PHYSICS

Set1

232/1
PHYSICS
PAPER 1

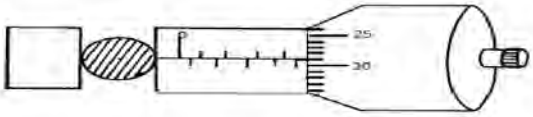
Instructions to candidates

- This paper consists of two sections A and B.
- Answer all the questions in the two sections in the spaces provided after each question
- All working must be clearly shown.
- Electronic calculators, mathematical tables may be used.
- All numerical answers should be expressed in the decimal notations.

SECTION	QUESTION	MAX MARKS	CANDIDATE'S SCORE
I	1 – 12	25	
II	12	11	
	13	12	
	14	11	
	15	09	
	16	12	
TOTAL		80	

SECTION A (25 MARKS)

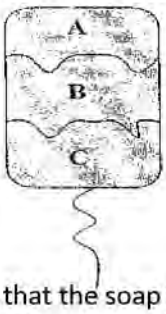
1. A spherical ball bearing of mass 0.0024 kg is held between the anvil and spindle of a micrometer screw gauge. The reading on the gauge when the jaws are closed without anything in between is 0.11mm. Use this information and the position of the scale in the figure below to answer the questions **(a)** and **(b)** below:



a) What is the diameter of the ball bearing? (1 mk)

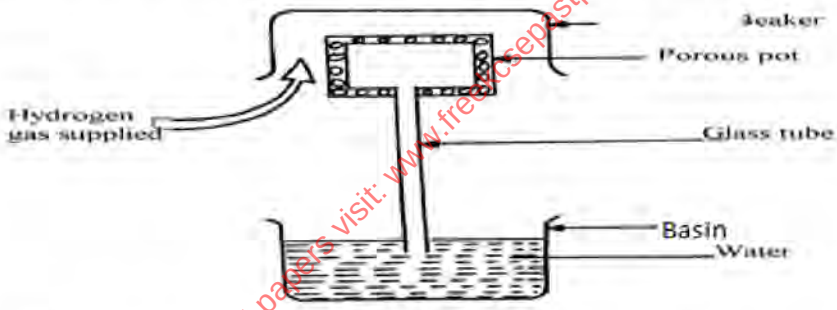
b) Find the density of the ball bearing correct to 3 significant figures (2 mks)

2. The diagram below shows a wire loop with two threads tied across it. The loop is dipped into a soap solution such that the soap film covers it as shown.



Region B is punctured such that the soap film in that section is broken. On the space alongside the diagram sketch the resulting shape of the wire loop. Give a reason for the shape. (2 mks)

3. The figure below shows an arrangement to demonstrate diffusion through solids:-



The hydrogen gas is supplied for sometimes then stopped and the beaker removed. State and explain what is likely to be observed when the hydrogen gas supply is stopped (3 mks)

Figure 2 shows two identical thermometers. Thermometer **A** has a blackened bulb while thermometer **B** has a silvery bulb. A candle is placed equidistant between the two thermometers

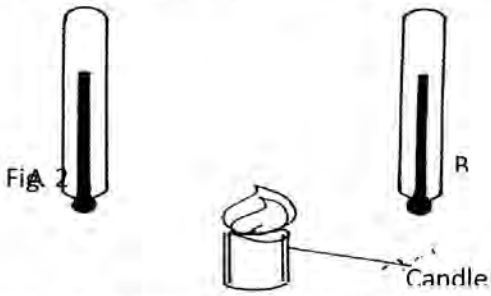
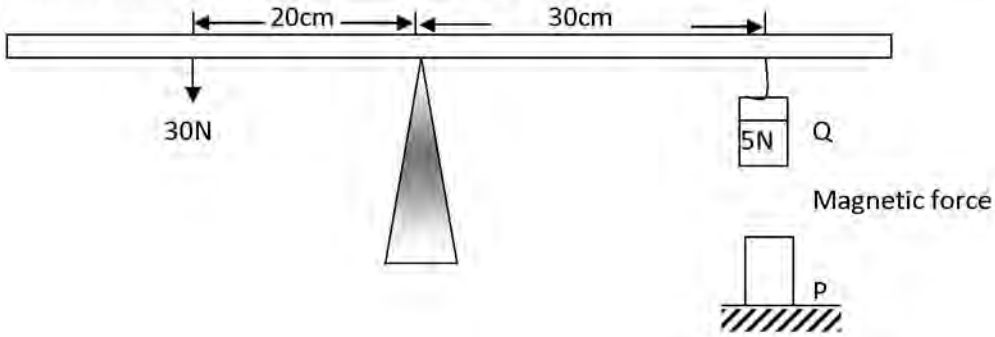


Fig. 2

State with a reason the observations made after some time(2 mk)

5. Explain why it is dangerous for a bus to carry standing passengers. (2 mks)

6. A uniform metre rule is balanced at its centre. It is balanced by the 30N, 5N and the magnetic force between **P** and **Q**. **P** is fixed and **Q** has a weight of 5N



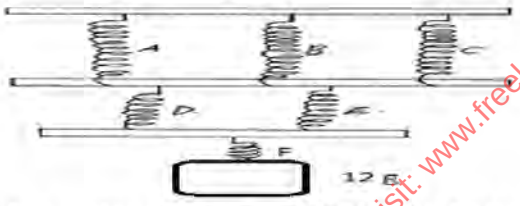
a) Ignoring the weight of the metre rule, calculate the value of the magnetic force between Q and P (2 mks)

b) Given that the lower end of Q is North pole, state polarity of the end of P facing Q. (1 mk)

7. (a) Give a reason why water is not suitable as a barometric liquid. (1 mk)

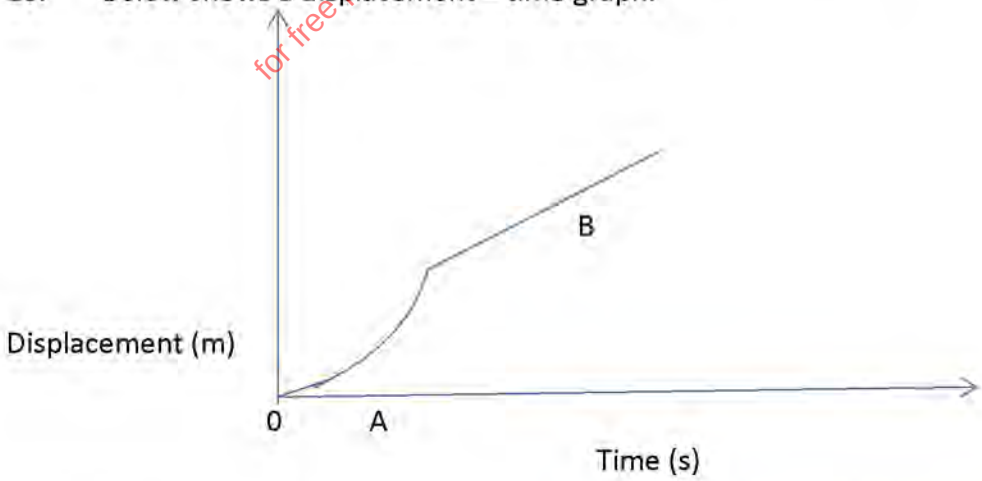
(b) Explain why a lift pump is unable to raise water from a borehole where the level of water is 20m below the ground level. (1 mks)

8. The diagram below shows a mass of 12g hanged on a set of 6 identical springs. When a mass of 12g was hanged on spring A alone, its extension was 5cm. Find the extension of the combination shown if each spring and each rod has negligible mass (2 mks)



9. Sea water of density **1.04g/cm^3** is being pumped into a tank through a pipe of uniform cross-sectional area of 3.142cm^2. If the speed of water in the pipe is 5m/s, determine the mass flux in S.I unit. (2 mks)

10. Below shows a displacement – time graph.



Describe the motion of the body between points:

OA (1 mk)

AB (1 mk)

11. A quantity of air occupied 500cm^3 at 15^{0}C when the pressure was 76 cmHg. At what temperature would it occupy 460cm^3 if the pressure was 85cmHg?(2 mks)

SECTION B (55 MARKS)

12 a) (i) Define velocity ration of a machine. (1 mk)

(ii) Draw a labeled diagram of a pulley system with a velocity ratio of 5. (2 mks)

(iii) Suggest any two possible reasons why the efficiency does not reach the 100% mark. (2 mks)

(b) The effort piston of a hydraulic machine is of radius 2.8 cm, while that of the load piston is of radius 14cm. The machine raises a load of 120 kg at a constant velocity through 2.5m. If the machine has an efficiency of 80%, find:-

(i) the velocity ratio of the hydraulic machine. (2 mk)

(ii) The mechanical advantage of the hydraulic machine. (2 mks)

(iii) The effort needed to raise the load. (2 mks)

13. (a) An object is released to fall vertically from height of 100m. At the same time another object is projected vertically upward with velocity of 40m/s.

(i) Calculate the time taken before the objects meet (3mks)

(ii) At what height do the objects meet? (2mks)

(b) A string of negligible mass has a bucket tied at the end. The string is 60cm long and the bucket has a mass of 45g. The bucket is swung horizontally making 6 revolutions per second. Calculate

(i) The angular velocity (2mk)

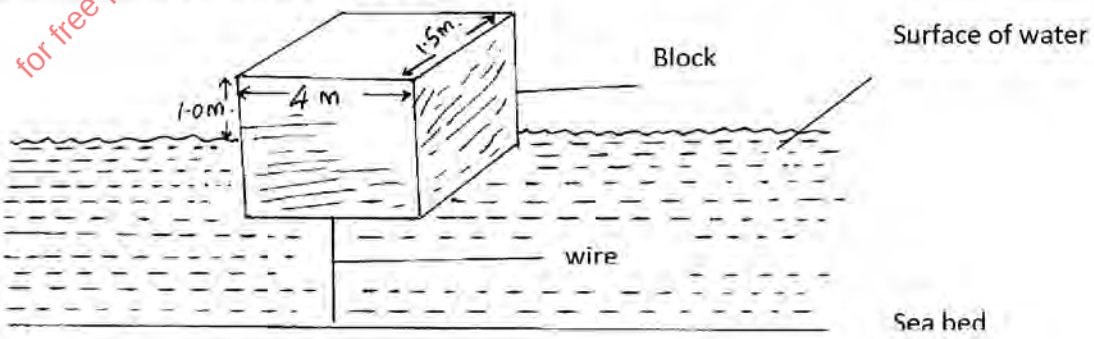
(ii) The angular acceleration (2mks)

(iii) The tension on the string (2mks)

(iv) The linear velocity (1mk)

14. a) State Archimedes' principle. (1mk)

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.



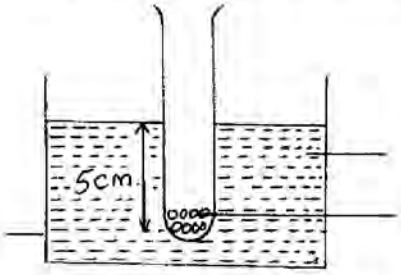
Calculate the :-

(i) Weight of sea water displaced by the buoy (density of sea water = 1100kg/m^3) (3 mks)

(ii) Upward force exerted on the buoy by the water. (1mk)

(iii) Tension in the wire (2mks)

(c) A test tube of mass 10g and uniform cross-sectional area $4cm^2$ is partly filled with lead shots and floats vertically in water with 5cm of its length submerged.



Find the:-

(i) Mass of the lead shots. (2mks)

(ii) Length of the test tube that would be submerged in a liquid of density $0.75g/cm^3$. (2mks

15. (a) State two differences between boiling and evaporation. (2 mk)

(b) 1200g of a liquid at 10^0C is poured into a well-logged calorimeter. An electric heater rated 1KW is used to heat the liquid. The graph in fig 4 below shows the variation of temperature of the liquid with time.

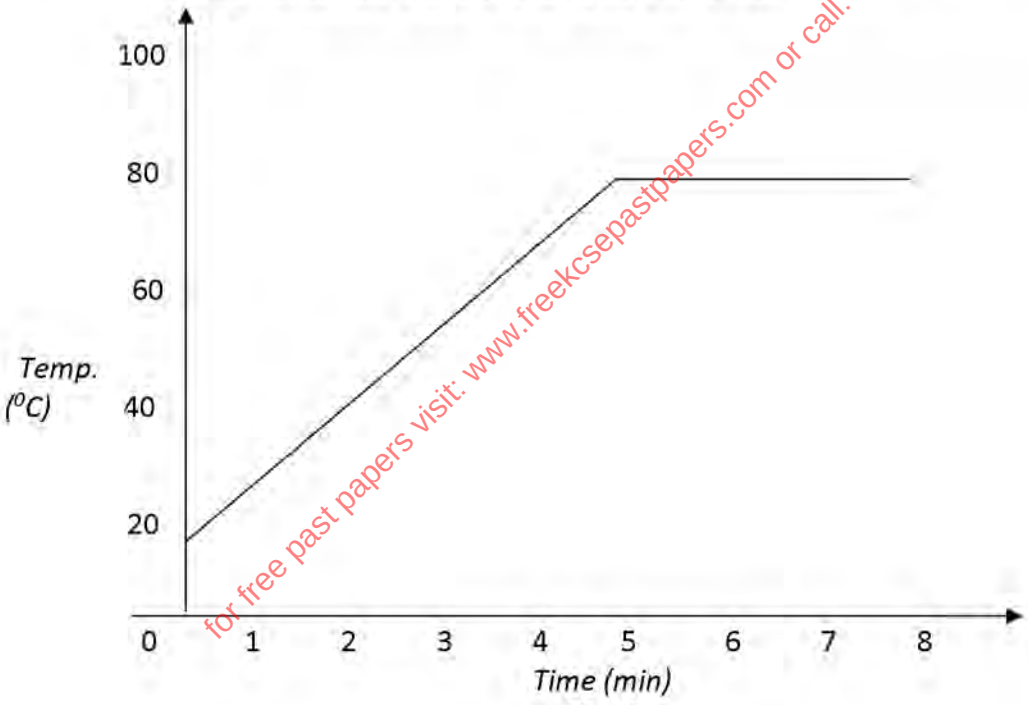


Fig. 4

Use the graph to answer the following questions:

(i) What is the boiling point of the liquid? (1 mk)

(ii) How much heat is given out by the heater to take the liquid to the boiling point? (2 mks)

(iii) Determine the specific heat capacity of the liquid stating any assumptions made. (2 mks)

(iv) If 50g of the liquid vapour was collected by the end of the 8^{th} minute, determine the specific latent heat of vaporization of the liquid. (2 mks)

16. (a) (i)State Newton's second law of motion. (1 mk)

(ii) A striker kicks a ball of mass 250g initially at rest with a force of 75N. if the foot was in contact with the ball for 0.10sec. Calculate the take off velocity of the ball. (2 mks)

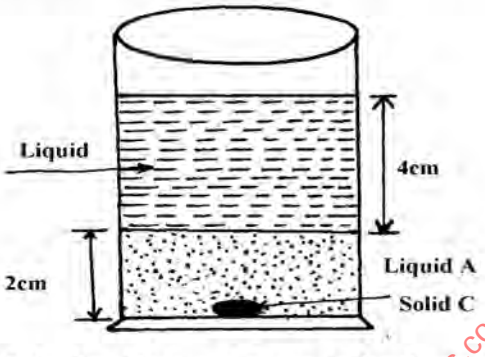
(b) A bullet of mass 20g moving at 400 m/s strikes a block of wood of mass 3.5kg initially at rest. The bullet sticks into the block and the two move off together on a horizontal surface,where a frictional retarting force of 4N is acting between the block and surface.

(i) Determine the initial common velocity of bullet and wooden block.(2 mks)

(ii) What distance does the block move before coming to rest? (3 mks)

(b) to the levels shown in the diagram below.

Figure 5



If the densities of the liquids **A** and **B** are 1g/cm^3 and 0.8g/cm^3 respectively and the atmospheric pressure 760 mmHg, find the total pressure acting upon solid **C** at the bottom of the container. (Take density of mercury to be 13.6g/cm^{3}and g = 10 N/Kg) (3 mks)

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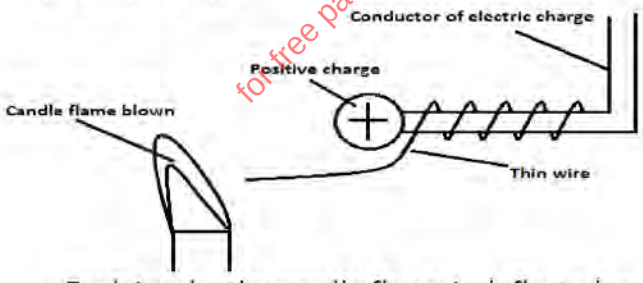
Paper 2

SECTION A (25 MARKS)

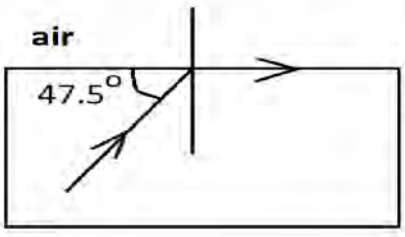
1. The figure below shows a thin wire connected to a charge generator and placed close to a candle flame.



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

2. State the meaning of the term "threshold frequency" as used in photoelectric emission. (1mark)

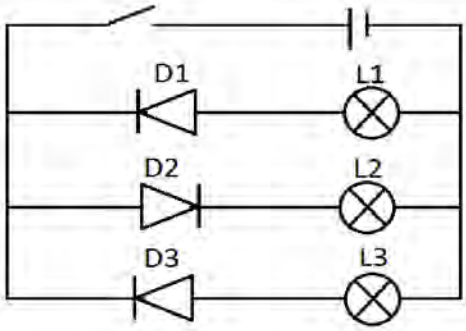
3. The figure below shows the path of light passing through a rectangular block of perpex, placed in air.



Calculate the refractive index of the Perspex. (2 marks)

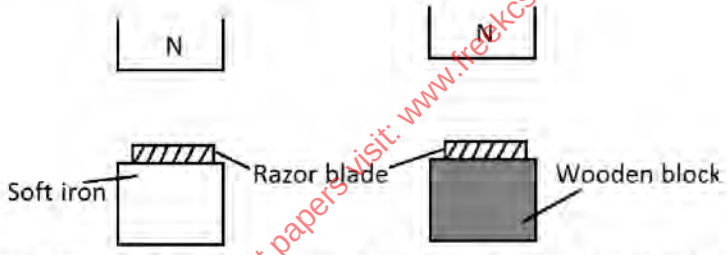
4. A radio signal of 30MHz is received by an aerial whose length is 1/8 th of its wavelength. If the speed of light is 3.0×10^8 m/s determine the length of the aerial. (3 marks)

5. The figure below shows an electric circuit with three diodes, three bulbs and a cell. State and explain what would be observed when the switch is closed.
(2 marks)



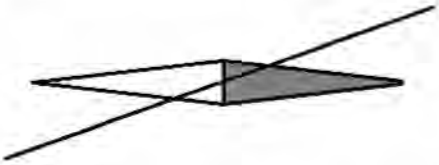
6. What property of cathode rays shows that they are particles and not waves?
(1 marks)

7. Two similar razor blades are placed one on a wooden block and the other on a soft iron block as shown in the figure below



It was observed that the razor blade on the wooden block was attracted to the magnet while the other on the soft iron block was not. Explain. (2 marks)

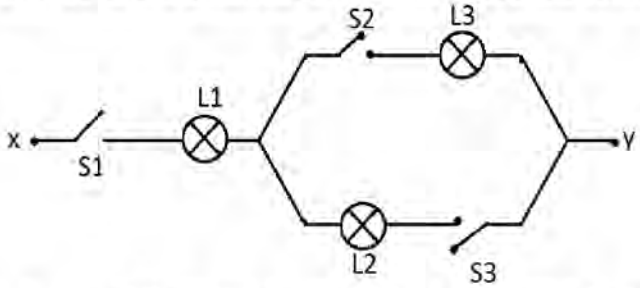
8. The figure below shows a wire carrying current placed over a magnetic compass. On the wire, indicate the direction of electric current. The shaded side is the North Pole. (1 mark)



9. Differentiate between a capacitor and capacitance. (1 mark)

10. A 10μF capacitor is charged by a 100 V supply and then connected a cross an uncharged 20μF capacitor. Calculate the final p.d on each capacitor. (3 marks)

11. Fig. 7 shows an electric circuit including three switches, S_1, S_2, S_3 and three lamps L_1, L_2, L_3. A constant potential difference is applied across X and Y.



i) Other than L_1, state the lamp that will light when S1 and S_2 are closed (1 mark)

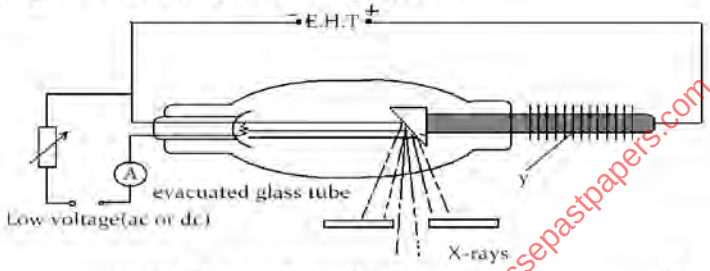
ii) How does the brightness in L1 in i) above compare with its brightness when all the switches are close. (1 mark)

iii) Explain the observation in ii) above. (1 mark)

12. During total eclipse of the sun, both light and heat are observed to disappear simultaneously. Explain the observation. (2 marks)

SECTION B (55 MRKS)

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



a) Label the part marked Y. (1 mark)

b) How would one increase

i). The intensity of the X –rays. (1 mark)

ii). Penetrating power of the X –rays. (1 mark)

c) Explain why the tube is highly evacuated. (2 marks)

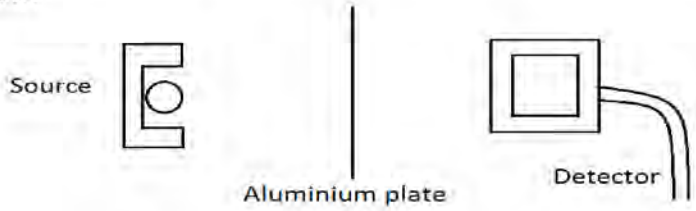
d) An X –ray tube operating with an anode potential of 10 kV and current of 15Ma.

i) Calculate the number of electrons hitting the anode per second. (3 marks)

ii) Determine the speed with which the electrons hit the target (3 marks)

(charge of an electron, $q=1.6\times10^{-19}C$, mass of an electron $M_e=9.1\times10^{-31}$ kg.)

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



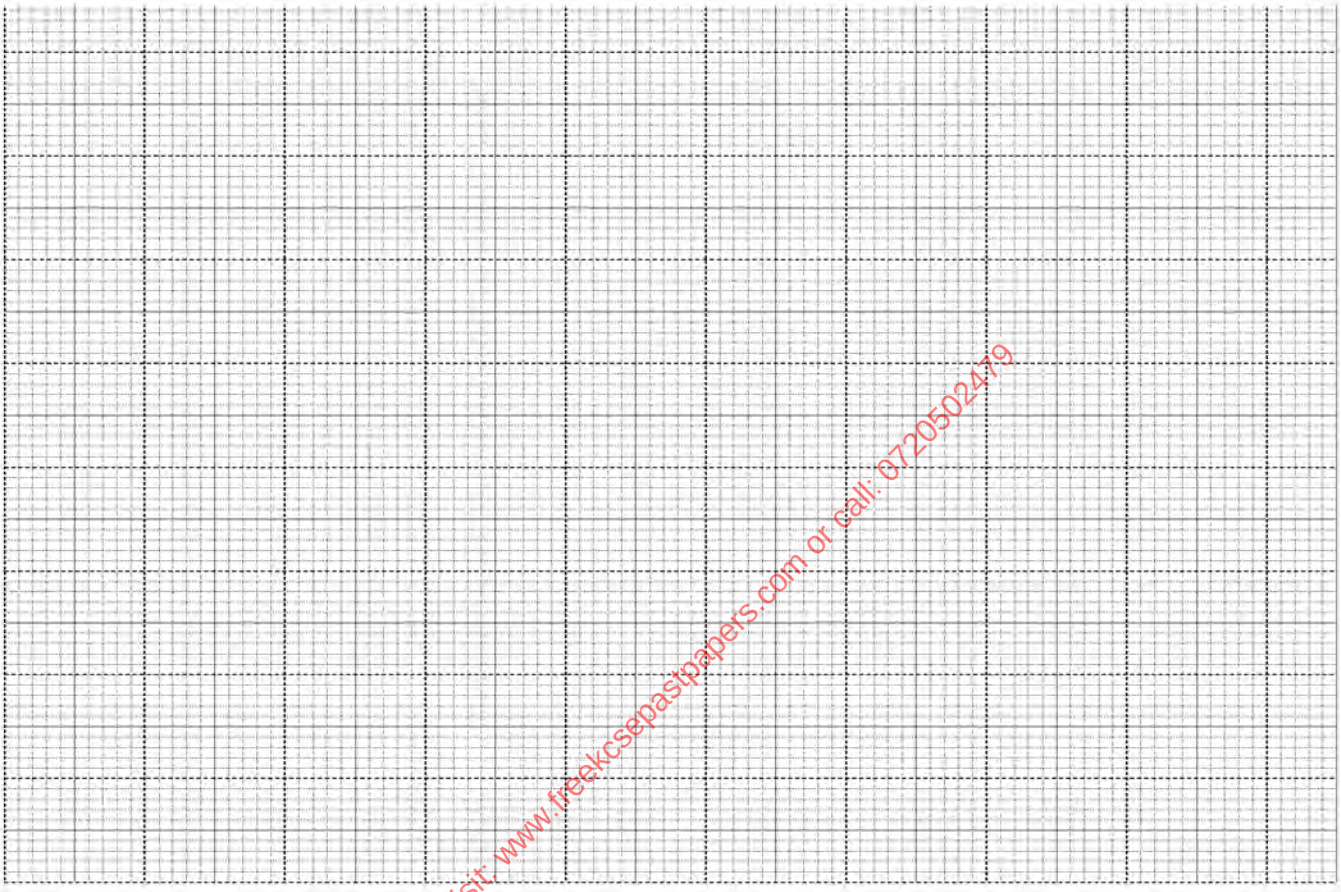
a)

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

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

Count rate(counts/s^{-1})	1440	1272	1128	840	624	480	360	264	204	180
Time	0	3	6	12	18	24	30	36	42	45

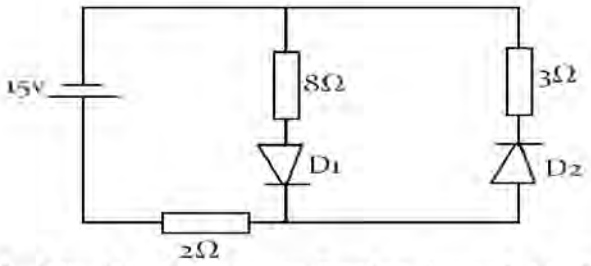
i). Plot a graph of count rate against time on the grid provided below (5 marks)



a. Use the graph to obtain the half life of the source. (1 mark)
b. Using the half life determine how long it would take for the count rate to fall from320 to 40 counts per second. (2 marks)

3.

a) Define the term electromagnetic spectrum. (1 mark)
b) Your radio is tuned into a radio station 144km away.
i). How long does it take the signal to reach your receiver?
(2 marks)
ii). If the signal has a frequency of 600 KHz, how many wavelengths is the station from your receiver.
(Take C=3.0x10^8 m/s) (3 marks)
c) State the function of magnetron in a microwave cooker. (1 mark)
a) Sketch the circuit symbol of a semiconductor diode and name its parts. (2 marks)
b) What is rectification (1 mark)
c) Study the diagram below and answer the following questions

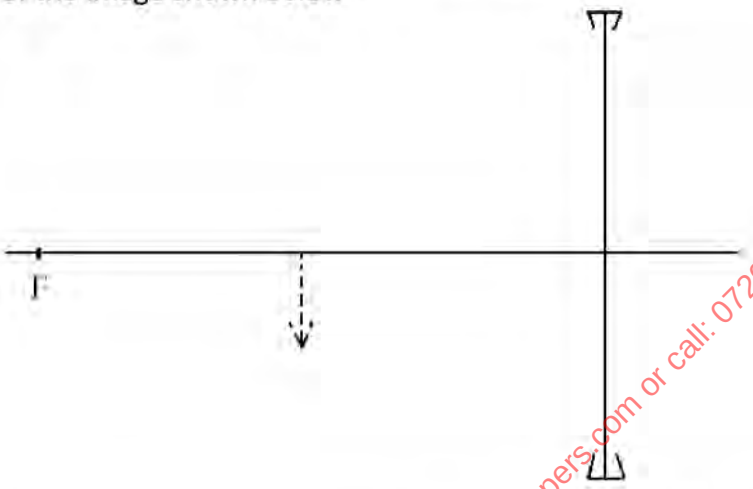


i). Calculate the current flowing through the 2Ω resistor. (2 marks)

ii). Calculate the voltage drop across the 3Ω resistor. (3 marks)

4.

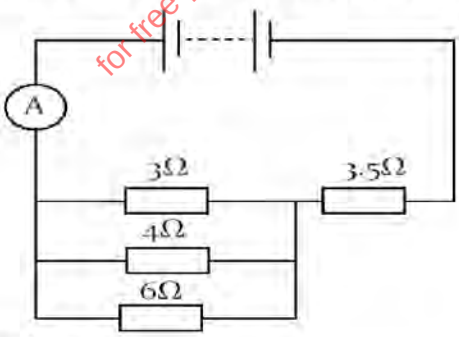
a) Complete the diagram below indicating the rays that will lead to the formation of the image shown below (3marks)



b) 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)

c) 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)

a) The diagram below show a battery of e.m.f 12V and an internal resistance of 0.17Ω connected to a combination of resistors.



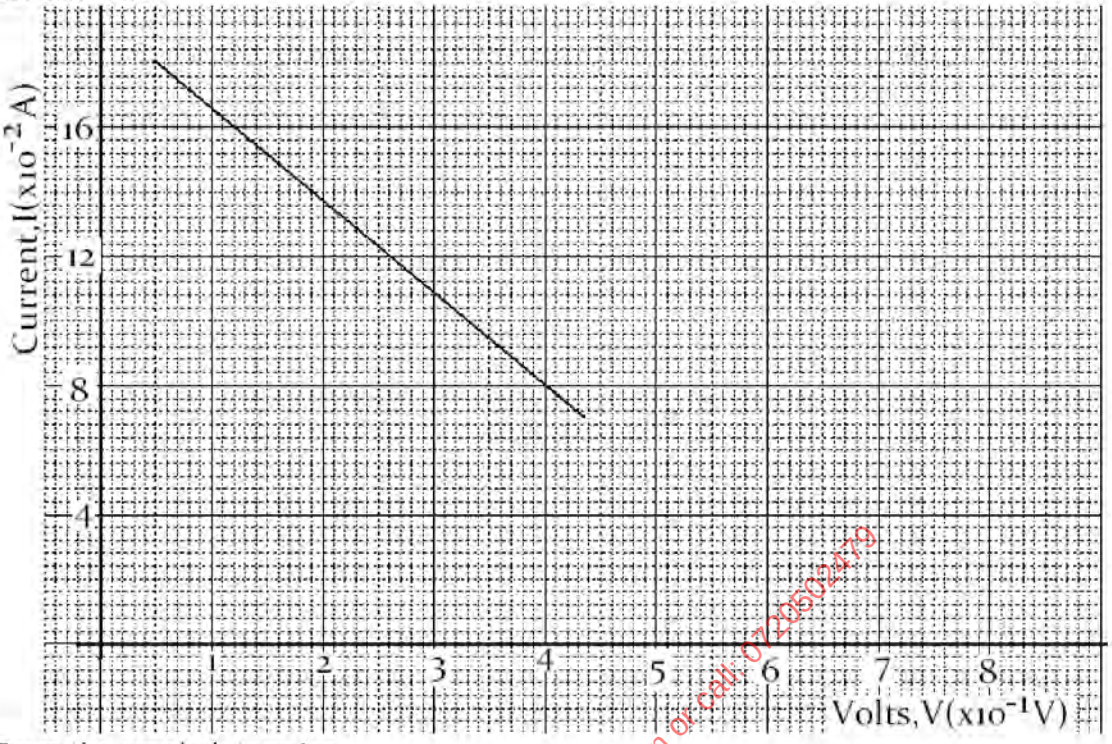
Calculate

i). The current through the 3.0Ω resistor (3 marks)

ii). The potential difference across the parallel connection. (2 marks)

iii). The current through the 4Ω resistor. (1 mark)

b) 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)

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Paper 3 (PRACTICAL)

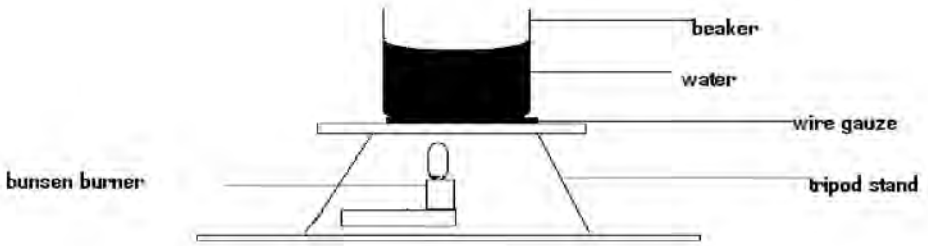
1.

You are provided with the following;

-A 400ml glass beaker

- A Bunsen burner
- A thermometer
- A stop watch
- A tripod stand and a measuring cylinder 100ml
- A wire gauze
- A source of heat.

Set up the apparatus as shown in the diagram below.



Measure 100cm^3 of water and pour it into the beaker. Take the initial temperature of the water.

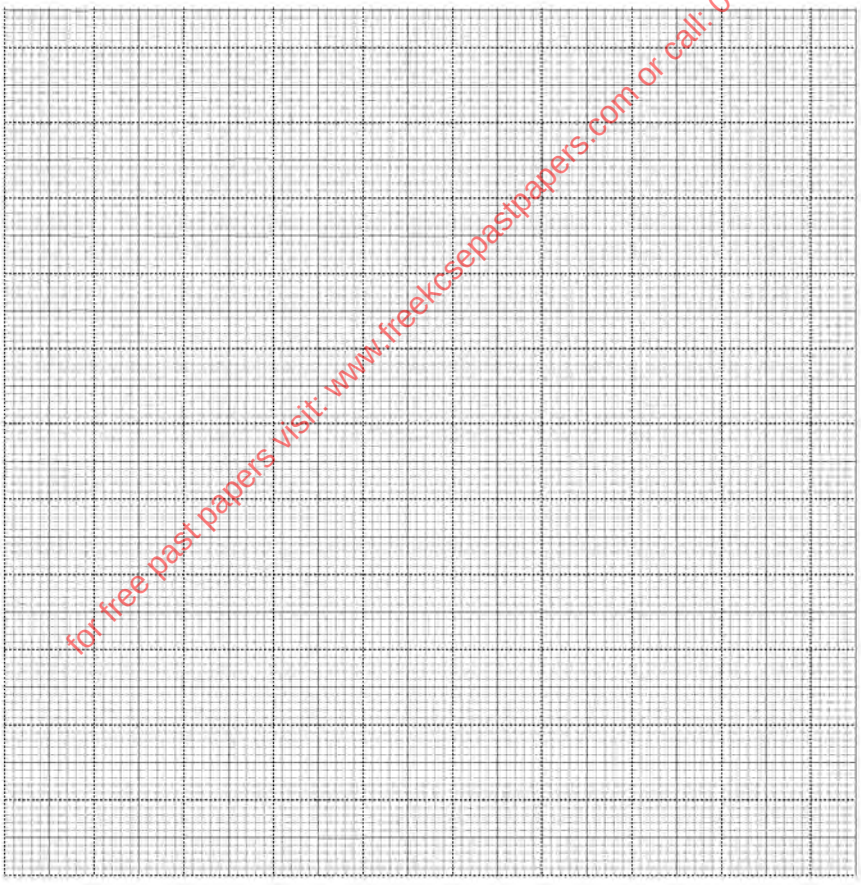
(1mk).

Now heat the water to a temperature of 90 ^{0}C. Switch off the gas tap and place a thermometer into the beaker and start the stop watch when the temperature is 65 ^{0}C. Take the temperature T ^{0}C of water every two minutes. Record your results in the table below.

Time (t) (min)	2	4	6	8	10	12	14
Temperature (T) ^{0}C							
$(T - T_0)^0$							
Log $(T - T_0)$							

(7mks)

(i) Plot a graph of Log $(T - T_0)$ against Time (t). (5mks



(ii) Find the value K of $\log(T - T_O)$ when t = 0 (2mks)
Determine the antilog of K. (2mks)

(iii) Calculate the temperature of the sorounding T_R using the expression
Antilog K = 65 - T_R. (3mks)

2.

This question has two parts A and B. answer both parts.

PART A

You are provided with the following:

- A meter rule
- Two identical 100g masses
- About 200ml of liquid L in 250ml beaker
- Three pieces of thread, each about half metre long.
- Stand with clamps
- Tissue paper.

Proceed as follows:

(a) Using a stand and one piece of thread, suspend the metre rule in air such that it balances horizontally. Record the position of the centre of gravity. G.

G = _____ mm

NOTE: The metre rule should remain suspended at this point through out the experiment.

(b) Set up the apparatus as in figure 2 below.

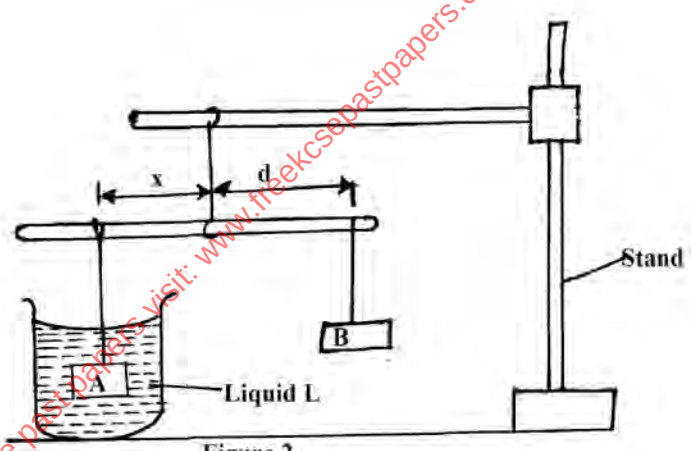


Figure 2

Suspend the mass A at a distance x = 50mm. adjust the position of mass B until it balances mass A immersed in liquid L.

Record the distance d, of mass B from the pivot.

Repeat the same process for other values of x in table 2 below and complete the table.

x(mm)	50	100	150	200	250	300
d(cm)						

(3 mks)

(c) Plot a graph of (x. (5mks)

d) Detemine the slope, S of the graph. (2mks)

(e) Gi

ven $S = \frac{F}{W}$, where F is the apparent weight of object A in the liquid L and W is the actual weight of A, find:-

(i) The value of F. (2mks)

(ii) The upthrust, U (3mks)

PART B

You are provided with the following:

- A concave mirror with holder
- A screen
- A meter rule
- A candle
- A match box (to be shared)

Proceed as follow:

(f) Set up the apparatus as in figure 3 below.

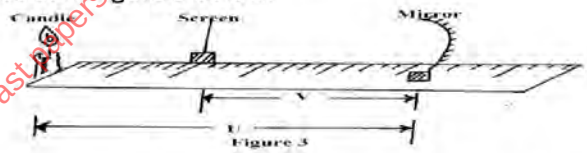


Figure 3

(g) Put the oblect at a distance u = 30cm from the mirror. Adjust the position of the screen until a sharp image is formed on the screen. Record the distance V.

(h) Repeat procedure (b) above for the distance u = 40cm and record the new distance V. complete the table 3 below.

U(cm)	V(cm)	$M=^{v}/_{u}$	(m+1)
30			
40			

(2mks)

(i) Given $f = \frac{V}{(m+1)}$, calculate the values of f hence determine the average value f_{av}(3mks)

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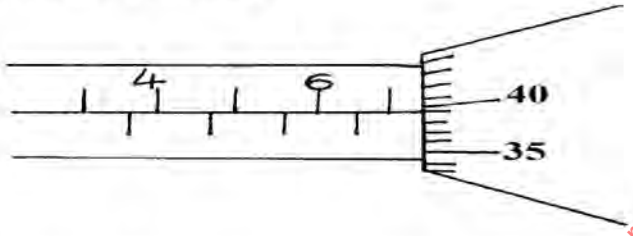
PHYSICS
PAPER 1

SECTION A (25 MARKS)

Answer All the questions in this section in the spaces provided after each question.

1 The micromer scewguage shown had an error of – 0.03mm and was used to measure the diameter of a ball bearing.



Find the radius of the ball bearing whose diameter is recorded by the instrument(2mks)

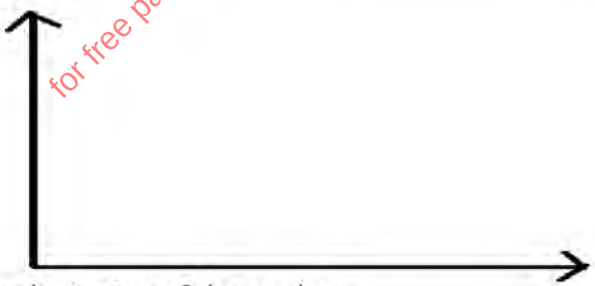
2 State **two** properties of a liquid that is considered during the construction of a liquid – in – glass thermometer. (2mks)

3 Explain why steel is selected as a better material for reinforcement for a concrete beam. (1mk)

4 Water tanks supplying showers and taps in a house are erected as high as possible.Exaplain. (2mks)

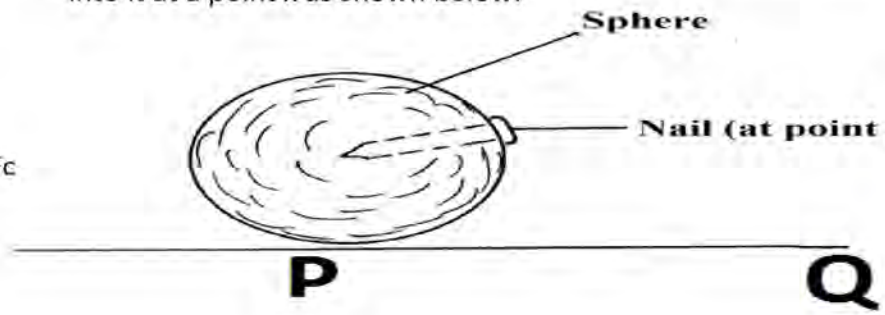
5 Explain why a dead dog thrown next to school smells so much during the day than during cold morning. (1mk)

6 Pure water at 0^0C is heated upto 10^0C sketch the graph its volume against temperature on the axis given below. (2mks)



7 State **one** limitation of the gas law. (1mk)

8 The figure below shows a homogenious wooden sphere with a nail driven or hammered into it at a point x as shown below.

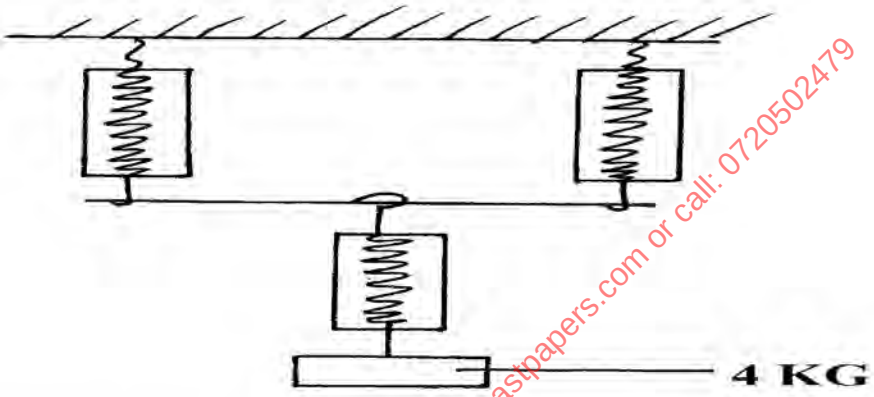


The sphere is allowed to roll after a little push on it. On what position will it settle along the plane PQ.Give a reason for your answer. (2mks)

9 A drop of oil has a volume of $3.0x10^{-6}m^3$ and spreads to form a patch of radius 16cm on the surface of water. Determine the thickness of the oil patch. (3mks)

10 A ball is kicked from a table top horizontally so that it moves and fall some distance on the horizontal ground 65cm away from the base of the table. If the table is a half a metre tall, calculate the initial horizontal velocity of the ball. (3mks)

11 Three identical spring balances of spring constant 40N/M and weight 0.5N are used to support a load as shown. Determine the total extension of the system. (3mks)



12 Curtains on the doors and windows are seen to bulge or hang outwards when there is a wind blowing across them. Explain this phenomenon. (2mks)

13 The temperature of a cold drink from a fridge was found to be 261kelvin.What temperature would this be in degrees centigrade. (1mk)

SECTION B (55MARKS)

Answer All the questions in this section in the spaces provided after each question.

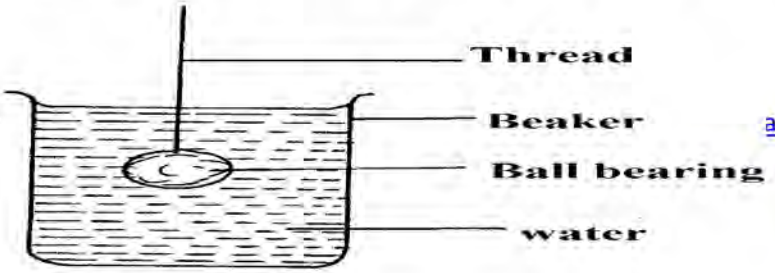
14 a) State the Archimade's principle. (1mk)

b) The reading on a spring balance is 7.2N when a metal ball bearing is hung from its lower end in air the density of the metal is $9.00g/cm^{-3}$ and that of water is $1.00g/cm^{-3}$.The ball is immersed in water in a Eureka can until it is completely submerged. (3mks)

i) What is the volume in m^3 of water displaced.

ii) What is the reading of the spring balance in N when the ball is completely submerged in water. (3mks)

c) Using the model below show all the forces that are acting on the metal ball bearing as it moves through the water (indicate with arrows). (3mks)



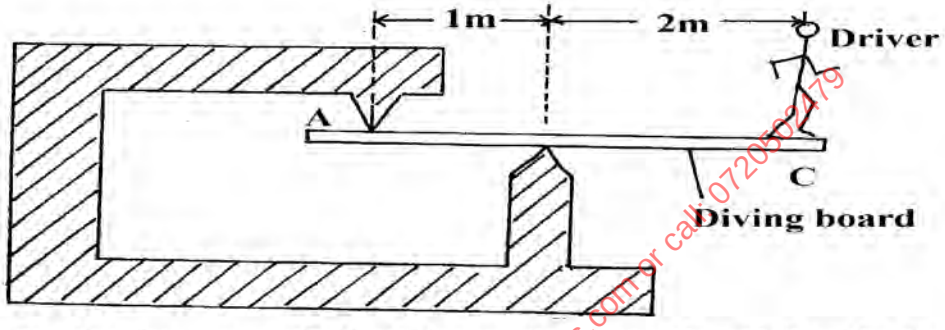
15 a) Name the two necessary conditions for a body to be in equilibrium.(2mks)

b) The handle of a door is fitted furthest from the hinoes during its assembly for easy operation. Explain this. (2mks)

c) If the handle were to be at 75cm from the hingers and a force of 70N were applied on it to open the door, determine the moment of force that would be experienced. (3mks)

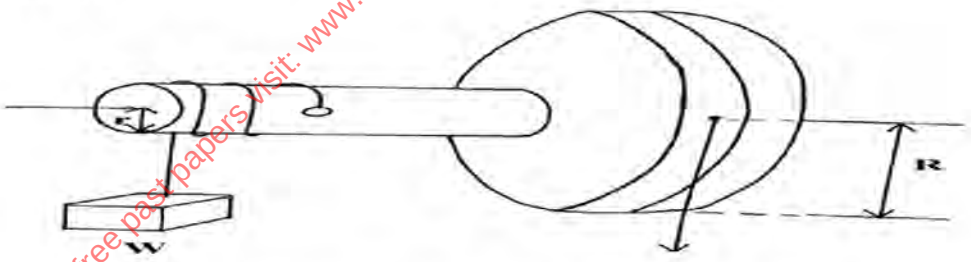
d) Explain what is meant by a uniform beam in equilibrium. (2mks)

e) The figure below shows a simple form of a driving board.



The diver has a mass of 60kg.Calculate the magnitude and show the direction of the force acting at A if the board is uniform and has a mass of 20kg.(3mks)

16 a) The following figure shows a wheel and axle used to raise a load W by applying an effort,F.The radius of the large wheel is R and that of the small wheel is r.



i) Show that the velocity ratio (V.R) of the machine is given by $^{R}/_{r}$(2mks)

ii) Given that r = 8cm and 2R = 20cm,determine the effort required to raise a load of 40N if the efficiency of the system is 85%. (4mks)

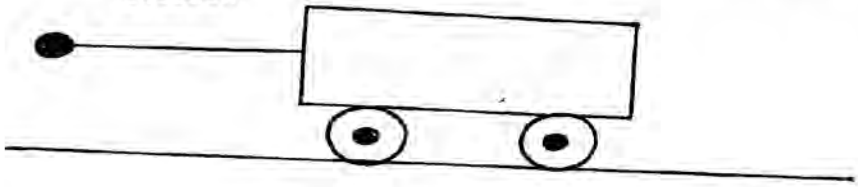
b) i) Give **two** examples of renewable sources of energy. (2mks)

ii) Distinguish between work and effort. (2mks)

17 a) An object which is moving over a horizontal surface does not continue its motion with a constant acceleration when the acceleration force is discontinued. The motion decays to zero finally. Explain what is responsible for this observation. (2mks)

b) A trolley of mass 5.00kg resets on a plain horizontal ground shown in the figure below.

i) On the sketch below show the forces acting on it when pulled in one direction (4mks)



ii) When trolley is pulled with a horizontal force of 24N, the trolley accelerates at $3ms^{-2}$.Find the frictional force acting on the trolley (3mks)

c) An automobile of mass 500kilograms is accelerated from rest a long a horizontal surface. The force produced by the engine is 300N and that due to friction is 50N.What is the accelerating force and what is the acceleration produced(3mks)

18 a) State what is meant by streamline flow. (1mk)

b) The figure below shows a cross-section of an aeroplane wing (aerofoil) with the aeroplane moving in the direction shown by the arrow.

i) Sketch treamline to show how air flows past the wing as the aeroplane move. (1mk)

ii) Explain how dynamic lift of the aeroplane is caused by the wing.(2mks)

c) i) Write down the expression for the equation of continuity and explain its components. (2mks)

ii) Explain how air is drawn into the barrel of a Bunsen burner when the gas supply is opened. (2mks)

d) A water pipe of diameter 5.2cm is connected to another pipe of diameter 1.3cm.The speed of the water in the smaller pipe is $3ms^{-1}$.What is the speed of the water in the larger pipe. (3mks)

set2
Paper 2 (Theory)

SECTION A (25MARKS)

1 Using the domain theory, explain how strong heating causes demagnetization.(2mks)

2 You are provided with two identical cells. Two lamps and a switch.

i) Draw a circuit diagram that would ensure that the bulbs have maximum brightness. (2mks)

ii) State **one** disadvantage of using such an arrangement in (i) above to light a whole house with many bulbs. (1mk)

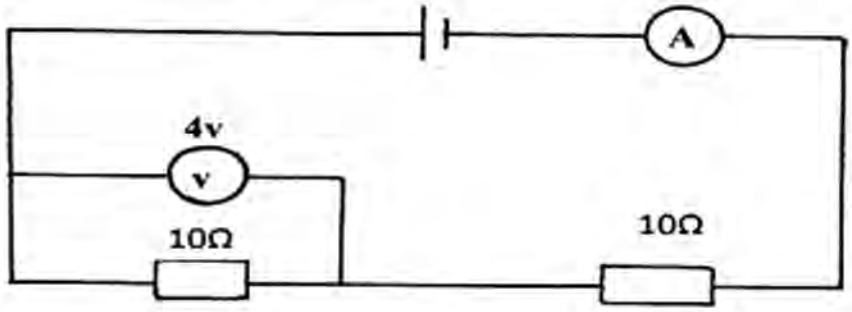
3 Calculate the operating current of a heating element rated 3KW,240 volts.(3mks)

4 What is local action and how is it minimized in a simple cell. (2mks)

5 The figure below shows an object O placed in front of a plane mirror.

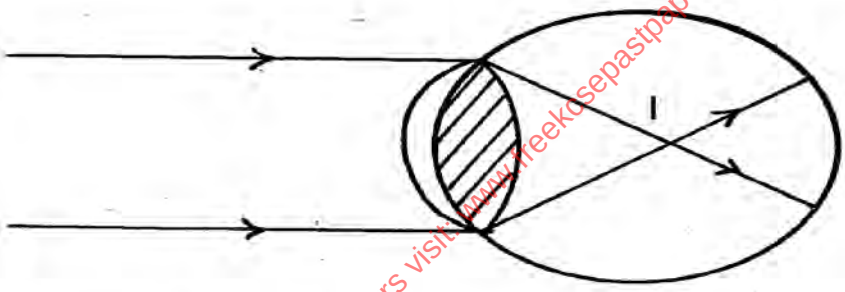
Use a ray diagram to locate the position of the image. (2mks)

6 In the circuit diagram in figure below, the voltmeter reads 4 volts.



Determine the ammeter reading. (3mks)

7 The figure below shows an eye defect.



Name the defect and state how it can be corrected. (2mks)

8 Kiss FM broadcasts at a frequency of 100 H_Z if the velocity of the radio waves is 3.0 x 10^8 m/s.Calculate the wavelength of radio waves. (2mks)

9 The refractive index of turpentine is 1.47,What is the refractive index of the air with respect to turpentine. (2mks)

10 State two factors that affect the strength of an electromagnet. (2mks)

11 A material of resistivity $1x10^{-2}$ Ω m has a cross-section area of $2x10^{-2}$ mm^2 and length 2m, determine its resistance. (2mks)

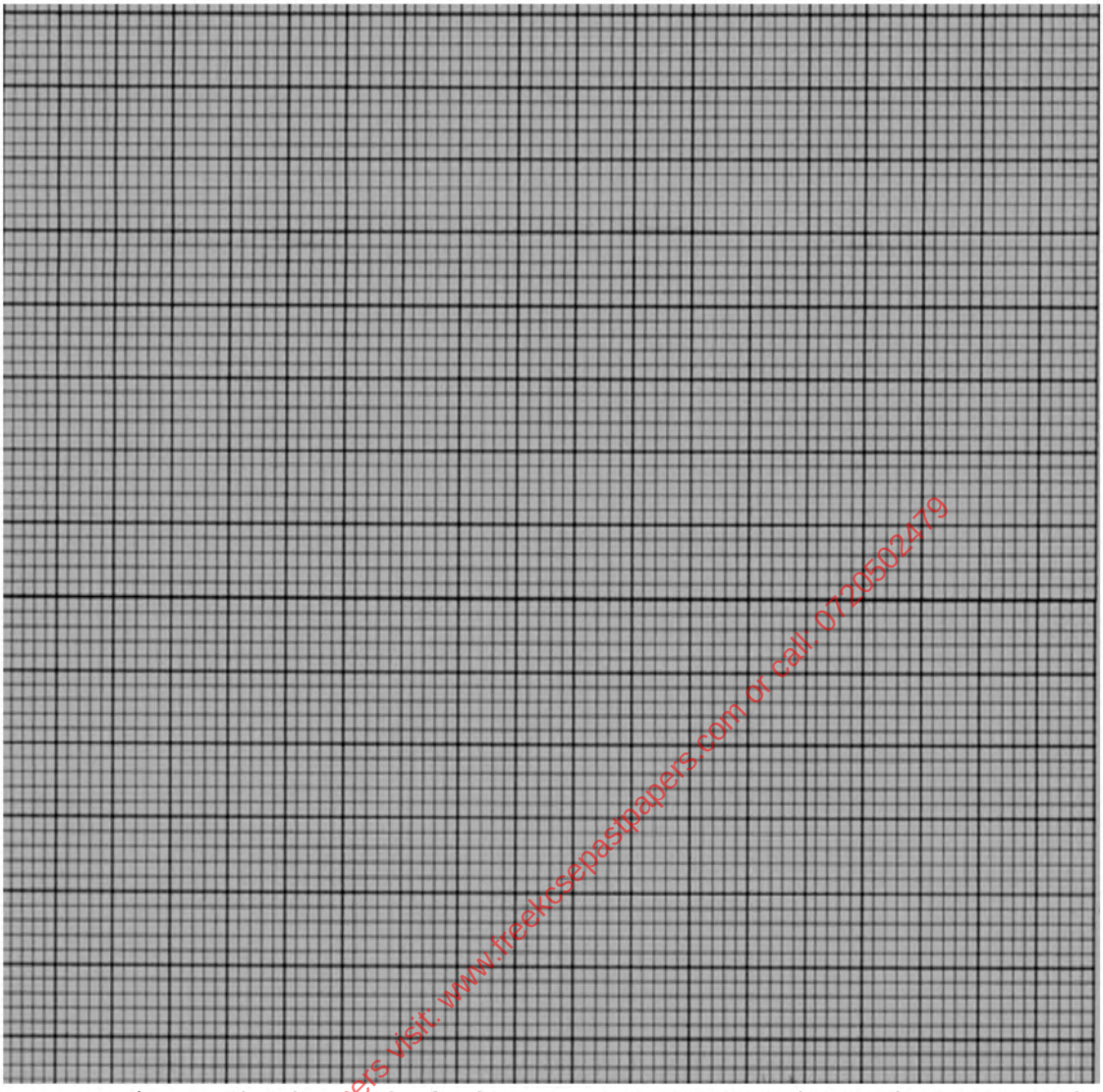
SECTION B (55MARKS)

12 a) State two factors affecting resistance of a resistor. (2mks)

b) In an experiment to determine the internal resistance of a cell, the following results were obtained.

Volts V x 10^{-1} V	14	10	8.4	6.0	4.2	2.0	1.0

Current 1 x 10^{-1} A	1.2	6.0	8.0	10.8	13.0	15.6	16.8



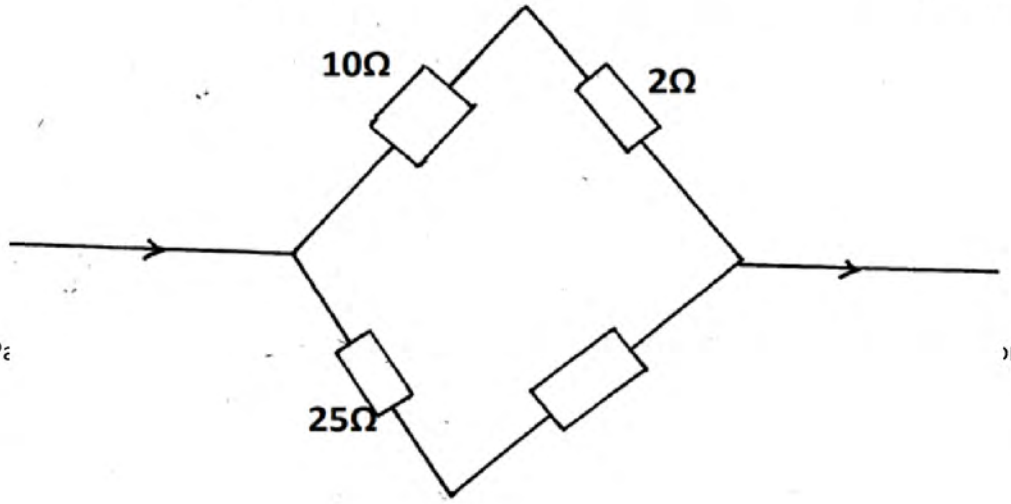
i) Plot the graph of voltage against current on the graph paper provided.

ii) Use the graph to determine:

a) e.m.f of the cell. (2mks)

b) The internal resistance of the cell. (2mks)

c) The figure shows a set of resistance, determine the effective resistance (3mks)



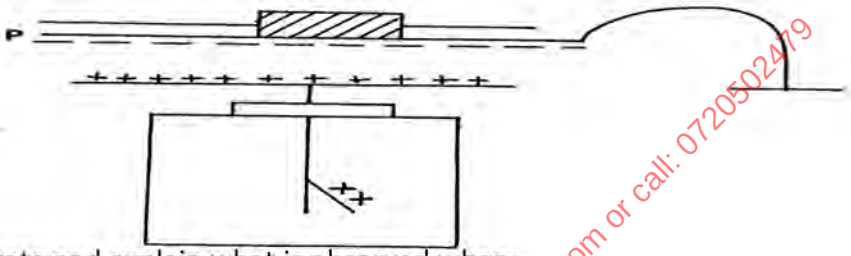
13 a) Give a reason why a candle flame is blown away when a highly charged rod is brought close to it. (2mks)

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

c) Sketch the electric field pattern around the following point charges.(1mks)

d) Give a reason why it is not advisable to take shelter under a tree especially when it is raining. (1mk)

e) An earthed metal P is placed directly above the plate of a charged electroscope as shown.



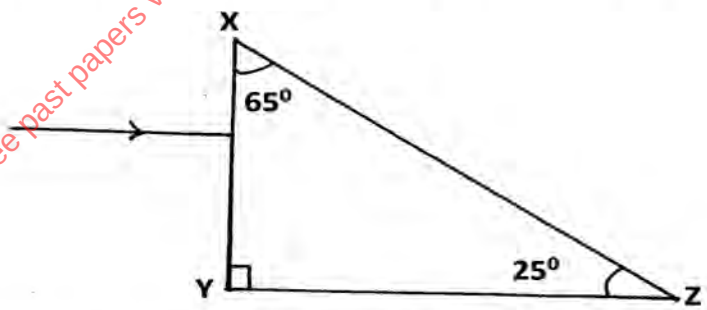
State and explain what is observed when:

i) P is slid slowly sideways. (2mks)

ii) P remains fixed in its position but a slab of paraffin was is slid slowly between the plates. (2mks)

14 a) A small object O is placed 30cm away from diverging lens of focal length 10cm.Determine by scale drawing the position and nature of the image on the grid provided. (3mks)

b) The diagram below shows a glass prism and incident ray striking the surface XY.



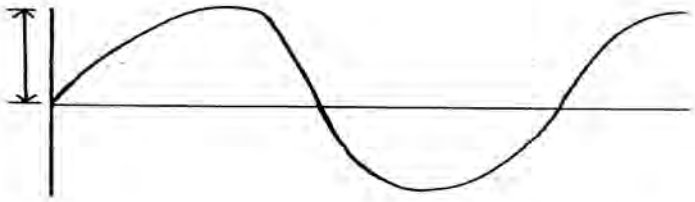
i) Indicate on the diagram the path of the emergent ray. (2mks

ii) Calculate the refractive index of the glass prism given that the critical angle of glass is 42^0 (3mks)

c) A concave lens of focal length 15cm forms an image 8cm from the lens. Calculate the object position from the lens. (3mks)

15 The screen of a cathode ray oscilloscope displays the trace shown in the figure belowThe ray y – sensitivity is set at 10v/cm and the base set at 0.2ms/cm.Obtain values for:

a) The peak voltage. (1mk)

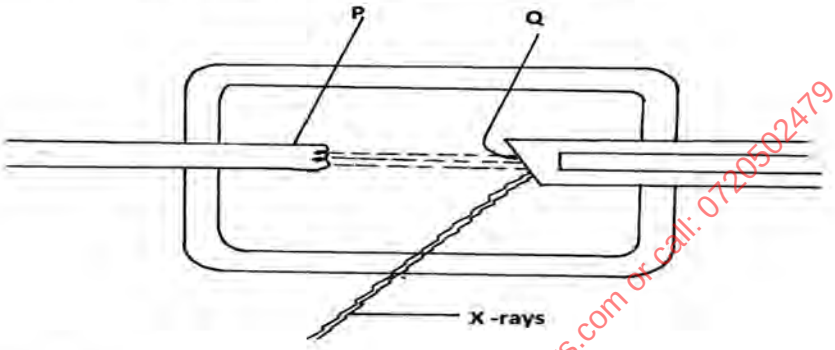


b) The frequency of the alternating signal. (2mks)

c) State two reasons why a c . R -O is advantageous to use as a voltage over ordinary meters (2mks)

d) List two uses of the graphite used in the T.V set. (2mks)

16 a) The diagram below shows part of X – rays tube.



Name parts:

b) i) What is the effect on the wavelength of X – rays if the number of electrons hitting metal target are increased. (1mk)

ii) What is the effect on wavelength of X –rays when pd across the tube is decreased. (1mk)

c) Calculate the maximum velocity of electrons that would produce x-rays of frequency $8.0 \times 10^{8} Hz$ if only 20% of kinetic energy is converted to x – rays.(Take planks constant = 6.63×10^{-34} JS and mass of electron = 9.1×10^{-31} kg). (3mks)

d) An x-ray tube operating at a potential difference of 50KV has a tube current 20mA.Calculate.

i) The electric power input. (2mks)

ii) The number of electrons hitting the target per second given that e = 1.6×10^{-19}. (2mks)

iii) The velocity of electrons when they hit the target. (3mks)

set2
Paper 3 (PRACTICAL)

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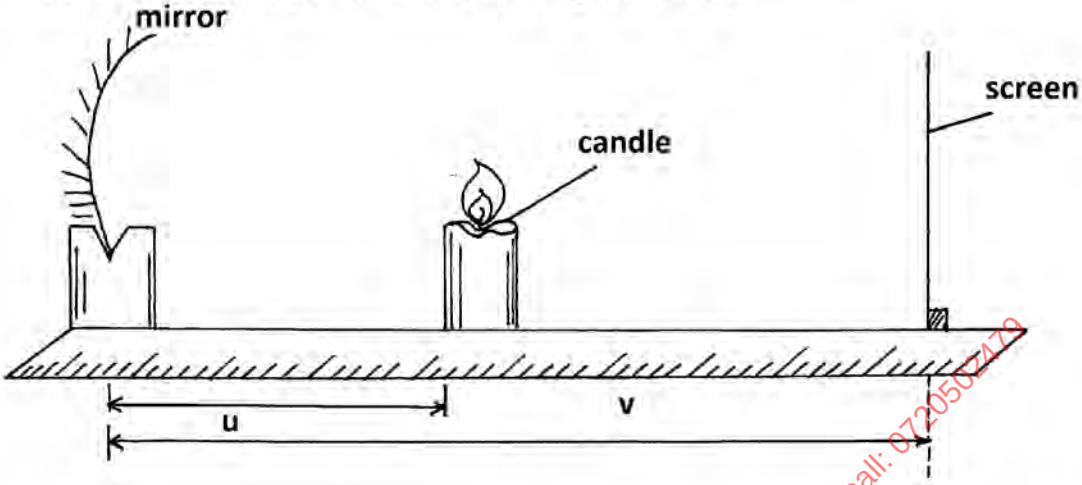
1. **PART A**

You are provided with the following apparatus

- Concave mirror and a holder
- Meter rule
- Candle (about 7cm)
- White screen

a) Determine the focal length of the mirror by focusing a distant object
f = (1mk)

b) Arrange the apparatus as shown in figure 1 below



c) Place the candle at a distance u =22cm from the mirror. Move the screen along the meter rule until a sharp image is formed on the screen. Measure and record the image distance V.

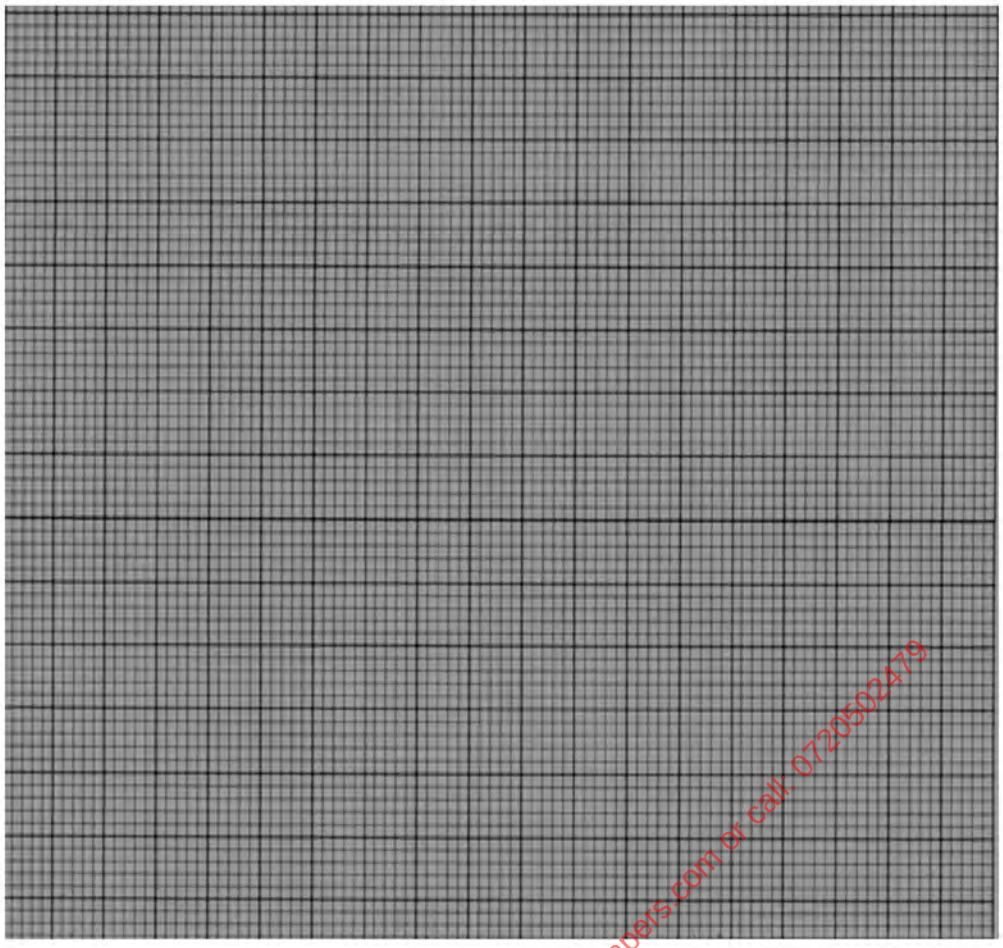
d) Repeat the experiments for other values of u and record your result in table 1 below..

Object distance u(cm)	22	24	26	28	30	32	34
Image distance V (cm)							
Magnification (v/u)							

(6mks)

e) Plot a graph of magnification, m(y-axis)against image distance v (5mks)

f) Given that $m = {}^{v}/_{f}-1$. Determine the focal length, f.



Part B

You are provided with the following apparatus

- A voltmeter 0-3 or 0-5v
- An ammeter (0-1A)
- 10Ω resister (fixed)
- A switch
- One dry cell and a cell holder
- Six connecting wires

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

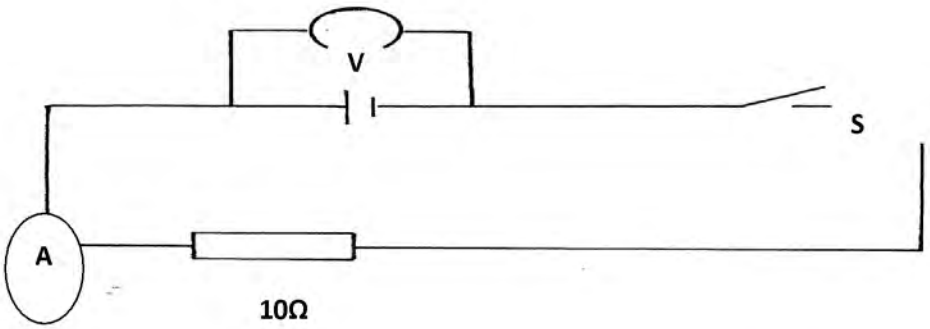


Figure 2

ii) With the switch S open, record E the voltmeter reading (1 mk)

E =

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

v = (1mk)

I iv) Given that E –V = Ir, Find r the fro the dry cell. (2mks)

Queston 2

Part A

You are provided with the folowng

- A triangular prism
- A piece of soft board
- Four (4) optical pins
- A sheet of plain paper
- Thumb pins

Proceed as follows:

a) Place the plain sheet of paper on the soft board . Trace the triangular outline of the prism on the sheet of paper. Remove the prism and use a ruler to extend the three sides of the outline

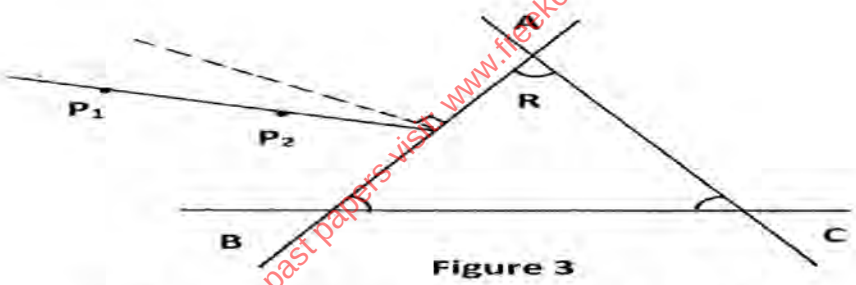


Figure 3

Use a protractor to measure the refracting angle R of the prism.

R = (1mk)

b) On the side AB of the triangular prism outline,. Draw a normal at a point half-way between A and B. (This normal will be used for the rest of the experiment).

c) Draw a line at an angle i-30^0 to the normal. Stick two pins P_1 and P_2 vertically on this line. See figure 3 above.

d) Place the prism accurately on the outline. By viewing through the prism from side AC. Stick two other pins P_3 and P_4 vertically such that they are in line with the images of pins P_1 and P_2

Remove the prism and the pins. Draw a line joining marks made by P_3 and P4 . Extending this line to meet AC. See figure 4 below.

Measure and record in tale 2 below the value of angle o

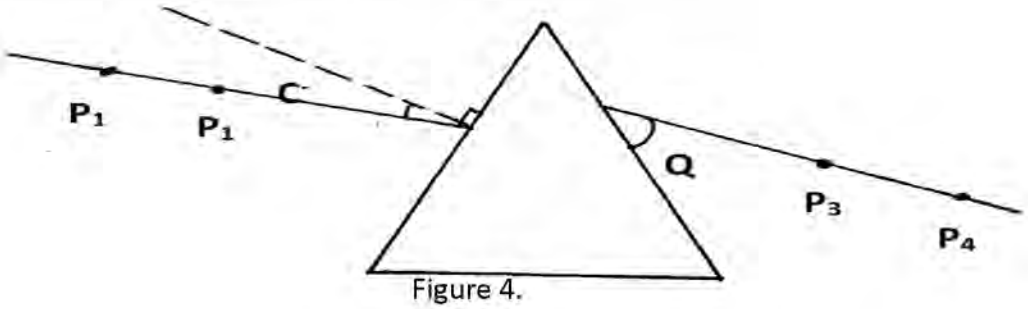


Figure 4.

e) Repeat the procedures in © and (d) above for other values of I shown in table 2. Complete the table.
Table 2

Angle of incidence i(degree)							
Angle ø (degree							
Angle f emergence E =90- ø(deg)							

(6mks)

F) On the grid provided plot the graph of the angle of the emergency E(yaxis) against the Angle of incidence i (5mks)

ii) Use the graph to find i(the angle of incidence at which i=E) (1mk)

(The teacher to collect the plane papers used for this experiment showing how the øis got.).

PART B

You are provided with the following

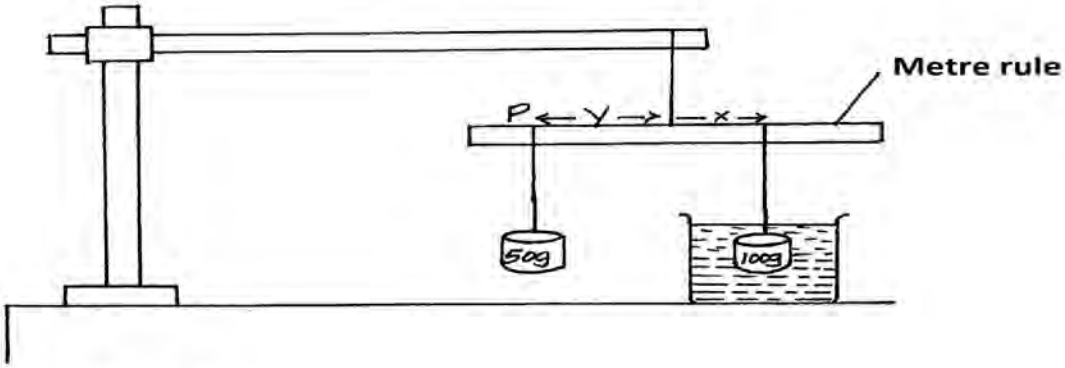
- Meter rule
- Report stand, clamp and boss
- 500ml beaker ¾ full of water
- 100g mas
- 50g mass
- Three pieces of thread

Proceed as follows

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

b) 9i) Suspend the 100g mass from the meter rule at a point x such that x = 10cm from pont G. With l00g mass completely immersed in water in the beaker, hang the 50 g

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)
P =..... (1mk)



ii) Find the value of Y.

Y (1mk)

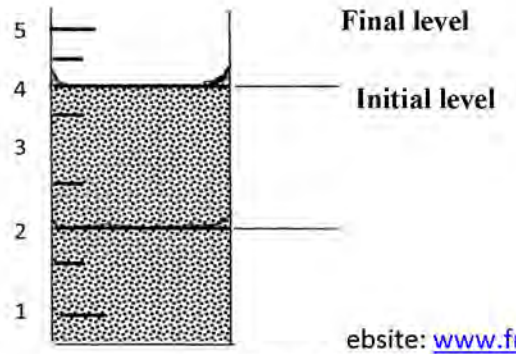
(iii) Using the information above, calculate the up thrust on the 100g mass if the density of water is 1000kg/m^3. (3mks)

Set3

232/1
PHYSICS
PAPER 1

SECTION A (25 MKS)

1. A packer pen was accidentally dropped into a measuring cylinder containing water. The volume of water moved from initial level to form the level as shown below;-



If the mass of the parker pen is 0.012kg determine its density (2mks)

2. The figure 1 below shows some forces acting on object.

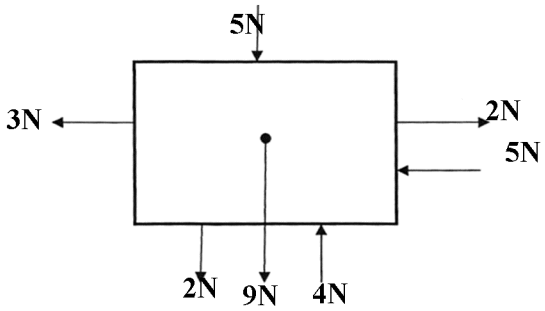
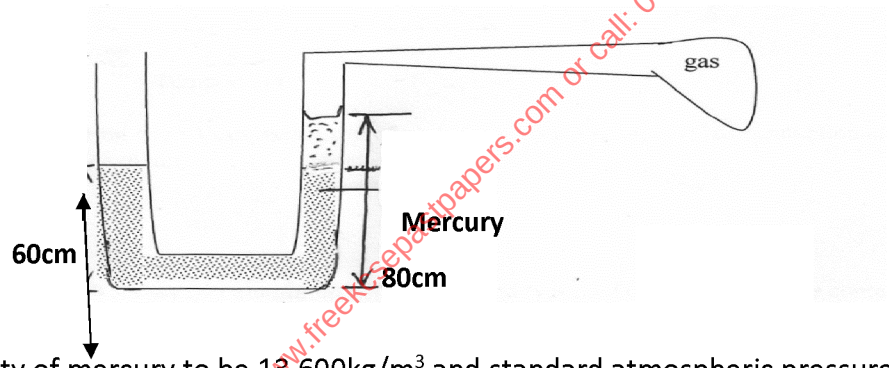


Fig. 2

On the figure below draw the resultant force acting on the object

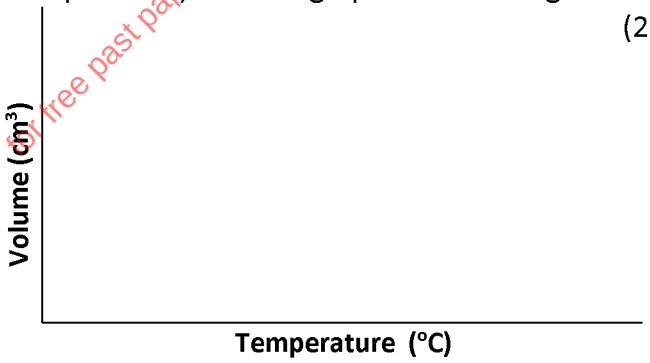
3. Figure two below shows the apparatus used to examine the pressure of a gas



Taking density of mercury to be 13,600kg/m^3 and standard atmospheric pressure 100,000N/m^2. Calculate gas pressure (3mks)

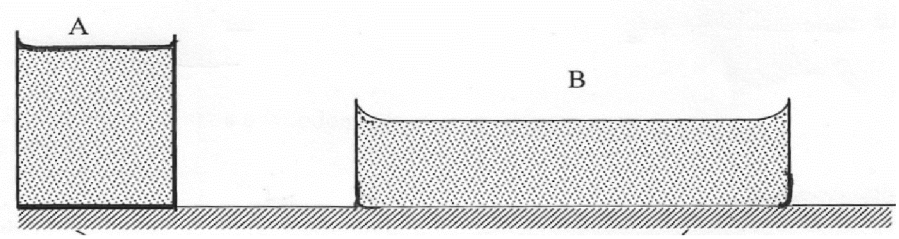
4. Explain why it is possible to compress gases but not solids or liquids (3mks)

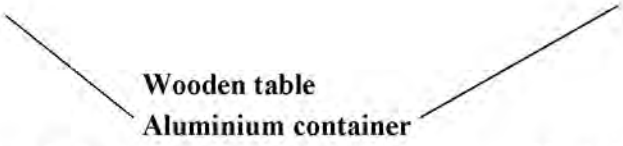
5. (a) One the axis provided, sketch a graph of volume against temperature of water from 0° to 20°C. (2mks)



(b) During anomalous expansion of water, heat transfer is limited to conduction and radiation only explain (1mk)

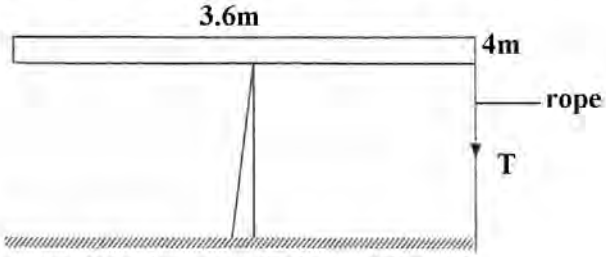
6. Figure 3 shows two aluminium container A and B placed on a wooden table containers A and B have equal volume of hot water initially at the same temperature





Explain why water in **B** cools faster than water in **A** (2mks)

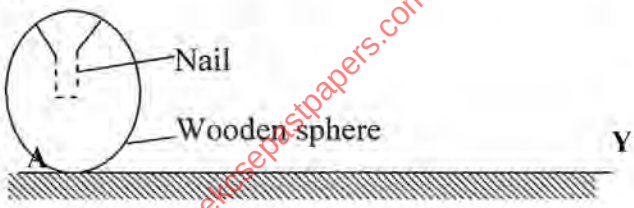
7. A uniform rod of length 4m and mass 4 kg is pivoted at 3.6m mark. The rod is held horizontally with a vertical rope at 4m mark as shown below



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

8. (a) Define centre of gravity of a body (1mk)

(b) The figure below shows a wooden sphere with a nail hammered into it at point A as shown below



The sphere is rolled on a horizontal ground and comes to rest after some time at point **Y**. Draw the sphere after it comes the rest at point Y and explain (2mks)

9. Define the term Heat capacity (1mk)

10. A girl heats 5kg of water to a temperature of 80°C. When she adds m kg of water at 15°C the mixture attains a temperature of 40°C. Determine the value of m(2mks)

11. State the difference between an ideal and real gas (2mks)

12. Define absolute zero temperature in terms of kinetic energy (1mk)

SECTION B (55 MARKS)

13. (a) In an experiment to estimate the diameter of an oil molecule, an oil drop of diameter 0.06cm spread over a circular patch whose diameter is 20cm. Determine

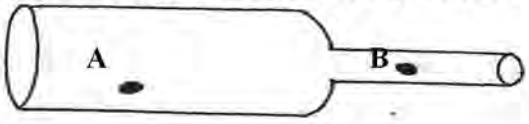
(i) The volume of the oil drop (2mks)

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

(iii) The diameter of the oil molecule (1mk)

(b) State any one assumption made in (iii) above

(c) The figure below shows parts A and B of a glass tube



(i) State the part of the tube in which the pressure will be lowest when air is blown through the tube to from **A** to **B** (1mk)

(ii) Compare the velocity of air at **A** and at **B**

(iii) What is the relationship between the velocity of the air and its pressure at any point along the tube AB

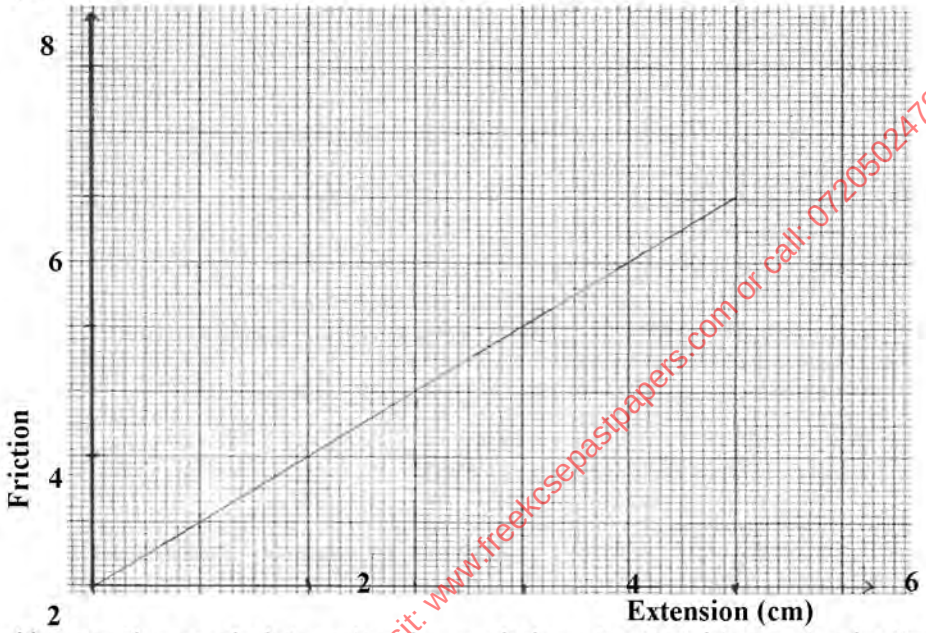
(d) Water flows a horizontal pipe of cross-section area $35cm^2$ and constriction of cross section area $5cm^2$. If the speed of water at the constriction is 2m/s, Calculate

(i) Continuity constant in SI unit (1mk)

(ii) The speed in the wide section (2mks)

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

(b) The graph provided is of force (y-axis) against extension.

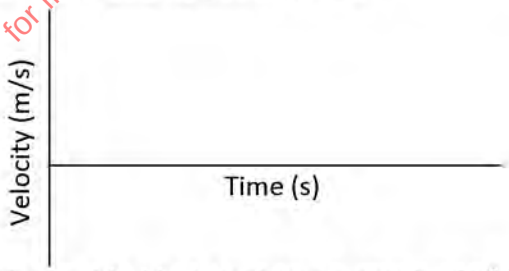


(i) From the graph determine the work done in stretching spring by 3cm (3mks)

(ii) Use the graph to determine the spring constant. Give your answer in SI units(3mks)

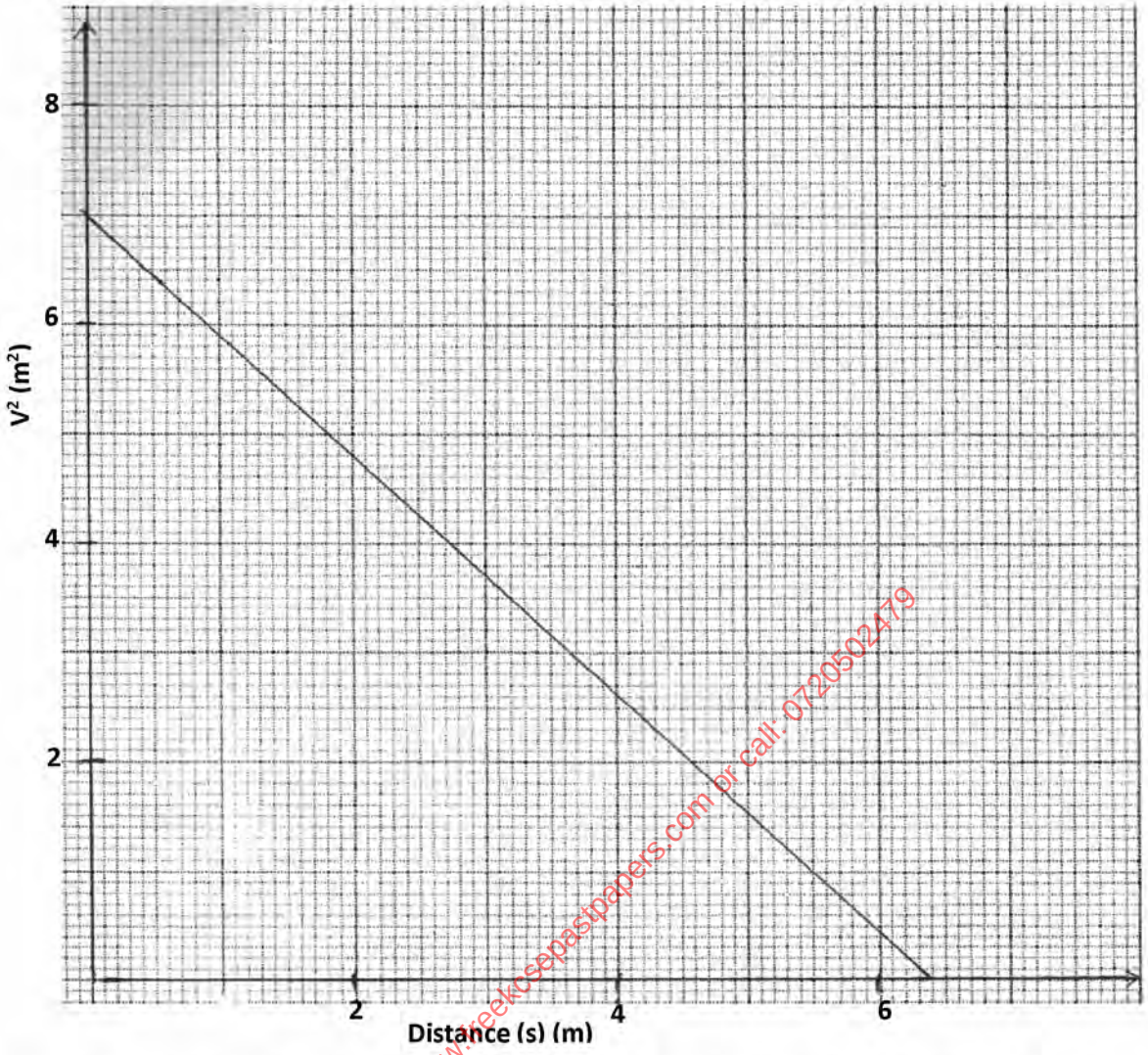
(iii) State **two** factors that affect the spring constant (2mks)

15. (a) On the grid provided, sketch a velocity time graph of a bouncing ball dropped from rest at a height of 2.5cm (2mks)



(b) The graph provided below shows a graph of V^2 against the distance S travelled by a

body projected vertically upwards at a point on the earth surface



(i) From the graph calculate the gravitational acceleration of the earth (g) at that point (3mks)

(ii) Using the graph determine

(I) The initial velocity of the body (3mks)

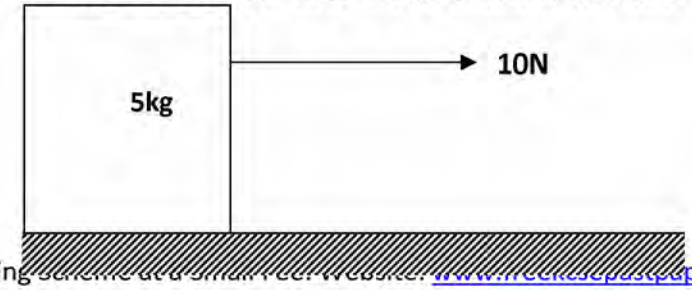
(II) The maximum height attained by the body (2mks

(c) A body is uniformly accelerated form rest to a final velocity of 50 m/s in 6 seconds.

Calculate the distance covered (2mks)

16. Why does gun recoil when it is fired? (1mk)

(a) The figure 6 below shows a body being pulled by a constant force of 10N for a distance of 4m over wooden surface. The co-efficient of friction is 0.03



Find the

(i) Acceleration of the body (2mks)

(ii) Velocity of the body after the 4 metres (2mks)

(iii) Kinetic energy of the body after the 4 metres (2mks)

(b)(i) Define the term angular velocity (1mk)

(ii) A particle moving along a circular path of radius 3.0cm describes an arc of length 2cm every second. Determine

I. Its angular velocity, **W** (2mks)

II. Its periodic time, **T** (2mks)

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

17. (a) Sometimes work is not done even if there is an applied force. Give a reason (1mk)

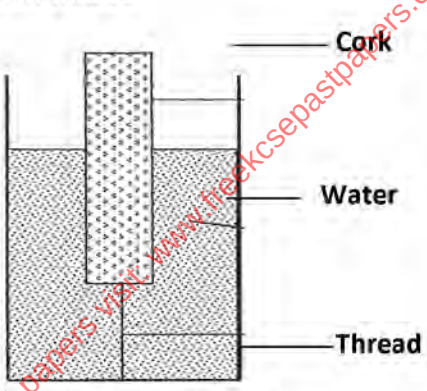
(b) A lorry weighing 64ookg is lifted with a jack screw of 11mm pitch. If the handle is 28cm from the screw

(i) Find the velocity ratio (2mks)

(ii) Neglecting the frictional force, Calculate mechanical advantage, MA(1mk)

(iii) Determine the force applied (2mks)

(c) The figure below shows a cork floating on water and held to the bottom of the beaker by a thin thread



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

(ii) State how each of the forces mentioned in (i) above changes when water is added into the beaker until it is filled up (3mks)

Set3

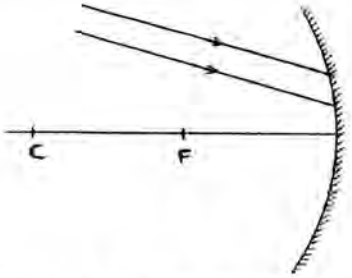
Paper 2 (Theory)

SECTION A(25 MARKS)

Answer ALL the questions in this section in the spaces provided

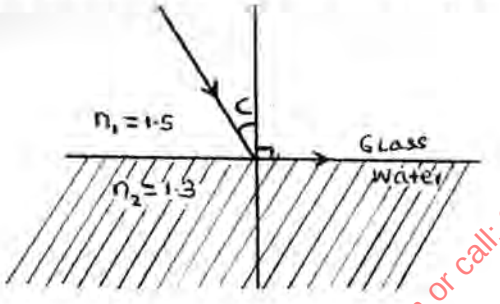
1. Two plane mirrors are inclined at an angle of 120° to each other such that their reflecting surfaces face each other. An object pins stands midway between the mirrors. Draw a ray diagram to show all the images (3mks)

2. State **two** conditions necessary for the occurrence of an annular eclipse (2mks)
3. The figure below shows two parallel rays incident on a concave mirror. F is the focal point of the mirror

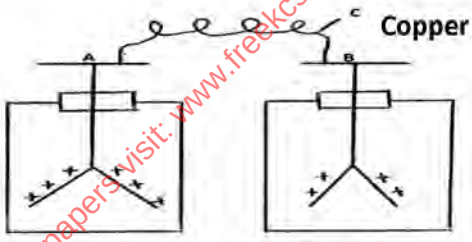


Sketch on the same diagram the path of the rays after striking the mirror. (2mks)

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

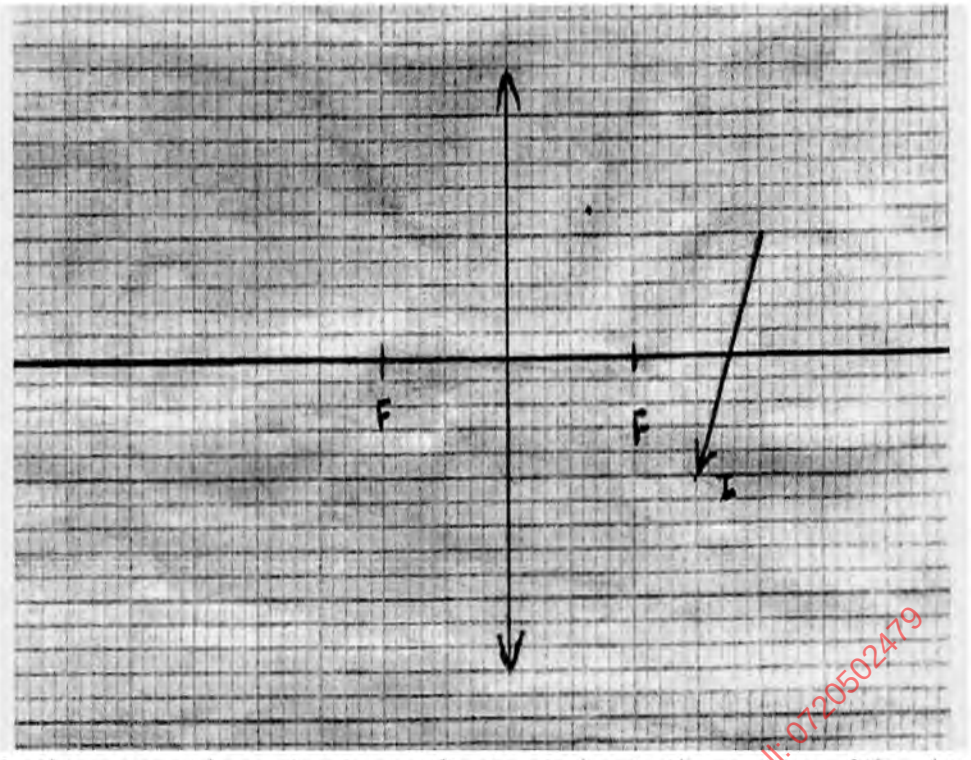


6. In the diagram below, two electroscopes A and B carry same type of charges as shown. The two are then connected with a copper wire as shown



State and explain the observations (2mks)

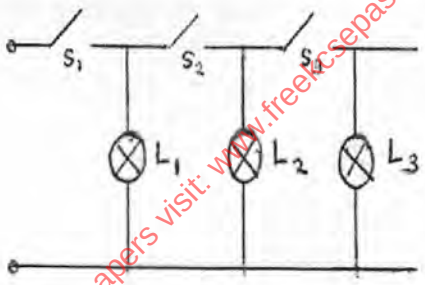
6. The figure below shows a real image I formed by a convex lens



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

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

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

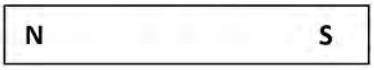


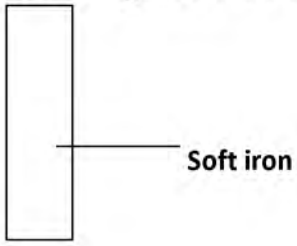
(i) Explain why this is a poor connection (1mk)

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

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

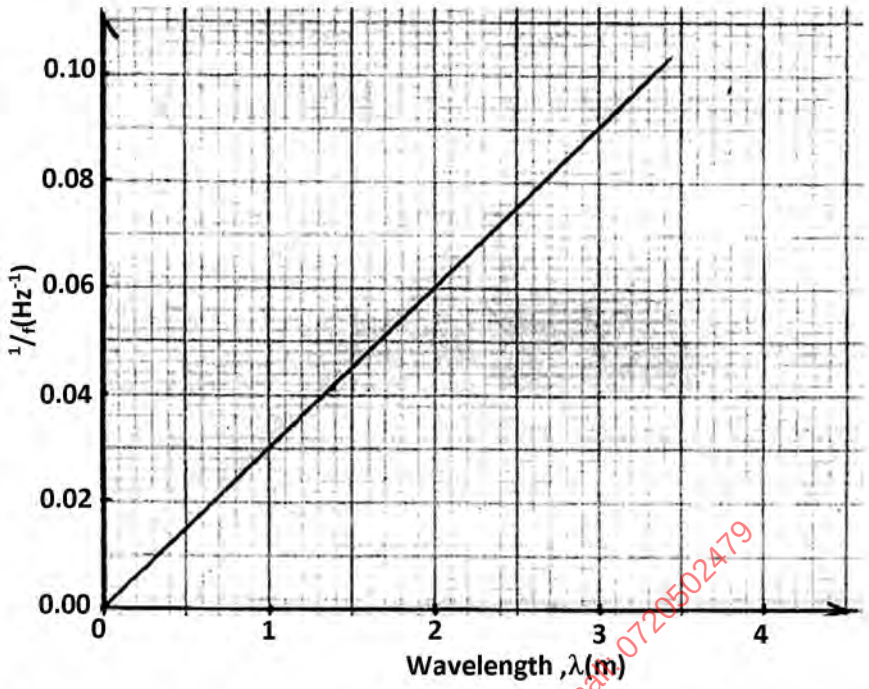
10. Draw the magnetic field lines due to the configuration shows below (1mk)





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

12. The graph below represents valves of –and corresponding valves of wavelength for waves transmitted in a certain medium



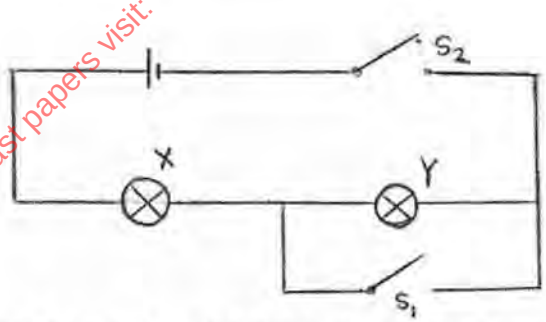
From the graph, determine the speed of the waves (3mks)

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

SECTION B (55 MKS)

Answer all questions in the spaces provided

14. (a) Study the circuit shown below



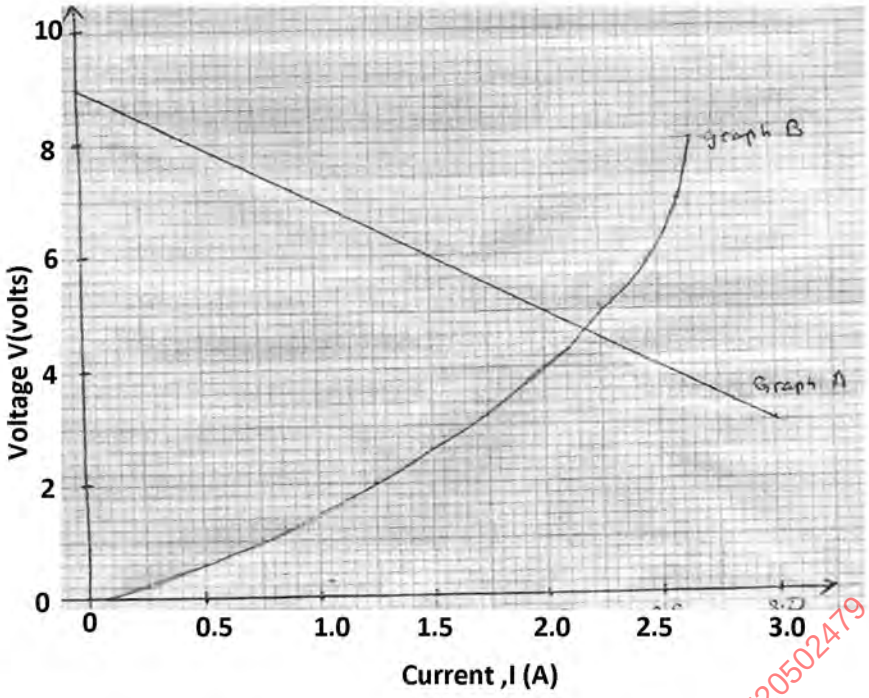
State and explain what happens to the identical lamps **X** and **Y** in the circuit shown when

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

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

(b) Graph **A** shows how potential difference across a battery varies with the current supplied.

Graph **B** shows how the current in a filament lamp varies with potential difference across it



(i)

I. Use graph A to determine e.m.f of the battery (1mk)

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

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

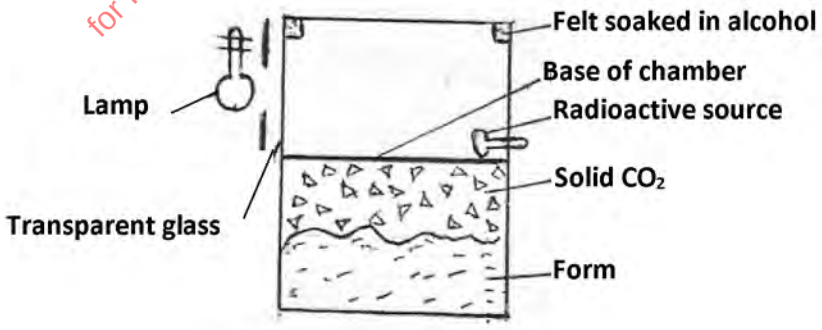
15. (a) (i) The following nuclear reaction is part of a radioactive series

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

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

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

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



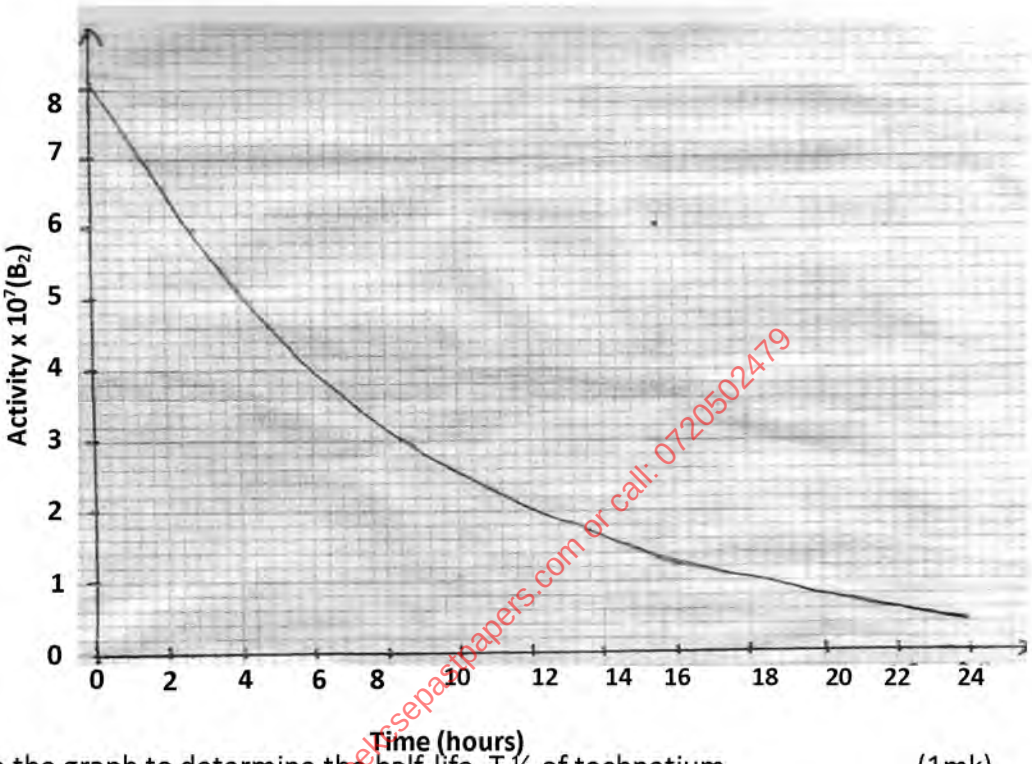
I. State the property of alcohol that makes it suitable for use in the chamber (1mk)

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

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

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

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



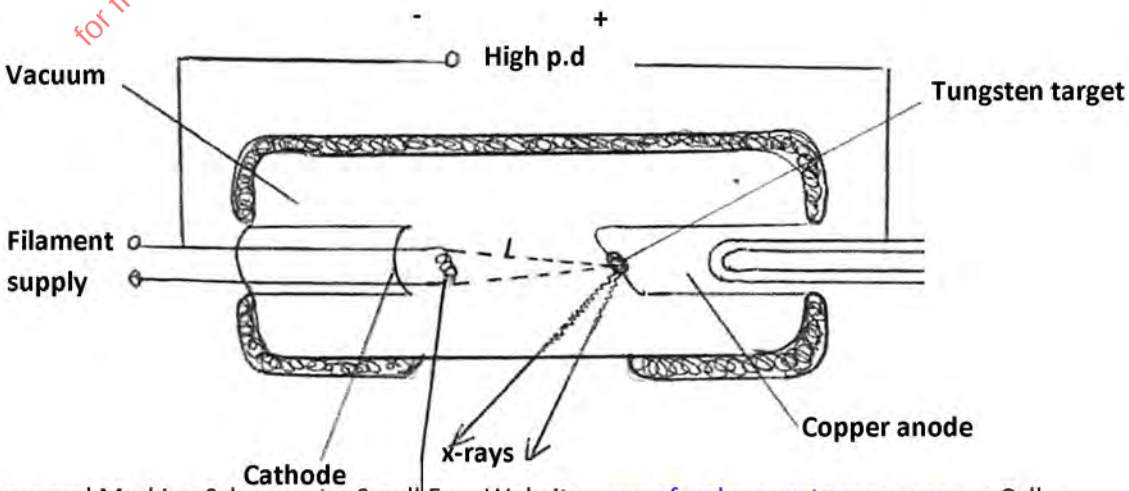
I. Use the graph to determine the half-life. T ½ of technetium (1mk)

II. Hence calculate the decay constant for technetium given that $T_{1/2} = \frac{0.6931}{\lambda}$

where λ is the decay constant. (1mk)

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

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



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

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

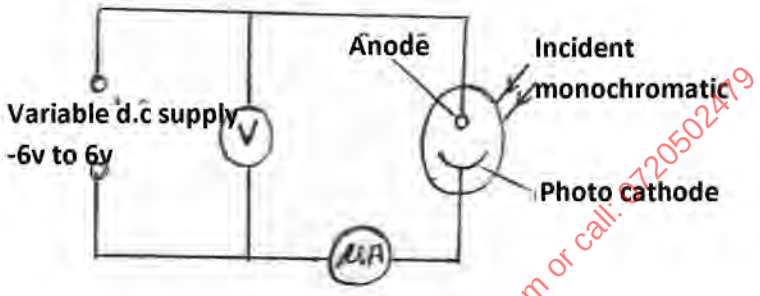
(b) An X-ray tube operates with a potential difference of 100kv and filament current is 20mA. Calculate ;

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

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

III. The maximum energy of X-ray produced (Take charge of an electron=$1.6x10^{-19}$C, mass of an electron =$9.1x10^{-31}$kg) (2mks)

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



The incident radiation has a wavelength of $2.15x10^{-7}$m. The metal surface of the photocell has a work function of 2.26 eV

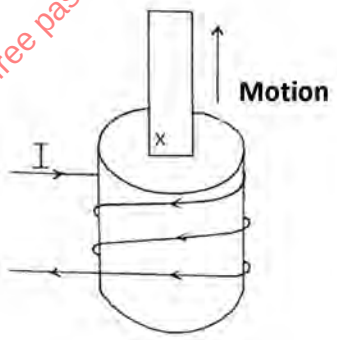
I. Calculate the energy in eV of a proton of the incident radiation *(Take speed of light C=3.0x108ms^{-1}, planck's constant, h=$6.63x10^{-34}$JS and electronic charge, e=$1.6x10^{-19}$C)* (3mks)

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

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

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

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



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

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

(c) A hydro-electric power station produces 500KW at a voltage of 10KV. The voltage is

then stepped up to 150KV and the power is transmitted through cables of resistance 200Ω to a step down transformer in a sub-station. Assuming that both transformers are 100% efficient. Calculate;

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

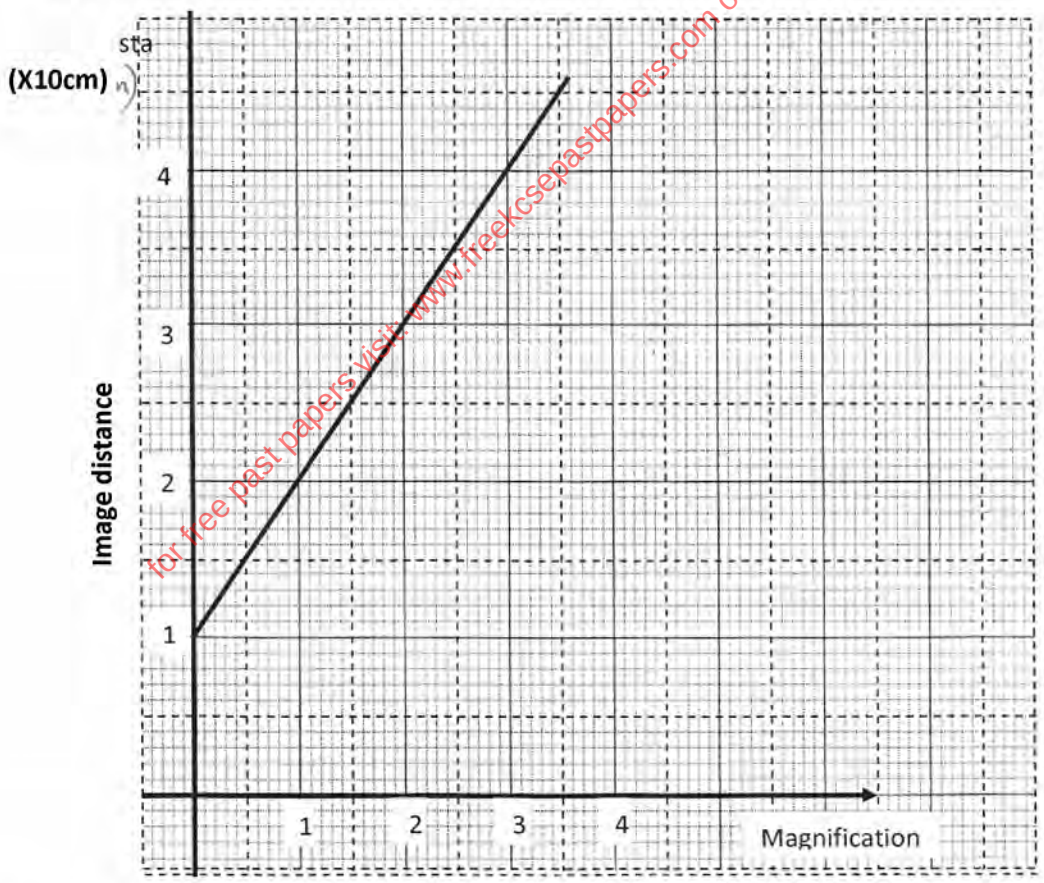
18. (a) State **two** factors that determine the capacitance of a parallel place capacitor (2mks)

(b) A 5μF capacitor is charged to a potential difference of 200V and isolated. It is then connected to a 10μ capacitor. Find

(i) The resultant potential difference across the combination (3mks)
(ii) Energy stored before connection (2mks)
(iii) Total energy in the capacitors after connection (2mks)

(c) Give one application of capacitors (1mk)

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



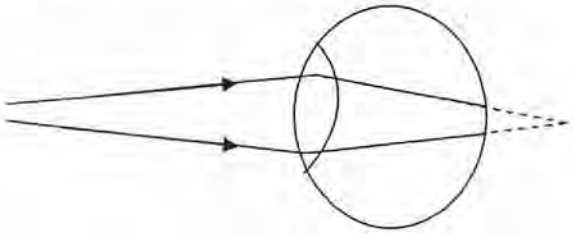
Using the graph and the equation $\frac{v}{f} = M + 1$ determine:

(i) The object position when the image position is 45 cm (2mks)

(ii) The focal length of the lens (2mks)

(iii) The power of the lens (2mks)

(b) The following figure shows an eye defect



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

Set3

Paper 3 (Practical)

---

1. You are provided with the following

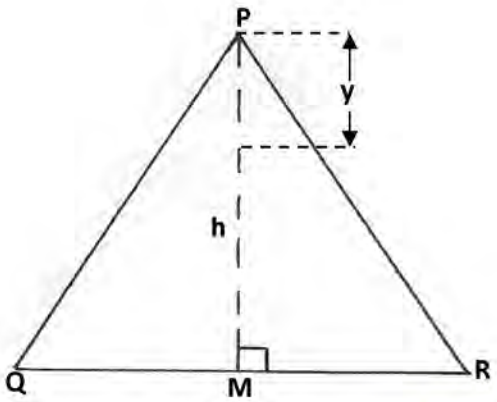
- Triangular card marked PQR
- Plastic or glass beaker
- Straight piece of wire
- Two strips of cellotape
- Optical pin
- Set square
- Millimeter scale
- Stop watch

You are required also to have a complete mathematical set

Proceed as follows

(a) Draw the perpendicular line to the base QR and measure and record, the height PM of the triangle

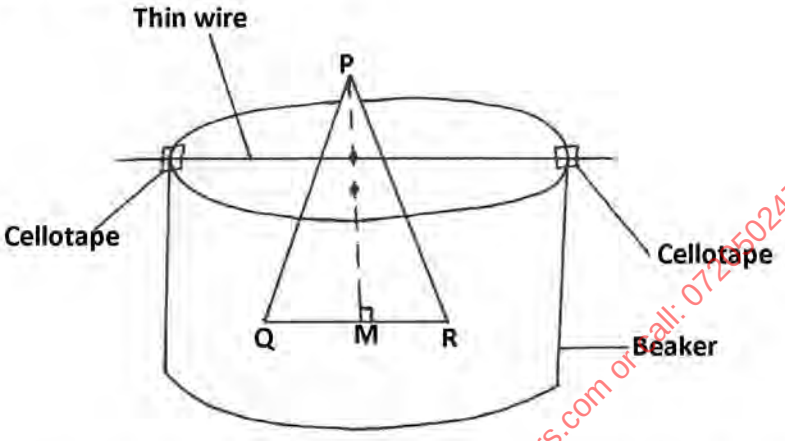
PM=h..... (1mk)



(b) Using the optical pin provided make holes along the perpendicular line drawn such that the distance y=10mm, 20mm,30mm,35mm,40mm,50mm, and 55mm from P.

(c) By using a small piece of cellotape attach both ends of the thin length of wire to the circumference of the beaker with the wire passing through the hole y=10mm and the card hangs freely. Displace the card so that it oscillates about the wire as an axis.

See figure below



(d) Determine the time for 5 complete oscillations and then find the periodic time T.

Record the value in the table 1

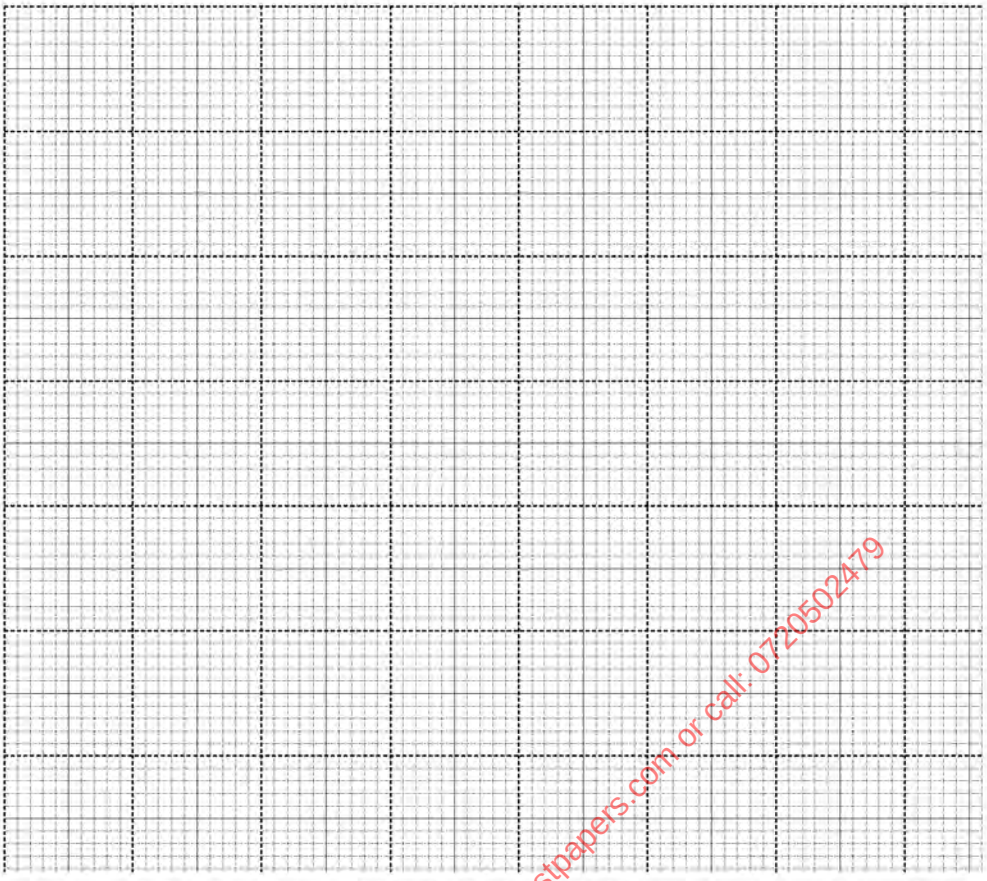
(e) Increase y to 20mm and repeat the experiment so as to determine the new value of T. Repeat the procedure in (d) for other values of y and complete the table

Table 1

Y(mm)	10	20	30	25	40	50	55
Time for 5 oscillations							
Periodic time, T (seconds)							

On the grid provided ;

(f) Plot a graph of T(y-axis) against y (5mks)



(g) From the graph, determine T, the periodic time for which y= 1/3h. (2mks)

(h) Hence, calculate the constant K from the formula,

$t = \sqrt{\frac{33.6}{k}}$ where t is the time for 5 complete oscillations when y= 1/3h

(3mks)

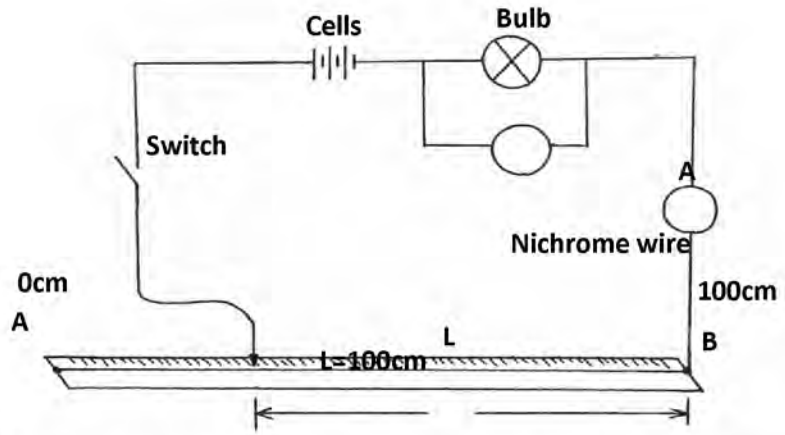
QUESTION 2

You are provided with the following;

- 3 new dry cells (size D)
- A bulb
- A voltmeter (0-3V or 0-5V)
- An ammeter (0-1A)
- A mounted nichrome wire on a millimeter scale
- A switch
- 7 connecting wire at least 2 with crocodile clips at the ends
- A micrometer screw gauge (to be shared)

Proceed as follows;

(a)(i) Set up the circuit as shown in figure below;

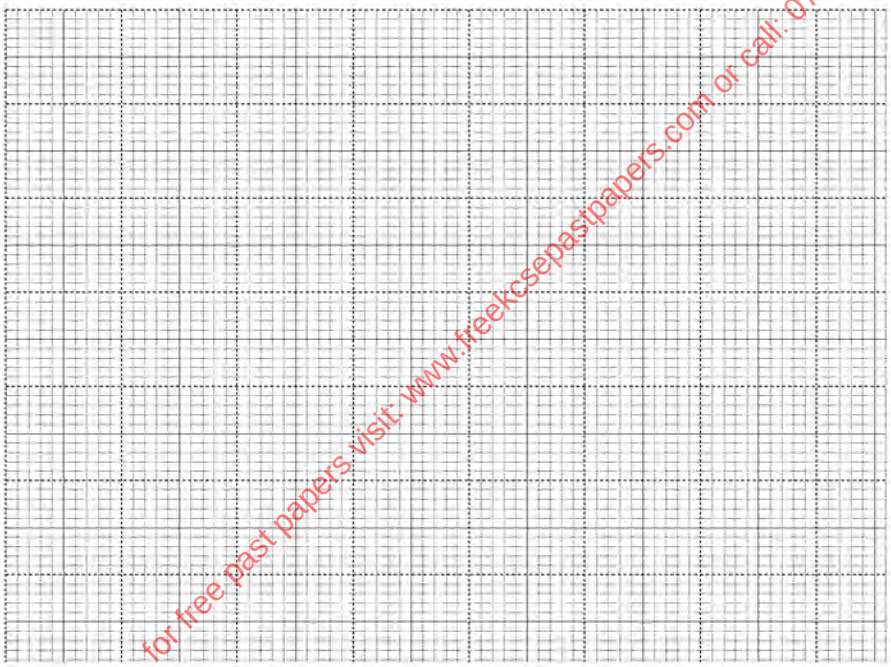


(ii) With the crocodile clip A take (L=100cm) take the voltmeter and the ammeter readings.
Record V and I. repeat the readings for L=80,60,40,20, and 0cm respectively. Complete the table below; Key (6mks)

Length L(cm)	100	80	60	40	20	0
Voltage V(v)						
Current,I(A)						

(iii) What changes do you observe on the bulb as L decreases from A? (1mk)

(iv) Plot a graph of current I (y-axis)against voltage ,V (5mks



(v) Determine the slope of your graph at V=2 volts (3mks)

(b)(i) Given the apparatus in a (i) above, draw a diagram of the circuit you would use to determine the current through the resistance wire AB and the potential differences across it (1mk)

(ii) Set up the circuit you have drawn. Record the ammeter reading I and the voltmeter reading
V, when L=100cm (1mk)

(iii) Using a micrometer screw gauge, measure the diameter d of the wire (1mk)

(iv) Calculate the quantity P given that

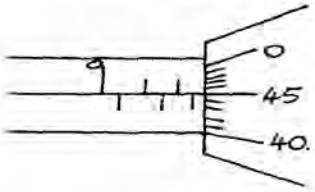
$p = 0.785\left(\frac{V}{I}\right)\left(\frac{d^2}{L}\right)$ and state its SI units, where L=1m (2mks)

Set4

232/1
PHYSICS
PAPER 1

SECTION A: (25 MARKS)

1. A student used the measuring instrument shown below to measure the thickness of a cylindrical wire, If the wire is 10cm long, find the volume of the wire. (3mks)

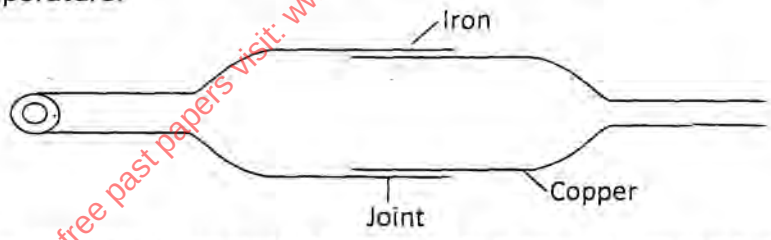


2. The figure below shows two containers of equal volume but of different diameters.

Equal volume of hot water was put in both containers. Explain why it cools faster in the Wider container than in the narrower one. (Irnk)

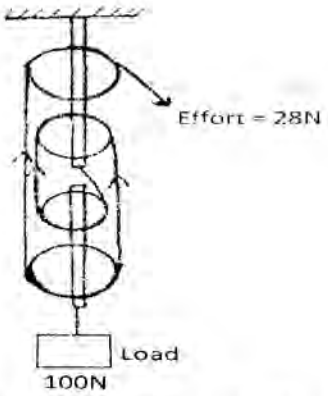
3. A body in a uniform circular motion experiences acceleration despite moving at a constant speed. Explain. – (1mk)

4. The diagram below shows a-metal tube made of iron and copper. The joint is tight at room temperature.



Explain how you would separate the two by changing the temperature given that copper expands more than iron for some change in temperature. (2mks)

5. Figure below shows a pulley system being used to raise a lead.



if the effort applied is 28N and the load lifted is l00N, determine the efficiency of the system. (3mks)

6. (a) What is surface tension? (1mk)

(b) The figure below shows a funnel dipped into a liquid soap solution.

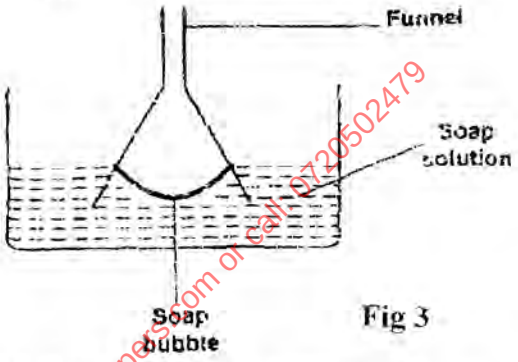


Fig 3

Explain what happens to the soap bubble when the funnel is removed. (1mk)

7. A trolley of mass 0.5kg moving with a velocity of l .2ms^{-1} collides in elastically with a second trolley of mass 1.5kg moving in the same direction with a velocity of 0.2ms^{-1} .Determine the velocity of the trolleys after collision. (2mks)

8. Highlight **one** fact which shows that heat from the sun does not reach the earth surface by convection. (1 rnk)

9. State **one** reason why mercury is preferred as a barometric liquid and not water. (lmk)

10. State **one** reason why racing cars are stable. (lmk)

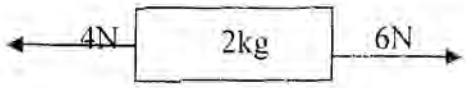
11. Find the velocity ratio of the following gear wheels. (2mks)

12. A stone and a feather are dropped from rest from a building 20m tall. If they reach the ground at the same time, find.

(a) The velocity with which they reach the ground. (Take g=l0m/s^2) (2rnks)

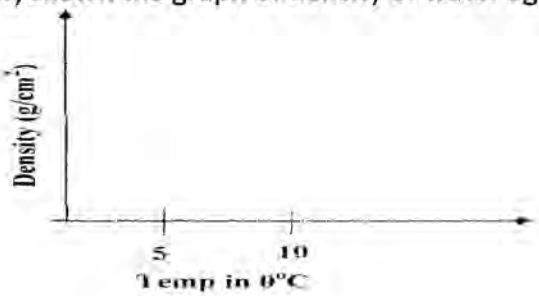
(b) The condition under which they fall. (lmk)

13. The forces act on a trolley as shown below.



Find the acceleration of the trolley. (2mks)

14. On the axes below, sketch the graph of density of water against temperature. (1mk)



SECTION B (55MKS)

15. (a) A car is negotiating unbanked circular track. State one factor that will determine the critical speed of the car. (1mk)

(b) Given that the ear above has a mass of 1000kg and the circular path has a radius of 25m. Determine the maximum speed with which the motorist can travel so as not to skip the
frictional force between the tyres and the road is 6500N. (3mks)

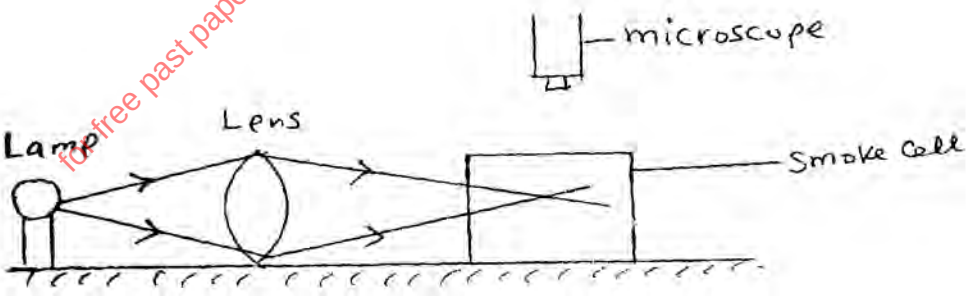
(c) A 200g mass tied to a string is being whirled in a vertical circle of radius 32cm with uniform speed, At the lowest position the tension in the siring is 10.5N. Calculate:

(i) The speed of the mass (2mks)

(ii) The tension in the string when the mass is at the uppermost position of the circular path (Take g = 10m/s²) (2rnks)

16. Brownian motion of smoke particles can be studied by using the apparatus shown in figure.7. To observe the motion, some smoke is closed in the smoke cell and then observe through the Microscope.

Fig.7



(a) Explain the role of the smoke particles, lens and microscope in the experiment.

(i) Smoke cell. (1 mk)

(ii) Lens (1 mk)

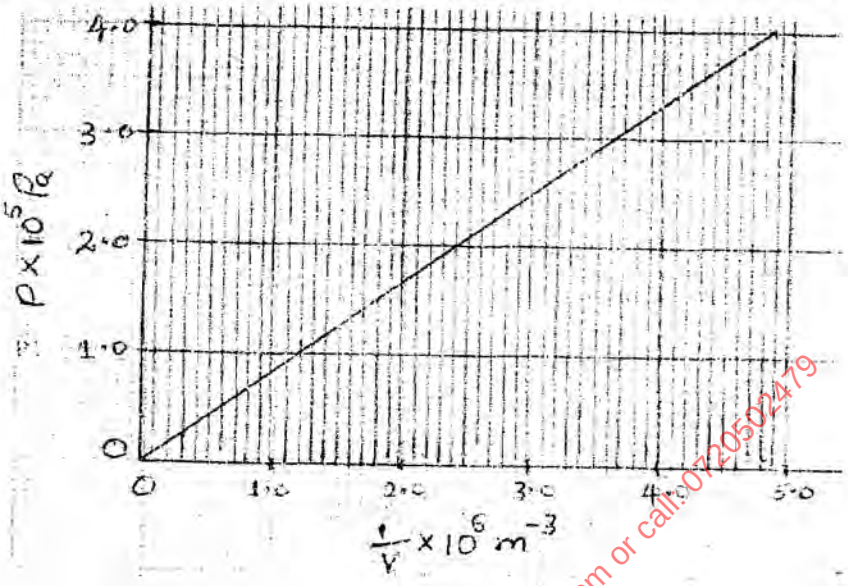
(iii) Microscope (lmk)

(b) State and explain the nature of the observed motion of the smoke particles (2rnks)

(c) State what will be observed about the motion of the smoke particles if the temperature surrounding the smoke cell is raised slightly. (1 mk)

17. (a) State what is meant by an ideal gas (1mk)

(b) The pressure acting in a gas in a container was changed steadily while the temperature of the gas was maintained constant. The value of volume V of the gas measured various values of pressure. The graph in the figure A shows the relation between the pressure. P1 and the reciprocal of volume 1/V



(i) Given that the relation between the pressure P1 and the value, V1 of the gas is given by PV = k Where k is a constant, use the graph to determine the value (3rnks)

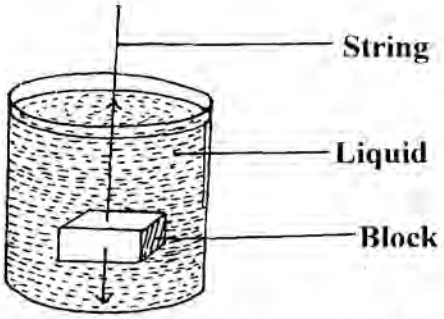
(ii) What physical quantity does **K** represent? (1mk.)

iv) State **one** precaution you would take when performing such an experiment. (1mk)

(c) A gas occupies a volume of 4000 litres temperature of 37°C and normal atmosphere pressure. Determine the new volume of the gas if it is heated at constant pressure to a temperature of 67°C (normal atmosphere pressure P = 1.01×10^5pa) (3marks)

18. (a) State Archimedes Principal (lmk)

(b) The figure 9 shows rectangular metal block of density 10500kgm^{-3} and dimensions 30cm x 20cm x 20cm suspended inside a liquid of density 1 200kgm^{-3} by a string attached to appoint above the liquid. The three forces acting on the block are; the tension I. on the string, the weight W, of the block, and the up thrust ,U, due to the liquid.



(i) Write an expression relating T, U and W when the block is in equilibrium inside the liquid. (1 mk)

(ii) Determine the weight, **W**. of the block (3 mks)

(iii) Determine the weight of the liquid displaced by the fully submerged block. (2rnks)

Hence determine the tension, 1, in the string (1mk).

(c) A certain solid of volume $50cm^3$ displaces $10cm^3$ of kerosene) (density 800 $kgrn^{-3}$) when floating. Determine the density of the solid. (3mks)

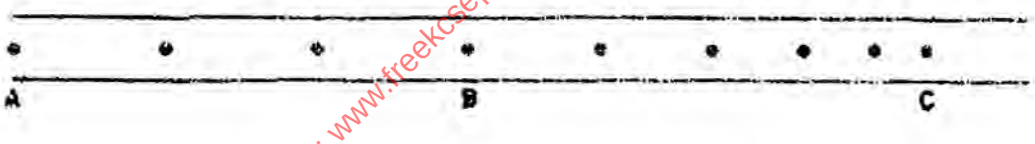
19. (a) Define angular displacement. (1 rnk)

(b) A mass of 20 g is 14 cm from the centre of a compact disc rotating at 75 revolutions per minute. Determine:

i) the angular speed (2 mks)

ii) the centripetal acceleration (2 rnks)

(c) Shown in the figure below are dots which were made by a ticker timer-tare attached to a trolley. Scale 1. 5



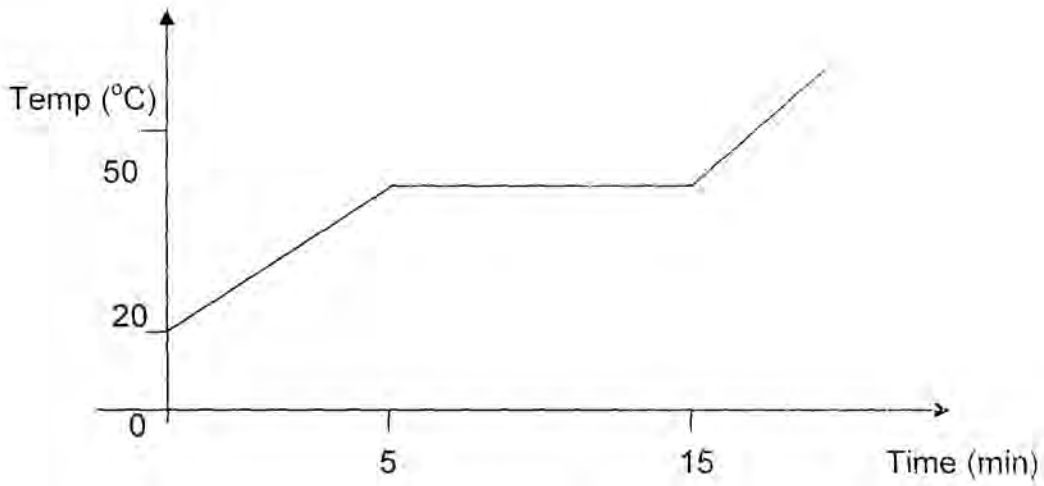
The frequency of the timer was 50 Hz. Determine for the trolley:

i) The velocities between AB and BC (3mk)

ii) The deceleration of the trolley. (3mks)

20. (a) What is meant by specific heat capacity? (1 mk)

b) A heater rated 1 .25 kW is used to heat 3 kg of a substance which is initially in solid state.



Use the information in the graph to find:

i) the specific heat capacity of the substance in solid form. (3 mks)

ii) the latent heat of fusion of the substance. (2 mks)

iii) The time taken for the temperature to reach 90°C, assuming specific heat capacity does not change . (3 rnks)

iv) Suggest a reason why the actual time may be longer. (1 mk)

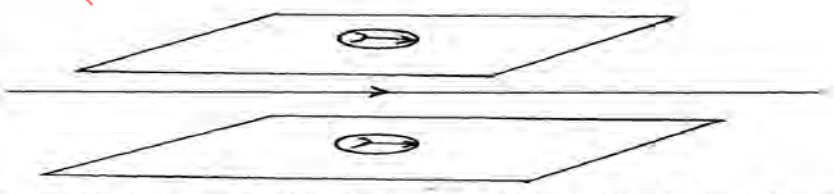
set4

Paper 2 (Theory)

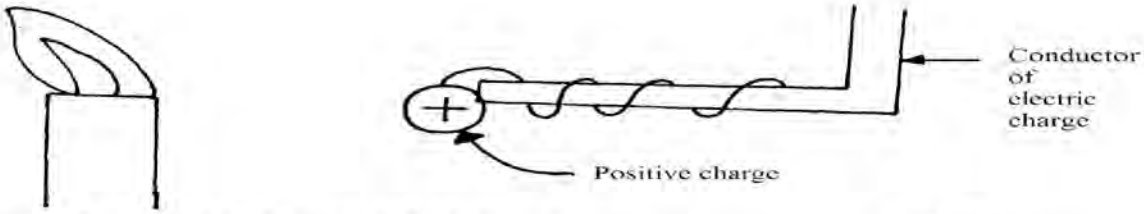
SECTION A (25 MARKS)

Answer ALL questions in this section in the spaces provided.

1. The figure below sow a current carrying conductor passing between two cardboards. Show the direction of the deflection on each compass on the cardboard. (2marks)



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



Explain why the candle flame is deflected as shown. (2mks)

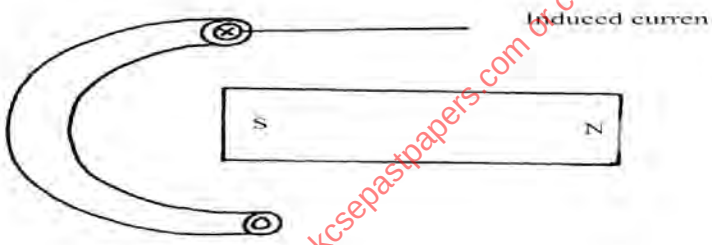
3. Why is the metre bridge method a more accurate means of measuring resistance than Ammeter-voltmeter method. (1mark)

4. State one factor which does not change as water waves moves from shallow deep end. (1mark)

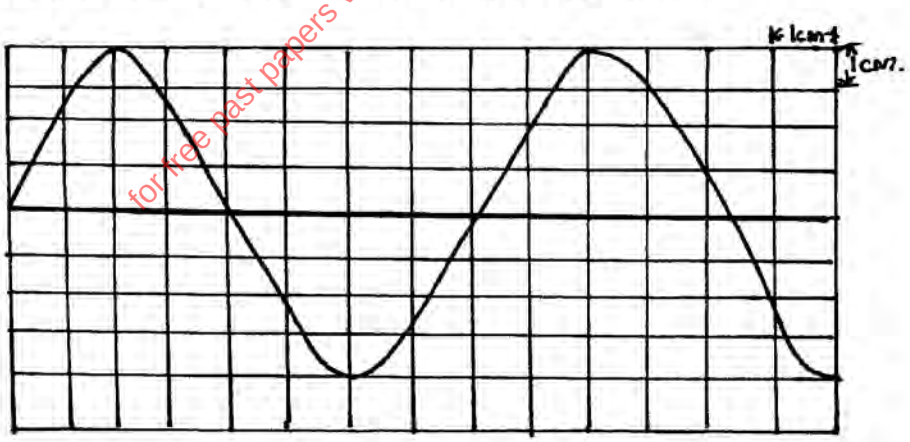
5. Calculate the cost of using a electricity iron rated 1200W, for a total of 30hours given that the cost of electricity per KWh is ksh8. (3mks)

6. State one similarity between an image formed in a plane mirror and that in a convex mirror. (1mk)

7. The figure below shows a circular conductor placed closely to a magnet. When the magnet is moved, a current is induced as shown. Indicate the direction of motion of the magnet. (1mark)



8. The figure below shows a CRO screen display trace when the Y-amplication control and time base setting are 100mV and 0.8ms/cm respectively.



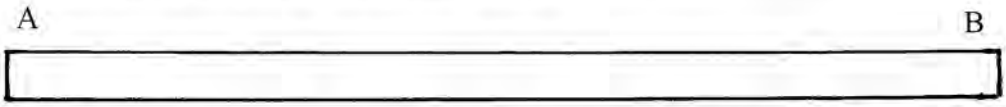
Calculate:

a) The peak potential difference. (2marks)

b) The frequency of the signal. (2 marks)

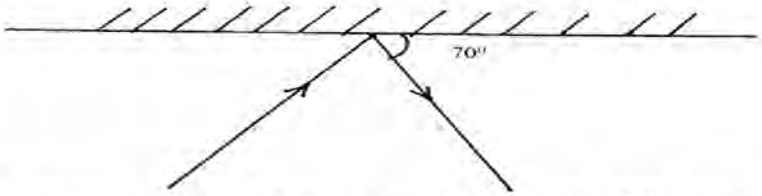
9. Distinguish between an intrinsic semiconductor and an extrinsic semiconductor and give one example for each. (3marks)

10. You are provided with a long steel rod shown below.

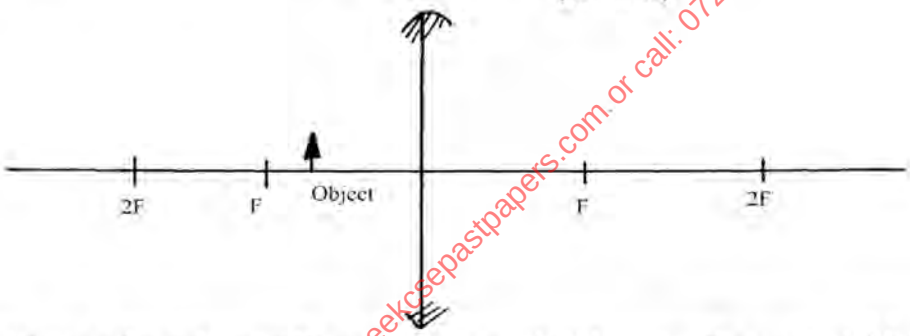


Using a diagram, describe hoe you would magnetise end A to obtain a south pole using an electric current. (2marks)

11. Determine the angle of incidence and angle of reflection in the mirror shown below. (2marks)



12. Complete the ray diagram below and state one characteristic of the image formed by the following convex base. (3marks)



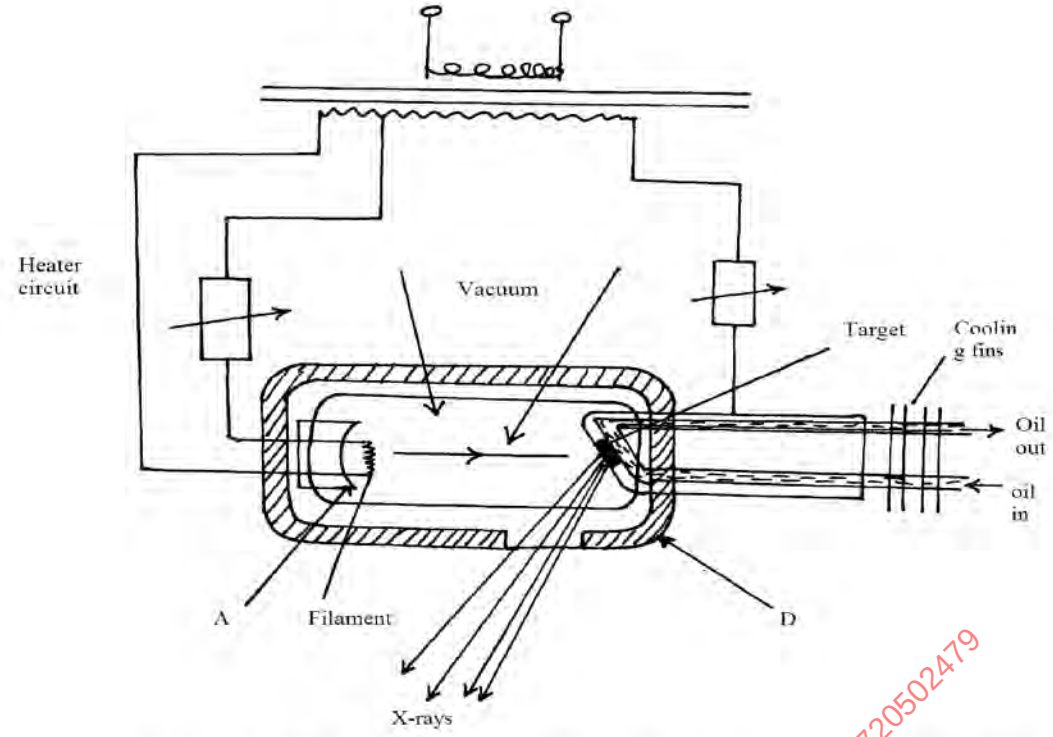
13. Various isotopes of an element X can be distinguished by using the symbol ${}^{A}_{Z}X$, what do the symbols A and Z stand for. (1mark)

SECTION B (55 MARKS)

Answer all the questions in this section in the spaces provided.

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

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



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)

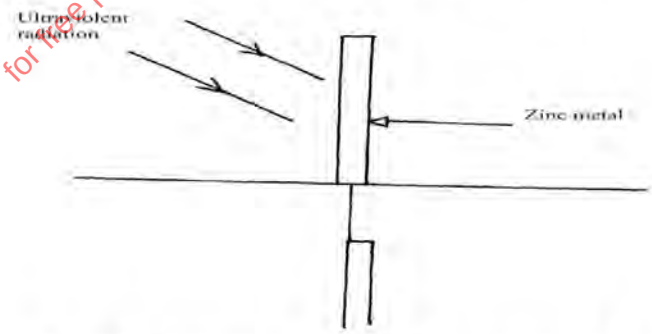
iv) Name one feature of the X-ray tube which makes it possible for heat to be conducted away safely without causing overheating. (1mark)

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

vi) The frequency of X-rays ranges from 3.0×10^{16}Hz to 3.0×10^{19}Hz. determine the range of wavelength . (take C =3.0×10^{8}m/s) (3marks)

15. a) What is photoelectric effect? (1mark)

b) Some students used the following setup to show the effect of illuminating an uncharged electroscope with ultra violent radiation.



i) Before the students began the experiment, they cleaned the zinc metal. Why was this necessary? (1mark)

ii) Explain briefly what the students observed (3marks)

c) i) Draw a sketch graph of stopping potential against frequency of incident

radiation (2marks)

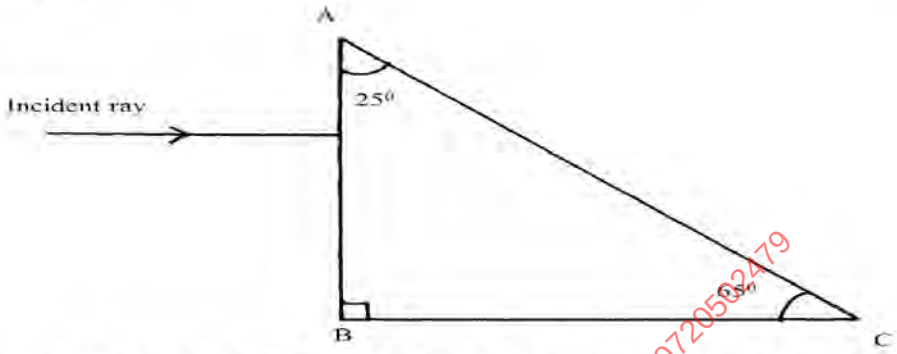
ii) On the same graph label the threshold frequency (1mark)

iii) Explain what is meant by stopping potential(Vs) (1mark)

d) When electromagnet radiation of wavelength 4.0×10^{-7} is incident on a metal surface, a stopping potential of 0.75V is just sufficient to prevent the emission photoelectrons. determine the maximum kinetic energy of the emitted electrons when the stopping potential is zero (3marks)

16. a) State the first law of refraction (1mark)

b) The diagram below shows a glass prism and an incident ray striking the face marked AB



i) Indicate on the diagram the path of the emergent ray. (2marks)

ii) Calculate the angle of refraction(r) of the resultant ray given the refractive index of glass is 1.5 (3marks)

c) Find the angle through which the ray is deviated. (2marks)

d) Explain why the ray is not totally internally reflected (1mark)

17. a) Sketch a graph of displacement against time for a transverse wave of frequency of 50Hz of at least two cycles with amplitude 2cm. (4marks)

b) Distinguish electromagnetic waves and mechanical waves (2marks)

c) A pulse-echo sounder is used by fishing boat to locate a shoal of fish in water. The sounder sends sound of frequency 21KHz and wavelength of 7.5cm. if the echo is received after 0.4seconds, determine how far the shoal of fish is from the base of the boat. (4marks)

18. a) The figure below shows how two magnets are stored in pairs with keepers at the ends.
Explain how the keeper keeps the magnets from demagnetisation. (2marks)

b) Explain magnetic saturation using domain theory. (2 marks)

c) The figure below is that of an electric horn.
(Diagram)

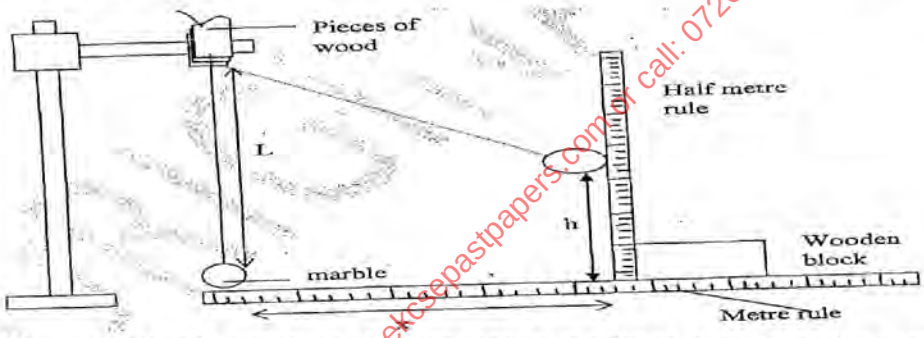
i) Explain how it works. (3marks)

ii) Explain how performance of the horn can be improved without changing its material make –up (2marks)

set4
Paper 2 (Practical)

1. You are provided with;
   (a) A Marble with a piece of the thread attached.
   (b) Two wooden blocks.
   (c) Clamp, stand + boss
   (d) Metre rule.
   (e) ½ metre rule supported on a wooden block.
   (f) 2 pieces of cellotape.
   (g) Stop watch.

   Procedure:
   (I) Fix the thread between the wooden blocks and fasten in the clamp. Adjust the thread so that the length, L, shown in the figure below is 50cm.
   (II) Fix the metre rule horizontally to the bench using the cello tape provided.



   (III) Adjust the clamp so that the marble is next to the end of the metre rule as shown above.
   (IV) Displace the marble by a horizontal distance X20cm and measure the corresponding vertical displacement h=_____ cm. (1mark)
   (V) Repeat the experiment to find h for each of the following values of X and complete the table.

X cm	h(cm)	X^2cm^2	X^2/h cm
20			
25			
30			
35			
40			
45			

(6mks)

   (VI) plot a graph X^2/h against h.
   (give the grid/draw grid)

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

(VIII) From the graph find the value of X^2/h when h=0 (2mks)

(IX) With the metre rule and half-metre removed — Displace the marble through a horizontal distance of about 10cm and let it to swing freely, Time 20 oscillations.

Time for 20 oscillations _____ (Imk)

(X) Determine periodic time , T

Periodic time, T=_____ (1 mk)

(XI) Calculate the value of P from the following equations. (4mks)

$$T=2\pi\sqrt{p/g} \qquad g= 10m/s$$

2. You are provided with the following apparatus

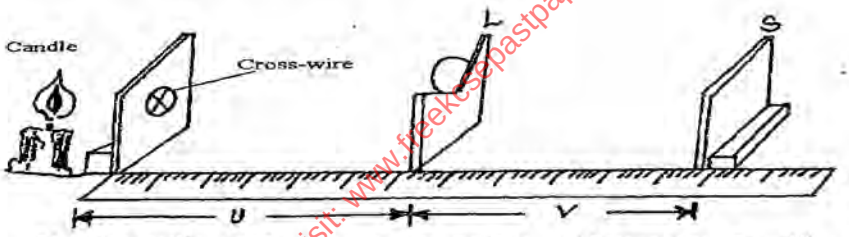
- A metre rule
- A log of plasticine
- Bi convex lens
- A candle
- A lens holder
- Across wire mounted on a cardboard
- A white screen

(a) Determine the focal length of the lens using a distance object.

F=..... (Imk)

(b) Briefly explain the method you have used above. (2mks)

c) Set up the apparatus as shown



(d) Starting with u=30cm, vary the position of the screen S until a sharp image of the cross wire is observed on the screen. Measure and record the value o the image distance v.

(e) Repeat the experiment above for other values of u35cm, 40cm, 50cm, and 55cm

U (cm)	30	35	40	45	50	55
V (cm)						
$M=\frac{v}{u}$						

(f) Plot a graph of M against v *(5marks)*

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

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

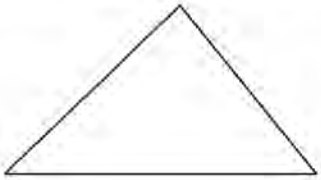
(h) The equation of the graph is given by

Use the graph to obtain the value of f 2mks)

Set5
232/1
PHYSICS
PAPER 1

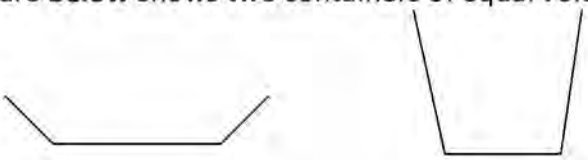
SECTION A: (25 MARKS)
Answer all questions in this section in the spaces provided:

1. The figure **below** shows a uniform triangular lamina.



Locate the centre of gravity of lamina. (2mks)

2. The figure **below** shows two containers of equal volume but of different diameters.

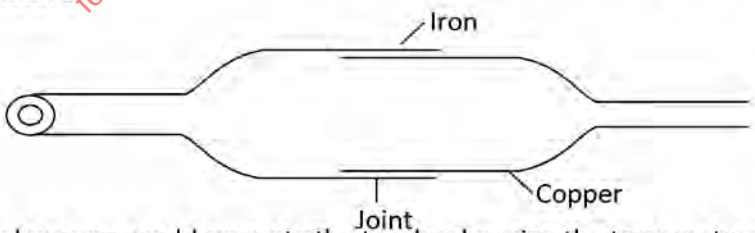


Equal volume of hot water was put in both containers. Explain why it cools faster in the wider container than in the narrower one. (1mk)

3. State **one** advantage of hydraulic brakes over mechanical brakes. (1mk)
4. A body in a uniform circular motion experiences acceleration despite moving at a constant speed. Explain. (1mk)

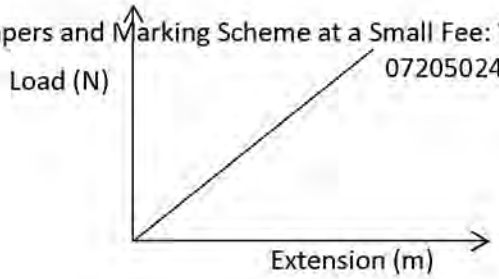
Use the information below to answer question **5** and **6**:
In an experiment to determine the density of a liquid, the following readings were made.
Mass of empty density bottle = 20g
Mass of bottle filled with water = 70g
Mass of bottle filled with a liquid = 695g

5. Find the density of the liquid, given that density of water is $1000kgm^{-3}$. (3mks)
6. Find the mass of the liquid. (3mks)
7. The diagram **below** shows a metal tube made of iron and copper. The joint is tight at room temperature.



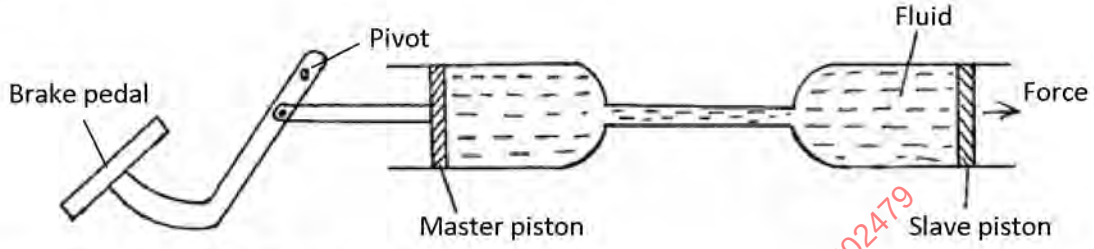
Explain how you would separate the two by changing the temperature given that copper expands more than iron for some change in temperature. (2mks)

8. State **one** assumption made when estimating the size of an oil molecule in the oil drop experiment. (1mk)
9. The figure **below** shows a load-extension graph for various loads hung from a single spring.



On the same axes sketch a graph for a spring double the diameter and half the length of the first one (1mk)

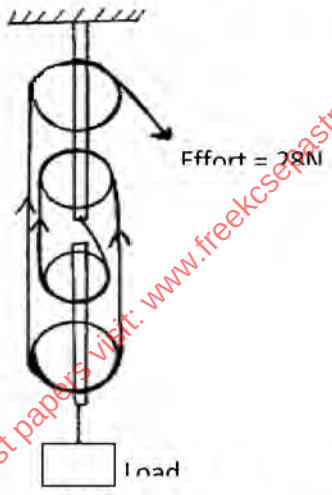
Use the information **below** which represents hydraulic braking system to answer questions **10** and **11**.



10. State **one** property the fluid should have. (1mk

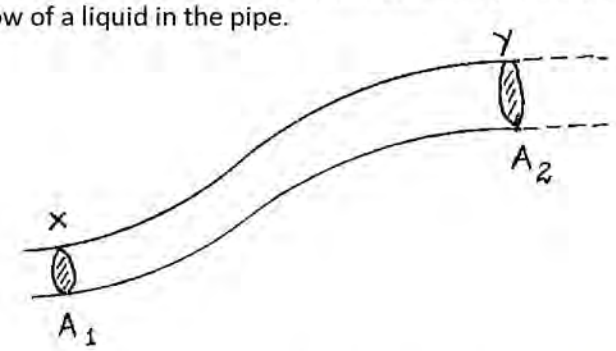
11. Explain briefly how the system operates. (3mks)

12. Figure **below** shows a pulley system being used to raise a load.



If the effort applied is 28N and the load lifted is 100N, determine the efficiency of the sys (3mks)

13. Figure **below** shows a section of a pipe XY. A constant pressure difference maintains a streamline flow of a liquid in the pipe.



If the cross-sectional area A_1 at X is less than A_2 ay Y, state how the liquid velocity V_2 at Y compares with V_1 at X. (1mk)

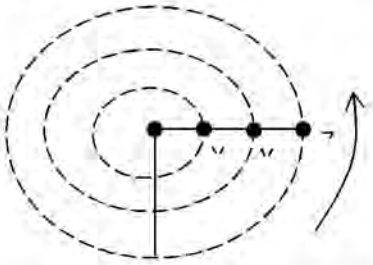
14. Explain the cause of random motion of smoke particles as observed in Brownian motion experiment using a smoke cell. (2mks)

SECTION B: (55 MARKS)

Answer question in this section in the spaces provided.

15. (a) State what is meant by centripetal acceleration. (1mk)

The figure shows masses **X**, **Y** and **Z** placed at different points on a turn table. The turn table is rotated at different angular velocities.



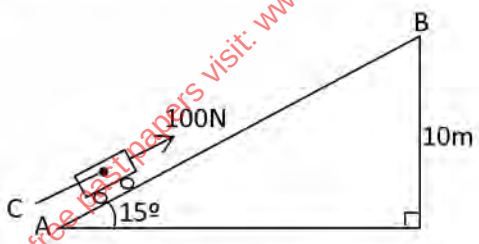
(i) State **two** factors that would cause the masses to slide. (2mks)

(ii) At the time that start sliding off, state the mass with the highest angular velocity,
give reason for your answer. (2mks)

(c) (i) If the centripetal for is 2N and the mass and radius of the path for mass Y are 100g and 0,03m respectively. Calculate the angular velocity of the mass when the system is in equilibrium. (3mks)

(ii) Indicate on the same diagram the direction of velocity of mass Z at that position. (1mk)

16. The figure **below** shows an inclined plane, a trolley of mass 30kg is pulled up a slope by a force of 100N, parallel to the slope. The trolley moves so that the centre of mass C travels from points A to B.



(i) What is the work done on the trolley against the gravitational force in moving from **A** to **B**.? (2mks)

(ii) Determine the work done by the force in moving the trolley from **A** to **B**. (2mks)

(iii) Determine the efficiency of the system. (3mks)

(Iv) Determine the work done in overcoming the frictional force. (1mk)

(v) Determine the mechanical advantage of the system. (3mks)

17. The graph represents displacement-time graph for a car moving with uniform acceleration along a straight horizontal road.

From the graph determine:

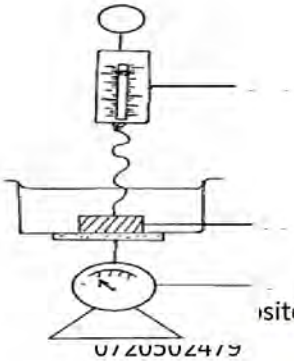
(i) the velocity of the car at the 20th second. (2mks)

(ii) the velocity at the 50th second. (2mks

(iii) the acceleration of the car between the 20th second and 50th second. (3mks)

(b) A bullet is fired horizontally from a storey building 15m high. If the initial speed is $350ms^{-1}$, determine the maximum horizontal distance covered by the bullet.(3mks)

18. (a) A cylindrical block of metal of mass 500g and density $5.0 \times 10^3 kg/m^3$ rests on the bottom of a beaker containing a liquid of density $2.5 \times 10^3 kgm^{-3}$, standing on a compression balance. The metal is attached to a spring balance by a light inextensible string and to begin with the string is slack as shown in the figure **below**.



The metal is slowly raised by raising the spring balance vertically until the metal is well above the surface of the liquid. The mass of the beaker and liquid, without the metal is 1.5kg. Determine the readings, in Newton's, that will be recorded on each of the balances when

(i) the string is slack as shown the diagram. (3mks)

(ii) the string is taut with the metal fully immersed in the liquid. (5mks)

(b) The weight of a stone in air is 7.5N. When fully immersed in paraffin of density $0.8g/cm^3$ its weight is 6.3N. Determine the;

(i) up thrust in the paraffin. (1mk)

(ii) volume of the stone. (2mks)

19. (a) What is meant by specific latent heat of vaporization of a substance? (1mk)

(b) In an experiment to determine the specific latent heat of vaporization of water, steam at 100ºC was passed into water contained in a well-lagged copper calorimeter. The following measurements were made:

- Mass of calorimeter= 55g
- Initial mass of water = 75g
- Final mass of calorimeter + water + condensed steam = 133g
- Final temperature of the mixture = 30ºC

[Specific heat capacity of water = $4200JKg^{-1}k^{-1}$ and specific heat capacity of copper = $390JKg^{-1}k^{-1}$]

Determine the

(i) mass of condensed steam. (1mk)

heat gained by the calorimeter and water if the initial temperature of the calorimeter + water = 20ºC. (2mks)

(ii) given that L is the specific latent heat of vaporization of steam,

(I) Write an expression for the heat given out by steam. (2mks)

(II) Determine the value of L. (2mk

(c) (i) In verifying the Charles' law of gases, the volume and the temperature of a gas are varied at constant pressure, State the condition necessary for the law to hold. (1mk)

(ii) With an aid of a labeled diagram, describe an experiment to verify Charles' law. (5mks)

Set5

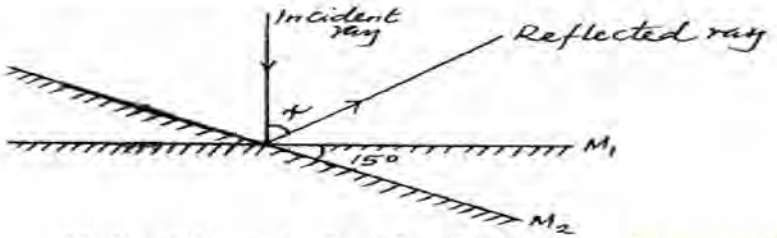
Paper 2 (Theory)

SECTION A: (25 MARKS)

Answer all questions in this section in the spaces provided:

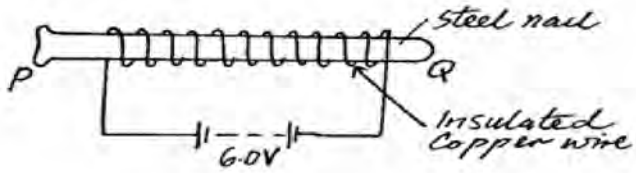
1. State **two** conditions under which a pinhole camera may form an image on its screen which has the same size as the object. (2mks)

2. The figure shows a ray of light incident along the normal. The mirror is rotated at an angle of 15º in a clockwise direction without changing the position of the incident ray,



Determine the angle between the reflection ray and the incident ray. (2mks)

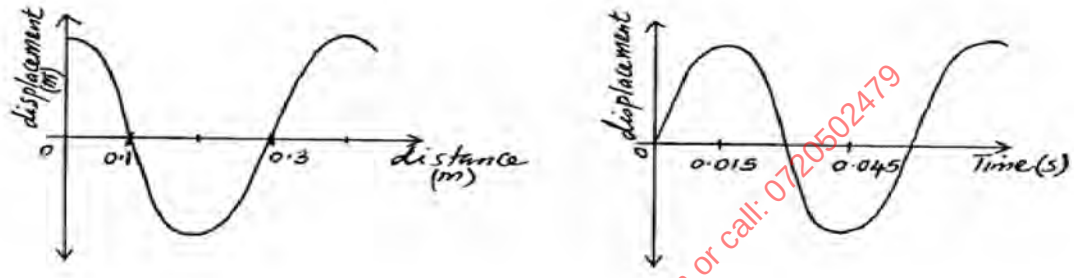
3. A steel is to be magnetized by electrical method as shown below. Identify the pole **P** and **Q** of the resulting magnet. (1mk)



P:

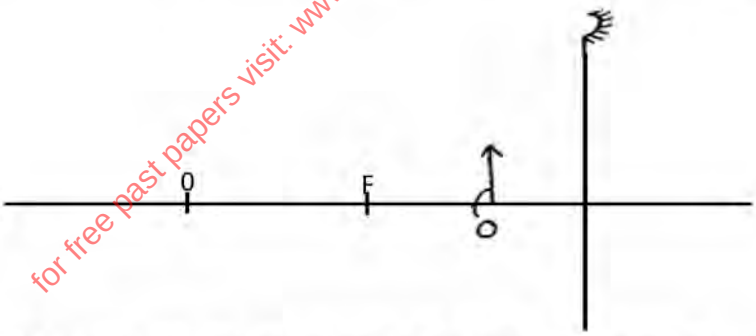
4. A small chain is often seen hanging at the back of a petrol carrying lorry. State and explain its significance. (2mks)

5. The figure **below** shows two waveforms representing the same wave motion.



Determine the velocity of the wave. (3mks)

6. An object O is placed in front of a concave mirror and on the principal axis, as shown in the figure **below**. Complete the light ray diagram to locate the position of the image. (3mks)



7. Arrange the following radiations in order of increasing wavelengths. (1mk)
Infrared, blue light, ultraviolet, radiowaves, χ-rays.

8. The figure **below** shows a block diagram of a p-n junction diode.

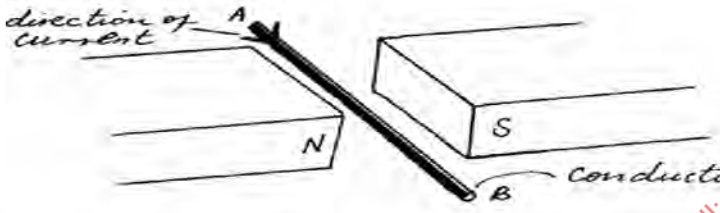
On the same diagram, show how a cell may be connected so that it is reverse biased. (1mk)

9. 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. (3mks)

10. What do you understand by polarization as used in a simple cell? (1mk)

11. State how the defect mentioned in question 10 above is minimized in a simple cell. (1mk)

12. A current-carrying conductor **AB** is in a magnetic field as shown in the figure **below**.



(a) Indicate the direction of force F acting on the conductor. (1mk)

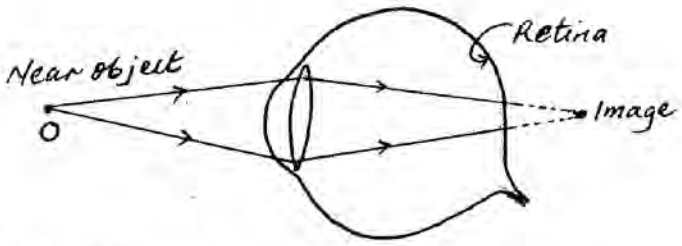
(b) State **two** factors that determine the direction of the force F. (2mks)

13. You are given three resistors of values 5Ω, 8Ω and 12Ω. Show in a circuit diagram how you would connect them so as to give:
(a) an effective resistance of 9.8Ω. (2mks)
(b) the least effective resistance. (1mk)

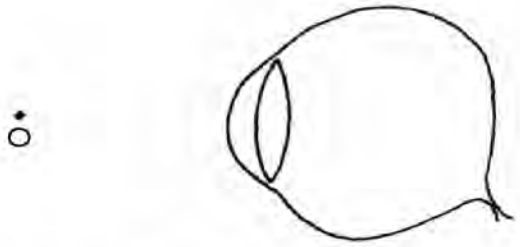
SECTION B: (55 MARKS)

Answer question in this section in the spaces provided.

14. (a) Define refractive index. (1mk)
(b) The critical angle of a certain material medium is 43.2º. Determine the refractive index of the material. (2mks)
(c) (i) What do you understand by the term accommodation? (1mk)
(ii) The diagram **below** shows a certain defect of vision. Name the defect. (1mk)



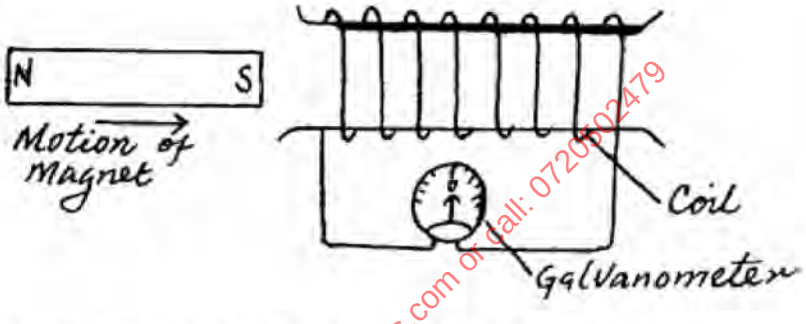
(iii) On the figure **below** show how the defect can be corrected (2mks)



(d) An object is placed 40cm in front of a concave lens of focal length 20cm; determine the position of the image. (3mks)

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

A bar magnet is moved into a coil of insulated copper wire connected to a centre-zero galvanometer, as shown in the figure **below**.



(i) Show on the diagram the direction of induced current in the coil. (1mk)

(ii) State and explain clearly what is observed on the galvanometer when the S-pole of the magnet is moved into and then withdrawn from the coil. (4mks)

(b) A transformer has 800 turns in the primary and 40 turns in the secondary winding.

The alternating e.m.f connected to the primary is 240V and the current is 0.5A.

(i) Determine

I the secondary e.m.f (2mks)

II the power in the secondary if the transformer is 95% efficient. (2mks)

(ii) Explain how energy losses in a transformer are reduced by having:

I a soft-iron core. (2mks)

II a laminated core. (1mk)

16. (a) (i) Distinguish between thermionic emission and photoelectric emission. (2mks)

(ii) State **one** factor which affects the rate of each of the above types of emission.

Thermionic emission. (1mk)

Photoelectric emission. (1mk)

(b) Sodium has a work function of 2.3eV. Given that: Planck's constant h = 6.63×10^{-34}JS, velocity of light in vacuum, C = 3.0×10^{8}m/s, 1 electron-volt (1eV) = 1.6×10^{-19} C and mass of an electron, $m_e = 9.1 \times 10^{-31}$kg, calculate:

(i) its threshold frequency. (2mks)

(ii) the maximum velocity of the photoelectrons produced when the sodium is illuminated by light of wavelength 5.0×10^{-7}m. (4mks)

(iii) the stopping potential V, with the light of this wavelength. (2mks)

17. (a) State **two** advantages of using a Cathode Ray Oscilloscope (C.R.O) as a voltmeter over the ordinary voltmeter. (2mks)

(b) An X-ray operates at 30000V and the current through it is 2mA. Given that the charge of an electron is 1.6×10^{-19}C, h = 6.63×10^{-34}JS, speed of light, C = 3.0×10^{8}m/s,
calculate:-

(i) the maximum kinetic energy of the electrons when hitting the target. (2mks)

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

(iii) the minimum wavelength of the X-rays emitted. (2mks)

18. (a) A radioactive carbon-14 decays to nitrogen by beta particles as shown **below**.

$$^{14}_{6}C = ^{\chi}_{7}N + ^{0}_{y}e$$

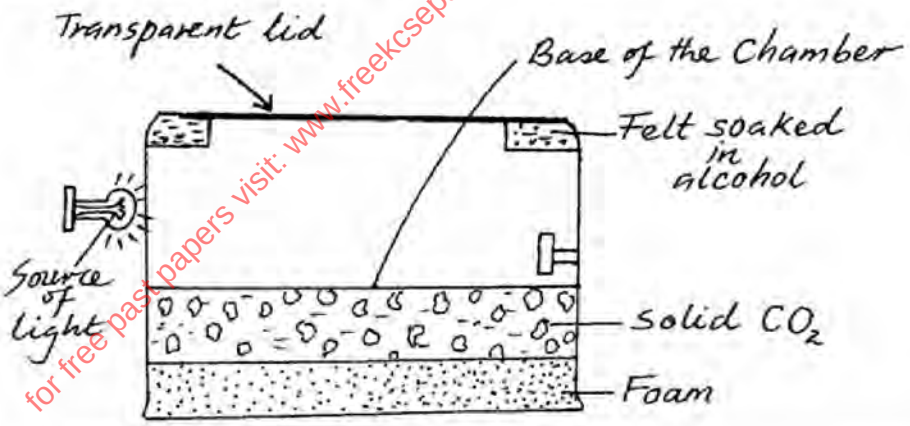
Determine the values of χ and y. (2mks)

(b) The graph **below** shows the activity (disintegrations per minute) of a sample of carbon-14 against the time in years.

(i) From the graph determine the half-life of carbon-14. (2mks)

(ii) A mass of 100g of carbon-14 decays and the mass taken after 15000 years.
Determine the mass that remains. (3mks)

(c) The figure **below** shows the cross-section of a diffusion cloud chamber used to detect radiation from radioactive sources.



(i) State the function of the following:

I Alcohol. (1mk)

II Solid CO_2. (1mk)

(ii) Explain briefly how the diffusion cloud chamber can be used to detect and identify alpha particles. (3mks)

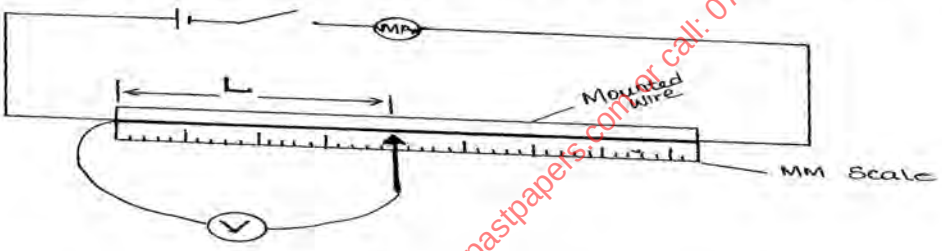
Set5
Paper 3 (Practical)

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

Proceed as follows:

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

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



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

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

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

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

f) (i) Plot the graph of R (Y-axis) against L(m). (5mks)

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

(iii) Given that $R = PL/A$ were A is the cross-sectional area of the wire and P is a constant for the material of the wire, determine the value of the constant P. (3mks)

2. You are provided with the following:

- A marble with a piece of thread attached.
- Two wooden blocks.
- Clamp, boss and retort stand.
- Meter rule.
- $1/2$ metre rule attached to a wooden block.
- Cello tape (2 pieces of about 10cm long)
- Stop watch.

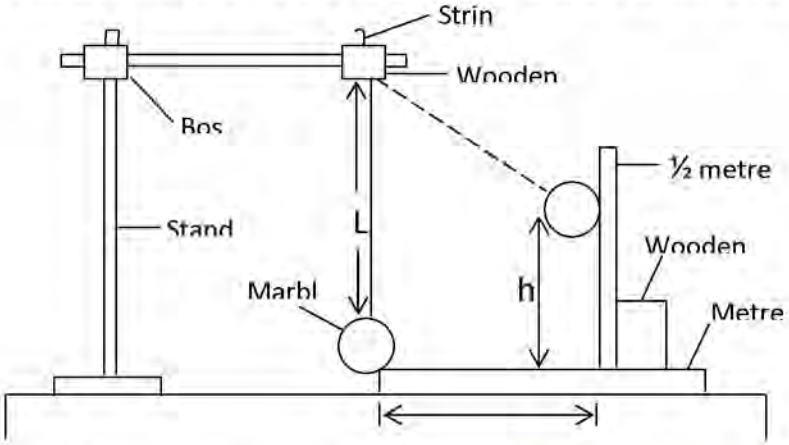
Proceed as follows:

(a) Fix the thread between the two wooden blocks and fasten the clamp.

(b) Adjust the thread so that the length L shown in figure 1 is 50.0cm.
Fix the metre rule horizontally to the bench using the cello tape provided.

(c) Adjust the clamp so that the marble is next to the end of the metre rule as shown.

Fig.1



(i) Displace the marble by a horizontal distance X = 20cm and measure the corresponding vertical.

Displacement h = _____ cm (1mk)

(ii) Repeat the experiment to find h for each of the following values in the table.

(Complete the table). (2mks)

χ(cm)	h(cm)	χ^2(cm²)	χ^2/h(cm)
20		200	
25		625	
30		900	
35		1225	
40		1600	
45		2025	

(iii) Plot the graph of $\frac{\chi^2}{h}$ (y-axis against h. Draw the best through the points.(5mks)

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

(v) From the graph, find the value of $\frac{\chi^2}{h}$ when h = 0. (1mk)

(b) Raise the clamp slightly without changing the length L so that the marble is free to swing. Determine the period, T, for one complete oscillation by timing ten oscillations.

Time for 10 oscillation = _____ (1mk)

Period T = _____ (1mk)

(c) Calculate the value of P from he following equation.

$T = 2\pi\sqrt{\left(P/g\right)}$ where g = 9.8ms^{-2} (2mks)

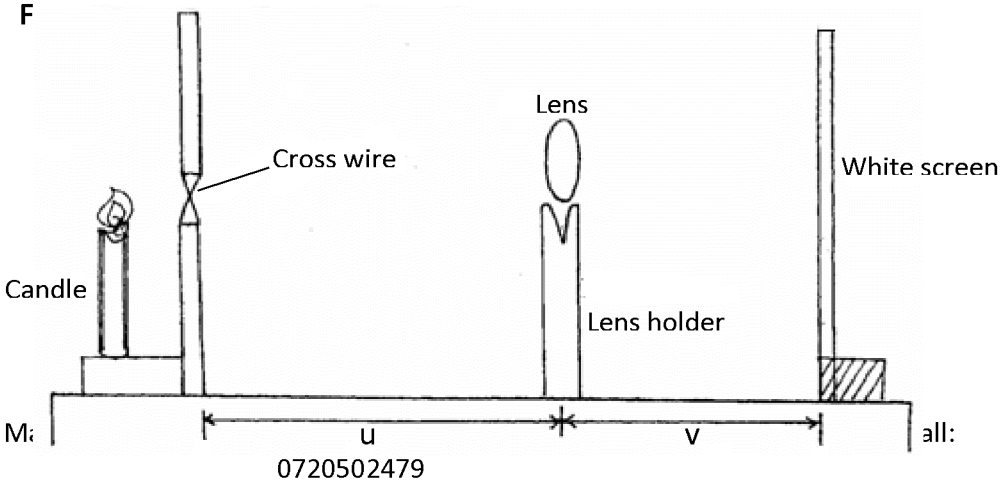
2. (b) You are provided with the following apparatus:

- Candle
- Lens
- Lens holder
- Metre rule
- Cross wire
- Screen
- Vernier calipers

Proceed as follows:

(i) Arrange the apparatus as shown in the figure **2 below**.

F



(ii) Place the cross-wire before the lens so that U = 28cm. The lit candle should
be placed close to the cross-wire.

(iii) Adjust the position of the screen until a sharp image is cast on the screen.

(iv) Measure and record the value of image distance, V, in the table.

(v) Repeat the same procedure for the other values in the table.

Table 2

U(cm)	V(cm)	$M = \frac{V}{U}$
30		
36		

(2mks)

(vi) Given that the focal length f of the lens satisfies the equation $f = \frac{V}{1+M}$

determine average value of the focal length, f. (3mks)

Set6

232/1
PHYSICS
PAPER 1

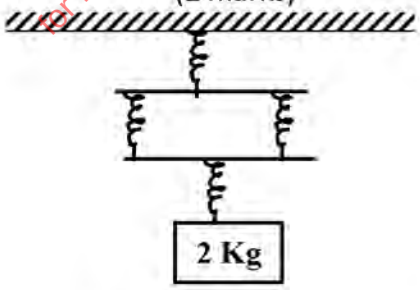
SECTION A:

1. The load carried by a truck loader was measured to be 65,000 grams. Convert the mass of the load into milligrams and express the answer in standard form. (2 Marks)

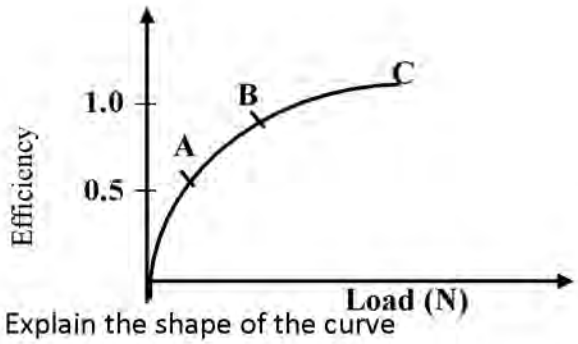
   A form one girl observed that when mercury is put into a glass it does not wet the glass. Explain the observations made by the girl. (2 Marks)

   In using the lift pump to raise water from a bore hole. It is observed that practically the height the water is raised cannot be 10m and more. Give two reasons for this observation. (2 Marks)

   When a mass of 2kg is hang from a single spring, the spring extends by a distance x. Determine the total extension in the set up below. (2 marks)



2. The sketch below shows the relationship between the efficiency and the load for a pulley system.



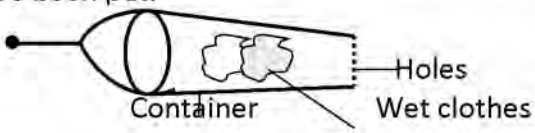
Explain the shape of the curve (2 Marks

State a reason why the efficiency of a machine is always less than 100% (1 Mark)

6. (i) Explain why bodies in circular motion undergo acceleration even when their speed is constant.

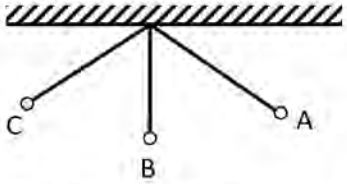
(1 Mark)

(ii) The figure below shows a container with small holes at the bottom in which wet clothes have been put.



When the container is whirled in air at high speeds, it is observed that the clothes dry faster. Explain how the rotation of the container causes the clothes to dry faster. (2 Marks)

7. The diagram below shows a swinging pendulum.



(i) Which position does the bob have the:

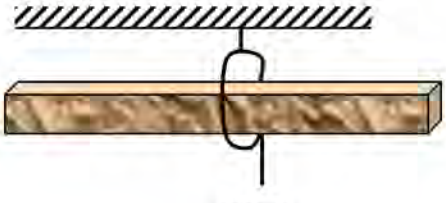
(a) Maximum momentum (1 Mark)

(b) Minimum kinetic energy (1 Mark

(ii) What basic physical quantity can be measured using a single pendulum. (1 Mark)

8. (a) State the principle of moments (1 Mark)

(b) A uniform 1m wooden bar with uniform cross-sectional area of 2.5cm by 2.5cm is suspended at the 60cm mark and kept balanced by hanging a mass 450g at 100cm mark.



Determine

(i) The density of the material of the metre rule (2 Marks)

(ii) The tension T in the string (1 Mark)

9. Explain the term sea breeze (3 Marks)

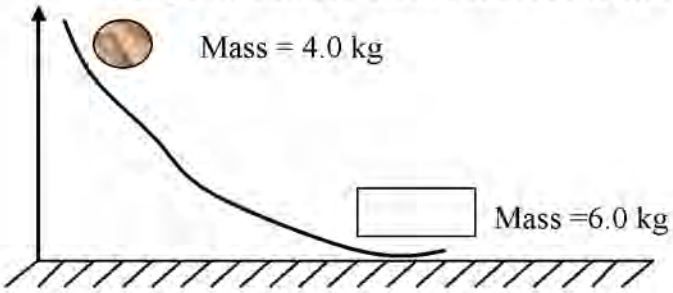
10. State two factors which affect the rate of diffusion in gases (2 Marks)

SECTION B – 55 Marks

Answer all the questions in this section in the spaces provided

11. (a) State two characteristics of perfectly inelastic collisions (2 Marks)

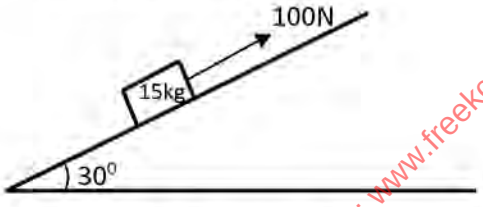
(b) A body of mass 4.0 kg held at a vertical height of 500cm is released to travel along a frictionless curved path as shown in the figure below.



The 4.0kg mass strikes body of mass 6.0kg at rest immediately it reaches the horizontal. The bodies stick together and move in the same direction. Determine the velocity of the bodies immediately after collision. (4 Marks)

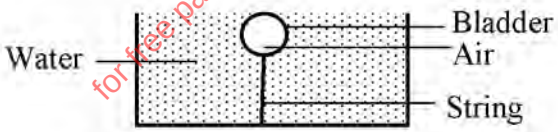
(c) (i) A matatu whose mass is 2500kg is lifted with a jack screw of 10mm pitch. If the handle is 30cm from the screw, find force applied (Neglect frictional force) Take $\pi = 3.14$ (4 Marks)

(ii) The figure below shows an inclined plane and a load of mass 15kg pulled by an effort of 100N.



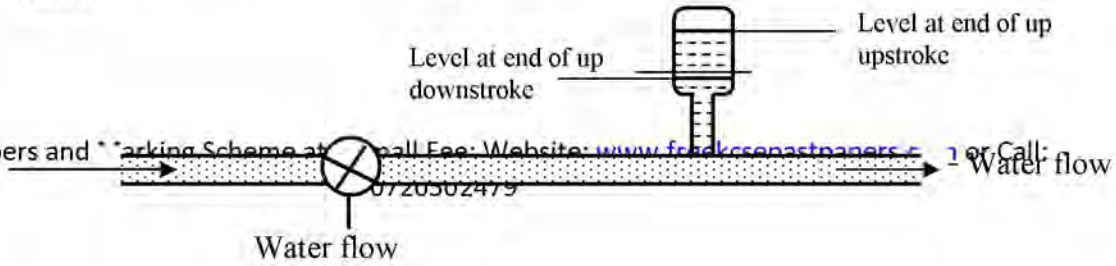
Find the efficiency of the machine (3 Marks)

12. (a) The diagram below shows a rubber bladder filled with air and fixed to the bottom of a water container with a string.



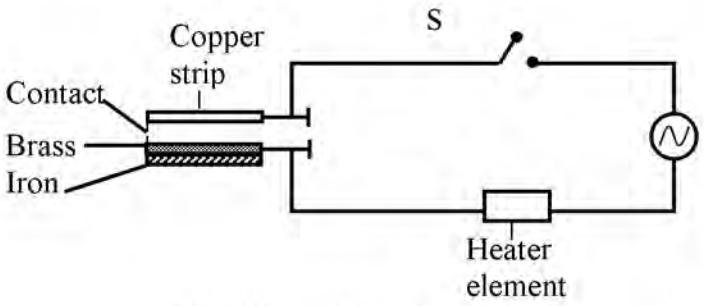
Explain why the tension in the string increases when the water is heated (3 Marks)

(b) The figure below shows water pump which forces water through a hydraulic system. An air chamber is used to maintain a continuous flow of water during both the upstroke and down stroke of the piston.



Explain how the continuous flow of water is maintained (2 Marks)

13. (a) The figure below shows a circuit diagram for a device for controlling the temperature in a room.



(i) Explain the purpose of the bimetallic strip. (2 Marks)

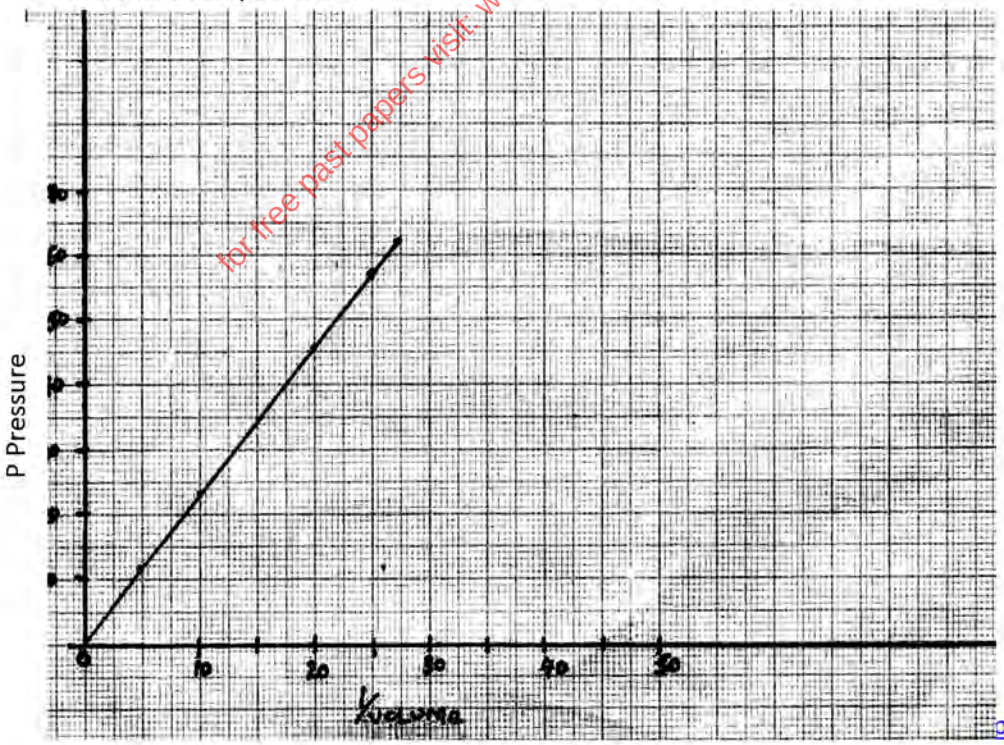
(ii) Describe how the circuit controls the temperature when the switch S is closed. (3 Marks)

(b) (i) Define the term specific latent heat of vaporization of a substance (1 Mark)

(ii) An electric kettle rated 2.5kW is used to raise the temperature of 3.0kg of water through 50^0C.
Calculate the time required to effect this (Specific heat capacity of water is 4200j/kgK) (3 Marks)

(c) A 12.9 gram sample of unknown metal at 26.5^0C is placed in a Styrofoam cup containing 50.0 grams of water at 88.6^0C. The water cools down and the metal warms up until thermal equilibrium is achieved at 87.1^0C. Assuming all the heat lost by the water is gained by the metal. Determine the specific heat capacity of the unknown metal. (Specific heat capacity of water is 4.18j/g/^{0}C) (4 Marks)

14. (a) The graph below represents the relationship between $\frac{1}{Volume}$ and pressure at constant temperature.



$\frac{1}{volume}$

(i) With the aid of a labelled diagram describe the apparatus and arrangements used in getting the results used to plot the graph above. (4 Marks

(ii) From the graph state the law under investigation. (4 Marks)

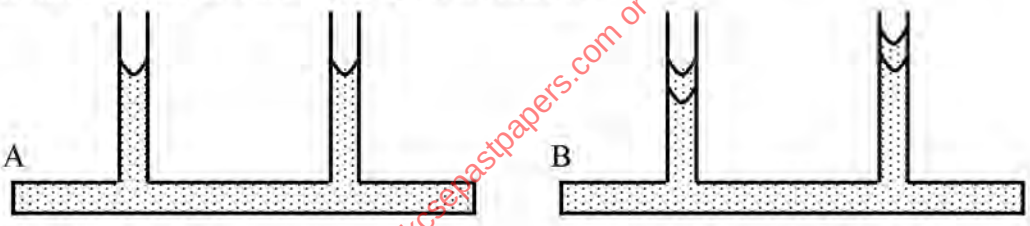
(iii) State and explain how the graph can be used to verify the law stated in (ii (3 Marks)

15. (a) State what is meant by streamline flow (1 Mark)

(b) The figure shows the cross section of an aeroplane wing, with the aeroplane moving in the direction shown by the arrow.

Sketch streamlines to show how air flows past the wing as the aeroplane moves (1 Mark)

(c) The diagram below shows two horizontal pipes, A and B. Tube A contains liquid at rest while tube B contains liquid in motion.



(a) Liquid at rest (b) Liquid at motion

(i) Sketch graphs for (a) and (b) to show variation in pressure (2 Marks)

(d) A jet of water emerges from a hose pipe of cross-sectional area 5.0 x $10^{-3}m^2$ with a velocity of 3.0ms^{-1}. The water strikes a wall at a right angle and comes to rest without rebounding. Determine the mass of water striking the wall per second (Density of water is 1000 kgm^{-3})

16. (a) Explain how a hydrometer may be used to test whether a car battery is fully charged (2 Marks)

(b) A submarine made of iron was observed to float in water while a piece of iron rod sinks in water.
Explain this observation (2 Marks)

(c) A solid displaces 5.0cm3 of paraffin when floating and 20cm3 when fully immersed in it. Given that the density of paraffin is 0.8g/cm3. Calculate the density of the solid (4 Marks)

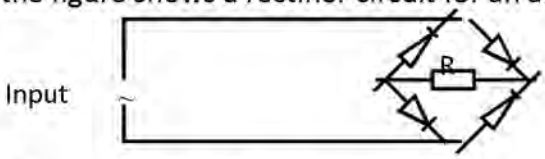
(d) Define the term relative density as used in liquids (1 Mark)

Set6

Paper 2 (Theory)

SECTION A: 25 MARKS

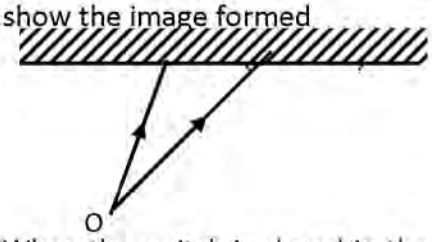
1. The image formed by a convex mirror is virtual. State two other characteristics of image formed by the convex mirror. (2 Marks)
2. State the function of the control grid in a cathode ray oscilloscope (1 Mark)
3. A metal iron has work function of 6.8×10^{-19}J. Calculate the minimum frequency of light that can cause photoelectric emission. (Take $h = 6.63 \times 10^{-34}$ Js) (2 Marks)
4. In the figure shows a rectifier circuit for an alternating current input.



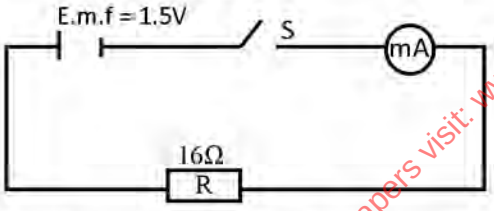
   (a) On the circuit, indicate the flow of current to illustrate rectification.(1 Mark)
   (b) Sketch a graph to show how the voltage across R varies with time.
5. Complete the nuclear equation below by inserting the values of a and b. (2 Marks)

$$^{14}_{6}C \longrightarrow ^{b}_{a}X + ^{14}_{7}N$$

6. State and explain the effect of increasing the E.H.T in an ex-ray tube on the x-rays.(2 Marks)
7. The figure below shows the incident rays from a point object O. Draw a ray diagram to show the image formed



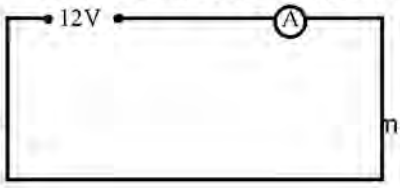
8. When the switch is closed in the figure below, the milliameter reads 75mA. Determine the internal resistance of the cell
   (3 Marks)

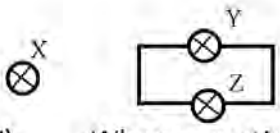


9. Determine the cost of using an electric heater rated 3kW for 12 hours given that the cost of electricity per kilowatt-hour is Sh. 8.00. (2 Marks)
10. Name two types of electromagnetic radiations whose wavelengths are greater than that of ultraviolet radiation (2 Marks)
11. What is the main difference between an a.c. and d.c generators (1 Mark)
12. State two conditions to be satisfied for total internal reflection of light to take place. (1 Mark)
13. Give an example of a longitudinal wave (1 Mark)

SECTION B

14. (a) The figure below shows how a student set up a circuit using 3 identical bulbs X, Y and Z each rated "12V, 2.0A"





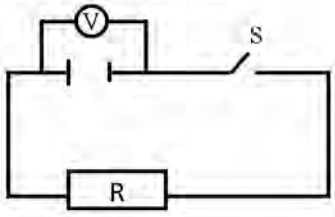
(i) When operating normally, calculate the resistance of one of the bulbs(2 Marks)

(ii) Calculate the effective resistance of the three bulbs. (2 Marks)

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

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

(b) When the switch S is kept open in the circuit shown below the voltmeter reads 1.5V. When the switch is closed, the readings drops to 21.3V and the current through the resistor is 0.5A.

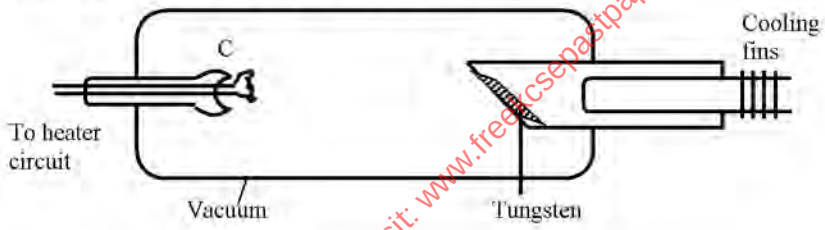


(i) What is the e.m.f of the cell? (1 Mark)

(ii) What the terminal voltage of the cell? (1 Mark)

(iii) Calculate the value of R. (2 Marks)

15. The figure below is of an x-ray tube



(a) Explain how x-rays are produced by the tube (4 Marks)

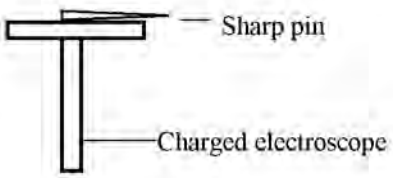
(b) Explain briefly the energy changes that take place when the x-ray tube is operating (3 Marks)

(c) Why is it necessary to maintain a vacuum inside the tube? (2 Marks)

(d) The accelerating voltage of an x-ray tube is 12V. Calculate the speed of the electron on reading the anode. (Charge to mass ratio of an electron $\frac{e}{me} = 1.76 \times 10^{11}$ (3 Marks)

16. (a) Define capacitance (1 Mark)

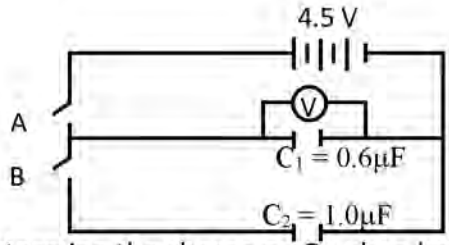
(b) In the figure below, a sharp pin is fixed on a cap of a leaf of the electroscope. The electroscope is highly charged and then left for some time.



State and explain the observation made after sometime (2 Marks)

(c) The figure below shows a circuit where a battery of e.m.f. 4.5V, switches A and B, two capacitors

C_1 =0.6μF and C_2 = 1.0μF and a voltimeter are connected.



(i) Determine the charge on C_1 when both switch A is closed and switch B is open.(2 Marks)

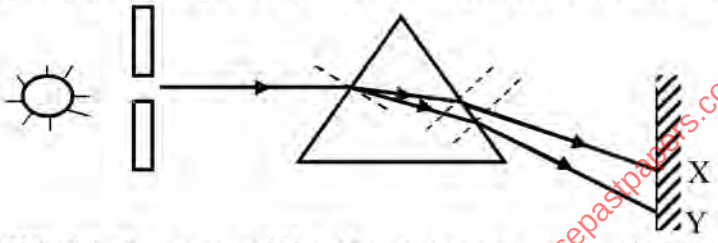
(ii) What is the effective capacitance when both switches are closed? (2 Marks)

(iii) State and explain what is observed on the voltmeter when;

- Switch A is closed and switch B is open (2 Marks)
- Switch A is closed and B is closed (2 Marks)

(d) State two ways in which the capacitance of a parallel plate capacitor can be reduced. (2 Marks)

17. (a) The diagram below shows a narrow beam of white light onto a glass prism.



(i) What is the name of the phenomenon represented in the diagram? (1 Mark)

(ii) Name the colour at X and Y (2 Marks)

(iii) Give a reason for your answer in part (ii) above (1 Mark)

(iv) What is the purpose of the slit (1 Mark)

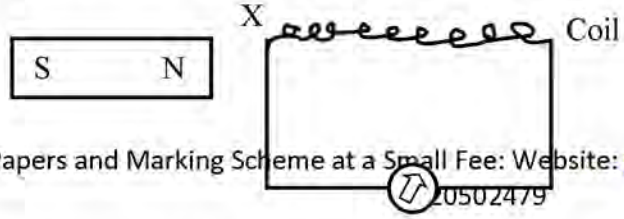
(b) The figure below shows the path of ray of yellow light through a glass prism. The speed of yellow light in the prism is 1.8×10^8 m/s

(i) Determine the refractive index of the prism material (Speed of light in vacuum, $C = 3.0 \times 10^8$ m/s) (3 Marks)

(ii) Show on the same diagram, the critical angle C and hence determine its value.

(iii) Give that $r = 31.2^0$ determine the angle θ (3 Marks)

18. (a) In the figure below the bar magnet is moved into the coil.



State and explain what is observed in the galvanometer (2 Marks)

(b) State two ways in which energy is lost from a transformer and explain each. (2 Marks)

Set6

Paper 3 (Practical)

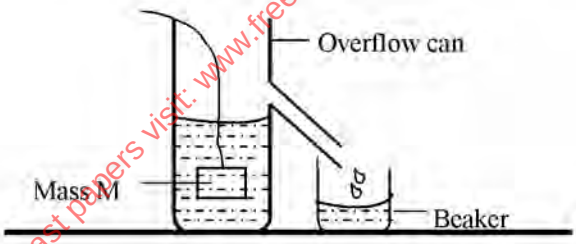
1. You are provided with the following apparatus
- A meter rule
- A wire of length at least 100cm
- A retort stand
- A stop watch
- a micrometer screw gauge
- An overflow can
- A 100ml beaker
- A 50ml measuring cylinder
- A piece of thread
- Water in a 250ml beaker
- Two pieces of wood
- Mass labeled m

PROCEDURE

a)

i. Fill an overflow can with water to overflowing and then let it drain.

ii. Immerse the mass m into the can. Collect the overflow water into a beaker as shown below.

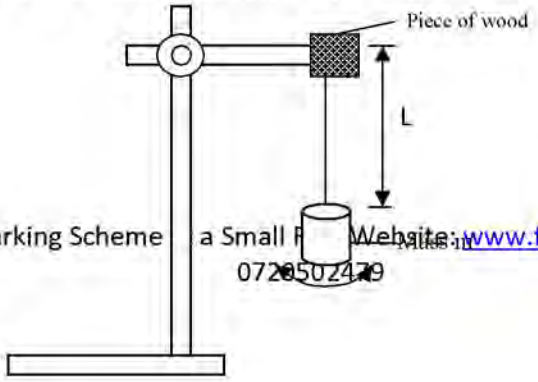


iii. Using the measuring cylinder provided, determine the volume V of the water collected in the beaker

V=. (1mark)

iv. Calculate I given that $I = \frac{10^6 m}{V}$ $where\ m = 0.30kg$ $(2mks)$

Set up the apparatus as shown below. Ensure that the wire is free of kinks and the end tied to the hook is firm and the hook does not move.



b) Adjust the length L of the wire so that L=70cm. Give the mass m a slight twist so that when released, it oscillates about the vertical as shown above. Measure the time t for twenty oscillations and record in the table below.

c) Repeat the procedure above for other values of L as shown and complete the table.

Length L (cm)	70	60	50	40	30	20
Length L(m)						
Time for 20 oscillation						
Period T(s)						
$T^2(s^2)$						

(5mark)

d) On the grid provided plot a graph of $T^2(s^2)(y-axis$ against L(cm) (5marks)

i. Measure the diameter of the wire
d=metre (1mark)

ii. Determine the slope of the graph (2marks)

iii. Given that $T^2 = \frac{32\pi^2 l}{Gd}$ determine the value of the constant G (3mark)

PART TWO

You are provided with the following apparatus

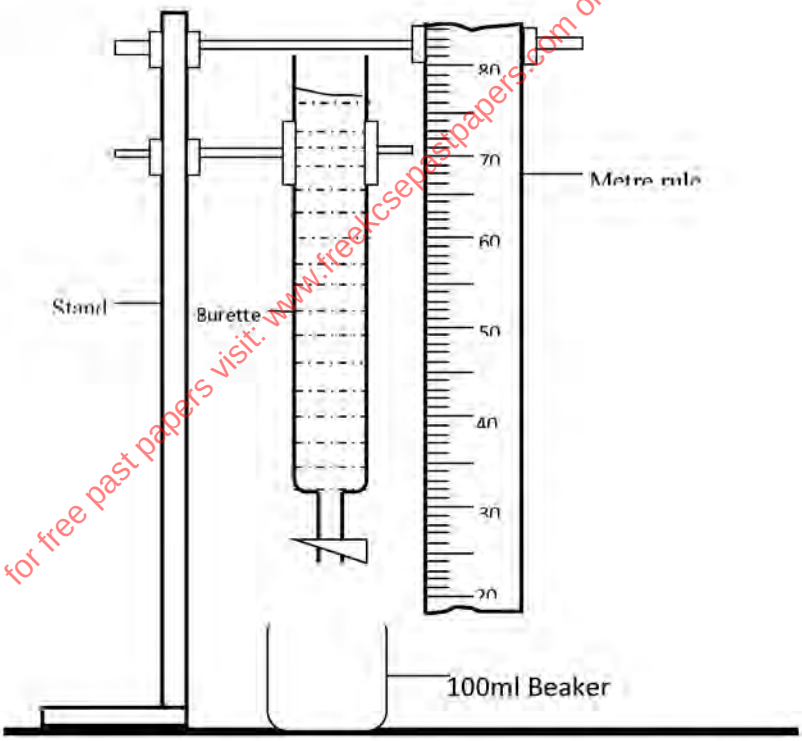
- A clean burette
- Retort stand
- Two clamps and 2 bosses
- A metre rule
- Water
- 100ml beaker
- A stop watch

PROCEDURE

a) Clamp the burette and metre rule vertically and as close to each other as possible

b) Adjust the position of the burette so that its lower end is 10cm above the bench and place the 100ml beaker underneath it.

c) Fill the burette with water to a height above the 70cm mark of the metre rule as shown below.



- By trial and error method adjust the rate of flow of the water until the time taken for the water to flow from 70cm mark to 65cm is between 25-30 seconds.
- Once this flow rate has been achieved do not alter the flow rate for the rest of the experiment.
- Fill the burette again with water to a level above the 70cm mark.

- With the water level at the 70cm mark (at t=0) start the stop watch. Note the time taken for the height h of the water surface in the burette to decrease by 5cm;Do not stop the watch.
- Continue to record the time taken for the height h of water surface to decrease by successive 5.0cm marks till you have 10 more readings.
- Enter the results in the table below
- Stop the watch and close the burette tap.
- Repeat the procedure to get second and third set of readings for t.

Height h(cm)	Time (s)			
	Trial 1	Trial 2	Trial 3	Mean time t
70				
65				
60				
55				
50				
45				
40				
35				
30				
25				
20				

(6marks)

Complete the table above and calculate the mean time t

c) Plot a graph of height h (y-axis) against mean time t (5marks)

d) Use your graph to determine the time taken for the height h to change from 64cm to 32cm. (2marks)

e) From the graph determine the time t when h=35cm (1mark)

PART THREE

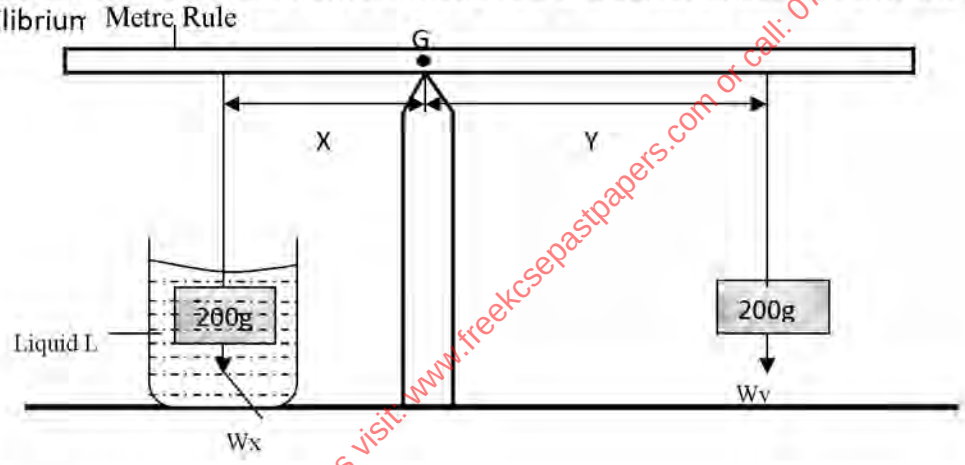
You are provided with the following apparatus

- 2 200g masses
- 2 pieces of thread
- A metre rule
- A beaker
- A knife edge
- A vernier calipers
- Liquid labeled L

PROCEDURE

f) Using the vernier calipers, determine the volume of the 200g mass provided. (2marks)

g) Arrange the apparatus as shown in the diagram below such that x=100mm from pivot (centre of gravity of the metre rule) with 200g mass completely immersed in liquid L and hang the other 200g mass from the metre rule and adjust its position until the system is in equilibrium



i) Determine the distance y in mm

Y=. (1mark)

Given that $\frac{Y}{X} = \frac{Wx}{Wy}$ where W_x is the apparent weight of the mass in the liquid L and W_y is the actual weight.

Calculate the value of W_x and the up thrust U of the liquid (3marks)

PART FOUR

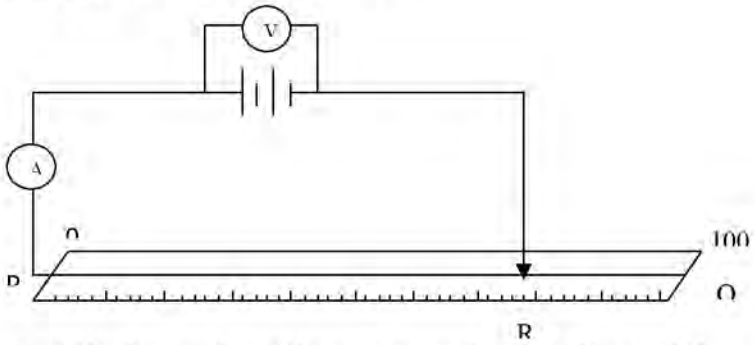
You are provided with the following apparatus

- Two dry cells
- An ammeter
- A voltmeter
- A cell holder
- Five connecting wires

- A jockey
- A nichrome wire mounted on a mm scale labeled PQ

PROCEDURE

a) Set up the apparatus as shown below



Disconnect the jockey from the wire at point R and record the voltmeter reading V and the corresponding ammeter reading. (2marks)

V =

I =

b) Now connect the jockey at the 70cm mark and record the voltmeter reading V and the corresponding ammeter reading in the table below. Repeat for values of V and J at the 50cm, 40cm, 30cm,20cm and10cm mark

(6 marks)

Length cm	70	50	40	30	20	10
p.d (v)						
Current I(A)						

c) Plot a graph of p.d (v) against current I (5marks)

d) From the graph determine

a. The e.m.f of one cell (2marks)
The internal resistance of one cell (3marks)
b. The voltage p.d when current I=0.05A (1mark)
c. The current I when the p.d voltage is 1.0V (1mark)

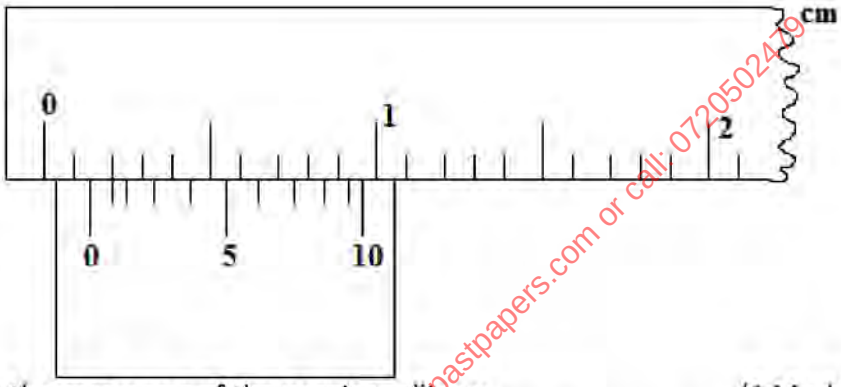
Set7

232/1
PHYSICS
PAPER 1

SECTION A (25 MARKS)

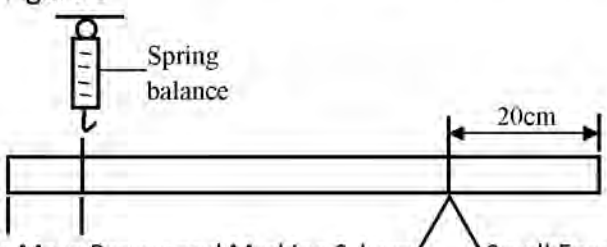
Answer ALL questions in this section in the spaces provided after each question

1. The figure 1, below shows parts of a vernier calliper when the jaws are closed without an object between the jaws.
Fig. 1



(a) Calculate the zero error of the vernier callipers. (1 Mark)
(b) A student used the vernier callipers shown in Fig. 1 to measure the diameter of a test tube whose actual diameter was 2.13cm. Determine the reading of the vernier callipers. (2 Marks)

2. Explain why ethylated spirit at room temperature when dropped at the back of the palm makes the palm to feel very cold. (2 Marks)
3. A block measuring 20cm by 10cm by 4 cm rests on a flat surface. The block has a weight of 6.0N. Determine:
(a) The minimum pressure it exerts on the surface. (2 Marks)
(b) The density of the block in kg/m^3. (2 Marks)
Take (g = 1N/kg)
4. (a) State the kinetic theory of matter. (1 Mark)
(b) Why is smoke preferred for use in the smoke cell experiment?
5. In the figure 2 below shows a uniform bar of length 1.0M pivoted near one end. The bar is kept in equilibrium by a spring balance shown.
Figure 2

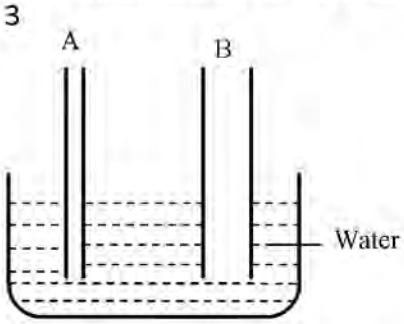


Given that the weight of the metre bar is 1.4N, determine the reading of the spring balance. (3 Marks)

6. A turntable of radius 10cm is rotating at 43 revolutions per second. Determine the linear speed of a point on the circumference of the turntable. (3 Marks)

7. The figure 3 below shows two capillary tubes of different sizes dipped in water.

Figure 3

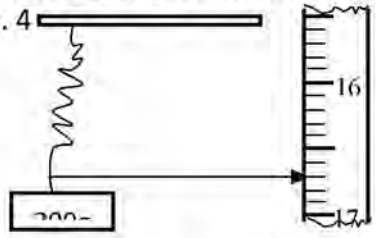


(a) Mark on the diagram the level of water in the capillary tubes. (1 Mark)

(b) Explain the difference in the level of water in the two tubes. (1 Mark)

8. Figure 4 shows a spring on which a mass of 200g is suspended at its lower end.

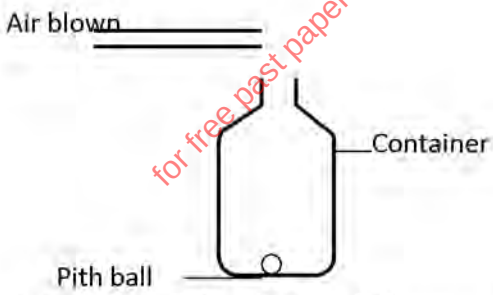
Fig. 4



If the pointer was at 102cm mark mon the scale, without the mass, determine the spring constant for the spring. (Give your answer to the nearest 4 significant figures) (3 Marks)

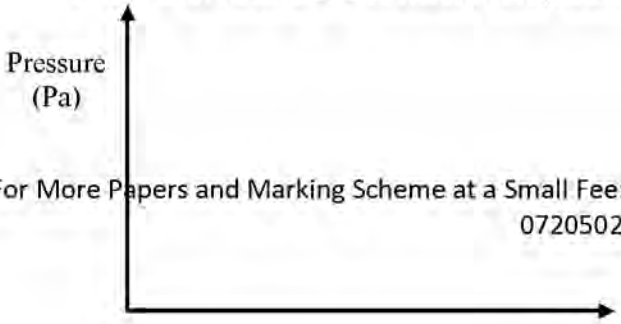
9. The figure below shows a pith ball in a container.

Figure 5



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

10. On the axes below, sketch a graph to show how the pressure of a friend mass of a gas varies with nature at a constant temperature. (1 Mark)



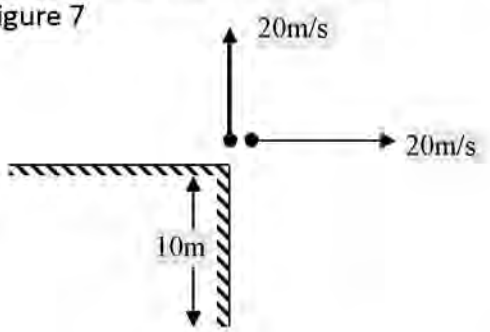
Vol (cm^3)

SECTION B (55 MARKS)

ANSWER ALL QUESTIONS

11. (a) The figure 7 below shows the starting of motion of two arrows 10M above the ground. Both arrows were shot with initial velocity of 20m/s, from one point and at the same instant.

Figure 7



(i) Determine the total height reached by the arrow shot vertically (3 Marks)

(ii) Calculate the time of flight taken by the arrow shot horizontally as it strikes the ground. (2 Marks)

(iii) Calculate the horizontal distance covered by the arrow shot horizontally as it strikes the ground (2 Marks)

12. (a) (i) State 2nd Newtons law of motion. (1 Mark)

(ii) Explain why a high jumper flexes his knees when landing on the ground (1 Mark)

(b) A ball of mass 100g is dropped from a height of 1.25m above the ground surface. It rebounds to a height of 1.1m.

Calculate

(i) Velocity of ball before impact (2 Marks)

(ii) Force of impact (Take g = 10N/kg) (3 Marks)

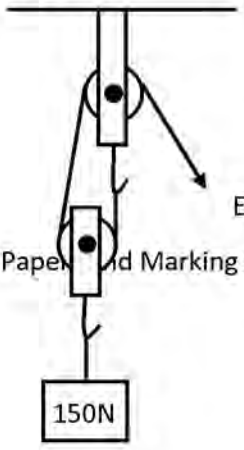
(d) (i) Distinguish between elastic and inelastic collission (1 Mark)

(ii) A car of mass 800kg collides heads with a truck of mass 5000kg travelling at 40m/s. The car is thrown on to bonet of the truck which continous to move after impact at 10m/s in the original direction. How fast was the car moving (3 Marks)

13. (a) Define a machine 1 Mark)

(b) The figure 8 below shows a pulley a pulley system for lifting heavy objects.

Figure 8



(i) State the velocity ratio of the pulley system. (1 Mark)

(ii) If the efficiency of the machine is 75%, calculate the mechanical advantage of the system. (3 Marks)

(iii) Determine the effort applied (3 Marks)

(c) A stone of mass 4kg is thrown upwards with a kinetic energy of 240J. Neglecting air resistance,

calculate the height to which it will rise. (Take g = 10N/kg) (3 Marks)

14. (a) Explain why water kept in a porous pot on a hot day remains cooler than that contained in a metallic vessel. (1 Mark)

(b) (i) An immersion heater takes 30 minutes to heat 20kg of water from 25^0C to 60^0C. How long would the same heater take to heat the same mass of kerosene through the same temperature range assuming no hear is lost to the surrounding? (4 Marks)

{Specific heat capacity of water = 4200JKg-1k-1
Specific heat capacity of kerosene = 2200 JK-1K-1)}

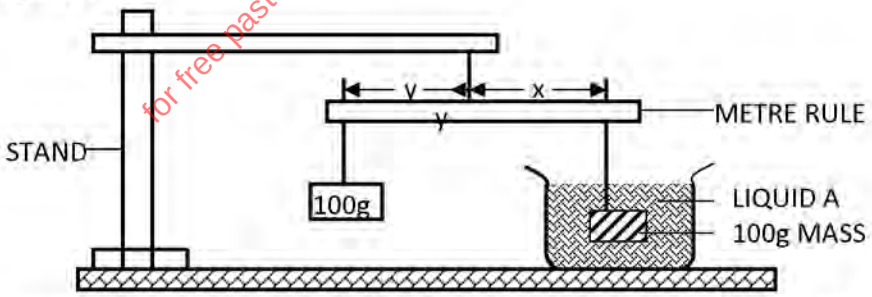
(ii) How long would the same heater take to vapourise the whole amount of water? (Specific latent heat of vaporisation of water = 2.26×10^6JKg^{-1}) (4 marks)

(c) State two factors that affect the boiling point of water and in each case explain how it is affected (3 Marks)

15. (a) Define the relative density of a solid (1 Mark)

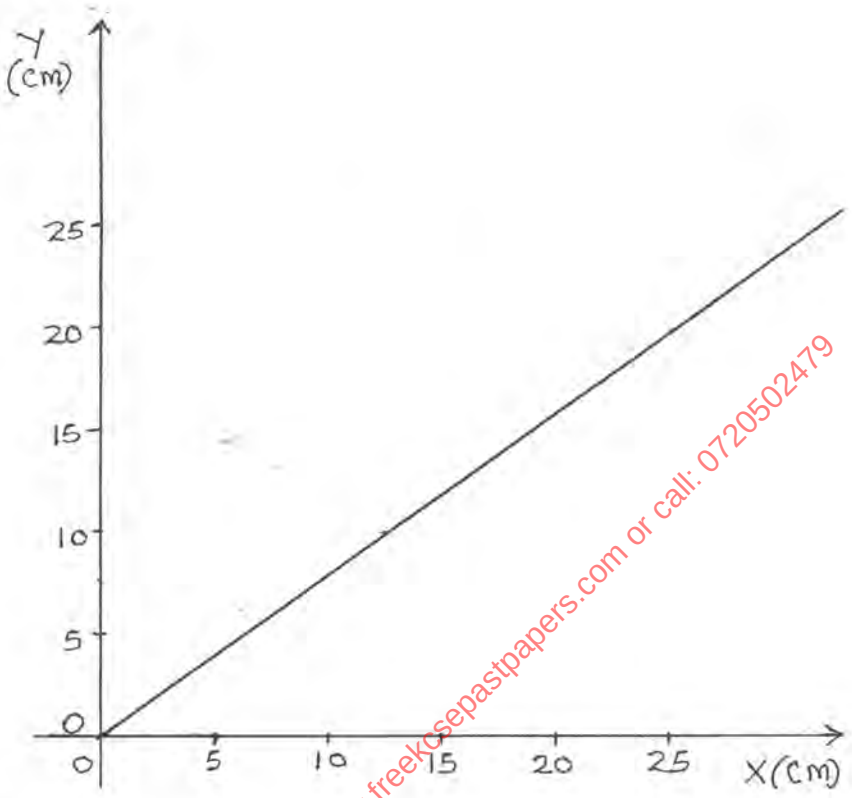
(b) In an experiment to determine the relative density of liquid A, the following set up was used.

Figure 9



The distance x of the mass in liquid A was measured for various length, y of an identical mass of equilibrium and a graph of y against x was drawn as shown in the grid below.

GRAPH OF Y AGAINST X



(i) Determine the gradient, S, of the graph. (3 Marks)

(ii) If $S = \frac{F}{W}$, where F is the apparent weight of mass in liquid A and W is the actual weight of the mass. Calculate the value of F and the apthrust u.

(iii) Determine the relative density of the liquid a, Given that the weight of the 100g mass in water was 0.9N.

(c) A balloon's fabric weighs 10N and has a gas capacity of $2M^3$. If the gas in the balloon weighs 2N and air has density 1.29kg/m3, Find the resultant force on the balloon when it is floating in air. (4 marks)

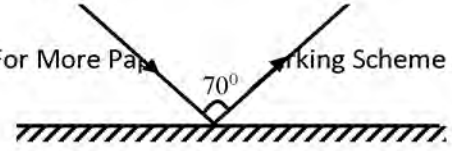
Set7

Paper 2 (Theory)

SECTION A – 25 MARKS

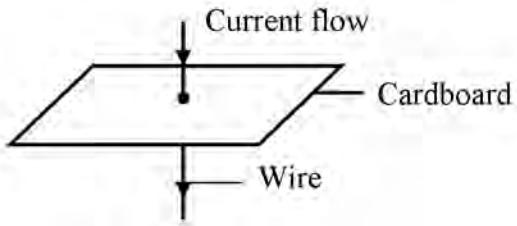
1. Figure 1 shows a ray of light incident on a plane mirror.

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)

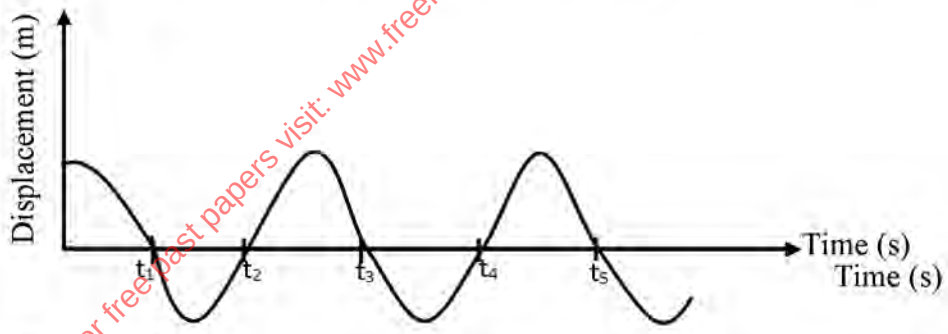
2. A dry cell is not recharged once used up. However when used well, it can serve one for some time. State the precautions necessary when using it other than storing it in dry condition. (2 Marks)
3. A charged rod A is used to charge another rod B by contact. When rod B is brought close to a charged 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 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

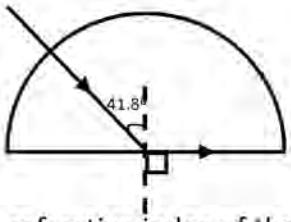
7. An electric kettle has an element of resistance 28.8Ω. It is operating from a 240V main supply. Determine its power rating. 3 Marks)
8. Distinguish between intrinsic and extrinsic semi-conductor. (1 Mark)
9. The following is part of a radioactive series.

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

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

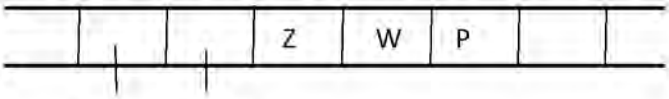
10. Figure 4 shows light passing through a transparent block.

Figure 4



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

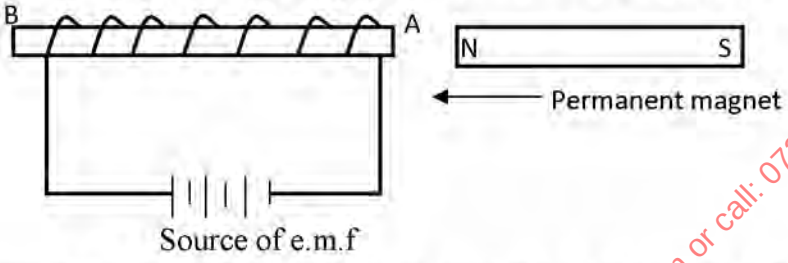
11. Figure 5 shows part of the electromagnetic spectrum.



Ultra violet Visible Light

Identify radiation W and state one of its uses.

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



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

A.

(b) State the law applied

SECTION B – 55 MARKS

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

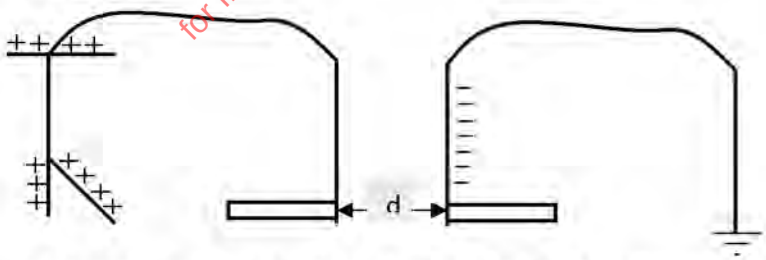
13. (a) A strong positive charged rod is brought close to the cap of a charged electroscope from a high position. It is observed

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

(ii) Explain this obervation (2 Marks)

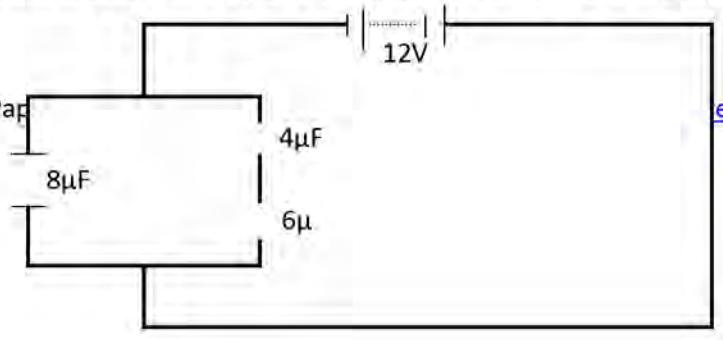
(b) A parallel – plate capacitor is connected to an electroscope as shown in Fig. 7 below.

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.

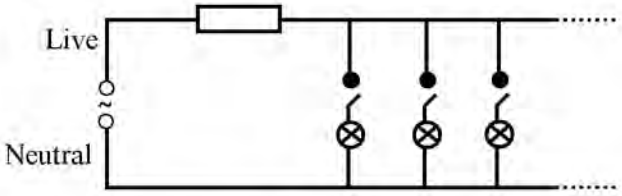


Determine

(i) Effective capacitance (3 Marks)

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

14. (a) The figure below shows part of the lightinjg circuit of a house.



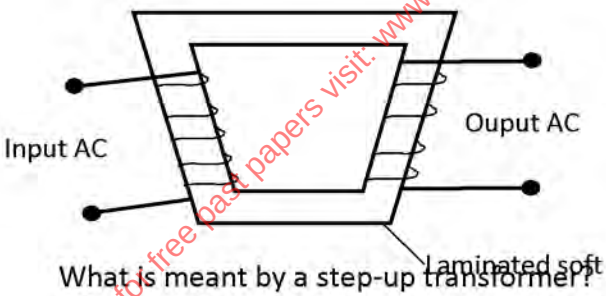
(i) Explain why a fuse is included in the circuit. (1 Mark)

(ii) Explain why the fuse is placed in the live wire rather than in the neutral wire. (1 Mark)

(iii) Each lamp has a power of 60W. Calculate the current through one lamp when it is switched on. (2 Marks)

(iv) The fuse has a rating of 4A. Calculate the maximum number of lamps that can be connected and switched on without the fuse blowing each bulb is switch on without blowing. Each bulb os parallel with the power supply. (2 Marks)

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



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

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

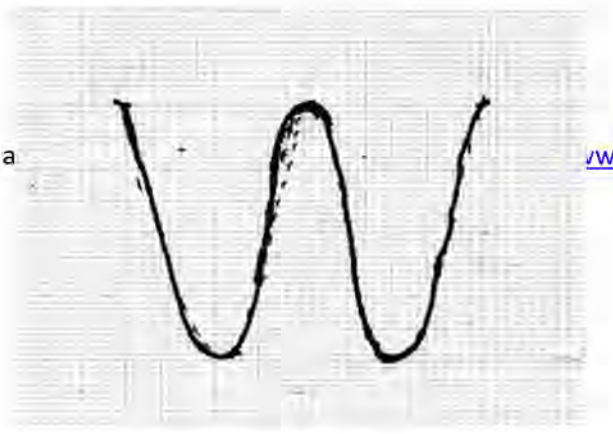
(iii) What is the purpose of the soft iron core? (1 Mark)

(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 9 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 9



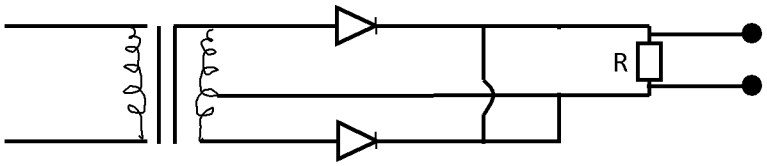
Given that the time base control is 10ms/cm and the Y-gain is at 120V/cm determine

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



(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 10) 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) In a photoelectric experiment, the following data was obtained using a clean metal surface.

Stopping potential	0.2	0.4	0.6	0.98
Frequency x 10^{14} HZ	5.0	5.5	6.0	7.0

(i) Use the data to plot a graph of stopping potential against frequency (5 Marks)

For M all:

(ii) Use the graph to determine:

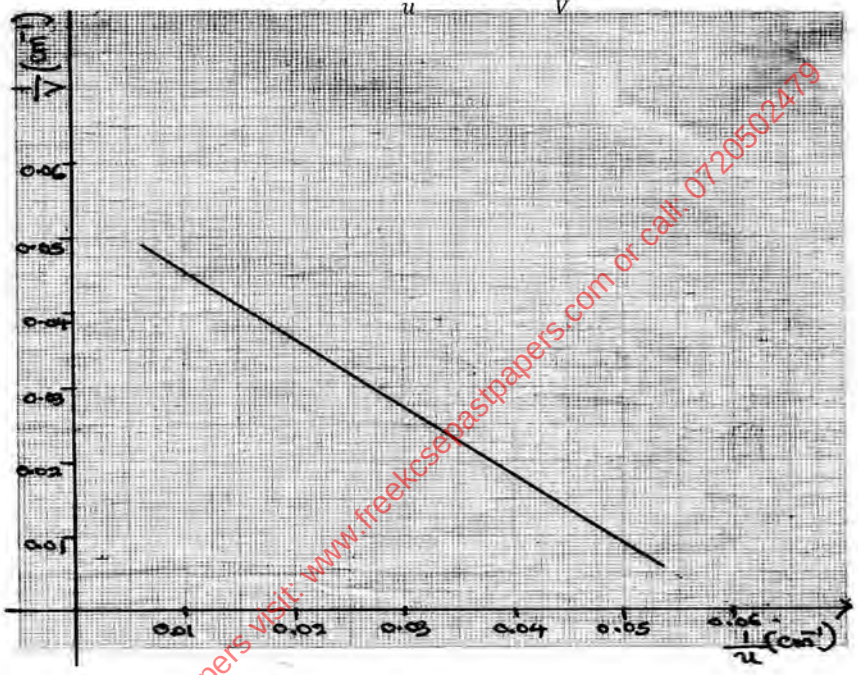
(I) The threshold frequency of the metal (1 Mark)

(II) The planks constant ($e = 1.6 \times 10^{-19}$) (1 Mark)

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

(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.

GRAPH OF $\frac{1}{u}$ AGAINST $\frac{1}{V}$



(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)

Set7

Paper 3 (Practical)

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1. You are provided with the following apparatus:
   - ✓ A metre rule
   - ✓ A 250 ml plastic beaker
   - ✓ 4 pieces of cotton thread each 30cm long
   - ✓ A piece of cellotape

- ✓ 100ml measuring cylinder
- ✓ Complete stand
- ✓ A 50g mass
- ✓ Water in a beaker

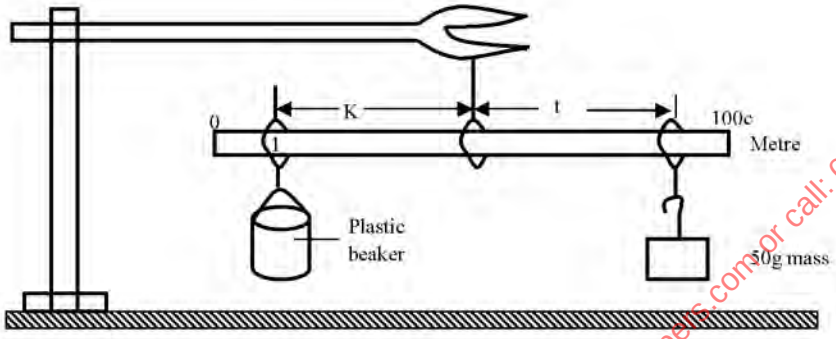
Proceed

(a) Suspend the metre rule using the thread and ensure it balances horizontally (the point of balance schould remain unchanged throughout the experiment.

(b) Suspend the empty plastic beaker at the 10cm mark and hang the 50g mass on the other side of the metre rule.

- Move the 50g mass along the metre rule until the set-up balances horiztontally as shown in the figure below.

Figure 1



(c) - Record the distances K and t (1 mark)

(Use the cellotape to fix the position of 50g mass)

- The 50g mass should remain at this position throughout the experiment.

(d) Using the measuring cylinder, measure $20cm^3$ of water and pour it into the pastic beaker. Adjust the position of the beaker until the metre rule balances horizontally again. Record the distance K in table 1 below.

(e) Repeat the procedure (d) above for the other value of V shown. (6 Marks)

Table 1

Volume, V (cm^3)	0	20	40	60	80	100	120
Distance, K, (cm)							
$\frac{1}{k}$ (cm^{-1})							

(f) Plot a graph of volume, V (y – axis) against $\frac{1}{k}$ (5 Marks)

(g) Determine the slope, S, of the graph. (2 Marks)

(h) Given that $V = 1000\left(\frac{50t}{dk}\right) - \frac{1000m}{d}$

Use your graph to determine the values of

(i) d = (3 marks)

(ii) m = (3 marks)

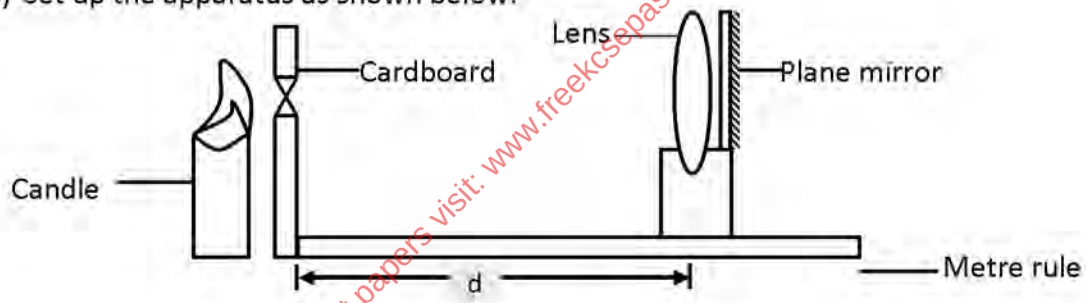
2. You are provided with the following:-

- ✓ Candle
- ✓ Plane mirror
- ✓ Metre rule
- ✓ Lens
- ✓ Lense holder
- ✓ A cardboard with cross-wire at its centre
- ✓ Screen

Proceed as follows:

(a) Attach the plane mirror to the lens using cellotape.

(b) Set up the apparatus as shown below.



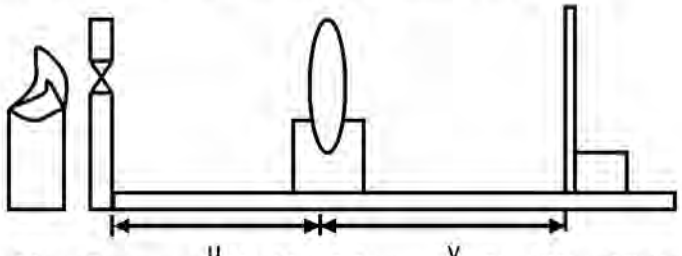
Ensure that the candle flame is at the same level as the cross wires.

(c) Place the cardboard with cross wires at the 0cm mark.

(d) Move the lens along the metre rule until a sharp image of the cross-wire is formed alongside the object cross wire. Measure the length d.

d = _____ cm

Now set up the apparatus as shown below.



(e) Set u = 25cm and adjust the screen until a clear image of the cross wire appears on the screen.

Measure the value of v and record in the table.

(f) Repeat the procedure (e) above for other values of u and complete the table below.

u (cm)	25	30	35	40	50
v (cm)					
m = $\frac{v}{u}$					

(7 Marks)

(g) Plot a graph of m against v (5 Marks)

(h) Determine the slopes of the graph (3 Marks)

i) Given that the equation of the graph is given by m= $\frac{v}{n}$ – 1where n is a constant, determine the value of n. (2 Marks)

j) Find the value of v when m = 0 (1 Mark)

k) What physical quality does n represent? (1 Mark)

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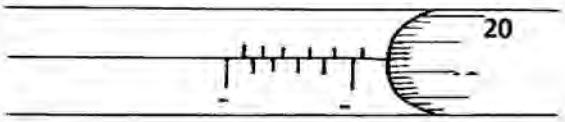
PHYSICS
PAPER 1

SECTION A (25 MARKS)

Answer all the questions in the is section in the spaces provided

1. Figure 1 shows a magnified portion of the scale of a micrometer screw gauge used to measure the diameter of spherical object.

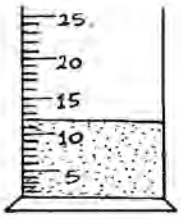
Fig.1



What is the diameter

2. Figure 2 shows water placed in a measuring cylinder calibrated in cm^3

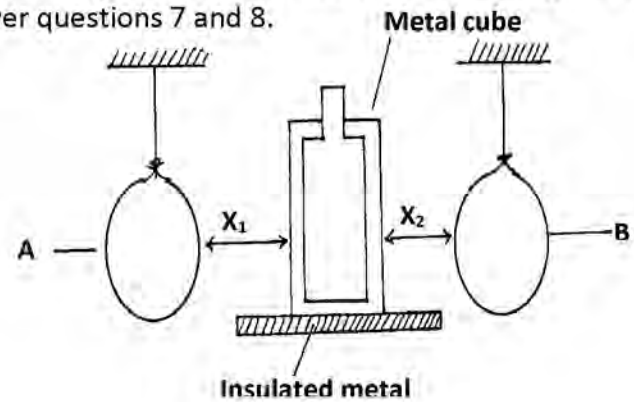
Fig.2



An object of mass 50.1g and density 16.7 g/cm^3 is lowered gently in the water. Indicate on the diagram the new level (1mk)

3. An object is attached to a spring balance and its weight determined in air. It is then gently lowered into a liquid in a beaker. State what will happen to the reading (1mk)
4. Give a reason why a person may nose bleed after ascending a high mountain (1m
5. 'Seen in a microscope, pollen particles in water move about irregularly. Explain this observation from your knowledge of physics (2mks)
6. Sketch a graph showing how volume of pure water varies with temperature from 0^0C to 10^0C (2mks)

Figure 3 shows two identical balloons **A** and **B** the balloons were filled with equal amounts of same type of gas. The balloons are suspected at distance **X1** and **X2** from a metal cube filled with boiling water and placed on an insulating material. Use this information to answer questions 7 and 8.

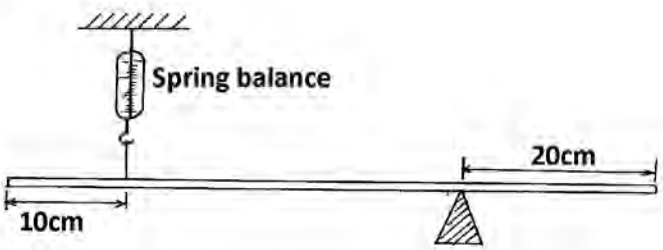


7. State the mode by which heat travels from the cubes to the balloons (1mk)

8. The face of the cube towards **A** is bright and shiny and face towards **B** is dull black. State with reasons the adjustments that should be made on the distances **XI** and **X2** so that the rate of change of temperature in both balloons remains the same (2mks)

9. Figure 4 shows a uniform bar of length 1.0m pivoted near one end. The bar is kept in equilibrium by a spring balance as shown.

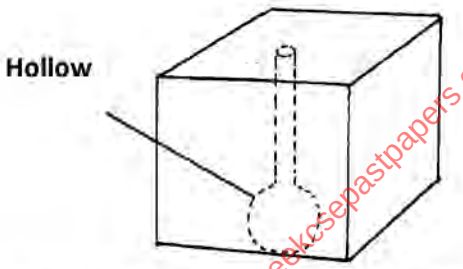
Fig. 4



Given that reading of the spring balance is 0.6N. Determine the weight of the bar (3mks)

10. Figure 5 shows a rectangular block of wood of wood with a hollow section at the position shown. The block is resting on a horizontal bench.

Fig. 5



State and explain the effects on stability of the block when the hollow section is filled with water (2mks)

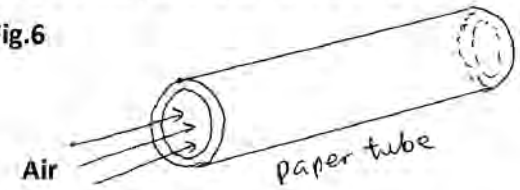
11. Table 1 below shows the results of an experiment carried out to study the properties of a spring.

(Force (N)	0	10	20	30	40
Extension (cm)	0	2	4	6	8

State with a reason whether the experiment was done within the elastic limit of the spring (2mks)

12. Figure 6 shows a sheet of paper rolled into a tube

Fig.6



When a fast stream of air is blown into the tube as shown in the diagram the pear tube collapses.

Explain the observation. (2mks)

13. A footballer kicks a ball of mass 0.6 kg initially at rest using a force of 720N. If the foot was in contact with the ball for 0.1 seconds, what was the take of speed of the ball? (3mk

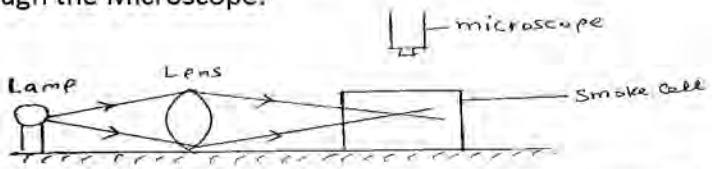
14. A turn table of radius 8cm is rotating at 33 revolutions per second. Determine the linear speed of a point on the circumference of the turn table (3mks)

SECTION B (55 MARKS)

Answer all questions in the spaces provided.

15. Brownian motion of smoke particles can be studied by using the apparatus shown in figure.7. To observe the motion, some smoke is closed in the smoke cell and then observe through the Microscope.

Fig.7



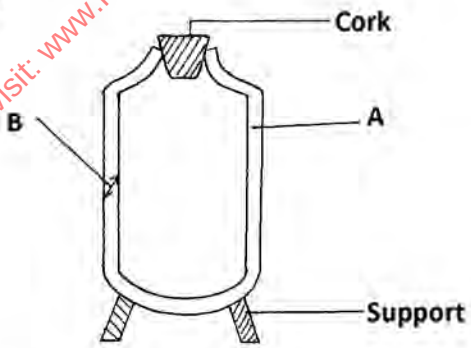
(a) Explain the role of the smoke particles, lens and microscope in the experiment.
Smoke cell (2mks)
Lens (2mks)
Microscope (2mks)

(b) State and explain the nature of the observed motion of the smoke particles. (3mks)

(c) State what will be observed about the motion of the smoke particles if the temperature surrounding the smoke cell is raised slightly. (1mk)

16. Figure 8 shows a cross section of a vacuum flask

Fig.8



(a) (i) Name the parts labeled **A** and **B**

(ii) Explain how the heat losses are minimized when hot liquid is poured into the flask (3mks)

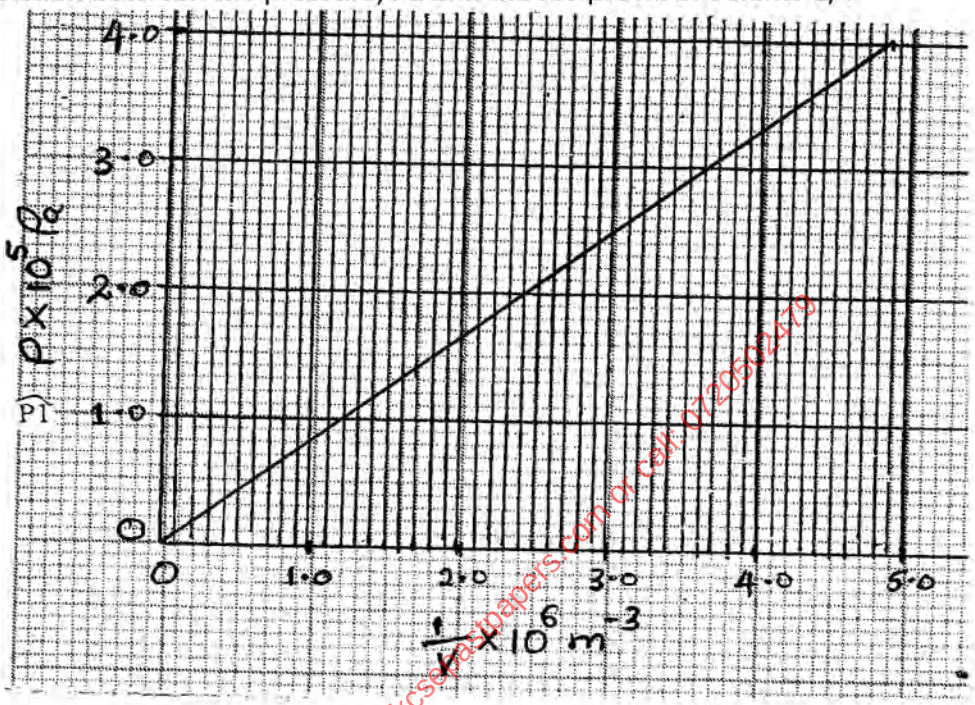
(iii) Boiling water is poured into two identical vacuum flasks **A** and **B** flask **A** is partially filled while flask **B** is completely filled. Both are closed tightly. State with reasons the flask in which the water is likely to have a higher temperature eight hours later. (2mks)

(b) A block of ice of mass 40g at 0^0C is placed in a calorimeter containing 400g of water at 20^0C.

Ignoring the heat absorbed by the calorimeter, determine the final temperature of the mixture after all the ice have melted. (Specific latent heat capacity of fusion of ice = 340,000JKg^{-1} and the specific heat capacity of water = J/KKg (6mks)

17. (a) State what is meant by an ideal gas (1mk)

(b) The pressure acting in a gas in a container was changed steadily while the temperature of the gas was maintained constant. The value of volume V of the gas measured for various values of pressure. The graph in the figure A shows the relation between the pressure, P1 and the reciprocal of volume 1/V



(i) Suggest how the temperature of the gas could be kept constant (1mk)

(ii) Given that the relation between the pressure P1 and the volume, V1 of the gas is given by

PV = **k**

Where k is a constant, use the graph to determine the value of **k** (3mks)

(iii) What physical quantity does **K** represent? (1mk)

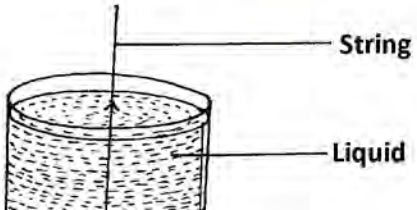
(iv) State **one** precaution you would take when performing such an experiment (1mk)

(c) A gas occupies a volume of 4000 litres temperature of 37^{0}C and normal atmosphere pressure. Determine the new volume of the gas if it is heated at constant pressure to a temperature of 67^{0}C (normal atmosphere pressure P = 1.01 x 10^{5}pa) (4mks)

18. (a) State Archimedes Principal (1mk)

(b) The figure 9 shows rectangular metal block of density 10500kgm^{-3} and dimensions 30cm x 20cm x 20cm suspended inside a liquid of density 1200kgm^{-3} by a string attached to appoint above the liquid. The three forces acting on the

Figure 9.



block are; the tension T, on the string, the weight W, of the block, and the upthrust ,U, due to the liquid.

T

U ↑

(i) Write an expression relating **T**, **W** and **W** when the block is in equilibrium inside the liquid. (1mk)

(ii) Determine the weight, **W**, of the block (3mks)

(iii) Determine the weight of the liquid displaced by the fully submerged block (2mks)

(iv) hence determine the tension, T, in the string (1mk)

(b) A certain solid of volume $50cm^3$ displaces $10cm^3$ of kerosene) (density 800 kgm^{-3}) when floating . Determine the density of the solid. (4mks)

19. (a) Figure 10 shows a pulley system being used raise a load

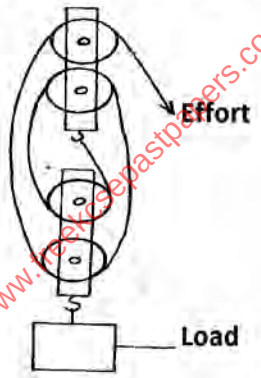


Fig 10

(i) Determine the velocity ration (VR) of the system (1mk)

(ii) If a load of 100N is raised by applying an effort of 28N, determine the efficiency of the system. (3mk)

(b) A certain machine raises 20 tonnes of water through 22 metres. If the efficiency of the machine is 80%, how much work is done on the machine? (acceleration due to gravity g = $10ms^{-2}$ (3mks)

(c) A cart of mass 30kg is pushed a long horizontal path by a horizontal forces of 8N and moves With a constant velocity. The force is then increased to 14N Determine;

(i) The resistance to the motion of the cart (1mk)

(ii) The accelerate of the cart (2mks)

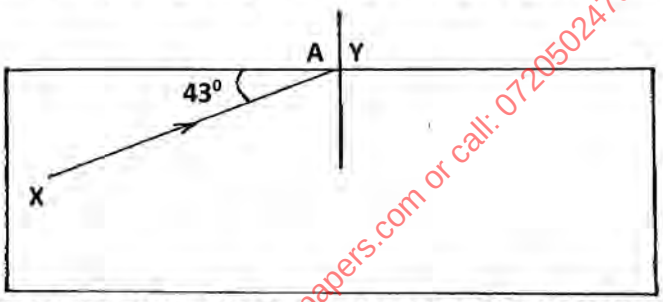
Set8

Paper 2 (Theory)

SECTION A 25 MARKS

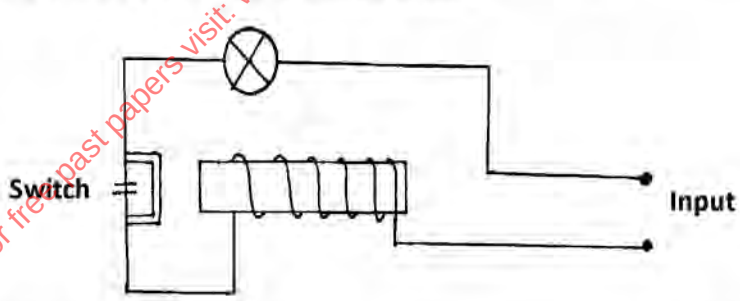
Answer all the questions in this section in the spaces provided

1. A pin hole camera forms on the screen an image which appears upside down and magnified with the aid of a ray diagram, explain how this happens. (2mks)
2. A form one student has the following apparatus two cells, a switch, connecting wires and two bulbs. Draw a possible circuit diagram for the arrangement that will allow the two bulbs to light simultaneously (2mks)
3. An object is placed 30cm from a concave mirror of focal length 20cm. Calculate the magnification (3mks)
4. You are given three bars. One is magnetized with opposite poles at its ends. Another is magnetized with consequent poles. The third is not magnetized. Describe an experiment which you would perform to identify each. (2mks)
5. The diagram below shows a ray of light **xy** traveling through a glass block of critical 42^0 to point **A**



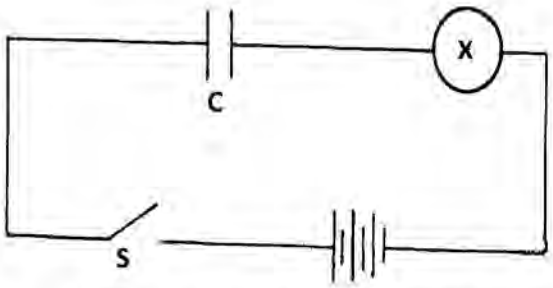
On the same diagram, draw the path of the ray as it travels past point **A**. (2mks)

6. Sketch a displacement time graph of a wave of frequency 4HZ and amplititude 3.0cm over a time interval of 1.5 seconds (3mks)
7. The figure below shows a diagram of circuit breaker



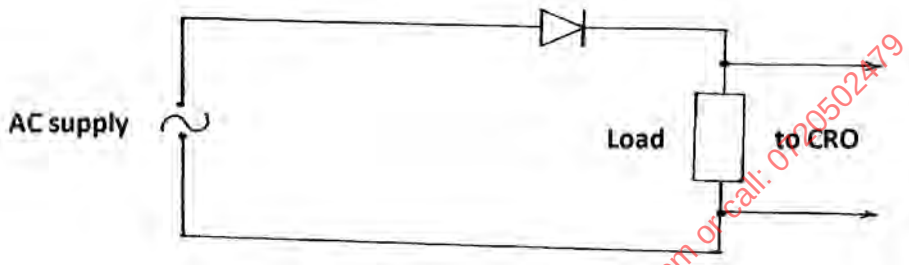
Explain how it operates (3mks)

8. Differentiate between sound wave and water wave (1mk)
9. In the figure below, capacitor is connected in series to a bulb and to a source of e.m.f of three cells as shown. When the switch is closed state and explain the observation. (3mks)



10. A form four student needs to hold a text book at arms length in order to read it. State a likely defect of vision which would cause this and the type of spectacle lens that should be required to correct this. (2mk)

11. The figure below shows a circuit used to achieve half – wave rectification of an alternating potential difference.

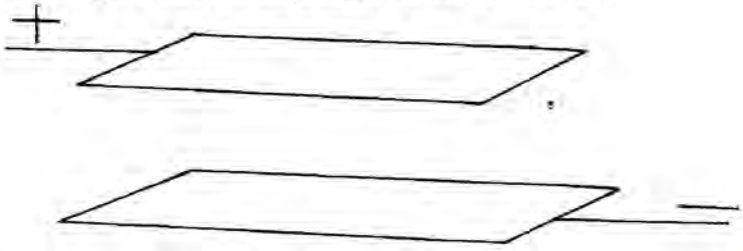


Sketch in the figure below the output of the pd in the CRO, on the same figure show the output voltage when a capacitor is connected across the load.

SECTION B (55 MARKS)

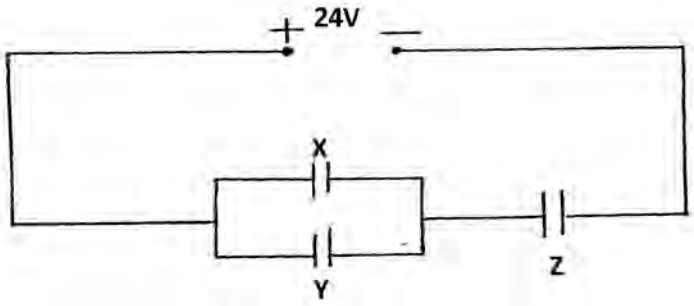
Answer all the questions in this section in the spaced provided

12. (i) The figure below shows a pair of parallel plates of a capacitor connected to a battery, the upper plate is displaced slightly to the left



State with reason the effect of this movement on the capacitance (2mks)

(ii) The figure below shows an electrical circuit with three capacitor **X, Y** and **Z** of Capacitance 8.0 μF 10.0 μF and 6.0 μf respectively connected to a 24V battery.

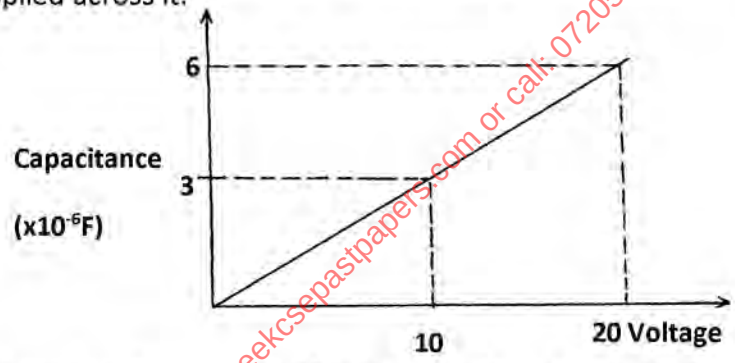


Determine;

(I) The combined capacitance of the three capacitors. (3mks)

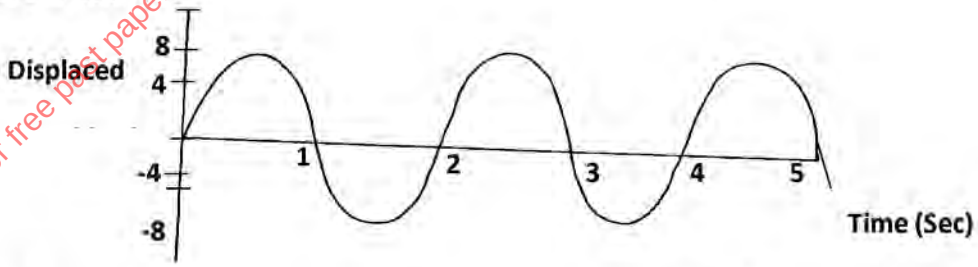
(II) The charge on the capacitor **Z** (2mks)

(iii) The graph below shows the variation of capacitance of a capacitor with voltage supplied across it.



Use the graph to determine the quantity of charge stored in the capacitor. (3mks)

13. (a) The figure below shows a displacement-time graph of a wave. The velocity of the crave is 100m/s.



Determine;

(i) Amplitude (1mk)

(ii) Period (1mk)

(iii) Wave length (3mks)

(iv) Frequency (2mks)

(b) State **One** factor that does not change as water waves moves from shallow to deep part of a Pool (1mk)

14. A student is provided with two resistors of value 2 Ω and 6 Ω

(i) Draw a circuit diagram showing the resistor in series with each other and with a battery (1mk)

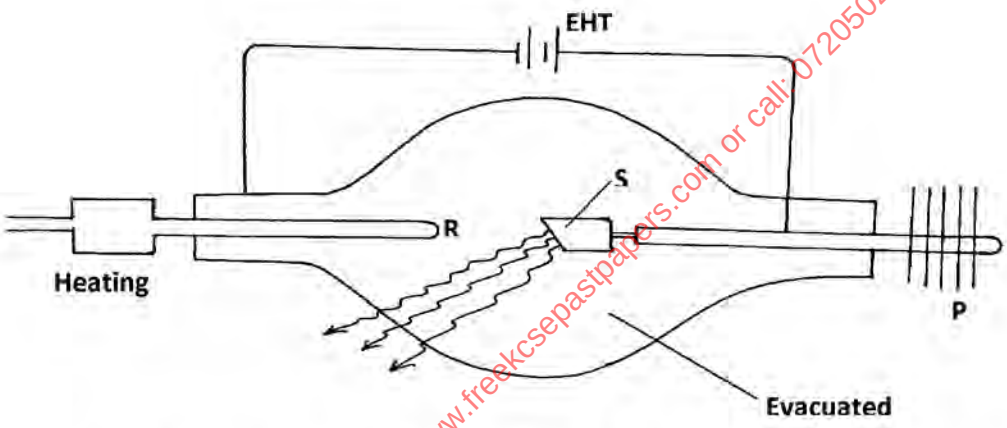
(ii) Calculate the total resistance of the circuit (assume negligible internal resistance) (2mks)

(b) Given that battery has an e.m.f of 3V and internal resistance 1.2Ω. Calculate the current through.

(i) The 6 Ω resistor (3mks)

(iii) The 2 Ω resistor when the two over in parallel. (3mks)

15. (a) The diagram below shows an X-ray tube drawn by a student. Use it to answer the questions which follow.



(i) State with reason the material used for the part labeled **R**. (2mks)

(ii) Why is the tube evacuated (1mk)

(iii) How can the wavelength of the X-rays emitted from this tube be reduced (1mk)

(b) X-rays are emitted when a tube operates at 3×10^2 V and a current of 0.01 A is passing through it (take e = 1.6×10^{-19}C, Me = 9×10^{-31}kg). Calculate ;

(i) The velocity of the electron on hitting the target. (3mks)

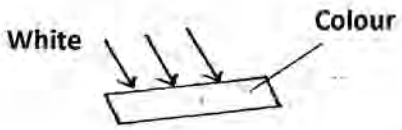
(ii) The minimum wavelength of the X-rays emitted (3mks)

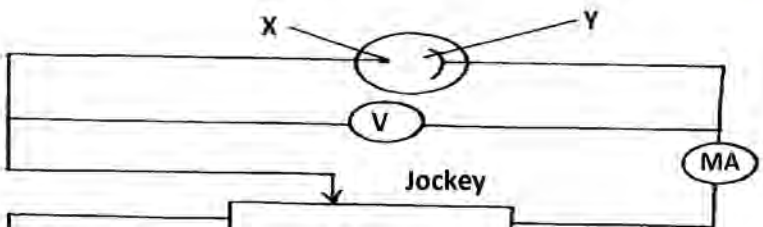
C (i) State **two** properties of X-rays (2mks)

(ii) Sate **two** uses of X-rays (2mks)

16. (a) What is meant by the term photo electronic effect (1mk)

(b) The figure below shows an arrangement used to investigate photo electronic effect





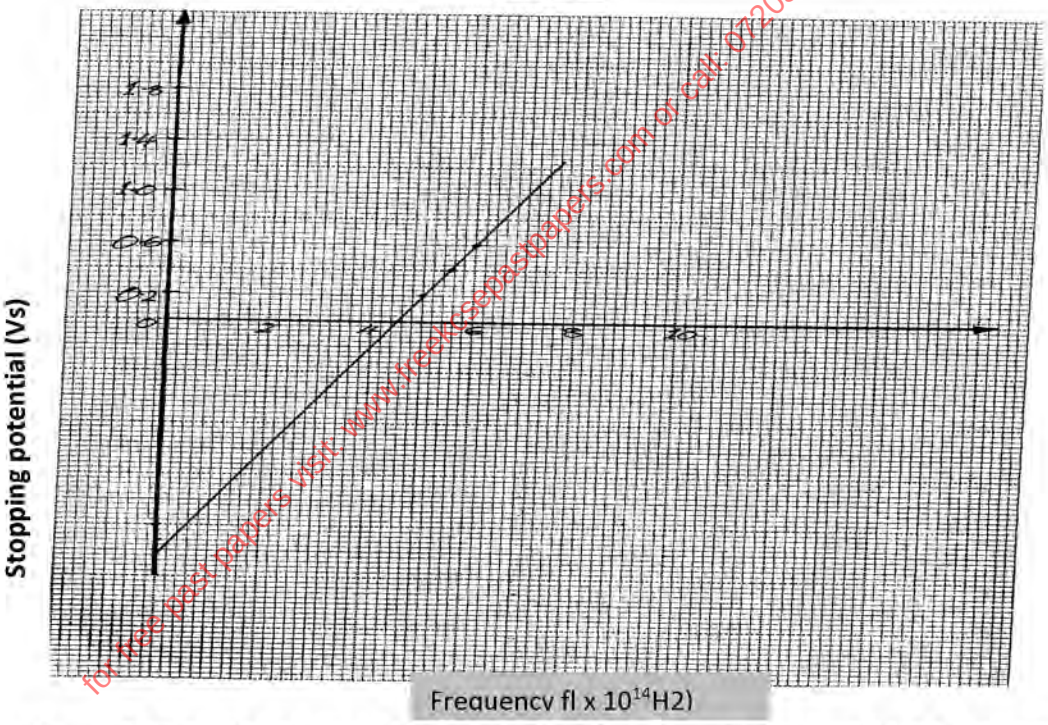
(i) Name the parts **X** and **Y** (2mks)

(ii) State **three** measurable quantities in this setup. (3mks)

(iii) State how the intensity of light affects the photo current (1mk)

(e) The result obtained from experiment with different colours are shown graphically below

Graph 1



(i) The graph indicates that there is a frequency below which no electrons are emitted. Explain why this is so. (1mk

(ii) From the graph determine;

(i) Planks constant (3mks)

(ii) The work function of the metal (3mks)

Set8
Paper 3 (Practical)

Question one

You are provided with the following:

- Two dry cells and a cell holder
- One ammeter
- One voltmeter
- A variable resistor
- A switch
- Connecting wires

Proceed as follows

(a) Set up apparatus as shown in the circuit diagram in figure 1

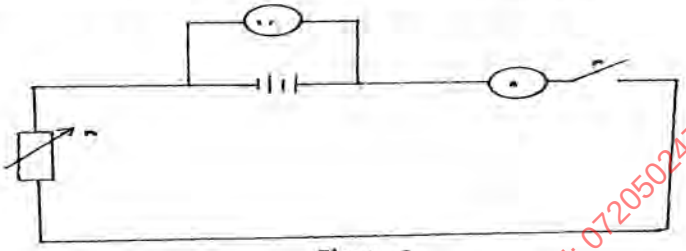


Figure 1

Use the voltmeter provided to measure the p.d V_B across the batteries when the switch, **S** is opened. (1mk)

(b) Reconnect the circuit as shown in figure 2.

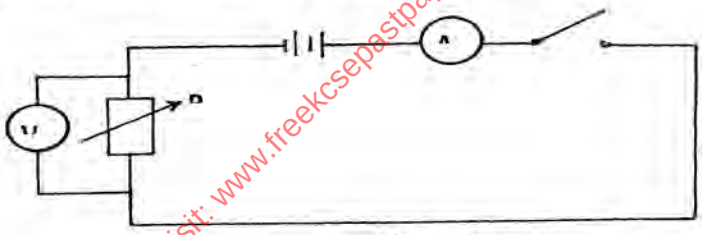


Figure 2

(c) Close switch S and adjust the variable resistor until the voltmeter reads 2.9V (if 2.9v is not obtained, take the maximum possible value and insert in it the table in place of 2.9v).
Read and record the value of **V** and the corresponding value of **1** in table 1. Open the switch.

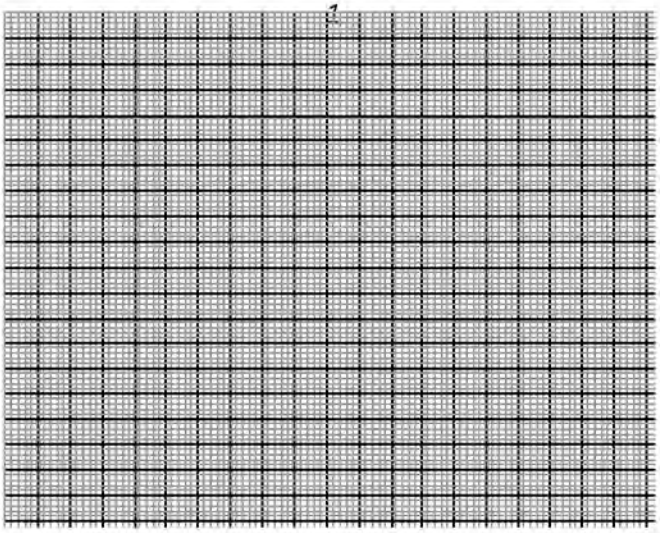
(d) Repeat the procedures in (c) above for other values of **V** shown in table 1. Complete the table.

Table 1

Table 1 Voltage, V (volts)	2.9	2.7	2.5	2.3	2.0	1.8	1.6
Current , 1 (A)							
$R = \frac{V}{I}\ \Omega$							
$\frac{1}{I}\ (A^{-1})$							

(6mks

(e) (i) Plot the graph of $\frac{1}{I}$ *(y-axis)* against R (5mks)



(ii) Determine the slopes, **S** of the graph (2mks)

(iii) From the graph, determine **A**, the value of $\frac{1}{}$ *when* $R = 0\Omega$ (1mk)

1

(iv) From the graph, determine the e.m.f **E**, and the internal resistance, **r** of the battery given that $E = IR + Ir$ (5mks)

QUESTION TWO

The question has two parts A and B. Answer both parts

PART A

You are provided with the following

- Vernier calipers
- Transparent cylindrical vessel of external diameter at least 70mm
- Millimeter scale (½m rule)
- A rectangular strip of manila paper fixed to a half meter rule.

Proceed as follows:

(a) Set up the apparatus shown below (figure 3)

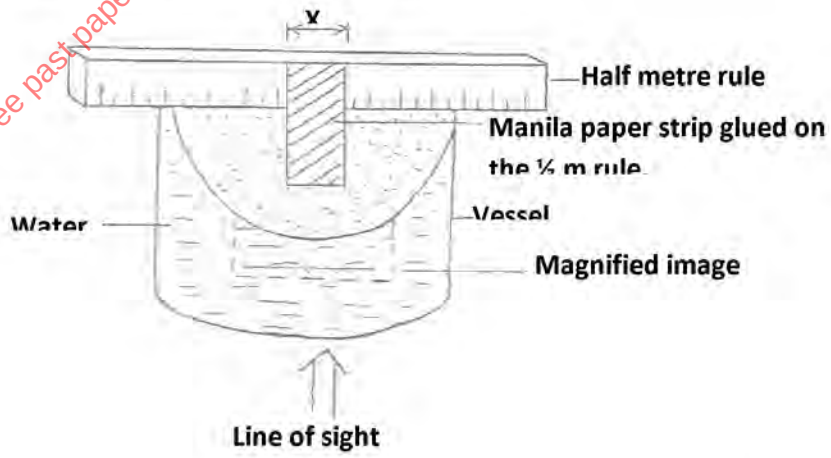


Figure 3

(b) Measure and record the width, **X,** of the rectangular manila paper strip. (1mk)

(c) Using the vernier calipers, measure and record the external diameter of the vessel at two different parts and determine the average diameter, **D**.

D_1 = _____ cm

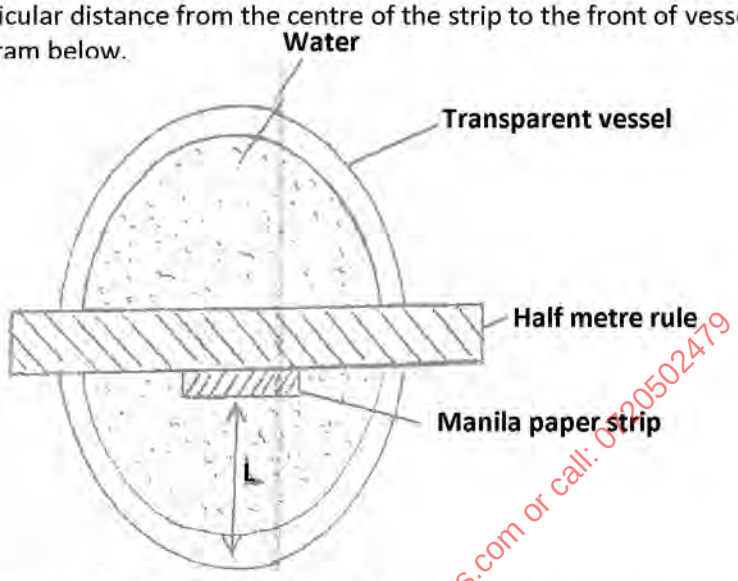
D_2 = _____ cm

Average diameter D = _____ cm

(2mks)

(d) View the strip through the water in a direction perpendicular to the strip. The strip appears magnified and its apparent width ***y*** can be measured against a scale.

(e) Read and record the value of ***y*** corresponding to the value of **L** = 1.5cm, where **L** is the perpendicular distance from the centre of the strip to the front of vessel as shown in the diagram below.



Top view of the vessel

(e) Repeat the procedure in (e) above for other value of **L** shown in the table 2. Complete the table.

L (cm)	1.5	2.5	3.0	4.5	5.0	5.5	6.0	6.5
Y (cm)								
M = y/x								

Table 2 (5mks)

(g) (i) Plot a graph of ***m(y-axis)*** against **L** (5mks)

[You may use the following range on the axes 1≤ m≤1.6 and 0≤l≤7]

(iii) Determine from the graph the value of m $L = \frac{D}{2}$ (2mks)

PART B

You are provided with the following:

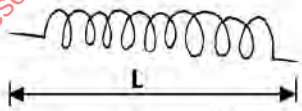
- One spiral spring
- A strip of paper
- One retort stand with two clamps
- Two pieces of wood
- One metre rule
- One 100g mass.

Proceed as follows:

(h) Wrap the strip paper provided three times round the spring. Measure and record the length **X** of the three in meters.

X = _____ cm _____ m (½ mk)

Measure and record in meters the unstrenched length L of the spring as shown below

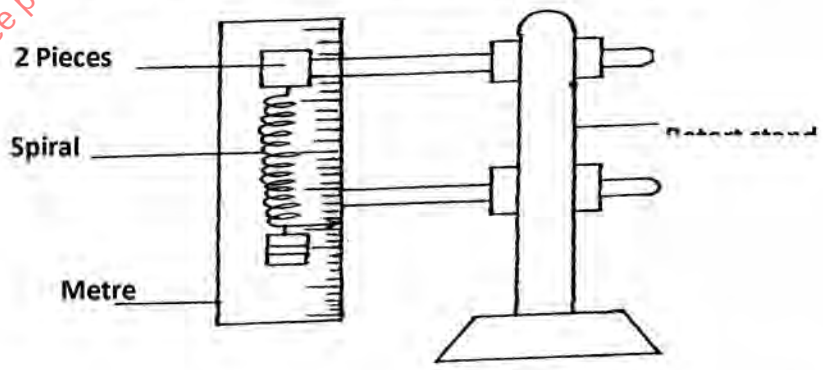


L= _____ cm = _____ m

(½ mk)

(j) Find the value of **K** from $\frac{36\pi l}{X^2}$ (1mk)

(k) Clamp the spring along side a meter rule as shown in the figure below.



(i) Hang the three masses of total mass m equal to 300g on the spring and record the extension, ***y*** produced in the table below.

(m) Remove a mass of 100g from the spring and record the new extension. Repeat the procedure until there is no mass left. Record the extension produced each time ann complete the table.

Mass, m (g)	300	200	100
Extension y (cm)			
y/m (cmg^{-1})			

(1½mk)

(n) (i) Find the average value of $\frac{y}{m}$ let this value be **S**. (½ mk)

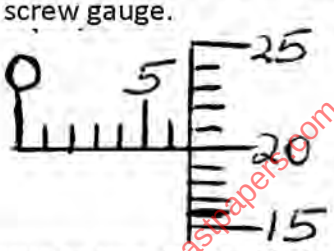
(ii) Calculate the constant **E** of the spring from formular. $E = \frac{0.98K}{S}$ (1mk)

Set9

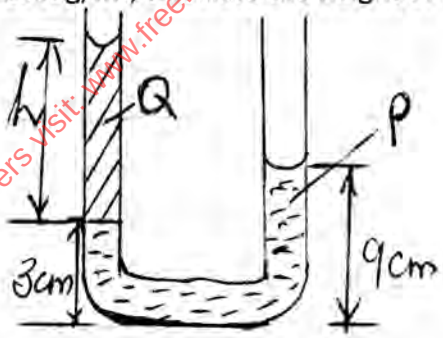
232/1
PHYSICS
PAPER 1

Answer ALL questions in this section in the spaces provided

1. The figure below shows a micrometer screw gauge that has a zero error of +0.02. State the actual reading of the micrometer screw gauge. (1mk)



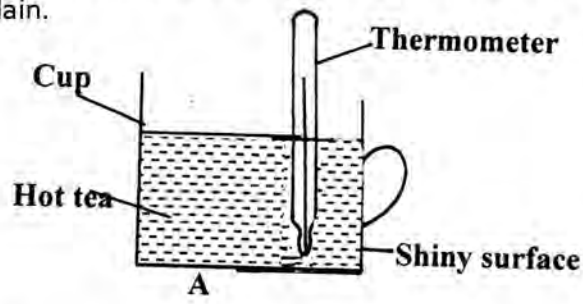
2. In the figure below, the U-tube contains two immiscible liquids P and Q. If the density of Q is 900kg/m^3 and that of P is 1200kg/m^3, calculate the height of liquid Q. (3mks)

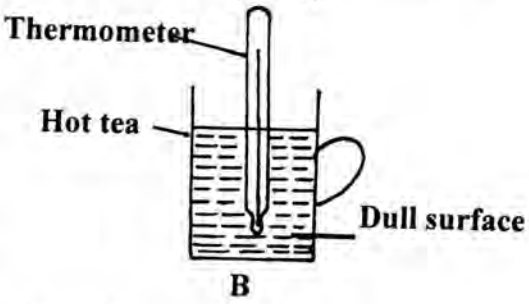


3. A body is acted upon by a force of I0N towards the right hand side and 6N towards the left hand side. What is the resultant force? (2mks)
4. The difference between the ice point and steam point on a liquid thermometer is 30cm. What temperature is recorded when the mercury thread is 12cm. (2mks)
5. Water flows through a horizontal pipe of cross-sectional area of 40cm^2. If the speed at the constriction is 4ms^{-1}, calculate the mass flux (density of water = 1000kg/m^3) (3mks)

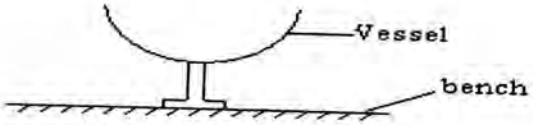
In terms of intermolecular forces, explain the difference between liquid and gaseous state. (2mks)

6. The diagram below shows two similar cups of tea containing equal volumes of hot tea at the same level. It was observed that the rate of cooling was the same in the two cups. Explain. (2mks)





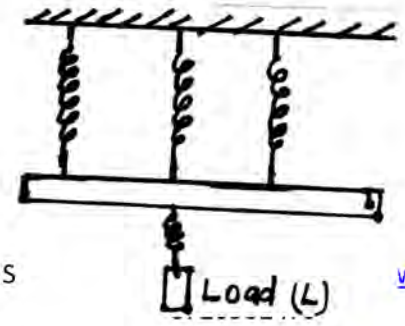
7. The figure below shows a vessel resting on a horizontal bench.



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

8. What does it mean to say the density of water is $1g/cm^3$? (1mk)
9. State any **two** possible ways of increasing velocity ratio of wheel and axle. (2mks)
10. (a) Under what conditions can a feather and a stone released from the same height land on the ground at the same time? (1mk)
    (b) On the axis below, sketch displacement time graph for an accelerating body. (1mk)

11. The figure below shows four equivalent springs with negligible weight, the weight of the rod R is 20N. Given that the spring constant is 5N/m. Calculate the load L which causes an extension of 28m to the system. (3mks)



SECTION B (55 MARKS)

Answer ALL questions in this section in the spaces provided

12. (i) 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:-

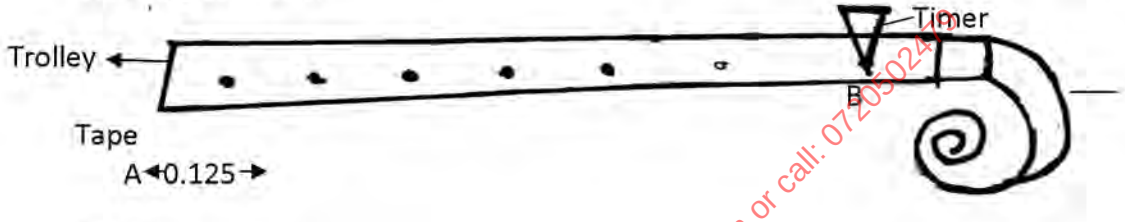
(a) Height of the mountain. (2mks)

(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 the trolley. (2mks)

13. (a) Two gear-wheels have 80 teeth and 20 teeth and they lock with each other. They are fastened on axles of equal diameter such that equal weight of 150N attached to the string around the axle will just raise 450N on the other axles.

Calculate:

(i) The mechanical advantage. (2mks)

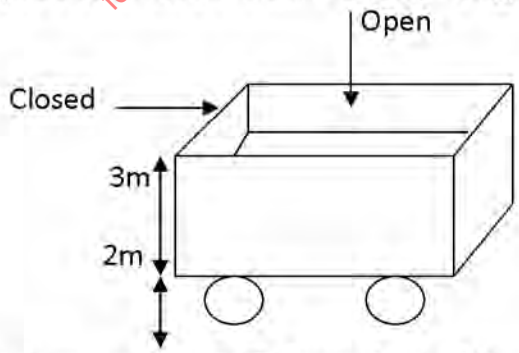
(ii) The velocity ratio. (2mks)

(iii) The efficiency of this machine. (2mks)

(b) (i) A Loudspeaker is a transducer. Explain. (1mk)

(ii) Explain the energy change that occur when a man climbs the mountain. (1mk)

(c) Calculate the total power in lifting 0.2kg of metal cane containing $2000cm^3$ of ice onto a lorry as shown below within 4s. (SIQ = $0.9g/cm^3$) (3mks)



14. (a) What is meant by specific latent heat of Vaporization? (1mk)

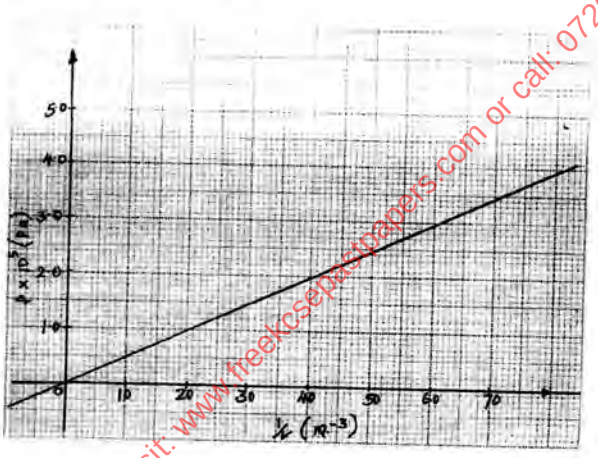
(a) In an experiment to determine the specific latent heat of vaporization of water, steam at 100^0C was passed into water contained in a well lagged copper calorimeter. The following measurements were made:-

Mass of calorimeter	=	50g
Initial mass of water	=	70g
Initial temperature of water	=	5^0C
Final mass of water + Calorimeter + condensed steam	=	123g
Final temperature of mixture	=	30^0C
Specific heat capacity of water	=	$4200JKg^{-1}k^{-1}$
Specific heat capacity of copper	=	$390\ JKg^{-1}k^{-1}$

I. Determine the:-
   (i) Mass of condensed steam (2mks)
   (ii) Heat gained by water and calorimeter. (2mks)

II. Given that L is the specific latent of heat of vaporization of steam:
   (i) Write an expression for the heat given out by steam. (1mk)
   (ii) Determine the value of L. (2mks)

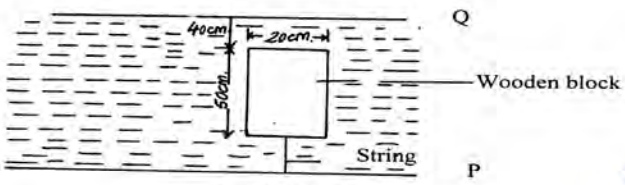
(b) The pressure P1 of a fixed mass of gas at constant temperature, T= 300K is varied continuously as depicted in the graph below.



From the graph:
(i) Determine the volume of the gas when the pressure read 2.5×10^5Pa. (2mks)
(ii) Given that pV = 2RT where R is a constant, use the graph to determine R. (2mks)

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)

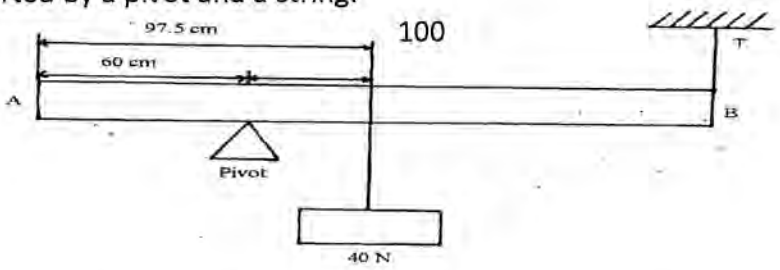
(c) The diagram in figure 9 below shows a wooden block of dimensions 50cm by 40cm by 20cm held in position by a string attached to the bottom of a swimming pool. The density of the block is $600kgm^{-3}$.



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

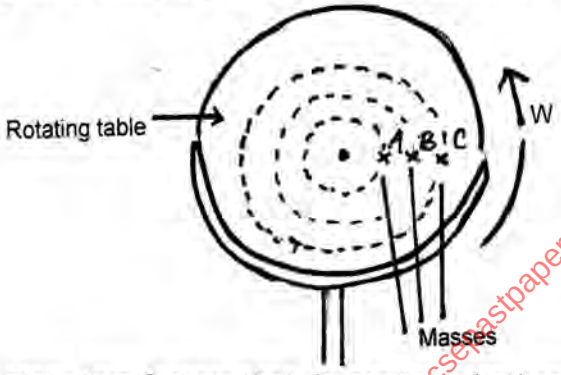
(ii) Calculate the tension on the string. (3mks)

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



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 **two** factors that determine whether a particular mass slides off the table or not. (2mks)

(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)

Set9
Paper 2

SECTION A (25 MARKS)

Answer ALL questions in this section in the spaces provided

1. The figure 1 shows a wire in a magnetic field. A current is switched on to flow through the wire in the direction shown. State the direction of motion of the wire. (1mk)

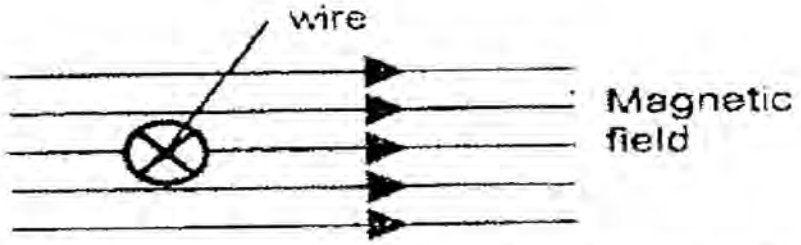


Figure 1.

2. In a textile industry, the machines experience electrostatics forces at certain points. Suggest **one** method of reducing these forces. (1mk)
3. When the device X is connected in the circuit below, the voltage across it is 0.14V.

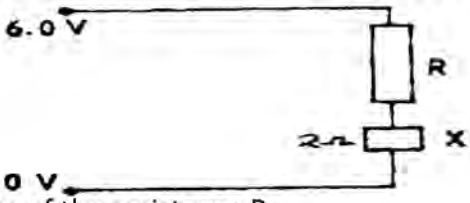


Fig. 2

Calculate the value of the resistance R. (2mks)

5. Four bars of metal W, X, Y and Z are tested for magnetism. X attracts both W and Y but not Z. Z does not attract W, X or Y. W and Y sometime attract one another and sometimes repel one another. What conclusion can you draw about? (2mks)
   (a) Bar W
   (b) Bar X
6. (a) An observer watching a fireworks displays sees the light from an explosion and hears the sound 4 seconds later. How far was the explosion from the observer? (Speed of sound in air 330m/s). (3mks)

(b) A vertical object is placed at the focal point F of a diverging lens as shown in figure 3.

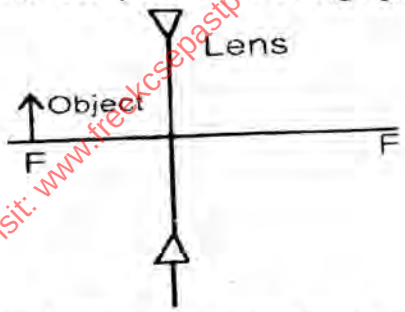


Fig. 3

Sketch a ray diagram to show the image of the object. (2mks)

7. If the focal length of the lens above is 10cm. Calculate its power. (2mks)
8. At what part of the cathode ray tube would the time base be connected? (1mk)
9. A heater of resistance R_1 is rated P watts, V volts while another of resistance R_2 is rated 2P WATTS, $^{V}/_{2}$ volts. Determine $^{R1}/_{R2}$. (2mks)
10. The figure below shows an experimental arrangement. S1 and S2 are narrow slits.

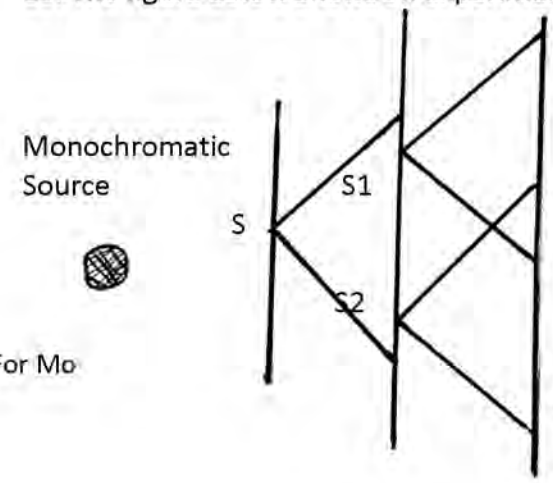


Fig. 4

Double
Slit Screen

State what is observed on the screen when the source is: (3mks)

(i) Monochromatic

(ii) White light

Use the diagram below to answer question 10.

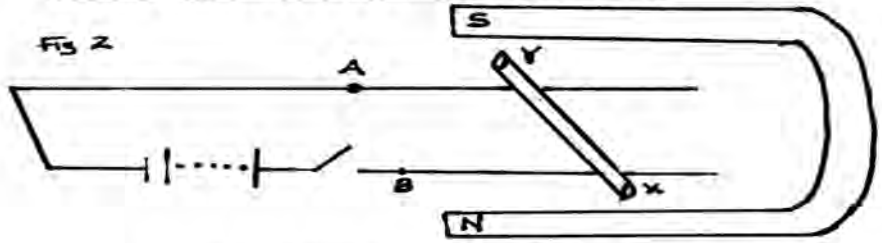


Fig. 5

An un-insulated copper wire XY lies over the fixed wire A and B connected to a battery. When the key in the circuit is closed, the rod XY moves. In which direction does the wire XY experience the force? (Indicate using an arrow) (1mk)

11. When is the force on the wire XY greatest? (1mk)

12. State and explain the effect of reducing the EHT in an X-ray tube on the X-rays produced (1mk)

13. The graph below shows the variation of capacitance of a capacitor with voltage supplied across it.

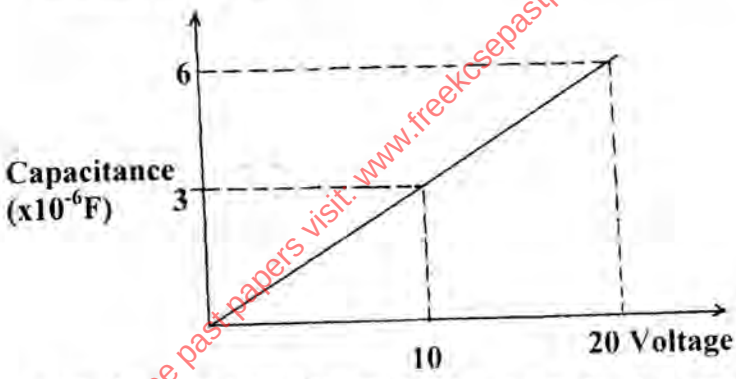


Fig. 6

Use the graph to determine the quantity of charge stored in the capacitor. (3mks)

SECTION B (55 MARKS)

Answer ALL questions in this section in the spaces provided

14. (a) (i) State the meaning of the statement diode characteristic. 1mk)

- Sketch a circuit diagram that can be used to investigate p-n junction diode characteristics. (2mks)

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

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

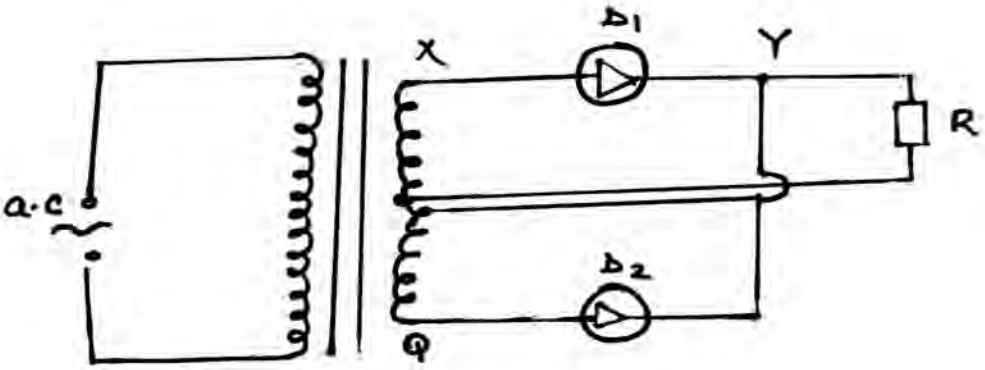


Fig. 7

(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)

15. Figure 8 below shows an experimental set up in a vacuum for investigating the effect of a magnetic field on the radiation emitted by a radioactive source.

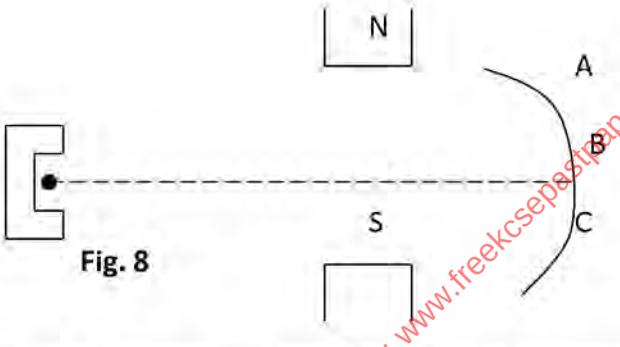


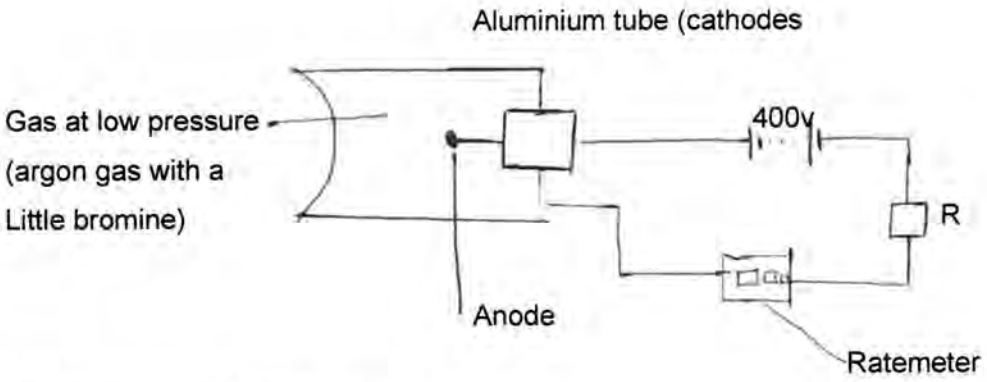
Fig. 8

The background radiation at the place is 5 counts per minute. The detectors are placed a positions A, B and C respectively. Results obtained are shown in the table below.

Positions	A	B	C
Counts / min	480	5	400

Use the table to explain which of the three types of radiations are emitted from the source. (2mks)

(b) Figure 9 below shows the features of a Geiger-Muller (G.M) Tube used for detecting radiation.



(i) State the use of Argon gas and Bromine. (1mk)

Argon gas

Bromine

(ii) Explain how radiation from the source is detected by the tube. (4mks)

(iii) State **one** use of radio activity in medicine. (1mk)

(c) The box contains names of seven parts of electromagnetic spedrium.

Radio waves	Microwaves	Infra-red	Visible light	Ultra violet	X-rays	Gamma rays

(i) State the order in which they have been written. (1mk)

(ii) The parts are all transverse waves. State **one** other property which they all have in common. (1mk)

16. A photocell has a cathode made of caesium metal when a monochromatic radiation is shone on the cathode photoelectrons are emitted. A graph of kinetic energy against frequency is drawn as shown in figure 10.

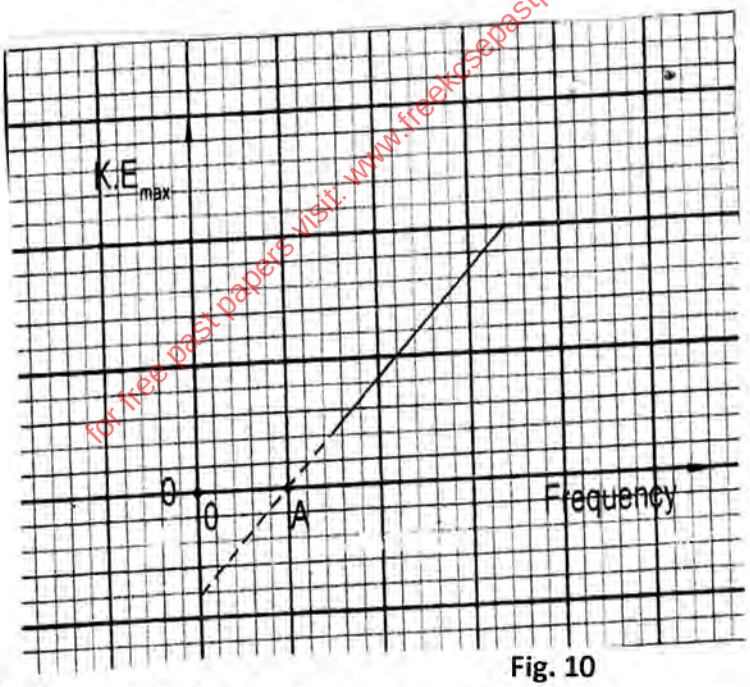


Fig. 10

e) Use the graph to answer the questions below.

⇨ What is the unit of the slope? (1mk)

⇨ What physical quantity is represented by point A? (1mk)

⇨ Lithium metal has a higher work function than caesium. On the same axes, sketch the graph of lithium. (1mk)

⇨ What does the term Monochromatic mean? (1mk)

f) The maximum Kinetic energy of the electrons emitted from a metallic surface is 1.6×10^{-19}J when the incident radiation is 7.5×10^{14}Hz. Calculate the minimum frequency of radiation for which electrons will be emitted.
(A planck's constant = 6.6×10^{-34}Js) (3mks)

17. (a) Refraction is the bending of light as it travels from one media to another. State the cause of the bending. (1mk)

b) The figure 11 below shows two adjacent solids of materials Diamond and Ruby.

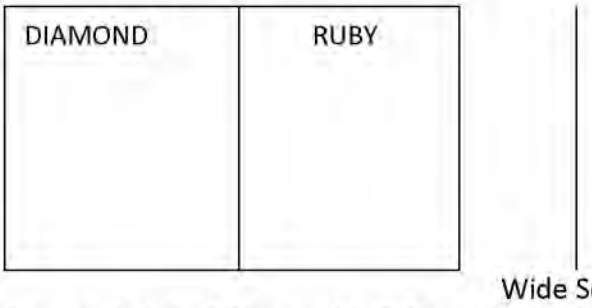


Fig. 11

The refractive index of Diamond is 2.4 and that of Ruby is 1.75.

(i) Find the refractive index of Ruby with respect to diamond. (3mks)

(ii) Draw an accurate ray from diamond such that no light is incident on the screen. (3mks)

(c) The figure 12 below shows white light incident on a rain drop.

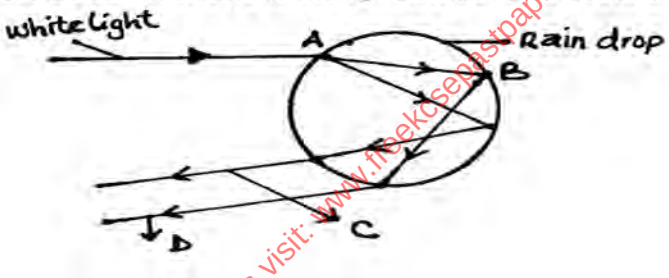


Fig. 12

(i) State what happens at A and B. (1mk)

(ii) State the colour of rays C and D. (2mks)

18. (a) The figure 13 shows shadow formation using an extended source of light.

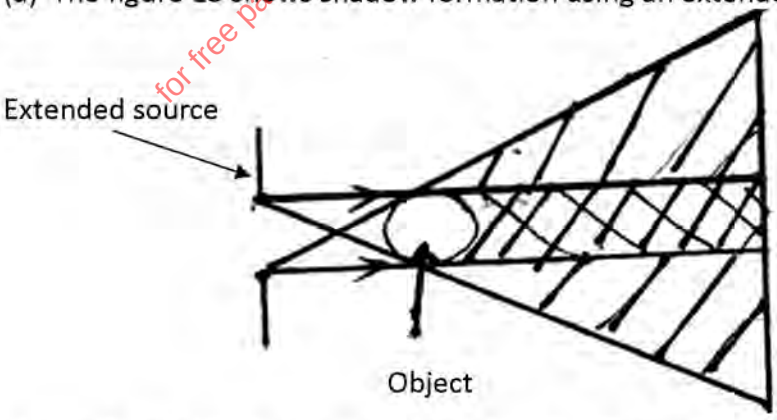


Fig. 13

State the effect on the umbra as the object is moved away from the screen when:

(i) Diameter of the hole is the same as the diameter of the object. (1mk)

(ii) The diameter of the object is smaller than the diameter of the hole. (1mk)

(iii) The diameter of the object is greater than the diameter of the hole. (1mk)

(b) The figure 14 shows an object infront of a plane mirror. Complete the diagram to show the location of the image,

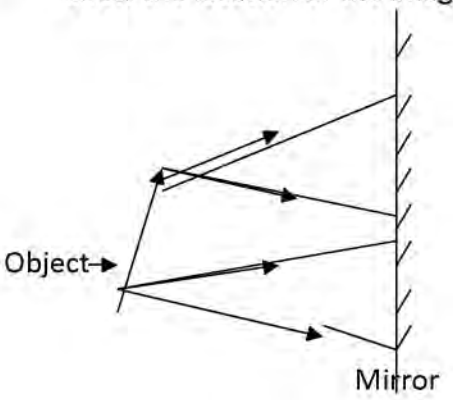
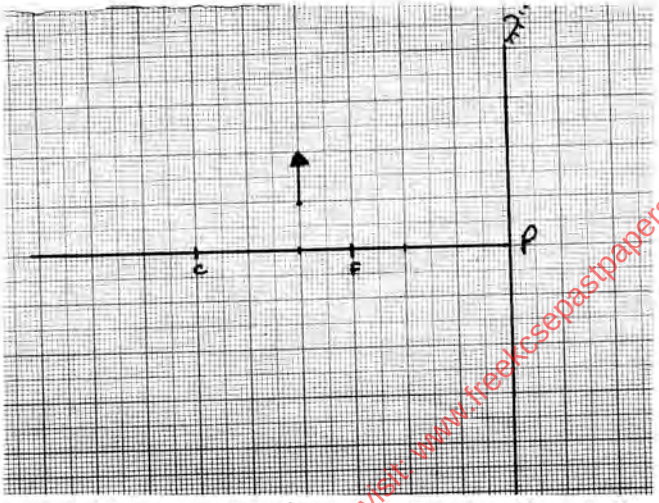


Fig. 14

(c) The graph below shows an object O placed in front of a concave mirror of focal length 30cm.



Construct ray diagrams to show the position of the object. (3mks)

d) Give **one** feature that makes Parabolic Mirrors suitable for use as car head lights.(1mk)

19. (a) Appliances which draw current from a ring's main circuit have a third cable connected to the earth. Give a reason why? (1mk)

b) In a lighting circuit the wires used are relatively thinner than those of a cooker circuit. Give an explanation for this. (1mk)

c) A transformer with 6000 turns in the primary circuit and 300 turns in the secondary circuit has its primary circuit connected to a 400V a.c. source. A heater connected to the secondary circuit produces heat at the rate of 600W. Assuming that the transformer is 100% efficient determine:-

- ⇨ The voltage in the secondary circuit. (3mks)
- ⇨ The current in the primary circuit. (2mks)
- ⇨ The current in the secondary circuit. (2mks)

Set9
Paper 3

1. Question one

This question has two parts A and B. Answer both parts.

PART A

You are provided with the following:-

- A retort stand, clamp and boss.
- A spiral spring.
- A stop watch.
- Three 100g masses.

Proceed as follows:

(a) Suspend a 100g mass at the end of the spring as shown in figure 1.

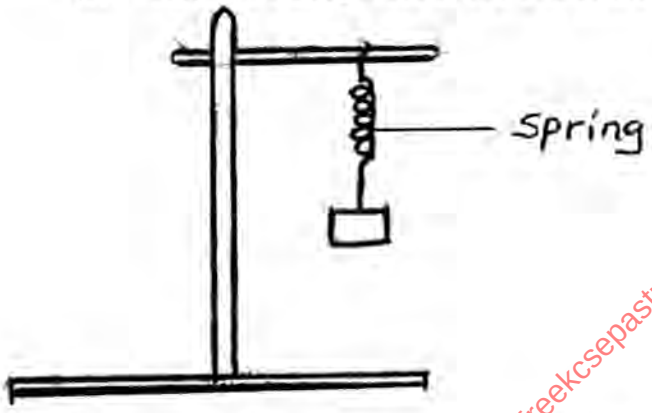


Fig. 1

Now give the mass a small vertical displacement and release so that it performs vertical oscillations. Time ten oscillations and determine the period T. Enter your results in table 1.

b)Repeat the experiment for the other values of mass and complete the table.

Table 1

Mass m (g)	100	200	300
Time for 10 oscillations (s)			
Periodic time T(s)			

(3mks)

c) Given that $T = 2\pi\sqrt{\frac{m}{K}}$, where k is the spring constant, find the average value k for the spring. (2mks)

PART B

You are provided with the following:-

- A 250ml glass beaker
- A Bunsen burner
- A Thermometer
- A Stop watch

- A Tripod stand and a Wire gauze
- A measuring cylinder 100ml
- Water

Set the apparatus as shown in figure 2 below.

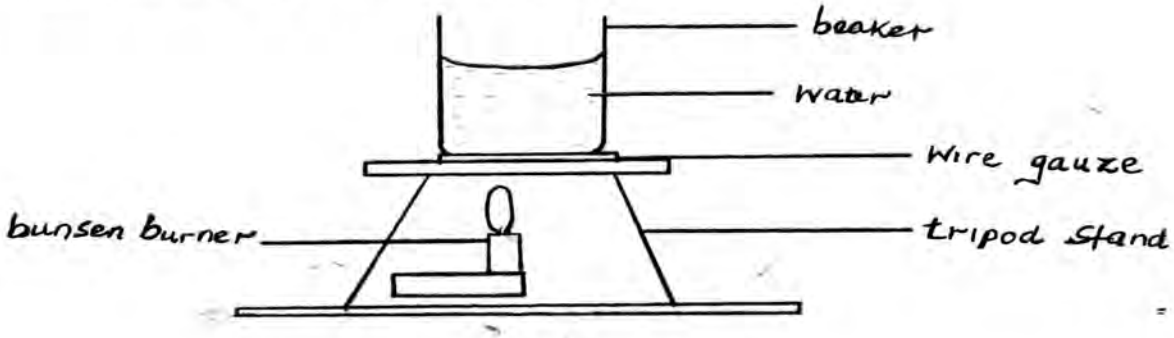


Fig. 2

d) Measure $100cm^3$ of water and pour it into the beaker. Take the initial temperature of the water.

T_0 = ...^0C (1mk)

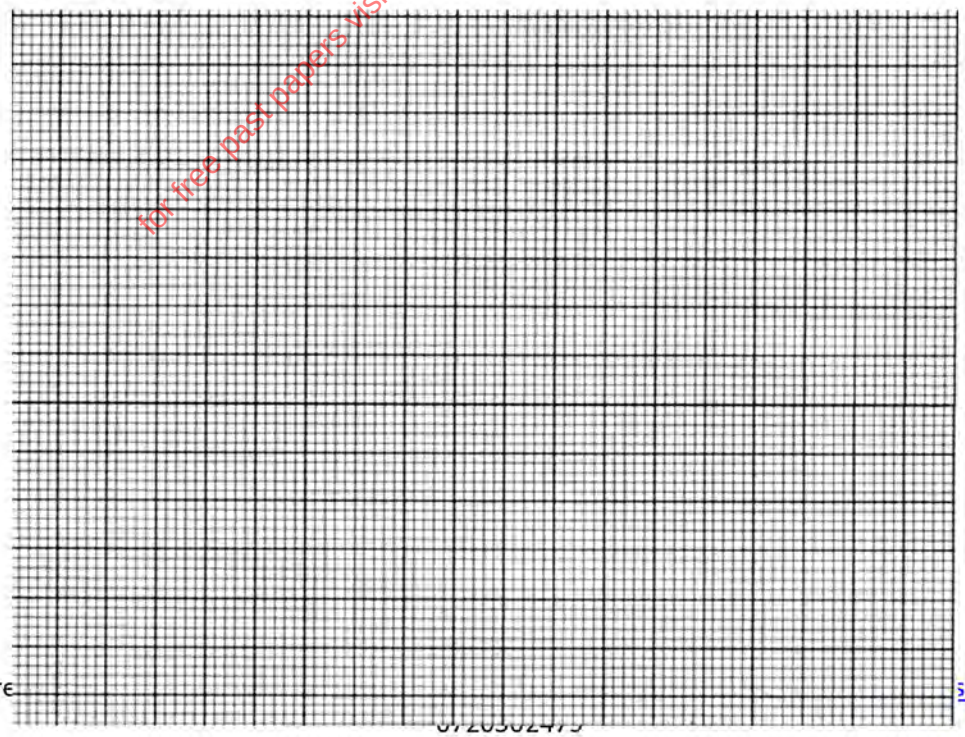
Now heat the water to a temperature of 80^0C. switch off the gas tap and place a thermometer into the beaker and start the stop watch when the temperature is 65^0C. Take the temperature T^0C of water ever two minutes. Record your results in the table 2 below.

Table 2

Time, t(min)	2	4	6	8	10	12	14
Temperature (T) ^0C							
$(T - T_0)$							
Log $(T - T_0)$							

(5mks)

(e) Plot a graph of Log $(T - T_0)$ against Time (t). (5mks)



(f) Find the value of P of log $(T - T_0)$ when t = 0. (1mk)

(g) Determine N, where N is the antilog of P. (1mk)

(h) Calculate the temperature of the surrounding T_R using the expression $N = 65 - T_R$ (2mks)

Question 2

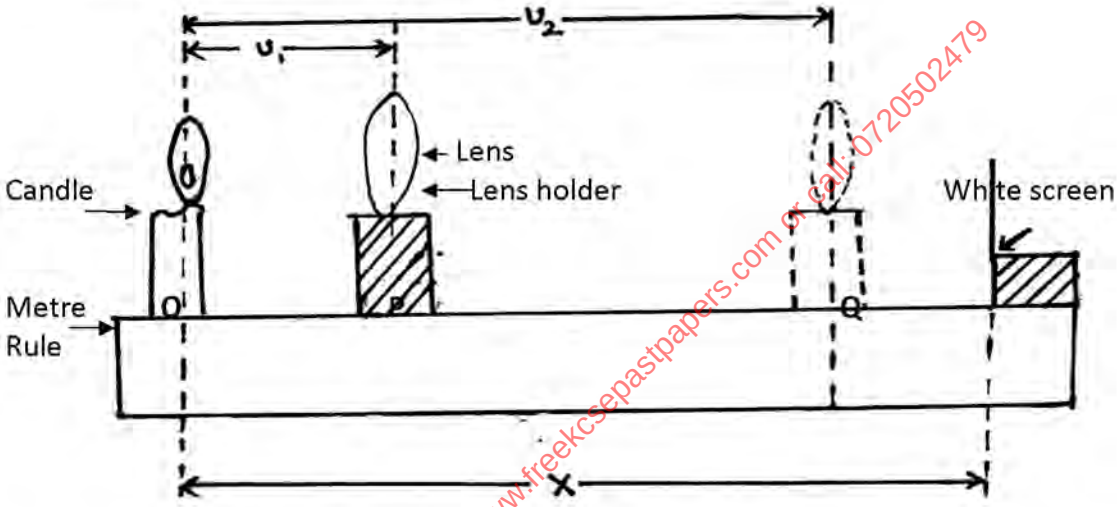
Part A

You are provided with the following:-

- A lens and a lens holder.
- A candle.
- A white screen.

Proceed as follows:

⇨ Set the apparatus as shown below.



⇨ Place the white screen at a distance X = 100cm from the candle. Let the lens be at position P, adjacent to the lit candle.

⇨ Move the lens towards the screen until an enlarged image of the candle is formed on the screen. Measure and record the distance u_1.

⇨ Move the lens to a second position Q where the image of the candle is sharp but diminished on the screen.
Measure and record the distance u_2.
Hence determine the value of $d = u_2 - u_1$.

⇨ Repeat the procedure in (c) and (d) for either values of x = 95, 90, 85, 80cm. Complete table 2 shown below.

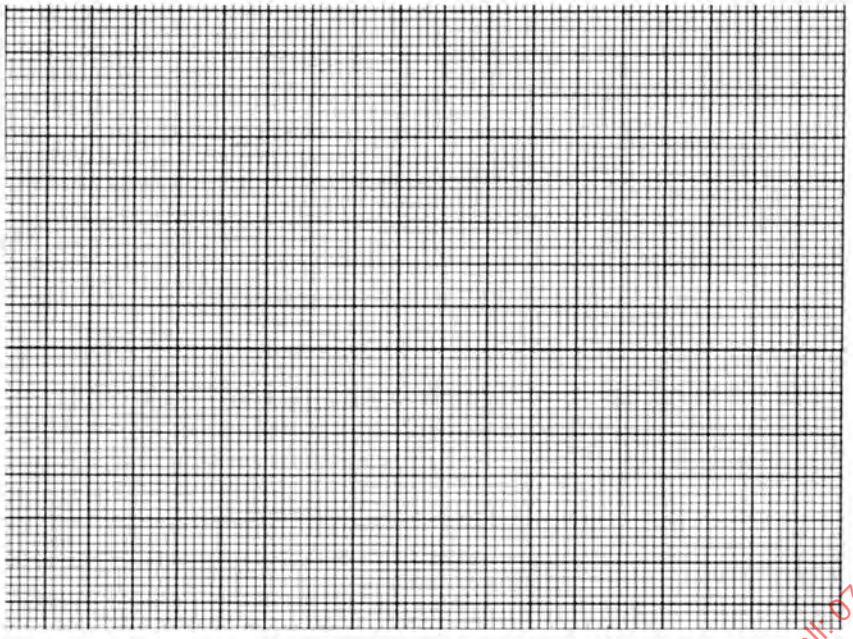
Table 2

x (cm)	100	95	90	85	80
u_1(cm)					
U_2(cm)					
$d = u_2 - u_1$(cm)					

$y = {}^{d^2}/_{x}$(cm) (2d.p)					

(8mks)

⇨ On the grid provided, plot a graph of y against x. (5mks)



⇨ Determine the value of $x = x_0$, when $y = 0$. (1mk)

x_0 = ... cm

⇨ Given that $k = \frac{x_o}{4}$, determine the value of k. (1mk)

PART B

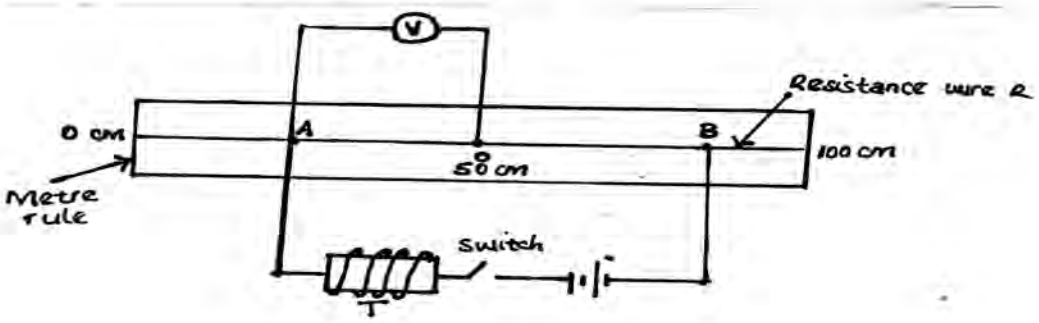
You are provided with the following:-

- A voltmeter
- A resistance wire labelled R mounted on a metre rule.
- A metre rule.
- A resistance wire labelled T mounted on a small piece of carton.
- Two dry cells and a cell holder.
- Six connecting wires, each with a crocodile clip at one end.
- A switch.

Proceed as follows:

⇨ Measure and record the e.m.f. E_0 of the cells connected in series, E_0 = _____ v. (1mk)

⇨ Connect the circuit as shown below. Point O on resistance wire P is at 50cm mark of the metre rule. A and B are points on resistance wire P such that AO = OB = X = 30cm.



⇨ Close the switch. Read and record the potential difference V across AO
V = ... Volts. (1mk)

⇨ The relationship between V and x is given by:

$$\frac{1}{V} = \frac{35}{x} + \frac{1}{y}$$

Determine the value of y. (2mks)

⇨ Use the e.m.f. E_0 to determine the constant k, given that:

$$k = \frac{8}{35E_0}$$ (1mk)

Set10

232/1
PHYSICS
PAPER 1

1. Figure 1 below shows a section of a burette containing some water

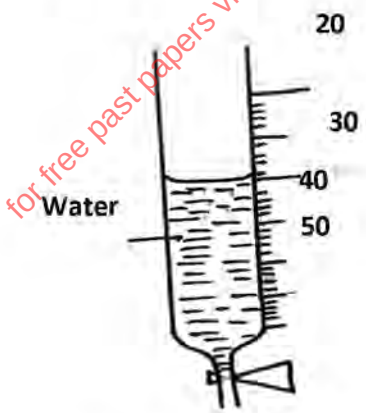


Figure 1

Determine the reading on burrette if four (4) drops of water each of volume $0.5cm^3$ are added (2mks)

2. A uniform wooden plank weighing 50N and 5m long is suspended by two ropes A and B, 1.5m apart. A is 2m from one end and B is 1.5m from the other end as shown in figure 2 below. A concrete block of weight 100N is suspended from the centre of the plank

Calculate the tension T_A in string A (3mks)

3. A steel sphere released in a tall transparent water jar attains a constant velocity after a while. The same sphere released in air falls at a constant acceleration. Explain with a reason the difference in its motion in water and in air (2mks)
4. The stability of a body can be increased by increasing the base area and lowering its centre of gravity. State one way of lowering its centre of gravity. (1mk)
5. To what temperature must 2,000cm^3 of a gas at 27°C be heated at constant pressure in order for its volume to increase to 25000cm^3? (3mks)
6. A body of mass 25kg moving with uniform accelaration has an initial momentum of 60kgm/s and after 10s the momentum is 90kgm/s. calculate the acceleration of the body (3mks)
7. A load was raised using the system shown below. The system was then modified as in (b) and used to raise the same load

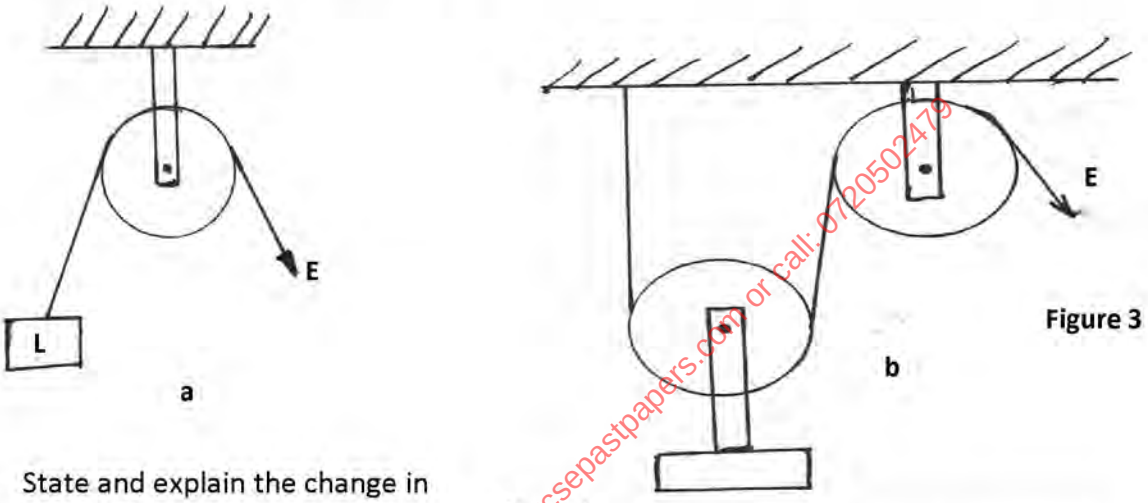
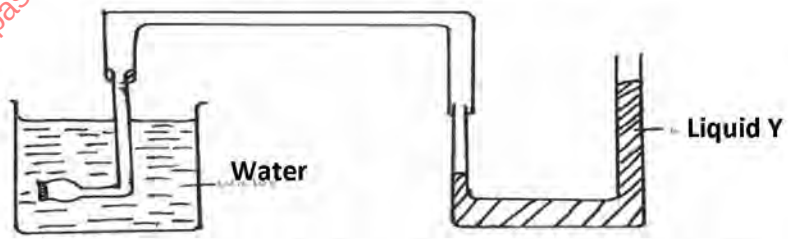


Figure 3

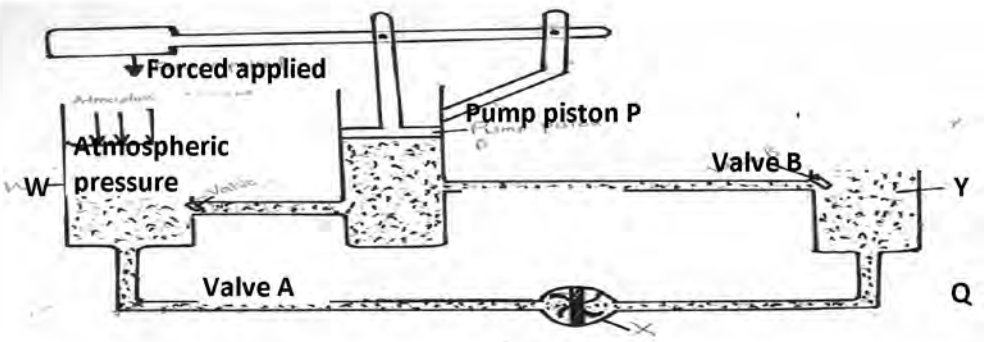
State and explain the change in efficiency (2mks)

8. State two physical properties of a material medium which may be used to measure temperature (2mks
9. On increasing the temperature of a fixed mass of a gas its pressure was noted to increase. Explain (2mks)
10. The figure 4 below shows a set used in a physics demonstration



Briefly suggest **two** conclusions that may be drawn from the experiment (2mks)

11. A 60 litre giant density bottle weighs 100N when empty. What will be its mass when filled with liquid W whose density is 0.72g/cm3? *(g=10N/kg)* (3mks)
12. Figure 5 below is a hydraulic jack system



(a) Name the parts labeled W,X and Y (3mks)

(b) Briefly explain how the device may be used to raise a load at the position shown (3mks)

(c) Part W is left open to the atmosphere as indicated. Explain (2mks)

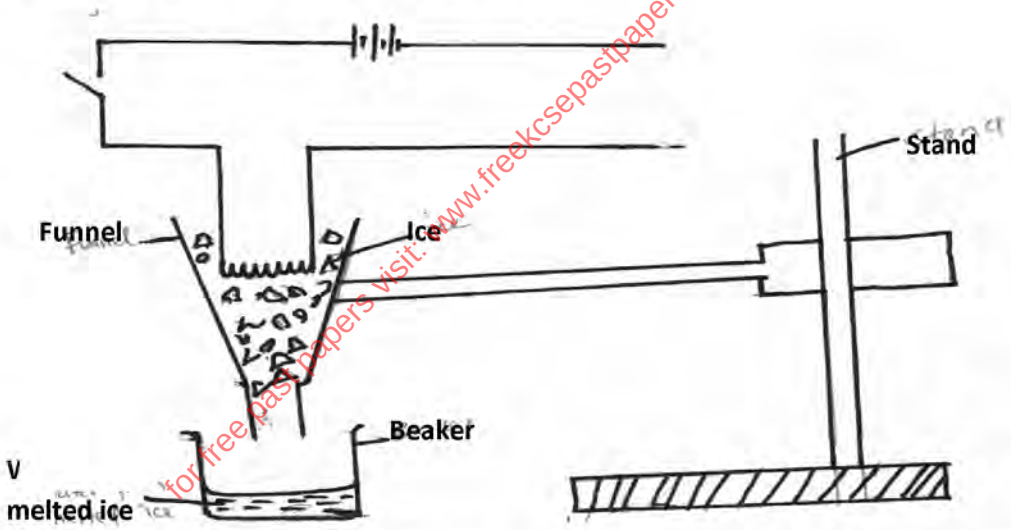
(d) State two ways by which the mechanical advantage of the device may be increased (2mks

(e) One such hydraulic brake system was used to lift a car whose mass was 1200kg. The cross sectional area of Q was 5000cm^2 and that of P was 5cm^2. Determine the force exerted on the pump piston (3mks)

13. (a) Define specific latent heat of fusion (1mk

(b) State two factors which affect freezing point of ice (1mk

(c) Figure 6 below illustrates an experiment in which electrical energy is used to determine specific latent heat of fusion



(i) Other that time, state other measure measurements that would be used to determine the quantity if heat Q absorbed by ice in unit time (2mks)

(ii) Complete the circuit to show connection of the essential circuit components (3mks)

(iii) Explain how to proceed and determine the value of L_{f1}, the specific latent heat of fusion of Ice (3mks)

(d) In a similar experiment, the following results were obtained when heat was switched on for 5 minutes

Voltmeter reading =6.0V

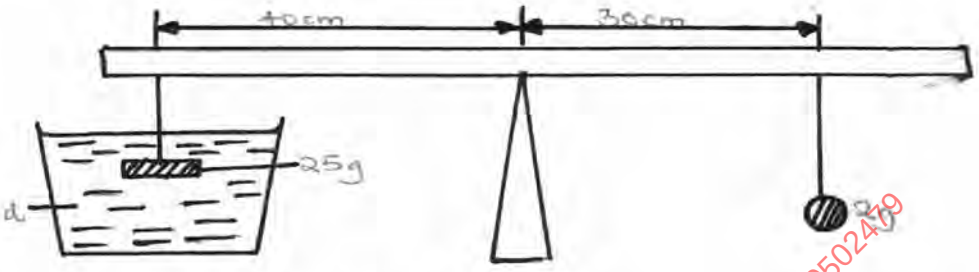
Ammeter reading =1.25A

(i) Calculate the power rating of the heater (3mks)

(ii) If by the end of the experiment, 200g of water at 0oC was collected, determine the latent heat of fusion of ice (2mks)

14. (a) State Archimedes principle. (1mk)

(b)Figure 7 below shows a block of mass 25g and density 200kgm-3 submerged in a certain liquid while suspended from a horizontal beam by means of a thread. A mass of 2g is suspended from the beam as shown



(i) Determine the upthrust force acting on the block (3mks)

(ii) Calculate the density of the liquid (3mks)

(c) Figure 8 shows a piece of cork held with a light thread attached to the bottom of a beaker. The beaker is filled with water

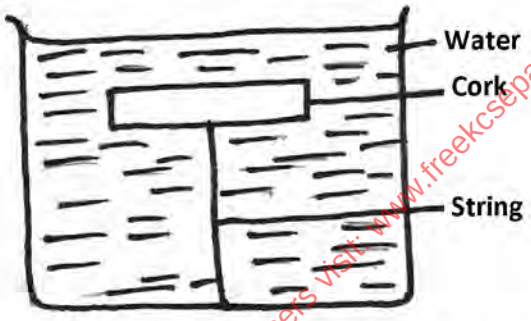


Fig 8

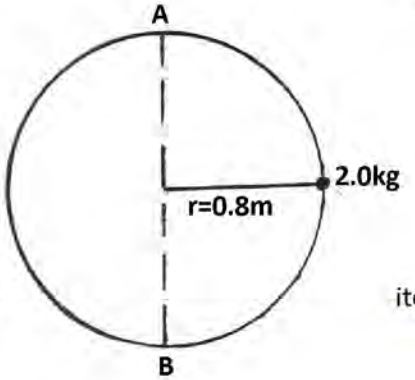
(i)Indicate and label on the diagram the forces acting on the cork (3mks)

(ii) Write an expression showing the relationship between the forces (1mk)

(d) A solid displaces 8.5cm3 of a liquid when floating and 11.5cm3 when fully submerged in the liquid. The density of the solid is 0.8g/cm3. Determine the upthrust on the solid when floating (3mks)

15. (a) Define angular velocity (1mk)

(b) The diagram below fig.9 shows an object of mass 2.0kg being whirled in a vertical circle of radius 0.8, at a uniform speed of 50m/s



Determine
(i) The centripetal force on the object (3mks)
(ii) The tension in the string when the object is at **A** (3mks)
(iii) The tension in the string when the object is at **B** (3mks)

(c) The speed of rotation is gradually increased until the string snaps. At what point is the string likely to snap? Explain (3mks)

Set10
Paper 2 (Theory)

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

1. State the property of light associated with formation of shadows (1mk)
2. Explain why soft iron keepers are suitable for storing magnets (2mks)
3. Fig 1 below shows a conductor carrying current placed in the magnetic field of two magnets. Complete the diagram by showing the field pattern and the direction of force F that acts on the conductor (2mks)

Figure 1

4. State two quantities that are used to determine whether accumulator require recharging or not (2mks)
5. The figure 2 below shows the image I, formed in a convex mirror. Complete the ray diagram to show the position of the object. (2mks)

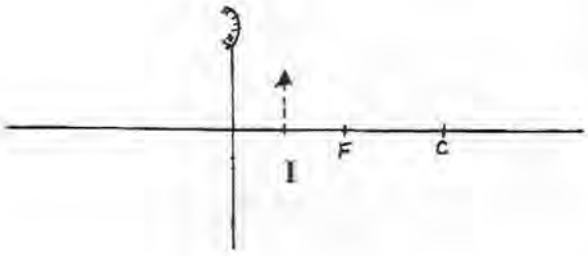


Figure 2

6. Draw the electric field around the charges shown below (2mks)

7. The figure below shows a displacement –time graph for a wave with a period of 0.5 seconds

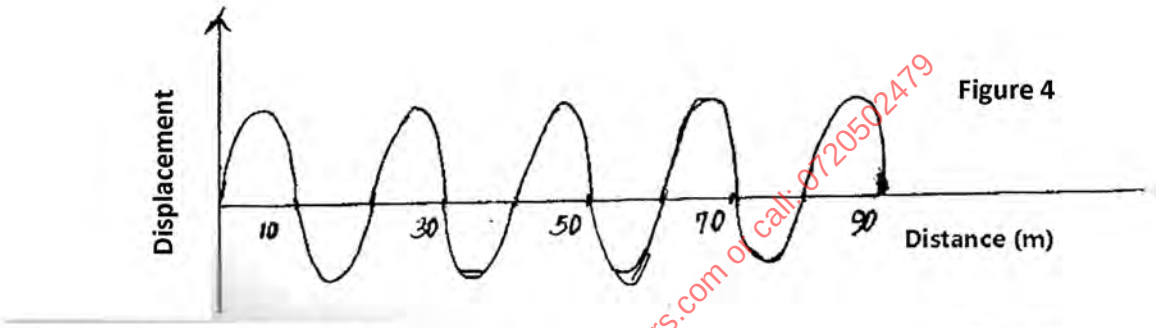


Figure 4

Calculate the velocity of the wave (2mks)

8. Determine the ammeter reading in the figure below (3mks)

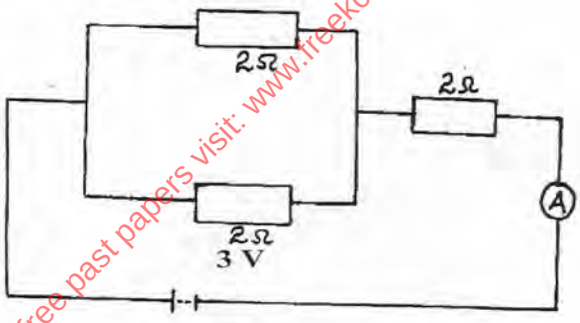
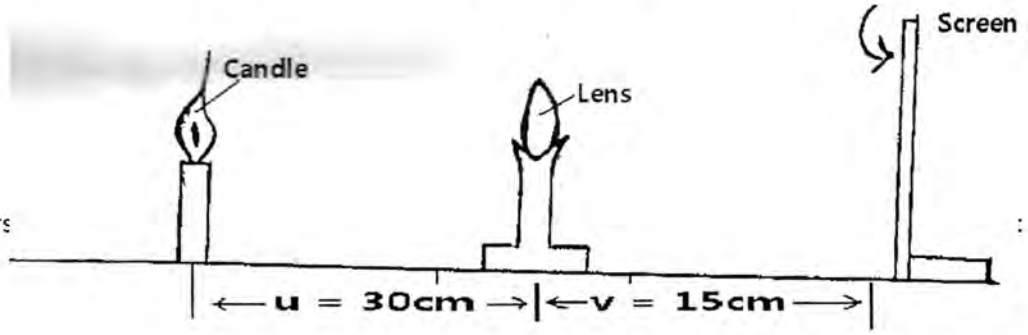


Figure 5

9. State two ways in which x-rays differ from Gamma rays (2mks)
10. Find the cost of using a 3kw immersion heater and five 75w electric bulbs for a day if the price per unit (kwh) is 80cts (3mks)

11. Fig 6 shows a diagram of an arrangement used by a student to determine the focal length of a convex lens. Use it to answer the questions that follow



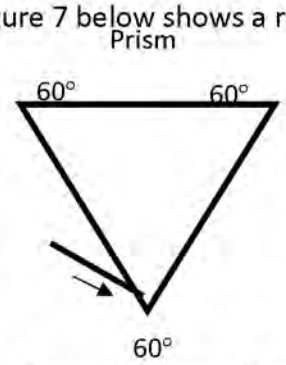
(a)Give two properties of the image formed by the lens in this position (1mk)
(b) What is the focal length of the lens? (1mk)

12. Calculate the wavelength of green light whose energy is 3.37×10^{-19}J. ($h=6.63 \times 10^{-34}$JS, $C=3.0 \times 10^{8}$m/s) (3mks)

SECTION B (55 MKS)

Answer all questions in the spaces provided

13. (a) Figure 7 below shows a ray of white light incident on the surface of a glass prism



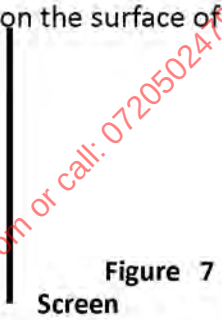


Figure 7

(i) Complete the path of the ray until it reaches the screen. (Use only two extreme rays) (2mks)
(ii) Mark on the diagram the two rays as they appear on the screen (1mk)
(iii) What colours will be observed on the screen if white light was replaced by yellow light? (1mk)
(b) (i) Distinguish between reflection and refraction of light (1mk)
(ii) Figure 8, (I) and (II) show refraction of light at air-water interface

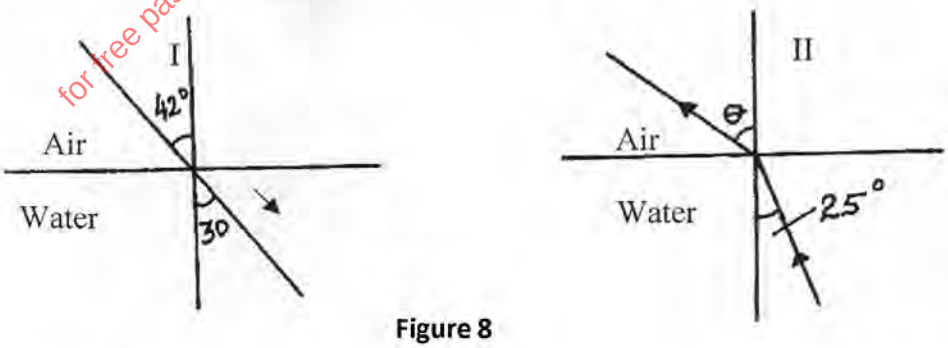


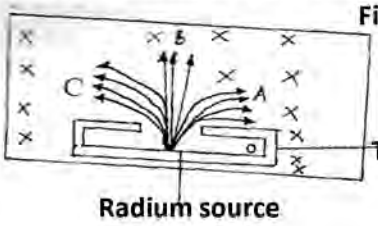
Figure 8

Determine angle θ in figure 9, (II) (3mks)
(iii) State two laws of refraction (2mks)
(iv) State two conditions necessary for total internal reflection to occur (2mks)

14. (a) (i) Define radioactivity (1mk)

(ii) Figure 9 shows a radium source of raditions subjected to strong magnetic field. Use to answer questions that follow

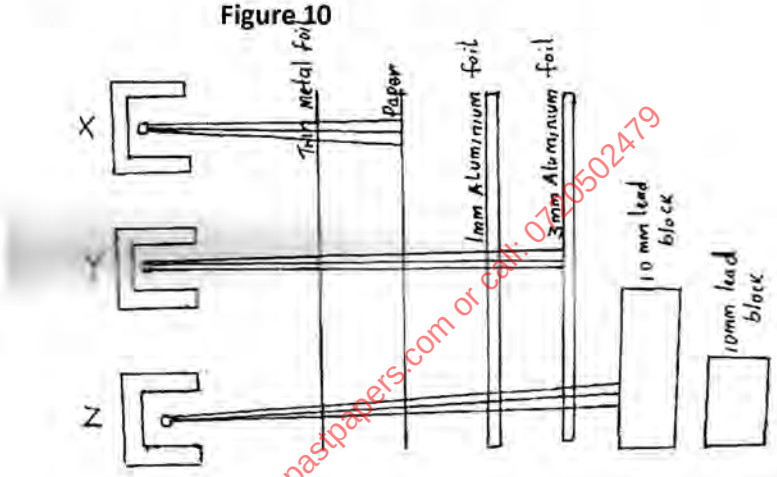
Figure 9



Write the names of radiations A,B and C (3mks)

(iii) Figure 10 shows the penetrating power of radioactive radition n various materials, Use it to answer questions that follow

Figure 10



Which of the radiations indicate?

(i) Gamma radiation (1mk)

(ii) Alpha radiation (1mk)

(b) (i) The following is part of a radioactive decay series

210 3ß decay S T

$$PO \longrightarrow A \longrightarrow C$$

84 87 82

Determine the value of S and T (2mks)

(ii) A radioactive material was picked from cave. Its average count rate was found to be 97 counts per second. After at time of 210 seconds, the count rate was registered as 34 counts per second. The average back ground count rate remained 35 counts per seconds. What is its half life? (3mks)

15. (a) A transfprmer is connected to a.d.c source. The secondary coil is connected to a centre zero galvanometer. State and explain the observation made on the galvanometer (2mks)

(b) State Lenz's law (1mk)

(c) (i) Distinguish between semi conductors and conductors (2mks)

(ii) Give one example of a semi conductor and one example for a conductor (2mks)

(iii) What is meant by donor impurity in a semi conductor (1mk)

(iv) Draw a circuit diagram including a cell, a diode and a resistor in the reverse biased mode (1mk)

(v) n the circuit in figure 11 below, when the switch is closed, the voltmeter shows a reading.

When the cell terminals are reversed and the switch is closed the voltmeter reading is zero

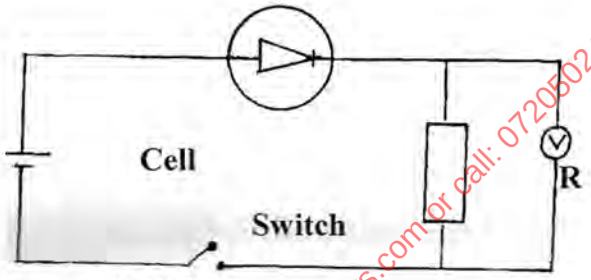
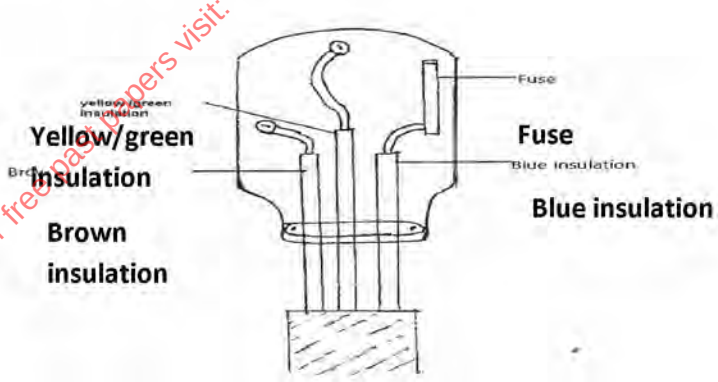


Figure 11

Explain this observation (2mks)

16. Figure 12 below shows a flex to the 13A-3 pin



(a) Plug which has been incorrectly fitted
List two mistakes and suggest corresponding remedies. (4mks)

(b) (i) Why would it be wrong to fit an electric heater in a bathroom on the wall directly the bath? (1mk)

(ii) Where would such a heater be fitted and what type of switch should be used to operate it? (2mks)

(c) A power line from a power sub- station to a town some distance away, has a resistance of 0.10 hms per kilometer. Determine the rate of energy loss in the transmission of power over 50km at a current of 60 Ampheres (3mks)

17. (a) Define the following terms as used in the photoelectric electric.

(i) Work function (1mk)

(ii) threshold frequency (1mk)

(b) In an experiment to find the relationship between frequency of radiation and kinetic of photoelectrons in a photoelectric device, the following graph was obtained

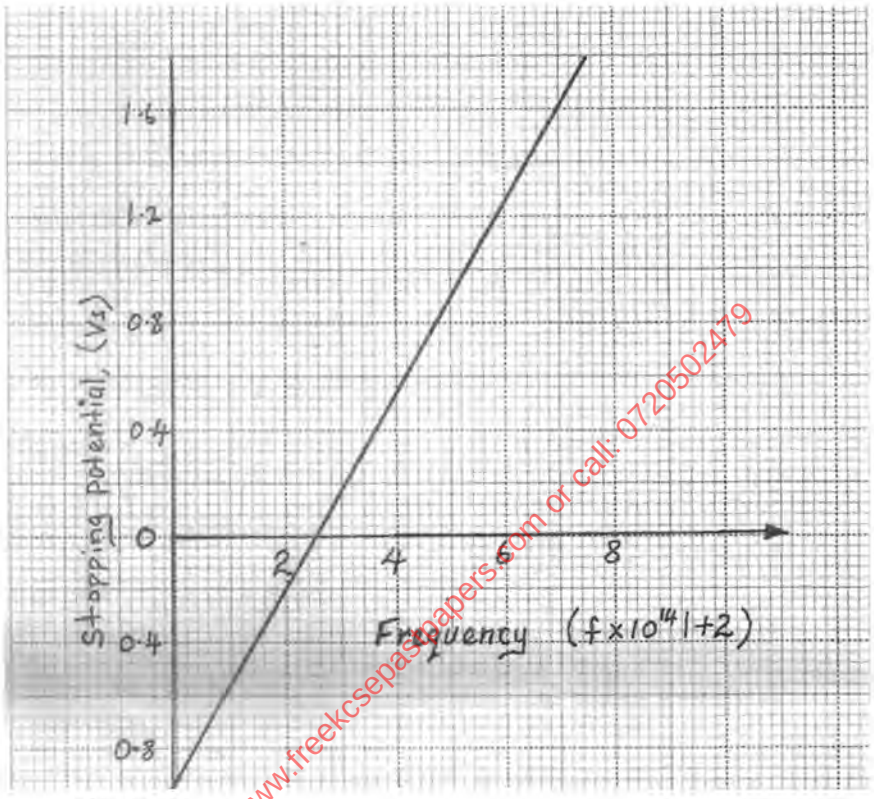


Figure 7

Use the graph to answer the following questions,

(a) (i) Determine the threshold frequency (1mk)

(ii) Find the plank's constant h (3mks)

(Take the charge of an electron to be 0.6x 10^{-19}C)

(ii) Calculate the work function of the metal in joules (3mks)

(b) The threshold frequency of sodium is 4.8x10^{14}Hz. Calculate the work function of sodium. (*Take the plank's constant to be 6.6x10-34JS)* (2mks)

Set10

Paper 3 (Practical)

QUESTION 1 PART A

1. You are provided with the following

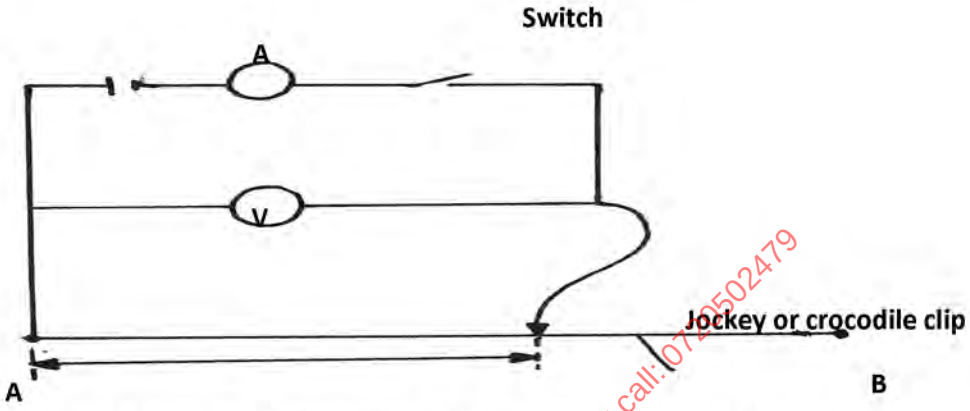
- A micrometer screw gauge (to be shared)
- A voltmeter (0-3v or 0-5v)

- Ammeter (0-1A)
- A switch
- A jockey/long wire with crocodile clip attached
- One new dry cell
- 8 connecting wires with crocodile clips attached to one end

Proceed as follows

(a) Set up the circuit below, 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 (½ mk)

(ii) Disconnect the jockey from wire AB and close the switch. Record the value E of the voltmeter reading.

E=_____V (½ mks)

(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
D.d(v)						
Current I(A)						
IV(watts)						

(I) Complete the table (5mks)

(ii) Plot a graph of IV (vertical axis) against L (5mks)

(iii) Using your graph, find the value lo where your graph (the horizontal axis)

Lo=_____cm (1mk)

(c)(i) Now, place the jockey on AB such that long the L is equal to the value of l=63cm. close the switch and record both the voltmeter reading, V and the ammeter reading, I

V=_____V (½ mk)

I=_____A (½ mk)

(ii) Work out the values v where (1mk)

$$r = \frac{E - V}{I}$$

(d) Work out the value of e where (1 ½ mks)

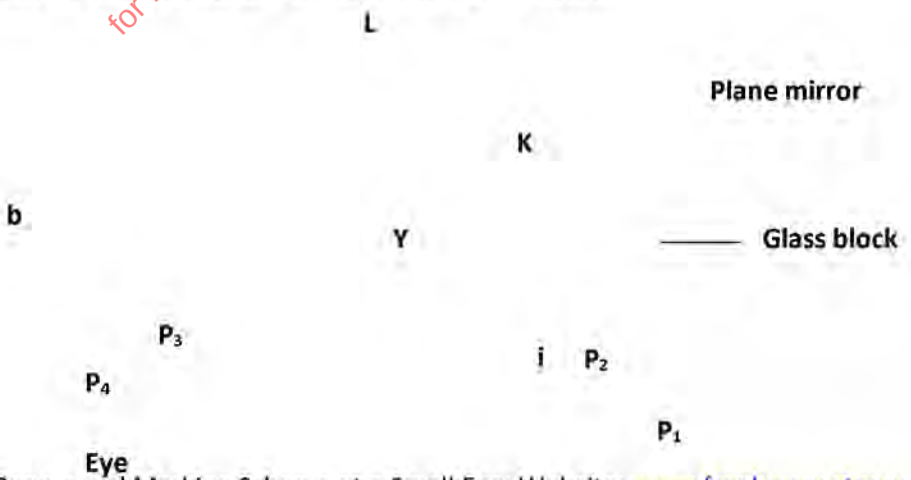
$$e = \frac{\Pi r d^2}{2.52}$$

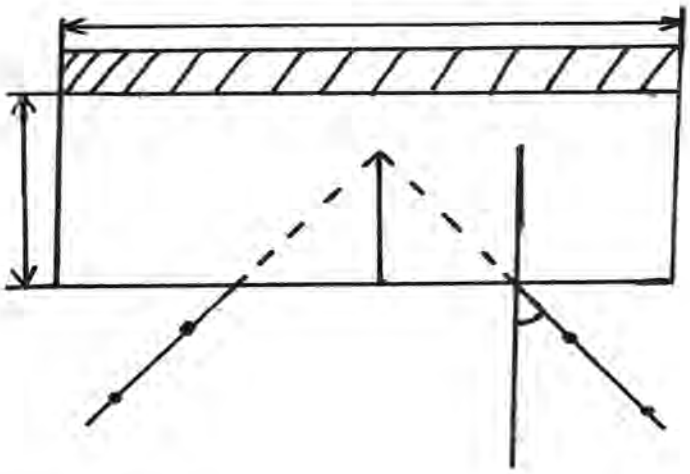
Question 1 part B

You are provide with

- Rectangular glass block
- Four optical pins
- Ruler
- 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 (½ mk)

(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° from the normal

(iv) Draw the line representing the incident ray and fix pins P1 and P2 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 P3 and P4 and extend them to intersect line P1P2 produced. Measure the perpendicular distance Y

(vii) Repeat steps(iii-vi) for different values of I given and record your values in the table 2 below

Table 2

i°	10	20	30	40
Y(cm0				

(g) (i) Determine the average of the values of Y (1mk)

(ii) Dtermine the values of constant k given that $k = \frac{b}{Y}$ (1mk)

2. PART A

You are provided with the following

- Metre rule
- Knife edge
- 10 microscope slides
- A 50g mass
- A piece of cellotape

- A pair of vernier calipers

Proceed as follows

(a) Using the vernier calipers provided measure the length l and the width of the microscope slide

L=_____

W=_____ (1mk)

(b) Stack ten(10) slides together using a cellotape as shown below fig 3

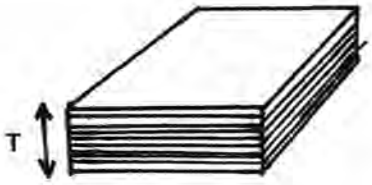


Figure 3

(i) Measure the thickness T of the space of microscope slab (1mk)

T=_____

(ii) Determine the volume v of the stack (1mk)

V=(WT)=_____

(c) Balance the metre rule at its centre of gravity and maintain the position of the fulcrum on the centre of gravity throughout the experiment

Place the 50g mass and the stack of slides as shown in figure 4 below

Adjust the position of both the spaces and the mass until the rule is again balanced make the distances x and y as large as possible

(i) x=_____ (1mk)

y=_____

(ii) Calculate the mass M in grams of the stick of slides given that (1mk)

$m = 50\frac{x}{y}$

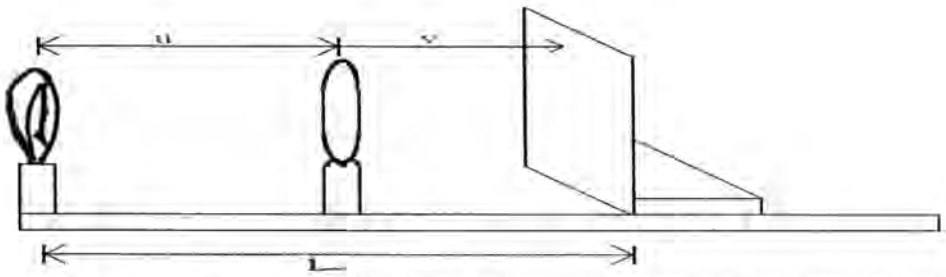
(iii) Determine the density of glass given that $density = \frac{m}{v}$ (1mk)

PART B

(d) You are provided with a metre rule, a lens holder, convex lens, a candle amounted white screen proceed as follows

(e) Set up the apparatus as shown in figure 5 below

(f) Ensuring that L=100cm adjust the lens until you get a sharp diminished image on the screen. Measure the object distance u, and image distance v



(g)(i) Repeat the procedure with L=95cm, 90cm, 85cm,80cm and 75cm each time recording the value of u and v and tabulating the results in the table II below (5mks)

L(cm)	100	95	90	85	80	75
U(cm)						
V(cm)						
$m=\frac{v}{u}$						

(ii) Plot a graph of m against v (5mks)

(iii) Determine the slope of the graph (2mks)

(iv) Given that $\frac{v}{f}=m+1$, determine the focal length of the lens from the graph above (2mks)

Set11

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PHYSICS

PAPER 1

SECTION A (25MARKS)

Answer all questions in this in the spaces provided

1. Figure 1. Shows a glass beaker of cross sectional area 10.5cm^2

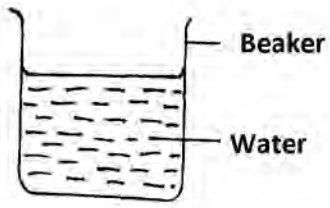
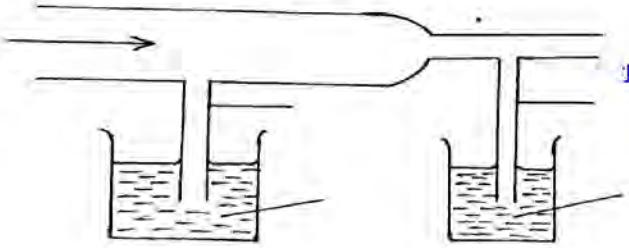


Fig 1

When a metal block of mass 250 g is immersed into the water, the level of water rises by 3.5 cm. determine the density of the metal block. Express your answer in S.I unit (3mks)

2. The figure 2 shows air flowing through a pipe of nonuniform cross sectional area. Two tubes **A** and **B** are dipped into the liquid as shown.



Tube B

Tube B

Fig 2 Liquid Liquid

(a) Indicate the level of the liquid in tubes **A** and **B** (1mk)

(b) Explain your answer in part (a) above (1mk)

3. A motor cyclist wears a helmet in the inside with sponge. Explain how this minimizes injuries to the motorists head when involved in an accident. (2mks)
4. A balloon is filled with a gas which is lighter than air. It is observed to rise in air up to a certain height state a reason why the balloon stops rising. (1mk)
5. Figure 3 shows two corks **P** and **Q** fixed on a polished and a dull surface with wax.

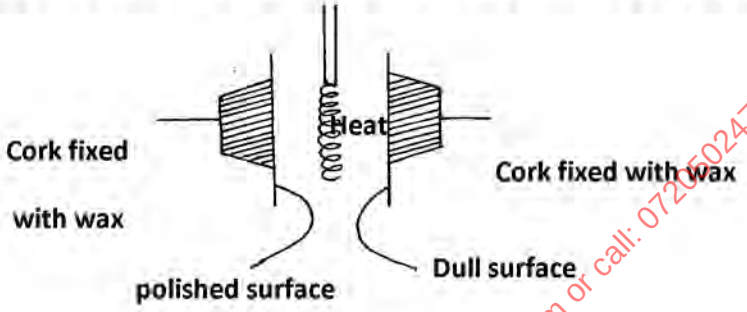


Fig 3

Explain the observation, when the heater is switched on for a short time given that the heater is equidistant from the two surfaces. (2mks)

6. The air pressure at the base of Mt. Kenya is 70cmHg while at the top of the mountain is 55cmHg. Given that the average density of air is 130kg/m^3 and the density of mercury is 13600kg/m^3. Determine the height of the mountain. (3mks)
7. Figure 4 shows a store of weight **W** placed on an inclined plane. If the angle of inclination is θ

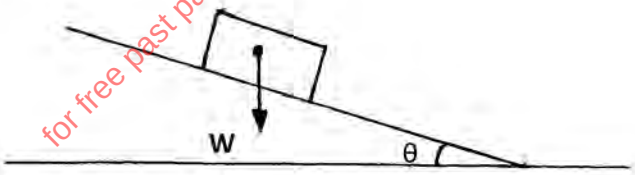
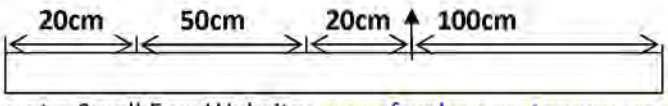


Fig 4

a) Indicate with arrows, two other forces acting on the stone. (1mk)

b) State how each of the forces in (a) above is affected when the angle θ is increased. (1mk)

8. State the reason why it is easier to separate water into drops than to separate a solid into smaller pieces. (1mk)
9. Figure 5 shows a uniform beam held at equilibrium.



Determine the weight of the beam. (3mks)

10. Figure 6 shows a glass filled with ice placed on a bench.

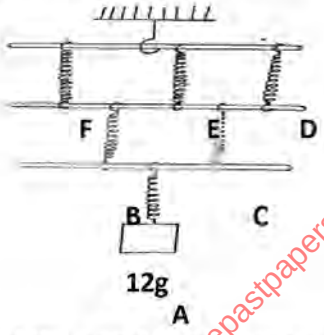
Fig 6

State the change on the stability of the glass when temperature increases. (1mk)

11. State the fastest mode of heat transfer. (1mk)

12. Explain how sensitivity of clinical thermometer can be improved. (1mk)

13. Figure 7 shows a mass of 12g suspended on a set of 6 identical springs. When the mass was hanged on spring **A**, it extended by 5cm.



Determine the extension of the combination shown if each spring and rod has negligible weight. (2mks)

14. Sketch a graph of volume of a fixed mass of a gas against pressure on the axes below. (1mk)

SECTION B (55 MARKS)

Answer all the questions in this section in the spaces provided.

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

(b) A ball of mass 50kg is thrown from the top of a cliff 20m high with a horizontal velocity of 20m/s. On reaching the ground it completely covered arm **X** of a hydraulic lift such that no water splashed out. The other arm **Y** has a weight of 25200N. Assuming the tap was opened when the ball struck the surface of water.

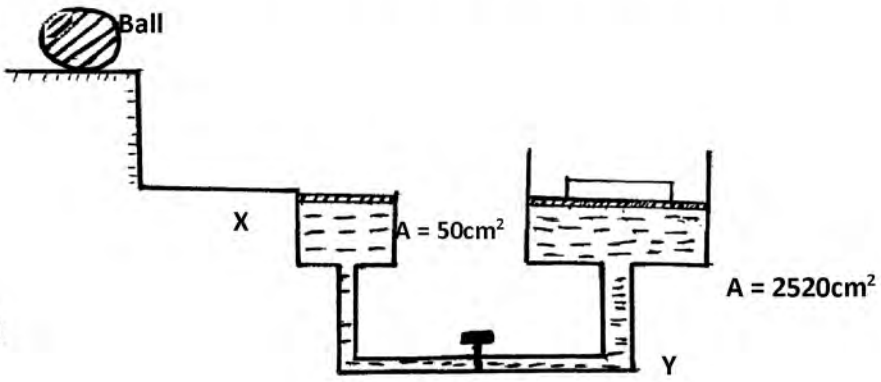


Fig 8

Determine

(i) The time taken by the ball to strike the surface of water at arm **X** (3mks)

(ii) The distance from the foot of the cliff to where the ball strikes the surface of water (2mks)

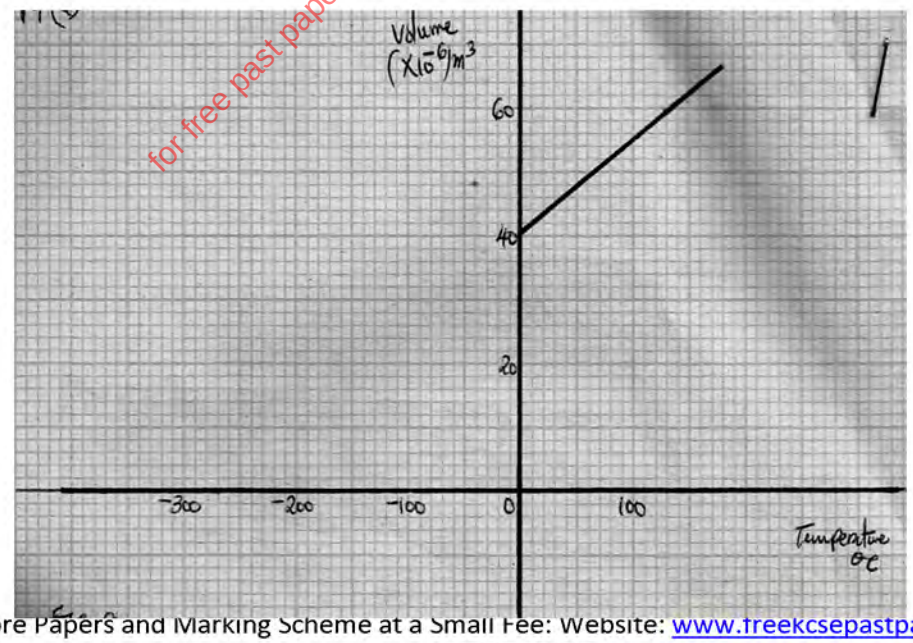
The vertical with which it struck the surface of water at arm **X** (2mks)

The force with which the ball struck the surface of water (2mks)

(iii) The distance moved by the 25200N load arm **Y** if the level of water in arm **X** and arm **Y** was initially the same. (2mks)

16. The graph shows the relationship between volume and temperature for an experiment

Fig 9



(i) What was the volume of the gas at 0°C (1mk)

(ii) At what temperature would the volume of the gas be Zero (1mk)

(iii) Explain why the temperature is part (ii) above cannot be achieved. (1mk)

(b) A wooden block of mass 50g floats with 20% of its volume above the water surface and kept in place by a string as shown below. The tension in the string is 0.06N

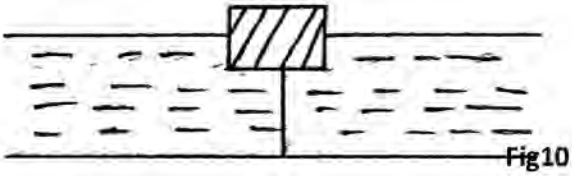


Fig10

Determine

(i) The upthrust experienced by the object . (2mks)

(ii) The volume of the displaced. (2mks)

(iii) The density of the object (3mks)

16. Figure 11 shows a car of mass, **m** moving along a curved part of the road with a constant speed.

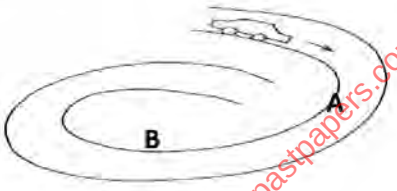


Fig11

(a) (i) Explain why the car is more likely to skid at **B** than at **A** (2mks)

(ii) If the radius of the path at **B** is 250m and the car has a mass of 6000kg, determine the maximum speed the a car can be driven while at **b** to avoid skidding if the co-efficient of friction between the road and the tyres is 0.3 (3mks)

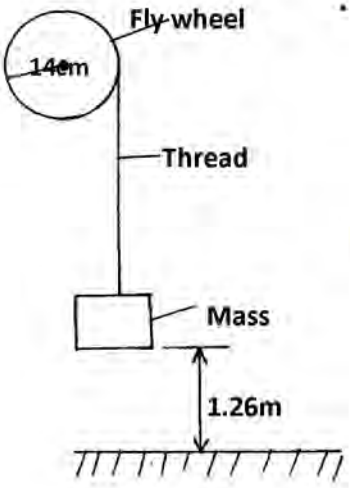
(b) A string of length 70cm is used to whirl a stone of mass 0.5kg in a circle of a vertical plane at 5rev/s. determine:

(i) The period (2mks)

(ii) The angular velocity (3mks)

(c) The figure 12 shows a flywheel of radius 14cm suspended about a horizontal axis through its centre so that it can rotate freely about the axis. A thread is wrapped round the wheel and mass attached to its loose end so as to hang at a point 1.26m above the ground.

Fig12



When the mass is released, it accelerates at $0.28m/s^2$ determine the angular velocity of the wheel just before the mass strikes the ground. (4mks)

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

(b) Water of mass 200g and temperature 10°C is put in a copper calorimeter of mass 80g. steam from boiler at normal pressure is passed into the calorimeter for some time. The total mass of the calorimeter and contents is 283g. the final temperature of the contents is measured and is **T**.

Determine :

(i) Heat lost by steam on condensing to water. (2mks)

(ii) Heat lost by condensed water. (2mks)

(iii) Heat gained by the calorimeter and the cold water. (3mks)

(iv) The value of **T** (2mks)

(take specific heat capacity of water = 4200J/kg/k and copper = 900j/kg/k. specific latent heat of vaporization of steam = 2.26×10^6 J/kg)

18. (a) The figure 13 shows a pulley system used for lifting loads.

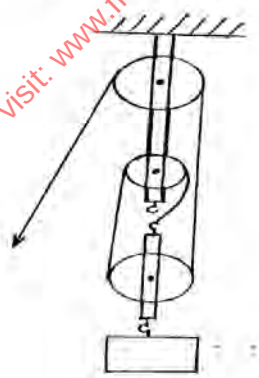


Fig13

(i) What is the velocity ratio of the pulley system (1mk)

(ii) If it's efficiency is 80%. Determine its mechanical advantage. (2mks)

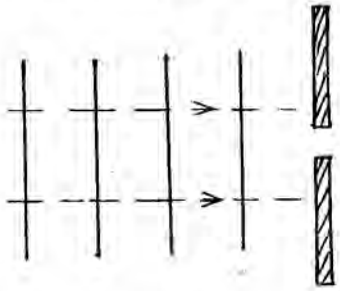
(iii) If the load is 300N, determine the effort. (2mks)

(b) Derive an expression for the velocity ratio of the wheel and axle machine if the wheel has a radius of **R** and axle has a radius of **r**. (3mks)

Set11
Paper 2

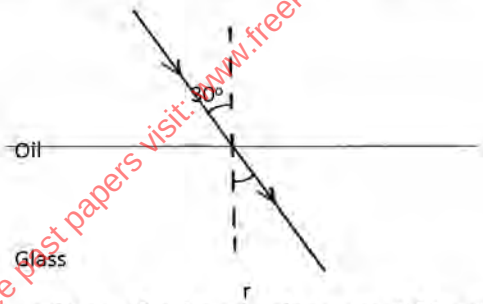
SECTION A (25 MARKS)

1. The figure below shows a series of wavefronts one wavelength apart approaching a gap between two barriers in aripple tank



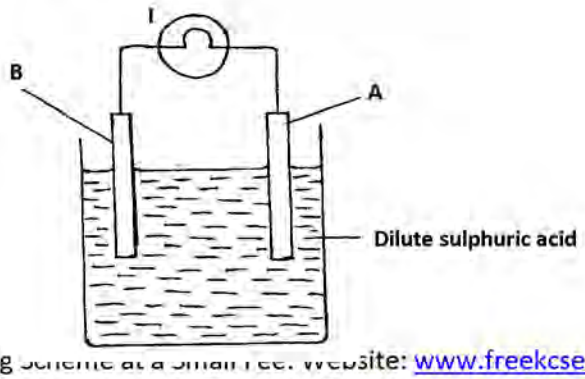
Show on the figure what happens as the waves pass the gap. (1mk)

2. A mine worker stands between two vertical cliffs 400m from the nearest cliff. The cliff are x and metres apart. Every time he strike the rock once , he hears two echoes, the first one after 2.5 seconds, while the second follows 2 seconds later.
   Calculate
   (i) The speed of sound in air. (2mks
   (ii) The value of ***x*** (3mks)
3. The coil of an electric motor is usually round on a soft iron armature. State the purpose of soft iron armature. (1mk)
4. The diagram below shows a ray of light incident on a glass-oil interface.



If the refractive indices of oil and glass are 6/3 and 3/2 respectively, determine the value of **r** (3mks)

5. The figure shows a simple cell.

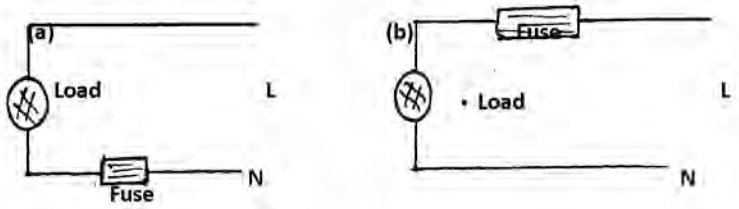


Use the information on the figure to answer the questions below.

(a) Name the parts labeled **A** and **B** (1mk)

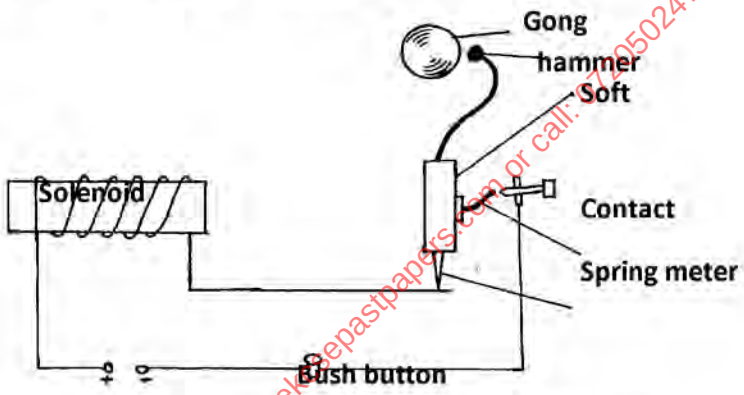
(b) It is observed that the bulb goes off after a short time. Explain this observation (2mks)

6. The figure below shows how a fuse may be connected in electric current



In either case the fuse blows out but (a) is dangerous while (b) is not. Explain (2mks)

7. The figure shows a simple circuit diagram of an electric bell.



Explain how it works (2mks)

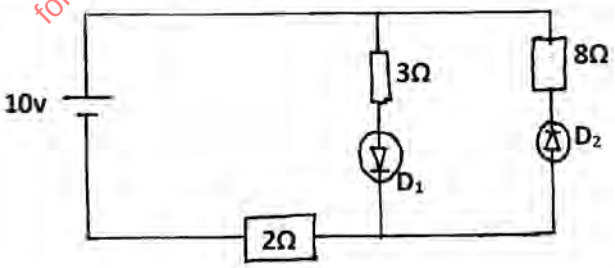
8. The figure shows part of electromagnetic spectrum

Ultra violet rays	**Micro wave**	**x-rays**	**Red light**

Arrange the electromagnetic waves in the order of decreasing energy. (1mk)

9. State **one** advantage of using optical fibres in communication. (1mk)

10. Find the current flowing and voltage across the 8Ω resister in the circuit. (3mks)



11. The following is part of radio active decay series. $^{234}_{83}Bi \xrightarrow{\beta} {}^{90}_{84}X \xrightarrow{\alpha} {}^{230}_{b}Y$

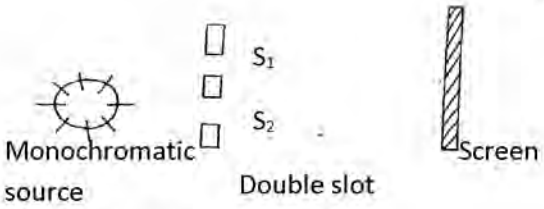
Determine the value of **a** and **b** (2mks)

12. State **one** property of cathode rays. (1mk)

SECTION B (55MARKS)

Answer all the questions in this section

13. (a) In the experiment to observe interference of light waves a double slit is placed close to the source see figure.



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

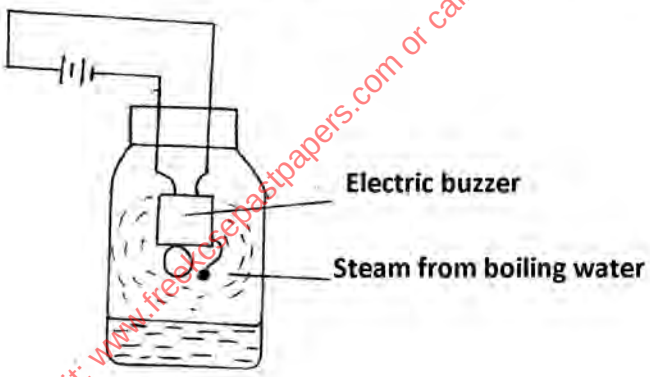
(ii) State and explain what is observed on the screen. (3mks)

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

(I) The slit separation S_1S_2 is reduced. (1mk)

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

(c) (i) The figure below shows a set up by a student.

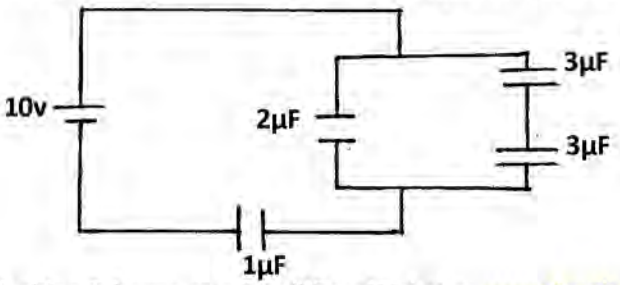


State and explain what happens to the sound from the buzzer as the bottle and its contents are cooled to 0°C (3mks)

(iii) In the pipe below complete the diagram to show how air in the open pipe vibrate with a frequency of first overtone. (1mk)

Open pipe

14. (a) The figure below shows an arrangement of capacitor connected to a 10V DC supply.

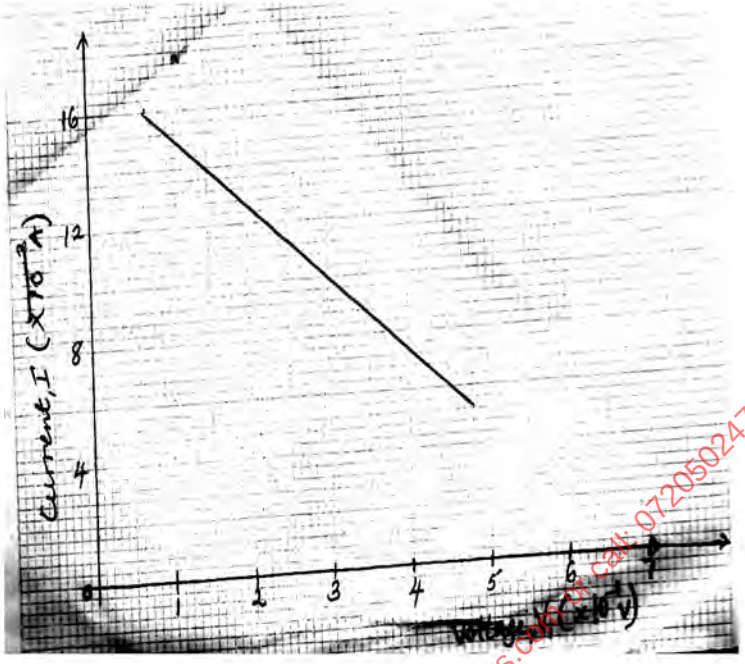


Determine

(i) The combined capacitance of the arrangement. (3mks)

(ii) The total energy stored. (2mks)

(b) The graph below shows the variation of potential difference **V** with current, **I** for a certain cell.



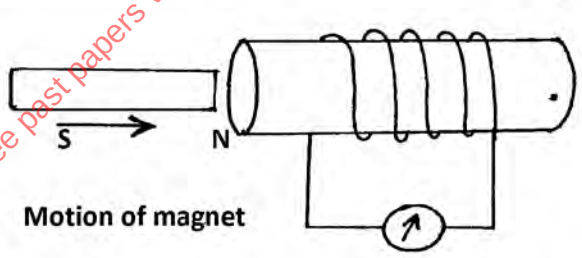
From the graph determine:

(i) Internal reaction of the cell. (3mks)

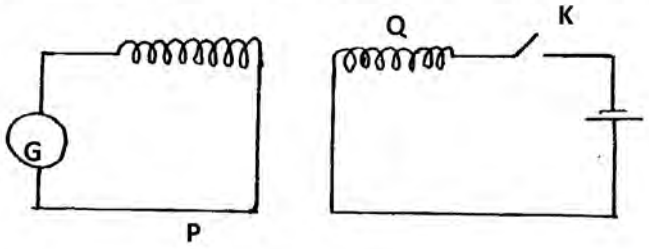
(ii) The e.m.f of the cell (2mks)

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

(ii) Use the law to determine the direction of the induced current in the circuit below (1mk)



(b) Two identical coils **P** and **Q** are placed close to each other as shown.



(i) State the observation on the galvanometer made when the switch **K** is closed. (1mk)

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

(c) A student designed a transformer to provide power to an electric bell marked 24W, 6V from a 240V mains. He wound 50 turns and **N** turns on an iron ring. When he a connected the coil of 50 turns to the bell and the **N** turns coil to an a.c, he found that the transformer was only 60% efficient. Find:

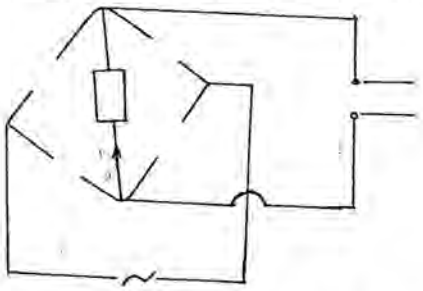
(i) The value of **N** (2mks)

(ii) The power in the coil with N turns (2mks)

16. (a) (i) With the aid of a diagram differentiate between forward biased and reverse biased diode. (2mks)

(ii) Sketch a graph to show how a current through a forward biased **p-n** function varies with potential difference across it. (2mks)

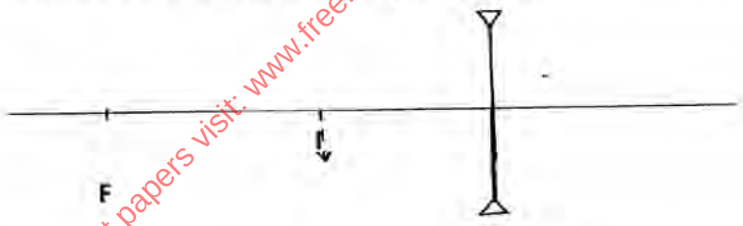
(b) The figure below shows an incomplete circuit for full wave rectification



(i) Complete the diagram to show how the diodes should be arranges for the current to flow through **R** in the direction shown with an arrow. (2mks)

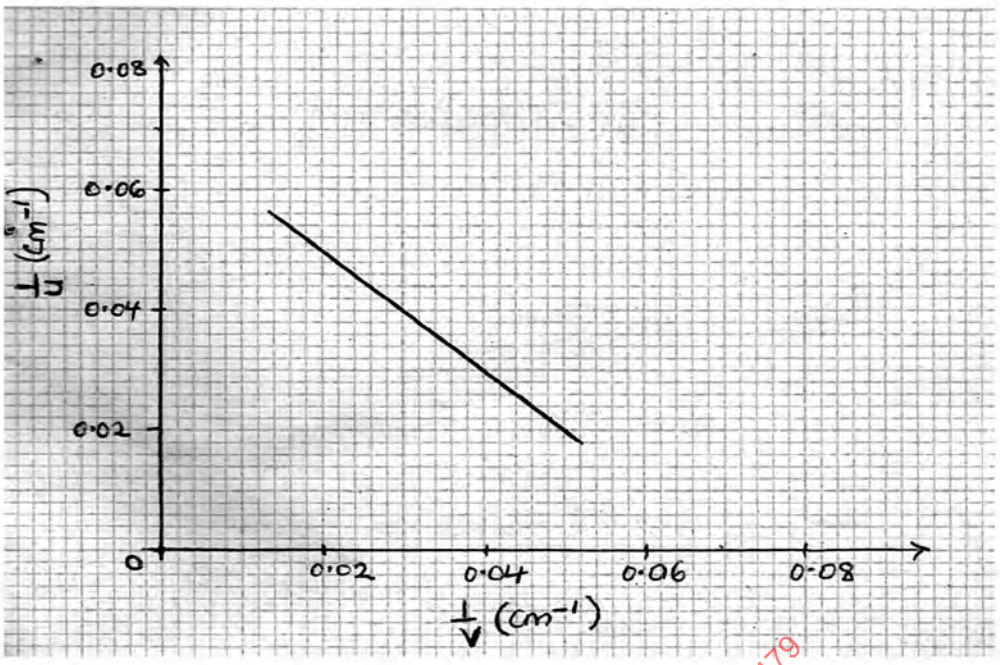
(ii) Sketch the output voltage as observed in the CRO (1mk)

17. (a) Complete the diagram below indicating the rays that will lead to the formation of the image shown below and locate the object position (2mks)



(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. (3mks)

(c) The graph below shows variation of $\frac{1}{u}$ (cm^{-1}) with $\frac{1}{v}$ (cm^{-1}) for an object placed infront of a concave mirror

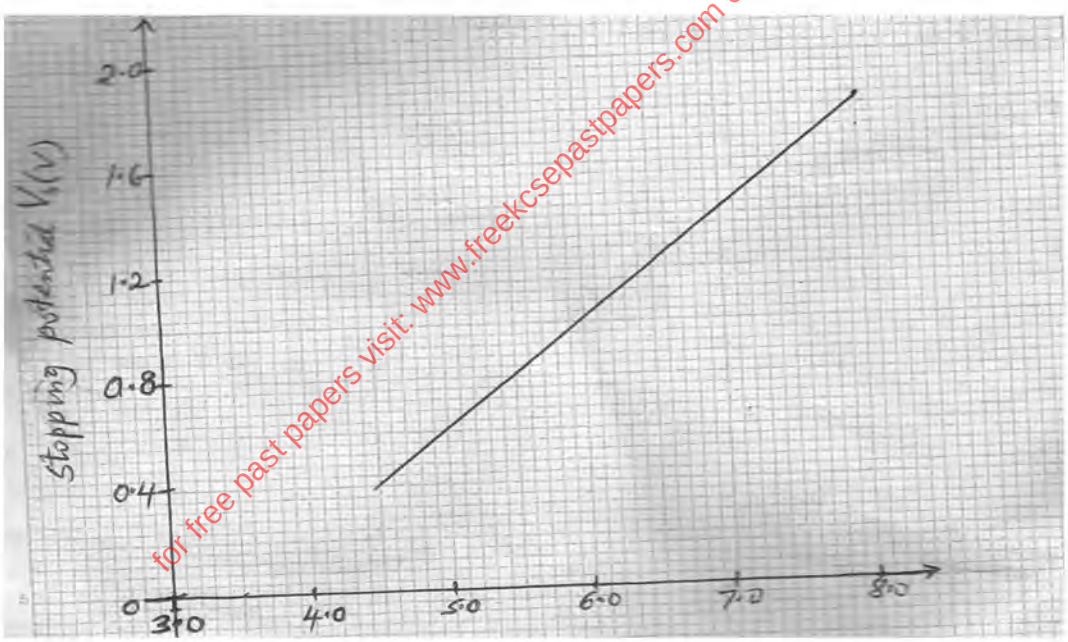


From the graph,

(i) Determine the focal of the mirror. (2mks)

(ii) Determine the image distance when the object is 20cm from the mirror. (2mks)

18. (a) The graph below shows stopping potential V against frequency for a photocell.



Frequency f (x10^{14}Hz)

From the graph determine:

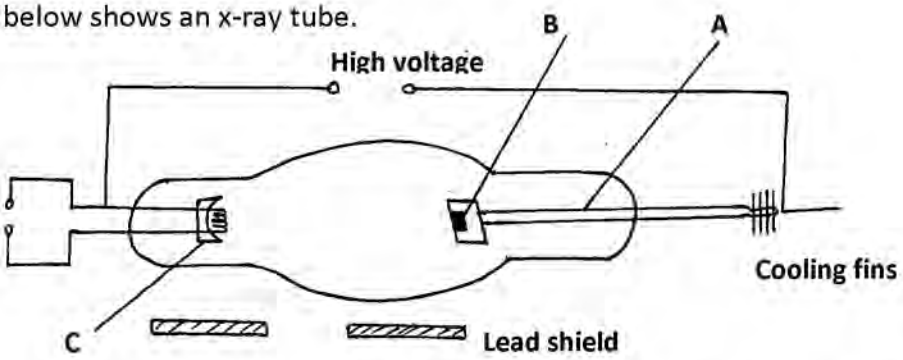
(i) Threshohd frequency (1mk)

(ii) Planck's constant (2mks)

(iii) Work function of the metal (2mks)

(take **e** = 1.6 x 10-19c)

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



(i) Indicate on the diagram the path of the x-ray beam supplied by the tube. (1mk)
(ii) Why is **B** set at an angle of 45° relative to the electron beam. (1mk)
(iii) Why are cooling pins necessary (1mk)
(iv) Why is the tube evacuated. (1mk)
(v) State the function of the part labeled **C** (1mk)

Set11
Paper 3 (Practical)

Part A

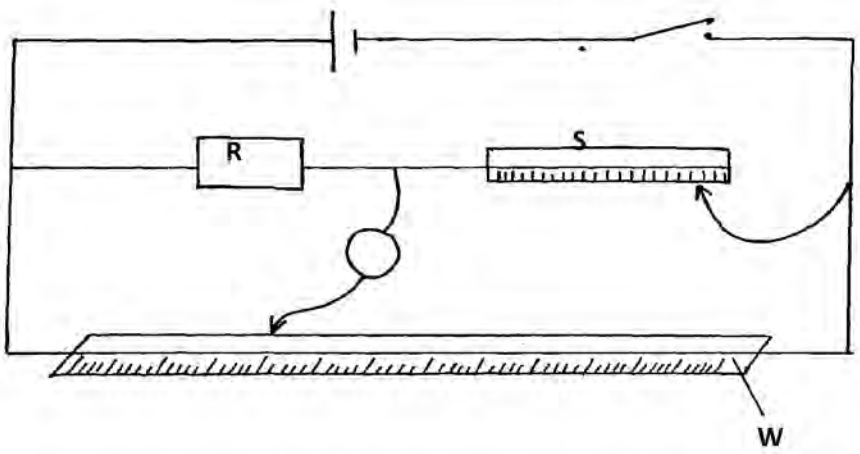
1. Question 1
You are provided with the following apparatus

- One resistor labeled **R**
- A wire labeled **W** mounted on millimeter scale
- A wire lebelled **S** mounted on a millimeter scale
- One dry cell and a cell holder
- One jockey
- One centre zero galvanometer
- Eight connecting wires, four with crocodile clips at both ends
- A micrometer screw gauge
- A switch

Proceed as follows

(a) Determine the average diameter D, of the wire labeled W, using the micrometer screw gauge provided.
D_1=_____mm, (½ mk)
D_2=_____mm (½ mk)

(b) Set up the apparatus as shown in the circuit diagram in figure 1, below.
Use the crocodile clips to fix length **L**, of wire labeled S at 50 cm from the end connected to the galvanometer **G**.



(c) Close the switch, and use the jockey to touch one end of the wire **W**, and then the other end. The deflections on the galvanometer should be in opposite directions, if not check the circuit. Adjust the positions of the jockey along the wire **W** until there is no deflection in the galvanometer. Record the value of **x** and **y**.

X = _____cm (½ mk)

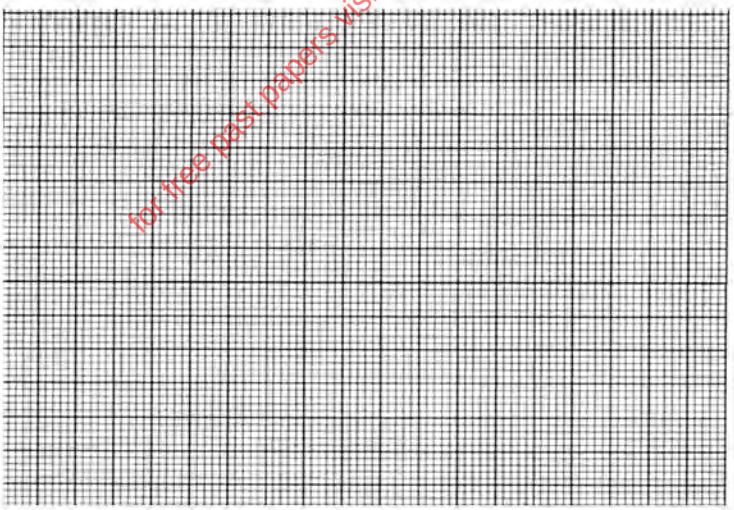
Y= _____ cm (½ mk)

(d) Repeat for other values of **L** in the table

L (cm)	45	40	35	30	25	20
X (cm)						
Y (cm						
$\frac{y}{x}(adp)$						

(3mks)

(e) (i) Plot a graph of $^1/x$ (y- axis) against, **L** (4mks)



(ii) Determine the slope , **m** of the graph. (2mks)

(iii) Given that K = 100D, determine the value of **K** (2mks)

m

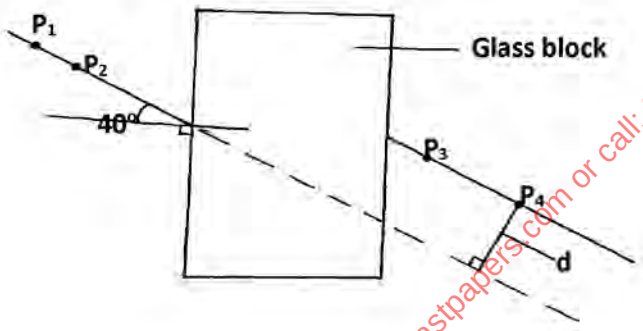
PART B

You are provided with the following apparatus

- A rectangular glass block
- Four optical pins
- A piece of soft board
- A plain sheet of paper
- 4 thumb tacks
-

Proceed as follows

Place the plain sheet of paper on the soft board and fix it using the thumb tacks provided. Place the glass block at the centre of the sheet, draw its outline. Remove the glass block.



(ii) Draw normal at point 2cm from the end of one of the longer side of the block outline.
Draw a line at an angle of $\theta = 40^\circ$ from the normal. Stick two pins p_1 and p_2 vertically on this line.
By viewing through the glass from the opposite side stick two other pins p_3 and p_4 vertically such that they are in line with the images of the first two pins. Draw a line through the marks made by p_3 and p_4 to touch the outline. Extend the line p_1p_2 through the outline (dotted line).
Measure and record the perpendicular distance d_1, between the extended line and the line p_3p_4

d_1 = _____ cm (1mk)

Repeat the procedure in above $\theta = 60^\circ$

Hence find $d = \frac{d_1 + d_2}{2}$

= _____cm (1mk)

NB: the sheet of paper with the drawing **MUST** be handed in together with the question paper.

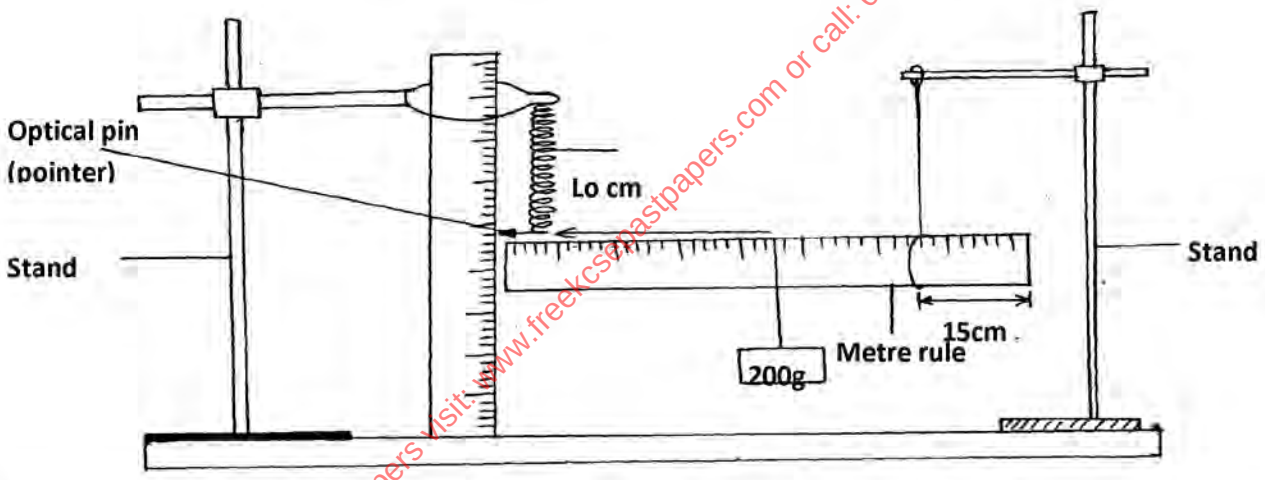
Question 2 A

You are provided with the following apparatus

- Two metre rule (not half metre rules)
- Two stands and two clamps
- Two bosses
- Three pieces of threads
- One optical pin
- A piece of cellotape (and or plasticine)
- A spring
- One mass of 200g
- A stop watch.

Proceed as follows

(i) Set up apparatus as shown in the figure 1 below. Attach the pin (to act as the pointer) at one end of the metre rule using a cellotape.



(ii) Suspend one end of the metre rule with a thread at 5 cm mark from the end

(iii) Suspend the other end with spring also 5cm from the end so that metere rule is horizontal.

(iv) Hold the other rule vertically on the bench so that it is near the end with apointer as shown in the diagram above.

(v) Read the pointer position, Lo_____cm (1mk)

(a) Hang on the horizontal metre rule the 200g mass at a length **l** = 10cm from the spring record the extension, **e**, of the spring in the table below.

(b) Displace the mass slightly downward and release it to oscillate vertically. Take time for 20 oscillation and record in he table below.

(c) Repeat for other position of **L**, of the mass.

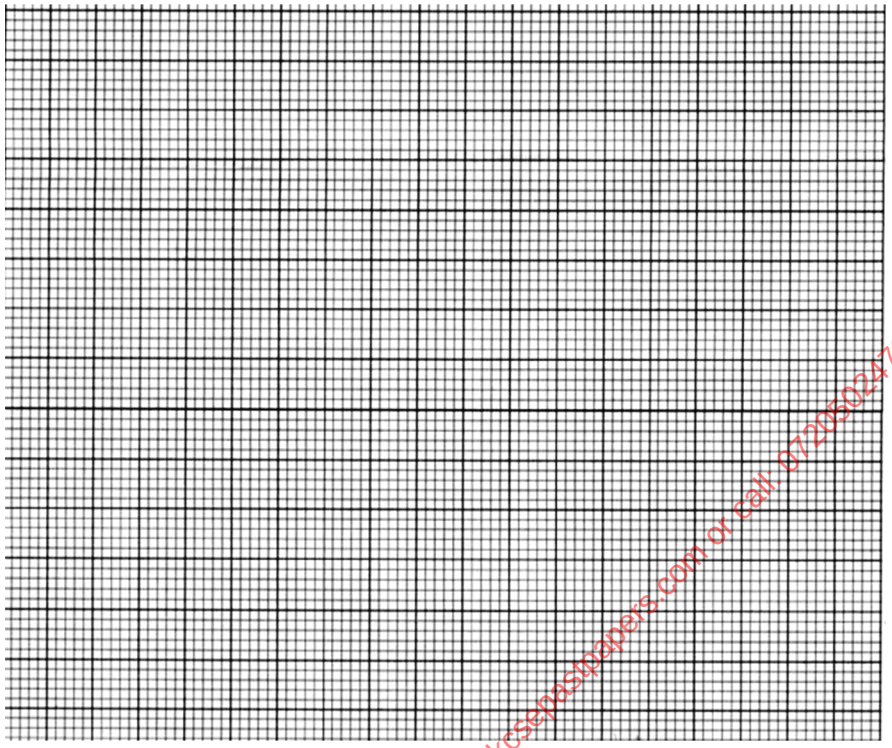
NB: before taking the reading, ensure the oscillation is steady.

Length L (cm)	**10**	**20**	**30**	**40**	**50**

Extension M (cm)					
Time for 20 oscillation (sec)					
Periodic time T (sec)					
T^2 (sec)^2					

(5mks)

(vi) Plot a graph of extension, e (m) (y – axis) against T^2 $(s)^2$



(vii) Calculate the gradient of the graph (2mks)

(viii)Given that $e = \frac{RT^2}{4\pi^2} + C$, determine the value of **R** (3mks)

Part B

(b) You are provided with a lens **P** a lens holder a white screen and a 30cm rule

Procedure:

(i) Set the apparatus as shown in figure 4 below. Focus a sharp image of a distant object on the screen. The object should be at least 10cm away.

(a) Measure he distance **x** in cm between the lens and the screen at which a sharp image is obtained repeat this two times, using different objects and record your readings in table 3 below.

Table 3

Object	Distance X, (cm)
1	
2	

(2mks)

(ii) Calculate the average value of **x** (2mks)

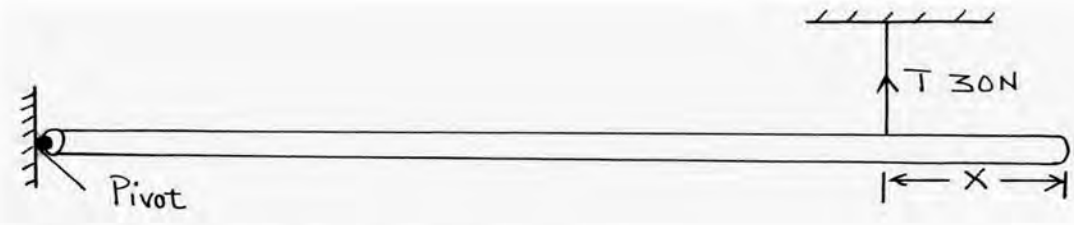
(iii) What is the physical significance of the result obtained in (iii) above ? (1mk)

Set12

232/1
PHYSICS
PAPER 1

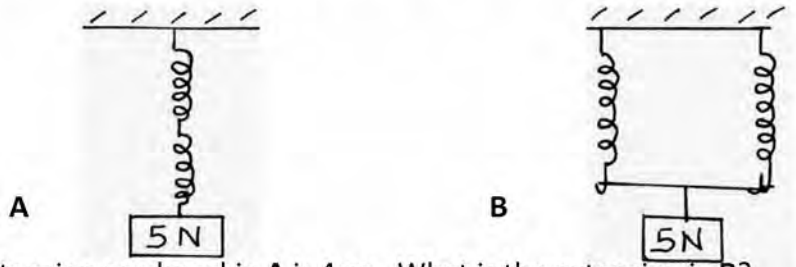
SECTION A: (25 MARKS)

1. The water level in a burette is 40.6cm³. 50 drops of water each of volume 0.2cm³are added to the water in the burette. What is the final reading of the burette?(2mks)
2. State the reason why it may be very difficult to suck a liquid using a drinking straw on the surface of the moon. (1mk)
3. A piece of thick glass removed from hot water and dipped into cold water will crack; while thin glass does not crack. Explain this observation. (1mk)
4. Using particulate nature of matter, explain why a solid expands when heated?(2mks)
5. A metal bench feels colder than a wooden one. When one sits on it on a cold morning even though both are at same temperature. Explain this observation. (2mks)
6. The uniform rod of length one metre shown in the figure below is in equilibrium.



Find the value of χ if the weight of the rod is 40N.

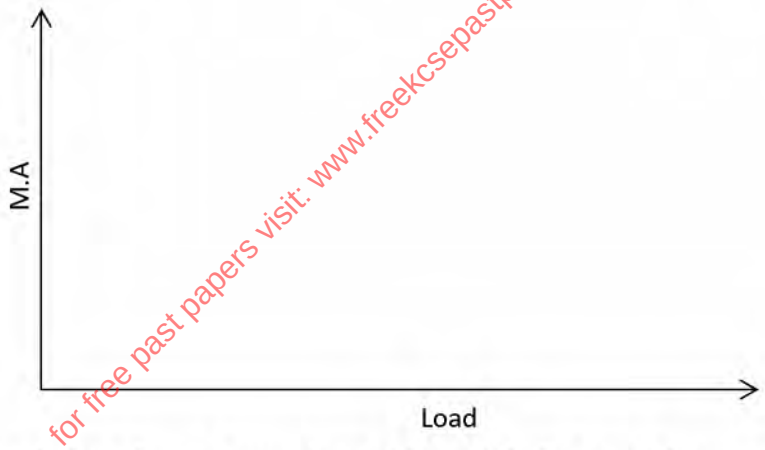
7. The springs in the figure below are identical.



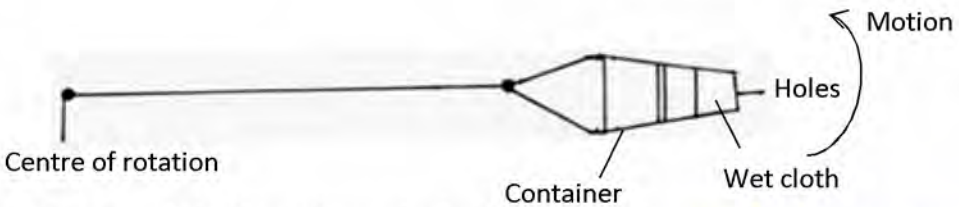
The extension produced in **A** is 4cm. What is the extension in **B**? (3mks)

8. A lawn sprinkler has 20 holes each of cross-sectional area $1.25 \times 10^{-3}cm^2$ and is connected to a horse-pipe of cross-sectional area $2.4cm^2$. If the speed of the water in the horse pipe is 1.5m/s. Calculate the speed at which the water emerges from the holes. (3mks)

9. On the axes provided, sketch a graph of Mechanical Advantage (M.A) against load for a pulley system. (1mk)



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

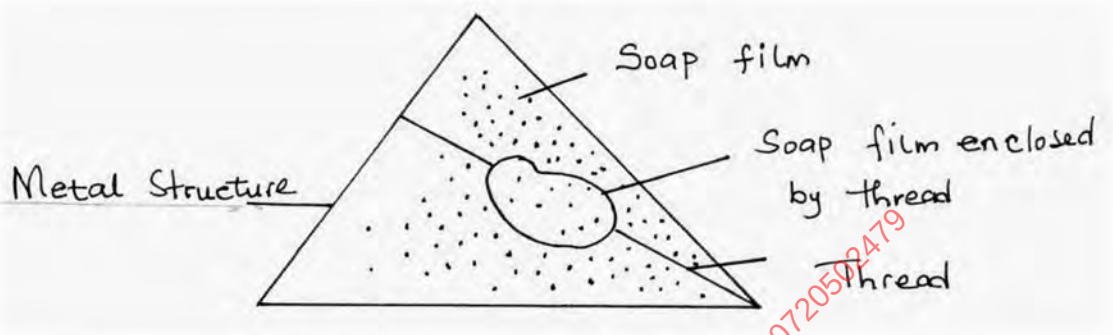


Explain how the rotation of the container causes the clothes to dry so fast.(2mks)

11. A ball rolls off a platform of height 1.8m at a horizontal speed of 15m/s. How far off the edge of the platform does it land? (Take g = 10ms^{-2}). (3mks)

12. State the law that relates the volume of a gas to the temperature of the gas. (1mk)

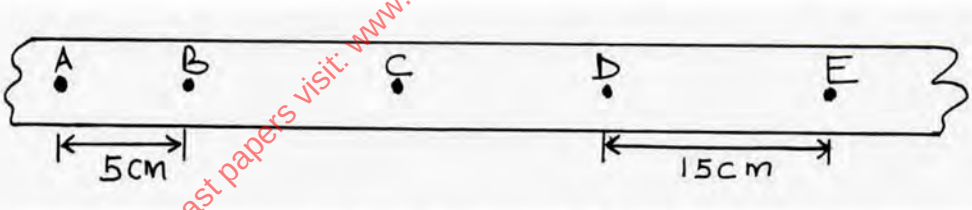
13. The diagram show a metal wire structure with a loop of thread inside after it was dipped into a soap solution.



Sketch the appearance of the thread loop after the film enclosed by the tread is broken. (1mk)

SECTION B: (55 MARKS)

14. The figure below shows a section of a ticker-tape produced by a ticker-timer operating at a frequency of 50Hz.



(a) (i) Find the average velocity between **A** and **B**. (2mks)

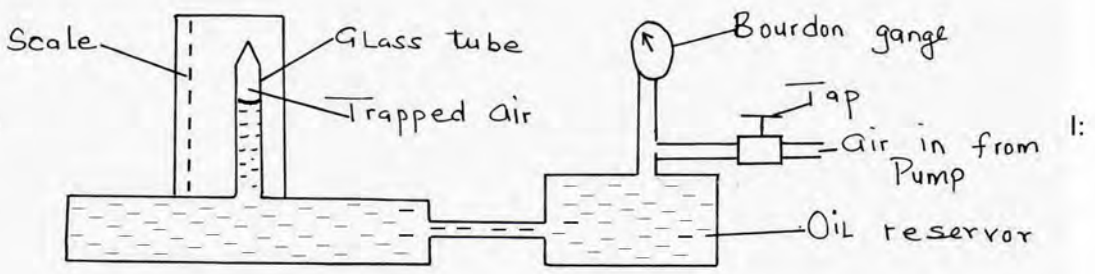
(ii) Find the average velocity between **D** and **E**. (2mks

(iii) Determine the average acceleration. (2mks)

(b) (i) Explain why bodies in circular motion undergo acceleration even when their speed is constant. (2mks)

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

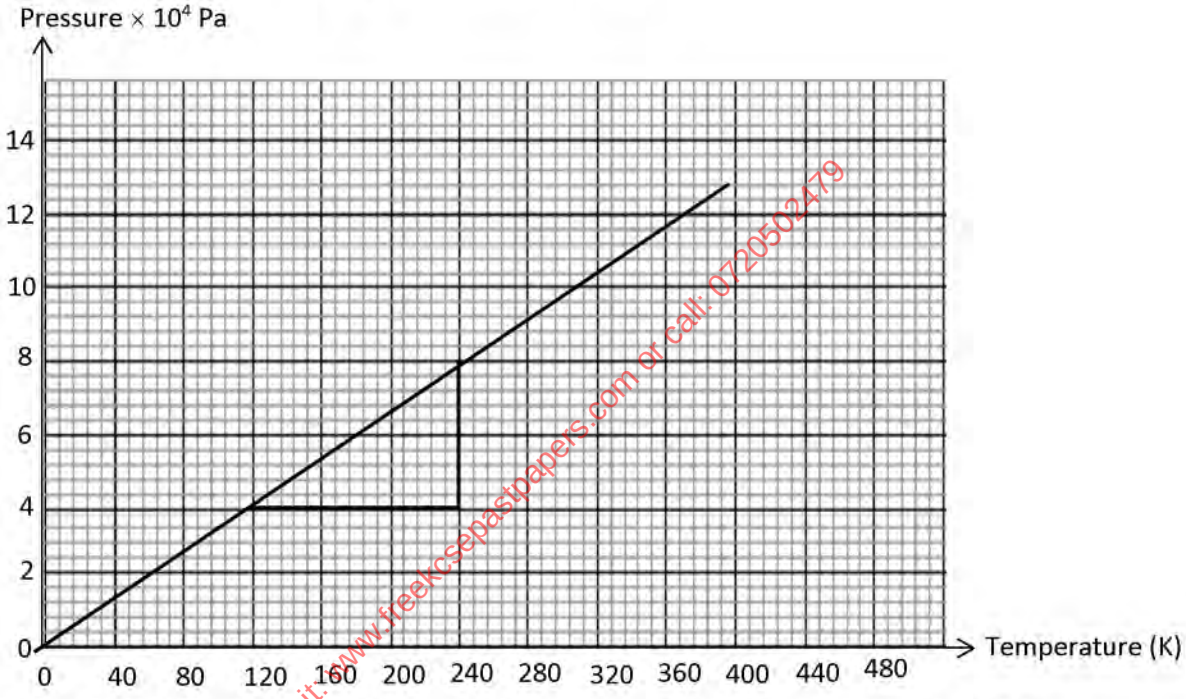
15. (a) (i) The figure below show a set-up that may be used to verify Boyle's Law.



Describe the measurements that should be taken in this experiment. (2mks

(ii) Explain how the measurements taken would be used to verify Boyle's Law. (3mks)

(b) The graph below shows the relationship between the pressure and temperature for a fixed mass of an ideal gas at constant volume.



Given that the relationship between the pressure P and temperature T in Kelvin is in the form

$P = kT + C$ where k and C are constants.

(i) Determine from the graph the values of k and C. (2mks)

(ii) Why would it be impossible for the pressure of the gas to be reduced to zero in practice? (1mk)

A gas is put into a container of fixed volume at a pressure of 2.1×10^5Pa and temperature of 50°C. The glass is then heated to a temperature of 400°C.

Determine the new value of pressure. (3mks)

16. (a) Distinguish between latent heat of fusion and specific latent of fusion. (1mk)

Figure 8 shows a block of ice. A thin copper wire with two heavy weights hanging from its ends-passes over the block. The copper wire is observed to

pass through the block of ice without cutting it in a process known as relegation.

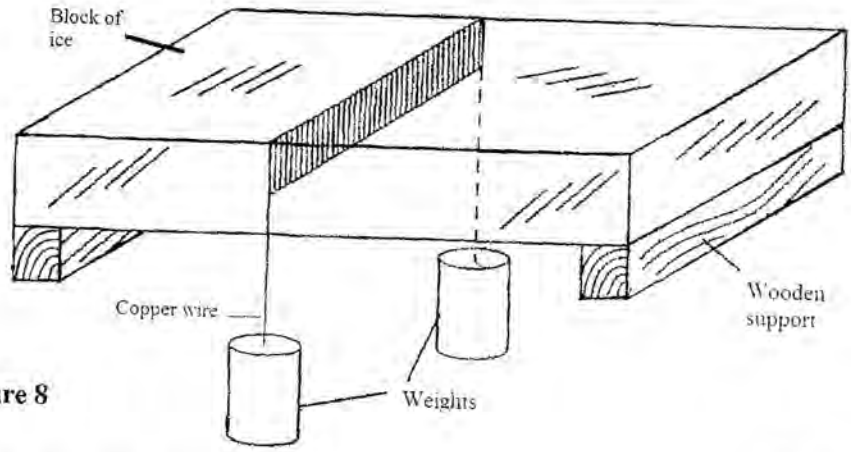


Figure 8

(i) Explain this observation. (3mks)

What would be the effect of replacing the copper wire with a cotton thread? Explain. (2mks

Figure 9 shows one method of measuring the specific latent heat of fusion of ice. Two funnels **A** and **B** contain crushed ice at 0°C.

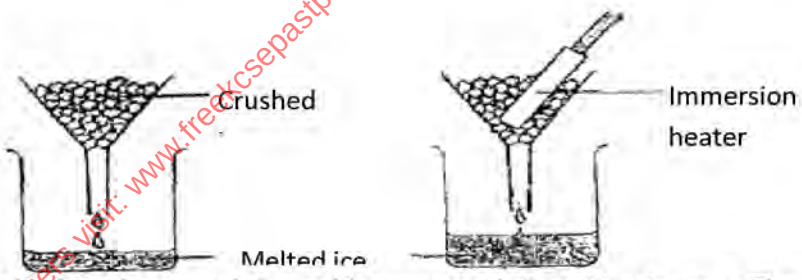


Figure 9

The mass of melted ice from each funnel is measured after 11 minutes. The results are shown below.

Mass of melted ice in A = 24g

Mass of melted ice in B = 63g

(i) What is the reason for setting up funnel A? (1mk)

Determine the:

I quantity of heat supplied by the heater. (2mks)

II mass of ice melted by the heater. (1mk)

III specific latent heat of fusion of ice. (3mks)

17. (a) (i) State the Archimedes Principle. (1mk)

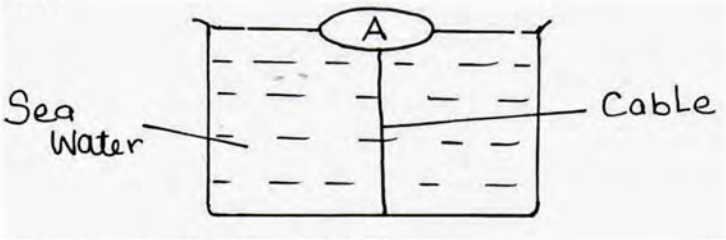
An object weighs 1.05N in air and 0.66N when fully immersed in water and 0.73N when fully immersed in a liquid. If the density of water is 1000kgm^{-3}.

Find the density of the liquid. (3mks)

(b) (i) Define the law of flotation. (1mk)

(ii) Give a reason why a steel rod sinks in water while a ship made up of steel floats on water. (1mk)

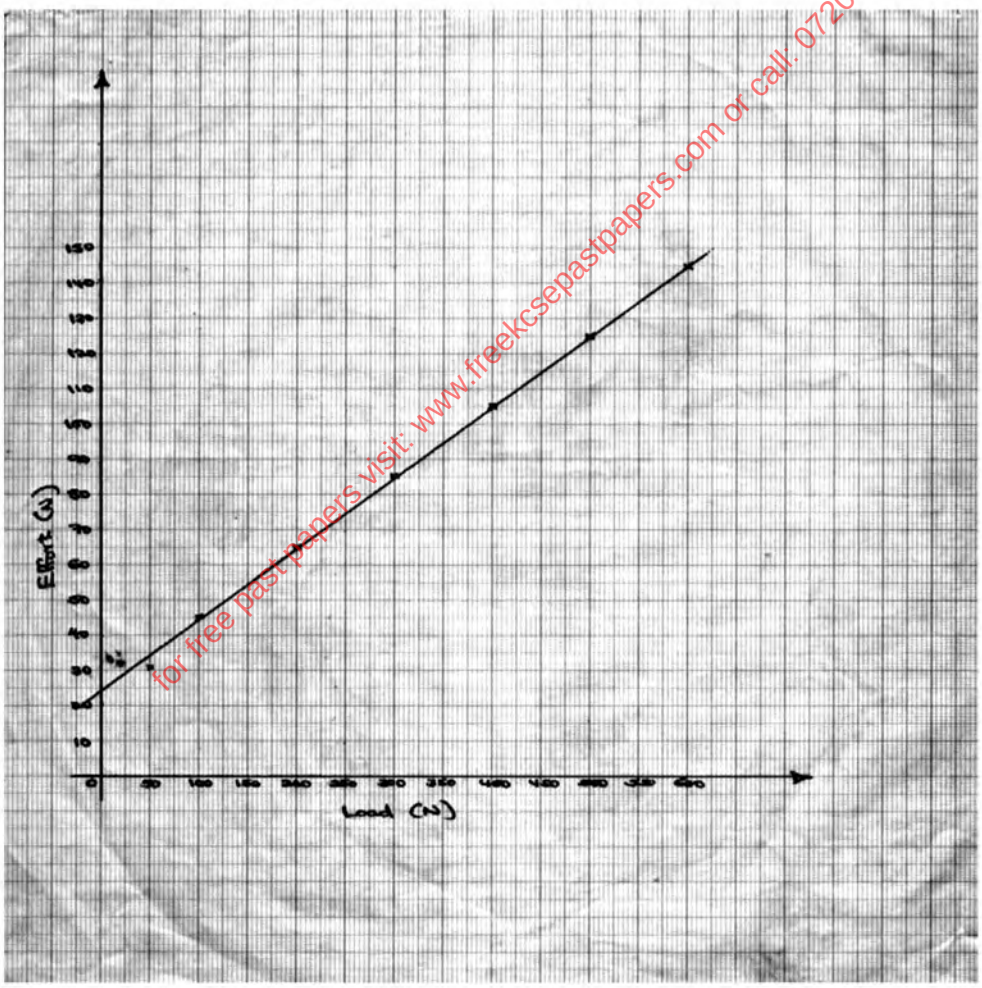
(iii) The figure below shows a buoy, A, volume 45 litres and mass of 9kg. It is held in position in sea water of density 1.03g/cm³ by a light cable fixed to the bottom so that $\frac{7}{8}$ of the volume of the buoy is below the surface of sea water.



Determine the tension T in the cable. (3mks)

18. (a) Define mechanical advantage of a machine. (1mk)

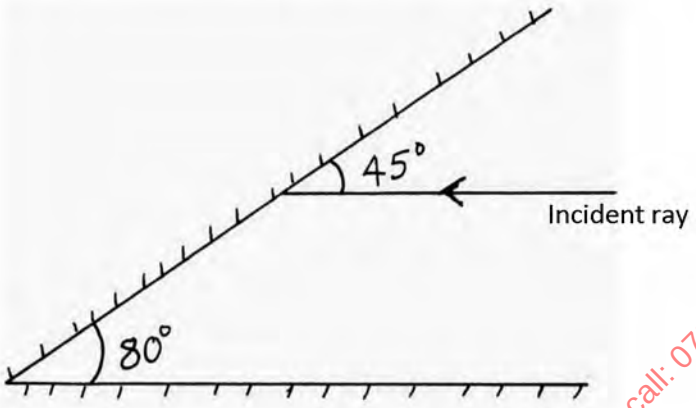
In an experiment to investigate the performance of a pulley system with a velocity ratio of 5 and the following graph was plotted.



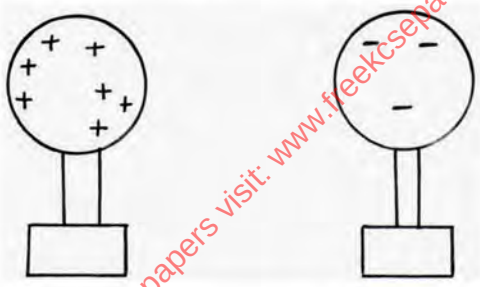
Set12
Paper 2 (Theory)

SECTION A: (25 MARKS)

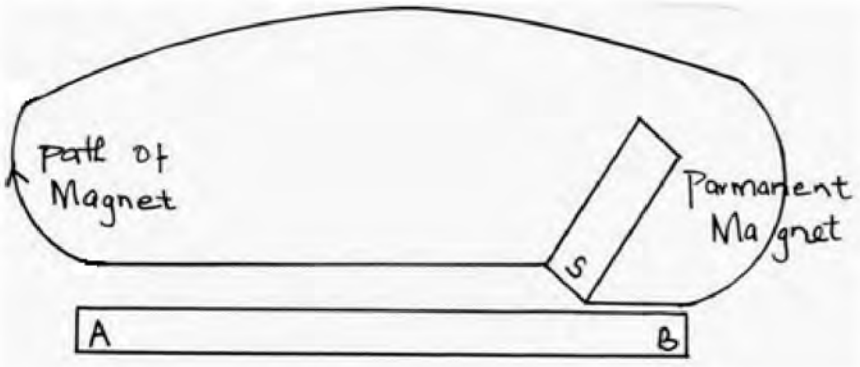
1. The figure below shows two mirrors M_1 and M_2 placed at an angle of 80°. A ray of light incident to the mirror makes an angle of 45° with the mirror M_1. Find the angle the ray turns after reflection n the two mirrors. (3mks)



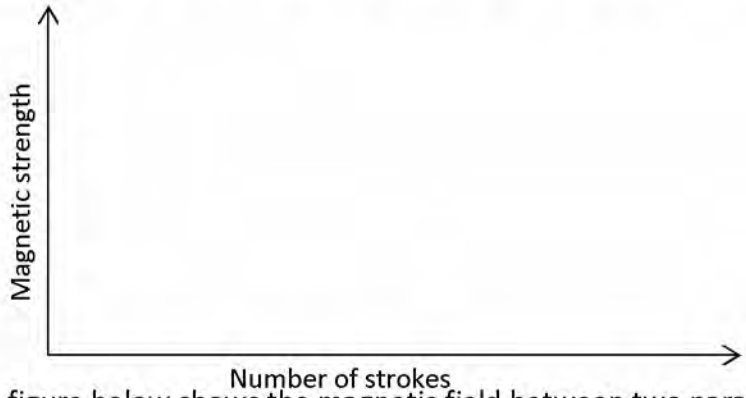
2. The figure below shows two charged spheres A and B. If the two spheres are brought into contact and then separated complete the diagram showing charge distribution on the two spheres after separation. (2mks)



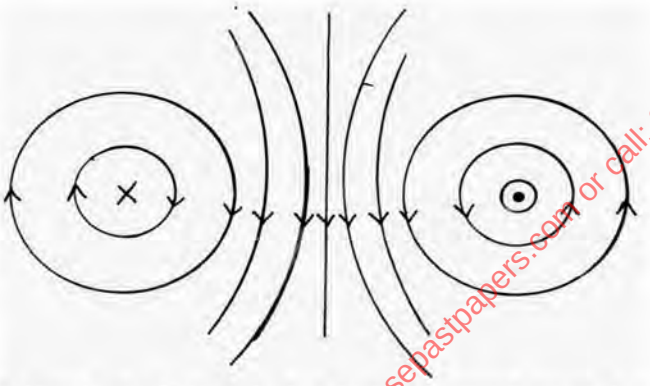
3. Explain how polarization reduces the emf in a simple cell. (1mk)
4. The diagram below shows a method of magnetization.



Ferromagnetic material is being magnetized sketch a graph to show how the strength of a magnet being created varies with the number of strokes. (2mks)

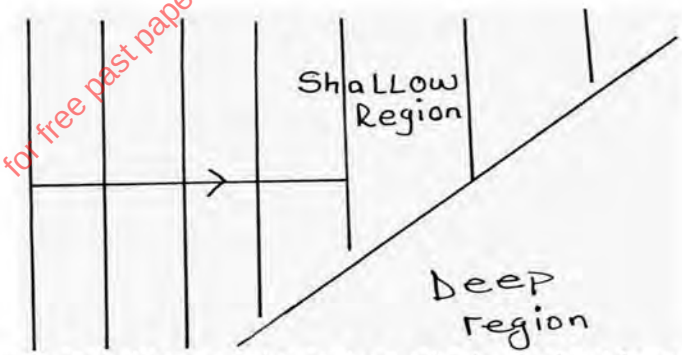


5. The figure below shows the magnetic field between two parallel current carrying conductors **A** and **B** placed close to one another current flows in the opposite directions.



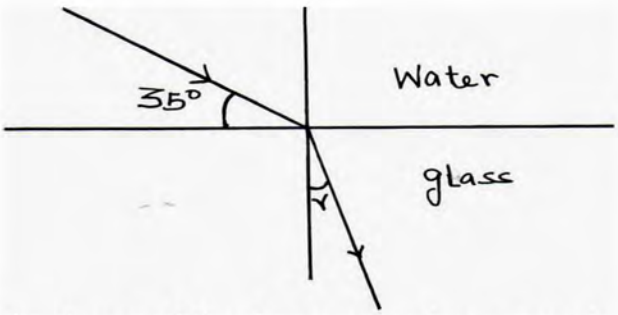
Indicate the direction of force F, due to the current on each conductor.

6. The figure below show water waves moving from a shallow region to a deep region. Complete the diagram to show the appearance of the waves in the deeper region. (2mks)



7. An echo sounder produces a pulse and an echo is received from the sea bed after 0.4 seconds. If the speed of sound in water is 1500m/s. Calculate the depth of the sea bed. (2mks)

8. The diagram below shows a ray of light travelling from water to glass given that the refractive index of water and glass are 1.33 and 1.5 respectively find the angle of refraction in glass. (3mks)

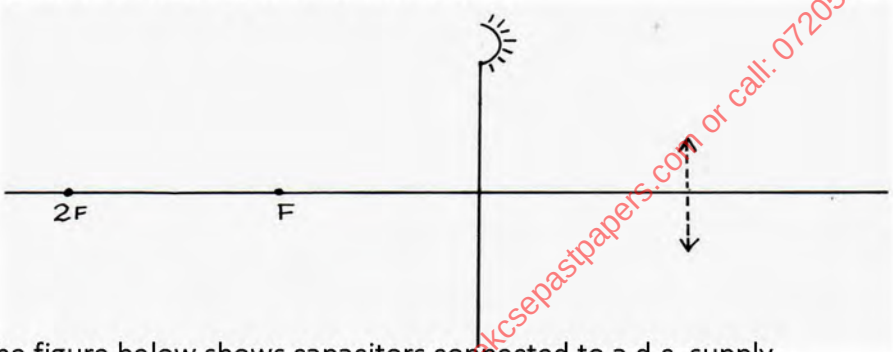


9. Below is part of the electromagnetic spectrum in order of increasing wavelength.

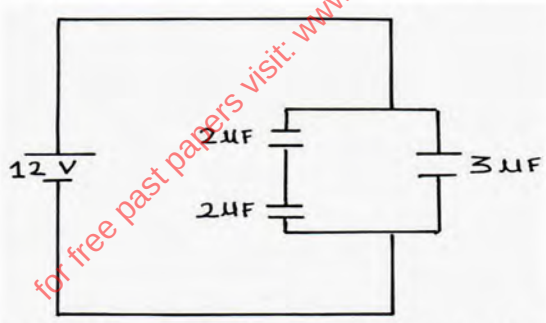
A	B	C	Visible light	Infra-red	D	E

How are waves **A** produced? (2mks)

10. The figure below shows an image formed by concave mirror. Complete the drawing rays and locate the position of the object. (2mks)



11. The figure below shows capacitors connected to a d.c. supply.

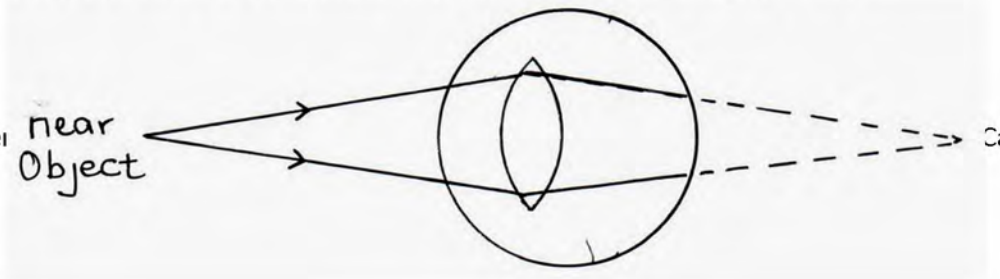


Determine the charge stored in the 3μF capacitor. (3mks)

12. A pendulum bob takes 0.5 seconds to move from its mean position to a maximum displacement position. Calculate its frequency. (2mks)

SECTION B: (55 MARKS)

13. (a) A defective eye focuses a near object as shown in the figure below.



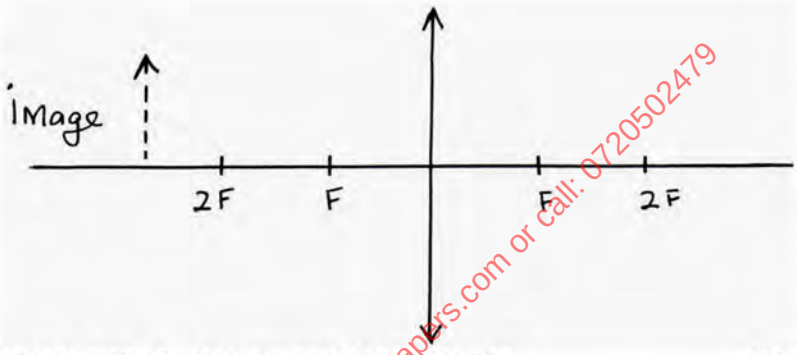
(i) State the defect. (1mk)

(ii) Suggest a suitable lens that can be used to correct the defect. (1mk)

(iii) Draw a diagram to illustrate the correction of the defect. (2mks)

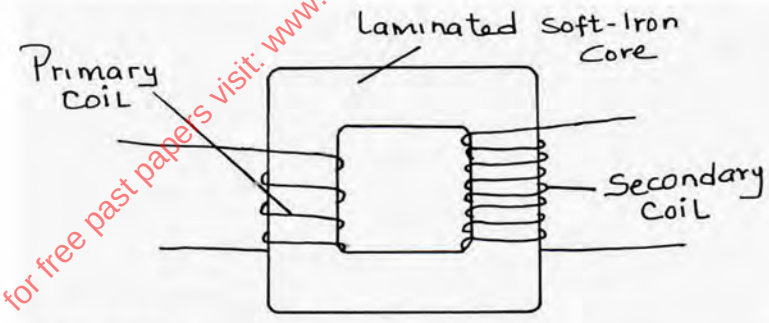
(b) (i) A real image, half the size of the object is formed by a lens. If the distance between the object and the image is 450mm. Determine the focal length of the lens. (3mks)

(ii) The figure below shows a virtual image formed by a convex lens. Complete the ray diagram to show the position of the object.(3mks)



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

(b) The figure below shows a simple transformer. Study it and answer the questions that follow.



(i) Explain why the core is a continuous loop. (1mk)

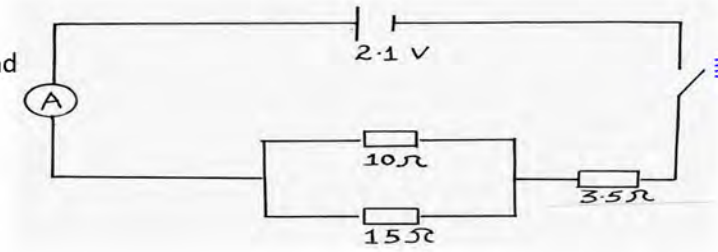
(ii) Give a reason as to why the core is laminated. (1mk)

(iii) State and explain which coils are thicker. (2mks)

State **one** difference and **one** similarity between a step up transformer and an induction coil. (2mks)

State **two** advantages of the use of alternating voltage for the transmission of electrical energy. (2mks)

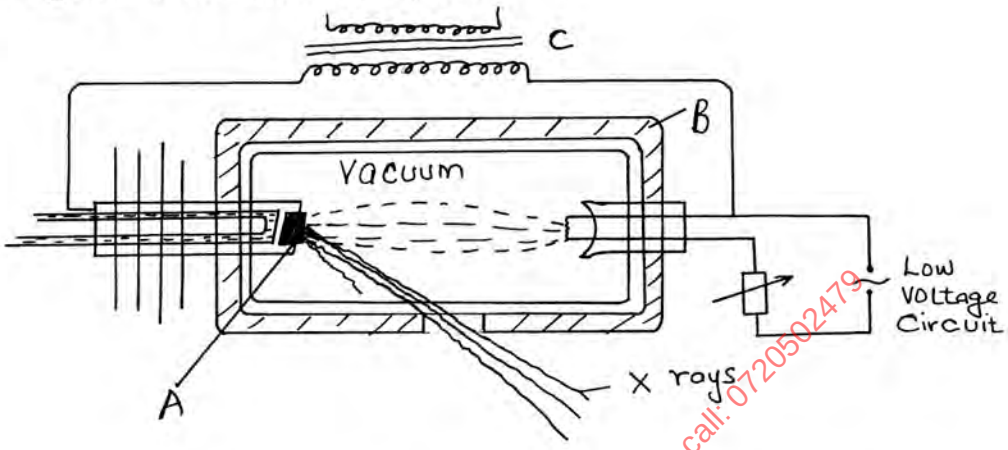
In the circuit below, the e.m.f of the battery is 2.1V and has an internal resistance of 0.5Ω.



(i) Determine the effective resistance in the circuit. (2mks)

(ii) Determine the ammeter reading when the switch is closed.(2mks

15. (a) Figure 6 below shows an X-ray tube.



(i) Name the elements used in making the parts labelled **A** and **B**.(2mks)

(ii) Explain the use of the part labelled **C**. (1mk)

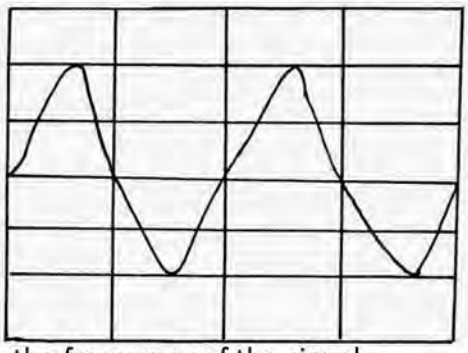
(iii) Explain how the X-rays are produced. (2mks)

(iv) Why is the X-ray tube evacuated? (1mk)

(b) The penetrating power of X-rays is normally varied depending on the intended use. Explain briefly how this is done. (1mk)

(c) The energy of X-rays is 1.989×10^{-14} joules. Given that the speed of light is 3.0×10^{8}m/s and plank's constant is 6.63×10^{-34}JS. Find the wavelength of the X-rays. (2mks)

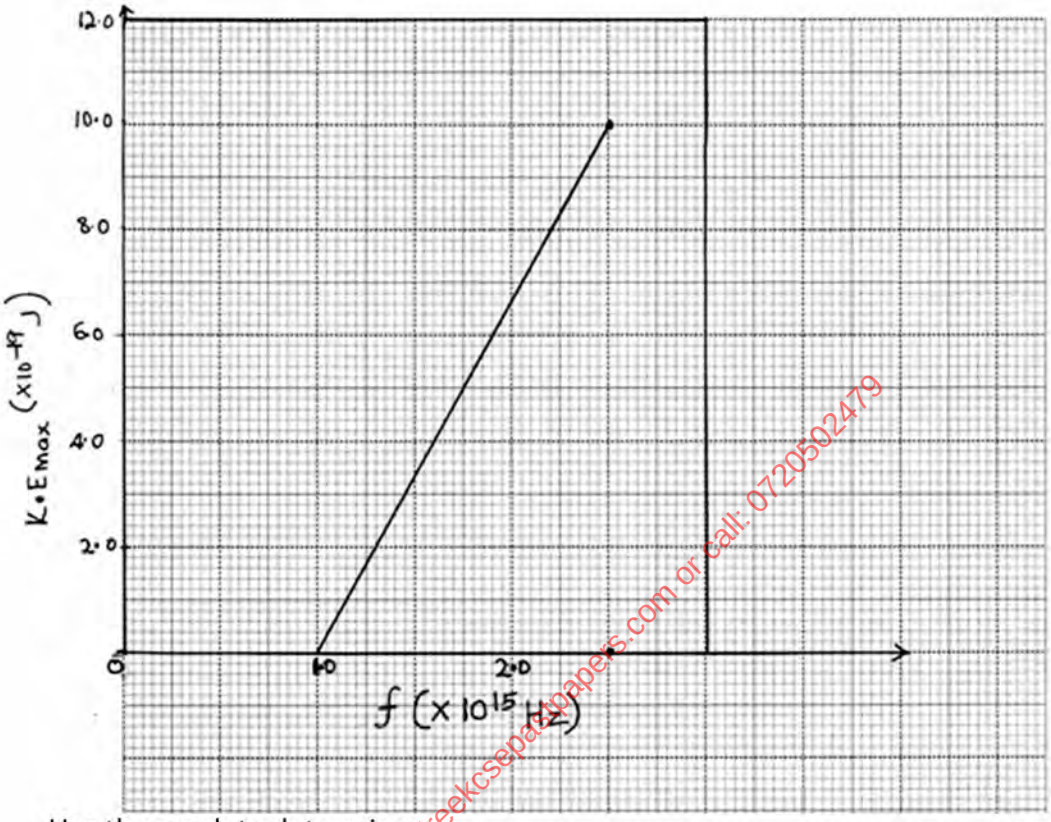
(d) The figure below shows a wave form displayed on the screen of C.R.O when the time base
is set at 20ms per division.



Determine the frequency of the signal. (3mks)

16. (a) Give a condition necessary for electrons to be emitted from the cathode of a photocell. 1mk)

(b) In an experiment using a photocell, ultraviolet light of varying frequency strikes a metal surface. The maximum Kinetic Energy ($K.E_{max}$) of photoelectrons for each frequency f is measured. The graph below shows how the maximum kinetic energy varies with the frequency f.



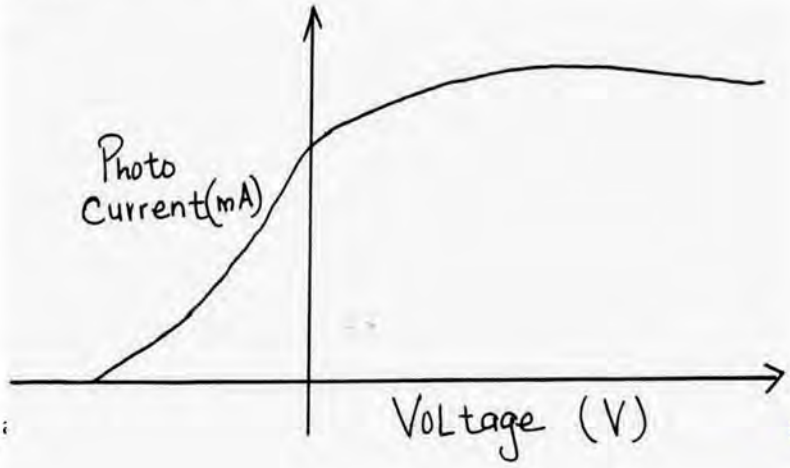
Use the graph to determine:

(i) The Threshold frequency, f. (1mk)

(ii) Planck's constant, h. (3mks)

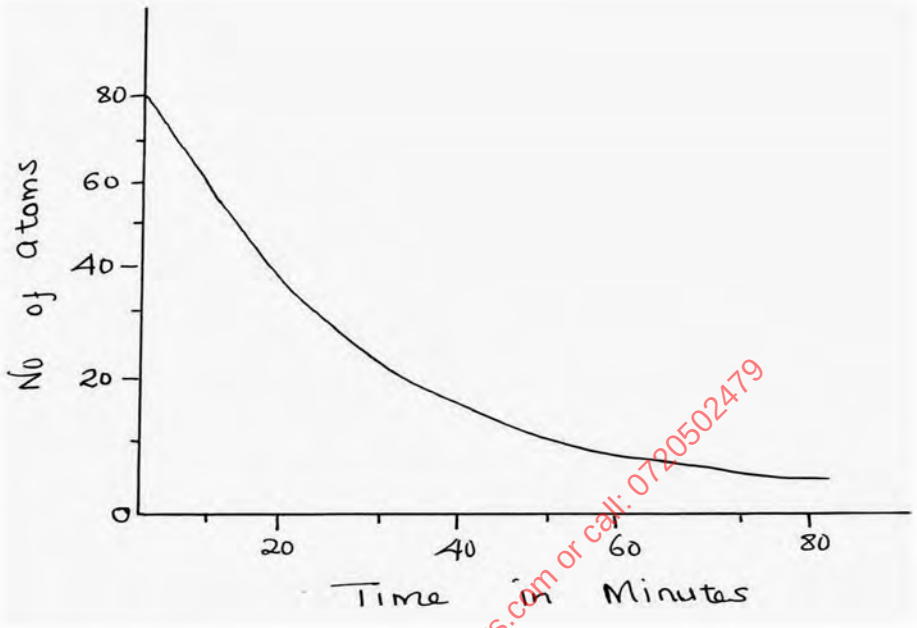
(iii) Work function of the metal. (3mks)

(c) The figure below shows the variation of photoelectric current with applied voltage when a surface was illuminated with light of a certain frequency. On the same axes, sketch the graph when a light of higher intensity but same frequency is used to illuminate the same surface. (1mk)



17. (a) (i) Define the term half life of a radioactive material. (1mk)

(b) The figure below shows a decay of a certain element. The diagram is drawn to scale.



From the graph find:

(i) Half life of the element. (1mk)

(ii) Number of half lives undergone when the count rate is 10 atoms. (2mks)

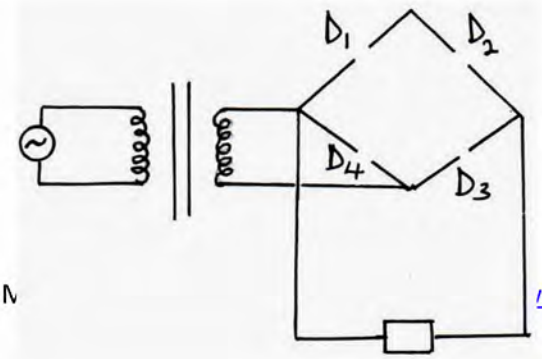
(iii) The following is part of a radioactive decay series.

$$^{232}_{90}Th \xrightarrow{\beta} {}^{a}_{91}X \xrightarrow{Y} {}^{228}_{b}Y$$

Determine the value of 'a' and 'b'. (2mks)

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

(b) The diagram below shows a bridge rectifier for alternating current. Complete the diagram by placing the diodes in the correct order. (2mks)



(c) Explain why a bridge rectifier circuit is better than a single diode rectifier circuit. (1mk

(d) What happens to depletion layer when diode is reverse biased. (1mk)

From the graph above, find:

(i) The effort when the load is 450N. (1mk)

(ii) M.A when the load is 450N. (2mks)

(iii) The efficiency corresponding to the load of 450N. (2mks)

(b) Thendu uses the system in (b) to lift a body of mass 50kg. It rises with a velocity of $0.15ms^{-1}$. Determine the power developed by Thendu. (3mks)

(d) (i) State the law of conservation of linear momentum. (1mk)

An object of mass 150kg moving at $20ms^{-1}$ collides with a stationary object of mass 90kg. They fuse after collision. Determine their common velocity after collision.(3mks)

Set12
Paper 3 (Practical)

1. You are provided with the following apparatus:

- Two optical pins mounted on corks.
- Candle.
- Metre rule.
- Screen.
- White sheet of paper.
- Lens and lens holder.
- Plane mirror.
- Clamp stand.
- Boss and a clamp.
- Piece of cellotape.
- Vernier calipers.

(a) Set up your apparatus as in figure 2 such that the tip of the cork is vertically above the center of lens.

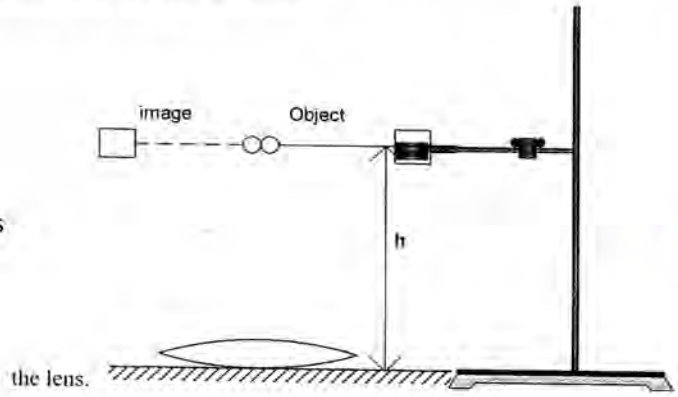


Figure 2

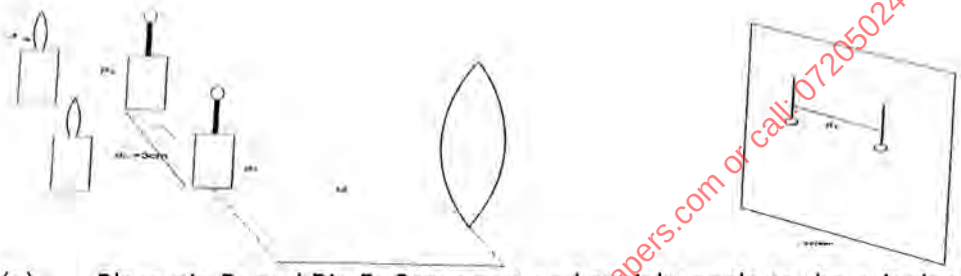
(b) Raise the cork until it coincides with is image without any parallax.

(c) Measure the height h. h = _____ cm (2mks)

(d) Measure the thickness of the lens t. t = _____ cm (1mk)

(e) Calculate the focal length from $f = \frac{2h-t}{2}$ f = _____ cm (1mk)

PART B



(a) Place pin P_1 and Pin P_2 3cm apart and at right angle to the principal axis of the convex lens.

(b) Place the candle behind P_1 to illuminate it.

(c) Fix the white sheet of paper on the screen using a cello tape.

(d) Place the screen in front of the lens and move it until a shape image of pin appear on the screen.

(e) Draw a line against image of P_1.

(f) Without moving the screen, move the candle behind P_2 so that a shape image of P_2 appears on the screen.

(g) Draw a line against the image of P_2 and measure the distance d1, between the two images.

(h) Calculate the magnification from M = $\frac{d_1}{d_0}$.

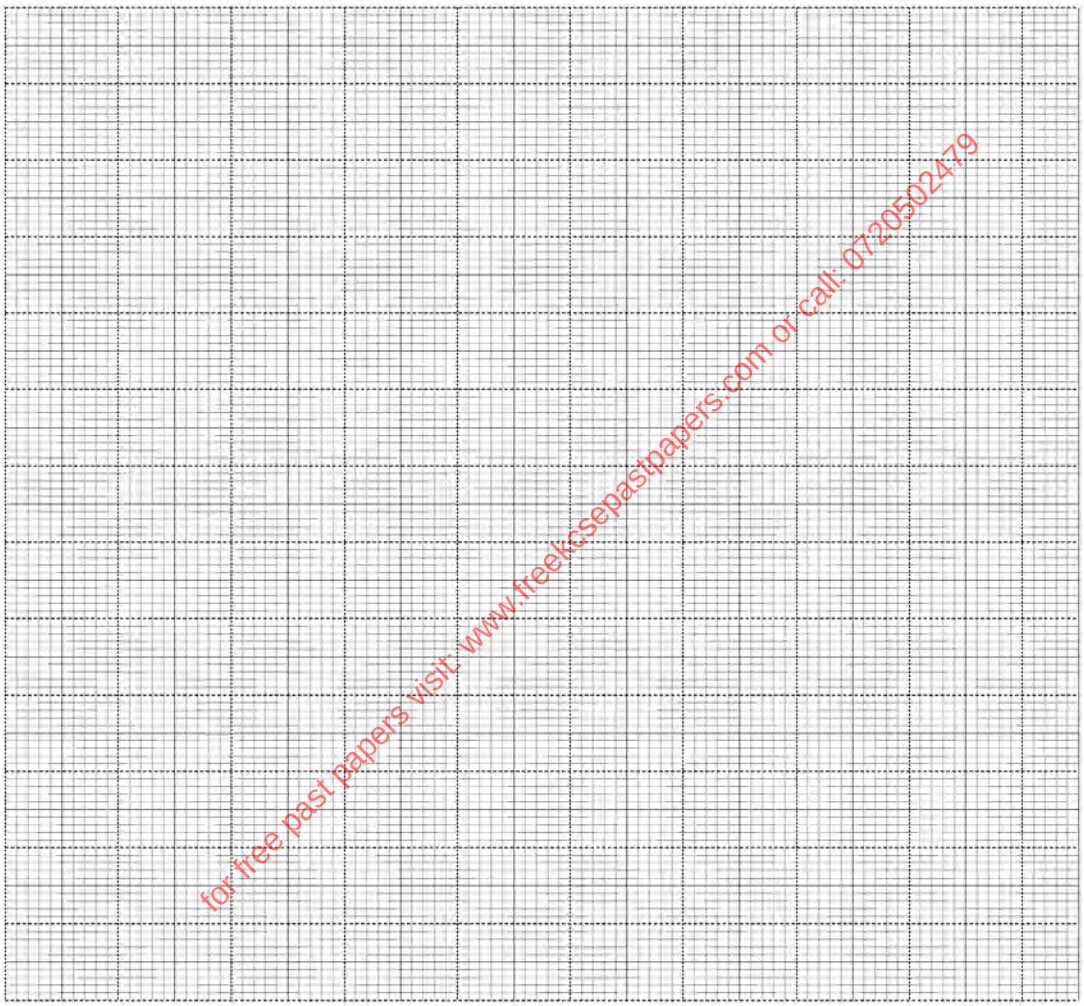
(i) Complete the table using other values of the objects distances (U) in the table.

	Object distance U(cm)	d_1(cm)	Magnification (M)	$\frac{1}{M}$
1.	23.5			

2.	26.5			
3.	30.0			
4.	35.0			
5.	40.0			
6.	45.0			
7.	50.0			

(5mks)

(j) Plot a graph of U (cm) against $\frac{1}{M}$ (5mks)



(k) Determine the gradient of the graph. (3mks

(l) Given that $\frac{U}{f} = \frac{1}{M} + 1$ determine the focal length of the lens. (2mks)

(m) Calculate the average value of focal length. (1mk)

2. You are provided with the following apparatus.

- 2 new dry cells size D

- A cell holder.
- One 100cm resistance wire mounted on millimeter scale.
- 1 switch.
- 1 Voltmetre 0 – 3V.
- 1 Ammeter 0 – 1A.
- 8 connecting wires (4 with at least 1 crocodile clip).
- Resistor wire mounted on cardboard.

(a) Connect the circuit as shown below in figure 3.0.

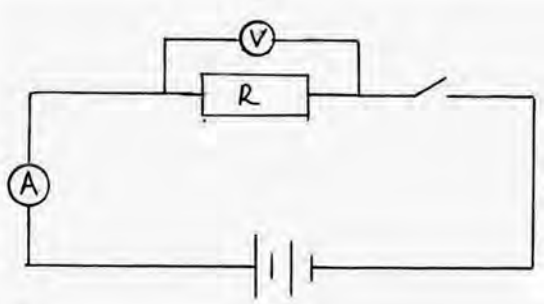


Figure 3.0

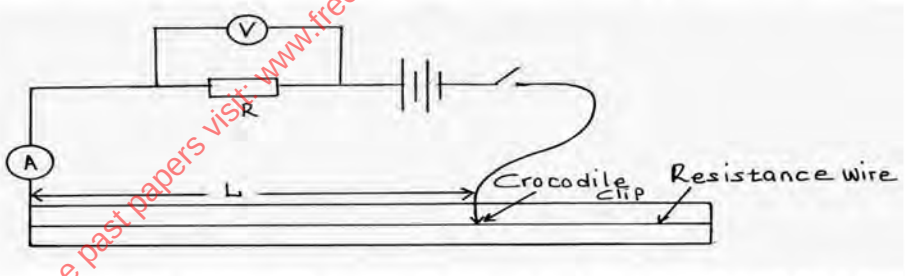
Record the reading of

(i) Ammeter, I = _____ A (1mk)

(ii) Voltmeter, V = _____ V (1mk)

(iii) Given that $K = \frac{V}{I}$, find K = _____ (1mk)

(b) Disconnect figure 3.0 above and arrange the apparatus as shown below.



(i) Adjust the position of crocodile clip on the resistance wire to a point such that L = 10cm.

(ii) Record in the table 2, the value of p.d across R and corresponding current through R.

(iii) Repeat procedure in (2) above for L = 20, 30, 40, 50, 60, 70cm.

L(cm)	10	20	30	40	50
V(V)					
I(A)					

(5mks)

(iv) On the grid provided plot the graph of V (Y-axis) against I (X-axis). (5mks)

(v) Find the slope of the graph. (2mks)

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

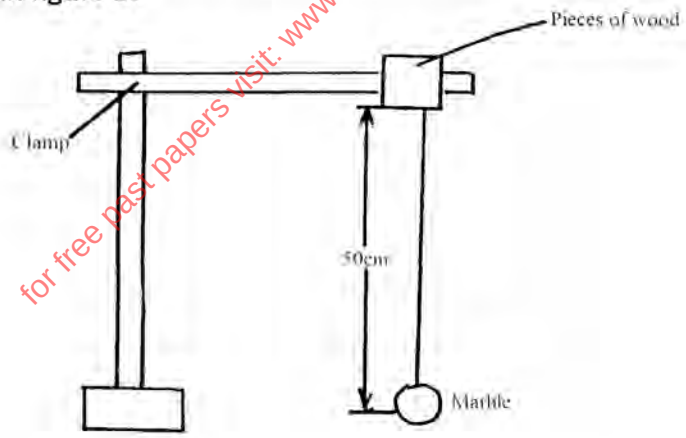
PART B

You are provided with the following:

- A 70cm long thread.
- Stopwatch.
- Metre rule.
- Clamp, boss and retort stand.
- Small pieces of wood.

Proceed as follows:

(i) Using the provided thread, tie the marble to be used as a pendulum clamp the thread so that the length of the pendulum to the centre of the marble is 50cm as in figure 3.



Displace the marble slightly so as to oscillate along the vertical plane. Time and record the time, t, for 20 oscillations.

t = _____ S (1mk)

(ii) If the oscillation of the marble is given by the formula $T^2 = \frac{4\pi^2 \ell}{g}$.

Use the values in part (i) above to determine the value of g. (3mks)

Set13

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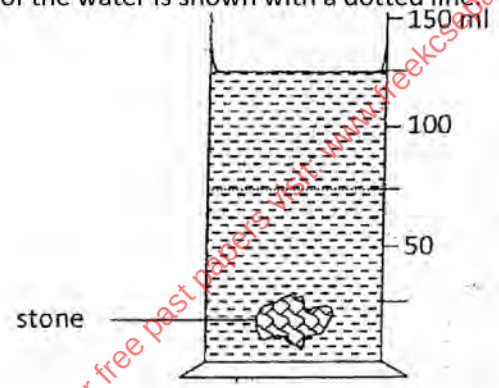
PHYSICS
PAPER 1

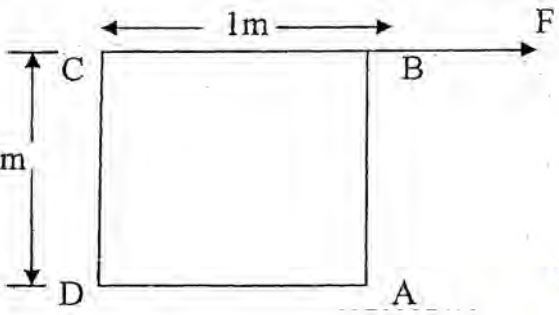
SECTION I (25 Marks)
Answer ALL the questions in the spaces provided

1. Figure below shows the level of water in a measuring cylinder after a stone of mass x g is immersed in the water. The initial level of the water is shown with a dotted line.

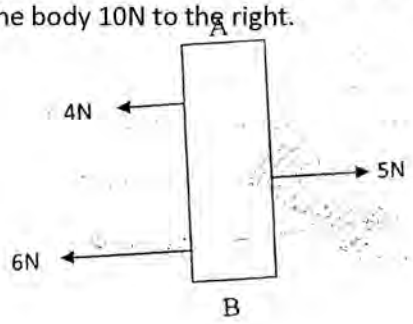


If the density of the stone is 2.008g/cm^3 what is the mass of x? (2mks)

2. The diagram below shows a metal plate 2m x 1m of negligible thickness and mass 1.0kg. A horizontal force F applied at B just makes the plate to tilt. Calculate the value of the force F. (2mks)



3. The diagram shows parallel forces acting on a body AB. Indicate on the diagram another force to make the resultant force on the body 10N to the right. (1mk)

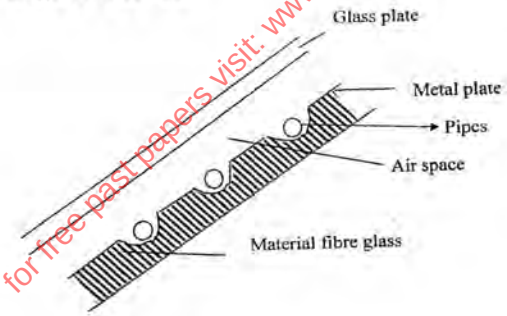


4. Figure shows a section through a mug which has the shape of a truncated cone and which is full of liquid.

The area of the base is $0.003m^2$ and the depth of the liquid is 0.015m. The density of the liquid is $1100Kg/m^3$. What is the force exerted by the liquid on the base of the mug? (3mks)

5. A garden sprinkler has small holes each 2.00mm^2 in area. If water is supplied at the rate of $3.0 \times 10^{-3}m^3s^{-1}$ and the average velocity of the spray is 10m/s. Calculate the number of the small holes. (2mks)

6. The diagram below shows the essential features of a solar heating panel. A small electric pump circulates the liquid through the pipes.

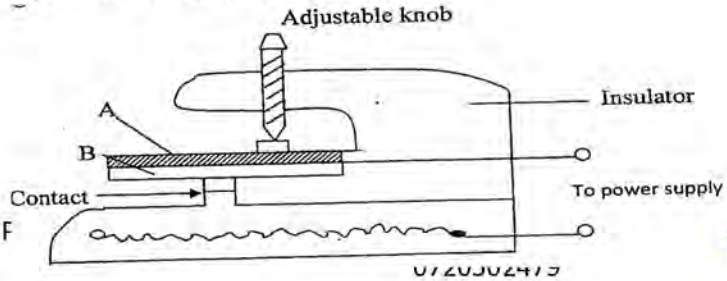


State briefly why:

(i) The pipes and metal plates are blackened. (1mk)

(ii) There is a material fibre glass on the panel. (1mk)

7. The figure below shows an electric iron.



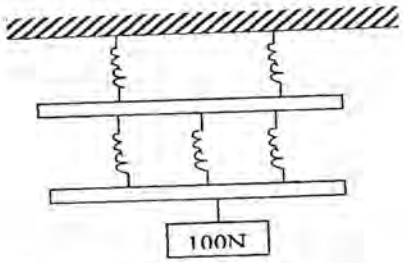
Two metal plates A and B are riveted to form a bimetal strip as used above.

(i) Which metal expands more (1mk)

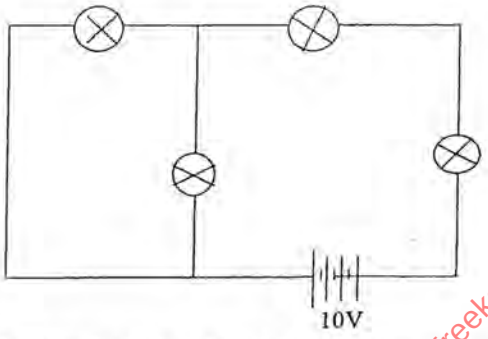
(ii) Explain how the electric iron works when the power is on (2mks)

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

(b) Five identical spiral springs are arranged as shown below. Each spring weighs 1.0N and each cross bar weighs 2.0N. If the spring system extends by 21.85cm when supporting a load of 100N. Calculate the spring constant of one spring in S.I. units. (3mks)



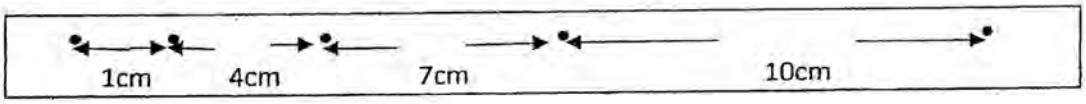
9. Four identical bulbs each of resistance 20Ω are arranged in a circuit as shown below. The voltage source is 10V.



Calculate the total electric energy converted to heat energy by the bulbs in one hour and 10 minutes. (2mks)

10. Given that a material X of density 8.5g/cm^3 is attached to a piece of wood of mass 100g and density 0.2g/cm^3. Calculate the volume of material X which must be attached to the piece of wood so that the two together just submerge beneath liquid of density 1.2g/cm^3. (2mks)

11. The five-tick tape shown below was produced by a ticker timer connected to mains supply of 50Hz when a force pulls the trolley. Determine the acceleration of the trolley. (2mks)

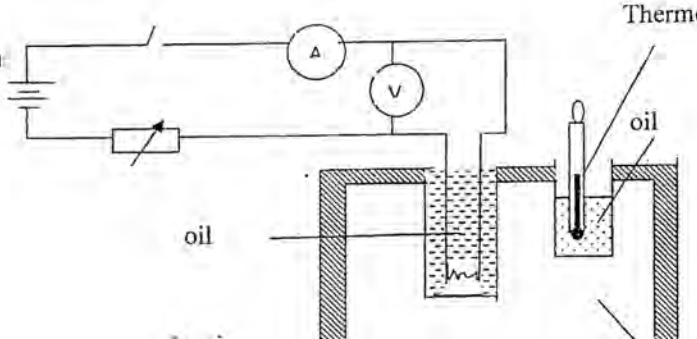


SECTION II (55 Marks)

Answer ALL the questions in the spaces provided

12. (a) Distinguish between heat capacity and specific heat capacity. (1mk)

(b) (i) Figure below shows a set-up that can be used to determine the specific heat capacity of a metal block



(I) State the measurements that should be taken in the experiment to determine the specific heat capacity of the block. (2mks)

(II) Show how the measurements in (I) above can be used to determine the specific heat capacity of a metal block. (2mks)

(III) State the functions of the following in the set-up. (2mks)

Lagging

Oil

(IV) State one precaution that should be taken. (1mk)

(c) A well lagged copper copper can together with a stirrer of total heat capacity $60JK^{-1}$ contains 200g of water at 10^0C. Dry steam at 100^0C is passed in while the water is stirred until the content reach a temperature of 40^0C. Calculate the mass of condensed steam. (5mks)

13. A man uses a rope to pull a crate of mass 75Kg up an inclined wooden plank of effective length 4.50m and onto a platform 1.50m high at a steady speed. The frictional force between the crate and the plank is 200N and the component of the weight of the crate parallel to the length of the plank is 250N.

Find:

(a) The effort he must exert on the rope (1mk)

(b) The V.R. (2mks)

(c) The mechanical advantage, M.A. (2mks)

(d) The energy wasted in pulling the crate to the platform. (2mks)

(e) Given that the normal reaction N = mg cosθ where θ is the angle of the plane with the horizontal. Calculate the co-efficient of friction between the crate and the plane. (3mks)

14. (a) A bob having a mass of 1.0Kg is moving in uniform circular path in a vertical plane having a radius of 1.0m. If it is whirled with a frequency of 2 cycles per second, calculate;

(i) The tension in the supporting string when the bob is at the top most part of the circle. (2mks)

(ii) The tension when the bob is at the bottom of the circle. (2mks)

(iii) At what position of the bob is the string likely to break? (1mk)

(b) A steel ball is dropped into a cylinder containing oil. Sketch a graph showing the variation of:

(i) Velocity with time during the fall. (1mk)

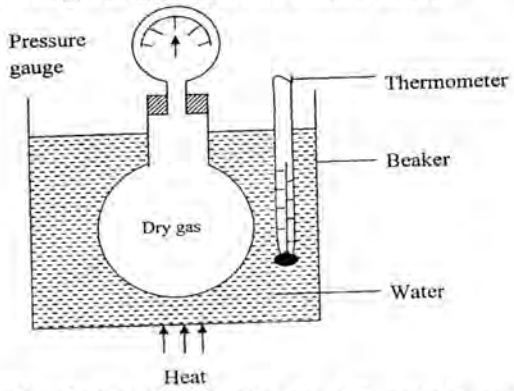
(ii) Displacement with time during the fall. (1mk)

(iii) Acceleration with time of the ball during the fall (2mks)

(c) State the forces acting on the ball as it moves through the oil. (1mk)

15. (a) State the pressure law. (1mk)

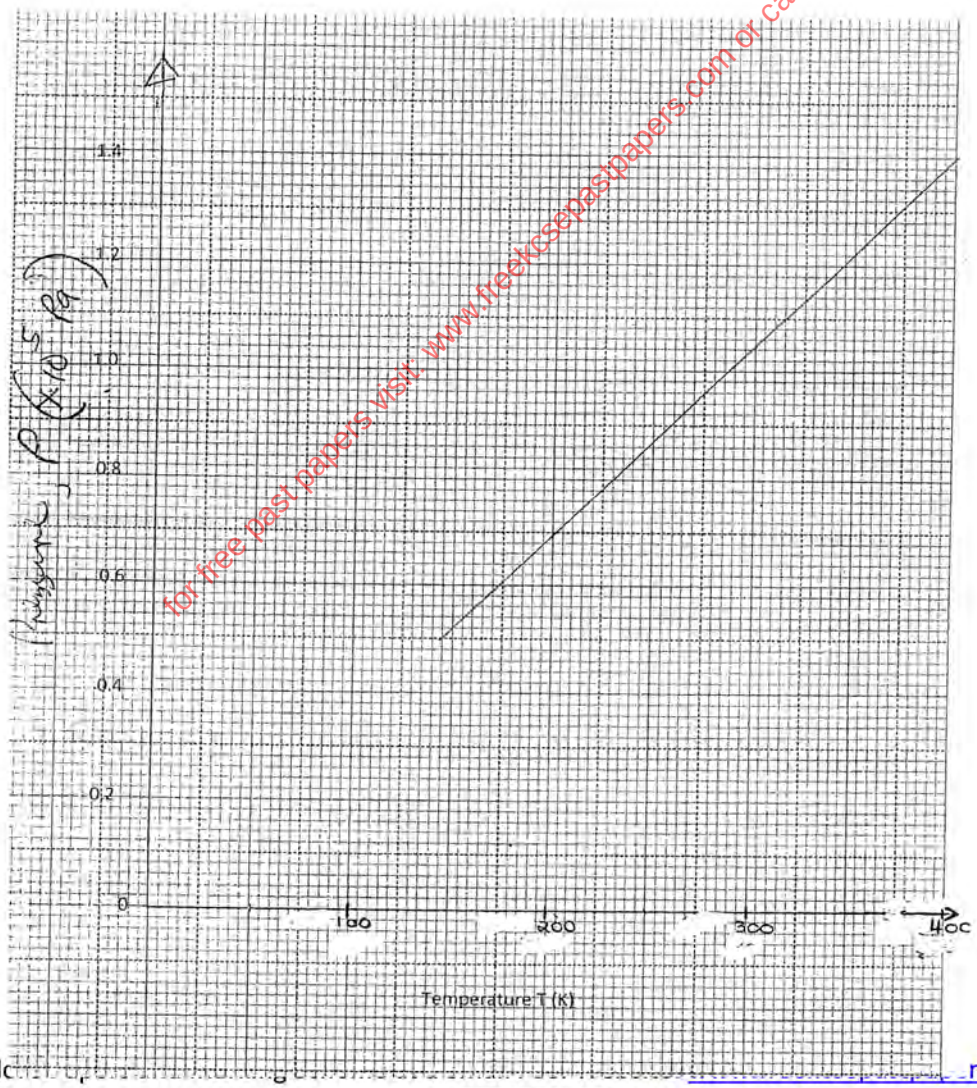
(b) A student investigated the relationship between the pressure and temperature of a fixed mass of a gas using the apparatus as shown below.



The set up is heated continuously with a Bunsen burner and the reading of pressure and temperature recorded after every minute.

(i) State one way in which this experiment may be improved. (1mk)

(ii) The graph shows the relationship between pressure and temperature for the above experiment.



(I) From the graph, determine the pressure at a temperature of 273K. (1mk)

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

(III) Describe what happens to the gas molecules as the gas is cooled. Indicate how this result in reduction in pressure. (2mks)

(c) The volume and pressure of hydrogen at 15^0C are $336cm^3$ and 756mmHg respectively. Determine the volume of hydrogen at standard temperature and pressure (s.t.p) (At s.t.p, temperature = 0^0C, pressure = 760mmHg).

16. You are provided with the following:

- Oil
- $1cm^3$ graduate pipette
- Water
- Level tary
- Two wax-coated rods
- Lycopodium powder
- Metre rule

(a) Using the apparatus listed above, describe how you would carry out an experiment to determine the size of oil molecule. (5mks)

(b) What is the purpose of the lycopodium powder? (1mk)

(c) Why does the drop of oil spread out into a patch? (2mks)

(d) In an oil drop experiment, it was found that one oil drop spread on water to form a patch of diameter 0.8cm and thickness 2.0×10^{-6}mm. Calculate the radius of the drop. (3mks)

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Paper 2 (Theory)

SECTION A (25 Marks)

1. State any two maintenance practices for secondary cells (2mks)

2. The diagram in figure 1 below shows the displacement against time for a wave whose wavelength is 4.0mm.

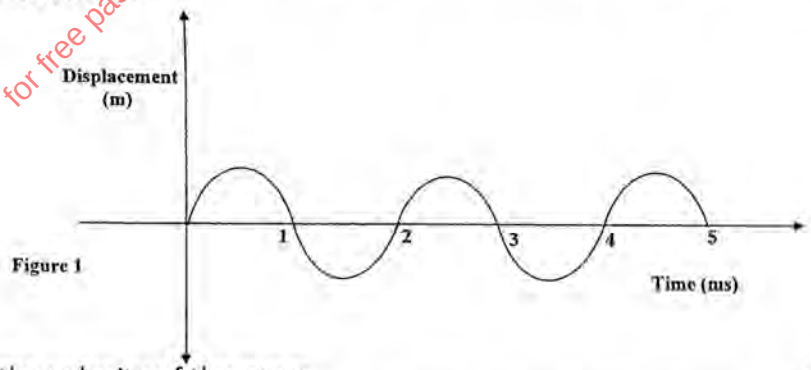


Figure 1

Determine the velocity of the wave. (2mks)

3. Complete the ray diagram in figure 2 below to show the location of the object and the image. (3mks)

Figure 2

4. Two rays are incident to the base of a triangular prism as shown in figure 3. If the refractive index of the prism is 1.414. Sketch the rays until they emerge from the prisms. (4mks)

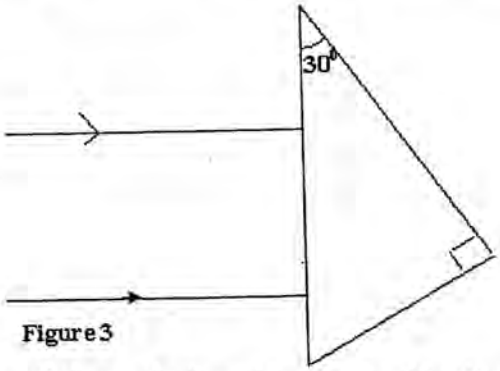


Figure 3

5. Figure 4 drawn below shows a combination of resistors connected to a cell of e.m.f E volts and negligible internal resistance.

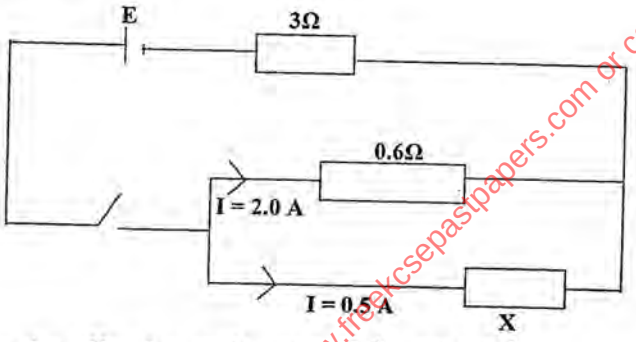


Figure 4

Determine the effective resistance of the network. (3mks)

6. A magnet moves into a coil of wire as shown in figure 5 below

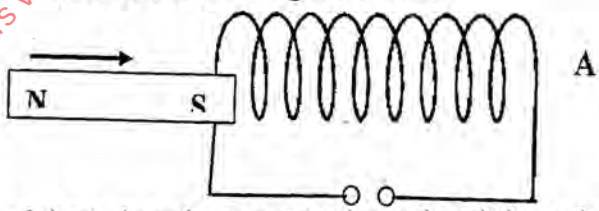


Figure 5

(i) Show the direction of the induced current in the coil and the polarity of the end A of the coil. (2mks)

(ii) State the law applied in (i) above (1mk)

7. Plane parallel waves in a ripple tank strike a barrier as shown in figure 6 below.

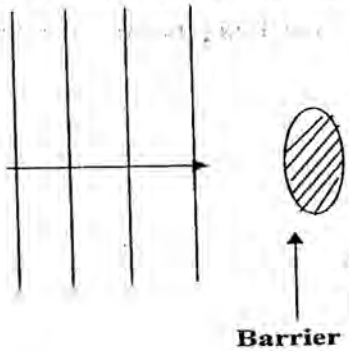


Figure 6

Complete the diagram by showing the appearance of the waves after the barrier (1mk)

8. State two operational differences between the C.R.O and the T.V tube. (2mks)

9. What property of cathode rays is demonstrated by the maltese cross? (1mk)

10. (i) You are provided with one magnet whose poles are marked, one magnet whose poles are not marked, one magnetic material and a string. Explain how you would identify the magnet and the magnetic material. (2mks)

(ii) Attraction is not the sure way for testing polarity. Explain (1mk)

11.

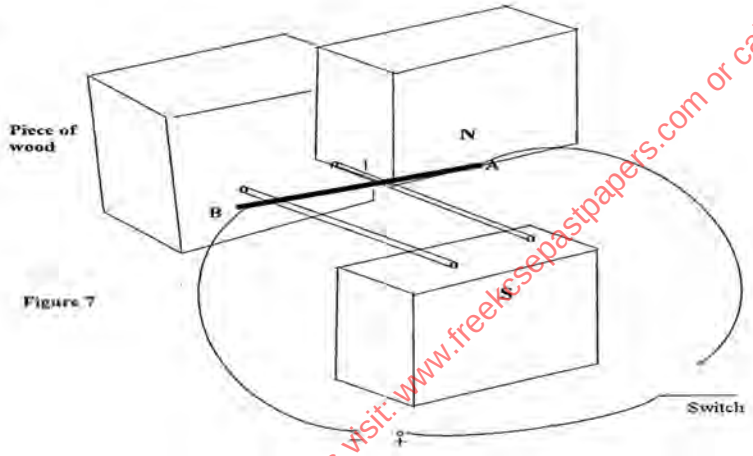


Figure 7

(i) State the direction the conductor AB moves when the switch S is closed. (1mk)

(ii) Suggest one method by which the effect in (i) above can be increased. (1mk)

SECTION B (55 Marks)

12. (a) You are provided with a metre rule, a distant object, a concave mirror and a white screen. Briefly describe how you can determine the focal length of the concave mirror. (3mks)

(b) The values in the table below were obtained in an experiment using concave mirror.

Object distance (U) (cm)	80	26.7	22.4	20.6	19.6
Image distance V (cm)	20	40	56	76	88
Magnification (M)					

(i) Complete the table for values of M (1mk)

(ii) On the grid provided, plot a graph of magnification against image distance. (5mks)

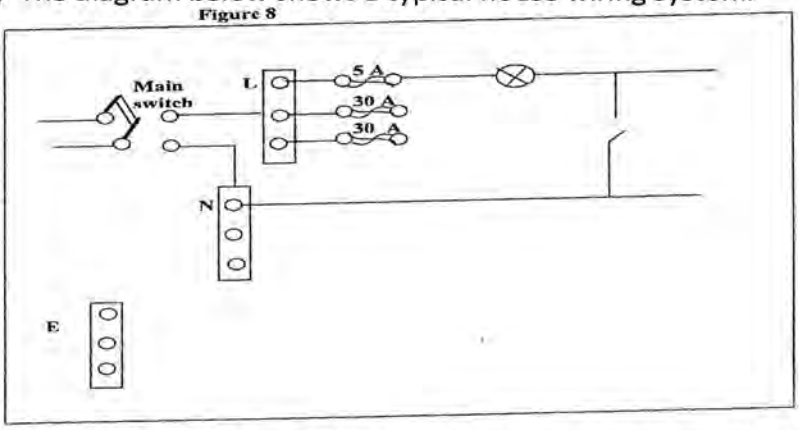
(iii) Using your graph, determine the focal length of the mirror (give your answer to 2 d.p.) (3mks)

13. (a) What is the purpose of using a fuse in a circuit? (1mk

(b) In domestic wiring (consumers fuse box) use of circuit breakers are preferred to fuses. Give two advantages of using a circuit breaker over a fuse. (2mks)

(c) The diagram below shows a typical house wiring system.

Figure 8



(i) The main switch is a double pole switch. What does this mean? (1mk)

(ii) Identify one mistake in the wiring above. (1mk)

(iii) On the diagram show how the cooker may be connected. (2mks)

(d) An electric cooker operating from a 240V main has a 4KW oven, 2KW grill and 2 rings each rated at 0.5KW. The cooker is connected to 30A fuse. Determine whether the fuse is suitable or not. (3mks)

14. (a) The SI unit of capacitance is the Farad. Define the Farad. (1mk)

(b) Figure 9below shows two aluminium plates X and Y of equal dimensions 30cm x 30cm fixed on wooden support and fairly close to each other but separated by a distance d.

Figure 9

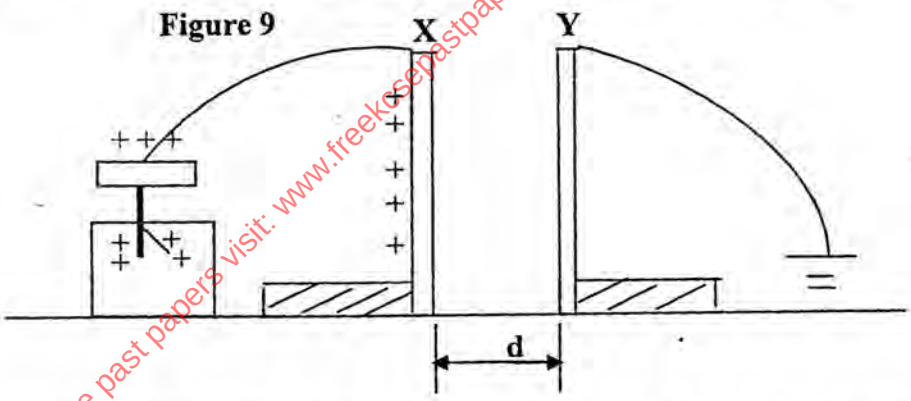


Plate X is charged to a high voltage and then connected to uncharged gold leaf electroscope. The area of overlap is maintained but the distance of separation d, is varied by moving plate Y.

(i) What happens to the divergence of the electroscope when plate Y is moved closer to plate X? Give a reason for your answer. (2mks)

(ii) What happens to the leaf divergence when plate Y is moved away from plate X while area of overlap is maintained? (1mk)

(iii) What effect does the movement of plate (Y) above have on the capacitance? (1mk)

(iv) The area of overlap is decreased by moving plate Y parallel to plate X but keeping the distance of separation constant. What happens to the leaf divergence? (1mk)

(v) The area of overlap and the distance of separation are kept constant; but an insulator introduced between the plates, what happens to the divergence of the leaf? (1mk)

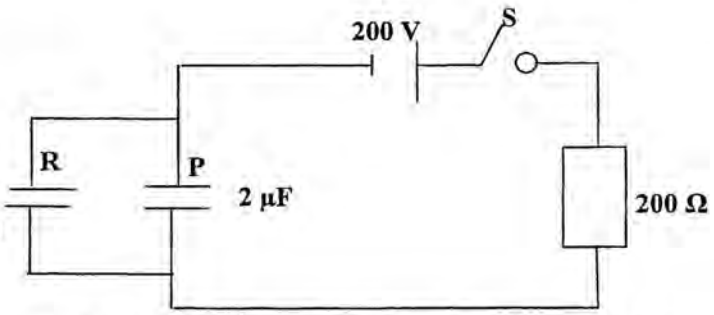


Figure 10

A 2μF capacitor P is charged to a potential of 200V, then the supply is disconnected as shown in figure 10 above. The charged capacitor is then connected to another uncharged capacitor (R). The p.d across the parallel arrangement is 80V.

Calculate:

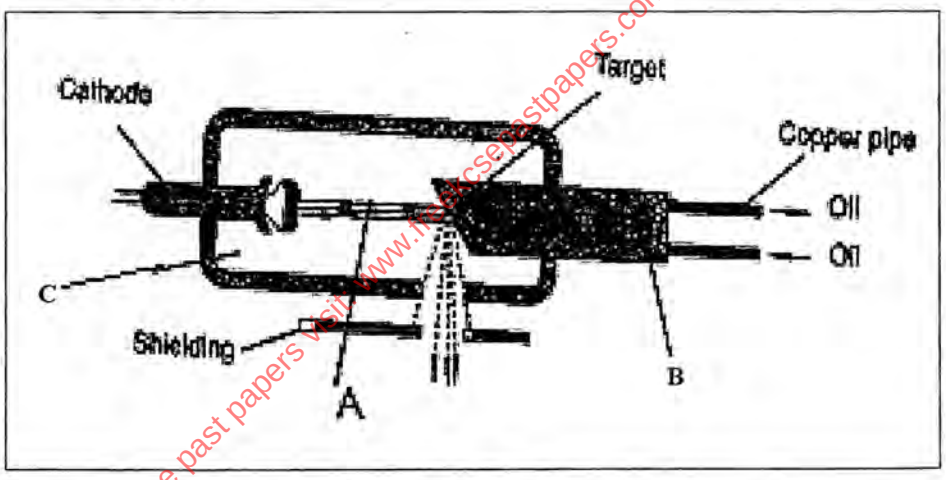
(i) The capacitance of the second capacitor. (2mks)

(ii) The final charge on each capacitor. (2mks)

(iii) What is the initial energy stored by capacitor P? (1mk)

15. (a) The figure below shows the features of an X-ray tube.

Figure 11



(i) Name the parts labeled A, B and C (1 ½ mks)

(ii) Briefly describe how X-rays are produced. (2mks)

(iii) Why is it necessary to maintain a vacuum inside an X-ray tube. (1mk)

(iv) During the operation of the tube, the target becomes very hot. Explain how this heat is caused. (1mk)

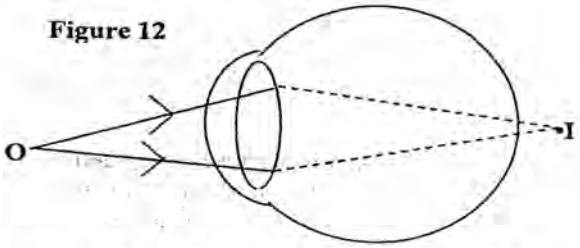
(b) An X-ray tube produces X-rays whose wavelengths vary from 6.0×10^{-13} to 4.5×10^{-9}m. ($v=3.0\times10^{8}ms^{-1}$ and $h=6.63 \times 10^{-34}Js$). Determine:

(i) The range of the frequency of X-rays. (2mks)

(ii) The highest energy of the X-rays. (2mks)

16. (a) The figure below shows an eyeball illustrating a defect in vision.

Figure 12



(i) Name the defect explaining its possible cause. (2mks)

(ii) Illustrate on a separate sketch how the above defect could be corrected. (1mks)

(b) (i) State one way a camera differs from the human eye. (1mk)

(ii) State one ways in which the two resemble. (1mk)

(c) You are provided with two converging lenses of focal lengths F_1 and F_2. F_1 and F_2 are short but F_2 is slightly longer than F_1. Sketch a diagram to show the two lenses may be used to make a compound microscope. (2 ½ mks)

Set13

Paper 3 (Practical)

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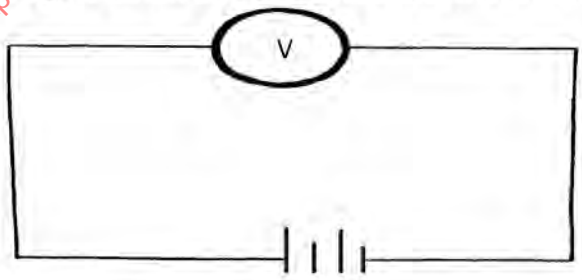
1. ***You are provided with:***

- A resistance wire mounted on millimeter scale
- Two dry cells in a cell holder
- A voltmeter
- Four connecting wires, one with a crocodile clip at one end

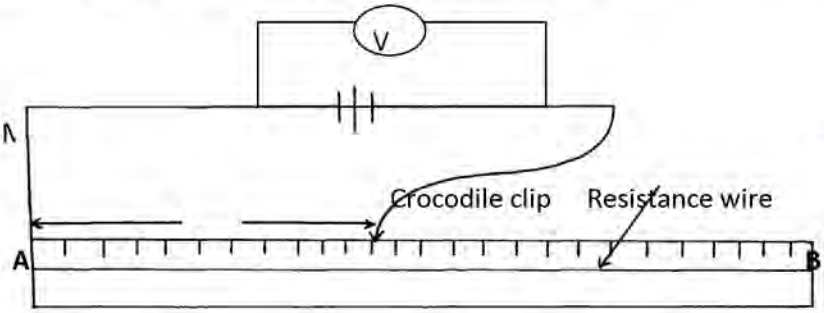
Proceed as follows:-

(a) Set up the circuit as in the figure below and determine the total electromotive force E, of the cells. (1mk)



Electromotive force E, of the cells.....Volts

(b) Set up the circuit shown in the figure below, connect the wire with clip on the mounted wire at a length (L) of 10cm from the end marked A. Record the voltmeter reading in the table provided in part (c) below:



(c) Repeat the procedure in (b) above for the following values of length L: 20cm, 30cm, 40cm, 50cm, and 60cm and complete the table below:

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

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

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

(f) Given the equation $\frac{V}{E-V} = K_1L_1 + K_2$

Determine the values of K_1 and K_2 (2mks)

K_1..... K_2.....

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

2. ***You are provided with the following apparatus:***

- A candle
- A lens holder
- A convex lens
- A screen
- A metre rule
- An object

Proceed as follows:

Using an object infinity outside the room, focus its image on the screen provided. The image should be as sharp as possible and inverted. Measure the distance from the lens to the screen hcm. Repeat the same for three other values of h. Record your results and then calculate the average value of the three results, Hcm.

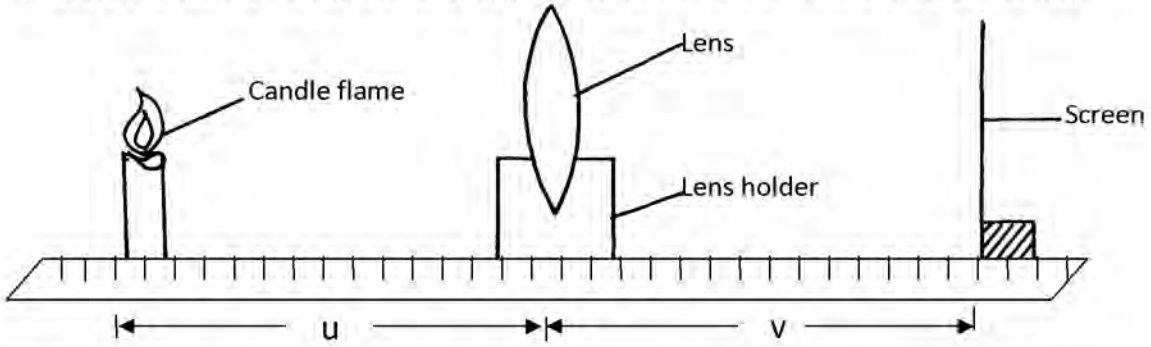
First reading of h (1mk)

Second reading of h (1mk)

Third reading of h (1mk)

The average value of h(H) (1mk)

Arrange the candle flame, the lens, and the screen as shown in the diagram below:



b) i) For particular value of u, adjust the position of the screen until a sharp image appears on the screen. Measure distance Vcm. Repeat the experiment for each of the other values of u, and enter the results in the table below:(7mks)

Distance L(cm)	Distance V(cm)	uv(cm^2)	U + v (cm)
12			
15			
18			
21			
24			
27			
30			

(ii) Plot a graph of uv against u + v (5mks)

(iii) From your graph, calculate the slope S (2mks)

(iv) Calculate the value of k given that kH = S (2mks)

Set14

232/1
PHYSICS
PAPER 1

SECTION A 25 MARKS

Answer all questions in this section

1. The figure below shows a vernier caliper scale.

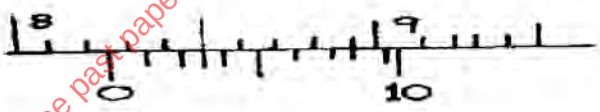


Fig. 1

If the vernier calipers used had a zero error of -0.02 what is the actual reading of the scale. (2mks)

2. A body is projected vertically upwards from the top of a building. Assuming that it lands at the base of the building. Sketch the velocity time graph of the motion. (2mks)
3. The stability of a body can be increased by increasing the base area and lowering its centre of gravity. State **one** way of lowering its centre of gravity. (1mk
4. When a mercury thermometer is used to measure the temperature of hot water, it is observed that the mercury level first drops before beginning to rise. Explain. (2mks)
5. When a Bunsen burner is lit below wire gauze, it is noted that the flame initially burns below the gauze as shown in figure 2 below. After sometime the flame burns below as well as above the gauze

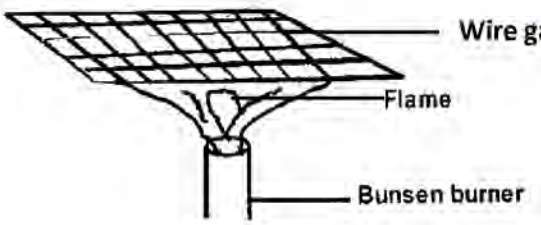


Fig 2

Explain this observation (2mks)

6. Name **one** force that determines the shape of a liquid drop on a solid surface (1mk)

7. (a) What is surface tension? (1mk)

(b) Figure 3 below shows a funnel dipped into a liquid soap solution.

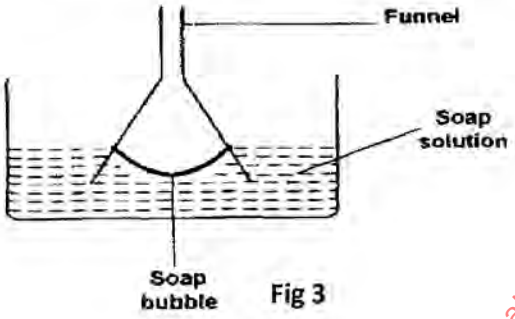


Fig 3

Explain what happens to the soap bubble when the funnel is removed.(1mk)

8. Using the idea of particles, explain why the pressure inside the tyre is increased when it is pumped up. (2mks

9. A trolley of mass 0.5kg moving with a velocity of 1.2ms^{-1} collides inelastically with a second trolley of mass 1.5kg moving in the same direction with a velocity of 0.2ms^{-1}.

(a) What is an inelastic collision? (1mk)

(b) Determine the velocity of the trolleys after collision (2mks)

10. Highlight **one** fact which shows that heat from the sun does not reach the earth surface by convection. (1mk

11. Three identical springs each of spring constant 4.5N/m and weight 0.5 N are used to support a load as shown in figure 4 below.

Determine the total extension of the system (2mks)

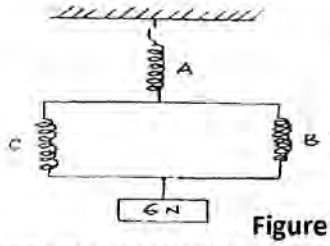


Figure 4

12. State **two** reasons why mercury is preferred as a barometric liquid and not water (2mks)

13. Figure 5 below shows a uniform meter rule balancing when a mass of 200g is hung at one end. Determine the tension **T** in the string (2mks)

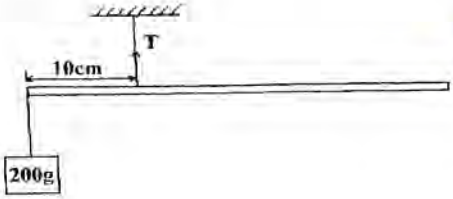


Figure 5

14. Water tanks in houses are erected as high as possible. Explain (1mk)

SECTION B (55 MARKS)

Answer all questions in this section

15. (a) What is work as defined in physics? (1mk)

(b) A pulley system has two pulleys on the lower block and one pulley on the upper block.

In order to raise the load of 6N, an effort of 2N is applied.

(i) Draw a sketch to show the pulley system. (3mks)

(ii) Determine the efficiency of the pulley system. (3mks)

(iii) If the lower block weighs 0.4N, determine the frictional force which opposes the motion (3mks)

16. (a) A liquid at 80^0C in a cup was allowed to cool for 20 minutes. State **two** factors that determine the final temperature. (2mks)

(b) What is meant by specific latent heat of vaporization? (1mk)

(c) In an experiment to determine the specific latent heat of vaporization **L** of water, steam at 100^0C was passed into water contained in a well lagged copper calorimeter. The following measurements were made.

Mass of calorimeter = 80g

Initial mass of water = 70g

Initial temperature of water = 5^0C

Final mass of calorimeter + water + condensed steam = 156g

Final temperature of mixture = 30^0C

Specific heat capacity of water = 4200JKg^{-1} K^{-1} and specific heat capacity for copper = 390J/Kg^{-1}K^{-1}

(i) Determine the:

(i) Mass of condensed steam (2mks)

(ii) Heat gained by the calorimeter and water (2mks)

(iii) Given that **L**. is the specific latent heat of vaporization of steam;

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

(ii) Determine the value of **L** (3mks)

17. (a) The figure 6 below shows a stone of mass 450g rotated in a vertical circle at 3 revolutions per second. If the string has a length of 1.5m, determine:

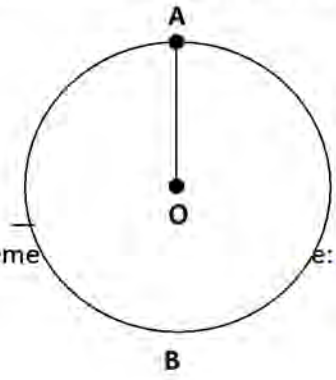


Figure 6

(i) The linear velocity (2mks)

(ii) The tension of the string at position **A** (3mks)

(b) A stone is whirled with uniform speed in horizontal circle having radius of 10cm. It takes the stone 10 seconds to describe an arc of length 4cm. Determine:

(i) The angular velocity ω (2mks)

(ii) The period **T** (3mks)

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

(b) Figure 7 shows a piece of cork held with a light thread attached to the bottom of a beaker. The beaker is filled with water.

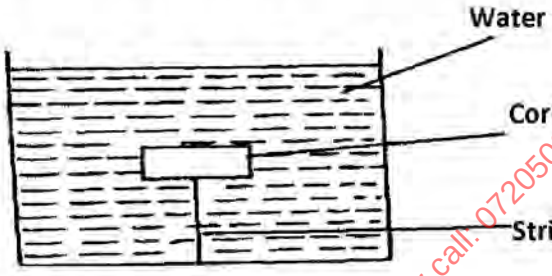


Figure 7

(i) Indicate and label on the diagram the forces acting on the cork (3mks)

(ii) Write an expression showing the relationship between the forces (1mk)

(c) A solid displaces 8.5cm^3 of liquid when floating on a certain liquid and 11.5cm^3 when fully submerged in the liquid. The density of the solid is 0.8g/cm^3, determine:-

(i) Up thrust on the solid when floating (3mks)

(ii) Density of the liquid (2mks)

19. (a) Define impulse in terms of momentum (1mk)

(b) For a particle of mass **m** which is initially moving vertically downward with velocity **u**, obtain an expression for changes in kinetic energy after;

(i) It has moved freely under gravity for time **t**, (3mks)

(ii) It has moved freely under gravity for a vertical distance (3mks)

(c) A lead ball is placed on the surface of viscous oil and released.

(i) State the **three** forces acting on the ball as it falls through the oil (2mks)

(ii) State which forces vary during the fall and explain why the variation. (2mks)

(iii) What is meant by the term terminal velocity of the ball (1mk)

(iv) Sketch a graph showing the variation of the displacement of the ball with time from when it was released. (2mks)

Set14
Paper 2

SECTION A - 25 MARKS

Answer all questions in this section

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

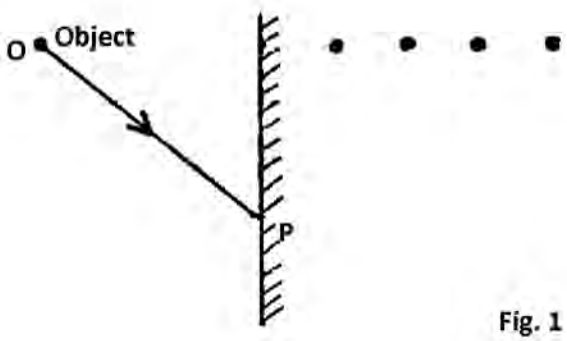


Fig. 1

(i) Which of the four dots represent correct position of the image of **O**? Label this dot **Q** (1mk)

(ii) By drawing a line on the diagram above to represent the reflected ray at **P**, mark the angle of reflection and label it **r.** (1mk)

2. A charged conductor is slowly brought near the cap of a positively charged electroscope. The leaf first collapses and then diverges. State the charge on the conductor (1mk)

3. Give a reason why it is necessary to leave the caps of the cells open when charging an accumulator (1mk)

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

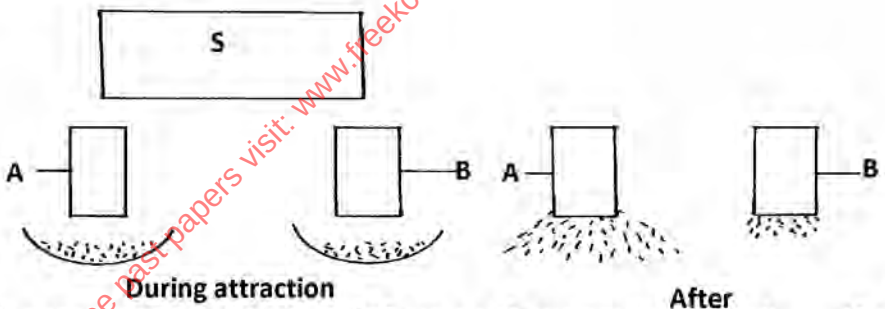


Fig. 2

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

5. Figure 3 below shows two parallel current carrying conductors **P** and **Q** placed close to one another. Current flows in the opposite directions.

Fig. 3

Sketch on the figure the magnetic field pattern formed by the two conductors. (1mk)

6. Figure 4 below shows two identical lamps L_1 and L_2 connected to a battery.

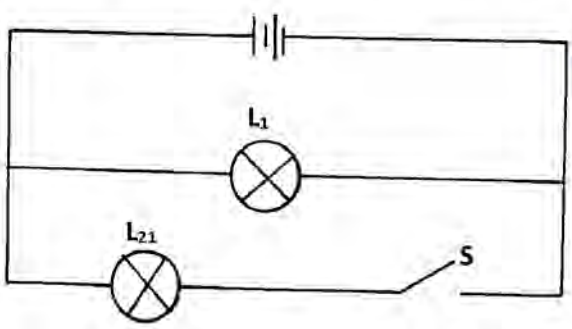


Fig.4

(a) Using an arrow, indicate on the diagram above the direction of the convectional current (1mk)

(b) State the effect if any, of closing switch **S** on L_1 (1mk)

7. Figure 5 below shows a ray of light incident on water-kerosene interphase.

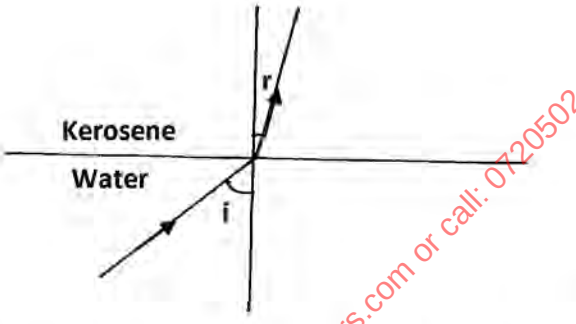


Fig.5

State which one of the two liquids has a higher absolute refractive index. (1mk)

8. The table in **figure 6** below shows part of the electromagnetic spectrum in order of decreasing wavelength

A	B	INFRA RED RADIATION	VISIBLE LIGHT	C	D

Figure 6

(a) How are waves **C** produced? (1mk)

(b) State one use of the wave **D** (1mk)

9. Figure **7** below shows two solenoids, **X** and **Y** close to each other.

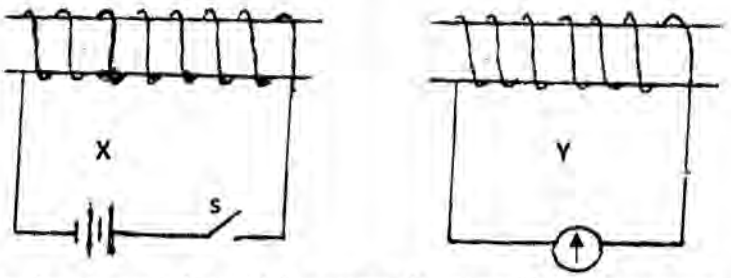


Fig.7

(a) Name the process by which current is caused in **Y** by closing the switch **S**. (1mk)

(b) Show on the diagram above the direction of current in **Y** as switch **S** closes. Use an arrow. (1mk)

10. 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)* (3mks)

11., State **two** properties of X-rays similar to those of visible light.(2mks)

12. Explain why the tube of a cathode ray oscilloscope is made of thick glass walls. (2mks)

13. (a) Define the term work function (1mk)

(c) Explain how the intensity of radiation affects the photo-electric effect (1mk)

14. Figure 8 below shows an eye defect

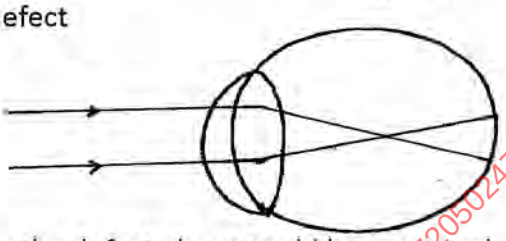


Fig 8

Use a ray diagram to show how the defect above could be corrected. (2mks)

SECTION B - (55 MARKS)

15. (a) An object **O** stands on the principal axis of a concave mirror as shown in figure 9 below.

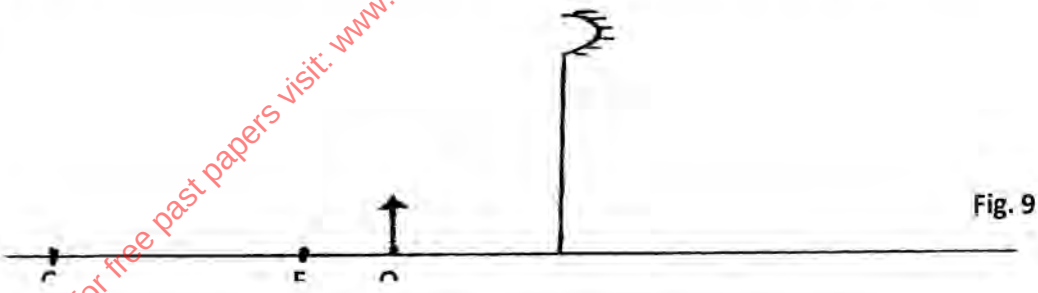
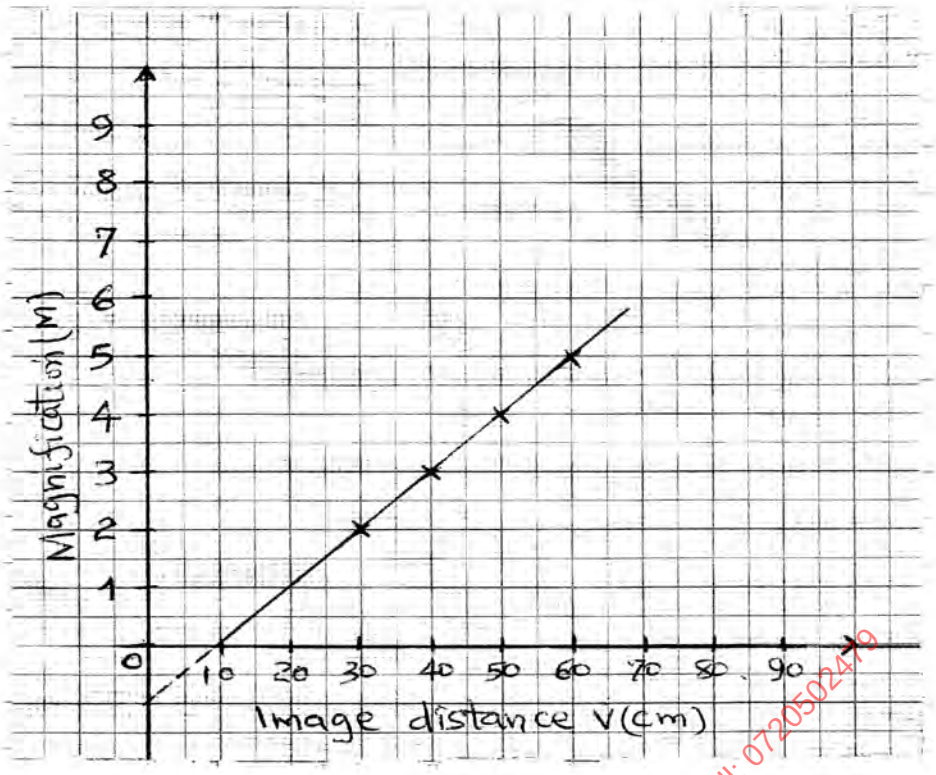


Fig. 9

(i) By drawing suitable rays, show the position of the image (2mks)

(ii) Determine the magnification of the image formed (2mks)

(b) In an experiment to determine the focal length of a concave mirror, a group of form two students collected some data and used the results to plot the graph shown in figure **10** below.



Using the graph above, determine:

(i) The object position when the image position is 45 cm (2mks)

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

(iii) The focal length of the mirror given

$$m = \frac{v}{f} - 1$$ (1mk)

16. (a) Students set up a mass attached to a spring such that when it oscillates it taps on water surface in a wide shallow tank as in figure 11 below.

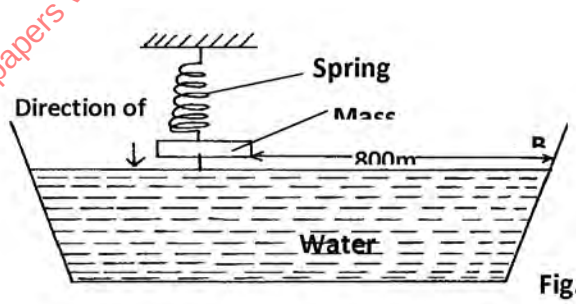


Fig. 11

The students measured time for 20 oscillations and found that the mass takes 36 seconds.

Determine:

(i) The periodic time of the mass (2mks)

(ii) The frequency of the waves produced on the water surface (1mk)

(iii) The speed of the waves if the students counted four ripples between the mass and end **B** of the tank (3mks

(b) State any **two** factors that would increase the speed of sound in air (2mks)

(c) An echo sounder of a ship received the reflected waves from a sea bed after 0.20s.

(i) Determine the depth of the sea bed if the velocity of sound in water is 1450m/s (2mks)

(ii) When the ship above passes over a sunken reef, the echo sounder receives an echo after 0.16s. Determine the height of the sunken re (2mks)

17. (a) (i)Define capacitance of a capacitor (1mk)

(ii) **Figure 12** below shows a pair of parallel plates of a capacitor connected to a battery. The upper plate is displaced slightly to the left.

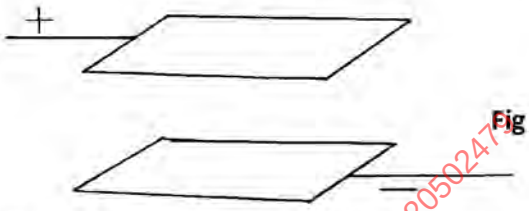


Fig 12.

State with a reason the effect of this movement on the capacitance (2mks)

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

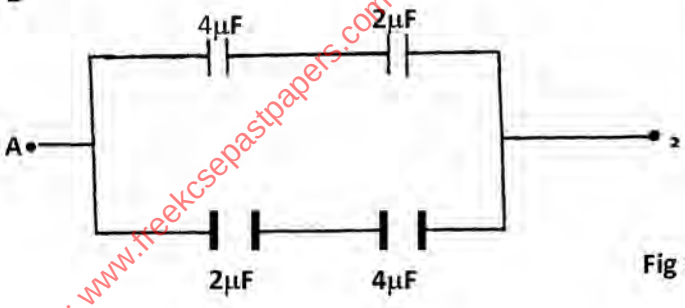


Fig 13

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

(d) **Figure 14** below shows metal plates **X** and **Y**. Metal **Y** is illustrated by ultra-violet radiation.

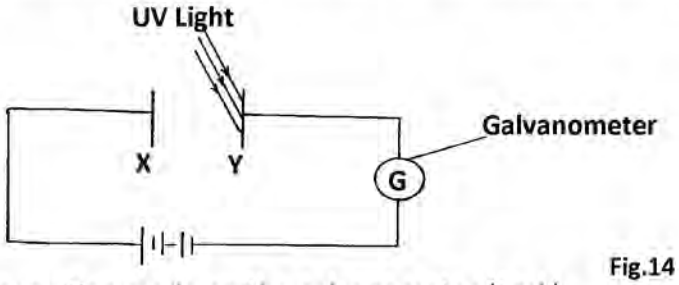


Fig.14

(i) State the observation made on the galvanometer (1mk)

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

(iii) A material has a work function of 2.0eV. Determine the largest wavelength of incident radiation that can cause photo electrons to be emitted from its surface.

C = 3×10^8 m/s, h = 6.63×10^{-34} Js (4mks

1eV = 1.6×10^{-19}J

18. (a) Define Radioactivity (1mk)

(b) An element **R** decays by giving off an alpha particle. Complete the equation below showing the valves of **a** and **b** (1mk)

R = V + He

a = _____ b = _____

(c) Figure **15** below shows the features of a diffusion cloud chamber used for detecting radiations from radioactive sources.

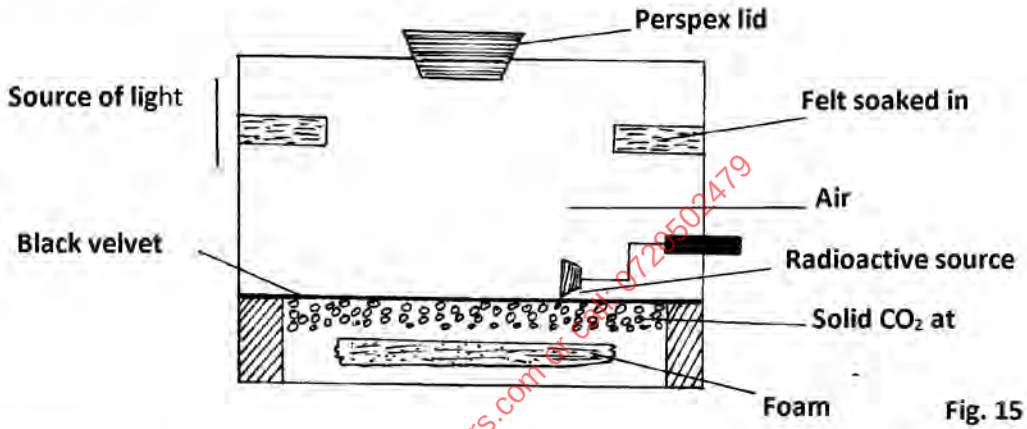


Fig. 15

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

(ii) State the function of the Perspex lid. (1mk)

(iii) Explain why the base velvet chamber is painted black (1mk)

(iv) Explain how the radiation from the radioactive source is detected in the chamber. (4mks)

(v) State **one** advantage of the cloud chamber over a charged leaf electroscope when used as detectors of radiations (1mk)

19. A student connected a circuit as shown in figure 16 below hoping to produce a rectified out put

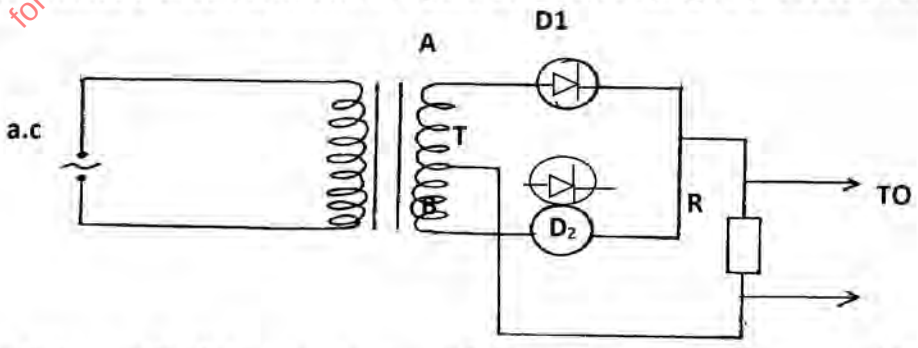


Fig 16.

(a) Sketch the graph of the out put on the **CRO** screen (1mk)

(b) Explain how the output above is produced (2mks)

(c) Name other **two** uses of a junction diode (2mks)

(e) Graph in figure 17 below shows a forward bias characteristic of a **P - N** junction

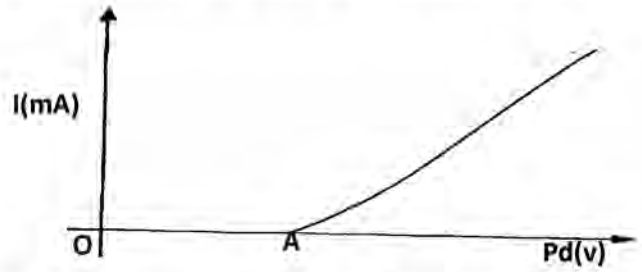


Fig.17

The depletion layer decreases from **O** to **A**. Explain what is meant by depletion layer. (2mk)

(i) Define the term doping (1mk)

(ii) Explain how doping produces a P-type semi-conductor. (3mks)

Set14
Paper 3

---

1. This question consists of two parts A and B attempt both parts

PART A

You are provided with the following:

- two pieces of wooden blocks
- a retort stand, boss and clamp
- a glass marble
- a piece of cotton thread
- a square piece of polythene paper
- a half-metre rule
- a 20 grammes metal mass
- some water
- a 250 ml beaker
- some tissue paper

Proceed as follows:

(a) Cut two pieces of cotton thread measuring 60cm and 30cm respectively. Use the threads to make two loops. Suspend the half-metre rule freely at its centre of gravity, **P** using the longer loop.

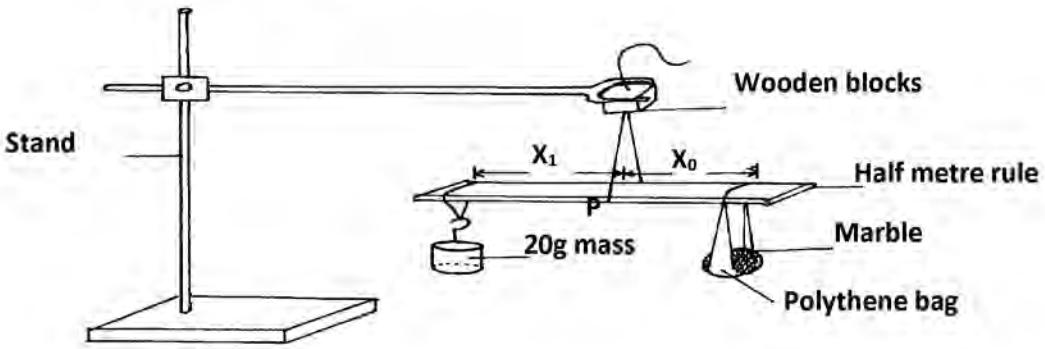


Fig. 1 (a)

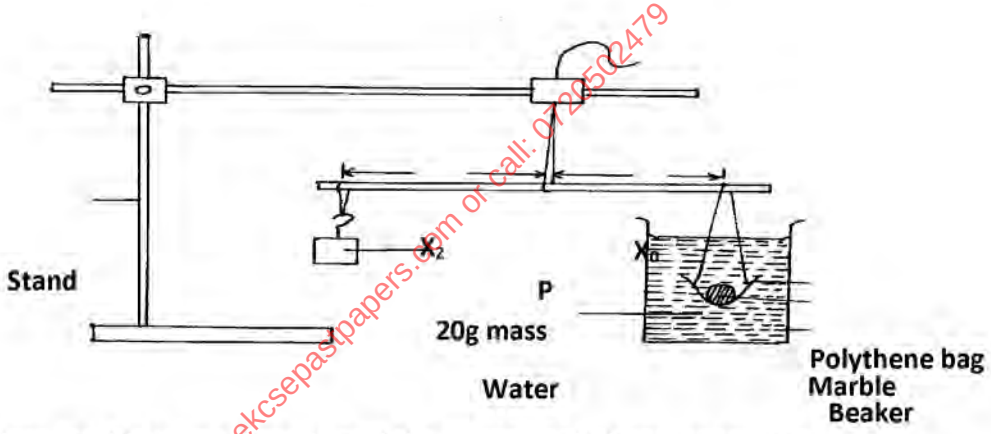


Fig. 1(b)

(b) Sspend the glass marble using threads and the square polythene paper at a distance X_0 = 15cm from the point of suspension, **P**. Also use the shorter thread loop to suspend the 20g metal mass on the opposite side and adjust its position till the half-metre rule is horizontal as in figure 1(a) above. Record the corresponding distance X_1 of the 20g mass from **P**

X_1 = ...cm (1mk)

(c) Fill the beaker with water up to about three quarters capacity. Maintain the distance X_0 invariant as you immerse the glass marble in water and slide the thread holding the 20g metal mass, till the half-metre rule is horizontal again. Note the new corresponding distance X_2
(i.e distance between point of suspension of 20g mass and **P**)

X_2 = ... cm (1mk)

(d) Repeat the procedure in **(b)** and **(c)** for increased values of X_0 as given in table 1 below.
NB:- After every attempt, wipe the polythene paper and marble dry with the tissue paper provided.

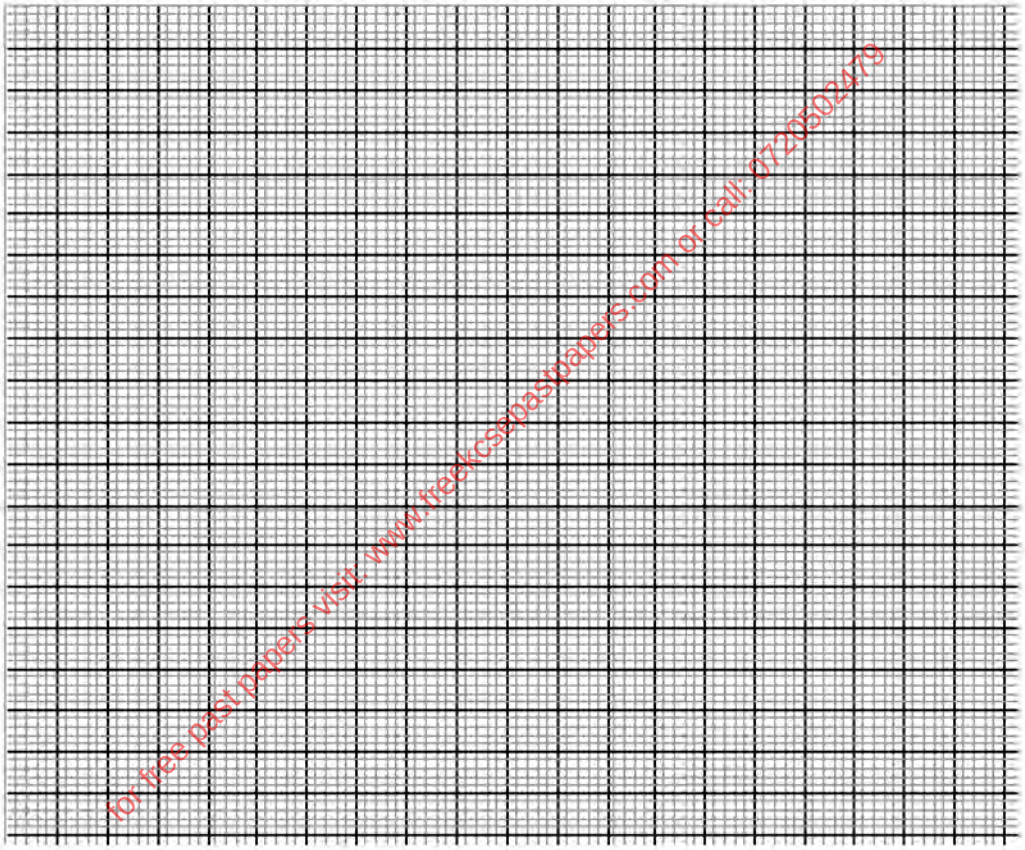
- Ensure this experiment is done in a draught **free area.**

(e) Complete the table 1 (5mks)

Table 1

Distance of marble in air X_0 (cm)	**15**	**17**	**19**	**21**	**23**	**24.5**
Distance of 20g metal mass, X_1 (cm)						
Distance of 20g metal mass, X_2 (cm) When marble is in water						
$X_1 - X_2$ (cm)						

(f) On the grid provided, plot a graph of $X_1 - X_2$ (y-axis) against X_1 (5mks)



(g) Determine the slopes, S of the graph (3mks)

PART B

You are provided with the following:

- vernier callipers
- glass marble

Proceed as follows

h) Using the vernier callipers, measure the diameter of the glass marble

1st attempt; diameter D_1 = ...cm

2nd attempt (after spinning the glass marble)

Diameter D_2 = ... cm (1mk)

Determine the value of **D** in the expression:

$$D = \frac{D_1 + D_2}{2}$$

= .....cm (1mk)

(i) Find the volume of the glass marble in m^3

Volume = ... (3mks)

This question consists of two parts; A and B

Attempt both parts and attach the two plain papers used in this question

2. PART A

You are provided with the following:

- a soft board
- a white plain paper
- Four (4) optical pins
- a mounted plane mirror labeled **XY**
- Some plasticine (or 4 drawing pins)

Figure 2(a)

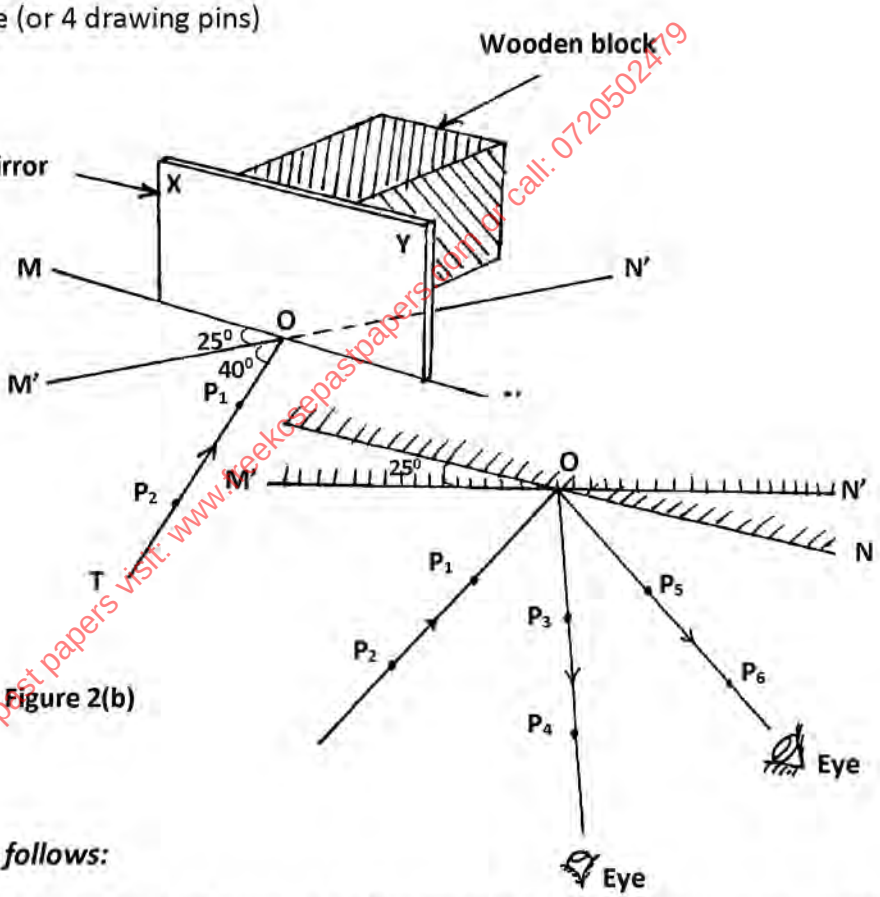


Figure 2(b)

Proceed as follows:

(a) Use small lumps of plasticine (or drawing pins) to stick the white plain-paper provided onto the soft board and draw a straight line **MN** on the paper.

- Draw another straight line **M'N'** which intercepts the line **MN** at point **O.**
- The two lines **MN** and **M'N'** make a vertical acute angle of 25^0 with each other at **O**
- Draw a third line **OT** which makes an angle of 40^0 with **OM'**. Fix two pins; P_1 and P_2 along the line **OT.** **OT** is representing the approaching ray of light. See figure 2(a) (1mk)

(b) Place the plane mirror **XY** lengthwise along line **MN**. Fix pins P_3 and P_4 in line with the images of P_1 and P_2 as they appear through the mirror.
- Remove the pins P_3 and P_4, then draw line OP_3P_4.
- Line OP_3P_4 is representing the reflected ray of light. (1mk)

(c) (i) Rotate the plane mirror **XY** through the angle of 25^0 about point **O** such that it lies along the line **M'N'.**
- Using two pins again, repeat step **(b)** above to obtain the new position of the reflected ray. Label the marks of the two pins P_5 and P_6 respectively.
- Line OP_5P_6 is representing a new position of the reflected ray after rotation.

See figure 2 (b).

(ii) Measure the size of a cute angle $\propto$ between the lines OP_3P_4 and OP_5P_6

Angle $\propto$ = (1mk)

PART B

You are provided with the following:
- a soft board
- a white plain paper
- 4 optical pins
- 4 drawing pins or (some plasticine)
- a mounted plane mirror labelled **XY**

(d) (i) ***Proceed as follows***

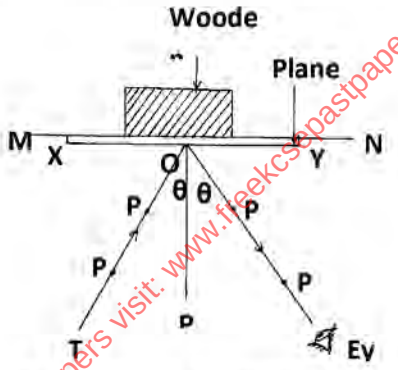


Figure 3

Use small lumps of plasticine (or drawing pins) to stick the white plain paper onto the soft board. (Use the second paper provided).
- Draw a straight line **MN**
- Draw another straight line **ON** which is perpendicular to **MN** at **O**. Line **ON** is representing the normal, see **figure 3** above.

Draw a third line **OT** which intercepts **MN** at **O** and makes acute angle $\Theta_1 = 10^0$ with the normal to the left.

Fix pins P_1 and P_2 onto line **OT**. Line **OT** is representing the approaching ray of light.

Measure the acute angle $\Theta_1 = 10^0$ between the approaching ray and the normal.
- Place the plane mirror **XY** lengthwise along the line **MN** and observe from the opposite side of the normal to locate the images of P_1 and P_2 as they appear in the mirror
- Fix pins P_3 and P_4 such that they are in line with the images of P_1 and P_2 as they appear in the mirror.

(ii) Remove the mirror, join P_3 and P_4 and produce it to meet at **O** so as to obtain the reflected ray.

Measure angle θ_2, the angle between the normal, **PO** and OP_3P_4

Angle θ_2 = ... (1mk)

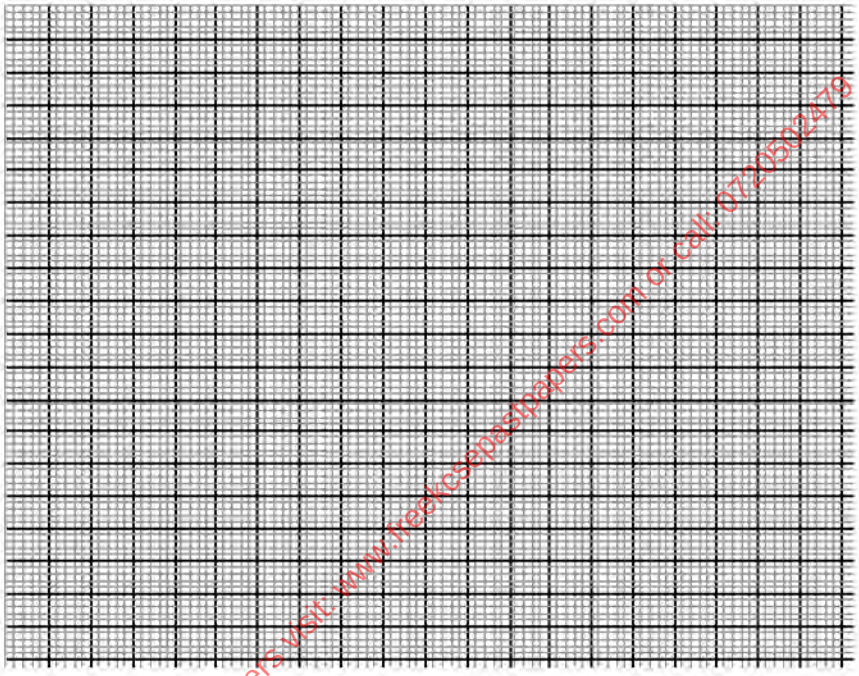
(e) Repeat step (d) above for the values of θ_1 given in table 2.

i) Complete table 2

Table 2 (5mks)

θ_1	10	20	30	40	45	55
θ_2						
Cos θ_1						
Cos θ_2						

(ii) Plot a graph of cos θ_2 (y-axis) against cos θ_1
(5mks)



(iii) Determine the slope **S** of the graph in e(ii) above. (3mks)

(iv) Find the value of Φ in the expression $27 = \frac{\Phi}{S}$ (2mks)

(f) State the physical law that is verified by the results of question 2 part **B**. (1mk)

Set15
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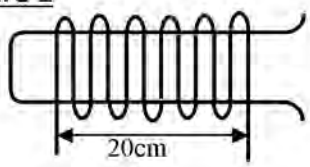
PHYSICS
PAPER 1

SECTION A (25 MARKS)
Answer all the questions in this section in the spaces provided.
(Take g=10N/kg or 10m/s^2)

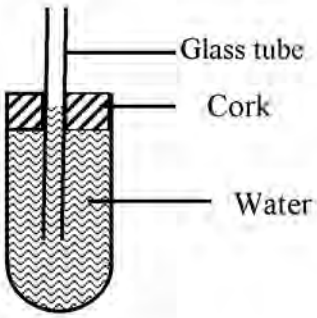
1. The figure1 below shows a wire wound on a test tube. The windings just touch each other. If the total number of complete loops was found to be 15, and the distance covered by the windings on the test tube is 20cm; find the radius of the wire. (2marks)

   Figure 1

2. A paratrooper flexes his legs when he lands. Explain (1mark)
3. A needle may float on clean water but sinks when a detergent is added. Explain. (1 mark)
4. 50g of ice at -10^{0}c is melted to water at 0^{0}c.Given that the latent heat of fusion of water=336000J/Kg and the specific heat capacity of ice = 2100J/KgK; Determine the amount of heat required. (3 marks)
5. Water flows in a pipe of diameter 7cm at a speed of 5m/s. The water then gets to the perforated end which has 20 holes of diameter 0.7cm each. Determine the speed of water jets. (3 marks)
6. For an enclosed system with a liquid, a force is applied at one point.
   a) Briefly explain how force is transmitted to other parts of the system. (2 marks)
   b) State one application of such a system. (1 marks)
7. A 150g mass tied on a string is whirled in a vertical circle of radius 30cm with a uniform speed. At the lowest position the tension in the string is 9.5N.Calculate the velocity of the mass. (3 marks)
8. A spring of elastic constant K has its length increased from 4.00m when unloaded to 4.25m when loaded with a 75N weight. Assuming that the elastic limit is not exceeded, determine the value of K. (2 marks)
9. The figure 2 below shows a glass tube fitted on to a boiling tube filled with water. State and explain what is observed when the boiling tube is heated. (2marks)

   Figure 2

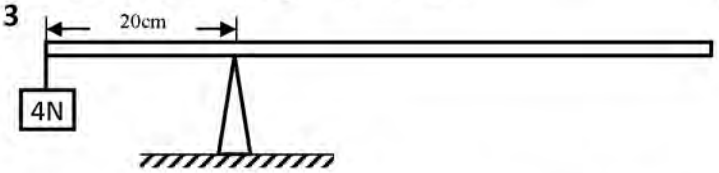
   

10. A bus that carries goods in the carrier is less stable than one that carries goods in the boot. Explain why this is so. (1 mark)

11. A rod consists of glass on one part and copper on the other. The rod is wrapped with a piece of paper and then a flame passed below it. It is observed that the paper on the side with glass is charred while that on the side of copper is not. Explain this observation. (1 mark)

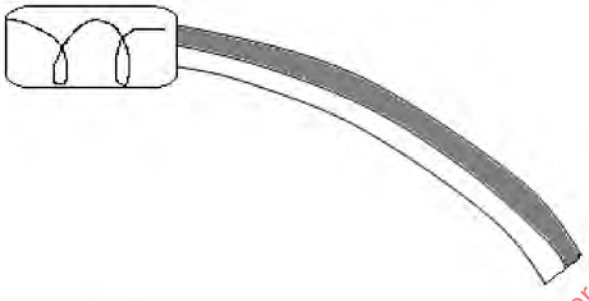
12. The figure 3 below shows a uniform 50cm rod. It is balanced horizontally by a load of 4N on one end. Calculate the weight of the rod. (2marks)

fig. 3



13. The figure 4 below shows a bimetallic strip cooled below room temperature. Sketch on the side the bimetallic strip at room temperature. (1Mark)

Figure 4.



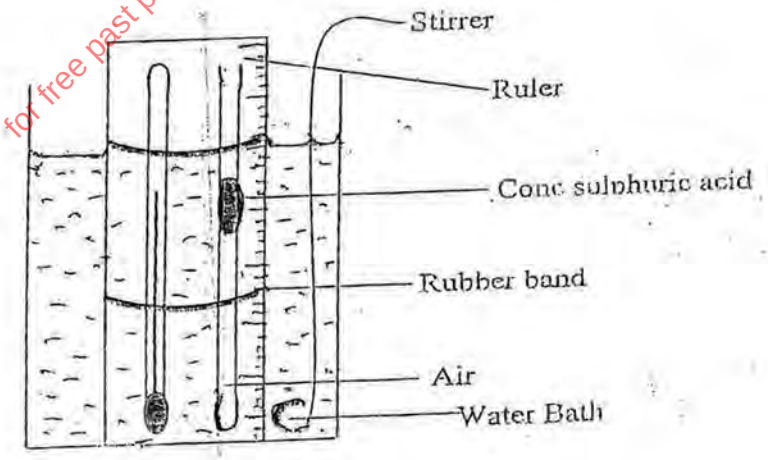
SECTION B (55 Marks)

Answer all questions in this section in the spaces provided.

14. a) Define "absolute zero temperature" for an ideal gas (1 Mark)

b) Using kinetic theory, explain Boyle's law for an ideal gas. (2Marks)

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



i) Explain the function of;

(I) Concentrated sulphuric acid (1 Mark)

(II) Stirrer (1 Mark)

ii). Explain how the set up above can be used to verify Charles law for an ideal gas (2 Marks)

iii. On the grid below sketch a graph of volume (cm^3) against temperature (^0c). Mark with letter T the absolute zero temperature. (2 Marks)

(d) A column of air 20cm long is trapped by mercury thread 6cm long as shown below.

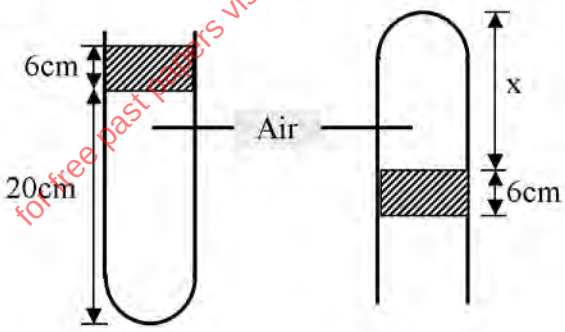


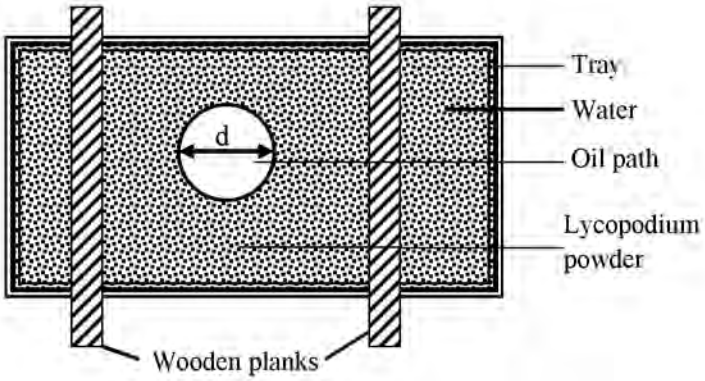
Fig 7

(a) (b)

If the same arrangement is now inverted, determine column X in figure b).Take atmospheric pressure as 76cm of mercury. (2Marks)

15. The figure 8 below shows an experimental set up for estimating the diameter of an oil molecule.

Figure 8



a) Describe how the oil patch is formed (3 Marks)

b) i) In this experiment the diameter 'd' of the oil patch was measured to be 21cm for an oil drop of radius 0.28mm. Determine the diameter of the oil molecule. 3Marks)

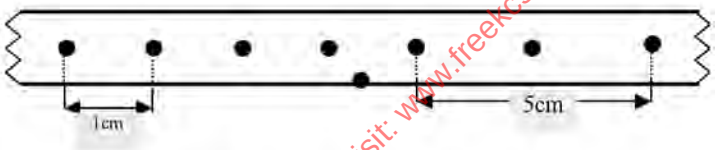
ii) State any two assumptions made in calculating the diameter of the oil molecule. (2Marks)

c) What is the role of the lycopodium powder in this experiment? (1Mark)

d) Describe one method of determining the diameter of an oil drop. (2Marks)

16. The figure 9 below shows the pattern formed on a tape in an experiment to determine the acceleration of a trolley. The frequency of the ticker tape used was 50Hz

Figure 9



Calculate

i) The initial velocity of the trolley (2Marks)

ii) The final velocity of the trolley (2Marks)

iii) The acceleration of the trolley (2Marks)

b) A gun is fired vertically upwards from the top of an open truck moving horizontally at a uniform velocity of 50m/s. The bullet attains a maximum height of 45m.

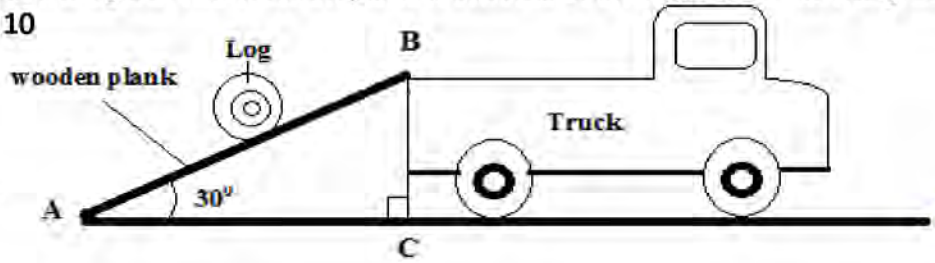
Calculate

i) The time taken by the bullet to reach the maximum height (3Marks)

ii) The distance covered by the truck just before the bullet reaches the level from which it was fired. (3Marks)

17. A man used a wooden plank to lift a wooden log from the ground to a stationary truck as shown in the figure. The wooden plank is inclined at an angle of 30^0 to the ground.

Figure 10

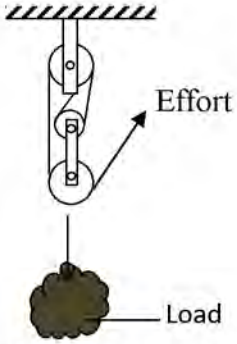


i) Show that the velocity ratio of the system is given as V.R= $\frac{1}{Sin\ 30^0}$ (3Marks)

ii) Explain why the efficiency of this system cannot be 100%. (1Mark)

b) The figure 11 shows a pulley system.

Figure 11



i) State the velocity ratio of the machine. (1Mark)

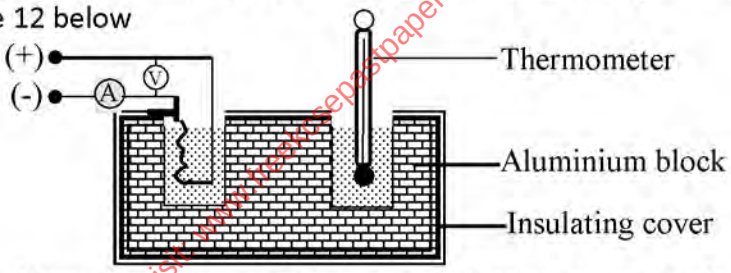
ii) Explain what happens to the mechanical advantage of the machine as the load is increased gradually. (1Mark)

c) Water falls from a water fall to the bottom. The temperature of the water is found to be higher at the bottom than at the top. State the energy transformation. (1Mark)

18. a) Define "specific heat capacity" of a substance (1Mark)

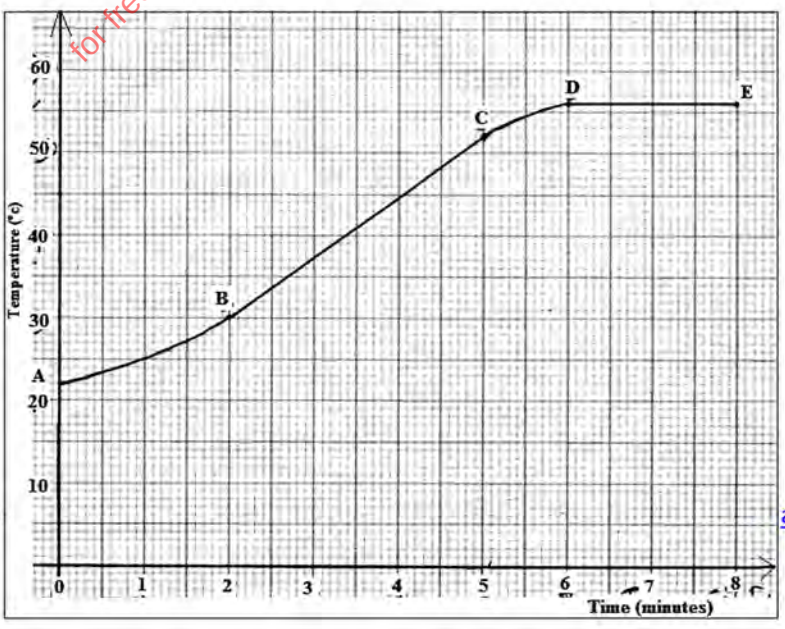
b) In an experiment an aluminium block of mass 2kg was heated using an immersion heater as shown in figure 12 below

Figure 12



The temperature of the block was recorded every minute for exactly five minutes and then the heater was switched off. A graph of temperature in ^{0}c against time in minutes for the experiment is shown below

Figure 13



Study the graph and answer the questions that follow. Suggest why;

i) The reading in the thermometer rose relatively slowly between point A and B. (1Mark)

ii) The temperature continued to rise after the water was switched off (1Mark)

iii) Use the straight portion of the graph (B to C)to calculate the specific heat capacity of the aluminum given that the voltmeter read 22.00v and ammeter 10A throughout the course of the experiment. Show all the steps you use clearly. (3Marks)

c) Explain the two reasons why the value calculated in b) iii) will not be accurate. (2Marks)

d) A temperature scale X has an ice point of 40^0 and a steam point of 240^0 .What is the temperature in ^{0}X when the celcius temperature is 50^0C. (3Marks)

Set15

Paper 2 (Theory)

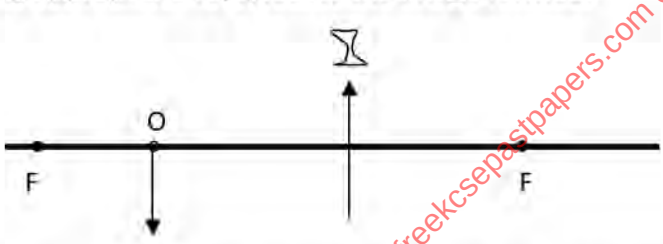
SECTION A(25 MARKS)

Answer all the questions in the spaces provided.

1. State two factors that affect the capacitance of a parallel plate capacitor. (2marks)

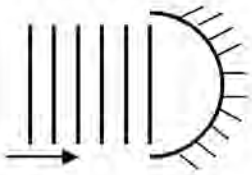
2. The figure1. Shows an object, O placed in front of a concave lens.
   By drawing appropriate rays, locate the image formed. (3marks)

Fig .1



3. Kenya power sells electricity at ksh. 10 per unit. What is the cost of using an electric heater rated 1500w for a total of 30 hours. (3marks)
4. You are provided with resistors of 2.0Ω, 4.0Ω and 6.0Ω.Draw a circuit diagram to show how the three resistors can be connected together to give an effective resistance of 3Ω. (2marks)
5. Figure 2 shows wave fronts approaching a concave surface

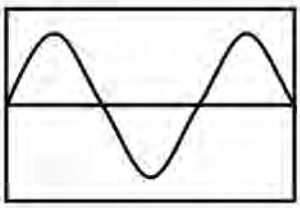
Fig. 2



Complete the diagram to show the wave fronts after striking the surface (2marks)

6. Figure 3. Shows the pattern produced by an a.c voltage on a cathode ray oscilloscope screen.

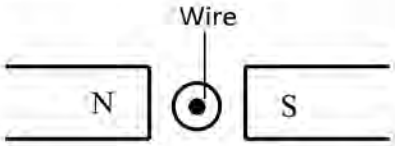
Fig .3



On the same diagram sketch the pattern produced by the same voltage when the time base is switched off. (1mark)

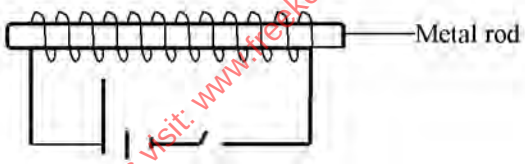
7. State one difference between electromagnetic and mechanical waves. (1mark)
   A wire carrying current is placed in the direction shown is placed in a magnetic field. Indicate on the diagram the direction of the force. (1mark)

Fig . 4



8. When ultraviolet radiation is directed into a clean zinc plate connected to the cap of a negatively charged leaf electroscope, the leaf falls. Explain this observation. (2marks)
9. An electric bulb is rated 75w, 240v, determine the resistance of the bulb. (3marks)
10. A man standing 600m from a cliff claps his hands and hears an echo 3 seconds later. Determine the speed of the sound in air. (2marks)
    A metal rod made up of iron and steel joined end to end is put in a circuit as shown in figure 5.
    Explain how you can identify the side which is iron. (2marks)

Fig. 5



Explain how polarization reduces current in a simple cell. (1mark)

SECTION B (50 MARKS)

Answer all the question in this section

11. a) State Lent's law of electromagnetic induction. (1mark)
    b) The secondary coils of a step down transformer has 500 turns and primary has 15000turns

i) If the voltage in primary is 3600vfind the voltage in secondary. (2marks)
   If the current in primary is 3.0A find the current in secondary. (2marks)

c) A generator at kindaruma can supply 375MW of electric power. If the generator is 85% efficient. Find

i) The rate which falling water must supply energy to the turbine. (3marks)
   If the water falls a height of 22m what is the mass of the water that passes through the turbine each second. (2marks)

Explain how energy loss in a transformer is minimised. (2marks)

a) What is photoelectric effect? (1mark)

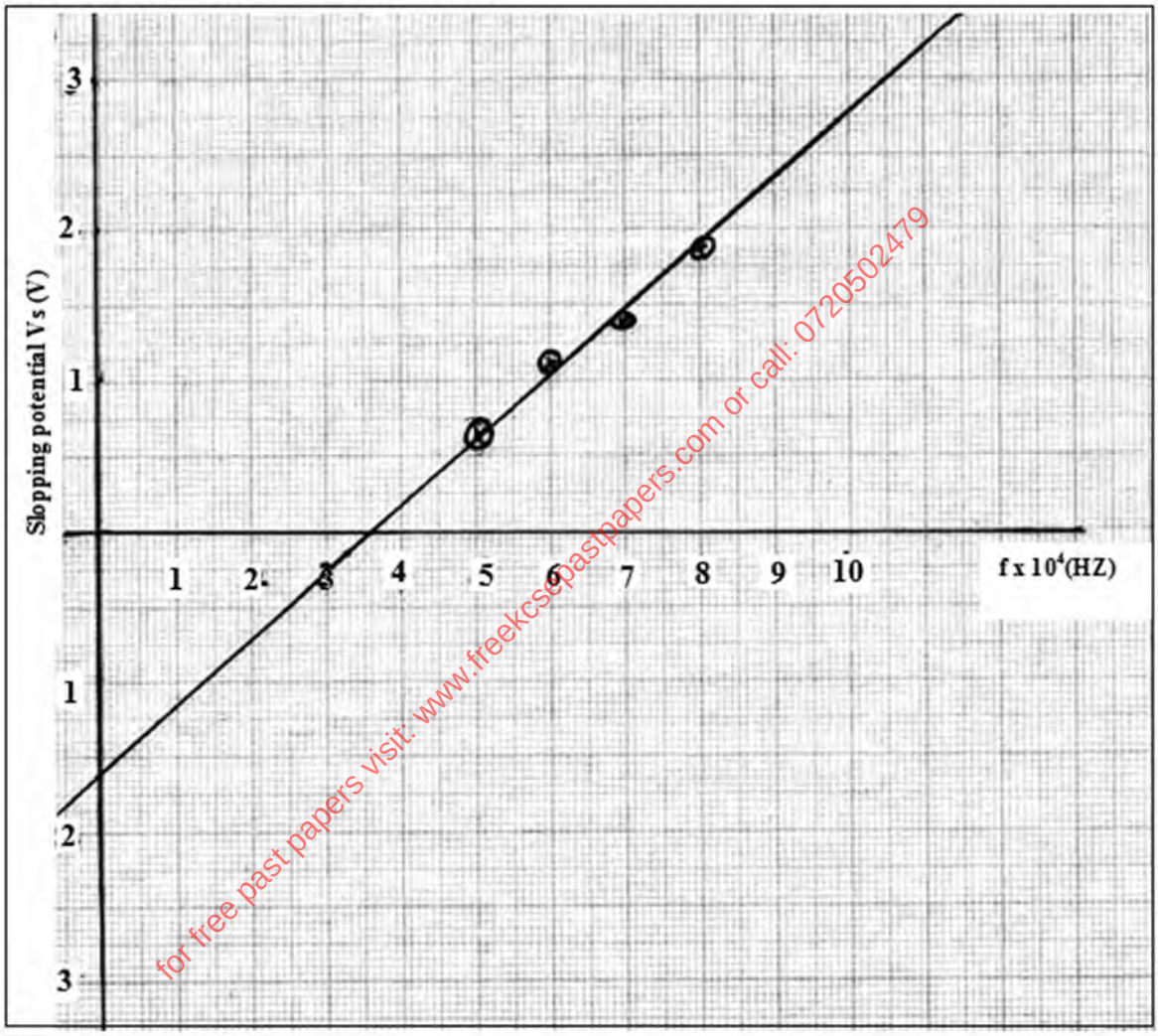
Name two factors that affect photoelectric effect. (2marks)

The threshold frequency of sodium is 5.6×10^{14}Hz .Planks constant=6.6×10^{-34}Js.Find

i) Work function of sodium (2marks)

The kinetic energy of the ejected electrons when sodium is shone with light of frequency 8.6×10^{14}Hz

A certain metal is illuminated with radiation of different frequencies and corresponding stopping potential determined. The graph below shows how the stopping potential vary with frequency. Electronic charge, e=1.6×10^{-19}.



Using the graph determine

i) Planks constant. (3marks)

Work function of the metal (3marks)

a. State ohms law (1mark)

b. A battery of Emf E drives a current of 0.25A when connected to a 5.5Ω resistor. When the 5.5Ω resistor is replaced with 2.5Ω resistor the current flowing becomes 0.5A.Find the emf, E and the internal resistance, r, of the battery. (4marks)

A capacitor of capacitance 6μF capacitor is charged using a 6v d.c source. It is then connected across a 12μF capacitor. Find :-

i) Final voltage (2marks)

ii) Charge stored in each capacitor (2marks)

a) State Snell's law (1mark)

b) A ray of light travelling from water to glass makes an angle of incident of 30^0. Find the angle of refraction in the glass. Refractive index of water $= {}^4/_3$. Refractive index of glass $= {}^3/_2$ (3marks)

c) State the necessary and sufficient conditions for total internal reflection to occur. (2marks)

You are provided with a glass block, a soft board, white sheet of paper and three optical pins. With the help of a diagram explain how you would use these apparatus to determine the refractive index of the glass block using real and apparent depth method. (4marks)

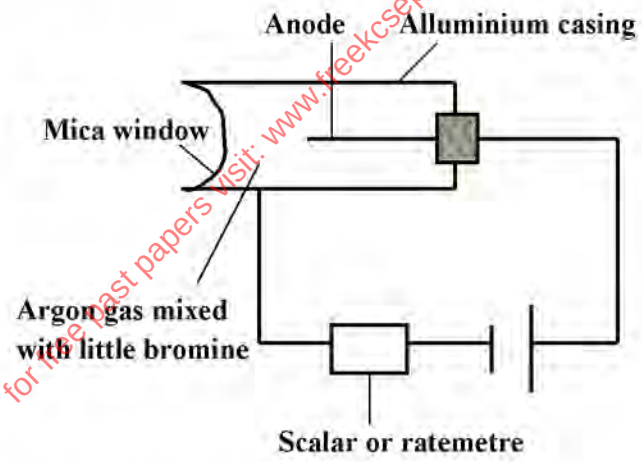
12. a) $^{226}_{88}Ra$ decays into $^{222}_{86}Rn$ by emission of an alpha particle. Write a nuclear equation for the decay (2marks)

b)

i) What do you understand by the term half-life of a radioactive substance. (1mark)

A G.M tube registers an initial count rate of 3200 counts for a certain substance and 100 counts 30 hours later. What is the half-life of this substance. (3marks)

c) The figure below shows a G.M tube.



i) What is the purpose of the mica window? (1mark)

ii) What is the purpose of the bromine (1mark)

iii) Briefly explain how it works. (2marks)

Set15

Paper 3 (Practical)

Question 1

You are provided with the following:-

- Vernier callipers
- Micrometer screw gauge
- Masses; 10g, 20g, 50g and 100g
- A helical spring
- Metre rule or half metre rule

Proceed as follows

(a) Determine the number of complete turns of the helical spring.

N = _____ (1 Mark)

(b) Measure the external diameter of the spring using the vernier callipers

D = _____ m (1 Mark)

(c) Use the micrometer screw gauge to determine the diameter of the wire of the spring.

d = _____ m (1 Mark)

(d) Determine the value of m (2 Marks)

$N = \frac{0.4D}{dm}$

Suspend the helical spring vertically alongside the clamped half metre rule as shown in figure 1 below. Determine the length L_0, of the spring before loading it.

L_0 = _____ cm

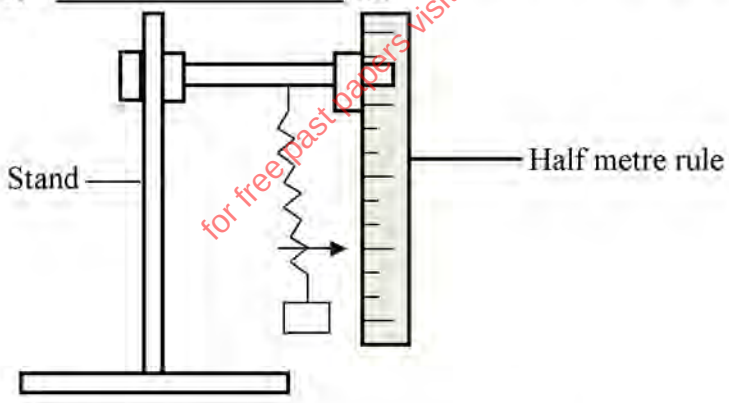


Figure 1

(e) Load the spring with a mass of 20g and determine the new reading on the metre rule. (L) Record this in the table below.

Calculate the extension e = L – L_0 due to the mass of 20g and record the value in the table given below. Repeat step f for other masses and complete the table.

Mass (g)	0	10	20	30	40	50	60	70	80	90	100
Weight (N)											
Reading (L) (cm)											
Extension e (cm)											
$\frac{1}{e}$ (cm^{-1})											

(6 Marks)

(f) Plot a graph of weight (N) against $\frac{1}{e}$ (cm^{-1}) (4 Marks)

(g) Determine the slope (s) of the graph at a mass of 45g (2 Marks)

(h) Given that m = $\frac{-255T}{(S+60)^2}$

Determine the value of T where (S) is the slope at 45g (3 Marks)

2. This question consists of two parts A and B attempt both parts.

PART A

You are provided with the following:

- 5 optical pins
- A glass block
- A plain paper
- A soft board
- 4 thumb pins

Proceed as follows:

(a) Fix the white piece of paper on softboard using the thumb pins provided. Place the glass slab on the white paper and draw the outline of the block on the paper. Remove the block and indicate the sides ABC and D as shown. On side BC determine the centres of side BC using your ruler and fix pin P_0 as shown. Looking from one side at the opposite end of the slab fix pin P_1, P_2 so that they are in with the image I of P_0. On the other side locate the same image using pins P_3 and P_4 as shown in figure 2. Remove the glass block and produce lines P_1, P_2 and P_3, P_4 to their points of intersection which is the position of the image I.

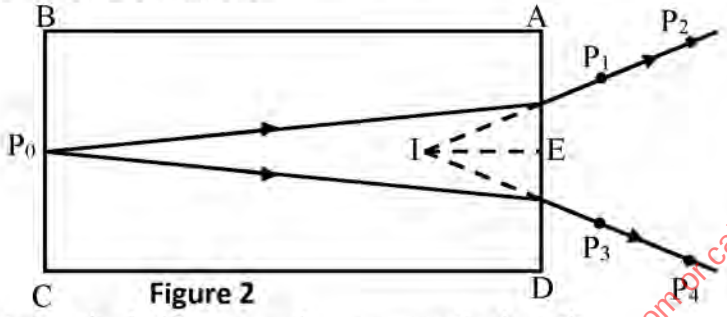


Figure 2

(b) (i) Using the half metre rule measure the lengths

EP0 = _____ cm (1 Mark)

EI = _____ cm (1 Mark)

(ii) Work out the ratio n = $\frac{EP_O}{EI}$ (2 d.p) (1 Mark)

(iii) What does n represent? (1 Mark)

Part B

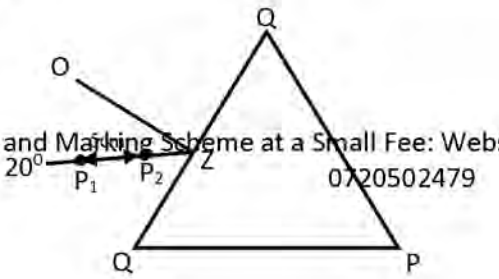
You are provided with the following.

- A plain sheet of paper
- A soft board
- 4 optical pins
- 4 thumb pins
- A triangular prism

Proceed as follows

(c) (i) Firmly fix the plain sheet of paper on the softboard using the thumb pins and place the prism near the centre of the paper. Trace the outline of the prism using a pencil.

(ii) Remove the prism from the outline and label the vertices of the outline PQ and R. On the side QR mark a point and draw a normal OZ at this point. Measure an angle of 200 from the normal and draw a line along this angle as shown in **figure 3.**



(d) Replace the prism on the outline and fix pins P_1 and P_2 on the 20^0 line at a distance of 3cm from
each other.
View the images of the pins P_1 and P_2 through side PR and fix other pins P_3 and P_4 so that all the pins appear on one line. Remove the prism and draw a line to pass through the holes made by pins P_3 and P_4 extend the line into the outline as shown in figure 3. Also extend the 20^0 line so that the two lines cross each other. Determine angle θ and record in the table below.

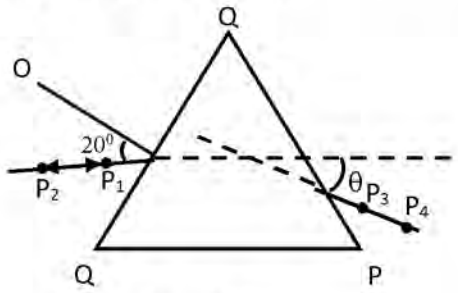
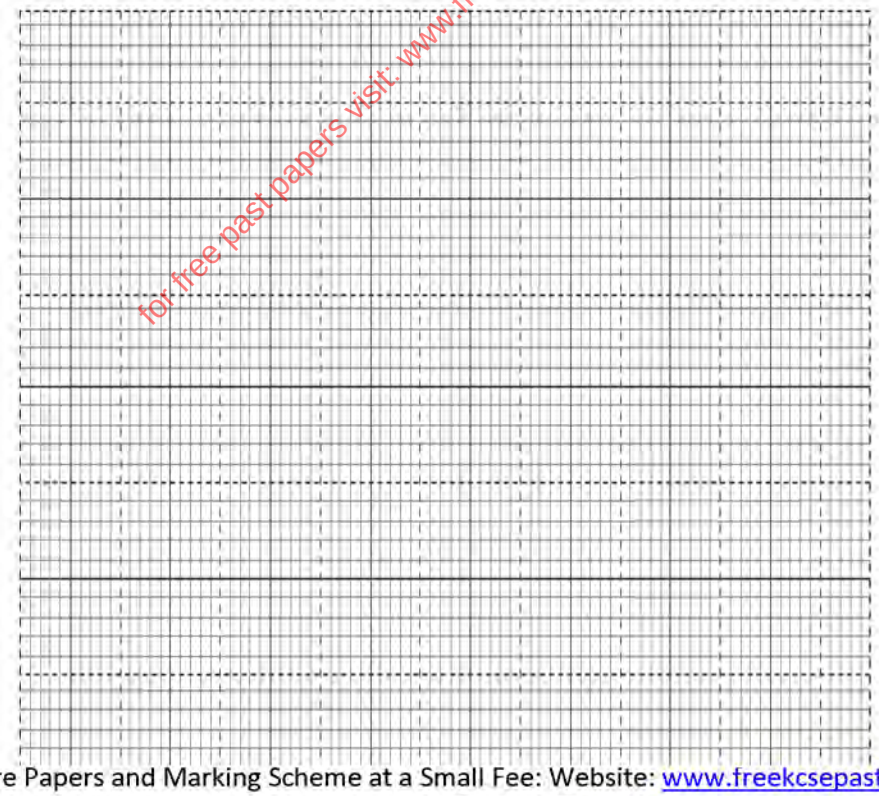


Figure 4

(e) Repeat the procedure and complete the table below.

Angle I ($^{(0)}$	20	30	40	50	60	70
Angle θ						

(f) On the grid provided plot a graph of angle θ against angle i (5 Marks)



(g) Use your graph to determine the highest value H_{max} of angle θ H_{max} = (2 Marks)

(h) Determine the constant R for the glass prism from the formula. (3 Marks)

$$R = \frac{Cos\ 40}{Sin^2\left(16+\frac{H_{max}}{3}\right)}$$