ALL the questions in sections A and B.
(b) ALL working MUST be shown clearly
(c) Mathematical tables and silent electronic calculators may be used.

SECTION A (25 MARKS)

*Answer **ALL** the questions in this section.*

1. (a) Distinguish between real and virtual image (1mark)
   b) A pinhole camera forms an image of size 10cm. The object is 5m tall and 20m away from the pinhole. Find the length of the pinhole camera. (2marks)
2. Why is it safer to carry explosive fuels in metal cans instead of plastic can? (1mark)
3. The **figure 1** below shows a cross section of a dry cell.

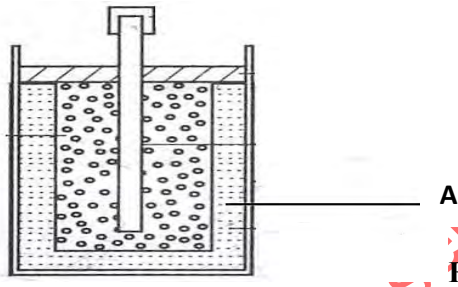
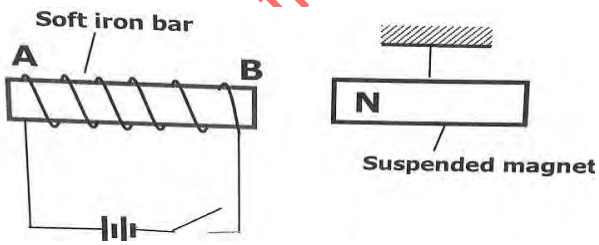


Figure 1

(i) Name the part labeled A (1 mark)
(ii) State the use of manganese (iv) oxide in the cell (1 mark)

4. a) The **figure 2** below shows a soft iron bar that's placed in a coil near a free suspended magnet.



State and explain the observation made when the switch is closed. (2marks)
b) Give a reason why attraction in magnetism is not regarded as a reliable method of testing for polarity. (1mark)

5. Explain the term wavelength in terms longitudinal wave (1mark)
6. (a) State the effect of pressure on the speed of sound in air. (1mark)
   (b) A boy stands 190m from a high wall and claps his hands. If he hears an echo1.3 Seconds later, calculate the speed of sound in air. (2marks)

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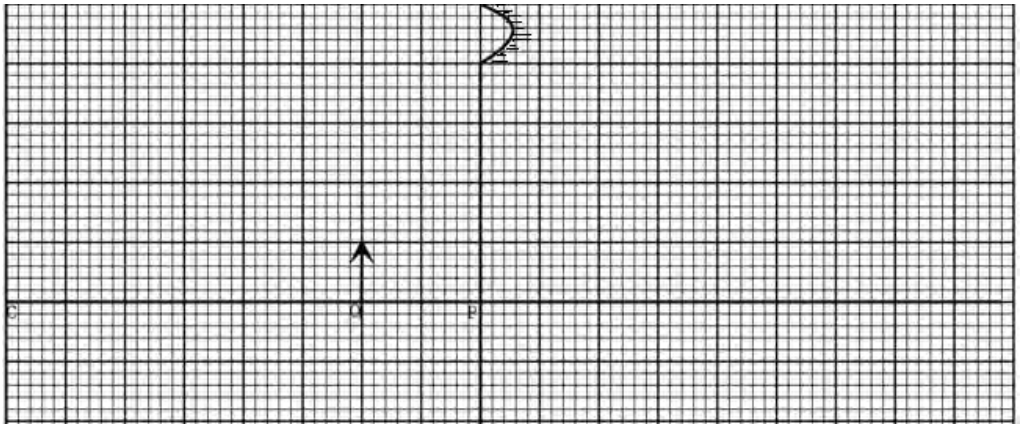
7. **Figure 3** below shows an object, O placed 10 cm in front of a concave mirror whose radius, C is 40 cm.



On the same figure, draw a ray diagram to show the position of the image formed. (3 marks)

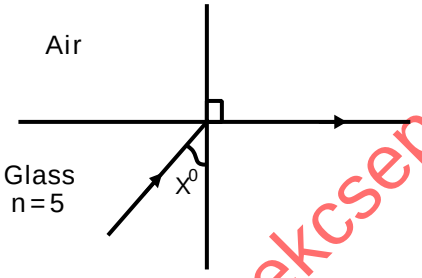
8. State any factor that determine the heating effect by an electric current. (1mark)
9. **Figure 4** shows the table of electromagnetic. Spectrum in the increasing order of wavelengths.

P	**x-rays**		**Q**	**Infra-red**

a) Identify the radiation marked Q (1mark)

b) State the application of radiation marked **P** (1mark)

10. Light travels from glass to air as shown in **figure 5**. The refractive index of glass 1.5



a) Determine angle **x** (2marks)

11. **Figure 6** shows air molecules in front of a hollow, wooden box B set vibrating by a tuning fork.

figure 6

i) State the reason of mounting the tuning fork on the box which is open at one end. (1mark)

ii) What is the name given to this kind of wave? (1 mark)

12. The **figure 7** below shows an isolated negative charge placed closer to a negatively charged plate. Draw the electric field patterns. (1mark)

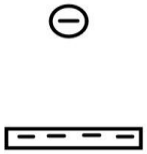


figure 7

13. Kenya launched the use of optical fibres in communication recently. State why optical fibres are preferred to ordinary cables (1mark)

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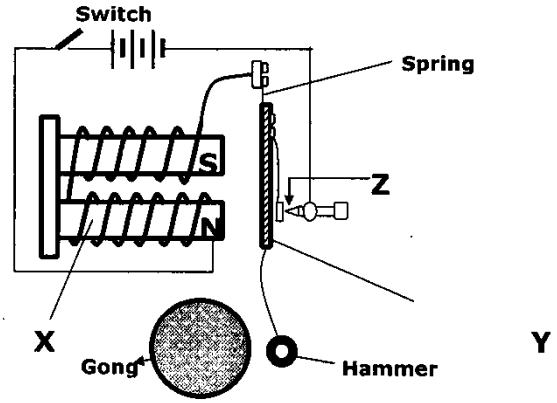
SECTION B (55 MARKS)

14. a) State **two** ways in which the speed of rotation of a motor can be increased (2marks)

b) The **figure 8** below shows a simple electric bell circuit



i) Name the parts label X and Y (2marks)

ii) When the switch is closed, the hammer hits the gong repeatedly. Explain why:

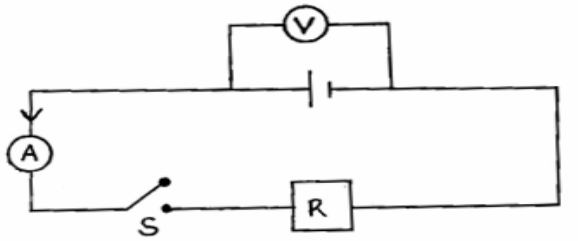
I) The hammer hits the gong. (2marks)

II) The hammer hits the gong repeatedly (2marks)

iii) If the armature is made of steel metal, it is observed that the bell will take longer to ring. Explain this observation. (1 mark)

iv) Name two adjustment should be done to the system to make it operate effectively with a lower voltage battery? (2mark)

15. (a) In an experiment to determine the internal resistance of a cell, the following circuit was used.



It was noted that when S is open, the voltmeter reads 1.5V and when S is closed the voltmeter reads 1.3V and ammeter reads 0.2A.

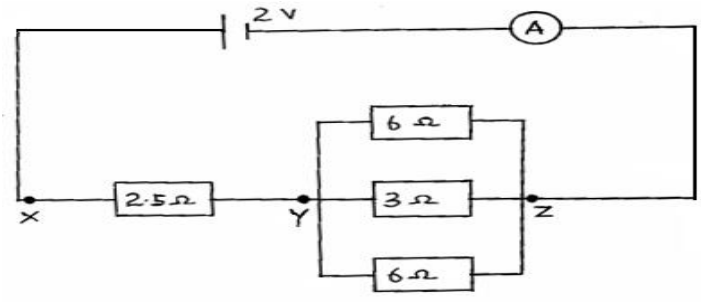
(i) Define the term e.m.f of the cell. (1mark)

(ii) Determine the lost voltage. (1mark)

(iii) Determine the value of R. (2marks)

(iv) Determine the internal resistance of the cell. (3marks)

(b) Study the circuit **below** and answer the questions that follow.



(i) Determine the effective resistance of the circuit. (3marks)

(ii) Determine the p.d between X and Y. (2marks)

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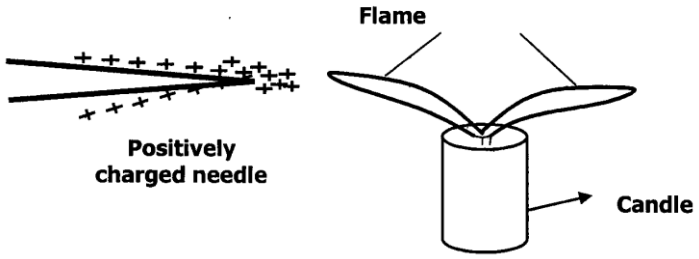
16. (a) (i) Define capacitance of capacitor (1mark)

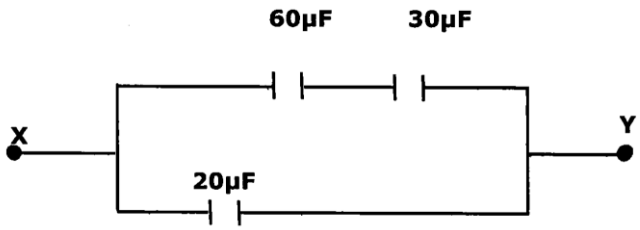
(ii) A positively charged rod with a pointed end is brought near a candle flame as shown **fig. 9**.



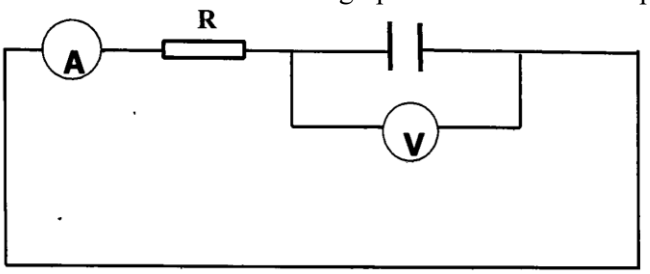
Explain why the flame burns in the direction shown (1mark)

b) One of the factors which affect the capacitance of a parallel plate capacitor is the area of overlap of the plates. Name **two** other factors. (2marks)

c) Calculate the effective capacitance of the capacitors shown across points X and Y. (3marks)



d) A capacitor was full charged to a potential of 40v. The capacitor is connected as shown in the figure below to discharge at load resistor R. Sketch a graph to show how the capacitor discharges with time (2marks)



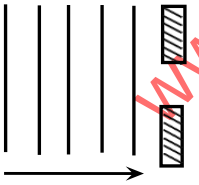
17. (a) Water waves from a given source move from a deeper a shallow to end. What effect would this have on the;

(i) Frequency (1mark)

(ii) Wavelength (1mark)

(iii) Velocity of the wave (1mark)

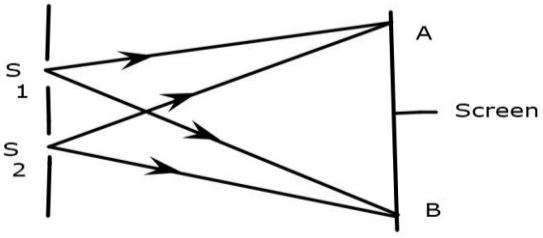
(b). The **figure 10** shows wave fronts approaching a wide opening



i) Complete the diagram to show the appearance of the wave fronts after crossing the opening. (2mark)

ii) State what would be observed on the pattern if the gap was made smaller (1mark)

c) **Figure 11** below shows light rays from two coherent sources S_1 and S_2 falling on screen. Dark and bright fringes are observed between A and B



i) State the function of S_1 and S_2 (1mark)

ii) State how

I. Bright fringes are formed (1mk)

II. Dark fringes are formed (1mark)

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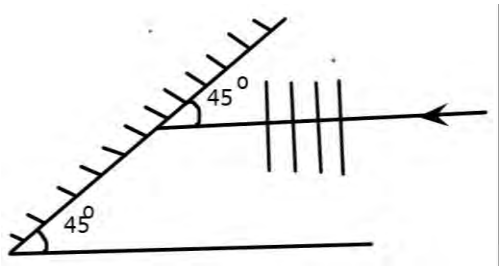
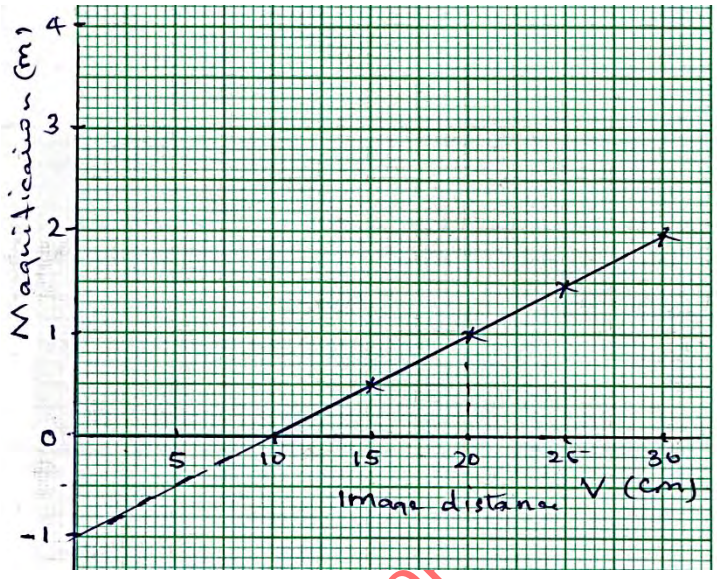
c). **Figure 12** below shows plane water waves incident on a plane reflector placed at an angle to the path of the waves.



Complete the diagram to show the reflected waves (2marks)

18. a) Define the term principal focus for in converging lens (1mark)
b) Sketch on a diagram to illustrate how a convex lens is used as a magnifying glass. (3 marks)
c) In an experiment to determine the focal length of a converging lens using lens formula, several values of image distance corresponding to value of object distance u were determined and a graph of magnification m against image distance v, plotted as shown in **Figure 13**



The equation of the graph can be represented by the equation $m = \frac{v}{f} - 1$

i) State the significance of the gradient of the graph (1mark)
ii) From the graph, determine the focal length of the lens. (3marks)
iii) Determine the value of object distance for which the image is not magnified. (1mark)
iv) An object of height 10.5cm stands before a diverging lens of focal length 20cm and a distance of 10cm from the lens. Determine the image distance. (3 marks)

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KAPSABET FORM FOUR EXAMINATION, 2023.
Kenya Certificate of Secondary Education (K.C.S.E)
232/3
PHYSICS
PAPER 3
(PRACTICAL)

CONFIDENTIAL INSTRUCTIONS TO SCHOOLS

QUESTION ONE

Every student should be provided with the following:

- A lens holder
- Convex lens of *(focal length 15.0 cm ± 1cm)*
- A candle
- A white screen
- A metre rule
- A Equilateral triangular glass prism of side *3.7cm*
- A plain sheet of paper
- A soft board
- 4optical pins /thumbs
- 4 paper pins
- A watch glass of *(diameter 10.0cm ± 1cm)*
- A piece of plasticine *about 20g*
- A marble of *(diameter 1.60 cm± 0.50cm)*
- A Stopwatch-An electronic balance *(to be shared)*
- Vernier calipers (*to be shared*)
- Geometrical set

QUESTION TWO

- An ammeter (**0 – 1 A**)
- A voltmeter (**0 – 3 V** or **0 – 5 V**)
- A variable resistor of **100Ω**
- A **10Ω** carbon resistor
- A piece of resistance wire (**SWG 30**) **50cm** long
- Two New Size D dry cells
- A cell holder
- A switch
- Seven connecting wires of **4** should have crocodile clips both ends and **3** with crocodile clip on one end

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KAPSABET FORM FOUR EXAMINATION, 2023.
Kenya Certificate of Secondary Education (K.C.S.E)
232/3
PHYSICS
PAPER 3
(PRACTICAL)
2 ½ hours

INSTRUCTIONS TO CANDIDATES
1. Answer all questions.
2. Non-programmable calculators and mathematical tables may be used.
3. Show all your workings.

QUESTION 1
PART A
You are provided with the following:
- A watch glass
- A piece of plasticine
- A marble
- A Stopwatch
- An electronic balance (*to be shared*)
- Vernier calipers (*to be shared*)
- Geometrical set

Proceed as follows:
(a) Measure the mass, **m** of the marble.
m = ……g ($^1/_2$mark)

b) Place the watch glass on the table. Cut the plasticine into two pieces and use them to hold the watch glass firmly on the table as shown in **Figure 1**.

c) Release the marble from one end of the watch glass and time 5 complete oscillation with the stopwatch. Repeat this one more time.

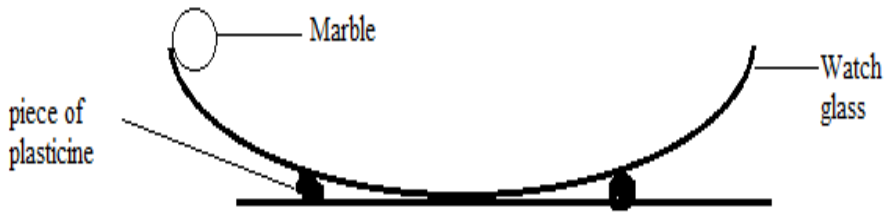

Figure 1

d) Record your values in the **Table 1** ($1^1/_2$ marks)

Attempt	Time for **5** oscillations (seconds)	Periodic time, **T**(s)
1st		
2nd		

Table 1

e) Find the average periodic time **T** (1mark)

f) i) Measure the diameter of the marble with the Vernier calipers, hence find its radius
Diameter, **d** = …… (1mark)
Radius, **r** = ……m ($^1/_2$mark)

(ii) Determine the volume of the marble given that V = $\frac{4}{3}\pi r^3$ where π =3.142 (1mark)

(iii) Calculate the radius of the curvature of the watch glass R from the formula R – r = $\frac{5gT^2}{7(2\pi)^2}$
Where g =10m/s^2 and π=3.142 (1mark)

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PART B

You are provided with the following:

- A glass prism
- A plain sheet of paper
- A soft board
- 4 optical pins
- 2 Thumb tacks

Proceed as follows:

g) (i) Firmly fix the plain sheet of paper on the soft board using the thumb tacks and place the prism at the centre of the paper. Trace the outline of the prism using a pencil.

(ii) Remove the prism from the outline and label the vertices of the outline L, M and N as shown in **Figure 2**

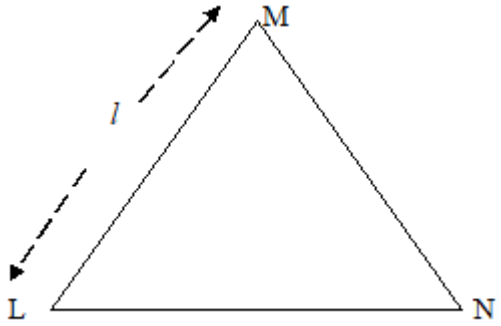

Figure 2

Measure Angle LMN and length, **l** using a ruler

Angle LMN = …… (1mark)

Length, l = …… (1mark)

iii) On the side ML mark a point and draw the normal at that point. Measure an angle T, 60° from the line LM and draw a line along this angle as shown in **Figure 3.**

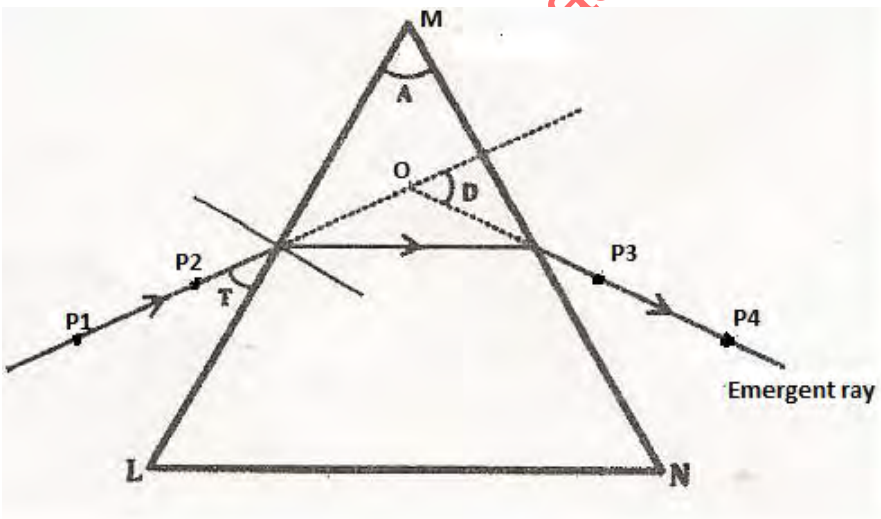

Figure 3

iv). Replace the prism on the outline and fix pins P_1 and P_2 on the 60° line at a distance of 3cm from each other. View the images of the pins P_1 and P_2 through side MN and fix P_3 and P_4 so that they appear to be on straight line with the images of P_1 and P_2.

v). Remove the prism and the pins and draw a line to pass through the holes made by pins P_3 and P_4. Extend the line into the outline as shown in figure 3 above. Also extend the 60° line so that the two lines cross each other at point O. Determine angle D and record it in the **Table 2**

h). (i) Repeat the procedure and complete the **Table 2** (2 $^1/_2$marks)

Angle T (°)	60°	50°	40°
Angle D(°)			
Angle I°(90° − *T*)			

Table 2

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(ii) Determine the average value D_m of D (1mark)

(iii) Determine the constant ***k*** for the glass prism from the formula (2marks)

$$k = \frac{\sin(\frac{A + D_m}{2})}{\sin\frac{A}{2}}$$

iv) State the significance of ***k*** (1mark)

PART C

You are provided with the following:

- A lens holder
- Convex lens
- A candle
- A white screen
- A metre rule

Proceed as follows:

i) Set up the apparatus as shown in **Figure 4**

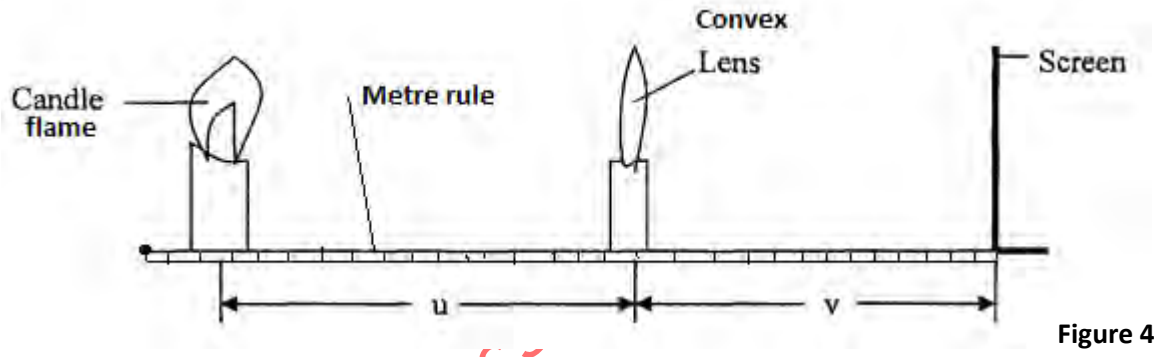

Figure 4

(j) Starting with u = 30 cm, adjust the position of the screen to obtain a sharp image of the candle flame. Record the value of v in **Table 3**.

(k) (i) Repeat the procedure in (i) for u = 30 cm. Complete **Table 3** (3marks)

u (cm)	v (cm)	m = $\frac{v}{u}$
30		
50		

Table 3

(ii) Given that the focal length f of the lens satisfies the equation f = $\frac{v}{m+1}$, determine the average value of the focal length, f. (2 marks)

QUESTION 2

You are provided with the following:

- An ammeter (**0 – 1 A**)
- A voltmeter (**0 – 3 V** or **0 – 5 V**)
- A variable resistor
- A **10Ω** carbon resistor
- A piece of resistance wire
- Two new dry cells
- A cell holder
- A switch
- Seven connecting wires

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Proceed as follows:

a) Take the resistant wire and coil it around the biro pen to make a coil.

b) Set up the apparatus as shown **Figure 5** below such that the **10Ω** carbon resistor and the coil are in parallel connection.

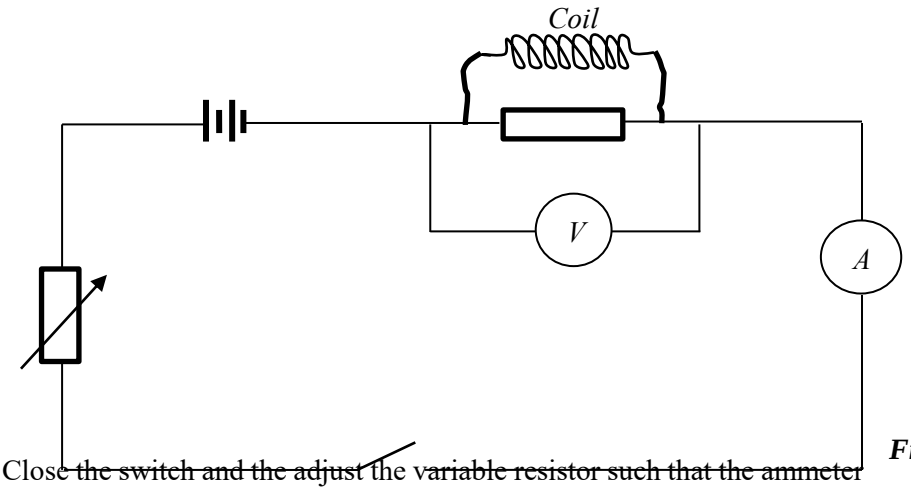

Figure 5

c) Close the switch and the adjust the variable resistor such that the ammeter reads a current of I_1=**0.08A** and record the corresponding voltmeter reading $\mathbf{V_1}$

i) $\mathbf{V_1}$ =…… (1mark)

ii) Calculate resistance $\mathbf{R_1 = \frac{V_1}{I_1}}$ (1mark)

d) Repeat (c) above for current of I_2 = **0.16A** and record the corresponding voltmeter reading $\mathbf{V_2}$

i) $\mathbf{V_2}$ =…… (1mark)

ii) Calculate resistance $\mathbf{R_2 = \frac{V_2}{I_2}}$ (1mark)

e) Find the average value of resistance **R** (1mark)

f) Determine the resistance, **C** of the coil (2marks)

g) Now set up the apparatus as shown in **Figure 6** below such that the voltmeter is connected across the cells, **10Ω** carbon resistor and the coil are in parallel connection.

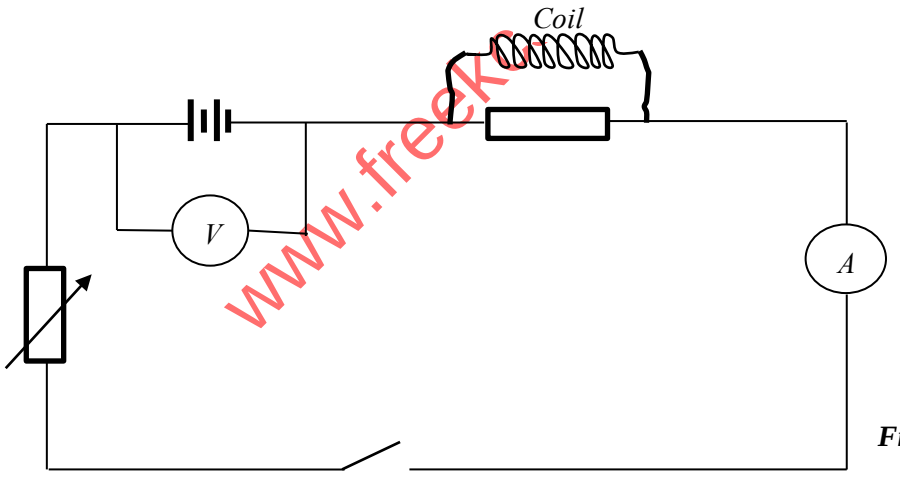

Figure 6

h) Close the switch and the adjust the variable resistor such that the ammeter reads a current of **0.04A** and note the corresponding voltmeter reading. Record the value in the **Table 4** below.

i) Repeat (h) above for other values of current and voltage and complete the **Table 4** below

Current, I (A)	**0.04**	**0.08**	**0.12**	**0.16**	**0.20**	**0.24**
Voltage, V(V)						

Table 4 (4marks)

j) On the grid provided plot a graph of **Voltage, V (V)** against **Current, I (A)** (5marks)

k) Determine the slope of the of the graph (2marks)

l) Given that graph is related to equation $\mathbf{E = V + Ir}$ where **E** and **r** are the emf and internal resistance of the cells respectively, use your graph to determine the value of:

E =…… (1mark)

r =…… (1mark)

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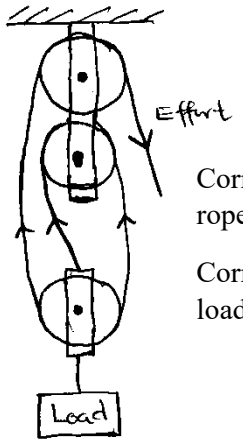
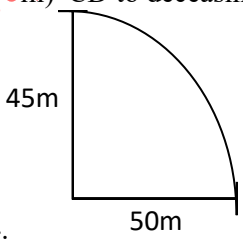
232/1
PHYSICS
PAPER 1
MARKING SCHEME

1. 16.21mm✓1 correct answer with correct units
   Accept 1.621cm or 0.01621m
   Magnetic force
   Electrostatic force
   Gravitational force
2. Momentum is conserved momentum before = momentum after
   $72 \times 9 = 216 \times 4$✓1
   $\Rightarrow u = \frac{72 \times 9}{216}$ ✓1 $= 3.0$m/s✓1
3. Roofing materials allows radiations to penetrate into the greenhouse✓1 but not out. Higher concentration of carbon dioxide inside the greenhouse helps to retain higher temperature by trapping/ insulating✓1 the heat.
4. 

✓1,
   Correct running of the rope
   Correct label of the load and effort
5. V.R = 3✓1
6. Increase in temperature increases✓1 the speed of sound.
7. i) Convection takes place in air upwards direct due to✓1 to density defect.
   ii) Convection requires a ✓1 material medium but the space between the sun and the earth i.e. space of the atmosphere has no material medium
8. From the equation of continuity
   $A_1U_1 = A_2U_2$ ✓1(flow rate is constant)
   $120 \times 0.4 = 4 \times U_2$
   $\therefore U_2 = \frac{120 \times 0.4}{4}$ ✓1
   $= 12\ ms^{-1}$✓1
9. Work done on the mass
   = force × distance
   $= 25 \times 10 \times 120$ $= 5000$J. ✓1
   Work done = power × time
   $= 200 \times 30$✓1
   $= 6000$J✓1
   But $= \frac{work\ output}{work\ input} \times 100$
   $= \frac{5000}{6000} \times 100$ $= 83.3\%$ ✓1
10. $\Delta H = MC\Delta\theta$
    $= \frac{150}{1000} \times 1000 \times 4200 \times (70 - 15) +$
    $390 \times 20 \times (70 - 15)$
    $= 34650.000 + 429000$
    $= 463650$✓1
    Energy dissipation E = pt
    $3000 \times t = 463650$✓1
    $\Rightarrow t = \frac{463650}{3000} = 154.55$ sec✓1
11. At balance
    Sum of clockwise = sum of anti-clockwise moments
    $\left(\frac{180}{1000} \times 100\right) \times 40 = 30 \times X + (10 \times 1.8)$ ✓1
    $1.8 \times 40 = 30X + 18$
    $X = \frac{1.8 \times 40 - 18}{30}$ ✓1
    $= 1.8$N✓1
12. To increase surface area of contact thus reducing pressure exerted on the road✓1

SECTION B

13.
a) i) A-B - stationary body
   ii) B – C to moves with increasing velocity
   iii) CD to deceasing velocity
b) 

   R = Ut
   h = ½ gt2
   45 = ½ x 10 x t
   $t^2 = \frac{45}{5} = 9$
   t = 3less

14.
a) The pressure of a fixed mass of gas is directly proportional to absolute temperature provided that volume is kept constant. ✓1
b) When a gas is heated it expands ✓1 increasing the number of collusions per unit area which in turn raise the pressure✓1
c)
i) - Temperature of water✓1
   - Pressure gauge reading✓1
ii) - Collect various values of pressure under different temperatures✓1
   - Plot a graph of pressure against temperature and study the values✓1
iii) $P\ \alpha\ T \rightarrow P = KT \rightarrow K = \frac{P}{T}$
   $P_1 - 5.0 \times 10^5$ Pa
   $P_2 = ?$
   $T_1 = 273 + 37 = 300$k
   $T_2 = 75 + 273 = 348$k
   $\frac{P_1}{T_1} = \frac{P_2}{T_2}$ ✓
   $\frac{500000}{300} = \frac{P_2}{348}$ ✓1
   $P_2 = \frac{500000 \times 348}{300}$
   $= 580000$

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$P_2 = 5.8 \times 105$ Pa✓1

(ii) $R = ut$

$\frac{50}{3} = \frac{0 \times 3}{3}$

$U = \frac{50}{3} = 16.67$ m/s

(iii) $V = u + at$

$= gt$

$= 10 \times 3$ $= 30$m/s

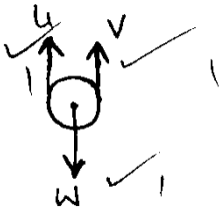
15.

a) i) In elastic collision – K.E and momentum of the objects are conserved✓1

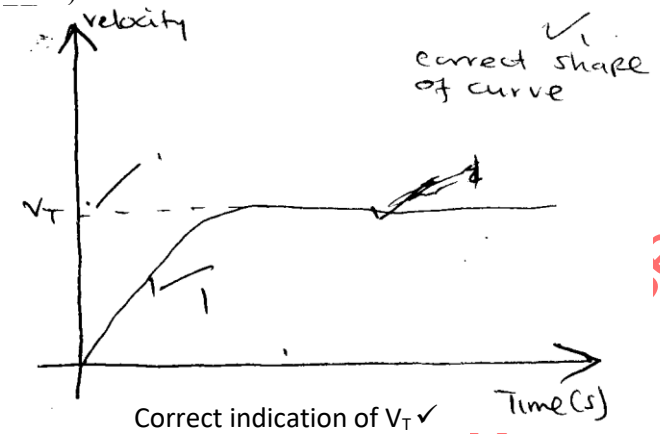
Elastic collision – only momentum is conserved✓1

ii) Initial momentum = Final momentum

b) i)



ii)



Correct indication of V_T ✓

16.

a) i) $\omega = 2\pi f$

$= 2\pi \times 10$

$= 20\pi$rad s^{-1}

$= 62.83$ rad^{-1}

$T_A = M\omega^2 r - mg$

$= (1 \times 62.83^2 \times 0.5) - (1 \times 10)$✓1

$= 19 + 3.9 - 10$ $= 1963.9$N✓1

ii) At the lowest point

$F_c = T - Mg$

$\Rightarrow Fe + Mg$

$= mr\omega^2 + mg$

$= 1 \times 0.5 \times 62.83^2 + (1 \times 10)$✓1

$= 1973.9 + 10$ $= 1983.9$N✓1

b) a)

i) Tension in the spring supporting the object. ✓1

ii) There is change in the direction of instantaneous velocity at various points along the circular path. ✓1

b)

iii) The spring balance reading increases. ✓1

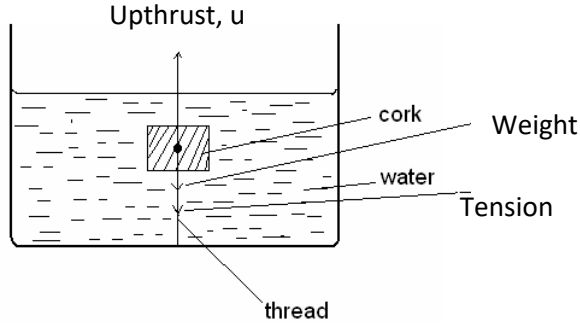
iv) The centripetal force

v) The object moves tangentially to the circular path at that point where it cuts. ✓1

17.

a) A floating object displaces its own weight of the fluid in which it float.

b) i)



ii) $U = mg + T$

ii) Viscous drag

(i) Upthrust = weight of solid

$= \frac{11.5 \times 0.8 \times 10}{1000}$

$= 0.092$ N

(ii) $\frac{\text{Density of solid}}{\text{Density of liquid}} = \frac{\text{volume submerged}}{\text{Total volume}}$

$\frac{0.8}{e_l} = \frac{8.5}{11.5}$

$e_l = 1.0824$g/cm^3

Alternatively

$e = \frac{m}{v}$

$= \frac{0.\ 0.92 \times 100}{8.5}$ 1mk

$= 1.0824$g/cm^3

18.

i)

Load	0.00	1.00	2.00	4.00	5.00	6.00	
L	10.00	11.50	13.50	16.00	18.00	24.00	
E	0.00	1.50	3.50	6.00	8.00	14.00	√

ii) Suitable axes labelled √1

All points correct √1

Suitable line √1

iii) Springs constant $K = \frac{\varsigma F}{\varsigma e}$ √1

Use students graph

Correct units √1

iv) Energy stored when the length is stretched by 16 cm

Area under the graph √1

Or $E = \frac{1}{2} ke^2$

Use k from graph and e = 16 cm.

K must be correct.

Correct substitution √1

Answer correct unit √1

(iii) Upthrust = weight of liquid displaced

$= \frac{11.5 \times 1.0824 \times 10}{1000}$

$= 0.1245$ N

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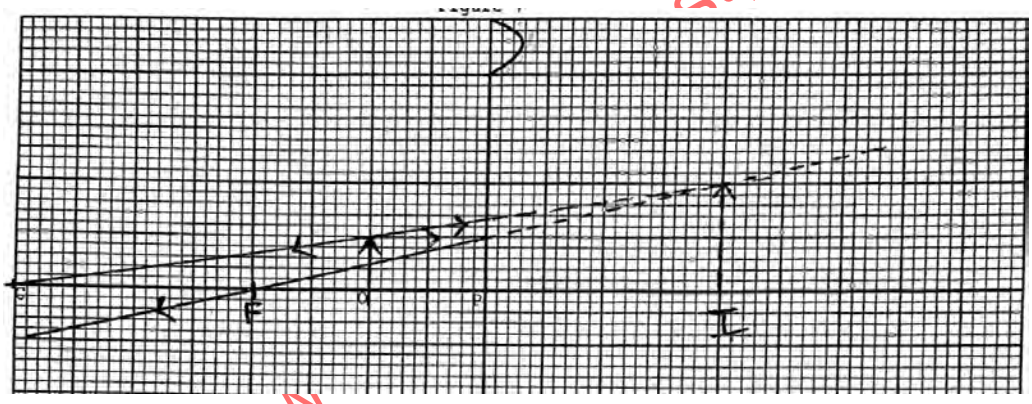
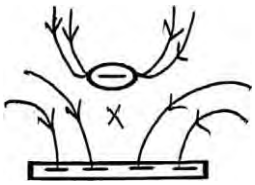
Kenya Certificate of Secondary Education (K.C.S.E)
232/2
PHYSICS
PAPER 2
MARKING SCHEME

SECTION A (25 MARKS)

1. a) Real image is formed by intersection of real rays while virtual image is formed by intersection of virtual rays✓ **OR**
   A real image is one that can be focused on a screen while a virtual image is one that cannot be focused on a screen
   b) $\frac{v}{2000}=\frac{10}{500}$✓
   =40cm or 0.4m✓
2. Metal tanks can be earthed thus discharging preventing explosion, the plastic tank would insulate thus leading to build up of charges that can lead to explosions. ✓
3. i) Ammonium chloride paste
   ii) Acts as depolarizer/ oxidizing agents
4. a) Suspended magnet is repelled /moved away from the electromagnet. ✓✓
   Reason; current flows making soft iron bar to be electromagnet acquiring north pole at B hence repulsion✓
   b) Occurs either between unlike poles of a magnet or between a magnet and a magnetic material
5. It is the distance between two successive crests or troughs in a transverse wave or the distance between two successive rarefactions or compressions in a longitudinal wave. ✓
6. a) No effect
   b) V=2d/t
   $=\frac{2x190}{1.3}$/1.3✓
   = 292.3m/s✓
7. 
   Figure 3
8. - Resistance✓
   - Time of heating✓
   - Current✓
9. a) Q. –visible light
   b) Sterilize medical equipment
10. a) Angle x (2marks)
    $\sin X = \frac{1}{n} = \frac{1}{1.5} = 0.6667$
    $X=41.81^{\circ}$
11. i) To produce a coherent source of vibration
    ii) Longitudinal wave
12. 

13. Because they have higher carrying capacity than ordinary cables.

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SECTION B (55 MARKS)

14. a) Winding the coil on a soft iron core.
Increasing the number of turns of the rotating coil.
Using a stronger magnet
Multiplying the number of coils and commuter segments

b) i)

I) X Soft iron core

II) Y Soft iron armature

ii)

I. The hammer hits the gong. (2mk)
When the switch S is closed, the current flows through the circuit and the core becomes magnetised, the electromagnet induces magnetism in the soft iron strip (armature), which is then attracted to the poles of the electromagnet. The hammer attached to the armature thus strikes the gong.

II. The hammer hits the gong repeatedly (2mk)
The attraction of the soft iron armature separates the contacts breaking the circuit. The magnetism in the core therefore dies off and the spring returns the armature to its original position. Contact is made again and the process is repeated. So long as the switch is closed, the hammer strikes the gong repeatedly.

iii) Steel metal takes much time to be magnetized

iv) - Reducing the contact space between the contact screw and the steel spring
- Increase the number of turns

15. a) i) 1.5v ✓

ii) 1.5 - 1.3 = 0.2v ✓ (1mark)

iii) V = IR
1.3 = 0.2R ✓
$R = \frac{1.3}{0.2} = 6.5\Omega$ ✓

iv) E = I (R + r) ✓
1.5 = 0.2 (6.5 + r) ✓
1.5 = 1. 3 + 0.2r
0.2r = 0.2
R = 1 Ω✓

b) i)

$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$ ✓

$= \frac{1}{6} + \frac{1}{3} + \frac{1}{6} = \frac{1+2+1}{6} = \frac{4}{6}$

$R = \frac{6}{4} = 1.5$ ✓

$R_T = 1.5 + 2.5 = 4\ \Omega$ ✓

ii) V = IR
$I = \frac{2}{4} = 0.5\ A$ ✓
V = IR
= 0.5 x 2.5 = 1.25 v ✓

16. a) i) Capacitance is the ratio of charge stored on the plate to the potential difference between the plate.

ii) The negative ions in the flame are attracted to the rod, diverting part of the flame towards it.
At the same time, positive ions are repelled away diverting part of the flame away.

b) Distance of separation.
Nature of the dielectric materials

c)

$C_S = \frac{60\times30}{60+30}$

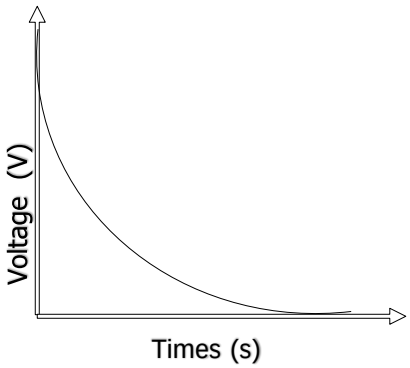
$= \frac{1800}{90}$

=20 µF

C_T=20 µF +20 µF

=40 µF

d)



17. a) (i) Frequency remains constant ✓
(ii) Decreases✓
(iii) Decreases ✓

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b) i)

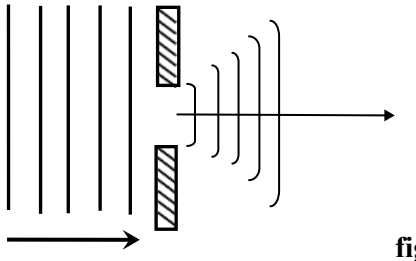


figure 10

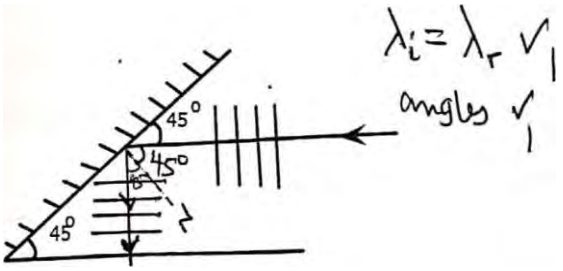
ii) Circular waves would be observed after the slit. ✓

c) i) To act as coherent source of light waves that causes interference. ✓

ii) I. Due to constructive interference / when the two crest or troughs meet✓

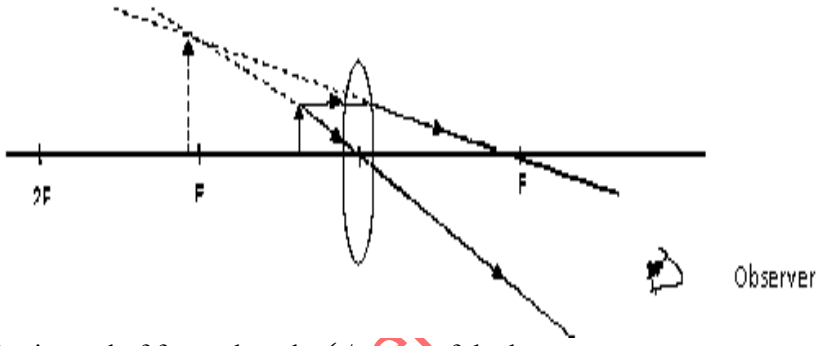
II. Due to destructive interference / when the crest and troughs of two waves meet✓

d)



18. a) This is a point on the principal axis for a convex lens that all the rays seem to converge.

b)



(c) i) Reciprocal of forces length ✓ /power of the lens

ii) Gradient $= \frac{1}{f}$ ✓

$G = \frac{1.0}{20-10} = 0.1$

$\frac{1}{f} = 0.1$

$f = \frac{1}{0.1} = 10$ cm

iii) V = u = 20cm ✓ (when m = 0)

iv) $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$ f = –20 cm

u = + 10cm

$\frac{1}{v} = \frac{-1}{f} - \frac{1}{v}$

$= \frac{1}{20} - \frac{1}{10}$ ✓ $= \frac{-1-2}{20} = \frac{-3}{20}$

V = 6.667 cm ✓

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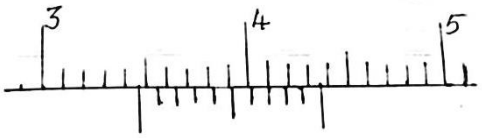
KIRINYAGA WEST SCHOOL BASED EXAMINATION, 2023
Kenya Certificate of Secondary Education
232/1
PHYSICS
PAPER 1
(THEORY)
2 HOURS

Instructions to candidates
*(d) Answer **ALL** the questions in section **A** and **B**.*
*(e) **ALL** working **MUST** be clearly shown.*
(f) Mathematical tables, electronic calculators and slide rules may be used.

SECTION A: (25 MARKS)

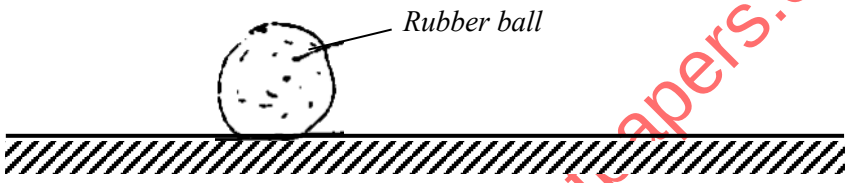
1. The figure below shows a section of a vernier calipers used to measure the thickness of a wooden block



If the vernier caliper has zero error of -0.02. What is the actual thickness of the wooden block. (2mks)

2. Define absolute zero temperature for an ideal gas. (1mk)

3. State the type of equilibrium for a rubber ball placed on a horizontal table as shown below. (1mk)



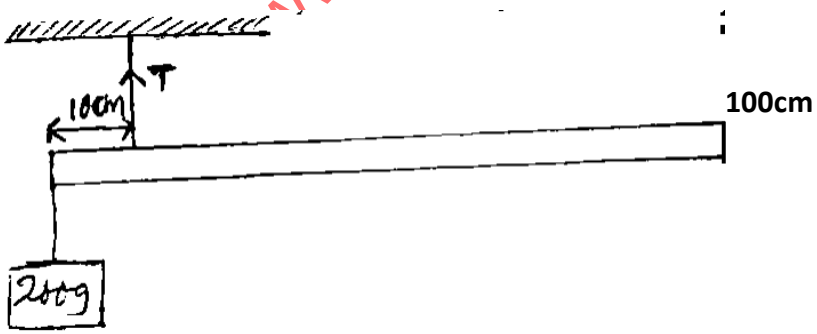
4. A ball is thrown vertically upwards and return to its starting point after 6 seconds.
Calculate the maximum height reached. ($g = 10m/s^2$) (3mks)

5. A piece of a paper is held in front of the mouth and air is blown horizontally over the paper.
It is observed that the paper get lifted up. Explain this observation. (2mks)

6. Give a reason why hot water put in a sufuria covered with a blackened aluminium foil cools faster than one covered with a shiny foil. (1mk)

7. A mass of 7.5kg has a weight of 30N on a certain planet.
Calculate the acceleration due to gravity on this planet. (2mks)

8. The figure below shows a uniform metre rule balancing when a mass of 200g is hung at one end.
Determine the tension, T in the string. (3mks)

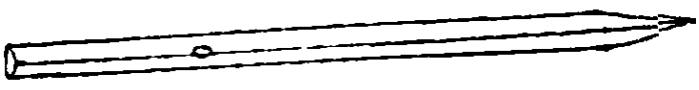


9. A diver is 12m below the surface of water in a dam. If the density of the sea water is $1000kg/m^3$
Determine the pressure due to the water on the diver. ($g = 10N/kg$) (2mks)

10. A crystal of potassium permanganate was carefully introduced at the bottom of water column held in a gas jar. After sometime the whole volume of water was coloured. Explain this observation (1mk)

11. A substance of mass 2kg and specific heat capacity $400Jkg^{-1}K^{-1}$ initially at 80^0C is immersed in water at 19^0C.
If the final temp is 20^0C. Calculate the mass of water, (specific heat capacity of water = $4200Jkg^{-1}k^{-1}$) (3mks)

12. The cover of a ball point has a small hole on the stem as shown below. Explain its function. (1mk)



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13. A salt solution of volume $30cm^3$ and density $1.1g/cm^3$ is mixed with $25cm^3$ of pure water of density $1g/cm^3$. Determine

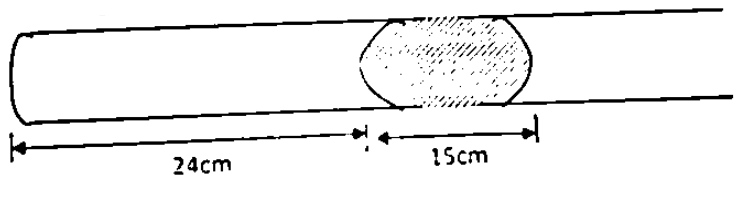
a) Total mass of the mixture (1mk)

b) Density of the mixture. (2mks)

SECTION B: (55 MARKS)

*Answer **ALL** questions this section in the spaces provided.*

14. (a) A glass capillary contains enclosed air by a thread of mercury 15cm long when the tube is horizontal, the ` length of the enclosed air column 24cm as shown.



i) What is the length of the enclosed air column when the tube is vertical with the open end uppermost if the atmosphere pressure is 750mmHg? (2mks)

ii) Explain why the mercury does not run out when the tube is vertical with the closed end uppermost. (1mk)

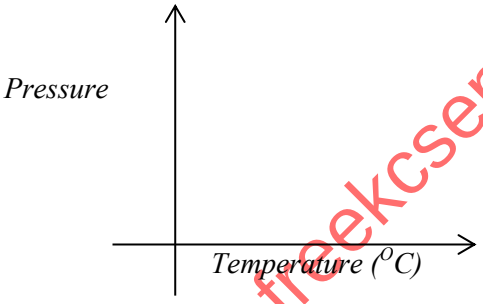
(b) Explain why an air bubble increase in volume as it rises from the bottom of a lake to the surface. (1mk)

(c) When an inflated balloon is placed in a refrigerator it is noted that its volume reduces, use the kinetic theory of gases to explain this observation. (2mks)

d) A certain mass of hydrogen gas occupies a volume of $1.6m^3$ at a pressure of $1.5 \times 10^5 Pa$ and a temperature of 22^0C. Determine the volume when the temperature is 0^0C at a pressure of $0.8 \times 10^5 Pa$. (3mks)

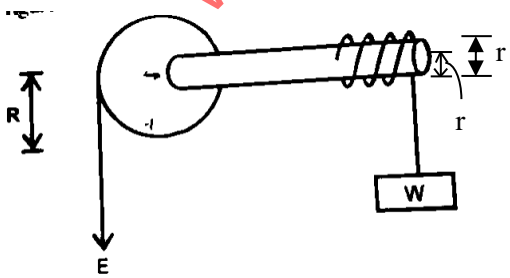
e) i) State the pressure law. (1mk)

ii) On the axis provided, sketch a graph of pressure against temperature on the celcius scale. On the same axis sketch another graph for a gas of a larger volume. (2mks)



15. (a) A machine is a device that enables work to be done more easily and conveniently. State **two** ways in which a machine ensures this. (2mks)

(b) The figure below shows a simple machine being used to raise a load W by applying an effort E.



i) Name the machine (1mk)

ii) Show that the velocity ratio (V.R.) of the machine is given by R/r (2mks)

iii) Given that r = 11cm and R = 99cm, determine the effort E required to raise a load of 2800N if the efficiency (η) of the machine is 95% (4mks)

c) Explain why as the load increases the value of mechanical advantage of a machine approaches the value of the velocity of the machine. (1mk)

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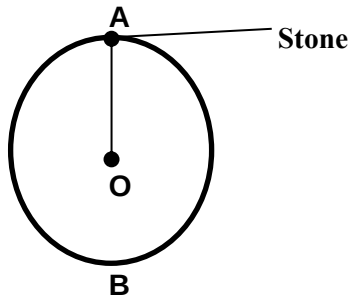
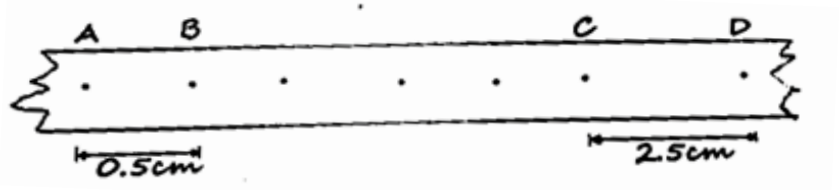
16. (a) The figure shows a stone of mass 450g rotated in a vertical circle in anticlockwise direction at 3 revolutions per second. If the string has a length of 1.5m, determine

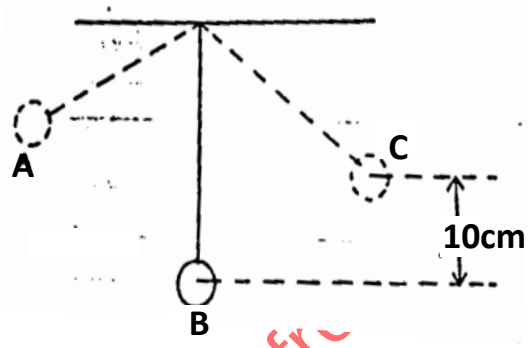


(i) The linear velocity (3mks)
(ii) The tension of the string at position **A**. (3mks)
b) On the diagram indicate the path that the stone will follow if the string snaps at point B. (1mk)
c) The figure shows the motion of a trolley on a ticker timer. The ticker timer has a frequency of 50Hz.



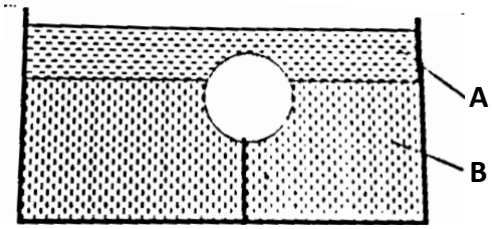
i) Calculate the initial velocity between A and B. (2mks)
ii) Calculate the final velocity between C and D. (1mk)
iii) Calculate the acceleration of the trolley during the motion. (2mks)

17. The diagram below shows a pendulum bob swinging freely to and fro.



a) i) State the position where the pendulum bob has maximum kinetic energy. (1mk)
ii) Determine the velocity of the bob at the position identified in (a) (i) above if the maximum vertical displacement of the bob is 10cm. (3mks)
b) A bullet of mass 20g moving with a velocity of 1000m/s hits stationery wooden block of mass 12kg. The bullet imbeds and the two move in one direction.
Calculate their common velocity. (3mks)
(c) A block of mass 200g rests on a rough horizontal table. A force of 0.6N pulls the block so that it moves with a constant acceleration of $1m/s^2$. Calculate
(i) the time it takes to travel a distance of 200m. (2mks)
(ii) the friction force between the block and the table. (2mks)

18. The sphere below has a volume of 0.1 litres. It is held with a tight string at the base with ¼ of its volume in liquid A of density $380kg/m^3$ while the rest is in Liquid B of density $700kg/m^3$. The tension of the string is 0.32N.



Find:
a) Mass of liquid A displaced. (2mks)
b) Mass of liquid B displaced. (2mks)
c) Upthrust experienced by the sphere. (2mks)
d) Mass of the sphere (2mks)
e) Density of the sphere (2mks)

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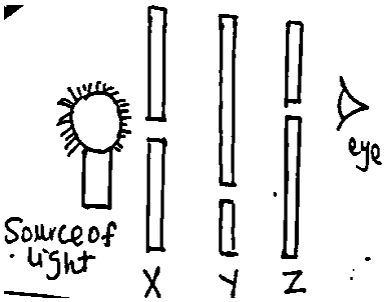
KIRINYAGA WEST SCHOOL BASED EXAMINATION, 2023
Kenya Certificate of Secondary Education
232/2
PHYSICS
PAPER 2
(THEORY)
2 HOURS

Instructions to candidates:

(a) Answer **ALL** the questions in Section **A** and **B**.
(b) All workings must be clearly shown.
(c) Non-programmable silent electronic calculators and KNEC Mathematical tables may be used.

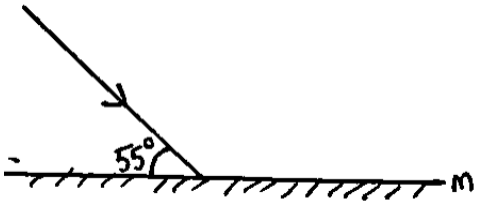
SECTION A: (25 MARKS)

1. a) **Figure 1** shows three cardboards; X, Y and Z with holes in positions shown. A bright source of light is placed before cardboard X and an observer observes behind the hole in cardboard Z.



State the property of light being investigated in the experiment. (1mk)

b) **Figure 2** shows a ray of light incident on a plane mirror striking the reflecting surface as shown.

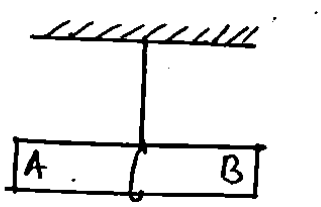


Complete the diagram indicating the value of angle of reflection. (2mks)

2. A glass rod is rubbed against a piece of nylon cloth.
(a) State the type of charges acquired by the glass rod. (1mk)
(b) Explain how the charges in (i) above are acquired. (1mk)

3. A battery of four cells connected in series produces an emf of 4.8V.
Determine the emf of a battery of five such cells. (1mk)

4. **Figure 3** shows a bar magnet AB suspended by a thread.



When the North pole of hand held bar magnet is brought close to end B, there is repulsion. State with a reason the observation made when a South pole of another hand-held magnet is brought near end A. (2mks)

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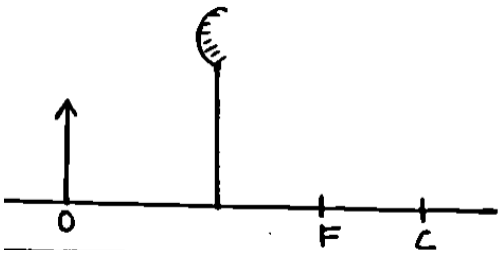
5. **Figure 4** shows a vertical object, O, placed in front of a convex mirror whose principal focus, F and centre of curvature, C are shown.



Draw a ray diagram showing how the image is formed. (2mks)

6. **Figure 5** shows a small electromagnet used for lifting and releasing a small steel ball.

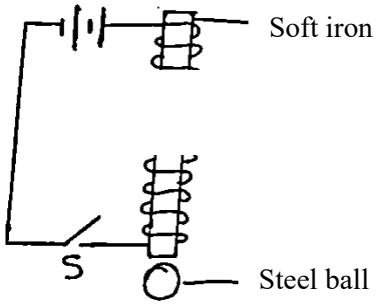


Figure 5

a) State why soft iron is preferably used in the core compared to steel. (1mk)

b) The electromagnet is required to lift a slightly heavier steel ball. State one adjustment that should be made on the electromagnet. (1mk)

7. A vibrator is producing 16 ripples per second across some water surface. Each two consecutive crests of the ripples are 5cm apart. Determine the velocity of the ripples. (2mks)

8. a) Explain the effect of wind on the speed of sound. (1mk)
   b) State the reason why, the inside walls of concert halls (auditorium) are covered with soft materials. (1mk)

9. a) State one observation made on water wave as it moves from a shallower region to a deeper region on an oblique boundary. (1mk)
   b) In young's double slit experiment, what does the bright fringes on the screen represent. (1mk)

9. **Figure 6** shows two 2Ω resistors and a 3Ω resistor connected to a battery as shown.

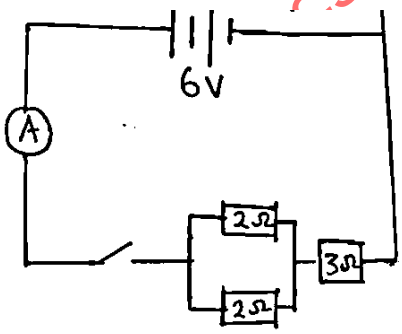


Figure 6

Determine the ammeter reading assuming the battery has negligible internal resistance. (2mks)

11. An electric heater rated 1800W, 240V is connected to a 240V mains supply through a fuse rated 5A. Determine whether the fuse is suitable for the heater. (2mks)

12. a) State one similarity between the working of the human eye and the camera. (1mk)
    b) State one possible cause of short sight. (1mk)

13. Arrange the following electromagnetic waves in order of decreasing frequency.
    Red light, X-rays, Infrared, radio waves. (1mk)

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SECTION B- (55 Marks)

14. a) **Figure 7** shows two circuits placed close to each other.

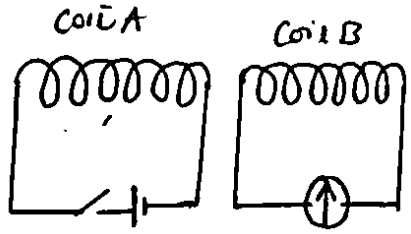


Figure 7

When the switch is closed, the pointer in the galvanometer shows some deflection and returns to zero. When the switch is opened, the galvanometer pointer deflects in the opposite direction and return to zero. Explain. (3mks)

b) State the energy losses minimized by the following.

(i) Wounding over the secondary coil over the primary coils. (1mk)

(ii) Using thin sheets of insulated soft iron plates (laminating the core) (1mk)

c) **Figure 8** shoes a simple generator producing 48W at 12V a.c. The power is then fed in to a step up transformer as shown. An a.c voltage is also connected to the secondary coil.

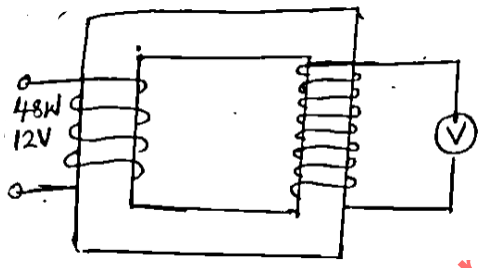


Figure 8

Determine

(i) The current in the primary coils of the transformer. (2 mks)

(ii) The voltage reading. Hint count the number of turns in each coil. (3mks)

d) **Figure 9** shows an electric iron box connected to the main supply. Three wires, live, Y and Z are the main wires.

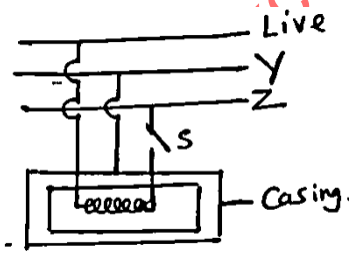


Figure 9

(i) State the colour code of wire Y. (1mk)

(ii)Identify one error in the wiring circuit. (1mk)

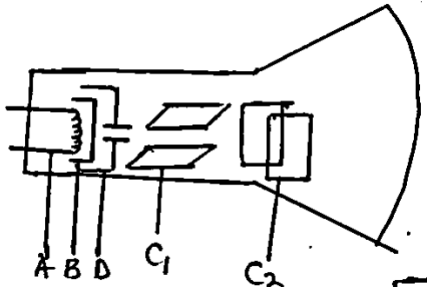
15. a) In the X-ray tube, state:

i) the reason why tungsten is suitable for use in the target. (1mk)

ii) the adjustment made to produce X-rays with a higher penetrating power, (1mk)

iii) The part(s) which facilitate efficient cooling of the anode. (1mk)

b) **Figure 10** shows some parts of a cathode ray oscilloscope. (C.R.O)



i) Explain how the electrons are produced in the tube. (2mks)

ii) State the function of part C_1. (1mk)

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iii) Give the collective name for parts A, B, C_1 and C_2 (1mk)

c) **Figure 11** shows the output signal on a C.R.O when an a.c signal is connected to the Y-plates when the time base is set at 80ms/cm.

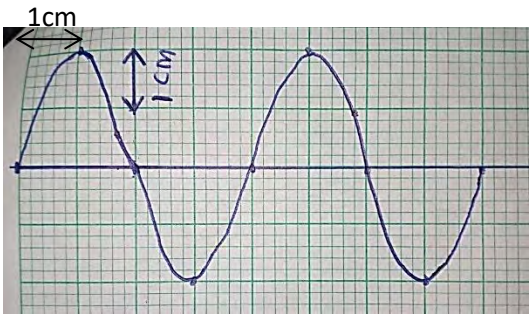

Figure 11

Determine

i) the frequency of the signal. (2mks)

ii) the peak to peak voltage if the Y-Gain is 2.5V/cm. (2mks)

16. a) **Figure 12** shows a circuit consisting of two neutral metallic plates X and Y connected in series to a battery and a microammeter.

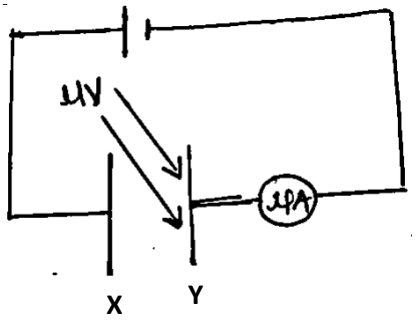

Figure 12

i) It is observed that when some ultraviolet irradiated on the metallic plate Y, the micro ammeter deflects. Explain. (2mks)

ii) State the observation made when the intensity of the ultraviolet radiation is increased. (1mk)

iii) It is observed that when infrared radiation is irradiated on the same metallic plate; the galvanometer does not deflect no matter the intensity. (2mks)

b) Light of wavelength 4.25 x 10^{-7}m is incident on two metal surfaces, A and B. Given that

- The speed of light, C = 3.0 x 10^{8}m/s
- Plancks' constant, h = 6.62 x 10^{-34} Js
- Charge of an electron, e = 1.6 x 10^{-19} C

  eV = 1.6 x 10^{-19} J

Mass of an electron Me= 9.11 x 10^{-31}Kg

i) Determine the energy of the incident radiation:

I – in Joules (2mks)

II – in eV (2mks)

ii) If the work function of metal A is 1.8 x 10^{-19} J, determine the speed of the photoelectrons from the metal surface A. (3mks)

17. a) State one factor that affect the capacitance of a parallel plate capacitor. (1mk)

b) **Figure 13** shows a positive point charge placed close to a negatively charged plate.

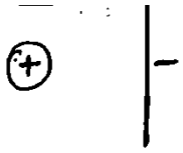

Figure 13

On the figure sketch the resulting electric field pattern. (2mks)

c) Tall buildings are fitted with lightening arrestors that are made of thick copper wire buried very deep in the earth and with protruding spikes at the top. State the reasons for using

i) Thick copper wire (1mk)

ii) Protruding spikes at the top. (1mk)

d) i) Define the term critical angle. (1mk)

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ii) **Figure 14** shows a ray of light travelling from glass to air.

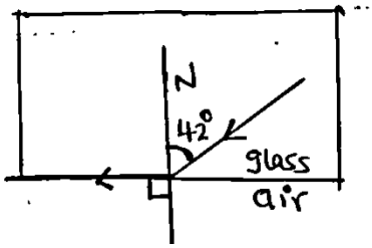


Figure 14

Determine the

I – Critical angle for the glass – air interphase (1mk)

II – Refractive index of glass (2mks)

e) An optical pin is placed at the bottom of a glass beaker filled with Ice. Give that the height of the beaker is 18cm and that the refractive index is ice is 1.25, determine the distance from the top surface of the ice to point the pin appears. (2mks)

18. a) State one precaution that requires to be observed when working with radioactive substances. (1mk)

b) A radioactive material has half-life of 15 seconds. Determine the

I – Number of half-lives in one minute. (1mk)

II – Fraction of the original mass remaining after one minute. (2mks)

c) State the main difference between n-type and p-type semiconductors. (2mks)

d) **Figure 15** shows an a.c supply, connected to a diode, a resistor load and the output connected to the C.R.O

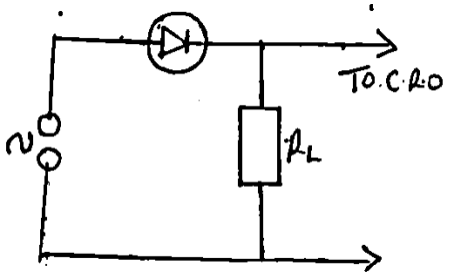
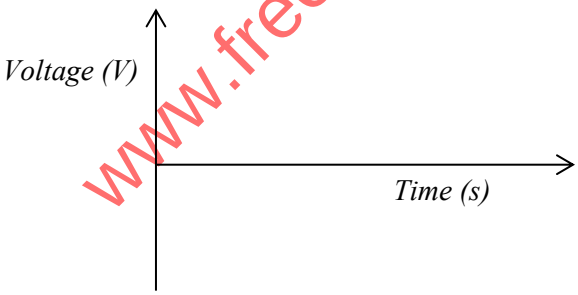


Figure 15

i) State the type of rectification achieved by the circuit. (1mk)

ii) On the axes below, draw the waveform of the rectified output as observed on the C.R.O. (2mks)



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KIRINYAGA WEST EXAMINATION, 2023
Kenya Certificate of Secondary Education
232/3
PHYSICS
PRACTICAL
CONFIDENTIAL

Confidential Instructions to schools

Question 1

- ✓ Concave mirror of focal length 10cm.
- ✓ Metre rule.
- ✓ White screen (at least 16 x 18cm).
- ✓ Candle (about 7cm).
- ✓ A complete stand.
- ✓ A spring with a pointer (L= 7.5cm, D = 1.3cm) $\pm$ 0.1cm.
- ✓ One 50g mass labeled 'M'.
- ✓ Stop watch.
- ✓ A concave mirror holder.

Question 2

- ✓ A micrometer screw gauge (to be shared)
- ✓ Nichrome wire mounted on a mm scale labeled AB of length 100cm and diameter 0.35mm $\pm$ 0.01mm
- ✓ An ammeter (0 – 1A)
- ✓ A voltmeter (0 – 3V or 0 – 5V)
- ✓ A switch
- ✓ A jockey / long wire with crocodile clip attached.
- ✓ Two new dry cells and a cell holder.
- ✓ 8 connecting wire with crocodile clips attached to one end.

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KIRINYAGA WEST SUB-COUNTY SCHOOL BASED EXAMINATION, 2023
Kenya Certificate of Secondary Education
232/3
PHYSICS
(PRACTICAL)
PAPER 3
2 ½ HOURS

Instructions to candidates

- Answer all the questions.
- You are supposed to spend the first 15 minutes of the 2½ hours allowed for this paper reading the whole paper carefully.
- Marks are given for clear recording of the observation actually made, accuracy and use of them
- Record your observation as soon as you get them.
- All working **must** be clearly shown.
- Non programmable silent electronic calculators and **KNEC** mathematical tables may be used.

Question 1 – A

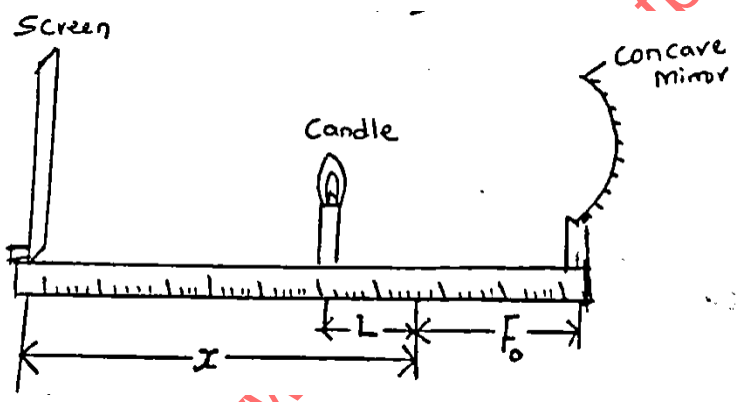
You are provided with the following apparatus:

- Concave mirror and a holder
- Metre rule
- Candle (about 7cm)
- White screen

a) i) Determine the focal length of the mirror by focusing a distant object. (1mk)

f_0 = ……cm

ii) Arrange the apparatus as shown in the figure 1 below.



iii) Place the candle at distance $f_0 + L$ (Say $f_0 + 4$cm) from the mirror.

iv) Starting with the screen at a distance of 100cm from the mirror, gently move it towards the mirror until a sharp inverted image is formed.

v) Measure and record the distance x,

vi) Repeat step (iii-v) for the other values of L and record your results in table 1.

Complete the table. (4 marks)

Table 1

L (cm)	4	5	6	7	8	9	10
x(cm)							
$^1/_L$ (cm^{-1})							

b) Plot a graph of x against $^1/_L$ (5mks)

c) Find the slope S of the graph. (3mks)

d) Given that $x = \frac{f^2}{L} + k$ determine f from your graph. (2mks)

e) What does f represent? (1mk)

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Question 1B

You are provided with the following;

- Metre rule
- Complete stand
- A spring with a pointer
- One 50g mass labeled M.
- Stop watch

Proceed as follows;

a) Set up the apparatus as shown;

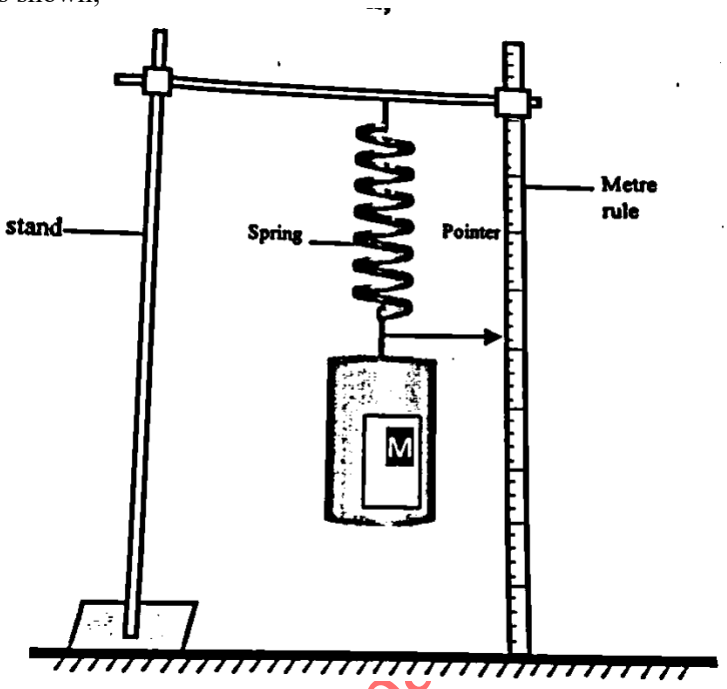

Fig. 2

b) Hang the unloaded spring so that the pointer is at X_0 such that X_0 is 0.3m

c) i) Load a mass of 50g and determine the extension of the spring.

e_1 ..... cm (1mk)

e_1 ..... m (1mk)

ii) Displace the 50g mass slightly downwards and release it to oscillate vertically. Time 20 oscillations and obtain t_1.

t_1 ..... s (1mk)

iii) Find the periodic time T_1.

T_1 ..... s (1mk)

iv) Use the equation $T_1 = 2\ \pi \sqrt{\frac{e_1}{p_1}}$ to find the value of P_1. (3mks)

Question 2

You are provided with the following.

- A micrometer screw gauge (to be shared)
- Nichrome wire mounted on a mm scale labeled AB
- A voltmeter (0-3V or 0-5V)
- Ammeter (0-1A)
- A switch
- A jockey/long wire with crocodile clip attached.
- Two new dry cells and cell holder.
- 8 connecting wires with crocodile clips attached to one end.

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