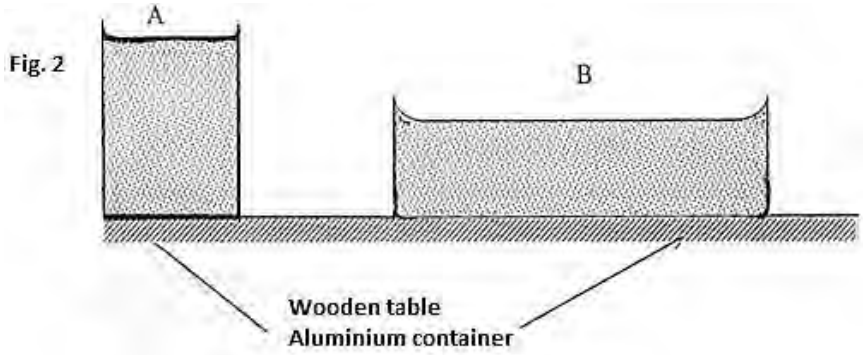
NAMBALE ACK JOINT MOCK 2021
232/1
PHYSICS PAPER 1
NOVEMBER

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. (3mks)
2. The height of the mercury column in a barometer 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 kgm^{-3}) (3mks)
3. Figure 1 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

Figure 1



Explain why water in ***B*** cools faster than water in ***A***. (1mk)

4. Smoke particles in air when strongly illuminated were observed to describe a continuous random and haphazard motion. Explain what would be observed if air temperature is decreased (2mks)
5. Two 10g masses were fixed using wax on the sides of two aluminium plates of same thickness. One of the plates was polished shinny while the other was painted black. The heater was placed close to the shiny plate but further away from the blackened plate. Explain why the two masses fell off at the same times (2mks)

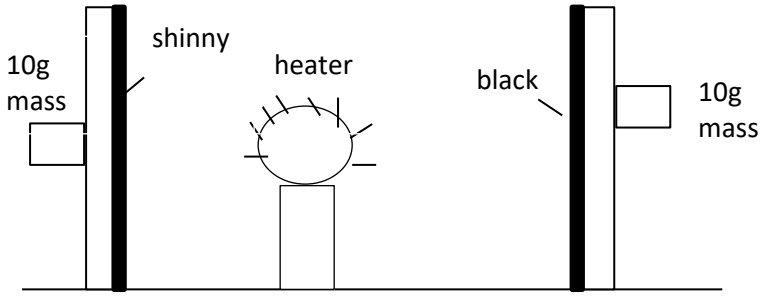


Figure 2

6. Explain why gases easily compressible while liquids and solids are almost incompressible (2mks)
7. State two properties of a clinical thermometer that make it suitable for measuring body temperature (2mks)
8. The pointer of a spring points at 2 cm when no load has been added. A mass of 200g is added and the pointer points at 6cm. Determine the load that makes the pointer indicate 9.5cm (3mks)
9. Sketch a velocity – time graph to show motion of a body thrown vertically upwards with an initial velocity of u m/s up to the maximum height (1mk)

10. 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

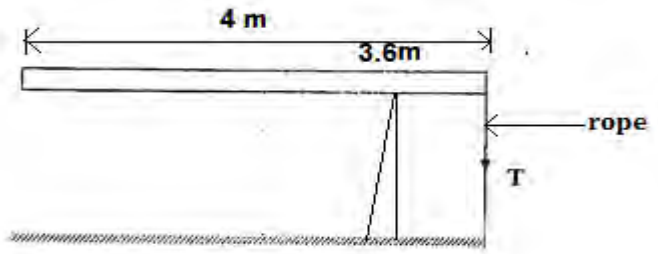


Figure 3

Calculate tension **T** in the rope (Take g=10N/kg) (3mks)

11. One of the transport TLB rules is that a passenger should put on the safety belt. Explain how the belt enhances safety in case of an accident. (1mk)
12. The figure below shows a vessel resting on a horizontal bench.

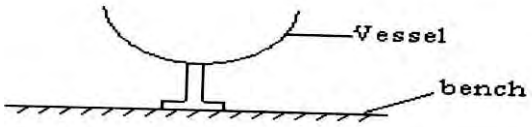


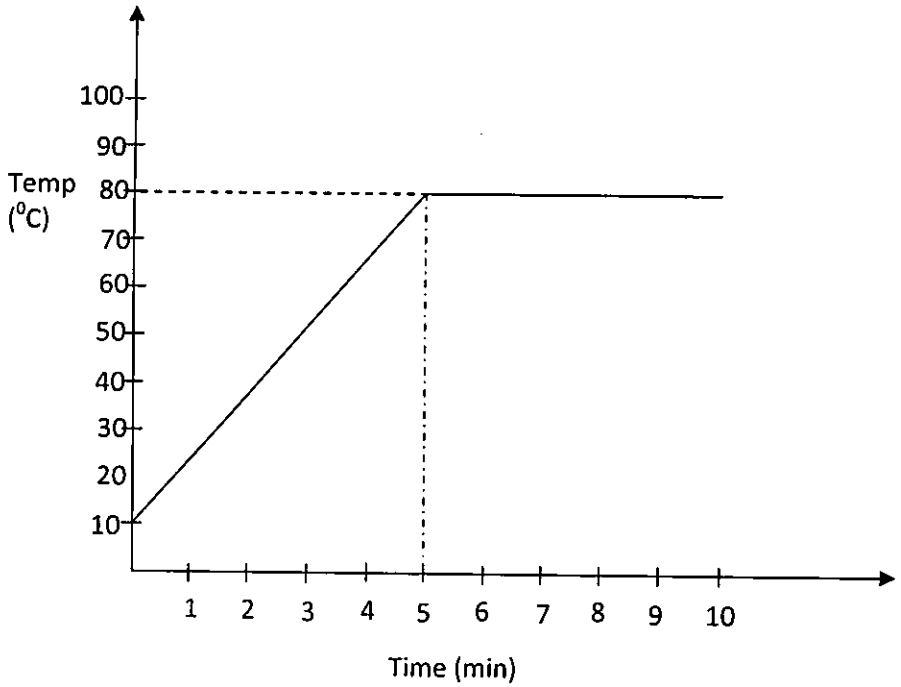
Figure 4

State and explain the effect on the stability of the vessel when it is filled with water. (2mks)

SECTION B : (55 marks)
(Answer all the questions in this section)

13. (a) 1200g of liquid at 0°C is heated in a vessel by using a lower. An electric heater rated 1KW is used to heat the liquid. The graph below shows the variation of the temperature of the liquid with time.

fig.6

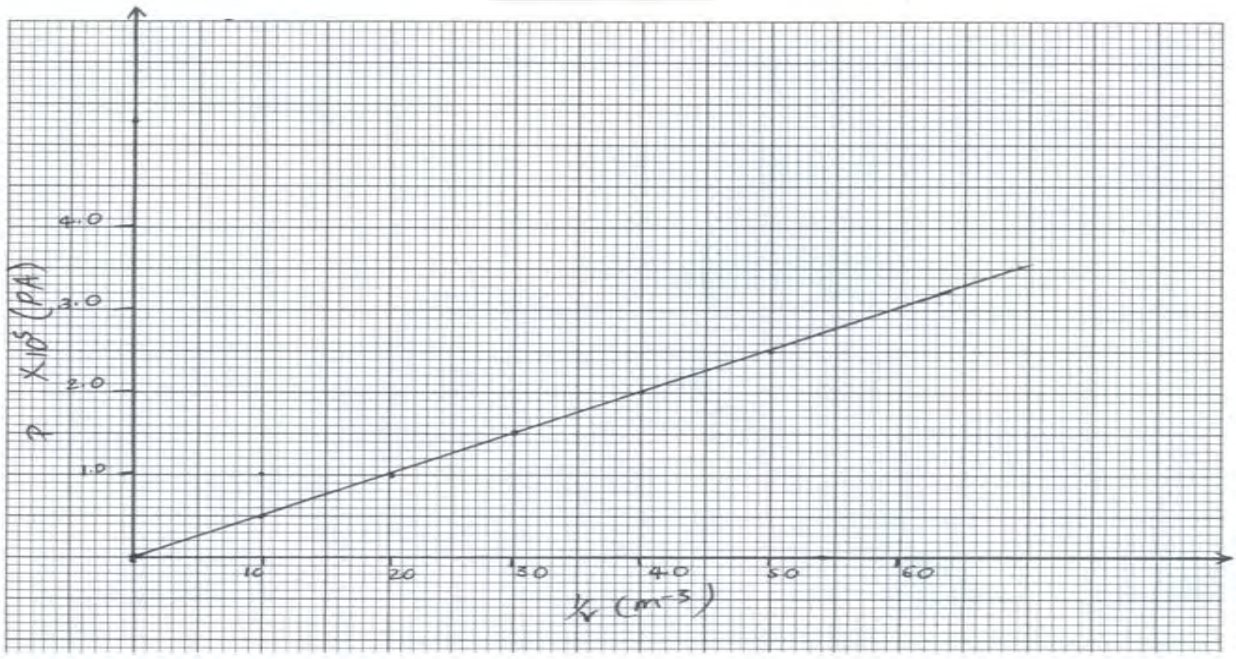


i) State the boiling point of the liquid in Kelvin scale. (1mk)
ii) State a reason why the graph does not start from origin. (1mk)
iii) Determine how much heat is given out by the heater to heat the liquid to the boiling point. (2mks)
iv). Determine the specific heat capacity of the liquid (2mks)

v. If 50 g of the liquid vapor was collected by the end of the 8th minute, determine the specific latent heat of vaporization of the liquid. (3mks)

14. (a) State the pressure law for an ideal gas. (1mk)

(b) The pressure P of a fixed mass of a gas at a constant temperature of T=200K is varied continuously and values of corresponding volume recorded. A graph P against $\frac{1}{v}$ is shown on grid below.



Use the graph to determine:

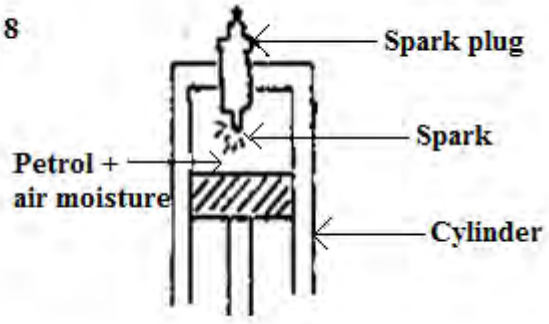
(i) The volume of the gas when the pressure reads $2.8\times10^5\ pa$ (2mks)

(ii) The Slope of the graph. (2mks)

(iii) Given that $T = \frac{PV}{2R}$ where R is a constant, use the slope obtained in (ii) above to determine the Value of R (3mks)

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

Fig 8

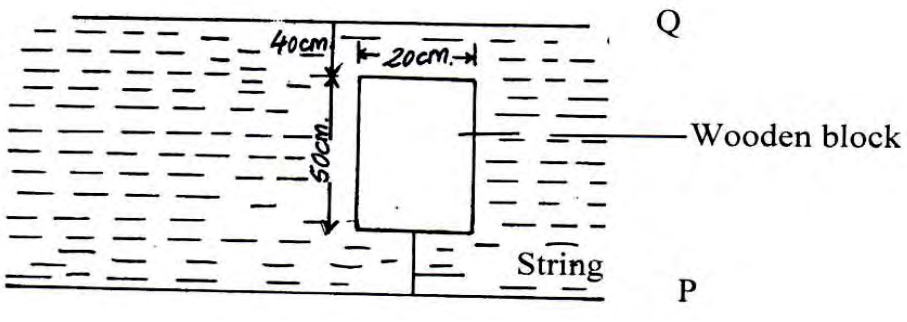


Explain in terms of kinetic theory why the piston moves downwards. (3mks)

15. (a) State the law of floatation. (1mk)

(b) A block of wood of mass 80kg floats in water with 0.6 of its volume in water. Calculate the number of rods each 20g that can be placed on the block so that its top is level with the surface of water. (4mks)

(c) The diagram in figure 9 below shows a wooden block of dimensions 50cm by 40cm by 20cm held in position by a string attached to the bottom of a swimming pool. The density of the block is $600kgm^{-3}$.

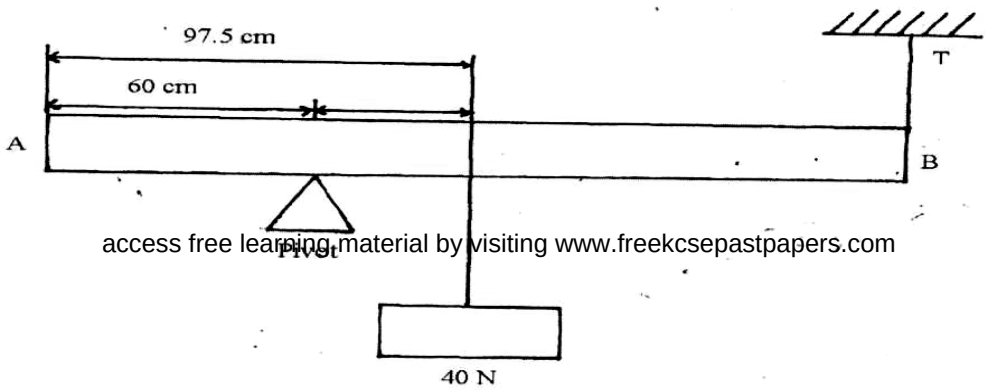


i) State the **three** forces acting on the block and write an equation linking them when the block is stationary. (2mks)

ii) Calculate the tension on the string. (3mks)

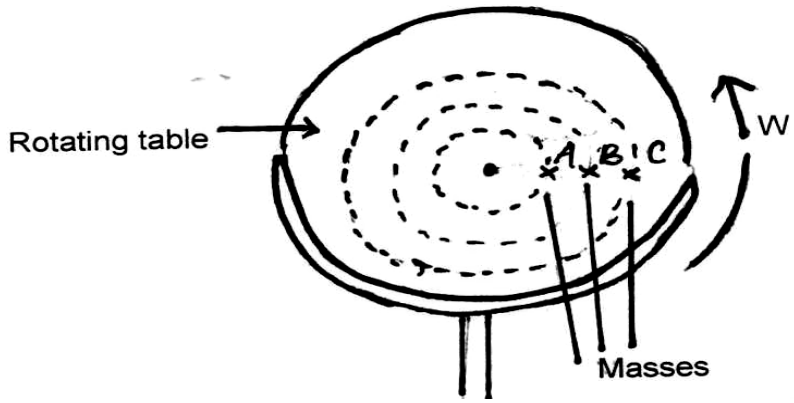
(b) The figure below shows a metal rod AB of length 2m horizontally balanced while supported by a pivot and a string.

100



Determine the mass of the metal rod if the tension is 15N. (3mks)

16. (a) The figure below shows asses A, B and C placed at different points on a rotating table. The angular velocity W, of the table can be varied

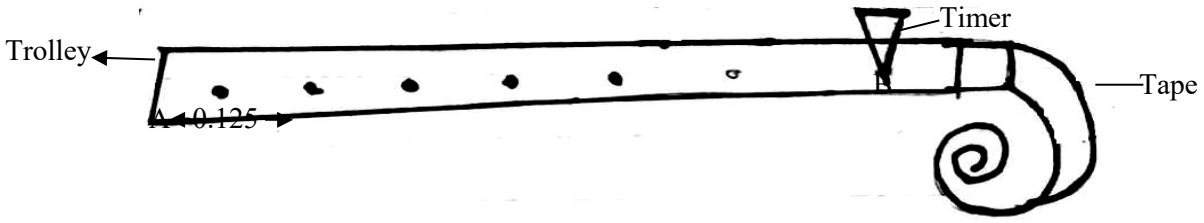


i) State and Explain **two** factors that determine whether a particular mass slides off the table or not. (4mks)

ii) It is found that the masses slide off at angular velocities W_A, W_B and W_C respectively. Arrange the values of W_A, W_B and W_C in decreasing order. (1mk)

(b) A block of mass 200g is placed on a frictionless rotating table while fixed to the centre of the table by a thin thread. The distance from the Centre of the table to the block is 15cm. If the maximum tension the thread can withstand is 5.6N, determine the maximum angular velocity the table can attain before the thread cuts. (4mks)

17. A stone thrown vertically upwards from the base of a mountain with an initial velocity of 100m/s. The stone just stopped as the apex and came back. Another boy projected a stone horizontally from the top of the mountain. Calculate:-
    (a) Height of the mountain. (3mks)
    (b) Time taken for the stone to follow the trajectory. (2mks)
    (c) The range if the horizontal velocity is 20m/s, (2mks)
    (d) Calculate the impulse of force produced when a table is pulled for 3s by a constant force of 10N towards the right and then for 2s by a constant force of 20N towards the left. (2mks)
    (e) The figure below shows a tape from a trolley accelerating at $5m/s^2$ and the timer is vibrating at 100Hz.



Calculate:
(i) Change in velocity from A to B. (2mks)
(ii) The final velocity of trolley

NAMBALE ACK JOINT EXAM – 2021
232/2
PHYSICS
PAPER 2

SECTION A (25 MKS):
Answer all questions in this section in the spaces provided.

1. **Figure 1** shows a ray of light incident on a mirror at an angle of 45^0. Another mirror is placed at an angle of 45^0 to the first one as shown

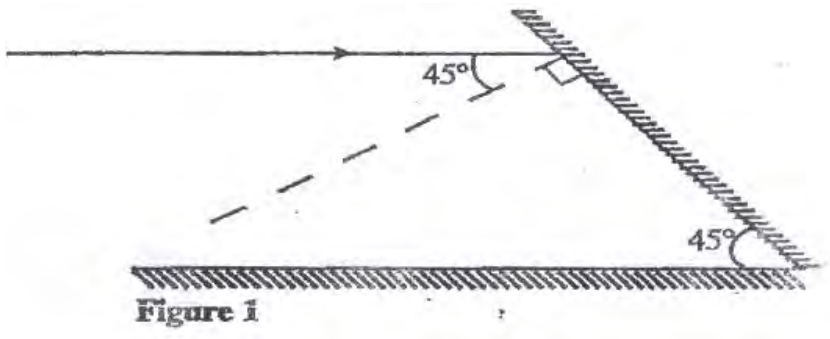


Figure 1

Sketch the path of the ray until it emerges (2 mks)

2. **Figure 2** shows a soft iron bar AB placed in a coil near a freely suspended magnet.

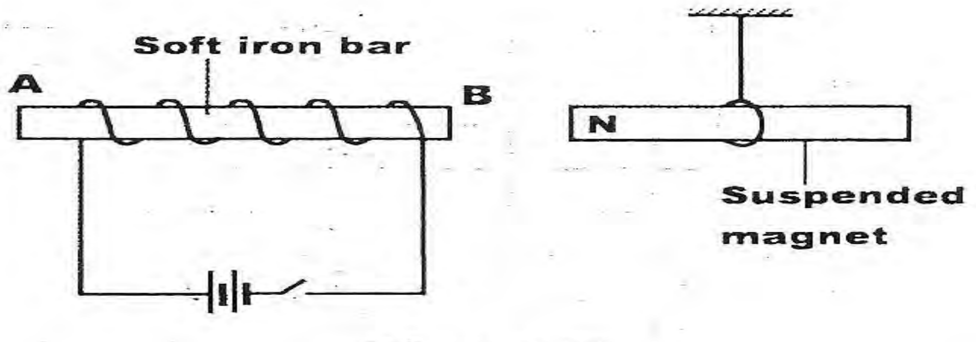


Figure 2

Explain the observation made when the switch is closed. (2 mks)

3. Table 1 shows radiations and the irrespective frequencies.

Type of radiation	Yellow light	Gamma rays	Radio waves	Micro waves
Frequency (Hz)	1×10^{15}	1×10^{22}	1×10^{6}	1×10^{11}

Arrange the radiations in the order of increasing energy. (1 mk)

4. State the reason why electrical power is transmitted over long distances at very high voltages (1 mk)

5. A boy standing in front of a cliff blows a whistle and hears the echo after 0.5s. He then moves 17 metres further away from the cliff and blows the whistle again. He now hears the echo after 0.6s. Determine the speed of the sound. (4mks)

6. **Figure 3** shows a human eye with a certain defect

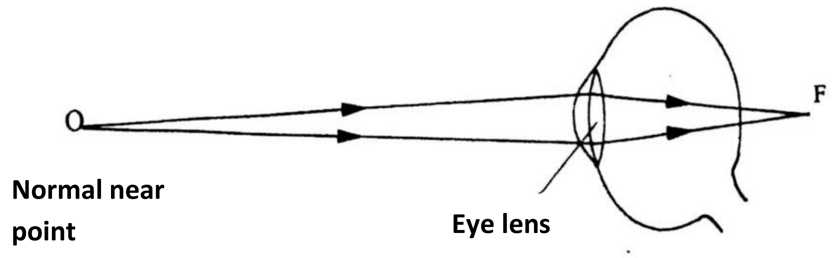


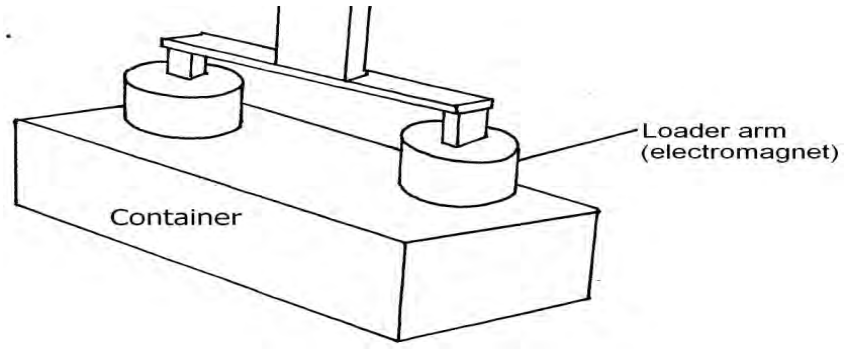
Figure 3

(i) Name the defect (1 mk)

(ii) On the same diagram, sketch the appropriate Len and rays to show how the defect can be corrected. (2mks)

7. Polarisation is a defect of a simple cell. State how it reduces the current produced and how this defect can be minimized (2mks)

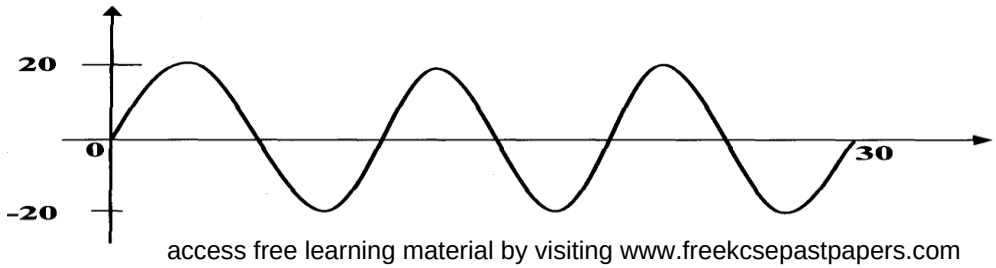
8. The figure below shows container loader which uses electromagnet to offload containers from a ship.



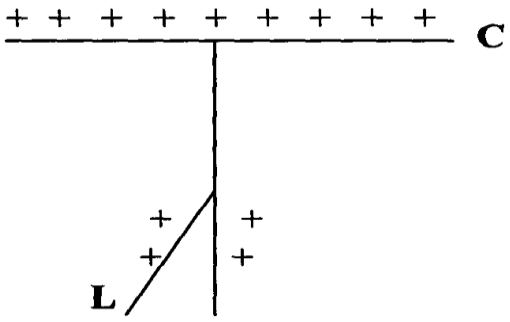
(i) Why should the container be made of iron or steel (1mk)
(ii) State two ways in which the loader can be made to lift heavier container (2mks)

9. Two 12V lead acid accumulators are rated 60Ah and 70Ah. State two physical differences between the accumulators (2mks)

10. The diagram below shows part of a wave form. The numbers on the diagram show scales in meters. If the speed of the wave is $20ms^{-1}$, determine the frequency and wavelength of the wave. (3mks)



11. 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 happens to **L** when a positively charged rod is brought near **C** without touching it. (2mks)



SECTION B (55 MARKS)

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

(b) The figure below shows the voltage – current relating for a certain battery used in an electrical circuit

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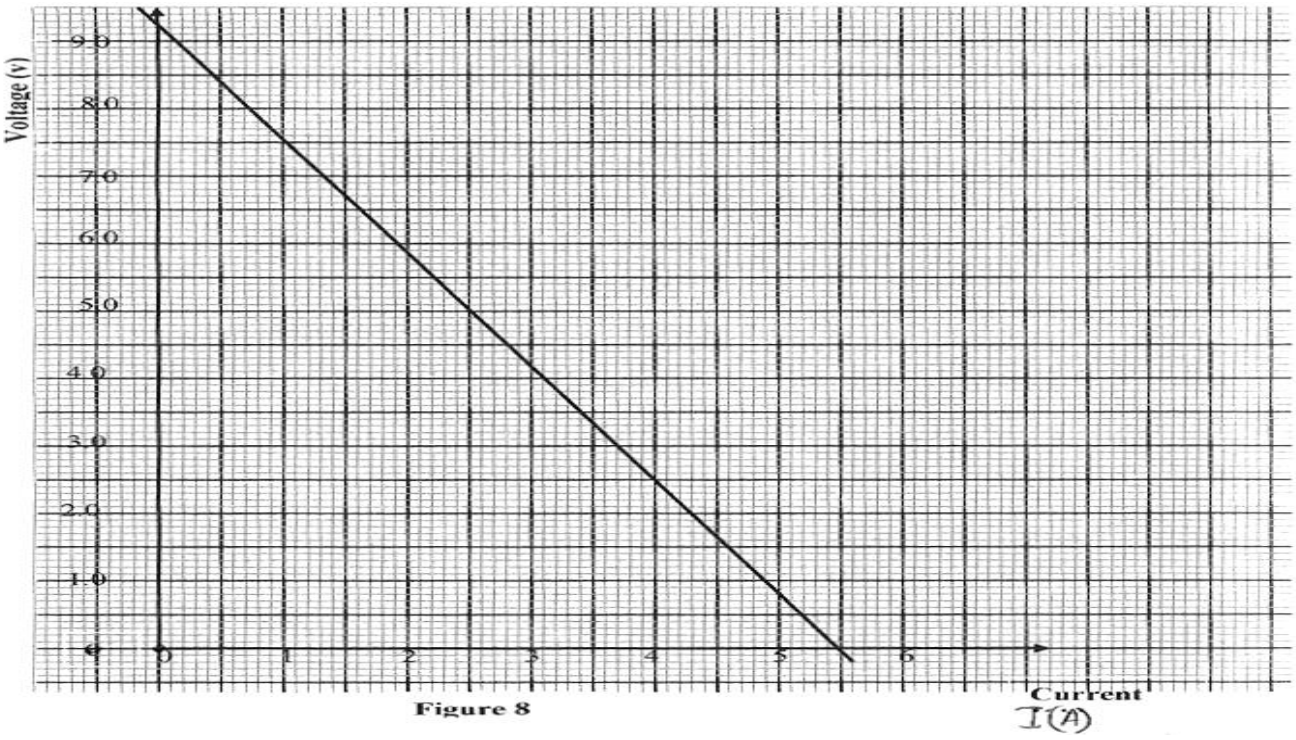


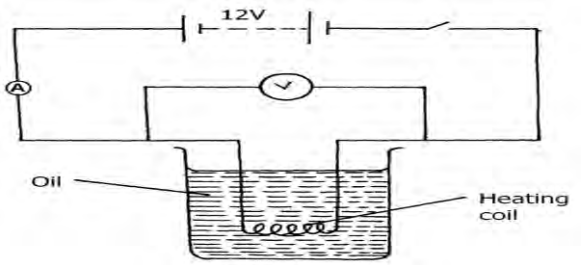
Figure 8

Given that the equation of the graph is V = E – Ir , from the graph , determine

(i) The e.m.f of the battery. (1mk)

(ii) The internal resistance of the battery used. (3mks)

(c) The figure below shows a circuit with a coil used to warm oil in a beaker.



(i) Explain how heat is produced in the coil (2mks)

(ii) Given that the reading of the ammeter is 2.4A determine the resistance of the coil. (3mks)

(iii) How much heat is produced in the coil in a minute? (2mks)

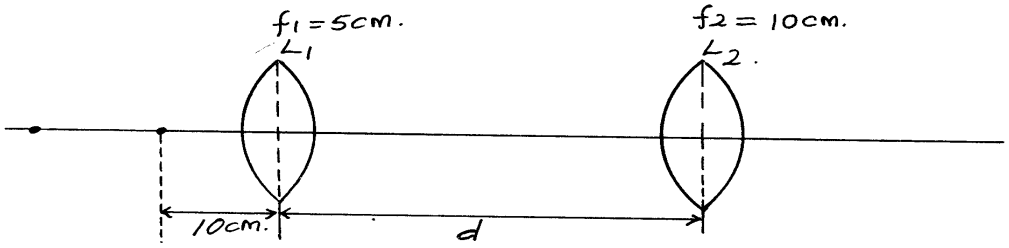
(iv) Give two changes that can be made in the set up in order to produce more heat per minute. (2mks)

13. a) With an aid of a ray diagram show how a convex lens can be used as a magnifying glass (3mks)

(b) From the definition of magnification M and equation $f = \frac{uv}{v+u}$ show that magnification

$M = \frac{v}{f} - 1$ where the symbols have their usual meanings. (3mks)

(c) Two converging lenses whose focal lengths are f_1=5cm and f_2=10cm are arranged to have a common axis as shown in figure below.



A point object is placed 10cm from L1. Given that the final image is formed 20cm to the left of $L2_1$ calculate the separation d of the lenses (4mks)

14.(a) Figure **8** shows a circuit that may be used to charge a capacitor.

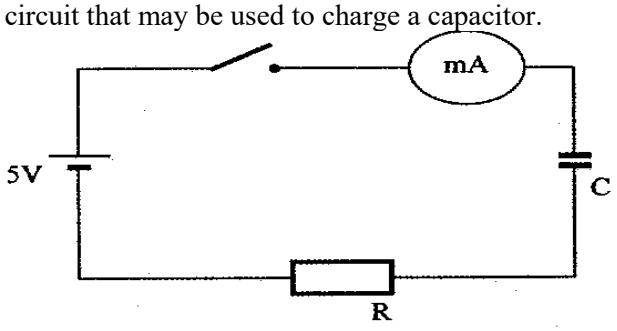


Figure 8

(i) State the observation on the milliameter when the circuit is switched on: (1mk)

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

(b) The circuit in **figure** 8 is left on for some time. State the value of 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. (3mks)

(d) **The Figure** shows three capacitors connected to a 10V battery.

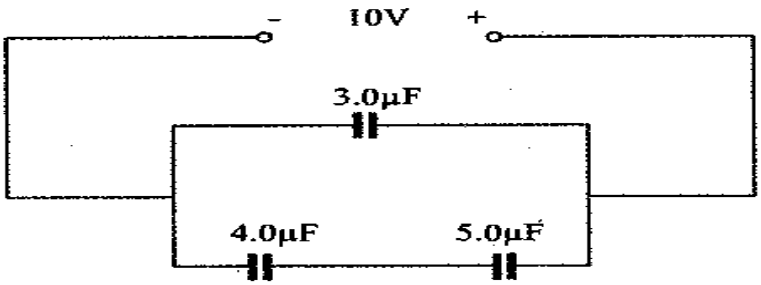


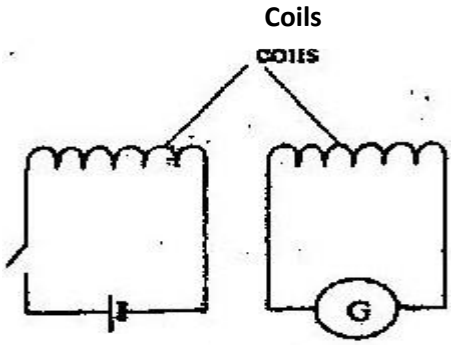
Figure 9

Calculate:

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

(ii) the charge on the 5.0 μF capacitor. (2mks)

15. (a) Figure below shows two circuits close to each other



Figure

When the switch is closed, the galvanometer shows a reading and then returns to zero. When the switch is then opened, the galvanometer shows a reading in the opposite direction and then returns to zero. Explain these observations. (3mks)

b) An ideal transformer has 2000 turns in the primary circuit and 200 turns in the secondary circuit. When the primary circuit is connected to a 400V a.c. source the power delivered to a resistor in the secondary circuit is found to be 800W. Determine the current in:
   (i) The secondary circuit (3mks)
   (ii) The primary circuit (3mks)

c) Explain how energy losses in a transformer are reduced by having **a soft- iron core** (2mks)

16. (a) (i) State the meaning of the statement diode characteristic. (1mk)
(ii).Sketch a circuit diagram that can be used to investigate p-n junction diode characteristics. (2mks)

(b) Define the term acceptor atom as applied in semiconductor. (1mk)

(c). Study figure 7 below and use it to answer questions that follow.

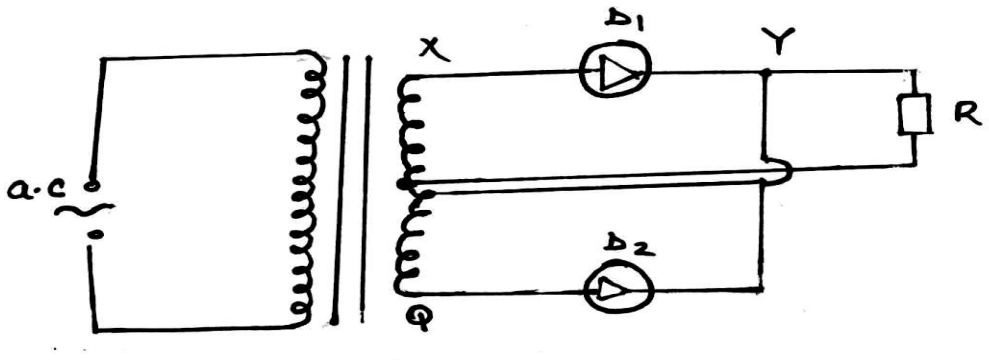


Fig. 7

(i) Briefly explain how the circuit works to produce a rectified alternating current. (3mks)
(ii) Draw on the diagram to show the position of the capacitor. (1mk)
(iii) State the functions of the capacitor in the circuit. (1mk)
(iv) Sketch the graph of the output as seen on a CRO screen. (1mk)

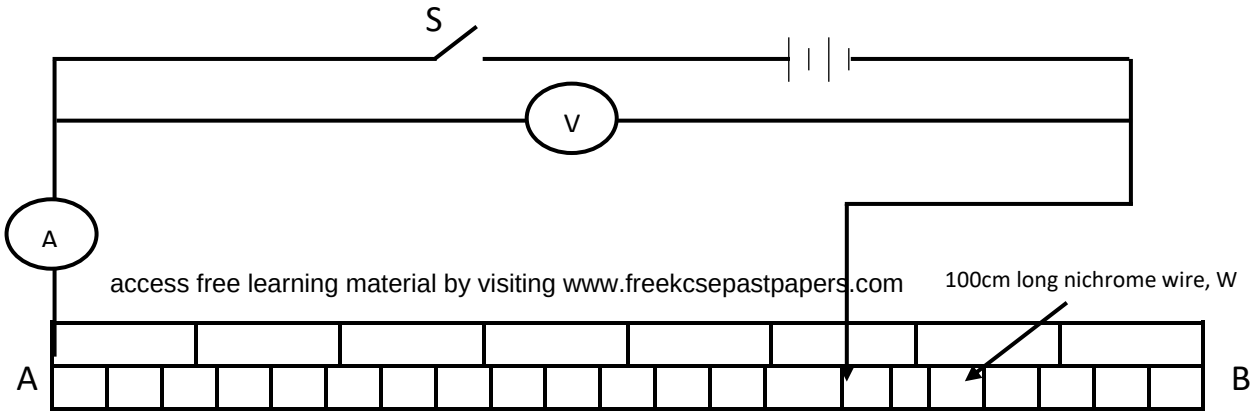
NAMBALE ACK SCHOOLS JOINT EXAMS
232/3
Physics Paper 3
PRACTICAL

Question One
You are provided with the following

- Two cells of 1.5V each
- Nichrome wire labeled W mounted on a metre rule
- An ammeter (0 – 1.5A) or (0 - 2.5A)
- A cell holder
- Voltmeter (0 – 5V)
- 8 connecting wires atleast 4 with crocodile clips (or a jockey)
- A switch
- A metre rule

Proceed as follows:

(a) Connect the circuit as shown in the figure 1 below.
Figure 1



(b) (i) Connect the end of A and point B when AB = 100cm across the terminals as shown in the figure 1 above.
Close the switch and measure both current I and p.d, V across the wire AB
Current I _____ A
P.d, V _____ V

(ii) Measure the emf of the cell, E = _____ V

(c) Reduce the length AB as shown, 100cm, 70cm, 60cm, 50cm, 40cm, 30cm and 20cm. In each case record the current (I) and the corresponding values of p.d (V)

(d) Enter the length as shown in the table 1 below:

Table 1

Length AB (cm)	100	70	60	50	40	30	20
Current I (A)							
p.d (V)							
E – V (V)							

(e) Complete the table
(i) Plot a graph of (E – V) against I (A)
(ii) Determine the gradients of the graph

Given the equation, E = V =Ir, determine the internal resistance of each cell (3mks)

Question Two

Part A

You are provided with the following apparatus

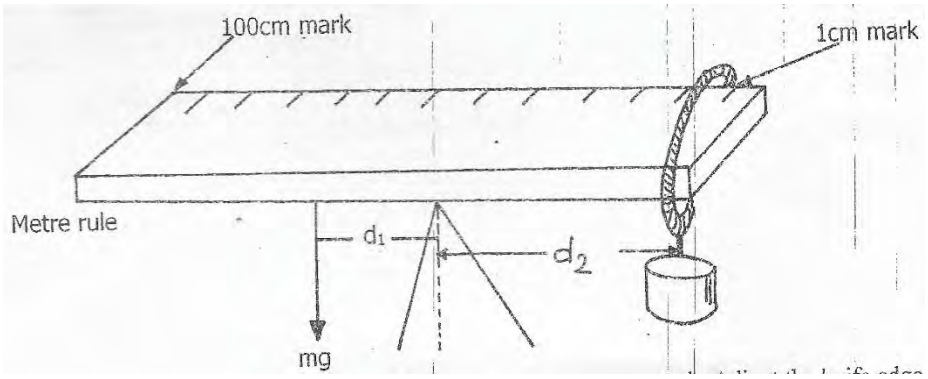
- A wooden metre rule
- 10cm long cotton thread
- Masses, two of 10g and two of 20g
- Knife edge – 20cm high

Proceed as follows

(a) Arrange the apparatus as shown in figure 2 below

(b) Balance the metre rule on the edge and adjust the metre rule until it balances horizontally when there is no mass on it. The knife edge is now at the position of (cog)

(c) Record the position of (cog)
Position of c.o.g = _____ cm
Figure 2



(d) Now hang a mass on the metre rule by use of the thread at 1cm mark. Adjust the knife edge until the metre rule balances again at new mark. Record the length d_1 and the corresponding length d_2.

(i) Repeat the procedure for different masses and complete the table 2 shown below.

Table 2

Mass, m(g)	10	20	30	40	50	60
Distance d_1 (cm)						
Distance d_2 (cm)						
Mass (m) x distance d_2 $=md_2$						

(ii) Plot a graph of md_2 against d_1 (5mks

(iii) Calculate the slopes of the graph (2mks)

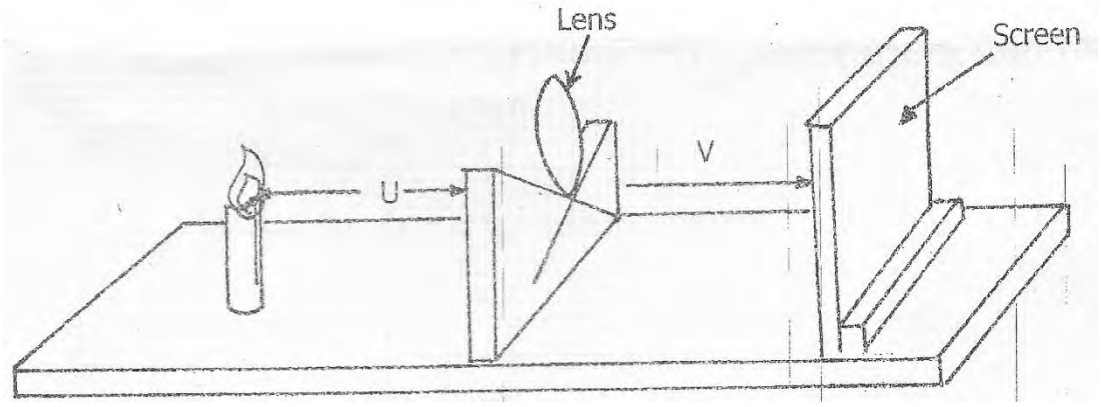
Part B

You are provided with the following apparatus

- A lens
- A lens holder
- A candle
- A white screen
- A metre rule

Procedure

(e) Set up the apparatus as shown in the figure 3 below:



(f) Starting with u = 30cm adjust the position of the screen to obtain a sharp image of the candle. Record value of V in the table shown below:

(g) (i) Repeat the procedure above for u = 20cm and complete table below:

Table 3

u (cm)	v (cm)	M = $^{v}/_{u}$
20		
30		

(2mks)

(ii) Given that the focal length of the lens satisfies the equation, $f = \frac{v}{1+m}$ determine the average value of the focal length

NAMBALE ACK SCHOOLS JOINT EXAMS
232/3
PHYSICS PAPER 3
PRACTICAL
CONFIDENTIAL

Question One

- Two dry cells of 1.5V each.
- Nichrome wire labeled W mounted on a metre rule.
- An ammeter (0-1.5A) or (0-2.5A)
- A cell holder.
- Voltmeter.
- 8 connecting wires atleast 4 wash crocodile clips (or a Jockey)
- A switch.
- A metre rule.

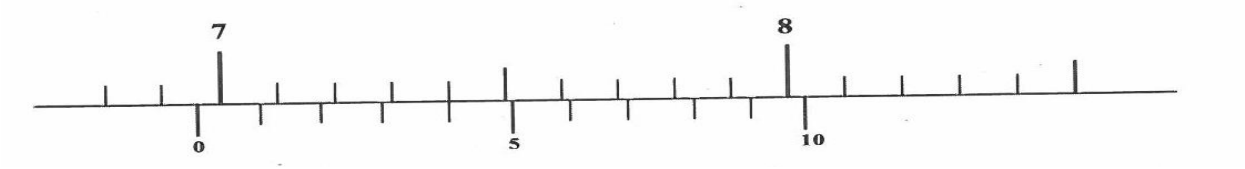
Question Two

- A metre rule.
- 10cm long cotton thread.
- Two masses of 10g.
- Two masses of 20g.
- Knife edge, 20cm high.
- A candle.
- A lens holder.
- A white screen.
- Converging len of focal length 15cm.

KIGUMO CLUSTER
232/1
PHYSICS PAPER 1
TIME: 2 HOURS

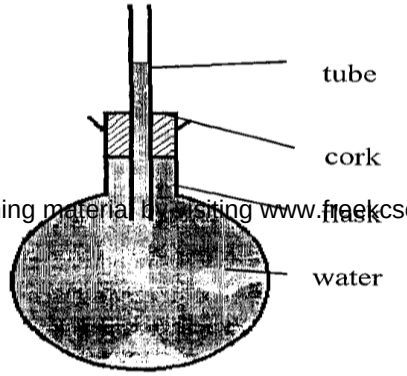
SECTION A: (25 MARKS) ***Answer all questions in this section in the spaces provided***

1. Figure below shows a scale of vernier calipers when measuring the width of a meter rule.



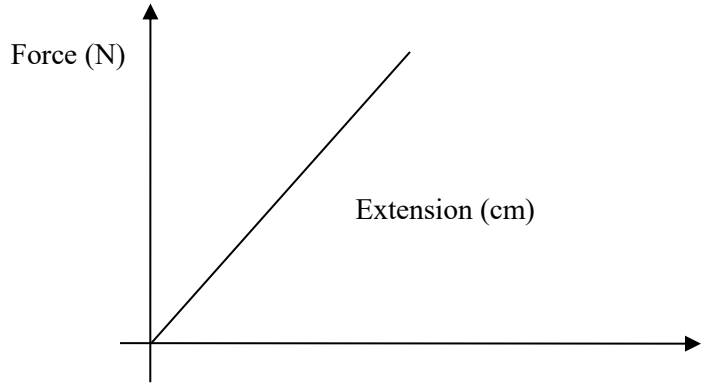
What is the actual width of the meter rule if the calipers has a zero error of + 0.6mm.? (2mks)

2. Water is known to boil at 100°C. A student heated some water and noticed that it boiled at 101°C. State two possible reasons for this observation (2mks)
3. The Figure below shows a flask filled with water. The flask is fitted with a cork through which a tube is inserted. When the flask is cooled, the water level rises slightly, and then falls steadily.



Explain the observation (3mks)

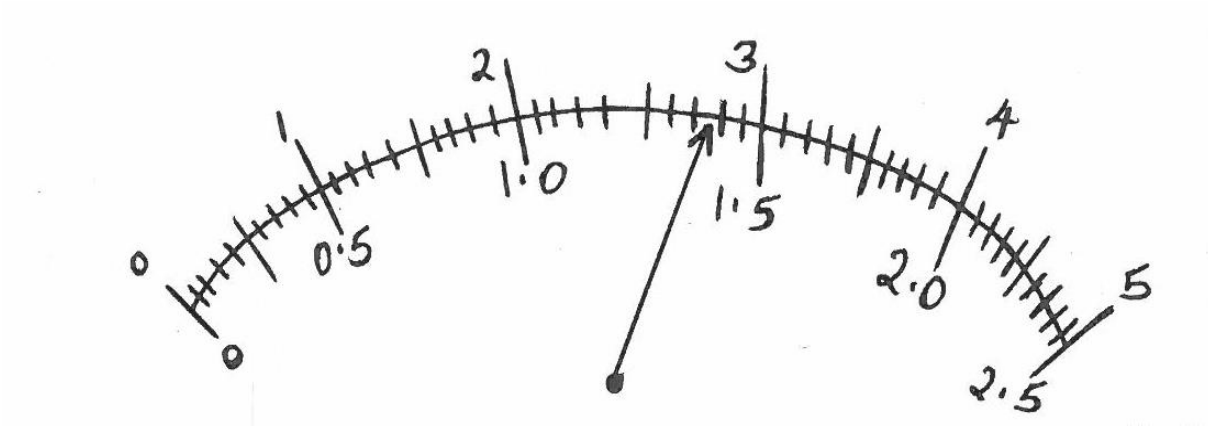
4. A pipe of radius 4mm is connected to another pipe of radius 6mm. if water flows in the wider pipe at the speed of 5 ms^{-1}, what is the speed in the narrower pipe? (3mks)
5. Find the total pressure experienced by a diver 8 meters below the sea surface. (3mks)
   Take; *Atmospheric pressure = 103360N*
   Density of sea water = 1030 kg/m^3
6. The following is a graph of force against extension for a spring



On the same axes, sketch a graph of force against extension for a spring double the length, same thickness, same material as the spring above (1mk)

7. Explain the cause of random motion of particles as observed in Brownian motion in a smoke cell experiment. (1mk)

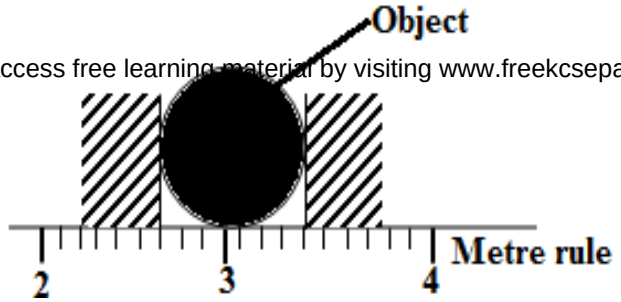
8. Figure below shows an ammeter used to measure current through the conductor .The student used the lower scale.



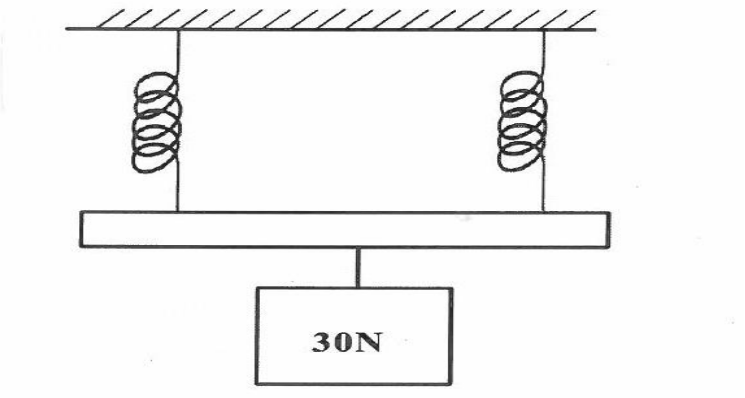
State the reading from the meter (1mk)

9. Convert -200°C into Kelvins (1mk)

10. Figure shows an object held between two straight edges. Determine the radius of the object using the meter rule shown in figure below. (2 marks)



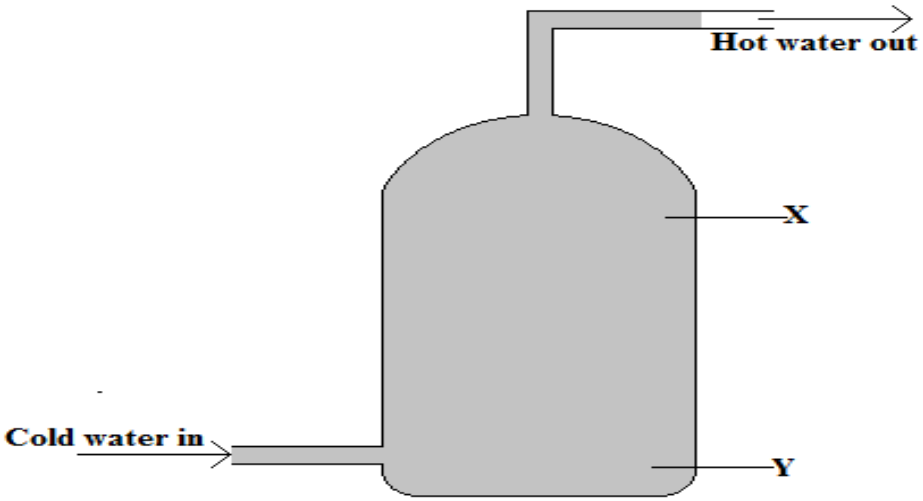
11. Figure below shows two identical springs constant 3N/cm supporting a load of 30N.



Determine the extension of each spring (3mks)

12. Convectional and diffusion both involve motion of fluid molecules. Distinguish between the two (2mks)

13. The figure shows a water tank that is used to heat water and supply through taps.



State with a reason whether the appropriate position for a heater is X or Y (2 marks)

SECTION B (55 MKS) ***Answer all questions in this section in the spaces provided***

14.

a) A mixture consists of 80cm^3 of water and 120cm^3 of liquid X. If the density of water and liquid X are 1.0g/cm^3 and 0.8g/cm^3 respectively. Calculate the density of the mixture (3 mks)

b) Why is mercury more suitable for use in a simple barometer than water? (2 mks)

c) State one factor that would increase the surface tension of pure water in a beaker of water. (1mks)

15.

a) Distinguish between solid and liquid states of matter in terms of intermolecular force (1mk)

b) In an experiment to estimate the diameter of an oil molecule, an oil drop of diameter 0.05 spreads 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 the oil (2mks)

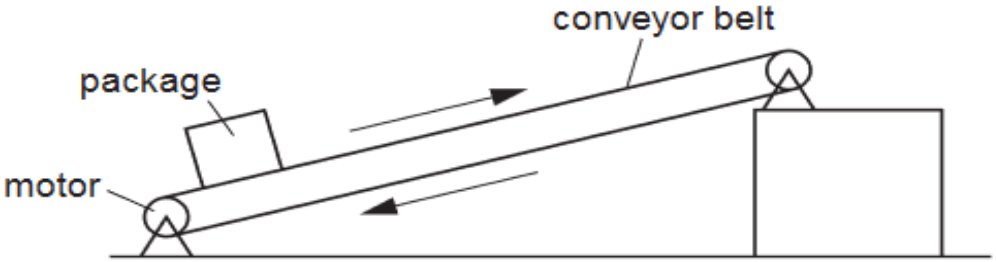
(iii) The diameter of the oil molecule (2mks)

c) State

(i) Any assumption made in (b) (iii) above (1mk)

(ii) Two possible sources of errors in this experiment (2mks)

16. The figure shows a conveyor belt transporting a package to a raised platform. The belt is driven by a motor.



The mass of the package is 36 kg. Determine:

a) The increase in the gravitational potential energy (G.P.E.) of the package when it is raised through a vertical height of 2.4 m. (2 marks)

b) The power needed to raise the package through the vertical height of 2.4 m in 4 s (2 marks)

c) The electrical power supplied to the motor is much greater than the answer to (b). Explain how the principle of conservation of energy applies to this system. (2 marks)

d) Assume that the power available to raise packages is constant. A package of mass greater than 36 kg is raised through the same height. Suggest and explain the effect of this increase in mass on the operation of the conveyer belt. (2 marks)

17.

a) Explain why a hammer of mass 3kg strikes a nail when moving at 40m/s making the nail sink into wood yet when the same hammer is placed on the nail head, it cannot sink in the wood (1mk)

b) A trolley of mass 20kg moving at 0.6m/s on a frictionless horizontal surface was acted upon by a force of 2.5 N. The resultant velocity of the body was 4.8 m/s. Determine

i) The change in momentum of the trolley (2mks)

ii) The time interval and the force acted on the body (2mks)

iii) The acceleration of the trolley (3mks)

c) A gun of mass 3kg fires a bullet of mass 20g at 600m/s. Calculate the recoil velocity of the gun (3mks)

18.

a) State the two conditions necessary for a system of forces acting on a body to be in equilibrium. (2 marks)

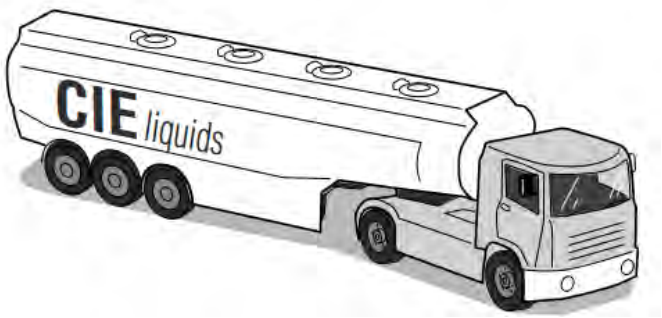
b) The figure shows a loaded wheelbarrow held in equilibrium by a gardener. The wheel of the wheelbarrow is in contact with the ground at point **C**

There are three vertical forces acting on the wheelbarrow **P** is the upward force applied by the gardener. **Q** is the upward force of the ground on the wheel at point **C**.**W** is the weight of the wheelbarrow and its contents. Explain why the force **P** is less than the force **W**

i) By considering the forces **P**, **Q** and **W**, (2 marks)

ii) By considering the moments of the forces **P** and **W** about point **C**. (2 marks)

c) The figure shows a tanker lorry full of liquid. Study the diagram and answer the questions that follow



i) The tanker delivers the liquid and drives away empty. Compare the acceleration of the empty tanker with the acceleration of the full tanker for the same resultant force (2 marks)

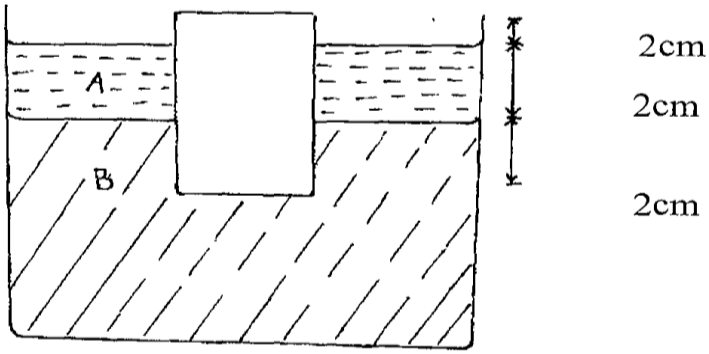
ii) Given that empty tanker has a weight of 50 000 N. The forward force is 6000 N and the total resistive force is 2000N. Determine the acceleration of the tanker (3 marks)

19.

a) (i) State the law of floatation (1mk)

(ii) Explain why a hollow metal sphere floats on water while a solid metal sphere of the same material sinks in water. (2mks)

b) The figure below shows a uniform block of uniform cross-sectional area of 6.0cm^2 floating on two liquids A and B. The lengths of the block in each liquid are shown.



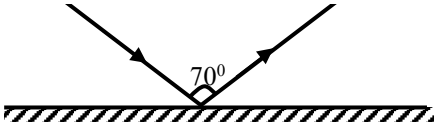
Given that the density of liquid A is 800kg/m^3 and that of liquid B is 1000kgm^{-3}, determine the:

(i) Weight of liquid A displaced (2mks)
(ii) Weight of liquid B displaced (2mks)
(iii) Density of block (3mks)

KIGUMO CLUSTER
FORM 4 TERM 2 2021 EXAM
232/2
PHYSICS PAPER 2

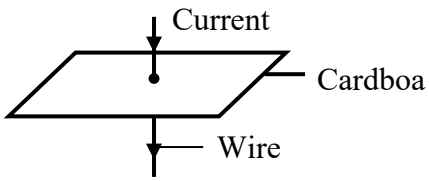
SECTION A – 25 MARKS

1. Figure 1 shows a ray of light incident on a plane mirror.
Figure 1



The plane mirror is then rotated clockwise through an angle of 20^0 keeping the incident ray fixed. Determine the new angle of reflection. (2 Marks)

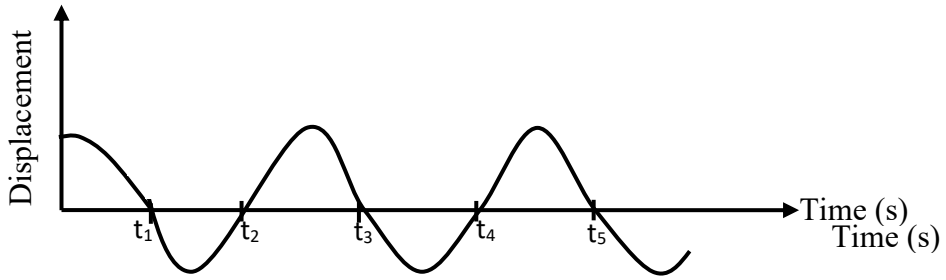
2. A dry cell is not recharged once used up. However when used well, it can serve one for some time. State the precautions necessary when using it other than storing it in dry condition. (2 Marks)
3. A charged rod A is used to charge another rod B by contact. When rod B is brought close to a charged acetate rod, repulsion occurs. State the type of charge on rod A. (1 Mk)
4. A nail is electrically magnetised, it attracts an increasing number of pins as the magnetising current increase. After some time it can no longer attract any more pins. Explain this observation domain theory. (2 Marks)
5. Figure 2 below shows a current carrying vertically right wire at right angle to a cardboard. Iron fillings are sprinkled on the card and card slightly tapped.



Draw and indicate the direction of the magnetic field pattern displayed on the card. (2 Marks)

6. Figure 3 below shows a wave profile for a wave whose frequency is 2.5HZ

Figure 3



Determine the value of t_3 (2marks)

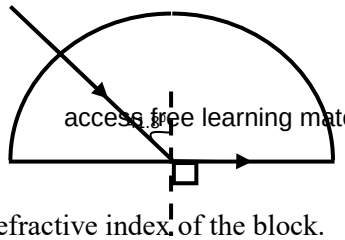
7. An electric kettle has an element of resistance 28.8Ω. It is operating from a 240V main supply. Determine its power rating. (3 Marks)
8. Distinguish between intrinsic and extrinsic semi-conductor. (1 Mark)
9. The following is part of a radioactive series.

$$^{238}_{92}u \xrightarrow{(i)} {}^{234}_{90}Th \xrightarrow{(ii)} {}^{234}_{91}Pa$$

Identify the radioactive particles emitted in stages (i) and (ii) (2 Marks)

10. Figure 4 shows light passing through a transparent block.

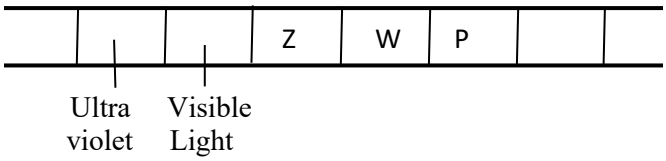
Figure 4



Determine the refractive index of the block. (3 Marks)

11. Figure 5 shows part of the electromagnetic spectrum.

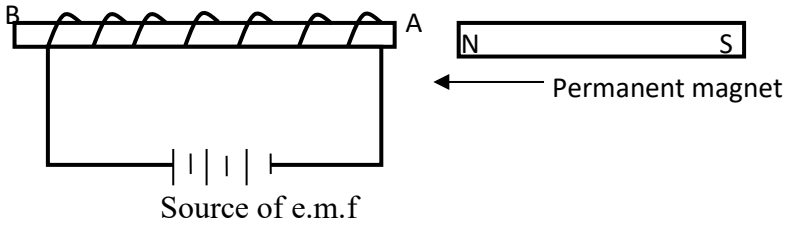
Figure 5



Identify radiation W and state one of its uses. (2marks)

12. Figure 6 shows a permanent magnet placed near a solenoid connected to a source of e.m.f.

Figure 6



(a) State and explain what is observed when the North – pole of the permanent magnet is brought to end A. (2marks)

(b) State the law applied (1mark)

SECTION B – 55 MARKS

Answer ALL questions in the spaces provided after each section of the question

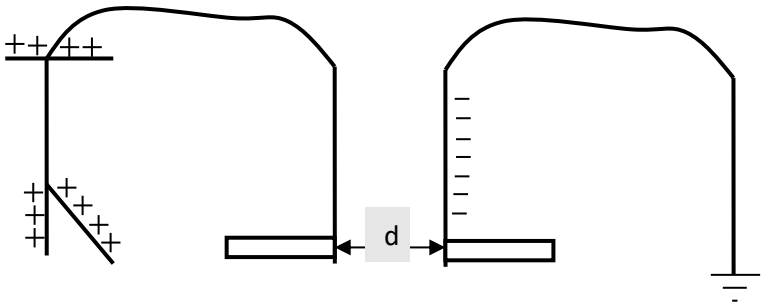
13. (a) A strong positive charged rod is brought close to the cap of a charged electroscope from a high Position. It is observed

(i) State the charge on the electroscope (1 Mark)

(ii) Explain this observation (2 Marks)

(b) A parallel – plate capacitor is connected to an electroscope as shown in Fig. 7 below.

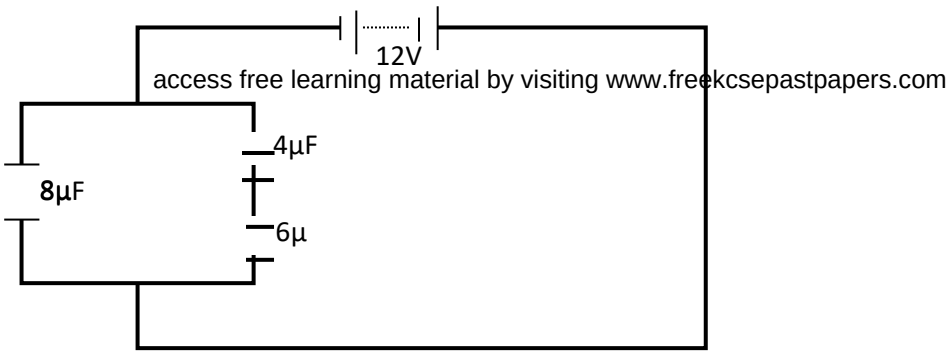
Figure 7



State and explain the behaviour of the leaf when the distance (d) between the plates is increased (2 Marks)

(c) Figure 8 shows an arrangement of capacitors to a 12V d.c. supply.

Figure 8



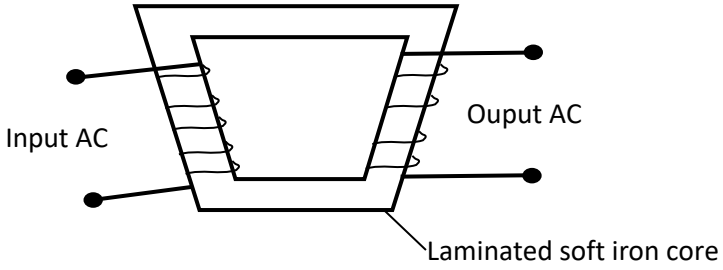
Determine

(i) Effective capacitance (3 Marks)

(ii) Charge across the 8μF capacitor. (3 Marks)

14. (i) The figure 9 below shows a step-up transformer commonly used at a power station.

Figure 9



(i) What is meant by a step-up transformer? (1 Mark)

(ii) Why does a transformer work with AC only? (1 Mark)

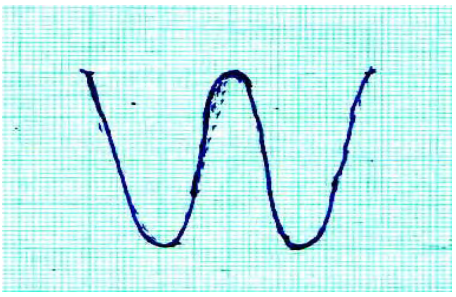
(iii) What is the purpose of the soft iron core? (1 Mark)

(iv) State four ways in which power is lost in a transformer (1 Mark)

(v) Why is the e.m.f. produced at a power station stepped up to high voltage for long distance transmission (2 Marks)

15. (a) Figure 10 shows the trace on the screen of a.c. signal connected to the Y-plates of a C.R.O with the time – base on.

Figure 10



Given that the time base control is 10ms/cm and the Y-gain is at 120V/cm determine

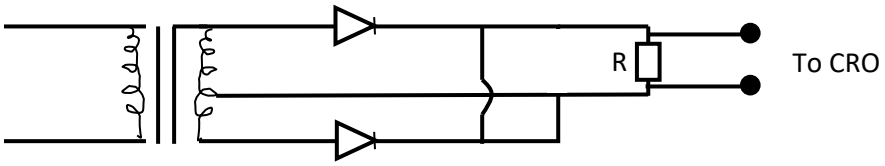
(i) The frequency of the a.c. signal (3 Marks)

(ii) The peak voltage of the input signal (3 Marks)

(iii) State what would be observed on the screen if the time base is switched off (1 Mark)

(b) Figure 11 shows a circuit whose output voltage with time as displayed on the CRO screen. (2 Marks)

Figure 11



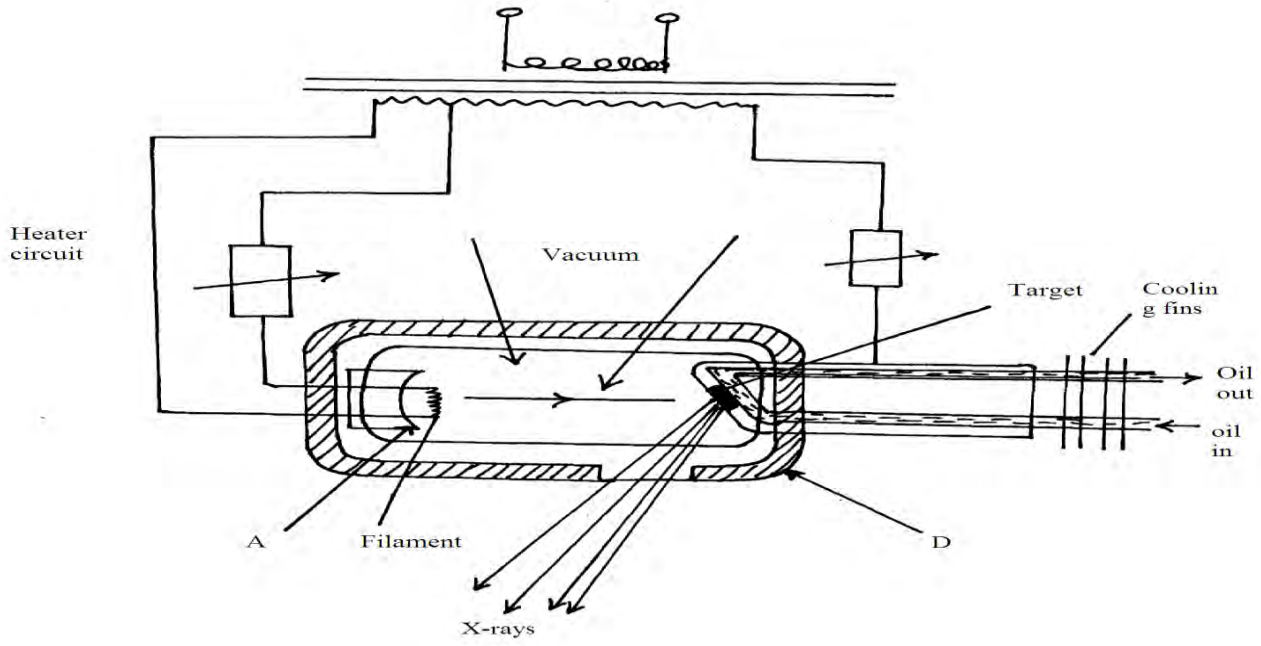
(i) Sketch a graph to show the variation of output voltage with time as displayed on the CRO screen. (2 Marks)

(ii) Show on the diagram (Figure 11) how a capacitor should be connected to smooth the output voltage (1 Mark)

(iii) Sketch a curve of smoothed output voltage against time. (2 Marks)

16. a) X-rays are used for detecting cracks inside metal beams: State the type of X-rays used. (1mark)

b) The figure 12 below shows the feature of an X-ray tube. **Figure 12**



i) Name the parts labelled A,B,C,D. (2marks)

ii) Explain how X-rays are produced in the tube. (3marks)

iii) During the operation of the tube, the target becomes very hot explain. (2marks)

iv) Name one feature of the X-ray tube which makes it possible for heat to be conducted away safely without causing overheating. (1mark)

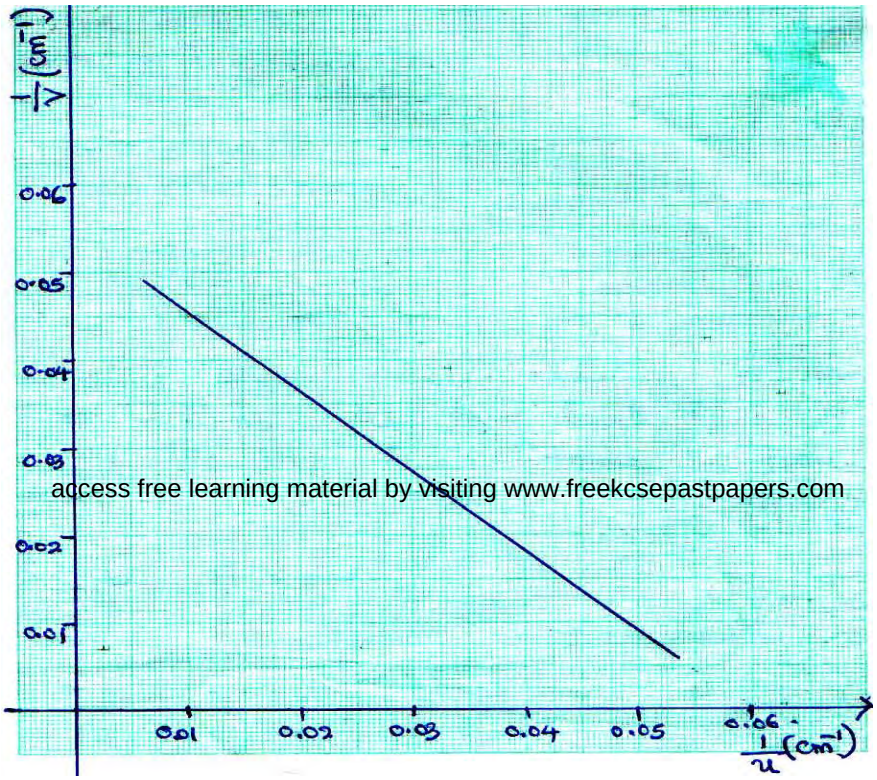
v) Explain the use of X-ray in textile industries. (3marks)

vi) The frequency of X-rays ranges from $3.0x10^{16}$Hz to $3.0x10^{19}$Hz. determine the range of wavelength . (take C =$3.0x10^{8}$m/s) (3marks)

17. (a) With the aid of a labelled diagram, explain how the focal length of a convex lens may be estimated by focusing a distant object. (3marks)

(b) The graph below shows values obtained in an experiment to determine the focal length of a convex lens. Use the graph to determine the focal-length of the lens. (4 marks)

GRAPH OF $\frac{I}{u}$ AGAINST $\frac{I}{V}$



(c) An object is placed 30cm infront of a converging lens of focal length 20cm.

(i) By calculation determine the position of the image. (2 Marks)

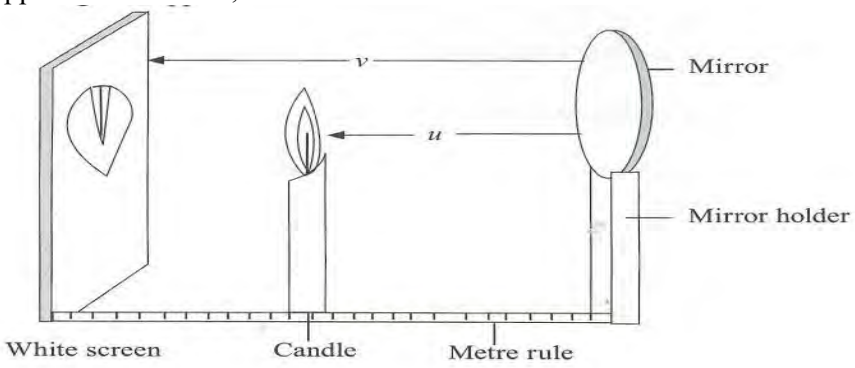
(ii) State the nature of the image (1 Mark)

KIGUMO CLUSTER
232/3
PHYSICS
PAPER 3 PRACTICAL

1. a) You are provided with the following apparatus;
   - Concave mirror
   - Lit candle
   - Metre rule
   - Screen

   Procedure

   a) Arrange the apparatus as follows;



   b) Place the candle at distance u = 20cm from the mirror. Move the screen towards or away from the mirror until a sharp image of the flame is formed on the screen.
   c) Measure the distance between the screen and the mirror .
   d) Record the values as V in the table below; (5 marks)

U(cm)	25	30	35	40	45	50	55
V(cm)							
$\frac{1}{u}$ (cm^{-1})							
$\frac{1}{v}$ (cm^{-1})							

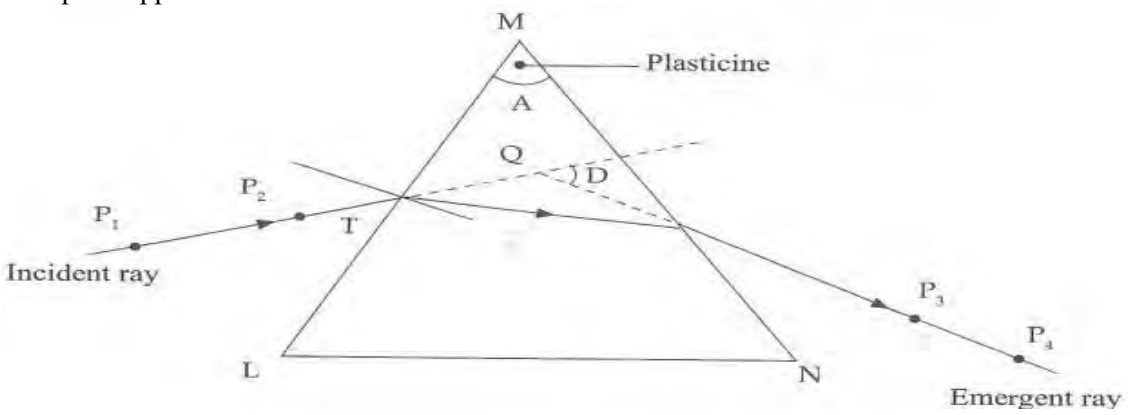
e) (i) Plot the graph of $\frac{1}{v}$ (vertical axis) against $\frac{1}{u}$ (5 marks)

(ii) The graph is related by the equation $\frac{1}{u} = -\frac{1}{v} + \frac{1}{f}$

Use your graph to determine the focal length of the mirror, f. (3 marks)

1. b) You are provided with the following apparatus:
   - prism ($60° - 60° - 60°$)
   - 4 optical pins
   - Plain paper
   - Protractor
   - Some plasticine

i. Set up the apparatus as shown below:



ii. Measure the angle A of the prism using a protractor. (1 mark)
A = _____

iii. Place the prism on a plain paper and trace its outline with a pencil.
Attach some plasticine to the prism to indicate the refracting angle, A.
Construct a normal at point T along LM. Draw an incident ray to strike the prism at T at 60°.
Replace the prism and press pins P_1 and P_2 to define the incidence ray. View the pins P_1 and P_2 from the opposite face (MN). Insert pins P_3 and P_4 so that they appear to be in line with the images of P_1 and P_2.
Remove the prism and join P_3 and P_4 to give emergent ray.
Extrapolate the emergent ray into the prism so as to meet the extrapolated incident ray at Q.

iv. a) Measure angle D. (1 mark)
b) Calculate the value of n; from the expression. (3 marks)

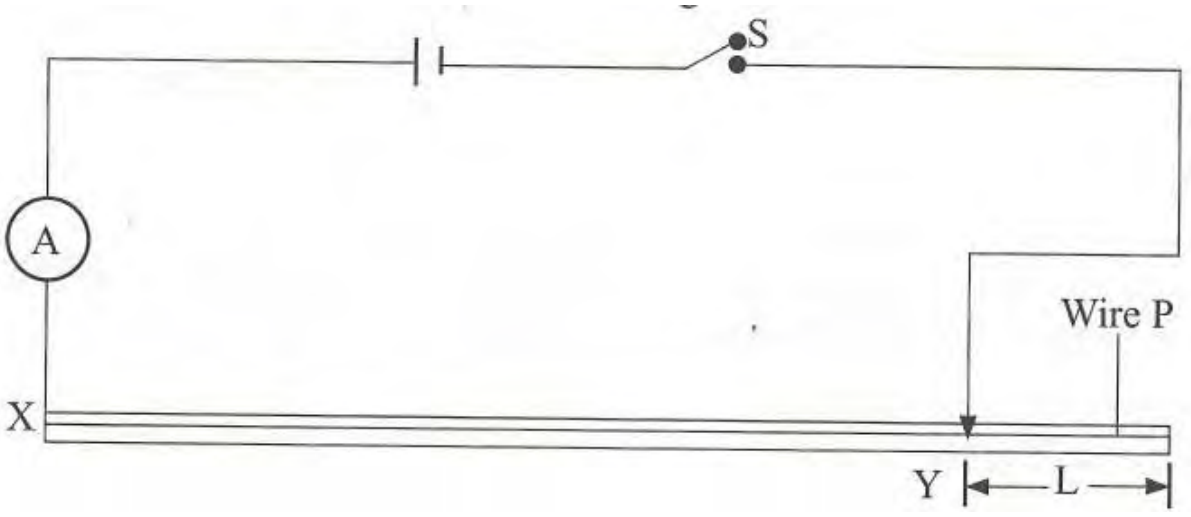
$$n = \frac{\cos\left\{90° - \left(\frac{A+D}{2}\right)\right\}}{\sin\frac{A}{2}}$$

c) What is the significance of 'n'? (1 mark)

2. (a) You are provided with the following:
- An ammeter
- A wire P mounted on a millimeter
- One cell (1.5 v)
- Four connecting wires (two with clips at the end)
- Switch
- Micrometer screw gauge.

Procedure

i) Set up the apparatus as shown in the figure below



ii) Adjust the length L of the wire to 20 cm by placing the crocodile clip at Y. Record the ammeter reading.

iii) Repeat the procedure above for other values of length L given in the table below and record the corresponding ammeter readings.

Length, L (cm)	20	30	40	50	60	70
Length (100 – L) cm						
Current, I (A)						
$\frac{1}{I}$ (A^{-1})						

iv) Complete the table above. (5 marks)

v) Plot the graph of Length (100 – L) (vertical axis) against $\frac{1}{I}$ (5 marks)

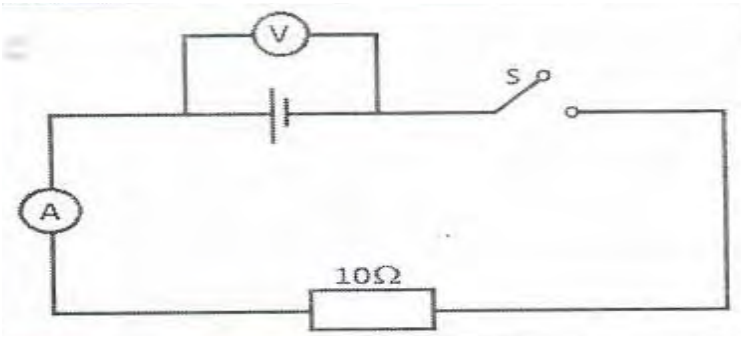
vi) Determine the slope of the graph. (3 marks)

vii) Measure the diameter of the mounted wire using the micrometer screw gauge.
Record the diameter, d.
d = _____ mm (1 mark)

iv) Given the relation $K = \frac{SE\,\pi d^2}{4}$ where S is the slope of the graph and E = 1.5 v, determine the value of K. (2 marks)

2. (b) You are provided with the following apparatus:
- A voltmeter (0 – 3 or 0 – 5V)
- An ammeter(0 – 1 A)
- 10 Ω resistor (fixed)
- A switch
- One dry cell and a cell holder
- Six connecting wires.

i) Connect the above apparatus as shown in the circuit diagram below with the switch S open.



ii) With the switch S open, record E the voltmeter reading.
E = _____ (I mark)

iii) Close the switch and record V, the voltmeter reading and I, the ammeter reading.
V = _____ (1 mark)
I = _____ (1 mark)

iv) Given that : E – V = Ir . Find r for the dry cell. (2 marks)

KIGUMO CLUSTER
232/3
PHYSICS PAPER 3
PRACTICAL

CONFIDENTIAL

Question One

- Two dry cells of 1.5V each.
- Nichrome wire labeled W mounted on a metre rule.
- An ammeter (0-1.5A) or (0-2.5A)
- A cell holder.
- Voltmeter.
- 8 connecting wires atleast 4 wash crocodile clips (or a Jockey)
- A switch.
- A metre rule.

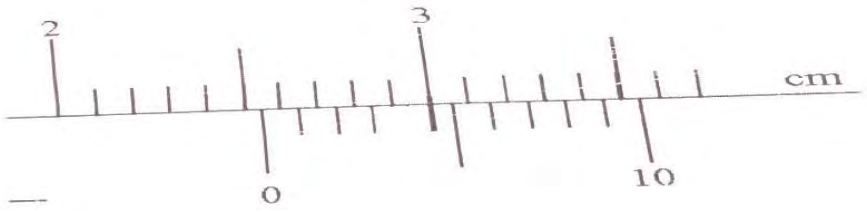
Question Two

- A metre rule.
- 10cm long cotton thread.
- Two masses of 10g.
- Two masses of 20g.
- Knife edge, 20cm high.
- A candle.
- A lens holder.
- A white screen.
- Converging len of focal length 15cm.

LANG'ATA / KIBRA CLUSTER
231/1 PHYSICS
PAPER 1 (THEORY)
DECEMBER 2021

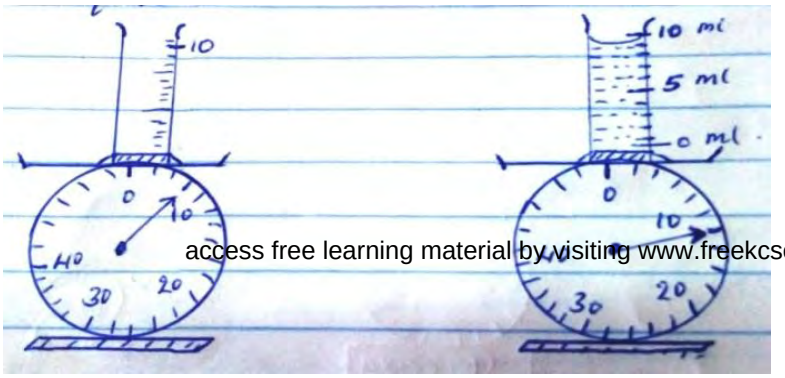
SECTION A – 25 MARKS (ANSWER ALL THE QUESTIONS)

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

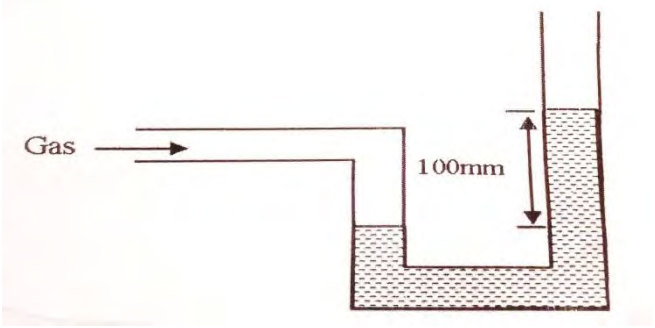


State the actual reading of the measuring instrument (2 marks)

2. Fig.1(a) and (b) shows a set – up to determine the density of a liquid. The balance is calibrated in grams. Determine the density of the liquid. (3mks)



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

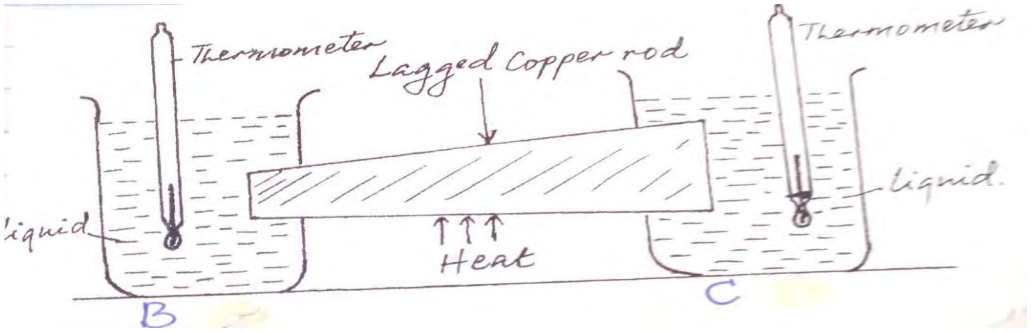


If a mercury barometer reads 760mm, calculate the pressure of gas (give your answer in N/m^2).
(Density water = 1 g/cm^3, density of mercury = 13.6 g/cm^3 (3 marks)

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)

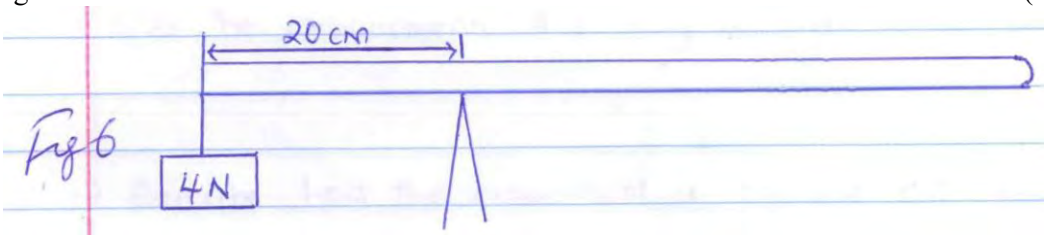
5. A measuring cylinder contains $20cm^3$ of water. $10cm^3$ of salt is added and stirred. Explain why the new volume is not $30cm^3$ (2 marks)

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.



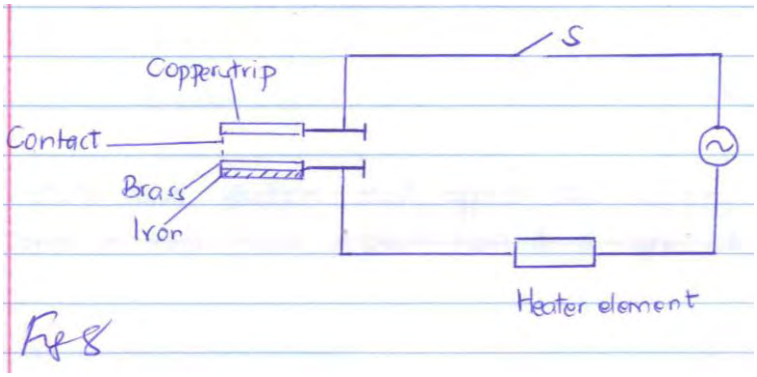
If the rod is heated at the middle, state and explain which of thermometers records a higher temperature (2 marks)

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 travel 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)

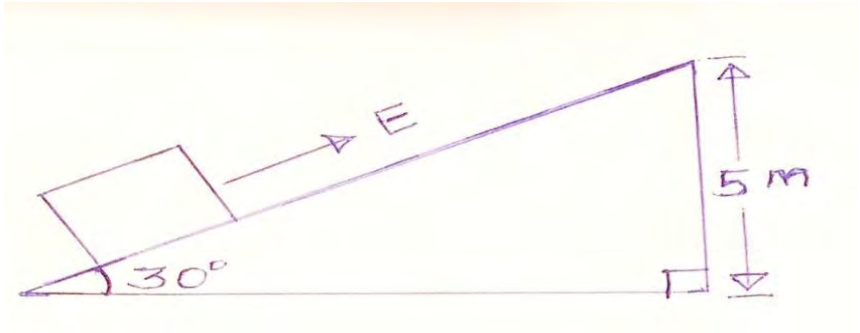
ii) Describe how the circuit controls the temperature when the switch S is closed (2mks)

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 30^0 to the horizontal (take g to be $10m/s^2$)

(i) Determine the velocity ratio of the inclined plane. (2 marks)

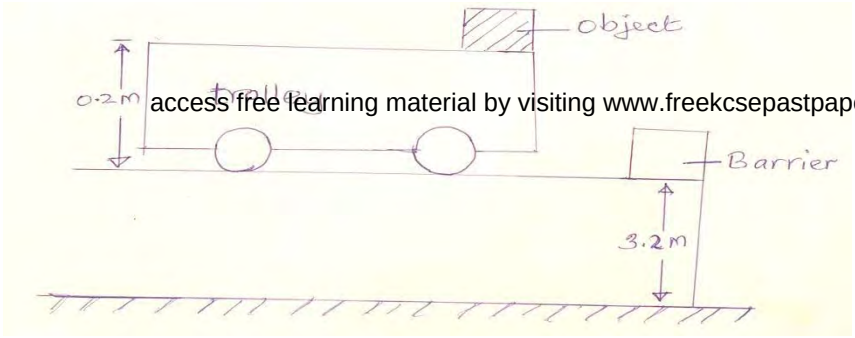


(ii) If the efficiency of the plane is 75% determine:

(I) The mechanical advantage (2 marks)

(II) The effort E, needed to pull the load up the plane. (2 marks)

(c) 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)

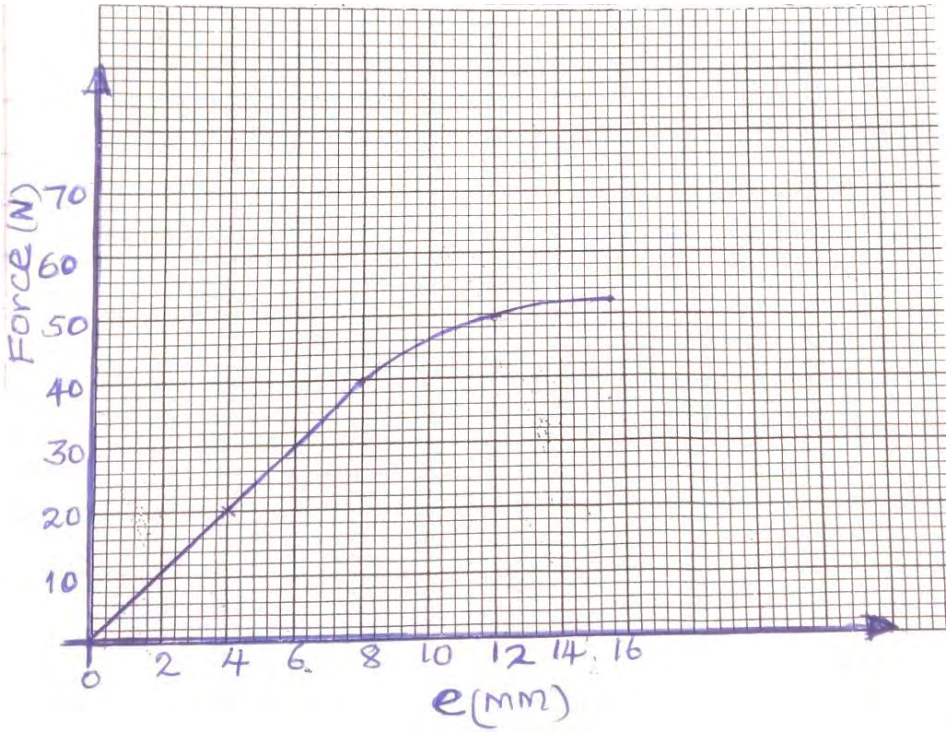
(ii) Determine the time taken by the object to land on the ground (2 marks)

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 (b)(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.

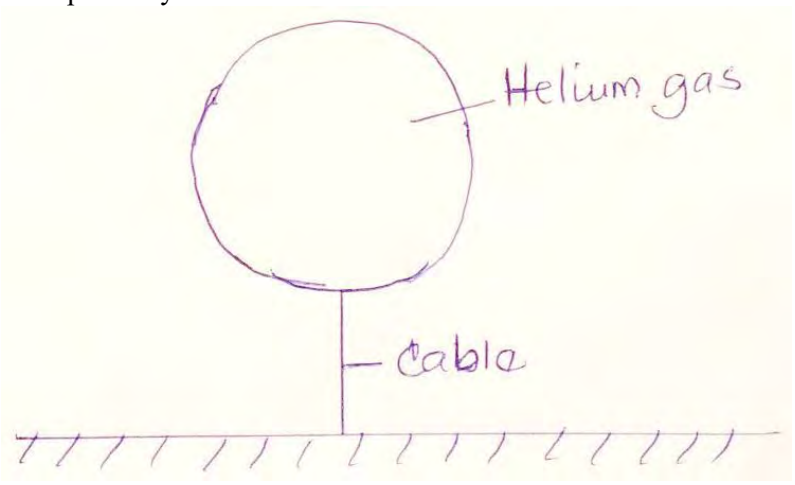


Determine the spring constant of the spring (3 marks)

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.

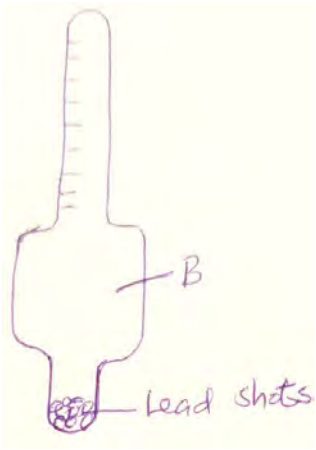


i) State 3 forces acting on the set up. (3 marks)

ii) Determine the tension in the cable (3 marks)

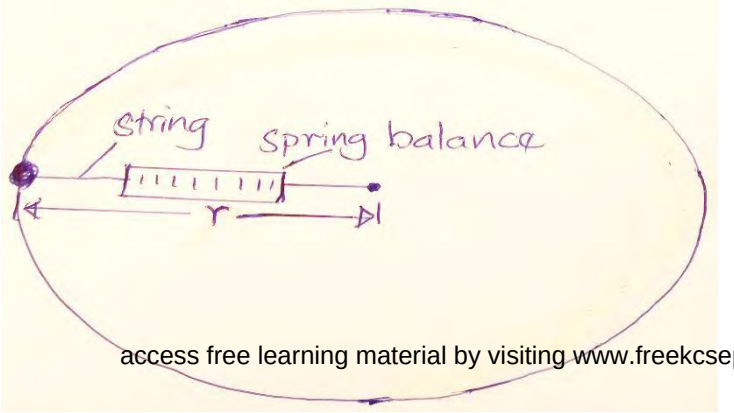
iii) Calculate the acceleration of the balloon if the cable is cut. (2 marks)

(d) The diagram below shows a hydrometer.



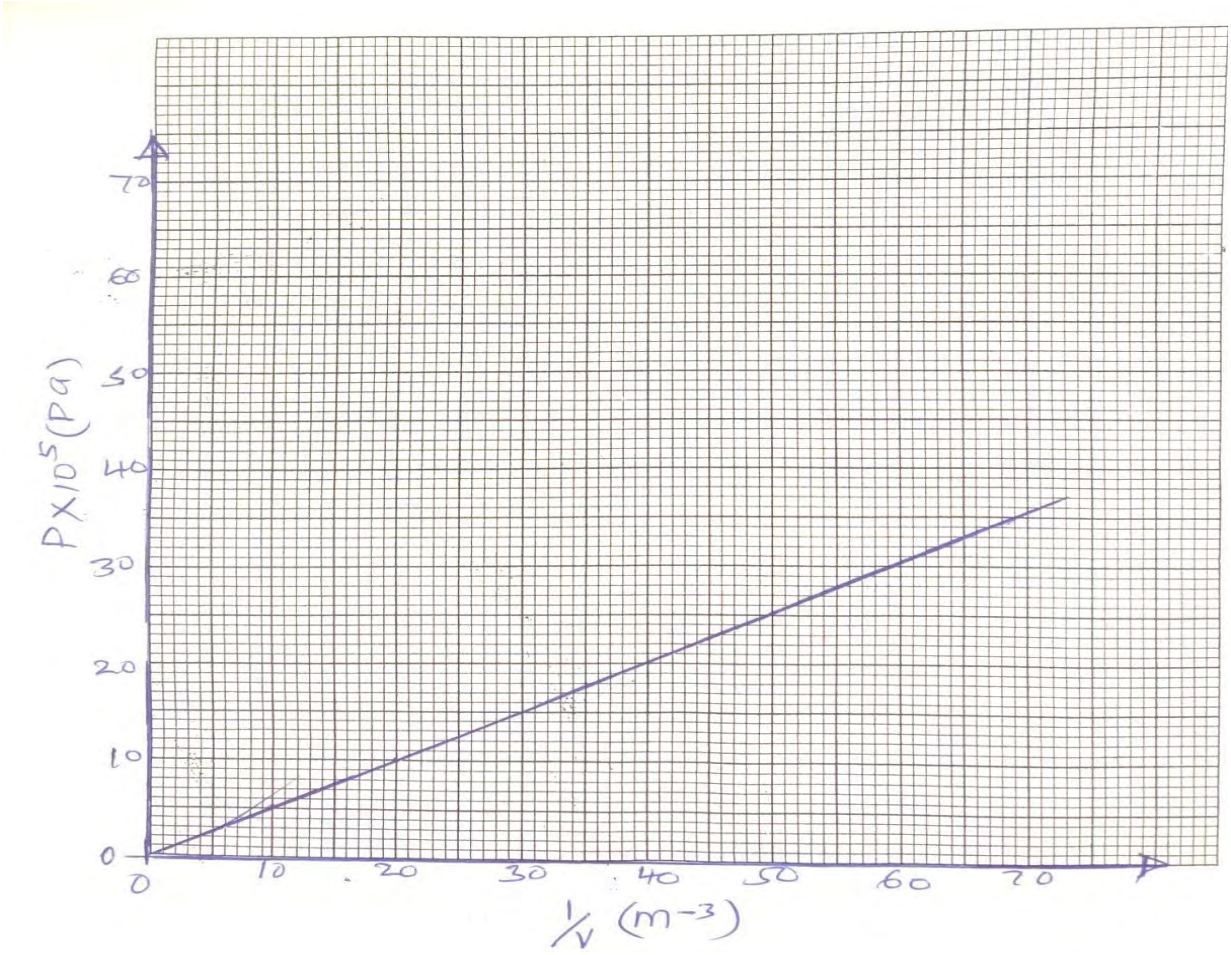
Why is the part marked B wider? (1 mark)

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 accelerating 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)

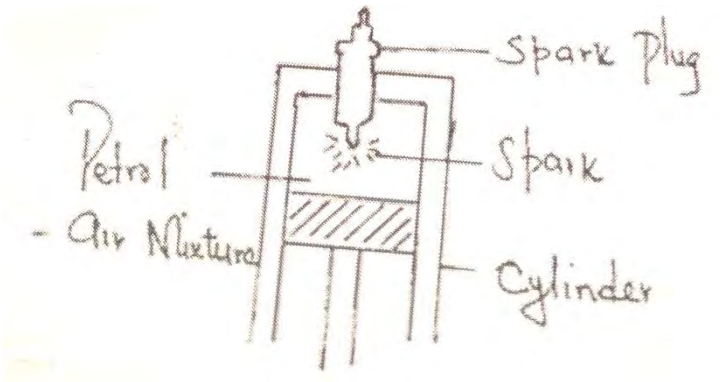
16. (a) State the pressure law for an ideal gas. (1 mark)
(b) The pressure P of a fixed mass of gas at constant temperature of T = 200k is varied continuously and the values of corresponding volume recorded. A graph of P against $\frac{1}{v}$ is shown on the graph below.



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)

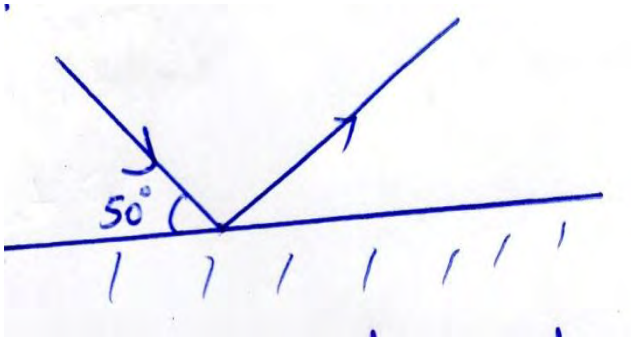
(ii) Quantity of heat gained by water. (3mks)

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

LANGA'TA / KIBRA CLUSTER
232/2
PHYSICS PAPER 2
2HOURS

SECTION A (25MARKS)

1. The figure below shows a ray of light incident on a plane mirror at point O



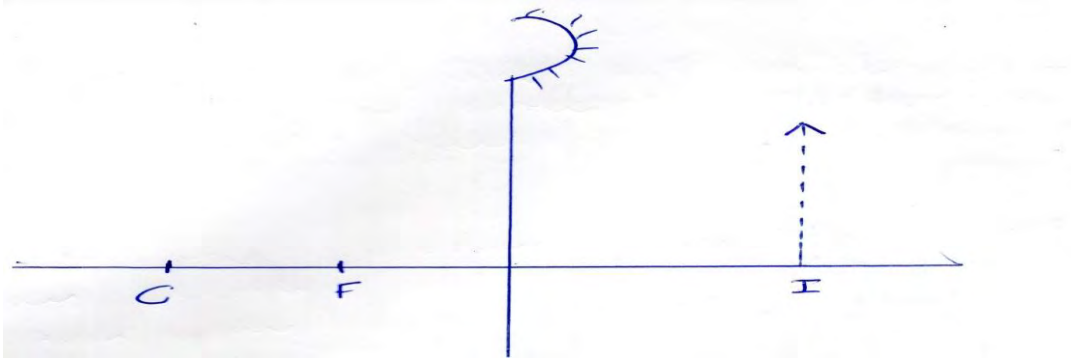
The mirror is rotated clockwise through an angle 30°C about an axis perpendicular to the paper. Determine the angle through which reflected ray is rotated (2mks)

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

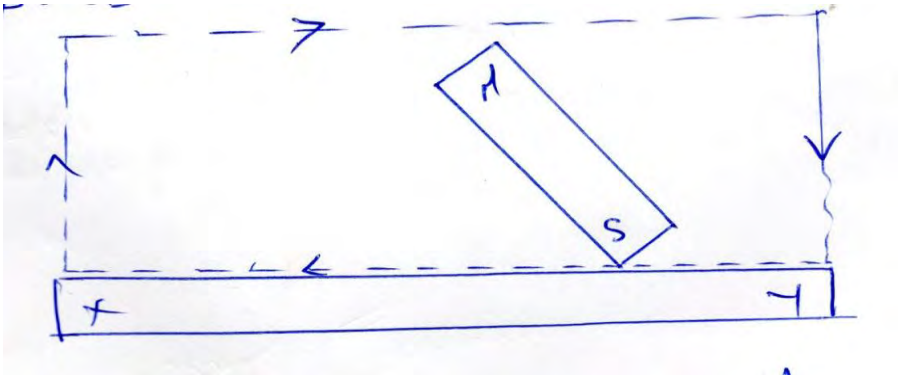
Radio wave	A	B	Visible light

a) Name radiation represented by A (lmk)
b) 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



a) state the method of magnetization (1mk)

c) Identify polarity X (lmk)

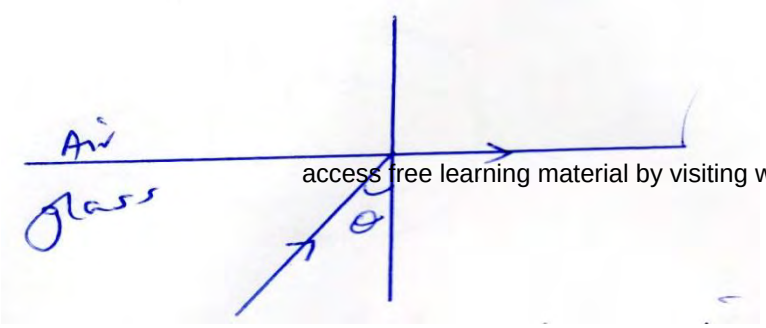
11. The initial mass of a radioactive substance is 50g. The substance has a half life of 5 years. Determine the mass remaining after 30 years (3mks)

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

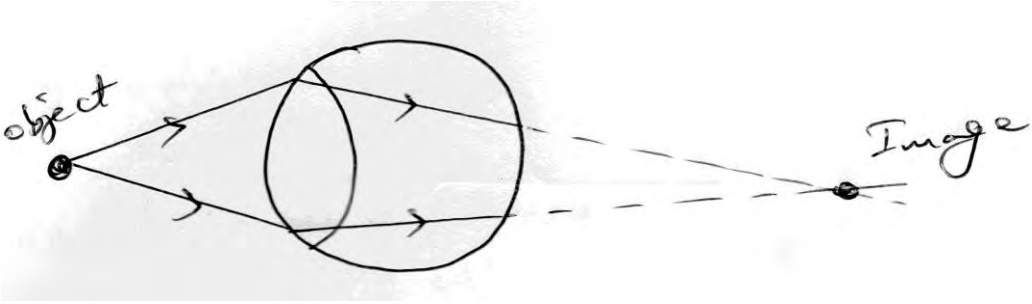
14(a) The figure below shows a ray of light incident on glass-air interface



Given that the refractive index of glass is 1.48. Determine the value of θ (3mks)

b) 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



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)

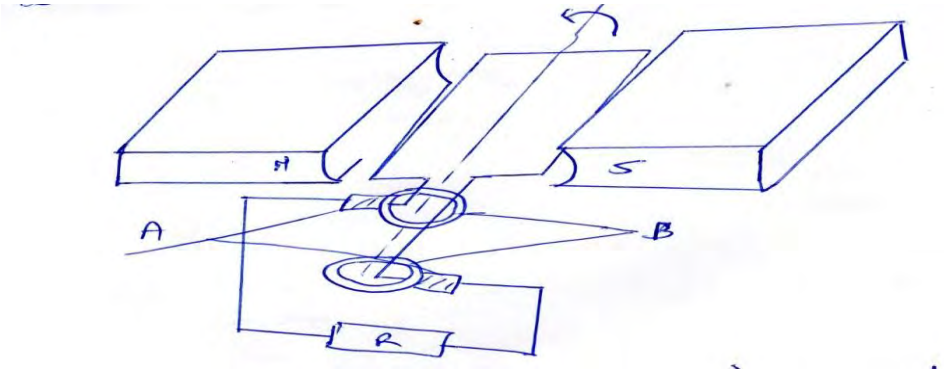
c) A transformer has 800 turns in the primary coil and 40 turns in the secondary windings, The alternating e.m.f connected in the primary coil is 24ov and the current is 0.5A.

Determine

(i) Secondary e.m.f (3mks)

(ii) Power in secondary coil if the transformer is 95% efficient (3mks)

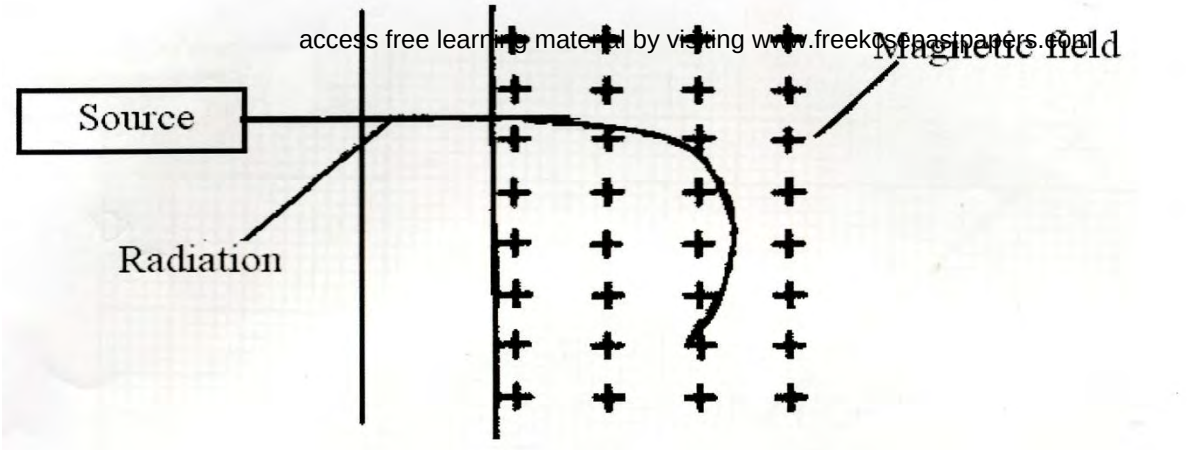
c) The figure below shows a simple generator. The coils are rotated in the anticlockwise direction as shown below.



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)

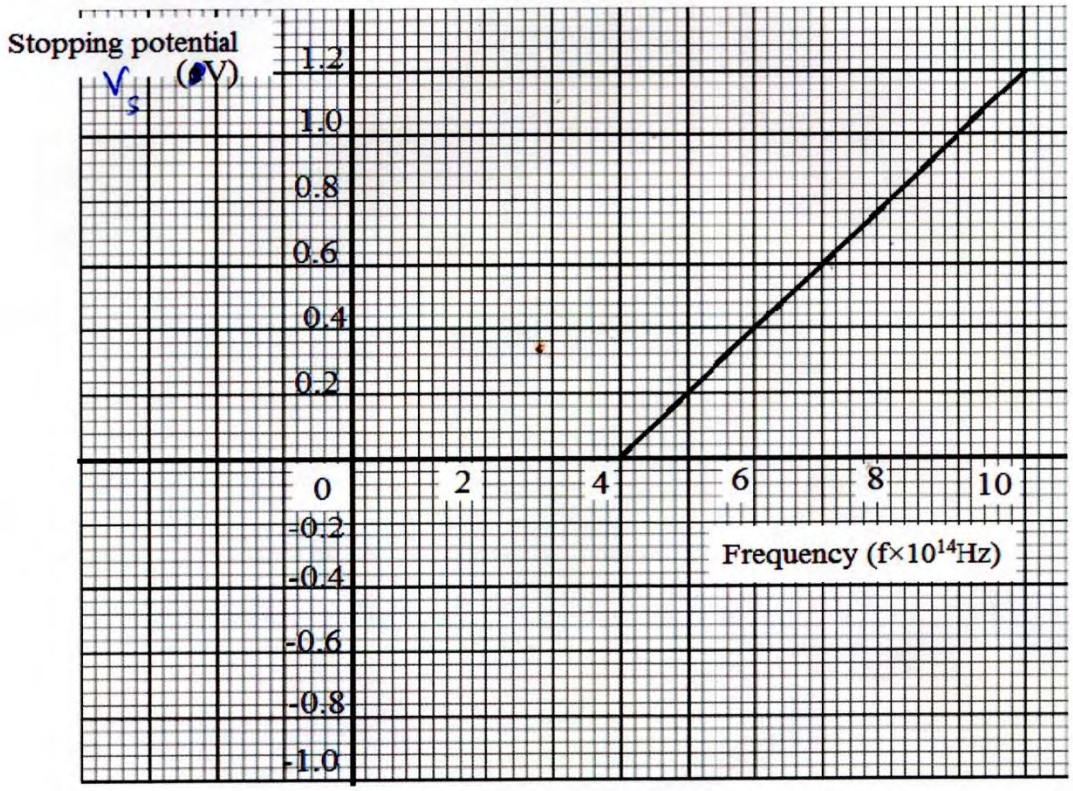
b) Below is a nuclear reaction

$$^{232}_{90}A \xrightarrow{K} {}^{228}_{88}B \xrightarrow{B} {}^{y}_{x}C$$

i) Identify radiation K (lmk)

ii) Determine the value of x and y. (2mks)

c) The results obtained for various mono-crhomatic radiations of different colours are as shown in the graph in figure below

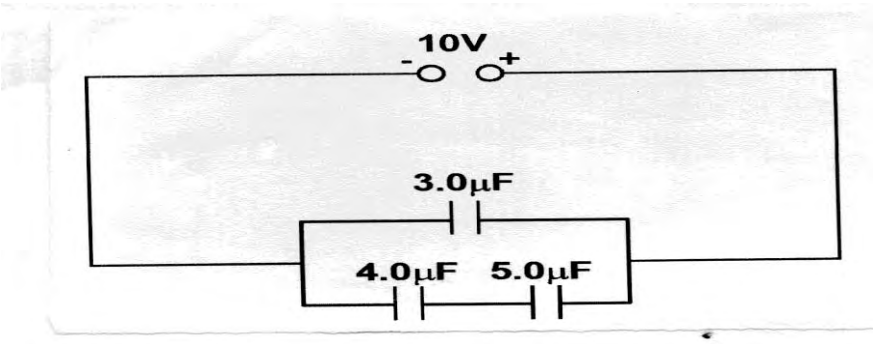


From the graph, determine

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 capacitor (3mks)

ii) The charge of the 5.0μf capacitor (3mks)

b) The figure below shows displacement time graph for a progressive wave

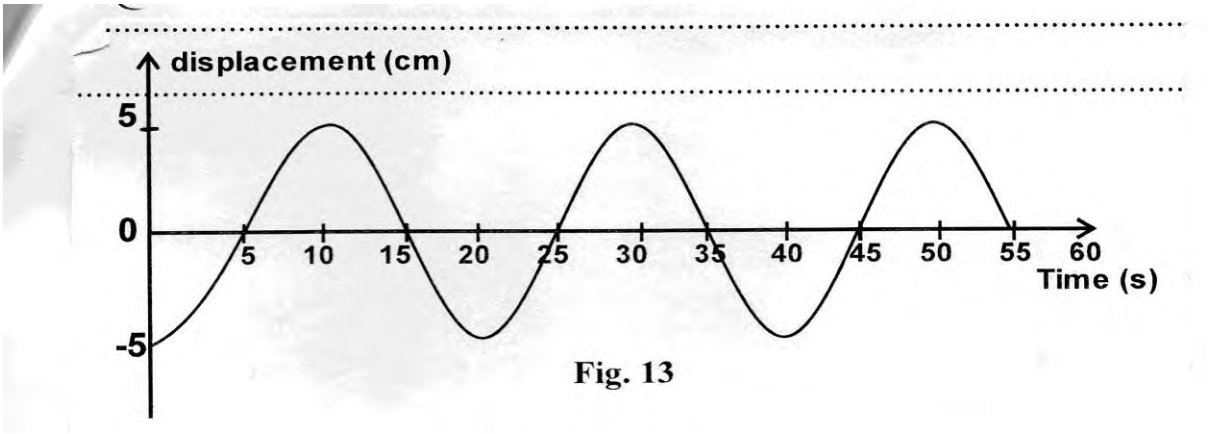
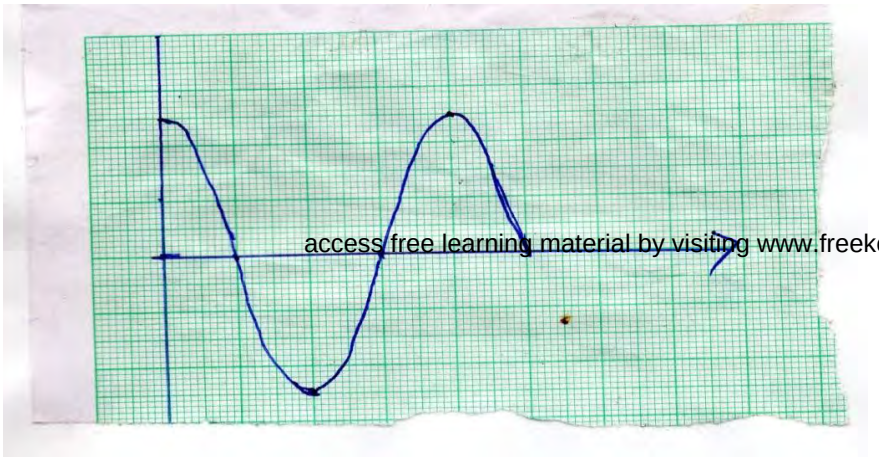


Fig. 13

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)
ii) State why lead is used for shielding x-ray tube (lmk)
iii) In a certain x-ray tube the electrons are accelerated bya 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)

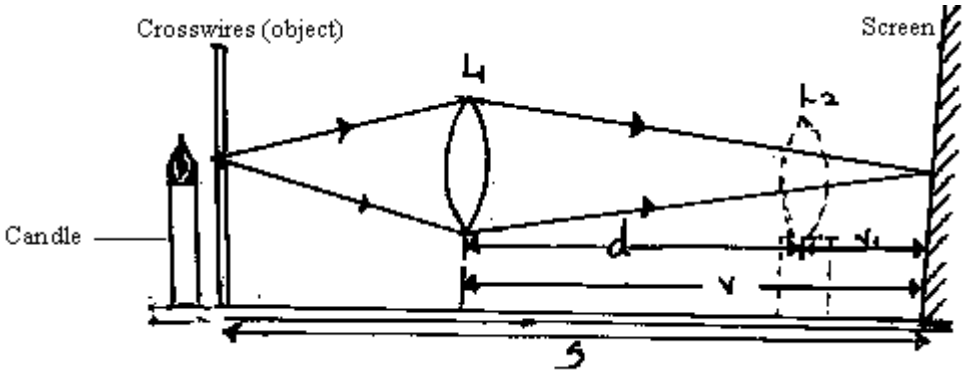
LANGA'TA / KIBRA CLUSTER
232/3
PHYSICS PRACTICAL
PAPER 3
DEC. 2021

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)

iiii) 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.

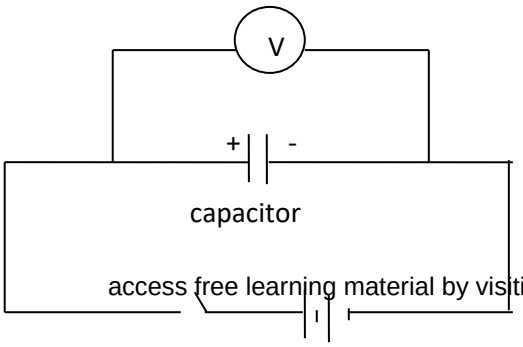
Part A

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

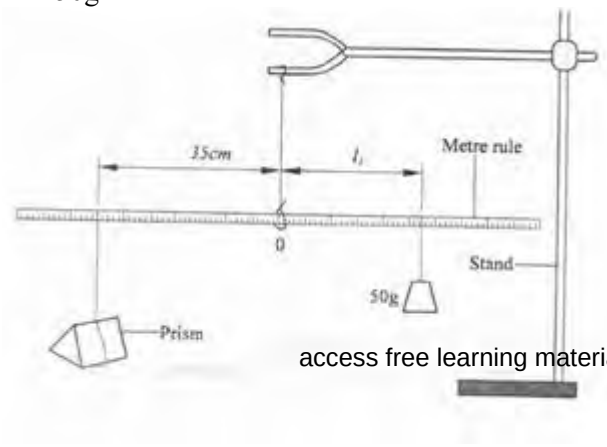
You are provided with the following;

- ✓ 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.

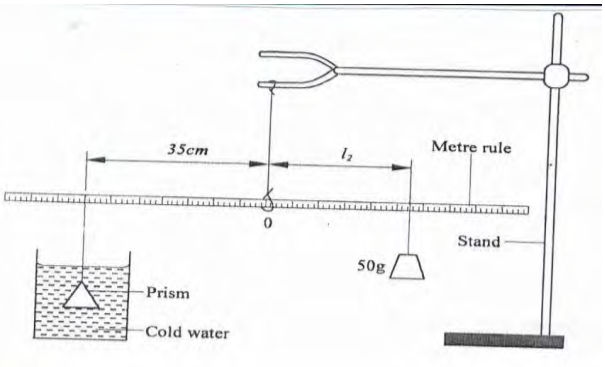


i) Determine the distance L_1, between O and the point of support of the 50g mass.

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. [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. [1 mark]

ii) Measure and record the temperature of the hot water. [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]

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

CONFIDENTIAL
LANGA'TA / KIBRA CLUSTER
232/3
Physics
Paper 3
(Practical)
Dec. 2021
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

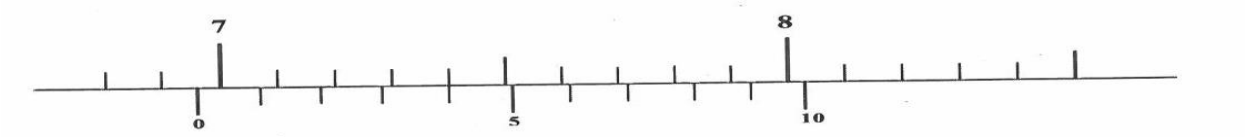
QUESTION TWO

- 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^o,60^o,60^o)
- 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 -10ºC to 110ºC
- A stopwatch
- A metre rule
- A stand, boss and clamp

CASPA AMUKURA PARISH
PHYSICS PAPER 1
232/1
SECTION A (25 MARKS)

Answer all the questions in this section

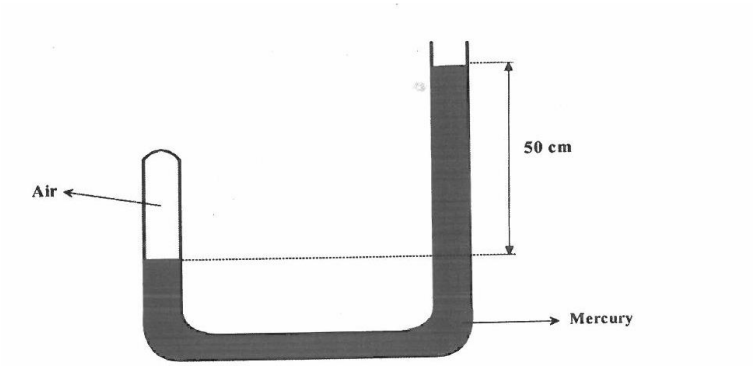
1. **Figure 1** below shows a scale of vernier calipers when measuring the width of a meter rule.



What is the actual width of the meter rule if the calipers has a zero error of + 0.6mm.? (2mk)

2. A clinical thermometer has a constriction in the bore just above the bulb. State the use of the constriction. (1mk)

3. **Figure 2** below shows air trapped by a column of t6he mercury in a U-tube . The atmospheric pressure is 76 cm Hg.

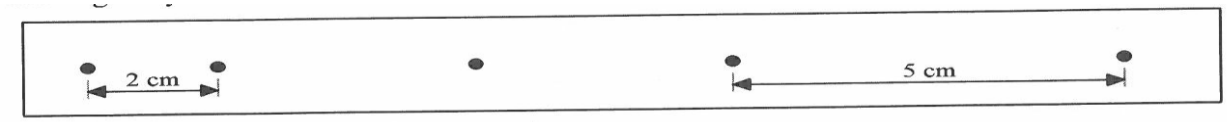


At what pressure in mmHg is the enclosed air? (3mks)

4. A girl of mass 50 Kg runs up a flight of height 4m in 4 seconds . Calculate the power she developed in this time (2mks)

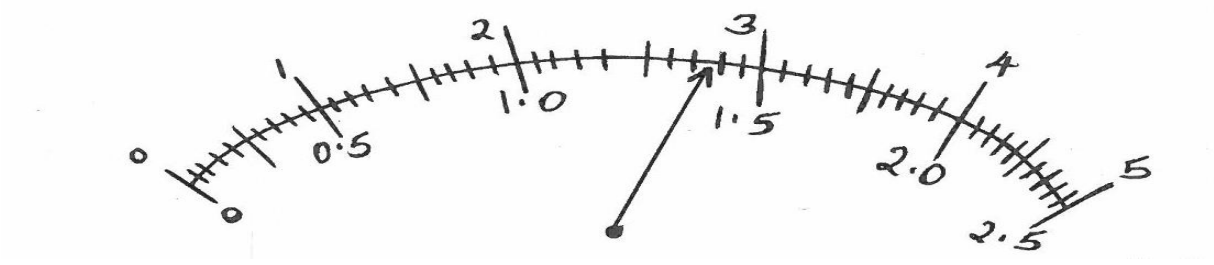
5. Name the transducer in the following energy conversions.
   i). Kinetic to electrical (1mk)
   ii). Solar to heat (1mk)

6. **Figure 3** below shows dots produced on a tape pulled through a ticker timer by a moving body .



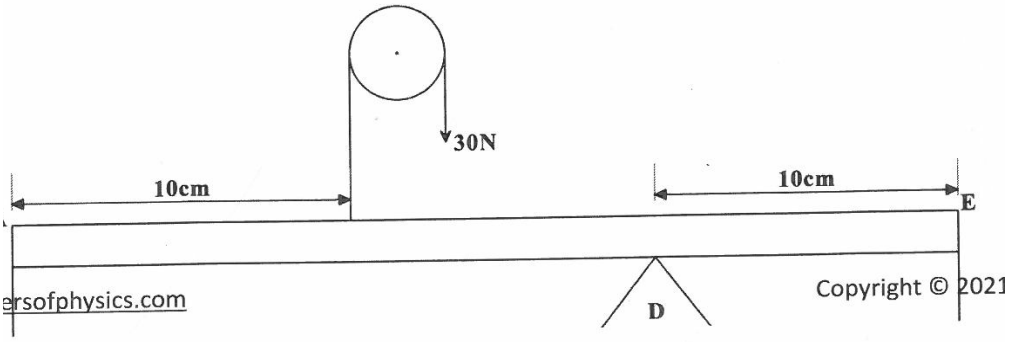
The frequency of the ticker –timer is 50 Hz. Calculate the acceleration of the body. (3mks)

7. **Figure 4** below shows an ammeter used to measure current through the conductor .The student used the lower scale.



State the reading from the meter (1mk)

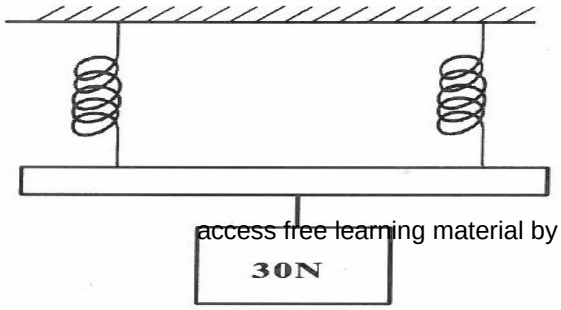
8. **Figure 5** below shows a uniform rode AE which is 40 cm long. It has a mass of 2Kg and pivoted at D. If 2N is acting at point E , and 30N force is passed through a frictionless pulley.



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

9. Convert -200°C into Kelvins (1mk)

10. **Figure 6** below shows two identical springs constant 3N/cm supporting a load of 30N.

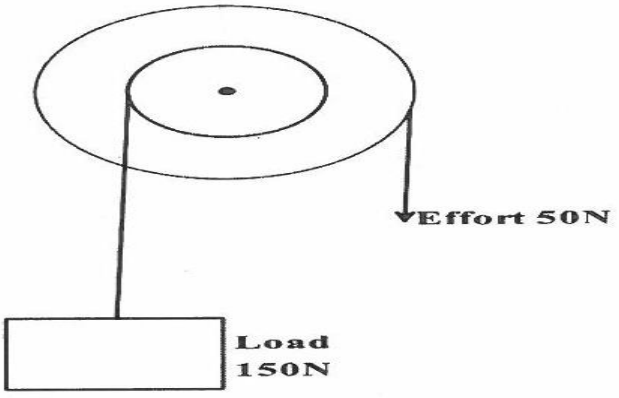


Determine the extension of each spring (3mks)

11. Explain why a bus should not carry standing passengers. (1mk)
12. State TWO reasons mercury is preferred as a barometric liquid and not water. (2mks)

SECTION B (55MARKS)
Answer all questions in this section

13. a) Define the term efficiency as used in machines . (1mk)
    b) **Figure 7** below shows the cross –section of a wheel and axle of radius 6.5 cm and 1.5 cm respectively used to lift a load. Use it to answer the question that follow.



Determine the

i. Mechanical advantages (M.A) of the system (2mks)
ii. Velocity ratio (V.R) of the system (2mks)
iii. Efficiency of the machine (2mks)
iv. Give one reason why the above machine is not 100% efficient (1mk)

c) State the law of conservation of energy (1mk)

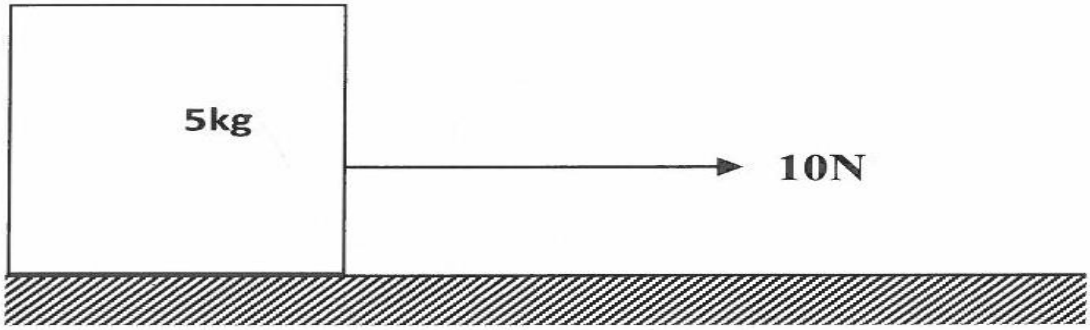
14. a) In inelastic collision , kinetic Energy is lost .Explain . (1mk)

b). A Trailer of mass 30 tonnes travelling at a velocity of Km/ her rams onto a stationery bus of mass 10 tonnes . The two move together after impact. Determine the common velocity at which they move after impact. (3 Mks)

c) A stone is thrown vertically upward with an initial velocity of 30 M/s

i) Determine the maximum height reached. (2mks)
ii) Time taken to come back to the point of projection (2mks)

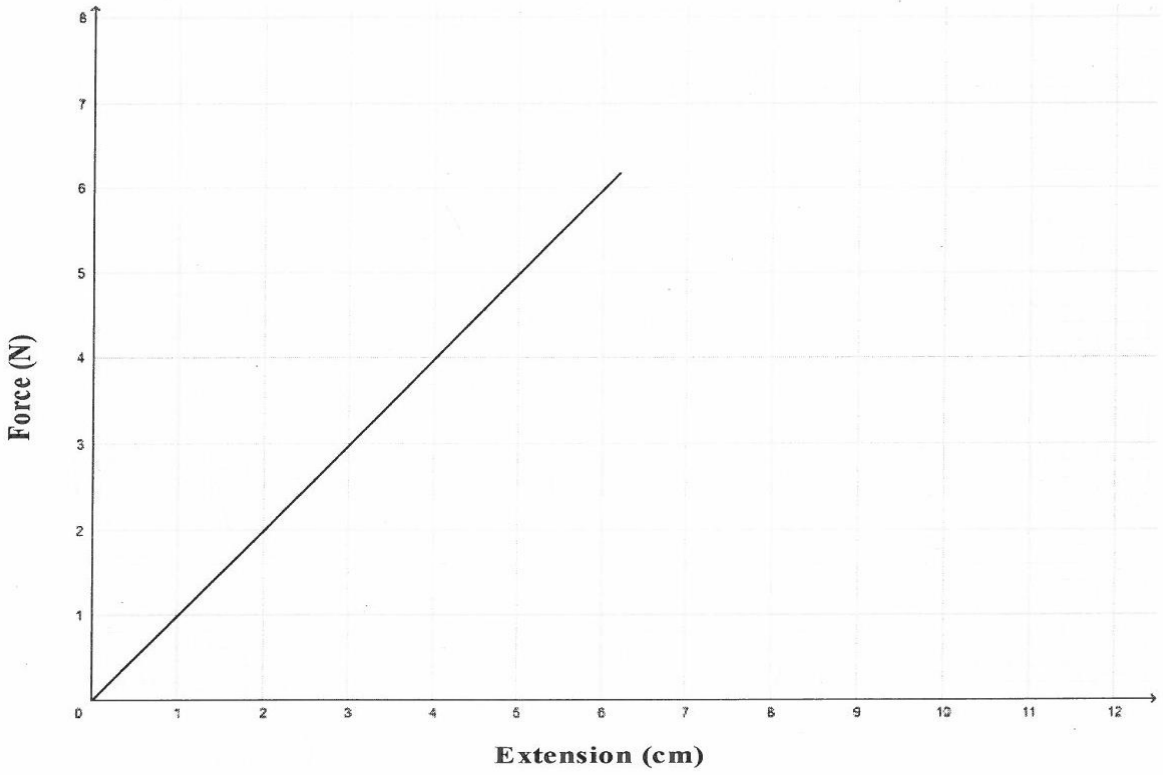
d) The figure 6 below shows a body being pulled by a constant force of 10N for 4m over wooden surface . The co- efficient of friction is o.03.



Find the acceleration of the body (3mks)

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

(b) A graph of force (y-axis) against (x-axis) is provided. Use it to answer questions below.



From the graph determine;

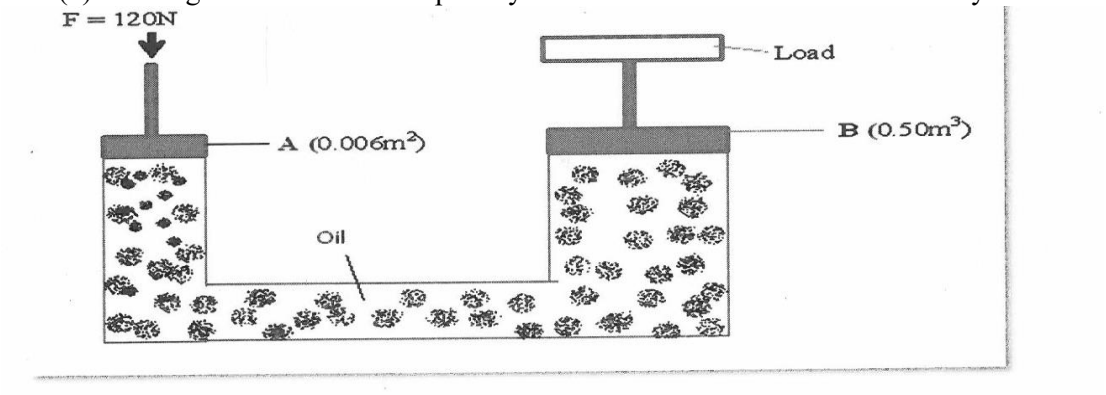
i). Work done in stretching the spring by 3cm. (3mks)

ii). Spring constant .Give your answer in SI Units. (3mks)

iii). State **two** factors that affect the spring constant. (2mks)

16. (a) Give reason why ink is likely to ooze a pen when one is up in an airplane. (1mk)

(b) The figure below is a simple hydraulic machine used to raise heavy loads.



Calculate;

i. The pressure exerted on the oil by the force applied at A (2mks)

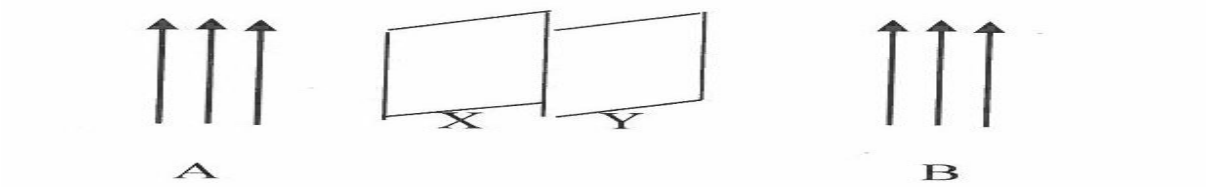
ii. The load raised at B (2mks)

iii. Give two properties which make the oil suitable for use in this machine . (2mks)

(c) The barometer reading at the base of the mountain is 60cm/ Hg while at the top is 50 cm/Hg. If the densities of air and mercury are 1.25kgm-3 and 13,600kgm-3 respectively. Calculate the height of the mountain. (3mks)

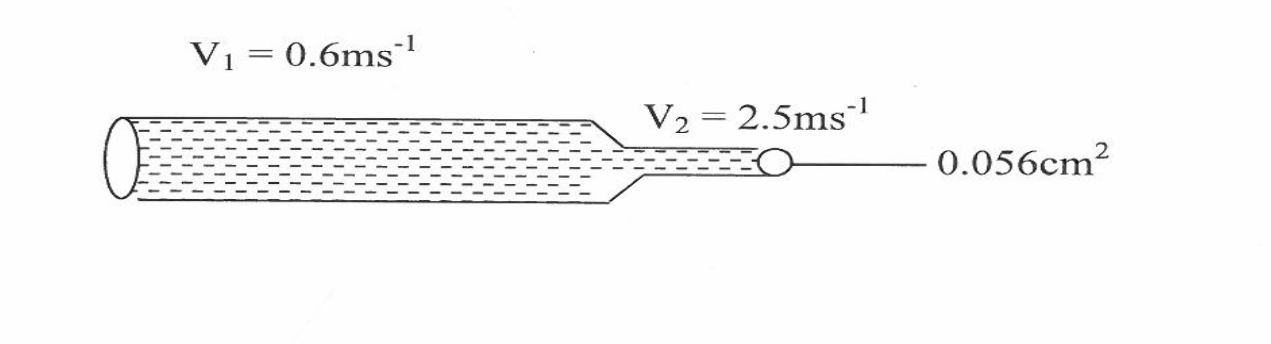
17. (a) Distinguish between streamline and turbulent flow. (2mks)

(b) Figure below shows two light sheets of paper arranged as shown



Explain the observation made when air is blown at the same time at point A and B. (2mks)

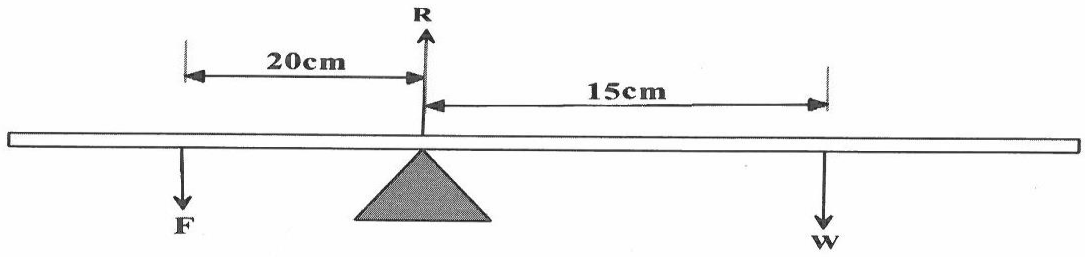
(c) Figure 12 below shows an incompressible fluid moving through a tube of varied cross-section area. If the area of the small tube is 0.05m2, Calculate the area of large tube in cm2. (3mks)



(d) State the Bernoulli's principle (1mks)

(e) State any **TWO** assumptions made when deriving the equation of continuity (2mks)

18. a) State the **principal of moments** (1mk)
    b) A uniform metal strip is 3.0cm wide, 0.5 cm thick and 100 cm long. The density of the metal is 2.7 g/cm3. Determine
    (i) The weight of the Metal strip. (2mks)
    The strip is placed on a pivot and kept in equilibrium by forces in the figure below.



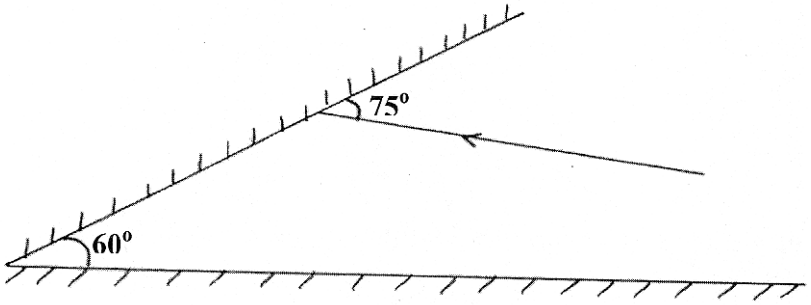
(ii) Determine the value of F . (3mks)

CASPA AMUKURA 2021
232 / 2
PHYSICS PAPER 2
THEORY

SECTION A (25 MARKS)
Answer ALL questions in this section in the spaces provided

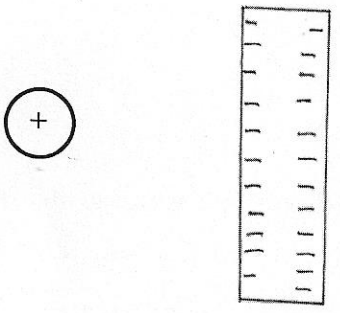
1. Figure 1 below shows a ray of light incident to the first of the two mirrors inclined at an angle of 60^0. Complete the path of the ray after reflection from the mirror. (1mk)

Fig. 1



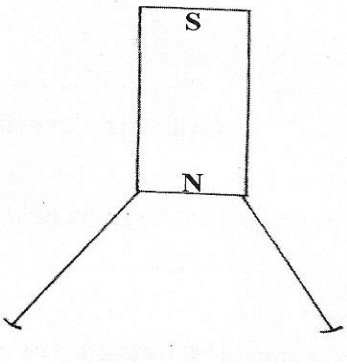
2. Figure 2 below shows a positive charge near a plate carrying negative charge. Draw the electric field between them. (2mks)

Fig.2



3 Two pins are hanging from a magnet S shown in diagram below figure 3.

Fig. 3



Explain why the nails do not hang vertically downwards. (2mks)

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

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

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

5 (i) Arrange the following waves in order of decreasing wavelength; x-rays, infrared, microwaves and visible light. (1mk)

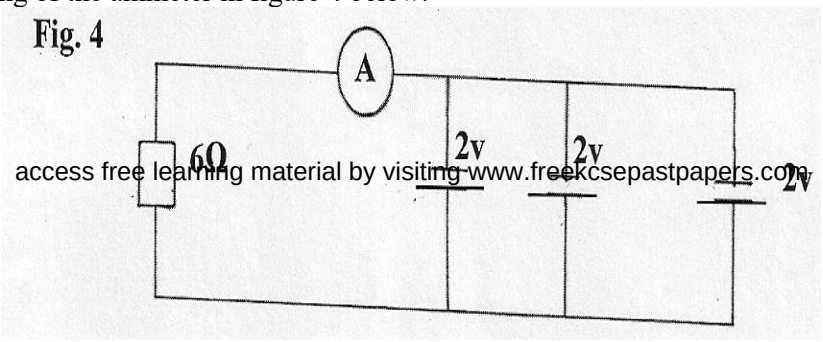
(ii) State **one** application of visible light. (1mk)

6 State one defect of a simple cell and explain how it can be controlled. (2mks)

7 A girl shouts and hears 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)

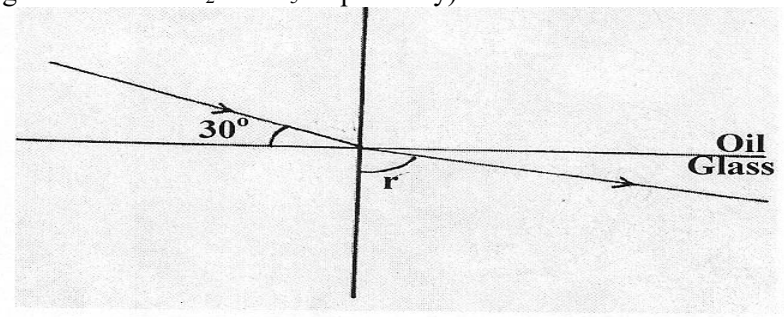
8 Determine the reading of the ammeter in figure 4 below. (2mks)

Fig. 4



9 A ray of light is incident on a glass-oil interface as shown in fig. 5 below. Determine the value of r. (Take refractive index of glass and oil as $^3/_2$ and $^8/_5$ respectively) (1mk)

Fig. 5



10 State **two** factors that affect the capacitance of a parallel-plate capacitor. (2mks)

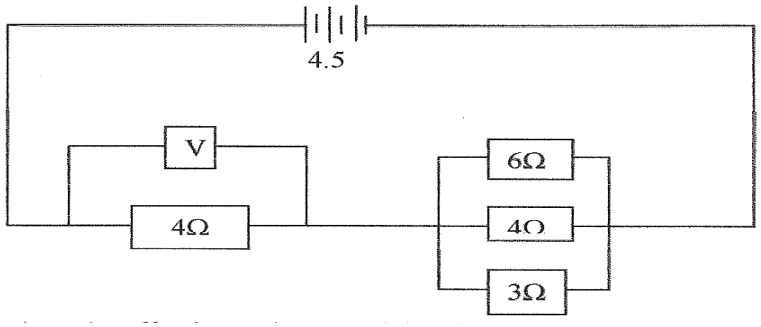
11 a) state two advantages of an alkaline accumulators over the lead acid accumulators 2mks

12 An electric bulb is rated 40W ,240v .what is the resistance of the filament 2mks

SECTION B (55 MARKS)
Answer ALL the questions in this section in the spaces provided

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

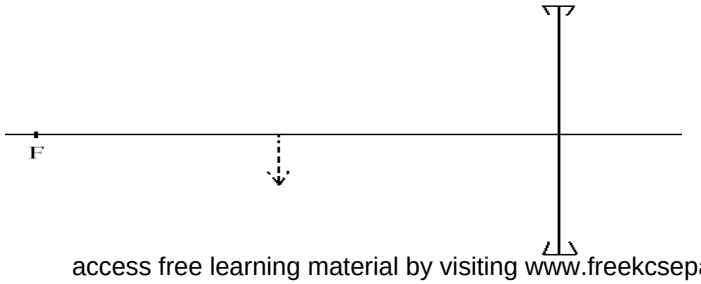
Fig



(i) Calculate the effective resistance of the circuit. (3mks)
(ii) Find the voltmeter reading. (3mks)

(b) A cell drives a current of 3.2A through a 2.8Ω resistor. When it is connected to 1.6Ω resistor, the current that flows is 5A. Find the E.m.f. (E) and internal resistance of the cell. (4mks)

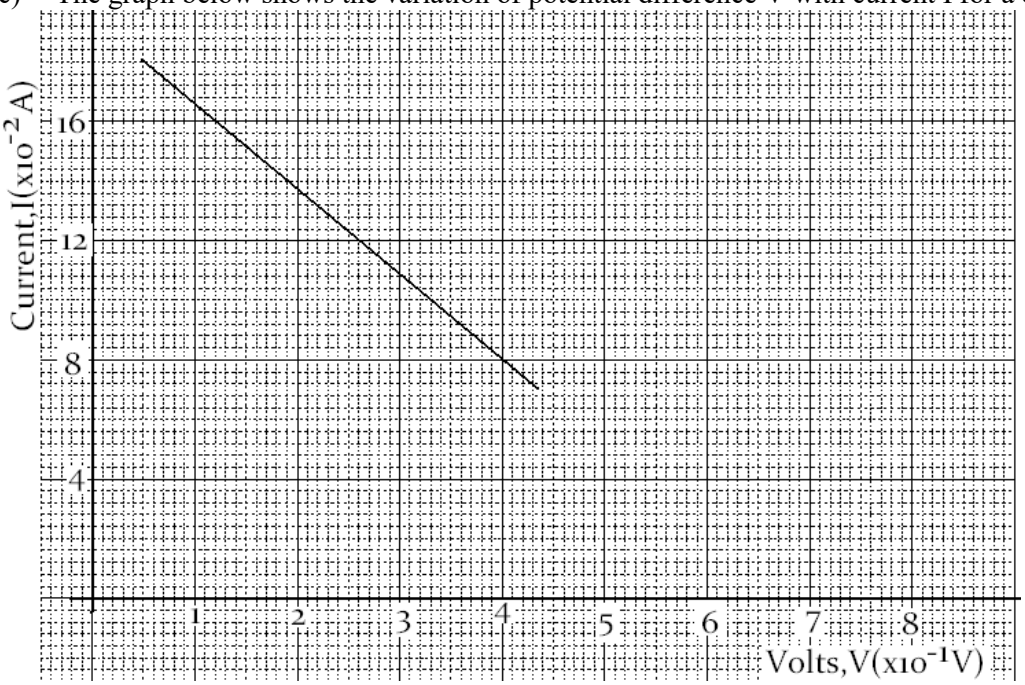
14 Complete the diagram below indicating the rays that will lead to the formation of the image shown below (3marks)



a) A compound microscope with an objective lens L_o of focal length 1.2cm and an eye piece lens L_e of focal length 2.8cm. An object is placed 1.8cm from the objective lens. The system of lenses produces a final image a distance of 12.0cm from L_e. Determine the distance of separation of lens L_o and L_e. (4 MARKS)

b) An object is placed 12cm from a convex lens and it forms a virtual image 36cm from the lens. Calculate the focal length of the lens. (3 MARKS)

c) The graph below shows the variation of potential difference V with current I for a certain cell.



From the graph determine

i). The internal resistance of the cell (3 marks)

ii). The e.m.f of the cell (1 mark)

14 (a) (i) State one cause of energy losses in a transformer and explain how it can be minimized. (2mks)

(ii) Describe briefly the energy changes involved in the generation of electrical energy at a hydropower station (2mks)

(iii) What are the advantages of transmitting power at:

(I) Very high voltages (1mk)

(II) Alternating voltage (1mk)

(b) (i) Explain how electrons are produced in a cathode ray oscilloscope (CRO) (2 mks).

(ii) State two functions of the anodes in a CRO. (2mks)

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

(iv) State why the tube is highly evacuated (1mk)

15 a) Define the term supersonic speed as used applied in sound waves (1mark)

b) in an experiment to determine the speed of sound in air, a drum at a point 150 m from a vertical wall was struck at varying frequencies while listening to the echo .The echo coincided with sound from the drum at a time when 20 successive strikes were made within a time of 18.5 s.

(I) Determine the time taken for the echo to heard 3marks

(ii) Determine the speed of sound in air at the place 2marks

(iii) What difference would you expect if the experiment was repeated on a colder day 1mark

c) A boy strikes a railway with a hammer. A railway worker 600 m away hears two sound s , One from the railway and the other from the air .If the time intervals between the two Sounds is 1.65s and the speed of sound in air is 340m/s, determine the speed of in the Railway line. 4 marks

16 a) define the term eclipse of the moon 1 mark

b) differentiate between umbra and penumbra as used in the eclipse 2marks

c) an incident ray forms an angle of 40 degrees with the mirror at point of incidence .If The position of the incident ray is kept constant while the mirror is rotated at an angle of 20 degrees .Find the angle through which the reflected ray is rotated 2 marks

d) A tree 25 m high stands , 50 m in front of a pinhole camera whose screen is 30 cm behind the pinhole. What is the height of the image of the tree formed on the screen . 3mks

AMUKURA CATHOLIC PARISH CASPA EXAMS
232/3
PHYSICS PAPER 3

1. QUESTION 1

You are provided with the following apparatus

- Ammeter
- A voltmeter
- A wire mounted on a millimeter scale
- A switch
- A new dry cell
- A micrometer screw gauge
- 6 Connecting wires
- A jockey

Proceed as follows

a) Measure the diameter d of the mounted wire at three different points

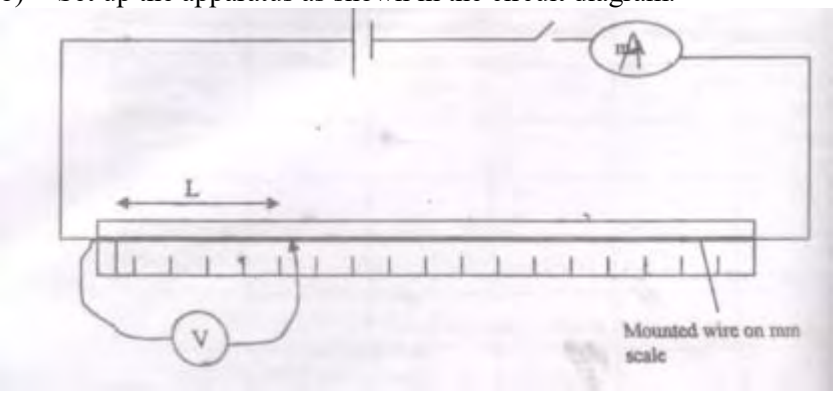
d_1= _____ mm

d_2=_____ mm (½mk)

d_3=_____ mm

Average d = _____ mm (½mk)

b) Set up the apparatus as shown in the circuit diagram.



Close the switch and tap the mounted wire with jockey as shown in the circuit. Ensure that both meters show positive deflection, open the switch.

c) Tap the wire at L= 20cm, close the switch, read and record in the table the ammeter and voltmeter reading.

d) Repeat the procedure in (c) for other values of L shown in the table and complete the table.

L(m)	V(Volts)	I(A)	R=V/I
0.2			
0.3			
0.4			
0.5			
0.6			
0.7			
0.8			

(6mks)

e) Plot a graph of R against L (m). (5mks)

f) Determine the slope of the graph. (3mks)

g) Given that R= $p\frac{L}{A}$ where A is the cross-sectional area of the wire and p is a constant for the material of the wire, determine the value of the constant p. (3mks)

2. QUESTION 2

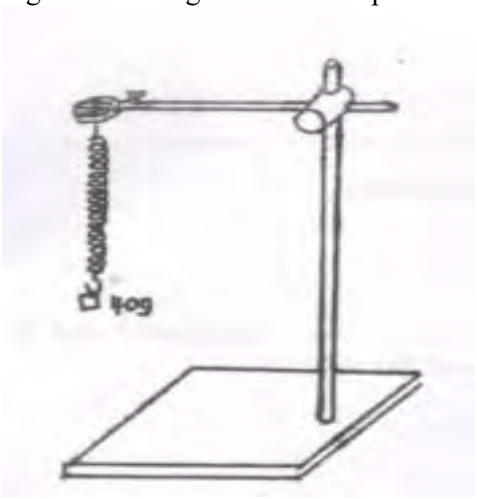
Part 1

You are provided with the following;

- A spiral spring
- A complete stand
- 7 masses of 20g each
- A stop watch
- 2 small pieces of wood for clamping

Proceed as follows

a) Clamp the spiral spring so as to hang from the clamp as shown in the figure below



b) Hang a 40g 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) Determine the periodic time T in the table.

e) Repeat the experiment for other values of mass m shown in the table. Complete the table below.

Mass (m)g	**40**	**60**	**80**	**100**	**120**	**140**
Mass m (kg)						
Time for 10 osc(s)						
Period T(s)						
T^2 (s^2)						

(6mks)

f) Plot a graph of T^2 (s^2) against mass m(kg). (5mks)

g) Determine the slope of the graph. (2mks)

h) Given that the equation of the graph is $\mathbf{T^2=\frac{4\pi^2 m}{w}}$

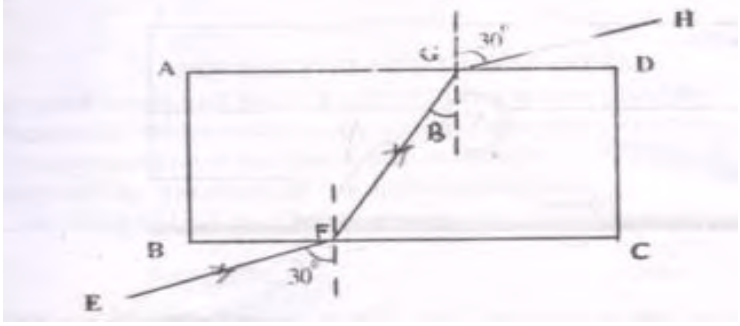
Determine the value of **w**. (3mks)

Part II

You are provided with a glass block, 4 optical pins, a soft board, one plain paper.

a) Place the rectangular glass block on a sheet of paper fixed on the soft board with one of its longest face uppermost. Mark the outline ABCD as shown in the figure. Remove the glass block and draw a line EF to represent a ray of light making an angle of incidence $i=30^0$ with the longest side BC of the block.

b) Stand pins p1and p2 on this line as far as possible. Replace the block and mark the emergent ray by looking into the side AD of the block and placing pins p3 and p4 in line with images of p1 and p2 as seen through the glass block. Remove the block and the pins and draw ray EFGH as shown in the figure below.



a) Draw the normal at G as shown.

b) Measure angle B (1mk)
B = ……

c) Given that **k**=$\frac{sin\ 30^0}{\sin B}$
Calculate the value of **k**. (2mks)

d) The main paper used should be handed over together with this paper (correct use made of the plain paper) (1mk)

AMUKURA CATHOLIC PARISH CASPA EXAMS
232/3
PHYSICS PRACTICAL
PAPER 3 CONFIDENTIAL.

QUESTION ONE REQUIREMENTS

- Ammeter
- Voltmeter
- Nichrome wire mounted on a millimeter scale (gauge 28)
- Switch
- A new dry cell
- A micrometer screw gauge
- Connecting wires
- A jockey

QUESTION TWO REQUIREMENTS

- A spiral spring (spring diameter =15mm

Length= 70mm, diameter of spring wire=1.8mm, number of turns=88)

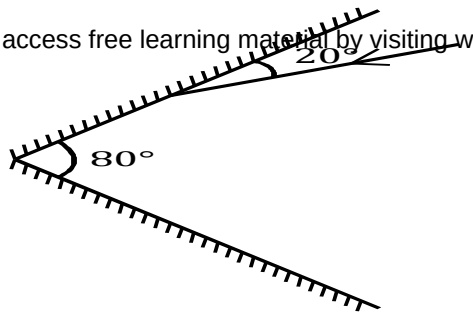
- A complete stand
- 7 masses of 20g each

- A stopwatch
- 2 small pieces of wood for clamping
- A glass block
- 4 optical pins
- A soft board
- One plain paper
- Student to come with geometrical set.

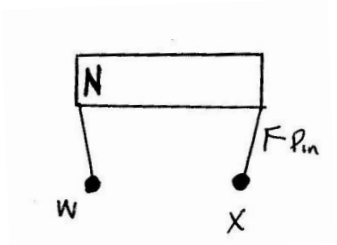
BUTULA SUB COUNTY JOINT EVALUATION
232/2
PHYSICS (THEORY)
DECEMBER 2021

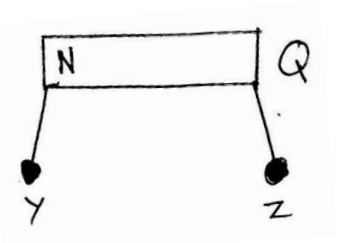
SECTION A (25 marks)

1. The figure below shows two mirrors inclined at an angle of 80° to each other. A ray of light is incident on Mirror as shown below.



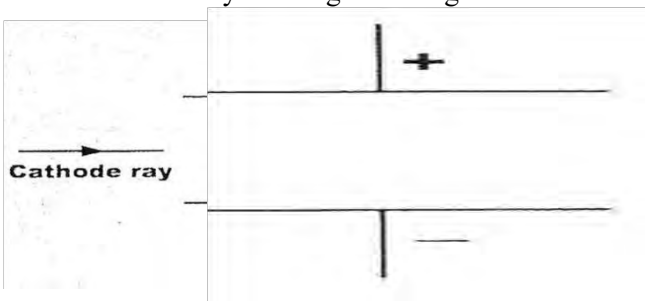
   i) Complete the path of the ray as it emerges. (1 mark)
   ii) Indicate the angle of reflection on each mirror. (2 marks)
2. State the reason why the magnetic field strength of a magnet is greatest at the poles. (1 mark)
3. You are provided with; 1.0 μF, 2.0 μF and 3.0 μF capacitors. Arrange the three capacitors with a cell such that the total capacitance is 1.5. (3 marks)
4. Fours pins were hang onto two magnets as shown.





X…….
Z……
Q……..
Identify the polarity on end X, Z, and Q. (3mks)

5. **The** Figure shows a cathode ray entering into a region between two charged plates.



Complete the diagram to show the path of the ray in the field. (1 marks)

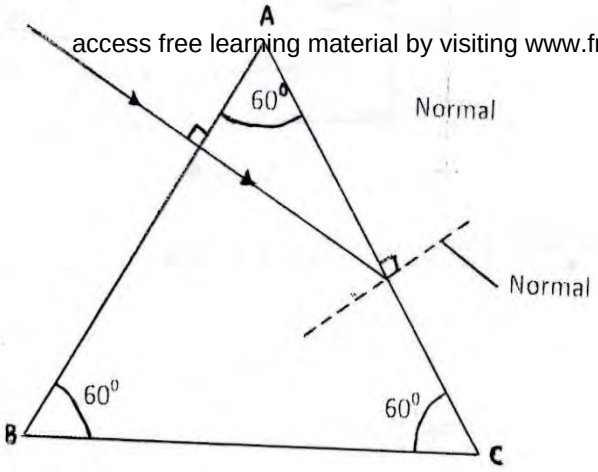
6. A form two student found the dry cells leaking on removing them from the torch. Name this defect and how is minimized. (2 marks)

7. Below is radioactive decay.

$$^{232}_{90}A \xrightarrow{K} {}^{228}_{88}B \xrightarrow{\gamma\, gamma} {}^{y}_{x}C$$

(i) Identify radiation K. (1 mark)
(ii) Determine the values of x and y. (2 marks)

8. **The figure below** shows a ray of light passing into a glass prism ABC.



Sketch the path of the ray as it travels from face AC. (*critical angle for glass is 42^0*) (2 marks)

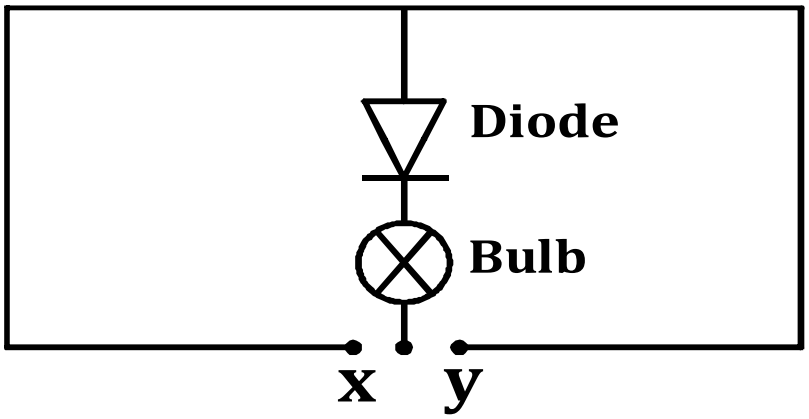
9. An electric heater is rated 1000W, 240V. Calculate the resistance of this element. (3 marks)

10. The figure below shows electromagnetic spectrum.

Radio wave	Microwave	A	Visible light	UV	X- ray	Gamma radiation

a) Identify A. (1 mark)
b) State how A is detected. (1 mark)

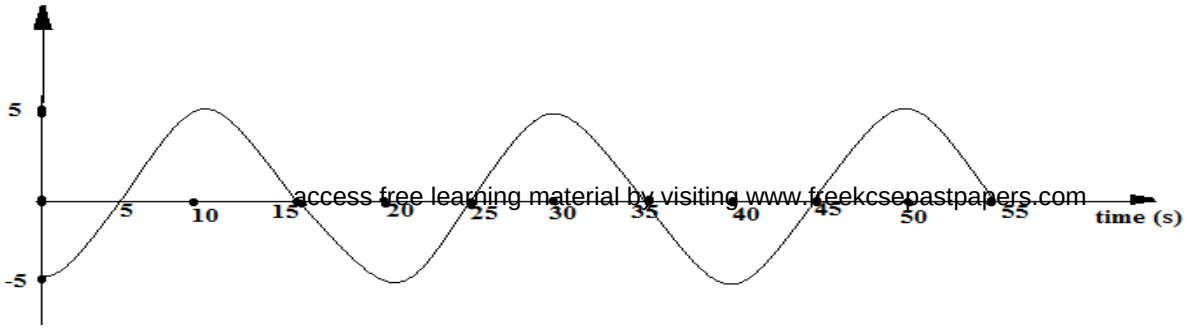
11. Study the figure below and answer the question that follows.



When switch is closed at x, the lamp lights but when switch is closed at Y, the lamp does not light. Explain this observation. (2 marks)

SECTION B (55 Marks)

12. a) Distinguish between rarefaction and compression. (1 mark)
    b) The **figure** below shows a displacement (cm) time graph for a progressive wave.



i) State the amplitude of the wave. (1mark)
ii) Determine the frequency of the wave. (2marks)
iii) Given that the velocity of the wave is 320cm/s determine its wavelength (3marks)

b) A man standing600 away from a wall hangs two pieces of wood together and hears an echo 2.5 seconds later. Determine the speed of sound in air at that place. (3 marks)

c) State any one use of x- rays in medicine. (1 mark)

13. (a) State two factors that affect photoelectric emission. (2 marks)

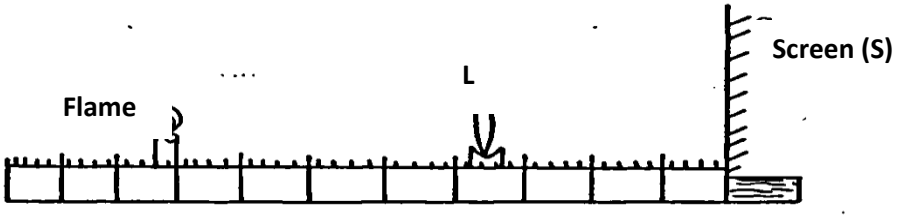
(b) Light of wavelength 4.3 x 10^{-7}m is incident on two different metal surfaces, nickel and potassium. (*Take speed of light as 3.0 x 10^{8} $ms^{-1}$and planks constant h, as 6.63 x $l0^{-34}$Js*).

(i) Determine the energy of the incident radiation. (3 marks)

(ii) If the work function of nickel is 8.0 x 10^{-19}J and that of potassium is 3.68 x 10^{-19}J, state with a reason from which of the two metals the given light will eject electrons. (2 marks)

(iii) Determine the velocity of the emitted electrons from the metal surface in b(ii). *(Take the mass of an electron as 9.1 x 10^{-31} kg).* (3 marks)

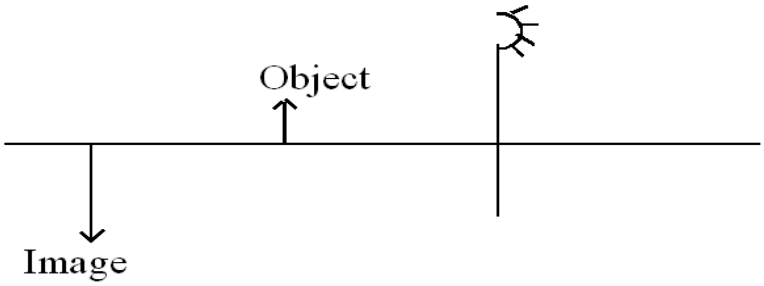
14. a) Figure below shows an experimental set up consisting of a mounted lens, I, A screens, a metre rule and a candle



i) Describe how the set up may be used to determine the focal length f, of the lens. (3 marks)

ii) State why the set up would not work if the lens were replaced with a diverging lens. (1 mark)

b) The Figure below shows an object in front of concave mirror and it's image.



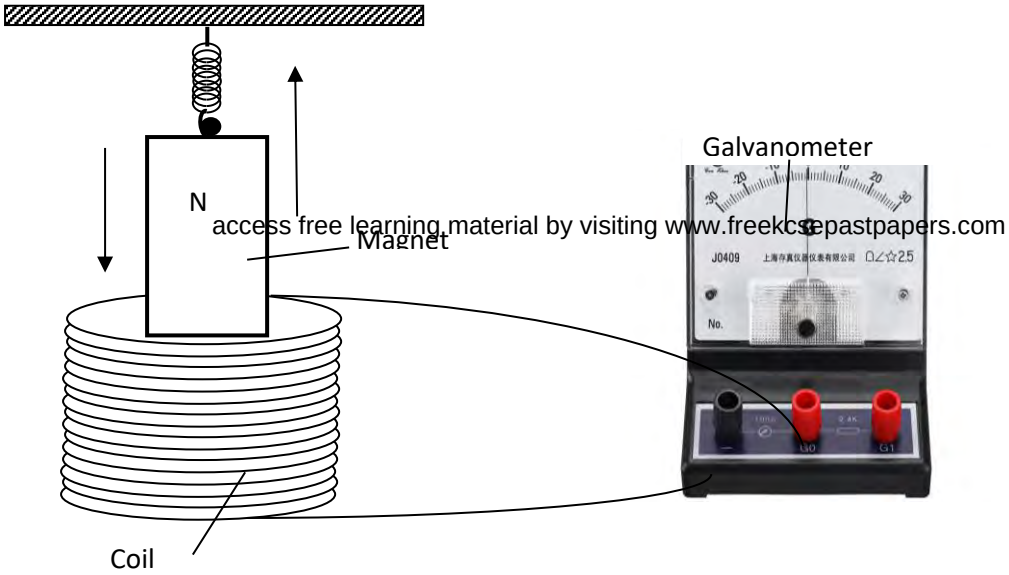
i) Locate position of its principal focus. (3marks)

ii) If the figure is drawn to scale, determine the magnification. (2 marks)

c) State one reason why a convex mirror is preferred over a plane mirror for use as a driving Mirror. (1 mark)

15. a) State Lenz's law. (1 mark)

b) The diagram in the figure below shows a bar magnet attached to a spring oscillating through a coil connected to a galvanometer.

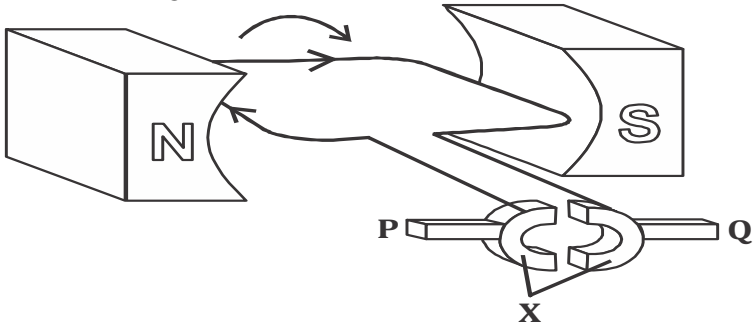


(i) State and explain the observations made on the pointer of the galvanometer. (2 marks)

ii). Explain why the oscillations dies off very fast. (1 mark)

c) The primary coil of a transformer has 1200 turns and the secondary coil has 60 turns. The transformer is connected to a 240V A.C source. Assume there are no energy losses, determine secondary voltage (2 marks)

d) The following figure shows a coil in a magnetic field. The coil is rotated in the direction shown by the arrow to produce an alternating current.



i) Name the parts labelled X. (1 mark)
ii) State two factors that influence the magnitude of the induced e.m.f (2 marks)

e) State and explain any one ways by which energy losses are minimized in a transformer (2 marks)

18. a) Give a reason why power is transmitted at high voltage. (1 mark)

b) The cost of electricity in a region is sh.7.20 per kwh.

I. a 1.5KW water heater for 1 hour per day.
II. a 100W light bulb for 30 days at 12 hours per day and
III. a fan of resistance 24ohms connected to a 240V supply for 30 days at 2 hours per day.

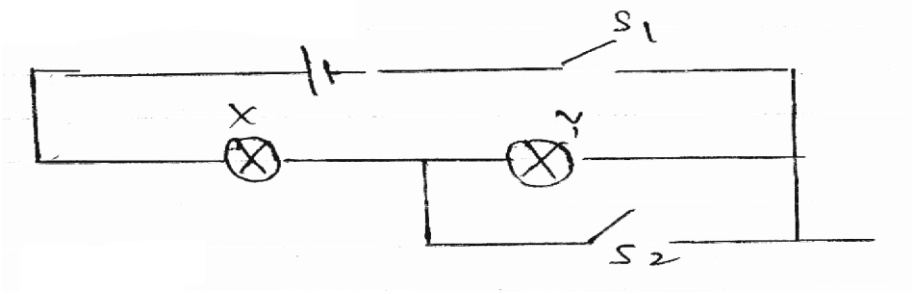
i) What would be the monthly bill for a household using the above appliances? (3 marks)

ii) In addition to the energy consumed, the company charges each customer the following.

I. a monthly standing charge of sh.150.00.
II. a fuel cost levy of 50 cents per kwh consumer.
III. a foreign exchange levy of 40cts per kwh.
IV. a value added tax of 16% of the monthly energy consumption

Find the total monthly bill .(2 marks)

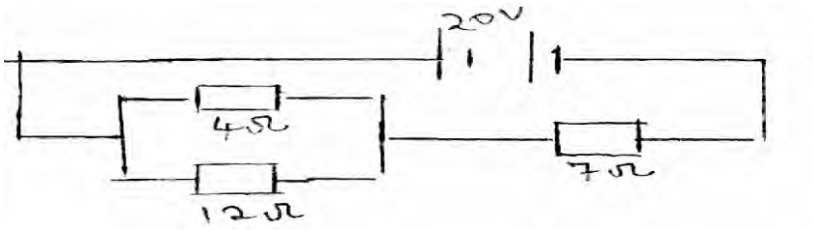
c) The figure below shows an electric circuit with two bulbs X and Y, which are identical.



Explain what happens to the bulbs when:

i) S_1 only is closed (1 mark)
ii) S_1 and S_2 are closed. (1 mark)

d) The figure below shows an electric circuit.



Find

(i) the effective resistance. (2 marks)
ii) the current supplied by the battery (3 marks)

BUTULA SUB COUNTY JOINT EVALUATION
PHYSICS PAPER 3
NOVEMBER/DECEMBER 2021
Question one

You are provided with the following:

- A micrometer screw gauge (to be shared)
- A vernier calliper (to be shared)
- Glass tube
- A wire labelled **M**
- Some cello tape
- One 50 g mass
- Some masses totalling 40g
- A meter rule
- 100 ml beaker
- A stand boss and clamp
- A stop watch
- Candle
- A screen
- Some water
- measuring cylinder

PART A

Proceed as follows

(a) Using a micrometer screw gauge , measure and record the diameter of the wire labelled **M** (2 mark)
d= …… mm
d=……m

(b) Using wire **M** make a spring as follows :
(i) Use some sellotape to fix one end of the wire M (about 2.5 cm) along the glass tube ;
(ii) Hold firmly the part of the wireunder the tape with one hand. Use the other hand to wind 30 turns as closely and tightly as possible (*see **figure 1***)

(c) Remove the sellotape and release the spring from the tube
(*The spring will slightly unwind and some turns will disappear*)
Bend the free ends as shown in **figure 2**

(c) Using a vernier callipers , measure and record the external diameter d of the spring (2 mark)

D = ……..cm
D= ……m

(e) suspend the spring and a 50g mass from a retort stand as shown in **figure 3**
Count and record the number of turns **N**of the suspended spring (1mark)

(f) Add 40g to the 50g record the extension **X** of the spring (2mark)

(g) Determine **c** given that (1mark)
C= $\frac{0.4}{x}$

(h) Determine**n** given that (2marks)
C = $\frac{nd^4}{8ND^3}$

(i) With the spring still loaded with the 90g, pull the lower mass slightly downwards and let go so that the mass oscillates vertically. Record the time **t** for 20 oscillations. Hence determine the period **T**
t= …… (s) (1mark)
T =…… (s) (1mark)

(j) Determine Z given that

$T = 2\pi\sqrt{\frac{m}{z}}$

Where m is the mass in kg on the spring (2 marks)

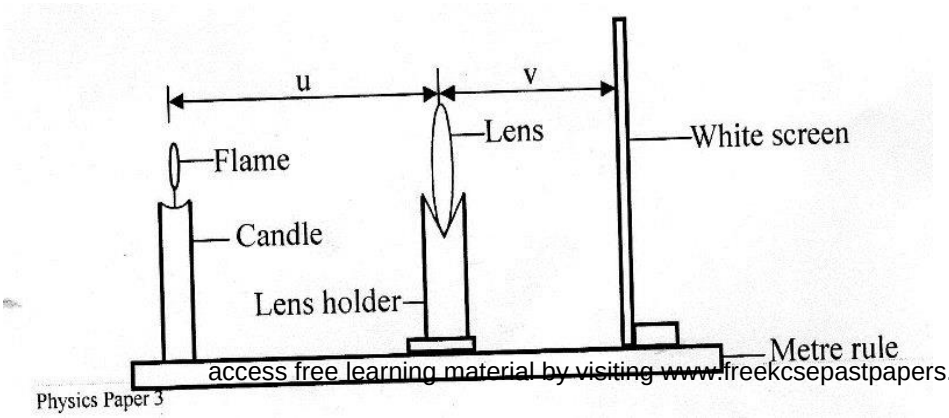
PART B

1. You are provided with the following:

– A candle
– Metre rule
– White screen
– Lens holder
– Convex lens

Proceed as follows:

(k) Place the lens on a metre rule. Arrange the set up as shown in the figure 4 below.



Physics Paper 3

(l) Adjust the position of the lens so that it is a distance u = 30cm from the candle. Adjust the position of the screen until a well focused image of the flame is formed on the screen. Measure and record in the table 2, the image distance v, between the screen and lens.

(m) Repeat part (b) for other values of (u) shown in the table 1 and complete the table.

u (cm)	30	35	40
v (cm)			
$x = \frac{v}{u}$			
$y = \frac{v}{(x+1)(cm)}$			

. (5mks)

(n) Determine the mean value of y (2marks)

Question 2

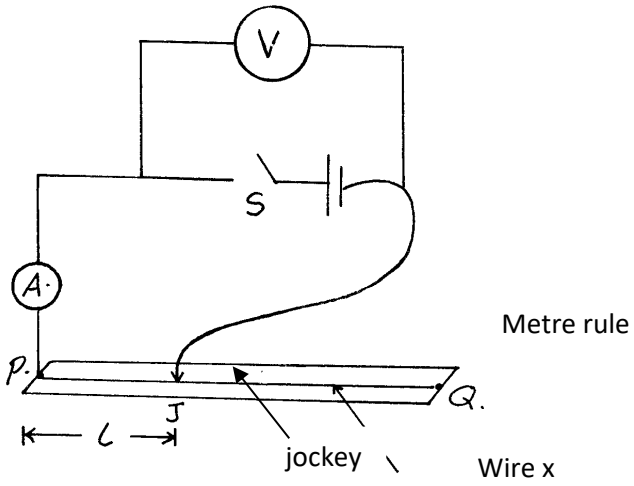
PART A

. You are provided with the following apparatus

– A voltmeter
– An ammeter
– A wire x mounted on a metre rule
– 8 connecting wires with crocodile clips
– Micrometer screw gauge
– A switch
– A jockey
– One new dry cell and a cell holder.

Proceed as follows:

a) Connect the apparatus provided as shown in the circuit in figure 5 below.



b) With the crocodile clip at L = 10 cm , close the switch S and record the ammeter and voltmeter reading.
I =..... (1 mark)
V =..... (1mark)

c) Repeat the procedure in (b) for other values of l = 10cm, 20cm, 30cm, 40cm, 50cm and 60 and recordthe readings in the table 2 below below. (5marks

Length. L. (cm)	10	20	30	40	50	60
Voltmeter reading , V (volts)						
Ammeter reading , I(A)						

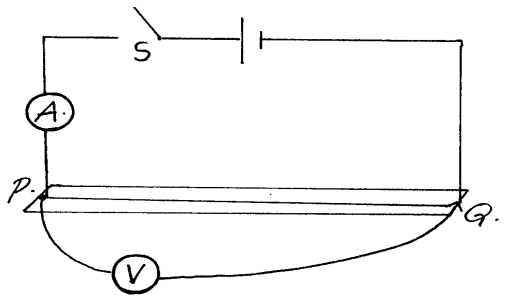
d) Plot a graph of potential difference, V(y-axis) against the Current I .(5 marks)

e) Determine the slope of the graph (2marks)

f) Given that V= E – I r, use your graph to determine the value of;
(i) E (1mk)
(ii) r (1mks)

(g) Measure the diameter d of the wire x using the micrometer screw gauge. (1 mark)
d =..... mm
D.....m

(h) Dismantle the apparatus and set up the circuit as shown figure 6 below.



(i) Close the switch S and record the ammeter and the voltmeter readings (1mark)

I =.....
V =.....
Hence find R, the resistance of the wire x.
R = ...Ω (1mk)

j) Given that $R = \frac{4\rho}{\pi d^2}$,

determine ρ (2 mks)

BUTULA PHYSICS CONFIDENTIAL

Question one

You are provided with the following:

- A micrometer screw gauge (to be shared)
- A vernier caliper (to be shared)
- Glass rod (diameter= 0.8 cm $\pm$0.1)
- A 50 cm nichrome wire SWG 28 labeled **M**
- Some cello tape
- One 50 g mass
- Some masses (totaling 40g)
- A meter rule
- A stand boss and clamp
- A stop watch

Question two

You are provided with the following:

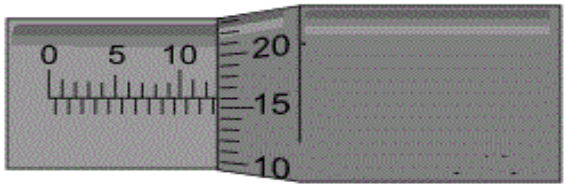
- A candle
- Metre rule
- White screen
- Lens holder
- Convex lens of focal length 15 cm .
- A voltmeter (0-3 or 0-2.5or 0-5)
- An ammeter(0-1)
- A nichriome wire labeled x mounted on a millimeter scale SWG 32
- 8 connecting wires with crocodile clips
- Micrometer screw gauge
- A switch
- A jockey
- One new dry cell and a cell holder.

KANGUNDO
232/1
PHYSICS PAPER 1
THEORY

SECTION A (25 MARKS)

Answer all questions in this section in the spaces provided:

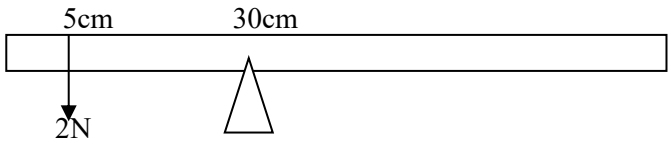
1. Figure below shows a micrometer crew gauge being used to measure the diameter of a metal rod. The thimble scale has 50 divisions.



What is the reading shown? (2 marks)

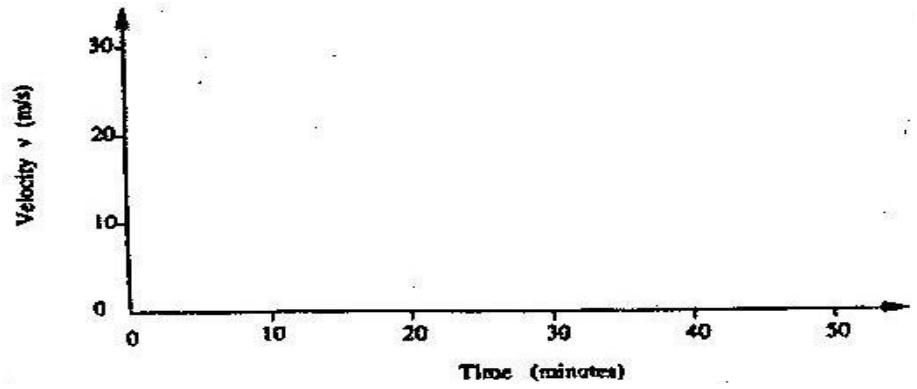
2. (a). State one difference between heat transfer by convection and radiation. (1 marks)
   (b) Give a reason why a thick glass bottle cracks when boiling hot water is suddenly poured inside it (1 mark)
3. An aircraft 300m from the ground, travelling horizontally at 400 m/s releases a parcel. Calculate the horizontal distance covered by the parcel from the point of release. (Ignore air resistance) (3 marks)
4. A fixed mass of a gas has a volume of 1.25 litres at 27°C and atmospheric pressure. It expands at constant pressure to 1.55 litres. Determine the new temperature of the gas. (3 marks)
5. State two factors that affect the boiling point of a liquid. (2 marks)
6. A pipe of radius 6 mm is connected to another pipe of radius 9 mm. If water flows in the wider pipe at the speed of 2 ms^{-1}, what is the speed in the narrower pipe? (3 marks)
7. A concrete block of mass 1.50×10^3 kg and volume 5.0×10^{-1} m^3 is fully immersed in sea water of density 1.03×10^3 kg/m^3. Determine the weight of the block in water. (Take g =10 N/kg) (3 marks)

8. A steel needle when placed carefully on water can be made to float. When a detergent is added to the water it sinks. Explain this observation. (2 marks)
9. **Figure 3** shows a uniform metre rule pivoted at 30cm mark. It is balanced by weight of 2N suspended at the 5cm mark.



Determine the weight of the metre rule. (3 marks)

10. A car starting from rest accelerates uniformly for 5 minutes to reach 30m/s. It continues at this speed for the next 20 minutes and then decelerates uniformly to come to stop in 10 minutes. On the axes provided, sketch the graph of velocity against time for the motion of the car. (2 marks

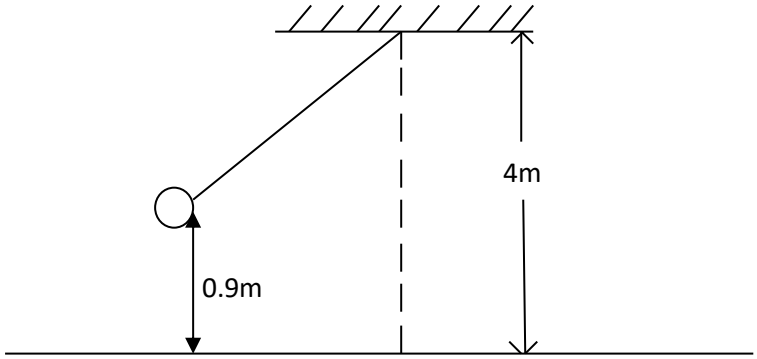


SECTION B

Answer all questions in this section in the spaces provided:

11. a) An electric crane lifts a load of 2000kg through a vertical distance of 3.0m in 6s.
Determine:
i) Work done (2 mark)
ii) Power developed by the crane (2 marks)
iii) Efficiency of the crane if it is operated by an electric motor rated 12.5 Kw. (g = 10 N/kg) (2marks)

b) A bob of mass 20kg is suspended using a string of 4m from a support and swings through a vertical height of 0.9m as shown below:

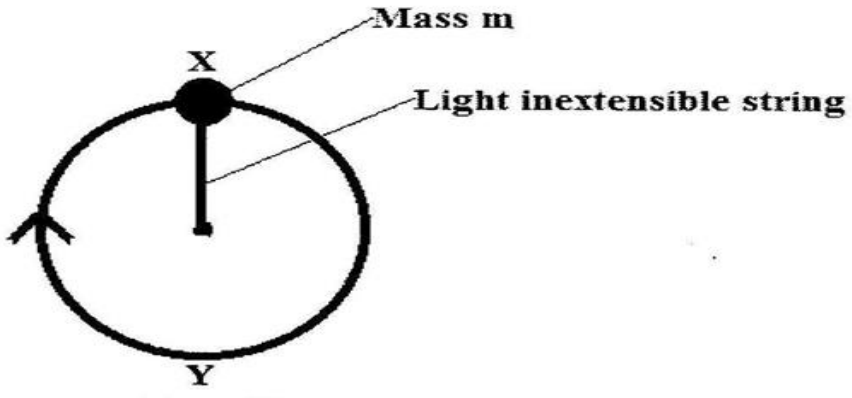


Determine:

i) The potential energy of the body at its position. (2mks)
ii) Speed of the body when passing through the lowest point. (2mks)

12. (a)
i) Define the term angular velocity. (1 mark)
ii) A body having uniform motion in a circular path always accelerates and yet the speed remains constant. Explain this observation. (1 mark)
iii) An object is whirled in a horizontal plane at an angular velocity of 40 rad/s. Given that the radius of the circular path is 3.0m, determine the linear velocity of the body. (2 marks)

b) The figure below shows the path of a body of mass 400g tied to a string of length 0.4m and being whirled in a vertical circle at a linear speed of 10m/s.



i) State what provides the centripetal force on the mass m. (1 mark)
ii) Calculate the tension on the string at point X. (3 marks)
iii) At what point is the string likely to break? Give a reason for your answer. (2 marks)

13. a) In a hydraulic press, a force of 200N is applied to a master piston of area 25cm^2. If the press is designed to produce a force of 5000N, determine the area of the slave piston. (2marks)

(b) 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 the barometer at the same place? (Density of paraffin = 8.0 x 10^2 kg /m^3). (3 marks)

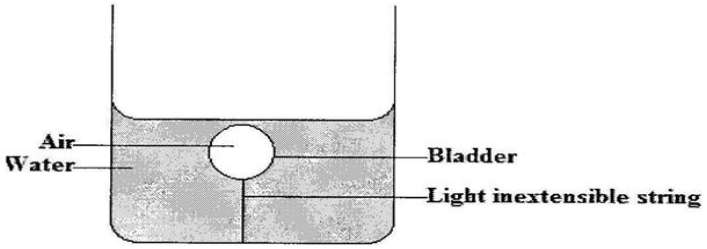
(c) In an experiment to determine atmospheric pressure, a plastic bottle is partially filled with hot water and the bottle is then tightly corked. After some time the bottle starts to get deformed.

(i) State the purpose of the hot water. (1 mark)

(ii) State the reason why the bottle gets deformed. (1 mark)

(d) A hole of area $2.0cm^2$ at the bottom of a tank 5m deep is closed with a cork. Determine the force on the cork when the tank is filled with sea water of density $1.2g/cm^3$. (3 marks)

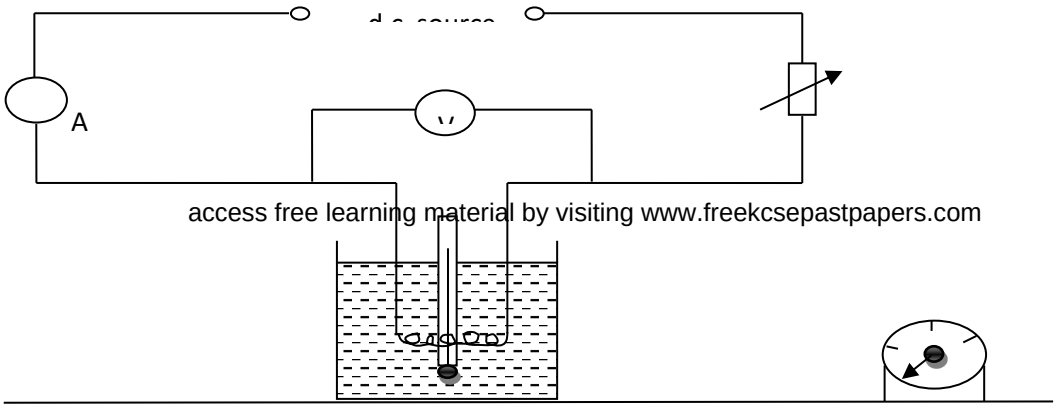
(e) The figure below shows a rubber blander filled with air and fixed to the bottom of a water container with a string.



State and explain what happens to the tension in the string when the temperature of the water is raised. (2 marks)

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

b) The illustration below is used to produce a measured rise in temperature of a liquid using electrical energy.



Explain why;

(i) The liquid will tend to be warmer at the top of the container than at the bottom. (1 mark)

(ii) The temperature will eventually stop rising even though the current is still passing through the heating coil. (1mark)

(c) A 50W heating coil is totally immersed in100g of water contained in an insulated flask of negligible heat capacity. The initial temperature of water in the flask is 20^oc.

(i) Determine how long it takes for the water to boil at 100^oC when the heater is switched on. (Take specific heat capacity of water as 4200 J/kg/K) (2marks)

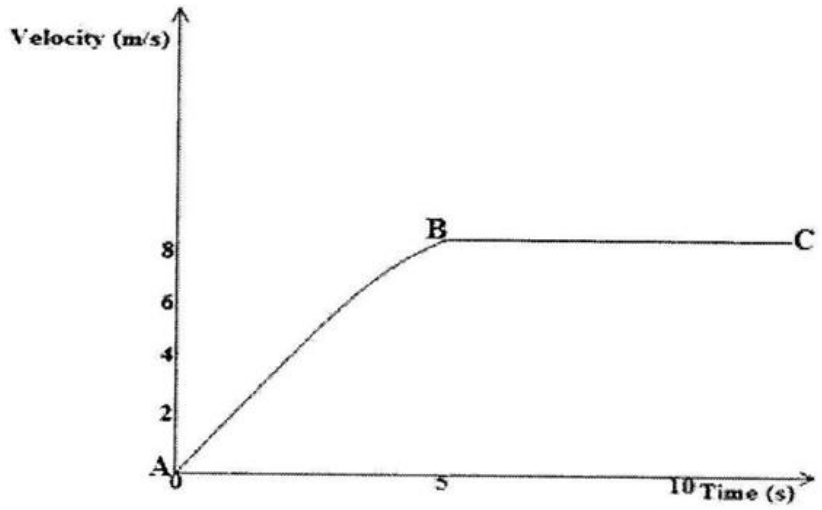
(ii) After the water has been boiling for 15 minutes, it is found that the mass of water in the flask has decreased to 80g. Assuming no external heat losses, calculate a value for the specific latent heat of vaporization of water. (3 marks)

15. (a) State the principle of conservation of linear momentum. (1 mark)

(b) Calculate the recoil velocity of a gun of mass 0.4kg which fires a bullet of mass 0.0045kg at a velocity of $400ms^{-1}$ (3 marks)

(c) State **one** factor which affect frictional force of a body (1 mark)

(d) The figure below shows a velocity-time graph for a ball bearing released at the surface of glycerine in a measuring cylinder. Study the graph and answer the question that follows.



Explain the motion of the ball between point B and C. (2 marks)

16.

(a) In an experiment to estimate the diameter of an oil molecule, an oil drop of diameter 0.05 cm spreads over a circular patch whose diameter is 20 cm. Determine

i) The volume of the oil drop (2 marks)

ii) The area of the patch covered by the oil (2 marks)

iii) The diameter of the oil molecule (2 marks)

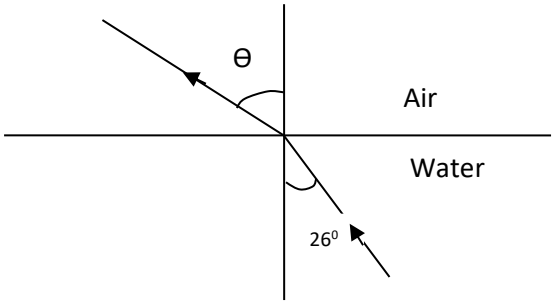
(b) State any assumption made in (a) (iii) above (1 mark)

(c) One possible source of errors in this experiment. (1 mark)

KANGUNDO
232/2
PHYSICS Paper 2
THEORY

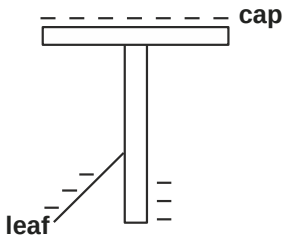
SECTION A (25 MARKS)

1. Name one Characteristic of an image formed by a plane mirror (1 mark)
2. Identify one difference between the human eye and the camera (1 mark)
3. The figure below shows refraction of light at air-water interface.



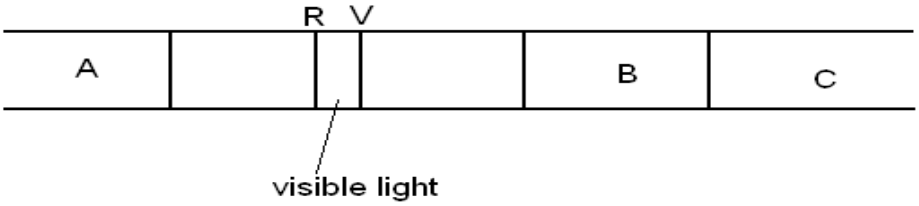
Determine angle Θ if the refractive index of water is 1.33 (3 marks)

4. The figure below shows a gold leaf electroscope charged negatively.

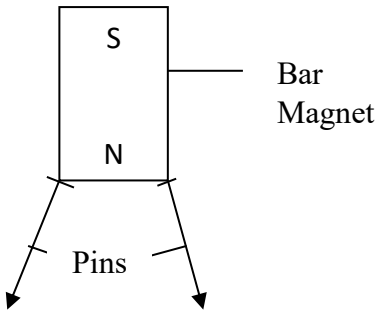


State what happens to the leaf when a negative charged rod is brought near the cap without touching it. (1 mark)

5. Give a reason why it is necessary to leave the caps of the cells open when charging an accumulator (1 mark)
6. A girl standing at a distance claps her hands and hears an echo from a tall building 2 seconds later. If the speed of sound in air is 340m/s, determine how far the building is. (3 marks)
7. A house has a lighting circuit operated from a **240V** mains supply. Four bulbs rated **40W 240V** and six bulbs rated **100W 240V** are switched on for **5** hours a day. Determine the monthly bill for the consumer given that the cost of electricity is at shs. 5.50 per unit.
   (Take 1 month = 30 days and the standing charge is sh. 150) (3 marks)
8. The figure below shows regions of the complete electromagnetic spectrum. Name the regions labeled A and C. (2 marks)



9. How can the intensity of a X-ray beam be increased in an X-ray machine? (1 marks)
10. Explain the behavior of the pins as illustrated below (2 marks)



11. Light of a certain wavelength strikes a metal surface. State two factors that determine the maximum kinetic energy of the electrons emitted (2 marks)
12. The following is a part of a radio – active series.

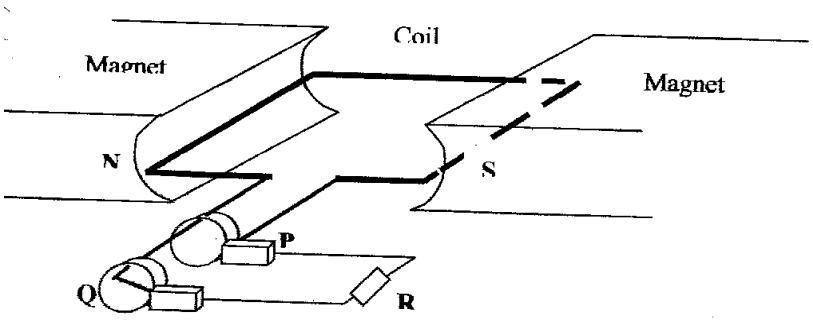
$$^{210}_{83}X \xrightarrow{r} {}^{210}_{84}Y \xrightarrow{\propto} {}^{c}_{d}Z$$

Identify the radiation r, find the values of c and d. (3 marks)

13. A hair drier is rated 2000W, 240V. Determine its resistance. (2 marks)

SECTION B (55 MARKS)

14. The figure below shows a simple electric generator.



a) i) Name the parts labeled P and Q (2 marks)

ii) State two ways of increasing the magnitude of the induced current in this type of generator. (2 marks)

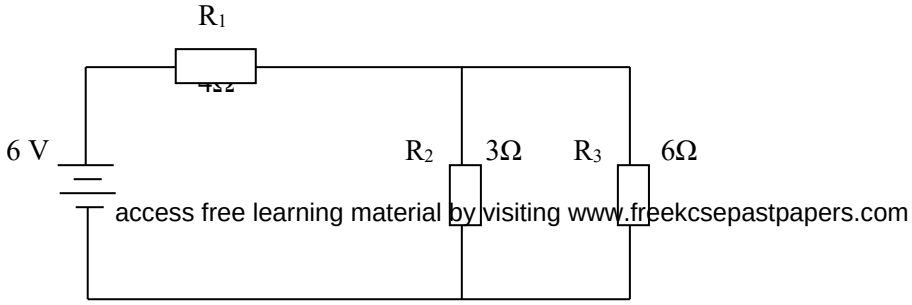
b) The primary coil of a transformer has 1200 turns and the secondary coil has 60 turns. The transformer is connected to a 240v a.c source. Determine the:

i) Output voltage (2 marks)

ii) Output current when the primary coil has a current of 0.5A. Assume there are no energy losses. (2marks)

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

b) The figure below shows a circuit.



Calculate:

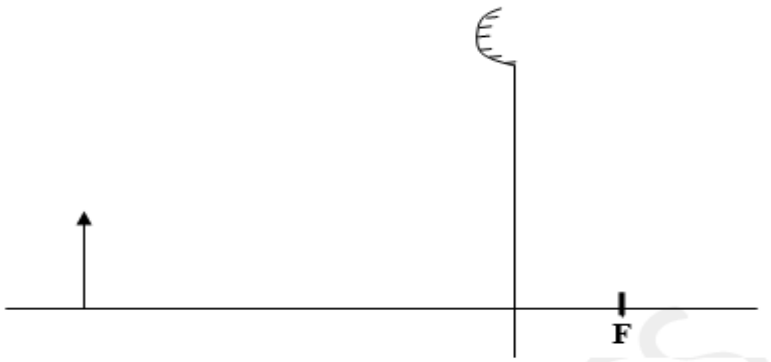
i) The total resistance of the circuit. (3 marks)

ii) The total current flowing in the circuit. (2 marks)

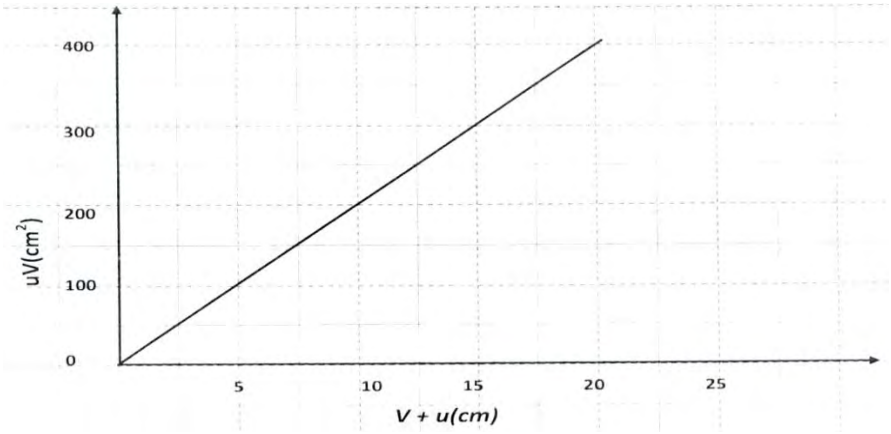
iii) The voltage drop across resistor R_1. (2 marks)

iv) The current through the 3Ω resistor. (3 marks)

16. (a) The figure below represents an object O placed 8m in front of a diverging mirror. F is the focal point of the mirror. Draw rays to locate the position of the image. (2 marks)



(b) A girl performed an experiment to measure the focal length of a converging mirror. In the experiment, a series of object distance, U(cm) and image distance V(Cm) were obtained and the graph UV (cm^2) against V + U obtained as shown below.



Use the graph to determine:

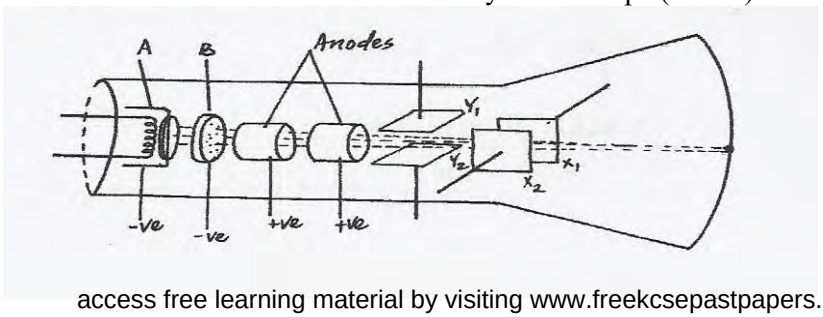
i) Focal length of the mirror. (2 marks)

ii) Radius of curvature. (2 marks)

(c) State two applications of diverging mirror. (2 marks)

(d) Explain how a concave mirror is used by a dentist to enlarge image of the tooth. (2 marks)

17. The figure below shows the main features of cathode ray oscilloscope (C.R.O)



a) (i) Name the parts labeled A and B. (2 marks)

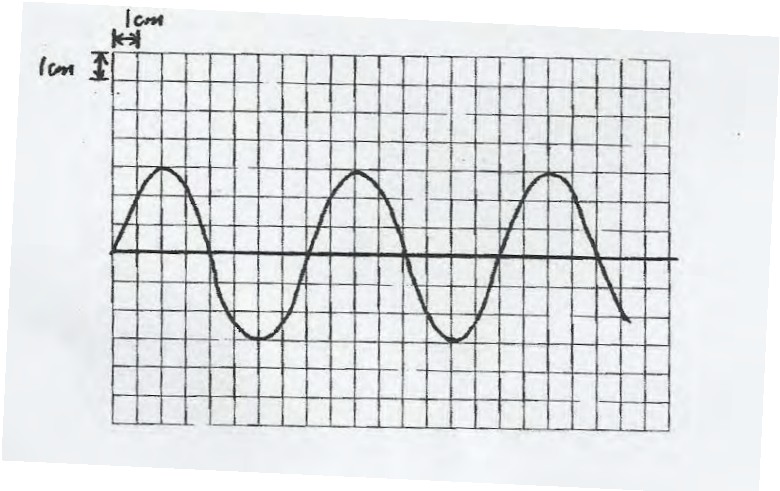
A ……

B ……

(ii) State the function of B and briefly outline how it works. (2 marks)

(iii) State two function of the anodes. (2 marks)

b) The output of an a.c generator was connected to the input of the cathode ray oscilloscope whose time base settling was 5 milliseconds per centimetre and the y-gain at 10 volts per centimetre, the figure below shows the waveform displayed on the screen of the C.R.O.



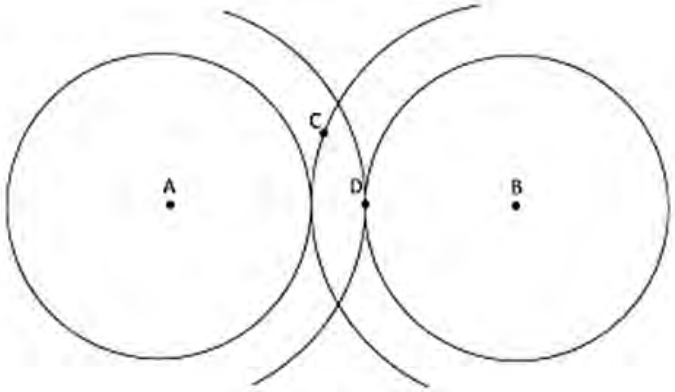
Determine

(i) The peak voltage of the generator. (2 marks)

(ii) The frequency of the voltage. (2 marks)

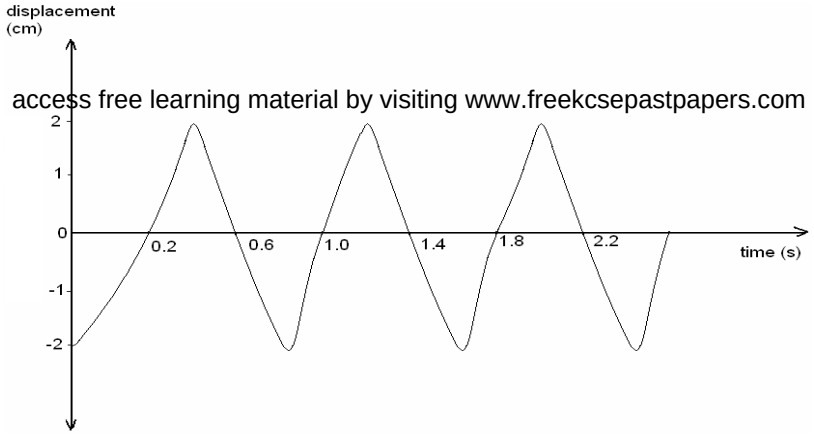
18. (a) Define doping (1 mark)
(b) Distinguish between a p-type and n-type semi-conductors (2 marks)
(c) Give one example of a semi-conductor and one example for a conductor. (2 marks)
(d) What is meant by donor impurity in a semiconductor? (1 mark)
(e) Why is a capacitor included in a bridge circuit? (1 mark)
(f) Sketch the graph for when a load is connected to a CRO, in a bridge circuit where a capacitor has been used. (3 marks)

19. a) The figure below shows crests of circular water waves spreading from two points **A** and **B** due to a vibrator. **C** and **D** are points on the surface of the water.



Given that the amplitude of each wave is 5 cm, state the amplitudes of the waves at point:
(i) C (1 marks)
(ii) D (1 marks)

b) The figure below shows a wave. Use it to answer the questions that follow.



i) State the period of the wave. (1 mark)
ii) If the wave has a wavelength of 2×10^{-2}m, determine the speed of the wave. (3marks

KANGUNDO
232/2
PHYSICS PAPER 3
DECEMBER 2021

PART A

You are provided with the following:

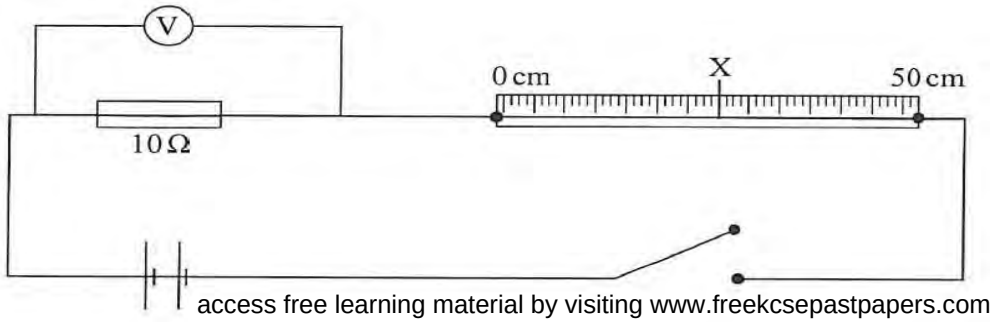
- A Voltmeter
- A resistor labelled 10 Ω
- A resistance wire mounted on a half metre rule
- Two cells in a cell holder
- A switch
- Eight connecting wires
- A micrometer screw gauge

Proceed as follows:

a) Measure and record the diameter d of the resistance wire X (1 mark)

d = …… mm
= …… m

b) Set up the circuit as shown in the figure below



I. Close the switch and record the potential difference $\mathbf{V_1}$ across 10 Ω resistor.
V_1 = …….. (1 mark)

II. Open the switch. Determine the current **I** flowing through in the circuit. (2 marks)

c) i. Now connect the voltmeter across wire X. close the switch and record the potential difference V_2 across wire X.
V_2 = …….. (1 mark)

ii. Determine the resistance **R** of the wire X (2 marks)

iii. Determine K the resistance per metre of wire **X** (1 mark)

iv. Determine **Q** given that $Q = \frac{\pi K d^2}{4}$ (*where d is in metres*) (2 marks)

PART B

You are provided with the following:

- A metre rule.
- A knife edge.
- One 50g mass and a 100g mass.
- Some thread.
- Some water in a beaker.
- Liquid L in a beaker.
- Tissue paper.

Proceed as follows:

d) Balance the metre rule on the knife edge and record the reading at this point.
Balance point …….. cm (1 mark)
(*For the rest of this experiment the knife edge must be placed at this position*.)

e) Set up the apparatus as shown in the figure 1. Use the thread provided to hang the masses such that the positions of the support can be adjusted.

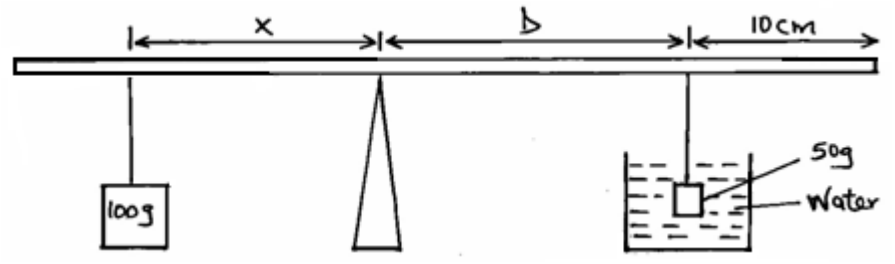


Figure 1

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 water. Record the values of **X** and **D**.

X = …….. cm (1 mark)

D = …….. cm (1 mark)

f) Apply the principle of moments to determine the weight W_1 of the 50 g mass in water and hence determine the upthrust U_W in water.

W_1 = ……...N (1 mark)

U_w = ……..……N (1 mark)

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

g) i. Now balance the metre rule when the 50g mass is fully immersed in the liquid L. Record the value of the distance x.

x = ……..cm (1 mark)

ii. Apply the principle of moments to determine the weight W_2 of the 50g mass in the liquid L and hence determine the up thrust U_L in the liquid.

W_2= …… (1 mark)

U_L= …… (1 mark)

(h) i) Determine the relative density R.D of the liquid L, given that: (1mark)

$$R.D = \frac{U_L}{U_w}$$

ii) Hence determine the density of liquid x in kg/m³. (Given that density of water in 1000kg/m³). (1 mark)

QUESTION 2

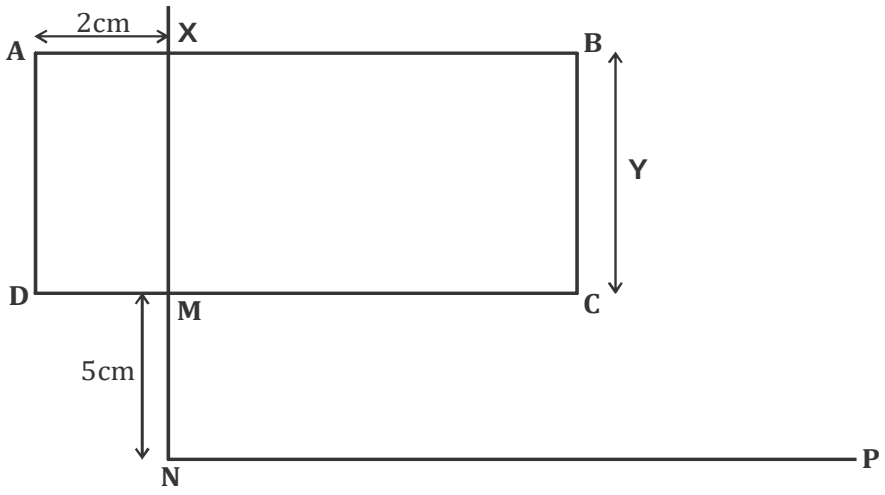
You are provided with the following:

- A glass block
- Soft board
- 2 plane paper
- Five optical pins
- Four thumb pins
- A protractor
- A 30cm plastic ruler

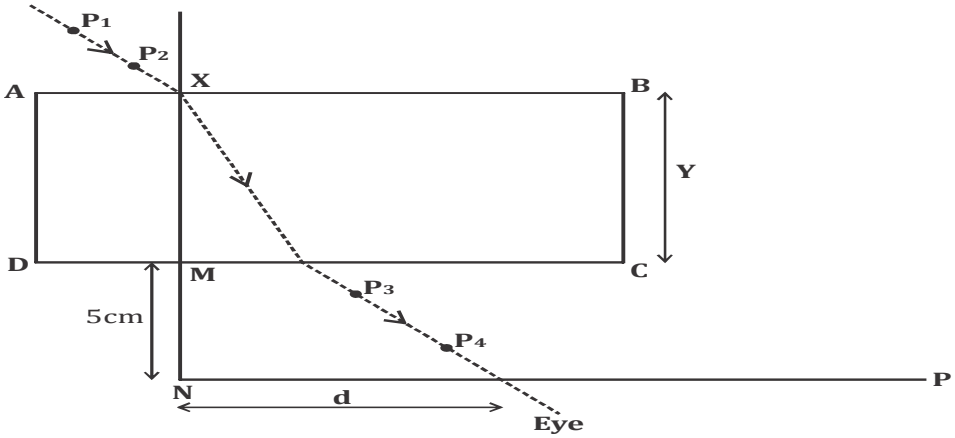
PART A

a) Fix the plane paper on a soft board using the four paper pins
b) Place the glass block on the plane paper. 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 and mark a point X on one of the longer side of the traced glass block as shown in the figure 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 the 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 = 10°. Fix two optical pins P_1 and P_2 along RX.
i) Replace the glass block to traced figure.
j) View the path of the incident ray RX through the glass block using the two pins P_3 and P_4. This can be done by ensuring that the images of P_1 and P_2 are in a straight line with the pins P_3 and P_4
k) Remove the glass block and draw the emergent ray through P_3 and P_4 as shown below.
l) Measure the distance, d, of the emergent ray from point N along line NP as shown in the figure below.



m) Record the corresponding values of d in the table 1 below.

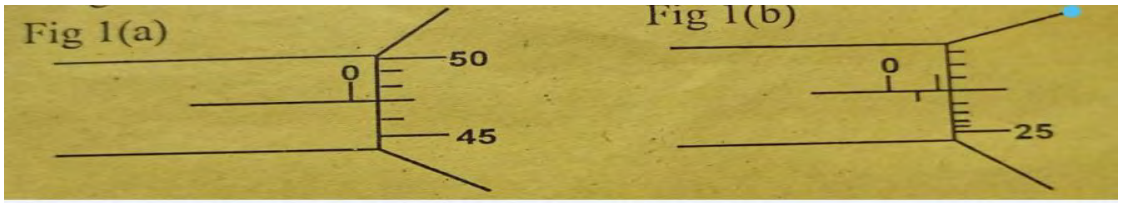
angle of incidence *I*	10°	20°	30°	40°	50°
Distance, d, (cm)					
sin *i*					
$\sin^2 i$					

n) Repeat the procedure for other values of i. (6 marks)
o) Plot a graph of $\sin^2 i$ (y-axis) against d on the grid provided. (5 marks)
p) Calculate the gradient of the graph. (3 marks)

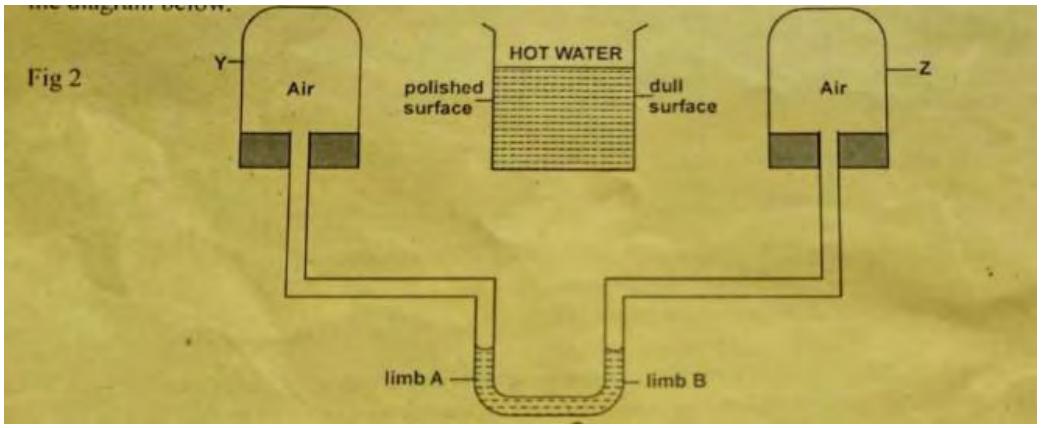
MURANG'A SOUTH MULTILATERAL EXAM
232/1
PHYSICS PAPER 1
THEORY

Section A (25 marks)
Answer all the questions in the spaces provided

1. Figure 1 (a) below is micrometer screw gauge when closed, and figure 1 (b) shows the same micrometer screw gauge measuring the thickness of a sim card.
   Determine the thickness of the sim card. (2mks)

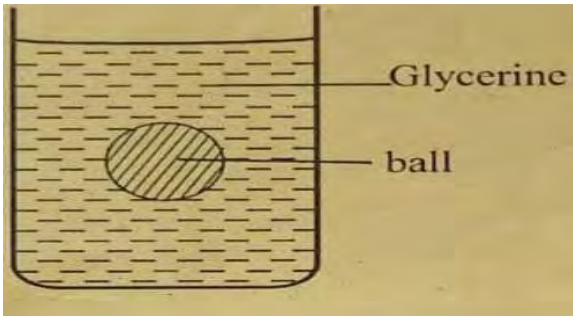


2. A rectangular container measures 2.4cm x 4cm x 6cm. what is the weight of the mercury that will fill the container to the brim. (take g =10N/kg, density of mercury =13600kg/m^3) (3mks)
3. It is painful when you press a small piece of stone with your palm of the hand than when you place the same stone on the palm. Briefly explain. (2mks)
4. Why are luggage compartments in buses placed under the seats rather than on the roof racks (1mks)
5. a) A uniform metre rule in balanced horizontally at its centre. When a mass of 50g is suspended at 4cm mark the rule balances horizontally if a mass M is suspended At 73cm mark. determine the mass m. (2 marks)
   b) Give one application of moment of force. (1mk)
6. Figure below shows a U-tube containing coloured water, two boiling tubes Y and Z both painted black. A container with hot water painted black on one side and polished shinny on the opposite side is placed as shown in the diagram below.



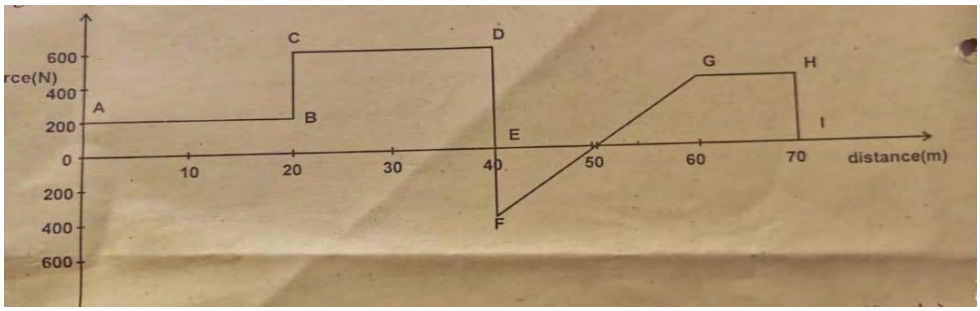
   (a) State the observation made after some time in the level of the liquid in the U-tube. (1mk)
   (b) Explain your observation (3mks)
7. A stone is thrown vertically upwards from the edge of a platform. Eventually the stone lands without bouncing on the ground below the platform. Taking upwards velocity to be positive sketch the velocity –time graph of the motion of the stone. (2mks)
8. Trees along a busy road grow bending towards the road, Explain. (1 mk)
9. A solid displaces 5.5cm^3 of ethanol when floating and 20.0cm^3 when fully immersed in it. Given that the density of ethanol is 0.8g/cm. Calculate the density of the solid. (3 mks)
   A student observed light rays penetrating through a small hole on the roof of smoky room. State the observation made on the smoke particles. (1 mk)
10. Give the energy transformation involved when a boy kicks a football to a wall. (1mk)

11. Identify the forces acting on a ball bearing as it moves down a cylinder containing glycerine (2 mks)



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

13. i) State the law of conservation of energy. (1mks)
    ii). It is easier to use a thick screw driver than a thin one. Explain. (1mk)
    b) The figure below shows a force-distance graph for a car being towed on a horizontal ground.



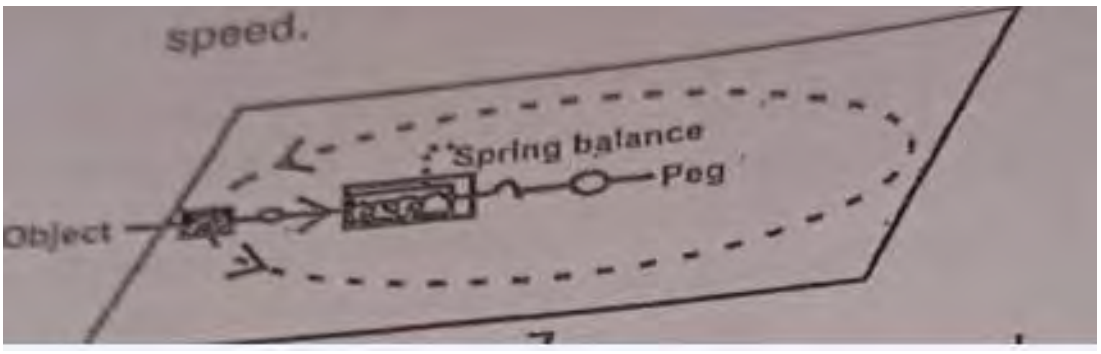
From the graph;

i). Calculate the total work done. (4mks)

i). If the velocity just before reaching point D is 0.6m/s. Calculate the power developed by the source providing the force at this point. (2mks)

c). An electric pump can raise water from a low level reservoir to a higher level reservoir at a rate of 3.6x10kg/hr. The vertical height the water is raised is 400m. if the rate of energy loss inform of heat is 200kw,determine the efficiency of the pump. (3.mks)

14. (a) State two ways in which the centripetal force on a body of mass m can be increased. (2mks)
    (b) Figure below shows an object at the end of a light spring balance connected to a peg using a string. The object is moving in a circular path on a smooth horizontal table with a constant speed.



(i) State what provides the centripetal force (1mk)
(ii) Indicate with an arrow on the figure the direction of the centripetal force (1mk)
(iii) State with a reason why the object is accelerating while its speed remains constant. (1mk)
(iv). Given that the mass of the object is 0.5kg and it is moving at a speed of 8m/s at a radius of 2m ,determine the reading on the spring balance (3mks)
(iv) A stone thrown vertically upwards reaches a height of 100m. determine:

(i) Initial velocity of the stone. (neglect air resistance and take g= 10m/s) (3mks)

Total time the stone is in air (2mks)

15 . Draw a block and tackles pulley system that has a velocity ration of 3. (2 mks)

Determine:

i) The mechanical advantage of the system in 80% efficient (3marks)

ii) The effort used, if the load lifted is 4.8N (3mks)

iii) The work done by the effort in lifting the load through a distance of 70cm (3marks)

iv) How much energy is wasted? (2 marks)

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

(b). The following data was obtained from an experiment to determine specific heat capacity of a solid by electrical method.

Mass of the solid. ……750g

Initial temperature of solid……..200C

Ammeter reading……1.0A

Voltmeter reading……6.0V

Final temperature of the solid…….240C

Time for which current flows in water……..6 minutes.

(i) Draw a simple diagram to show how the experiment was done. (3mks)

(ii). From the data given calculate;

(I). Electrical energy supplied to water. (2mks)

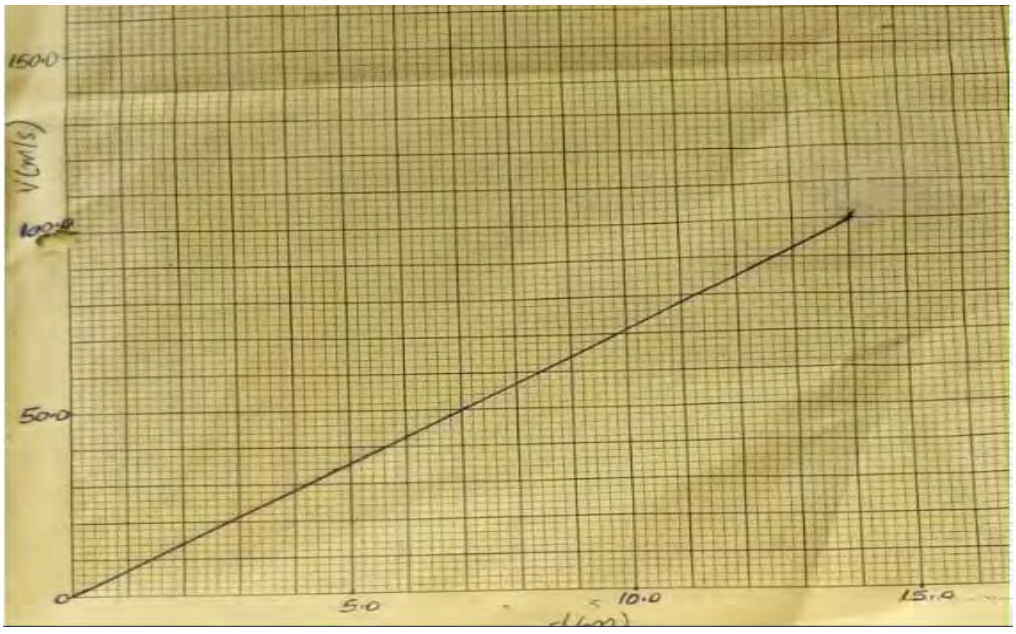
(II). Specific heat capacity of the solid. (3mks)

(c). The heat capacity of kerosene is $84JK^{-1}$. Calculate the quantity of heat energy required to warm kerosene from 20^0C to 26^0 (3mks)

17.

(a) State Newton's first law of motion (1 mk)

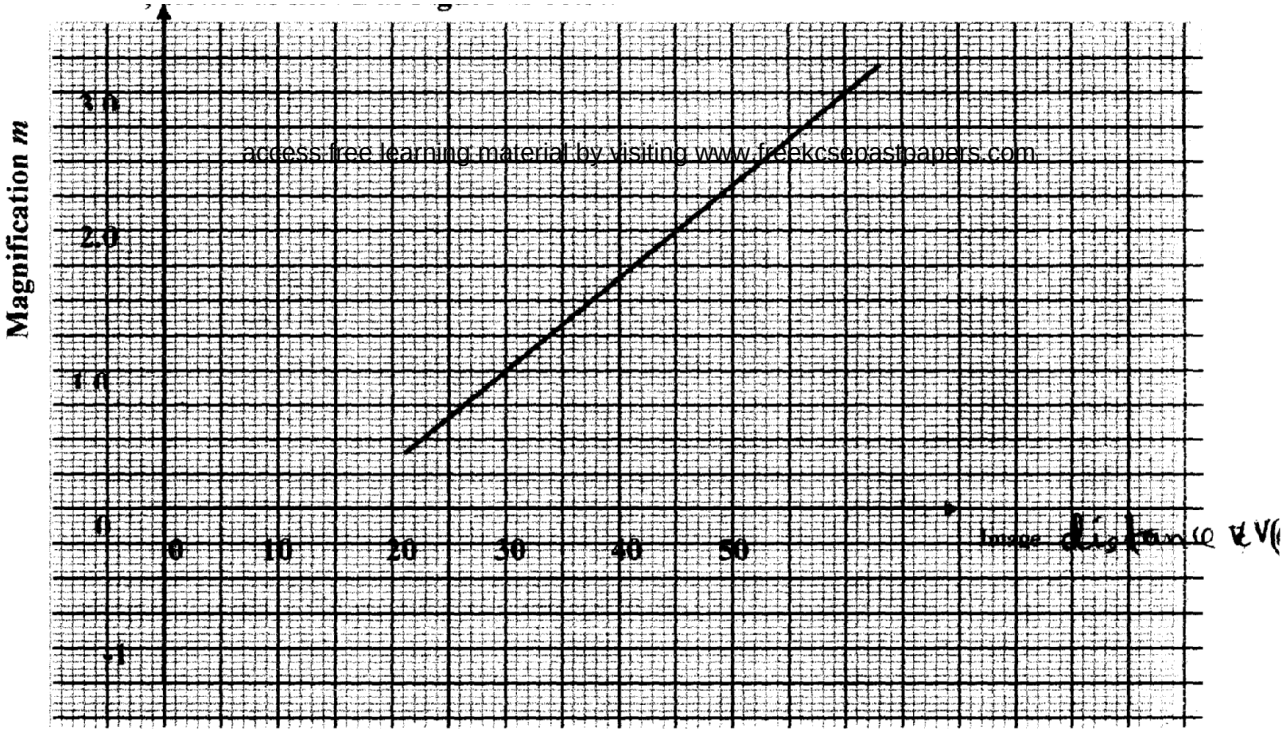
so that it slides on the bench surface for a distance d, before coming to a stop. The values of d were measured and recorded for various values of initial velocity. Figure below shows the graph of u^2 against d.



(i) Determine the slope of the graph. (2mks)
(ii) Given that $u^2 = 20kd$, where k is a constant for the bench surface, determine the value of k form the graph. (2mks)
(iii). A car of mass 800kg start from rest and accelerates at$0.12m/s^2$ determine its momentum after it has moved 400m from the starting point (3 mks)

MURANG'A SOUTH MULTILATERAL EXAM
232/2
PHYSICS (THEORY)
Paper 2
SECTION A 25MARKS

1. At what angle should two plane mirrors be inclined at to produce 5 images? (2marks)
   In a simple cell consisting of copper and zinc plates, bubbles of gas are seen forming around the copper plate
   i) What is the name given to this defect (1mk)
   ii) Suggest how the defect you have named in 1 (i) above can be minimized (1mk)
2. In an experiment to determine the focal length of a converging lens using the lens formula, several values of image distance corresponding to value of object distance U were determined and a graph of magnification m against image distance v, plotted as shown in **Figure 11** below

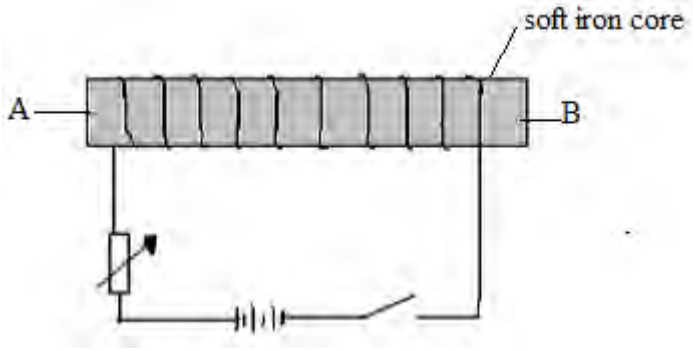


The equation of the graph can be represented by the equation

$$m = \frac{v}{f} - 1$$

(i) What does the gradient of the graph represent? (1mk)
(ii) Determine the focal length of the lens. (2mks)
3. One way of magnetizing a magnet is hammering. Explain how the magnetization is achieved (2marks)

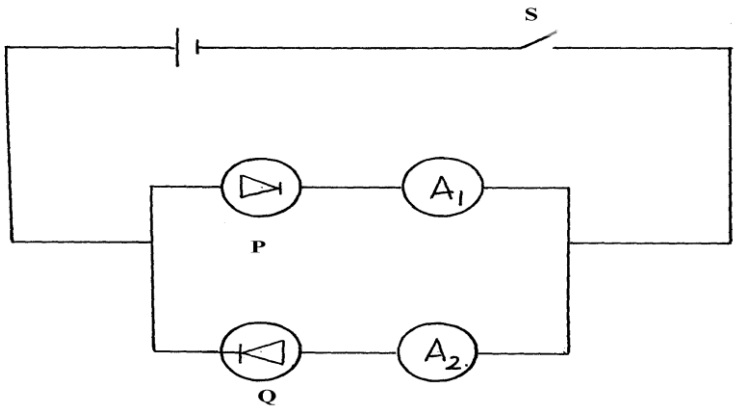
4. Figure below shows a solenoid wound on a soft iron core



3

State the polarities at point A and B when the switch is closed (2mark)

Figure below shows a circle with two diodes **P** and **Q** and a cell:-



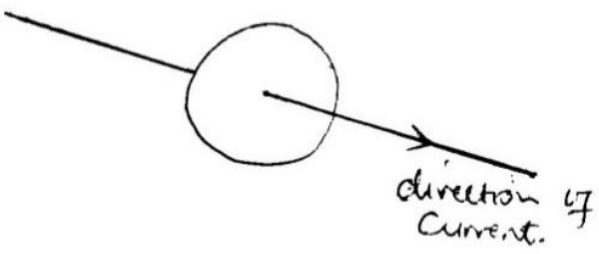
Explain the observation which would be made if **S** is closed (2mks)

5. The following is a part of a radio – active series.

$$^{210}_{83}X \xrightarrow{r} {}^{210}_{84}y \xrightarrow{\propto} {}^{c}_{d}Z$$

Identify the radiation r, find the values of c and d. (3 marks)

6. State one reasons why Alluminium is preferred to copper in transmission of power (as overhead cables) (1mark)
7. Define the term 'wavelength' of a transverse wave (1mark)
8. A boy standing 400m away from a cliff claps his hands and hears an echo 2.5s later
   Determine the speed of sound in air (2marks)
9. Velocity of light in water is 2.2×10^8m/s while in glass velocity is 2.0×10^8m/s. Calculate the angle of incidence in water which could produce an angle of 30^0 in glass (3marks)



a) On the same diagram draw, the magnetic field pattern produced. (1mk)
b) State one possible rule that can be used to predict the field direction produced in the above diagram. (1mk)

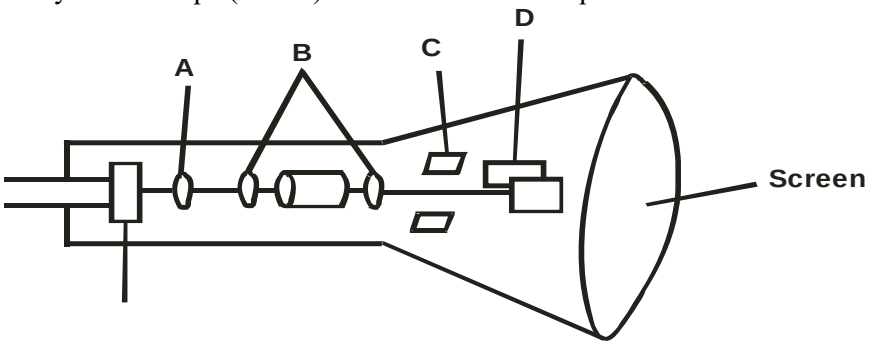
10. State one advantages of using a convex mirror as a driving mirror. (1mk)
Table below shows part of the electromagnetic spectrum

Microwave	Infra-red	Visible light	A	X-ray

Name part labelled A (1mark)

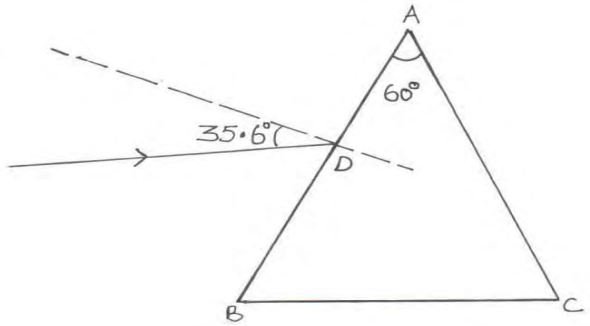
SECTION B 5 5MARKS

11. The figure below represents a cathode ray oscilloscope (C.R.O). use it to answer the questions that follows.



a) 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)

12. (a) The refractive index of glass is $^{3}/_{2}$ and that of water is $^{4}/_{3}$. Calculate the refractive index of glass with respect to water. (2 mks)
(b) The figure below shows a ray of light incident at an angle of 35.6□ at point D on the first face of a glass prism ABC. The refractive index of the prism is 1.6.

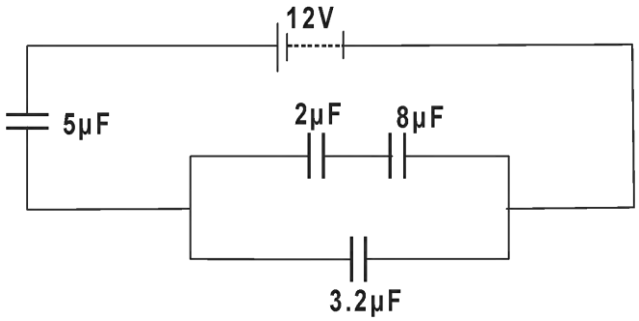


i) Determine the angle of refraction at point D. (2 mks)
ii) Find the angle of incidence of the refracted ray on the face AC to 1 decimal point. (2 mks)
iii) Complete the ray diagram to show the emergent ray from the face AC. (2 mks)
iv) State **two** conditions necessary for total internal reflection to occur. (2 mks)

13. a) State one application of a capacitor. (1 mk)

b) Figure 7 shows four capacitors connected to a battery of 12 volts.

c)



Calculate:

i) Effective capacitance. (2 mks)

ii) Charge on 3.2μF (2 mks)

iii) Potential Difference across 5μF (2 mks)

iv) The energy stored by 2μF (2 mks)

(c) What are effects on capacitance of a parallel plate capacitor when :

(i) Increasing the area overlap of the plates ? (1mk)

(ii) Increasing the distance of separation between plates ? (1mk)

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

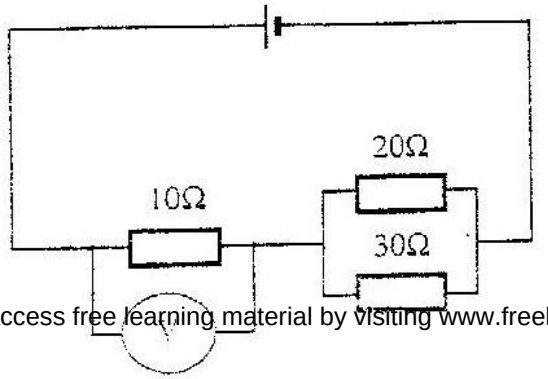


Figure 10

Determine the

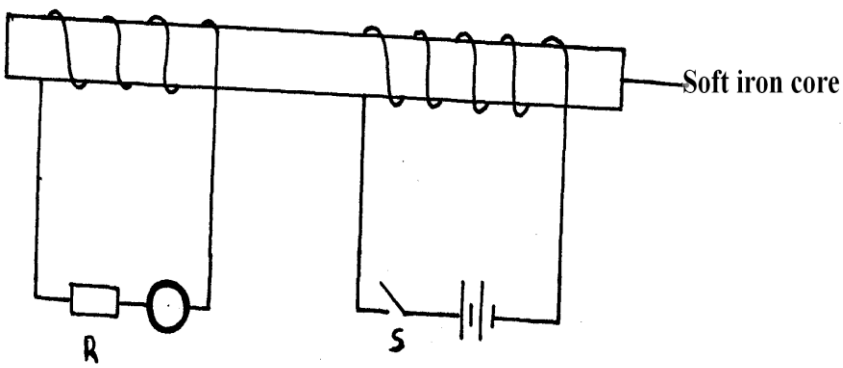
(i) Total resistance in the circuit (2 marks)

(ii) Current in the circuit (1 mark)

(iii) Reading of the voltmeter (2 marks)

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

b) The figure shows two coils of insulated copper wires wound on a single soft iron core. One coil is connected to a battery through a switch and the other is connected to a resister through a galvanometer.



It is observed that as the switch is closed, the pointer of the galvanometer deflects momentarily. The same as when the switch is opened.

i) Explain why the pointer deflects momentarily. (2mks)

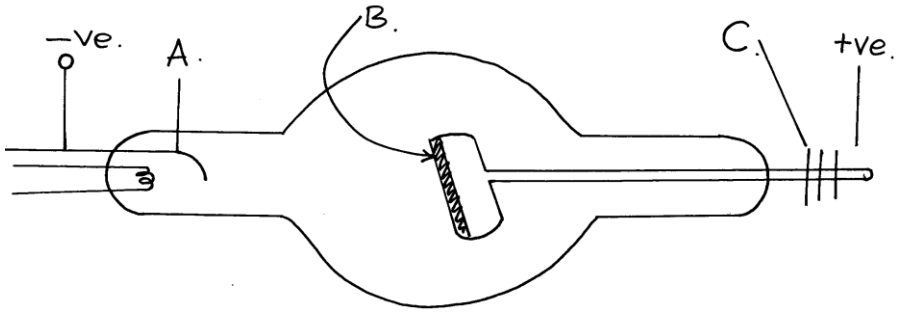
ii) State one way in which the current through R can be increased. (1mk)

c) i) State one way in which power is lost in a transformer. (1mk)

ii) A transformer uses 240V ac supply to deliver 9A at 80V to a heating coil. If 10% of the energy taken from the supply is lost in the transformer itself, What is the current in the primary winding? (2mks)

15. (i) The diagram below shows simplified diagram of an x-ray tube,

Figure 8



(a) Name the parts **A, B,** and **C**. (3mks)

(b) What adjustments would be made to:

(i) Increase the penetrating power of the x-rays produced. (1mk)

(ii) Increase the intensity of the rays produced. (1mk)

(c) Name a suitable material for the part marked **B** and give a reason for your choice. (2mk)

(d) Name a suitable material for the part marked **C** and state its purpose. (2mk)

(e) Why is it necessary to maintain a vacuum inside the tube? (1mk)

a) In a certain X- ray tube electrons are accelerated by p.d of 12 kV. Assuming all energy goes to produce X-rays, determine the frequency of the X-rays produced
(Planck's constant $=6.63\times10^{-34}$ Js. Charge of an electron$=1.6\times10^{-19}$C) (3 mks)

MURANG'A SOUTH MULTILATERAL EXAM
232/3
PHYSICS PAPER 3
PRACTICAL

QUESTION 1

You are provided with

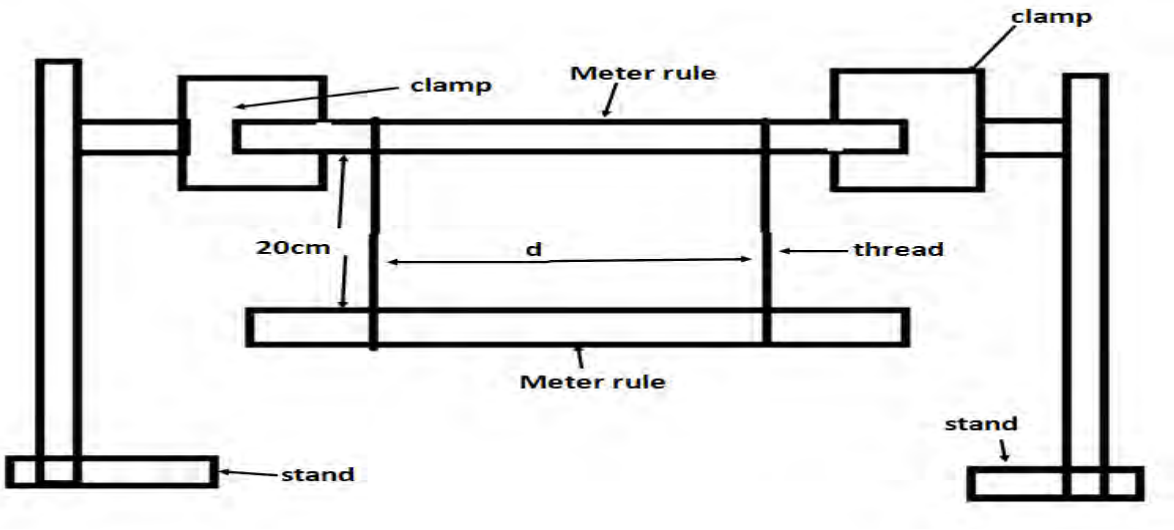
- 2 metre rulers
- A half metre rule
- Two complete stands
- 2 pieces of thread, each 40 cm long
- Stop watch
- Vernier calipers (can be shared)

a) (i) Using the Vernier caliper measure the width of the metre rule = _____cm. (1 Mk).
Thickness of the metre rule = _____cm (1 Mk)

(ii) Find the volume of the material of the metre rule:
Volume =_____cm^3 (1mk)

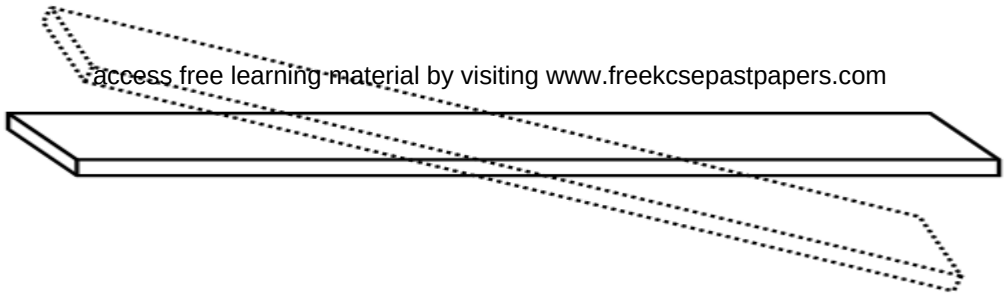
(iii) Find the density of the material of the meter rule given that it has a mass of 100g
Density = _____g/cm3 (1mk)

b) Now set up the apparatus as shown in the diagram below



Ensure the loops of the thread are loose for easy sliding of the threads along the rulers. The separation between the two meter rules must remain 20cm throughout the experiment.

c) Adjust the position of the threads such that one is on the 10cm mark and the other on the 90cm. mark so that d = 80cm.
Maintain the threads vertical by making the separation of the loops on the two rulers the same.
Displace one end of the lower meter ruler slightly on the horizontal plane so that when released it oscillates about a vertical axis as shown in the figure below.



Measure the time for 20 oscillations and record the values in the table given below.

d) Repeat the procedure in (c) for other values of d in the table (set the values of d by adjusting the position of the loops in steps of 5cm on both sides of the meter rules.
Complete the table below (6mks)

d (cm)	**d(cm)**	**$\frac{1}{d^2}$ (m^{-2})**	**Time for 20 oscillations t(s)**	**Period T (s)**	**T2 (S2)**
80					
60					
50					
40					
30					
20					

e) Plot a graph of T^2 (S^2) against $\frac{1}{d^2}$ (m^{-2}) (5MKS)

f) determine the slope of the graph (3mks)

g) given the equation of the graph is $T2 = \frac{16K^2}{d^2}$
Use the graph to find the value of K (2mks)

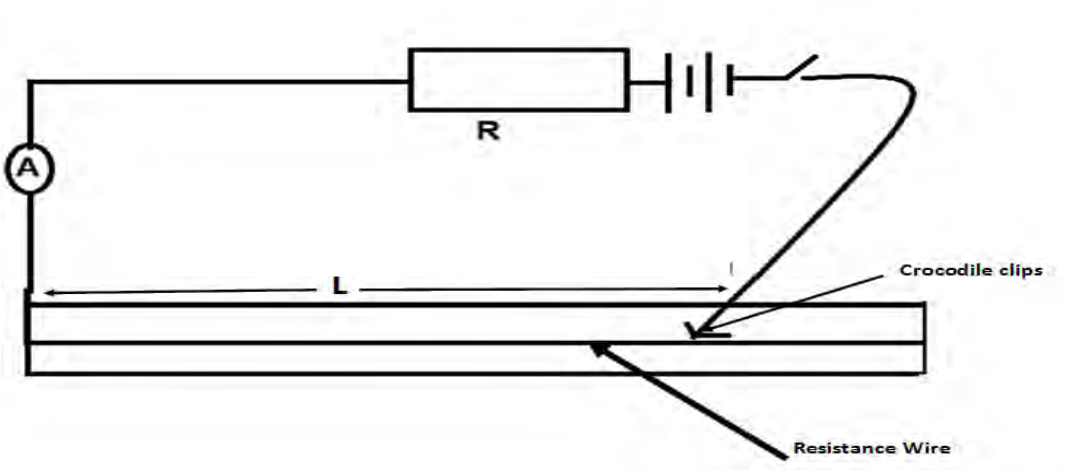
QUESTION 2

PART A

You are provided with the following apparatus.

- 2 new dry cells size D (1.5 V)
- A cell holder
- One 100cm resistance wire mounted on a millimeter scale
- One switch
- One voltmeter 0-3v
- One ammeter 0-1A
- 8 connecting wires (4 with at least 1 crocodile clip)
- Resistor wire mounted on card board

a) Connect the circuit as shown below



b) Adjust the position of crocodile clip on the resistance wire to a point such that L = 10CM.

c) Record in the table below the value of P.D across R and corresponding current through R.

d) Repeat procedure in (b) and (c) Above, for L =20, 30, 40, 50, 60, 70 and 80cm.

TABLE OF RESULTS

L(CM)	10	20	30	40	50	60	70	80
V(VOLTS)								
I(AMPERES)								

(4MKS)

i) On the grid provided plot the graph of V(Y - Axis) against I(X - Axis) (5Mks)

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

iii) What quantity is represented by the slope of the graph? (1mk)

PART B

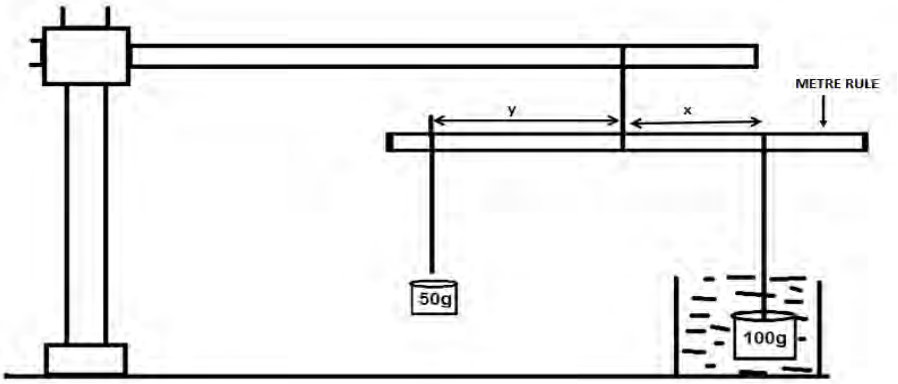
You are provided with the following

- Metre rule
- Retort stand , clamp and boss
- 500ml beaker ¾ full of water
- 100g mass
- 50gm mass
- 3 pieces of thread

Proceed as follows

(a) Balance the meter rule horizontally by suspending it from the stand and clamp with one of the threads. Record the balance point G. (1MK)

(b) (i) Suspend the 100g mass from the meter rule at a point X such that X =10cm from point G. with 100g mass completely immersed in water in the beaker, hang the 50g mass from the meter rule and adjust its position until the system is in equilibrium as shown in the diagram below.
Note the point of suspension P of the mass 50g (1mk)



(ii) Measure distance Y . (1mk)

(iii) Using the information above, calculate the up thrust on the 100g mass if the density of Water is 1000kg/m^3 (4mks)

MURANG'A SOUTH MULTILATERAL EXAM SECOND TERM 2021
PHYSICS FORM 4 PRACTICAL CONFIDENTIAL
QUESTION 1

Each candidate must be provided with the following

- 2 metre rulers
- A half metre rule
- Two complete stands

- 2 pieces of thread, each 40 cm long
- Stop watch
- Vernier calipers (can be shared)

QUESTION 2(PART A)

Each candidate must be provided with the following

- ✓ Two new dry cells size D (1.5 V)
- A cell holder
- One 100cm resistance wire mounted on a millimeter scale (SWG 32)
- One switch
- One voltmeter 0-3v
- One ammeter 0-1A
- 8 connecting wires (4 with at least 1 crocodile clip)
- Resistor wire of length 25cm mounted on card board or cartoon (SWG 28)

QUESTION 2 (PART B)

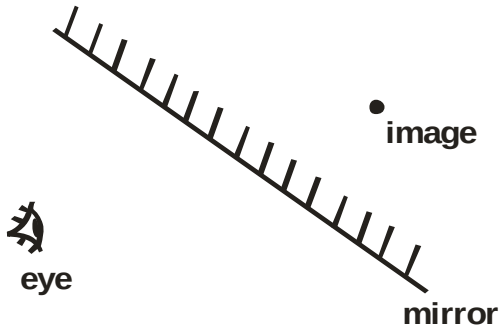
Each candidate must be provided with the following

- Metre rule
- Retort stand , clamp and boss
- 500ml beaker ¾ full of water
- 100g mass
- 50gm mass
- 3 pieces of thread

SAMIA SUB-COUNTY JOINT EXAMINATIONS
232/2
PHYSICS PAPER 2
(THEORY)

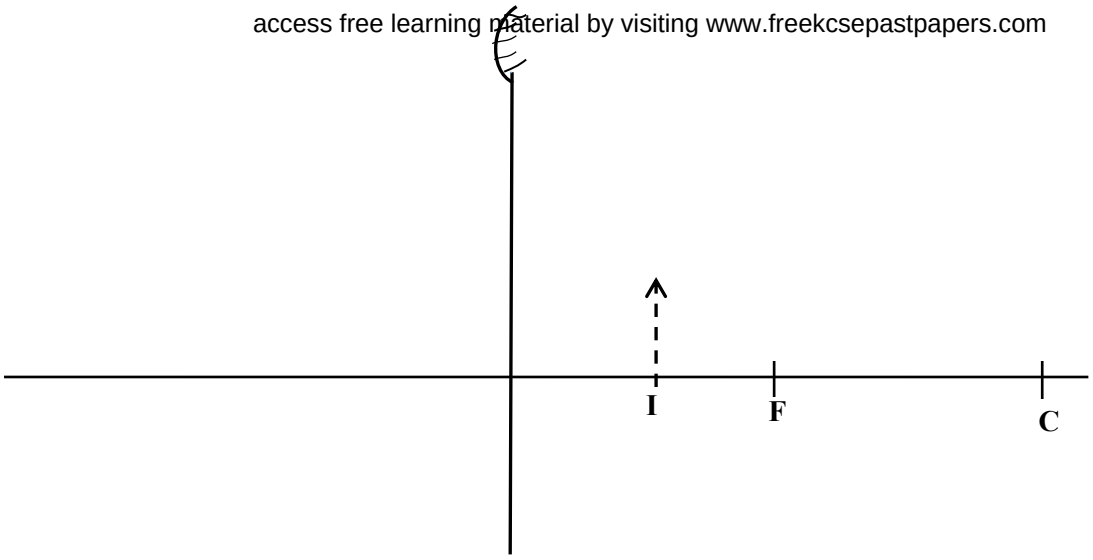
SECTION A (25 MARKS)
Answer ALL the question in this section in the spaces provided

1. The figure below represents a point image formed by a mirror.



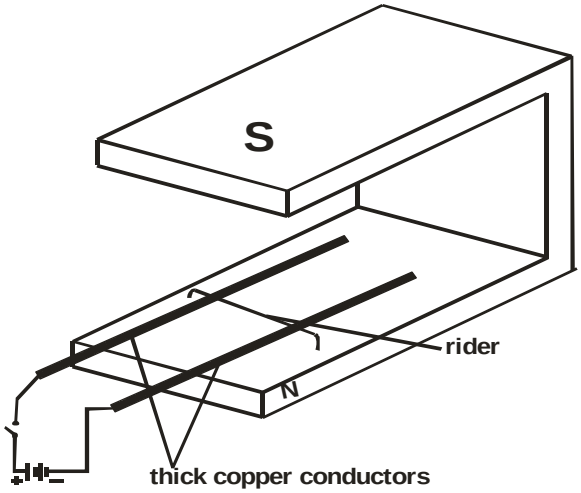
Sketch rays to show how the image is formed and seen by the eye. (2 mks)

2. State any **two** ways of increasing the size of an image formed by a pinhole camera. (2 mks)
3. A leaf electroscope A is charged and placed on a bench. Another uncharged leaf electroscope B is placed on the same bench and moved close to A until the caps touch each other. **State** and **explain** what is likely to be observed on the leafs of A and B. (2 mks)
4. State **one** way in which polarization reduces the current produced by a simple cell. (1 mk)
5. Using the domain theory of magnetism, explain why a bar magnet may lose its magnetism when hammered. (1 mk)
6. The figure below shows an image, I formed by an object placed in front of a convex mirror.



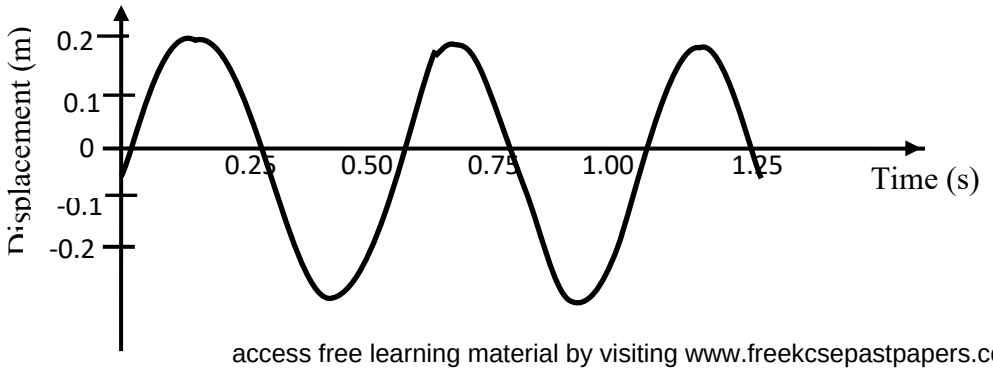
On the same diagram, draw appropriate rays and locate the object. (2 mks)

7. The figure below shows two parallel thick copper conductors connected to a d.c power supply. A rider made from a thin copper wire is placed on the conductors as shown.



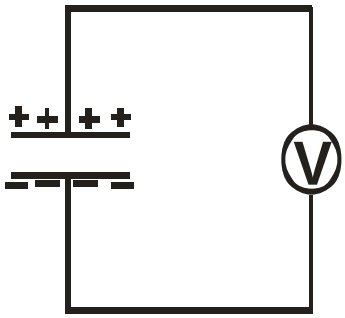
State and explain what is observed on the rider when the switch is closed. (2 mks)

8. The figure below shows how the displacement varies with time for a certain wave.



Determine the frequency of the wave. (2 mks)

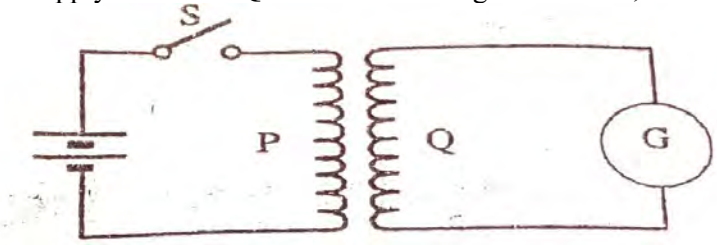
9. The figure below shows a voltmeter connected across two charged parallel plates.



When a thin sheet of mica is inserted between the plates, the reading of the voltmeter is observed to reduce. Explain this observation. (2 mks)

10. An electric heater is rated **240 V**, **3000 W** is to be connected to a **240 V** mains supply, through a **10 A** fuse. Determine whether the fuse is suitable or not. (3 mks)

11. The figure below shows two identical copper coils **P** and **Q** placed close to each other. Coil **P** is connected to a d.c power supply while coil **Q** is connected to a galvanometer, **G**.



a) **State** and **explain** what would be observed on the galvanometer immediately the switch **S** is closed. (2 mks)

b) State the difference that would be noted in the observation made in (a) if the number of turns in coil **Q** were halved. (1 mk)

12. The activity of iodine was found to be 1 024 counts per minute. After 80 days, the activity became 32 counts per minute. Determine the half-life of iodine. (3 mks)

SECTION B (55 MARKS)

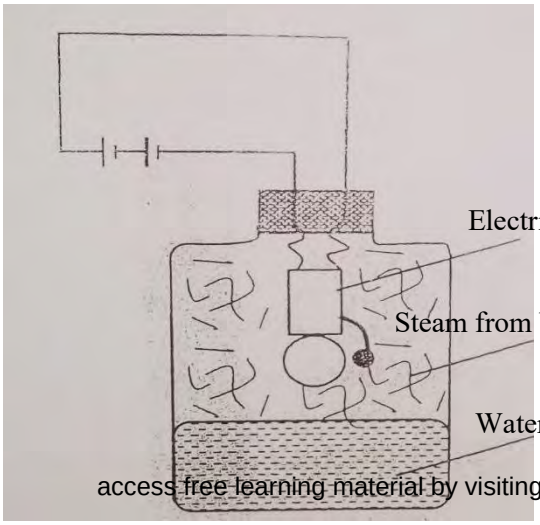
Answer ALL the questions in this section in the spaces provided

13. a) State one difference between light and sound waves (1 mk)

b) In determining the depth of a sea, an echo sounder produces **ultrasonic sound**. Give **two** reasons why this sound is preferred. (2mks)

c) Explain how an increase in temperature affects the velocity of sound in air. (2 mks)

d) The figure below shows a set up made by a Form 2 student to study an aspect of a wave.



(i) State what happens to the sound from the bell as the bottle and its contents are cooled to 0°C (1 mk)

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

e) A boy stands some distance from a high wall and claps his hands. He claps again each time he hears an echo.

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

(ii) The boy's friend notes that it takes 10 s to make 11 claps. Determine how far the boy is from the wall, given that the speed of sound in air is 330 m/s. (2 mks

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

b) With an aid of a diagram, describe an experiment to verify Ohm's law for a wire. (4 mks)

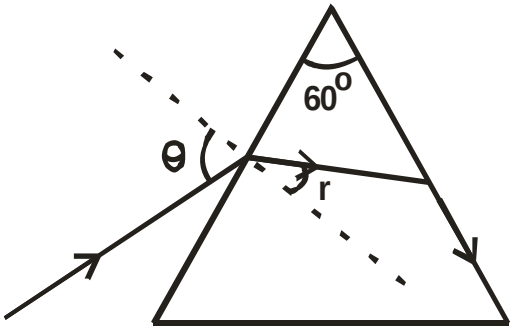
c) Two resistors, R_1 and R_2 are connected in series to a 10 V battery of negligible internal resistance. The current that flows in the set-up is 0.5 A. When R_1 is connected alone to the battery, the current that flows is 0.8 A. Calculate:

(i) The value of R_2 (3 mks)

(ii) The current that flows when R_1 and R_2 are connected in parallel to the same battery (3 mks)

15. a) State **two** conditions necessary for total internal reflection to occur. (2 mks)

b) The figure below shows the part of a ray of yellow light through a glass prism. The speed of yellow light in the prism is 1.88×10^8 m/s.

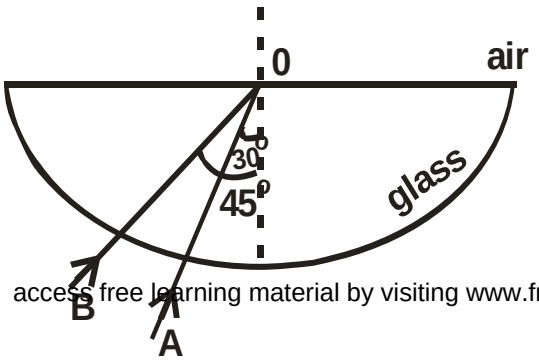


i) Determine the refractive index of the prism material (Speed of light in air, $C = 3.0 \times 10^8$ m/s) (2 mks)

ii) Show on the figure the critical angle **C**, and determine its value. (3 mks)

iii) Given that $r = 21.2^o$, determine angle θ. (2 mks)

c) The figureshows two rays A and B entering a semi-circular glass block which has a critical angle of42^o. The rays are incident at point O.



(i) Complete the path of the two rays from point O. Label A^1 and B^1 the corresponding rays. (2 mks)

(ii) Calculate the refractive index of the semicircular glass block. (2 mks)

16. a) (i) State two properties of X — rays (2mks)

(ii) In a certain X-ray tube, electrons are accelerated by a potential difference of 10KV. Assuming that 5% of the energy is converted into X — rays, determine the frequency of the X-rays produced. (h = 6.62 x 10-34Js , e = 1.6 x 10-19 C) (3mks)

b) Describe how a P-type semiconductor is formed (3mks)

c) Give one experimental observation which shows that each of the following is not an electromagnetic wave: (2 mks)

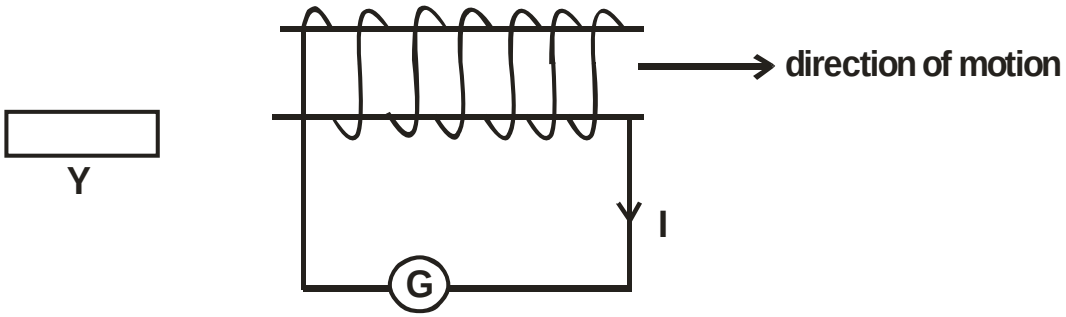
(i) Sound waves

(ii) Cathode rays

d) A source of radiation gives photons of energy 5.9×10^{-19} J. Calculate the wavelength of the photons (Planck's constant, **h** = 6.23×10^{-34}Js and the speed of light, c = $3.0 \times 10^8 m/s$) (2 mks)

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

b) A coil is moved quickly away from the end of a stationary magnet Y and current noted to flow asshown below.



(i) Indicate on the same figure, the polarity at the end of the coil near the magnet Y. (1 mk)
(ii) State the essential condition for emf to be induced in the coil above. (1 mk)

c) A transformer has 800 turns in the primary winding and 40 turns in the secondary winding. The current in the primary is 0.2 A when connected to an alternating e.m.f of 240V. Find:
(i) The secondary e.m.f. (2mks)
(ii) The power in the secondary if the transformer is 80% sufficient. (2mks)

SAMIA SUB-COUNTY JOINT EXAMINATIONS
232/3
PHYSICS PAPER 3
(PRACTICAL)

Question 1

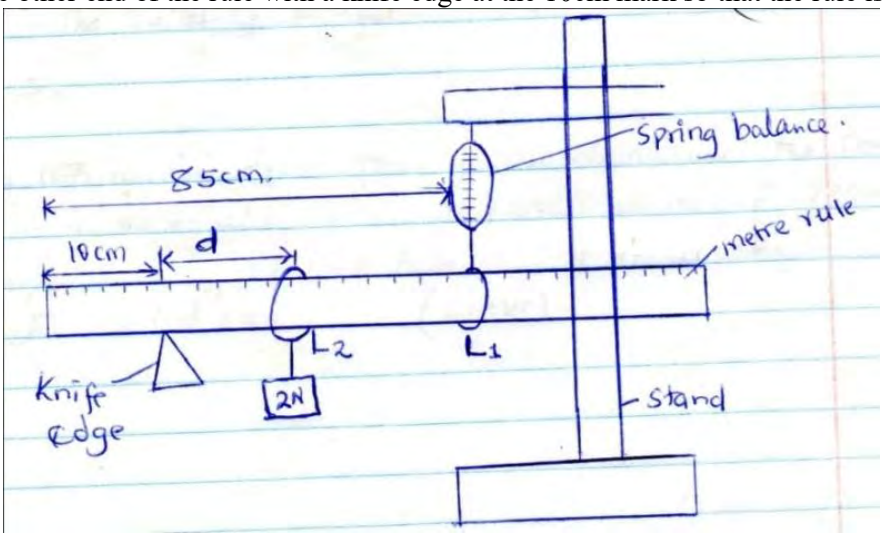
You are provided with the following:

- A metre rule
- A spring balance

- A mass of 200g (2N) with a hook or (two 100g masses)
- Stand
- Knife edge support.
- Two light strings about 10cm long.

Proceed as follows:

(a) Using the string provided make two loops to be used as hooks L1 and L2 in the diagram.
(b) Suspended the spring balance from a clamp and using one loop to support the rule from the spring so that the loop L2 is on 85cm mark.
(c) Support the other end of the rule with a knife edge at the 10cm mark so that the rule is horizontal.



(d) Using loop 1 suspended the 2N weight at a distance d=10cm from the knife edge as shown and take the reading of the spring balance, record the results in table 1.

(e) Adjust the distance d to 20cm, 30cm e.t.c and each time recording the reading of the balance to complete the table.

Table 1

Distance (d)	10.0	20.0	30.0	40.0	50.0	60.0	70.0
Force (N)							

(7marks)

(f) Plot a graph of force F against distance d(cm) (5 marks)

(g) From your graph determine:

i) The slope (2mks)

ii) The value of F when d=0 (2mks)

(h) Using the information from your graph, determine the constant k and m in the equation below and state units, f represents the reading of the balance and d is as shown in the above. **F=2md +40k.** (4marks)

Question 2

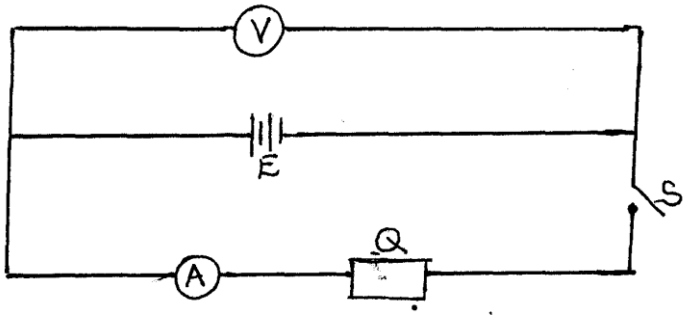
PART A

You are provided with the following:

- Two new dry cells
- A resistor labeled Q
- Wire mounted on a millimeter scale
- 6 connecting wires with crocodile clips on one end of at least three
- A voltmeter
- An ammeter
- A switch

Proceed as Follows:

(a) Connect the apparatus provided as shown in the figure below.



(i) Take the voltmeter reading when the switch S is open.

V_1 = …… volts (1 mark)

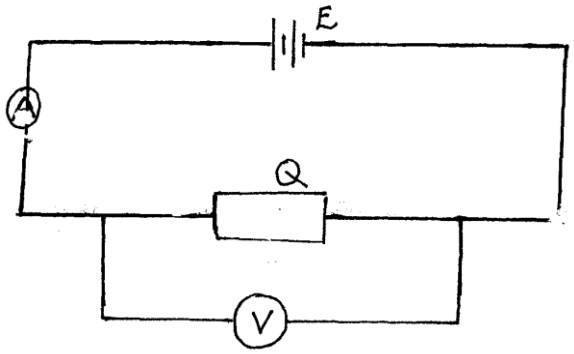
(ii) Close the switch S, and take the voltmeter reading V_2 and the ammeter reading I

V_2 = …… volts (1 mark)

I_1 = ……... Amperes (1 mark)

(iii) Calculate the quantity P = $\frac{V_1 - V_2}{I_1}$ (2 marks)

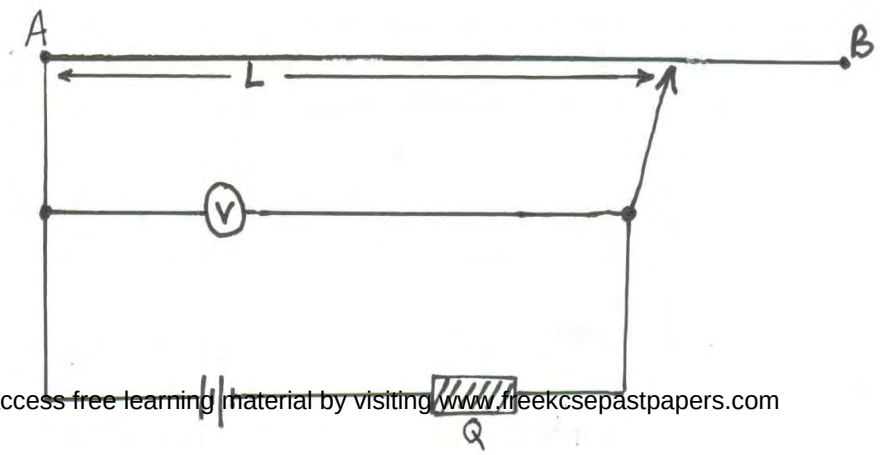
(b) Set up the circuit as shown in the figure below



(i) Take the voltmeter reading V and the ammeter reading I. (2 marks)
V = ……
I = ……

(ii) Determine the resistance R of Q (2 mark)

(c) Set up the circuit shown in the figure below



(d) Move the crocodile clip along the wire AB to a point such that L = 100cm. Note the voltmeter reading and record in table 2.

(e) Repeat (d) above for values of L = 80cm, 60cm, 40cm, 20cm and 0 cm, tabulate your results. (5 marks)

Table 2

Length L (cm)	**100**	**80**	**60**	**40**
$\frac{1}{L}\left(\frac{1}{cm}\right)$				
Voltmeter Reading (V)				
$1/V$ $(\frac{1}{V})$				
$Z = \frac{1/L}{1/V}$ **(V/cm)**				

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

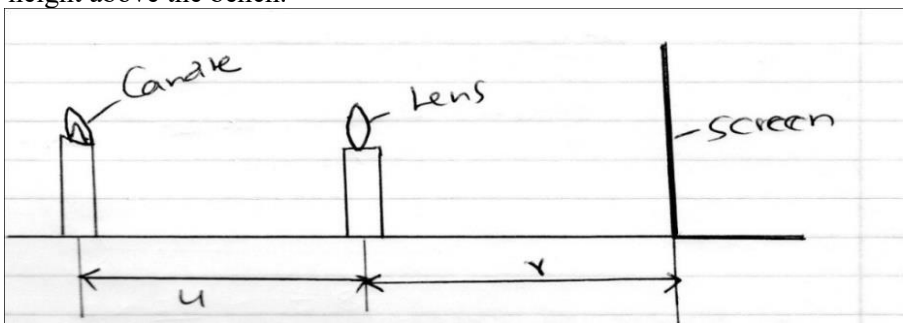
PART B

You are provided with the following

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

(g) Determine the focal length, f by focusing a distant object.
f = ……cm (1mark)

(h) Set up apparatus as shown in the figure below ensure that the candle flame and the lens are approximately the same height above the bench.



(i) Set the position of the lens so that it is 40cm from the candle (u=40cm). Adjust the position of the screen until a sharp image of the candle flame is obtained. Measure the distance (v) between the lens and screen. Record the value of **v** in the table below.

(j) Repeat the procedure in (i) above for the other values of u in the table 3 below. Complete the table (3marks)

Table 3

U(cm)	**40**	**50**
V(cm)		
Magnification *m=v/u*		

SAMIA SUB-COUNTY JOINT EVALUATION EXAMS
232/3 PHYSICS
PAPER 3 PRACTICAL

CONFIDENTIAL INSTRUCTIONS TO SCHOOLS

- The information contained in this paper is to enable the head of school and teacher in charge of Physics to make adequate preparations for this year's Physics joint practical examination. NO ONE ELSE should have access to this paper or acquire knowledge of its contents. Great care must be taken to ensure that the information herein does not reach the candidates either directly or indirectly.
- The Physics teacher is NOT expected to perform the experiments
- The apparatus required by each candidate for the Physics joint practical examination are set out on this page. It is expected that the ordinary apparatus of a Physics laboratory will be available.
- The Physics teacher should note that it is his/her responsibility to ensure that each apparatus acquired, for this examination agrees with specifications on this page.

Question 1
Provide each candidate with the following apparatus.

- A metre rule
- A spring balance
- A mass of 200g (2N) with a hook or (two 100g masses)
- A complete retort stand
- Knife edge support atleast 10cm high
- Two light strings about 10cm long.

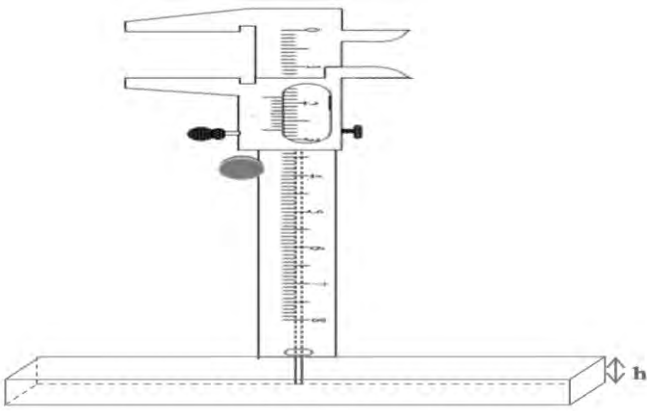
Question 2

- Two new dry cells
- Cell holder
- 10 ohms resistor labeled Q
- 100cm of nichrome wire SWG 28 labeled AB at the ends mounted on a millimeter scale
- 6 connecting wires, atleast 3 with crocodile clips
- A voltmeter (0 – 5v)
- An ammeter (0 – 1A) of (0 – 2.5A)
- A switch
- A candle
- A lens of focal length 20cm and a lens holder
- A white screen
- A metre rule

KIRINYAGA CENTRAL SUB- COUNTY
232/1
PHYSICS

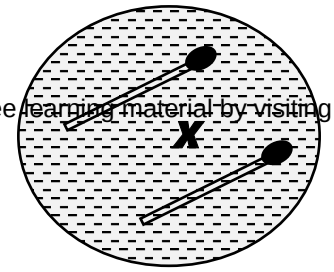
SECTION A (25MARKS)

1.



The figure above shows a vernier calipers being used to measure height 'h', record the actual height if the instrument had a zero error of – 0.02cm (1mark)

2. The figure below shows two pieces of match sticks arranged on the surface of water as shown. A red hot nail is placed at the point marked **X** and it is observed that the match sticks move apart*(away from each other)*.

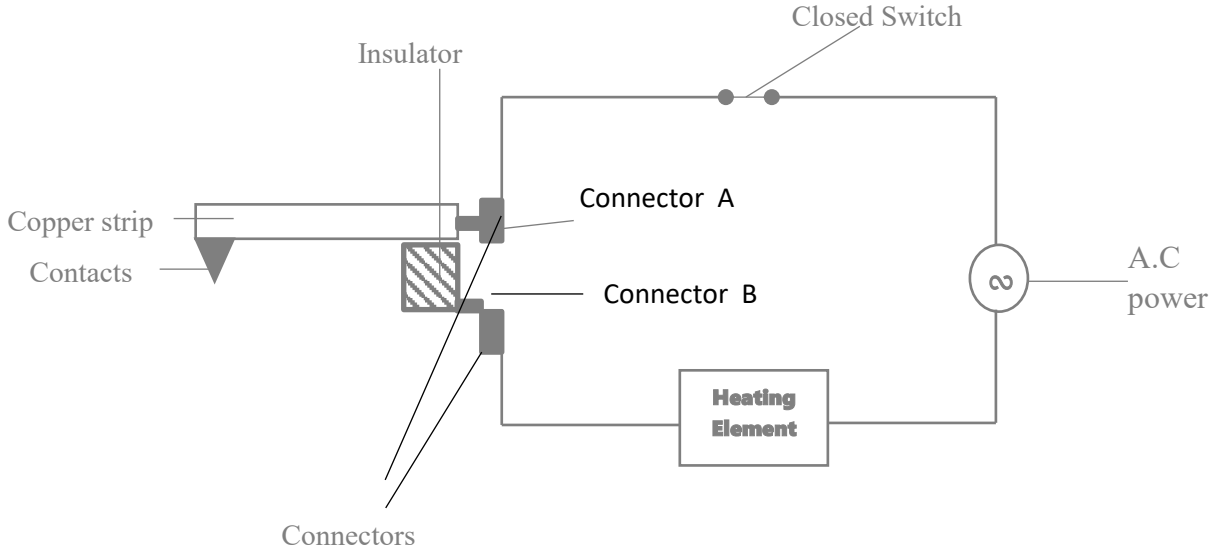


Explain the observations made (1marks)

3. In a smoke cell experiment smoke particles are seen moving in random motion.Expain the cause of this motion . (2marks)

4. A student was sucking a drink with a straw which had a hole.Explain why it was difficult. (1marks)

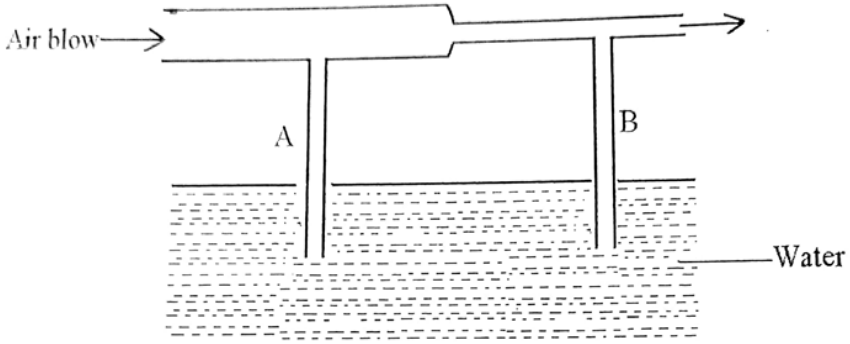
5. Figure below shows a circuit diagram for controlling the temperature of a room.



(i) Insert a bimetallic strip at connector B, identifying any two correct metal strips used in making it (1mark)

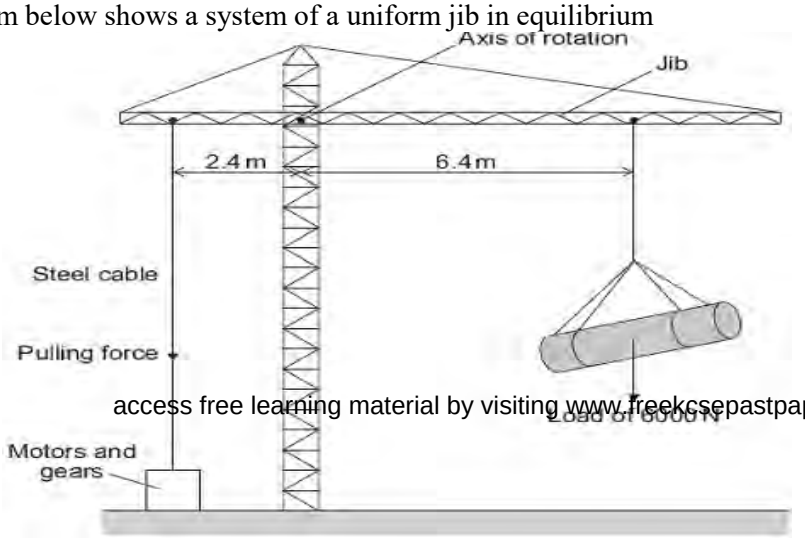
(ii) Describe how the circuit controls the temperature when the switch is closed (2marks)

6. A student blew over the mouth of a tube with varying cross-sectional sections as shown below



If the tubes A and B have the same cross-section areas. Show the relative positions of level of water in tube A and B and give an explanation (2marks)

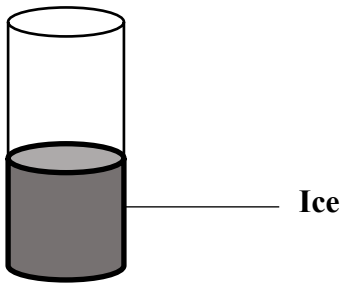
7. The diagram below shows a system of a uniform jib in equilibrium



Calculate the weight of the jib if its length is 10m and a pulling force of 17841.67N is needed in the steel cable to keep the jib horizontal (2marks)

8. The diagram below shows a container half filled with frozen ice at 0°C. If the container is warmed up to 4°C, explain the effect of this on the stability of the tube

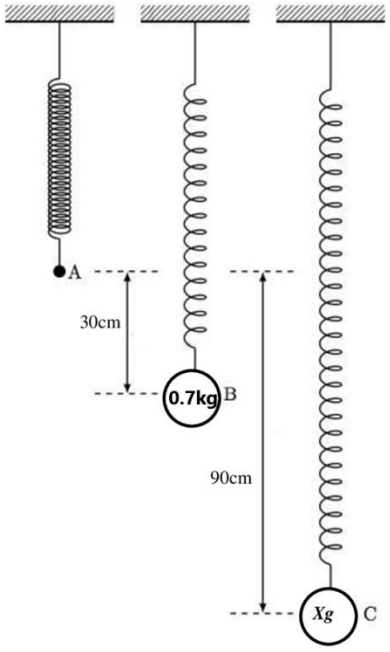
(1mark)



9. An object weighs 69N on earth where gravitational acceleration is 9.82N/Kg and 51.2N on another planet.

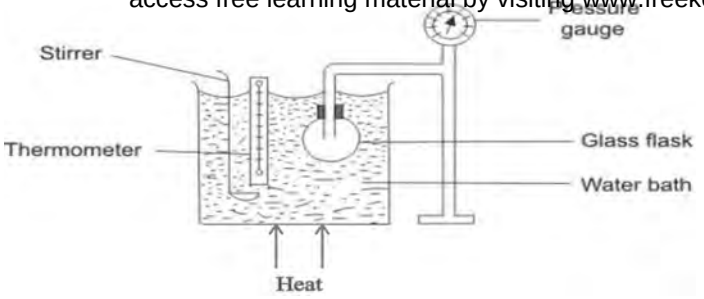
Determine the gravitational acceleration on the planet (2marks)

10. The figure below shows a spring of length ***y*** cm. Its length increases by 30cm when a mass of 0.7kg is suspended to it and its length again increases by 90cm when a mass of ***X*** kg is suspended to it. This is as shown below



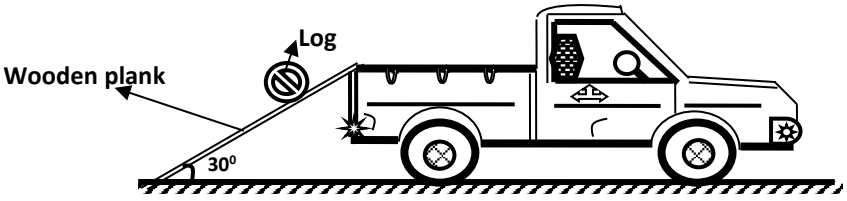
Determine the value of ***X*** (2marks)

The figure below shows a set-up that may be used to verify pressure law.



Use this information to answer questions 11 and 12

11. State the measurements that should be taken in the experiment. (2marks)
12. Explain how the measurements in **11** above may be used to verify pressure law. (3marks)
13. A man used a wooden plank to lift a log of wood from the ground to a stationary pick up vehicle on a flat ground as shown in figure below. The wooden plank was inclined at an angle of $\mathbf{30^0}$ to the ground

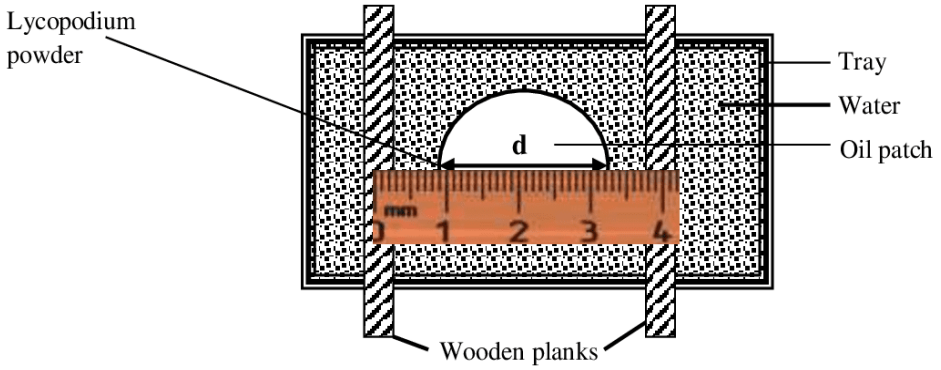


Calculate the mechanical advantage if the system was working at an efficiency 80%. (2marks)

14 . A hand feels hot when placed above a lighted match, as shown in Fig below. Explain in detail how convection causes this to happen. (1mark)

.

15. The figure below shows an experimental set up for estimating the diameter of an oil molecule.



(i) Describe how the oil patch is formed (2marks)
(ii) Record the diameter 'd' in cm (1mark)
(iii) Explain how the volume of an oil drop can be determined (2marks)
(iv) Determine the diameter of the oil molecule. If an oil drop had radius of 0.28mm (3marks)
(v) State any two assumptions made in calculating the diameter of the oil molecule. (2marks)
(vi) What is the role of the lycopodium powder in this experiment? (1mark)

16. (a) The figure below shows a ticker-tape for trolley used in an experiment.

If the frequency of the ticker timer was 50Hz, calculate,
(i) Initial velocity (2marks)

(ii) Final velocity (1mark)
(iii) Acceleration of the trolley (2marks)

(b) Figure ***(a)*** below shows a free-fall parachutist falling vertically downwards. Figure ***(b)*** shows how the speed of the parachutist varies with time.

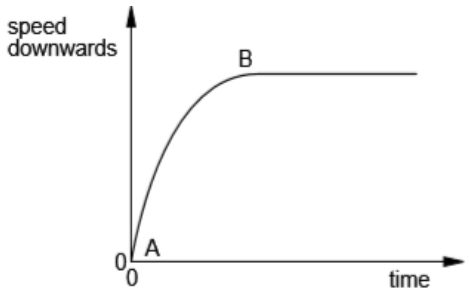
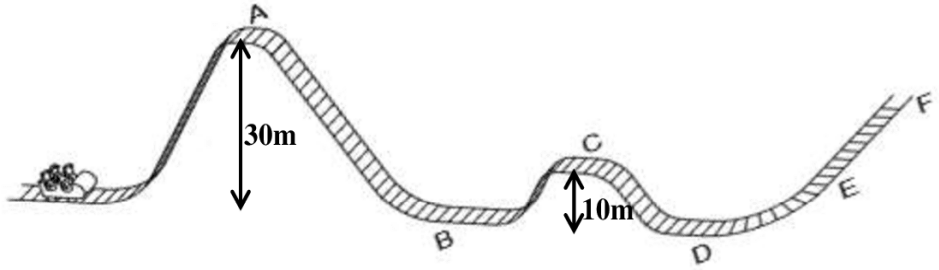


Figure ***a*** Figure ***b***

i) State **three** forces acting on the parachutist. (3marks)
ii) Explain why the acceleration decreases from A to B. in figure (b) (1mark)
iii) Explain why the parachutist falls at a constant speed after B. (2marks)

17. Figure below shows a children's ride. A carriage containing children is pulled up the slope by a motor. The carriage stops at A and then runs down through B, C and D without further input of energy. Between D and E the carriage turns through a bend at constant speed, as shown in figure below. At E, brakes are applied and the carriage slows to a stop at F. The height of the ride is 30m at A and 10m at C.

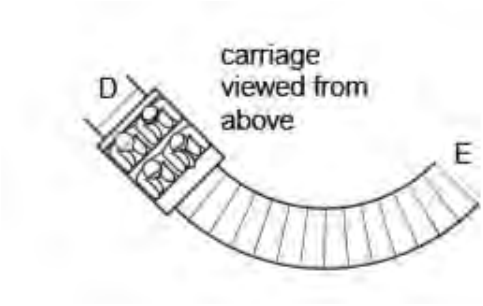


The mass of the carriage and children is 500kg. Take the gravitational field strength as 10N/kg.

(a) (i) State the energy changes that occur in the ride from A to D. (2marks)

(ii) Calculate the maximum potential energy of the carriage and children (2marks)

(iii) Assuming that there is no friction between A and C, determine the Kinetic energy of the carriage and children at C (2marks)



Between D and E, the carriage goes round part of a horizontal circle at constant speed. During this time the velocity of the carriage changes.

(i) Explain how the carriage can have a constant speed but a changing velocity. (1mark)

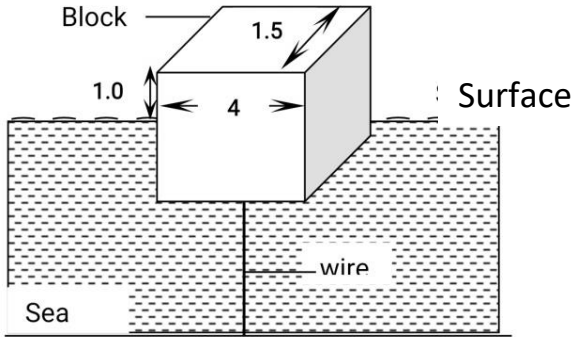
State the direction of the force that acts on the carriage to make it move round the curve. (1mark)

Between E and F, a frictional force of 3000N acts to slow the carriage. Calculate the deceleration of the carriage. (2marks)

18 (a) State Archimedes' principle. (1mark)

The figure below shows a rectangular buoy of mass 4000kg tethered to the sea-bed by a wire. The dimensions are 4m x 1.5m x 2.2m.

(Density of sea water = 1100kg/m^3)



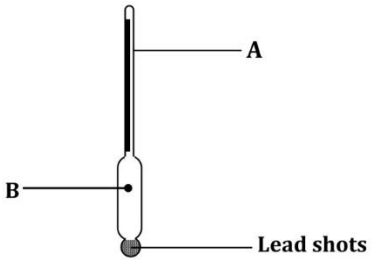
Calculate the:-

(i) Upward force exerted on the buoy by the water (2marks)

Tension in the wire (2marks)

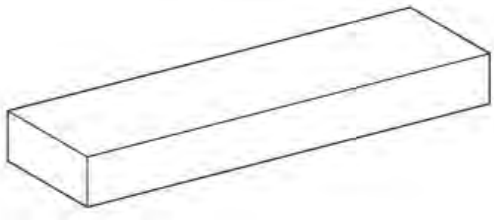
(ii) If the buoy was to be tethered by a wire to the bottom of a big container fully filled with paraffin of density 800kgm^{-3} determine the height that will remain afloat if the wire experiences the same tension force as in (ii) above (2marks)

c). The diagram below shows a hydrometer



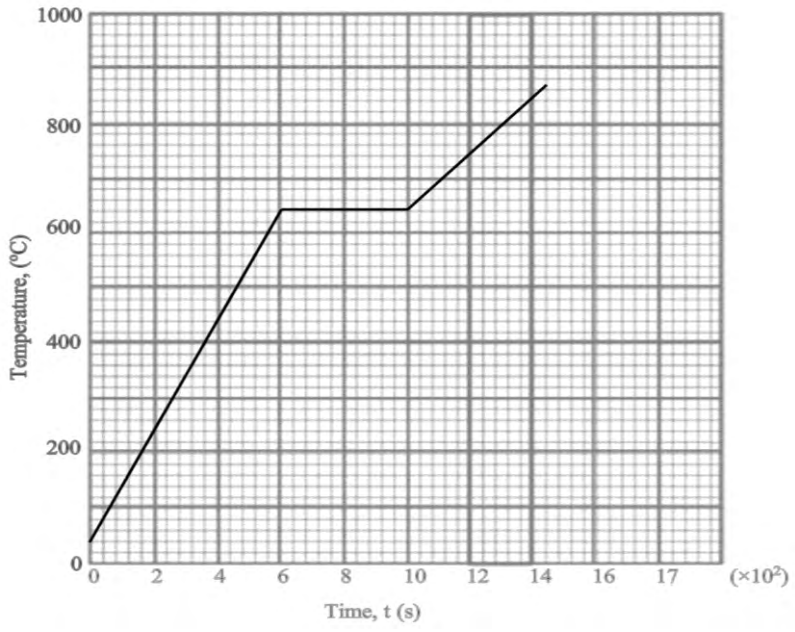
(a) Give a reason why:
(i) The part marked B is made wider (1mark)
(ii) The part labeled A is made narrow (1mark)
iii) Give a reason why the scale of the hydrometer is calibrated down
(Lowest reading at the top and the highest at the bottom) (2marks)

19. Figure below shows an aluminium bar drawn to a scale of 1:5



(a) Describe how the density of aluminium may be determined using the bar. In your description account for
(i) the readings to be taken, stating clearly the instruments to be used (2marks)
(ii) Determine the density of the aluminium given that the mass of the bar is
3.645 Kg (2marks)

(b) The bar is placed in a small furnace. Figure below shows how the temperature of the bar varies with time



i) Using the graph what is the value of room temperature (1mark)
ii) State what happens to the bar between t = 600s and 1000s. (1mark)
iii) Explain what effect the energy supplied to the bar has on its molecules between t = 0 and 1000s.
(2marks)

(c) The mass of the bar is 3.645 kg and the specific heat capacity of aluminium is 880 $Jkg^{-1}K^{-1}$. Calculate the energy supplied to the bar between t = 0 and 600s.
(2marks)

(d) Between t = 600s and 1000s the furnace supplies 30 joules of energy per second to the bar. Calculate the specific latent heat of fusion of aluminium. If the mass of the bar is 3.645 kg (2marks)

KIRINYAGA CENTRAL SUB-COUNTY
232/2
PHYSICS PAPER 2-THEORY
DECEMBER 2021

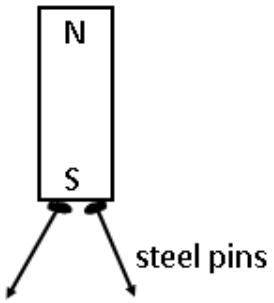
SECTION A (25 marks)
Answer all the questions in this section in the spaces provided.

1. State the reason why when a ray of light strikes a plane mirror at an angle of 90^{O}, the reflected ray travels along the same path as the incident ray. (1 mark)

2. Explain why tankers carrying petroleum oil or other flammable materials have a chain hanging under them as they move. (2 marks)

3. **Figure 1** shows two steel pins attached to a S-pole of a bar magnet.

Figure 1

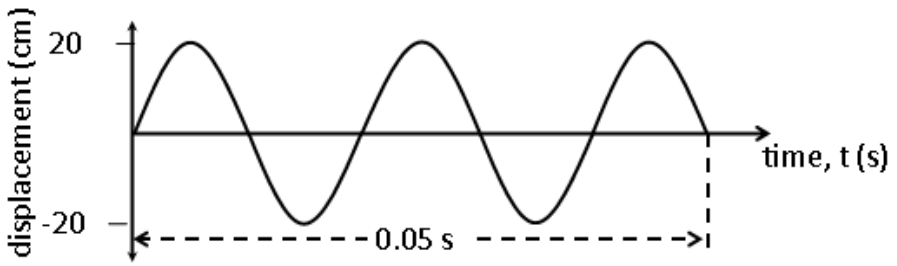


Explain why the pins are not parallel to each other. (2 marks)

4. Arrange the following electromagnetic radiations in order of increasing frequencies: *Gamma, Radio waves, Infrared and X-rays.* (1 mark)

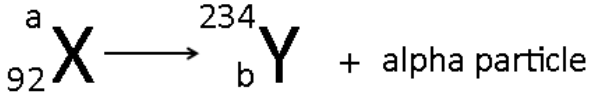
5. **Figure 2** shows a displacement-time graph for a certain wave.

Figure 2



Determine the frequency of the wave. (2 marks)

6. A nuclear reaction is represented by the following equation:



Determine the values of a and b. (2 marks)

7. **Figure 3** shows a positive point charge placed near a negatively charged rod.

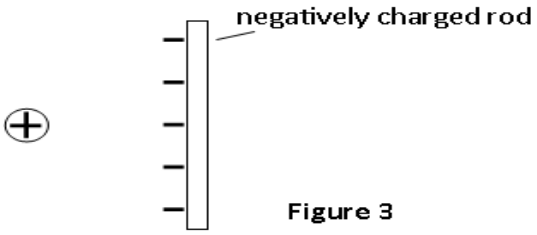
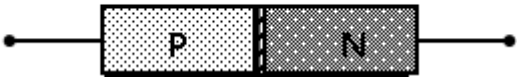


Figure 3

Draw on the diagram, the resulting electric field pattern. (2 marks)

8. **Figure 4** shows a block diagram of a p-n junction diode.

Figure 4



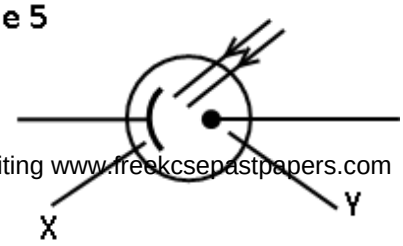
On the same diagram, show how a battery of two cells may be connected so that the diode is forward biased. (1 mark)

9. A ray of light passes from air into glass at an angle of incidence of 30^{O}. If the angle of refraction in the glass is 19^{O}, determine the refractive index of glass. (2 marks)

10. Explain why mains electricity is transmitted at very high voltage. (2 marks)

11. **Figure 5** shows a photocell.

Figure 5



a) Identify from X and Y the anode and the cathode. (1 mark)

b) Describe how electrons are produced in the cell. (1 mark)

12. An electric bulb rated 60 W is operating on a 240 V mains. Determine the resistance of its filament. (2 marks)

13. **Figure 6** shows a parabolic reflector with a source of light placed at its focal point F.

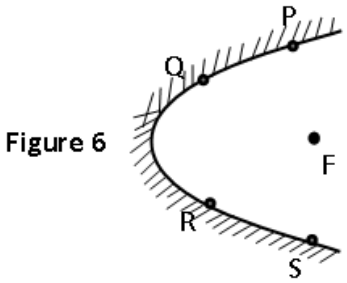


Figure 6

Draw rays to show reflection of the surface when rays from the source strike the surface at points P Q R and S. (1 mark)

14. **Figure 7** shows a current-carrying coil placed in a magnetic field.

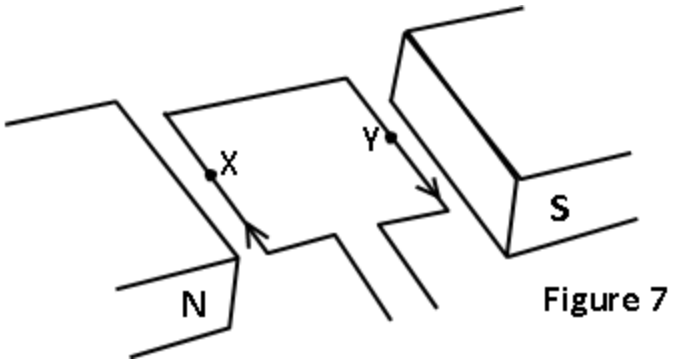


Figure 7

a) Show at points X and Y on the figure, the direction of the force F acting on the coil when current flows in the direction shown. (1 mark)

b) State **two** ways in which the speed of rotation of the coil may be increased. (2 marks)

SECTION B (55 marks)

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

15

a) State **two** factors that affect the speed of sound in air. (2 marks)

b) State what is meant by the term ***coherent sources*** as used in the study of waves. (1 mark)

c) **Figure 8** shows sound waves in air produced by a vibrating tuning fork. The prong of the fork takes 0.005 s to move from C to D. The distance from M to N is 11.9 m

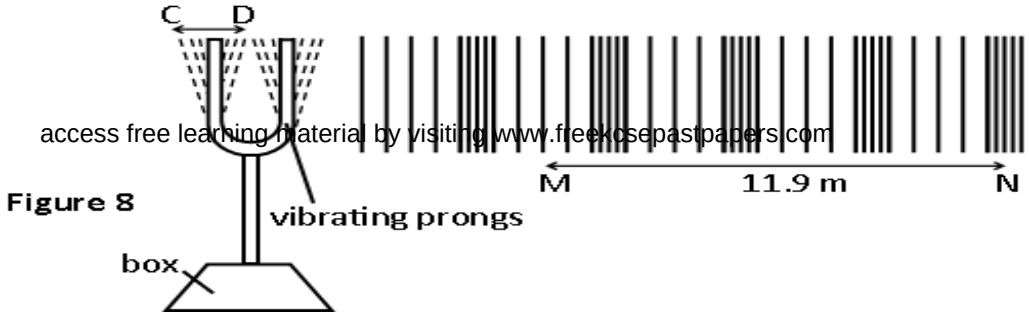


Figure 8

(i) Using a line, indicate on the diagram, a distance d equal to one wavelength of the wave. (1 mark)

(ii) Determine the :

I. wavelength of the wave (2 marks)

II. frequency of the wave (2 marks)

III. velocity of the wave. (2 marks)

d) **Figure 9** shows straight wave fronts in a ripple tank approaching a shallow region in the tank.

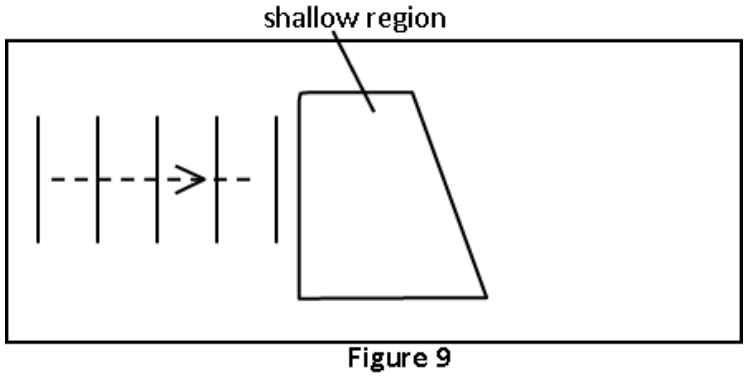


Figure 9

Complete the diagram to show the wave fronts as they pass over the shallow region and after leaving the region. (1 mark)

16

a) State Lenz's law of electromagnetic induction. (1 mark)

b) **Figure 10** shows a magnet being moved into a stationary solenoid and stopped when inside the solenoid.

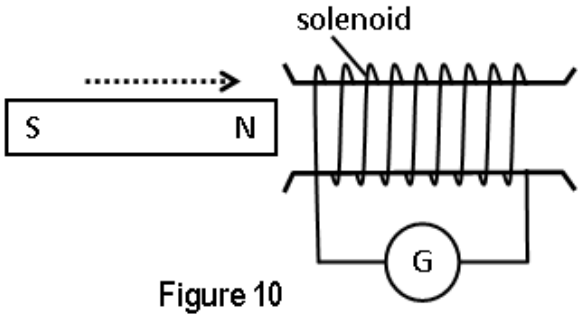


Figure 10

(i) State what is observed in the galvanometer. (1 mark)

(ii) Explain the observation stated in (i) above. (3 marks)

(iii) State what would be observed on the galvanometer if the magnet is now withdrawn from the solenoid. Give a reason for your answer. (2 marks)

c) One of the causes of energy loss in a transformer is *heating in the coils when current flows (copper loss)*. State how the heating can be minimized. (1 mark)

d) **Figure 11** represents a step-down transformer with 800 turns in the primary and 300 turns in the secondary. The turns are wound uniformly on the core. The lengths XY and YZ are indicated.

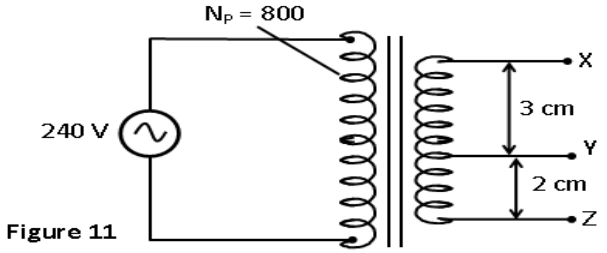


Figure 11

Determine the p.d across YZ. (3 marks)

17

a) **Figure 12** shows an object O, height 10 cm placed in front of a converging lens of focal length 20 cm.

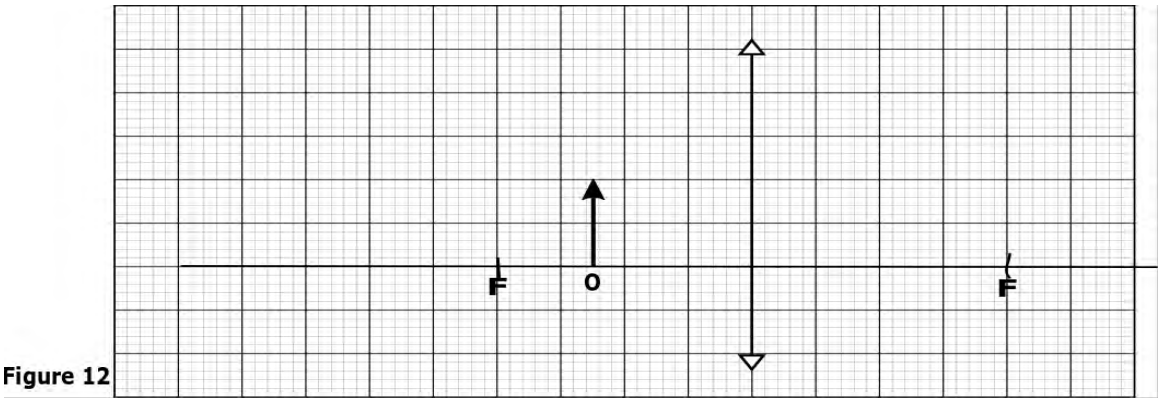


Figure 12

(i) On the same figure, draw a ray diagram showing the location of the image. (3 marks)

(ii) Use the diagram to determine the:

I. image distance (1 mark)

II. magnification. (2 marks)

b) State the function of aperture in a lens camera. (1 mark)

c) **Figure 13** shows a set-up of apparatus: screen, lens on a lens holder, a lit candle and a metre rule.

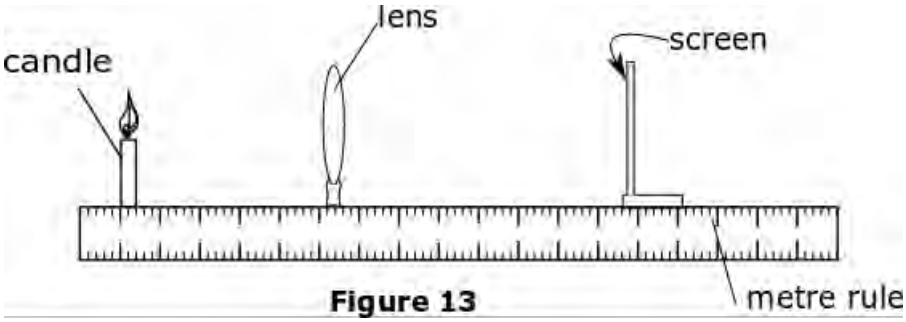


Figure 13

Describe how the set-up may be used to determine the focal length f, of the lens by formula method. (4 marks)

18.

a) **Figure 14** shows the parts of an x-ray tube.

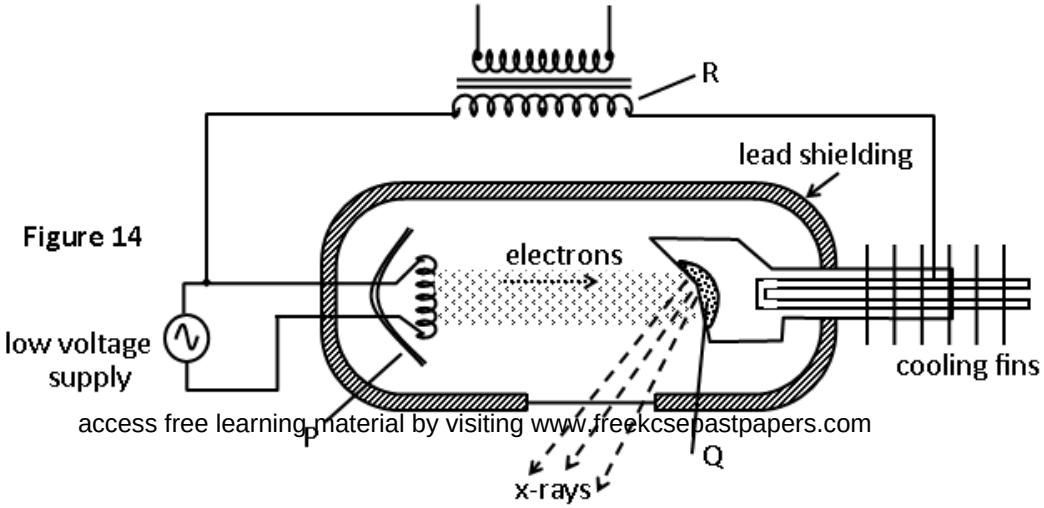


Figure 14

i) Name the parts labeled P and Q. (2 marks)

ii) Explain the role of the part labeled R. (2 marks)

iii) State how intensity of x-rays can be increased in an x-ray tube. (1 mark)

iv) The energy of x-rays in a certain x-ray tube is 1.6×10^{-14}J. Determine the wavelength of the x-rays.
(take speed of light, c = $3.0 \times 10^{8}\ m/s$ and Planck's constant, h = 6.63×10^{-34} Js)
(3 marks)

b) **Figure 15** shows the waveform of a signal applied at the y-plates of an oscilloscope whose time-base is switched on to a setting of 2.5 ms/cm.

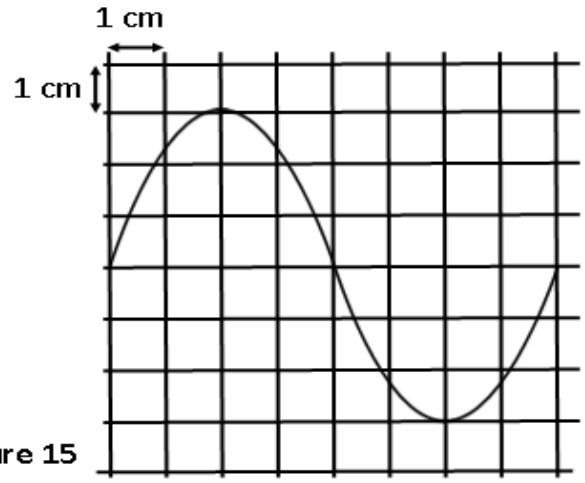


Figure 15

Determine the:

(i) period T, in seconds, of the signal (2 marks)

(ii) frequency f, of the signal. (2 marks)

19.

a) A lead-acid accumulator with an e.m.f of 12 V can start a car while a battery of eight dry cells in series with total e.m.f of 12 V cannot.
Explain this observation. (2 marks)

b) State **two** reasons why lights in a house are wired in parallel and not in series. (2 marks)

c) A car battery is rated 60 Ah, and it is expected to supply a steady current for 720 minutes. Determine the strength of the current delivered. (2 marks)

d) The graph in **figure 16** shows how the terminal voltage, V, of a certain cell varies with the current, I, being drawn from the cell.

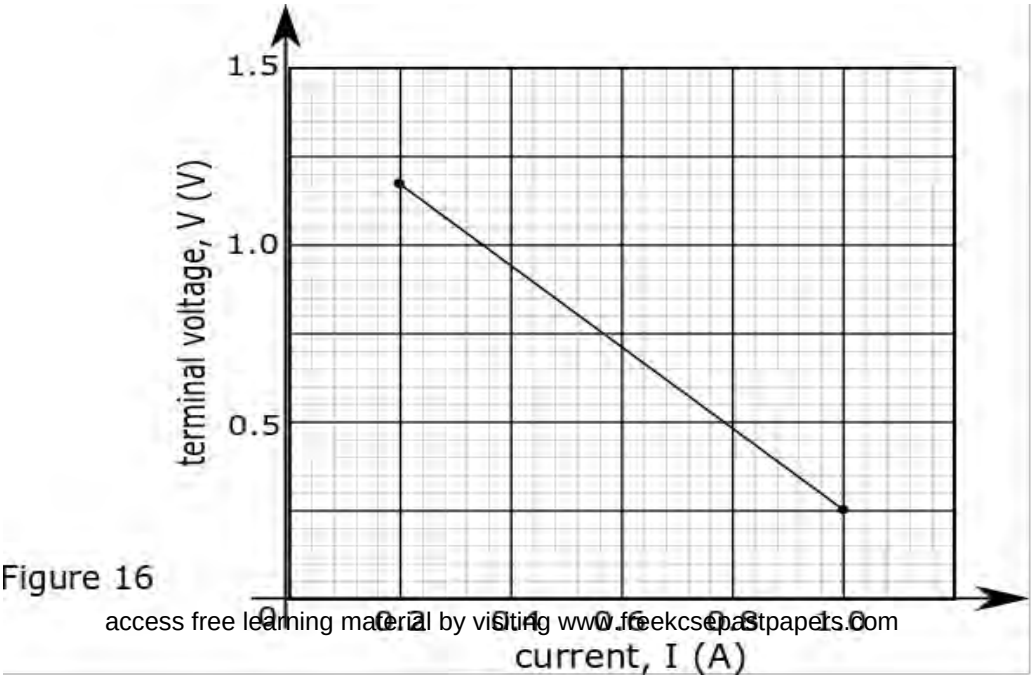


Figure 16

Given that $= V + Ir$, use the graph to determine the:

(i) electromotive force (e.m.f), E of the cell (1 mark)

(ii) the internal resistance, r, of the cell. (3 marks)

KIRINYAGA CENTRAL SUB-COUNTY
232/3
PHYSICS PAPER 3
(PRACTICAL)

NOVEMBER/DECEMBER 2021

QUESTION 1 PART A

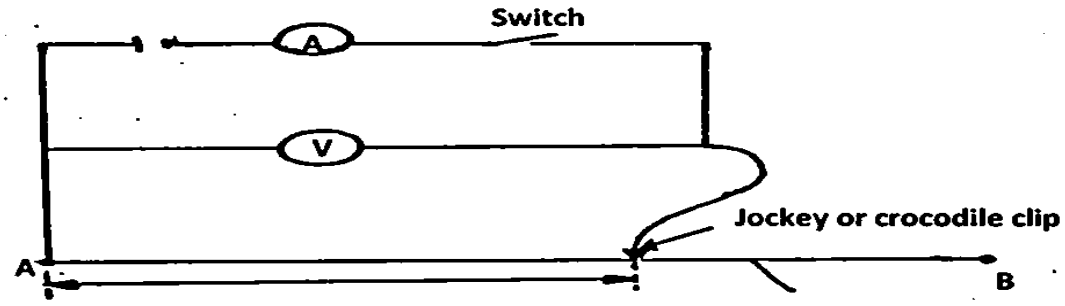
1. You are provided with the following

- A micrometer screw gauge (to be shared)
- A voltmeter (0-3V or 0-5V)
- Ammeter (0-1A)
- A switch
- A jockey/long wire with crocodile clip attached
- One new dry cell
- Nichrome wire mounted on a millimeter scale labeled AB
- 8 connecting wires with crocodile clips attached to one end

Proceed as follows

a) Set-up the circuit shown below in, Fig 1 **ensure** that when the switch is open, both meters read zero, keep the switch open when readings are not being taken.

Fig 1



i) Measure and record the diameter d of the nichrome wire AB using the micrometer screw gauge
d = _____ M ($^1/_2$ mk)

ii) Disconnect the jockey from wire AB and close the switch. Record the value E of the voltmeter reading.
E = _____ V ($^1/_2$mk)

b) Now, connect the jockey on AB at a distance L = 2.5cm. Close the switch and record the voltmeter and ammeter readings, V and I respectively in table 1 below.

Table 1

L(cm)	2.5	7.5	10.0	20.0	30.0	40.0
P.d(v)						
Current I (A)						
IV (Watts)						

i) Complete the table (5mks)

ii) Plot a graph IV (vertical axis) against L (5mks)

iii) Using your graph, find the value L_0 where your graph cuts the horizontal axis.
L_0 = _____ cm ($^1/_2$mk)

c) i) Now, place the jockey on AB such that the L is equal to the value of L = 63cm. Close the switch and record the voltmeter reading, V and the ammeter reading, **I**
V = _____ V ($^1/_2$mk)
I = _____A ($^1/_2$ mk)

ii) Work out the values r where, (1 mk)

$$r = \frac{E - V}{I}$$

d) Work out the value of e where ($1^1/_2$ mks)

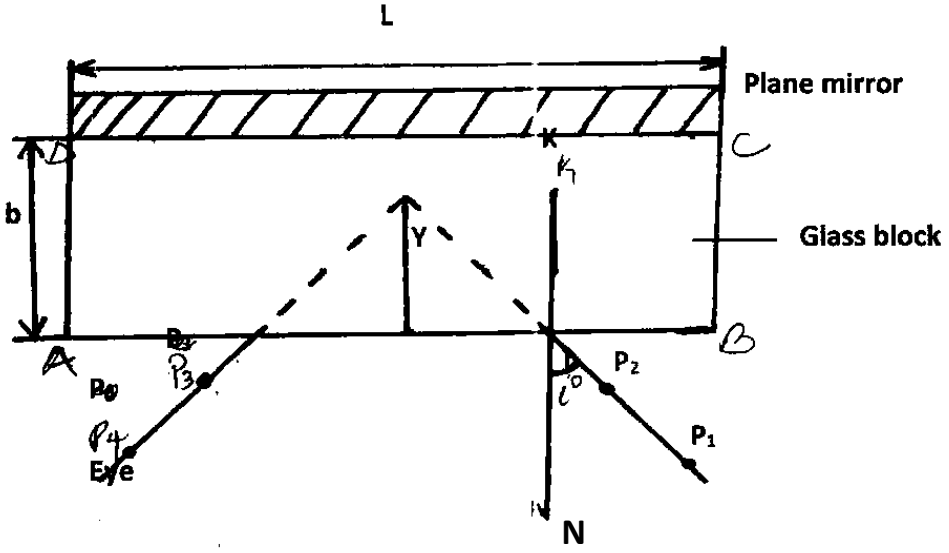
$$e = \frac{\Pi r d^2}{2.52}$$

Question 1 part B

You are provided with

- Plane mirror
- Rectangular glass block
- Four optical pins
- Geometrical set (students to carry)
- Soft board
- Plain paper
- Cellotape
- Vernier calipers (to be shared)

e) Set up the apparatus as shown in figure below.



Proceed as follows

f) i) Using the vernier calipers provided, measure and record the breadth b of the glass block.
b = _____ cm (1mk)

ii) Using cellotape, fix the mirror on one side (length) of the glass block and trace its outline on the plain paper.

iii) Draw the normal NK to the side AB and measure angle i = 10^0 from the normal.

iv) Draw the line representing the incident ray and fix pins P_1 and P_2 as shown in the figure.

v) By observing the images of the pins P1 and P2, locate the position P3 and P4 such that they appear in a line (no parallax) using other pins.

vi) Join the points P_3 and P_4 and extend them to intersect line P_1P_2 produced.
Measure perpendicular distance Y.

NB: Hand in the A4 paper together with answer sheet

vii) Repeat steps (iii-vi) for different values of I given and record your values in the tables below.

Table 2

i^0	10	20	30	40
Y(cm)				

(2mks)

g) i) Determine the average of the values of Y (1mk)

ii) Determine the values of constant k given that $k = \frac{b}{Y}$ (1mk)

Question II

Part A

Your are provided with the following

- A meter rule
- A retort stand, clamp and boss
- A 250ml beaker ¾ full of water
- A 100g mass
- A 50g mass
- Three pieces of thread

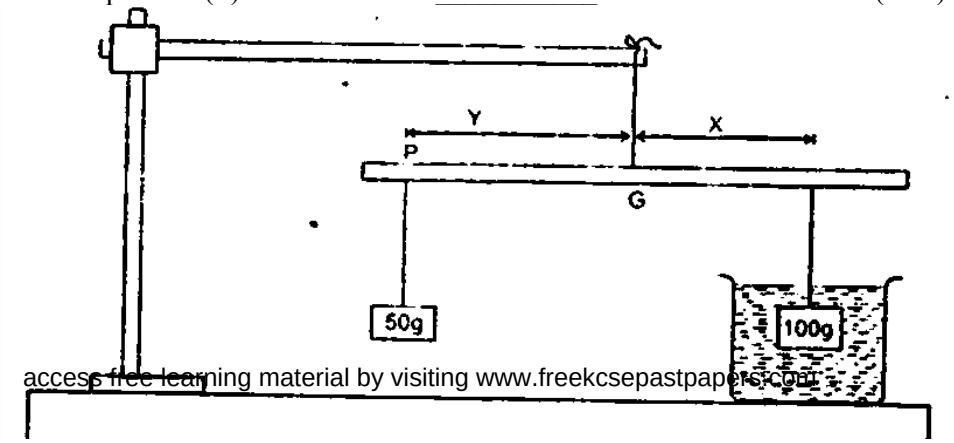
Procedure

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 mark (1mk)

b) Suspend the 100g mass from the metre rule at a point such that x = 5cm from point G with the 100g completely immersed in water in the beaker hang the 50g mass from the metre rule and adjust its position until the system is in equilibrium as shown in the diagram below.

Note the point of the suspension (P) of the mass P = _____ (1mk)



Repeat the procedure for values of x = 5cm, 10cm, 15cm, 25cm. Record the values of y in the table below. (4mks)

Note: Ensure that during each case the position of the thread through G does not change.

X(cm)	Position of 50g mass	Y(cm)
5		
10		
15		
20		
25		
30		

c) i) On the grid provided plot a graph of y against x. (5mks)

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

d) Find the density d, of the liquid given that (2mks)

$$\frac{Y}{x} = \frac{(0.68 - 12.0x10^{-5})d}{0.32}$$

PART B

You are provided with the following:

- A lens and lens holder
- A candle
- A screen
- A meter rule
- A screen with cross-wire

Set up the apparatus as shown in figure below.

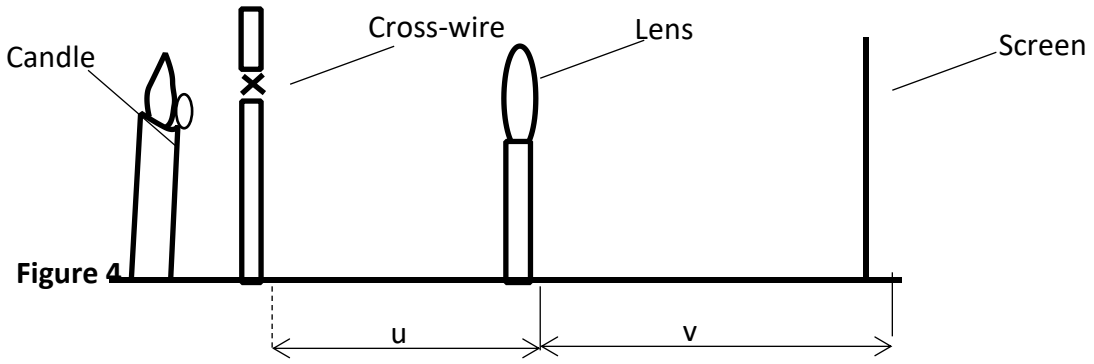


Figure 4

a) Starting with u = 30cm, adjust the position of the screen to obtain a sharp image of the cross-wire. Record the value of v in table below.

b) Repeat the procedure in (a) for u = 20cm. Complete the table (a)

Table (a)

U(cm)	V(cm)	$m = \frac{u}{v}$
20		
30		

(2mks)

c) Given that the focal length f of the lens satisfies the equation $f = \frac{v}{1+m}$ determine the average value of the focal length, f. (2mks)

KIRINYAGA CENTRAL SUB-COUNTY EFFECTIVE 40 EXAMINATION 2021
232/3
PHYSICS PAPER 3
(PRACTICAL)

CONFIDENTIAL.
QUESTION 1.

- A voltmeter (0 - 3v or 0 - 5V)
- Ammeter(0-1A)
- A switch
- A jockey/ long wire with crocodile clip attached
- One new dry cell and a cell holder
- Nichrome wire SWG 32 mounted on a millimeter scale labeled AB
- 8 connecting wires with crocodile clips attached to one end
- A micrometer screw gauge (to be shared)
- Rectangular glass block approximate 120mm x 60mm x 38mm
- Four optical pins
- Geometrical set {student to carry one}
- Soft board
- Plain paper
- Cellotape/ masking tape
- Vernier calipers (to be shared)
- Plane mirror(13 cm by 6cm) (approximately)

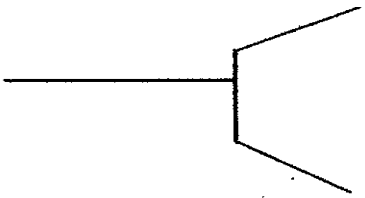
QUESTION II:
Each candidate will require the following

- One metre rule
- One retort stand, one boss and one clamp
- One 250ml beaker(plastic or glass)
- One 100g mass
- 3 pieces of thread approximately 30 cm long
- A source of water
- A bi-convex lens focal length, f = 10cm
- A lens holder
- A candle
- A white screen
- Cross-wire mounted on a screen.

KIRINYAGA WEST
232/1
PHYSICS PAPER 1
DECEMBER 2021

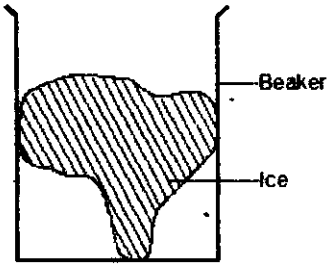
SECTION A.

1. The figure below shows part of micrometer screw gauge with 50 divisions on the thimble scale. Complete the diagram to show a reading of 5.73mm. (2 marks)



2. A bottle containing a smelling gas is opened at the front bench of a classroom. State the reason why the gas is detected throughout the room. (1 mark)

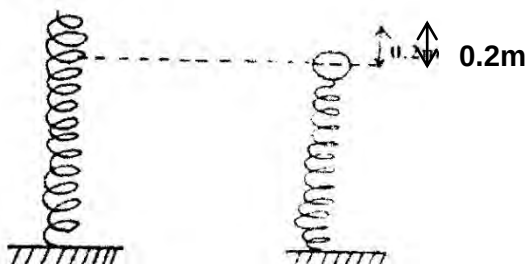
3. The figure below shows beaker containing a block of ice.



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

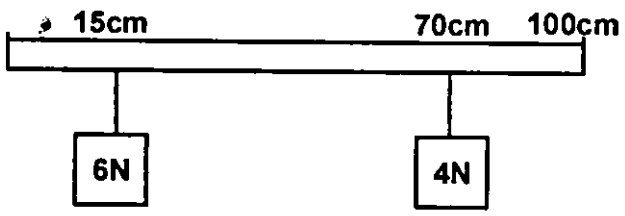
4. An aeroplane is moving horizontally through still air at a uniform speed. It is observed that when the speed of the plane is increased, its height above the ground increases. State the reason for this observation.
(2 marks)

5. A steel ball of mass 0.05kg was placed on top of a spring on a level ground. The spring was then compressed through a distance of 0.2m.



If the spring constant is 2.5 N/M. Calculate the maximum height reached when the spring is released.
(3 marks)

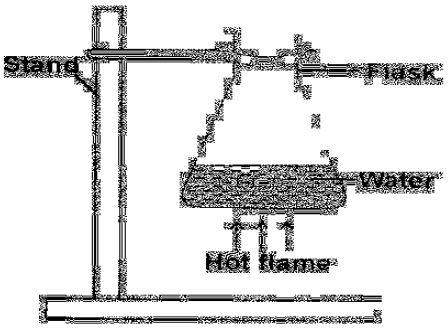
6. The figure below shows a uniform metre rule of weight 3N supporting two weights. The metre rule is pivoted somewhere such that it is horizontally balanced.(Pivot not shown)



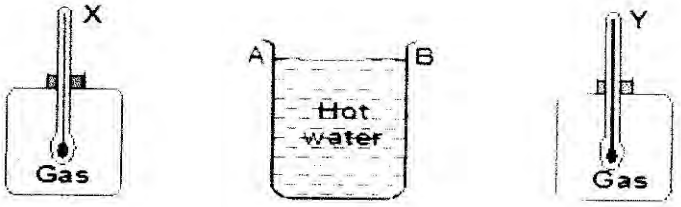
The 6N weight is at 15cm mark while the 4N weight is at 70cm mark. Determine the position of the pivot from zero cm mark. (3 marks)

7. State one environmental hazard that may occur when oil spills over a large surface of the sea. (1 mark)

8. The figure shows a flat bottomed flask containing some water. It is heated directly with a very hot flame. Explain why the flask is likely to crack? (2marks)



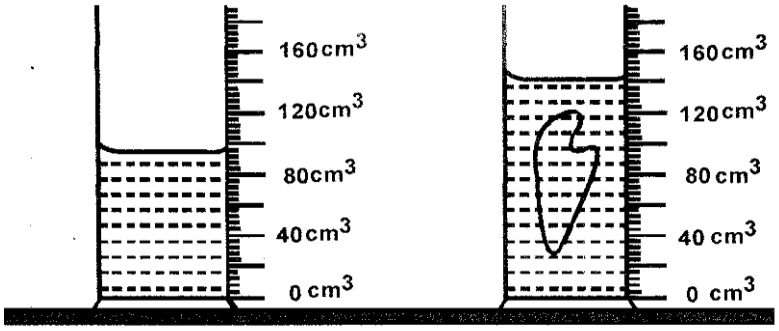
9. The figure below shows a cylindrical container having hot water at 95 ^{0}C. End A is shiny while end B is dull black. At equal distances from the container is placed two identical gas jars fitted with thermometers X and Y.



Compare the readings of the two thermometers after two minutes (1 mark)

10. Give a reason for your answer in Question 9 above (1 mark)

11. The figure below shows the change in volume of water in a measuring cylinder when an irregular solid is immersed in it.



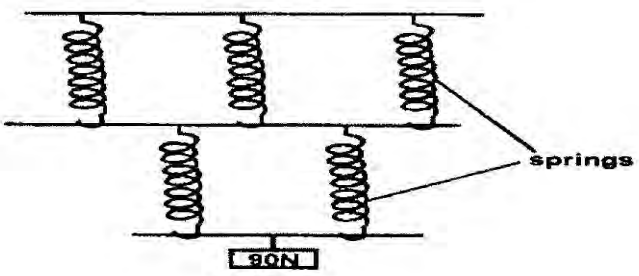
Given that mass of the solid is 268g. Determine the density of the solid in SI units.

(3 marks)

12. The following figure shows a rod made of wood on one end and metal on the other end suspended freely with a piece of thread so that it is in equilibrium.

The side made of metal is now heated with a Bunsen flame. State with a reason, the side in which the rod is likely to tilt. (2 marks)

13. The spiral springs shown in the figure below are identical. Each spring has a spring constant K = 300N/M



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

SECTION B : 55 MARKS

14. a) State two differences between boiling and evaporation (2 marks)

b) State three ways in which loss of heat is minimized in a vacuum flask (3 marks)

c) In a certain experiment, 50g of dry steam at 100^0 c was directed into some crushed ice at 0^0 C, given that the latent heat of vaporization of water is 2.26×10^6 JKg $^{-1}$, latent heat of fusion of ice is 3.34×10^5 JKg^{-1} and specific heat capacity of water is 4.2×10^3 JKg^{-1k-1}

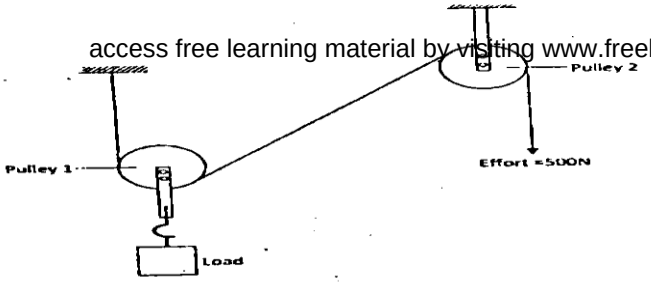
Determine the,

i) Quantity of heat lost by steam to change to water at 100^0C (2 marks)

ii) Quantity of heat lost by water to cool to 0^0 C (2 marks)

iii) Mass of ice melted at 0^0 c (3 marks)

15. The diagram below shows a pulley system lifting a load of 800N



If the movable pulley has negligible mass and the applied force is 500N for a distance of 6m, find:

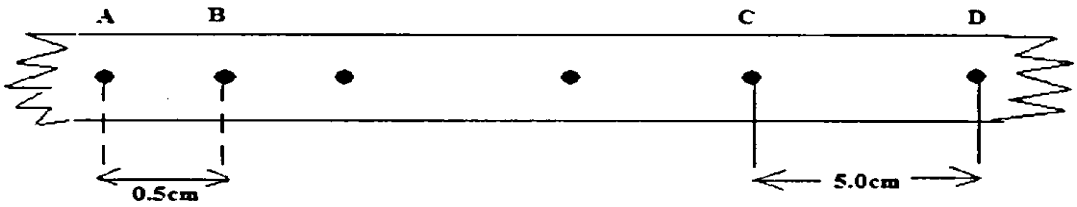
i) The velocity ratio of the machine. (1 mark)

ii) The load distance (2 marks)

iii) The work done on the load (2 marks)

iv) The efficiency of the machine (3 marks)

16. The figure below shows a tape from a ticker –timer at 50Hz.



a. Determine;

i) Time taken for one tick interval (1 mark)

ii) The velocity between AB in SI unit (2 marks)

iii) The acceleration of the trolley between AD (3 marks)

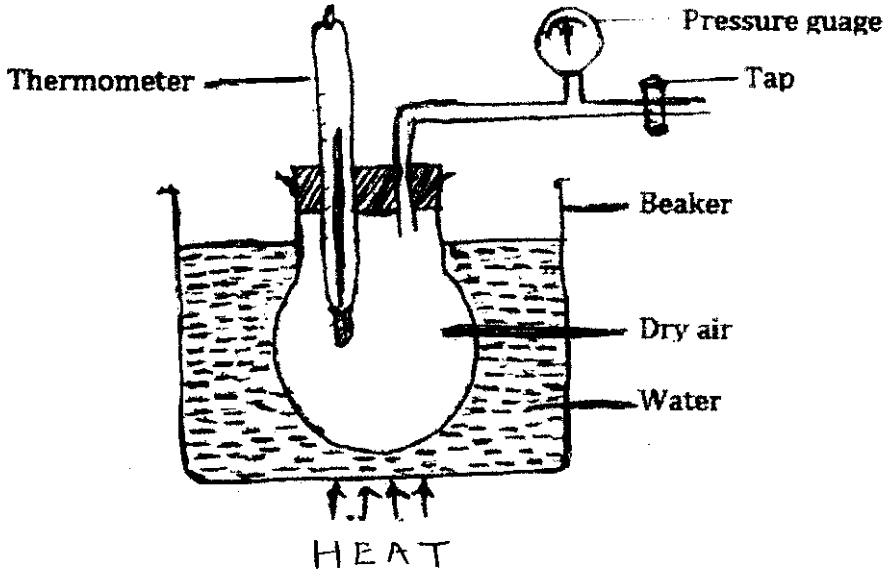
b. A girl threw a stone from the top of a tower 45m tall with a horizontal velocity of 25m/s. Calculate;

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

ii) The distance covered by the same horizontally (3 marks)

17. a State the pressure law (1 mark)

b. The figure below shown a setup used to verify pressure law.

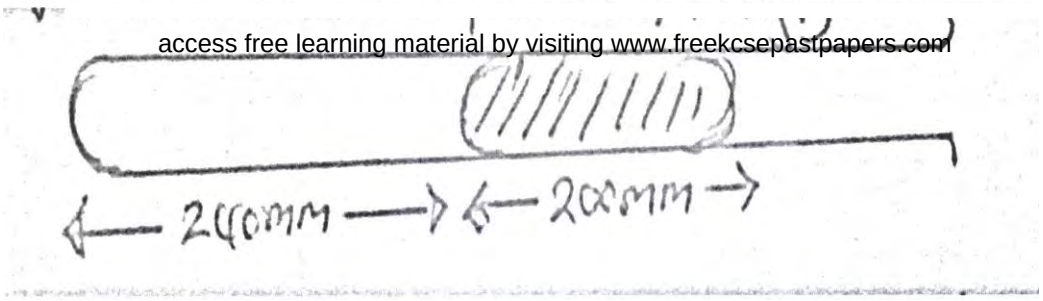


i) State the measurements that can be taken in the set up. (2 marks)

ii) Explain how the measurements in (i) above may be used to verify pressure law. (3 marks)

c. A car tyre is at air pressure of 4.0×10^5 Pa at a temperature of 27^0 c. While it was running, the temperature rose to 75^0C. What is the new pressure in the tyre? (Assume the tyre does not expand) (3 marks)

d. When the tube is held horizontally, the length of air column is 240mm and that of mercury column is200mm. (Assume the atmospheric pressure is 750mmHg).

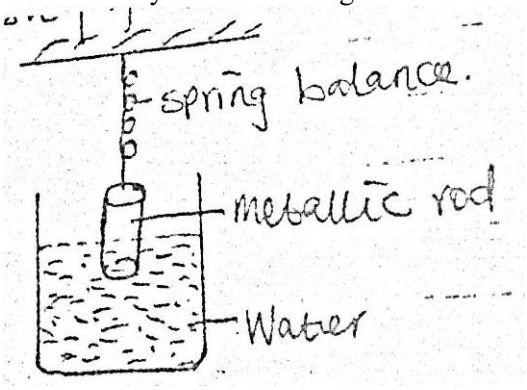


Calculate the length of air column when the tube is vertical with open end down.

(3 marks

18. a. State the law of floatation. (1 mark)

b. The figure below show a metallic rod of length 10cm and uniform cross-section area of $4cm^2$. It is suspended from a spring balance with 7.5 cm of its length immersed in water. The density of metallic material is $1.5g/cm^3$ and the density of water is $1.0g/cm^3$.



Determine;

i) The mass of the metallic rod (2 marks)

ii) The upthrust acting on the metallic rod (3 marks)

iii) The reading of the spring balance when the metallic rod is 7.5 cm immersed in water . (2 marks)
iv) The reading of spring balance when the metallic rod is wholly immersed in water. (3marks)

KIRINYAGA WEST
232/2
PHYSICS PAPER 2
SECTION A 25 MARKS)

1. Two mirrors were inclined at an angle Θ . The number of images formed were found to be 7. Find the value of angle Θ . (2 marks)

2. A conductor is brought near the cap of a negatively charged electroscope. The leaf first collapses and then diverges. State the charge on the conductor. (1 mark)

3. With regard to a lead – acid accumulator, state the reason why leaving the caps open during charging is necessary. (1 mark)

4. Draw a diagram showing how you can store two bar magnet so that they are able to retain their strengths for a long time. (1 mark)

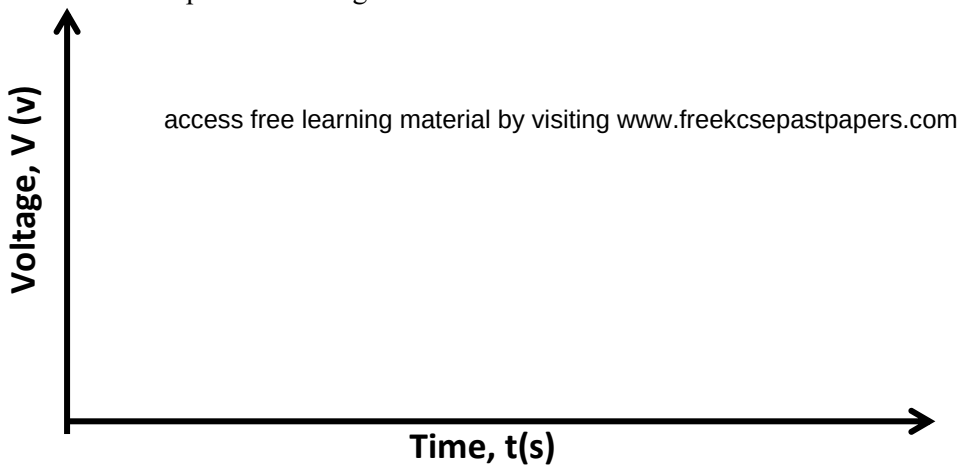
5. If a concave mirror has a focal length of 10 cm, state the position where the object can be placed to produce an image equal the size of the object. (1 mark)

6. State two factors that can cause the strength of an electromagnet to increase. (2marks)

7. The wavelength of a radio wave is 15 km. Determine its frequency.
(Take the speed of light as 3.0×10^8 m/s.) (2 marks)

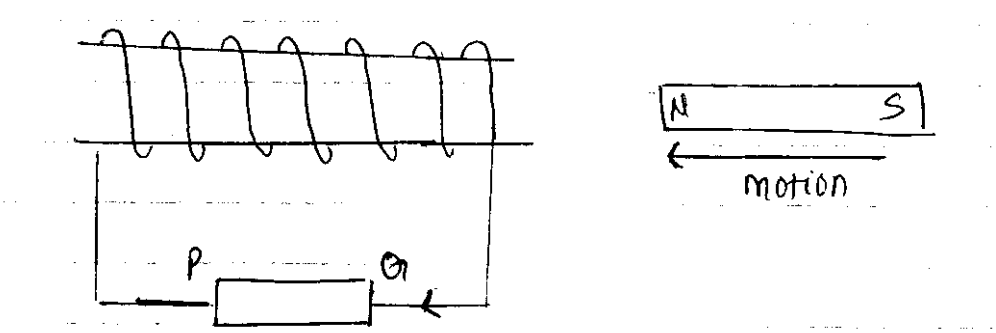
8. An electric bell was suspended inside a bell jar using rubber bands and connected to a vacuum pump. Air was evacuated from the bell jar. When the electric bell was switched on, only a faint sound was heard.
State then reason for this. (1 mark)

9. On the axis provided , sketch a graph to show how the potential difference across the plates of a capacitor varies with time when the capacitor is charged. (1 mark)



10. Two points A and B have a potential difference of V volts. Q Coulombs of charge flow between A and B for t seconds. Determine the power transformed in terms of V, Q and t. (2 marks)

11. The figure below shows a magnet being moved towards a stationary solenoid. It is observed that a current flows through the circuit in a direction Q to P.



Explain why the current flows from Q to P. (2 marks)

12. Arrange the following in order of their decreasing wavelength. Visible light, infra –red radiation, x–rays, UV radiation, radio waves. (1 mark)

13. The target in an x – ray tube is made of a material of high melting point. State the type of material used to make the target. (1 mark)

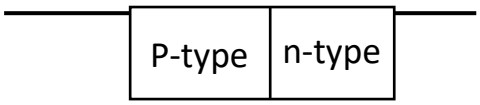
14. The equation below represents a nuclear reaction in which two deuterium nuclei fuse to form Helium and X.

$$ {}^{2}_{1}H + {}^{2}_{1}H \rightarrow {}^{3}_{2}He + {}^{a}_{b}X $$

i) Identify x (1 mark)

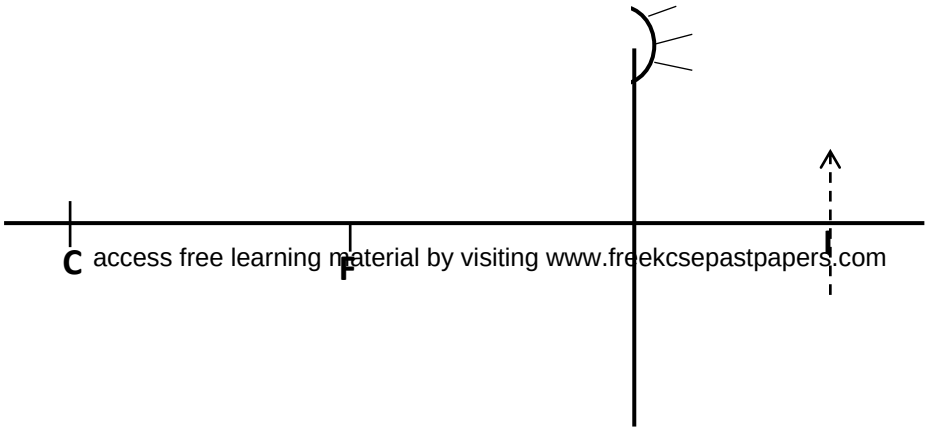
ii) Determine the values of a and b. (2 marks)

15. The diagram below shows a p-n junction diode.



On the same diagram, show how a battery may be connected so that the diode is reverse biased. (1 mark)

16. The figure below shows the image of an object O placed on the principle axis of a concave mirror.



On the same figure, draw a ray diagram to locate the object. (3 marks)

SECTION B (55 marks)

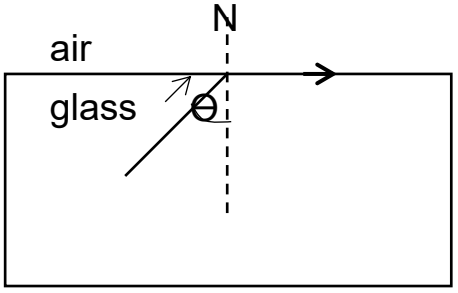
17. a) State Snell's law. (1 mark)

b) A ray of light traverses through air in to another transparent medium. The angle between the incident ray and interface (boundary) is 25^0 while the angle of refraction in the second medium is 38^0.

i. Sketch a diagram showing the angle of incidence and the angle of refraction. (2 marks)

ii. Determine the refractive index of the medium. (2 marks)

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

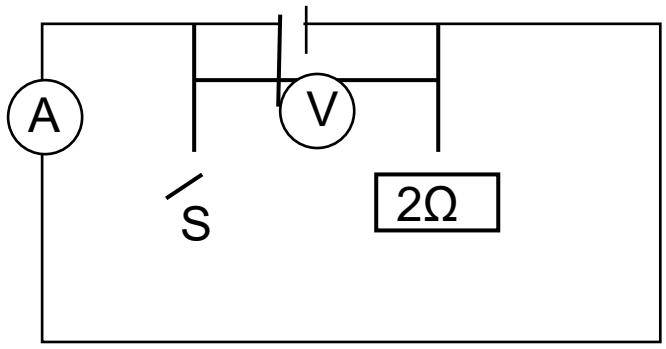


i. What special name is given to the angle Θ (1 mark)

ii. Given that the refractive index of glass is 1.59, determine the angle Θ, (2 marks)

18. a) State one condition under which Ohm's law in a conductor is obeyed (1 mark)

b) The figure below shows a cell connected in series with an ammeter, a 2Ω resistor and a switch. A voltmeter is connected across the cell.



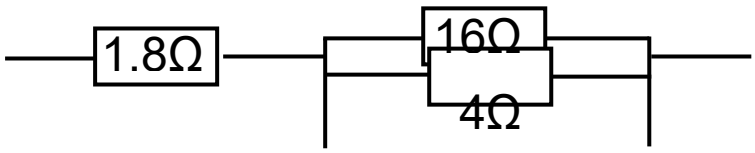
When the switch is open, the voltmeter reads 1.6V. But when the switch is closed, the voltmeter reads 1.0 V.

i. Which terms is used for the voltmeter reading across the cell in an open circuit? (1 mark)

ii. State the reasons for the drop in voltmeter reading in closed circuit. (1 mark)

iii. With the switch closed, the ammeter reading is 0.5 A. Determine the internal resistance of the cell. (2 marks)

c) The figure below shows a section of an electrical circuit. The current through the 1.8 resister is 2.0A.



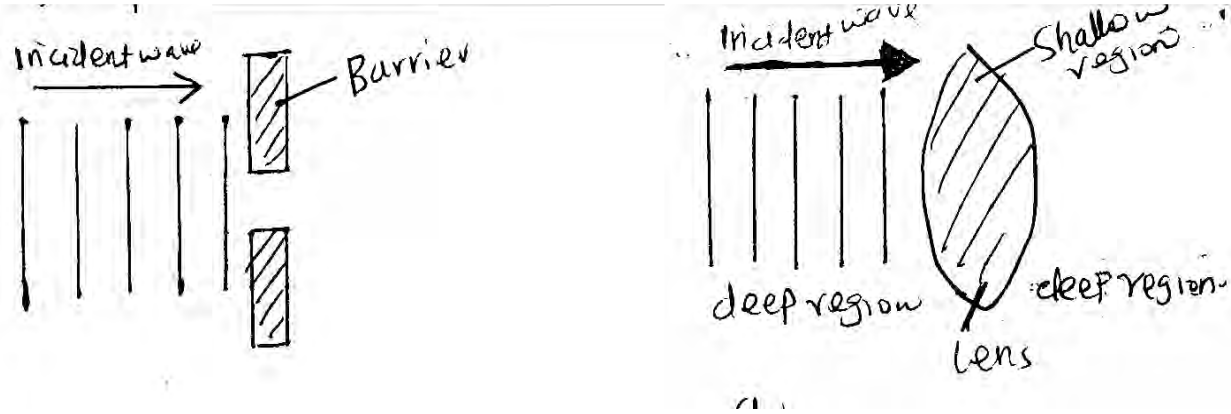
Determine

i. The effective resistance in the circuit. (2 marks)

ii. The current through the 4Ω resistor. (2 marks)

19. a) Define the term wavelength as used in waves. (1 marks)

b) Figure 15 (a) and (b) shows a barrier and a convex lens in the paths of incident plane waves.



On each figure, sketch the patterns of wave past the barrier and the lens respectively. (2 marks)

c) In an experiment to investigate interference in water waves in a ripple tank, describe

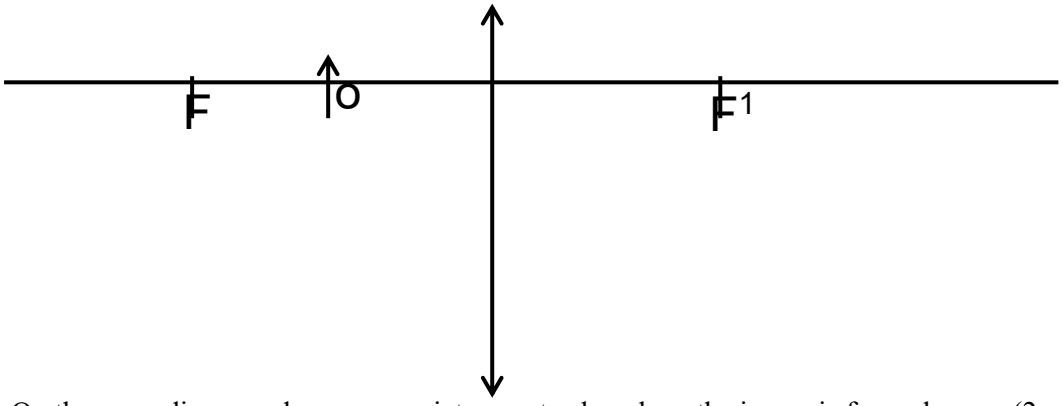
i) How two sets of coherent waves are produced? (2 marks)

ii) How constructive interference is produced and identified? (2 marks)

iii) How destructive interference is identified? (1 mark)

20. a) State one difference between real and virtual images. (1 mark)

b) The figure below shows a converging lens whose principle focus is indicated. An object O is placed at the position shown.



i. On the same diagram, draw appropriate rays to show how the image is formed. (2 marks)

ii. State one application of a converging lens as used in b(i) above. (1 mark)

c) In an experiment to determine the focal length of a lens using the lens formular method, state two measurement taken. (2 marks)

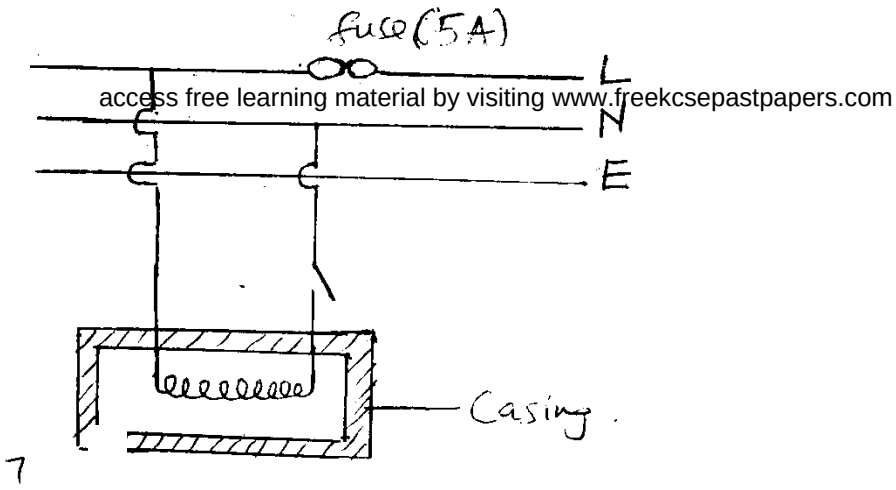
d) State one similarity and one difference in the working of the human eye and the camera as optical instruments. (2 marks)

21. a) Power transmitted over long distances is done at very high voltage and low current.

i. State the reason for transmitting power at very high voltage. (1 mark)

ii. How is a(i) above achieved. (1 mark)

b) The figure below shows part of an electric cooker circuit rated 30A connected to the mains supply.



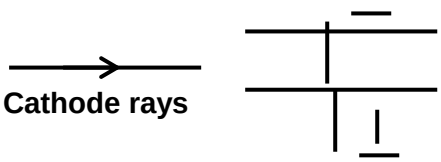
Identify two errors made in the wiring. (2 marks)

c) In domestic wiring, lamps are connected in parallel rather than in series. State one reason for this. (1 mark)

d) A house has 9 bulbs rated 120W, 240 V. Determine the appropriate fuse rating that can run these bulbs safely. (2 marks)

22. a) What is meant by the term thermionic emission. (1 mark)

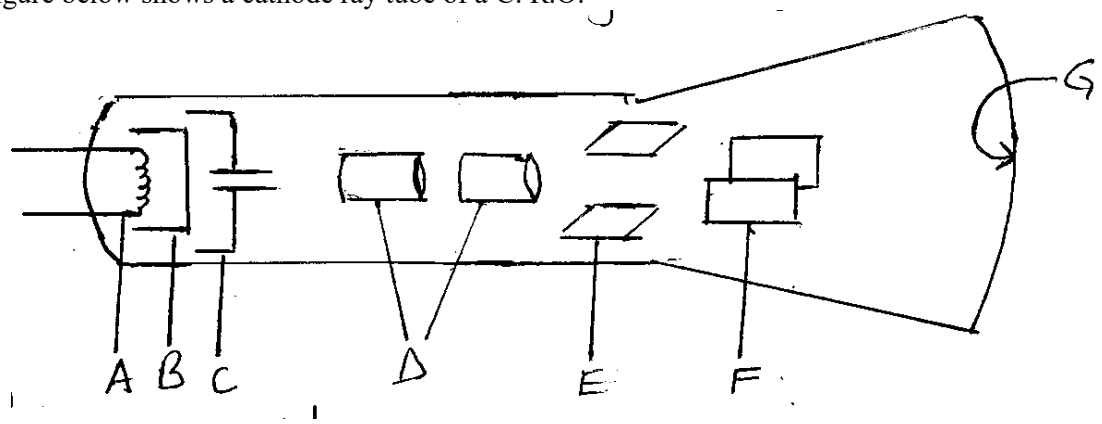
b) The figure below shows some cathode rays incident and passing in an electric field.



ii. What property of cathode rays is being investigated in the set up. (1 mark)

iii. Complete the diagram to show the path of the rays in the field. (1 mark)

c) The figure below shows a cathode ray tube of a C. R.O.



i. Identify parts labelled A and D. (2 marks)

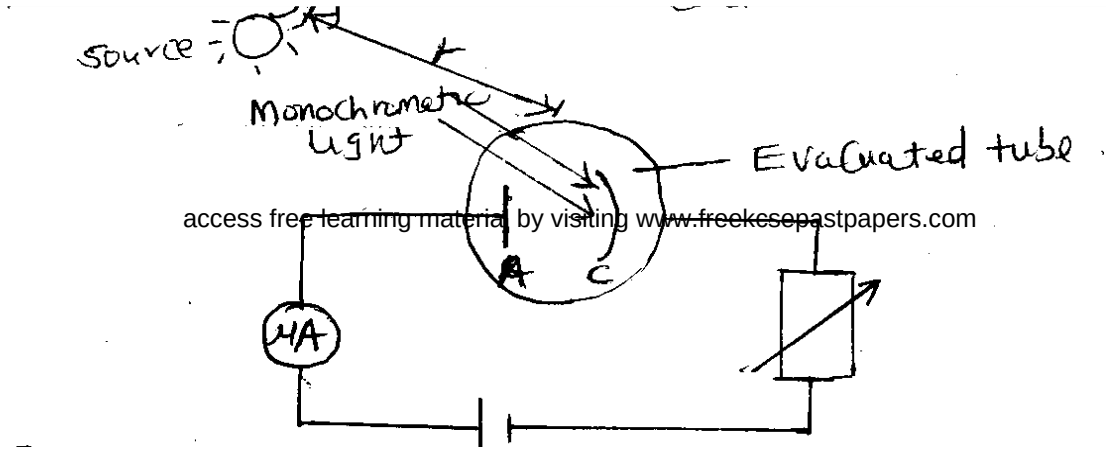
ii. Which parts of the tube

I – produces cathode rays (1 mark)

II – Deflects the cathode rays in the vertical direction. (1 mark)

23. a) What is meant by the term photoelectric effect. (1 mark)

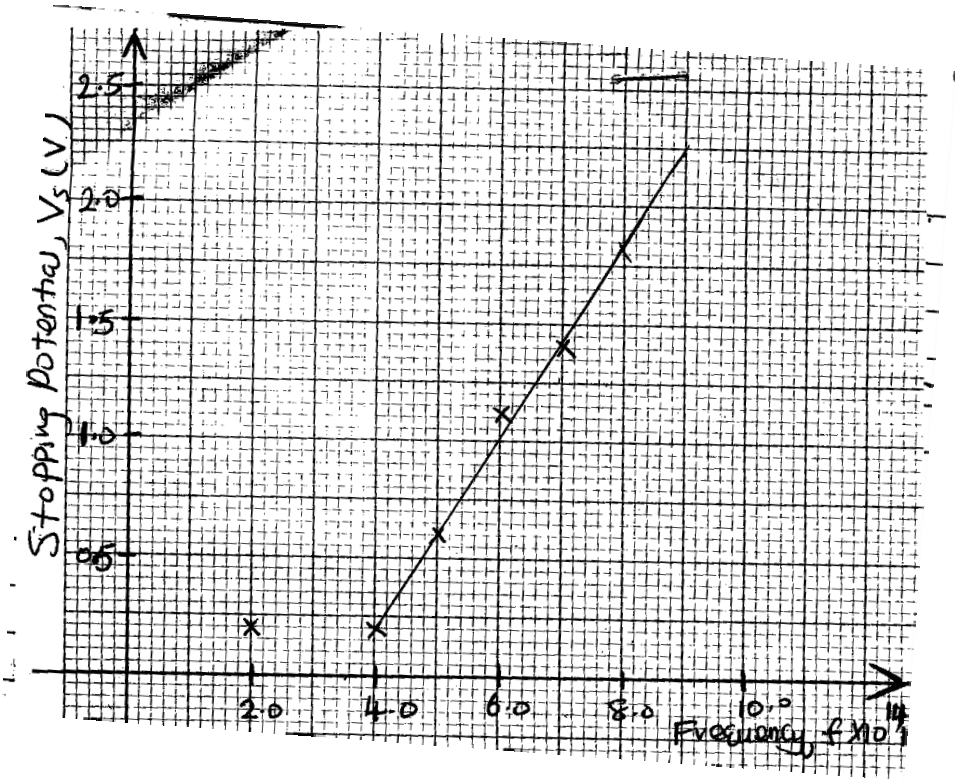
b) The figure below shows some monochromatic light incident on the cathode of a photocell which is connected to a battery, a micro ammeter and a variable resister.



i) State how monochromatic light can be obtained. (1 mark)

ii) State one adjustment that need to be done in order to register higher current in the microammeter. (1 mark)

c) The figure below shows a graph of stopping potential, V_s against frequency , f for an experiment done in investigating photoelectric effect. Given that the equation for the graph is $eVs = hf - W_0$ where the symbols has their usual meaning from the graph,



Take e = 1.6 x 10^{-19} C, determine

i. The threshold frequency of the metal surface. (2 marks)

ii. Planck's constant, h (3 marks)

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232/3
PHYSICS PRACTICAL
PAPER 3

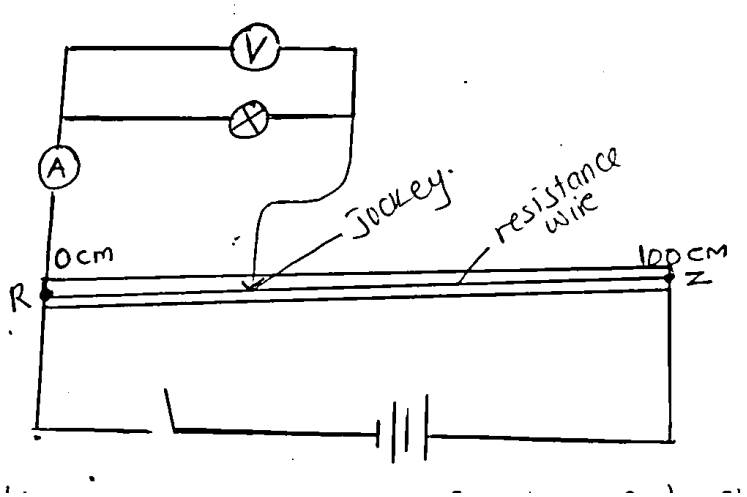
PART A

1. You are provided with the following:-

- 100 cm nichrome wire mounted on a mm scale.
- switch
- Ammeter 1 A
- 2 dry cells
- 2 cell holders
- A filament bulb 2.5v mounted on a holder.
- 8 connecting wires (four with crocodile clips).
- Voltmeter
- Jockey

Procedure.

i. Connect the circuit as shown below.



ii. Switch on the circuit and place the jockey at 10 cm on the mounted nichrome wire. Read then voltmeter and ammeter reading and record the values in the table below.

iii. Repeat step (ii) above to obtain values at 20cm, 30cm, 40cm, 50cm, 60cm, 70cm and 80cm.

(6 marks)

Table 1

Length (cm)	10	20	30	40	50	60	70	80
Voltage (V)								
Current (A)								

iv. Plot a graph of current (A) y axis against voltage (V). (5 marks)

v. Determine the gradient of the graph. (2 marks)

vi. Using the micrometer screw gauge, determine the diameter of the nichrome wire mounted on the mm scale.

(1 mark)

d = _____ mm

d = _____ m (1 mark)

vii. Workout the cross sectional area of the wire in S.I units. ($\pi = 3.142$) (2 marks)

A = _____

viii. Given that $\frac{1}{S} = \rho\frac{L}{A}$ at L = 0.3m, determine the quantity P. (3 marks)

PART B.

2. You are be provided with the following :-

- A salt solution in 250 ml beaker.
- Two identical cylindrical 100g masses.
- Two pieces of thread.
- A metre rule.
- A complete stand.
- Vernier caliper (To be shared)

a) i. Determine the volume V of one of the masses using the apparatus provided. Record V.

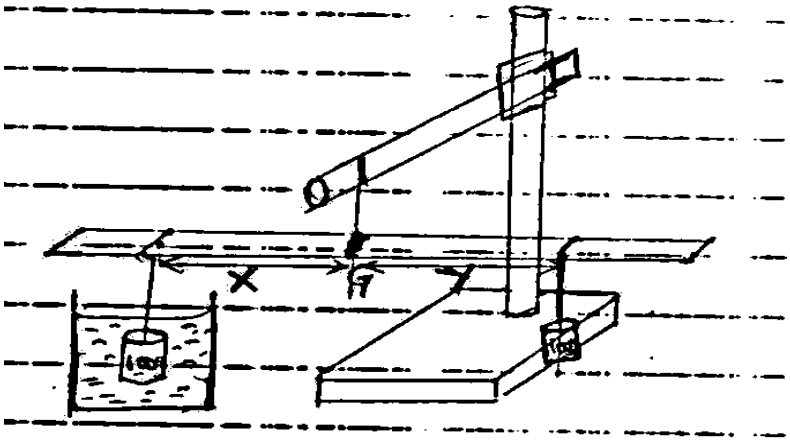
V = _____ (1 mark)

ii. Explain how you determined the volume V? (1 mark)

b) i. Determine the centre of gravity of the metre rule and record it as the balance point G.

G = _____ (1 mark)

ii. Arrange the apparatus as shown in the diagram below such that x = 5 cm from the pivot. With the 100g mass completely immersed in the salt solution hung the other 100g mass from the metre rule and adjust its position until the system is in equilibrium as shown.



Repeat the procedure above with the following values of x and fill in the table.
NB: During each experiment ensure that the position of the pivot does not change. (4 marks)

x(cm)	5	10	15	20	25	30
y (cm)						

Table 2

c) Plot a graph of Y against X in the grid. (5 marks)
d) Determine the slope **'s'** of the graph, (3 marks)
e) Given that $S = {}^{F}/_{W}$, where F is the apparent weight of the mass in the salt solution and W is the actual weight of the mass, calculate the value of F and the upthrust U.

F = _____ (1 mark)
U = _____ (1 mark)

f) Hence determine the density of the liquid L. (3 marks)

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PHYSICS PAPER 3
DECEMBER 2021

(Confidential)

Question 1.
1. A nichrome wire of a 0.40mm mounted on a mm scale (0 – 100 cm) and of gauge SWG 28.
- A switch.
- An ammeter (0 – 1A)
- 2 new dry cells.
- 2 cell holders.
- A filament bulb mounted on a bulb holder (2.5v).
- 8 connecting wires, four with crocodile clips on both ends.
- A voltmeter (0 – 3v) or (0 – 5v).
- A jockey.

Question 2.

2.

- A 250ml of salt solution in a 250ml beaker. (NB100g of salt to be dissolved in a 5 litres of water)
- Two identical cylindrical 100g masses.
- Three piece of thread 50 cm each.
- A complete stand (with a clamp and a boss).
- A vernier caliper (to be shared).