TRIAL 2 FORM FOUR COMMON EVALUATION TEST
Kenya Certificate of Secondary Education
PHYSICS
PAPER 1

SECTION A (25 MARKS)

1. State the name of the instrument used to take the following readings;
   (i) 10 kg (1 mk)
   (ii) 0.00245m (1 mk)
2. A micrometer screw gauge which had an error of +0.02mm was used to measure the diameter of a spherical marble. If the actual diameter was 3.67mm, draw a micrometer screw gauge showing this reading. (2 mks)
3. Fifty drops of oil have a volume of $1.0cm^3$. If a drop of oil forms an oil patch of diameter 20cm, determine the size of the oil molecule. (2 mks)
4. (a) A gun when fired the firer experiences an equal backward recoil, explain. (1 mk)
   (b) A man whose mass is 80kg stands on weighing machine. When the lift ascends with an acceleration of $2.45m/s^2$, what is the reading on the scale? (2 mks)
5. The figure below shows a sketch graph of velocity-time graph for a body falling through a liquid. Explain the motion of the motion between.

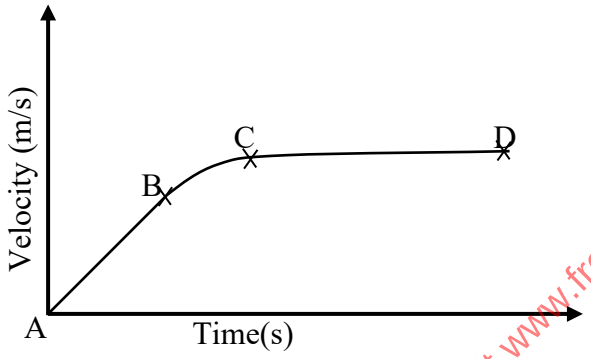


Figure 1
   (a) B and C (1 mk)
   (b) A and B (1 mk)
   (c) C and D (1 mk)
6. In a faulty mercury-in-glass thermometer it was found that the mercury level stands at 2 cm mark in the tube at 0^0C and 20cm when in steam above boiling water at normal atmospheric pressure. Calculate the temperature when the mercury stands at 13cm mark. (2 mks)
7. A balloon filled with argon gas of volume $199cm^3$ at the earth's surface where the temperature is 21^0C, and the pressure 760mm of mercury. If it is allowed to ascend to a height where the temperature is 2^0C and the pressure 100mm of mercury, calculate the volume of the balloon. (2 mks)
8. (a) The spiral springs shown in the figure below are identical. Each spring has a spring constant K = 200N/m. Each rod weighs 0.1N and each spring weighs 0.1N.

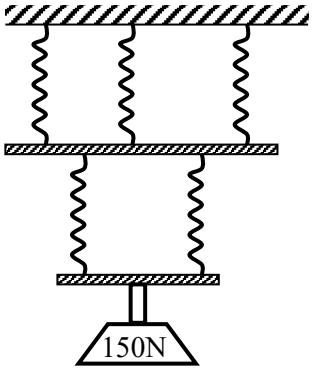


Figure 2
   Determine the total extension caused by the 150N weight. (2 mks)
   (b) Apart from length of the spring and nature of material, state one other factor affecting the spring constant. (1 mk)

9. The figure below shows a cuboid in two positions. Explain how the stability of the cuboid changes when it is changed from position 'a' to 'b'. (2 mks)

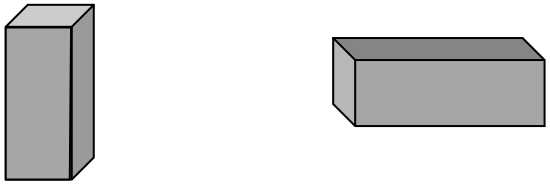


Figure 3

(a) (b)

10. (a) How does the area of support affect the stability of a body? (1 mk)

(b) The figure below shows a uniform rod **AE** which is 40cm long. It has a mass of 2kg and pivoted at **D**. If 2N is acting at point **E**, and 30N force is passed through a frictionless pulley.

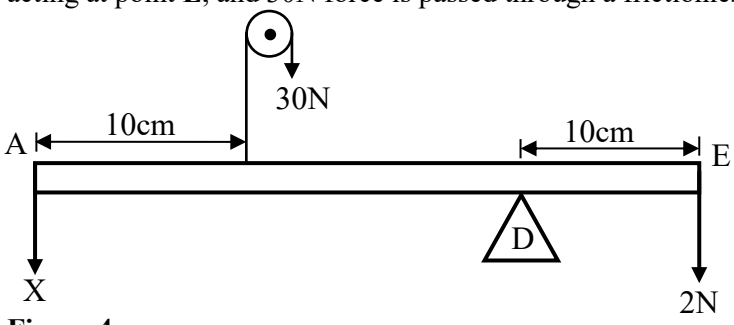


Figure 4

Find the force X acting at end **A**. (3 mks)

SECTION B (55 MARKS)

Attempt all the questions in this section

11. (a) Sketch a block and tackle pulley with three movable pulleys in the lower block and two fixed pulleys in the upper block, to give a velocity ratio of 6. (3 mks)

(i) An effort of 450N is used to raise a load of 2700N. Determine:

I. Mechanical advantage (M.A) (2 mks)

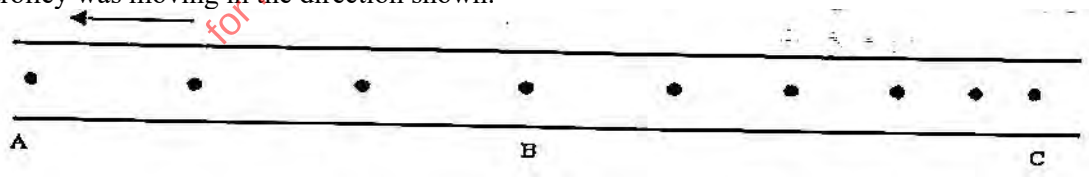
II. Efficiency of the pulley system. (2 mks)

(ii) If all the wasted energy is used to raise the lower block and the frictional force between the pulleys and moving parts is 3.6N; determine the weight of the lower block. (2 mks)

(c) If the load moved through a distance of 50cm, determine the useful work done by the effort. (3 mks)

(d) James applied a force of 400N in pushing a stationery wall. If he took one hour to push the wall, calculate the power developed. (1 mk)

12. (a) The figure below shows dots which were made by a ticker timer – tape attached to a trolley. The trolley was moving in the direction shown.



If the frequency used was 60Hz, distance AB = 12cm and BC = 7.2cm, determine

(i) the velocities between AB and BC (2 mks)

(ii) the acceleration of the trolley. (2 mks)

(b) An object is projected horizontally with a velocity of 40m/s at the top of a cliff 100m from the ground. (Take g = 10m/s^2)

(i) Calculate the time taken for the object to hit the ground (3 mks)

(ii) What is the range of the object from the foot of the cliff (2 mks)

(c) State two assumptions that were made when deriving the equation of continuity? (2 mks)

13. (a) A ship made of steel is able to float while a steel rod sinks explain. (1 mk)
(b) A block of length 50cm, cross-sectional area of 5cm^2 and density 1.4g/cm^3 is completely immersed in a liquid of density 1.08g/cm^{3,} find.
(i) the mass of the block (2 mks)
(ii) the weight of the block in the liquid. (2 mks)
(iii) the apparent loss in weight of the block if three quarters of it is immersed in the liquid. (2 mks)

14. (a) Define specific latent heat of fusion (1 mk)
(b) Given the following. A filter funnel, a thermometer, a stop watch, ice at 0^{0}C, an immersion heater rated P watts, a beaker, a stand, boss and clamp and weighing machine.
Describe an experiment to determine the specific latent heat of fusion of ice. Clearly state the measurements to be made. (4 mks)
(c) 200g of ice at 0^{0}C is added to 400g water in a well lagged calorimeter of mass 40g. The initial temperature of the water was 40^{0}C. If the final temperature of the mixture is X^{0}C,
(Specific latent of fusion of ice L = 3.36 x 10^{5}JKg^{-1}, specific heat capacity of water, c = 4200Jkg^{-1}K^{-1}, specific heat capacity of copper = 400Jkg^{-1}K^{-1})
(i) Derive an expression for the amount of heat gained by ice to melt it and raise its temperature to X^{0}C (2 mks)
(ii) Derive an expression for the amount of heat lost by the calorimeter and its content when their temperature falls to X^{0}C. (2 mks)
(iii) Determine the value of X. (3 mks)

15. (a) The moon goes round the earth at constant speed. Explain why it is true to say that the moon is accelerating. (1 mk)
(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 45g. The bucket is swung horizontally making 6 revolutions per second. Calculate:
(i) The angular velocity. (1 mk)
(ii) The centripetal acceleration. (2 mks)
(iii) The tension on the string. (2 mks)
(iv) The linear velocity. (1 mk)
(c) Figure 6 shows of mass m = 200g attached to the centre of a rotating table with a string. The radius of the spring was varied and different values of angular velocity recorded. The mass of the body remained constant throughout the experiment.

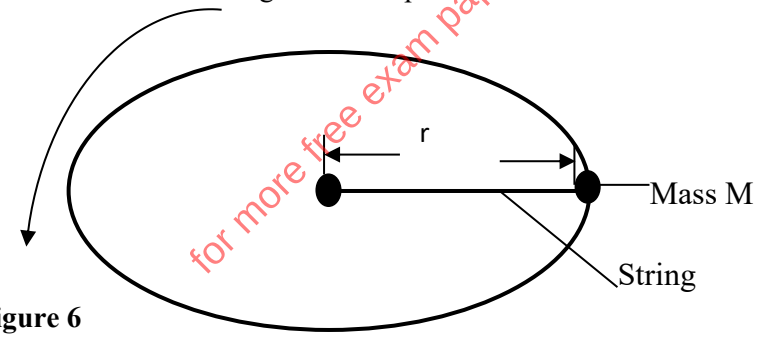
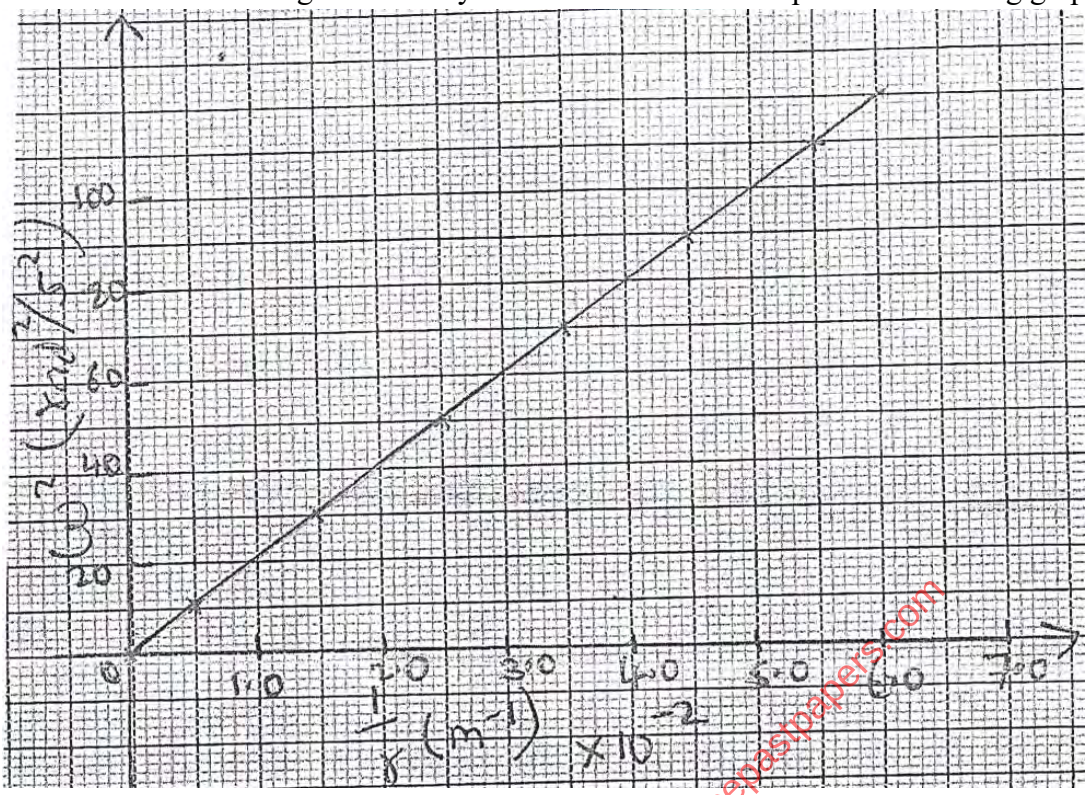


Figure 6

The results obtained for angular velocity and radius were used to plot the following graph.



From the above graph;

i) Calculate the value of the slope. (2 mks)

ii) If ω^2 and $\frac{1}{r}$ are related by the equation; $\omega^2 = \frac{p}{r} x \frac{1}{m}$, find the value of P. (2 mks)

iii) State the significance of **P**. (1 mk)

TRIAL 2 FORM FOUR COMMON EVALUATION TEST
Kenya Certificate of Secondary Education
PHYSICS
PAPER 2

SECTION A (25 MARKS)

1. Five images are formed when two mirrors are inclined at an angle between them. Determine the angle of inclination (2mks)
2. A soft iron ring placed between two magnets as shown in figure 1 below. Draw the magnetic field between the two magnets (2mks)

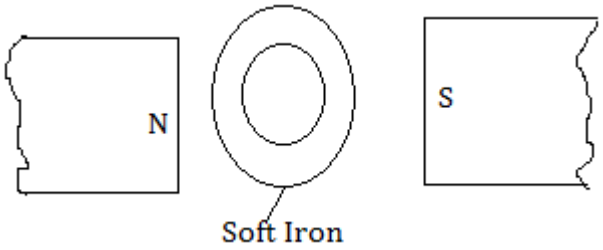
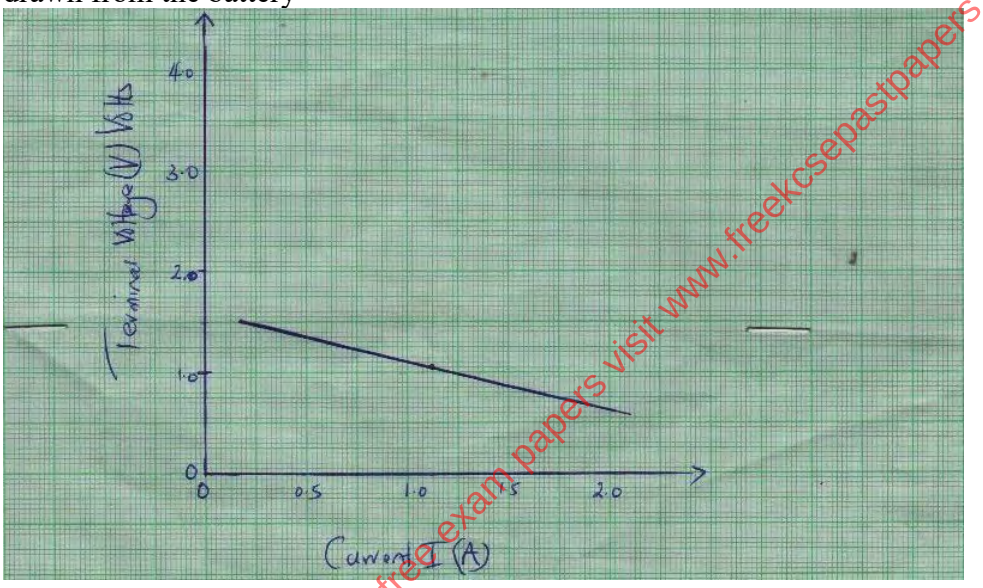


Figure 1.

3. The graph below shows the terminal voltage ,V, of a certain battery varying with the current , I, being drawn from the battery



i) Write an expression relating the e.m.f E, terminal voltage V, current I, and the internal resistance, r, of the battery (1mk)
ii) From the graph determine the internal, r, of the battery (3mks)

4. Two metallic spheres A and B stand in contact as shown below. A positively charged rod is held near sphere A

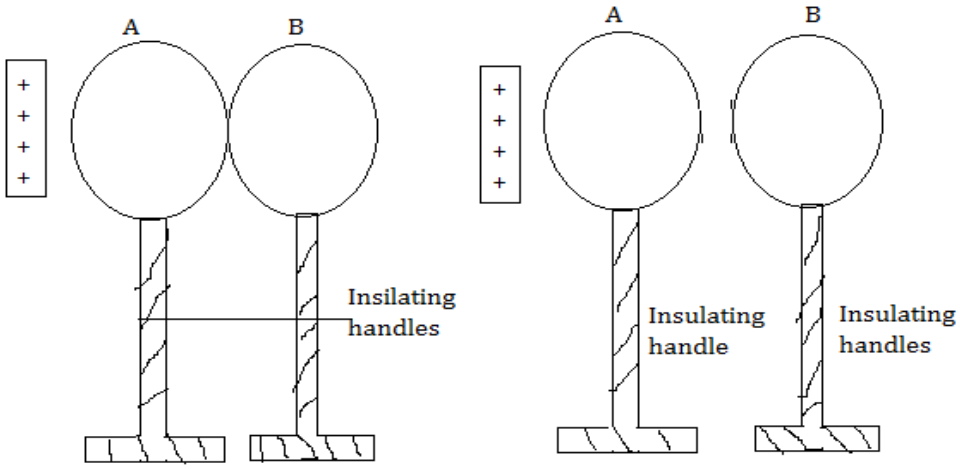


Figure 2.

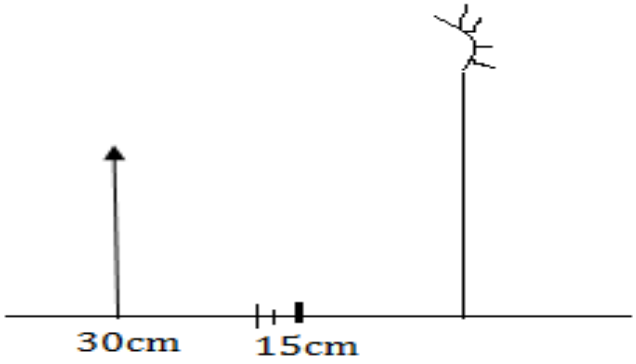
i) Show charge on each when the metallic balls are separated (2mks)
ii) Why are the spheres supported on insulated stands (1mk)

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

Radio waves	Infrared	Visible	A	X-rays	Gamma rays

i) Name the radiation represented by A (1mk)
ii) State two applications of the radiation identified in (i) above (2mks)

6. A boy standing 600m away from a cliff bangs two pieces of wood together and hears an echo 3.5 seconds later. Determine the speed of sound in air at the place (3mks)
7. An electric heater is made of a wire of resistance 100Ω and connected to a 240v mains supply. Determine the power rating of the heater (3mks)
8. Figure s below shows an object O placed in front of a converging mirror of focal length15cm

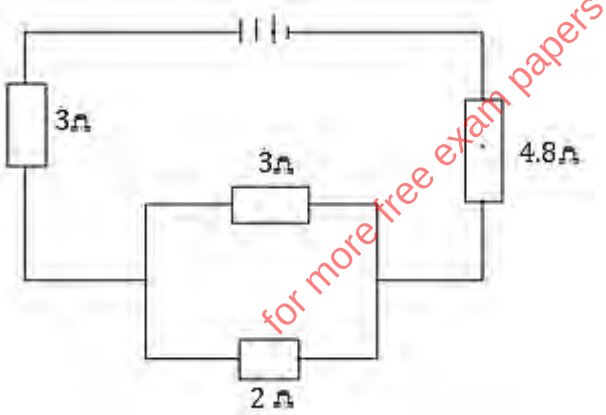


Draw on the figure a ray diagram to locate the image formed (3mks)

9. State faradays law of electromagnetic induction (1mk)

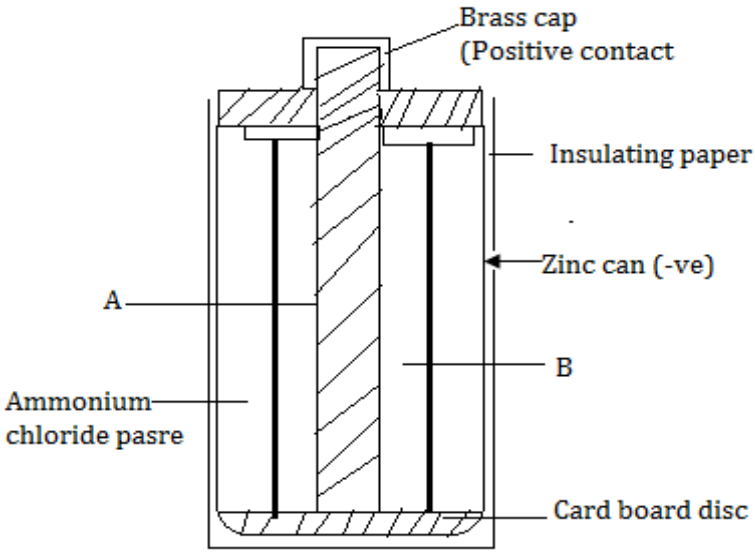
SECTION B (55 MARKS)

10. a) State two factors that affect the resistance of metallic conductors (2mks)
b) Study the circuit below and answer the questions that follow:



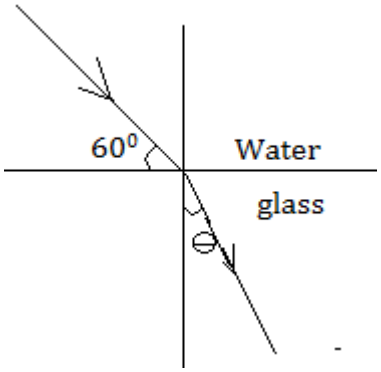
i) Determine the total resistance.
ii) Given that the total current in the circuit is 12A; ….
Determine the e.m.f of the battery (3mks)

c) The figure below shows cross-section of a dry cell. Use the information on the figure to answer the questions that follow.



i) Name the Parts labeled A and B (2mks)
ii) State the use of the manganese (IV) oxide in the cell. (1mk)
iii) State what is meant by polarization in simple cells. (1mk)

11. The figure below shows a ray of light travelling

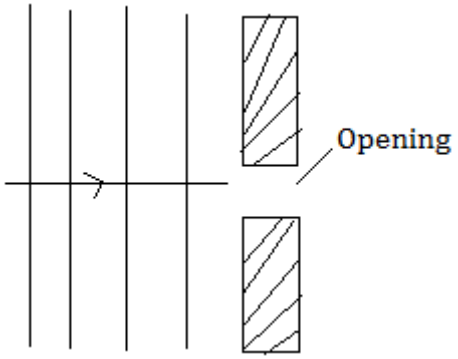


a) Calculate the refractive index of water to glass given the refractive index of glass and water are $^{3}/_{2}$ and $^{4}/_{3}$ respectively. (3mks)
b) Calculate the angle ø (3mks)
c) State the two laws of refraction (2mks)
d) State the conditions to be satisfied for total internal reflection to occur (2mks

12. a) Define the principal focus of a diverging lens. (1mk)
b) A real object of height 1cm is placed 50mm from a converging lense forms a virtual image 100mm from the lens. Determine the:
i) Focal length of the lens (3mks)
ii) Magnification (2mks)
a) On the grid provided, draw to scale the ray diagram for the set up to show how image is formed (2mks)
b) State two differences between the human eye and the camera. (2mks)

13. a) Define diffraction as applied in waves (1mk)

b) The diagram below shows wave fronts approaching an opening.



i) Sketch the wave front after passing the opening on the same diagram (1mk)

ii) State what would be observed on the pattern after passing the opening if:

a) The gap was made larger. (1mk)

b) The wave length was made larger. (1mk)

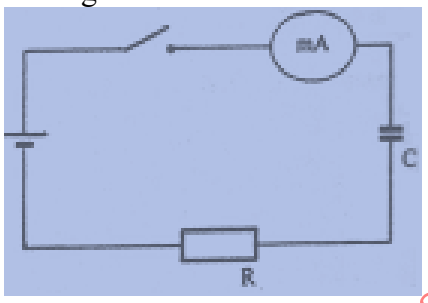
c) When a metre rule was placed in a ripple tank, it was noted that the distance between 15 successive dark lines (crests) was 30cm. The frequency of the vibrator was 20Hz. Determine:

i) One wave length of the waves in the ripple tank. (2mks)

ii) The periodic time of the wave (2mks)

iii) The velocity of the waves over the water surface. (3mks)

14. a) The figure below shows a circuit that may be used to charge a capacitor



i) State the observation on the millimeter when the circuit is switched on. (1mk)

ii) Explain the observation in a (i) above (2mks)

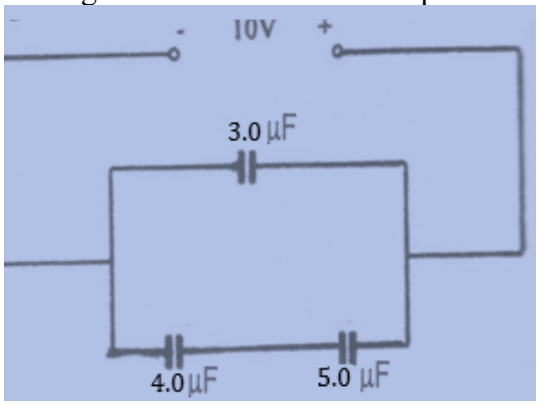
b) The circuit above is left on far duration of time. State the value of potential difference (p.d) across:

(i) The resistor R (1mk)

ii) The capacitor C (1mk)

c) Sketch the graph of potential difference V across R against time. (1mk)

d) The figure below shows three capacitors connected to a 10v battery.



Calculate:

i) The combined capacitance of the three capacitors (3mks)

ii) The change on the 5.0**µf** capacitor. (3mks)

TRIAL 2 FORM FOUR COMMON EVALUATION TEST
Kenya Certificate of Secondary Education
PHYSICS
PAPER 3
PRACTICAL

You are provided with the following
- Water in a beaker
- Complete retort stand
- Two clamps
- 100ml measuring cylinder
- Boiling tube
- Cotton thread
- Meter rule
- Beam balance(can be shared)
- Vernier calipers (can be shared

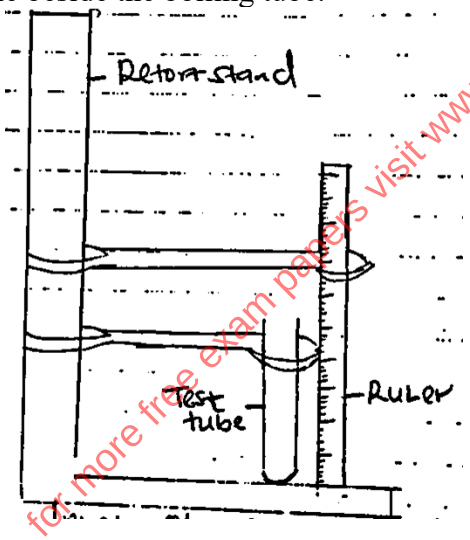
Proceed as follows

i) a) Using the vernier calipers, measure the internal diameter of the boiling tube
D=……. (1mk)

b) Measure the length H, of the boiling tube
H=…….cm (1mk)

ii) Measure the mass of the boiling tube using the beam balance M=……g (1mk)

iii)Clamp the boiling tube vertically with its base resting on a flat surface as shown, Use the second clamp to clamp the meter rule beside the boiling tube.



iv) Measure 10ml of water and pour into the boiling tube. Measure the height h, of the water. Keep adding water in small amounts in the boiling tube and complete the table below

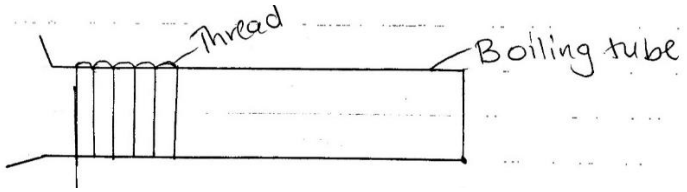
Volume in cm^3/ml	**Height h(cm)**
10	
20	
35	
45	
50	
65	

(3mks)

v) On the grid provided, plot a graph of volume V(cm^3) of water (y-axis) against height h(cm) (5mks)

vi) From the graph determine the slope, (3mks)

vii) Wind the cotton thread ten times round the boiling tube, pushing the windings very close together, the turns should not overlap on each other.



Unwind the thread and measure the length L of the thread.

L…….(cm) (1mk)

viii) Calculate the volume V,of the glass material which the boiling tube is made of, given that

$V=h\left[\frac{2L^2}{2500}-5\right]$

V= ……. (2mks)

ix) Calculate the density d, of the glass material of the boiling tube d=…… (2mks)

QUESTION 2

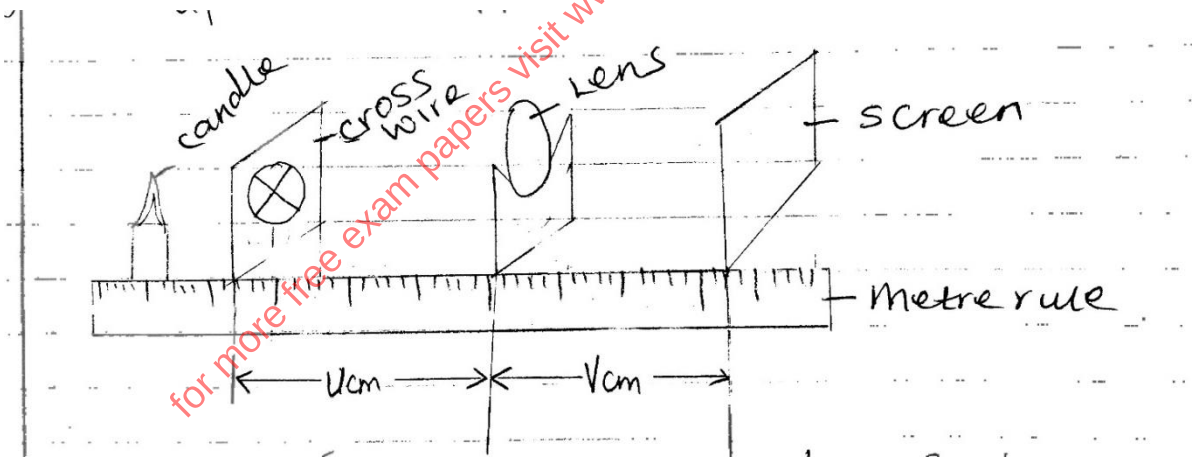
PART A

You are provided with the following

- ✓ A meter rule
- ✓ Convex lens
- ✓ A candle
- ✓ Len's holder
- ✓ Cross wither mounted on a cardboard
- ✓ A white screen

Proceed as follows:-

i) Set up the apparatus as shown



ii) Starting with U=30cm vary the position of the screen S until a sharp image of the cross wire is observed on the screen. Measure and record the value of the image distance V.

iii) Repeat the experiment above for other values of U, and complete the table below. (6mks)

U(cm)	30	35	40	45	50	55
V(cm)						
M= V/U						

iv) Plot a graph of M against V (5mks)

v) Determine the slope of the graph (3mk)

vi) The equation of the graph is given by $M=\frac{v}{f}-1$. Use your graph to obtain the value of f (2mks)

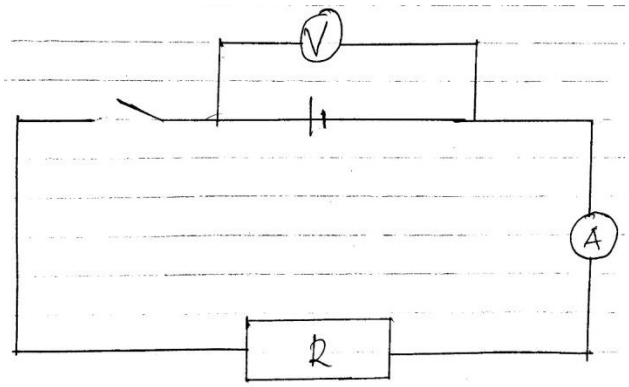
PART B

You are provided with the following apparatus:

- One cell and a cell holder
- Six connecting wires, two with crocodile clips
- A switch
- A 10 carbon resistor labeled R
- An Ammeter
- A voltmeter

Proceed as follows

i) Set up the apparatus as shown below.



Record the reading E of the voltmeter E…….. volts (1mk)

ii) Close the switch and record the reading, V, of the voltmeter and I the reading of the ammeter

V= ……..volts (1mk

I= ……amperes (1mk)

iii) Given that E = v + V + 1r, determine the value of r

r…….. volts (2mks)

TRIAL 2 FORM FOUR COMMON EVALUATION TEST
Kenya Certificate of Secondary Education
PHYSICS
PAPER 3
CONFIDENTIAL

Question 1

- ✓ Complete retort stand with two clamps
- ✓ Some water in a beaker ($100m^2$)
- ✓ 100ml measuring cylinder
- ✓ Boiling tube
- ✓ Cotton thread (100cm)
- ✓ Meter rule
- ✓ Beam balance (can be shared)
- ✓ Vernier calipers (can be shared)

Question 2

- ✓ Meter rule
- ✓ Convex lens of focal length 10cm
- ✓ A candle
- ✓ Lens holder
- ✓ Cross wire mounted on a cardboard
- ✓ A white screen
- ✓ One cell
- ✓ Cell holder (one cell)
- ✓ A switch
- ✓ Six connecting wires, at least two with crocodile clips.
- ✓ 10Ω carbon resistor (label it R)
- ✓ Ammeter
- ✓ Volt meter

KAKAMEGA CATHOLIC JOINT EVALUATION TEST
Kenya Certificate of Secondary Education
232/1
PHYSICS
PAPER 1

SECTION A (25 MARKS)

1. A micrometer screw gauge has a zero error of -0.03mm. It is used to measure the diameter of a wire. If the actual diameter of the wire is 0.30mm, draw the micrometer screw gauge showing the measured diameter of the wire. (3 marks)

2. A form one student set up the apparatus as shown below.

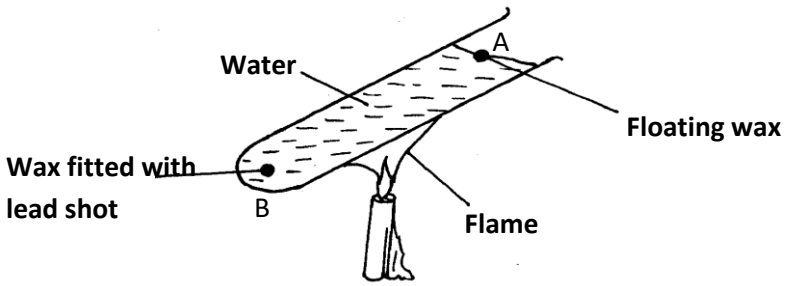


Fig 1

The boiling tube was heated in the middle as shown
(i) State which wax melted first. (1mk)
(ii) Explain your answer in (i) above. (1mk)

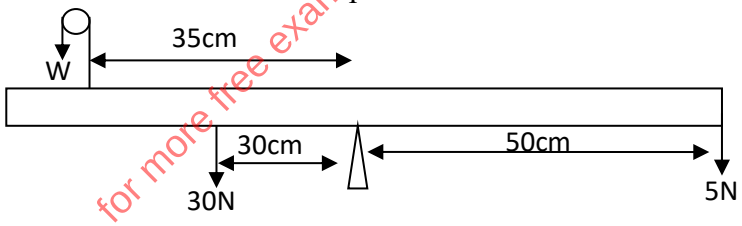
3. Estimate the size of an oil molecule if a drop of oil of volume 6.0×10^{-10} m^3 forms a patch of diameter 32cm on a water surface. (2mks)

4. Other than oil patch being monolayer, state any one other assumption in the oil drop experiment. (1mk)

5. An immersion heater rated at 180W is placed in a liquid of mass 2kg. When the heater is switched on for 7.5 minutes the temperature of the liquid rises by 40°C. Determine the specific heat capacity of the liquid. (3mks)

6. Other than temperature state one other factor that affects the surface tension of water. (1mk)

7. The figure below shows a uniform bar pivoted at its centre and is at equilibrium.



Determine the value of W. (3mks)

8. A catapult is used to project a stone of mass 40g vertically upwards to height of 5m. Determine the potential energy gained by the stone. (2mks)

9. A piece of glass weighs 0.5N in air and 0.3N while completely submerged in water. Determine the density of the glass material. (3mks)

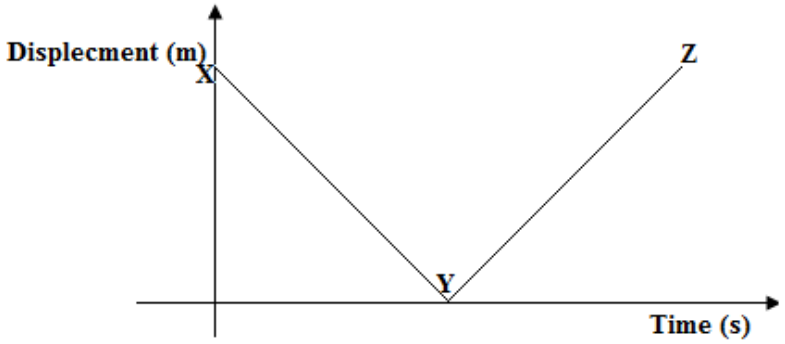
10. A person of mass 60kg stands on a spring balance inside a lift. The lift is accelerated upwards at $3ms^{-2}$. Determine the reading on the spring balance. (3mks)

11. A quantity of gas occupies a volume of $4m^3$ when the pressure of the gas is 4 atmospheres and it's temperature 27ºC. Determine its pressure if it is compressed into half the volume and heated to a temperature of 127^0 C. (2mks)

SECTION B (55 MARKS)

12.

a) The figure below shows a displacement- time graph for a particular body. Study it and answer the questions that follow



Describe the motion of the body (2marks)

b) **Figure 16** below shows a block of wood resting on a rough surface. Study the diagram and answer the questions that follow

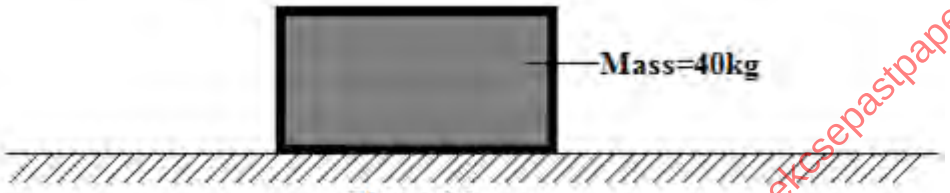


Figure 16

i. Show on the diagram the one force that acts on the block when it is at rest (1 mark)

ii. Given that the co-efficient of friction of the block is 0.6N. Determine;

I. The friction force on the block (2 marks)

II. The acceleration on the block if a pulling force of 300N is applied on the block (2 marks)

c) A body is moving along a circular path with a constant speed of 30m/s. Give a reason why the body is said to be accelerating. (1mark)

d) ***Figure 10*** shows a metal block of mass 400g is placed on a frictionless rotating table while fixed at the centre of the table by a thin thread

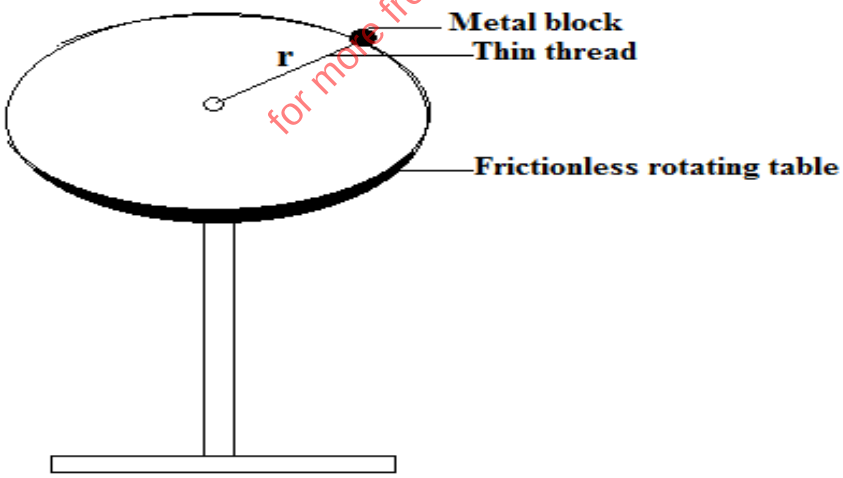


Figure 10

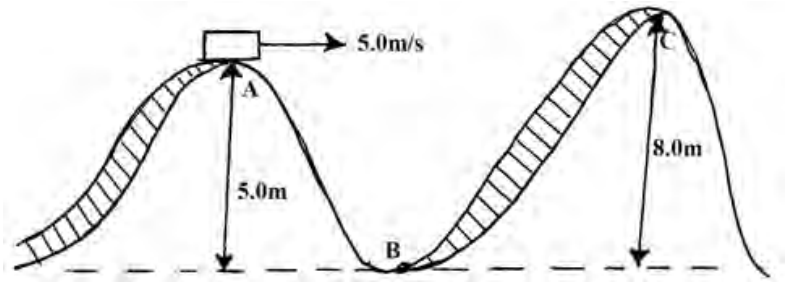
i. Given that the length of the thread is 20cm and that the thread can only withstand a tension of 7.2N, determine the maximum angular velocity for the turn table before the thread breaks (3marks)

ii. State the effect of decreasing the length of the thin thread on the centripetal force acting on the metal block (1 mk)

iii. State the two factors that will increase the critical speed of a car negotiating a bend on a flat level road. (2marks)

13

a) The figure shows a roller coaster rolling on a track. The speed of the roller coaster at point A is 5.0m/s

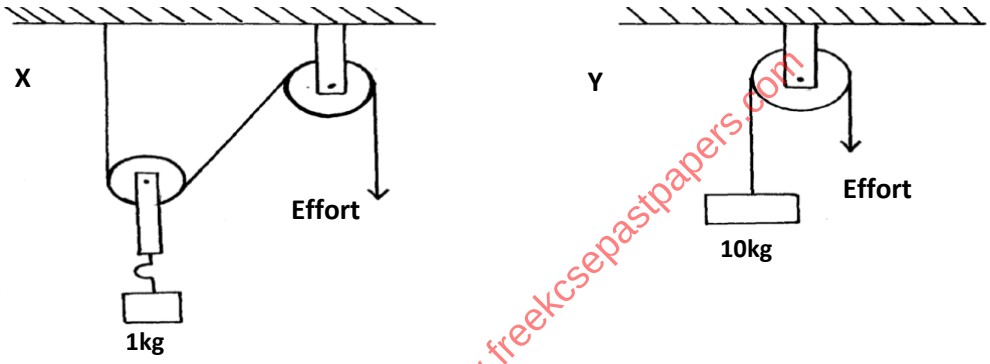


Determine

i) The speed of the roller coaster at B (3 mark)

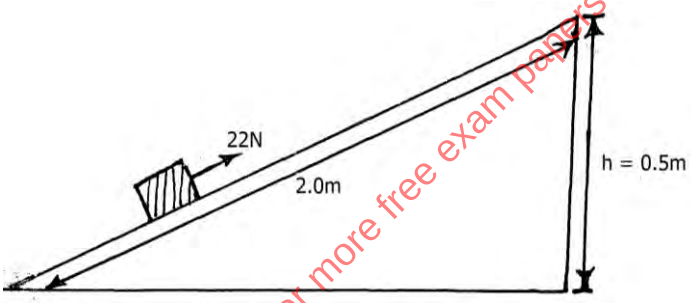
ii) Speed at A is required for the roller coaster to reach point C (2 marks)

b) Figure below shows two pulley arrangements used to lift different loads.



State with a reason which of the systems, between **X** and **Y** is more efficient. (2 marks)

c) The following diagram shows a load of 50N being raised by pulling it along an Inclined plane of length 2.0m



Determine

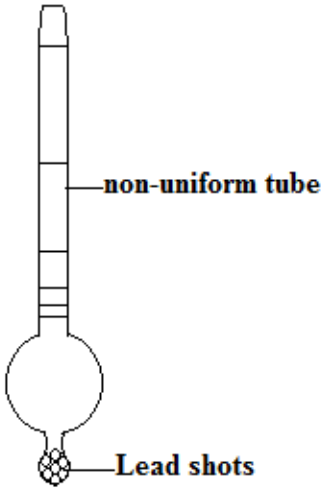
i) I) The work done by the 22N force (2 marks)

II) The work done against the load (2 marks)

ii) The efficiency of the system (2 marks)

iii) Give one reason why the efficiency less than 100% (1 mark)

14 The figure below shows a test-tube of uniform cross-section area 120cm^3 and total mass 15g modified as hydrometer.



The test tube is partially immersed in a liquid of density 0.8g/cm^3. Study the diagram and answer the questions that follow

a) State the function of a hydrometer (1 mark)

b) Determine

(i) The weight of the hydrometer (2 marks)

(ii) The upthrust exerted by the liquid on the hydrometer (1 mark)

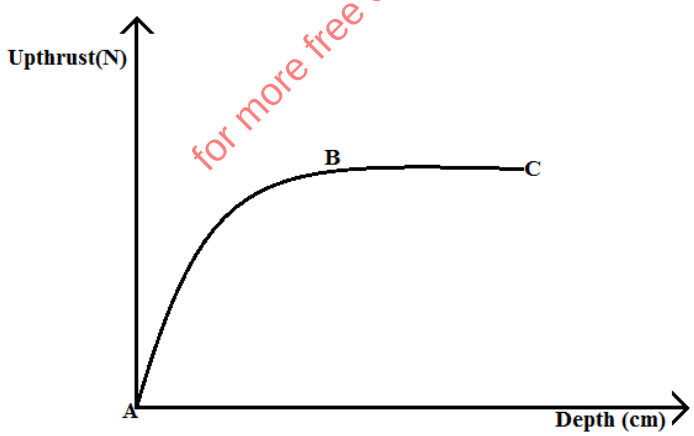
(iii) The volume of the hydrometer below the surface of the liquid (2 marks)

(iv) The height in cm of the hydrometer below the surface of the liquid (2 marks)

(v) When the part marked X is made narrower while the volume remains constant, it is observed that the hydrometer sinks more in the liquid. Explain this observation (2 marks)

c) A certain solid of volume 52cm^3 displaces 8.5cm^3 of kerosene (density 800kgm^{-3}) when floating. Determine the density of the solid. (2 marks)

d) A glass block is suspended from a spring balance and held inside a beaker without touching the beaker. Water is slowly added into the beaker until the glass block is fully immersed in the water. The figure below shows the graph of variation of upthrust on the block and the its depth in the water as water is added



State and explain the variation in upthrust and depth at the between the points B-**C** (2 marks)

15

a) 5 grams of water at 20°C is heated until it boils at 95°C. On further heating the temperature of the water does not change until it has all evaporated.

i) State what happens to the energy supplied to the water after attaining a temperature of 95°C. (1 mark)

ii) Calculate the amount of heat required to convert all the 5g of water to steam.(Latent heat of vaporization of water=2260000J/kg) (4 marks)

b) The figure shows a set-up of a cylinder with uniform cross-section area that was used to determine the relationship between the pressure P and volume V of a fixed mass of gas at constant temperature

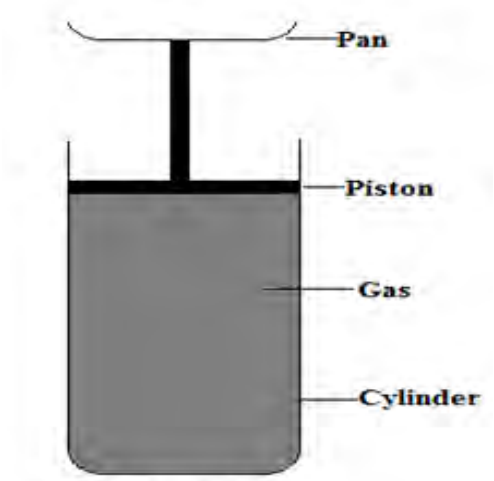


figure 4

Various masses were placed on the pan and the corresponding volume of gas in the cylinder measured and recorded in the table below

Pressure, P, Nm^{-2} x 10^5	1.00	1.20	1.40	1.60	1.80
$\frac{1}{\text{volume(v)}}$ x $10^{-2}(m^{-3})$	1.61	1.92	2.22	2.56	2.85

i. Plot a graph of P against $1/V$ (5marks)

ii. Given that $P=\frac{75\,R}{V}$ where R is a constant, use the graph to determine the value of R (3marks)

KAKAMEGA CATHOLIC JOINT EVALUATION TEST
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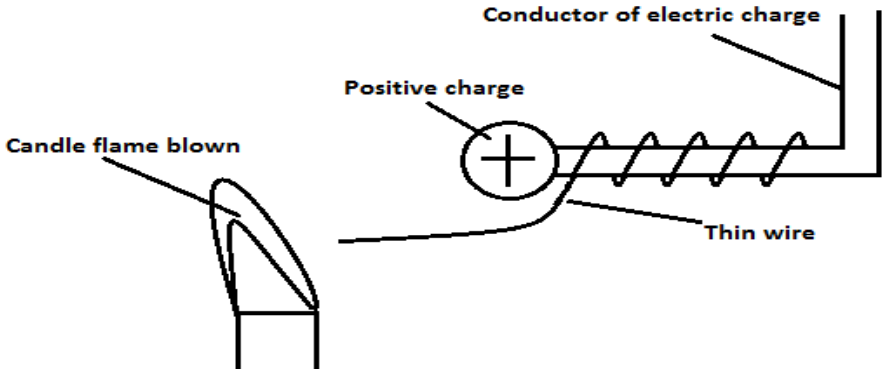
PHYSICS
PAPER 2

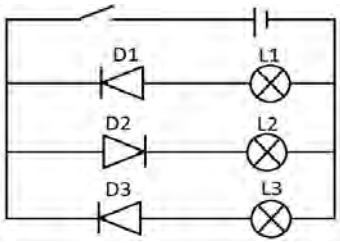
SECTION A (25 MARKS)

1. The figure below shows a thin wire connected to a charge generator and placed close to a candle flame.



Explain why the candle flame is deflected as shown. (3 marks)

2. State the meaning of the term "threshold frequency" as used in photoelectric emission. (1mark)
3. A radio signal of 30MHz is received by an aerial whose length is $1/8^{th}$ of its wavelength. If the speed of light is $3.0x10^8$ m/s determine the length of the aerial. (3 marks)
4. The figure below shows an electric circuit with three diodes, three bulbs and a cell. State and explain what would be observed when the switch is closed. (2 marks)



5. Figure 1 below shows two plane mirrors inclined at an angle x from each other. A viewer counts a total of seven images by looking directly from the object O. Determine value of angle x. (2mks)

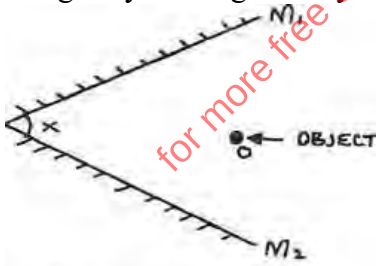
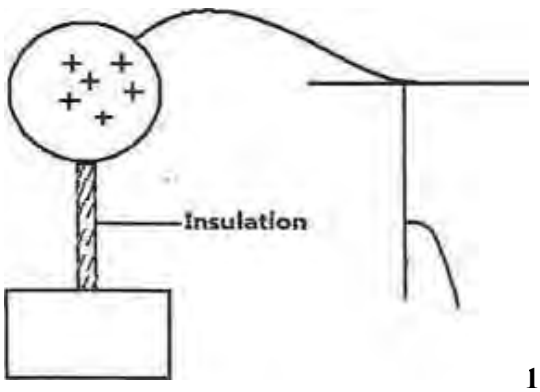
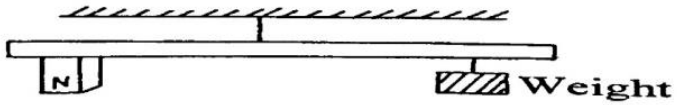


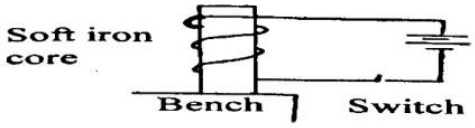
Figure 1

6 A charged metal sphere is connected to an uncharged electroscope as shown in the figure 2 below. State and explain the observations made. (2mks)



7. A metre rule is suspended by a thread such that it in equilibrium balanced by a permanent magnet attached to the metre rule and some weight as shown in figure 3 below.



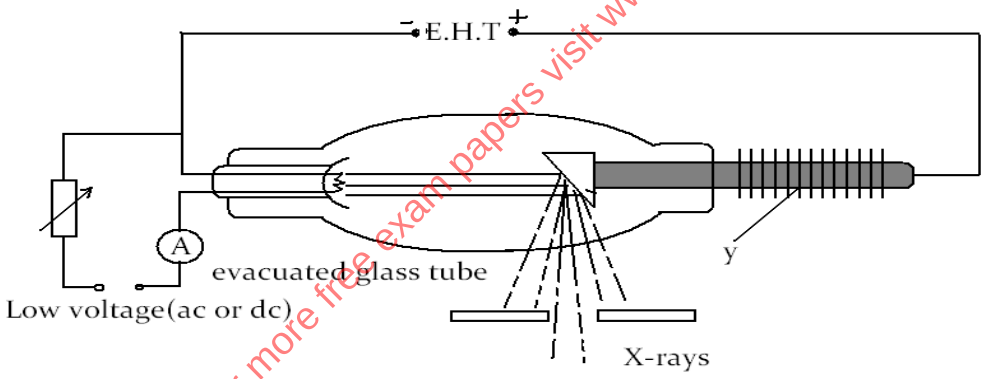


If the soft iron is fixed to the bench, state and explain the effect on the metre rule when the switch is closed. (2mks)

8. a) Explain why convex mirrors are preferred to plane mirrors as vehicle side mirrors. (1mk)
   b) A part from images being formed behind the mirror, state any other two similarities of images formed by a plane mirror and a convex mirror. (2mks)
9 i) Differentiate between polarization and local action in a simple cell (2mks)
   ii) State the use of manganese IV oxide in a dry cell (1mk)
10. Other than progressive waves travelling in opposite direction at the same speed, state any other two conditions necessary for the formation of stationary waves. (2mks)
11. A gun is fired and an echo heard at the same place 0.6s later. Determine how far the barrier, which reflected the sound from the gun is (Speed of sound in air=330ms^{-1}) (2mks)

SECTION B (55 MARKS)

12. The figure below shows an X-ray tube.

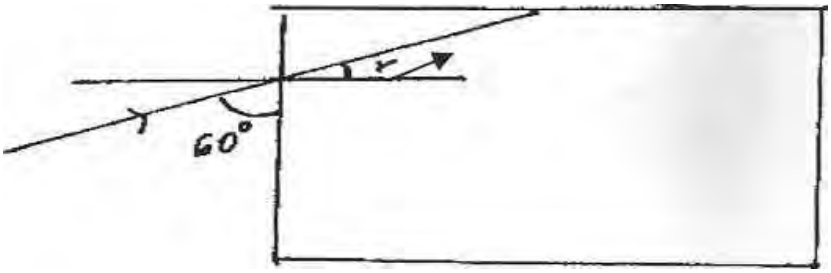


a) Label the part marked Y. (1 mark)
b) How would one increase
i). The intensity of the X –rays. (1 mark)
ii). Penetrating power of the X –rays. (1 mark)
c) Explain why the tube is highly evacuated. (2 marks)
d) An X –ray tube operating with an anode potential of 10 kV and current of 15mA.

i) Determine the number of electrons hitting the anode per second. (3 marks)
ii) Determine the speed with which the electrons hit the target (3 marks)
(charge of an electron, $Q=1.6x10^{-19}C$, mass of an electron $m_e=9.1x10^{-31}$ kg)

13. a) Define critical angle (1mk)

b) Figure 6 below shows a ray of light incident on the face of a cube made of glass refractive index 1.50



Determine

i) The angle r: (2mks)

ii) The critical angle for the glass air interface (2mks)

c) The figure 7 shows a ray of light incident on a glass prism. Given that the critical angle for the grass is 39°, sketch on the diagram the path of the ray through the prism. (2mks)

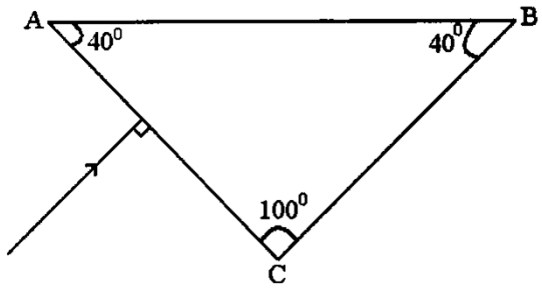


Figure 8

14 a) i) Define capacitance of a capacitor and state its S.I unit (2mks)

ii) State any two factors that affect the capacitance of a capacitor (2 mks)

iii) The figure 9 below shows three capacitors connected between two points A and B. (3mks)

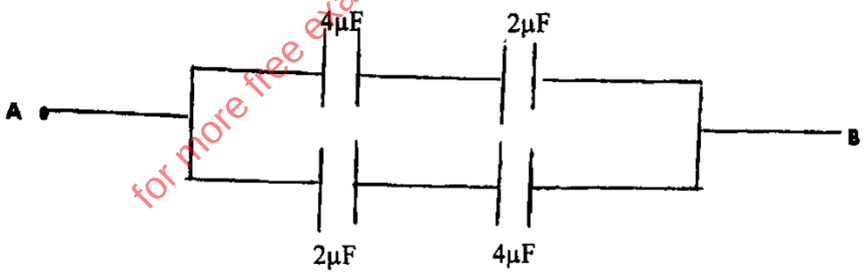


Figure 7

Determine the capacitance across AB

iv) Sketch a simple diagram that contains a capacitor, a two way switch, and a load resistor that can be used for charging and discharging a capacitor. (3mks)

15. a) State Ohm's law (1mk)

b) A wire was connected to a battery and was found that the energy converted to heat was 30J when 20C of charge flowed through the wire in 5 seconds. Determine;

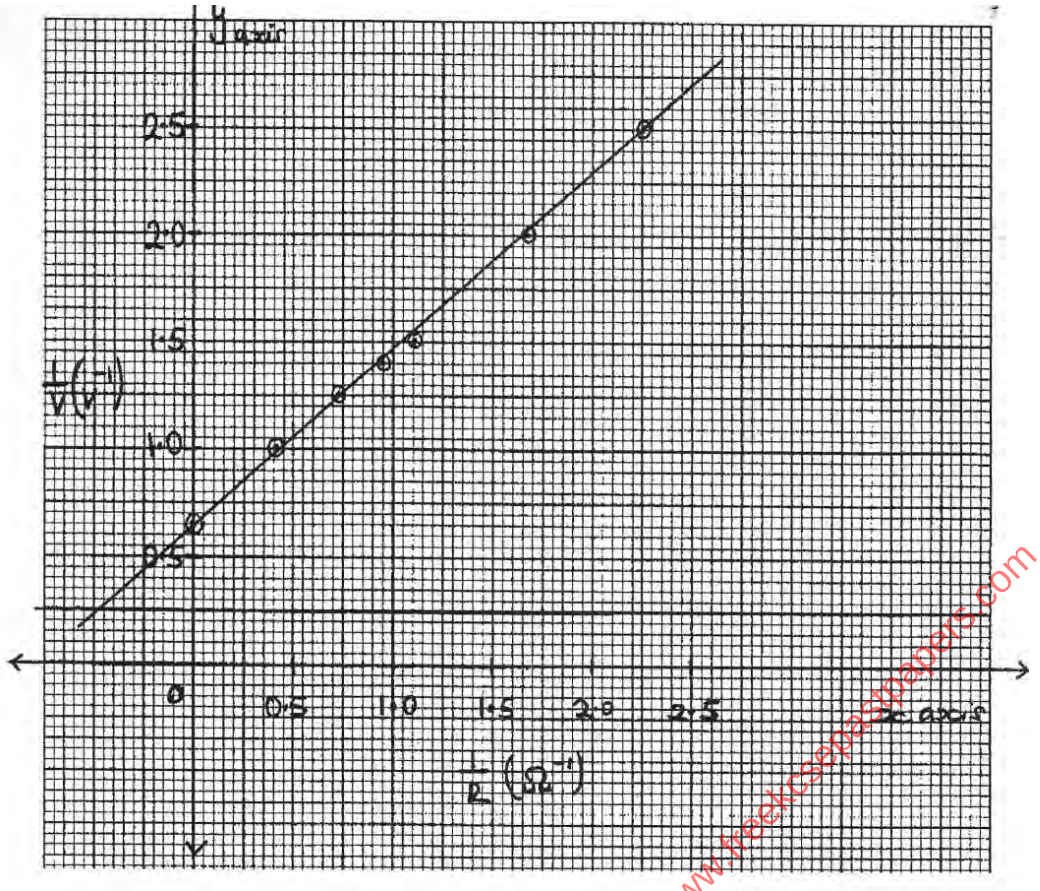
i) The p.d between the ends of the wire (2mks)

ii) The current flowing through the wire (1mk)

iii) The resistance of the wire (2mks)

iv)The average power development in the wire (2mks)

c) The graph below shows results obtained in an experiment the emf (E) and the internal resistance, r, of a cell.



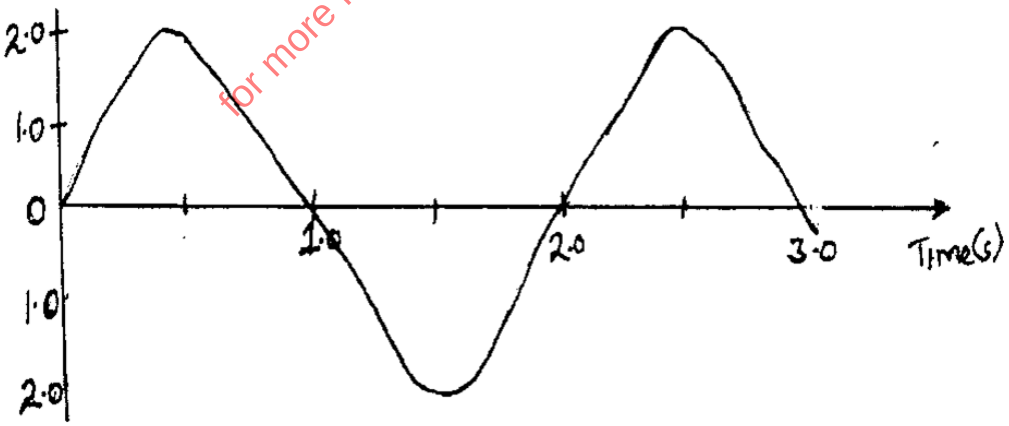
Given that the equation of the graph is $\frac{E}{V} = \frac{r}{R} + 1$, use the graph to determine the values of:

(i) E (2mks)

(ii) R

16. a) Distinguish between stationary waves and progressive waves in terms of their propagation. (2mks)

b) The figure 10 represents an oscillation taking place at a particular point while a wave in a gas passes the point. The vertical axis is labeled displacement.



i) Explain what is meant by displacement in this context. (1mk)

ii) From the figure determine

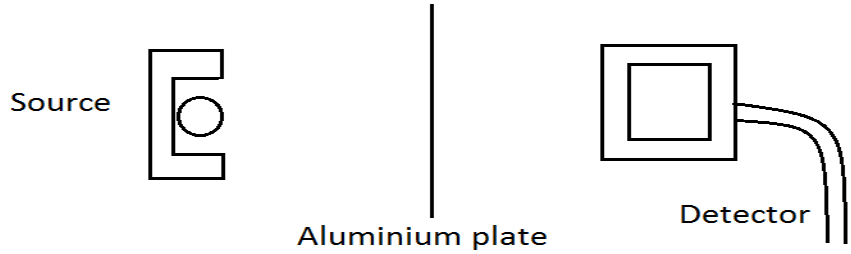
I) The period (1mk)

II) The frequency (1mk)

c) Determine the wavelength of the sound wave in the figure. Take the velocity of sound in the gas to be 340m/s (1mk)

d) State two factors that can increase the speed of sound in solids (2mks)

17 A radioactive source, aluminum plate and a suitable detector were arranged as shown below.



a) Before the source was introduced, the detector registered a reading of 40 counts per second. Explain this observation. (1 mark)

b) The following readings were obtained using a radioactive detector and a timer.

Count rate(counts/s)	1440	1272	1128	840	624	480	360	264	204	180
Time (hours)	0	3	6	12	18	24	30	36	42	45

b) i) Plot a graph of count rate against time on the grid provided below. (5 marks)

ii) Use the graph to obtain the half- life of the source. (1 mark)

iii) Using the half-life determine how long it would take for the count rate to fall from 320 to 40 counts per second. (2 marks)

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PHYSICS
PAPER 3
CONFIDENTIAL

Provide each candidate with the following:

Question 1

- ✓ A 250cm^3 beaker
- ✓ Water
- ✓ A Screen
- ✓ A metre rule
- ✓ A candle

Question 2

- ✓ A nichrome wire (**S.W.G. 32 or 30**, **0.28mm diameter** and **length 80cm**) free of kinks labelled **G** and mounted on a mm scale
- ✓ A Switch
- ✓ Voltmeter (0- 3V) or (0-5V) scale
- ✓ 2 new dry cells in a cell holder
- ✓ A resistor labeled **R (4Ω)**
- ✓ A micrometer screw gauge (to be shared)
- ✓ Six connecting wires with six crocodile clips

KAKAMEGA CATHOLIC JOINT EVALUATION TEST
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PHYSICS
PAPER 3
PRACTICAL

Question 1

You are provided with the following

- ✓ A 250cm^3 beaker
- ✓ Water
- ✓ Screen
- ✓ A meter rule
- ✓ Candle

Proceed as follows

a) i) Add 200cm^3 of water to the beaker and measure its height, h in cm. (1mk)

h =

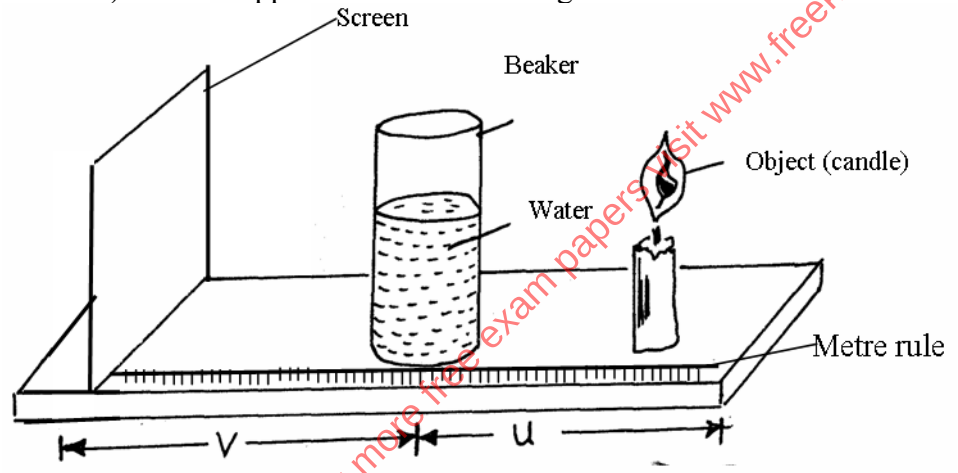
ii) Determine the approximate value of R, the internal radius in cm from the formula

$$R = \sqrt{\frac{100}{h}}$$

R = (1mk)

This experiment uses a cylindrical vessel filled with water as lens and compares its radius with the effective focal length.

b) Set the apparatus as shown in Figure 1 below.



c) Set U to be about 10R away from the centre of the 'lens' and use the screen to locate the image formed. The image is a sharp vertical line. Measure U and V from the centre of the vessel.

Repeat the experiment with the following multiples of R and record the corresponding values of u and v in table 1 below. (8mks)

Table 1

	10R	9R	8R	7R	6R	5R	4R	3R
u (cm)								
v (cm)								

d) Plot a graph of u (y-axis) against v. (5mks)

e) From the graph determine

i) 'V' the value of v for which v = u

'V' = _____ (1mk)

ii) 'U' the value of u for which u = 2v

'U' = _____ cm (1mk)

f) Determine the effective focal length of the 'lens' from the formula

$$'f' = \frac{'U'+'V'}{5}$$ (2mks)

g) Give the appropriate value of $^{R}/_{f}$ (1mk)

Question 2

You are provided with the following:
- ✓ A voltmeter
- ✓ Two new dry cells and a cell holder
- ✓ A switch
- ✓ A resistor labeled R (4Ω)
- ✓ A wire mounted on a mm scale and labeled G.
- ✓ A micrometer screw gauge (to be shared)
- ✓ Six connecting wires with six crocodile clips

Proceed as follows

a. i) Record the length L_0 of the wire labeled G

L_0 = ……

ii) Use the micrometer screw gauge provided to measure the diameter of the wire labeled G at two different points and determine the average diameter, d.

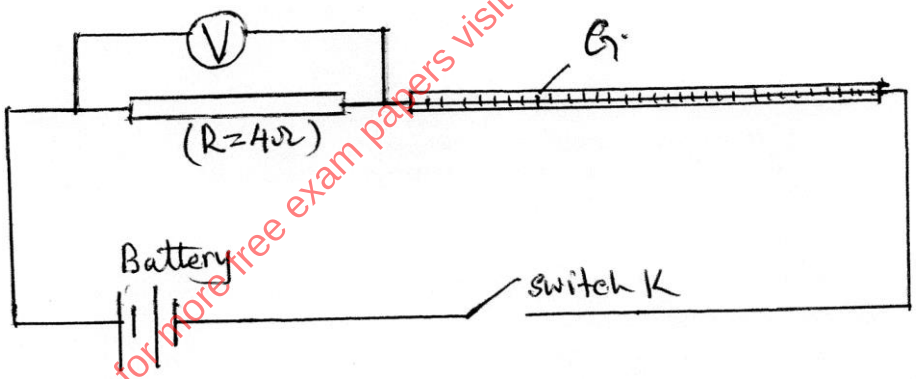
The diameter d_1 = ……mm, d_2 = ……mm (1mk)

Average diameter d = …….. mm (1mk)

iii) Determine the radius r of the wire in metres.

Radius r = …… m (1mk)

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



i. Use the voltmeter provided to measure the p.d V_R across R and the p.d, V_G across G when the switch is closed.

V_R = …… Volts (1mk)

V_G = …… Volts (1mk)

Open the switch

ii. Use the value of R provided and the value of V_R in b (i) above to determine the current I flowing through R when the switch was closed.

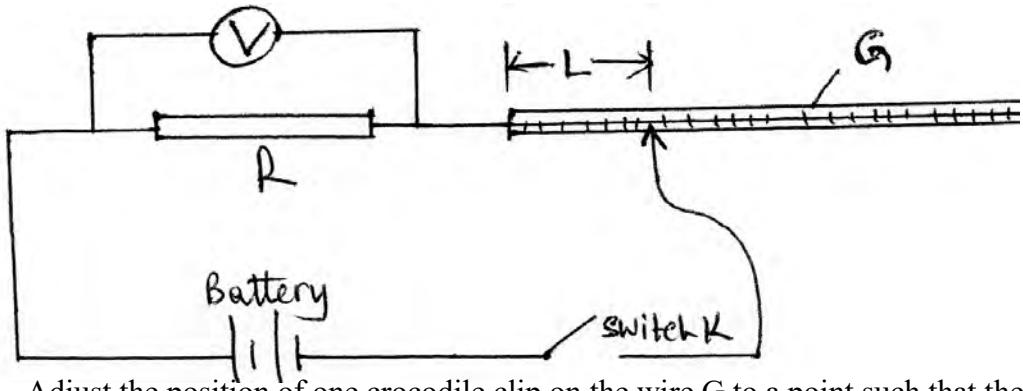
I = ……Amperes (1mk)

iii. Determine the constant H given that

$$H = \frac{100V_G}{IxL_0}$$

H = …… Ωm^{-1} (1mk)

c. Connect the voltmeter across R as shown in the figure below.



Adjust the position of one crocodile clip on the wire G to a point such that the length L of the wire in the circuit is 5cm (see the figure above). Close the switch.
Read and record in the table 2 the value for the p.d across R. Open the switch.

d. Repeat the procedure in (c) above for the other values of L shown in table 2. (3mks)

Table 2

Distance L (cm)	0	5	10	20	30	40	60	70
P.d V across R (V)								

e. (i) On the grid provided plot the graph of V (y-axis) against L (5mks)

(ii) From the graph determine L_1, the value of L when $\frac{V}{2} = V_0$ where V_0 is the p.d when L = 0 (1mk)

f. Determine the constant D for the wire given that (2mks)

$$D = \frac{R}{L_1} \times \frac{300}{V_0}$$

g. Determine the constant p given that

$$p = \frac{\pi r^2}{2}(D + H)$$ where **r** is the radius of the wire in metres. (2mks)

LANJET JOINT EXAMINATION 2020

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PHYSICS

PAPER 1

SECTION A 25 MARKS

Answer all questions in this section

1. A micrometer screw gauge is used to measure the thickness of a stuck of 10 microscope slide cover slips. The reading with the cover slips in position is as shown in figure 1.

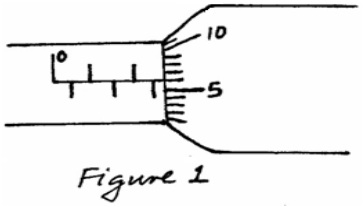
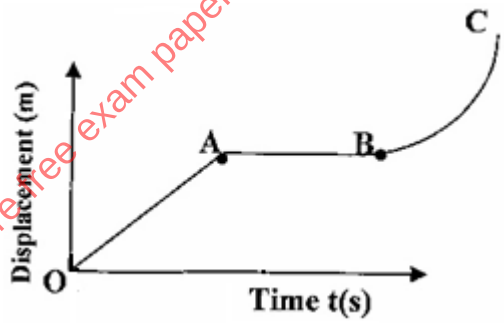


Figure 1

If the micrometer screw gauge has a negative zero error of 0.01mm, determine the thickness of each cover slip. (2mks)

2. Explain why ammonia gas released at the back of a laboratory spreads faster on a hot day than on a cold day. (1mk)
3. A piece of paper is held in front of the mouth and air blown horizontally over the paper, it is observed that the paper get lifted up. Give reason for the observation. (1mk)
4. (a) Estimate the size of an oil molecule if a drop of oil of volume 6.0×10^{-10} m^3 forms a patch of radius 32 cm on a water surface. (2mks)

   (b) Other than oil patch being monolayer, state any **one** other assumption in the oil drop experiment. (1mk)
5. In the study of free fall, it is assumed that the force F acting on a given body of mass, m, is gravitational, given by F = mg. State two other forces that act on the same body. (2mks)
6. The figure below shows a displacement-time graph of the motion of a particle.



Describe the motion of the particle in the region. (3mks)

i. OA
ii. AB
iii. BC

7. A 60 litre giant density bottle weighs 100N when empty. What will be its mass when filled with liquid W whose density is $0.72 g/cm^3$? *(g=10N/kg)* (3mks)
8. Figure 3 shows a uniform wooden plank which weighs 10N. The plank is balanced at 0.8m from one end by a mass of 2.5Kg.

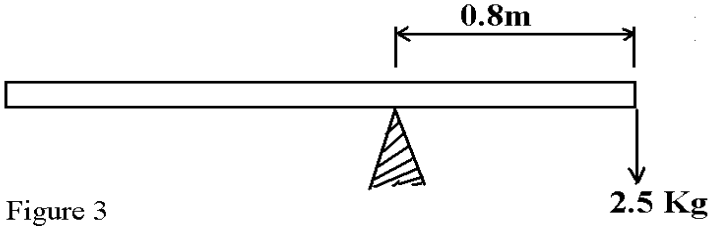
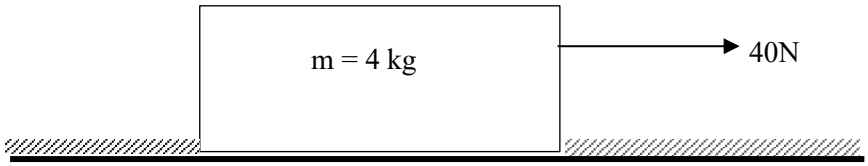


Figure 3

What is the length of the wooden plank in metres. (2mks)

9. The figure below shows a force of 40N acting on a body of mass 4kg. The coefficient of friction between the surfaces is 0.05.



Determine the acceleration of the body. (3mks)

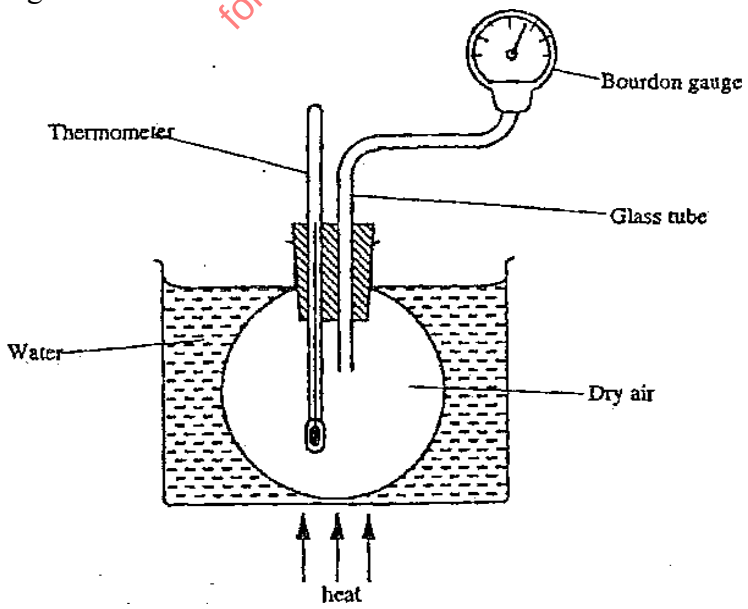
10. State one factor that affect the spring constant of a spring. (1mk)
11. A girl in a school in Nakuru plans to make a barometer using a liquid of density $1.25gcm^{-3}$. If the atmospheric pressure in the school is $93750Nm^{-2}$. Determine the minimum length of the tube that she will require? (3mks)
12. A form one girl observed that when mercury is put into a glass it does not wet the glass. Explain the observations made by the girl. (1mk)

SECTION B (55 MARKS)
ANSWER ALL QUESTIONS IN THIS SECTION

13. (i) Define Archimedes' Principle. (1mk)
    (ii) An object weighs 1.04N in air, 0.64N when fully immersed in water and 0.72N when fully immersed in a liquid. If the density of water is 1000 kg m^{-3}, find:
    a. The density of the liquid. (2mks)
    b. Calculate the density of the metal block. (2mks)
    (iii) Calculate the upthrust on the metal and the apparent weight of the metal when completely submerged in salt solution of density $1.2g/cm^3$. (3mks)
    (iv) A block of metal of volume $80cm^3$ weighs 3.80N in air. Determine its weight when fully sub merged in a liquid of density $1200kgm^{-3}$. (3mks)
14. The following readings were obtained in an experiment to verify Hooke's law using a spring.

Mass (g)	0	25	50	75	100	125
Reading (cm)	10.5	11.5	12.5	13.5	14.4	16.0
Force (N)						
Extension (mm)						

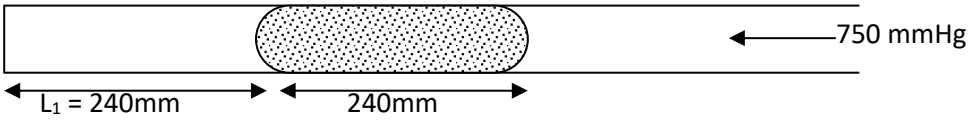
    a) Complete the table (2mks)
    b) Plot the graph of extension against force. (5mks)
    c) From the graph determine the:
    (i) Elastic limit (1mk)
    (ii) Spring constant. (2mks)
15. (a) State the pressure law for an ideal gas (1mk)
    (b) The set up shows an arrangement to determine the relationship between temperature and pressure of a gas constant volume.



Explain how the result form the experiment can be used to determine the relationship between temperature and pressure. (2mks)

(c) A bicycle tyre is pumped to a pressure of 2.2×10^5pa at23^0C. After a race the pressure is found to be 2.6×10^0 pa. Assuming the volume of the tyre did not change, what is the temperature of the air in the tyre. (3mks)

(d) Air is trapped inside a glass tube by a thread of mercury 240 mm long. When the tube is held horizontally the length of the air column is 240mm.



Assuming that the atmospheric pressure is 750mm Hg and the temperature is constant; calculate the length of the air column when the tube is vertical with open end down.(3mks)

16. a) A body of mass 20Kg hangs 4m and swings through a vertical height of 0.9m as shown in the figure 11.

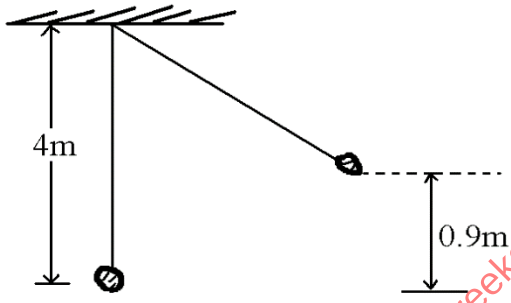


Figure 11

Determine;

i) The potential energy at its position. (2mks)

ii) The speed of the body when passing through the lowest point. (2mks)

b) A crane lifts a load of 2000Kg through a vertical distance of 3.0m in 6 seconds. Determine the;

i) Work done by the crane. (2mks)

ii) Power developed by the crane. (2mks)

iii) Efficiency of the crane given that it is operated by an electric motor rated 12.5kW. (2mks)

17. a) Define the term 'heat capacity'. (1mk)

b) A block of metal of mass 150g at a 100^0C is dropped into a well lagged calorimeter of mass 215g and specific heat capacity $400JKg^{-1}K^{-1}$ containing 100g of water at 25^0C. The temperature of the resulting mixture is 34^0C. (Specific heat capacity of water = $4200JKg^{-1}\ K^{-1}$). Determine;

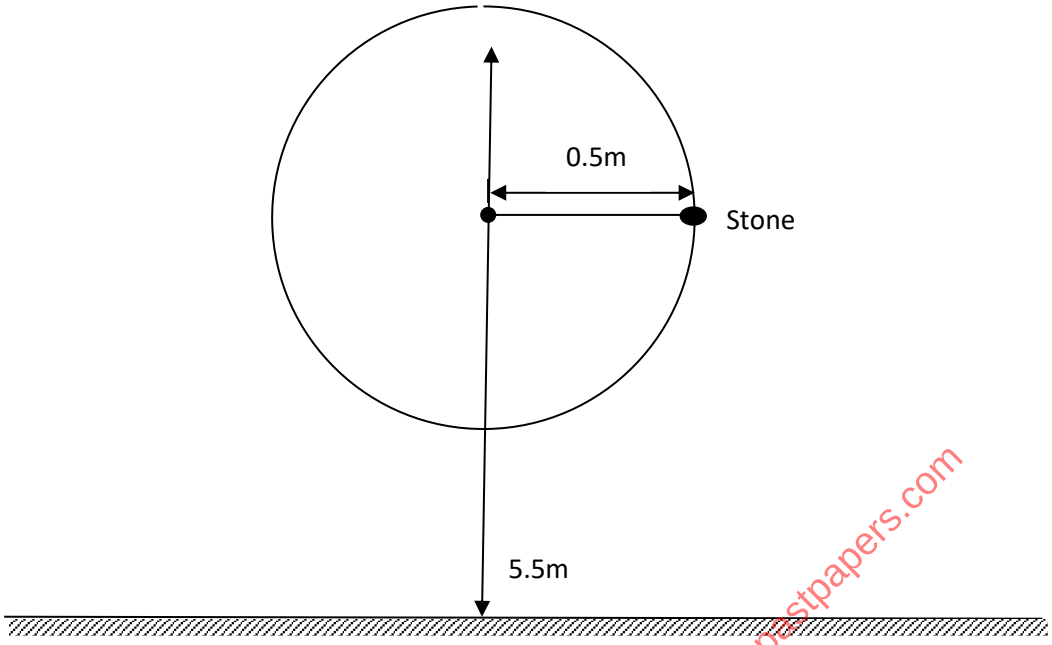
i) Heat gained by calorimeter. (2mks)

ii) Heat gained by water. (2mks)

iii) Specific heat capacity of the metal block. (3mks)

18. (a) State two factors affecting centripetal force (2mks)

(b) A stone of mass 0.5kg is attached to a string of length 0.5m which will break if the tension exceeds 20N. The stone is whirled in a vertical plane, the axis of rotation being above the ground, as shown in the Figure 10 below.



The angular velocity is gradually increased until the string breaks. At what angular velocity, ***w***, will the string break? (3mks)

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PHYSICS

PAPER 2

SECTION A (25 MARKS)

Answer all questions in this section

1. State one reason why in the construction of car head lamps parabolic reflectors are preferred to spherical reflectors. (1mk)

2. It is common practice that once an accumulator is recharged the terminals are connected using a wire to assess its state of charge. How is this dangerous to the life of the accumulator? (1mk)

3. Two identical spheres A and B each standing on an insulating base are in contact. A negatively charged rod is brought near sphere A as shown in figure 1

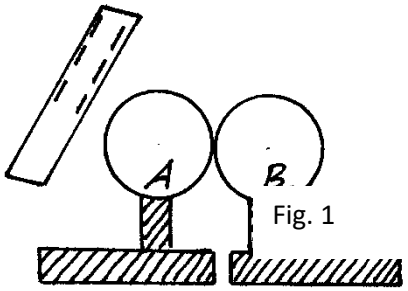


Fig. 1

In what way will A differ from B if separated while the rod is near? Explain. (2mks)

4. The ammeter in the circuit in figure 2 has negligible internal resistance. The cell has an internal resistance of 0.5Ω and an electromotive force of 3.0v.

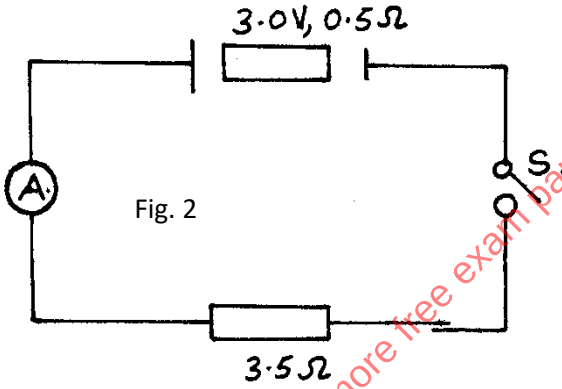


Fig. 2

Determine the value of current the ammeter registers when switch S is closed. (2mks)

5. Figure 3 represents a step-down transformer of ratio 10:1. The turns are wound uniformly on the core and the primary coil is connected to a 250va.c supply. The lengths KL and MN are as indicated.

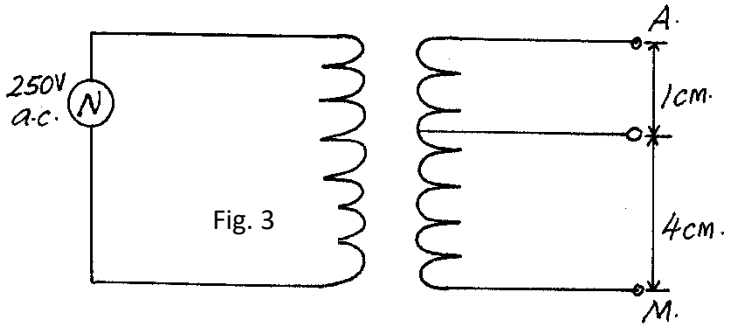


Fig. 3

Determine the p.d across LM. (4mks)

6. The diagram in figure 4 below shows a wire placed between the poles of two bar magnets.

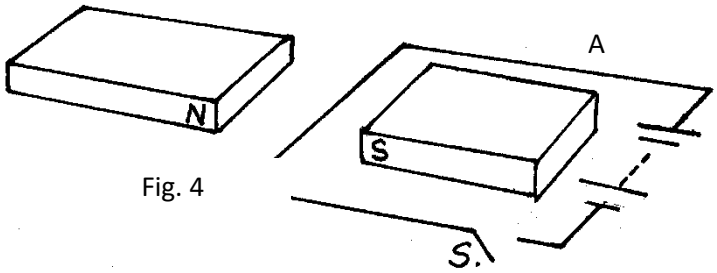


Fig. 4

Indicate with an arrow the force that acts on the section AB of the wire. (1mk)

7. An electric heater 480Ω is connected to a 240v main supply. Determine the energy dissipated in 4 minutes. (3mks)

8. A pin at the bottom of a beaker containing glycerine appears to be 6.8cm below the surface of glycerine. Determine the height of the column of glycerine in the beaker. (*take the refractive index of glycerine as 1.47*) (3mks)

9. 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)

10. What do you understand by 'doping' as applied with semiconductors? (1mk)

11. Arrange the following in order of decreasing wavelength Gamma radiation, Radio waves, Infrared and x-rays. (1mk)

12. Explain why soft iron keepers are suitable for storing magnets (2mks)

13. Figure 7shows a trace obtained on a cathode ray oscilloscope screen when an a.c is applied to the Y-plates and time base switched on.

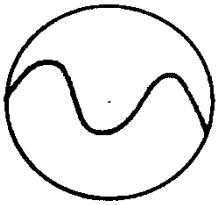


Fig. 7

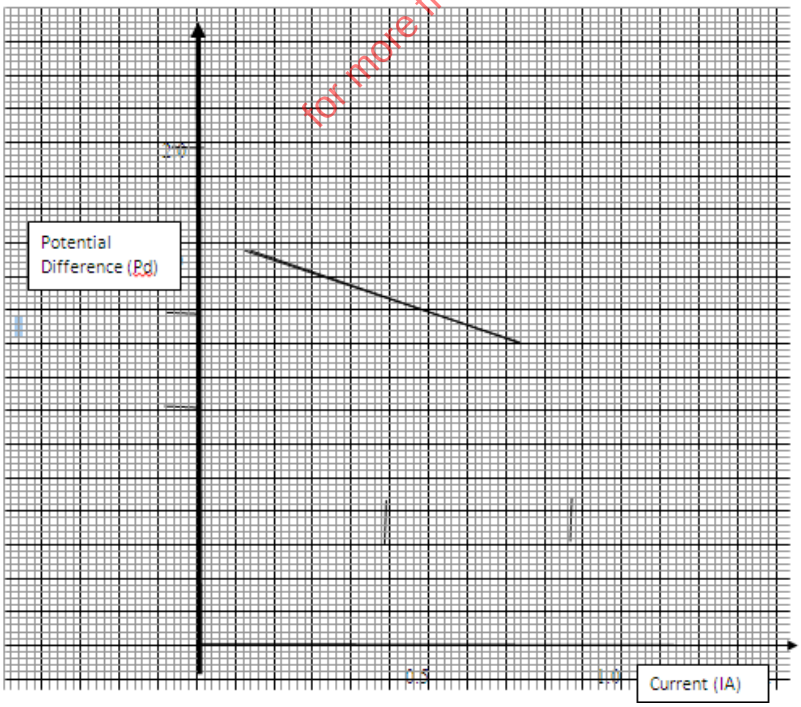
On the same figure draw a waveform showing what would be observed if the time base is doubled. (1mk)

SECTION B (55 MARKS)

Answer ALL the questions in this section in the spaces provided

14.(a) What is meant by an open circuit? (1mk)

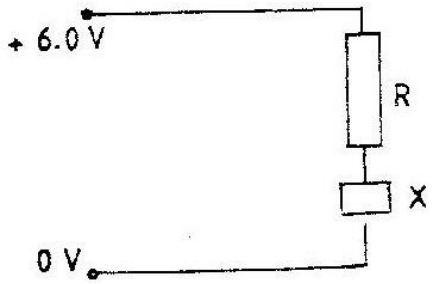
b) The graph in figure 5 shows the terminal voltage, V, of a certain battery varies with the current, I, being drawn from the battery.



(i) Write an expression relating the e.m.f. E, terminal voltage, V, current, I and the internal resistance, r, of the battery for the circuit drawn in (i) above. (1mk)

(ii) From the graph determine the; I internal resistance, r, of the battery. (2mks)

(b) When the device, X is connected in the circuit below, the voltage across it is 0.70 V.



Calculate the value of the resistance R. (3mks)

(c) The cell in figure 10 has an e.m.f of 2.1 V and negligible internal resistance.

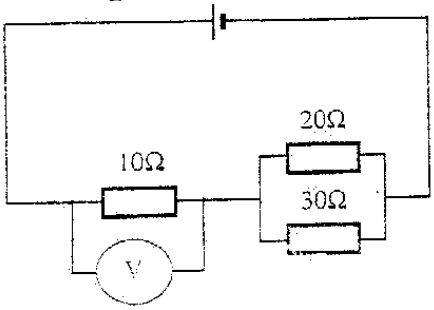


Figure 10

Determine the

(i) Total resistance in the circuit (2 marks)

(ii) Current in the circuit (1 mark)

(iii) Reading of the voltmeter (2 marks)

15. a) The figure 9 below shows magnetic relay circuit.

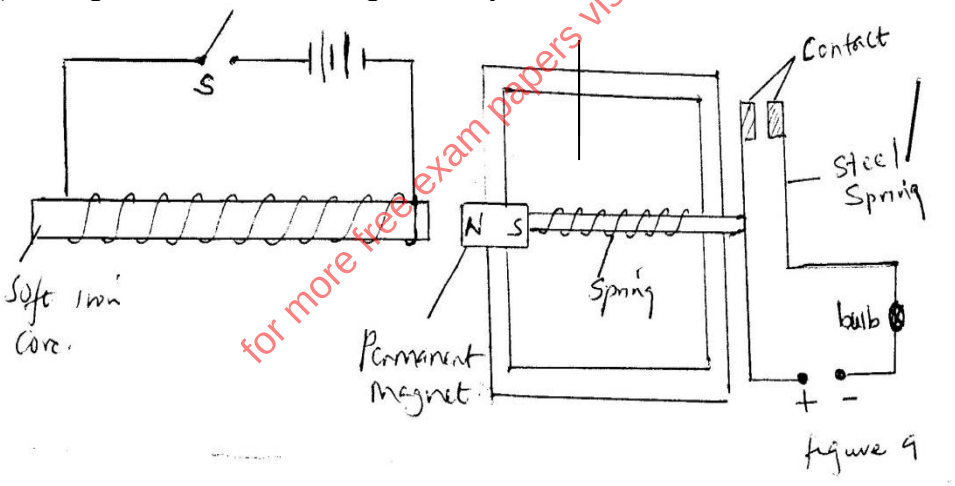
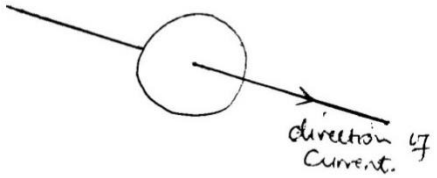


figure 9

Explain what will be observed when the switch is closed (4mks)

(b) The figure 10 below shows a current carrying conductor

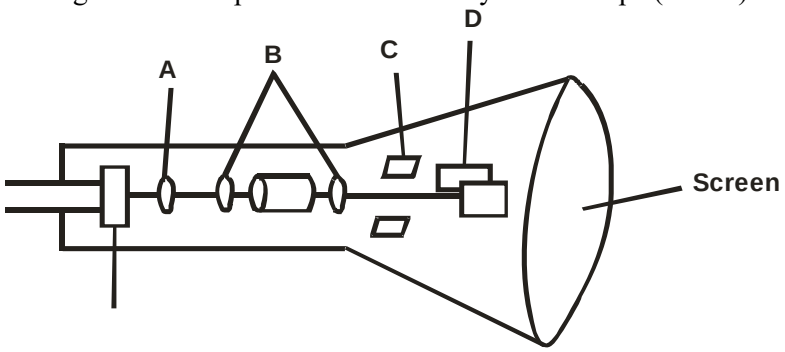


On the same diagram draw, the magnetic field pattern produced. (2mks)

(c) State two possible rules that can be used to predict the field direction produced in the above diagram. (2mks)

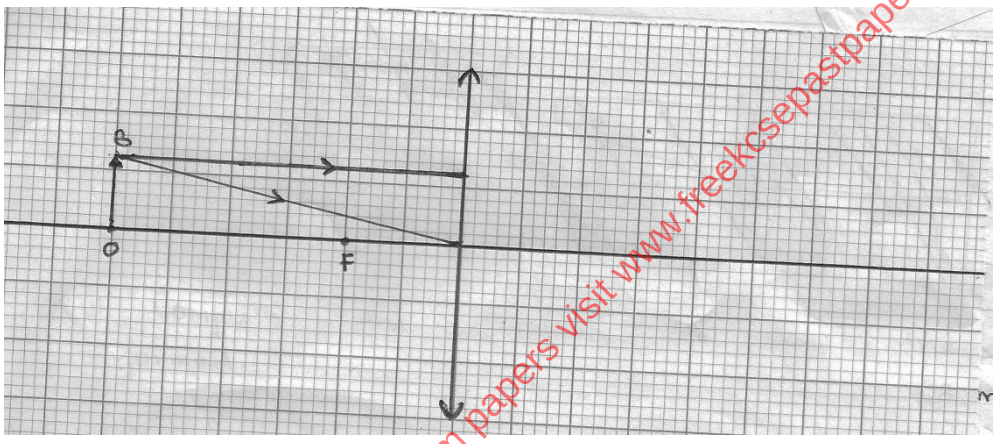
(d) List two applications of magnetic effect of electric current. (2mks)

16. a) The figure below represents a cathode ray oscilloscope (C.R.O)

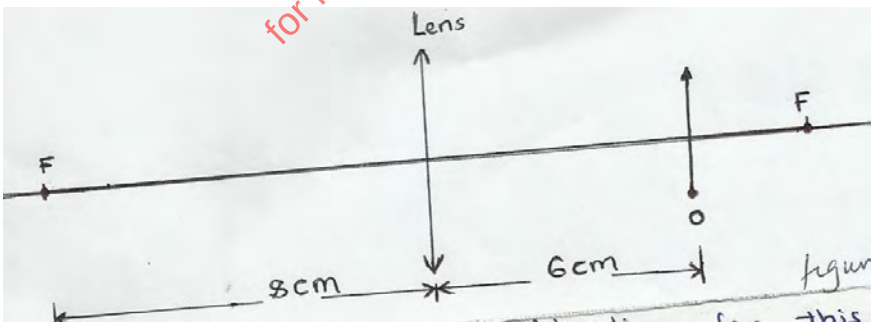


(b) Name the parts labelled A and B. (2mks)
(c) What are the functions of parts labelled C and D? (2mks)
(d) Explain how electrons are produced . (1mk)
(e) Give a reason why the tube is evacuated. (1mk)
(f) The potential between the anode and the cathode of an X-ray tube is 80kv. Calculate;
i) The energy of an electron accelerated in the tube. (Electronic charge e = 1.6×10^{-19} C) (3mks)
ii) The velocity of electrons in the tube. (Mass of an electron = 9.11×10^{-31}kg) (3mks)

17 (a) The figure 12 below shows two rays starting from the top of an object OB incident on a converging lens of focal length 2cm.



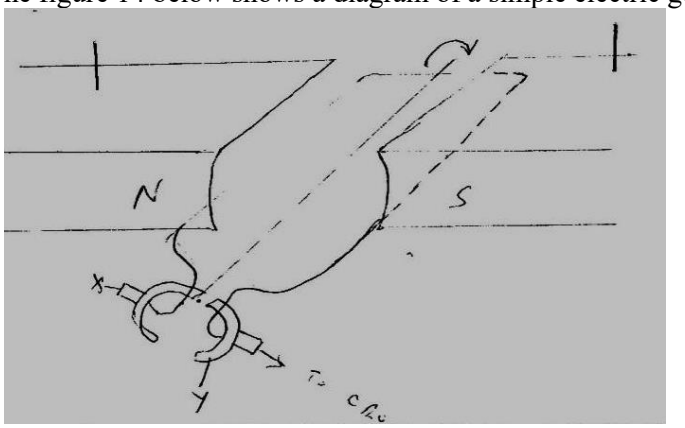
Complete the diagram to show the image formed (3mks)
(b) Add one or more incident ray from B and draw the corresponding refracted ray (1mk)
(c) Calculate the magnification produced by the lens (2mks)
(d) The figure 13 below shows an object placed at right angles to the principal axis of a thin converging lens.



i. Calculate the position of image formed (3mks)
ii. Give an application for this arrangement of a lens. (1mk)
iii. Describe the nature of the image formed (2mks)

18 (a) State Lenz's law of electromagnetic induction (1mk)

(b) The figure 14 below shows a diagram of a simple electric generator



State three factors that would affect the value of the voltage output (3mks).

(c) A transformer supplies a current of 13.5A at a voltage of 48v to a device from an AC main supply 240V. Given that the transformer is 80% efficient, calculate;

i. Power supplied to the transformer (3mks)

ii. Current in the primary coil (2mks)

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PHYSICS

PAPER 3

CONFIDENTIAL

Provide the following

- ✓ A watch glass.
- ✓ A small piece of plasticine.
- ✓ A marble.
- ✓ A stopwatch.
- ✓ Vernier calipers.
- ✓ An electronic balance (to be shared).
- ✓ Triangular prism of 60º.
- ✓ Four optical pins
- ✓ A softboard
- ✓ A plain paper
- ✓ Two dry cells.
- ✓ Nichrome wire 100cm on a mm scale.
- ✓ An ammeter.
- ✓ Cell holder.
- ✓ Voltmeter.
- ✓ Connecting wires with crocodile clips.
- ✓ Switch.

LANJET JOINT EXAMINATION 2020
Kenya Certificate of Secondary Education.
232/3
PHYSICS
PAPER 3
PRACTICAL

QUESTION 1 (PART A)

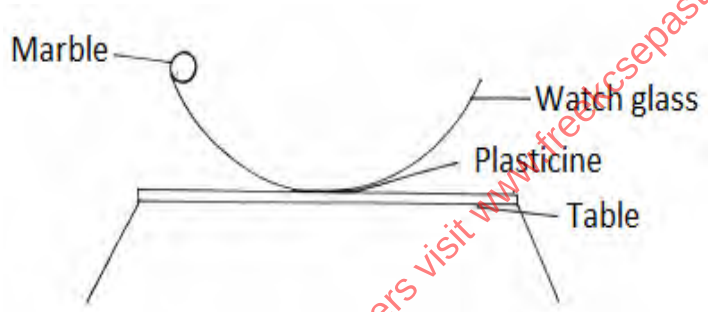
You are provided with the following:

- ✓ A watch glass.
- ✓ A small piece of plasticine.
- ✓ A marble.
- ✓ A stopwatch.
- ✓ Vernier calipers.
- ✓ An electronic balance (to be shared).

(a) Measure the mass M of the marble.
M = ……g (½mk)

(b) Place the watch glass flat on the table with a small piece of plasticine to fix it firmly to the table at the place it touches.

(c) Release the marble from one end of the watch glass and time 10 complete oscillations with a stop watch. Repeat this three times.



(d) Record your values in table 1 below.
Table 1

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

(2mks)

Find the average periodic time T.
T = …… S. (½mk)

(e) Measure the diameter of the marble with the vernier callipers and hence find its radius.
Diameter d = …….. m (½mk)
Radius r = …… m (½mk)

(f) Determine the volume (V) of the marble given that:

$$V = \frac{4}{3}\pi r^3$$ (1mk)

(g) 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/s² and π = 3.142.

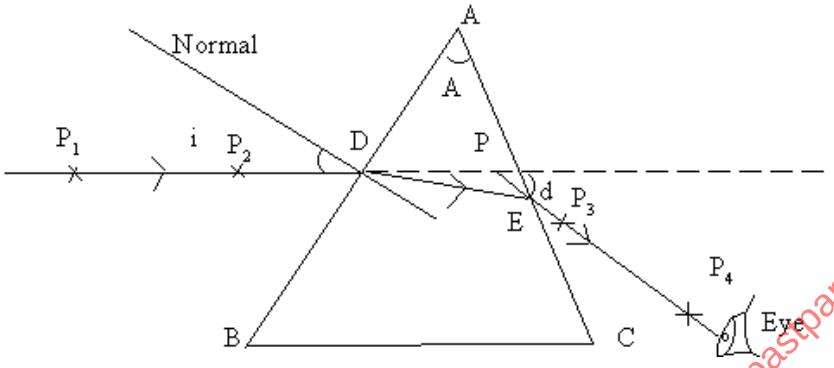
PART B

You are provided with the following

- ✓ A triangular prism of 60^0.
- ✓ Four optical pins
- ✓ A soft board
- ✓ A plain piece of paper

Proceed as follows

(a) Place the plain sheet of paper on the soft board
(b) Place the prism with one face on the plain paper and trace its outline.
(c) Remove the prism from the plain sheet of paper.



(d) Mark angle A and record its value.
A = ...(1mk)

(e) Draw a normal as shown and draw a ray of incident on the normal at an angle of incidence of 30^0.

(f) Replace the prism on the outline on the sheet.

(g) Stick two pins P_1 and P_2 along the path of the incident ray as shown in the diagram.

(h) View the images of P_1 and P_2 through the glass prism through face AC as shown on the diagram.

(i) Stick two pins P_3 and P_4 so that they appear to be in line with P_1 and P_2 as seen through the glass prism.

(j) Remove the pins and prism from the sheet. Trace the path of the ray until it emerges from the glasses shown in the diagram.

(k) Extend the incident ray and the emergent ray until they meet at P. Measure and record the angle of deviation d.

(l) Repeat the experiment for other angles of incidence shown in the table. (3 marks)

Angle of incidence (i)^o	30	35	40	45	50	55	60
Angle of deviation (d)^o							

(m) Plot a graph of angle of deviation $(d)^0$ against angle of incidence $(i)^0$. (5 marks)
(l) Present your working.
(n) From the graph determine the minimum angle of deviation D. (1 marks)
(p) Find the refractive index of the prism material using (3 marks)

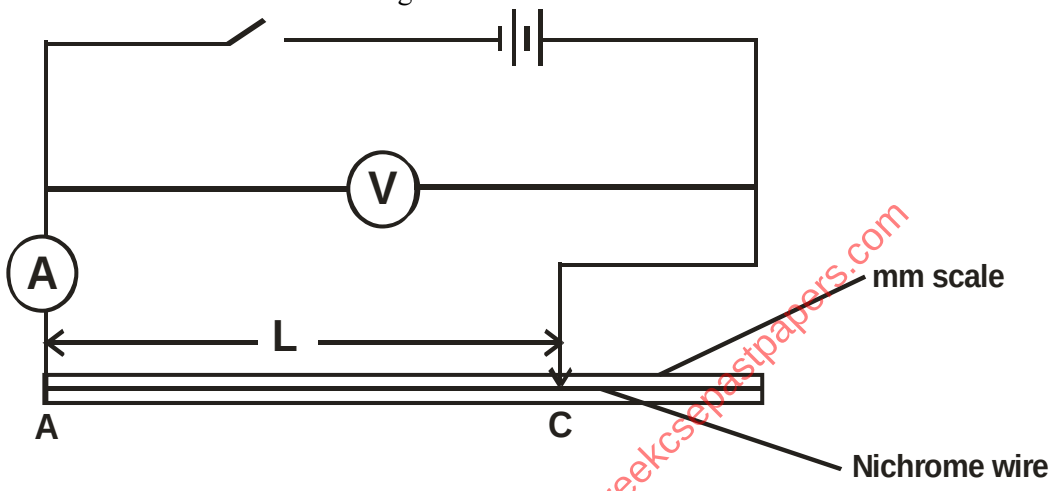
$$n = \frac{\text{Sin}\,\frac{(A+D)}{2}}{\text{Sin}\left(\frac{A}{2}\right)}$$

QUESTION 2
PART A

1. You are provided with the following apparatus.
   - Two dry cells.
   - Nichrome wire 100cm on a mm scale.
   - An ammeter.
   - Cell holder.
   - Voltmeter.
   - Connecting wires with crocodile clips.
   - Switch.

Proceed as follows;

a) Connect the circuit as shown in the diagram.



b) Connect the ends A and C where AC is the length L of the Nichrome wire across the terminals as shown. Close the switch and measure both current I and potential difference (P.d) across the wire AC when L = 100cm.
Current I = …… (1 mark)
P.d, V = …… (1 mark)

c) Measure the E.m.f of the cells, E.
E = …… (1 mark)

d) Reduce the length L (AC) to the lengths shown in the table below. In each case record the current, I, and the corresponding P.d.

Length L (cm)	100	70	60	50	40	20
I (A)						
P.d (V)						
E – V (v)						

(6 marks)

e) Plot a graph of E – V against I(A) on x-axis in the grid provided. (5 marks)

f) Given that E = V + Ir, determine the internal resistance, r, of each cell. (3 marks)

M O K A S A J O I N T E X A M I N A T I O N
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PHYSICS
PAPER 1
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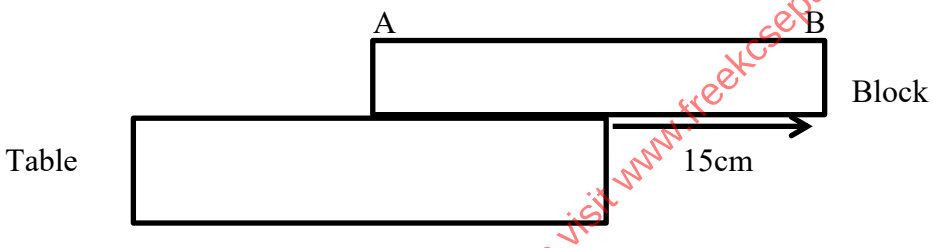
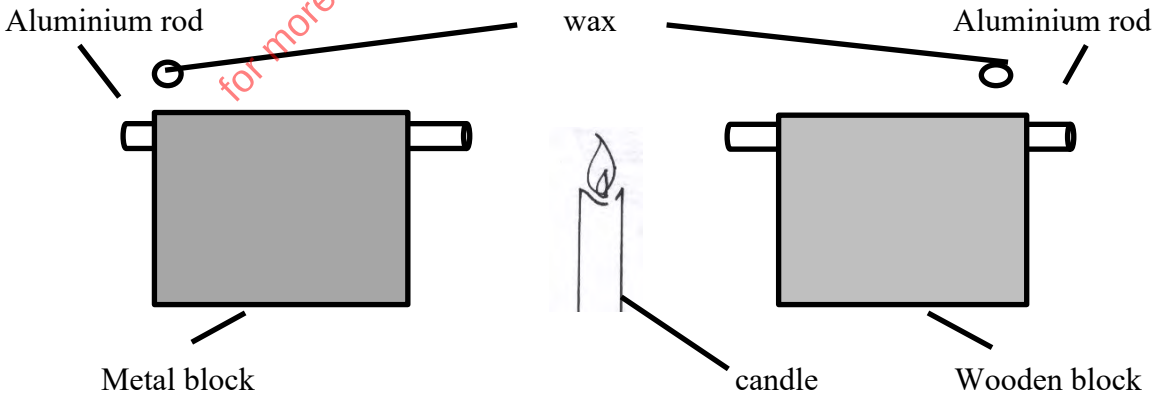
PHYSICS
THEORY
Paper 1
Time: 2 hours

SECTION A(25 MARKS)

1. State the difference between heat and temperature (1 mark)
2. The acceleration due to gravity on Jupiter is about 2.6 times that on earth. A spacecraft has a weight of 24500N on earth.
   a) What is the mass of the spacecraft? (1 mark)
   b) What would be the weight on Jupiter? (take acceleration due to gravity on earth as 10N/Kg) (2 marks)
3. Use kinetic theory to explain pressure law (3 marks)
4. The figure below shows a uniform block of mass 10kg and length 35cm lying on a table. It hangs over the edge of the table by 15cm.

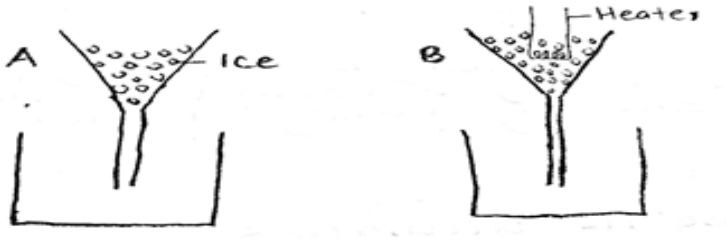


   Determine the minimum force that can be applied on the block at point B to make it turn about the edge of the table. (3marks)
5. Compare diffusion of chlorine gas into air and into vacuum then explain your comparison (2marks)
6. Two identical aluminum rods are placed as shown in the figure below. One rests on a metal block and the other on the wooden block. The protruding ends are heated on a Bunsen burner as shown below:



   State with reason in which bar the wax is likely to melt (2marks)

7. Figure below shows one method of measuring the specific latent heat of fusion of ice. Two funnels A and B contain crushed ice at 0°C.

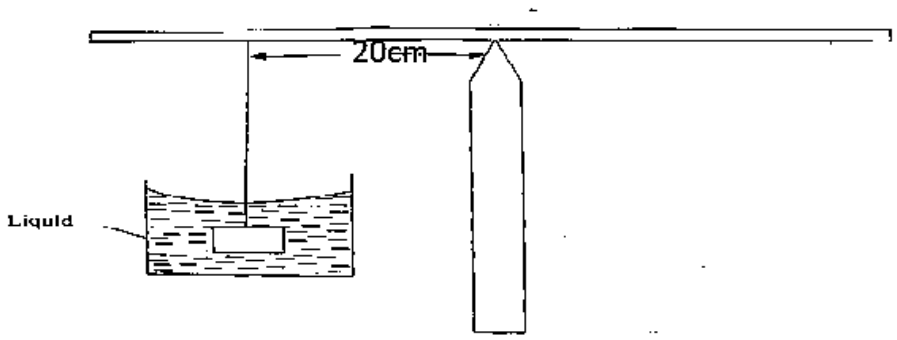


The mass of melted ice from each funnel is measured after 11 minutes. The results are shown below. Mass of melted ice in A = 24g, Mass of melted ice in B = 63g.If the power of the heater is 0.024KW, determine the specific latent heat of fusion of ice. (3marks)

8. An ungraduated mercury thermometer attached to a millimeter scale reads 24mm in ice at 0°C and 250mm in steam of water at 100°C.Calculate its reading on a day when the temperature is 30°C. (3marks)
9. Sketch a pulley system with a velocity ratio of 4 using 3 pulleys (2marks)
10. Explain why a Bunsen burner has a wide heavy base (2marks)
11. Why is the capillary bore of liquid in glass thermometer narrow (1mark)

SECTION B (55 MARKS)

12. a) State the principle of conservation of momentum (1mark)
    b) A bullet of mass 20g travelling horizontally at a speed of 250m/s hits a stationary block of wood of mass 1000g on a rough table surface. The bullet emerges on the other side of the block at a velocity of 90m/s
        i) State the types of collision involved above (1mark)
        ii) Determine the initial velocity of the block after being hit by the bullet (3marks)
        iii) If the block travels at a distance of 5m, determine;
            I. the deceleration on the block (3marks)
            II. frictional force on the block (2marks)
            III. coefficient of friction on the surface (2marks)
13. a) State the law of floatation. (1mark)
    b) A piece of sealing wax weighs 3N in air and 0.22N when immersed in water. Calculate
        i) its relative density (2marks)
        ii) its apparent weight in a liquid of density 800kg/m^3 (3marks)
    c) The figure below shows a uniform beam one metre long and weighing 2N kept in horizontal position by a body of weight 5N immersed in a liquid.



Determine the upthrust on the load (3marks)

d) A block of wood of volume V floats with 0.75 of its volume submerged in water. When put in another liquid it floats with 0.42 of its volume under the liquid. Calculate:

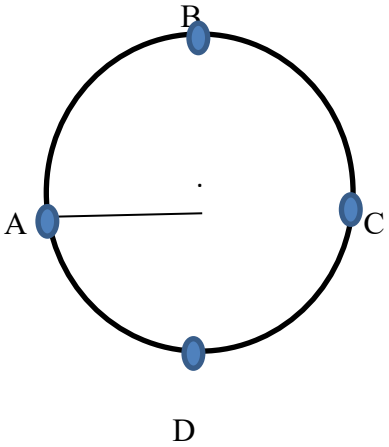
i. the density of the wood (3marks)

ii. the density of the liquid (3marks)

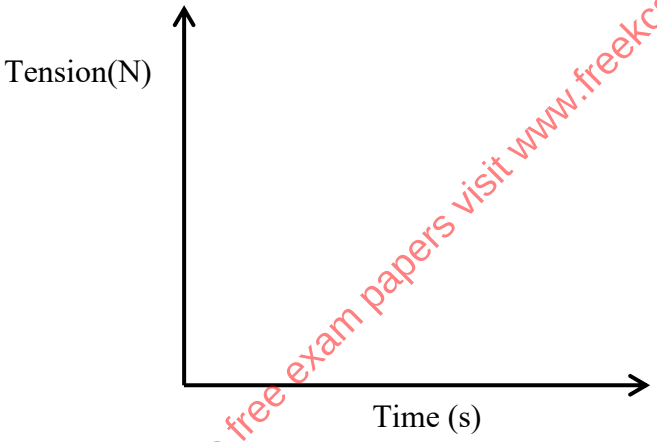
14. a) Explain why bodies in circular motion undergo acceleration even when their speed is constant. (2marks)

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

c) Figure below shows a stone being whirled in a vertical circle in the clockwise direction.

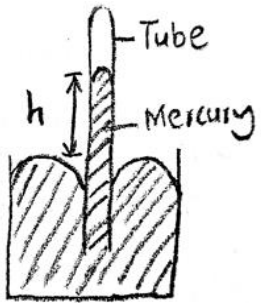


On the axes provided, sketch a graph of tension against time as the stone moves through points A, B, C and D. (2marks)



c) State two applications of uniform circular motion. (2marks)

15. a) The figure below shows a simple mercury barometer



=

i. When the tube was tilted mercury did not fill the tube completely. Give a reason for the observation (1 mark)

ii. give a reason why mercury is preferred as a liquid in a glass barometer (1mark)

iii. A town at an altitude of 548m has a barometric height of 70cmHg.Given that the standard atmospheric pressure is 76cmHg and that the density of mercury is 13600kg/m^3, determine the density of air (3marks)

b) A student half-filled a container with water, boiled the water for several minutes with the cork removed. Then later replaced the cork and poured some cold water on the container. State and explain the observation made (2marks)

c) Determine the pressure on a piston of cross-sectional 20cm^2 when a force of 50MN is applied to its surface (2marks)

16. In an experiment to determine the approximate diameter of an oil molecule, the following measurements were obtained:

-Diameter of oil drop=0.05cm

-Diameter of oil patch=0.2m

Determine:

i. Volume of oil drop (3marks)
ii. Area of oil patch (2marks)
iii. Thickness of oil molecule (3marks)
iv. State two assumptions made in the above experiment (2marks)

MOKASA JOINT EVALUATION TEST
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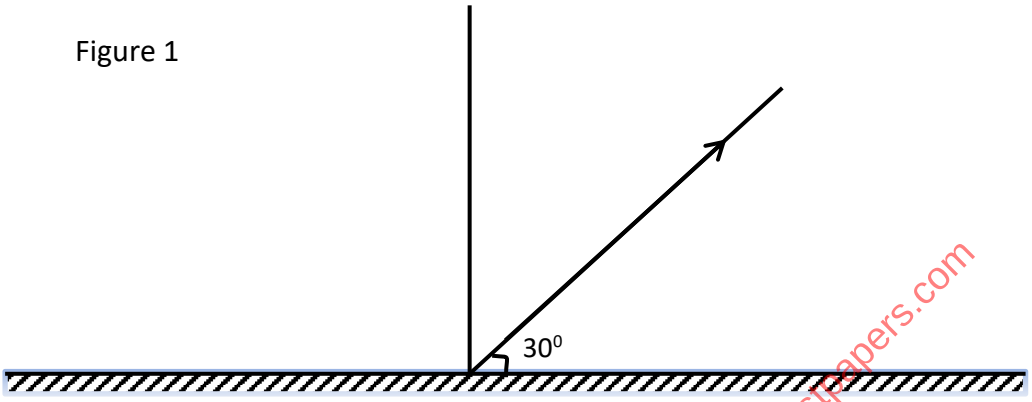
PHYSICS
PAPER 2

SECTION A (25 MARKS)

Answer all the questions in the space provided

1. **Figure 1** below shows a ray of light reflected from a mirror.

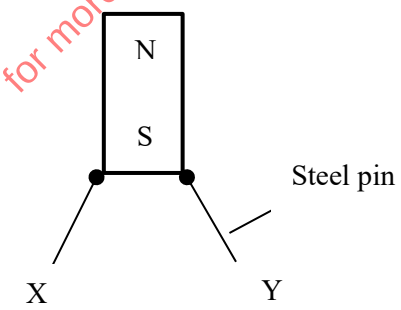
Figure 1



Complete the ray diagram and find the new angle of reflection after it is rotated 10^0 anticlockwise with the incident ray fixed. (2marks)

2. Three electric bulbs are connected in series with a battery of two dry cells and a switch. At first the bulbs light brightly.
   (a) State a reason why they gradually light dim. (2marks)
   (b) The switch is put off for sometimes. Explain why the bulbs again shine brightly. (1mark)
3. A positively charged rod is brought near the cap of a lightly charged electroscope. The leaf first collapses and as the rod comes nearer, the leaf diverges.
   (i) What is the charge on the electroscope? (1mark)
   (ii) Explain the behavior of the leaf. (2marks)
4. Figure 2 below shows a bar magnet attracting steel pin as shown

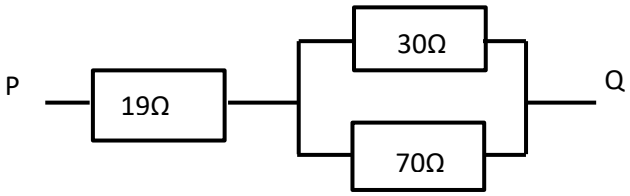
Figure 2



State and explain what would happen when a North pole of a bar magnet is brought near the tips of steel pin X and Y. (2marks)

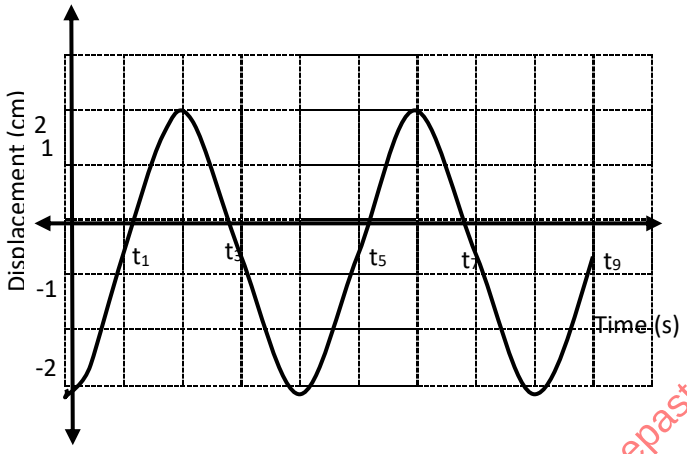
5. Determine the equivalent resistance between P and Q for the following resistors shown in Figure 3. (2marks)

Figure 3



6. Figure 4 below shows a wave profile for a wave whose frequency is 5Hz.

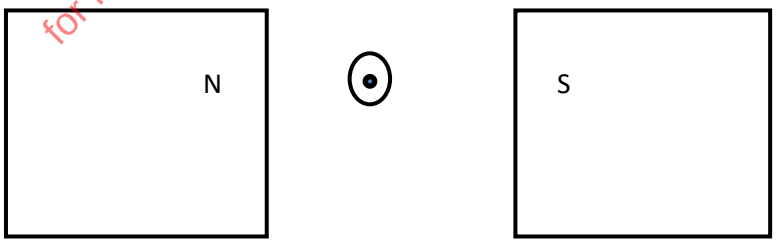
Figure 4



Determine the value of t_8. (2marks)

7. An electromagnetic radiation whose wavelength is greater than that of microwaves has a wavelength of 306.1224 m. Take speed of light in air, c = 3 x10^8 m/s.
   (a) Identify the radiation. (1mark)
   (b) Calculate its frequency. (2marks)
8. Two heating coils A and B connected in parallel in a circuit produces power of 36W and 54W respectively. What is the ratio of their resistance? (2marks)
9. State **two** conditions necessary for total internal reflection to occur. (2marks)
10. Define coherent source of a wave. (1mark)
11. Figure 5 below show a conductor carrying electric current place between two magnetic poles.

Figure 5



Complete the diagram by sketching the magnetic field and also show the direction of the force on the conductor. (3 marks)

Section B (55 marks)

Answer ALL the questions in the spaces provided

12. (a) State **one** factor that affects the force between two charged bodies. (1mark)

(b) To investigate charge distribution on metallic surfaces, electric charges were collected from different parts of the surfaces using a proof plane as shown in figure 6 below:

Figure 6

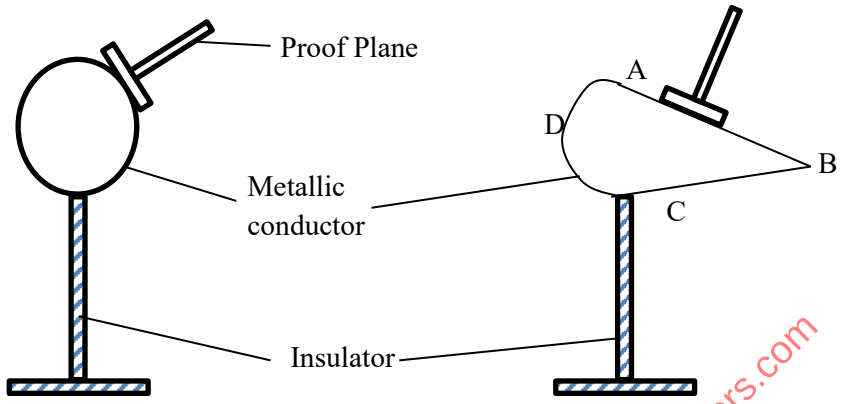


Fig. (i) Fig. (ii)

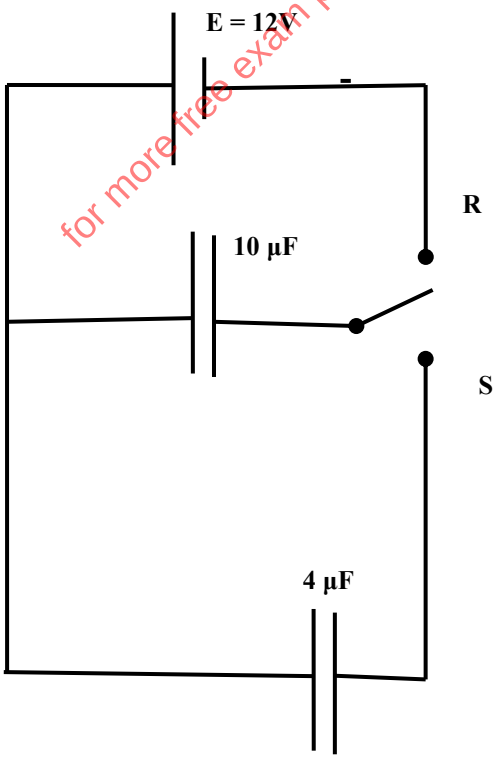
The proof plane was then placed on the cap of a neutral electroscope.

(i) State and explain the leave divergence of the electroscope as the proof plane is placed at various points round the spherical surface in figure (i) above. (2marks)

(ii) State with reason which part of the conductor in figure (ii) gave the greatest deflection of the electroscope. (2marks)

(c) Figure 7 shows a 10μF capacitor being charged from a 12V battery by connecting the switch terminal on R. The switch is then connected to S to discharge the 4μF capacitor.

Figure 7



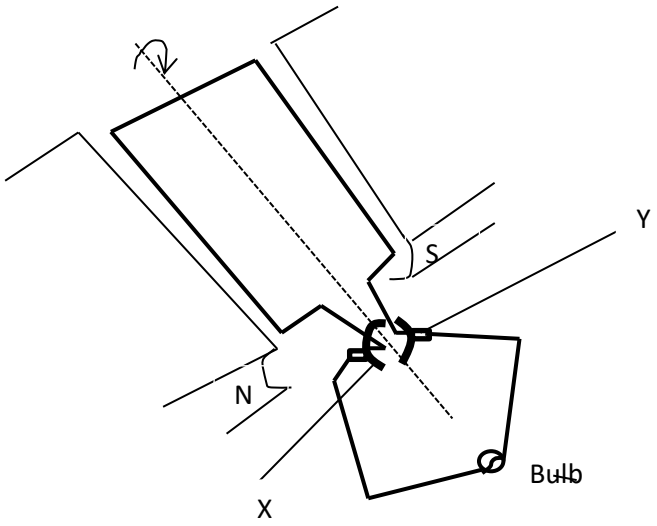
Determine the resultant potential difference between the two capacitors. (3marks)

(c) State two uses of capacitors. (2marks)

13. (a) State Faradays law of electromagnetic induction. (1mark)

(b) Figure 8 below shows a simplified circuit of a generator.

Figure 8



(i) Identify parts X and Y. (2marks)

(ii) State **two** ways of making the bulb light brighter. (2marks)

(c) An a.c generator produces an e.m.f of 50.0V which is used to operate a circuit that requires a minimum of 250.0V. If the power of the generator is 200W, determine the:

(i) Current generated by the a.c source. (2marks)

(ii) Current supplied to the circuit by the transformer assuming 100% efficiency. (2marks)

(iii) Ratio of turns in the coils of the transformer, primary: secondary. (2marks)

…(d) Explain how power loses in a transformer are minimized. (2marks)

(i) Eddy currents

(ii) Hysteresis losses

14. (a) A disc of a siren with 100 holes is rotated at constant speed making 0.5 revolutions per second. If air is blown towards the holes, calculate:

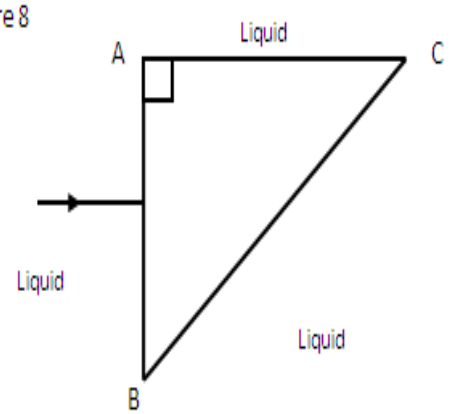
(i) The frequency of the sound produced. (2marks)

(ii) The wavelength of the sound produced, if the velocity of sound is 340 m/s. (2marks)

(b) A ship sends out an ultrasound whose echo is received after 5 seconds. If the wavelength of the ultrasound in water is 0.05 m and the frequency of the transmitter is 50 KHz, calculate the depth of the ocean. (3marks)

(c) A ray of light is incident at right angles to the face AB, of a right angled isosceles prism of refractive index 1.6 as shown in Figure 8 below.

Figure 8



If the prism is surrounded by a liquid of refractive index 1.40, determine:

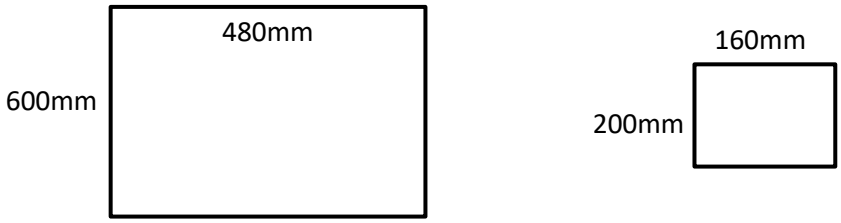
(i) The angle of incidence on the face BC. (1mark)

(ii) The angle of refraction on the face BC. (3marks)

(a) Distinguish between principal focus and focal length of a concave lens. (1mark)

(b) Figure 9 below shows sketches of a window frame and its image formed on a screen by a convex lens.

Figure 9



(i) State the nature of the image formed. (2marks)

(ii) Calculate the linear magnification of the imaged formed. (2marks)

(iii) The imaged of the frame was produced 500mm from the lens. Calculate the focal length of the lens. (3 marks)

(c) A student finds that at a distance of 25 cm, the words in a book looked blurred.

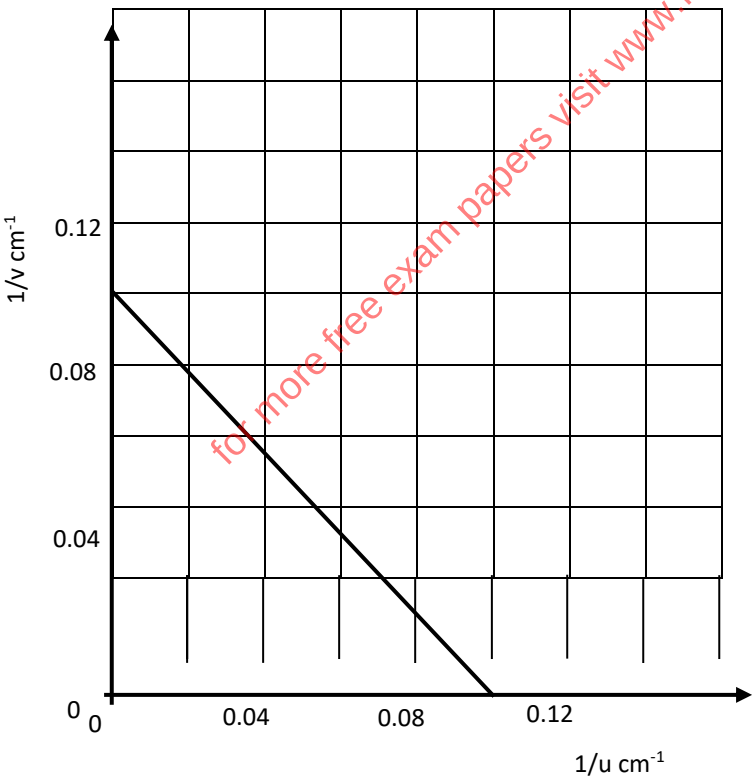
(i) What eye defect does the student suffering from? (1mark)

(ii) In which direction does he/she move the book to be able to see the words clearly from the distance? (1mark)

(iii) Which lens can be used to correct the eye defect? (1mark)

15. (a) (i) Figure 10 shows a graph of 1/v against 1/u for a concave mirror. Use your graph to determine the focal length of the mirror. (2marks)

Figure 10



(ii) Determine the image distance when the magnification is m = 2 for the concave mirror above. (3 marks)

(b) State **one** application of each of the following

(i) Convex mirror. (1mark)

(ii) Parabolic mirror. (1mark)

(c) A small object is placed 15 cm in front of a convex mirror of focal length 10 cm. Determine the position of the image. (3marks)

MOKASA JOINT EVALUATION TEST
Kenya Certificate of Secondary Education (KCSE)
232/2
PHYSICS
PAPER 2
Confidential

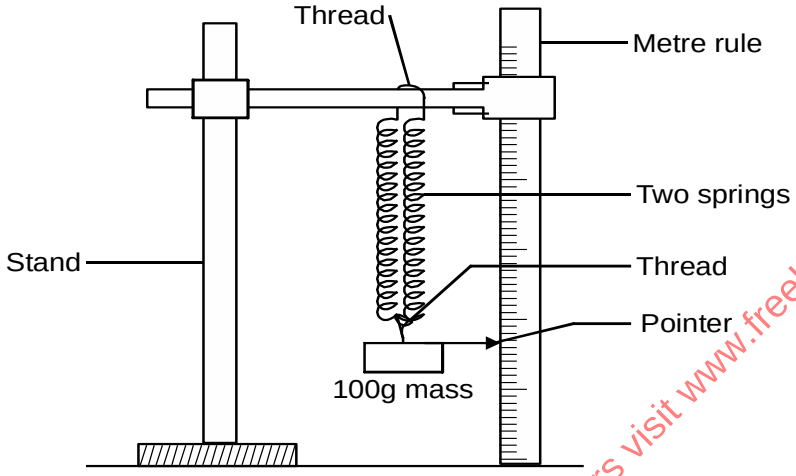
- ✓ One stand
- ✓ One boss
- ✓ One clamp
- ✓ Two pieces of thread
- ✓ One stopwatch
- ✓ One metre rule or half metre rule
- ✓ Two springs.
- ✓ Six 100g masses
- ✓ A piece of cellotape.
- ✓ Two dry cells.
- ✓ Nichrome wire mounted on a mm scale.
- ✓ An ammeter.
- ✓ Cell holder.
- ✓ Voltmeter
- ✓ 8 connecting wires.
- ✓ Metre rule
- ✓ Switch.
- ✓ Rectangular glass block
- ✓ 3 optical pins
- ✓ A soft board.
- ✓ A plane paper
- ✓ 4 paper pins.

MOKASA JOINT EVALUATION TEST
Kenya Certificate of Secondary Education (KCSE)
232/3
PHYSICS
PAPER 3

You are provided with the following:

- One stand
- One boss
- One clamp
- Two pieces of thread
- One stopwatch
- One metre rule or half metre rule
- Two springs.
- Six 100g masses
- A piece of cellotape.

a)



a) i) Hang the springs from rod of a clamp as shown in the figure above.
ii) Tie together the upper end and the lower ends to springs with pieces of thread as shown in the figure.
iii) Hang a 100g mass from the lower ends of he springs so that the mass is supported by both springs.
iv) Clamp the rule vertically with zero-centimetre mark uppermost.
v) Use cellotape to fix the optical pin on the top of the 100g mass so that it acts as a pointer.
vi) Adjust the rule so that the pointer is at 40.0cm mark from the top of the rule.

b) i) Add a 100g mass to the first mass. Record the new position of the pointer and the extension, e, in the table below.
ii) Add another 100g mass and record the new position of the pointer and the extension in the table.
iii) Repeat b(ii) until the total mass supported by the spring is 600g.

c) i) Remove the rule. Displace the 600g mass slightly downwards and release it to oscillate vertically.
ii) Time 20 oscillations. Record in the table the time, t_1 for 20 oscillations. Repeat this to obtain the average time, t, and the period of oscillation T.
iii) Repeat (c) (i) and (ii) for 500g, 400g 300g and 200g masses.
iv) Find T^2 and complete the table.

Mass (g)	100	200	300	400	500	600
Position of point (cm)	40.0					
Extension, e, cm	0.0					
Time of t, (s)						
20 oscillations t2(S)						
Average time, t(s)						
Periodic time, T(s)						
$T^2(S^2)$						

d) i) On the grid provided plot a graph of T^2(vertical axis) against the extension, e. (5 marks)
ii) Determine the gradient of the graph. (2 marks)
iii) The equation of the graph is given by

$$T^2 = \frac{4\pi^2}{b}e + c$$

Where b and c are constants.

Determine the value of b. (1 mark)

What does the value of b represent? (1 mark)

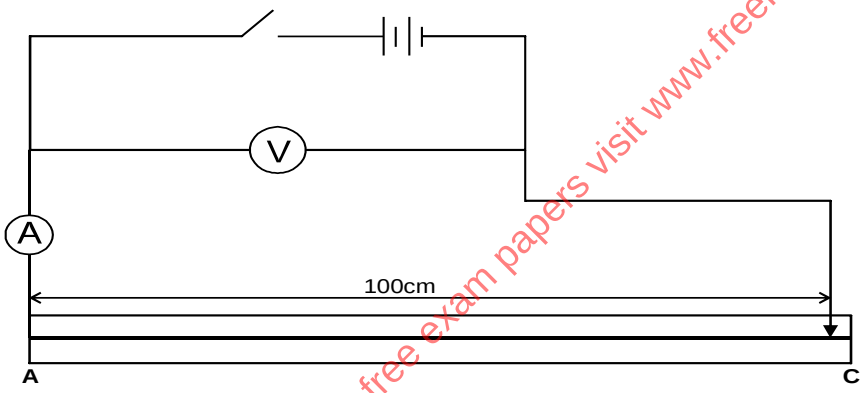
2. PART A

You are provided with the following apparatus.

- ✓ Two dry cells.
- ✓ Nichrome wire mounted on a mm scale.
- ✓ An ammeter.
- ✓ Cell holder.
- ✓ Voltmeter
- ✓ 8 connecting wires.
- ✓ Metre rule
- ✓ Switch.

Proceed

a) Connect the circuit as shown in the diagram below.



b) Connect the end A and C where AC is 100cm across the terminals as shown. Close the switch and measure both current I and p.d. across the wire AC.
Current = I ..... (½ mark)
P.d V = ... (½ mark)
c) Measure the emf of the cells E = ... (½ mark)
d) Reduce the length AC. In each case record the current I and the corresponding V. Complete the table below.

Length L(cm)	**100**	**70**	**60**	**50**	**40**	**20**
Current I (A)						
P.d. (V)						
E - V (v)						

e) Plot a graph of (E - V) against I (A) (5 marks)
f) Determine the slope of the graph. (2 marks)
g) Given that E = V + 1r determine r from your graph. (1½ marks)

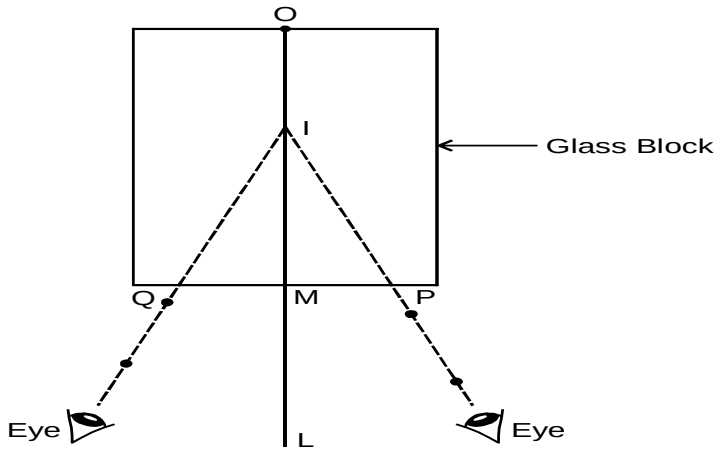
Question 2 PART B

You are provided with the following apparatus.

- ✓ Rectangular glass block
- ✓ 3 optical pins

- ✓ A soft board.
- ✓ A plane paper
- ✓ 4 paper pins.

Place the rectangular glass block in the middle of the plane paper and trace its outline. Using a pencil remove the block.



Construct a perpendicular line LMO bisecting the shorter sides of M and O.
Mark points P and Q such that PM = MQ = 5cm.

a) Measure (1 mark)
OM.....

- Place the plane paper on the soft board and carefully replace the glass block so that it fit the outline.
- Press the object pin on O such that it is upright and touching glass block and the second pin on P also upright and touching the block.
- Press the third pin P_1 a short distance form the block such that P_1, P and I lie on a straight line when viewed through the block with one eye. I is the image of the object pin O.
- Repeat the experiment with now on Q. Press the third pin P_2 a short distance from the block such that when viewed P_2, Q and I lie in a straight line.

b) Remove the pins and glass block; draw the lines P_1PI (PI dotted) and P_2 QI (QI) doted meeting OM at I.
IM = ...cm (1 mark)

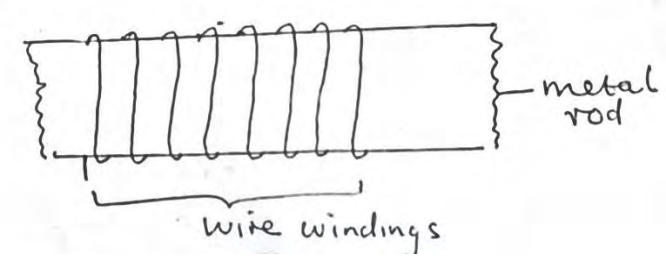
c) Using the above information calculate the refractive index of the glass block by real and apparent depth method. (2 marks)

d) NB - Hand in your work on the plane paper. (1 mark)

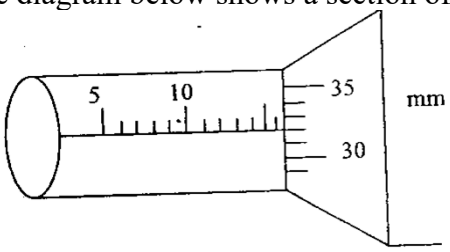
KIRINYAGA WEST JOINT EVALUATION TEST
Kenya Certificate of Secondary Education (KCSE)
232/1
PHYSICS
PAPER 1
THEORY

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

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)

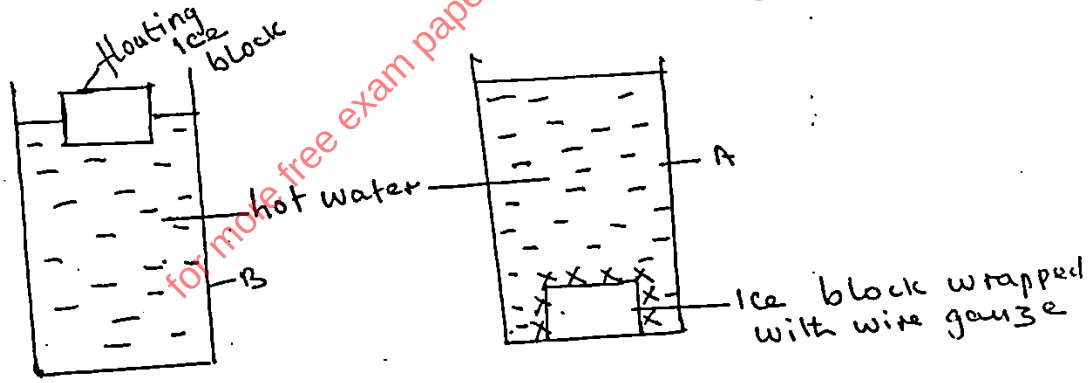


2. The diagram below shows a section of a micrometer screw gauge.



(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)

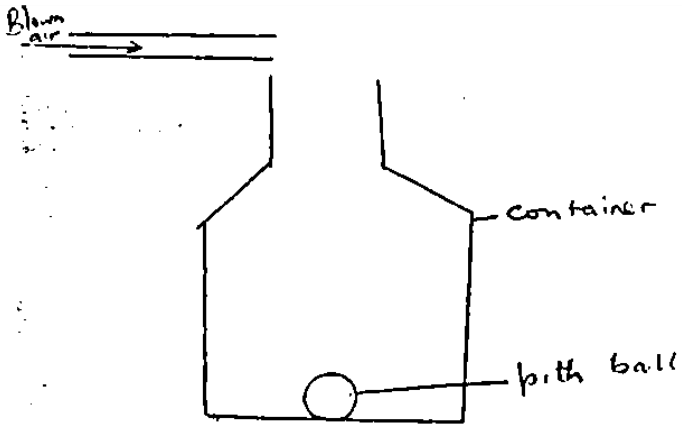
3. The figure below shows two identical containers A and B containing hot water and ice block.



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

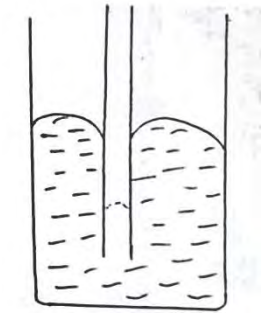
4. A bus that carries goods in the under seats carrier is more stable than one that carries goods in the carrier at the top. Explain why this is so. (1 mark)
5. A turntable of radius 16 cm is rotating at 960 revolution per minute. Determine the angular speed of the turntable. (2 marks)
6. Sketch a velocity – 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)



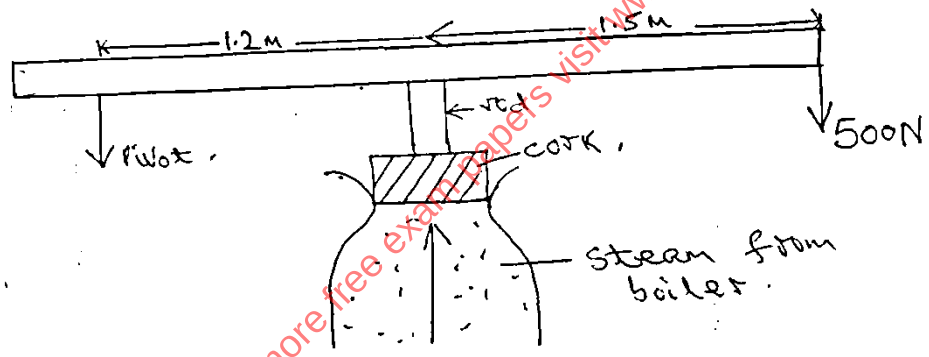
State and explain what would happen if air is blown over the mouth of the container. (2 marks)

8. The figure below shows a capillary tube placed in a trough of a mercury.



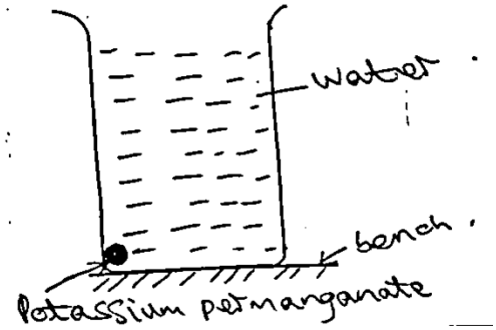
Give a reason why the level of mercury in a capillary is lower than in the beaker. (1 mark)

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)

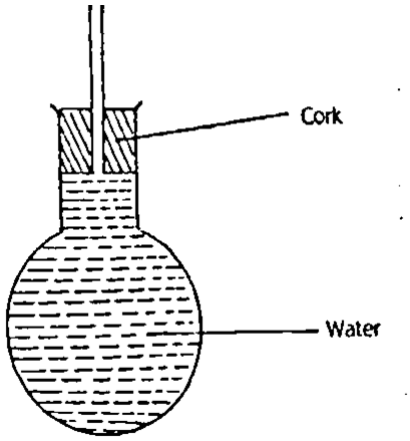
10. In an experiment a crystal of potassium permanganate was placed in water as shown below.



After sometime, it was observed that the water turned purple. Explain the observation. (1 mark)

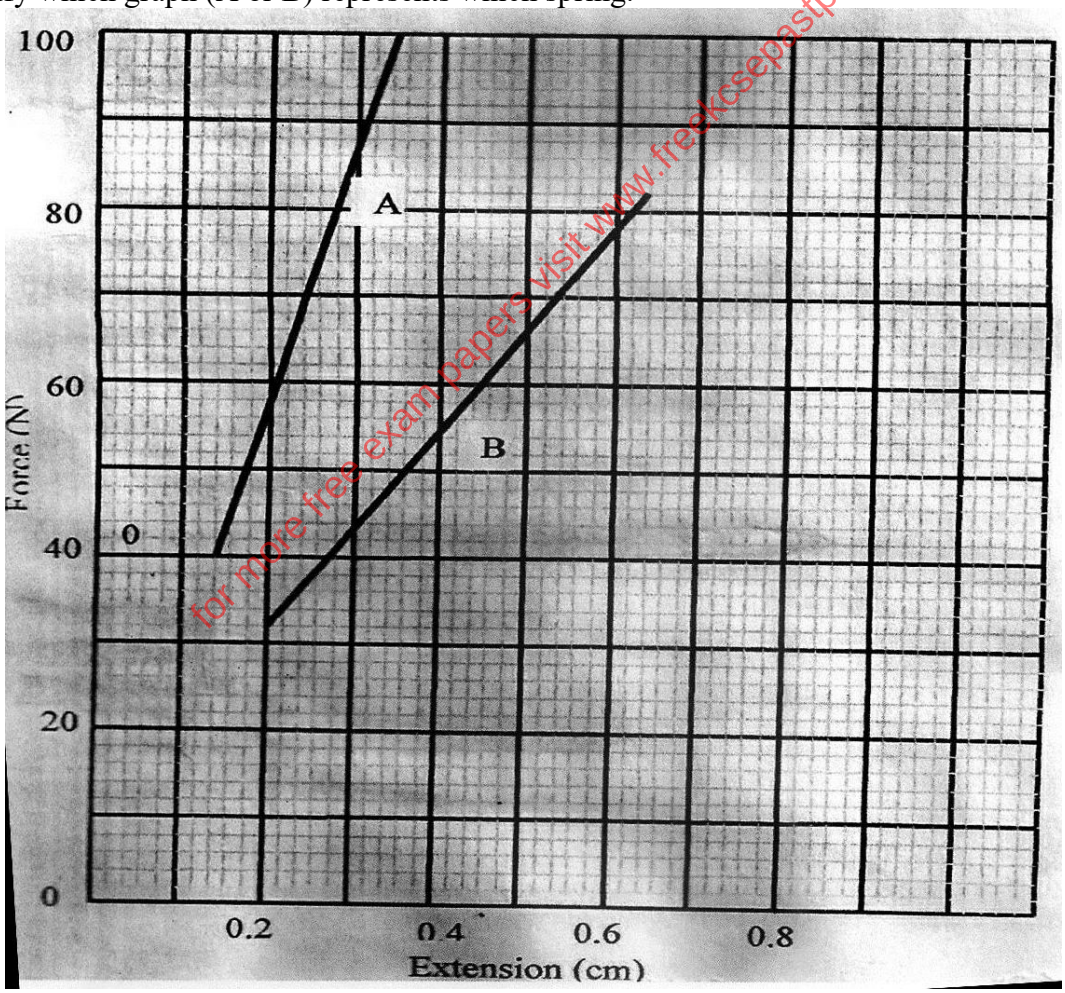
11. An aircraft 300m from the ground traveling horizontally at 400m/s releases a parcel. Calculate the horizontal distance covered by the parcel from the point of release.
(Ignore air resistance) (2 marks)

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)

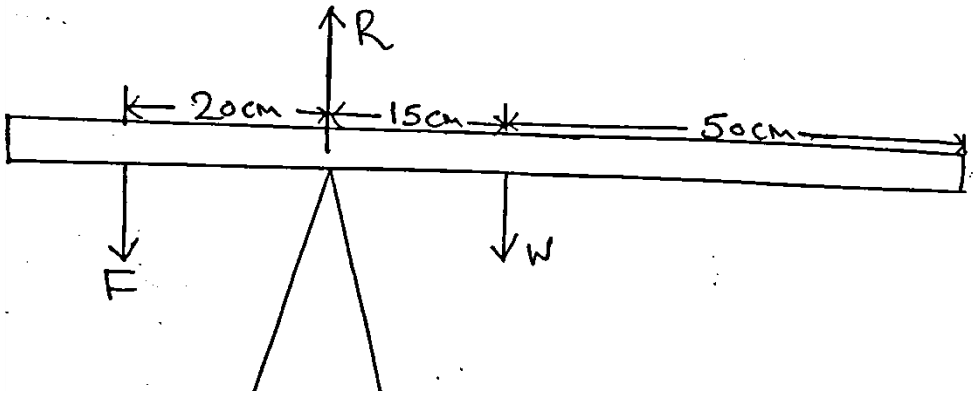


15. (a) State the principle of moments. (1 mark)

b) A uniform metal strip is 3.0cm wide 0.6cm thick and 100cm long. The density of the metal is $2.7g/cm^3$.

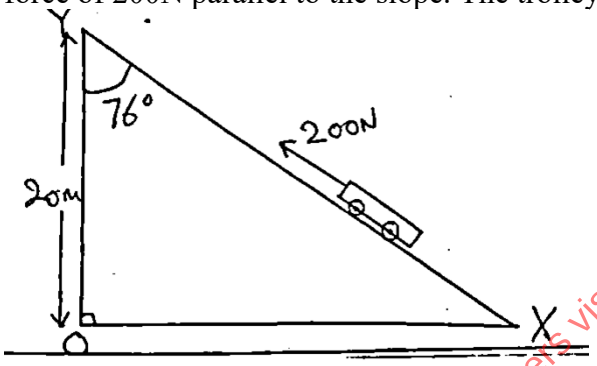
(i) Determine the weight of the metal strip. (3 marks)

(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)

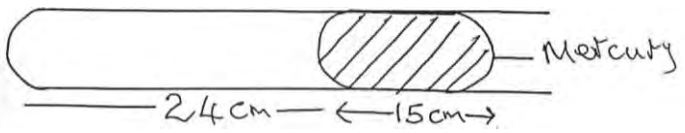
(ii) Work input of the system. (2 marks)

(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)

17. 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)

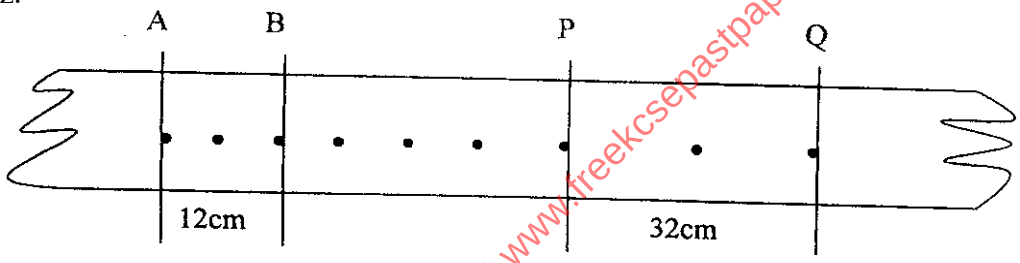
(d) A piece of sealing wax, weighs 3N in air and 0.22N when immersed in water, calculate the density of the wax. (3 marks)

(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)

KIRINYAGA WEST JOINT EVALUATION TEST
Kenya Certificate of Secondary Education (KCSE)
232/2
PHYSICS
PAPER 2

SECTION A (25 MKS)

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

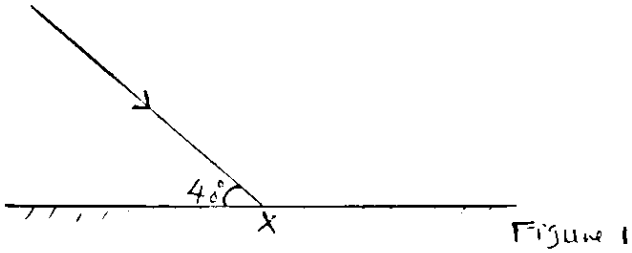


Figure 1

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.

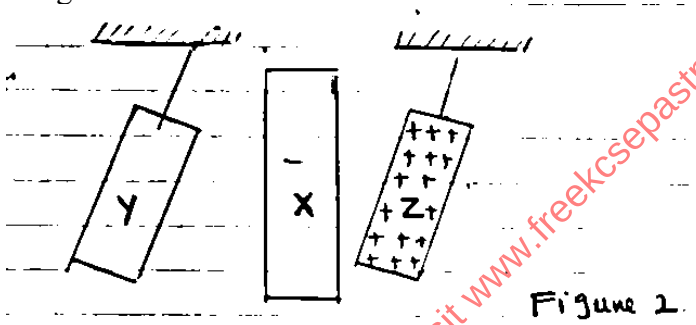


Figure 2

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.

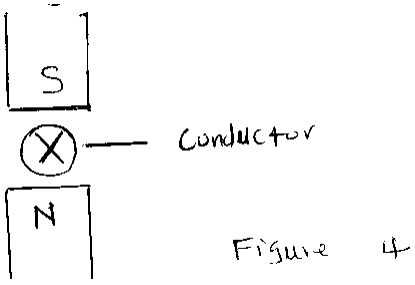


Figure 4

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)
(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)

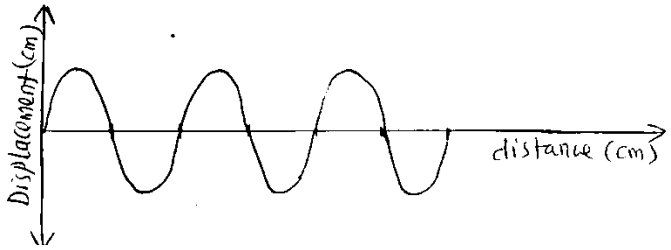


Figure 5

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.

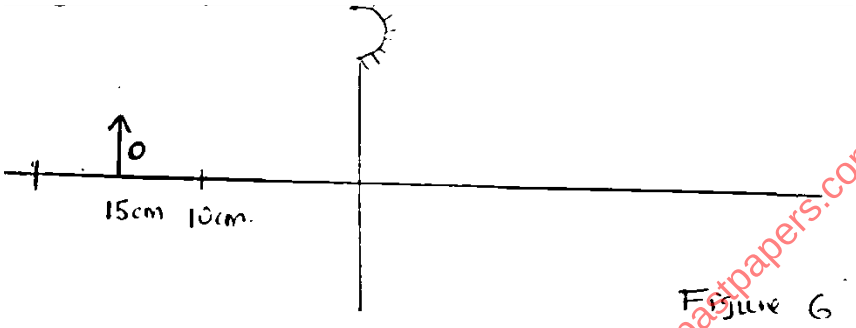


Figure 6

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.

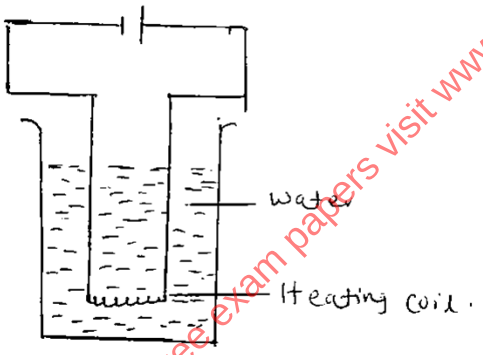


Figure 7

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.

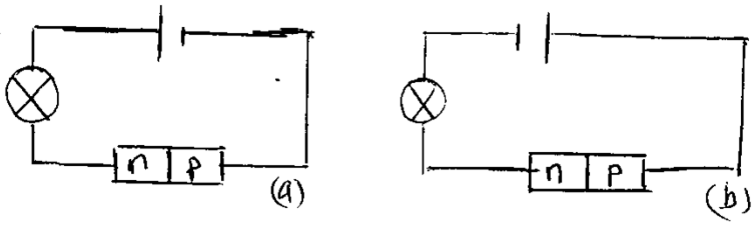


Figure 8

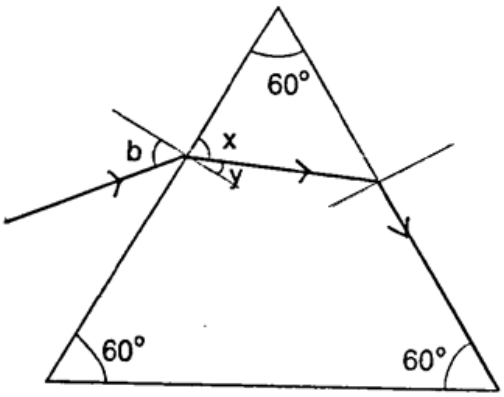
It is observed that the bulb in (a) does not light while the bulb in (b) lights.
Explain the reason for these observations. (2mks)

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)

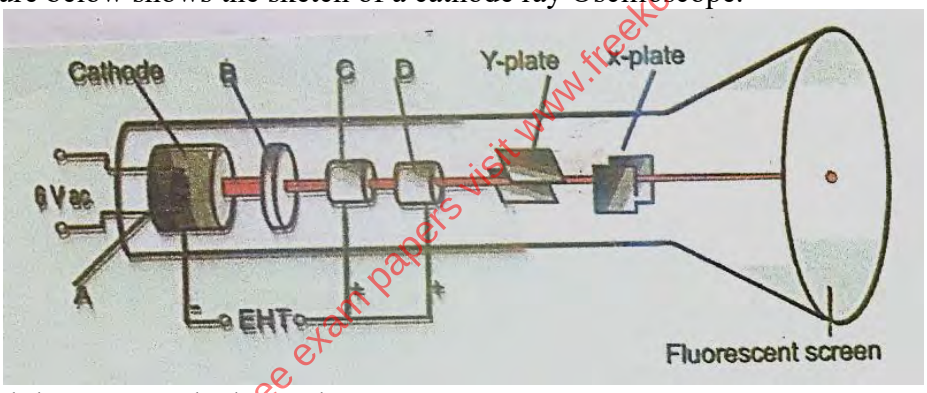
ii) Determine the

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)

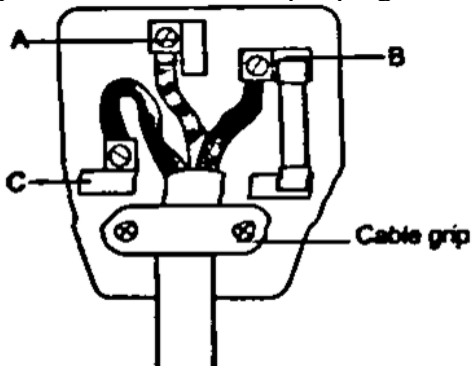
15. When a radiation of wavelength 1.8×10^{-9} m falls on a photo emissive surface, the photoelectrons can be stopped when a positive terminal of 400V is applied on the surface.

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.



(a) i) Identify the pins A, B and C and give the colour code of each. (3mks)

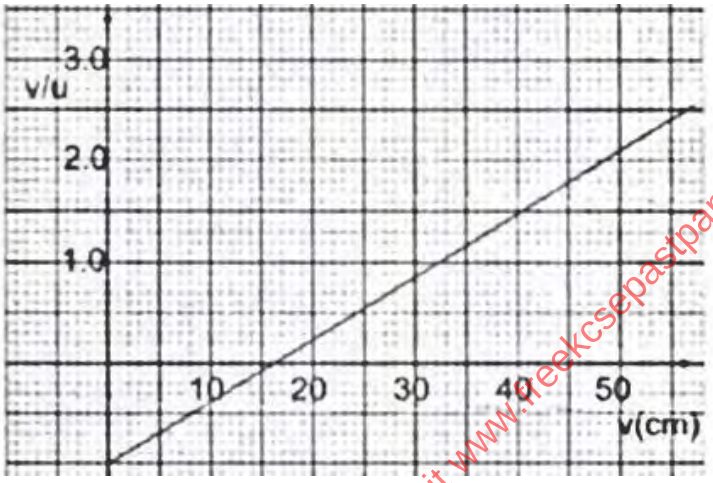
(ii) State the pin to which a switch should be connected to. (1mk)

(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

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

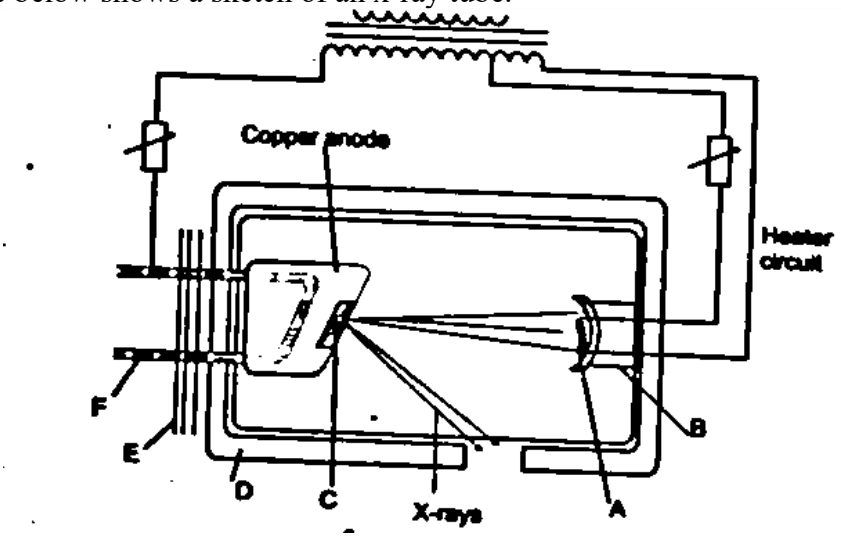
Determine the values of

(i) k (1mk)

(ii) c (1mk)

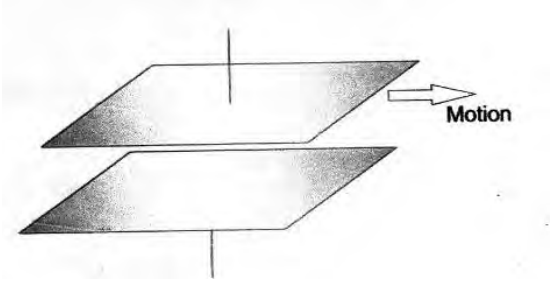
18. (a) Give one difference between x-rays and cathode rays. (1mk)

(b) The figure below shows a sketch of an x-ray tube.

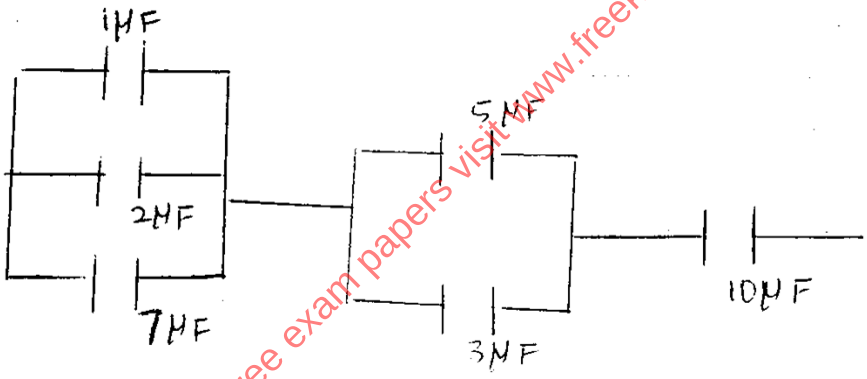


(i) Label the parts A, B and C. (3mks)
(ii) State the purpose of E and F. (1mk)
(iii) What physical characteristics are used to decide on the choice of C. (1mk)
(b) (i) State the function of the part labeled D. (1mk)
(c) Electrons from a cathode ray gun are accelerated in an X-ray tube by a potential 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.

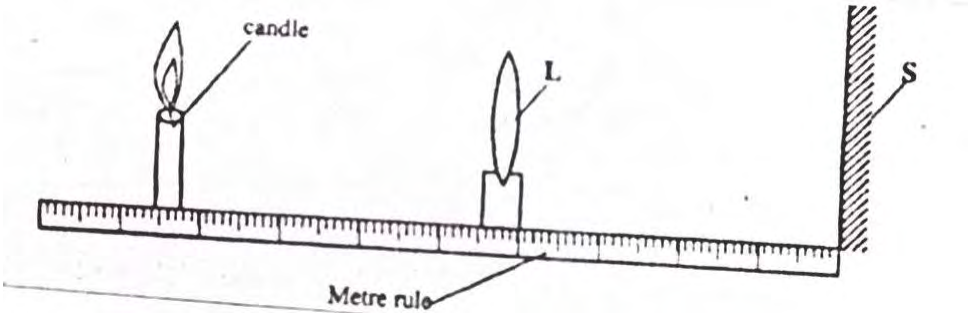


(a) State and explain what happen to the capacitance of the plates if the top plate is moved as shown. (2mks)
(b) Show that if three capacitors in parallel have capacitances C_1, C_2 and C_3, then the network capacitance is given as follows.
$C_N = C_1 + C_2 + C_3$ (2mks)
(c) The figure below shows a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

KIRINYAGA WEST JOINT EVALUATION TEST
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232/3
PHYSICS
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.

- ✓ 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.

KIRINYAGA WEST JOINT EVALUATION TEST
Kenya Certificate of Secondary Education (KCSE)
232/3
PHYSICS
PAPER 3
PRACTICAL

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)

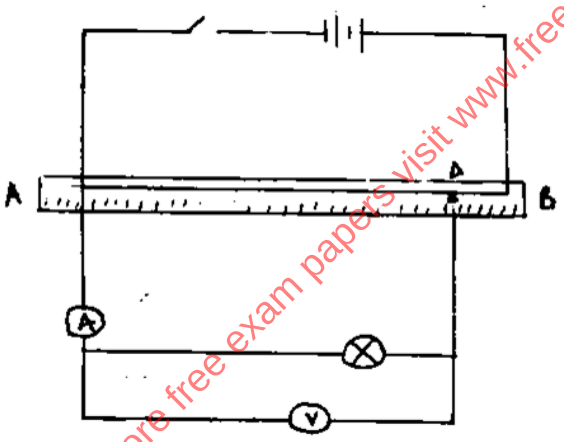
a) Measure the diameter, d of the mounted wire at two different points.

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		

(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

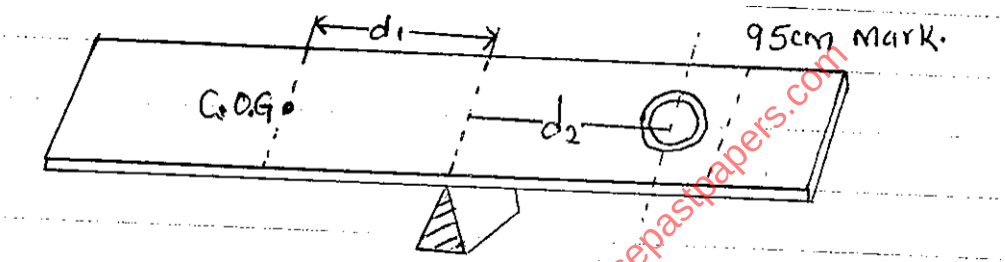
Procedure

(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 gains 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

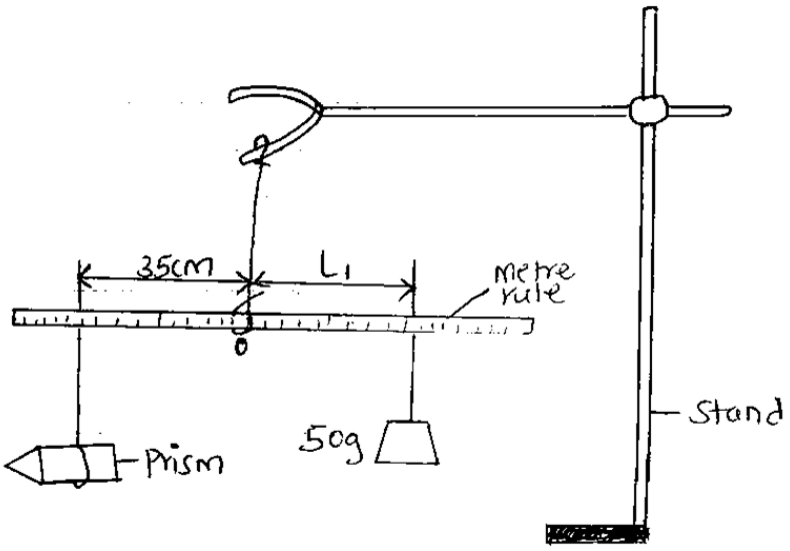
You are provided with the following

- ✓ 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)**

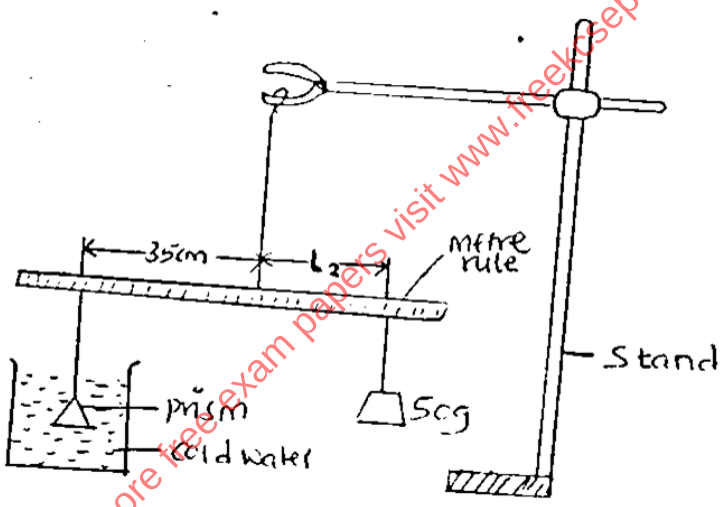
b) Using another piece of thread suspend the glass prism from the meter rule at a point 35cm from O. Suspend the 50g mass on the opposite side of O using another piece of thread. Adjust the position of the thread attached to the 50g mass until the metre rule balances once more.



(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 wawter.



(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)

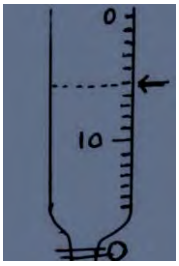
iii) Determine the weight W_3 of the prism in hot water. (2mks)

f) Determine the constant k for the water given that: (2mks)

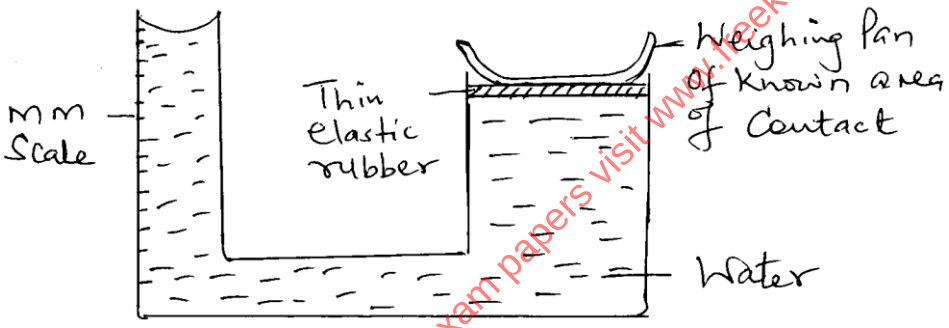
$$k = \frac{(W_1 - W_2) - (W_1 - W_3)}{(W_1 - W_3)(T_2 - T_1)}$$

LANGATA END OF TERM II 2020
232/1
PHYSICS
2 HOURS
SECTION A (25 MKS)

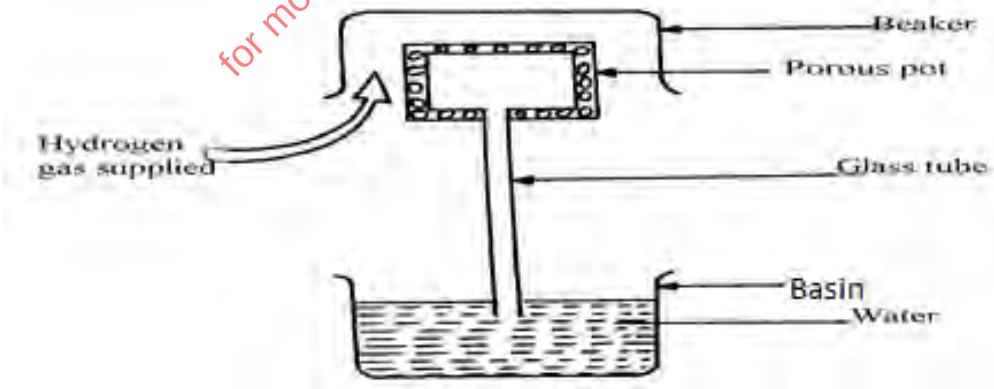
1. The figure below shows a burette partly filled with a liquid. The burette was initially full to the mark 0. If the quantity of the liquid removed has a mass of 20g, determine the density of the liquid. (2 mks)



2. Water at 20^0C falls over a waterfall of height 40m. Calculate the temperature of water at the bottom of the waterfall if 80% of potential energy at the top is converted into heat energy (3marks)
3. A faulty thermometer reads 2^0C when dipped in ice a 0^0C and 95^0C when dipped in steam at 100^0C. what would this thermometer red if placed in water at room temperature of 18^0C? (3 marks)
4. Xcm^3 of substance A which has density 800 kg/m^3 is mixed with 1000cm^3 of water with a density of 1000kg/m^3. The density of the mixture is 960kg/m^3. Determine the value of X. (3 marks)
5. The figure below shows a simple instrument designed by a student for weighing objects.

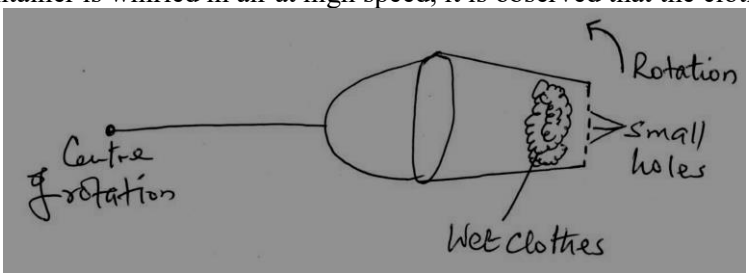


a) State what happens if one places an item on the weighing pan. (1 mark)
b) State two properties of water that make it suitable for this purpose. (2 marks)
6. The figure below shows an arrangement of demonstrate diffusion through solids.



The hydrogen gas is supplied for sometimes then stopped and the beaker removed. State and explain what is likely t be observed when the hydrogen gas supply is stopped. (3 marks)
7. A metal pin was observed to float in the surface of pure water. However, the pin sank when drops of soap solution were carefully added to water. Explain this observation. (1 mark)
8. Sauce pans have plastic or wooden handles. It is observed that in the morning the pan feels colder than the wooden handle. Explain the difference in this observation. (2 marks)
9. A bullet moving at a velocity of 350m/s hits a tree trunk of diameter 70cm. It emerges from the opposite side with a velocity of 180m/s. Determine the average deceleration of the bullet in the trunk. (3marks)

10. The figure below shows a container with small holes at the bottom in which wet clothes have been put. When the container is whirled in air at high speed, it is observed that the clothes dry faster.



Explain how the rotation of the container causes the clothes to dry why so fast. (2 marks)

SECTION B (55 MARKS)

11. The table below shows the value of the resultant force F and time t for a bullet raveling inside the gun barrel after the trigger is pulled.

Force F (N)	360	340	300	240	170	110
Times t (ms)	3	4	8	12	17	22

(a) On the grid provided plot a graph of force F against time t. (5 marks)
(b) Determine from the graph:
(i) The time required for the bullet to travel the length of the barrel assuming that the force becomes zero just at the end of the barrel. (1 mark)
(ii) Impulse of the force. (2 marks)
(c) Given that the bullet emerges from the muzzle of the gun with a velocity of 200m/s,
Calculate the mass of the bullet. (3marks)

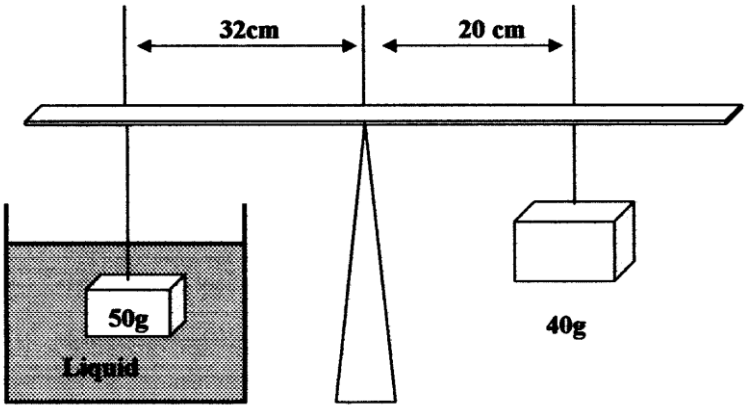
12. a) State the pressure law. (1 mark)
b) The pressure (P) of a fixed mass of a gas at constant temperature T=300k is varied continuously. The corresponding values of P and volume (v) of the gas are shown below.

Pressure ($x10^5$ Pa)	2.0	2.5	3.0	3.5	4.0	4.5
Volume (m^3)	0.025	0.02	0.017	0.014	0.012	0.011

i) Plot a graph of P against $^1/_V$ using grid provided below. (5 marks)
ii) Given that $P = \frac{2RT}{V}$, Find the constant R from the graph. (2marks)

c) A tin with an air tight lid contains air at a pressure of 1.0×10^5 Pa and a temperature of 12^0C. The air is heated in water bath until the lid opens. If the temperature at which the lid opens is 88^0C,
Determine the pressure attained by the gas. (3marks)

13. a) State Archimedes Principle (1 mark)
b) The figure below shows a block of mass 50g and density 2000kg/m3 submerged in a certain liquid and suspended from uniform horizontal beam by means of a string. A mass of 40g suspended from the other end of the beam puts the system in equilibrium



(i) Determine the up-thrust force acting on the block. (3 marks)
(ii) Calculate the density of the liquid. (3 marks)
(iii) Calculate the new balance point of the 50g mass (the 40g mass remains fixed) if the liquid was replaced with one whose density was 1500kg/m3. (3 marks)

14. a) A liquid at 80° in a cup was allowed to cool for 20 minutes. State two factors that determine the final temperature. (2 marks)
b) What is meant by specific latent heat of evaporation? (1 mark)
c) In an experiment to determine the specific latent heat of vaporization L of water, steam at 100°C was passed into water contained in a well lagged copper calorimeter. The following measurements were made:
Mass of calorimeter = 80g
Initial mass of water = 70g
Initial temperature of water = 5°C
Final mass of calorimeter + water + condensed steam = 156g
Final temperature of mixture = 30°C
(Specific heat capacity of water = 4200JKg^{-1}k^{-1} and specific heat capacity for copper = 390J/kg/k).
Determine:
i) Mass of condensed steam. (2 marks)
ii) Heat gained by the calorimeter and water. (2 marks)
iii) Given that L. is the specific latent host of vaporization of steam.
a) Write an expression for the heat given out by steam. (1 mark)
b) Determine the value of L. (3marks)

15. a) Distinguish between load and effort. (2 marks)
b) A mason uses a six-wheel pulley system to raise a weight of 250N through a vertical height of 2.5m using the machine. If the mason pulls using an effort of 500N. Calculate:
i) The velocity ratio of the pulley system. (2 marks)
ii) The work done by the mason. (3 marks)
iii) The useful work done by the pulley system. (2 marks)
iv) The efficiency of the system (3marks)

12. The Figure 4 below shows two coils used to demonstrate mutual induction.

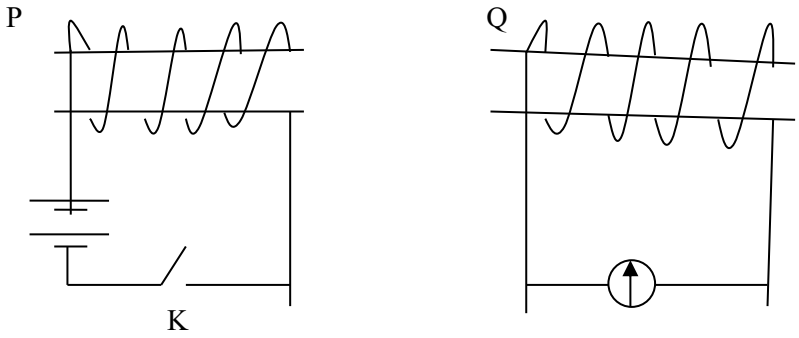


Figure 4

State what happens to the galvanometer when K is closed. (1mk)

13. Figure 5 below shows two parallel plate capacitors separated by a distance d units. Each plate has an area of A square units.

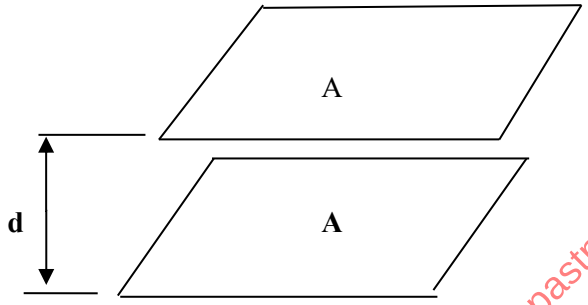


Figure 5

Suggest one adjustment that can be made so as to increase the effective capacitance. (1mk)

SECTION B (55 MKS)

14. (a) What is the purpose of a fuse? (1 mark)

(b) The diagram in figure 9 below shows a ring – main circuit used by an electrician in a certain house.

(i) Identify two faults in the installation. (2 marks)

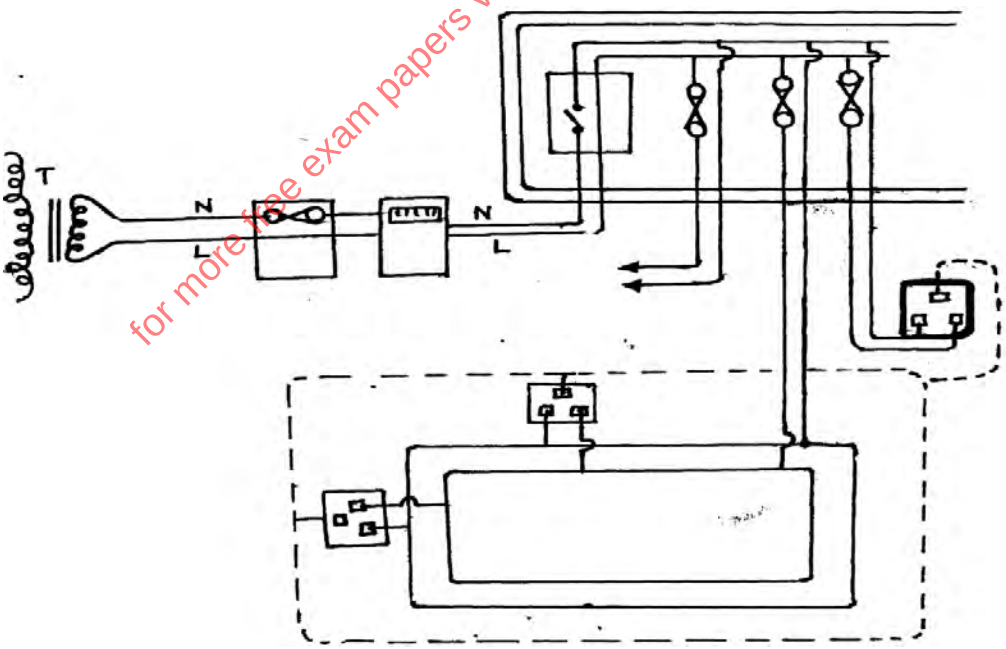


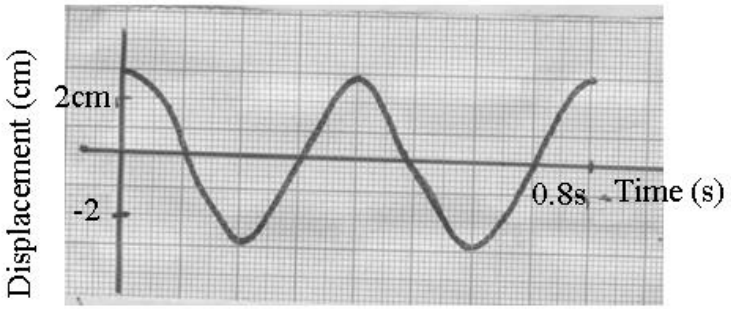
Fig 9

ii) Explain why the 3 – pin plug fuse has a longer earth pin than the live and neutral pins. (2 marks)

iii) Identify the type of transformer T used in the diagram in Fig. 9 (1 mark)

(c) A cooker rated 2.0kW was operated for 40minutes each for 30days. If the cost of each kilo – watt – hour unit is Shs. 15.50, Calculate the cost of electricity used. (4 marks)

15. (a) The figure below show the displacement time graph of a wave traveling at 400cm/s.

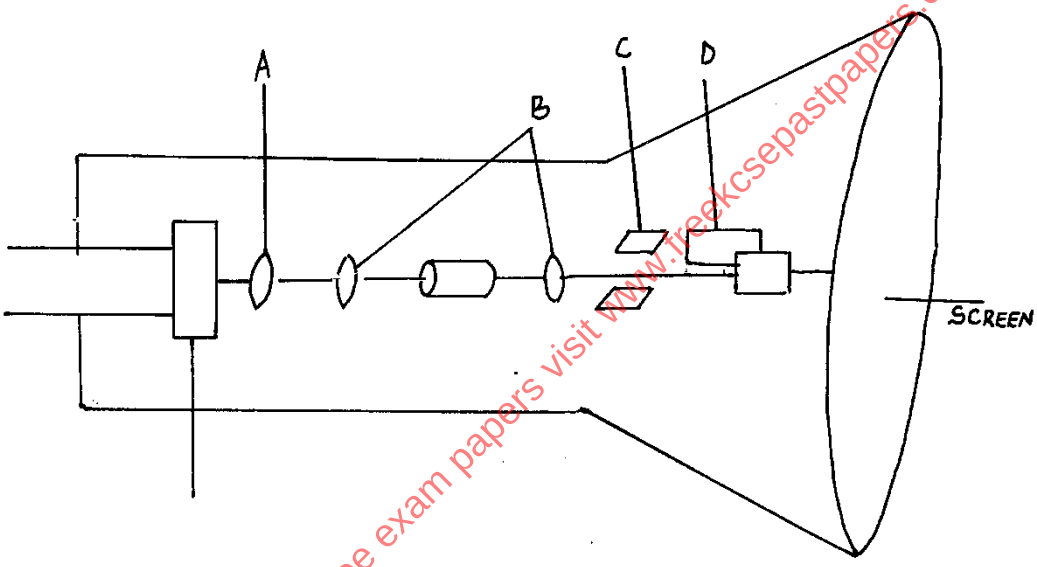


Determine for the wave the:

(i) Amplitude (1mk)
(ii) Period (1mk)
(iii) Frequency (2mks)
(iv) Wavelength (3mks)

(b) The human ear can distinguish two sounds as separate only if they reach it at least 0.1s apart. How far from a wall must an observer be in order to hear an echo when he shouts? (Speed of sound in air = $330ms^{-1}$) (3mks)

16. The figure 7 below represents a cathode ray oscilloscope (C.R.O)



i) Name the parts labeled A and B (2mks)
ii) What are the functions of parts labeled C and D (2mks)
iii) Explain how electrons are produced. (2mk)
iv) Give a reason why the tube is evacuated. (1mk)

(b) i) Distinguish between cathode rays and light rays (2mks)
ii) State the function of A (1mk)
iii) An alternating p.d is applied across the Y-plates. State what is the effect on the position of the spot on the screen? (1 mark)
iv) A signal with a frequency of 50Hz is applied across the Y-plates. If the time base with a period of 0.04s is applied across the X-plates, sketch a graph of p.d against time showing the number of waves that can be seen on the screen of the C.R.O (2 mks)
v) The tube of the CRO is coated with graphite. State three functions of the graphite coating (3mks)

17. (a) State <u>one</u> similarity and one difference between a concave lens and a convex mirror (2mks)
(b) A lens forms a focused image on a screen when the distance between the object and the lens is 100cm. The size of the image is twice that of the object.
i) What kind of lens was used? Give a reason (2mks)
ii) Determine the distance of the image from the lens (2mks)
iii) Determine the power of the lens (3mks)

(c) The figure shown in figure 9 shown below is a human eye with a certain defect

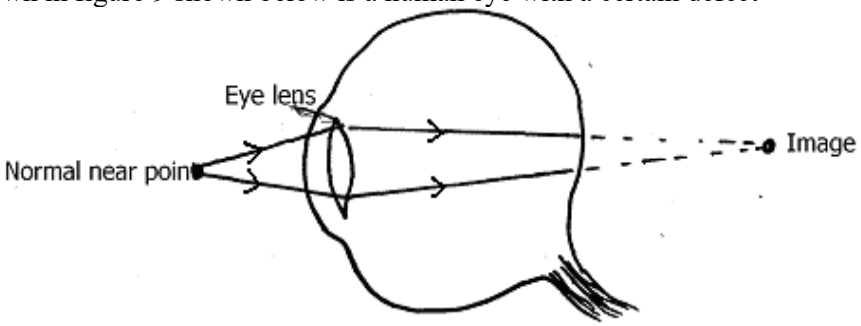


FIG 9

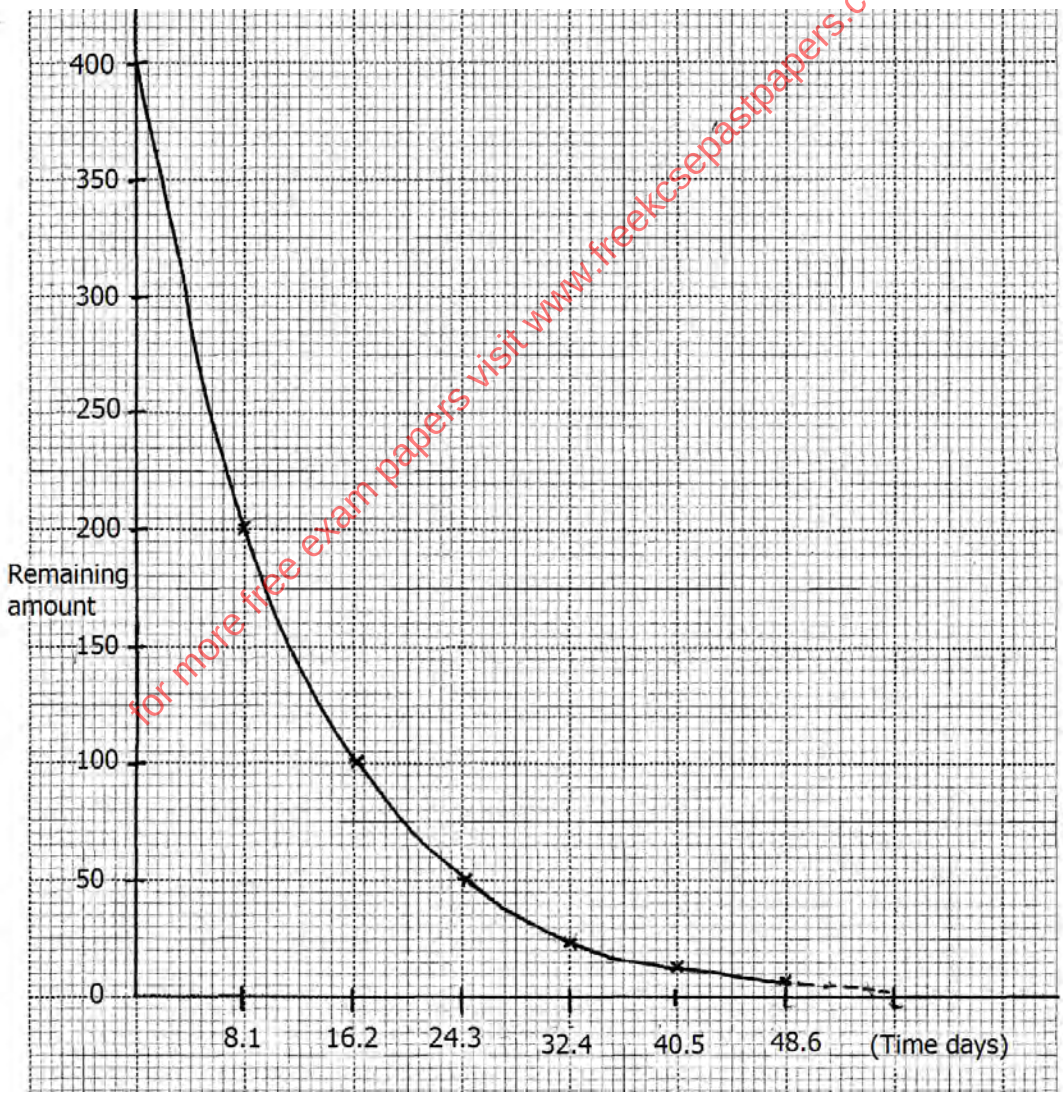
(i) Name the defect (1mk)

(ii) On the same diagram, sketch the appropriate lens to correct the defect and sketch rays to show the effect of the lens. (2mks)

18 a) Name any two types of radiations given out in a radioactive process. (2marks)

b) 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. (3mks)

c) The graph below shows radioactive decay of iodine.



Use the graph to determine the:-

i) fraction of the amount remaining after 16.2 days. (2mks)

ii) determine the half – life of iodine. (2mks)

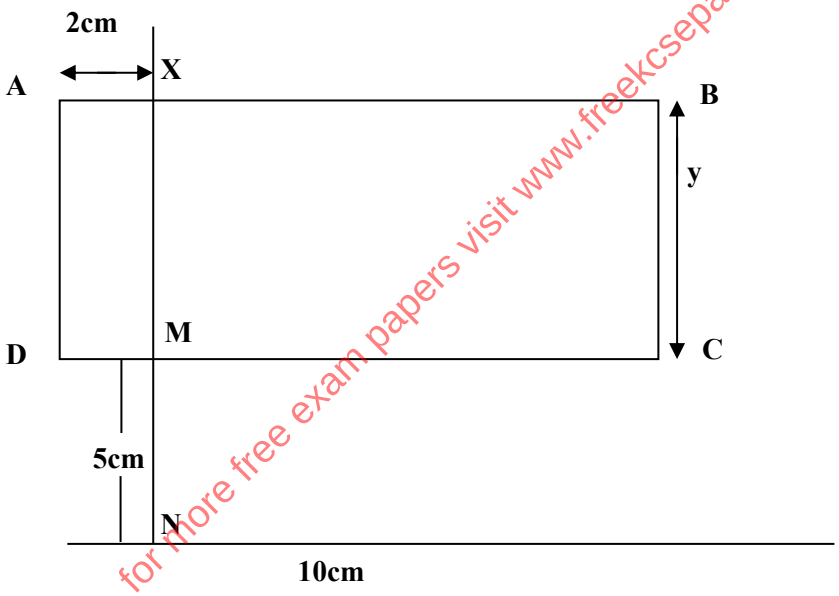
iii) mass remaining after 17 days. (1mk)

LANGATA - END OF TERM II 2020
232/3
PHYSICS - PRACTICAL
TIME: 2 ½ HRS

1. You are provided with the following apparatus
- A glass block (rectangular)
- Soft board
- Plane mirror
- Four optical pins
- Four thumb pins
- A protractor
- A ruler

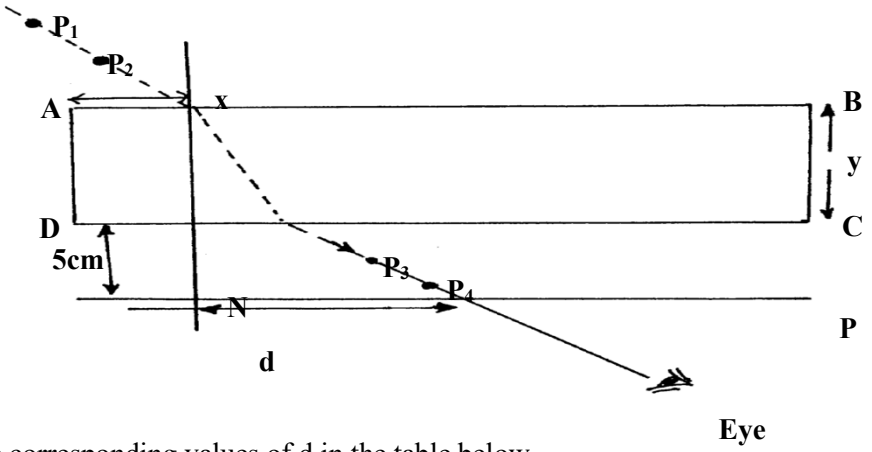
Proceed as follows

a) Fix the plane paper on the soft board using the four thumb pins
b) Place the glass block on the plane paper (fixed on the soft board). Let the glass block rest on the paper from the broader face
c) Trace the glass block using a pencil
d) Remove the glass block
e) Mark point X on the one of the longer side of the traced glass block a shown below. Point X should be 2cm from edge A



(e) Construct a normal at **x** to emerge through line **DC**. Let this normal meet line **DC** at point **M.**
(f) Mark point **N** along the emergent normal. 5cm from **M**
(g) Construct line **NP** to meet the normal at **N** at 90°. Line **NP** can be about 10cm
(h) Using a protractor, construct an incident ray Rx at an angle of incidence c=10°. Fix two pins **P1** and **P2** along **RX**.
(i) Replace the glass block to the traced figure
(j) View the path of the incident ray **RX** through the glass block using the other two pins **P3** and **P4.** This can be done by ensuring that the images of pin **P1** and **P2** are in line with **P3** and **P4**
(k) Remove the glass block and draw the emergent ray through **P3** and **P4**

(l) Measure the distance of the emergent ray from point **N** along line **NP** as shown below



(m) Record the corresponding values of d in the table below

(n) Repeat the procedure for other values of i

Angle of incidence i°	10	20	30	40	50	60
Distance d(cm)						
Sin i						
Sin ^{2}i						

(12marks)

(o) i) Plot the graph of sin2i against d (5marks)

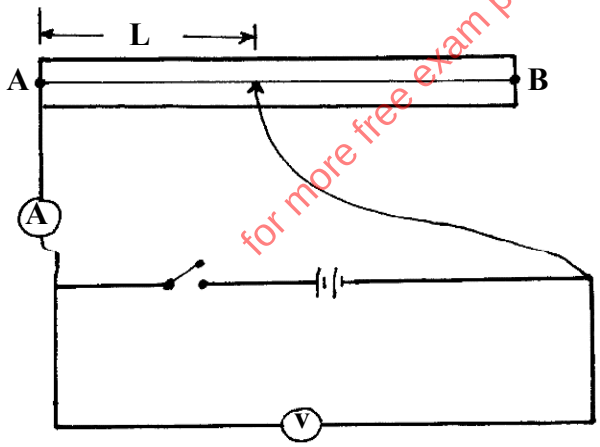
ii) Calculate the gradient of the graph (3marks)

2. You are provided with the following apparatus

- Resistance wire fitted on a scale labeled **AB**
- Switch
- Voltmeter
- Ammeter
- Two dry cells
- Six connecting wires

Proceed as follows:-

(i) Set up the apparatus as shown below



ii) Remove the crocodile clip from resistance wire **AB** and close the switch. Record the voltmeter reading

X=_____volts (1mark)

iii) Attach the crocodile clip to the resistance wire such that L=10cm

iv) Record the voltmeter and ammeter reading in the table below

v) Repeat the procedure in iii and iv for L=20cm, 30cm, 40cm, 50cm,60cm,70c, and 80cm

vi) Complete the table below

Length L(cm)	10	20	30	40	50	60	70	80
Current I (A)								
p.d V (v)								
X-V(V)								
$\frac{V}{X-V}$								
$\frac{V}{I}$=R(Ω)								

(10marks)

vii) (a) Plot the graph of $\frac{v}{x-v}$ against **R** (5marks)

(b) Determine the slope **S** of the graph (2marks)

(c) The graph is given by the equation

$\frac{V}{x-v} = \frac{mR}{5} + d$

Determine the value of **m** and **d** (2marks)

LANGATA - END OF TERM II 2020
232/3
PHYSICS PRACTICAL
CONFIDENTIAL

QUESTION 1

- A glass block (rectangular)
- Soft board
- Plane mirror
- Four optical pins
- Four thumb pins
- A protractor
- A ruler

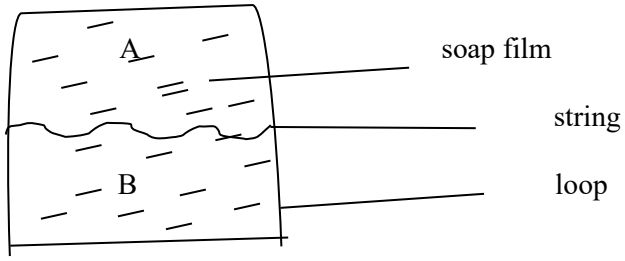
QUESTION 2

- A voltmeter
- Ammeter
- Two dry cells
- Six connecting wires
- Nichrome wire (SWG 28) on a metre scale labeled AB

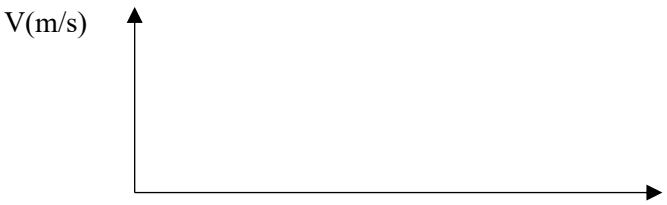
MECS JOINT EVALUATION TEST
Kenya Certificate of Secondary Education (KCSE)
232/1
PHYSICS PAPER 1
TIME 2 HOURS

SECTION A (25 MARKS)

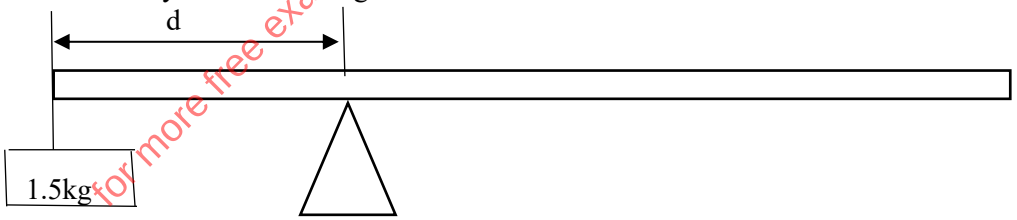
1. Draw a vernier calipers showing a reading of 2.49 cm (2 marks)
2. Figure 1 below shows a wire loop with a string that has been dipped into soap solution.



i) The soap film is pierced with a hot pin at B. Sketch a similar diagram to show the observed effect. (1 mark)
ii) Explain the observation in (i) above (1 mark)
3. On the axes below, sketch a graph of velocity (v) against time (t) for uniformly accelerated motion given that when t = 0, v is greater than zero.

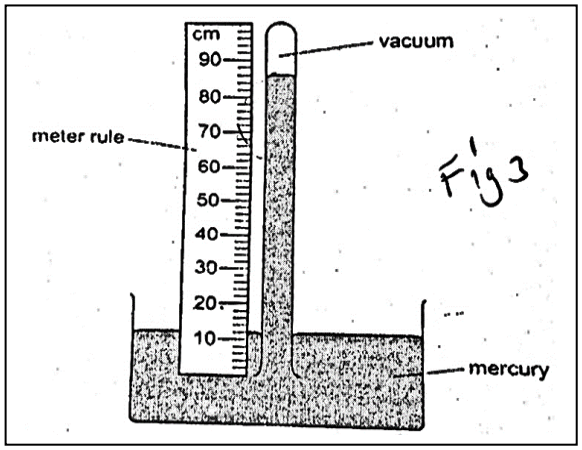


1mk
4. State two functions on which the sensitivity of a clinical thermometer depends on (2 marks)
5. Give the reason why one feels warmer in a woolen cloth than in a nylon clothing (1 mark)
6. A student wanted to have a warm bath at 60°C. He had 5.0kg of water in a basin at 80°C. What mass of cold water at 30°c must he cold to the hot water to have his bath of choice? (neglect heat loss and take specific heat capacity of water as 4200 J $kg^{-1}K^{-1}$) (3marks)
7. The figure 2 below shows a uniformly wooden plank of length 2m and weighs 5N. The plank is balanced at a distance (d) from one end by a mass of 1.5kg.



(fig 2)

Determine the distance d (3marks)
8. State one way of reducing stability of a body (1marks)
9. The figure 3 below shows a simple mercury barometer.



i) Calculate the value of the atmospheric pressure, take density of mercury = 13600 Kg/m^3 (2 marks)

ii) Why is mercury preferred over water as a barometric liquid (1 mark)

10. Water flows in a horizontal pipe of varying diameter as shown in fig 4.

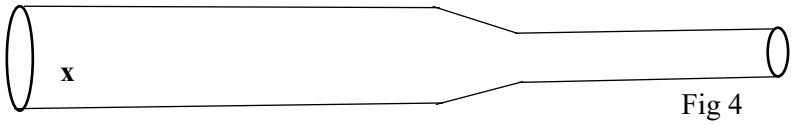


Fig 4

If the cross – sectional area of x is 40cm^2 and that of the narrow section is 2.5cm^2 and the rate at which water flows in the narrow section is 450 cm^3/s. determine the speed of water through x (3marks)

11. A student observed the smoke particles in a smoke cell and noted that they moved in a random way. Explain this observation. (2marks)

12. The figure 5 below shows a glass tumbler filled with water at room temperature.

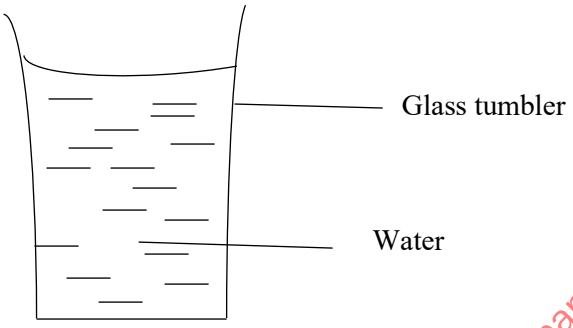


Fig 5

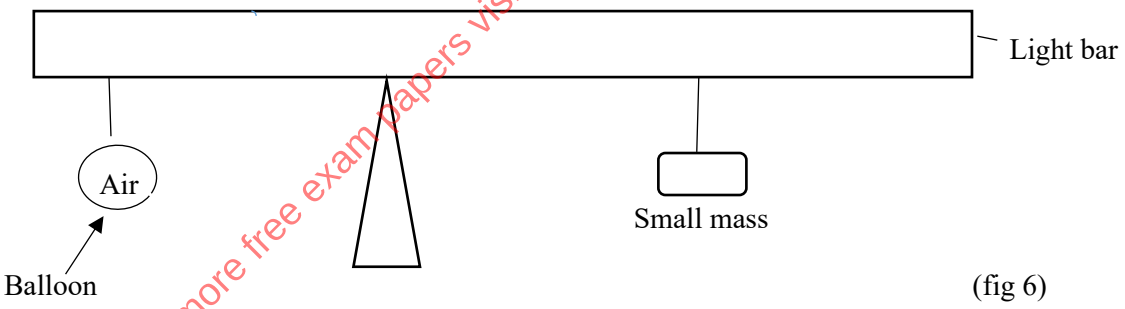
Briefly explain what happens to the stability of the tumbler when water is cooled to a temperature of 0^o from 5^{o}C. (2 marks)

13. State the relationship between physics and mathematics. (1 mark)

SECTION B (55 MARKS)

Answer all the questions in this section.

14 a) The figure 6 below shows a system in equilibrium at room temperature. The system is taken outside where the temperature of 200^{o}c higher for sometimes.



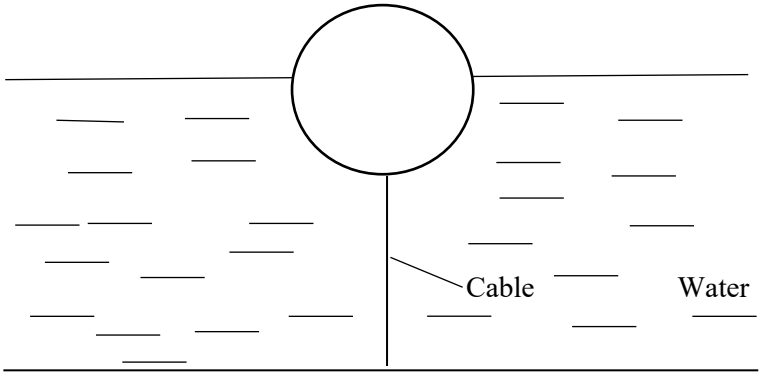
(fig 6)

Explain why it tips to the right when it is taken outside the room. (2marks)

b) i) State the law of floatation. (1 mark)

ii) The figure 7 below shows a floating object of volume 40,000 cm^3 and mass 10g. It is held as shown in water of density 1.25g/cm^3 by a light cable at the bottom so that ¾ of the volume of the object is below the water surface (assume the up-thrust due to air is negligible).

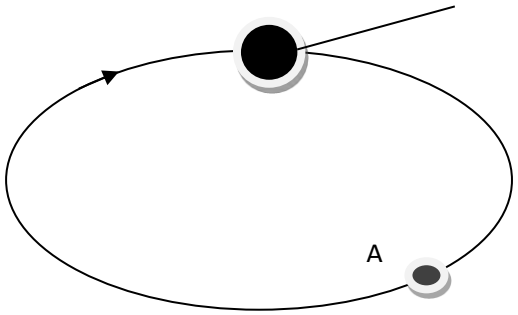
Fig 7



(I) Calculate the volume of the object under water (2marks)
(II) State the volume of water displaced by the object. (1 mark)
(III) Calculate the weight of water displaced. (2 marks)
(iii) Determine the tension in the cable. (3marks)
(iv) Calculate the density of the object. (2 marks)

15. (a) (i) The following diagram in fig 8 shows a ball whirled in a clockwise direction along a vertical plane. Sketch the path followed by the ball if the string breaks when the ball is at position A. (1 mark)

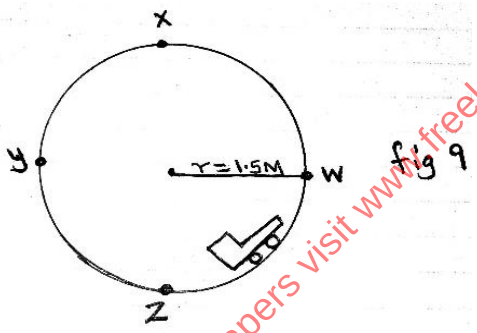
Fig 8



(ii) A body having a uniform motion in a circular path is always accelerating. Explain (2marks)

b) Fig 9 below shows a trolley moving on a circular rail in a vertical plane. The mass of the trolley is 200g and the radius of the rail is 1.5m.

Fig 9



(i) Determine the minimum velocity at which the trolley passes at point x. (3marks)
(ii) If the trolley moves with a velocity of 4m/s as it passes at point x, find its angular velocity at this point. (2marks)
(iii) Find the force exerted on the rail at point Z. (3 marks)

16. You are provided with a measuring cylinder, an electronic balance and cooking oil. Describe an experiment to measure the density of cooking oil of volume 25cm^3. (4 marks)

b) A density bottle weighs 70g when empty, 90g when filled with water and 94g when filled with a liquid A. Find the density of liquid A given that the density of water is 1000 kg/m^3. (3 marks)

c) i) In an oil drop experiment what assumption is made. (1 mark)
ii) Why is the surface dusted. (1 mark)
iii) Given that the diameter of an oil drop is 0.15cm and the diameter of a circular patch formed by the same drop on water is 35.35cm, calculate the thickness of the oil molecule. (3marks)

17. (a) Distinguish between speed and velocity. (2marks)

b) A jet fighter moving horizontally at a speed of 200m/s at a height of 2km above the ground is to drop a bomb to hit a target on the ground. How long does the bomb stay in air after release before it hits the target? (3marks)

c) An astronaut standing on the moon throws a stone vertically upwards. The stone leaves his hand at t=0. The line shows how the velocity V of the stone varies with time t until t=2.0 seconds.

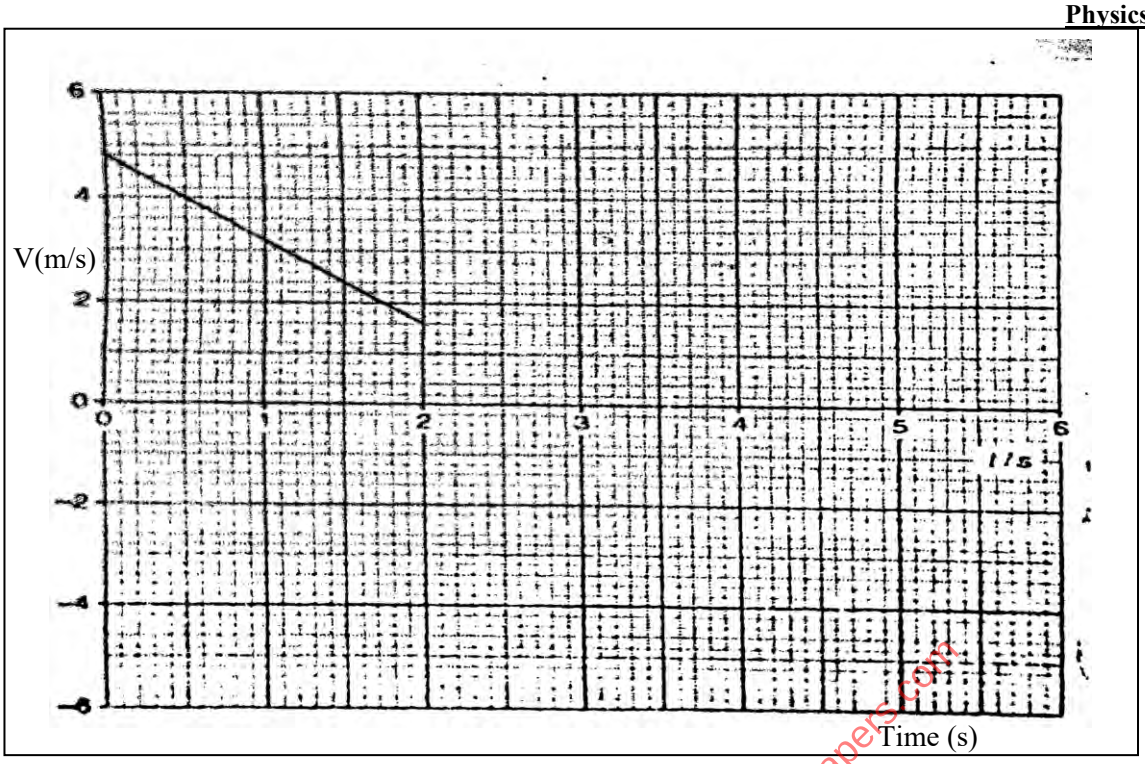


Fig 9

After rising, the stone falls. The astronaut catches the stone at t=6.0 second. There is no air resistance on the moon.

i) Complete the graph until t=6.0 second. (1 marks)

ii) State the value of time (t) when the stone is at the highest point. (1 mark)

iii) Calculate the acceleration of the stone between t=0 and t=2.0 seconds. (3marks)

d) A boulder is sliding down a slope with uniform acceleration of $3m/s^2$. If its starting velocity was 2m/s, calculate its velocity after it has slid 10m down the slope. (3marks).

18. A 50kg box resting on the floor requires 20N to start moving. In 10 seconds attains a maximum velocity of 4.5 m/s. Determine,

a) The acceleration of the box. (3marks)

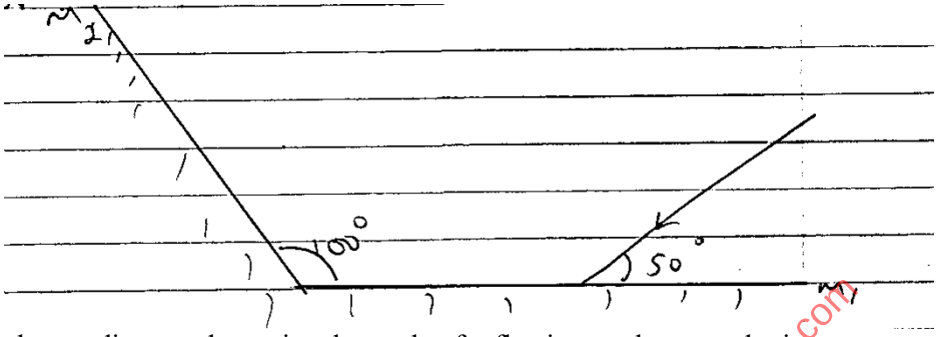
b) The acceleration force on the box. (2marks)

c) The friction force between the surfaces in contact. (1 mark)

MECS JOINT EVALUATION TEST
Kenya Certificate of Secondary Education (KCSE)
FORM FOUR END OF TERM 1, 2020
232/2
PHYSICS
PAPER 2

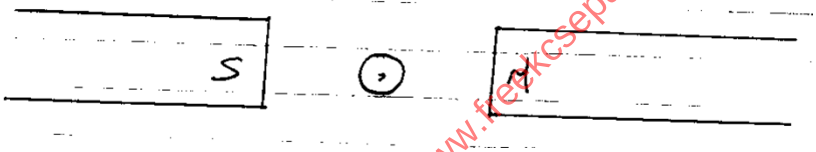
SECTION A (25MARKS)

1. The figure below shows two plane mirrors inclined at an angle of 100° to each other. A ray of light makes an angle of 50° with first mirror.



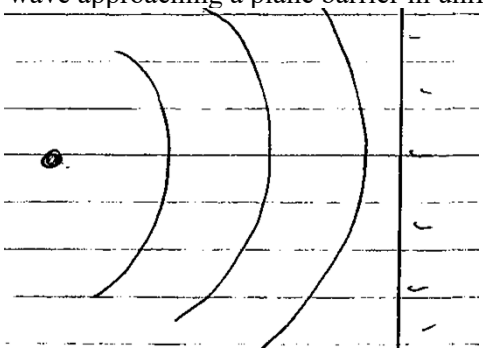
By completing the ray diagram determine the angle of reflection on the second mirror. (2mks)

2. Describe how a negatively charged electroscope can be used to identify an insulator and conductor (2mks)
3. State two properties of a magnet (2mks)
4. The figure below shows a conductor carrying current between two poles of permanent magnet.



(a) Magnetic field pattern and indicate direction of force (2mks)
(b) State one way of increasing the strength of an electromagnet. (1mk)

5. A loud speaker placed between two walls but nearer wall A than wall B is sending out constant sound waves. Determine how far the loudspeaker is from wall B if it is 100m from wall A and the time between the two echoes received is 0.2 seconds. (Take speed of sound in air as 340m/s) (3mks)
6. The speed of an electromagnet wave is 3.0 x 108m/s and its wavelength is 2.0 x 102M. Calculate the frequency of the wave (2mks)
7. a. Name one detector of infra-red radiation (1mk)
   b. State one use of microwaves (1mk)
8. In a single cell experiment a bulb was seen to light for a very short time and then goes off. State two reasons for this (2mks)
9. What is the effect of moving the pin-hole camera closer to the object? (1mk)
10. State one difference between the image formed by pin-hole camera and plane mirror. (1mk)
11. An electric iron rated 240v, 750W is to be connected to a 240V mains supply through a 3A fuse. Determine whether the fuse is suitable or not (2mks)
12. State ohm's Law (1mk)
13. The figure below shows a circular wave approaching a plane barrier in uniform medium



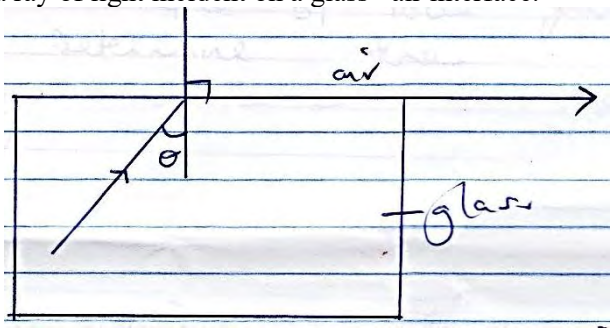
On the figure sketch the reflected waves (2mks)

SECTION B 55 MARKS

14 a. Define the term critical angle (1mk)

b. State two conditions of total internal reflection (2mks)

c. The figure below shows a ray of light incident on a glass –air interface.



Given that the refractive index of the glass is 1.53. determine angle Θ (3mks)

d. A pin is placed at the bottom of a beaker of depth 12.5cm. The beaker is then filled with paraffin. By using another pin on the side of the beaker and observing from the top the distance of the image of the pin in the beaker is found to be 4.5cm from the bottom. Determine the refractive index of paraffin. (4mks)

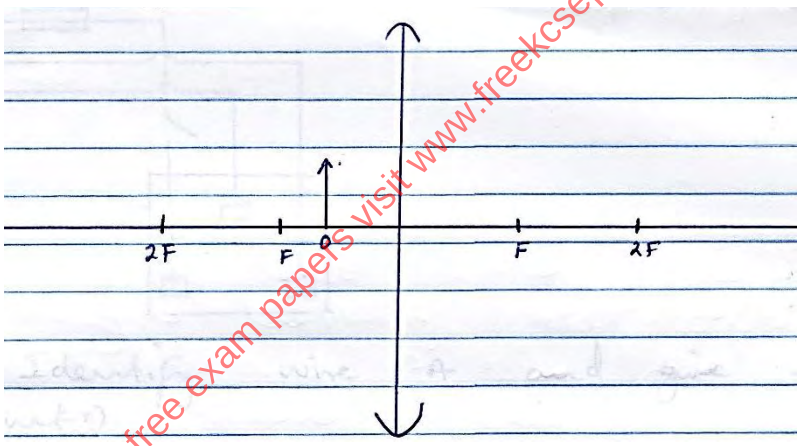
15 a. An object of height 10.5cm stands before a diverging lens of focal length 20cm and a distance of 10cm from the lens. Determine the

i). Image distance (3mks)

ii). Magnification (2mks)

iii) Height of the image (2mks)

b). The figure below shows an object O placed on the principal axis of a convex lens



On the figure, draw ray diagram to locate the object. (3mks)

16 a. State Lenz's Law of electromagnetic induction (1mk)

b. An immersion heater rated 1.5kw is used continuously for 30min per hour per day for 30days. If the cost of electricity is ksh. 6.70 per kwh, determine the monthly bill. (3mks)

c. A student designed transformer to supply a current of 10A at a potential difference of 60V to a motor from an a.c mains supply of 240V. If the efficiency of the transformer is 80%, Calculate:

i) The power supplied to the transformer. (3mks)

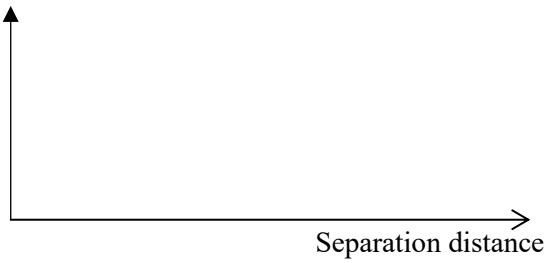
ii) The current in the primary coil. (2mks)

iii) The turns ratio. (1mk)

d. State any two factors that lead to energy loss in a transformer (2mks)

17. a) On the axis provided, sketch a graph of capacitance against separation distance of the plates of a parallel-plate capacitor (1mk)

Capacitance

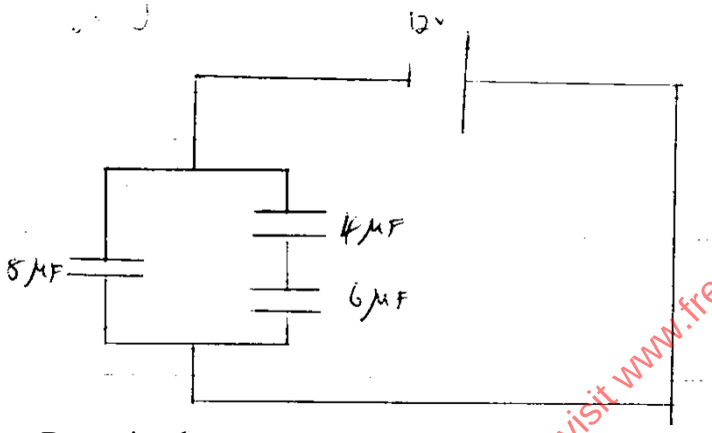


Separation distance

b. Draw a circuit diagram that may be used to investigate charging process of a capacitor (2mks)

c. On the axes provided sketch a graph of potential difference between the plates against time for the charging process (1mk)

d. The figure below shows an arrangement of capacitors connected to a 12v d.c supply

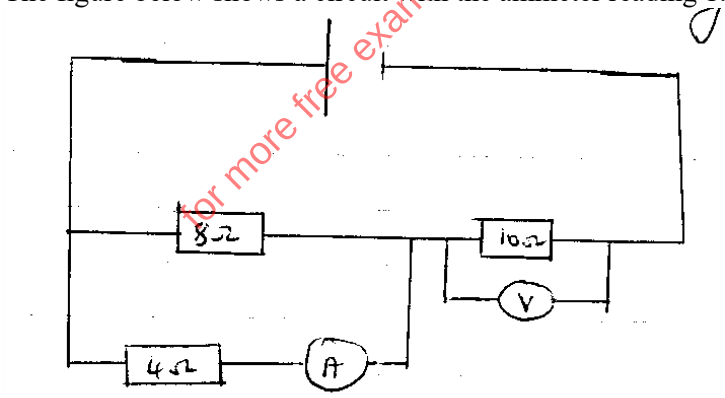


Determine the

i). Effective capacitance (3mks)

iii). Change across the 8μf capacitor (2mks)

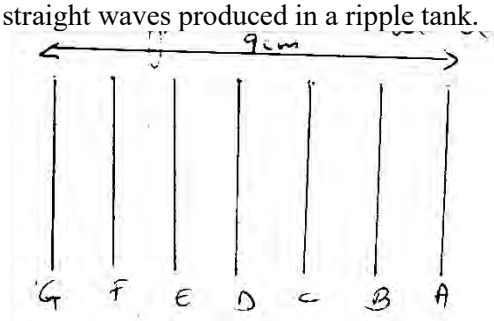
e. The figure below shows a circuit with the ammeter reading 1.5 A



Determine the voltmeter reading (3mks)

18. a. Define period (1mk)

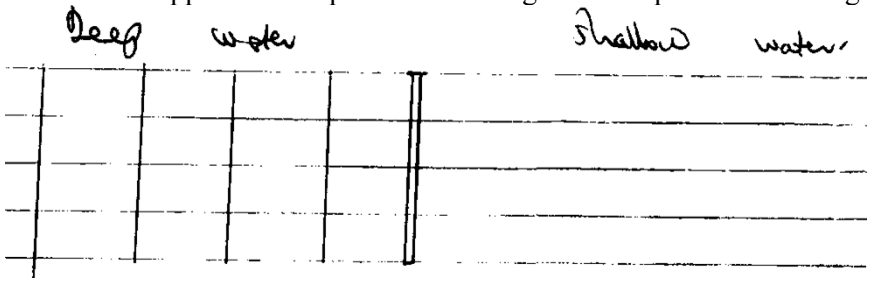
b. The below represent crests of straight waves produced in a ripple tank.



(i) Determine the wavelength of the waves (2mks)

(ii) Given that the crest at A occupied the position now occupied by crest G five seconds angle. Determine the frequency of the waves (3mks)

c. Plane waves produced in a ripple tank are passed from a region of deep water into a region of shallow water.



i) Complete the diagram on shallow water (1mk)

ii) State what happens at the bounding to

(i). The frequency of the wave. (1mk)

(ii). The speed of the wave (1mk)

(iii). The wavelength of the waves (1mk)

d. State the condition for interference to occur (1mk)

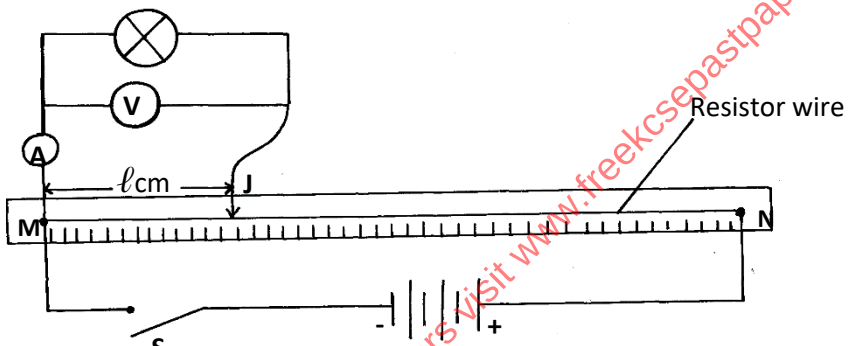
MECS JOINT EVALUATION TEST
Kenya Certificate of Secondary Education (KCSE)
FORM FOUR END OF TERM 1, 2020
232/3
PHYSICS
Paper 3
PRACTICAL
Time 2 ½ HOURS

QUESTION 1.
PART I
You are provided with the following:

- A resistor wire mounted on a millimeter –scale
- An ammeter,
- A voltmeter,
- A switch,
- Three dry cells,
- A cell-holder (**3 cells in series**),
- A bulb,
- Eight connecting wires (4 with clips at one end)

a) Set-up the circuit as shown in figure 2 below

Fig. 2



b) Place the sliding jockey at ℓ = 20cm from M then close the switch. Note both the ammeter and voltmeter readings
c) Repeat the procedure in (b) placing the sliding jockey J at points where ℓ = 40cm, 60cm,70cm,80cm and 90cm from M. Record the corresponding readings of the ammeter and voltmeter in table 2 below.
d) Complete the tale below.

Table 2 (8mks)

Length, ℓ (cm)	20	40	60	70	80	90
Current, I(A)						
I (mA)						
Voltage, V(v)						
V(mV)						

e) Plot a graph of I (A) (y-axis) against V(V) (5mks)
f) State the possible voltmeter reading when the ammeter, reads 0.16A (1mk)
g) Give a reason why both the bulb and voltmeter in the figure 2 above are connected in parallel. (1mk)

PART II

You are provided with the following:
- a metre rule
- a lens (Convex) mounted on a lens holder
- a candle
- a white screen

Proceed as follows

i) Set up the apparatus as shown in figure 1 below. (Ensure that the burning candle and the lens are in a straight line)

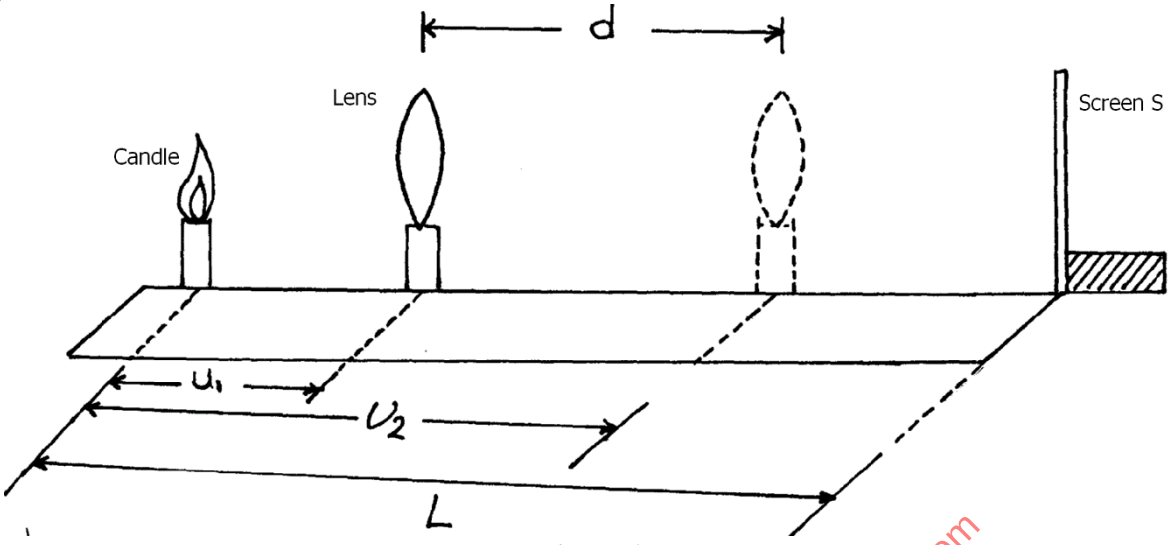


Figure 1

ii) With the candle placed at a distance L = 100cm from the screen, determine the position of a sharply focused magnified image of the candle on the screen by moving the lens towards the screen.

iii) Measure the distance U_1 between the lens and the candle

U_1 = …… cm. (1mk)

iv) Now move the lens towards the screen until you get a sharply focused diminished. Measure the new distance, U_2 between the lens and the candle.

U_2 = ……cm (1mk)

v) Calculate the displacement d of the lens given that $d = U_2 - U_1$

d = ……cm (1mk)

vi) Given that $f = \frac{L^2 - d^2}{4L}$, calculate the value of f. (2mks)

2. You are provided with the following:
- a metre rule;
- a retort stand, a boss and clamp;
- three pieces of thread;
- 200m1 of water in a 250ml beaker labelled W;
- 200m1 of a liquid in a 250m1 beaker labelled L;
- Two masses labelled m_1 and m_2.

Proceed as follows:

a) Suspend the metre rule so that it balances at its centre of gravity **G** and hang the masses as in **figure 2(a).**

G = ...cm (½ mk)

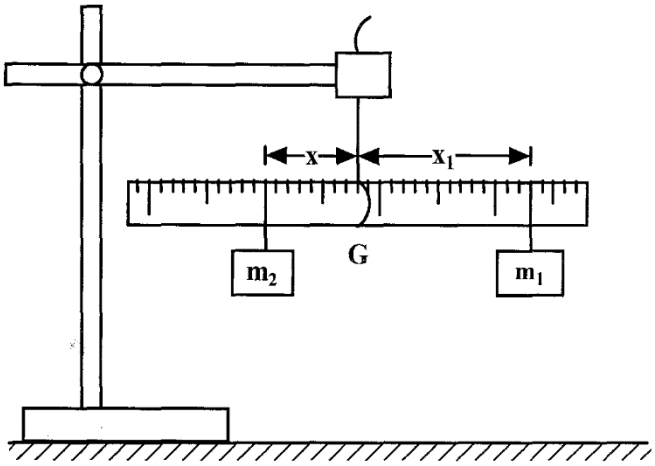


Figure 2(a)

b) Position mass $\mathbf{m_2}$ at a distance **x = 5 cm** from the centre of gravity **G** and adjust the position of $\mathbf{m_1}$ so that the metre rule balance at **G**. Record the $\mathbf{x_1}$ of $\mathbf{m_2}$ from the point **G** in **table 2**.

c) While maintaining the distance **x = 5cm**, immerse m_2 completely in water. Adjust the position of $\mathbf{m_1}$ until the metre rule balances again **(see figure 2(b))**. Record the new distance $\mathbf{x_2}$.

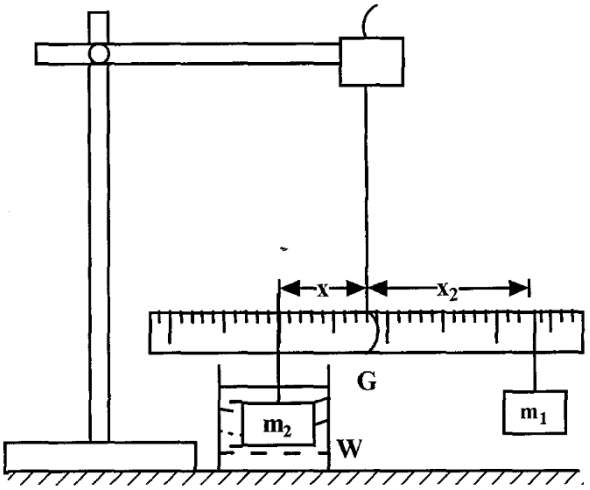


Figure 2(b)

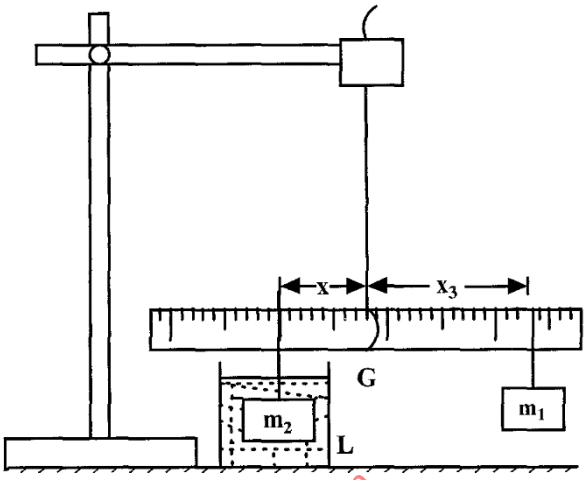


Figure 2(c)

d) Still maintaining the same distance **x = 5cm**, remove the beaker, W with water and replace it with the beaker **L** with the liquid. Immerse $\mathbf{m_2}$ completely in the liquid. Adjust the position of $\mathbf{m_1}$ until the metre rule balances again **(see figure 2(c))**. Record the new distance $\mathbf{x_3}$.

e) Remove mass $\mathbf{m_2}$ from the liquid and dry it with a tissue paper.

f) With the metre rule still suspended from its centre of gravity **G**, repeat the procedure in (b), (c), (d) and (e) for other values of **x** given in **table 2**. Complete the table. (9 ½ mks)

Distance x (cm)	Distance x_1 (cm)	Distance x_2 (cm)	Distance x_3 (cm)	$L_0 = (x_1 - x_2)$ (cm)	$L_1 = (x_1 - x_3)$ (cm)
5					
10					
15					
20					
25					

(g) Plot a graph of L_0 (y-axis) against L_1 (5mks)

(h) Find the slope S of the graph. (3mks)

(i) Find the value of k given that $L_1 = \frac{25}{K} L_0$ (2mks)

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MECS JOINT EVALUATION TEST - FORM FOUR END OF TERM 1, 2020
Kenya Certificate of Secondary Education (KCSE)
232/3
PHYSICS PRATICAL

CONFIDENTIAL INSTRUCTIONS

QUESTION 1
PART 1
Each candidate is required to have:
- A wire mounted on a millimeter scale and labeled X (32 SWG)
- A switch
- An Ammeter (0-2.5A)
- A Voltmeter (0-5V)
- 3 new size D dry cells
- Seven connecting wires, three with crocodile clips at both ends.
- Jockey Key.
- A cell holder for three cells in series

PART II
Q1. Each candidate should be provided with the following:
- Metre rule
- Convex lens of focal length 15cm
- A lens holder.
- Candle
- White screen
- Match box to be shared

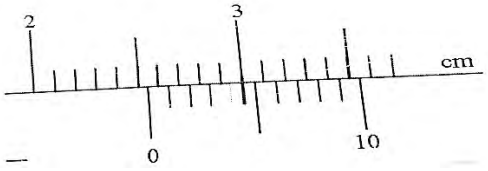
NB. The teacher to mount the lens on the lens holder.

Question 2
Each candidate is required to have:
- One metre rule
- 3 pieces of thin thread each about 20 cm long
- - a retort stand, a boss and clamp
- - 200m1 of water in a 250ml beaker labelled W;
- - 200m1 of a paraffin in a 250m1 beaker labelled L;
- - Two masses labelled m_1=50g and m_2= 100g

MERU CENTRAL SUB-COUNTY CLUSTER
Kenya Certificate of Secondary Education
232/1
PHYSICS
PAPER 1

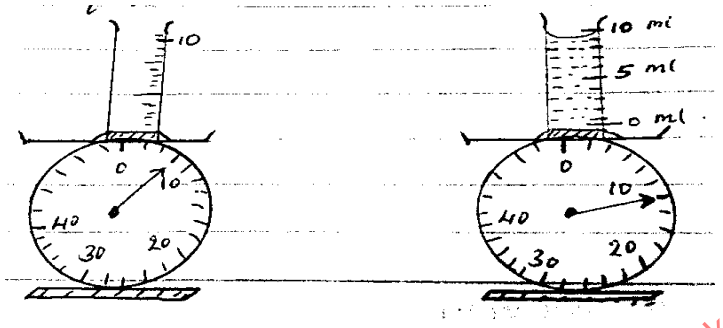
SECTION A – 25 MARKS (ANSWER ALL THE QUESTIONS)

1. The vernier calipers in the figure below has a zero error of -0.05cm.

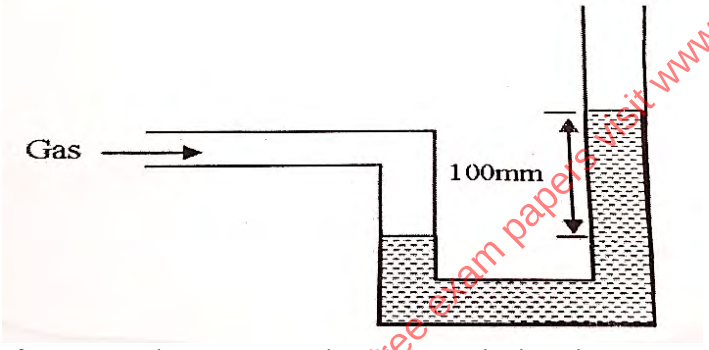


State the actual reading of the measuring instrument (2 marks)

2. Fig.1(a) and (b) shows a set – up to determine the density of a liquid. Determining the density of the liquid. (3mks)



3. The figure below shows an open-ended monometer with water connected to a gas supply

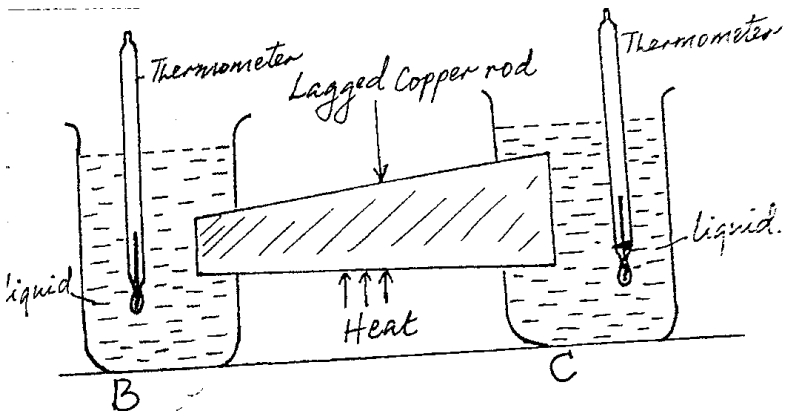


If a mercury barometer reads 760mm, calculate the pressure of gas (give your answer in N/m^3).
(Density water = 1g/cm3, density of mercury = 13.6 g/cm^3 (3 marks)

4. An object weighs 49N on earth where gravitational acceleration is 9.8N/Kg and 40.5N on another planet. Determine the gravitational acceleration on the planet (2 marks)

5. A measuring cylinder contains $20cm^3$ of water. $10cm^3$ of salt is added and stirred. Explain why the new volume is not $30cm^3$ (2 marks)

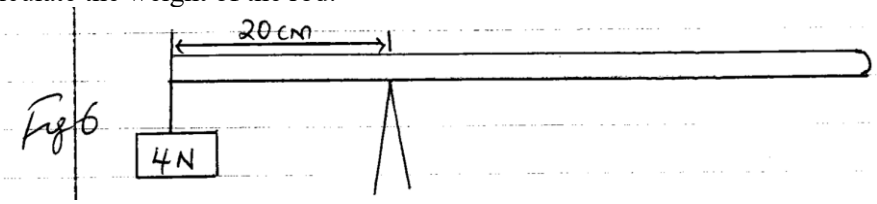
6. The figure below shows samples of same liquid B and C being heated through a well-lagged copper rod of non-uniform thickness. A thermometer is placed on each sample for some time.



If the rod is heated at the middle, state and explain which of thermometers records a higher temperature

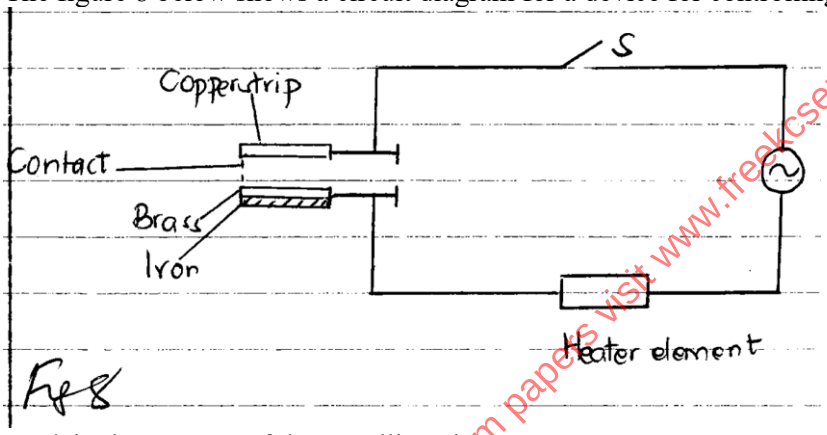
(2 marks)

7. Give one reason why boiling water cannot be used to sterilize a clinical thermometer (1mark)
8. The figure 6 below shows a uniform 50cm rod. It is balanced horizontally by a load of 4N on one end. Calculate the weight of the rod. (2mks)



9. Explain why a car feels lighter as it travels at a higher velocity. (2mks)
10. Pure water at 0^0c is heated up to 10^0c. Sketch the graph of volume against temperature on the axes given below (2mks)

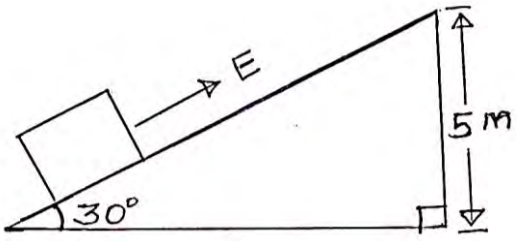
11. The figure 8 below shows a circuit diagram for a device for controlling the temperature in a room.



i) Explain the purpose of the metallic strip (2mks)
ii) Describe how the circuit controls the temperature when the switch S is closed (2mks)

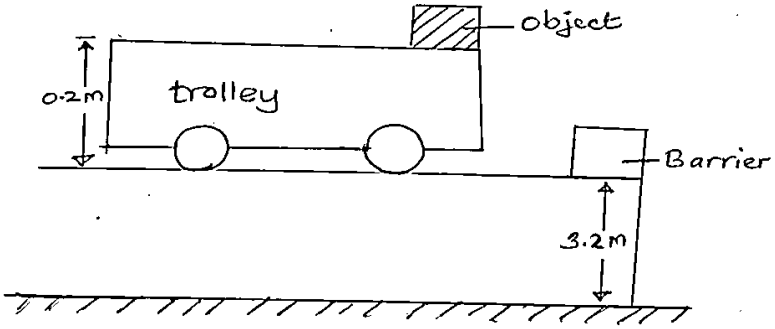
SECTION B – 55 MARKS (ANSWER ALL THE QUESTIONS)

12. (a) Define the term velocity ratio of a machine (1 mark)
    (b) A man pushes a load of mass 80kg up an inclined plane through a vertical height of 5m as shown below. The inclined plane makes and angle of 300 to the horizontal (take g to be $10m/s^2$)
    (i) Determine the velocity ratio of the velocity ratio of the inclined plane. (2 marks)



(ii) If the efficiency of the plane is 75% determine:
I. The mechanical advantage (2 marks)
II. The effort E, needed to pull the load up the plane. (2 marks)

(b) A trolley of height 0.2m moving on a horizontal bench of height 3.2m strikes a barrier at the edge of the bench. The object on top of the trolley flies off on impact and lands on the ground 2.5m from the edge of the bench as shown below. Use this information to answer the questions that follow:



(i) Give a reason why the object on the trolley flies off on impact (2 marks)

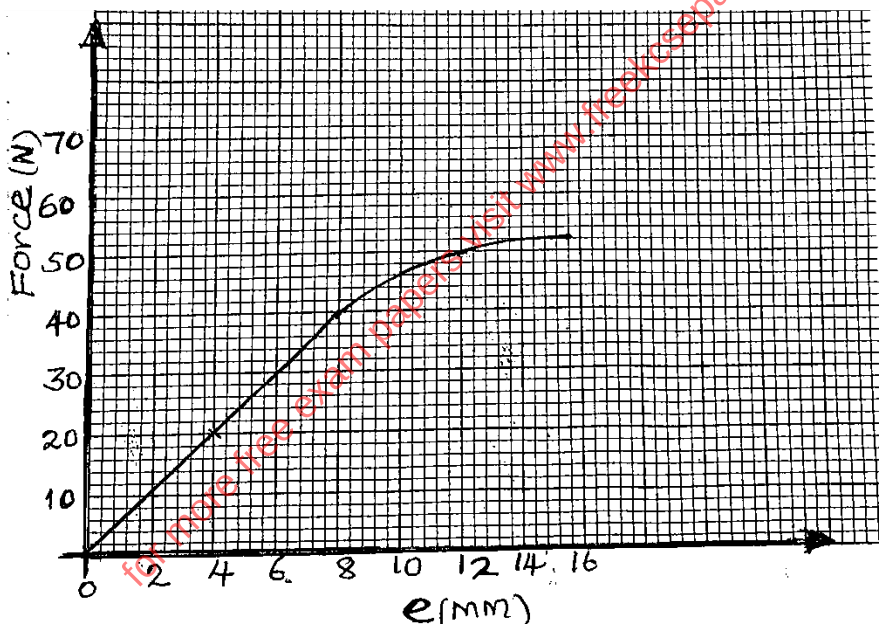
(ii) Determine the time taken by the object to land on the ground (2 marks)

13. (a) State Hooke's Law (1 Mark)

(b) (i) A vertical spring of unstretched length of 30cm is clamped at its upper end. When sand is placed in a pan attached to the lower end of the spring its length becomes 45cm. When 20g mass is placed on top of the sand the length increases to 55cm. Determine the mass of the sand (3 marks)

(ii) If the spring in (i) above is compressed from its original length to a length of 24cm, calculate the work done in compressing the spring. (3 marks)

(c) The graph below shows the relationship between (F) against extension (e) of a spring.

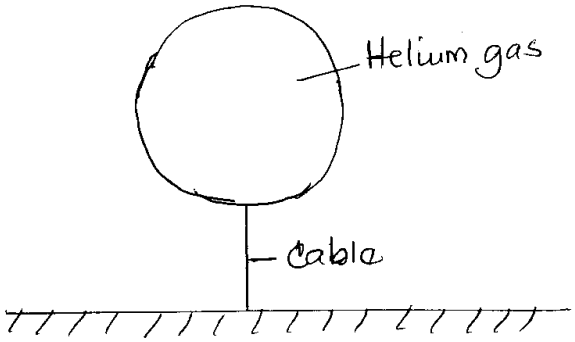


Determine the spring constant of the spring (3 marks)

14. (a) State Archimedes Principle (1 mark)

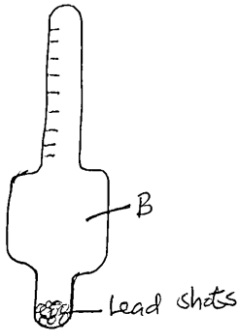
(b) Explain one application of Archimedes Principle in real life situation (2 marks)

(c) The mass of the fabric of a large balloon is 500g. The balloon is inflated with 2000m^3 of helium gas. The balloon is attached to a cable tied on the ground as shown. (Density of helium and air are 0.18g/cm^3 and 1.3g/cm^3 respectively.



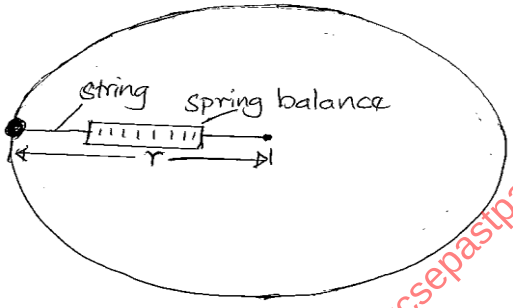
(i) State 3 forces acting on the set up. (3 marks)
(ii) Determine the tension in the cable (3 marks)
(iii) Calculate the acceleration of the balloon if the cable is cut. (2 marks)

(d) The diagram below shows a hydrometer.



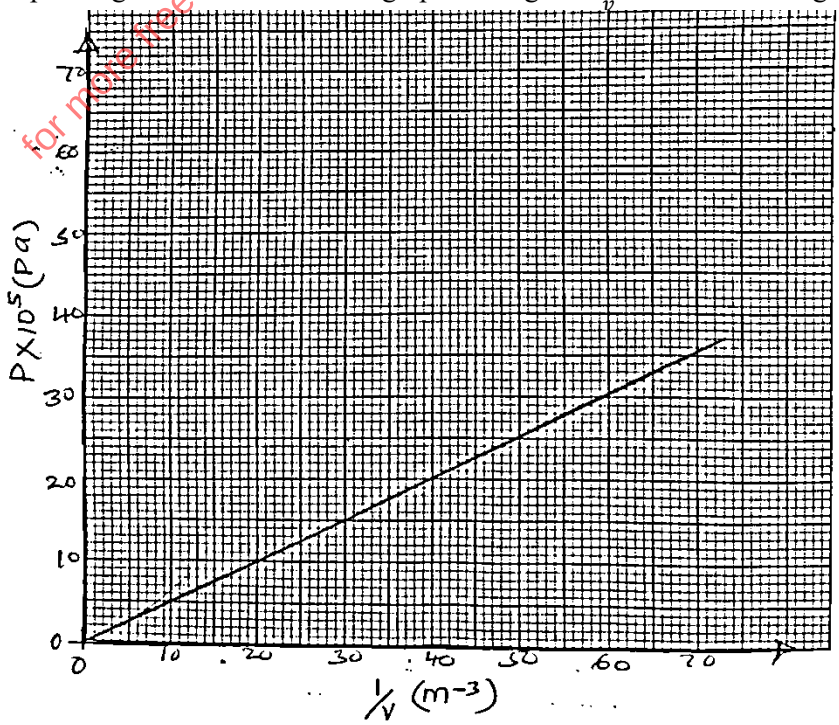
Why is the part marked B wider? (1 mark)

15. The diagram below shows a spring balance tied to an object of mass M and rotated in a circular path of radius r.



(a) (i) State the force that keeps the object moving in a circular path. (1mark)
(ii) The speed of the object is constant but the body is acceleration on the circular path. Explain (1 mark)
(b) (i) If the object is whirled faster, what would happen to the spring balance reading? (1 mark)
(ii) Give a reason for your answer in b (i) above (1mark)
(iii) As the object is whirled round, the sting snaps and cuts off. Describe the subsequent path of the object (1 mark)
(c) If the mass m of the object s 500g and radius r is 50cm. determine the velocity of the body if the spring balances reads 81N (3 marks)

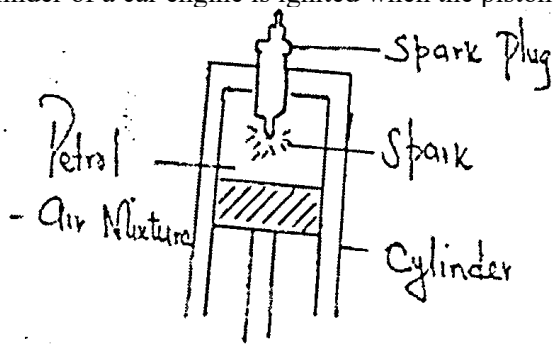
16. (a) State the pressure law for an ideal gas. (1 mark)
(b) The pressure P of a fixed mass of gas at constant temperature of T = 200k is varied continuously and the values of corresponding volume recorded. A graph of P against $\frac{1}{v}$ is shown on the graph below.



Use the graph to:

(i) Determine the volume of the gas when pressure reads 2.8×10^5 pa (2marks)

(d) The petrol air mixture in the cylinder of a car engine is ignited when the piston is in the position shown below.



Use kinetic theory of matter to explain why the piston moves down. (3 marks)

17. (a) Define the term specific heat capacity. (1mk)

(b) 100g of steam of 100^0C was passed into cold water at 27°C. The temperature of the mixture became 500C. Taking specific heat capacity of water as $4200 jkg^{-1}k^{-1}$ and specific latent heat of vaporization of water as $2260 kjkg^{-1}$ and that heat losses were negligible. Determine

(i) quantity of heat lost by steam. (2mks)

(ii) quantity of heat gained by water. (3mks)

(iii) Mass of the cold water. (3mks)

MERU CENTRAL SUB-COUNTY CLUSTER
Kenya Certificate of Secondary Education
232/2
PHYSICS
PAPER 2

SECTION A – 25 MARKS (ANSWER ALL THE QUESTIONS)

1. Figure 1 below shows an object **O** placed in front of a plane mirror. A ray of light is drawn coming object **O** and striking the mirror at **P.** After striking the mirror, the ray of light is reflected.

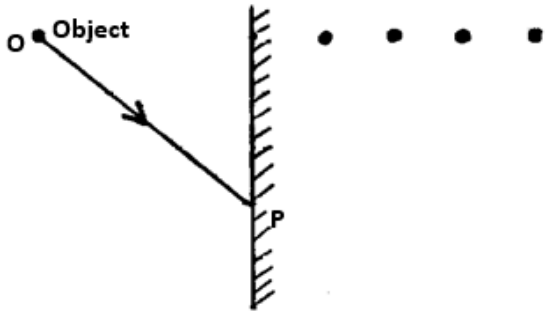


Fig. 1

(i) Which of the four dots represent correct position of the image of **O**? Label this dot **Q** (1mk)
(ii) By drawing a line on the diagram above to represent the reflected ray at **P**, mark the angle of reflection and label it **r**. (1mk)

2. An echo sounder of a ship received the reflected waves from a sea bed after 0.20s. Determine the depth of the sea bed if the velocity of sound in water is 1450m/s (2mks)

3. Figure 2 below shows a simple experiment using a permanent magnet and two metal bars **A** and **B** Put close to the iron filings.

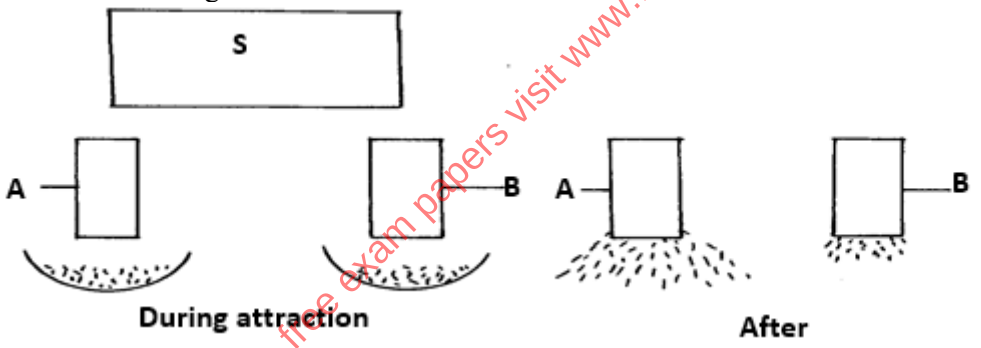
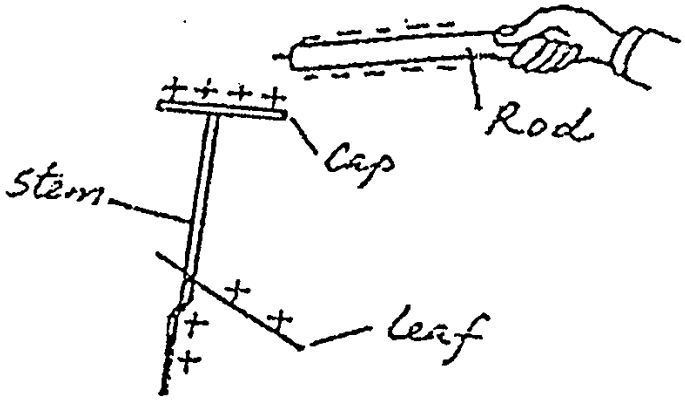


Fig. 2

State with a reason which bar is made from a soft magnetic material. (2mks)

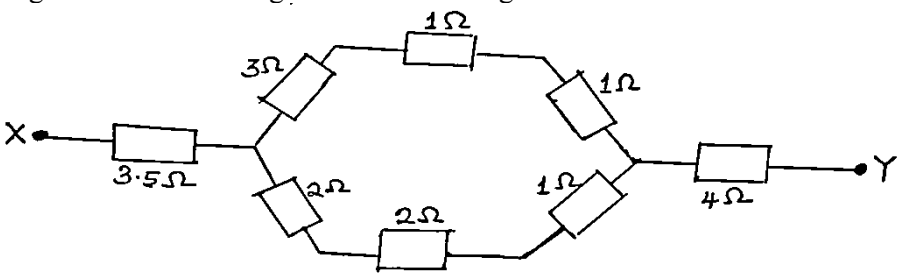
4. The figure below shows a highly negatively charged rod being brought slowly near the cap of a positively charged leaf electroscope. It is observed that the leaf initially falls and then rises.



Explain this observation (2 marks)

5. (a) A generator capable of producing 100kw is connected to a factory by a cable with a total resistance of 5 ohms. If the generator produces the power at a potential difference of 5kv. What would be the maximum power available to the factory? (2 marks)
(b) State one cause of power loss in transmission of the main electricity (1 mark)

6. The figure below shows eight resistors forming a network in circuit between X and Y.



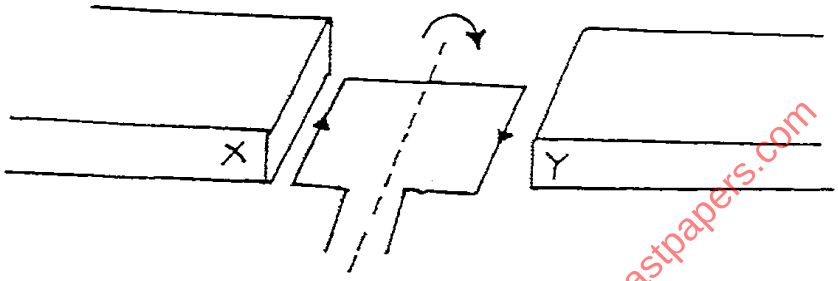
Calculate the effective resistance of the network. (3 marks)

7. State:

(a) One application of ultraviolet radiation (1 mark)

(b) One detector of the radiation in (a) above. (1 mark)

9. The figure below shows a rectangular coil in a magnetic field rotating in a clockwise direction.



(i) Indicate the poles X and Y of the magnets. (1 mark)

(ii) Suggest one way of increasing the magnitude of the force in such a coil. (1 mark)

10. A battery is rated at 30Ah. For how long will it work if it steadily supplies a current of 3A. (2 marks)

11. (b) An element **R** decays by giving off an alpha particle. Complete the equation below showing the valves of **a** and **b** (2marks)

$$^{236}_{72}R = {}^{a}_{b}V + {}^{4}_{2}He$$

a = _____ b = _____

12. The circuit diagram in figure13 below shows four capacitors connected between two points **A** and **B**

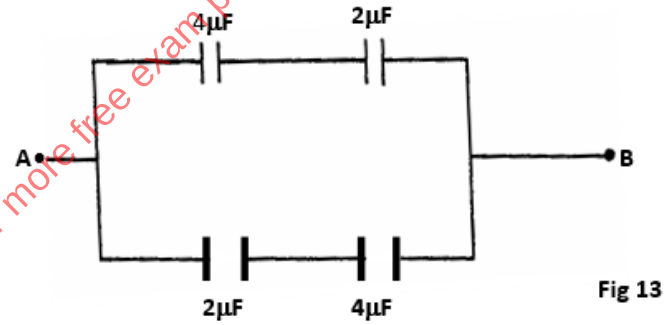
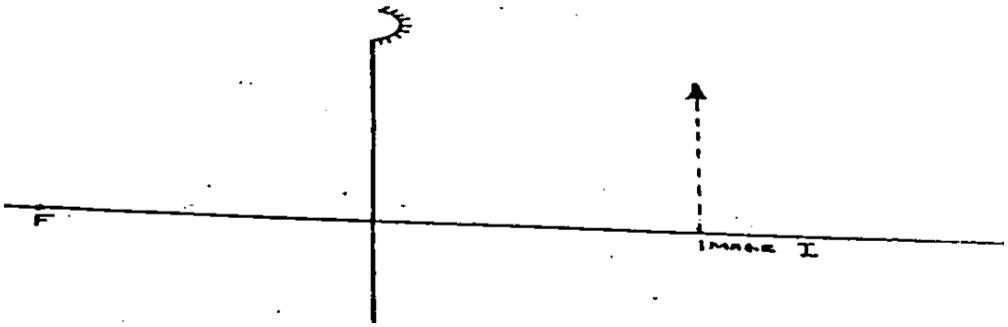


Fig 13

Determine the capacitance across **AB**. (3mks)

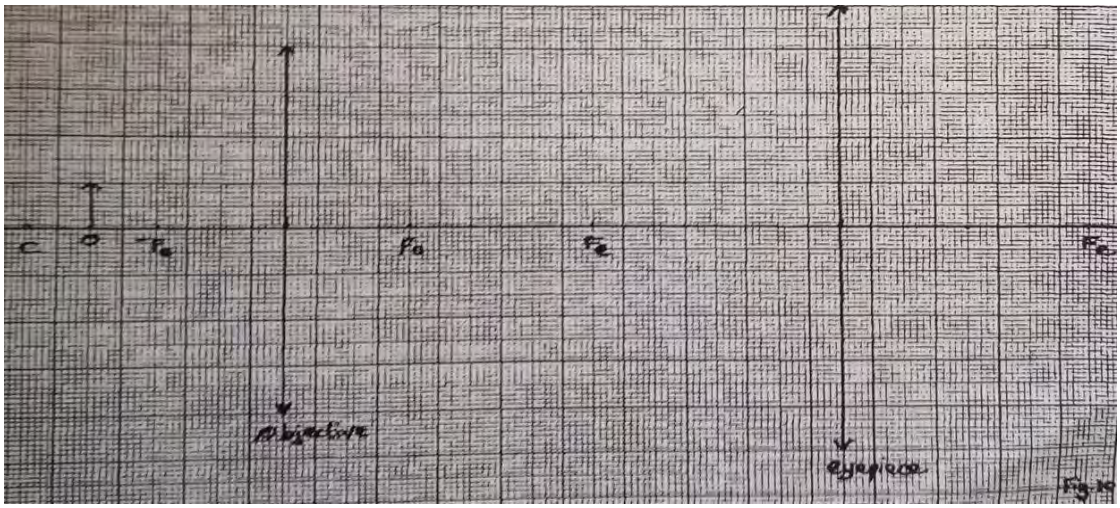
SECTION B (55 MARKS) - ANSWER ALL QUESTIONS

13. a) The figure below shows and image I formed by a concave mirror



Determine its magnification M. (3 marks)

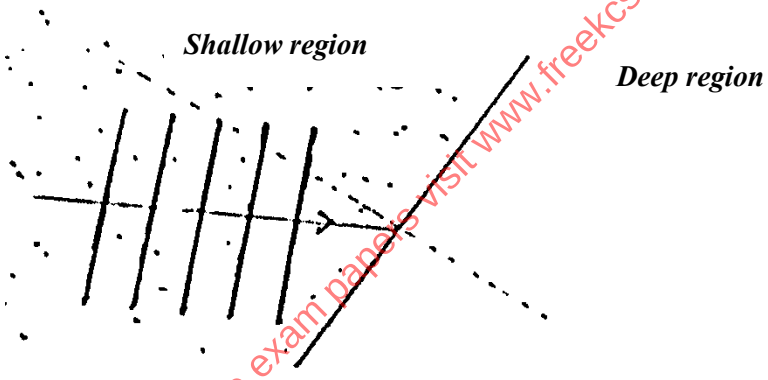
b) The figure below shows lenses of a compound microscope. The focal length of the objective is 2 cm and that of eyepiece is 4cm. The two lenses are 9cm apart. An object 1 cm high is placed 3cm from the objective lens.



(i) Construct rays to show the position of the final image seen by the eye. (4 marks)
(ii) Find the magnification obtained by this arrangement (2 marks)

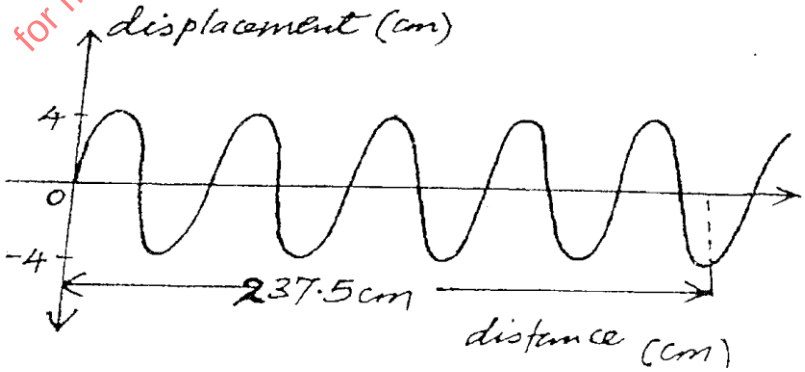
14. The figure below shows water wave fronts

(a) Approaching a boundary between a shallow and deep region. The speed of the waves in the shallow region is less than in the deep region.



On the same diagram complete the fare to show the wave fronts after crossing the boundary. (2 marks)

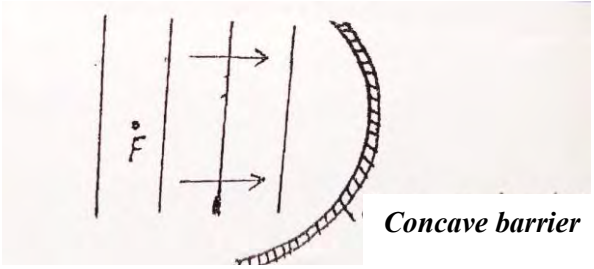
(b) A vibrator is used to generate water waves in a ripple tank. It is observed that the distance between the first crest and the midpoint to the fifth trough is 237.5cm. The waves travel 224.0cm in 6.0 seconds.



Determine:

(i) The wavelength of the waves (3 marks)
(ii) The speed of the waves (2 marks)
(iii) The frequency of the vibrator (2 marks)

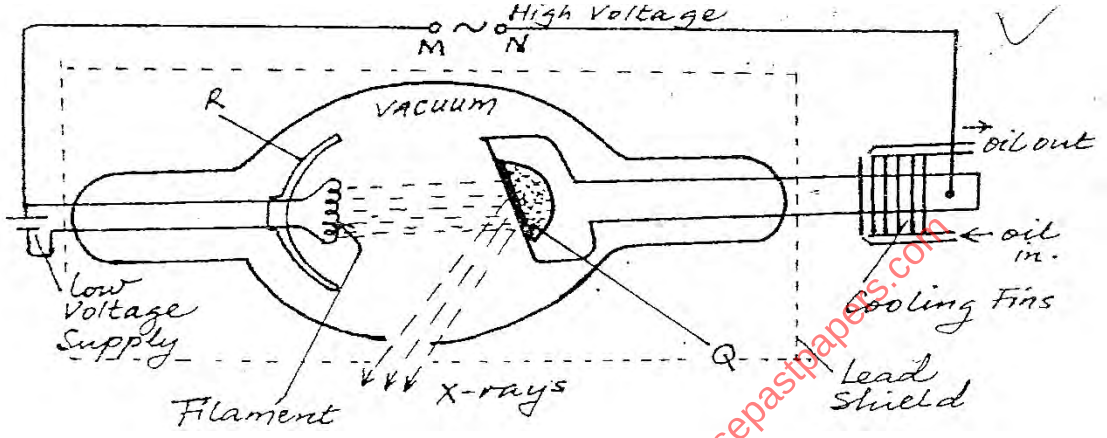
(c) The plane water waves front are incident onto a concaved barrier as show in the figure below.



Concave barrier

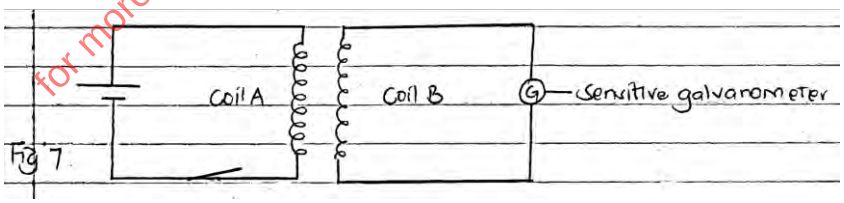
Show on the same diagram the nature of the reflected wave fronts. (2 marks)

15. The figure below shows the parts and circuit of a model X-ray tube.



(a) Name the parts labeled Q and R (2marks)
(b) State the suitable material for use in Q and give a reason for your answer (2marks)
(c) State the function of part R (1 marks)
(d) Describe how electrons, hence X-rays, are produced in the tube (2 marks)
(e) Explain why the glass tube is evacuated (2 marks)
(f) What property of lead makes its suitable material for shielding (1 mark)
(g) State how the following changes affect the nature of X-rays produced
(I) Increasing in potential across MN (1mark)
(II) Increasing the filament current (1 mark)

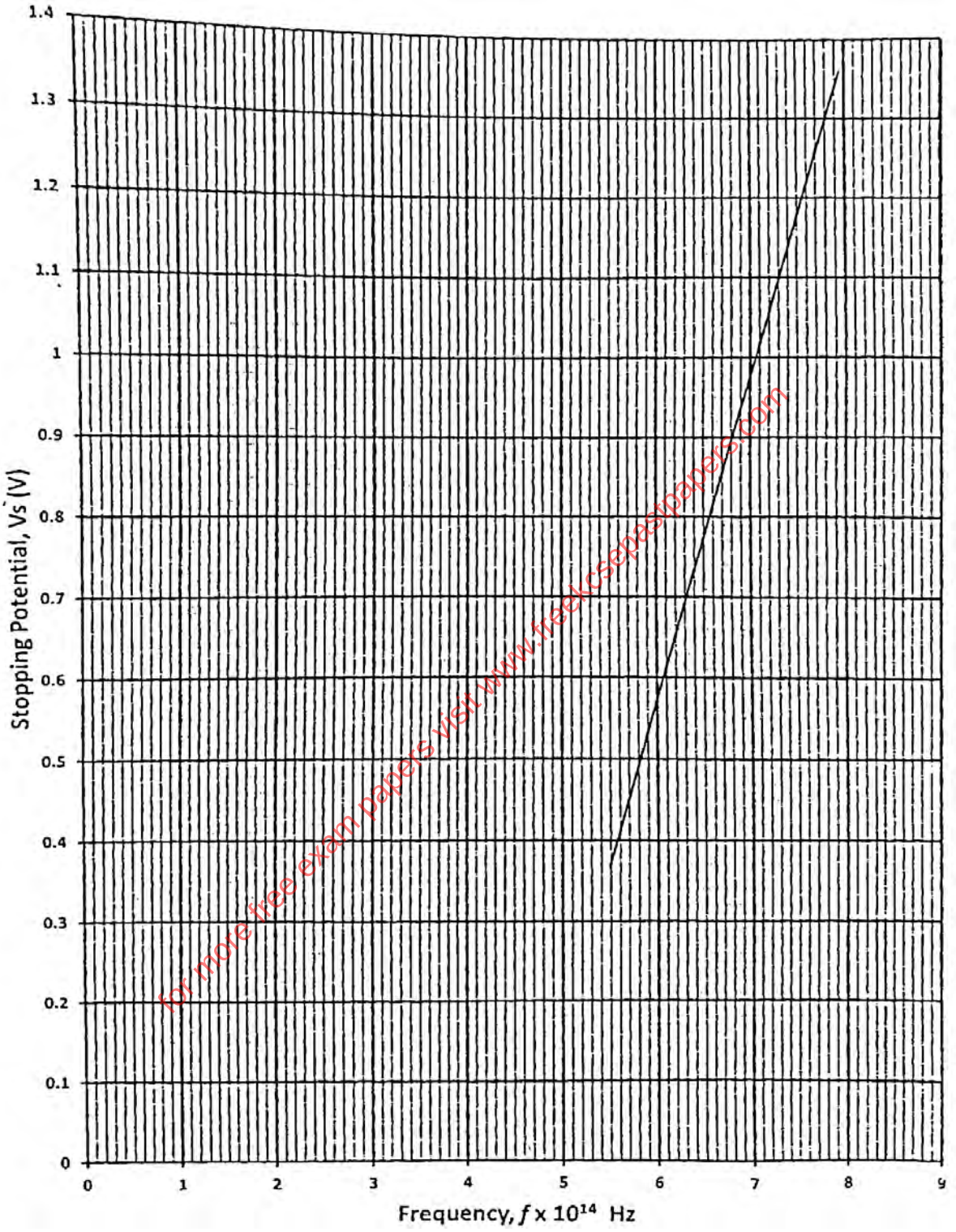
20. Figure 7 shows two coils A and B placed close to each other. A is connected to a steady dc supply and a switch B is connected to a sensitive galvanometer.



i) The switch is now closed. State the observation made on the galvanometer (2mks)
ii) Explain what would be observed if the switch is then open (2mks)
b) the primary coil of a transformer has 1000 turns and secondary coil has 200 turns the primary coil is connected to a 240v ac supply
ii) Determine the secondary voltage (3mks)
iii) Determine the efficiency of the transformer given that the current in the primary coil is 0.2A and in the secondary coil is 0.7A (3mks)

16 (a) What is photoelectric emission? (1 mark)
(c) A radiation falls on photosensitive material state how the following changes affect the emitted photoelectrons:
(i) Increase in intensity of incident radiation. (1 mark)
(ii) Increase in the frequency of incident radiation (1 mark)

(d) The figure below shows a graph of stopping potential (voltage)V, against frequency f, of a radiation falling on a photosensitive surface.
Given that eVs = hf – hfo where h= plants constant, f_o = threshold frequency i.e frequency when $V_s = 0$ and e is the charge on an electron = 1.6 x 10-^{9}C. Use the graph to determine;



(I) The threshold frequency for the surface (1 mark)
(II) The gradient of the graph, hence the value of plank's constant h. (3 marks)
(III) The work function Wo of the surface given that Wo = Hf_o for the surface (2mrk)

17. A student connected a circuit as shown in figure 16 below hoping to produce a rectified out put
(a) Sketch the graph of the output on the **CRO** screen (1mk)
(b) Explain how the output above is produced (2mks)
(c) Name other **two** uses of a junction diode (2mks)

MERU CENTRAL SUB-COUNTY CLUSTER
Kenya Certificate of Secondary Education
232/3
PHYSICS
PAPER 3
TIME: 2 HRS 30 MIN

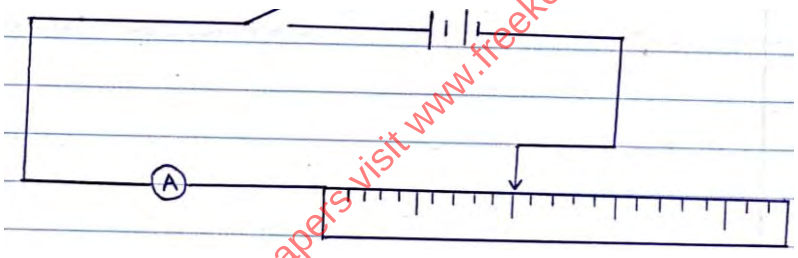
INSTRUCTIONS
Answer all the questions in the spaces provided

Question 1:
Each student will require the following

- 2 new dry cells (size D)
- A cell holder
- A switch
- An ammeter (0-2.5A)
- A voltmeter (0 – 5v)
- 6 connecting wires
- 2 crocodile clips
- A nichrome wire 1.0m long mounted on a scale (SWG 32) labeled X
- A micrometer screw gauge (can be shared)

Proceed as follows

a) Connect the circuit as shown in the figure below



b) Measure the voltage, E (across the cells) before closing the switch
E= …… (1mk)

c) Adjust the length L of the wire 0.2 close the switch S and read the value of current and record 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})						

d) Repeat the procedure in (c) above for the value of lengths given (6mks)

e) Calculate the values of $\frac{1}{I}$ and record in table above

f) On the grid provided, plot a graph of $\frac{1}{I}$ (y axis) against L (5mks)

g) Determine the gradient of the graph (3mks)

h) i) Measure the diameter of the wire in three points used
d_1 =
d_2=
d_3 =
Average d= (1mk)

ii) Determine the cross-section area of the wire (2mks)

i) From the equation
$\frac{1}{I} = \frac{kL}{AE} + \frac{Q}{E}$ determine,

i) The value of k (2mks)

ii) The value of Q (1mk)

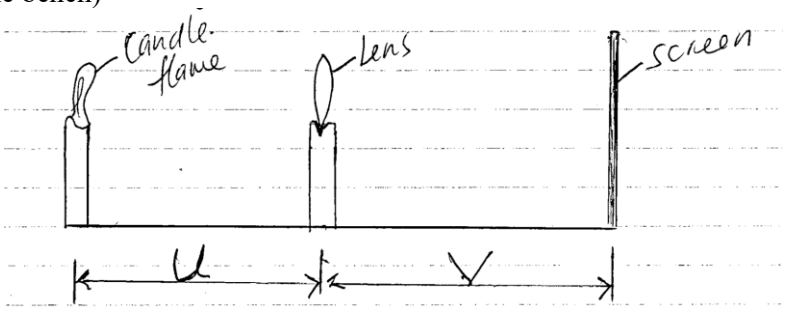
Question 2.

Section A

You are provided with the following

- A candle
- A lens and a lens holder
- A screen
- A metre rule

a) Set up the apparatus as shown in 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 the 40cm from the candle (U=40). 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_1 V = …… cm) 1mk)

c) Repeat the procedures in b) above for other values of U in the table b below.

Table b)

U(cm)	45	50	55
V(cm)			
Magnification (m) $\frac{v}{u}$			

d) Given that f = $\frac{v}{m+1,}$

where f is the focal length of the lens, use the results in table above to determine the average values of *f*. 4mks)

PART B.

You are provided with the following:

- rubber bung. - vernier calipers. - beam balance.

Proceed as follows:

a) Using a vernier caliper, measure the lengths D, d, and h as shown in **figure 2.**

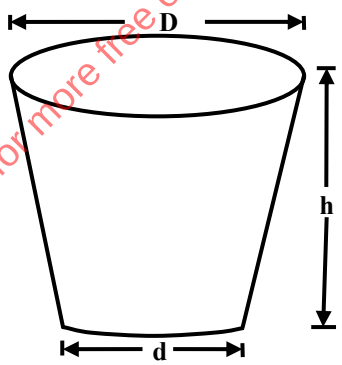


Figure 2

D = ... m (1 mark)

d = ... m (1 mark)

h = ... m (1 mark)

b) i) Measure the mass, M of the rubber bung using the beam balance.

M = ... kg (1 mark)

ii) Given that Q = $\left(\frac{d + D}{4} \right)$, determine the value of Q. (1 mark)

iii) Determine the value of r given that $\pi rQ^2 = \frac{M}{h}$ (3marks)

(iv) what are the units of r (1 mrk)

(v) what is the significance of r (1 mrk)

SECTION C

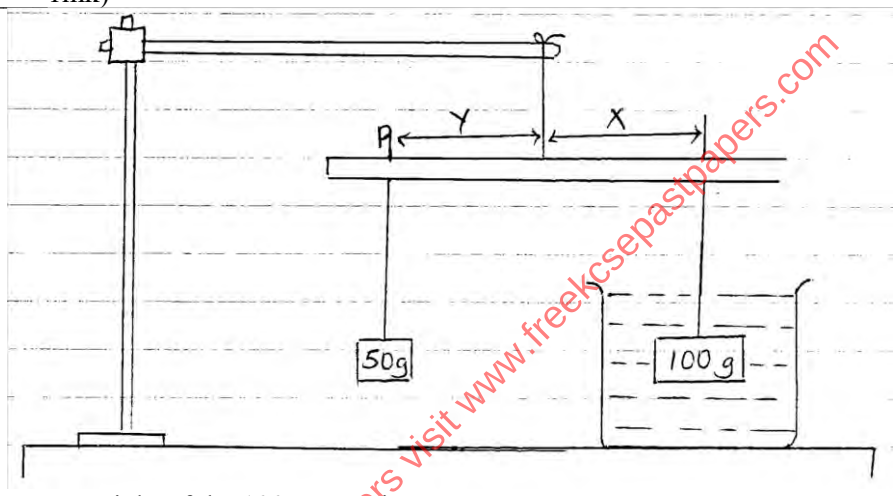
You are provided with the following

- a metre rule
- a retort stand, one boss, one clamp
- One 500ml beaker ¾ full of water
- One 100g mass
- One 50g mass
- 3 pieces of thread approximately 30cm long

Procedure

a) Balance the metre rule horizontally by suspending it from the stand and clamp with one of the threads. Record the balance point G
G = _____ cm (1mk)

b) suspend the 100g mass from the metre rule at a point such that x =5cm from point G, with the 100g mass completely immersed in water in the beaker hang the 50g mass from the metre rule. Note the point of suspension (p) of the mass
P=_____ 1mk)



c) Calculate the apparent weight of the 100 g mass in water. (3mk)

d) Find the upthrust of 100g mass in water. (2mk)

MERU CENTRAL SUB-COUNTY EVALUATION EXAMINATION

Kenya Certificate of Secondary Education (KCSE)

232 / 3

PHYSICS

CONFIDENTIAL

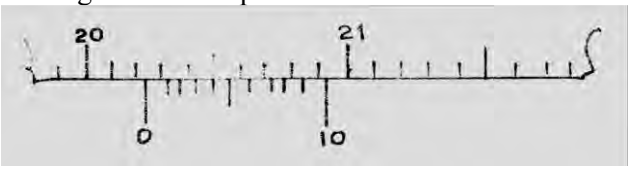
INSTRUCTIONS TO SCHOOLS

Each student will require the following: -

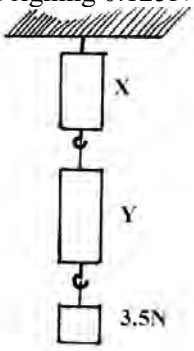
1. 2 new dry cells (size D)
2. A cell holder
3. A switch
4. An ammeter (0-2.5A)
5. A voltmeter (0 – 5v)
6. 6 connecting wires
7. 2 crocodile clips
8. A nichrome wire 1.0m long mounted on a scale (SWG 32) labeled X
9. A candle
10. A lens (f = 20 cm) and a lens holder
11. A screen
12. A metre rule
13. Rubber bung (hard).
14. Vernier calipers (shared).
15. Electronic beam balance (shared). (which records to 1 d.p.)
16. a retort stand, one boss, one clamp
17. One 500ml beaker ¾ full of water
18. One 100g mass
19. One 50g mass
20. 3 pieces of thread approximately 30cm long

KIGUMO END OF TERM 1 2020
232/1
PHYSICS
Paper 1 (Theory)
2 Hours
SECTION A (25 MKS)

1. The figure below shows a diagram of part of a vernier callipers that has a zero error of -0.02cm. Determine the length of the object measured using vernier callipers. (2mks)

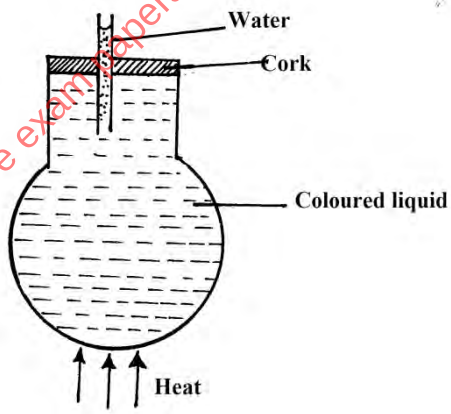


2. $100cm^3$ of sea water of density $1150kg/m^3$ is mixed with $100cm^3$ of fresh water of density $1000kg/m^3$. Determine density of the mixture. (3mks)
3. Two identical spring balances X and Y each weighing 0.125N are arranged as shown in the diagram.



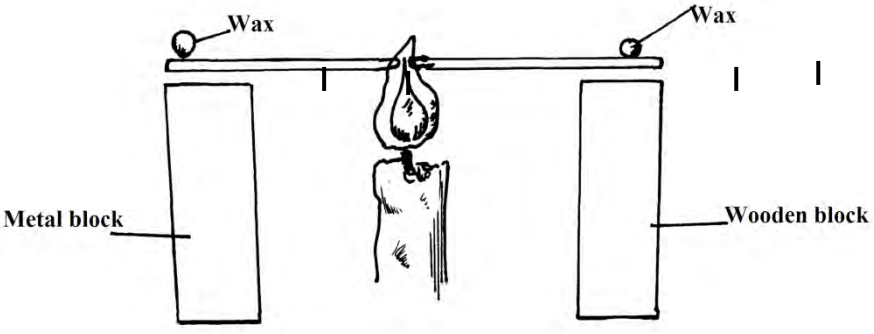
What is the reading on spring balance X (1mk)

4. The reading of mercury barometer is at 70.0cm. What is the pressure at the place in N/m^2. {Assume density of mercury is 1.36×10^4 kg/m^3} (3mks)
5. Using the kinetic theory of matter, explain why solids expand when heated. (2mks)
6. In the set up below, it is observed that the level of water initially drops before starting to rise.



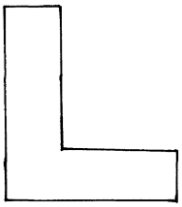
Explain the observations. (2marks)

7. Two identical rods are placed as shown in the figure below. One rests on a metal block and the other on a wooden block. The protruding ends are heated on a Bunsen burner as shown.



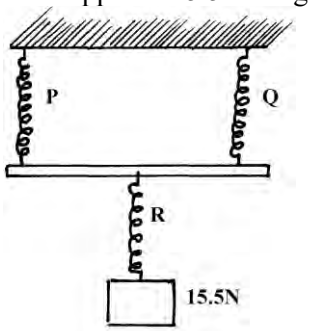
State with a reason on which rod wax is likely to melt sooner. (2mks)

8. A mass of 100g is placed on a 20cm mark and a mass of 50g on a 40cm mark of a uniform metre rule which is balanced at its centre. Where should a further 100g mass be placed to balance the arrangement? (3mks)
9. The diagram below shows a L – shaped solid



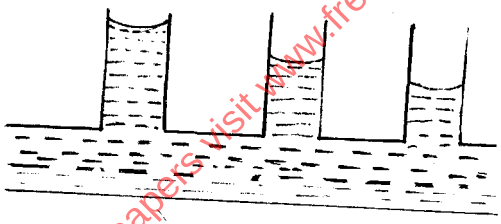
Identify the position of centre of gravity. (2mks)

10. Three identical springs P, Q and R are used to support a 15.5N weight as shown.



If the weight of the horizontal beam is 0.5N determine the total extension of the system if the spring constant of each spring is 400N/m. (3marks)

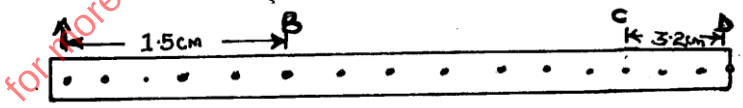
11. Explain how temperature affects surface tension (1mark)
12. The figure shows water flowing through a pipe with three similar vertical columns. Indicate the direction of flow in the main pipe. Give reason (2mks)



13. State one special feature of a hydrometer (1mk)

SECTION B (55 MKS)

14. (a) A paper tape was attached to a moving trolley and allowed to run through a ticker timer. The figure shows the section of the tape.

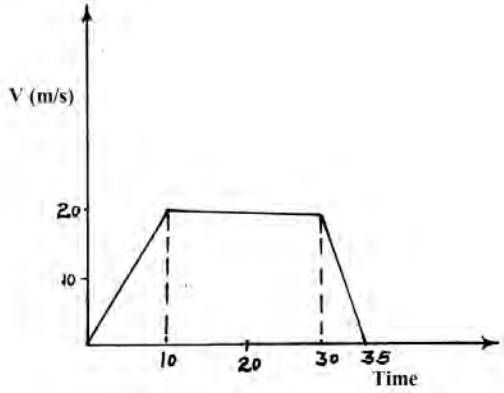


If the frequency of the tape is 100Hz, determine

(i) Velocity at AB and CD. (4mks)

(ii) The average acceleration. (3mks)

(b) The figure below shows a speed time graph for part of the journey of a bicycle.

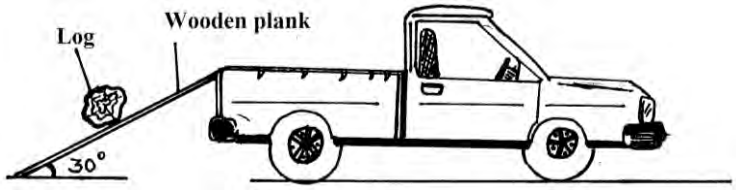


Calculate the total distance travelled. (3mks)

(c) A bomber flying horizontally at 100m/s releases a bomb from the height of 200m. Calculate the time taken for the bomb to hit the ground. (3marks)

15. (a) Define the term efficiency as applied in simple machine. (1mk)

(b) A man used a wooden plank to lift a log of wood from the ground to a stationary lorry on a flat ground as shown in figure below. The wooden plank was inclined at an angle of 30^0 to the ground.



(i) Indicate with an arrow on the diagram, the direction of the effort and the load. (2mks)

(ii) Calculate the velocity ratio of the set up. (2mks)

(iii) Calculate the mechanical advantage of the set up if its efficiency is 65%. (2mks)

(c) A pump is used to spray water from a pool to form fountain.

(i) Determine the minimum power of the pump if it ejects 50 litres of water per minutes and spray reached a height of 5 metres. (3mks)

(ii) Give a reason why water often returning to the pool has a different temperature from that which left the pump. (2mks)

16. (a) Define specific latent heat of vaporization. (1mk)

(b) In an experiment to determine specific latent heat of water, steam at 100^0C was passed into the water container, the following measurements were made.

Initial temperature of water = 15^0C
Mass of Calorimeter = 60g
Initial mass of water = 80g
Final mass of water + calorimeter + condensed steam = 160g
Final temperature of mixture = 40^0C
Specific heat capacity of water = 4200 J/Kg
Specific heat capacity of copper = 390J/Kgk

i) Calculate

I. Mass of condensed steam. (1mk)

II. Heat gained by calorimeter and water. (5mks)

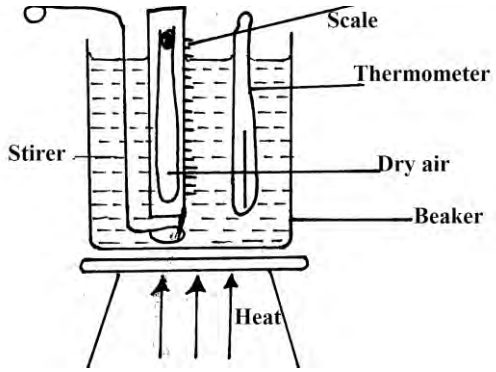
ii) Given that Lv is the specific latent heat of vaporization of steam.

I. Write an expression for the heat given out by steam. (1mk)

II. Determine the value of Lv. (3mks)

17. (a) Using Kinetic theory of Gases, explain how the rise in temperature of a gas causes rise in the pressure of a gas if the volume is kept constant. (3mks)

(b) The figure below is a set up that can be used to verify Charles' law of gases.



i) State the measurements that should be taken in the experiment. (2mks)

ii) Explain how the measurements taken above can be used to verify Charles law. (4mks)

c) A certain mass of hydrogen gas occupies a volume of $2.6m^3$ at a pressure of 1.5×10^5 Pa and temperature of 2^0C. Determine its volume at a temperature of 0^0C and pressure of 1.0×10^5 Pa.

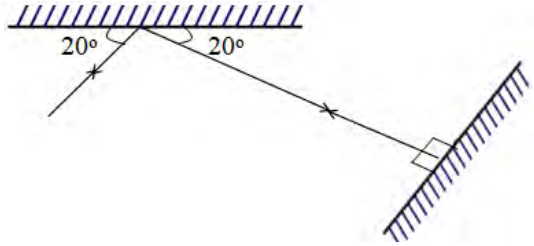
18. A 150g mass tied on a string is being whirled in a vertical circle of radius 30cm with a uniform speed. At the lowest position the tension is 9.5N. Calculate

(i) Speed of the mass. (4mks)

(ii) The tension of the string when it is at the uppermost point. (3mks)

KIGUMO END OF TERM 1 2020
232/2
PHYSICS
Paper 2
2 Hours

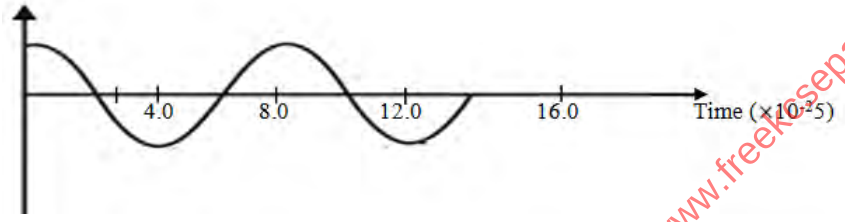
1. The following diagram shows path of a ray of light after striking two mirrors at an angle



(2mks)

Determine the angle between the two mirrors.

2. A rod rubbed with a duster is observed to attract tiny pieces of paper. However, as soon as the papers touch the rod, they are repelled. Explain this observation. (2mks)
3. State two factors that determine the capacitance of a parallel-plate capacitor. (2mks)
4. State two ways in which polarization reduces the p.d. across a simple cell. (2mks)
5. Using the domain theory of magnetism, explain how heating a magnet weakens its magnet. (2mks)
6. Explain why the coil is an electric motor is usually would on a laminated soft iron core. (2mks)
7. The figure below shows a wave on a string.



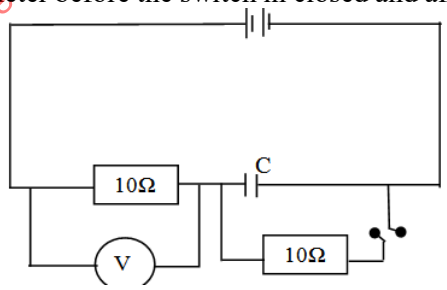
Determine the frequency of the wave. (3mks)

8. State the difference between sound waves and electromagnetic waves. (1mk)
9. The chart below shows an arrangement of different parts of the electromagnetic spectrum.

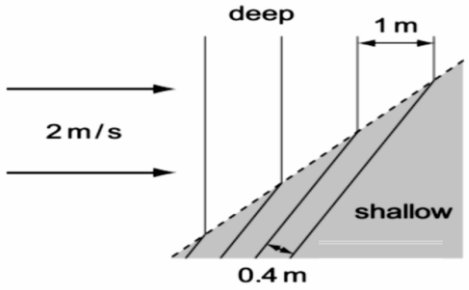
Radio wave	A	Infrared rays	B	Ultra-violet	χ-Rays

i) Name the radiation represented by A (1mark)
ii) State one use of radiation represented by B (1mark)

10. The diagram below shows a circuit containing a battery, two resistors, a capacitor and voltmeter.
Determine the reading on the voltmeter before the switch in closed and after the switch is c l o s e d . (3mks)



11. Define the term **electron volt** (1mk)
12. State Snell's law. (1 mark)
13. Waves pass from deep water to shallow water and refraction occurs.

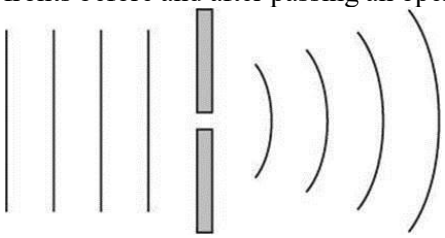


Calculate the speed of the waves in the shallow water (2 marks)

SECTION B (50 MKS)

14. a) Define the term **diffraction** as applied in waves. (1mk)

b) The diagram below shows wave fronts before and after passing an opening.



State what would be observed on the pattern after passing the opening if:

i) the gap was made smaller. (1mk)

ii) the wavelength was made very large. (1mk)

(c) When a metre rule was placed in a ripple tank where straight waves being produced by vibrator, it was noted that the distance between 12 successive dark lines (crest) was 30cm. The frequency of the b=vibrator was 20HZ. Determine.

i) the wavelength of the waves in the ripple tank. (2mks)

ii) the periodic time of the waves. (2mks)

iii) the velocity of the waves over the water surface. (3mks)

15. The table below shows the object distance **u** and the corresponding image distance **v**, for an object placed in front of a concave mirror

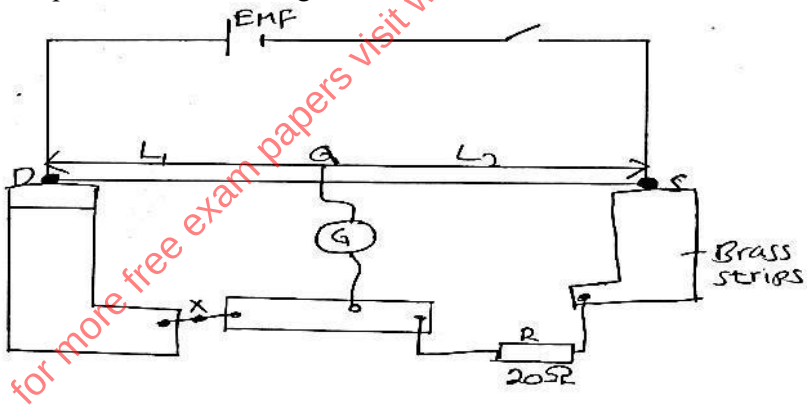
U(cm)	20	25	30	40	50	70
V(cm)	20	16.7	15	13.3	12.5	11.6
1/u (cm^{-1})						
1/v (cm^{-1})						

(i) Complete the table above. (3mks)

(ii) Plot a suitable graph using your table. (5mks)

(a) From the graph, determine the focal length of the mirror (3mks)

16. a) The diagram below represents a metre bridge used to determine the resistance of an electrical component x



From the diagram,

i) Explain why wide brass strips are used as terminals. (1mk)

ii) Explain why a cell of lower e.m.f. is preferable. (1mk)

iii) If null deflection was obtained when L_1 was 60.0cm. Calculate the resistance of component marked X. (2mks)

iv) State three ways of ensuring that error are minimized during the experiment above (3mks)

b) A uniform resistance wire of length 2.0m conducts a current of 0.25A when connected in series with a cell of e.m.f. 1.6V. How much current would be conducted if the wire is now cut into two equal lengths which are then arranged in parallel (4 marks)

17. (a) Define the term virtual **image** as applied in lenses. (2mks)

(b) You are provided with the following:

- A convex lens
- A screen
- A metre rule
- A candle

i) Sketch a diagram of a set-up that can be used in determine the focal length by lens –formula method using the apparatus. (2mks)

ii) State the measurement that would be taken. (2mks)

iii) Explain how those measurements would be used in determining the focal length of the lens. (3mks)

(c) A small vertical object in placed 9cm from a converging lens of focal length 10cm.Determine the nature of the image formed and the distance of the image from the lens. (4mks)

18. (a) Draw a well labeled diagram of an annular eclipse. (3mks)

(b) State two differences between an image formed by a pinhole camera and an image formed by a lens camera. (2mks)

(c) An object is placed 15cm from a concave mirror of focal length 6cm. Find the position, magnification and nature of the image formed. (4mks)

KIGUMO END OF TERM 1 2020
232/3
PHYSICS
Time 2½hrs

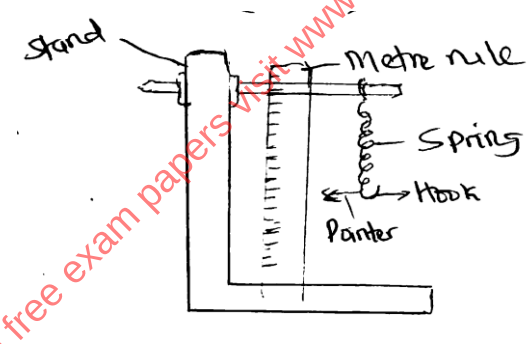
Question one

You are provided with the following apparatus.

- Spring with pointer and hook
- Beam balance (shared)
- Metre rule
- Stand and clamps
- Stop watch
- Masses to add up to 500g

a) Measure and record mass of spring with pointer
M1 = _____kg (1 mk)

b) Set apparatus as shown below



c) Set the pointer reading without mass, Lo at 47.1cm

d) Suspend 100g from hook of spring hence determine

i) New reading of pointer on metre rule
L = _____ cm (1 mk)

ii) Extension X from X=(L – Lo) cm
X = ____ cm (2 mk)

e) Remove the metre rule and displace the 100g mass slightly vertically to oscillate.

i) Measure and record time t for 10 oscillations
t = ____ s (I mk)

ii) Fin the periodic time T using $T = \frac{t}{10}$
T = _____ s (1 mk)

f) Repeat the above procedure using other masses and fill the table below:

Mass (kg)	Time for 10 oscillations (s)	Periodic time ($T = \frac{t}{10}$) (s)	T^2 (s^2)
0.1			
0.2			
0.3			
0.4			
0.5			

g) Plot a graph of $T^2(s^2)$ against mass (kg) (5 mks)

MURANG'A END OF TERM 2, 2020
232/1
PHYSICS
PAPER1
2 HOURS

SECTION A (25MKS)

1. In an experiment to determine the density of a liquid, the reading shown in figure 1 and figure 2 were noted

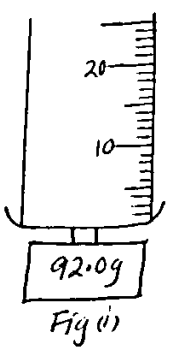


Fig (i)

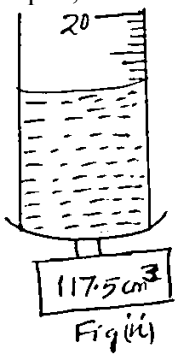
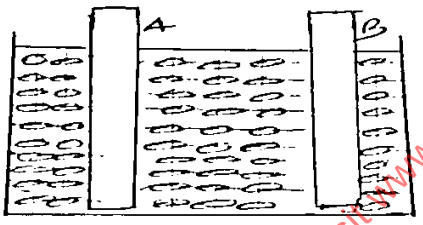


Fig (ii)

Calculate the density of the liquid (3mks)

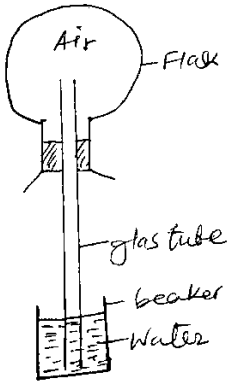
2. The weight of an object on earth is 20 **N.** If the object weighs 18 **N** on another planet determine the gravitational field strength at the planet (g= 10N/kg) (2mks)
3. Explain using kinetic theory of matter one difference between solids and gases (1mk)
4. The figure below shows **two** rods **A** and **B** immersed in a beaker containing ice cubes



Rod **A** is made of glass and **B** is made of copper. A boy holds the two rods with his hands.

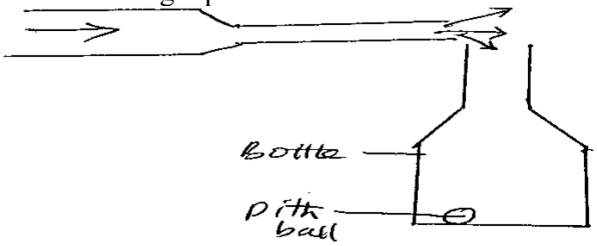
a) What observation is made by the boy. (1mk)
b) Explain the observation in **(a)** above. (2mks)

5. A particle on the edge of a wheel is to be released so as to fly when wheel is revolving at a rate of **2** revolution per second. If the wheel has a radius of 1.2m, determine its linear velocity. (3mks)
6. The figure below shows a flask containing air connected to a long glass tube and inverted into a beaker of water.



a) State what is observed when the flask is gently warmed and allowed to cool. (1mk)
b) Explain the observation in (a) above. (2mks)

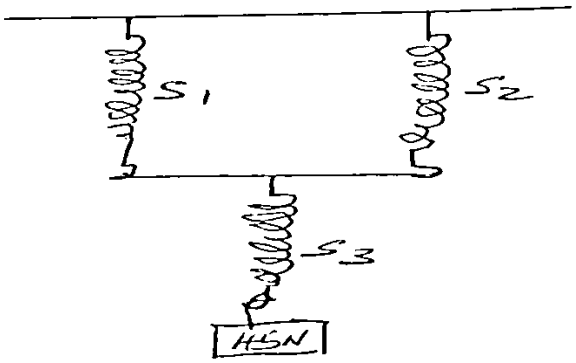
7. A girl drops a stone from a tower 45m tall. Determine the time taken for the stone to hit the ground. (3mks)
8. The figure below shows a light pith ball at the bottom of a bottle container.



i) State what would happen if a stream of air blown over the mouth of the bottle container at high speed. (1mks)
ii) Explain the observation in (i) above. (2mks)

9. A bus that carries goods in the under-seat carrier is more stable than one that carries goods in the carrier and the it's top. Explain why this is so. (1mk)

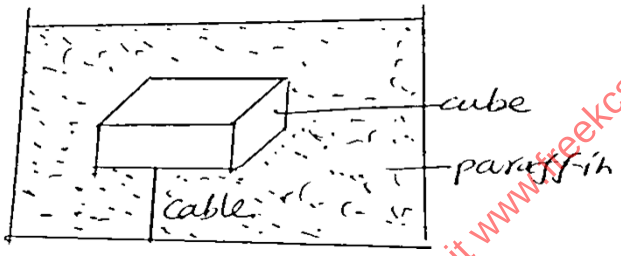
10. Three identical and light springs of a spring constant 40**N**/M are set as shown below.



Determine the total extension of the system when a 45N weight is hung on it. (3mks)

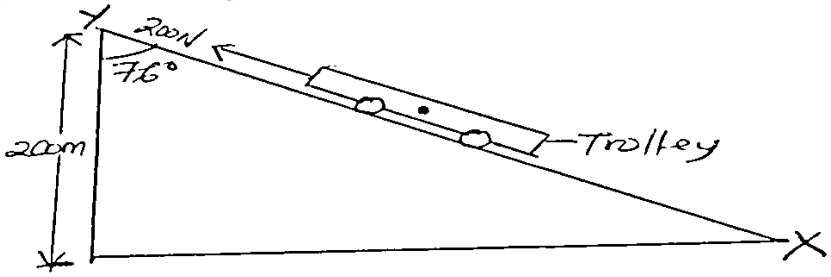
SECTION B (55 MARKS)

11. a) State the law of flotation. (1mk)
b) The figure below shows a cube of side 2m block and of mass 4800kg attached to the base of a tank containing paraffin of density 800kg/m^3 by means of an inextensible and light weight cable.



Determine:
i) The density of the block. (2mks)
ii) The upthrust acting on the block. (3mks)
iii) The tension in the cable. (2mks)
c) The cable is then released and the block rises to the surface where it subsequently floats. Determine the fraction the block which is beneath the surface of the paraffin. (2mks)

12.
a) An elastic band with elastic constant of 40N/M is stretched by 0.10m, it is then released to project a stone of mass 0.025 kg. Calculate
i) The energy stored in the stretched spring. (2mks)
ii) The kinetic energy of the stone when released. (1mk)
iii) The velocity of the stone on projection (2mks)
b) The figure below shows a trolley of mass 60kg resting on an inclined plane. It is then pulled up the slope by a force of 200N from **X to Y at** constant speed.



Determine:
i) The work output of the system. (2mks)
ii) The work input of the system. (2mks)
iii) The efficiency of the system. (2mks)

13.

a) When a force of 10N is applied to a block of mass of 2kg placed on a rough horizontal table, it moves along with constable velocity.

i) What is the coefficient of friction between the block and table? (2mks)

ii) When the force is increased to 15N, what is the acceleration produced? (3mks)

b) An air bubble expands as it rises to the surface of water in a deep pond. State the cause of this given that the temperature remains constant. (2mks)

c) Explain in terms of molecular theory how the increase in volume of a fixed mass of a gas at a constant temperature results in a reduction in pressure. (2mks)

d) A gas occupying 1200cm^3 at a pressure of 760 mmHg is compressed at a constant temperature to a volume of 500 cm^3. Calculate the final pressure of the gas. (2mks)

14

a) State factors that affect the boiling point of a liquid. (2mks)

b) A lagged copper calorimeter of mass 0.8kg contains 0.6kg of water at 22.0 ^{0} C. A metal nut of mass 0.4kg 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 400J/Kg/K and that of water is 4200 J/Kg/K, Calculate: -

i) Heat gained by the calorimeter and water. (3mks)

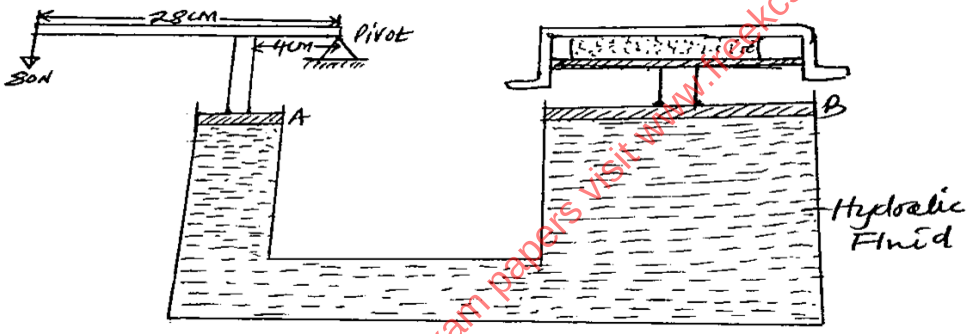
ii) Energy supplied (lost) by the metal nut. (1mk)

iii) The specific heat capacity of the material making the nut. (3mks)

c) An electric kettle Is rated 120V, 60W. If the heater is used to melt 20g of ice at 0^0 C to water at 0^0 C in 112 seconds, calculate the specific latent heat of fusion of ice. (3mks)

15

a) The figure below shows a hydraulic press that is used for compression by applying a force of 80N at the other end, the plunger being 4cm from pivot. The area of the piston A is 20cm^2 and that of piston **B** is 100 cm^2

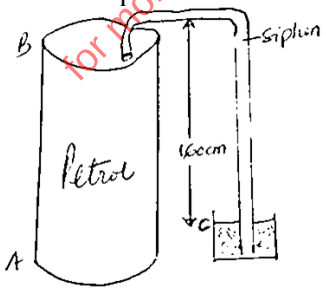


Calculate

i) The force exerted on piston **A.** (2mks)

ii) The force exerted on piston B. (2mks)

b) The figure below shows siphon that can be used to drain petrol from a tank.



i) State the condition that must be met for the petrol to be drained. (1mk)

ii) Determine the effective pressure that causes the petrol to flow out the tank given that the density of petrol 800kg/m^3. (2mks)

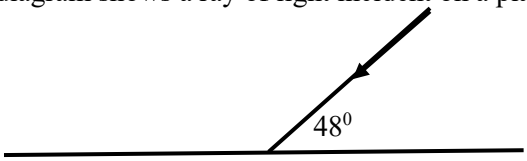
iii) List reasons why the maximum possible height of water can be raised by the lift pump is less than 10m is practice (2mks)

iv) Explain how one is able to drink a soda in a bottle using a drinking straw (2mks)

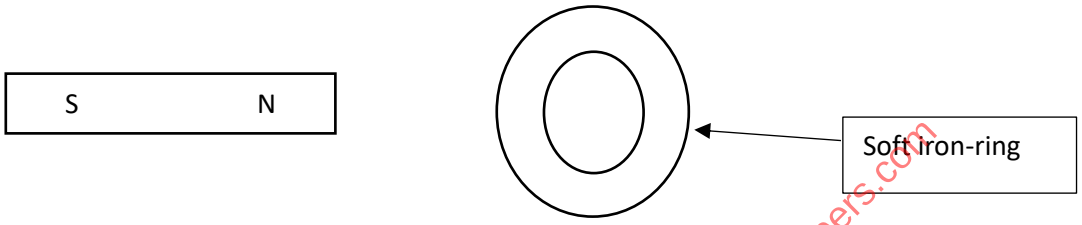
MURANG'A END OF TERM 2, 2020
232/2
PHYSICS
PAPER2
2 HOURS

SECTION A (25 MARKS)

1. The diagram shows a ray of light incident on a plane mirror. Determine the angle of reflection. (1mk)



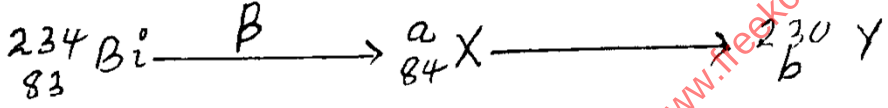
2. The figure below shows a soft-iron ring lying next to the North pole of a magnet.



Complete the diagram to show the correct magnetic field pattern for the arrangement. (2mrks)

3. Arrange the following electromagnetic waves in order of decreasing wavelength
Ultra-violent, Gamma rays, Infra-red rays, Visible light. (2mrks)

4. The following is part of a radioactive decay series.



Determine the value of *a* and *b* (2mrks)

5. An echo sounder of a ship transmits sound waves to depth of the sea and receives the echo after 1.2 seconds. If the speed of sound in sea-water is 1600m/s, determine the depth of the sea. (3mrks)

6. Explain why electric power is transmitted over long distances at high voltages. (2mrks)

7. Figure 3 below shows how the displacement of a particle through a point varies with time as a wave passes it.

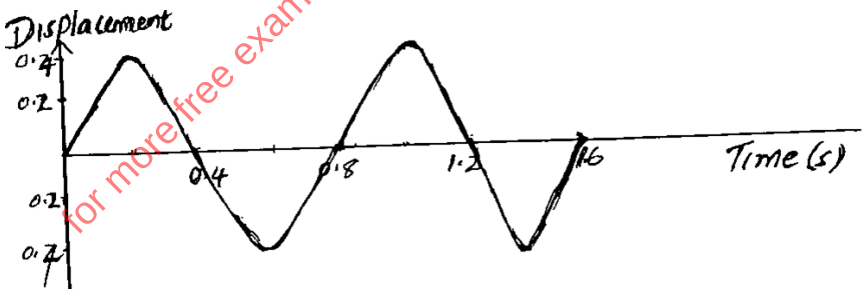


Fig 3

On the same figure, draw a wave which passes through the point, with half the amplitude and same frequency of the one shown. (2mrks)

8. Light travel from glass to air as shown in figure 4. The refractive index of glass is 1.5

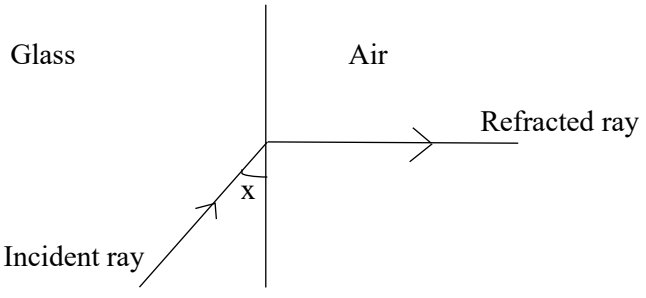
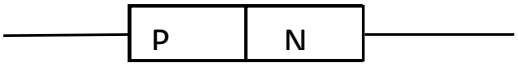


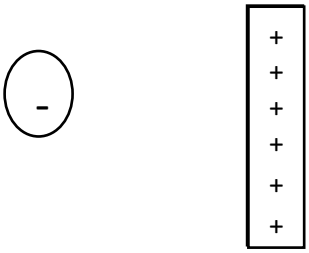
Fig 4

Determine angle X (3mrks)

9. Car accumulators can be used for long if well taken care of. Apart from recharging them regularly, state any other way of increasing its life span. (1mrk)
10. Figure 5 shows a block diagram of a P-N junction diode.
Figure 5



On the same diagram, show how a battery may be connected so that the diode is forward based. (1mrk)
11. An X-ray tube produces hard x-rays. State the adjustment that may be made so that the tube produces soft x-rays. (1mrk)
12. A sharp of a point of a pin is held in the bare hands and brought near the cap of a positively charged electroscope. State and explain the observation made on the electroscope. (2mks)
13. State one advantage of an electromagnet as compared to a compared to a permanent magnet. (1mk)
14. The figure below shows a negative charge near a plate carrying a positive charge.
Draw the electric field between them. (2mrks)



SECTION B:

15.

a) An object 0 is placed in front of a concave mirror as shown in figure 6.

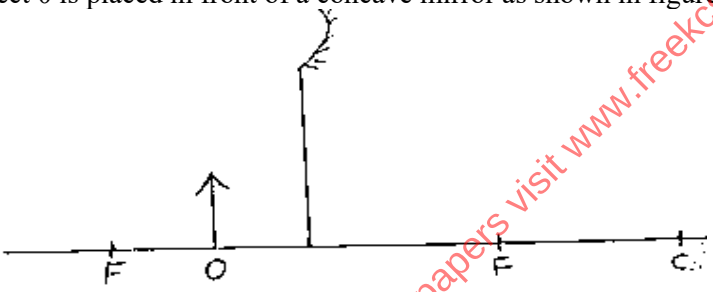
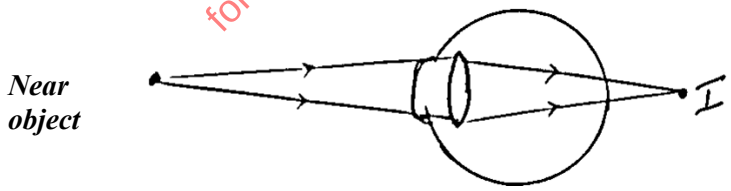


Fig 6

Complete:

i) Draw the ray diagram to show the position of the image. (3mrks)
ii) State any two characteristics of the image formed (2mks)
iii) State one application of convex mirror. (1mrk)

b) The figure 7 shows a certain eye defect.
Fig 7



i) Name the defect of the eye (1mrk)
ii) Draw an arrangement to correct the defect. (3mrks)

c) State one similarity and one difference between the eye and the camera.
Similarity- (1mk)
Difference- (1mrks)

16.

a) State ohms law (1mrk)

b)

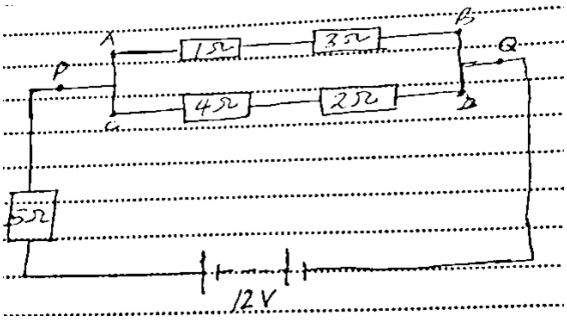


Figure 8.

The figure 8 above shows resistors connected in a circuit. The internal resistance of the battery is negligible.

i) Calculate the effective resistance. (3mrks)

ii) The total current between P and Q. (2mrks)

c) A heater is rated 500W is used to heat water for 6hours. Calculate the cost of electricity if the cost per unit (kwh) is Kshs 3.50 (2mks)

d) Figure 9 below shows a three-pin plug.

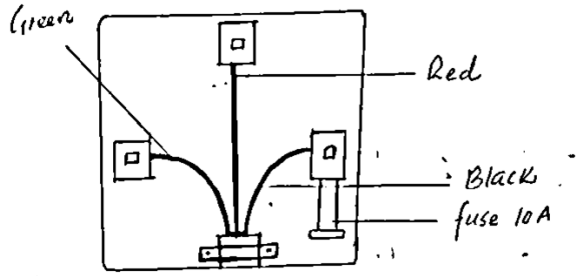


Figure 9

i) Identify one mistakes in the 3-pin plug shown above. (1mrk)

ii) Suggest what would happen if the plug was connected to the mains of the socket. (1mrk)

iii) Give a reason why the earth pin of a 3-pin plug is normally longer than the other two pins. (1mrk)

17.

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

b) In the figure 11 below the bar magnetic is moved out of the coil.

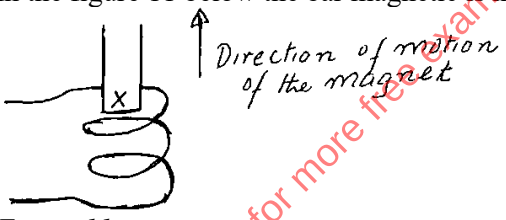


Figure 11

If the current is induced as shown in the coil, if the polarity of X is north pole show on the diagram the direction of the current. (1mk)

c) Define mutual induction. (1mrk)

d) State 2 ways in which the induced emf in both AC and DC generator can be increased. (2mrk)

e) State how the following energy loses in a transformer are minimized

i) Hysteresis loss (1mrk)

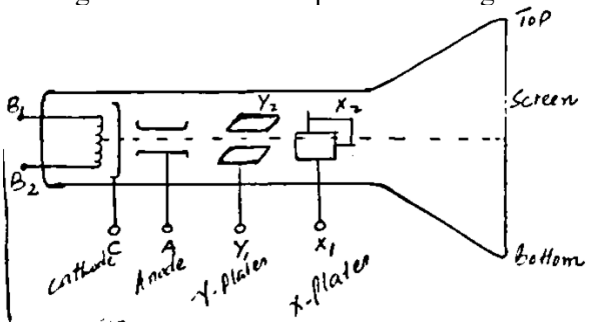
ii) Eddy current (1mrk)

f) A transformer in a welding machine supplies 6 volts from 240 volts mains supply. If the current used in the welding is 30A, if the transformer is 100, determine the current in the mains. (3mrk)

18.

a) Define the term thermionic emissions. (1mrk)

b) The figure 11 shows a simplified drawing of a cathode ray oscilloscope.



The cathode rays are represented by the broken line.

i) Which particles make up the cathode rays? (1mrk)

ii) How does the screen show the presence of cathode rays? (1mrk)

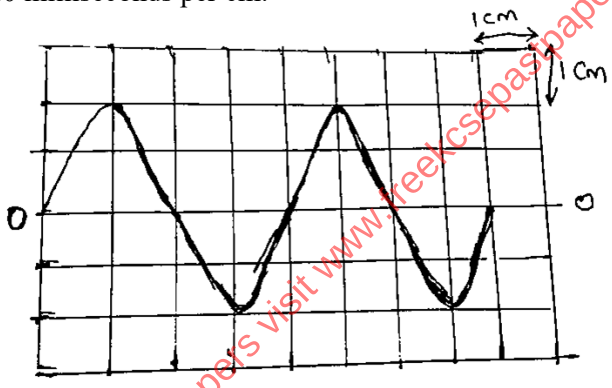
iii) Between which two of the labeled points should a potential difference be connected in order to:

I. Make the cathode hot (1mrk)

II. Accelerate the electrons along the tube (1mrk)

III. Deflect the electron beam (cathode rays) across the screen. (1mrk)

c) In a C.R.O a waveform given below was displayed on the screen when Y-shift of the C.R.O was set at 5v/cm and the time base calibration is 20 milliseconds per cm.



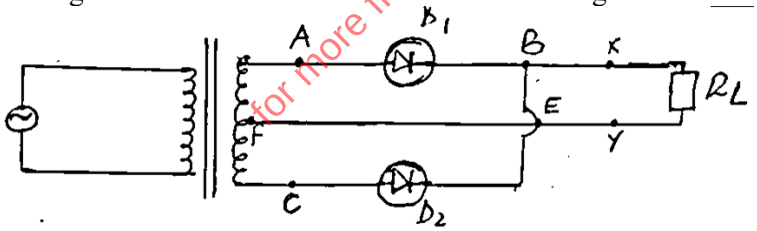
Determine

i) The peak voltage (2mrks)

ii) The frequency of the voltage (3mrks)

19.

a) The figure below shows a circuit of a rectifier using two diodes D1 and D2.



i) What is rectification (1mrk)

ii) Describe how full wave rectification is achieved using the above circuit diagram. (3mrks)

iii) On the axes provided below, sketch the graph of output voltage against time for the rectifier. (2mrks)

iv) A capacitor is now connected across XY. Explain the effect of the capacitor on the output. (2mrks)

b) What is a zener diode (1mrk)

MURANG'A END OF TERM 2, 2020
232/3
PHYSICS
PAPER 3

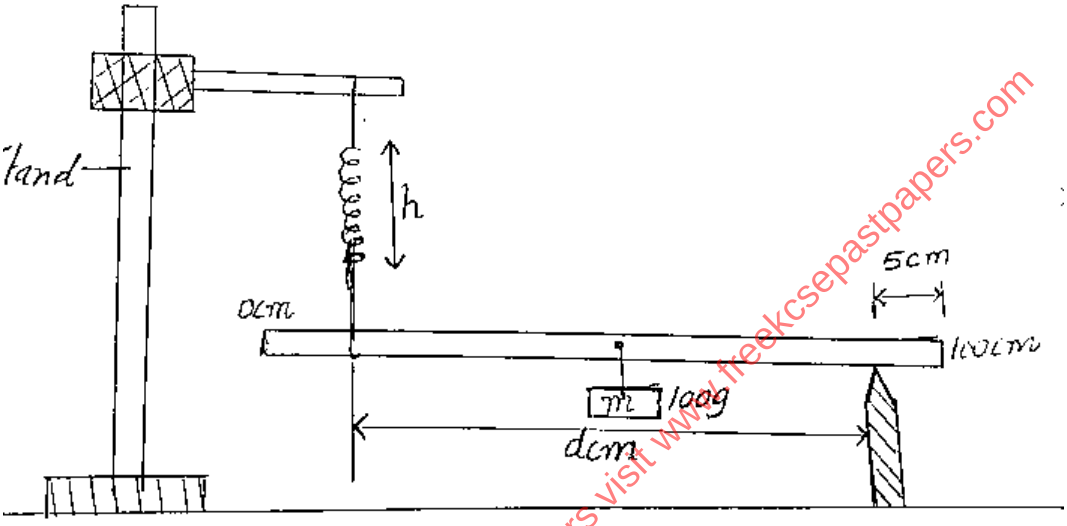
Question 1.
You are provided with the following;

- A spiral spring
- A complete stand
- A metre rule
- A 100g mass
- A knife edge
- Geometrical set

Proceed as follows

a) Determine the COG of the metre rule using knife edge.
C.O.G = ……. (1mk)

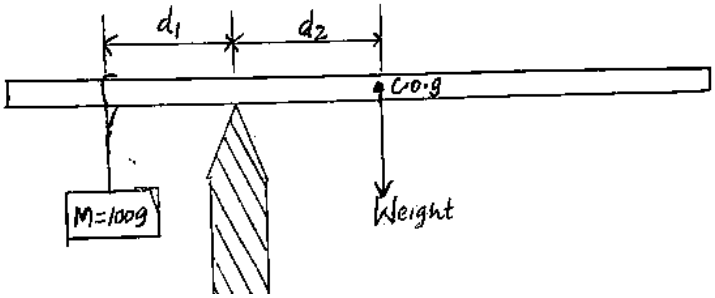
b) Set up the apparatus as follows in the diagram. Ensure the metre rule is horizontal. Hang 100g mass on the metre rule at the position of the COG. Ensure the mass M remains at the position of the COG throughout the experiment.



c) Adjust the position of the pivot so that it is approximately 5cm from the free end of the metre rule.
d) Adjust the clamp so that the metre rule is horizontal and the spring is vertical at 2cm mark.
e) Measure and record the length **h** of the coiled part of the spring and distance **d** from the pivot to the point where the spring is attached to the metre rule.
f) Repeat (c) and (d) above for different positions of the pivot along the metre rule as shown in the table.(4mks)

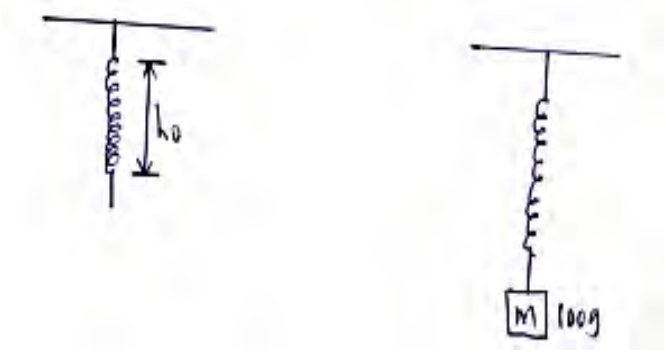
Position of pivot from free end (cm)	5	15	25	35	45
Length h (cm)					
d (cm)					
1/d (cm^{-1})					

g) Plot a graph of h (y-axis) against 1/d (5mks)
h) Determine the gradient m and y intercept c of the line.
m ……... (2mks)
c …… (1mk)
i) Determine the weight of the metre rule using the 100g mass as shown in the diagram.



d1 ……. (½mk)
d2 ……... (½mk)
Use your measurement to determine the weight of the metre rule (3mks)

j) Set the apparatus as shown in the figure below.



Measure and record the values of h_o and h (1mk)
Hence determine the spring constant k in SI unit. (2mks)

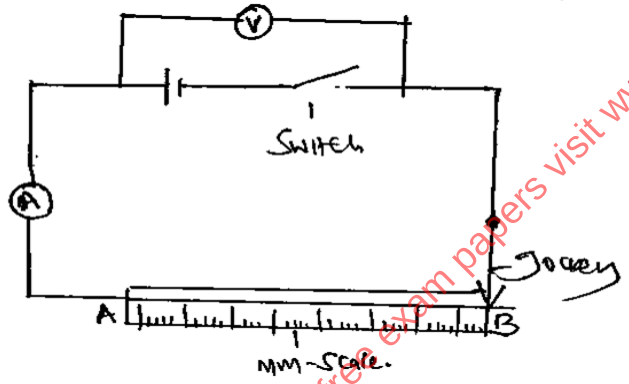
Question 2

You are provided with the following

- Nichrome wire mounted on mm scale labelled AB
- Micrometre screw gauge (to be shared)
- Voltmeter
- Ammeter
- Switch
- Jockey (long wire with a crocodile clip attached)
- 0ne dry cell and a cell holder
- 6 connecting wires with crocodile clips attached to one end

Proceed as follows

a) Set up the circuit below and ensure that when the switch is open both ammeter and voltmeter reads zero. keep the switch open when readings are not being taken



b) Measure and record the diameter(d) of the nichrome wire AB mounted on a mm scale using the micrometre screw gauge. (1mark)
d =……..

c) Disconnect the jockey from were AB and close the switch. record the value E of the voltmeter reading. (1mk)
E …… V

d) Now connect the jockey on AB at a distance l= 2.5cm from end A. Close the switch and record the voltmeter and ammeter readings V and I respectively in the table below. (6mks)

L(cm)	2.5	7.5	10.0	20.0	30.0	40.0
Pd(v)						
Current I(A)						
IV(watts)						

e) Plot a graph of IV against L (5mks)

f) Using your graph. Find the value Lo where the line intersects the horizontal axis. (1mk)
Lo ……...

g) Now place the jockey on AB such that the length L is 63cm.close the switch and record both the voltmeter reading V and the ammeter reading I. (2 marks)
V……v
I……...A

h) Determine the value r from the relation (2mks)

$r = \frac{E-V}{I}$

i) Determine the value of X from the relation (2mks)

$X = \frac{\pi r d 2}{2.52}$

MURANG'A END OF TERM 2, 2020
(232/3)
PHYSICS
PAPER 3
CONFIDENTIAL

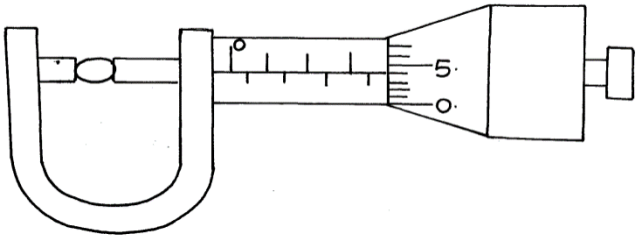
Question 1
- A metre rule
- A complete stand
- A 100g mass labelled M
- One spiral spring (spring constant range 0.07 N/cm to 0.12N/cm)
- Half metre rule or geometrical set
- A knife edge (15 cm by 20cm high)

Question 2
- One new dry cell (size D 1.5v)
- Nichrome wire (SWG 28 100Cm long mounted on mm scale) labelled AB
- An meter (0-1A)
- A voltmeter (0-3V or 0-5V)
- A cell holder
- A jockey or crocodile clip
- 6 connecting wires with crocodile clip on one end.

PREDICTION
End of Term 1 Form 4 Examination, 2020
232/1
PHYSICS
Paper 1
Time: 2 Hrs

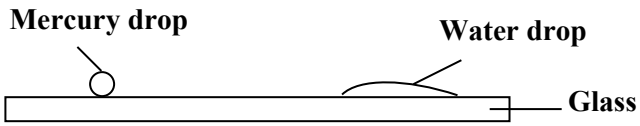
SECTION A (25 MARKS)

1. Figure 1. shows a micrometer screw gauge being used to measure the diameter of a ball bearing.



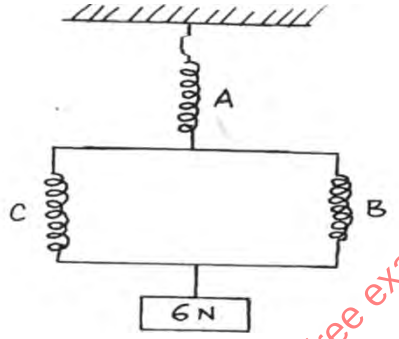
If the instrument has a negative zero error of 0.01mm, record the actual diameter of the ball bearing. (1mk)

2. Figure 2. shows drops of mercury and water on a glass surface,

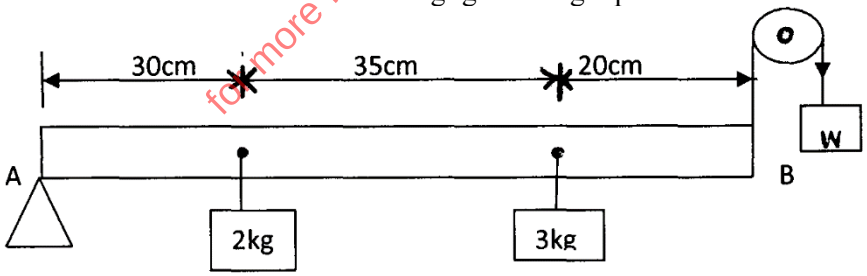


Explain the difference in the shapes of the drops. (2mks)

3. Explain why fish can survive under water when the surface is already frozen. (1 mk)
4. Figure 3 shows three identical springs each of spring constant 4.5N/m and negligible weight are used to support a load as shown. Determine the total extension of the system. (2mks)



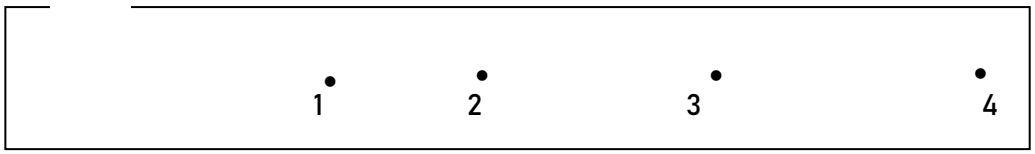
5. Figure 4 shows a uniform rod **AB** of negligible weight pivoted at **A**.



If the system is in equilibrium, determine the weight **W** shown in the diagram. (3mks)

6. 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)
7. The height of mercury column in a barometer density $13600kg/m^{-3}$, at a place is 64cm. What would be the height of a column of paraffin in barometer at the same place. (Density of paraffin = 8.0×10^2 kg $/m^3$). (3mks)
8. Explain one advantage of mercury over alcohol as a thermometric liquid. (1mk)
9. 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. (2mks)
10. A car of mass 1 tone moving at a velocity of 108km/hr is brought to rest in 5 seconds. Calculate the retarding force. (2mks)
11. Explain why a gas cylinder in a house containing cooking fire explodes. (2mks)
12. Oil is leaking from a car as it travels along a straight road. One drop falls on the ground every fifty seconds.

Figure 5 below shows the pattern of the drop on the ground.



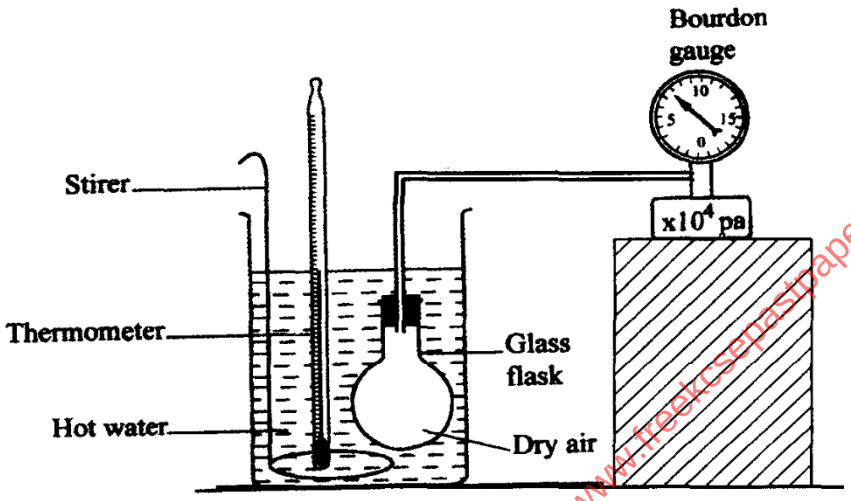
(i) Describe the motion of the car. (1mk)

(ii) Determine the acceleration of the car if the distance between drop 1 & 2 is 20 meters and the distance between drop 3 & 4 is 40 meters (2mks)

SECTION B - 55 MARKS

13. a) State Pressure Law . (2mk)

b) Figure 6 shows a set up that may be used to verify Pressure law.



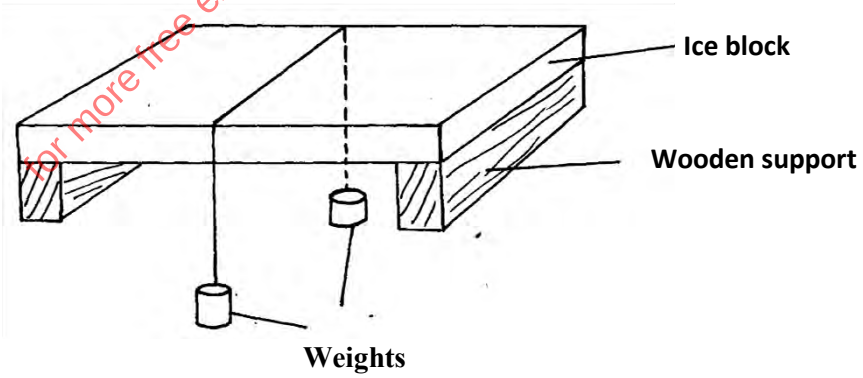
i) State the measurements that may be taken in the experiment. (2mks)

ii) Explain how the measurement in (i) above may be used to verify Pressure law. (4mks)

iii) A car tyre is at an air pressure of 4.0 x 10^5 Pa at a temperature of 27 °C. While it is running the temperature rises to 75 °C. What is the new pressure in the tyre?(Assume the tyre does not expand) (3mks)

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

(b) Figure 7 below shows a block of ice with two heavy weights hanging such that the copper wire connecting them passes over the block.



(i) It is observed that the wire gradually cuts through the ice block, but leaves it as one piece. Explain. (3mks)

(ii) What change would be observed if the copper wire used in the experiment was placed by a cotton thread. (1mk)

(c) A block of ice of mass 40g at 0°C is placed in a calorimeter containing 400g of water at 20°C. The heat absorbed by the calorimeter is negligible. The final temperature of the mixture after all the ice has melted is T. (specific latent heat of fusion of ice=340,000 J/kg, specific heat capacity of water=4200JKg^{-1}k^{-1})

i) Derive an expression for the heat gained by the ice as it melts to water at temperature **T**. (2mks)

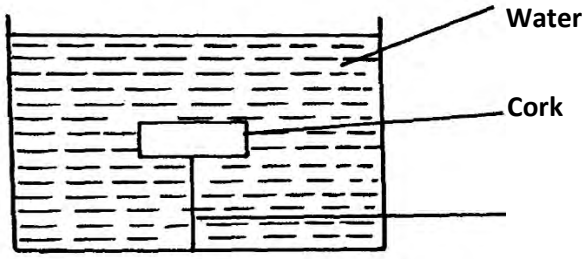
ii) Derive an expression for the heat lost by the water. (1mk)

iii) Determine the value of **T**. (2mks)

(d) State **two** differences between boiling and evaporation. (2mks)

15. (a) State the law of floatation. (1mk)

(b) Figure 8 shows a piece of cork held with a light thread attached to the bottom of a beaker. The beaker if filled with water.



i) Indicate and label on the diagram the forces acting on the cork. (3mks)

ii) Write an expression showing the relationship between the forces. (1mk)

(c) A solid displaces 8.5cm^3 of liquid when floating on a certain liquid and 11.5 cm^3 when fully submerged in the liquid. The density of the solid if 0.8g/cm3. determine:

i) Up thrust on the solid when floating. (3mks)

ii) Density of the liquid. (3mks)

16. (a) Name a device that is used to convert sound energy to electrical energy. (1mk)

(b) Define the term efficiency of a machine. (1mk)

(c) A pulley system having a velocity ratio of 4 is used to raise a load of 100N through a height of 0.6m at a constant speed using an effort of 60N in a time of 15 seconds.

i) Calculate the efficiency of the system. (2mks)

ii) How far does the effort end move in order to raise the load by 0.6m. (2mks)

iii) Determine the power developed by the effort. (2 mks)

17. (a) Define the following terms:

i) Instantaneous velocity. (1mk)

ii) Uniform acceleration (1mk)

(b) A car moves with a constant velocity of 15m/s for 300s and is then accelerated uniformly to a velocity of 25m/s in the next 20s. this velocity is maintained for the next 300s. the car is then brought to rest in 30s with uniform deceleration.

i) Sketch a velocity-time graph for this journey. (2mks)

From the graph determine;

ii) The acceleration while the velocity is changing from 15m/s to 25m/s. (2mks)

iii) The total distance traveled from the time the car reached maximum velocity of the car during this period. (2mks)

(c) A ball is thrown horizontally at V=8m/s from a tower. It reaches the ground after 4s. Find:

i) The horizontal distance d it travels before hitting the ground. (1mk)

ii) The height of the tower (2mks)

iii) The velocity on impact with the ground. (2mks)

PREDICTION - END OF TERM 1 FORM 4 EXAMINATION 2020
232/2
PHYSICS
PAPER 2
TIME: 2 HOURS

SECTION A (25mks)
Answer ALL questions in this section in the spaces provided after each question.

1. What is the purpose of a fuse in domestic wiring system? (1mrk)
2. Use the domain theory to explain briefly why a ferromagnetic material gets saturated when magnetized. (2mks)
3. The **figure 1** below shows an object placed some distance from a biconcave lens.

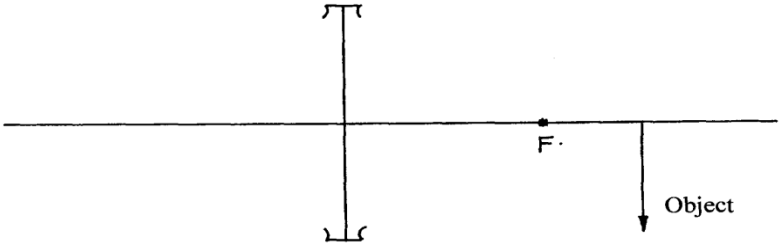


Figure 1

Construct the image on the diagram. (2mks)

4. What determines the hardness of X-rays? (1mk)
5. Distinguish between the terms 'photoelectric' and 'thermionic' effect. (2mks)
6. The **figure 2** below shows a light rod balanced due to the action of the forces shown. Q is a magnet of weight 4N and R is a permanent magnet which is fixed. Determine the force between Q and R and state whether it is attractive or repulsive. (3mks)

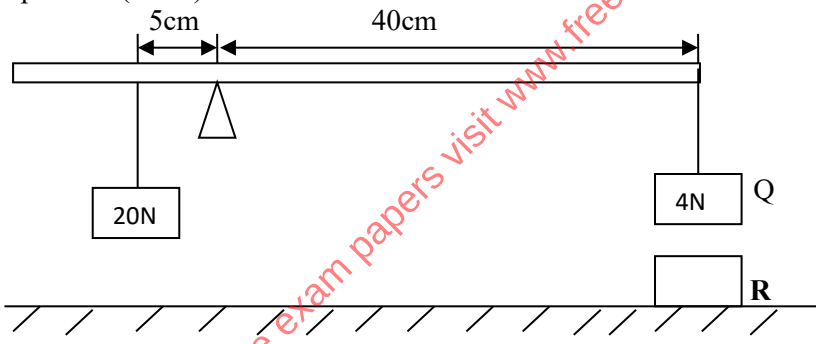


Figure 2

7. Determine the ammeter reading when the potential difference of 3.0 volts is supplied across PQ in figure 3. (3mks)

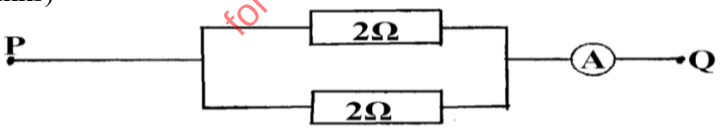


Figure 3

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

Radio	A	Visible	B	X – Rays	Gamma Rays

Name the possible radiations represented by letter **B**. (1mk)

9. A student stands at a distance 400m from a wall and claps two pieces of wood. After the first clap the student claps whenever an echo is heard from the wall. Another student starts a stopwatch at the first clap and stops it after the twentieth clap. The stopwatch records a time of 50 seconds. Find the speed of sound. (3maks)

10. The **figure 4** below shows a plane mirror KL and an object B.

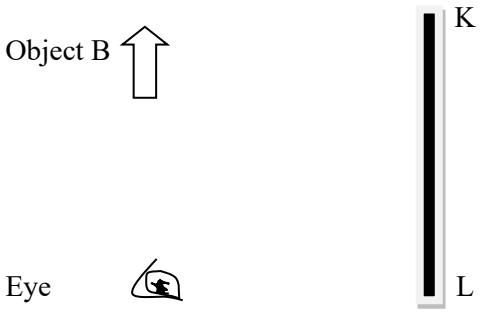


Figure 4

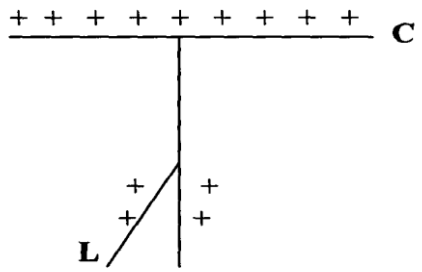
a) Complete the ray diagram to show how the person sees the image. (2mks)
b) State the nature of the image formed. (2mks)

11. The following equation represents a decay series.

$$^{210}_{83}\text{x} \longrightarrow {}^{210}_{84}\alpha \longrightarrow {}^{a}_{b}\text{Q}$$

Identify the radiation **x** and determine the values of **a** and **b.** (2mks)

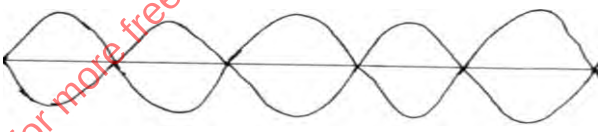
12. A gold leaf electroscope is positively charged as shown in the diagram below where **C** is the cap and **L** is the gold leaf. State and explain what happen to **L** when a positively charged rod is brought near **C** without touching it. (2mks)



SECTION B (55 MARKS)

Answer ALL questions in this section in the spaces provided after each question.

13. a) Differentiate between transverse and longitudinal waves. (2mks)
b) **Figure 5** shows a transverse stationary wave along a string



i). Label the nodes and antinodes on the diagram above. (2mks)
ii) If the distance between an anti-node and consecutive node is 1.0×10^{-3}m, determine the wavelength of the stationary wave. (2mks)
c). Five successive wave frequency in a ripple tank are observed to spread a distance of 6.4cm. If the vibrator has a frequency of 8 Hz, determine the speed of the wave. (3mks)
d). The **figure 6** below shows a displacement-time graph for a wave motion

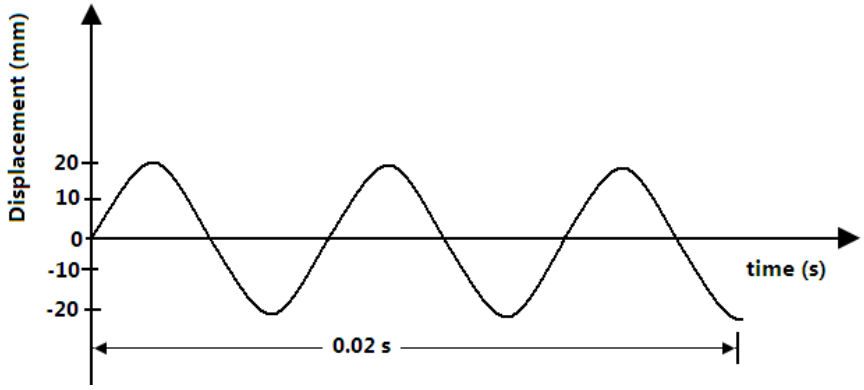


Figure 6

What is the frequency of the wave? (3marks)

14. (a) What do you understand by the term **e.m.f** of a cell?. (1mk)

(b) A cell of e.m.f **E** and internal resistance **r** is used to pass a current through various resistors R Ohms and the values of current recorded in the table below.

R(Ohms)	1.6	2.1	2.5	3.6	5.0	8.0
I(A)	1.0	0.8	0.7	0.5	0.37	0.34
1/i(A^{-1})						

i. Complete the table for the values of **1/i** giving your answer to 3d.p. (3mks)

ii. Plot a graph of **1/i** versus **R.** (5mks)

iii. Given that the equation **E =I(R +r),** use your graph to determine the values of **E** and **r.** (5mks)

15. a) State **three** factors that determine the capacitance of a parallel plate capacitor. (3marks)

b) Three capacitors of capacitance 200μf, 300μF and 600μf are connected together in a circuit.

i) Draw a circuit diagram to show the arrangement of the capacitors which gives an effective capacitance of 100μf. (2marks)

c) The figure 6 below shows a circuit where a battery of e.m.f 6V, switches X and Y, two capacitors of capacitance 2 μF and 4 μFare connected.

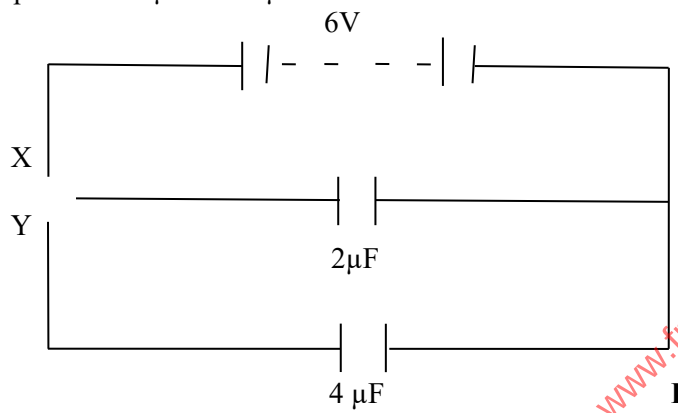


Figure 6

i. Determine the charge stored in the 2 μF capacitor when switch X is closed and switch Y is open. (3marks)

ii. When switch Y is finally closed and switch X is open, determine the potential difference across each capacitor. (3marks)

d) Briefly explain how the lightening arrester works. (3mks)

16. (a) Define the term 'work function'. (1mk)

(b) List three factors which affect photoelectric effects. (3mks)

(c) The table below shows the stopping potential and the corresponding frequencies for a certain photocell.

Stopping potential V_s (V)	0.2	0.6	1.10	1.42	1.83
Frequency f (×10^{14}Hz)	4.0	5.0	6.0	7.0	8.0

Plot a graph of stopping potential against frequency. (5mks)

Use your graph to determine;

i) The threshold frequency. (2mks)

ii) Plank's constant. (Take **e** to be 1.6×10^{-19}C) (2mks)

iii) Work function. (2mk)

PREDICTION - END OF TERM 1 FORM 4 EXAMINATION 2020
Kenya Certificate of Secondary Education
232/3
PHYSICS
PAPER 3
PRACTICAL
TIME: 2½ HOURS

Question 1

You are provided with the following: -

- Vernier calipers
- Micrometer screw gauge
- Masses; 10g, 20g, 50g and 100g
- A helical spring
- Metre rule or half metre rule

Proceed as follows

(a) Determine the number of complete turns of the helical spring.
N = _____ (1 Mark)

(b) Measure the external diameter of the spring using the vernier callipers
D = _____ m (1 Mark)

(c) Use the micrometer screw gauge to determine the diameter of the wire of the spring.
d = _____ m (1 Mark)

(d) Determine the value of m (2 Marks)
$N = \frac{0.4D}{dm}$

(e) Suspend the helical spring vertically alongside the clamped half metre rule as shown in figure 1 below.
Determine the length L_0, of the spring before loading it.
L_0 = _____ cm

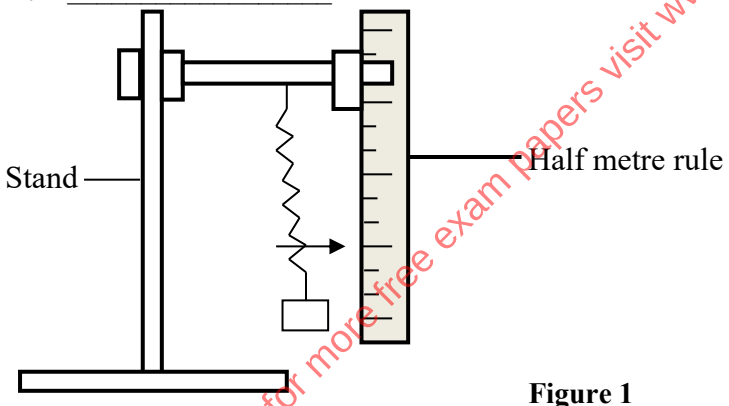


Figure 1

(f) Load the spring with a mass of 20g and determine the new reading on the metre rule. (L) Record this in the table below.
Calculate the extension e = L – L_0 due to the mass of 20g and record the value in the table given below. Repeat step f for other masses and complete the table.

Mass (g)	0	10	20	30	40	50	60	70	80	90	100
Weight (N)											
Reading (L) (cm)											
Extension e (cm)											
$\frac{1}{e}$ (cm^{-1})											

(6 Marks)

(g) Plot a graph of weight (N) against $\frac{1}{e}$ (cm^{-1}) (4 Marks)

(h) Determine the slope (s) of the graph at a mass of 45g (2 Marks)

(i) Given that $m = \frac{-255T}{(S+60)^2}$
Determine the value of T where (S) is the slope at 45g (3 Marks)

2. This question consists of two parts A and B attempt both parts.

PART A

You are provided with the following:

- 5 optical pins
- A glass block
- A plain paper
- A soft board
- 4 thumb pins

Proceed as follows:

(a) Fix the white piece of paper on softboard using the thumb pins provided. Place the glass slab on the white paper and draw the outline of the block on the paper. Remove the block and indicate the sides ABC and D as shown. On side BC determine the centres of side BC using your ruler and fix pin P_0 as shown. Looking from one side at the opposite end of the slab fix pin P_1, P_2 so that they are in with the image I of P_0. On the other side locate the same image using pins P_3 and P_4 as shown in figure 2. Remove the glass block and produce lines P_1, P_2 and P_3, P_4 to their points of intersection which is the position of the image I.

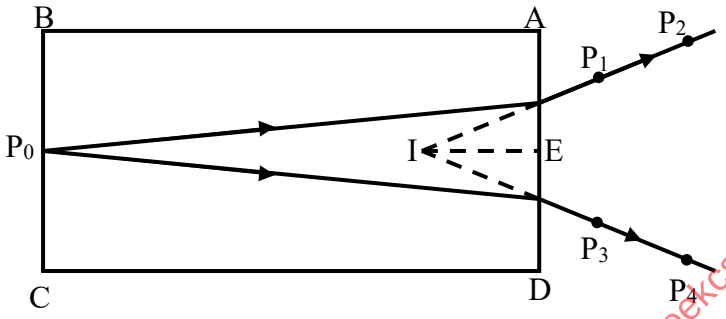


Figure 2

(b) i) Using the half metre rule measure the lengths

EP0 = _____ cm (1 Mark)

EI = _____ cm (1 Mark)

ii) Work out the ratio n = $\frac{EP_O}{EI}$ (2 d.p) (1 Mark)

iii) What does n represent? (1 Mark)

Part B

You are provided with the following.

- A plain sheet of paper
- A soft board
- 4 optical pins
- 4 thumb pins
- A triangular prism

Proceed as follows

(c) i) Firmly fix the plain sheet of paper on the softboard using the thumb pins and place the prism near 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 PQ and R.
On the side QR mark a point and draw a normal OZ at this point. Measure an angle of 200 from the normal and draw a line along this angle as shown in figure 3.

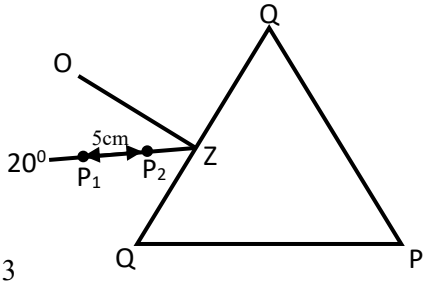


Figure 3

(d) Replace the prism on the outline and fix pins P_1 and P_2 on the 20^0 line at a distance of 3cm from each other.

View the images of the pins P_1 and P_2 through side PR and fix other pins P_3 and P_4 so that all the pins appear on one line. Remove the prism 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. Also extend the 20^0 line so that the two lines cross each other. Determine angle θ and record in the table below.

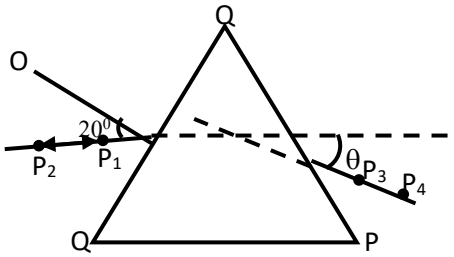


Figure 4

(e) Repeat the procedure and complete the table below.

Angle I ($^{(0)}$	20	30	40	50	60	70
Angle θ						

(f) On the grid provided plot a graph of angle θ against angle i (5 Marks)

(g) Use your graph to determine the highest value H_{max} of angle θ H_{max} = (2 Marks)

(h) Determine the constant R for the glass prism from the formula. (3 Marks)

$$R = \frac{Cos\ 40}{Sin^2\ (16+\frac{Hmax}{3})}$$

PREDICTION - END OF TERM 1 FORM 4 EXAMINATION 2020

Kenya Certificate of Secondary Education

232/3

PHYSICS

PAPER 3

CONFIDENTIAL

Question 1

EACH STUDENT REQUIRES

- ✓ Micrometer screw gauge (shared between 4 students)
- ✓ Vernier calipers
- ✓ Masses
- ♦ 10g
- ♦ 2 – 20g
- ♦ 50g
- ♦ 100g
- ✓ Helical spring (K = 0.08N/cm)
- ✓ Metre rule or half metre rule
- ✓ Complete retort stand

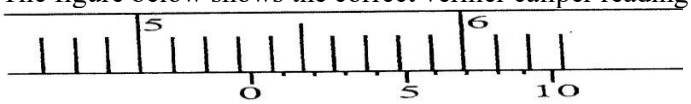
Question 2

- ✓ 2 plain papers (photocopy papers)
- ✓ 5 optical pins
- ✓ Glass block
- ✓ Softboard
- ✓ 4 thumb pins
- ✓ Triangular prism (60^0 x 60^0 x 60^0)

CEKENA FORM 4 END OF TERM ONE EVALUATION TEST 2020
(Kenya Certificate of Secondary Education)
232/1
PHYSICS PAPER 1
THEORY
TIME: 2 HRS

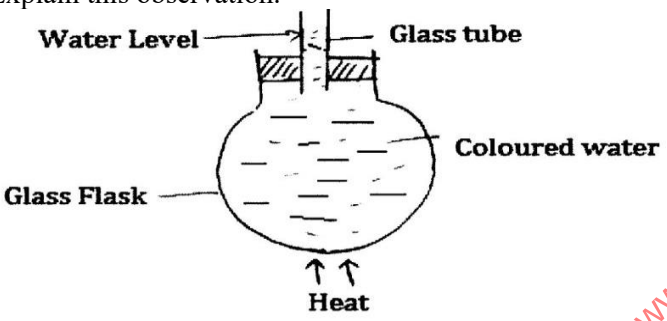
SECTION A (25 MKS)
Answer all the questions

1. The figure below shows the correct vernier caliper reading of the diameter of a test tube.

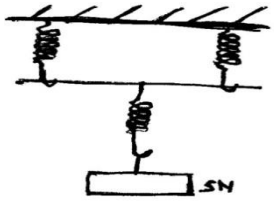


State the reading indicated by a vernier caliper if it has a zero error of 0.02 cm (2mks)

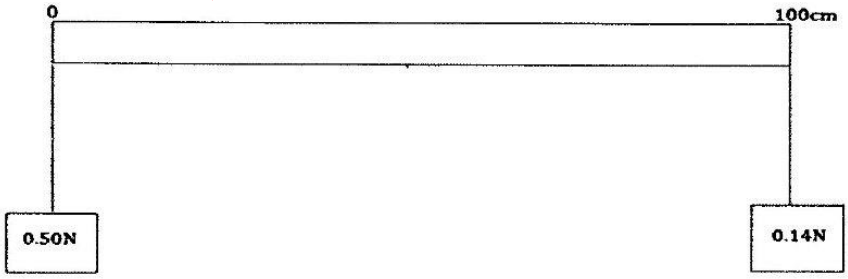
2. A hole of area 2.0 cm^2 at the bottom of a tank of depth 2m is closed with a stopper. Determine the force on the stopper when the tank is filled with water. (Density of water = 1000 kg/m^3, g = 10N/kg) (2mks)
3. Dust particles are seen to move in random manner when a beam of light is shown in a dusty room. Explain what causes the movement. (2mks)
4. In the setup shown in the figure below it is observed the level of water initially drops before starting to rise. Explain this observation. (2mks)



5. The diagram below shows identical springs of negligible weight suspended vertically from a surface. If the system extends by 1.5cm when 5N weight is hung as shown, determine the spring constant of each spring. (3mks)

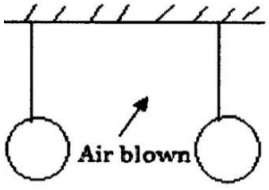


6. Give the reason why ventilators are situated near the ceiling in a room. (1mk)
7. The figure below shows a uniform metre rule of weight 0.96N with two weights of 0.50N and 0.14N suspended from its ends.

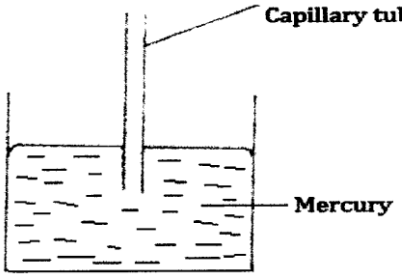


Determine how far from 0.14N weight a pivet should be placed in order to balance the metre rule. (3mks)

8. Two light balloons are on the same level while suspended from threads a short distance apart. A stream of air is blown between the balloons in a horizontal direction. Explain what happens to the balloons. (2mks)



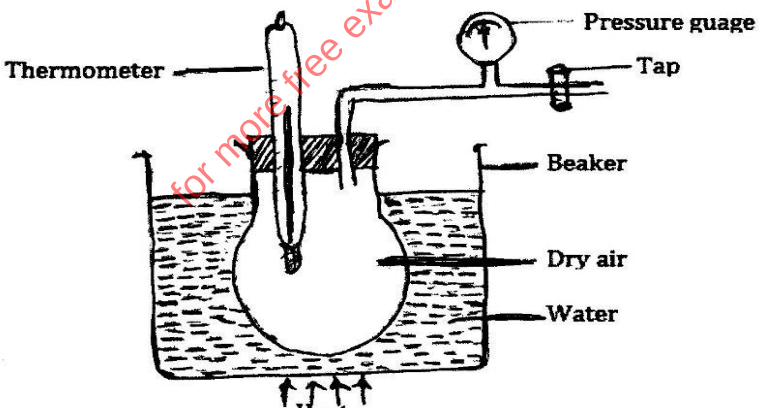
9. In the diagram below, indicate the level of mercury in the capillary tube. (1mk)



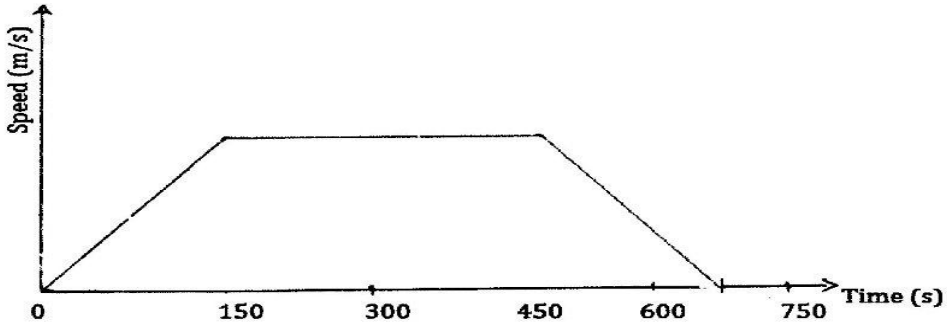
10. A person of mass 70kg stands on a scale balance in a lift. At a particular instant the lift is moving downwards uniformly at 2.8m/s^2. Calculate the reading on the scale in newtons. (2mks)
11. A particle in a disc rotating uniformly at 2 revolutions per second is 0.2 from the table axis of rotation. What is the tangential speed of the particle? (2mks)
12. Water and milk are mixed in the ratio 4:1 respectively. If the density of water is 1g/cm^3 and that of milk is 1.2g/cm^3, find the mass in grams, of 2.5 litres of the mixture. (3mks)

SECTION B

13. a) Water at 90^{0}C in a bottle was allowed to cool for 30 minutes. State two factors that determine the final temperature (2mks)
    b) What is meant by specific latent heat of vaporization (1mk)
    c) In an experiment to determine the specific latent heat of vaporization of water, state at 100^{0}c was passed into water contained in a well lagged copper calorimeter. The following measurements were made.
    Mass of calorimeter = 80g
    Initial mass of water = 70g
    Initial temperature of water = 5^{0}c
    Final mass of calorimeter + water + condensed steam = 156g
    Final temperature of mixture = 30^{0}c
    (Specific heat capacity of water = 4200J/kg/k and specific heat capacity of copper =390J/kg/k). determine;
    i. Mass of condensed steam (2mks)
    ii. Heat gained by the calorimeter and water (2mks)
    iii. Given that L is the specific latent heat of vaporization of steam
    i. Write an expression for heat given out by steam (2mks)
    ii. Determine the value of L (2mks)
14. a) The figure below shows a set up used to determine the relationship between temperature and pressure of a gas.



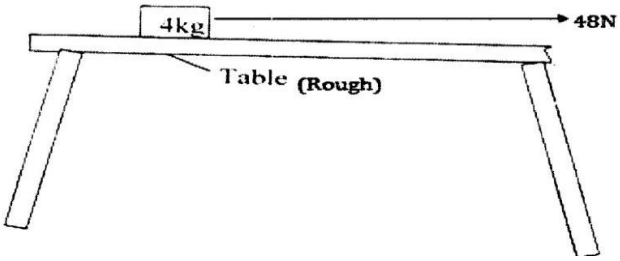
    i) Describe how the measurement are obtained from the experiment (2mks)
    ii) Explain how the results from the experiment can be used to determine the relationship between temperature and pressure. (3mks)
    b) A mass of a gas has a volume of 500cm^3 at a temperature of -73^{0}c and a pressure of one atmosphere. What is the volume of the gas at a pressure of four atmospheres and a temperature of 47^{0}c. (3mks)
15. The diagram below shows a speed time graph for a train travelling between two stations. The train starts from rest and accelerates uniformly for 150 seconds. It then travels at a constant speed for 300 seconds and finally decelerates uniformly to rest in 200 seconds.



Given that the distance between the two stations is 10450m, calculate:

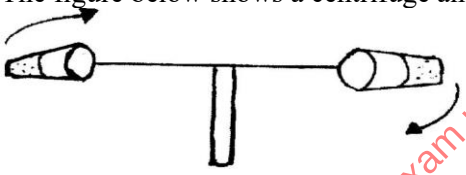
i. The maximum speed attained by the train in km/h (3mks)
ii. The acceleration for the first 150 seconds (2mks)
iii. The distance travelled during the last 100 seconds (2mks)
iv. The tie taken to travel the first half of the journey. (2mks)

16. a) State two advantages of frictional forces (2mks)
b) The figure below shows a mass of 4kg being pulled by a force of 48N.
If the coefficient of friction between the table and the mass is 0.3, use the arrangement that follow.



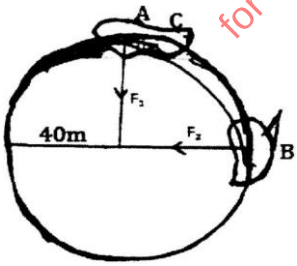
i) Label and show on the diagram two fortes acting on the 4kg mass (2mks)
ii) What is the frictional force acting on the 4kg mass (2mks)
iii) What is acceleration of the system when the mass of 6kg is released (2mks)
iv) What is the work done against friction when the 6kg mass 0.8m (2mks)

17. a) The figure below shows a centrifuge and two tubes containing muddy water being whirled at a high speed.



i. Explain how the high speed of rotation causes the separation of mud form water. (2mks)
ii. A perforated drum in a spin-dryer is used to dry wet clothes by rotating it at a very high speed. Explain (2mks)

b) The figure below is a diagram of a aircraft of mass 2000kg together with the pilot performing same air maneuvers in a vertical circle.



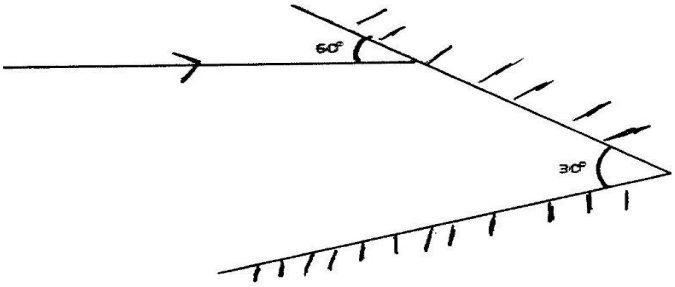
If the radius of the circular path is 40m and the aircraft is moving at a velocity of 200ms^{-1}
Calculate:

i. The external force F_1 provided by the air at point c (3mks)
ii. The external force f_2 provided by the air at point B (3mks)

18. a i) State the law of flotation (1mk)
ii) Why does a hydrometer have a narrow stem? (1mk)
iii) A hydrometer which has a bulb whose volume is 1.0 x 10 $^{-5}$m^3, a uniform stem of length 20cm and a cross-section area of 0.5cm^2, floats in water with only half of its length immersed. If the density of water is 1000kgm^{-3}, find the mass of the hydrometer and the smallest possible density of a liquid that can be measured with this hydrometer. (5mks)

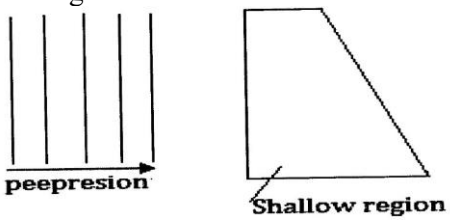
CEKENA FORM 4 END OF TERM ONE EVALUATION TEST 2020
232/2
PHYSICS PAPER 2
TIME: 2 HRS
SECTION A - 25 MKS
Answer all the questions

1. The following diagram shows two plane mirrors inclined at an angle of 30^0 to each other. A ray of light is incident on one mirror as shown below.



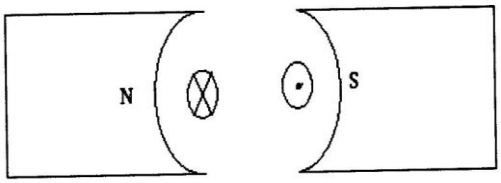
Sketch the path of the ray to show its reflection on the two mirrors. (2mks)

2. The figure below shows wave fronts of water approaching a shallow region from a deep region.

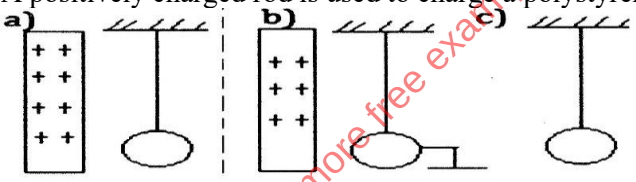


Show how the wave fronts move until they go beyond the shallow region (2mks)

3. The figure below shows a cross-section of an electric motor. On the same diagram, indicate the direction of the force on the two conductors.



4. A positively charged rod is used to charge a polystyrene ball as shown in the diagram below.

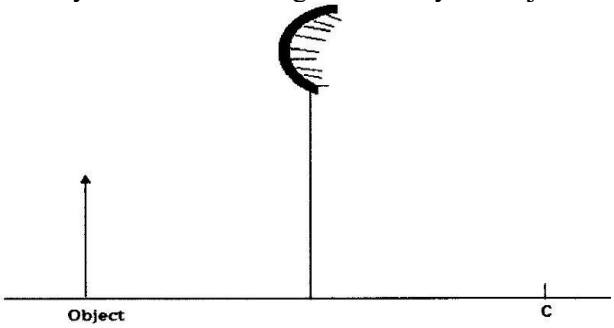


i. Show the charge distribution on the balls (3mks)
ii. State one use of a gold leaf electroscope (1mk)

5. A man standing in valley between two cliffs strikes a gong. He hears an echo from one cliff 0.7 second and from the other 0.2 second later. Determine the distance between the two cliffs. (speed of sound in air 330 m/s) (3mks)

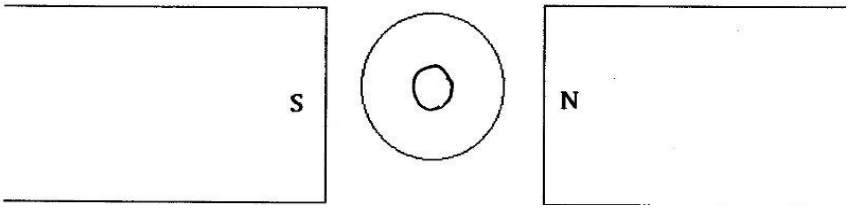
6. In a certain pin-hole camera, the screen is 10cm from the pin-hole. When the camera is placed 6m away from a tree a sharp image of the tree is 16 cm high is formed on the screen. Determine the height of the tree. (3mks)

7. Sketch rays to show the image formed by the object in the following ray diagrams



(C is the centre of curvature of the convert mirror)

8. An iron ring is placed between two magnet as shown below.

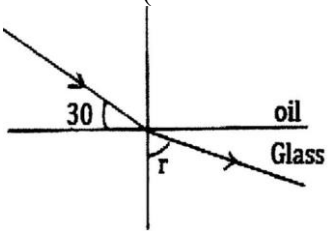


Sketch the magnetic field pattern between the poles and mark the neutral point X (2mks)

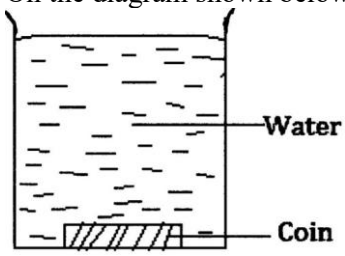
9. Name one detector of infrared radiations (1mk)
10. On a sunny day pastoralist travelled for hours looking for water which he could 'see' ahead but could not reach. Name this phenomenon and explain how it occurs. (2mks)
11. State one factor that would make a metallic conductor not to obey ohm's law (1mk)

SECTION B-55 MARKS

12. a) i) State the shell's law as applied in a refraction of light. (1mk)
    ii) A ray of light is incident on a glass-oil interface as shown in the diagram below. Determine the angle of refraction r (take the refractive index of glass and oil as 3/2 and 2 respectively. (3mks)

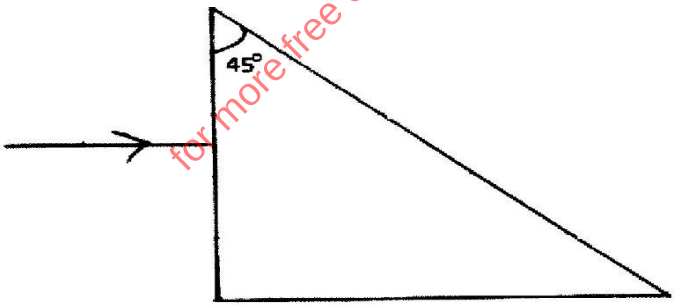


b) On the diagram shown below, by use of rays locate the image of the coin that is dipped in water (3mks)



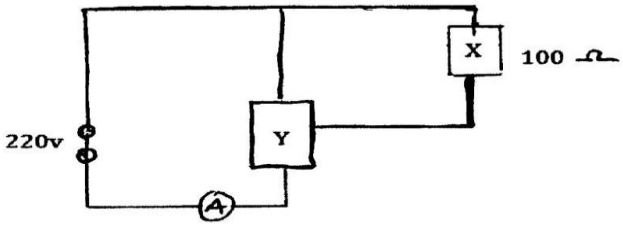
c i) What is meant by critical angle as applied in refraction of light. (1mk)
ii) State two necessary conditions for total internal reflection to occur. (2mks)

d i) The figure below shows a ray of light incident on a prison. On the diagram show the direction of the ray (1mk)



ii) State two advantage of optical fibres over ordinary cables when used in telecommunication (2mks)

13. a) Calculate the operating resistance of an electric lamp rated by the manufacture at 60W, 240V (3mks)
    b) In the circuit diagram shown below, x is a fixed resistor while Y can be varied between o and 100Ω using a sliding contact.

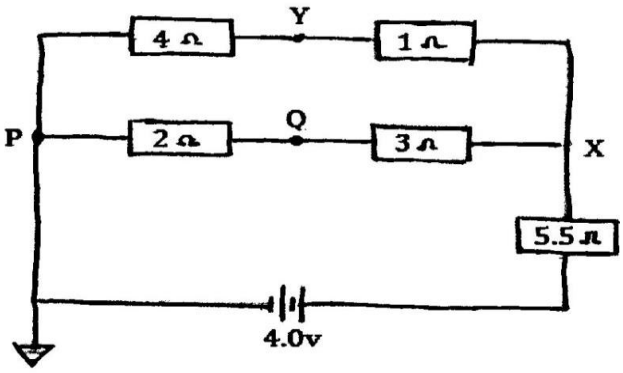


Calculate

i. The minimum possible current in the circuit (2mks)

ii. The maximum possible current in the circuit (2mks)

c) The figure below shows an electric circuit in which five resistors are connected to a battery of e.m.f 4.0v and negligible internal resistance.



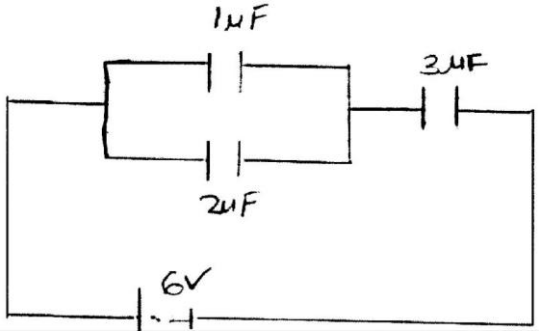
Determine

i) The total resistance of the circuit (2mks)

ii) The potential difference across 4ohm resistor. (2mks)

14. a) State two ways to increase the capacitance of a parallel plate capacitor (2mks)

b) The figure below shows an arrangement of capacitors connected to a 6v d.c supply.



Determine;

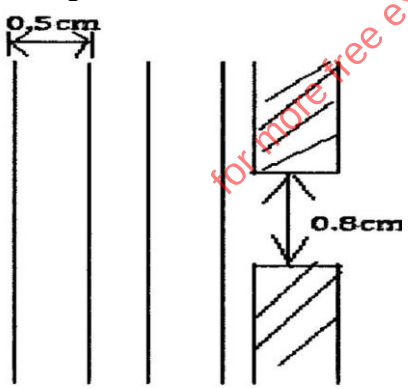
i. The combined capacitance of the arrangement (2mks)

ii. The charge stored in the 2μf capacitor (3mks)

iii. The total energy stored in the capacitor (3mks)

15. a) Define the term diffraction as applied in waves (1mk)

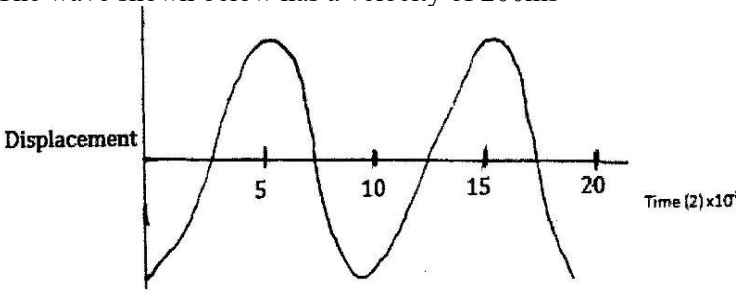
b) The figure below shows wave fronts approaching an opening an opening.



i. Complete the diagram to show the appearance of the wave fronts after crossing the opening (2mks)

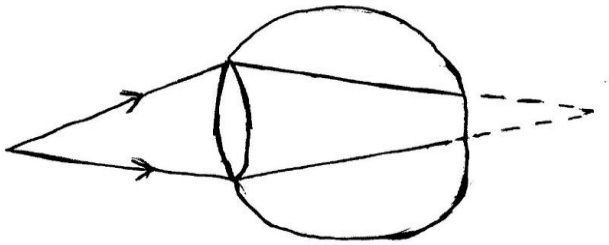
ii. State what would be observed on the pattern if the gap was made smaller than 0.5 (1mk)

c) The wave shown below has a velocity of $200ms^{-1}$



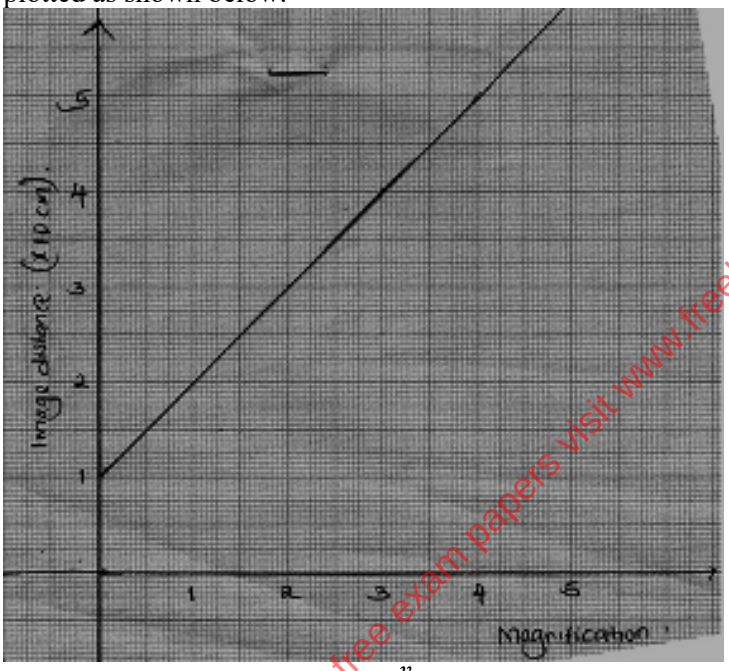
i) Find the periodic time T of the wave (1mk)
ii) Calculate the frequency of the wave (2mks)
iii) Calculate the wavelength of the wave (3mks)

16. a) State the meaning of the term principal focus as used in diverging lenses. (1mk)
b) The figure below shows an eye defect



i. Name the defect above (1mk)
ii. On the same diagram show how the defect can be corrected (2mks)

a. In an experiment to determine the focal length of a conveying lens several valves of image distance v and the corresponding magnification (m) were obtained. A graph of image distance v against magnification (M) was plotted as shown below.



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

i) The object position when the image position is 45 cm (3mks)
ii) The focal length of the lens (2mks)
iii) The power of the lens (2mks)

CEKENA FORM 4 END OF TERM ONE EVALUATION TEST 2020
232/3
PHYSICS PRACTICAL
PAPER 3
TIME: 2½ HRS

Question 1

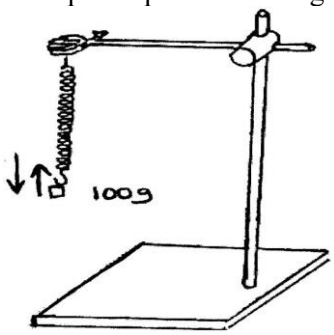
Part A

You are provided with the following;

- A spiral spring
- A complete stand
- A stop watch
- 2 small blocks of wood for clamping
- A 100g mass
- Five 20g masses

Proceed as follows;

a) Clamp the spiral as to hang from the clamp as shown in the figure below



b) Hang a 100g mass from the spring and displace the mass slightly downwards so that it executes vertical oscillations as shown

c) Measure and record in the table the time for 10 oscillations

d) Repeat the experiment for other values of mass m shown in the table. Complete the table below. (5mks)

Mass (m)g	100	120	140	160	180	200
Mass m (kg)						
Time for 10osc (s)						
Period T (s)						
T^2 (s^2)						

e) Plot a graph of T^2 (S^2) against mass m(kg) (5 mks)

f) Determine the slope of the graph (2mks)

g) Given that the equation of the graph is $T^2 = \frac{4\pi 2}{k}$m

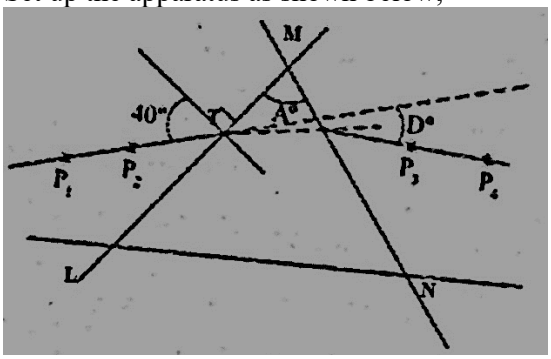
Determine the value of k (2mks)

Part B

You are provided with the following apparatus

- Prism
- 4 optical pins
- Plain paper
- Protractor

i. Set up the apparatus as shown below;



ii. Place the prism on a plain paper and trace its outline with a pencil

iii. Measure length LM

LM =…… (1mk)

iv. Measure angle A of the prism using protractor
A^0 = …… (1mk)

v. Construct a normal at point T about a third way from point M along LM. Draw an incident ray to strike the prism at T at 40^0.

vi. Replace the prism and press pins, P1 and P2 to define the incident ray.
View the pins P1 and P2 from the opposite face (MN)
Insert pins P3 and P4 so that they appear to be in line with the images of P1 and P2.
Remove the prism and join P3 and P4 to give the emergent ray.
Extrapolate the emergent ray into the prism so as to meet the extrapolated incident ray.

vii. Measure angle D
D =…… (2mks)

c) Calculate the value of n, from the expression (2mks)

$$n = \frac{\cos\{90^0 - [\frac{A+D}{2}]}{Sin\frac{A}{2}}$$

d) What is the significance of n? (1mk)

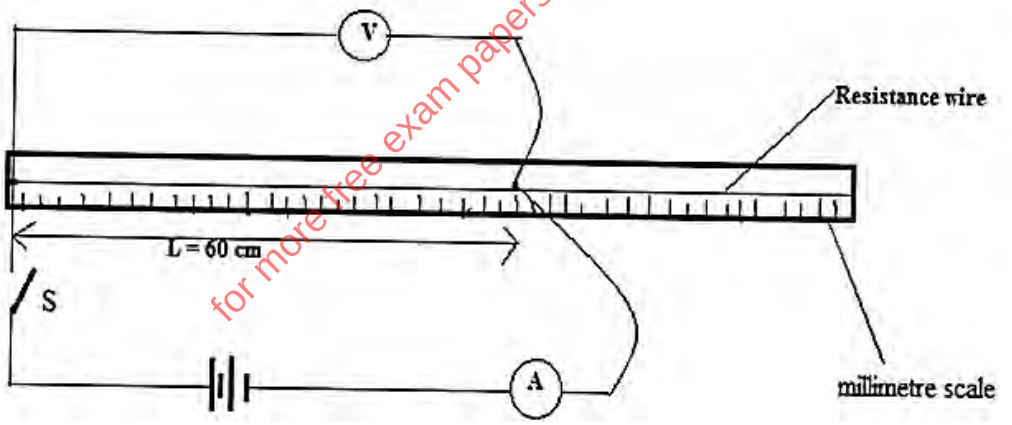
QUESTION 2

Part A

You are provided with the following apparatus

- Voltmeter (0-3 or 0-5V)
- An ammeter
- Six connecting wires at least 4 crocodile clips
- A switch
- 2 new size D dry cells
- A cell holder to hold 2 cells
- A SWG 28 nichrome wire mounted on a 100cm millimeter scale.
- A micrometer screw gauge (to be shared)
- Proceed as follows;

i. Connect the circuit as shown in the diagram below.



ii. Turn on the switch and record the voltmeter and ammeter readings.
Voltmeter reading, V= (1mk)
Ammeter reading, I= (1mk)

iii. Measure the diameter of D of the resistance wire
D =……..mm (1mk)
D =……..m (1mk)

iv. Calculate the cross-sectional area A of the wire in S1 unit (2mks)
Use $A=\pi r^2$

v. Determine quantity given quantity 60p=100Av/1 (2mks)

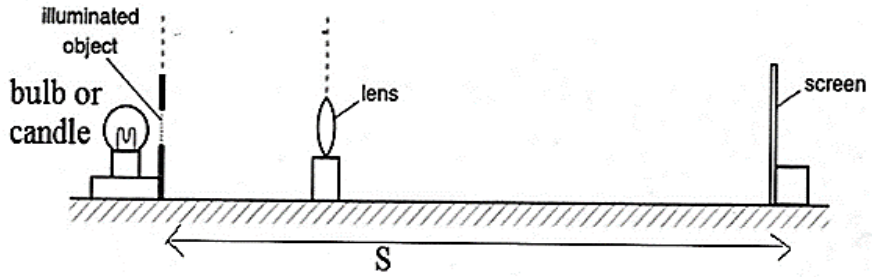
PART B

You are provided with the following:

- A cross wire as the illuminated object
- A lens and a lens holder

- A candle stick
- A screen
- A metre rule

Set up the apparatus as shown in the figure such that S=55cm



- Adjust the position of the lens to obtain a sharp enlarged image of the candle
- Measure the distance U1 between the candle and the lens
- Without changing the position of the candle and the screen, move the lens to obtain a sharp diminished image of the candle
- Measure the distance U2 between the candle and the lens
- Record the value of U1 and U2 in the table below

a) Repeat the procedure in (a) above for =45cm. complete the table (3mks)

S (cm)	U1(cm)	U2(cm)	D=U2-U1(cm)
55			
65			

b) Given that f= $\frac{S^2-d^2}{4S}$

Average value of the focal length f (3mks)

c) You are provided with the following

- A metre rule
- Knife edge
- One 50g mass and one 100g mass
- Some thread
- Liquid L in a 100ml beaker
- Tissue paper

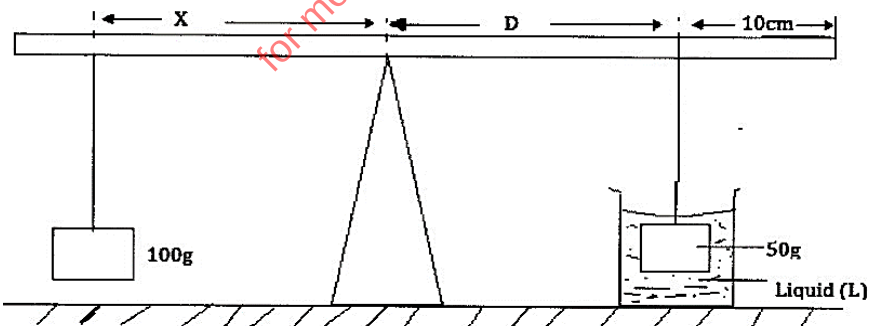
Proceed as follows;

a. Balance the metre rule on the knife edge and record the reading at this point

Balance point ……cm (1mk)

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. Use the thread provided to hang the masses such that the positions of the support can be adjusted.



The balance is attained by adjusting the position of the 100g mass. Note that the distance X and D are measured from the knife edge and the 50g mass is fully immersed in liquid L

X…… cm (1mk)

D ……cm (1mk)

Apply the principle of moments to determine the weight W of the 50g mass in liquid L and hence determine the upthrust U in liquid L

w……N (2mks)

U……N (1mk)

CEKENA FORM 4 END OF TERM ONE EVALUATION TEST, 2020
232/1
PHYSICS
232/3
CONFIDENTIAL

Question 1

1. A spiral spring of spring constant 10N/M
2. A complete stand
3. Stop watch
4. 2 small wooden blocks for clamping
5. A 100g mass
6. Five 20 g masses
7. An equilateral glass prism
8. 4 optical pins
9. A plain paper
10. Protractor

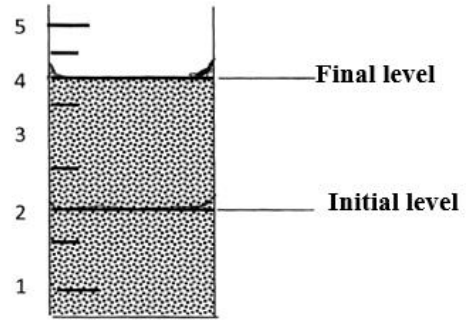
Question 2

1. A voltmeter (0-3 OR 0-5V)
2. An ammeter (0-1 or 0-0.2.5 A)
3. 6 connecting wire, at least 4 with crocodile clips
4. A switch
5. 2 new size D dry cell
6. A cell holder to hold 2 cells
7. A SWG 28 Nichrome wire mounted on a 100 cm mm scale.
8. Micrometer screw gauge (to be shared)
9. A cross wire
10. A convex lens of focal length 15cm
11. A lens holder
12. A candle stick
13. A match box
14. A white screen
15. A metre mk
16. A knife edge
17. One 50g mass and one 100g mass
18. Two pieces of thread
19. Liquid L liquid L is salt solution with 100g of salt (common) for every litre of water – liquid in a beaker where a 100g mas can get fully immersed to float.
20. A piece of tissue paper.

SUKEMO JOINT EXAMINATION TEST
Kenya Certificate of Secondary Education
PHYSICS 1
PAPER 1
THEORY
TIME: 2 HOURS

SECTION A (25 MKS)

1. A packer pen was accidentally dropped into a measuring cylinder containing water. The volume of water moved from initial level to form the level as shown below: -



If the mass of the parker pen is 0.012kg determine its density (2mks)

2. The figure 1 below shows some forces acting on object.

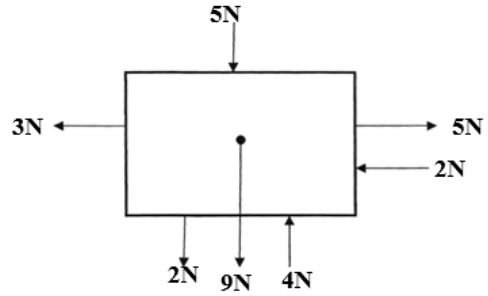
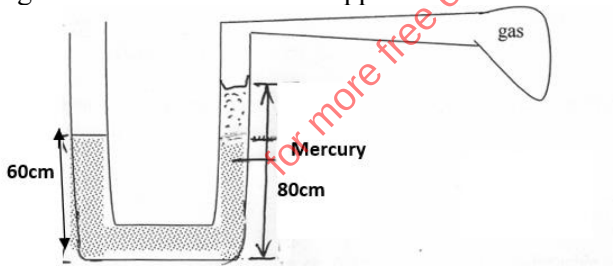


Fig. 2

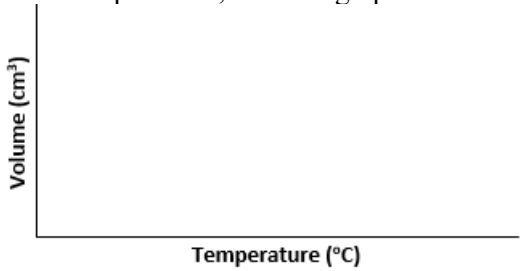
On the figure below draw the resultant force acting on the object (2mks)

3. Figure two below shows the apparatus used to examine the pressure of a gas



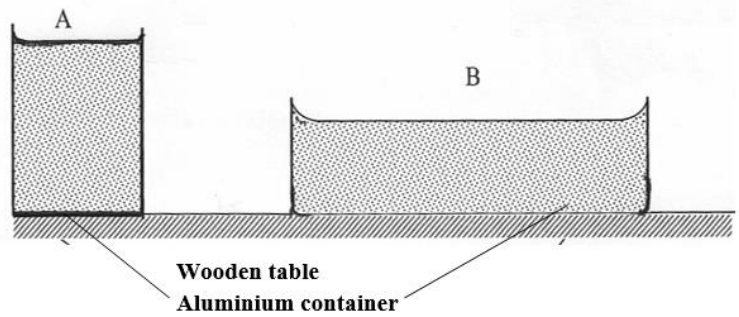
Taking density of mercury to be 13,600kg/m^3 and standard atmospheric pressure 100,000N/m^2. Calculate gas pressure (3mks)

4. Explain why it is possible to compress gases but not solids or liquids (3mks)
5. (a) One the axis provided, sketch a graph of volume against temperature of water from 0^o to 20^{o}C. (2mks)



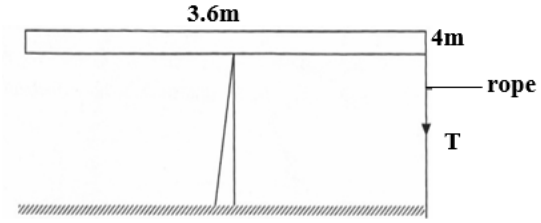
(b)During anomalous expansion of water, heat transfer is limited to conduction and radiation only explain (1mk)

6. Figure 3 shows two aluminium container A and B placed on a wooden table containers A and B have equal volume of hot water initially at the same temperature



Explain why water in **B** cools faster than water in **A** (2mks)

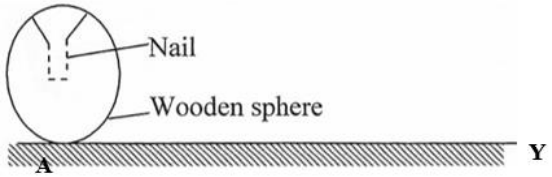
7. A uniform rod of length 4m and mass 4 kg is pivoted at 3.6m mark. The rod is held horizontally with a vertical rope at 4m mark as shown below



Calculate tension **T** in the rope (Take g=10N/kg) (3mks)

8. (a) Define centre of gravity of a body (1mk)

(b) The figure below shows a wooden sphere with a nail hammered into it at point A as shown below



The sphere is rolled on a horizontal ground and comes to rest after some time at point **Y**. Draw the sphere after it comes the rest at point Y and explain (2mks)

9. Define the term Heat capacity (1mk)
10. A girl heats 5kg of water to a temperature of 80°C. When she adds m kg of water at 15°C the mixture attains a temperature of 40°C. Determine the value of m (2mks)
11. State the difference between an ideal and real gas (2mks)
12. Define absolute zero temperature in terms of kinetic energy (1mk)

SECTION B (55 MARKS)

13. (a) In an experiment to estimate the diameter of an oil molecule, an oil drop of diameter 0.06cm spread over a circular patch whose diameter is 20cm. Determine

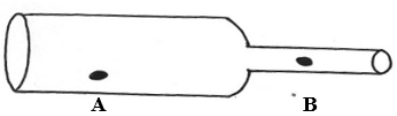
(i) The volume of the oil drop (2mks)

(ii) The area of the patch covered by oil (2mks)

(iii) The diameter of the oil molecule (1mk)

(b) State any one assumption made in (iii) above

(c) The figure below shows parts A and B of a glass tube



(i) State the part of the tube in which the pressure will be lowest when air is blown through the tube to from **A** to **B** (1mk)

(ii) Compare the velocity of air at **A** and at **B**

(iii) What is the relationship between the velocity of the air and its pressure at any point along the tube AB

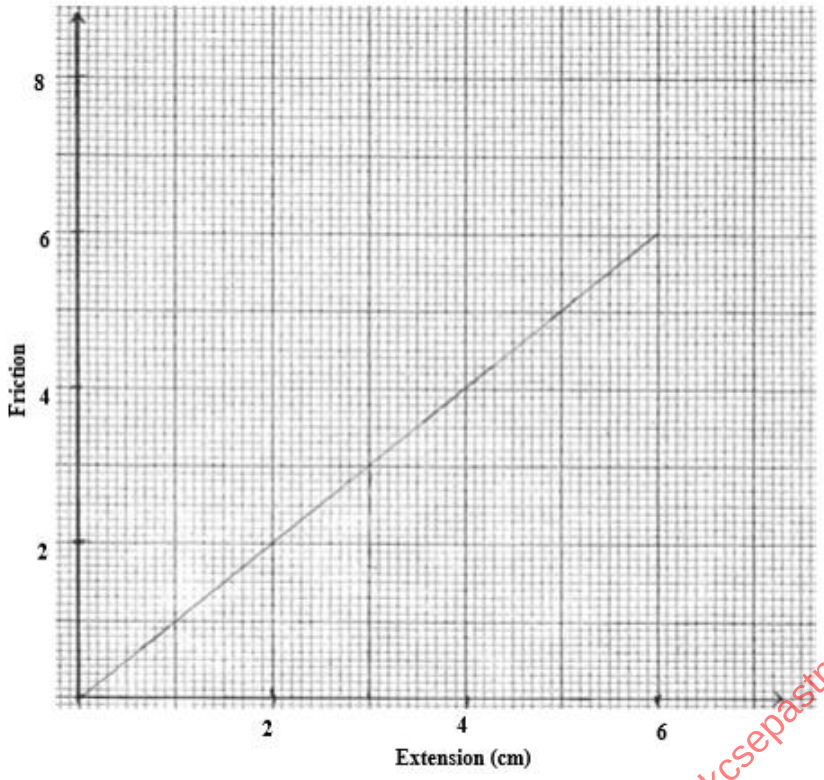
(d) Water flows a horizontal pipe of cross-section area 35cm^2 and constriction of cross section area 5cm^2. If the speed of water at the constriction is 2m/s, Calculate

(i) Continuity constant in SI unit (1mk)

(ii) The speed in the wide section (2mks)

14. (a) State Hooke's law (1mk)

(b) The graph provided is of force (y-axis) against extension.

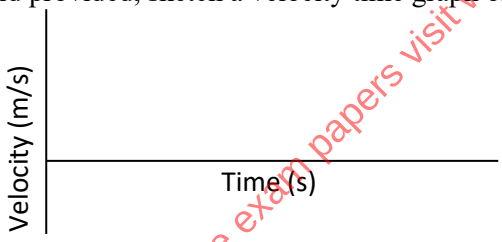


(i) From the graph determine the work done in stretching spring by 3cm (3mks)

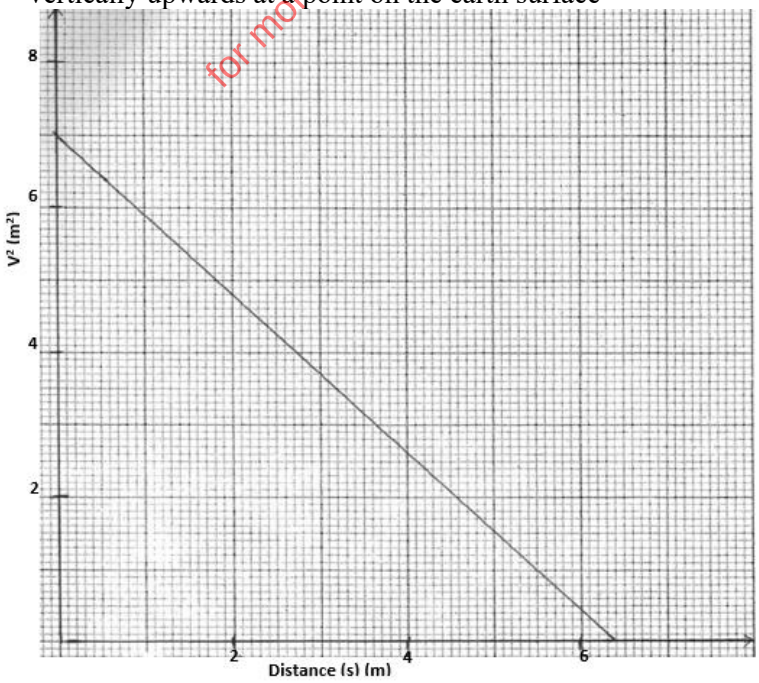
(ii) Use the graph to determine the spring constant. Give your answer in SI units (3mks)

(iii) State **two** factors that affect the spring constant (2mks)

15. (a) On the grid provided, sketch a velocity time graph of a bouncing ball dropped from rest at a height of 2.5cm (2mks)

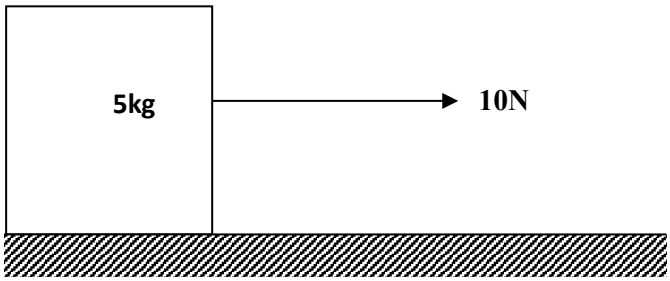


(b) The graph provided below shows a graph of V^2 against the distance S travelled by a body projected vertically upwards at a point on the earth surface



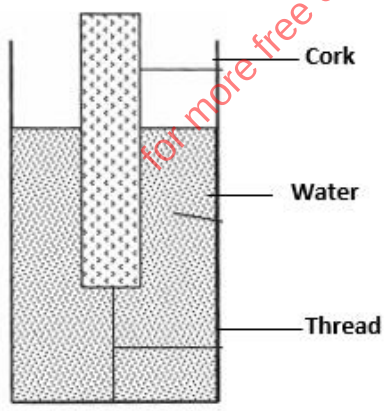
(i) From the graph calculate the gravitational acceleration of the earth (g) at that point (3mks)
(ii)Using the graph determine
(I) The initial velocity of the body (3mks)
(II) The maximum height attained by the body (2mks)
(c) A body is uniformly accelerated form rest to a final velocity of 50 m/s in 6 seconds. Calculate the distance covered (2mks)

16. (a) Why does gun recoil when it is fired? (1mk)
(b) The figure 6 below shows a body being pulled by a constant force of 10N for a distance of 4m over wooden surface. The co-efficient of friction is 0.03



Find the
(i) Acceleration of the body (2mks)
(ii) Velocity of the body after the 4 metres (2mks)
(iii) Kinetic energy of the body after the 4 metres (2mks)
(b) (i) Define the term angular velocity (1mk)
(ii) A particle moving along a circular path of radius 3.0cm describes an arc of length 2cmevery second. Determine
I. Its angular velocity, **W** (2mks)
II. Its periodic time, **T** (2mks)
III. A stone of mass 40g is tied to the end of a string 50cm long and whirled in a vertical circle of 2 revolutions per second. Calculate the maximum tension in the string (2mks)

17. (a) Sometimes work is not done even if there is an applied force. Give a reason (1mk)
(b) A lorry weighing 64ookg is lifted with a jack screw of 11mm pitch. If the handle is 28cm from the screw
(i) Find the velocity ratio (2mks)
(ii) Neglecting the frictional force, Calculate mechanical advantage, MA (1mk)
(iii) Determine the force applied (2mks)
(c) The figure below 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 (3mks)
(ii) State how each of the forces mentioned in (i) above changes when water is added into the beaker until it is filled up (3mks)

SUKEMO JOINT EXAMINATION TEST
Kenya Certificate of Secondary Education
PHYSICS 2
PAPER 2
THEORY
TIME: 2 HOURS

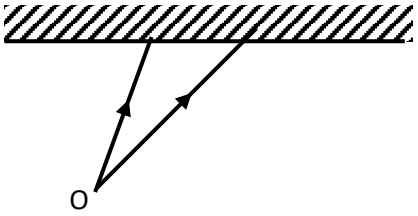
SECTION A: 25 MARKS

1. The image formed by a convex mirror is virtual. State two other characteristics of image formed by the convex mirror. (2 Marks)
2. State the function of the control grid in a cathode ray oscilloscope (1 Mark)
3. A metal iron has work function of 6.8×10^{-19}J. Calculate the minimum frequency of light that can cause photoelectric emission. (Take $h = 6.63 \times 10^{-34}$ Js) (2 Marks)
4. In the figure shows a rectifier circuit for an alternating current input.

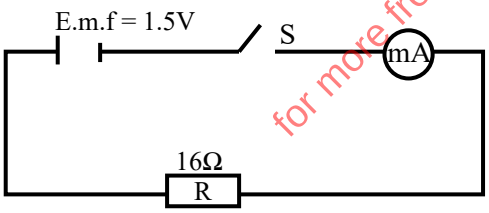
   (a) On the circuit, indicate the flow of current to illustrate rectification. (1 Mark)
   (b) Sketch a graph to show how the voltage across R varies with time.
5. Complete the nuclear equation below by inserting the values of a and b. (2 Marks)

$$^{14}_{6}C \longrightarrow ^{b}_{a}X + ^{14}_{7}N$$

6. State and explain the effect of increasing the E.H.T in an ex-ray tube on the x-rays. (2 Marks)
7. The figure below shows the incident rays from a point object O. Draw a ray diagram to show the image formed (3 Marks)



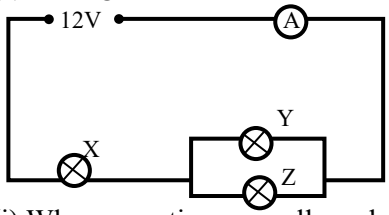
8. When the switch is closed in the figure below, the milliammeter reads 75mA. Determine the internal resistance of the cell (3 Marks)



9. Determine the cost of using an electric heater rated 3kW for 12 hours given that the cost of electricity per kilowatt-hour is Sh. 8.00. (2 Marks)
10. Name two types of electromagnetic radiations whose wavelengths are greater than that of ultraviolet radiation (2 Marks)
11. What is the main difference between an a.c. and d.c generators (1 Mark)
12. State two conditions to be satisfied for total internal reflection of light to take place. (1 Mark)
13. Give an example of a longitudinal wave (1 Mark)

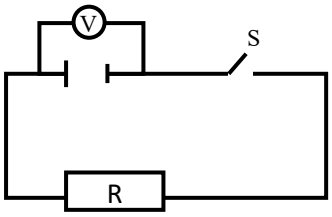
SECTION B

14. (a) The figure below shows how a student set up a circuit using 3 identical bulbs X, Y and Z each rated "12V, 2.0A"



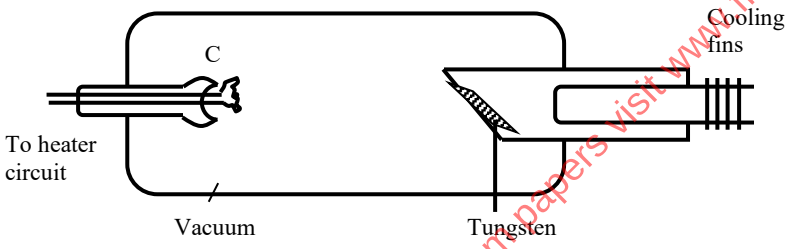
(i) When operating normally, calculate the resistance of one of the bulbs (2 Marks)
(ii) Calculate the effective resistance of the three bulbs. (2 Marks)
(iii) What will be reading of the ammeter? (2 Marks)
(iv) Draw a circuit diagram showing the three bulbs connected in such a way that they would all work at the same brightness especially if they are not identical. (2 Marks)

(b) When the switch S is kept open in the circuit shown below the voltmeter reads 1.5V. When the switch is closed, the readings drop to 21.3V and the current through the resistor is 0.5A.



(i) What is the e.m.f of the cell? (1 Mark)
(ii) What the terminal voltage of the cell? (1 Mark)
(iii) Calculate the value of R. (2 Marks)

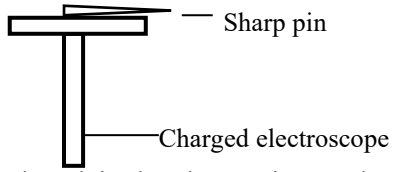
15. The figure below is of an x-ray tube



(a) Explain how x-rays are produced by the tube (4 Marks)
(b) Explain briefly the energy changes that take place when the x-ray tube is operating (3 Marks)
(c) Why is it necessary to maintain a vacuum inside the tube? (2 Marks)
(d) The accelerating voltage of an x-ray tube is 12V. Calculate the speed of the electron on reading the anode. (Charge to mass ratio of an electron $\frac{e}{me} = 1.76 \times 10^{11}$ (3 Marks)

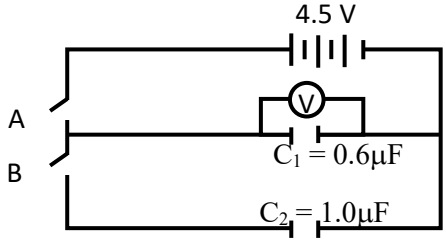
16. (a) Define capacitance (1 Mark)

(b) In the figure below, a sharp pin is fixed on a cap of a leaf of the electroscope. The electroscope is highly charged and then left for some time.



State and explain the observation made after sometime (2 Marks)

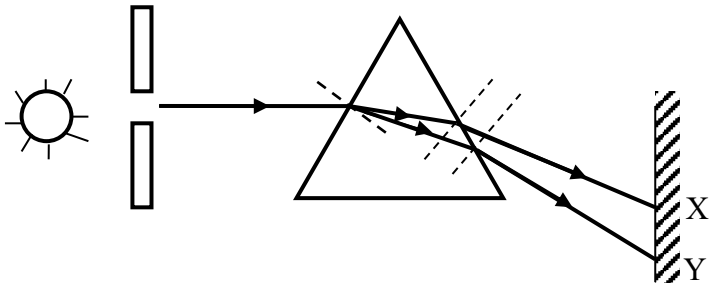
(c) The figure below shows a circuit where a battery of e.m.f. 4.5V, switches A and B, two capacitors C_1 =0.6μF and C_2 = 1.0μF and a voltameter are connected.



(i) Determine the charge on C_1 when both switch A is closed and switch B is open. (2 Marks)
(ii) What is the effective capacitance when both switches are closed? (2 Marks)
(iii) State and explain what is observed on the voltmeter when;
- Switch A is closed and switch B is open (2 Marks)
- Switch A is closed and B is closed (2 Marks)

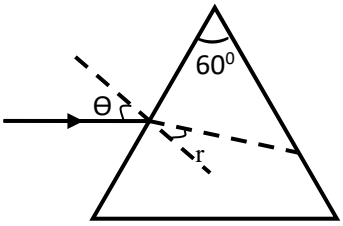
(d) State two ways in which the capacitance of a parallel plate capacitor can be reduced. (2 Marks)

17. (a) The diagram below shows a narrow beam of white light onto a glass prism.



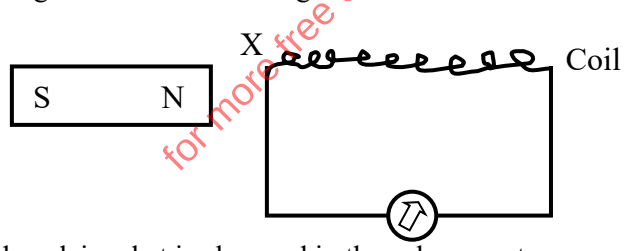
(i) What is the name of the phenomenon represented in the diagram? (1 Mark)
(ii) Name the colour at X and Y (2 Marks)
(iii) Give a reason for your answer in part (ii) above (1 Mark)
(iv) What is the purpose of the slit (1 Mark)

(b) The figure below shows the path of ray of yellow light through a glass prism. The speed of yellow light in the prism is 1.8×10^8 m/s



(i) Determine the refractive index of the prism material (Speed of light in vacuum, $C = 3.0 \times 10^8$ m/s) (3 Marks)
(ii) Show on the same diagram, the critical angle C and hence determine its value. (3 Marks)
(iii) Give that $r = 31.2^0$ determine the angle θ (3 Marks)

18. (a) In the figure below the bar magnet is moved into the coil.



State and explain what is observed in the galvanometer (2 Marks)
(b) State two ways in which energy is lost from a transformer and explain each. (2 Marks)

SUKEMO JOINT EXAMINATION TEST
Kenya Certificate of Secondary Education
Physics
PAPER 3
CONFIDENTIAL

- ✓ 100cm Nichrome wire mounted on a mm scale label X.(2016)
- ✓ An ammeter (0-2.5)
- ✓ A volt meter (0-5)
- ✓ Three new dry cells
- ✓ Cell holder
- ✓ Eight connecting wires (at least 4 with crocodile clips at the end)
- ✓ A 2.5-volt bulb fixed into a lamp holder
- ✓ A switch
- ✓ Micrometer screw gauge
- ✓ a glass prism (equilateral-60 degrees)
- ✓ a plain sheet of paper (the last sheet of this question paper)
- ✓ a soft board
- ✓ 4 optical pins
- ✓ 4 paper pins
- ✓ A metre rule.
- ✓ One stop watch. one stand, clamp and boss.
- ✓ One helical spring of uniform type.
- ✓ Two pieces of wood.
- ✓ A beam balance or electronic balance (to be shared)
- ✓ One mass labeled M (100 gms)

SUKEMO JOINT EXAMINATION TEST
Kenya Certificate of Secondary Education
PHYSICS 3
PAPER 3
PRACTICAL
TIME: 2 HOURS

1. You are provided with the following
   - ✓ 100cm Nichrome wire mounted on a metre rule label X.
   - ✓ An ammeter
   - ✓ A volt meter
   - ✓ Three new dry cells
   - ✓ Cell holder
   - ✓ Eight connecting wires (at least 4 with crocodile clips at the end)
   - ✓ A 2.5-volt bulb fixed into a lamp holder
   - ✓ A switch
   - ✓ Micrometer screw gauge

   Procedure: -

   (a) Connect the apparatus provided as shown in **figure 1**

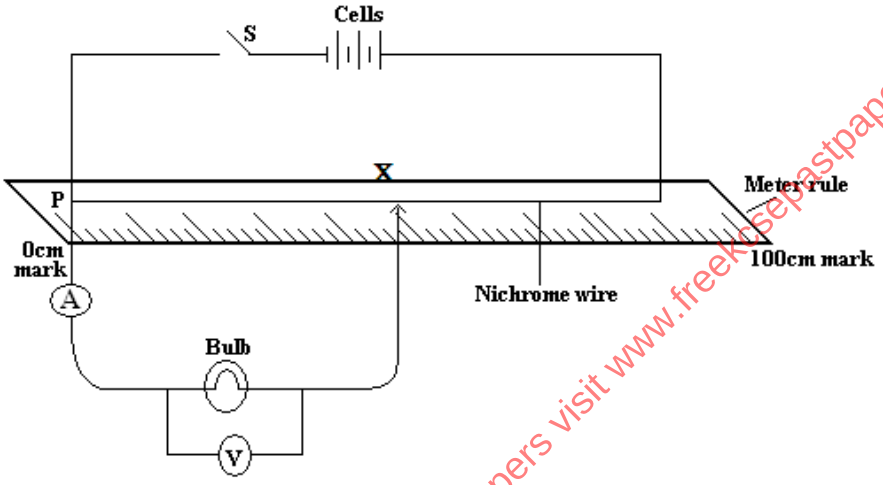


Figure 1

   (b) Place the sliding contact at X ,20cm from **P** then close the switch and record the ammeter and the voltmeter readings in **table 1**

   (c) Repeat the procedure in (b) by placing the sliding contact at **X**, 40cm, 60cm, 80cm and 100cm from **P**. Record your readings in **table 1**

Table1

Length, L(cm)	I(A)	p.d.(V)	I(mA)	p.d.(mV)	Log I(mA)	Log V(mV)
20						
40						
60						
80						
100						

Complete the table **8 marks**

(d) (i) Plot a graph of log I (y –axis) against log V **4 marks**

(ii) **Determine** the slope of the graph **2 marks**

(e) The relationship between the current I(mA) and p.d (mV) is given by the equation; $\log I = n\log V + \log k$

Where n and k are constants.

Determine using your graph the value of;

(a) K **1 mark**

(b) **N** **1mark**

(f) (i).Record the ammeter reading **I** and the voltmeter reading **V** when **PX** = L = 100cm.

V = ----------Volts **½ mark**

I = ----------Amperes **½ mark**

(ii).Using a micrometer screw gauge measure the diameter **d** of the wire.

d = ----------m **1 mark**

(iii) Determine the quantity **p** given that;

$$\mathbf{P} = 0.785 \frac{\mathbf{V}}{\mathbf{I}} \frac{\mathbf{d}^2}{L} \qquad \text{where L} = 100\text{cm}$$ **2 marks**

2. PART A

You are provided with the following:

- A glass prism
- A plain sheet of paper (the last sheet of this question paper)
- A soft board
- 4 optical pins
- 4 paper pins

Proceed as follows;

a) (i) Place the plain sheet of paper on the soft board and fix it there using the paper pins provided.
Do not detach this sheet from the question paper.
Place the prism near the centre of the paper.
Use a pencil to trace the outline of the triangular surface in contact with the paper.
Remove the prism and label the vertices of the outline A, B and C.

(ii) Mark a point N on the side AB of the diagram and draw a normal ON at this point.
Draw lines at angles i=30^0, 35^0 , 40^0 ,50 and 60 to the normal. See figure 2

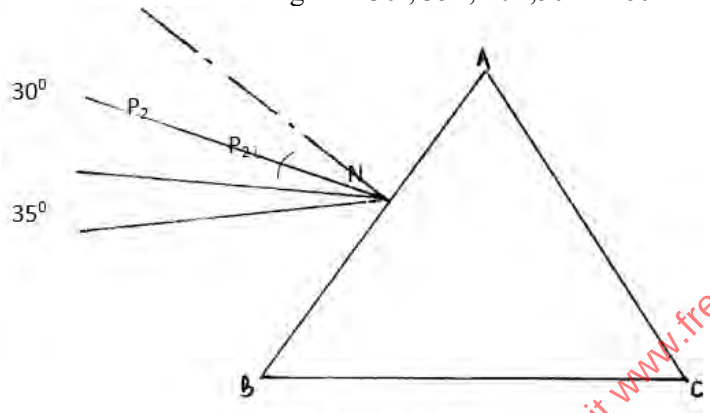


Figure 2

b) (i) Replace the prism on the outline. Fix two pins, P_1 and P_2 vertically on the 30^0 line such that they are about 4cm apart.
By viewing the images of the pins P_1 and P_2 through side AC, fix two other pins P_3 and P_4 in line with those images. Remove the prism.
Draw a line through the holes made by P_3 and P_4 and extend it into the outline. Now extend the 20^0 line so that the two lines cross each other. See figure 3.

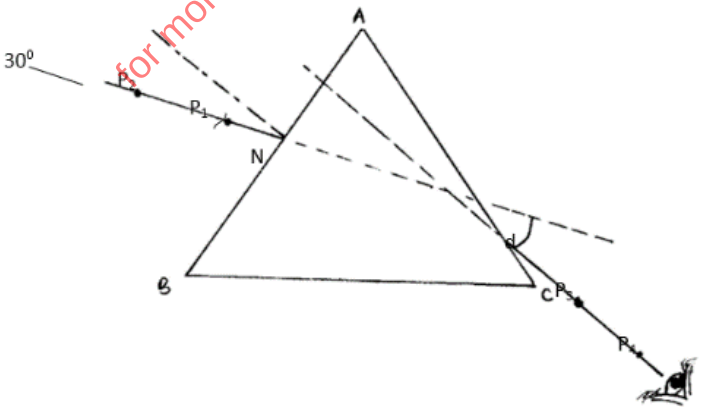


Figure 3

(ii) Measure and record in **table 2** the acute angle d between the two lines.

Angle i degrees	30	35	40	50	55
Angle, d (degrees)					

(c) Repeat the procedure in (b) for other angles shown in the table. **5marks**

NOTE: Attach the outline paper as evidence of work

d) On the grid provided, plot a graph of d (y-axis) against i. **4marks**

(e) From the graph, determine the minimum value, d_{min} of d.

d_{min} = _____ **1mark**

(f) Determine the constant K for the prism from the formula.

$$K = \left(\frac{\text{Sin } 30^0 + \frac{d_{min}}{2}}{\text{Sin } 30^0} \right)$$

2marks

2. PART B

You are provided with the following apparatus: -

- ✓ A metre rule.
- ✓ One stop watch. one stand, clamp and boss.
- ✓ One spring.
- ✓ Two pieces of wood.
- ✓ A beam balance or electronic balance (to be shared)
- ✓ One mass labeled M.

Proceed as follows:

(a) Hang the spring vertically by clamping one end as shown in figure 4. (Use the small pieces of wood to clamp the spring).

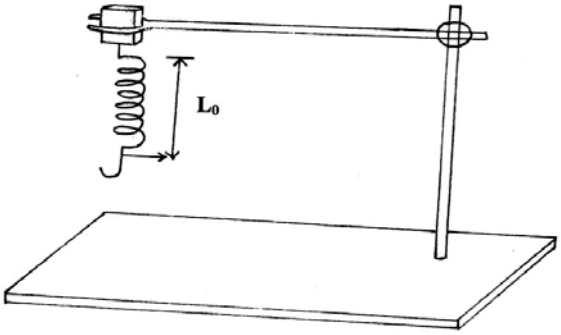


Figure 4

(b) Measure the length, Lo of the unloaded spring, and record below.

Lo = ----------m **½ mark**

(c) Hang the mass M given from the lower end of the spring. Measure the length, L_1 of the loaded spring.

L_1 = ---------- m **½ mark**

(d) Find the value of $L_1 - Lo$

$L = L_1 - Lo$ = ---------- **1 mark**

(e) Using the beam balance , determine the mass, M of the object .

M = ----------kg **1 mark**

(f) Hang the mass M from the lower end of the spring. Displace it by a small vertical distance and release so that the spring makes vertical oscillations.

Measure and record, time for the number of oscillations given in the table below.

Oscillations, N	10
Time in seconds, t (s)	
$Q = \frac{(N + 10t)}{10}$ (s)	
Q^2 (s^2)	

Complete the table. **3marks**

(g) Determine the constant k, given that:

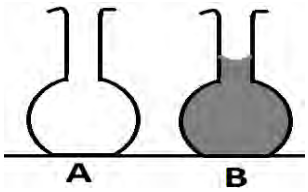
$k = \frac{MS}{13L}$ where $S = \frac{Q^2}{10}$

2marks

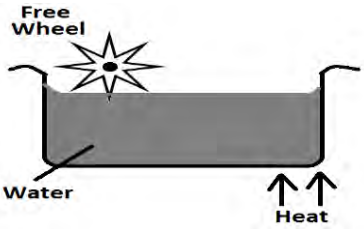
MECS 2CLUSTER JOINT EXAMINATION
Kenya Certificate of Secondary Education (KCSE)
232/1
PHYSICS
PAPER 1
TIME: 2 HOURS

SECTION A 25 MARKS. Attempt all questions

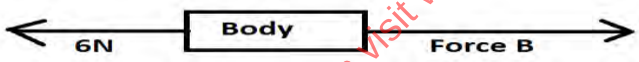
1. What is the meaning of SI units. (1 mark)
2. Distingish between mass and weight. (1 mark)
3. The diagram below shows an empty flask and a patially full flask. Which of the two is more stable.support your answer (2 mark) .



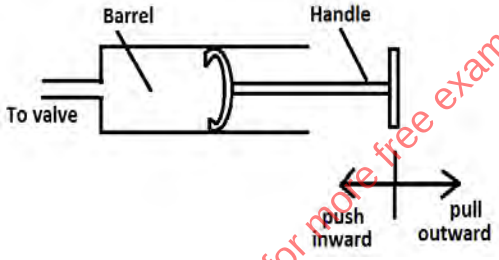
4. State two ways of reducing surface tension. (2 mark)
5. The diagram below shows a container with water. A free wheel is placed on one side and heating is done on one of the lower coner. Show on the diagram the direction of rotation of the free wheel. (1 mark)



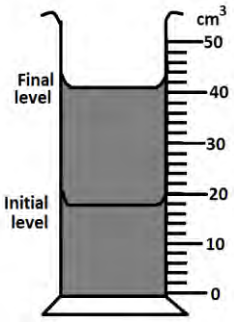
6. The diagram below shows two forces acting on a body. If the diagram is drwan to scale calculate magnitude of resultant force . (2 mark)



7. The diagram belo shows a biycle pump. Describe how a it works. (3 mark)



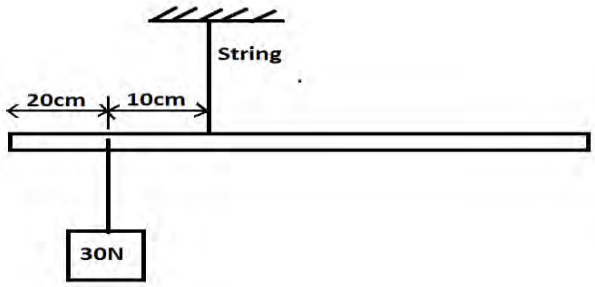
8. The diagram below shows a measurerin cylinder used to determine volume of irregular object. The initial and final level of water is as shown



a. State the method used to dertermine volume (1 mark)
b. Calculate of the volume of the irregular object. Express your answer in SI unit and in standarad form (2 mark)

9. What dou you understand by the term particulate nature of matter (1 mark)

10. The diagram below shows a meter rule suspended using a string. Calculate



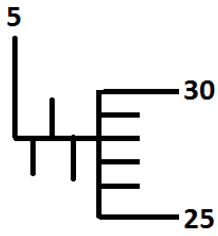
i. Weight of meter rule. (2 mark)
ii. Tension in the string . (2 mark)

11. State Bernoulli's effect (1 mark)

12. .
a. What is a machine as used in physics (1 mark)
b. Show that **Power = Velocity × Force** (3 mark

SECTION B 55 MARKS. Attempt all questions

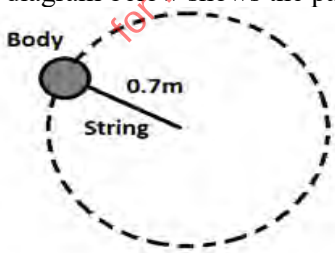
13. .
a. A form two students measured thickness of a physics text book of 400 pages excluding the covers using micrometer screw gauge. The diagram below shows the scale of micrometer screw gauge after measuring



i. State the reading of micrometer screw gauge. (1 mark)
ii. If micrometer scrwe gauge had an error of -0.012 cm fin the actual thickness of the text book (1 mark)
iii. Calculate thickness of one paper. Express your answer in SI unit and in standrad form (2 mark)
iv. In determining thickness of a paper why is it advisable to measure thicness of pile of papers instend of a single paper. (1 mark)

b. Oil leake from a faulty ship was esmated to cover an area of 2.4 km^2 of indian ocean . A sample that oil of volume 0. 1848cm^3 was allowed to spreed on the surface of water and formed a patch of area 0.77cm^2.
i. Determine volume of oil tha leaked. (3 mark)
ii. State one assumption in your calculation. (1 mark)

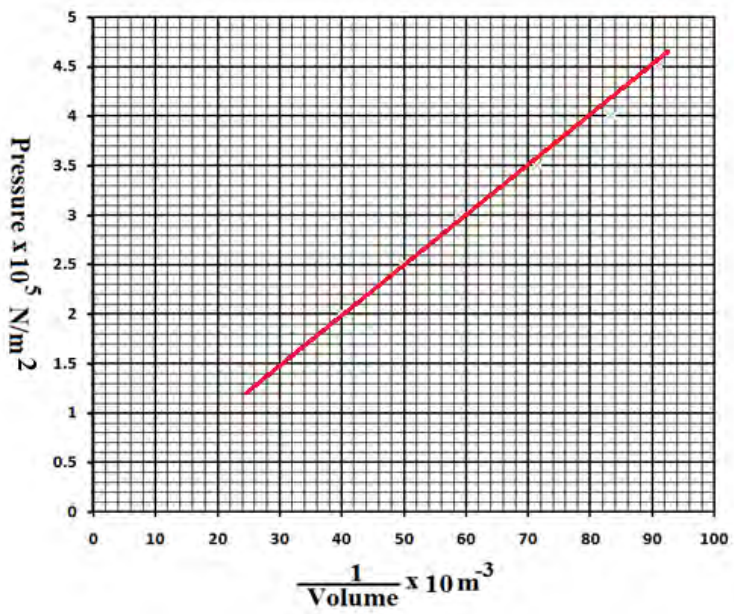
14.
a. The diagram below shows the path followed by a body in circular motion



i. If the motion is in a vertical pane show on the diagram the position where the string has maximum tention. (1 mark)
ii. If the body is rotating in anticlocwise direction direction and the string break where the body is, show on the diagram the direction the body will take. (1 mark)
iii. If the diffrence between minimum and mimimum tension in the string is 8.4N calculate mass of the body. (3 mark)

b. A stone is projected horizontally at a speed of 40m/s from a cliff 80m high. After how far from the base of the cliff will it fall? (3 mark)

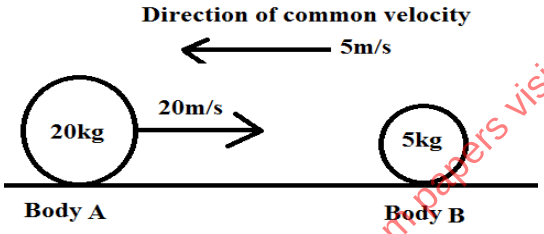
15. The graph below was obtained fro an experiment to verfy a certain gas law



i. State the law that was being verified . Support your answer. (2 marks)
ii. Determine the gradient of the graph. (3 marks)
iii. Given that the equation of the graph is PV = 2RT where R is a constant and temperature T = 300K, use your graph to determine the value of R. (3 marks)

16. .

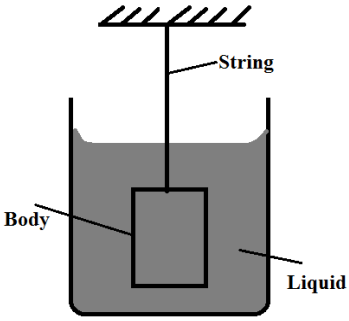
a. The diagram below shows a system of colliding bodies



i. State the type of collision shown above. Support yor answer (2 marks)
ii. Determine magnitude and direction of body B (4 marks)

b. State three ways of reducing friction (3 marks)
c. Explain why a person practising high jump flexes his/ her legs when landing (1 mark)

17. In an experiment to determine the density of a liquid a uniform metal cylinder of cross- sectional area 8cm^2 and length 5cm was hang from a spring balance and lowered gradually into the liquid as shown below.



a. On the diagram show three forces acting on the body. (3marks)
b. The up thrust was calculated from the spring balance and it was found to be 0.5N when the cylinder was fully submerged. Determine:
i. Volume of the metal cylinder. (1marks)
ii. Weight of the liquid displaced by the cylinder. (1 marks)
iii. Density of the liquid (3 marks)

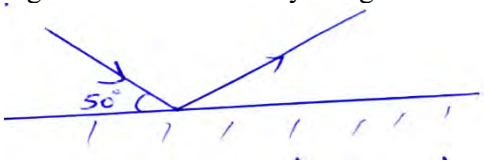
c. Explain why a hyrometer has. (3 marks)
   i. Thick bulb
   ii. Narrow stem
   iii. Lead shots

18. A block of metal of mass 150g at a 100^0C is dropped into a well rugged calorimeter of mass 210g and heat capacity $400JKg^{-1}K^{-1}$ containing 100g of water at 25^0C. The temperature of the resulting mixture is 34^0C. (Specific heat capacity of water = $4200JKg^{-1}K^{-1}$). Determine;
   i. Heat gained by calorimeter. (2 marks)
   ii. Heat gained by water. (2 marks)
   iii. Heat lost by the metal block. (2 marks)
   iv. Specific heat capacity of the metal block. (3 marks)

MECS 2CLUSTER JOINT EXAMINATION
Kenya Certificate of Secondary Education (KCSE)
232/2
PHYSICS
PAPER 2
TIME: 2 HOURS

SECTION A (25MARKS)

1. The figure below shows a ray of light incident on a plane mirror at point O



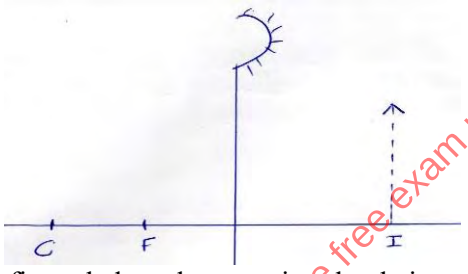
The mirror is rotated clockwise through an angle 30°C about an axis perpendicular to the paper. Determine the angle through which reflected ray is rotated (2mks)

2. A Bunsen burner flame brought near to the cap 0 of a charged electroscope causes the divergence of the leaf to decrease. Explain these observation (lmk)
3. The chart below shows an arrangement of different parts of the electromagnetic spectrum

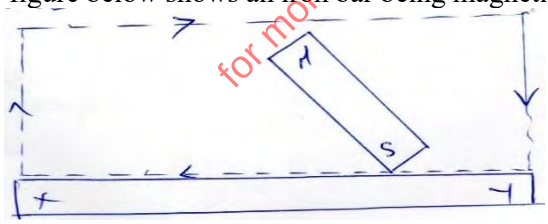
Radio wave	A	B	Visible light

i. Name radiation represented by A (lmk)
ii. State one detector of radiation B (lmk)

4. A cell has e.m.f E and internal resistance r. When a resistance of 1Ω and 2.5 Ω are connected in turn across the terminals, current of 0.4A and 0.2A passes respectively.
Calculate the value of E and r. (3mks)
5. Define work function of a metal (lmk)
6. Explain how n-type semiconductor is formed (3mks)
7. State reason why the core of an electric bell is made of soft iron and not steel (lmk)
8. An electric kettle is rated 2kw, 250v, what is the resistance of the coil of the kettle (2mks)
9. The figure below shows an image formed by concave mirror. Show using a ray diagram the position of the object (3mks)



10. The figure below shows an iron bar being magnetised by hitting it with a magnet

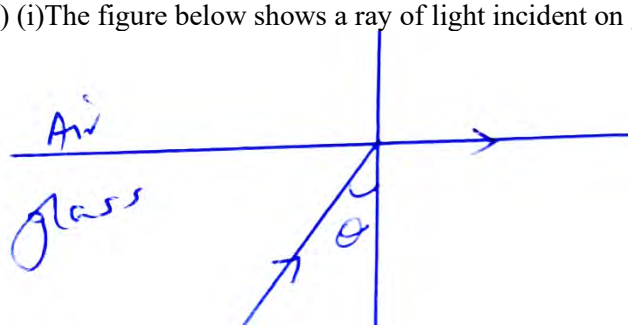


i. State the method of magnetisation (1mk)
ii. Identify polarity X (lmk)

11. The initial mass of a radioactive substance is 50g. The substance has a half-life of 5 years. Determine the mass remaining after 30 years (3mks)
12. State how local action is minimised in a simple cell (lmk)
13. State the condition necessary for interference to occur (lmk)

SECTION B 55 MARKS

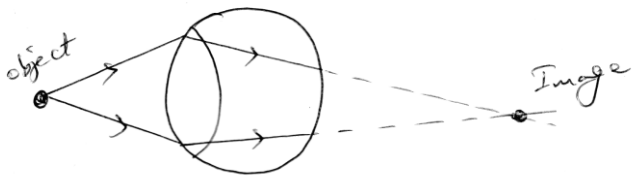
14.(a) (i)The figure below shows a ray of light incident on glass-air interface



Given that the refractive index of glass is 1.48. Determine the value of θ (3mks)

ii. An object of height 6cm placed in front of a diverging lens of focal length 10cm and 15cm from optical centre of the lens. Calculate the distance of the image form the lens (3mks)

c) The figure below shows a defective eye



c. (i)Name the defect (lmk)

(ii) State the cause of the defect (lmk)

(iii) State how the defect can be corrected (lmk)

(iv) State one difference between the eye and the camera (lmk)

15. (a) State how eddy current is reduced in a transformer (lmk)

b. A heater rated 2000w is used to heat water for 5 hours. Calculate the cost of electricity at Ksh.6.70 per unit (3mks)

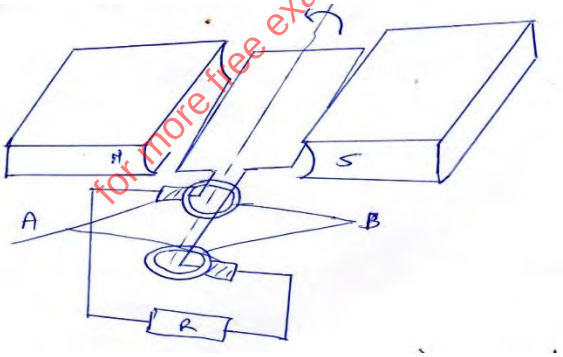
(c) A transformer has 800 turns in the primary coil and 40 turns in the secondary windings. The alternating e.m.f connected in the primary coil is 24ov and the current is 0.5A.

Determine

i. Secondary e.m.f (3mks)

ii) Power in secondary coil if the transformer is 95% efficient (3mks)

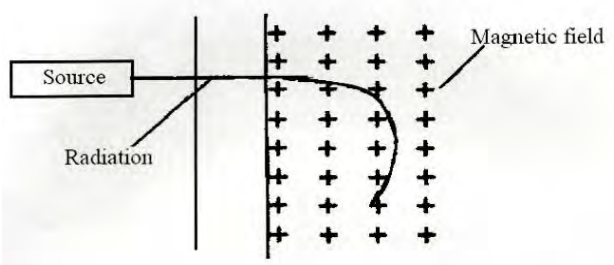
c. The figure below shows a simple generator. The coils are rotated in the anticlockwise direction as shown below.



i. Identify the type of generator illustrated above (lmk)

ii. Identify part labelled A and B (2mks)

16. (a) The figure below shows the path of a radiation from a radioactive source after entering a magnetic field. The magnetic field is directed into the paper and is perpendicular to the plane of the paper as shown.



Identify the radiation. Give reason for your answer (2mks)

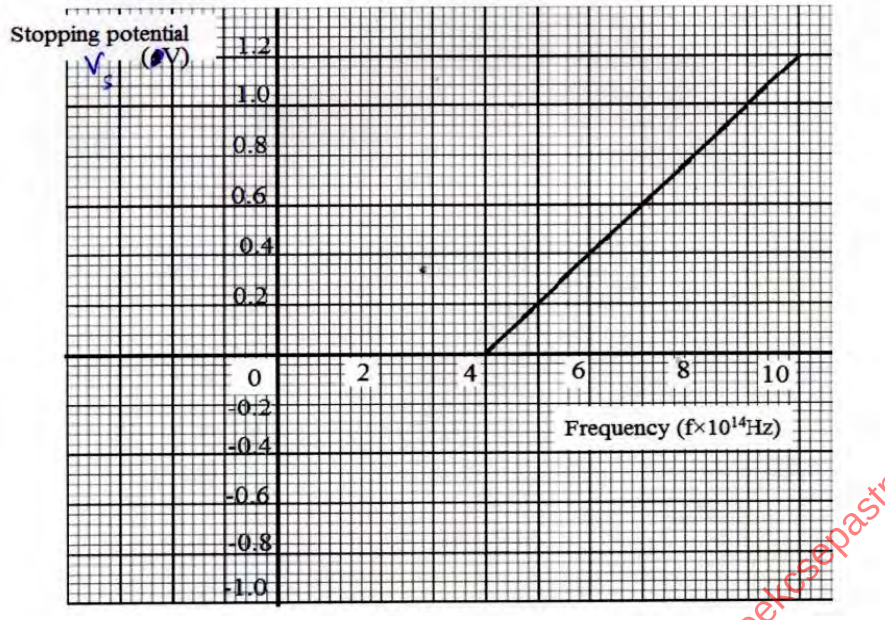
(b) Below is a nuclear reaction

$$^{232}_{90}A \xrightarrow{K} {}^{228}_{88}B \xrightarrow{B} {}^{y}_{x}C$$

i. Identify radiation K (lmk)

ii. Determine the value of x and y. (2mks)

c) The results obtained for various mono-chromatic radiations of different colours are as shown in the graph in figure below

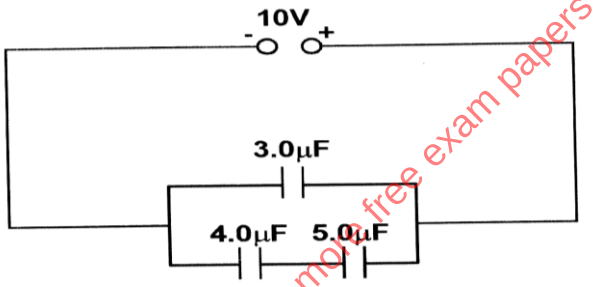


From the graph, determine

i. Plank's constant, h.(take electron charge, e=1.6x 10^{-19} C) (3mks)

ii. The work function W o of the metal (3mks)

17. (a) Figure shows three capacitors connected to a 10V battery



Calculate

i. The combined capacitance of the three capacitors (3mks)

ii. The charge of the 5.0μf capacitor (3mks)

b) The figure below shows displacement time graph for a progressive wave

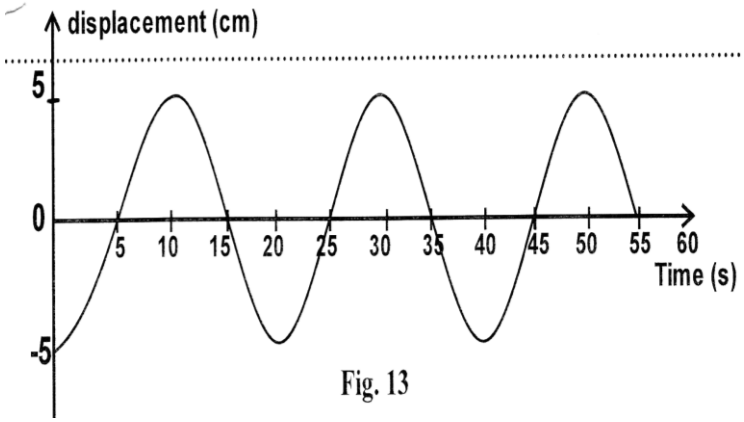
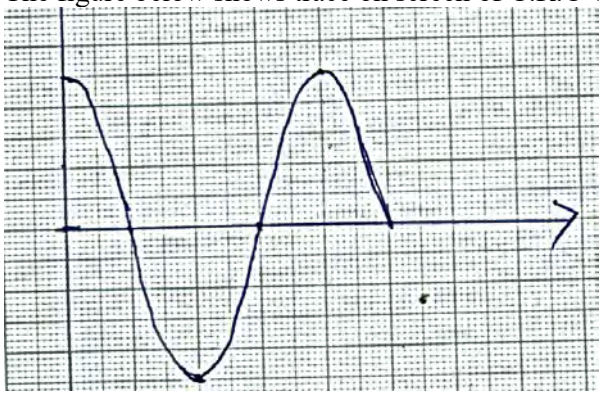


Fig. 13

i. State the amplitude of the wave. (lmk)

ii. Determine the frequency of the wave (3mks)

18. (a) The figure below shows trace on screen of C.R.O when a.c signal is connected to the y-plate with time base on



Given that time base control is 20ms/cm and y-gain at 50v/cm.
Determine

i. Frequency of a.c signal (3mks)
ii. Peat voltage of input signal (2mks)
b (i) state the type of x-ray used to detect metal flaw and give a reason (2mks)
iii. State why lead is used for shielding x-ray tube (lmk)
iv. In a certain x-ray tube, the electrons are accelerated by a p.d of 120,000v. Assuming that only 0.5% of the electrons energy goes into production of x-rays. Determine the frequency of x-rays produced (Take e= 1.6 x10^{-19} c, c= 3.0 x 10^{8}m/s, h=6.63 x 10^{-34} Js)

MECS 2CLUSTER JOINT EXAMINATION
Kenya Certificate of Secondary Education (KCSE)
232/3
PHYSICS
PAPER 3
TIME: 2 HOURS
PRACTICAL

QUESTION ONE

- ✓ A biconvex lens of focal length 15cm
- ✓ A lens holder
- ✓ A metre rule
- ✓ A white screen
- ✓ A candle illuminating crosswires mounted on a circular hole
- ✓ A matchbox

QUESTION TWO

- ✓ A voltmeter (0-5V range)
- ✓ a 25V, 2200 µf capacitor (Terminals should be labeled for candidates)
- ✓ A switch
- ✓ Five connecting wires, two with crocodile clips
- ✓ Two new size D dry cells with a cell holder
- ✓ Some cotton thread – 1m long (1 piece), 0.5m long (2 pieces)
- ✓ Triangular prism (approximately 3.8 cm x 3.8 cm equilateral 60°,60°,60°)
- ✓ A metallic 50g mass
- ✓ Hot water (provide a pool of boiling water to be shared)
- ✓ Cold water (tap water)
- ✓ Plastic Beaker (at least 250 ml)
- ✓ Thermometer -10°C to 110°C
- ✓ A stopwatch
- ✓ A metre rule
- ✓ A stand, boss and clamp

MECS 2CLUSTER JOINT EXAMINATION
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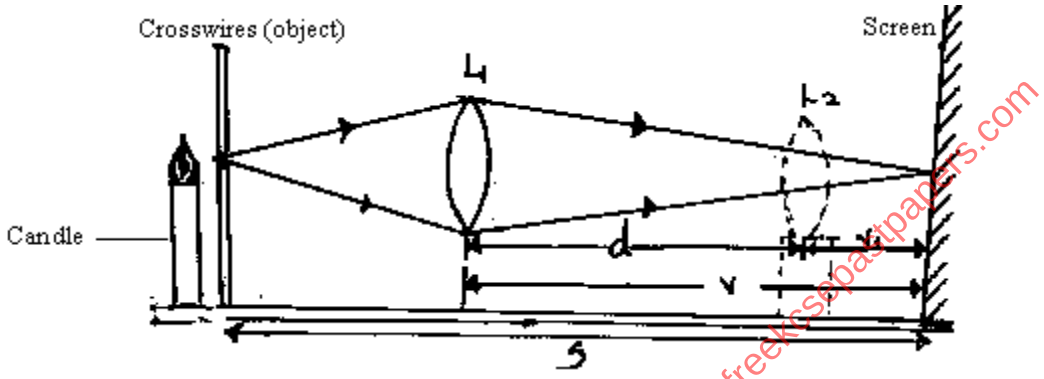
PAPER 3
TIME: 2 HOURS
PRACTICAL

Question One

1 You are provided with the following apparatus;

- ✓ A candle (source of light illuminating cross wires mounted on a circular hole)
- ✓ A convex lens
- ✓ A lens holder
- ✓ One-meter rule
- ✓ A whole screen

Set the apparatus as shown in the diagram below



Illuminate the object cross wires using the candle provided when the distance between crosswires and screen S = 60cm.

By moving the lens away from the crosswires obtain a focused clear image of the object (crosswires) on the screen. Measure and record the distance V, between the lens position L_1 and the clear image on the screen.

Keeping the distance S fixed i.e. S = 60cm move the lens further away from the object until another sharp image but diminished image of the cross wires is obtained on the screen. Measure and record the distance between the new lens position L_2 and the sharp diminished image. Record this as V_1. Repeat the procedure for other values of S shown in the table.

i) Complete the table (8marks)

S (cm)	60	65	70	75	80	85	90
V (cm)							
V_1 (cm)							
d = V - V1(cm)							
S^2 (cm^2)							
d^2 (cm^2)							
$S^2 - d^2$(cm^2)							

ii) Plot a graph of $s^2 - d^2$ against S (5marks)

iii) Determine the gradient (k) of the graph (3marks)

iv) Given that K =4f where f is the focal length of the lens used, determine the value for f. (2marks)

v) State the advantage the method used above to determine the focal length of a lens has over the other methods. (1mark)

vi) Focus the window frame or any distant object and obtain a rough estimate of the focal length of the lens. (1mark)

Question 2

This question consists of two parts, A and B. Attempt both parts.

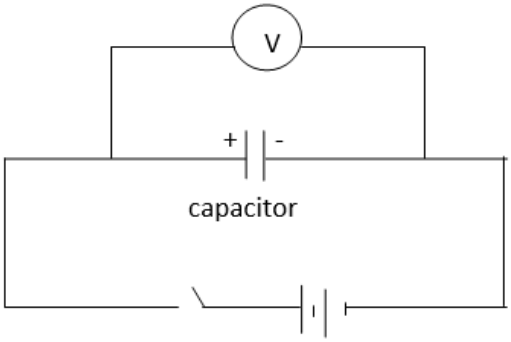
Part A

You are provided with the following

- ✓ A voltmeter
- ✓ A capacitor
- ✓ A switch
- ✓ A stopwatch
- ✓ Five connecting wires
- ✓ Two cells and a cell holder

Proceed as follows;

a) Connect the circuit as shown in the figure below.



Ensure the terminals of the capacitor and those of the battery are correctly connected.
(*Positive to positive and negative to negative)*

b) Close the switch, read and record the maximum voltage V_o across the capacitor.
V_o = _____ volts. (1 mark)

c) While the voltmeter shows the maximum voltage V_o open the switch and start the stopwatch simultaneously. Stop the stopwatch when the voltage has dropped from V_o to 2.5V. Read and record in the table 2 the time taken.

d) Reset the stopwatch and close the switch. Repeat the procedure in (c) to measure and record the time taken for the voltage to drop from V_o to each of the other values shown in table 2. (3marks)

Table 2

Voltage (V)	2.5	2.25	2.0	1.75	1.50	1.25
Time, t(s)						

e (i) On the grid provided, plot a graph of voltage, V (y-axis) against time, t. (4 marks)

ii) Use the graph to determine the time, t at which V = $^{Vo}/_{2}$

t= _____ seconds (1 mark)

f) Determine the resistance R of the voltmeter given that t = 0.693 CR where C is the capacitance of the capacitor. [1 mark]

Part B

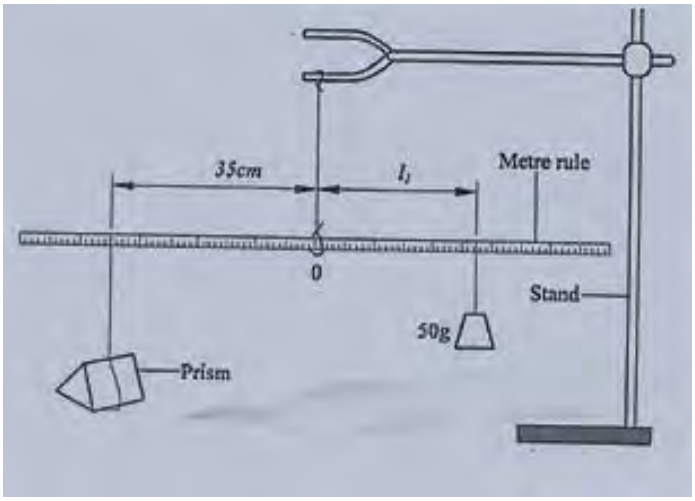
You are provided with the following;

- ✓ A triangular glass prism
- ✓ A metre rule
- ✓ A 50g mass
- ✓ Some hot water
- ✓ Some cold water
- ✓ Some thread
- ✓ A thermometer
- ✓ One stand, one boss and one clamp
- ✓ A beaker

Proceed as follows;

g) 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*).

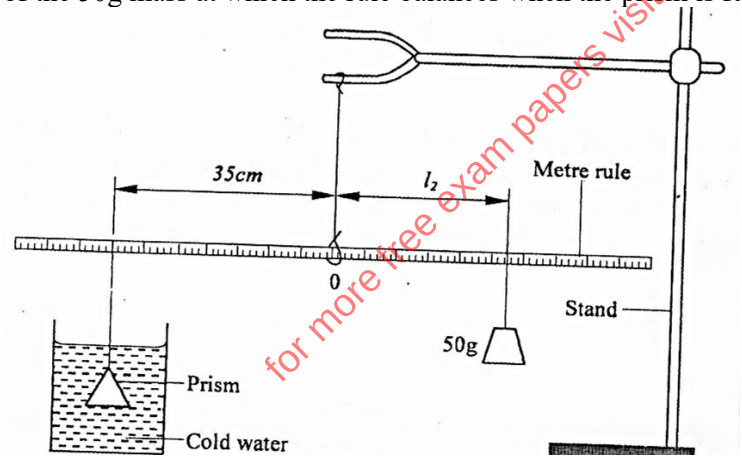
h) Using another piece of thread suspend the glass prism from the metre rule at a point 35cm from O. Suspend the 50g mass on the opposite side of O using another piece of thread. Adjust the position of the thread attached to the 50g mass until the metre rule balances once more.



i) Determine the distance L_1, between O and the point of support of the 50g mass.
$L_1 =$ _____ cm (1 mark)

ii) Use the principle of moments to determine the weight W_1 of the prism in air.
(Take g = 10N/kg) (1 mark)

iii) Put cold water into the beaker (approximately $^3/_4$). With the prism at 35 cm from O, determine the distance L_2 of the 50g mass at which the rule balances when the prism is fully submerged in cold water.



(I) $L_2 =$ _____ cm [1 mark]

(II) Determine the weight W_2 of the prism in cold water. [1 mark]

j) Measure and record the temperature T, of the cold water when the system is balanced.
$T_1 =$ _____ ^{0}C. [1 mark]

k) Now pour out the cold water and replace with hot water. Balance the metre rule with the prism fully submerged in hot water. (*Ensure that the prism is still supported at 35 cm 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 [1 mark]

ii) Measure and record the temperature of the hot water.
$T_2 =$ _____ ^{0}C. [1 mark]

iii) Determine the weight W_3 of the prism in hot water. [1 mark]

l) Determine the constant k for the water given that [2 marks]

$$K = \frac{(W_1 - W_2) - (W_1 - W_3)}{(W_1 - W_3)(T_2 - T_1)}$$