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Kenya Certificate of Secondary Education (KCSE)

SMARTFOCUS LATEST PREDICTIONS 2024

PHYSICS

PREDICTION 1-10

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PREDICTION 1

PAPER 1

Section A (25 marks)

Answer all the questions in the spaces provide

1. A partially inflated balloon at sea level becomes fully inflated at higher altitudes. Explain this observation (2 marks)

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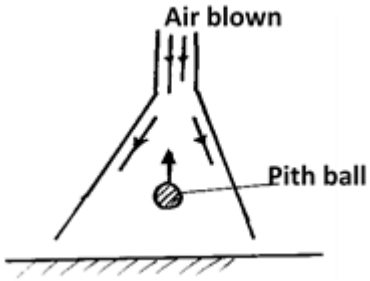
2. The figure below shows a pith ball being lifted into the funnel by blowing air into the funnel Explain this observation (2 marks)



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3. State **two** reasons why gases diffuses at a higher rate than liquids. (2 marks)

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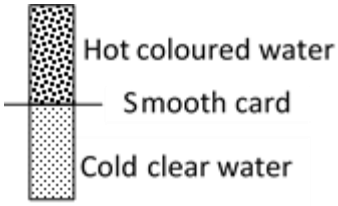
4. A student set up an experiment as shown below using two gas jars, one with hot coloured water, the other with cold clear water separated by a smooth card. The upper jar is upside down. Explain the observation made when the card is removed. (2 marks)



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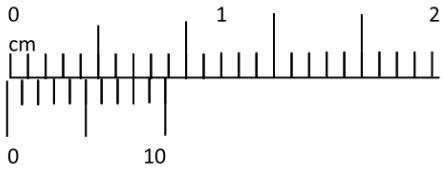
5. The figure below shows the scale of a Vernier calipers which is closed fully. State the Zero error of the instrument (1 mark)



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6. The figure below shows a uniform body suspended freely through a hole on an optical pin. State with reason the case where the body is more stable (2 marks)

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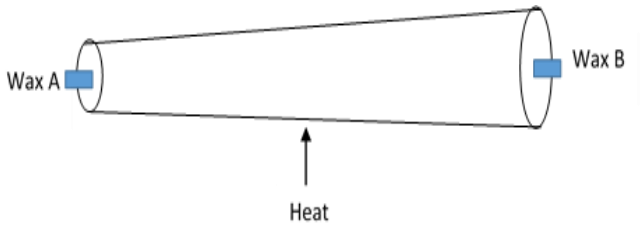
7. The figure below shows a metal being heater at the middle. Giving the reason state the wax that will fall off first (2 marks)



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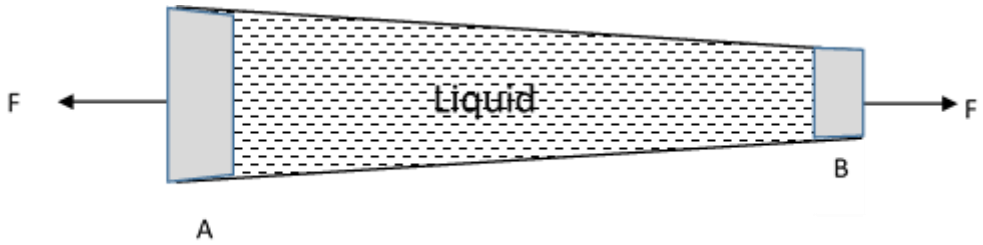
8. The figure below shows a system with a liquid enclosed by two pistons. Equal force F is applied on the system as shown. Giving reason show with an arrow the direction of movement of the liquid

(2 marks)



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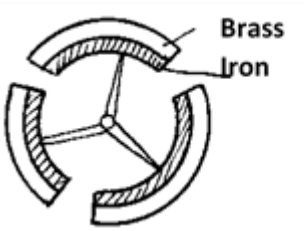
9. The figure below shows a bimetallic wheel whose diameter is not affected by changes in

temperature. Briefly explain how the diameter of the wheel remain unchanged as the temperature increases. (2 marks)



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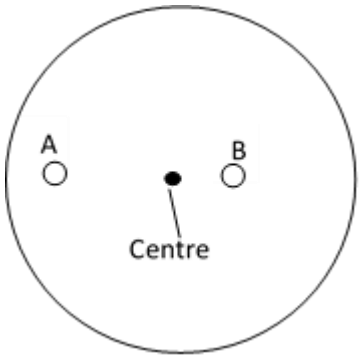
10. Two identical springs have a combined spring constant of 3.5N/cm when in series Determine combined spring constant when the springs are in parallel. (2 marks)

11. Two coins A and B of the same mass and material are placed on a turntable as show below. The turntable is then rotated at a high speed. With reason name the coin that skids first (2 marks)



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12. A substance of volume Xcm^3 and density $800kgm^{-3}$ is mixed with $100cm^3$ of water of density $1000kgm^{-3}$. The density of the mixture is $960kgm^{-3}$. Determine the value of X. (2 marks)

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13. A bullet of mass 10g travelling at a speed of $400ms^{-1}$ hits a tree trunk. It penetrates the tree trunk and stops inside the trunk after 4 cm. Calculate the average resistance force offered by the trunk to the bullet. (2 marks)

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Section B (55 marks)
Answer all the questions in the spaces provide

14. (a) A body accelerates from rest. Its velocity after 5 seconds is 26m/s and after 9 seconds its velocity is 42m/s. calculate

i) Distance moved during the motion (3 marks)

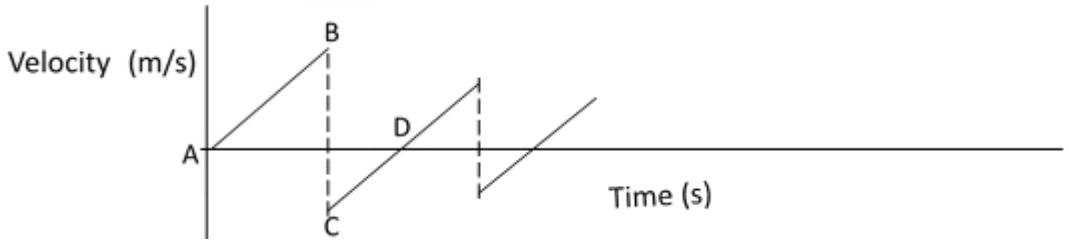
ii) Average speed of the journey (2 marks)

(b) A car can be brought to rest from a speed of 20m/s in a time of 2s when brakes are applies.

i. Find the average deceleration (1 mark)

ii. The car is stopped by a policeman when moving at a speed of 20m/s. If the driver's reaction time is 0.2s determine the shortest stopping distance. (2 marks)

(c) The figure below shows the graph of a tennis ball bouncing severally on a table



Describe the motion between

i. AB (1 mark)

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ii. BC (1 mark)

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iii. CD (1 mark)

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15. (a) State the Pascal principle (1 mark)

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(b) State the principal of moments (1 mark)

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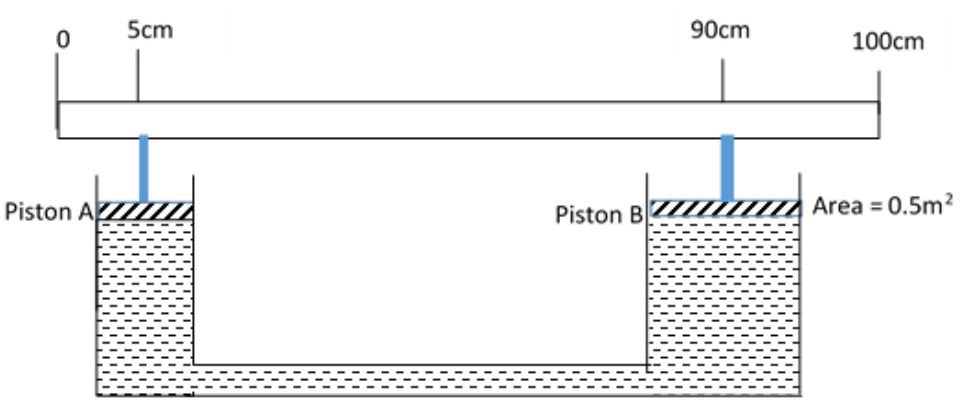
(c) The figure below shows a 100cm uniform bar of weight 50N balanced horizontally on two pistons.



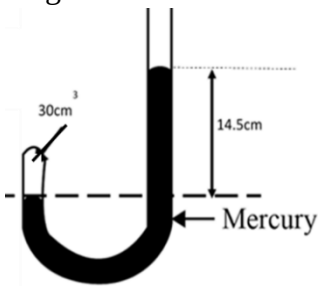
Correct to 2 decimal places determine

i. Force exerted on piston A (3 marks)

ii. Force exerted on Piston B (3 marks)

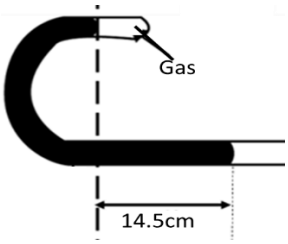
iii. Cross section area of piston A (3 marks)

16. a. The figure below shows $30cm^3$ of gas trapped in a tube containing mercury to a height of 14.5cm. The prevailing atmospheric pressure is 760mmHg. Determine the pressure acting on the gas in Pascals (3 marks)

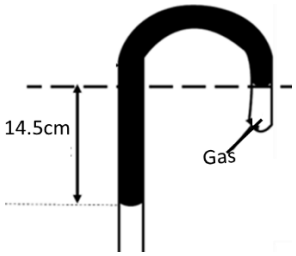


b. Determine the volume of the gas when the tube is held as shown below

i. (3 marks)



ii. (3 marks)



17. a) State the law of floatation. (1 mark)

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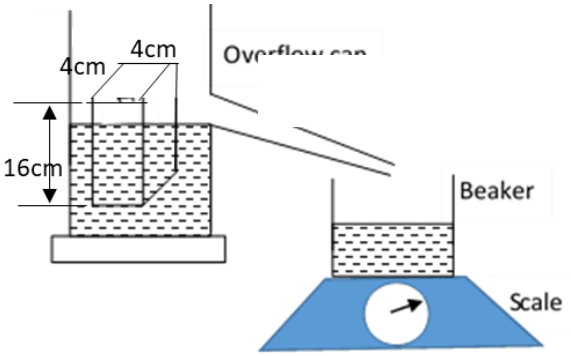
b) The figure below shows a block cuboid of dimensions 4cm by 4cm by 16cm floating in a liquid in an overflow can with $\frac{3}{4}$ of its height submerged.

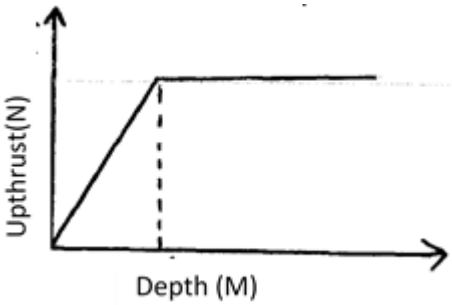


Given that the mass of the beaker when empty is 85g and the reading on the scale in the set up above is 245g, calculate:

(i) The density of the block. (3 marks)

(ii) The density of the liquid. (2 marks)

(c) A metal block is suspended from a spring balance and held inside a beaker without touching the beaker. Water is added gradually into the beaker. The graph below shows the variation of up thrust on the block with depth of water.



Explain the shape of the graph. (2 marks)

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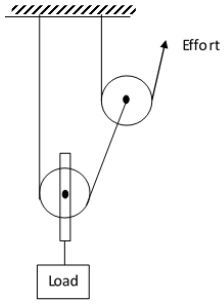
(d) The figure below shows a pulley system being used to raise a load.

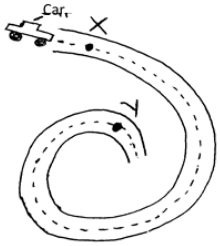


(i) Indicate the direction of the strings (1 mark)

(ii) If an effort of 35N raises a load of 105N, determine the efficiency of the system.

(3 marks)

18. (a) The figure below shows a car of mass (m) moving along a curved part of the road with a constant speed.



(i) Explain why the car is more likely to skid at Y than at X. (2 marks)

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(ii) If the radius of the road at V is 250m and the car has a mass of 600kg, determine the maximum speed at which the car can be driven while at V without skidding. Force of friction between the road and the tyres is 18000N. (3 marks)

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(b) A string of length 70cm is used to whirl a stone in a circle in a vertical plane at 5 rev/s.

Determine:

(i) The period (1 mark)

(ii) The angular velocity. (2 marks)

(iii) The speed of the stone (2 marks)

(c) A body moving in a circle with constant speed is said to have an acceleration. Explain. (1 mark)

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PREDICTION 1

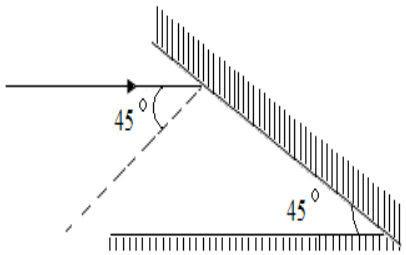
PAPER 2

SECTION A (25MKS)

Attempt all questions in this section

1. The figure below shows a ray of light incident on a mirror at an angle of 45°. Another mirror is placed at an angle of 45° to the first one as shown. Sketch the path of the ray until it emerges.

(2mks)



2. A circuit consists of a battery, metal wire, ammeter and a switch connected in series. The switch is closed and the ammeter reading noted. The metal wire is now heated.

a) State the observations made on the ammeter reading. (1mk)

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b) Give one reason for the above observation made (1mk)

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3. 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) Mention any source of waves C. (1mk)

……

(b) State one use of the wave D (1mk)

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4. A ray of light incident on the surface of a glass prism is observed as represented in the figure below.

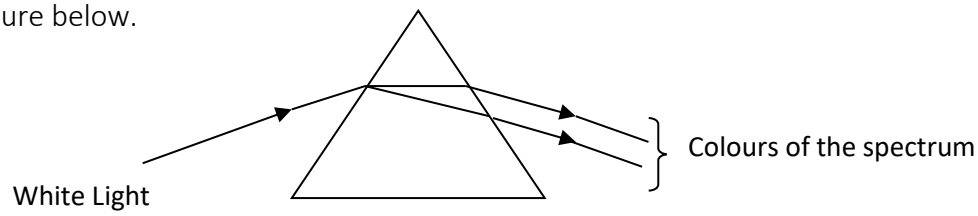

Figure 4.

Explain this observation. (2mks)

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5. (a) State the law of electrostatic charges. (1 mk)

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(b) Figure 5 shows a highly negatively charged rod being brought slowly near the cap of a positively charged leaf electroscope. It is observed that the leaf initially falls and the rises.

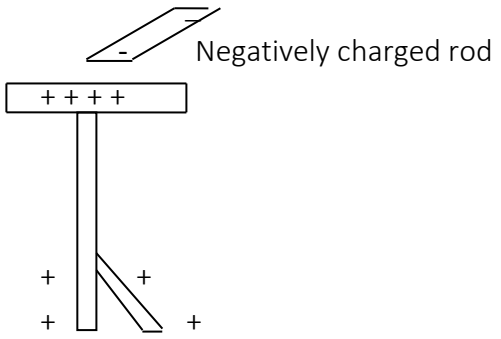

Figure 5

Explain this observation. (2mks)

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6. Distinguish between thermionic emission and photoelectric emission. (2mks)

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7. The expression below is an equation for a radioactive element P. Element Q and R are the daughter nuclides. P, Q and R are not the actual symbols of any of the elements.

$$\frac{235}{92}P \rightarrow \frac{231}{90}Q + \frac{x}{y}R$$

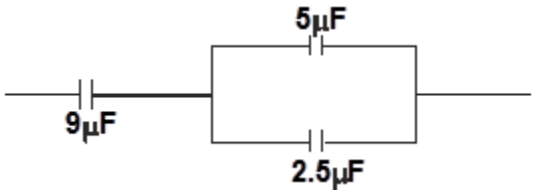
Identify the element R and state any of its characteristics.

R…… (1mk)

Characteristics……

……..(1mk)

8. The figure below shows part of an electric circuit. The charge stored in the 9µF capacitor is 1.4 micro coulombs (µC)



Determine the p.d across the 5µF capacitor. (3mks)

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9. A person standing behind a wall hears a bell ringing although he cannot see the bell. Mention this property of sound. (1mk)

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10. Complete the ray diagram in figure 10 below so as to form an image. (2mks)

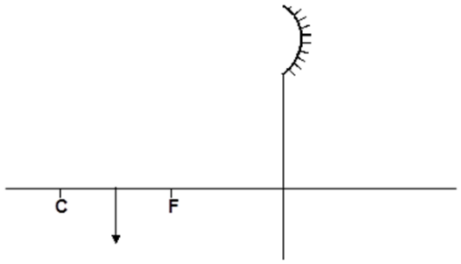

Fig 10

11. Explain the meaning of the following term as used in waves: (1mk)

Amplitude

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12. Figure 10 shows an object and its image formed on a screen by a thin lens.

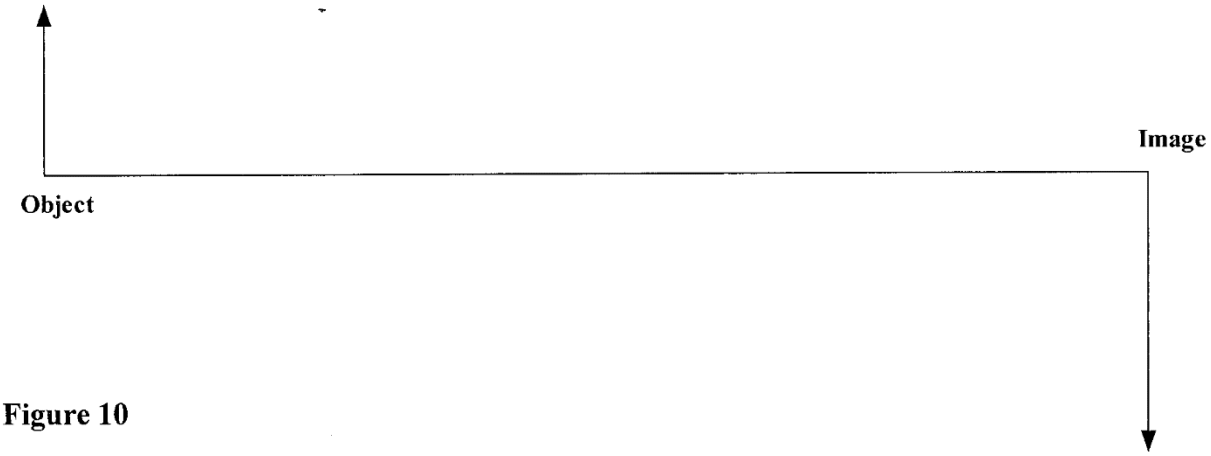


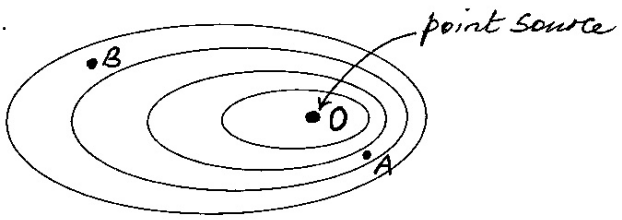
Figure 10

By using appropriate rays complete the diagram to show the position of:

(i) the lens. (1mk)

(ii) the two principal foci. (1mk)

13. The figure shown below illustrates crests of circular water wave-fronts radiating from a point source O in a pond.



State how the depth of the pond at A compares with that at B. (1mk)

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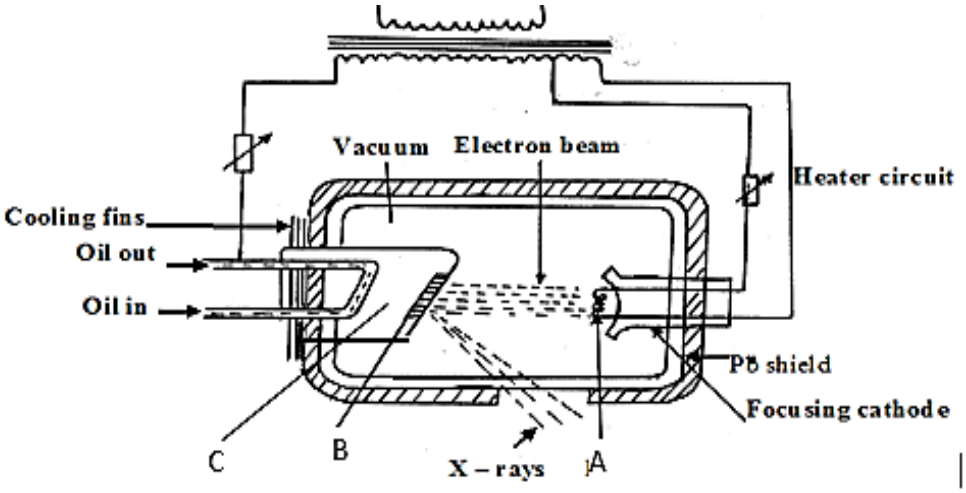
SECTIOIN B (55MKS)

Attempt all questions in this section

14. (a) Using the diagram below;



(i) Name the part labelled C (1mk)

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(ii) State the property of the material labelled B on the diagram which makes it suitable for use in the X-ray tube. (1mk)

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(iii) Why is C inclined at an angle of 45°? (1mk)

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(iv) State the adjustment that can be made to vary

I. The quality of X-rays (1mk)

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II. The quantity of the X-rays. (1mk)

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v) In an X-ray tube, the accelerating voltage is 100KV Calculate the kinetic energy of the electrons arriving at the target (take e = 1.6 x 10^{-19}C)

(2mks)

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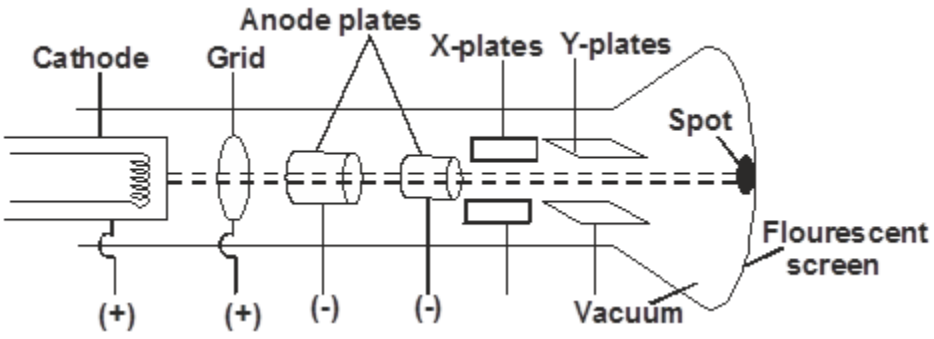
b) The figure below shows a cathode ray oscilloscope (CRO) drawn by a student.



i) Identify two mistakes in the diagram. (2mks)

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ii) In a correctly drawn C.R.O, what adjustment can be made to obtain a very bright spot. (1mk)

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iii) State the reason why the fluorescent screen should be earthed. (1mk)

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iv) State one difference between a C.R.O and T.V tube. (1mk)

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15. a) State one condition under which ohm's law is obeyed in a metal conductor. (1mk)

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b) You are provided with three resistors R_1, R_2 and R_3 connected in parallel. If the p.d across them is V, show that an expression for the effective resistance of the three resistors is given by. $\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$ (3mks)

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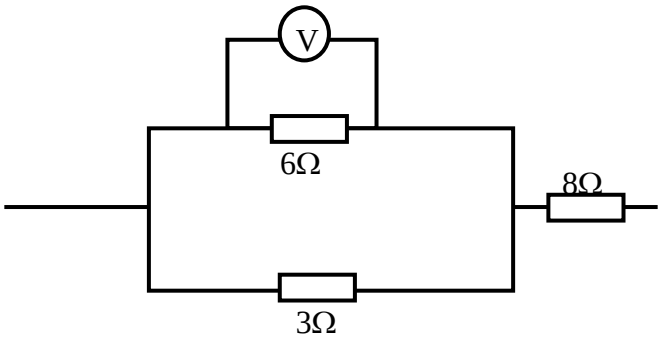
c) The figure below shows three resistors as shown.



If the voltmeter reads 4V, find the

(i) Effective resistance (2mks)

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(ii) Current through the 3Ω resistor (2mks)

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(iii) Potential difference across the 8Ω resistor if the voltage total voltage in the circuit is 10V (1 mk)

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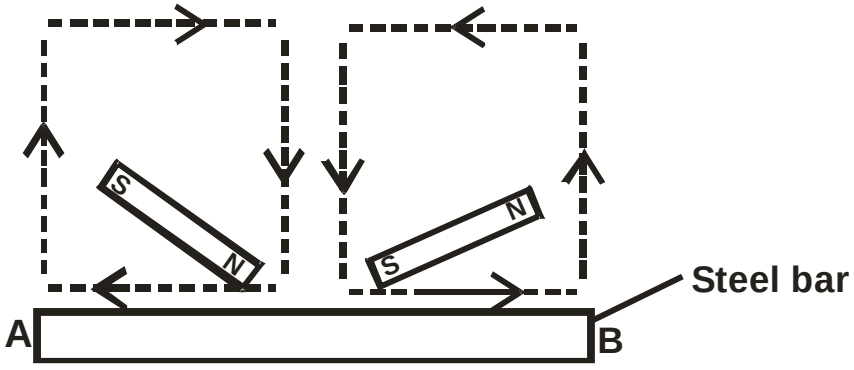
d) Draw a circuit diagram showing three bulbs A, B and C, an ammeter and a 12v supply connected in such a way that they operate at same potential and all light with equal brightness. (2mks)

16. a) The figure below shows a method of magnetization used in making magnets.



i) Name the method. (1mk)

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ii) Identify the polarities A and B of the magnet produced. (2mks)

A……

B……

b) In demagnetization by electrical method:

i) State the type of current used. (1mk)

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ii) Explain your answer in (i) above. (1mk)

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c) Explain why when demagnetizing a magnet, the magnet should be held in the East-West direction. (1mk)

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d) I. An electric kettle is rated at 1.8 kW, 240 V. Explain the choice of the safest fuse for the kettle. (the available fuses are 5 A, 10 A, and 20 A) (3mks)

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II. Explain one factor which affect heating by an electric current. (2mks)

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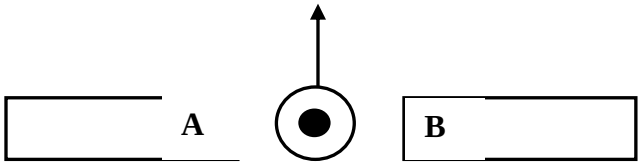
17. a) The figure below shows a section a flexible wire carrying current perpendicularly out of the paper.



The wire moves in the direction shown as current passes through it.

i) Label the polarities of the magnets A and B. (1mk)

ii) Explain the behaviour of the flexible wire. (2mks)

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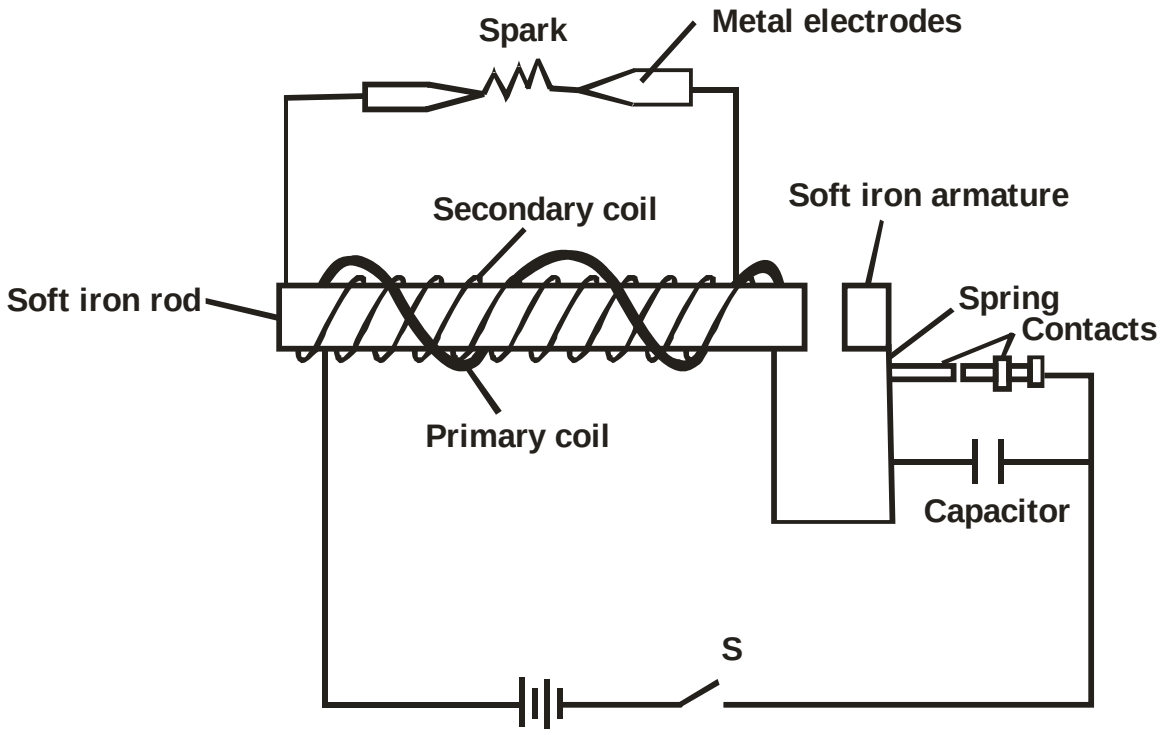
b) The figure below shows an induction coil used to step-up voltage.



i) State the difference between the induction coil and a step-up transformer. (1mk)

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ii) Explain how voltage is stepped up by the induction coil. (3mks)

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iii) The voltage is stepped up from 12V to 15kV. Determine the ratio of the secondary to primary coils in the induction coil. (1mk)

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iv) State how the capacitor eliminates sparking (1mk)

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v) Explain one form in which a transformer loses energy. (2mks)

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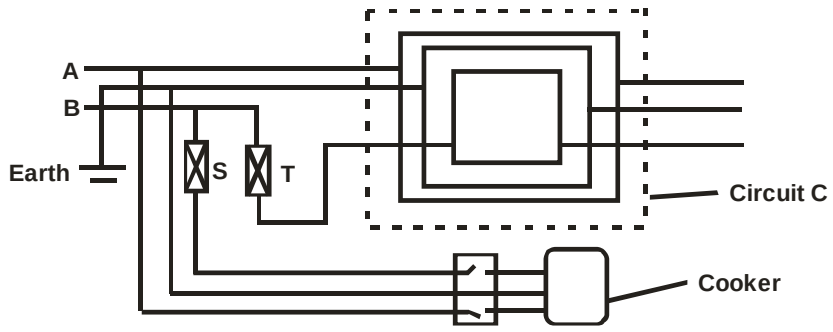
18. The diagram below shows part of a section of a house wiring system.



i) Name the circuit marked circuit C (1mk)

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ii) Identify the cables marked A and B (2mks)

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iii) Explain the function of the device marked S and T. (3mks)

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iv) A house has three rooms each with two 240V, 60W bulbs. If the bulbs are switched on from 7.00p.m to 10.00pm daily.

a) Calculate the power consumed per day in kilowatt-hours. (2 marks)

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b) Find the cost per week for lighting these rooms at sh.6.30 per kilowatt hour. (2 marks)

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PREDICTION 1
PAPER 3

QUESTION ONE

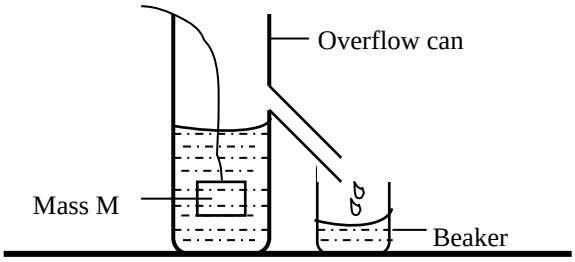
1. You are provided with the following apparatus
   A meter rule
   A wire of length 100cm
   A retort stand
   A stop watch
   A micrometer screw gauge
   An overflow can
   A 100ml beaker
   A 10ml measuring cylinder
   A piece of thread
   Water in a 250ml beaker
   Two pieces of wood
   Mass labeled M

PROCEDURE

a)

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

ii. Gently 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=..... m^3 (1mark)

iv. Calculate I given that $I = \frac{10^6 M}{V}$ $where\ M = 0.05kg$ $(2mks)$

.....

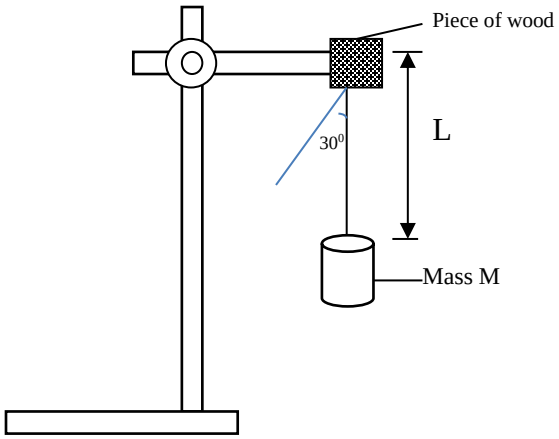
.....

.....

.....

v) What quantity does l represent? (1 mk)

b) Clamp a copper wire as shown in the set up below. Ensure that the wire is free of kinks and the end tied to the hook is firm and the hook does not move.

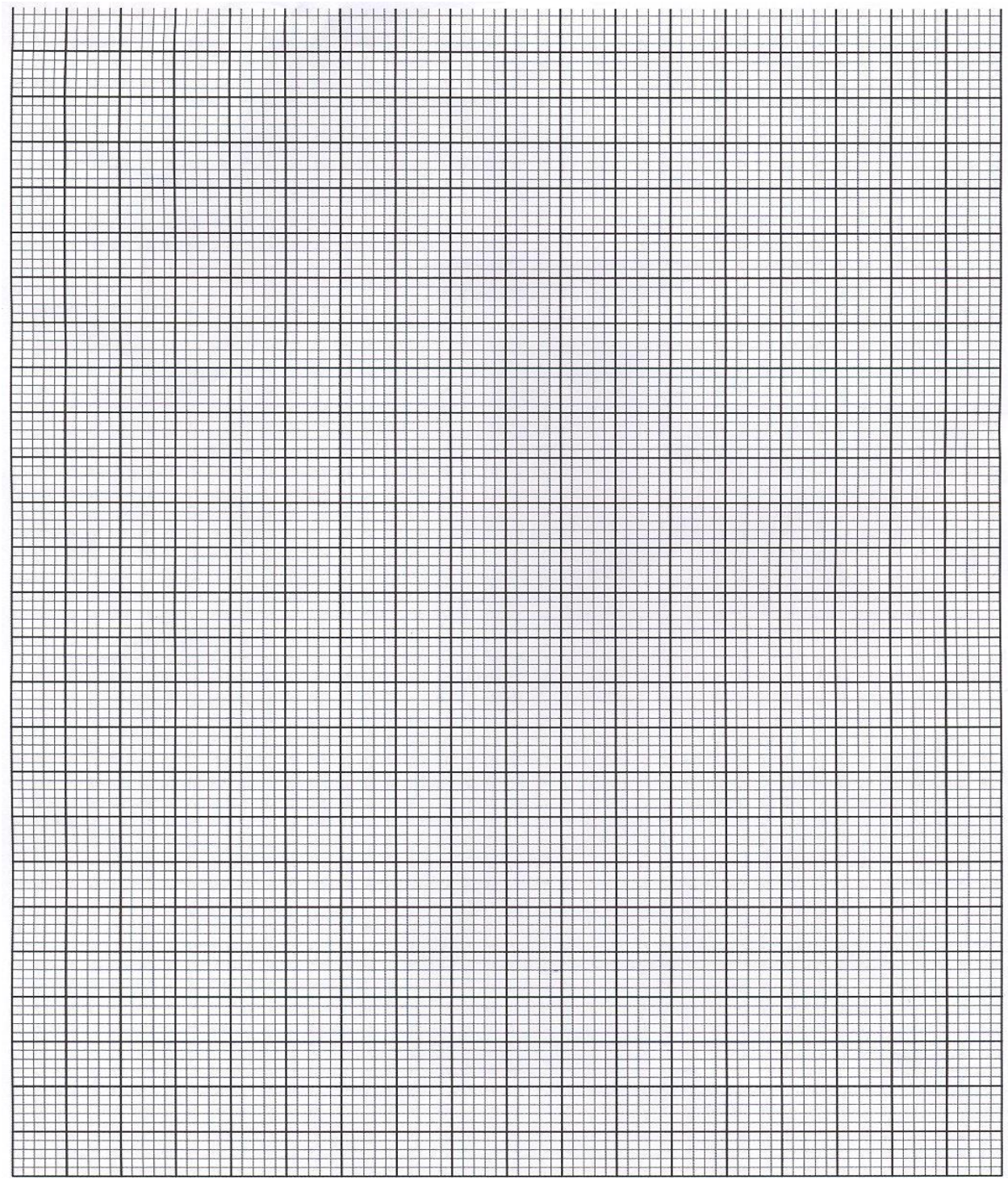


c) Adjust the length L of the wire so that L=70cm. Give the mass M a slight twist of about $30^0$from the point of inclination so that when released, it oscillates about the vertical as shown above. Measure the time t for twenty oscillations and record in the table below.

d) Repeat the procedure above for other values of L as shown and complete the table. (5mark)

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

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



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

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

.....

.....

.....

.....

.....

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

.....

.....

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.....

.....

QUESTION TWO

Part A

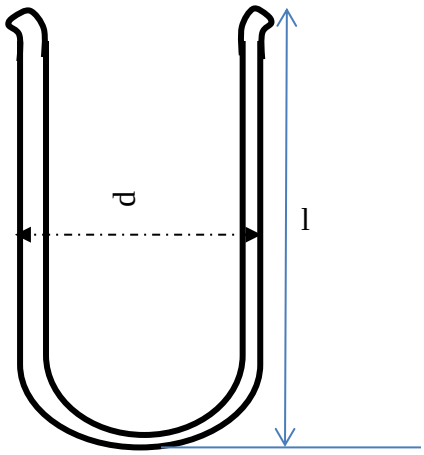
You are provided with the following apparatus.

Metre rule.
Electronic beam balance (shared)
vernier callipers (shared)
100ml measuring cylinder
Boiling tube.

Proceed as follows;

(a) Measure the length l of the boiling tube provided using a metre rule

l = …… cm (1mark)



(b) Measure the external diameter d of the boiling tube at the middle using Vernier callipers.

d=……cm (1mark)

(c) Calculate the external volume of the boiling tube. $V_1 = \frac{11d^2l}{14}$ (1mark)

……

……

(d) Completely fill the boiling tube with water. Pour the water into the measuring cylinder Read and record the volume V_2 of the water.

V_2 = …….. …… cm^3 (1mark)

(e) Calculate the volume V_3 of the glass used to make the boiling tube. (1mark)

……

(f) Using the electronic balance measure the mass of the dry empty boiling tube

Mass =……kg (1mark)

(e) Determine the density of the glass. (1mark)

……

……

……..

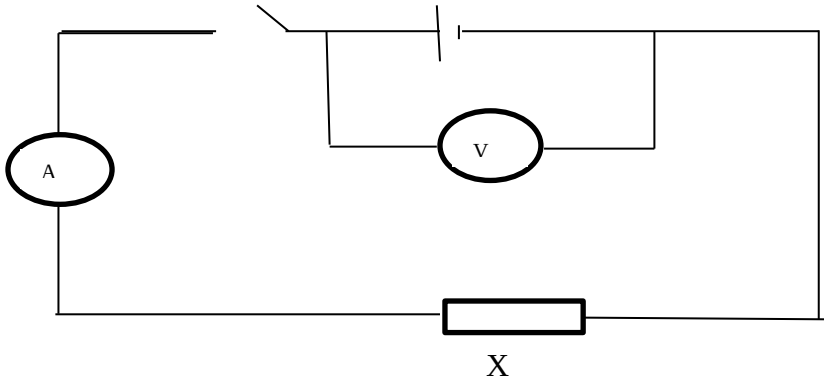
PART B

You are provide with the following

A wire mounted on a millimetre scale labelled AB
A galvanometer.
Jockey or a crocodile clip
A carbon resistor labelled X .
8 Connecting wires, 4 with crocodile clips at both ends.
A resistance wire labelled R mounted on a half meter rule
Ammeter
Voltmeter
One size D dry cell in a cell holder
Micrometer screw gauge

Proceed as follows:

(a) Set up the circuit as shown below.



(a) Record the voltmeter reading when the switch is open.

E = …… (1mark)

(ii) Close the switch and record the voltmeter and ammeter readings V and I.

V = …… (1mark)

I = …… (1mark)

(iii) Explain why V is less than E . (1mark)

……

……

……

(iv) Now connect the voltmeter across the carbon resistor X and record voltmeter reading V_1

when the switch is on.

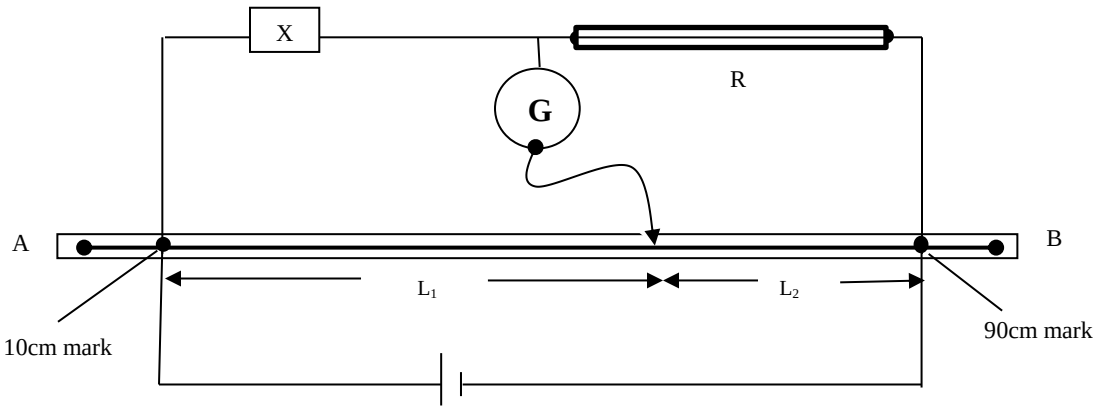
V_1 = ……. (1mark)

(v) Determine X given that $X = \frac{V_1}{I}$ (1mark)

(b) Using the micrometre screw gauge, measure and record the diameter D of the resistance wire R provided

D =……m (1mark)

(c) Now connect another circuit as shown in the figure below.



Touch the 10cm mark and the 90 cm mark and see that the galvanometer deflects in opposite direction in each case.

(i)Move the sliding jockey along the resistance wire AB and note the length L_1 and L_2 where the galvanometer pointer points at the zero mark. Record the values of L_1 and L_2.

L_1 =……m (1mark)

L_2 =…… m (1mark)

(ii) Determine the resistance of the resistance wire R using the relationship: (2marks)

$$\frac{R}{L_1} = \frac{X}{L_2}$$

(iii)Determine the resistance of the wire R per metre. (1 mark)

……

……

(iv)Given that, $R = \frac{0.1114S}{D^2}$ determine the value of S, where R is the resistance per metre. (1mark)

PREDICTION 2
PAPER 1
SECTION A (25 Marks)

1. The diagram below shows a graph of anomalous expansion of water.

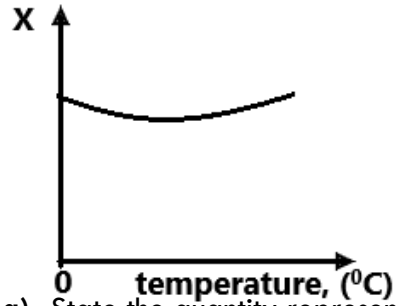


Figure 1

a) State the quantity represented by X **(1 mark)**

b) Explain the shape of the graph **(2 marks)**

2. A form one student attempted to measure the diameter of a spherical marble as shown in figure2 below.

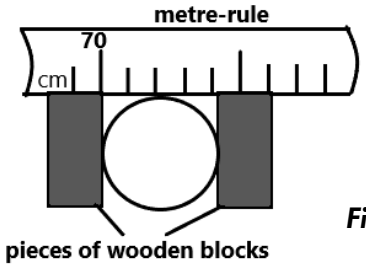


Figure 2

On the space alongside, determine the volume of the marble in SI units and expressed to two significant figure. **(2 marks)**

3. Two glass tubes of varying cross-section area dipped into water in a beaker as shown below. Show the level of water in the narrower tube. **(1 mark)**

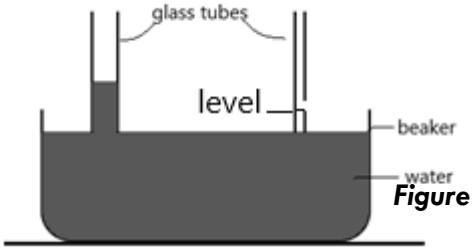


Figure 3

4. In an experiment to demonstrate Brownian motion, smoke was placed in an air cell and observed under a microscope, Smoke particles were observed to move randomly in the cell.

i. Explain the observation **(1mark)**

ii. What would be the most likely observation if the temperature in the smoke cell was raised? **(1mark)**

5. The diagram shown in figure 4 below is an arrangement of three pulley wheels used to help in lifting loads.

Figure 4

i. Complete the diagram to show how the rope goes round the wheels, position of the load and the effort. **(2 marks)**

ii. State the velocity ratio of the pulley system **(1 mark)**

6.

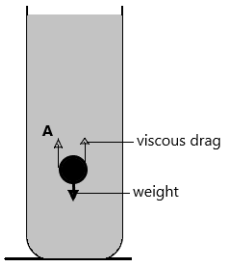
a) Explain how ghee is separated from milk using a centrifuge **(2 marks)**

b) Besides the centrifuge, state any other application of uniform circular motion **(1 mark)**

7. Differentiate between inelastic and elastic collisions. **(1 mark)**

8. The diagram in Figure 5 below shows some of the forces acting on a sphere moving in a viscous liquid in a tall measuring cylinder.

Figure 5



i. Identify the force labelled A **(1 mark)**

ii. State the relationship among the forces when the acceleration of the sphere down the fluid is zero **(1 mark)**

9. A mass of 1kg is attached to a cord of length 50cm. It is whirled in a circle in a vertical plane at 10 revolutions per second as shown in the figure below.

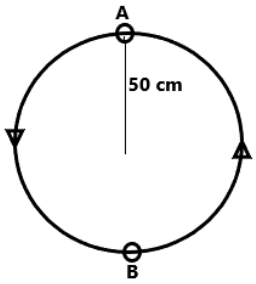


Figure 6

Find the tensions in the cord when the mass is at the lowest point at **B** **(3 marks)**

10. State **any two** changes that can be made to a fluid flowing in a streamline flow to make it turbulent flow. **(2 marks)**

11. A ship carrying load moves from a fresh water to a salty water. Will the depth of floating increase or decrease? Explain your answer. **(2marks)**

12. State **one** way of reducing surface tension in a liquid **(1 mark)**

SECTION B (55 Marks)

13.

a) Define '***specific heat capacity***' **(1 mark)**

b) In an experiment to determine the specific heat capacity of aluminium metal, the set up below was used.

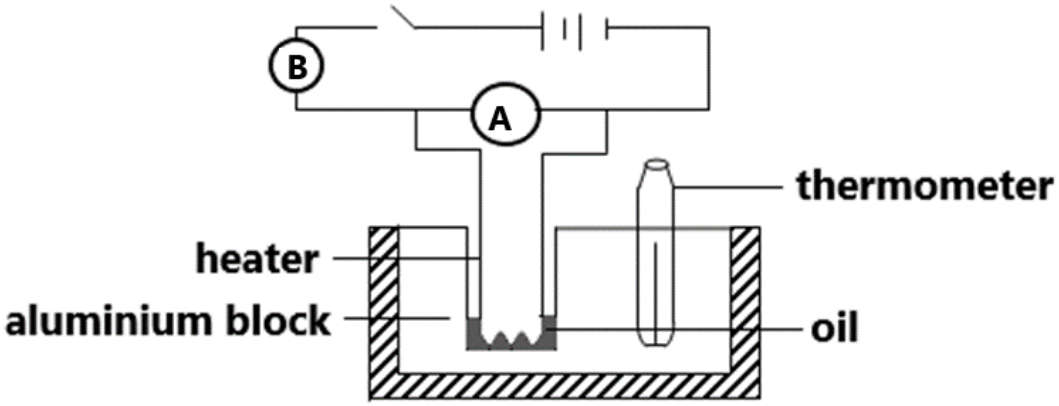


Figure 7

i) Name the measuring instruments labeled A and B **(2marks)**

A:

B:

ii) In the experiment the following data was recorded:

Voltmeter reading	= 2.9V
Ammeter reading	= 1.8A
Mass of the block	= 1.12kg
Initial temperature of block	= 22^0C
Final temperature of block	= 35^0C
Time for heating	= 250 seconds

Use the information above to calculate the specific heat capacity of the aluminium block **(3 marks)**

iii) Suggest a function of the oil in the above experiment **(1 mark)**

c) Food cooks faster along the coastline than at high altitude areas. Explain **(2 marks)**

d) Explain why water is a better coolant than other liquids **(1 mark)**

14.

a) State the law of flotation. **(1 mark)**

b) You are provided with the following apparatus:

- A block of wood.
- A spring balance
- A thin thread.
- Overflow can
- A small measuring cylinder.
- Some water in a beaker.

With the aid of labelled diagrams describe an experiment to verify the law of flotation.
(4 marks)

c) A block of length 80cm, cross sectional area, 3.0cm^2 and density 1300kg/m^3 is completely immersed in a liquid of density 1030kg/m^3. Determine the weight of the block in the liquid.
(3 marks)

d) Explain why a hollow glass sphere just floats on water at 4^{0}C but sinks when water is slightly heated. **(2marks)**

e) The system below is at equilibrium. Dry ice pellets are carefully added to the water until the temperature of water falls to below room temperature. State and explain the observations made.
(2 marks)

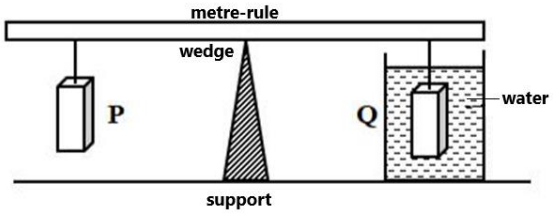


Figure 8

15.

a) Define '***angular velocity***' **(1 mark)**

b) Give an example of object travelling at constant speed and accelerating at the same time.
(1mark)

c) A marked point on the turntable plate has a linear velocity of 23.4 m/s. If the plate has a radius of 20 cm. Calculate the angular velocity of the point on the plate. **(2 marks)**

d) A stone is whirled in a vertical circle as shown in the diagram. The direction of rotation is shown by the arrow. On the axes provided, sketch a graph of tension against time as the stone moves through P, Q, R and S. Indicate on the graph, the positions of P, Q, R and S.**(2marks)**

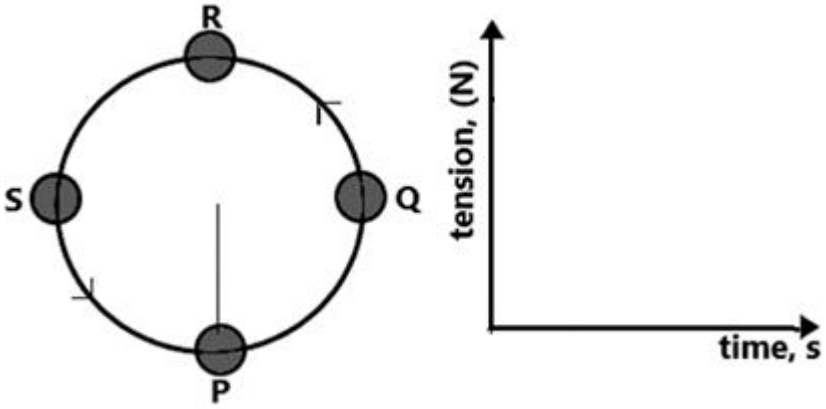


Figure 9

e) A 200g mass is tied to a string and rotated in a horizontal circle at constant angular velocity. The graph below shows the force required to keep the mass in the horizontal circle at different lengths (radius).

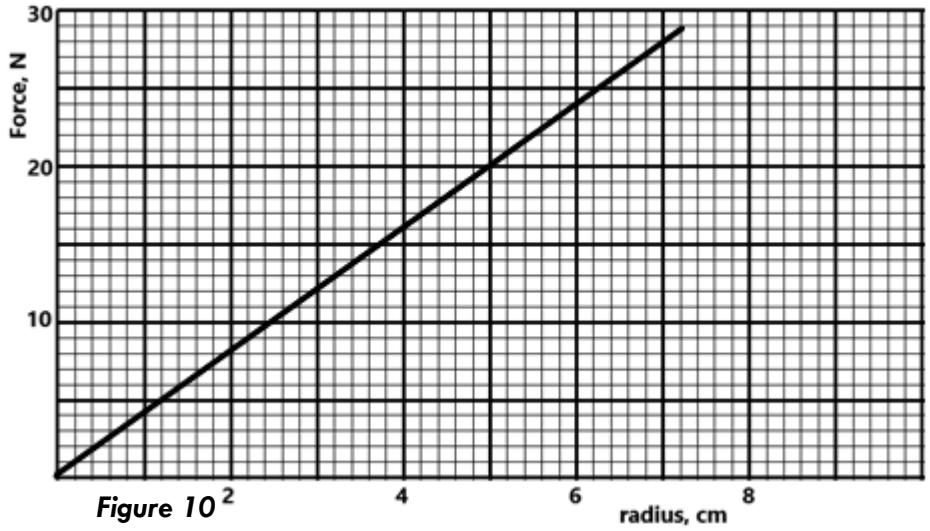


Figure 10

Determine, from the graph, the angular velocity of the mass. **(4 marks)**

16.

a) Define term 'atmospheric pressure' **(1 mark)**

b) Figure below shows an accurate simple mercury barometer.

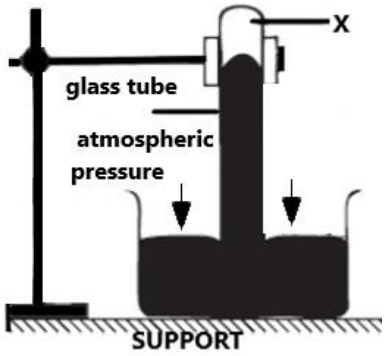


Figure 11

i. Identify the part labelled X **(1 mark)**

ii. Explain how you would test for the X **(2 marks)**

c) The figure below shows a U-tube filled with water, mercury and another liquid:

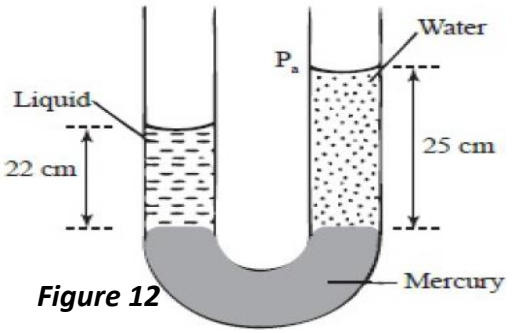


Figure 12

i. Determine the density of the liquid. **(3 marks)**

ii. State possible reasons why mercury is used. **(2 marks)**

d) It is dangerous to stand close to a railway line on which a fast moving train is passing. Explain **(2 marks)**

e) Differentiate between the: **Bernoulli's effect** and **Bernoulli's principle** **(2 marks)**

17.

a) Explain the meaning of the following as used in machines:

i. Mechanical advantage **(1 mark)**

ii. Efficiency **(1 mark)**

b) The figure below shows part of a hydraulic press. The plunger is the position where the effort is applied while the Ram piston is the position where the load is applied. The plunger has cross-section area, 10 cm^2 while the Ram piston has cross-section area, 50 cm^2.

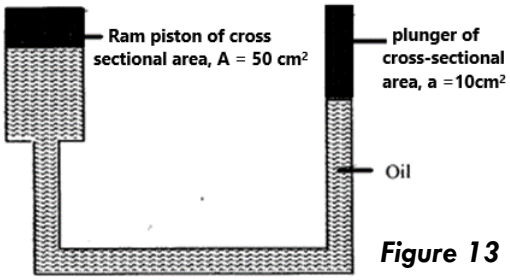


Figure 13

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

i. State any two properties of the oil used in the hydraulic press **(2 marks)**

ii. Determine the velocity ratio of the press in terms **(2 marks)**

c) A block of mass 5 kg is pulled up an inclined plane shown below by a force of 50 N.

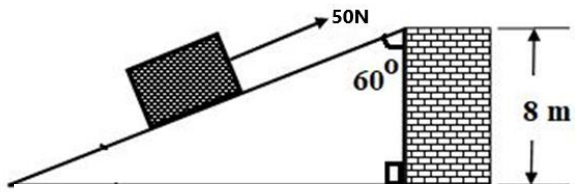


Figure 14

Calculate the efficiency of the plane. **(3 marks)**

d) Explain why the efficiency of the inclined plane is not 100% **(1 mark)**

PREDICTION 2

PAPER 2

SECTION A (25 marks)

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

1. (a) The figure 1 below shows the inner parts of a three-pin plug.

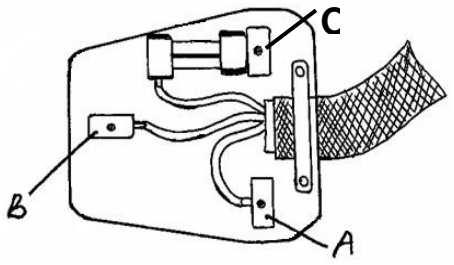


Figure 1

(i) Identify the pins **A** and **B**.

A. (1mk)

.....

B. (1mk)

.....

(ii) State the reason why the pin **B** is normally longer than the other two pins **A** and **C.**

(1 mk)

.....

.....

2. The figure 2 below shows an iron bar suspended near a coil connected in a circuit containing abattery of cells and switch.

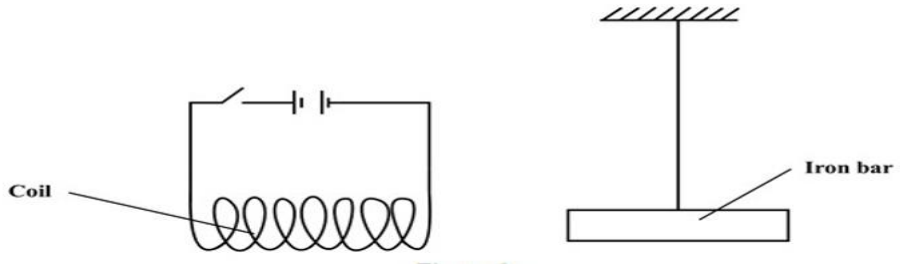


Figure 2

State and explain what is observed when the switch closed. (2 marks)

……
……
……

3. The figure 3 below shows a charged parallel plate capacitor connected to a voltmeter.
   The separation of the plates is adjustable

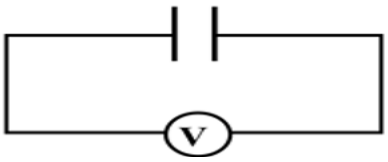


Figure 3

State and explain the change in the voltmeter reading when the plates are moved further apart.
(3 marks)

……
……
……
……

4. Give a reason why brass cap of a gold leaf electroscope is perfectly circular (1mk)

.....

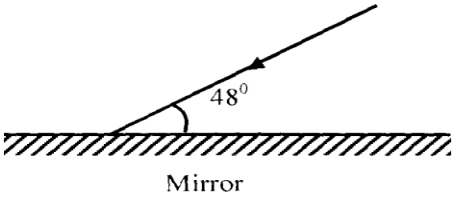


Figure 4

.....

5. The figure 4 below shows a ray of light incident on a mirror. (2 mks)
   Determine the angle of reflection

.....
.....

.....

6. Explain why lecture theatre halls are covered with soft perforated materials. (2mks)

.....

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7. The figure 5 below shows magnetic field around a current carrying conductor.

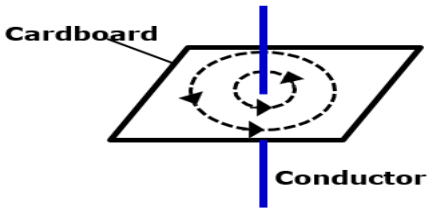

Figure 5

State the rule of physics that helps Indicate on the diagram the direction of the current. (1mk)

.....

8. The Figure 6 below shows how the displacement varies with time for a certain wave.

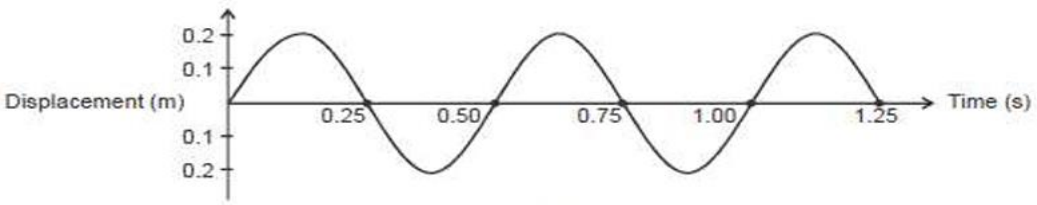

Figure 6

Determine the frequency of the curve. (3 marks)

……

……

……

9. The table below shows the arrangement of electromagnetic waves in the order of increasing energy of radiation.

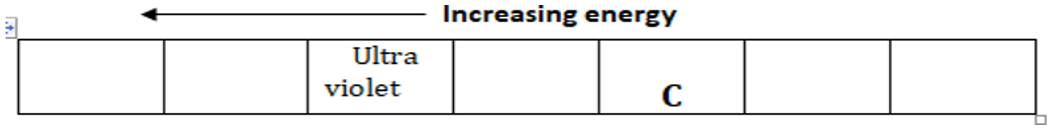

Figure 7

a. Identify wave C (1mk)

.....

b. State **one** use of the wave marked C (1 mk)

.....

10. Explain how x-rays of high quality can be produced from an x-ray tube . (2mks)

.....
.....
.....

11. State two factors that determine the heat produced by electric circuits. (2mks)

.....
.....

12. State two similarities of images formed by a plane mirror and a convex mirror. (2 marks)

……
……
……

SECTION B (55 marks)

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

13. a) An electric cooker has three electrical elements each rated 600 W. It is connected to a power supply of 240 V for 45 minutes.

I. Determine the value of the suitable fuse required for this cooker. (2mks)

.....
.....
.....

II. Determine the cost of operating the cooker for the given duration given that the cost of electricity is sh. 11.25 per unit. (2mks)

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b) **Figure 8** shows a simple diagram of a step-down transformer. The input voltage of the transformer is 12 kV and output voltage 240V. Current in the primary coil is 0.01 A.

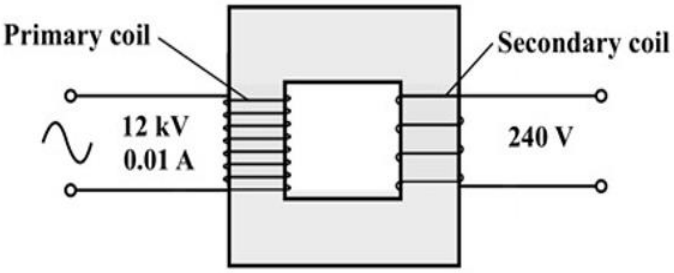

Figure 8

i. Explain how an e.m.f is induced in the secondary coil. (2 marks)

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……
……
……

ii. The transformer is used to supply electric power to a village 2 km away. The transmission lines have a total resistance of 10.0Ω per kilometer. If the transformer is 100 % efficient, determine the:

I. current in the secondary coil of the transformer, (3 marks)

……
……
……

II. electric power delivered to the village. (3 marks)

……
……
……
……

14. a) An object is placed 15cm from a diverging lens and the image is formed 6cm from the lens.

i. Define the term principal focus in relation to diverging lens. (1mk)

.....
.....
.....

ii. Calculate the focal length of the lens. (3mks)

.....
.....
.....
.....

b) State two differences between the human eye and the camera. (2mks)

.....
.....
.....

.c) i. Define refractive index. (1 mark)

.....
.....
.....

ii. Figure 9 shows an object **O** and its image **I** as seen through a glass block of length **r**. The block is made of glass of refractive index **n** and **d** is the displacement of the image from the object.

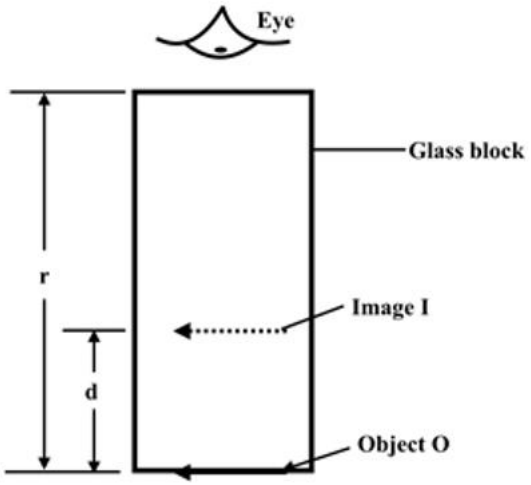

Figure 9

Show that the displacement, **d** is given by $d = r\left(1 - \frac{1}{n}\right)$

……
……
……

iii. A stream has water of depth 240.0 cm. Determine the apparent depth of the water in stream

when viewed from above. (Take refractive index of water $= {}^{4}/_{3}$). (3marks)

……
……
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……

d) Figure 10 shows a diagram of a polar bear and its inverted image in the sky.

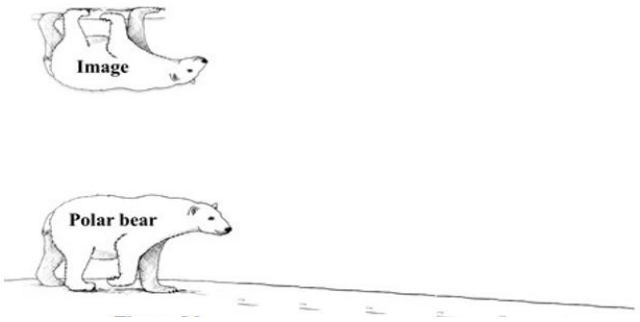

Figure 10

State and explain the phenomenon shown in this diagram. (2 marks)

……
……
……

15. (a) State what is meant by:

a. electromotive force of a cell. (1 mark)

……
……

b. internal resistance of a cell. (1 mark)

……
……

(b) A battery of e.m.f, **E** of 12.0 V and internal resistance, **r** =2.0 **Ω** is connected to a resistor R of resistance 20.0 **Ω** and a resistance wire P, as shown in **Figure 11**.

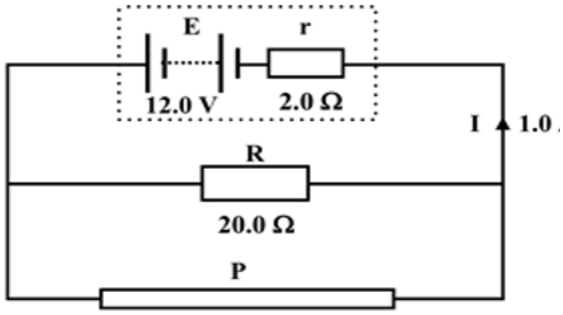

Figure 11

A current I = 1.0 A flows in the circuit.

(i) Determine the:

(I) terminal potential difference V of the battery, (3 marks)

……
……
……

(II) resistance of the resistance wire P. (3 marks)

……
……
……

(III) A new resistance wire Q of the same material as P has more resistance than wire P. State **two** possible differences between wire P and wire Q that would cause Q to have more resistance than P. (2 marks)

……..……..……
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(IV) Wire P is replaced with wire Q in the circuit in **Figure 11**. State and explain the effect of this change on the power output of the battery. (2 marks)

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……

16. The figure 12 below shows a circuit diagram for a photocell.

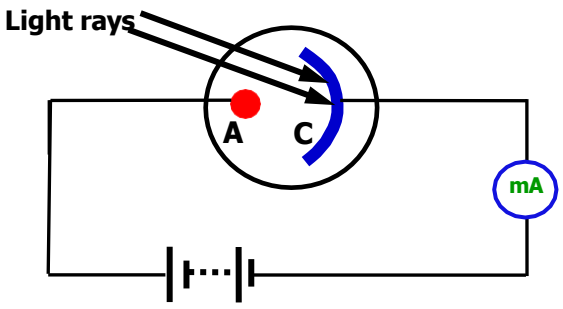

Figure 12

i) The milli-ammeter shows a deflection when ultraviolet light is shown on the photocell. Explain (2mks)

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……
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ii) Explain how the milliameter reading is affected when the intensity of light is increased. (2mks)

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(iii)The figure 13 shows the trace on the screen of a C.R.O when an a.c signal is connected to the Y plates. Time base control is set at 10ms/division and y-gain sensitivity at 120v/division.

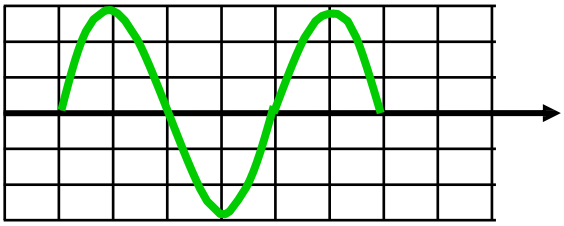

Figure 13

Determine the frequency of the a.c signal. (2mks)

.....

.....

.....

iv. The graph in **Figure 18** shows the variation of stopping potential V_S with frequency *f* of the incident light for two photosensitive surfaces, **A** and **B**.

a. State, with a reason, which surface has a longer threshold wavelength. (2 marks)

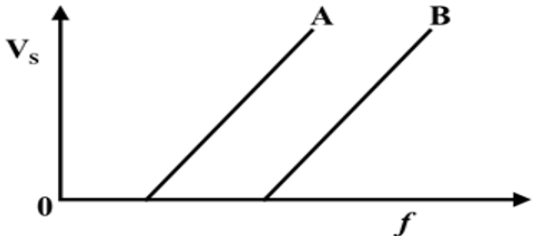

Figure 14

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b. Light of frequency$5.5 \times 10^{14} Hz$ is made to strike a surface whose work function is 2.5eV. Determine whether photoelectric effect will take place or not. (h=$6.63 \times 10^{-34} js$,1eV=1.6×10^{-19} J)
(3mks)

……

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……

17. a.(i)The half – life of cobalt – 60 is 5years.How long will a sample take for the activity to decrease to $^1/_{16}$ of its original value. (3mks)

.....
.....
.....

ii) The graph below shows radioactive decay of iodine.

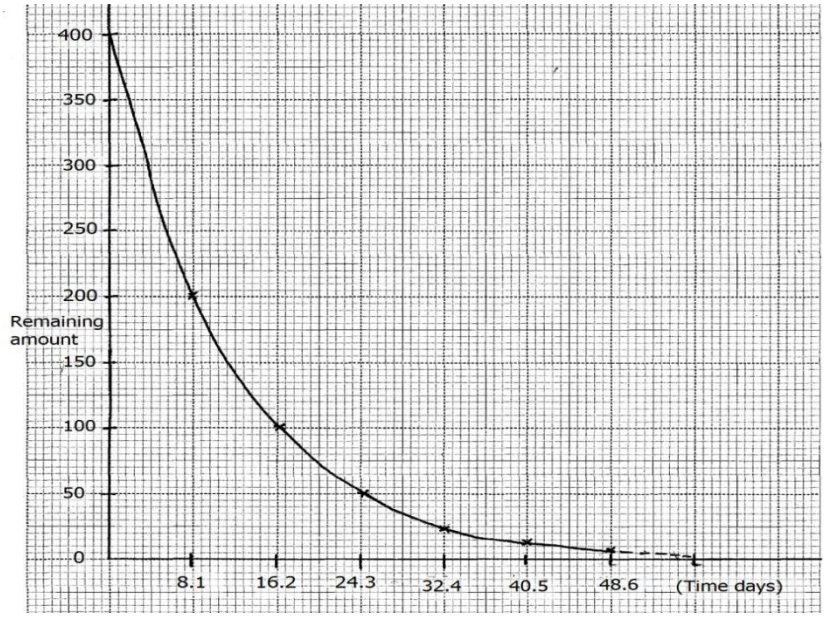

Figure 15

Use the graph to determine the:-

(I) Fraction of the amount remaining after 16.2 days. (2mks)

.....
.....
.....

(II) Determine the half – life of iodine. (1mk)

.....
.....

iii. The following is a decay series of Uranium 238.

Determine the values of *x* and *y*. (2 marks)

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……
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PREDICTION 2
PAPER 3
QUESTION ONE

You are provided with the following apparatus:

- ✓ A soft-board,
- ✓ an equilateral glass prism,
- ✓ 4 optical pins and 4 drawing pins,
- ✓ plain white paper

Proceed as follows:

a) On a plain white paper draw a line XY and mark its midpoint Q. At Q draw a normal NQM at right angles to XY. Draw a line PQ such that the angle of incidence, i, (PQN) is 25^0 (figure below). Fix the paper on the soft-board with the drawing pins.

b) Place the triangular prism vertically with the triangular base down, on the paper such that the midpoint of the edge CA of the prism coincides with the midpoint, Q, of the line XY, as shown. Draw the outline CAB of the prism.

(The plain paper to be collected with the answer sheet) **(3 marks)**

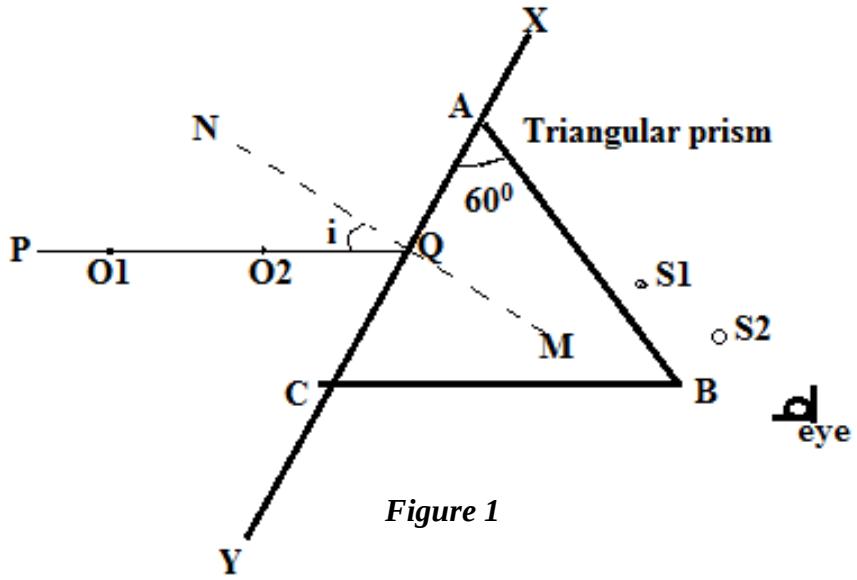


Figure 1

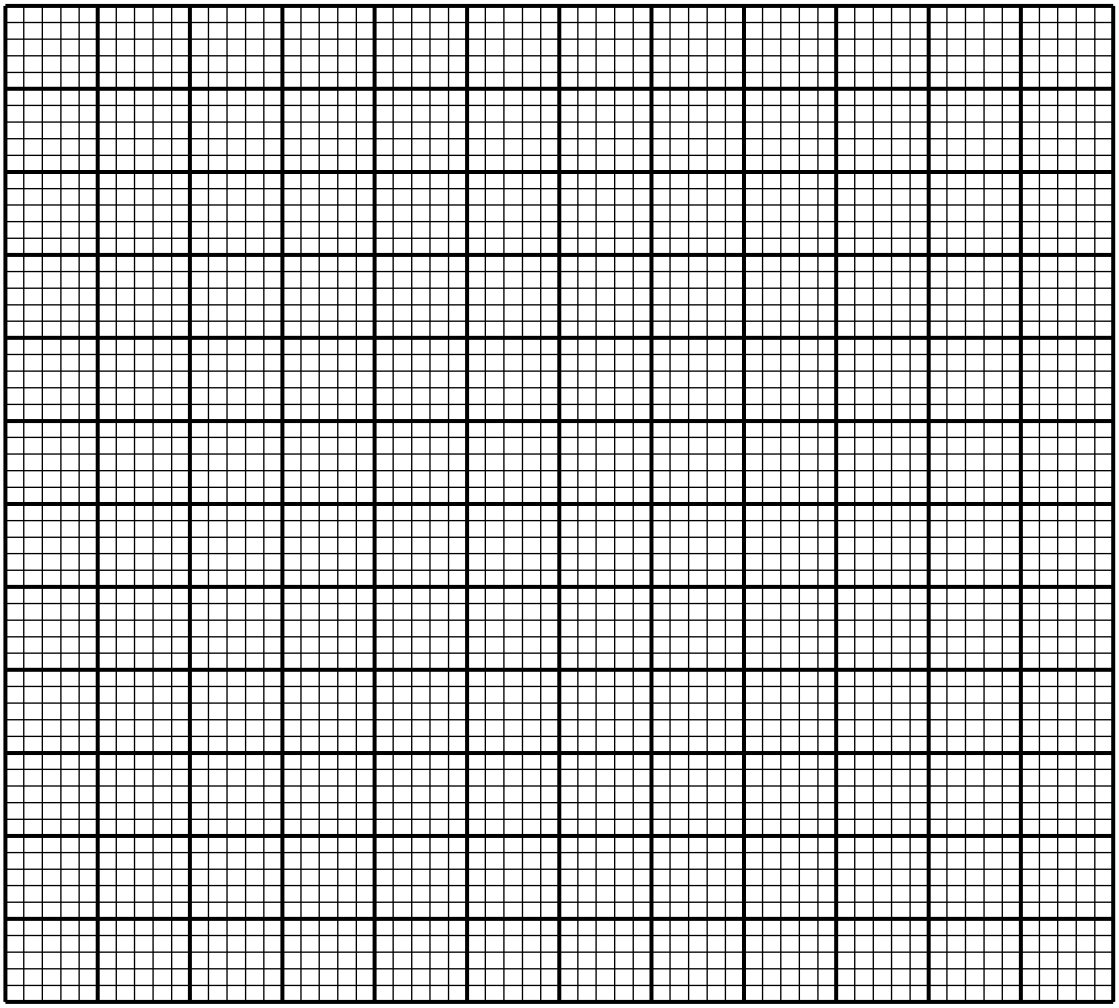
c) Stick two pins, O1 and O2 (object pins), on the line PQ vertically into the soft-board, about 5cm apart. View from the side AB of the prism and look for the images of the pins O1 and O2, as shown in the figure. Keeping the eye along the plane of the paper, fix two pins S1 and S2 (search pins), one after the other between your eye and the prism so that S1 and S2 and the images of O1 and O2, seen through the prism, appear one behind the other in a straight line. Mark the positions of the four pins and remove the pins, the prism and the paper.

d) Draw a line joining the points S1 and S2 to meet the line AB at R. Draw the line QR. Measure the angle of refraction, r (MQR). Record the values of the angles i and r in the table below.

e) Repeat the experiment for the other values of i and entre your results in the table 2 below. Complete the table. **(6 marks)**

i (^{0})	**r (^{0})**	**Sin i**	**Sin r**	$\frac{\sin i}{\sin r}$
25				
30				
35				
40				
45				

f) Plot a graph of $\sin i \ against \ \sin r$ **(5 marks)**



g) Determine the slope of the graph **(3 marks)**

h) Determine, k the average value of: $\frac{\sin i}{\sin r}$ **(1 mark)**

i) Compare your slope with the ratio: $\frac{\sin i}{\sin r}$ and state the significance of the slope **(2 marks)**

QUESTION TWO

PART A

You are provided with the following apparatus:

- A volt-meter (0-5V)
- An ammeter
- Two dry cells and holder
- Mounted wire
- Connecting wires (at least 2 with crocodile clips)
- Torch bulb in a holder
- Micrometer screw-gauge

Proceed as follows:

a) Arrange the apparatus as shown below:

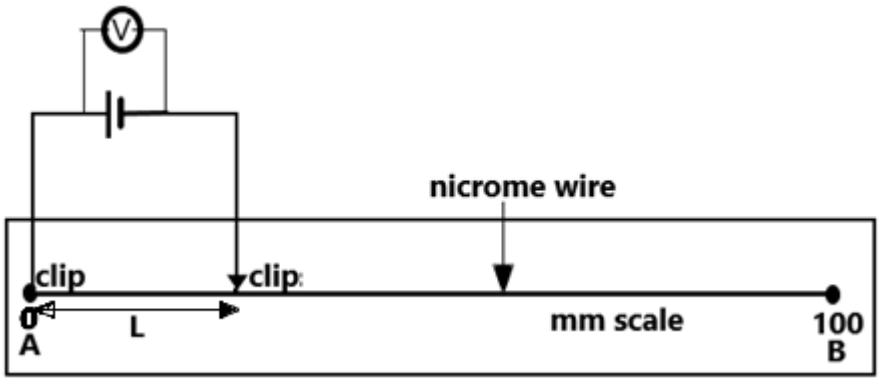


Figure 2

b) When L = 100 cm, record the voltmeter reading, V_0.

V_0 = …… **(1 mark)**

c) Take more readings from the voltmeter for values of L shown in the table 2. Complete the table. **(5 marks)**

Table 1:

L (m)	**0.9**	**0.8**	**0.4**	**0.2**	**0.1**
p.d (V)					
$\frac{V}{L}$ **(Vm^{-1})**					

d) Determine I_k the average value of $\frac{v}{L}$ in table 2 above **(1 mark)**

e) Now dismantle the apparatus and arrange them as shown in figure 4 below:

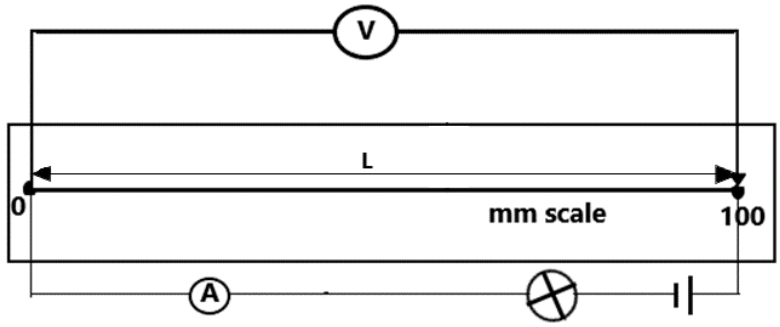


Figure 3

f) Record the ammeter reading, I_0 and voltmeter reading, V_1

i. I_0 = …… V_1 =……. **(2 marks)**

ii. Determine, k where: $k = \frac{V_1}{I_0}$ **(1 mark)**

iii. Explain the meaning of k above **(1 mark)**

g) Using the micrometer screw gauge, measure the diameter, **d** of the mounted wire

$\boldsymbol{d}$ = ……..m **(1 mark)**

h) Calculate the quantity, Q such that: $Q = \frac{8}{10}.k.(\frac{d^2}{L})$ **(2 marks)**

PART B

You are provided with the following apparatus:

- 400 ml plastic beaker labelled B
- Source of boiling water
- Thermometer (range: -10^0c – 110^0c)
- Stop-watch
- 100 ml of water in a beaker labelled A

Proceed as follows:

i) Measure the temperature, $\mathbf{T_0}$ of cold water in the beaker labelled A

$\mathbf{T_0}$ = ……. K **(1 mark)**

j) Transfer 200ml of boiling water into the beaker labelled B and wait for the temperature to drop to 65^0c then switch on the stop watch. Take and record the temperature, T ^{0}c of the water after every two minutes. Record your results in table 3 below: **(5 marks)**

Table 2:

Time (minutes)	**2**	**4**	**6**	**8**	**10**
Temperature, T_1 (^{0}C)					
Temperature, T_2 (K)					
(T_2 - T_0) K					

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PREDICTION 3

PAPER 1

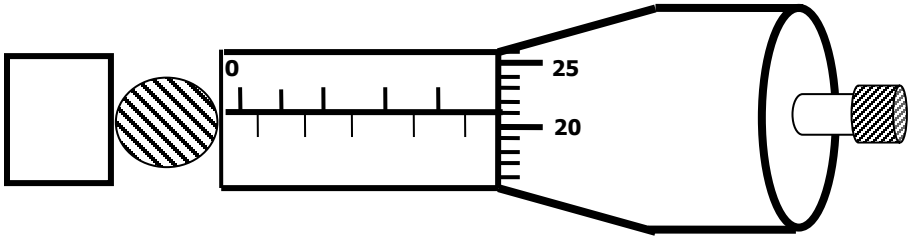
SECTION A (25 MARKS)

(Answer all the questions in the spaces provided)

1. State one effect of force on a moving body. (1mark)

   ……

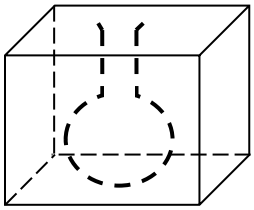
2. The figure below shows a reading of micrometer screw gauge with a positive zero error of 0.06mm. state the actual reading of the micrometer screw gauge. (2marks)



3. It is not correct to quote weight of object in kilogram. Explain. (1mark)

   ……

4. The figure below shows a rectangular block of wood with a hollow section (inside) at the position shown. The block is resting on a horizontal bench.



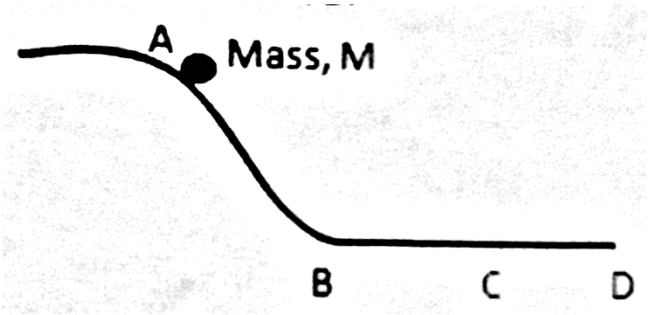
   State and explain the effect on the stability of the block when the hollow section is filled with water. (2marks)

   ……

   ……

   ……

5. Figure below shows a section of a curved surface ABCD. Point A is higher than point B while BCD is horizontal. Part ABC is smooth while CD is rough. A mass M is released from rest at A and moves towards D. state the change in velocity between.



   i. BC (1mark)

   ……..

ii. CD (1mark)

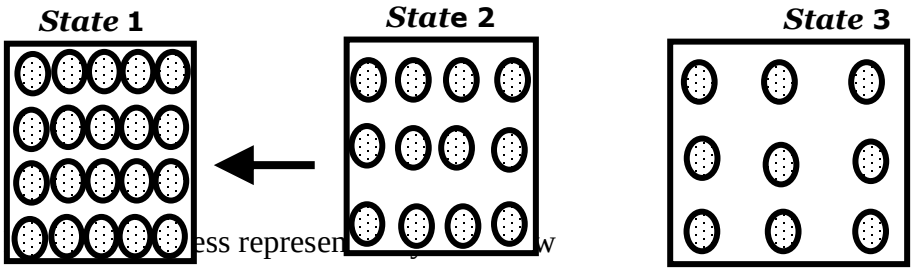
……

6. A student wearing sharp pointed heeled shoes is likely to damage soft wooden floor. Explain. (1mark)

……

……

7. Figure below shows the arrangement of molecules in the three states of matter.



i. ess represen w (1mark)

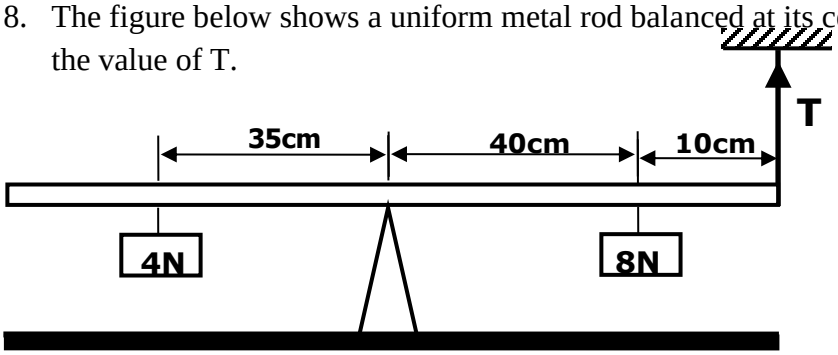
……

ii. State the reason for the arrangement of molecules in state 3 (1mark)

……

……

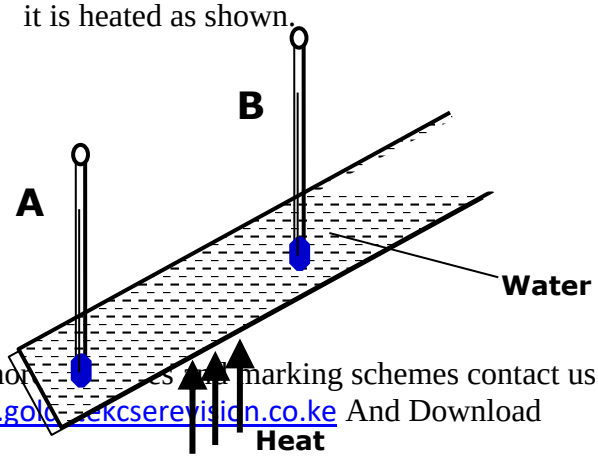
8. The figure below shows a uniform metal rod balanced at its centre by different forces. Determine the value of T. (3marks)



9. A person carrying a luggage using one hand leans her body away from the luggage. Give a reason for this observation. (1mark)

……..

10. Figure below shows a glass tube with water and is fitted with two identical thermometers A and B. it is heated as shown.



State with a reason which of the two thermometers shows a higher reading after some time. (2marks)

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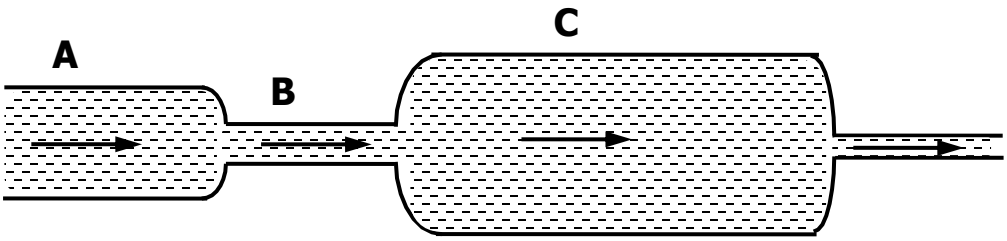
……

11. Thermodynamics is one of the branches of physics. State what it deals with. (1mark)

……..

12. A body of volume $6 \times 10^{-5} m^3$ floats on a paraffin of density $800 kgm^{-3}$ with $\frac{2}{3}$ of its volume submerged. Calculate the weight of the body. (2marks)

13. Figure below shows parts A, B and C of a none uniform glass tube. State with a reason the part of the tube where the pressure will be lowest when liquid is made to flow in the tube from A to C. (2marks)



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14. In an experiment to determine the density of a liquid R, a student obtain the following data;

Mass of empty density bottle = 55.0g

Mass of the density bottle + water = 80.0g

Mass of the density bottle + liquid R =70.0g

Determine the density of liquid R. (density of water is $1000 kgm^{-3}$) (3marks)

<u>Section B 55marks</u>.

(Answer all the question in this section.)

15.

a) Define the absolute zero of the kelvin scale. (1mark)

……..

.....

b) It is not possible to obtain zero pressure of a gas in real gas situation. Explain (2marks)

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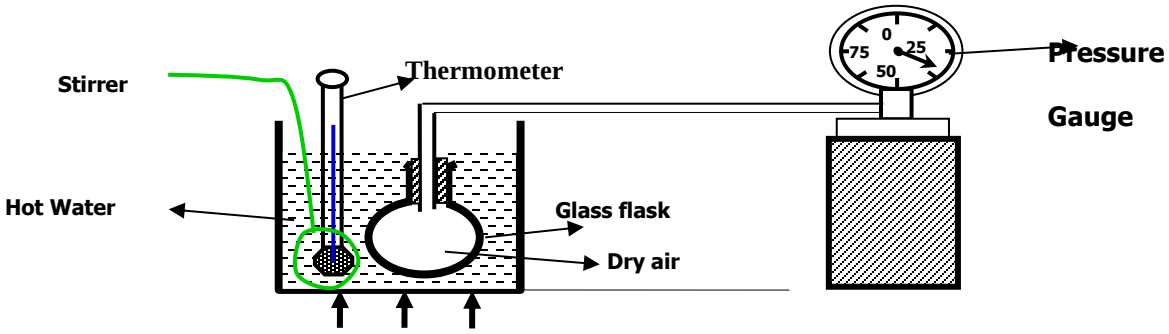
c) The diagram below shows an experiment that can be used to verify a certain gas law, use it to answer the following questions.



i. State the gas law that can be verified using the set up above. (1mark)

……

……

ii. State two measurements that can be obtained from the set up above. (2marks)

……

……

iii. Explain how the measurements in (ii) above can be used to verify the gas law in (i) above. (3marks)

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d) A fixed mass of a gas occupies $1.5 \times 10^{-3} m^3$ at a pressure of 760mmHg and temperature of 273K. determine the volume the gas will occupy at a temperature of 290K and preesure720mmHg. (3marks)

e) State two assumptions made in explaining gas laws using kinetic theory. (2marks)

……

……

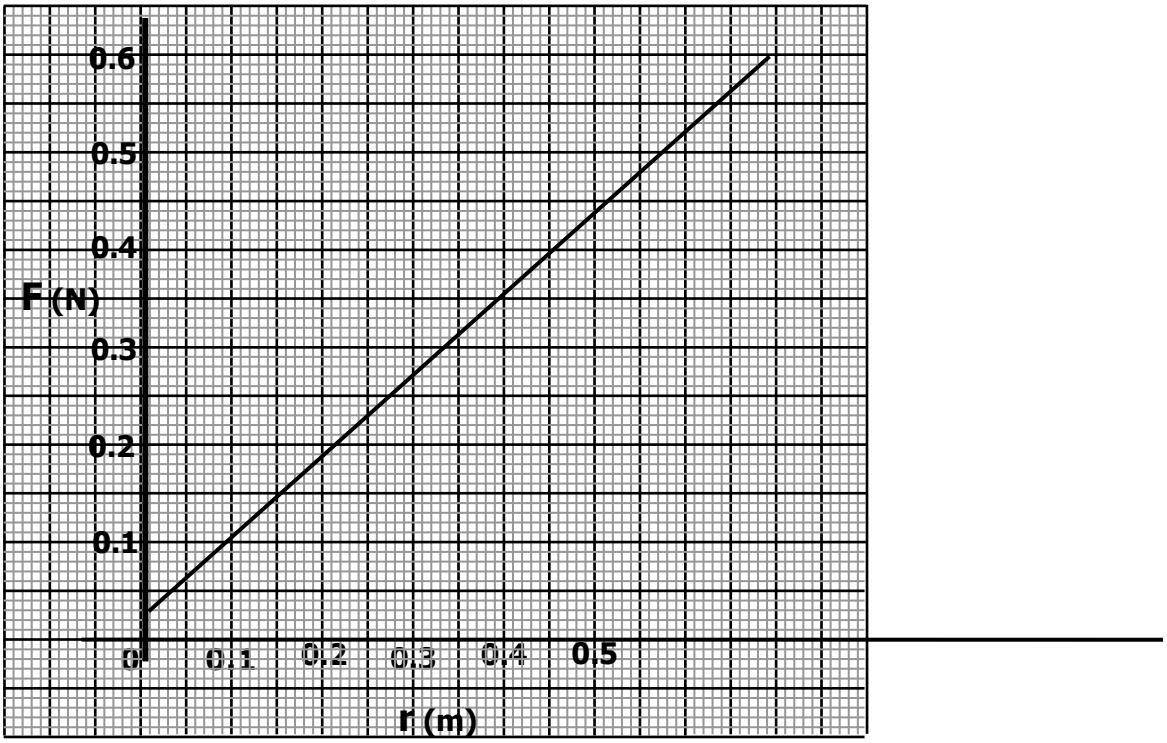
16.

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

……

……

b) The graph below was obtained from an experiment to investigate the variation of the centripetal force, F with radius, r of a circle which a body in circular motion describes.



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

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

d) A car negotiating a bend on a leveled ground experiences centripetal force towards the centre of the bend.

i. State what provides the centripetal force. (1mark)

……

ii. State two factors that determine the maximum speed by which the car safely negotiates the bend. (2marks)

……
……

17.

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

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……

b) Explain why temperature is constant during change in state. (1mark)

……
……

c) In an experiment, 50g of dry steam at 100^0c was passed through some crushed ice at 0^0c. (*latent heat of vaporization of water is* $2.26 \times 10^{6} J kg^{-1}$, *latent heat of fusion of ice is* $3.4 \times 10^{5} J/kg$ *and specific heat capacity of water is 4200J/kgK)*

Determine the;

i. Quantity of heat lost by the steam to change to water at 100^0c. (2marks)

ii. Quantity of heat lost by water formed to cool to 0^0c. (2marks)

iii. Mass of ice melted at 0^0c. (2marks)

d) State one assumption made in the experiment in question (c) above. (1mark)

……
……..

18.

a)

i. State two factors that affect the spring constant of a helical spring. (2marks)

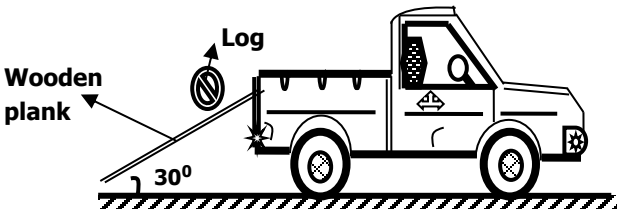
……
……

ii. A spring of length 8cm is loaded with a mass 200g and its length becomes 13cm.

I. Calculate the spring constant of the spring. (2marks)

II. Determine the elastic potential energy stored in the spring. (3marks)

b) A man used a plank of wood to lift a log of wood from the ground to a stationary pick up on a flat ground as shown in the figure below.



The wooden plunk was inclined at an angle 30^0 to the ground. Calculate the;

i. velocity ration of the set up. (2marks)

ii. mechanical advantage of the set up if its efficiency is 60% (2marks)

19.

a) Define an acceleration as used in linear motion. (1mark)

……
……

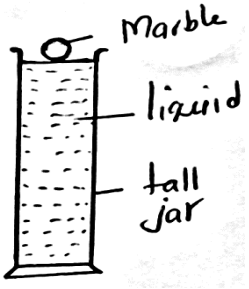
b) A tape attached to an accelerating trolley passes through a ticker timer that makes dots on it at a frequency of 50Hz. The ticker timer makes 10 dots on a 10cm long tape such that; the distance, a, between the first two dots is 0.5cm and the distance, b, between the last two dots is 1.5cm. Determine the;

i. Initial velocity of the trolly. (2marks)

ii. Final velocity of the trolly. (2marks)

iii. Acceleration of the trolly. (2marks)

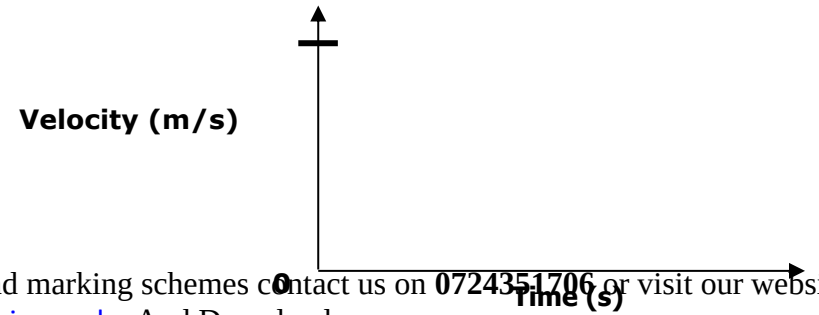
c) The figure below shows a marble dropping through a liquid. Use it to answer the following questions that follows.



i. Other than the weight of the marble state two other forces acting on the marble. (2marks)

……
……

ii. Sketch a velocity time graph for the marble in the grid provided below. (1mark)

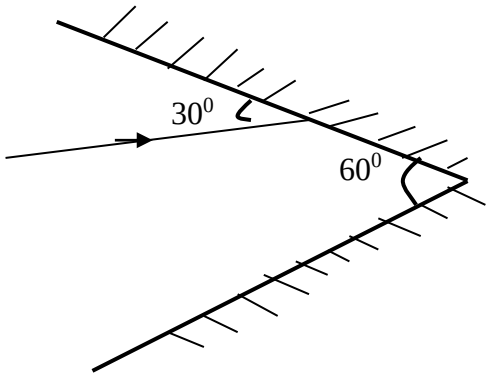


PREDICTION 3
PAPER 2

SECTION A: (25 MARKS)

Answer all questions in this section in the spaces provided

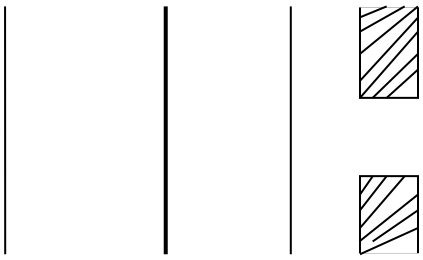
1. Figure 1 shows two mirrors inclined at an angle of 60^0 to each other. A ray of light is incident on one mirror as shown.



Sketch the path of the ray to show its reflection on the two mirrors. (2 marks)

2. State any **two** ways of increasing the size of an image formed by a pinhole camera.(2 marks)

3. The figure 2 below shows water waves moving towards barrier.



(i) State the property of wave under investigation. (1 mark)

(ii) Show the emergence of the reflected wave after passing the opening. (1mark)

(iii)State why passing of light through marrow opening is a very rare phenomenon.

(1 mark)

4. The figure 3 shows part of an electromagnetic spectrum.

A	B	Visible light	UV	C

(i) Identify radiation A and C (2 marks)

A.....

C.....

(ii) State **one** use of radiation C (1 mark)

.....

.....

5. An electric bulb is rated 100W 20v. Determine the resistance of its filament at its operating temperature. (2 marks)

.....

.....

.....

6. (a) State the basic law of magnetism. (1 mark)

.....

.....

(b) Figure 4 shows a bar of soft iron placed near a magnet.

On the same diagram, sketch the magnetic field pattern due to the set up (2 marks)

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.....

.....

7. State **two** uses of a charged gold leaf electroscope. (2 marks)

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8. State **two** physical quantities that can be measured to determine whether a secondary chemical accumulator requires to be charged. (2 marks)

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9. (a) Explain why the walls of studios are padded with woolen materials. (1 mark)

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.....

(b) A student stands between two classroom walls and claps. After 0.6 seconds, she hears the first echo and hears the second echo after 0.2 seconds later. Determine the distance from the student to the further wall. Take the speed of sound in air to be 320 m/s. (3 marks)

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10. Three resistors of 3Ω, 6Ω and 9Ω are connected in parallel. Determine the total resistance. (2 marks)

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SECTION B: (55 MARKS)

Answer all questions in this section

11. (a) Differentiate between progressive wave and standing waves. (2 marks)

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

(c) The figure 5 shows an experiment to observe interference of light waves. Waves are incident to double slits placed closed to a source of monochromatic light.

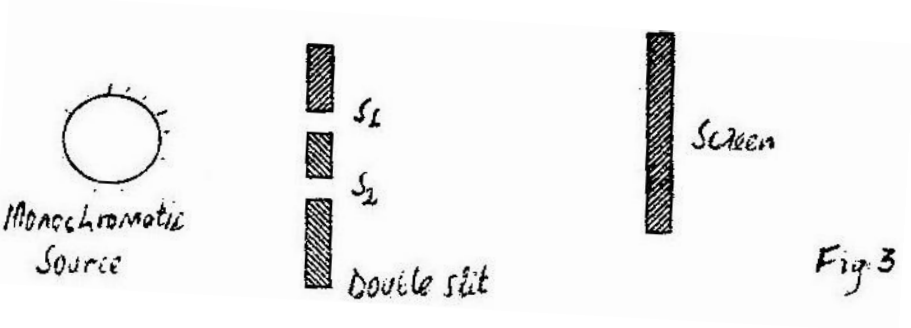

Fig 3

(i) State what is meant by a monochromatic source of light (1 mark)

.....

.....

(ii) State the function of the double slit. (1mark)

.....

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.....

(iii)State and explain what is observed on the screen. (3marks)

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(iv)State what is observed on the screen when the slit separation S_1 S_2 is reduced.

(1 mark)

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.....

.....

(v) While light source is used in place of monochromatic source. (1 mark)

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12. (a) State the meaning of the term principal focus as applied in converging lens. (1 mark)

.....

.....

(b) A real object of height 1 cm placed 50mm from a converging lens forms virtual image 100mm from the lens. Determine the following:

(i) Focal length of the lens (3 marks)

.....

.....

.....

(ii) The magnification. (2 marks)

.....

.....

.....

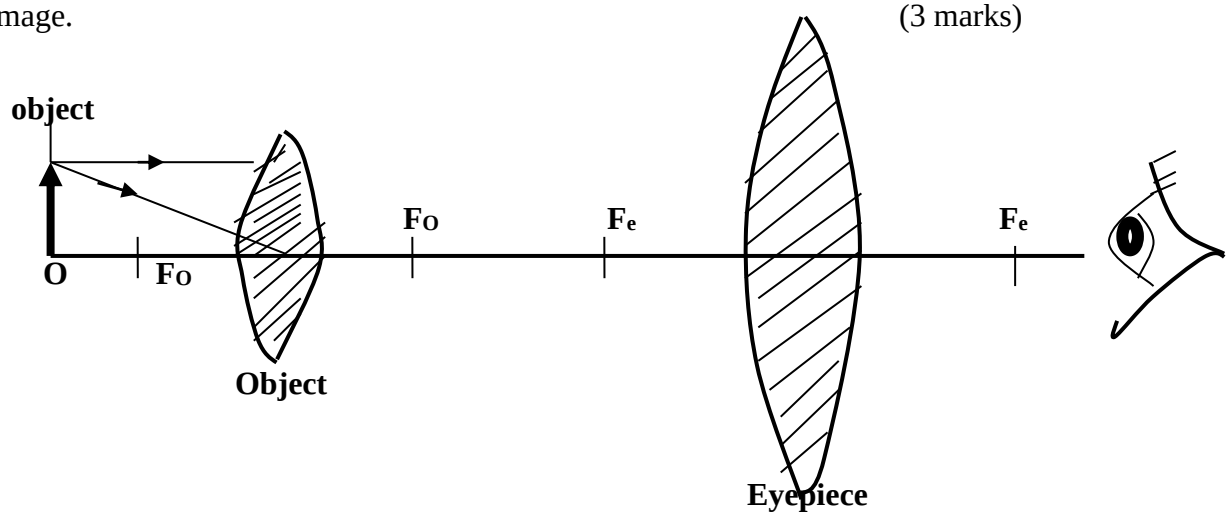
(c) State **two** optical instruments that produce a magnified real image using a convex lens. (2 marks)

.....

.....

.....

(d) The figure 6 shows a compound microscope with objective and eyepiece of principal foci F_O and Fe respectively. Complete the ray diagram to illustrate how the eye sees the final image. (3 marks)



(e) State **two** differences between human eye and camera (2 marks)

.....

.....

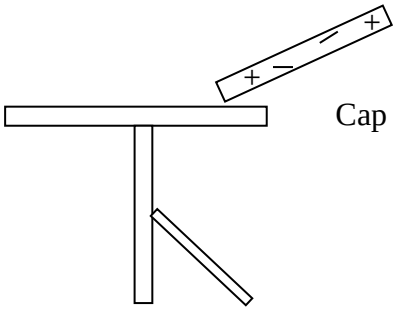
.....

13. (a) State the law of electrostatic charges. (1 mark)

.....

.....

(b) The figure 7 shows a highly positively charged glass rod being brought slowly near the cap of a negative charged gold leaf electroscope. It is observed that the leaf initially falls and then rises.



Explain this observation. (1 mark)

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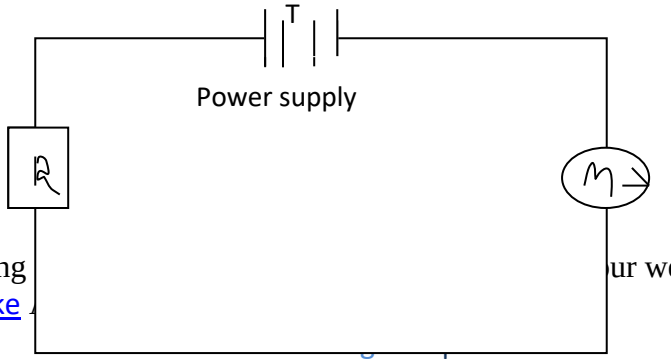
(c)(i) The figure 8 shows an electric circuit used to charge a capacitor C. when switch is closed, it is observed that, the millimeter records some current which gradually reduces to zero with time.



(i) Explain the observation (1 mark)

.....

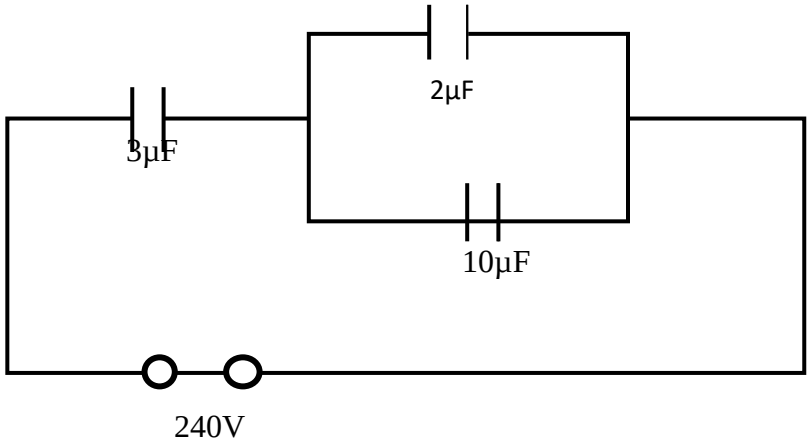
.....

(ii) State **one** factor that reduces the capacitance of a parallel plate capacitor. (1 mark)

.....

.....

(d) The figure 9 shows an electrical circuit with three capacitors of 10µF, 2µF and 3µF capacitance connected to a 240V supply.



Determine

(i) The effective capacitance of the capacitor combination. (2 marks)

.....

.....

.....

(ii) The charged stored in the circuit. (2 marks)

.....

.....

.....

(iii)The potential difference across the 2μF capacitor. (2 marks)

.....

.....

.....

.....

14. (a) A spoon partly submerged in a glass of water appears bent. Explain. (1 mark)

.....

.....

.....

(b) A coin placed at the bottom of a tall gas jar. When the jar is filled with paraffin to a depth of 32.4 cm, the coin is apparently seen displaced 9.9 cm from the bottom. What is the refractive index of paraffin? (3 marks)

.....

.....

.....

.....

(c) State **two** conditions necessary for total internal reflection. (2 marks)

.....

.....

.....

.....

(d) The speed of light in air is 3.0×10^8 m/s. what is the speed of light in glass?

(Take refractive index of glass = 1.5) (3 marks)

.....

.....

.....

.....

(e) State Snells' law. (1 mark)

.....

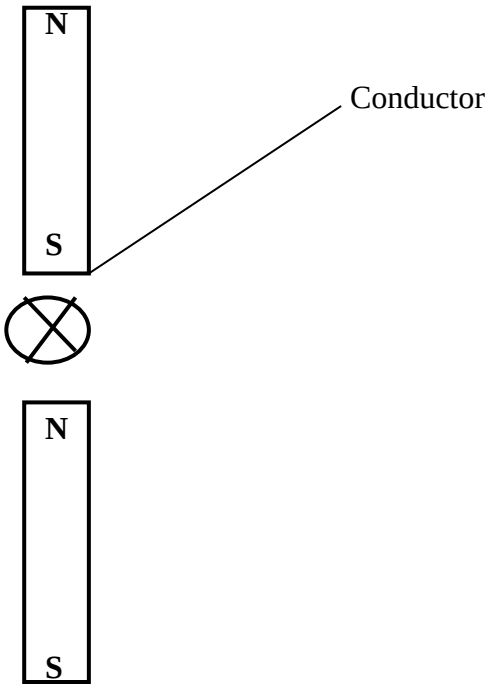
.....

15. (a)(i) State Flemings left hand rule. (1 mark)

.....

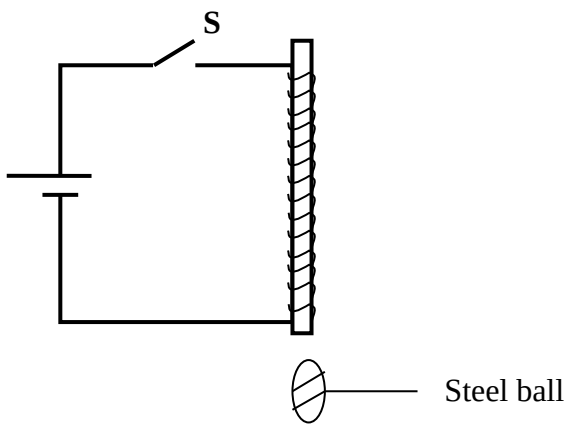
.....

(ii) The figure 10 shows the cross-section of two bar magnets and a current carrying conductor held between them.



Draw the field pattern, hence indicate an arrow the direction of force experience by the conductor (2 marks)

(b) A small electromagnet for lifting and releasing a small steel ball is made in the laboratory as shown in figure 11 below.



(i) Explain why soft iron is better material to be used for the core than steel.(1 mark)

.....

.....

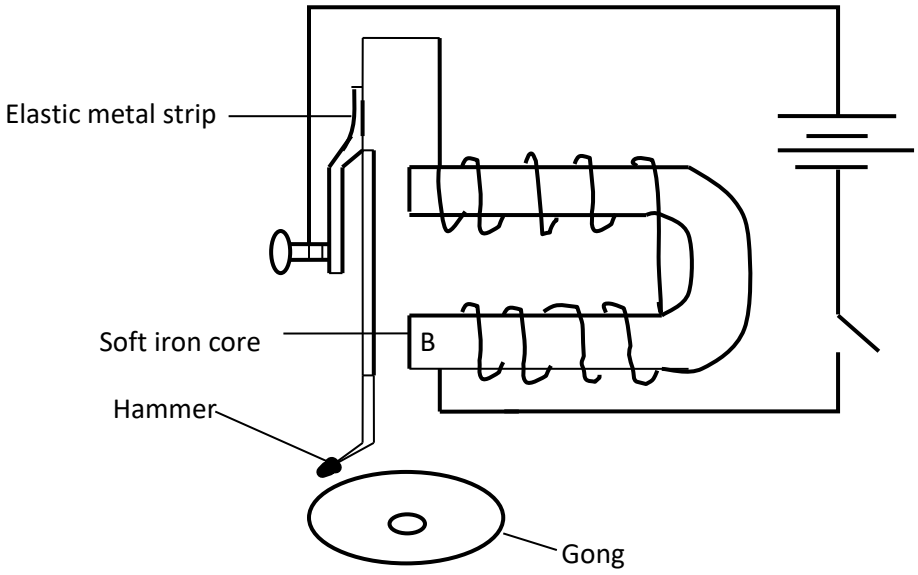
(ii) In order to lift a slightly larger ball, it is necessary to make a stronger electromagnet.

State two ways in which electromagnet can be made more powerful.(2 marks)

.....

.....

(c) The figure 12 below illustrates a circuit diagram of an electric bell.



Explain how the bell works. (4 marks)

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PREDICTION 3
PAPER 3

1.

You are provided with the following.

- An ammeter. (0-1A)
- A voltmeter. (0-3 or 0-5V)
- A wire mounted on mm scale labeled XY
- A switch.
- Two new dry cells (size D) and a cell holder.
- A micrometer screw gauge (may be shared).
- 6 connecting wires with crocodile clips at the end.

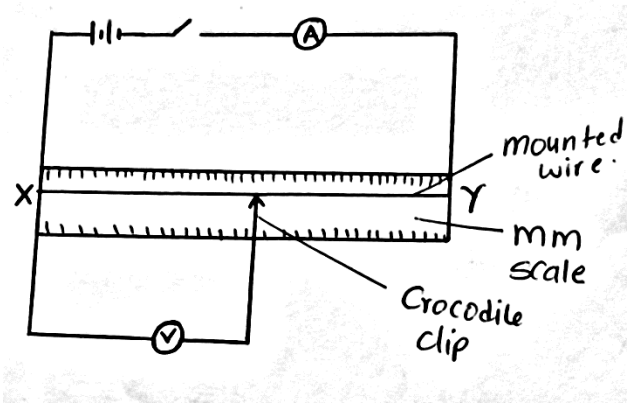
Proceed as follows:

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

Average diameter d = _____mm (1mark)

(b) Calculate the cross-sectional area of the wire in SI unit (2marks)

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



(d) Close the switch and tap the mounted wire with the crocodile clip at any point as shown in the circuit. Ensure that both meters show positive deflection. Record the ammeter reading I. Open the switch.

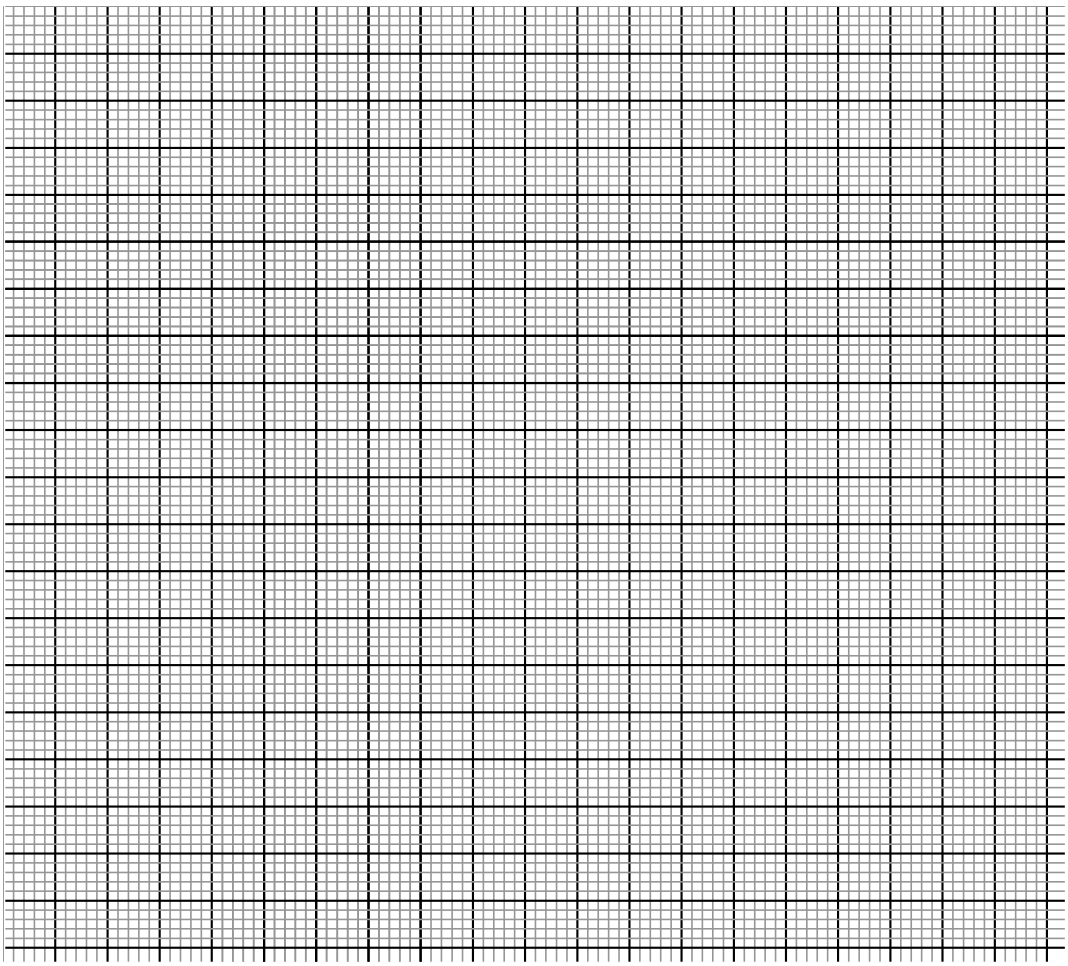
I……A (1mark)

(e) Tap the wire at X. Close the switch, move the crocodile clip towards Y until the voltmeter reads 0.2 V, read and record in the table below the corresponding length L.

(e) Repeat the procedure in (d) above for other values of V, shown in the table below and complete the table. (6marks)

V (Volts)	Length L(m)	IL(Am)
0.2		
0.4		
0.6		
0.8		
1.0		

(f) (i) Plot the graph of V (Y-axis) against IL(m). (5marks)



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

(iii) Given that $V = \frac{\rho IL}{A}$ were A is the cross-sectional area of the wire and ρ is a constant for the material of the wire; determine the value of the constantρ. (2marks)

2.

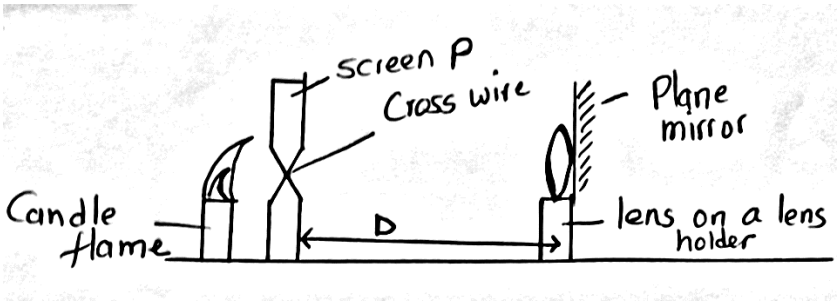
A

You are provided with the following apparatus.

- ✓ Candle
- ✓ A lens on a lens holder
- ✓ Two screens (one with cross wire labeled P and the other one labeled G)
- ✓ Plane mirror
- ✓ Masking tape
- ✓ Metre rule.

Proceed as follows.

a. Fixe the plane mirror at the back of the lens on a lens holder using masking tape provided. Set the candle flame to be in line with the cross wire on the screen P and the lens with the mirror at the back as in the figure below.



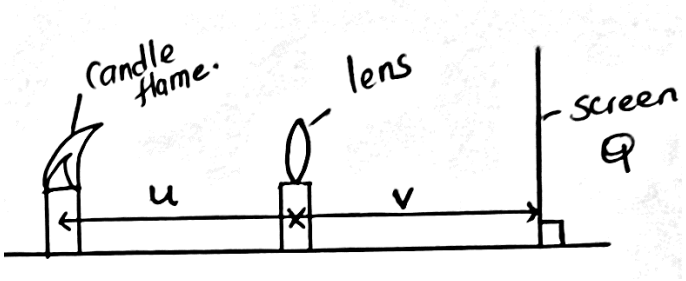
b.

i. Adjust the position of the lens until a sharp image of the cross wire is formed besides the cross wire. Measure the distance D between the screen and lens.

D…….m (1mark)

ii. Calculate quantity T, given that $T = \frac{1}{D}$, which property of lens is quantity T? (2marks)

c. Remove the mirror and now arrange the candle flame and screen Q on either side of the lens as in the figure below.



d. Adjust the position of the candle so that its centre is at a distance of $u = 20cm$ from the lens. Adjust the position of the screen until a sharp image of the flame is formed on the screen. Measure and record in the table below, the image distance v, *the distance between the screen and the lens*.

e. Repeat part (d) above for other values of u shown in the table and complete the table.
(5marks)

Distance $u\ (cm)$	20	25	30
Distance $v(cm)$			
$m = \frac{v}{u}$			
$k = \frac{v}{m+1}\ (cm)$			

f. Determine the average value of k.
(1mark)

B

You are provided with the following apparatus.

- ✓ 10ml measuring cylinder (plastic)
- ✓ Stop watch
- ✓ Source of heat (water bath)to be shared
- ✓ Thermometer
- ✓ Boiling tube
- ✓ Test tube holder.
- ✓ Some water in 50ml beaker
- ✓ Electric top pan balance

Proceed as follows.

g.

i. Measure the mass of a clean dry measuring cylinder. (1mark)

M_1……..……g

ii. Measure 10ml of water. Measure the mass of the measuring cylinder and the 10ml of water in it. (1mark)

M_2……g

iii. Determine the mass M of 10ml of water in kg. (1mark)

M……kg

h. Transfer the 10ml of water into boiling tube, hold the boiling tube using test tube holder and heat the boiling tube with its contents in the water bath until the temperature of the water in side it reaches 80^0c (*heating the boiling tube in boiling water makes the temperature of inside to rise fast*). Remove the boiling tube from the water bath and let the temperature of its content drop to 75^0c. At 75^0c start the stop watch and record the temperature θ_1 after every 30 seconds in the table below and complete the table.(*note; time should continuously run, do not stop until time reaches 90s*) (5marks)

Time t (s)	0	30	60	90
Temperature $\theta_1(\theta_1^0c)$	75			
Change in temperature θ^0c	0			
$R = 4200M\theta$	0			

i. Determine the average value of R from 30 – 90 s
(1mark)

j. Determine the quantity S given that $S = \frac{R}{t}$ where $t = 30s$.
(2marks)

k. State the physical quantity represented by S.
(1mark)
……

PREDICTION 4

PAPER 1

SECTION A.(25mks)

1. List down one precaution to observe in physics laboratory while handling electrical circuits and equipment. (1mark)

   ……

2. Give a reason why displacement method is unsuitable for determining the volume of irregular shaped solid ice. (1mark)

   ……

3. Give a reason for the random movement of particles suspended in a fluid. (1mark)

   ……

   ……

4. An oil drop of volume 1.0 x $10^{-10}m^3$ is placed on a clean water surface. The oil drop spreads to form a thin film as shown in the **figure 1 below**. The measuring instrument is a metre rule.

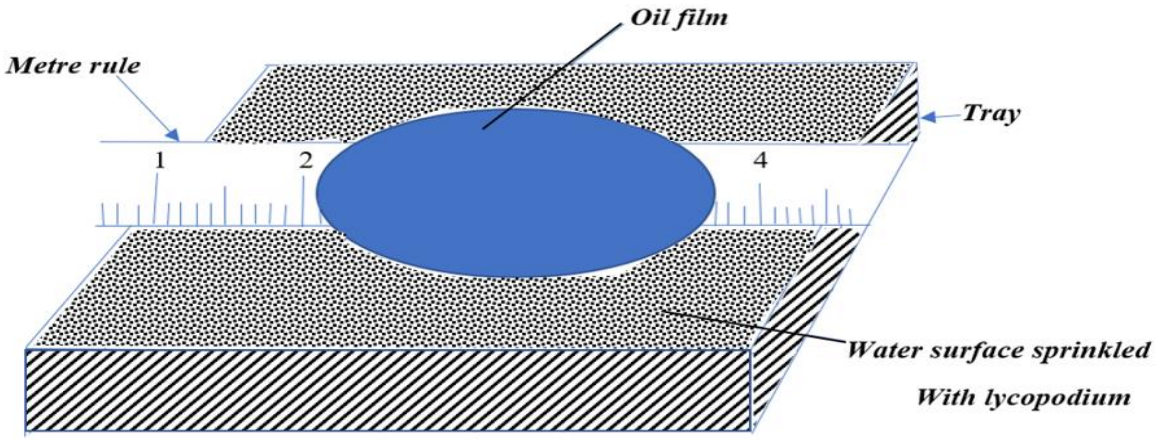


Figure 1

(a) Determine the area of the oil patch. (3marks)

……

……

……

(b) Determine the size of the oil molecule. (2marks)

……

……

5. Explain why a glass container with thick walls is more likely to crack than the one with thin walls when a hot liquid is poured into them. (2marks)

……

……

……

6. A metal pail feels colder than a plastic pail on a cold morning even though both have the same temperature. Explain this observation. (2marks)

……

……

……

7. Water flows along a horizontal pipe of cross-sectional area $48cm^2$ which has a constriction of cross-sectional area $12cm^2$ at one place. If the speed of water at the constriction is 36m/s, Determine the speed in the wider section. (2marks)

……

……

……

……

8. (a) State the **principle of moments**. (1mark)

……

……

……

(b). A uniform metre rule of mass 180g is pivoted freely at 0cm mark. Determine the upward vertical force needed to maintain the metre rule horizontally at 60cm mark. (2marks)

……

……

……

(c) Explain why the handle of the door is usually placed as far as possible from the hinge

……(1mark)

……

9. (a) Define the **centre of gravity of a body.** (1mark)

……

……

……

(b) Explain why bus-body builders build luggage compartments under the seats rather than on the roof racks. (2marks)

……

……

10. (a) State the **Hooke's law**. (1mark)

……

……

(b). The diagram below shows three identical springs which obey Hooke's law.

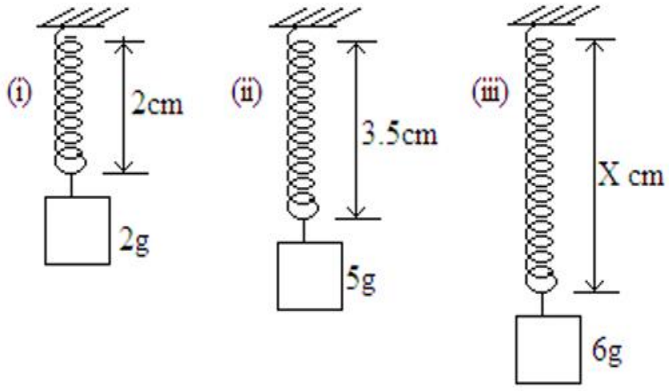


Figure 2

Determine the length **X** using the information from the figure 2 above. (3marks)

……

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……

SECTION B.(55mks)

11. A skydiver jumps out of an aircraft. The **figure 3 below** shows the two forces acting on the skydiver.

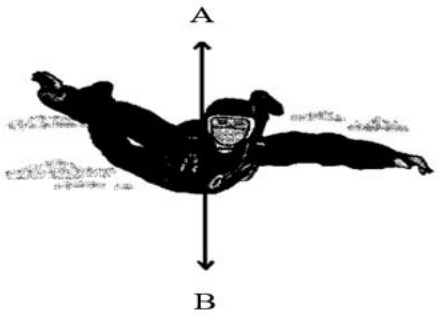


Figure 3

(a) State what cause forces A and B (2marks)

A ……

B…….

(b) The graph shows how her velocity changes before she opens her parachute.

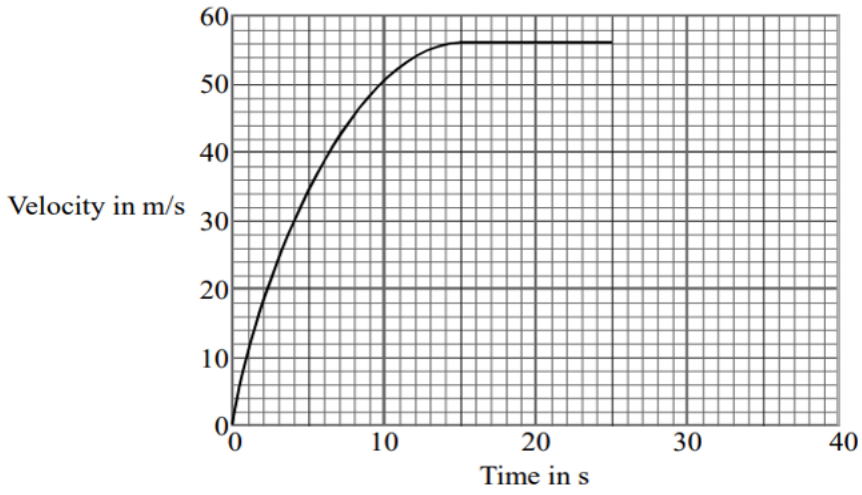


Figure 4

Determine the skydiver's terminal velocity. (1mark)

…….

(c) What is the relationship between the two forces on the skydiver, (2marks)

(i) Before she reaches terminal velocity;

……

(ii) When she is travelling at terminal velocity?

……

(d) A bullet is fired horizontally at a velocity of 400m/s from a cliff which is 50m tall as shown in the **figure 5** below.

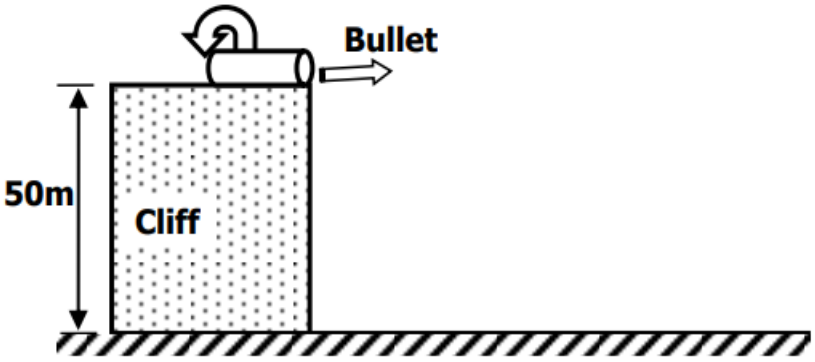


Figure 4

(i) On the same diagram draw the trajectory of the bullet until it comes to rest. (1mark)

(ii) Determine the time taken for the bullet to hit the ground. (2marks)

……

……

……

(iii) Determine the range. (2marks)

……

……

……..

(iv) The figure below shows the velocity – time graph for the motion of a body.

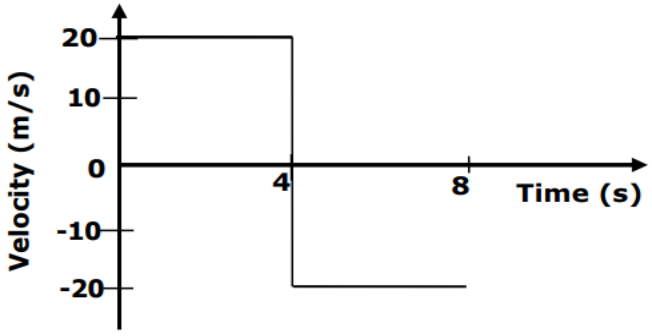
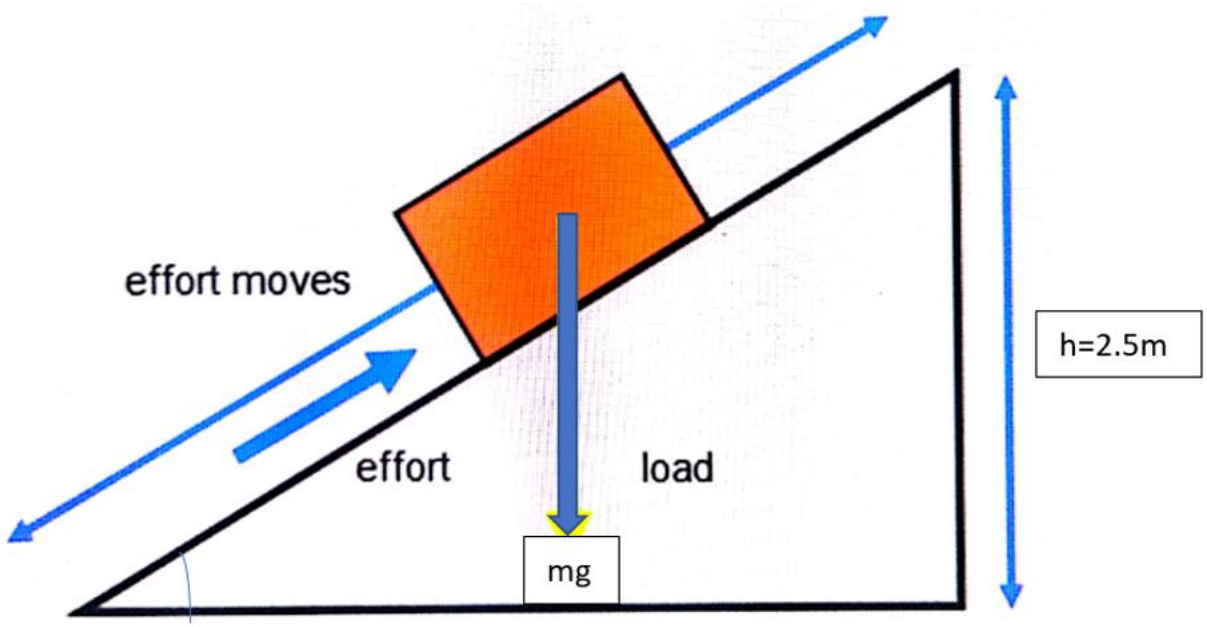


Figure 5

Sketch the speed time graph for the same motion. (2marks)

12. An object of weight 900N is pushed up along an inclined plane of length 20m as shown below.



If 500 Joules of energy was wasted in this operation, determine;

(i) The work output. (2marks)

……

……

(ii) Efficiency of the machine. (3marks)

……

……

……

(iii) Mechanical advantage. (3marks)

……

……

……

(iv) Effort needed. (2marks)

……

……

……

13. (a). Define the term specific latent heat of fusion of a substance. (1mark)

……

……

(b). The graph below shows a temperature Θ(°C) against time, t(s) of 20g of Naphthalene that was heat to 80°C then cooled to room temperature.

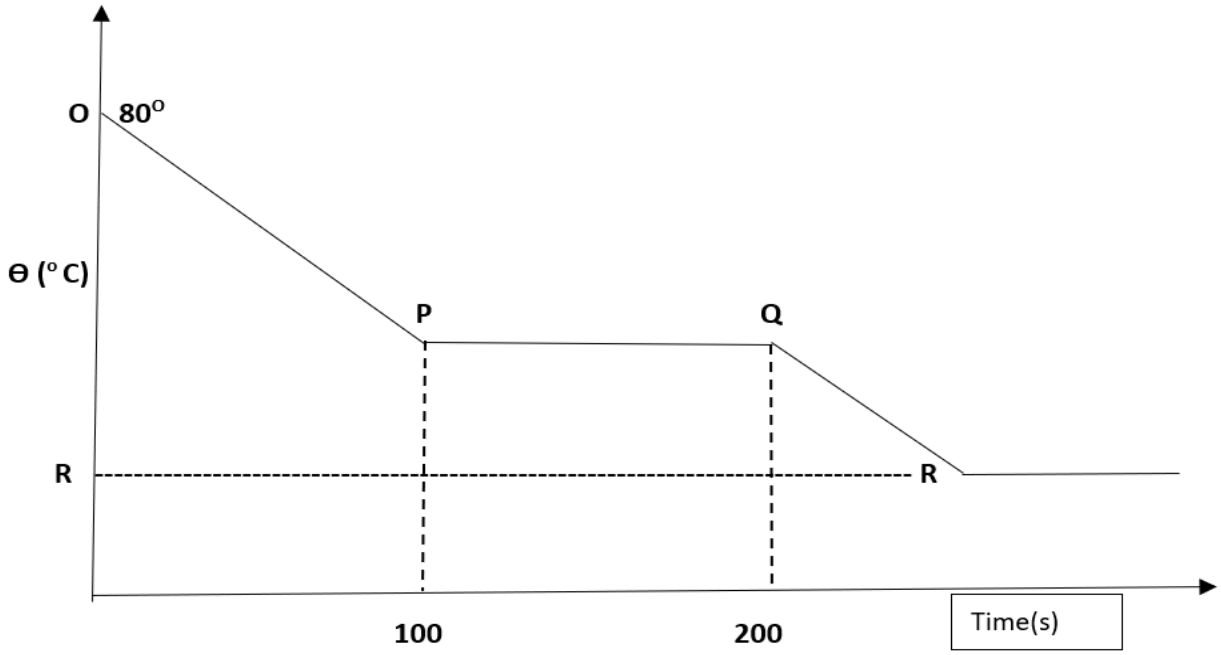


Figure 7

If the rate of heat given out on PQ was at the rate of 30W;

(i) State what happens in part PQ. (1mark)

……

……

(ii) Use the graph to determine the specific latent heat of fusion of Naphthalene.

(3marks)

……

……

……

14. The graph shows a graph that can be used to verify Charles law. Use the information provided to answer the questions below.

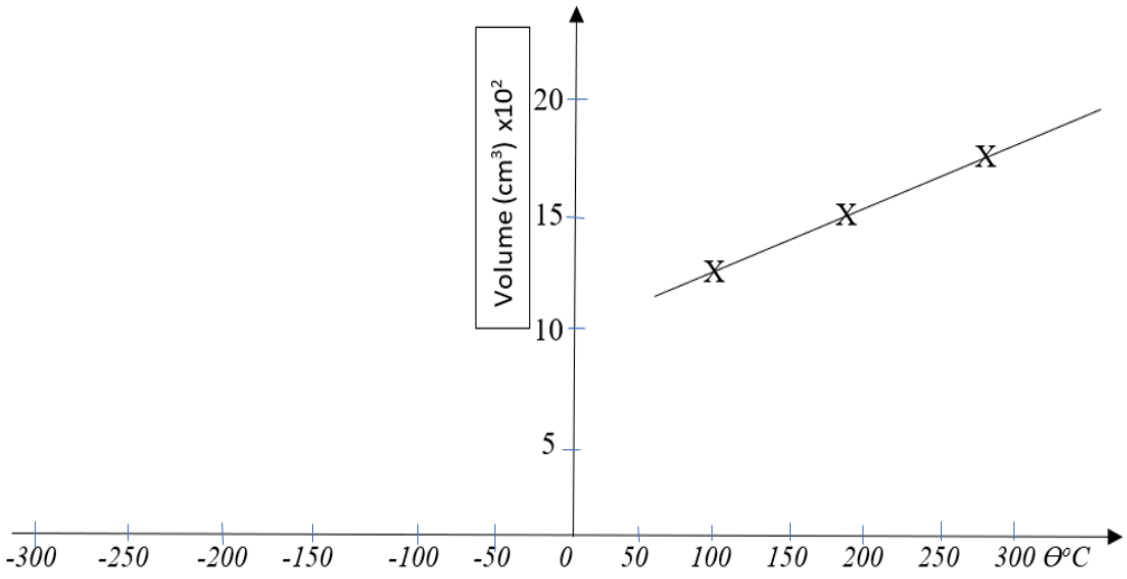


Figure 8

(a) What is the volume of the air at 0°C? (1mark)

……

(b) The value of 0 K in Celsius scale. (1mark)

……

(c) The glass tube in figure 9 below contains air enclosed by a thread of mercury as shown in a horizontal position at a temperature of 27°C.

Figure 9

The tube is then raised until its positioned vertically upwards with the opened end at the top, determine the length of the enclosed air in mm when in its new position.

…… (3marks)

……

……

15. (a). State Pascal's Principle of Transmission of pressure. (1mark)

……

……

(b) The figure 10 below shows a mercury manometer. Some dry gas is trapped in the closed space in one of the limbs while the other is open. Alongside is mercury barometer

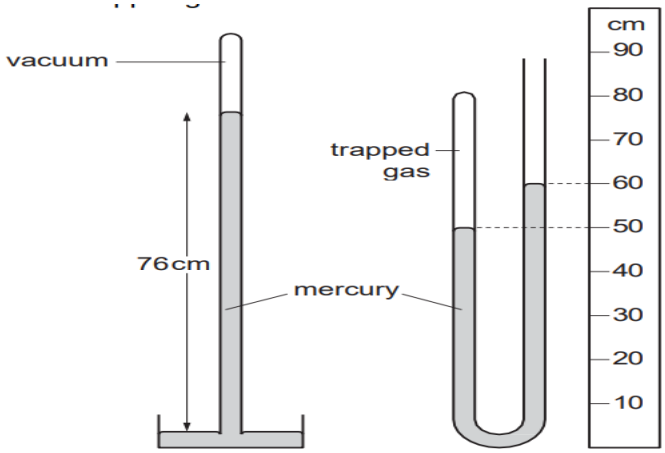


Figure 10

Determine the pressure of the trapped gas given that the density of mercury is 13600kg/m^3 in SI units. (3marks)

……

……

……..

(c) The figure 11 below shows a simple hydraulic used to raise a car.

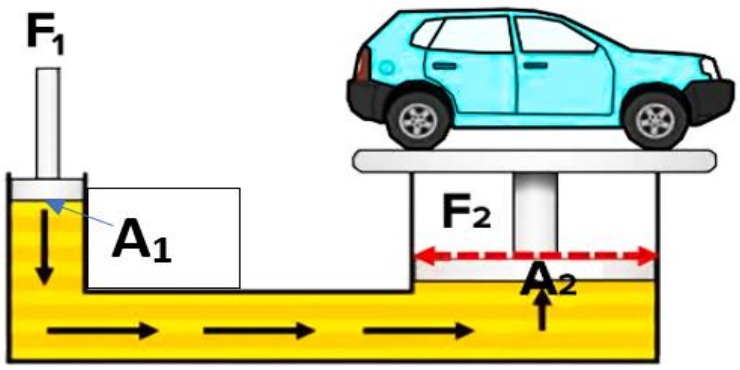


Figure 11

(i) Determine the pressure exerted by the piston given that F_1=120N, A_1= 0.006m^2 and A_2=0.2m^2. (3marks)

……

……

……

……..

(ii) Determine the weight of the car. (3marks)

……

……

……

……

(iii) Give one property which make the oil suitable for use in the above machine.

……..(1mark)

……

16. (a) State what contributes to centripetal force when a bucket full of water is at the top while being rotated in a vertical circle. (1mark)

……

(b). (i) Distinguish between angular velocity and linear velocity. (1mark)

……

……

(c). A particle moves in a semi-circular path of radius 3.5m with a constant speed of 20m/s as shown in the figure 12 below.

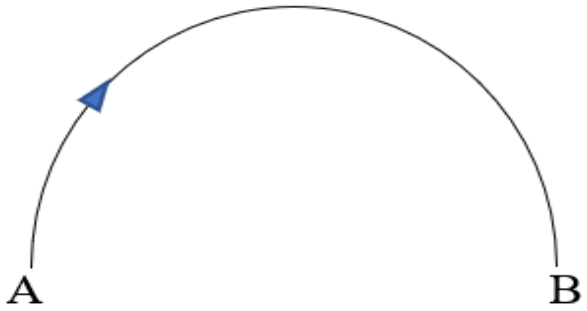


Figure 12

Calculate

(i) Determine the distance moved by the particle from A to B. (2marks)

……

(ii) The time taken to travel from A to B. (2marks)

……

……

……

(iii). The angular velocity of the particle. (3marks)

……

……

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

……

……

PREDICTION 4

PAPER 2

SECTION A

1. a) Figure 1 below shows a point object O placed in front of a plane mirror M. Using a ray diagram, locate the position of the image formed. (3 Marks)

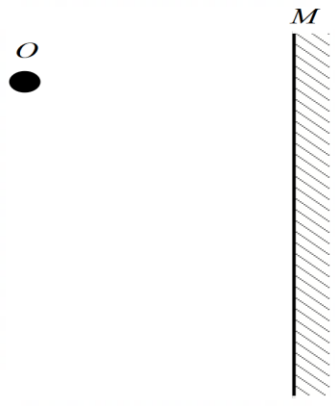


Figure 1

2. A magnetic material is placed in the north-south direction and hammered several times. Using the domain theory, explain the magnetization process. (3 Marks)

……

……

3. Figure 2 below shows a virtual image formed by a concave mirror. Complete the diagram to show the position of the object. (3 Marks)

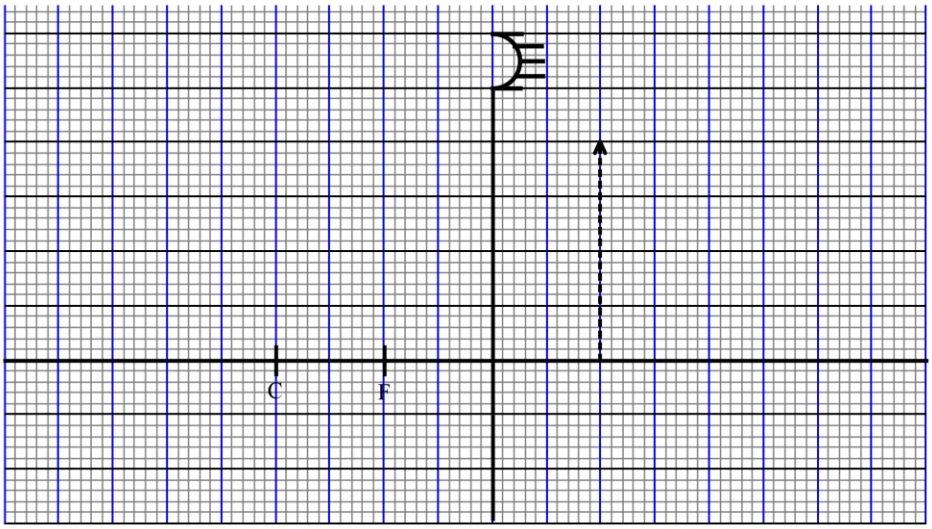


Figure 2

4. Figure 3 below shows a simple electric bell circuit.

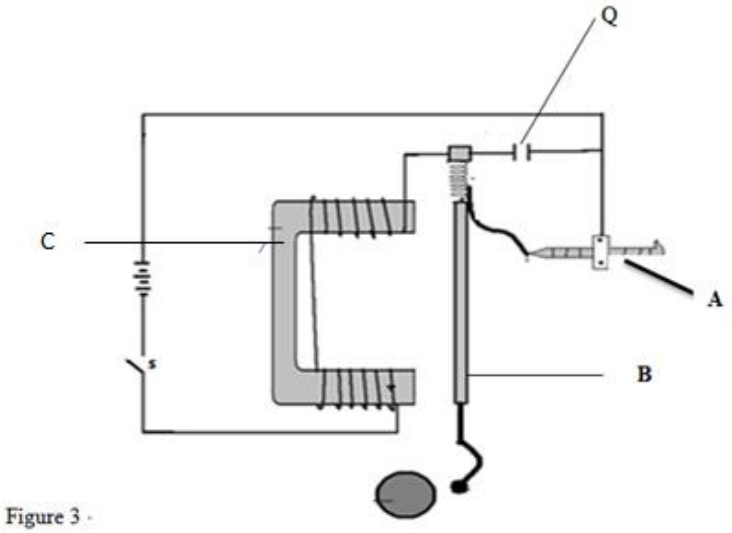


Figure 3

a) Name the parts labelled;

A: ……. (1 Mark)

B: ……. (1 Mark)

b) State the function of the part labelled Q in the circuit. (1 Mark)

……

c) State the effect of the part labelled C being made of steel metal. (1 Mark)

……

……..……..…

5. Figure 4 below shows a set up by a student to investigate the properties of sound.

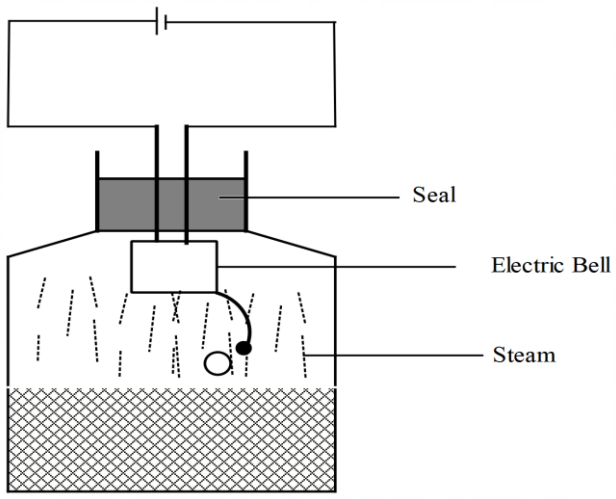


Figure 4

a) State and explain the observation made on the sound from the bell as the bottle and its contents are cooled to 0°C. (2 Marks)

……

……

……

b) An ultrasound signal of wavelength 5 cm and frequency of 0.05 MHz is sent by a ship to the seabed. Determine the depth of the sea given that the echo is received after 10 seconds. (2 Marks)

……

……

……

6. Figure 5 below shows a narrow beam of light incident on the face XY of a glass prism. The refractive index of the glass is 1.5091.

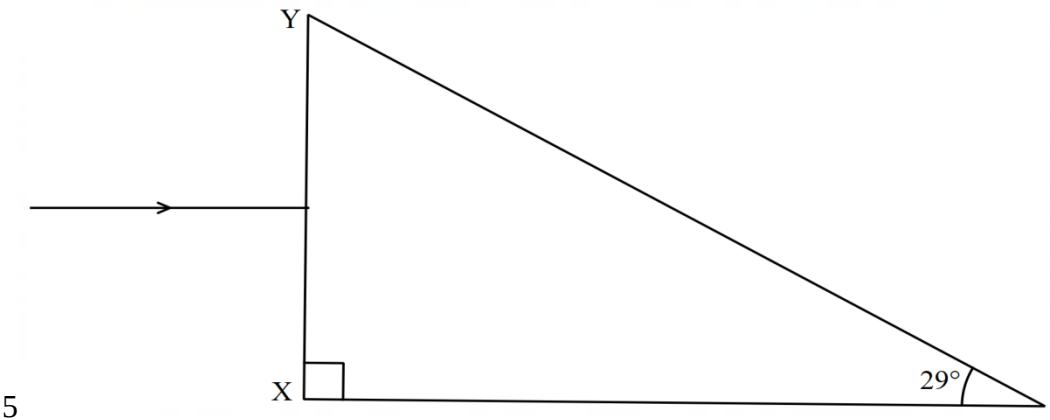


Figure 5

Use the provided information to answer the following questions.

(i) Determined the critical angle of the glass. (2 Marks)

……

……

……

(ii) On the same diagram, show how the ray will emerge from the prism. (1 mark)

(iii) Determine the angle of refraction of the resultant emergent ray. (2 Marks)

……

……

……....

7. Consider the table below for some electromagnetic waves.

Radiation	Production	Detection	Application
Radio waves	A: ……..…… ……	Aerials	B:…… ……
Infrared	Thermal vibration of atoms of hot bodies	C: ……	D: ……

Fill in the spaces labeled A,B and C. (3 Marks)

SECTION B

8. a) Explain how polarization affects the working of a simple cell. (1 Mark)

……

……

b) Figure 6 below shows an electric circuit with two switches S_1 and S_2 and three identical lamps L_1, L_2 and L_3.

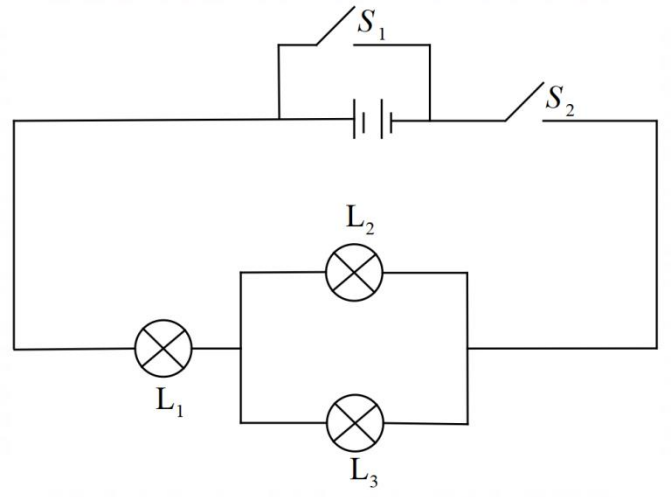


Figure 6

State and explain what will be observed if both switches S_1 and S_2 are closed simultaneously. (2 Marks)

……

……

……

c) (i) Apart from length, state one other physical factor that should be kept constant in a copper conductor for Ohm's law to hold. (1 Mark)

……

(ii) The Figure 7 below shows a resistor network connected to a power supply of 12V. The resistor R_1= 5Ω, R_2= 2Ω and R_3= 3Ω.

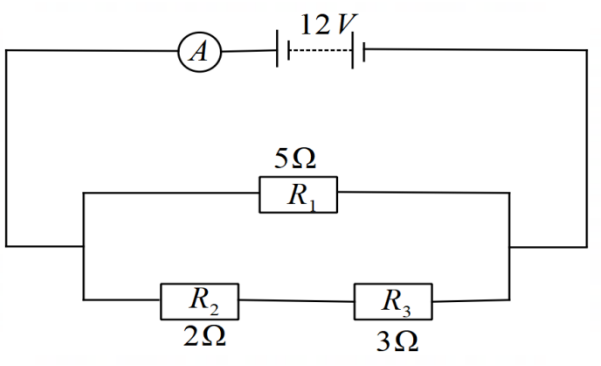


Figure 7

Determine:

I. the equivalent resistance in the circuit (2 Marks)

……

……

……

II. the reading in the ammeter A. (1 Marks)

……

……

……

III. the potential difference across the resistor R_3. (2 Marks)

……

……

……

9. (a) Figure 8 below shows a charged electroscope and two aluminum plates A and B.

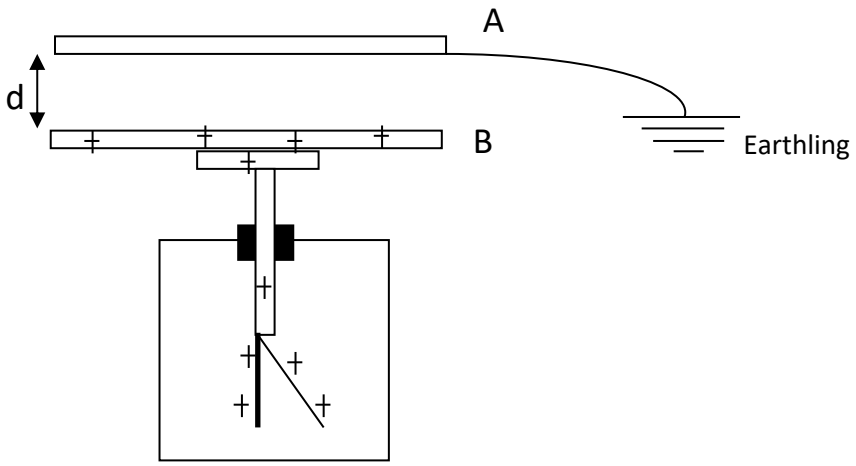


Figure 8

State and explain the observations made on the leaf divergence when plate A is moved closer to B. (2 Marks)

……

……

……

b) Figure 9 below shows a circuit having the following components: source of E.m.f of 20 V, a voltmeter, three switches S_1, S_2 and S_3 and two capacitors C_1 and C_2 of capacitances 13μF and 8μF respectively.

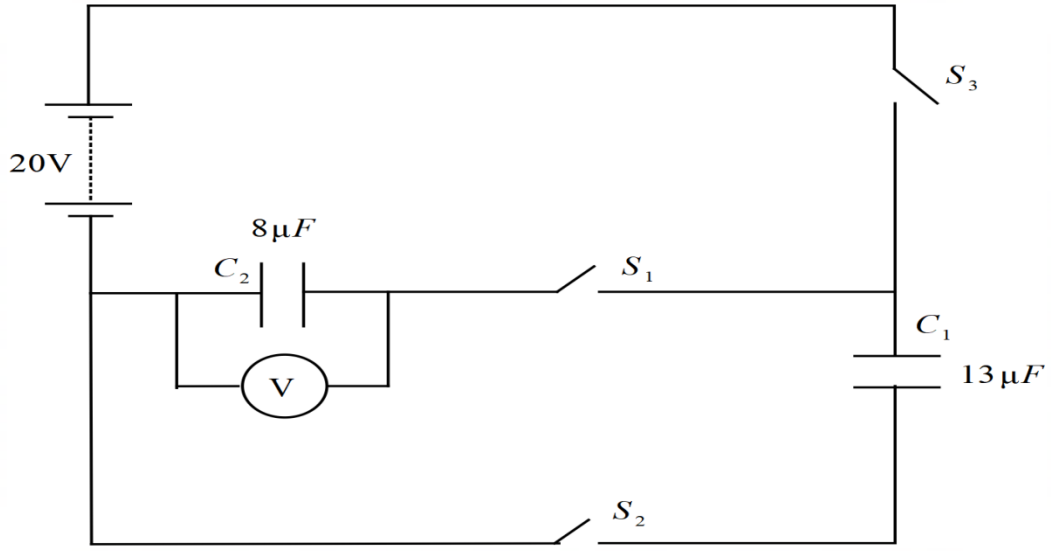


Figure 9

(i) Determine the charge on C_1 when switches S_2 and S_3 are closed while S_1 is open. (2 Marks)

.....

.....

.....

.....

(ii) After some time, S_3 is opened and both S_1 and S_2 are closed. Find the maximum voltage V recorded by the voltmeter. (2 Marks)

.....

.....

.....

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(iii) Determine the energy stored in C_2. (3 Marks)

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10. a) Figure 10 below illustrates waves emanating from two coherent sources S_1 and S_2.

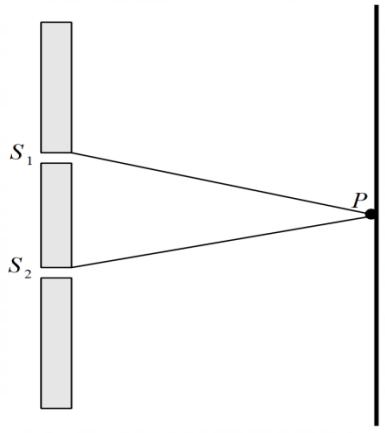

Figure 10

What would be observed at the central point P if the waves are:

(i) Light waves (1 Mark)

……

……

(ii) Sound waves (1 Mark)

……

……

b) Define the term diffraction as applied in waves. (1 Mark)

……

……

c) Figure 11 below shows water waves moving from a deep to a shallow region.

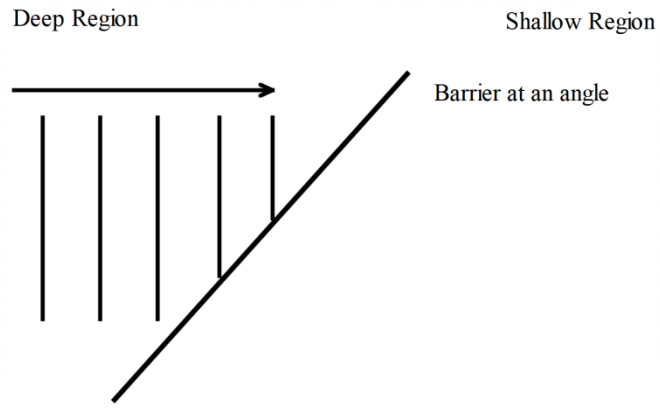

Figure 11

(i) In the same diagram, sketch the wave pattern beyond the barrier. (2 Marks)

(ii) State two changes that will occur to the wave when it moves from the shallow to the deep region if the frequency is kept constant. (2 Marks)

……

……

……...

iii) The distance between the antinode and its nearest node of a stationary wave is 0.08 m. Given that the wave has a velocity of $10ms^{-1}$, determine the frequency of the wave. (2 Marks)

……

……

……

d) State one difference between light waves and sound waves in terms of their propagation. (1 Mark)

……

……

……...

11. (a) (i) State one application of a fuse in an electric circuit. (1 Mark)

……

……

(ii) A kitchen is fitted with a kettle rated 6kW, 240V, select a suitable fuse for use by the appliance if the available fuses are 35A, 25A, 24A, 26A. (2 Marks)

……

……

……

(b) A current of 2A is passed through a circuit connected to an electrical heater. Determine the time taken by the heater to produce 1000 J of heat if the voltage across the heater is 10 V. (2 Marks)

……

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……

(c) State one reason why fluorescent tubes are preferred to filament lumps in lighting homes. (1 Marks)

……..……

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12. a) A scientist wanted to determine the focal length of the convex lens of thickness 0.5 cm using an optical pin and a plane mirror. Figure 12 below shows the set-up of apparatus when there is no parallax between the pin and the image.

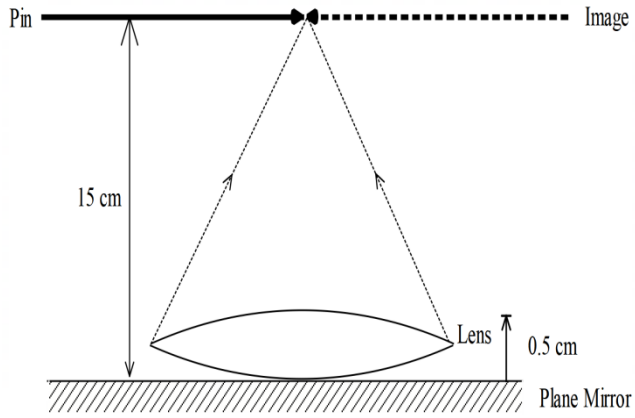

Figure 12

Determine the focal length of the lens. (2 Marks)

……

……

……

……

b) A lens forms a focused image on a screen when the distance between the object and the image is 50 cm.

(i) State with a reason the type of the lens used. (2 Marks)

……

(ii) Determine the object distance. (3 Marks)

……

……

……

c) Figure 13 below shows a human eye with a certain defect.

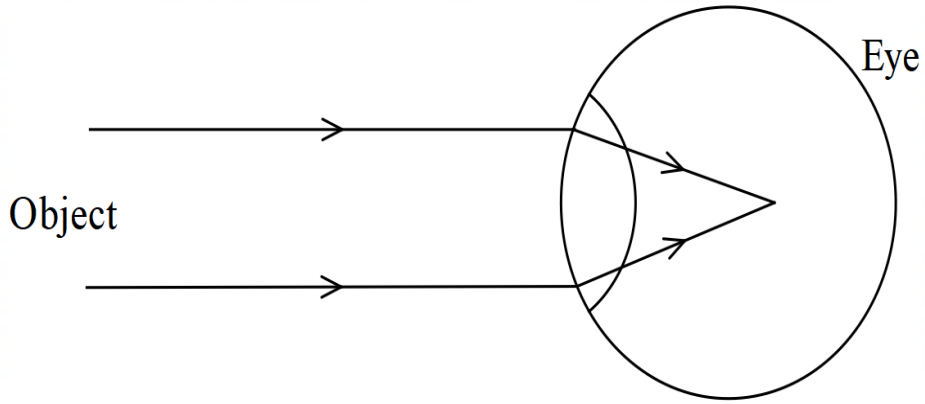

Figure 13

(i) Identify the defect. (1 Mark)

……

(ii) State one cause of the defect. (1 Marks)

……

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

13. a) In figure 14 below, a magnet is made to approach a coil as shown.

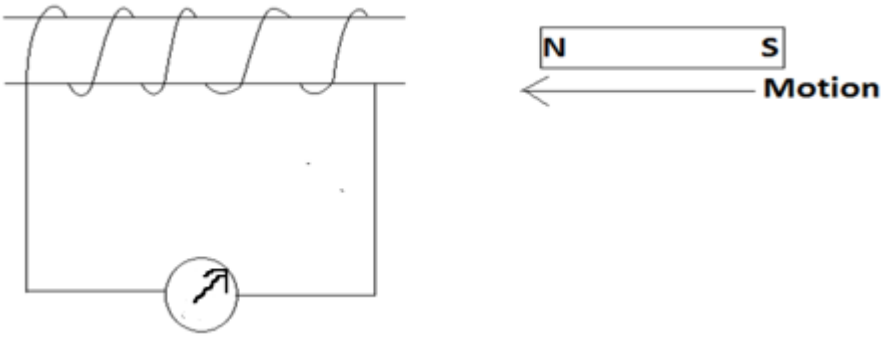

Figure 14

It is observed that the galvanometer deflects to one direction and goes back to zero.

Explain the observation made. (2 Marks)

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(b) Figure 15 below shows a simple illustration of an a.c generator.

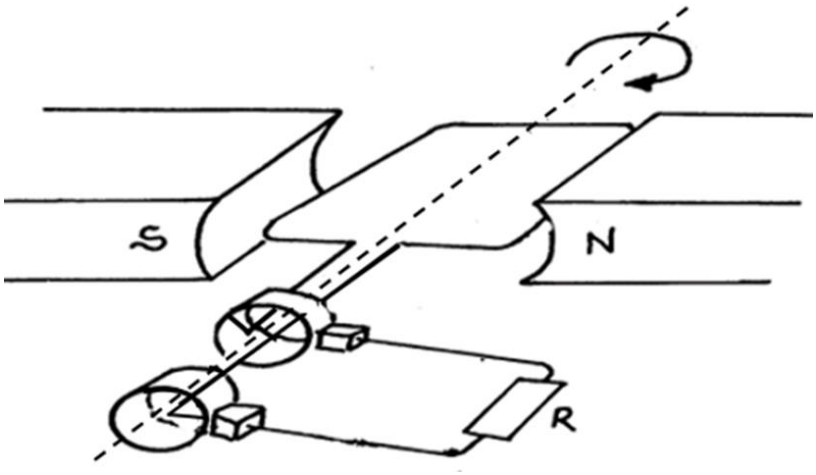

Figure 15

(i) Indicate on the diagram the direction of the induced current through R when the coil is in the horizontal position. (1 Mark)

(ii) Give one way of increasing the amount of induced current in the set up. (1 Mark)

……

(iii) On the axes of Figure 16 below, sketch the output of P.d across R. The coil is initially horizontal. (1 Mark)

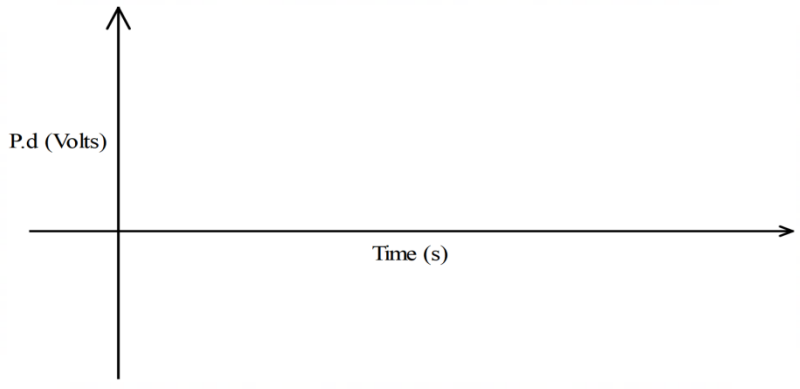

Figure 16

d) A transformer has 600 turns in the primary coil and 9000 turns in the secondary coil. The secondary coil is connected to a 250V mains and the current in it is 0.15A. Determine:

(i) Power in the primary coil if the transformer is 95% efficient. (2 Marks)

……

……

……

(ii) Current in the primary coil. (3 Marks)

……

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PREDICTION 4
PAPER 3

1. You are provided with the following:
   - A voltmeter
   - A milliameter
   - A micrometer screw gauge (to be shared)
   - A stop watch
   - A centre zero galvanometer
   - A switch
   - Ten connecting wires (at least five with crocodile clip on one end)
   - A resistance wire mounted on a millimeter scale labeled AB.
   - A resistance wire labeled P
   - A resistance wire labeled Q
   - A capacitor labeled C.
   - A meter rule or half meter rule
   - Two dry cells and a cell holder.
   - A carbon resistor labeled R.

Proceed as follows

PART A

(a) Using the micrometer screw gauge provided, measure the diameter.

(i) D of wire P

D = ……. (1mk)

(ii) d of wire Q

d = …….. (1mk)

(b) Determine C_1 the value of the ratio $\frac{D}{d}$

C_1 = …… (1mk)

(c) (i)Set up the circuit as shown in **figure 1**. (Ensure each of the wires **P** and **Q** is 50cm long)

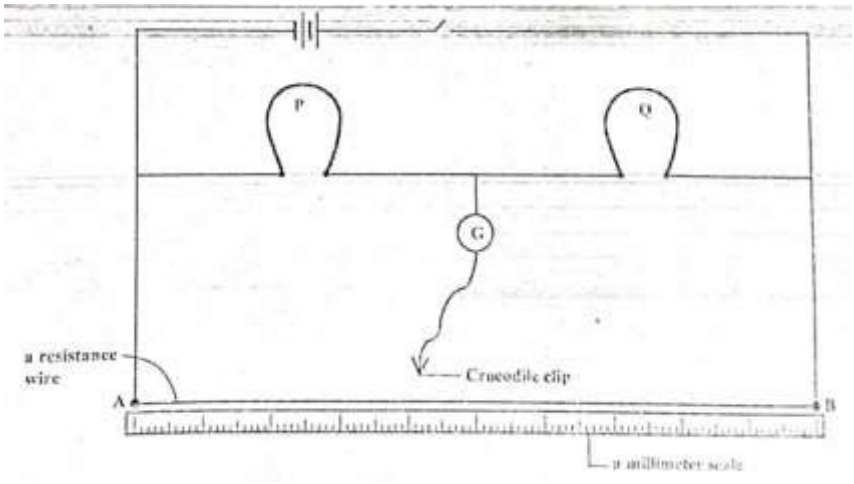

Figure 1

Close the switch. Using the clip at the free end of the wire from the galvanometer, tap wire **AB** near end **A** and observe the deflection in the galvanometer.

(ii)Then tap the wire near end **B** and again observe the deflection in the galvanometer.

(iii)Now tap the wire **AB** at various points between **A** and **B** to obtain a point **K** where there is no deflection in the galvanometer.

(I)Determine the length $\mathbf{L_1}$, the distance from **A** to **K**.

$\mathbf{L_1}$ = _____ (1mk)

(II)Determine the length $\mathbf{L_2}$, the distance from B to K.

$\mathbf{L_2}$ = _____ (1mk)

(d) (i) Given that the resistance $\mathbf{R_Q}$ of **Q** is 9.0 ohms, determine the resistance R_P of **P** using the expression

$$\frac{R_p}{R_Q} = \frac{L_1}{L_2}$$ (2mks)

……

……..

……..

(ii)Determine the value of C_2 given that;

$$C_2 = \sqrt{\frac{R_Q}{R_P}}$$ (2mks)

……

……..

……..

(iii)Compare the value of C_1 (in part (b) with that of C_2. (1mk)

……

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PART B

(e) Set up the circuit shown in **Figure 2**. **S** and **T** are crocodile clips.

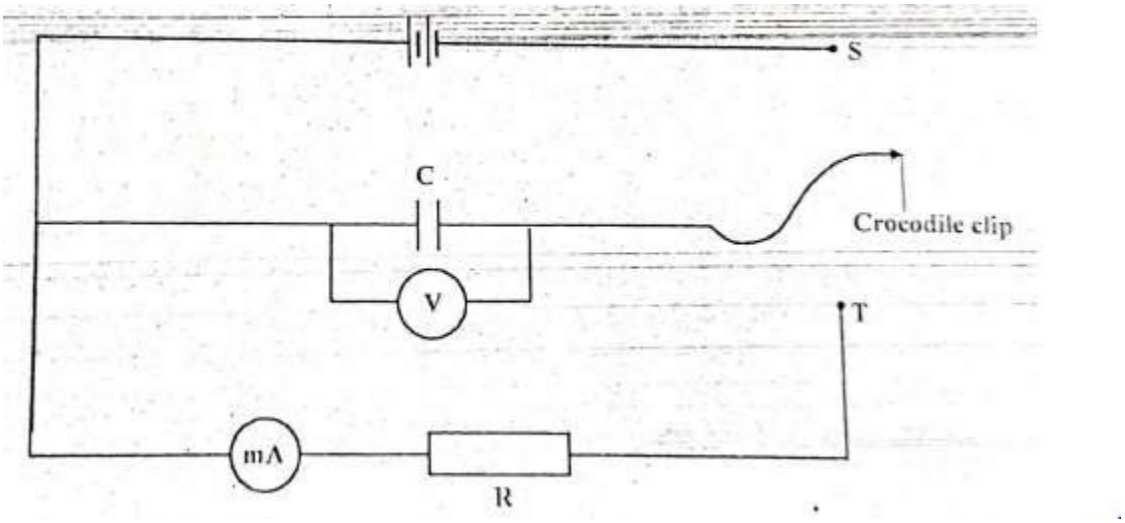


Figure 2

(i) Charge the capacitor **C** by connecting the crocodile clip to **S**. Record the reading of the voltmeter, V

V = ……(1mk)

(ii) Calculate the value of the current I_0 given that $I_0 = \frac{V}{R}$ = (where R = 4.7 x $10^3\Omega$

(3mks)

……

……..

……..

(f) (i) Discharge the capacitor by disconnecting the crocodile clip from **S** and connecting it to **T.** Observe and record the highest reading of the milliameter 1_1 (This is the current at $t_0 = 0$)

(**You may have to repeat the process to obtain an accurate value**).

I_1 = ……. (1mk)

(ii) Recharge the capacitor by connecting the crocodile clips to S.

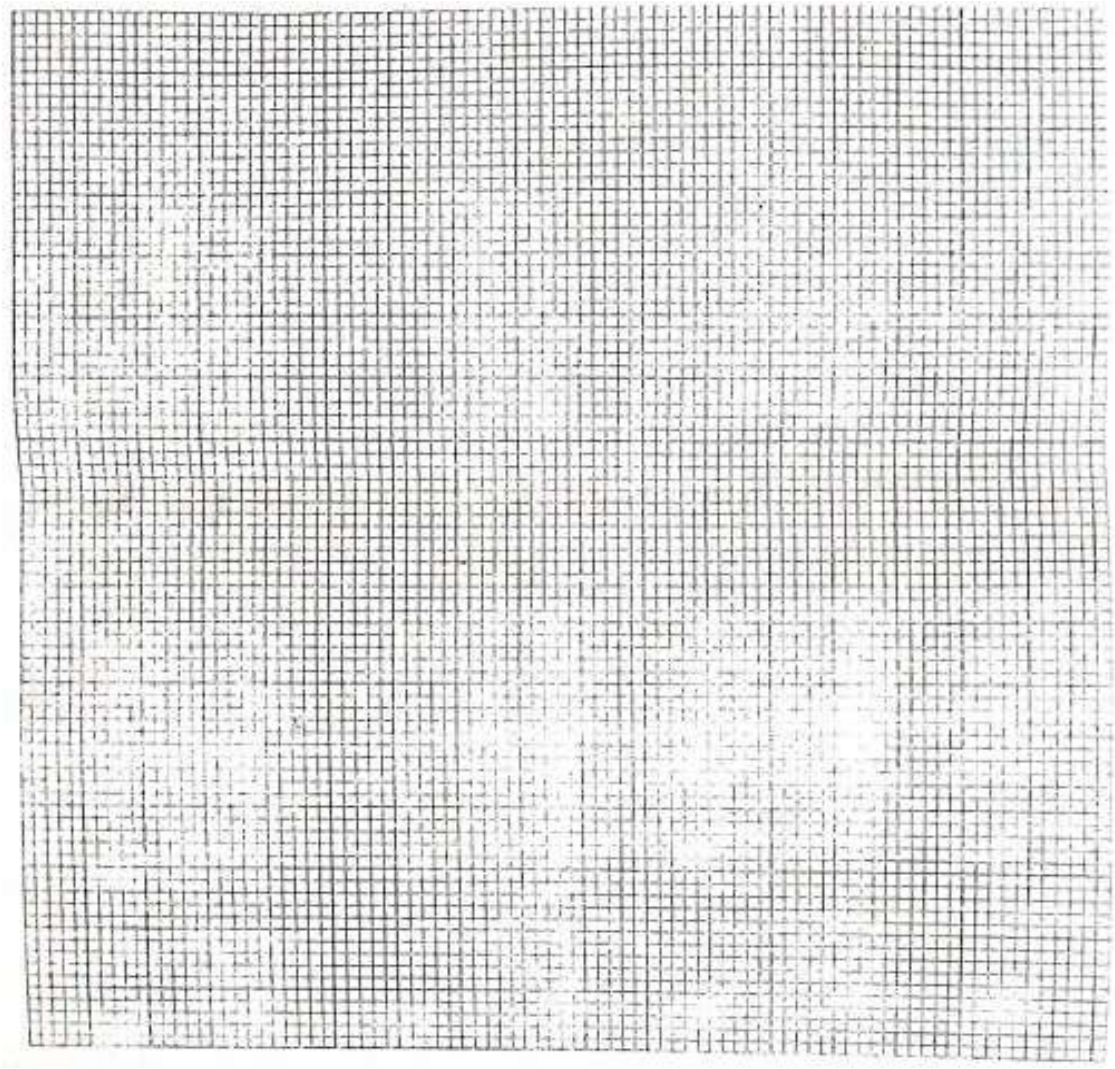
(iii) Discharge the capacitor and at the same time start the stop watch to measure the time t_1 taken for the current to decrease to half the value of 1_1 i.e. (½ 1_1)

t_1 = ……. (1 mk)

(g) (i)Recharge the capacitor and repeat the procedure in f(iii) to measure the time t_2 taken for the current to decrease to one tenth of the value of I_1 ie $(\frac{1}{10} I_1)$

t_2 = …….. …..(1mk)

(ii)Use the value of the currents I_1, ½ I_1, $^1/_{10}$ I_1 and their corresponding times to draw a graph of current I (y axis) against time on the grid provided.
(3mks)



QUESTION 2

You are provided with the following

- A meter rule
- A stand, boss and clamp
- A piece of string
- A 20g mass
- A 50g mass
- A measuring cylinder containing water
- A concave mirror
- A screen
- Candle
- Pieces of sewing threads
- A mirror holder (Lens holder)

Proceed as follows

PART A:

(a)Using a string, suspend the metre rule on the stand so that it balances horizontally at its centre of gravity. Record the centimetre mark at which the metre rule balances.

Centimeter mark = ……cm (1mk)

(b)With the metre rule balanced at its centre of gravity, suspend a 20g mass at a distance of 30cm from the centre of gravity. Suspend the 50g mass on the other side of the centre of gravity and adjust its position until the rule is balanced. **See figure 3.**

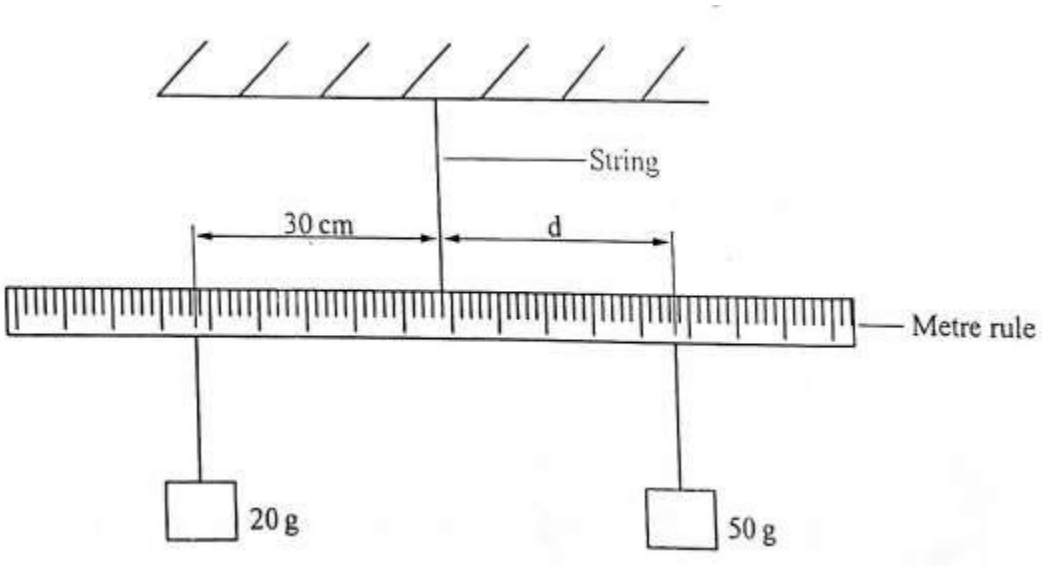


Figure 3

Record the distance d of the 50g mass from the center of gravity.

d = ……cm

d=……m (1mk)

(c) (i) Record the volume of the water in the measuring cylinder provided.

V= ……. (1mk)

(ii) Immerse the 20g mass fully into the water and adjust the position of the 50g mass so that the rule balances horizontally. Record the volume V_1 of the water plus 20g mass and the distance d_1 of the 50g mass from the centre of gravity.

V_1 = …… (1mk)

d_1 = …… (1mk)

(iii) (I) Determine the volume of the water displaced. (1mk)

`……

(II) Determine the weight of the water displaced (3mks)

(***density of water = 1 gcm^{-3}***)

……..

……

……

(d) (i) Using the principle of moments to determine the apparent weight of the 20g mass when fully immersed in water . (g = 10Nkg^{-1}) (2mks)

……..

……

……

(ii) Calculate the weight of the 20g mass in air (g = 10Nkg^{-1}) (1mk)

……..

……

……

(iii) Determine the apparent loss in weight of the 20g mass. (1mk)

……..

PART B

(e) Light the candle and place it at distance u = 20cm in front of the concave mirror. Adjust the position of the screen until a sharp image of the candle flame is obtained. See **figure 4.**

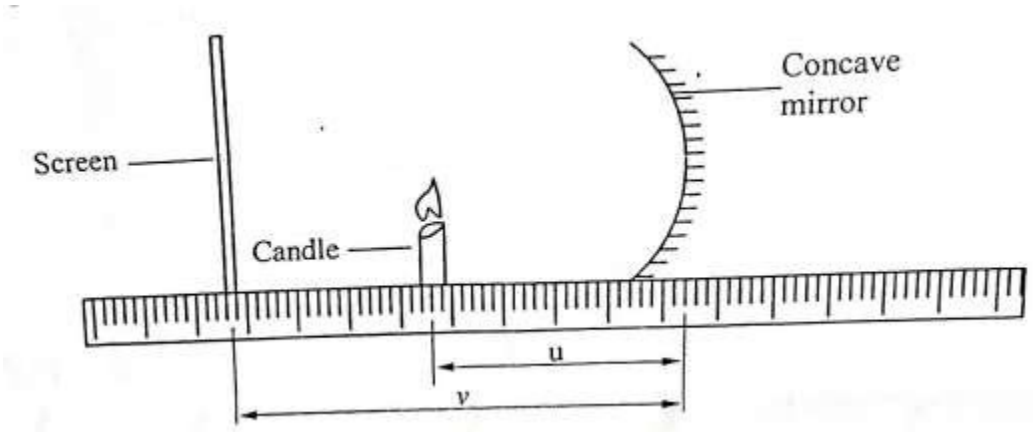


Figure 4

(i)Read and record the distance v between the screen and the mirror.

v=……..(1mk)

(ii)Determine

l. The magnification m of the mirror given that m = $\frac{v}{u}$

……(1mk)

……...

II. The value of f_l given that: $f_l = \frac{mu}{m+1}$

……(1mk)

……

……

(f) Repeat part (e) for distance $u_1 = 18cm$

(i) Read and record the distance v_1 between the screen and mirror.

v_1 = …….. (1mk)

(ii) Determine the magnification m_1 of the mirror. (1mk)

……..

……

……

(iii)1 Hence determine f_2

……..(1mk)

……

……

(g)Determine the average value of f. (1mk)

……..

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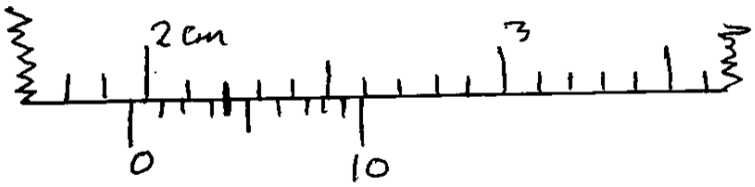
PREDICTION 5

PAPER 1

SECTION A 25 MARKS (ANSWER ALL QUESTIONS)

1. Water is normally used as a coolant in many internal combustion systems. Explain why (2mks)

2. Give the reading indicated in the section of the Vernier calipers shown below (2mks)



3. One advantage of friction force is that it enables motion. State one disadvantage of friction (1mk)

4. Steel bars are used to reinforce concrete beams. Give a reason why (2mks)

5. A stone of mass 50g is whirled in a vertical circle at a linear speed of 25m/s when attached to a string of length 0.5m. Calculate the tension on the string when the stone is at the bottom of the circular path**.** ***[g=10N/kg]***(3mks)

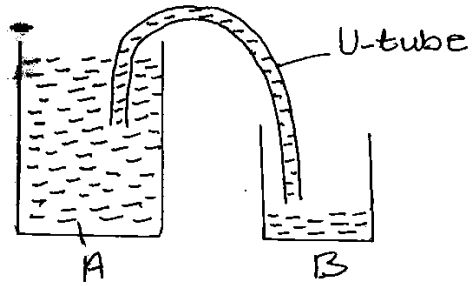
6. An inflated balloon is left on the sun for some time. The balloon burst, give a reason why it bursts. (2mks)

7. Name two factors that determine momentum of a body. (2mks)

8. It is common practice by motor vehicle body builders to make luggage compartments of buses underneath passengers' seats. How does this enhance safety of those travelling in such buses? (2mks)

9. An empty density bottle has a mass of 20g. When full of water, its mass is 70g and when full of a liquid ***X***, its mass is 55g. Given that density of water is 1000kg/m^3, find the density of liquid ***X***. (3mks)

10. Figure below shows a system used to transfer a liquid from a tank A to tank B on earth's surface.



(a). Give the name of this method (1mk)

(b). When some young astronauts tried the method on the moon's surface, they failed. Give a reason why they were unsuccessful (1mk)

11. What is the SI unit of specific heat capacity (1mk)

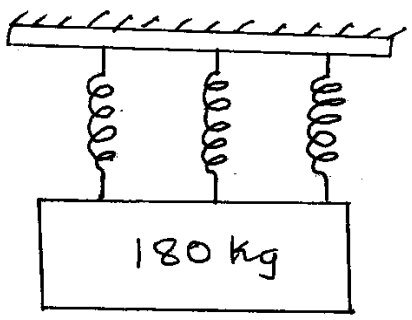
12. An object of mass 90kg weighs 360N on the surface of a certain planet. Find the acceleration due to gravity of this planet (3mks)

SECTION B (55 MARKS) ANSWER ALL QUESTIONS

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

(b). State three factors that affect spring constant (3mks)

©.A spring has a spring constant of 40N/cm. 3 such springs are used to suspend a mass of 180kg as shown in the figure below.



Find the extension of the system (3mks)

(d). A spring of elastic constant 50N/cm is compressed 2cm inside the muzzle of a shotgun. If the gun is to shoot a bullet of mass 20g when trigger is released. Find;

i. The initial velocity of the bullet as it leaves the gun (4mk)

ii. The recoil velocity of the gun if it has a mass of 4kg. (3 decimal places) (3mks)

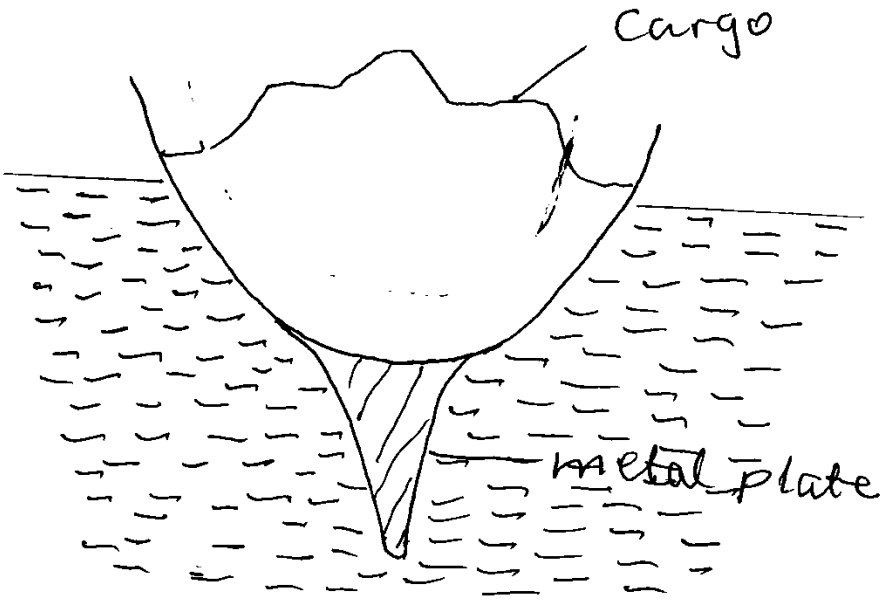
14. (a). What is an ideal gas (1mk)

(b). Absolute zero temperature is practically not attainable. Explain why (1mk)

©. A gas has a volume of $2m^3$ at 25˚C. What will be the volume of the gas at a temperature of 77˚C keeping pressure constant (2.d.p) (3mks)

(d). A hot air balloon is sometimes used by merry makers to rise to high heights. Explain how it works (3mks)

(e). Figure below represents a cross-section of a large ship.



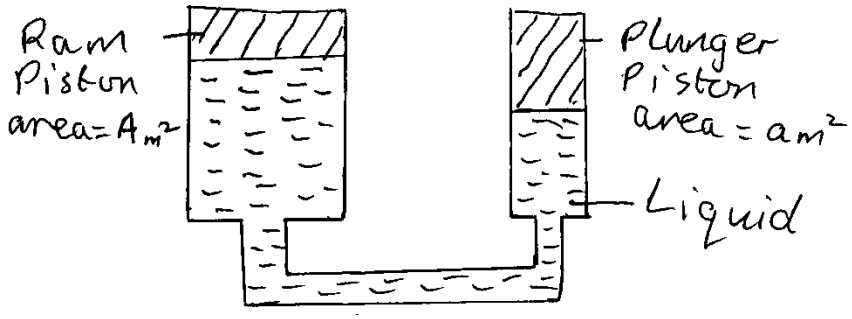
i. What is the use of the large metal plate underneath the ship (2mks)

ii. The ship can carry heavier luggage in sea-water than in fresh water. Explain (2mks)

iii. A loaded ship whose total weight is 4000 tonnes is moving in sea water of density 1030Kg/m^3. Find the volume of ship under the water surface (1.d.p) (3mks)

15. (a). Define the term velocity ratio of a machine (1mk)

(b). Figure below shows part of a hydraulic press. The plunger is the piston where effort is applied while the Ram piston is the piston where the load is applied. The plunger has a cross-sectional area ***a*** m^2while Ram piston has a cross-section area, ***A*** m^2.



When the plunger moves down a distance ***d*** the Ram moves up a distance ***D***. Derive an expression for the velocity ratio (V.R.) in terms of **A** and **a** . (4mks)

©. A machine of velocity ratio 45 overcomes a load of $\mathbf{4.5 \times 10^3 N}$ when an effort of 135N is applied. Determine

i. The mechanical advantage (M.A) of the machine (2mks)

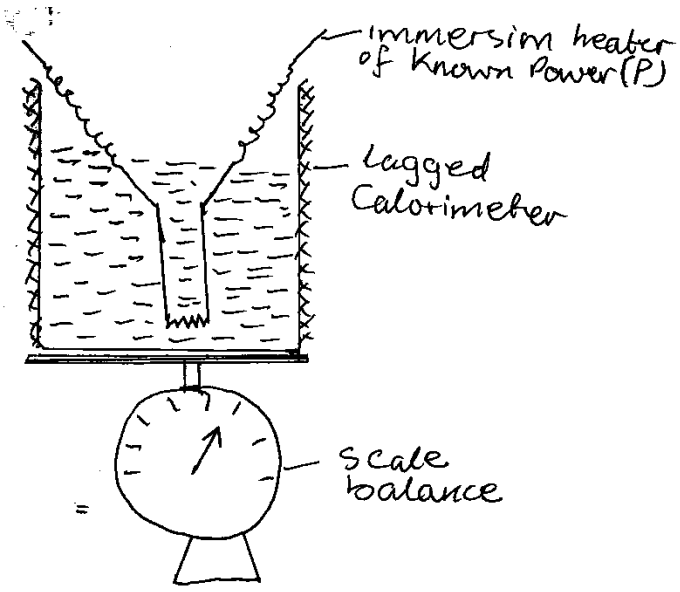
ii. Efficiency of the machine (2mks)

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

(d). State two properties of fluid suitable for use in such a hydraulic machine (2mks)

16. (a). Define the term specific latent heat of fusion (1mk)

(b). You are provided with the apparatus shown in the figure below. Describe an experiment to determine the specific latent heat of steam **L** using the set up. In your answer clearly explain the measurements to be made and how these measurements could be used to determine **L** (6mks)



©. A block of metal of mass 150g at 100˚C is dropped into a lagged calorimeter of heat capacity $40JK^{-1}$ containing 100g of water at 25˚C. The temperature of the resulting mixture is 34˚C. (Specific heat capacity of water **=$4200JKg^{-1}K^{-1}$**). Determine:

i. Heat gained by calorimeter (2mks)

ii. Heat gained by water (2mk)

iii. Heat lost by the metal block (1mk)

iv. Specific heat capacity of the metal block (2mks)

PREDICTION 5

PAPER 2

SECTION A(25 MKS)

1. State two properties of magnetic field lines around a bar magnet. (2mks)

2. Recharging is one of the practices of maintenance of accumulators; state two measurements which need to be taken to help you decide when the accumulator is ready for recharging. (2mks)

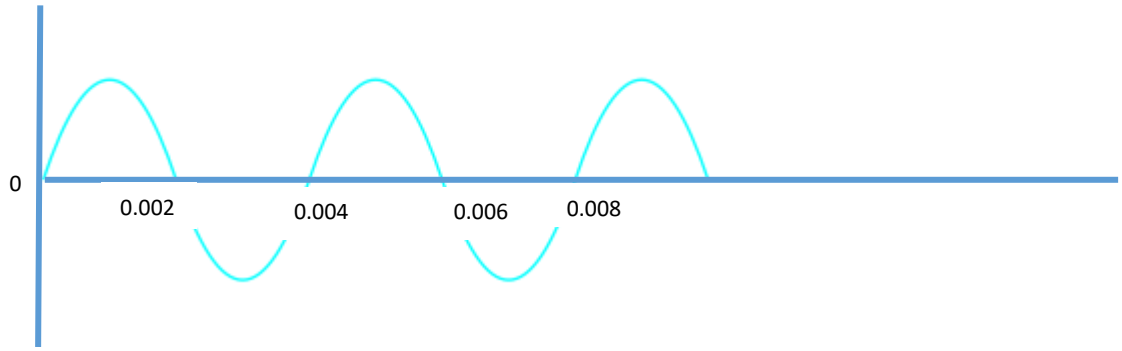
3. Two students stand 300m from a wall. One bangs two pieces of wood together and at the same time the other starts a stop watch. They hear an echo after 1.8 seconds. Determine the speed of sound in air. (3mks)

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

5. Arrange the following electromagnetic waves in order of increasing frequencies

   Infrared, X rays ,visible light, Radio waves . (1mk)

6. The figure represents displacement time graph for a wave.

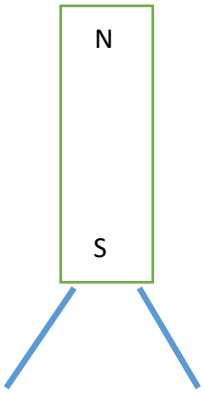


   Determine the frequency of the wave. (3mks)

7. Describe the change on the image formed when the following adjustment are made on a pinhole camera:
   (a) Size of the hole increased (1mk)

   (b) Length of the pinhole camera increased (1mk)

8. Two pins are hanging from a magnet as shown in the diagram below.



   State and explain why they do not hang vertically downwards (2mks)

9. The figure below shows magnetic field pattern due to current flowing through a conductor

   Using . or a x State the direction of electric current in the conductor. (1mk)

10. (a) What do you understand by the label 100W, 240v indicated on an electric bulb? (1mk)

(b) What property does a fuse wire have that makes it suitable for protecting excessive current in the circuit? (1mk)

(c) What is the operating resistance of an electric lamp rated by manufacturer at 80W , 240 V (3mks)

11. Sound waves cannot travel through vacuum. Explain. (1mk)

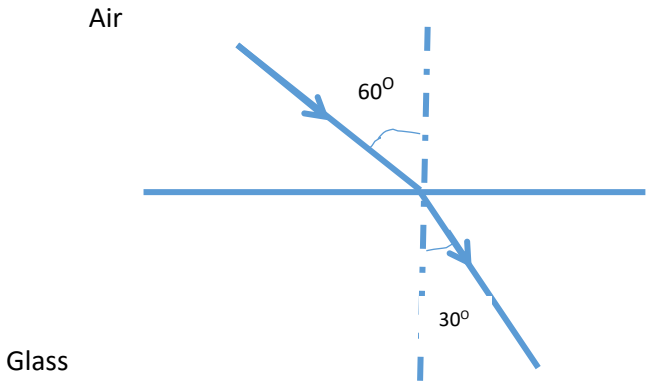
12. Other than the same frequency, state other two conditions for formation of stationary wave. (2mks)

SECTION B (55 MKS)

ANSWER ALL THE QUESTIONS IN THIS SECTION IN THE SPACES PROVIDED

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

(b) The figure below shows a ray of light incident on air glass interface. Study it and answer the questions that follow.



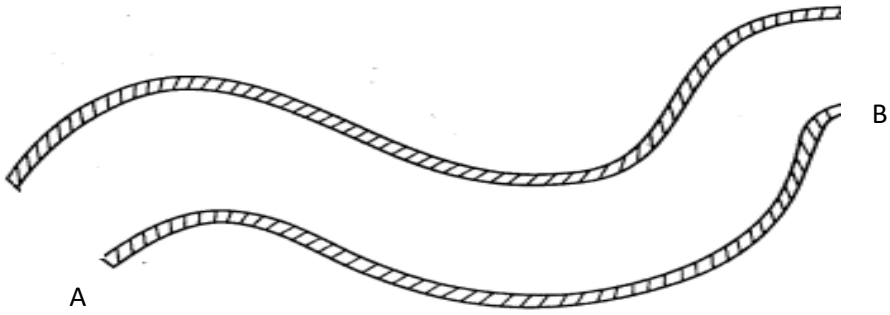
From the diagram determine

(i) The refractive index of the medium (2mks)

(ii) The critical angle of the medium (3mks)

(c) State two conditions under which total internal reflection occurs. (2mks)

(c) The figure below shows an optical fibre. Study it and answer the questions that follow.

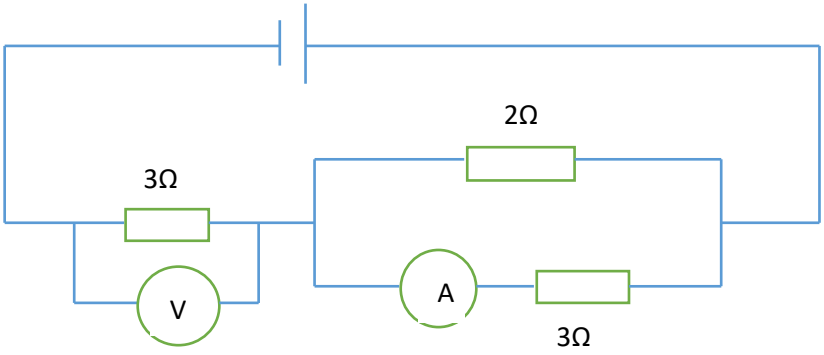


(i) Explain how the ray of light is transmitted from one point of incidence until it emerges at B through the tube. (1mk)

(ii) State two advantages of using optical fibre in communication. (2mk)

14. (a) State two physical quantities that affect the electrical resistance of a conductor at a constant temperature. (2mks)

(b) The cell in the figure below has an emf of 1.8V and negligible internal resistance.



Determine

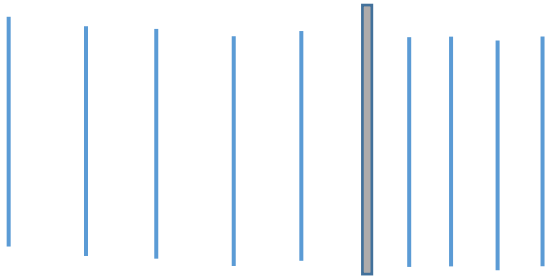
(i) Total resistance in the circuit. (3mks)

(ii) Current in the circuit. (2mks)

(iii) Reading of the voltmeter. (2mks)

(iv) Reading of the ammeter. (3mks)

15 (a) Plane water waves produced in a ripple tank are passed from a region of deep water into a region of shallow water. The figure below shows the top view of the tank .



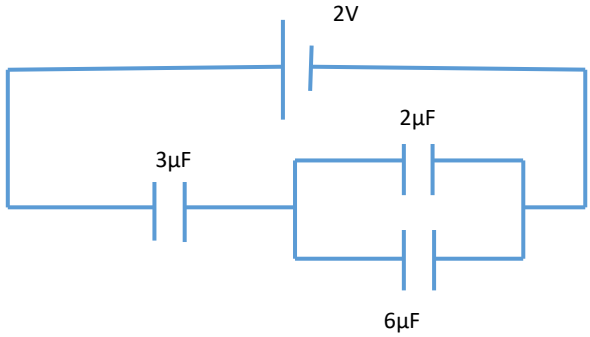
(i) State what happens at the boundary to the frequency of the waves. (1mk)

(ii) The waves have a speed of 24cm/s in the deep water. Consecutive waves crests are 0.08M apart in the deep water. Calculate the frequency of the source producing the waves. (2mks)

(b) Explain how an increase in temperature affects the speed of sound in air. (1mk)

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

(e) The figure below shows three capacitors connected in a circuit



Calculate

(I) The total capacitance of the circuit. (3mks)

(II) The charge stored in the circuit. (2mk)

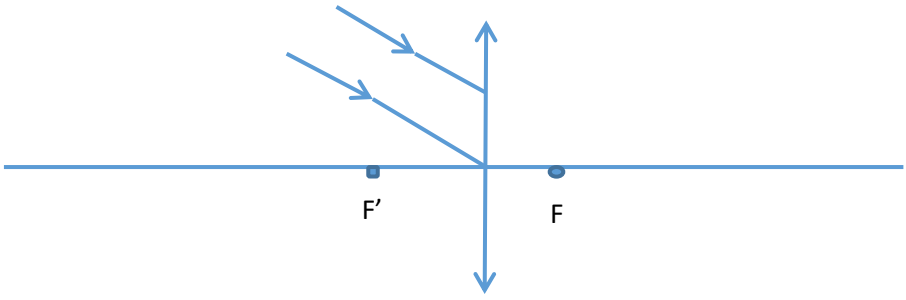
(III) The potential difference across the 2µF capacitor. (3mks)

16. (a) Define the following terms as used in mirrors

(i) Principal axis. (1mk)

(ii) The pole. (1mk)

(b) The figure shows two rays of incident on a converging lens.



Complete the ray diagram to show the rays after passing through the lens. (2mks)

(c) (i) State two differences between the human eye and the camera lens. (2mks)

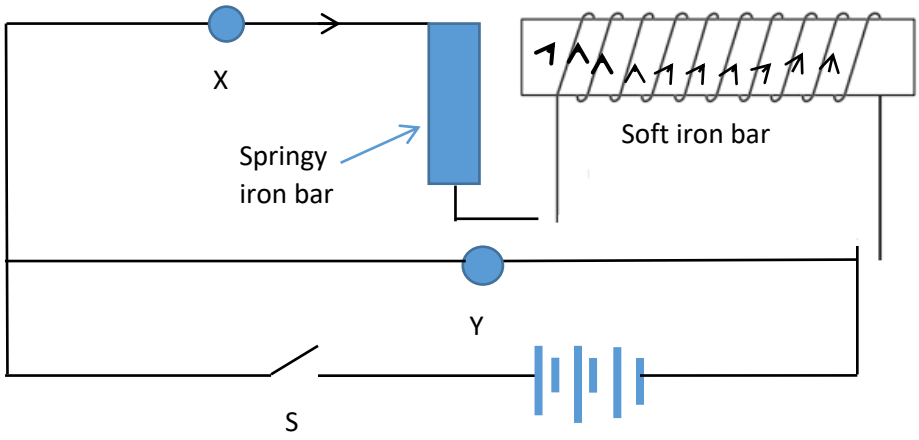
(ii) State the name of the part of the eye that enables the lens to focus images of objects at different distances. (1mk)

(f) An object which is 3cm tall is placed 20cm from a converging lens of focal length 12 cm. Calculate:

(i) The distance of the image from the lens. (3mks)

(ii) Magnification. (2mks)

17 (a) The figure below shows a circuit with two bulbs X and Y study the diagram and answer the question that follow.



Explain the following observations

(i) When the switch S is closed, bulb Y lights continuously. (1mk)

(ii) When the switch S is closed bulb X flickers. (3mks)

(b) You are provided with the following apparatus; a white screen, a metre rule, and a concave mirror and a mirror holder. Using the apparatus describe an appropriate method to determine the focal length of the mirror. (3mks)

PREDICTION 5

PAPER 3

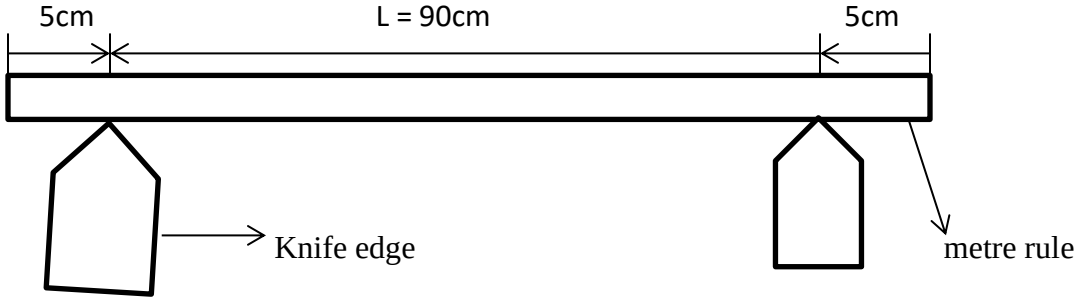
QUESTION 1: PART A

You are provided with the following:

1. Metre rule.
2. Vernier Callipers.
3. 300g mass
4. Two knife edges.
5. Thread

Proceed as follows:

(a) Place the metre rule on the knife edges such that each is 5cm from the end. Ensure the mm scale is facing upwards. Set the distance between the knife edges,L= 900mm as shown below.



(b) Place the vernier callipers vertically against the metre rule at 50cm mark with the depth gauge lowered to touch the bench.

(i) Record the height h_o of the upper edge of the metre rule at the 50cm mark.

h_o =_____cm = ----------mm (1mark)

(ii) Using the thread provided hang the 300g mass at 50cm mark of the metre rule ensuring it does not touch the bench. Measure and record the height h of the upper edge of the metre rule from the bench at the 50cm mark.

h =_____cm= _____mm (1mark)

(iii) With the 300g mass hanging at the 50cm mark, adjust the position of the knife edges so that the distance L is 600mm with the knife edges equidistant from the 50cm mark i.e. at 20cm from each end.
Measure and record the height h of the upper edge of the metre rule at

50cm mark.

h =_____cm= _____mm (1mark)

{iv}

Table1

Length L(mm)	900	600
Height h(mm)		
Depression, d = (h_o-h) (mm)		
Log L		
Log d		

(c) Determine the value of $s = \frac{log\ 900 - log 600}{log d_{900} - log\ d_{600}}$ (3marks)

(2marks)

(d) Evaluate $y = \frac{1}{s}$ (1mk)

e) Given that $G = \frac{log\ K}{y} where\ G = 2.75,$

Determine the value of K. (1mark)

PART B

You are provided with the following:

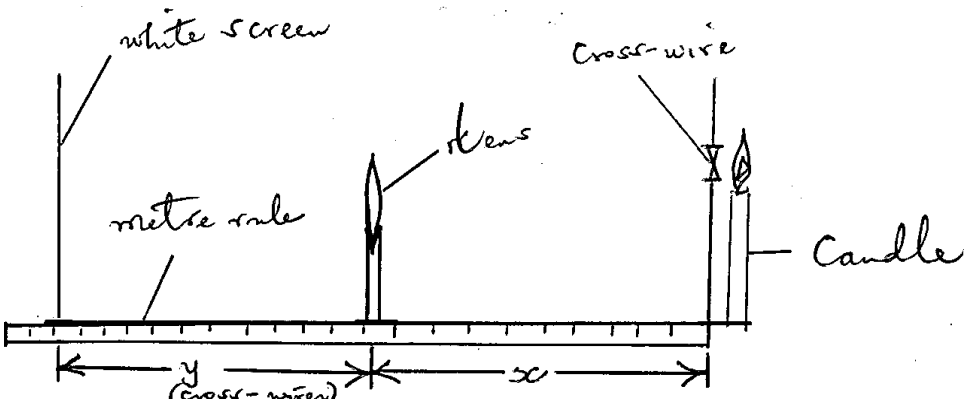
1. A white screen with crosswire
2. A Mounted lens
3. A White screen
4. A Candle
5. A Metre rule

Proceed as follows:

f) Estimate the focal length of the lens by focusing the image of a distant object on the screen provided e.g. distant window.

f_o =_____cm (1mark)

g) Arrange the apparatus as shown.



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

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

Table 1 (3 marks)

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

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

j) Compare the average $\frac{x+y}{xy}$ and $\frac{1}{f_0}$ (2mks)

k) Given that $\frac{1}{f_0} = \frac{y}{\left(\frac{y}{x}\right)+1}$ and x = 25cm. Determine the value of y. (2mks)

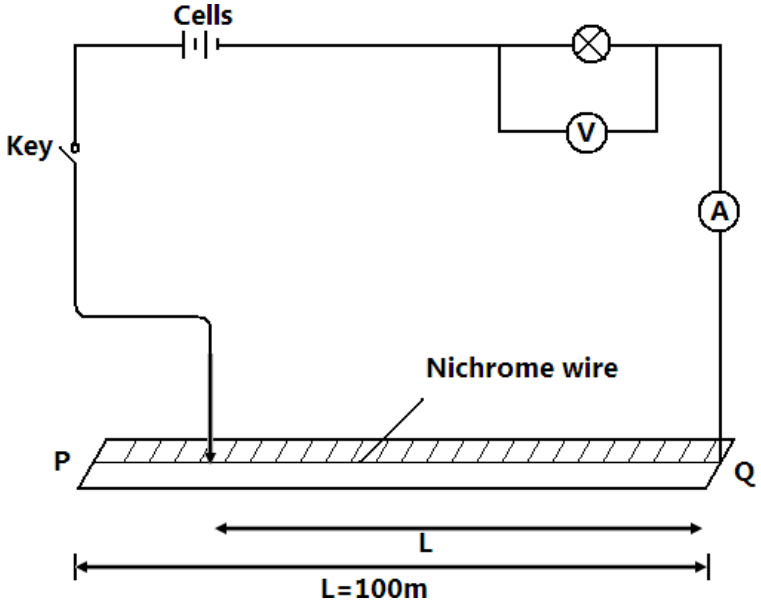
QUESTION 2 (20MKS)

You are provided with the following

- Two dry cell
- One bulb
- Voltmeter (0-3v)
- Ammeter (0-1A)
- Amounted nichrome wire mounted on a millimeter scale.
- Switch
- Seven connecting wire at least two with crocodile clips
- Micrometer screw gauge

Proceed as follows:

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



ii) With the crocodile clip at p, take the voltmeter reading and ammeter reading. Record v and 1 repeat thereadings for L=80, 60, 40, 20 and 0cm respectively and complete the table below. (5mks)

Table 2

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 P? (1mrk)

iv).Plot a graph of ammeter reading (y-axis) against voltmeter readings. (5mrks)

v). Determine the slope of the graph at V=1 volt. (2mrks)

vi). what physical quantity is represented by the slope of the graph at any given point? (1mrk)

b. (i) given the apparatus in a (i) above, draw a diagram of the circuit you would use to determine the current through the resistant wire and the potential difference across. (1mrk)

ii).Set up the circuit you have drawn. Record the ammeter reading I and the wire reading V when L=100cm

(2mks)

V=……
I=……..

iii). Using a micrometer screw gauge, measure the diameter of the wire.(1mrk)

d_1=……mm

d_2 =……m

iv)Calculate the quantity P given that P = 0.785 $\dfrac{V/I}{(d_2)^2}{L}$

and state its SI units, where L=1m (2marks)

PREDICTION 6

PAPER 1

SECTION A (25MARKS)

1. Define volume and state its SI unit (2marks)

……
……
……

2. State a reason as a to why weight of a body varies from place to place on the earth's surface.
(2marks)

……
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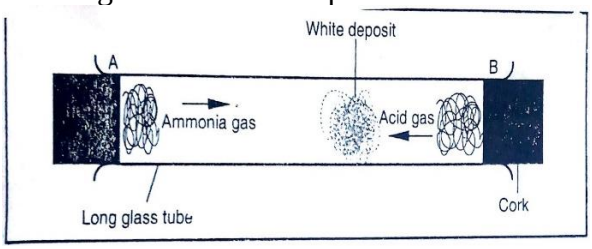
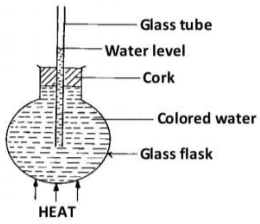
3. In the figure below, ammonia gas and an acid gas diffuse and react to form a white deposit on the walls of the glass tube. The deposit forms nearer end B.



If the experiment was performed at a higher temperature, would you expect it to take longer or shorter time to form the white deposit? Explain (2marks)

……
……

4. The diagram below shows a liquid inside a round bottom glass flask. State and explain what would happen to the level of the liquid, if the temperature of the surrounding increases.
(2marks)



……
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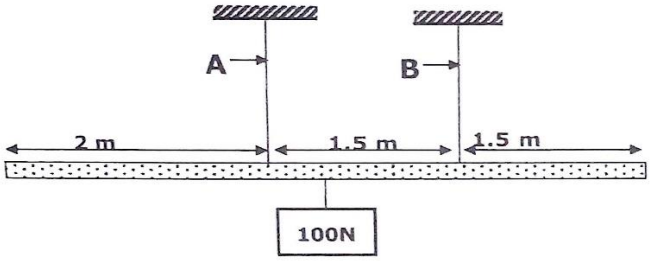
5. A paper windmill in a horizontal axis was placed above a candle as shown in the figure below. When candle was lit the paper windmill begun to rotate. Explain this observation
(2marks)

……
……
……

6. A uniform plunk of wood weighing 50N and of length 5m is suspended by two ropes, A and B. A is at 2m from one end while B is at 1.5m from the other end as shown below. A concrete block of weight 100N is suspended from the center of the plunk. Determine the tension on rope A.
(3marks)



……
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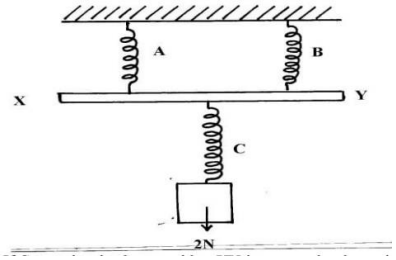
7. Three identical springs A, B and C of negligible weight are arranged as shown below;



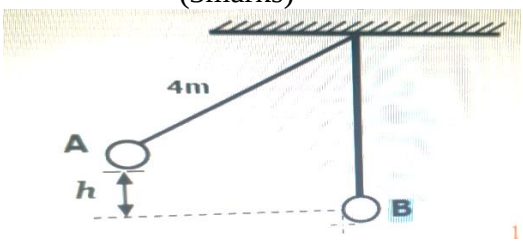
If C stretches by 3cm, and bar XY is assumed to be weightless, determine the extension in A.
(3marks)

……
……
……

8. Define the centre of gravity of a body. (1mark)

……
……
……

9. A metal ball suspended vertically with a wire is displaced through an angle as shown in the diagram below. The body is released from A and swings back to 'B'. Given that the maximum velocity at the lowest point B is 2.5 m/s. Find the height h from which the ball is released.
(3marks)



10. a) A cyclist negotiating a bend at a high speed leans inwards in order to successfully pass. Explain how this action enables him to negotiate a bend. (1mark)

……

……

b) State two conditions necessary for a driver to negotiate a bend on a bend on a flat level road at a relatively high speed. (2marks)

……

……

……

11. When a piece of metal is placed on water, it sinks. But when the same piece of metal is placed on a block of wood then placed on water both are found to float. Explain this observation. (2marks)

……

……

……

SECTION B(55 MARKS)

12. a) A car is travelling uniformly at 100km/hr when the driver observes a road block ahead. He takes 0.5s before applying the brakes which brings the car to rest with a uniform deceleration of $4m/s^2$. Determine the distance travelled by the car from the time the driver observed the road block until the car come to rest. (2marks)

(b) A car moves at constant speed of 20m/s for 50s and then accelerates uniformly to a speed of 25m/s over a period of 10s. This speed is maintained for 50s before the car is brought to rest with uniform deceleration in 15s. Draw the graph of velocity (y axis) against time (x axis) (3marks)

c) Determine:

i) The average speed for the whole journey (2marks)

ii) The acceleration when the velocity changes from 20m/s to 25m/s. (2marks)

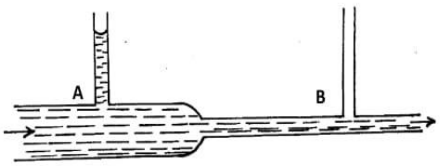
13. a) State the Bernoulli's principle. (1mark)

……

……

b) State the two conditions for a fluid to experience streamline flow. (2marks)

c) Figure below shows water flowing through two sections A and B of a pipe having cross-sectional area of $8cm^2$ and $2cm^2$ respectively.



i) Mark the appropriate level of water in the manometer B. (1mark)

ii) The velocity of water as it flows past the wider section of pipe is 0.6m/s. Calculate the velocity at the narrower section (3marks)

……
……
……
……

d) State one effect of Bernoulli's effect (1mark)

……

14. i) What is another name for the Newton's first law of motion (1mark)

……

ii) Why is it given that name? (2marks)

……

b) Why should we tie seat-belts? (2marks)

……
……

c) Explain how each of each of Newton's Law affects game of tug of war (3marks)

……
……
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15. a) Define latent heat of vaporization (1mark)

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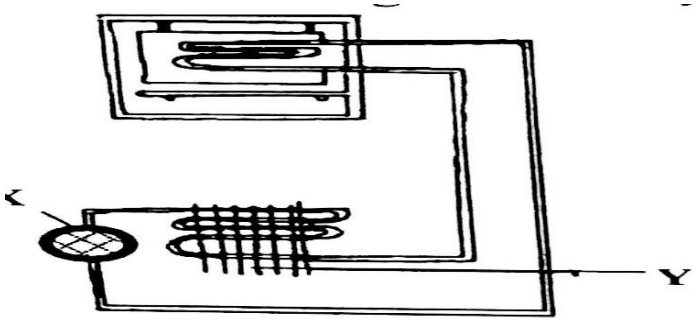
……
……

b) Figure below shows a domestic electric refrigerator



i) Label the parts

X…… (1mark)

Y……(1mark)

ii) What property is considered when selecting the liquid used as refrigerant? (1mark)

……

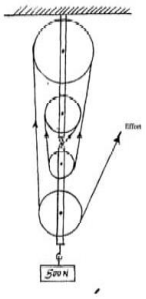
(c) (i) Define the term velocity ratio as used in machines. (1mark)

……

……

……

(ii) The figure below shows a block and tackle pulley system lifting a load of 500N.



(a) Determine the velocity ratio of the machine. (2marks)

(b) If an effort of 120 N is required to lift the load using the machines. Determine the efficiency of the pulley system. (3marks)

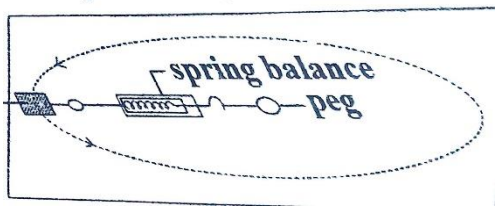
16. a) State two ways in which the centripetal force on a body of mass m can increased. (2marks)

……

……

……

b) Figure below shows an object at the end of a light spring balance connected to a peg using a string. The object is moving in a circular path on a smooth horizontal table with a constant speed.



i) State what provides the centripetal force. (1mark)

……

……

ii) Indicate with an arrow on the figure the direction of the centripetal force (1mark)

……

……..

iii) Given that the mass of the object is 0.5kg and it is moving at a speed of 8m/s at a radius of 2m, determine the reading on the spring balance. (2marks)

……

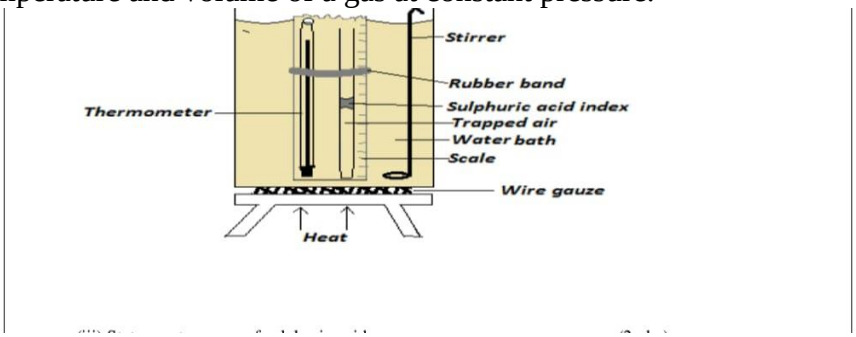
……

……

c) (i) State Charles' law for an ideal gas (1mark)

……
……
……

(ii) The set up below shows an arrangement that can be used to determine the relationship between temperature and volume of a gas at constant pressure.



(iii) State any two uses of sulphuric acid. (2marks)

……
……

(iv) The volume of a gas enclosed with a movable piston is $300cm^3$ when the temperature is 20^0 Determine the temperature at which the volume of the gas increase to 355 cm^3 (Assume pressure does not change). (3marks)

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

……
……

b) A rectangular brick of mass 10kg is suspended from the lower end of a spring balance and gradually lowered into water until its upper end is some distance below the surface.

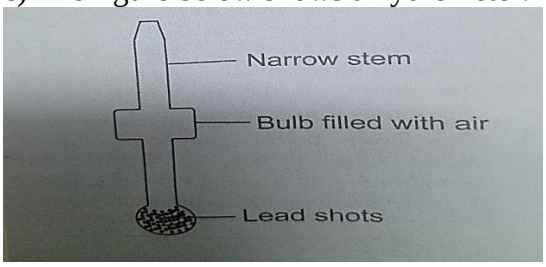
i) State and explain the changes observed in the spring balance during the process. (2marks)

……
……..

ii) If the spring reads 80N when the brick is totally immersed determine the volume of the brick. (Take density of water = $1000kg/m^3$) (2marks)

……
……
……

c) The figure below shows a hydrometer.



Explain:

i) Why the stem is made narrow (1mark)

……

ii) Why the bulb is made wide. (1mark)

……

iii) Why the lead-shots are placed at the bottom. (1mark)

……

PREDICTION 6

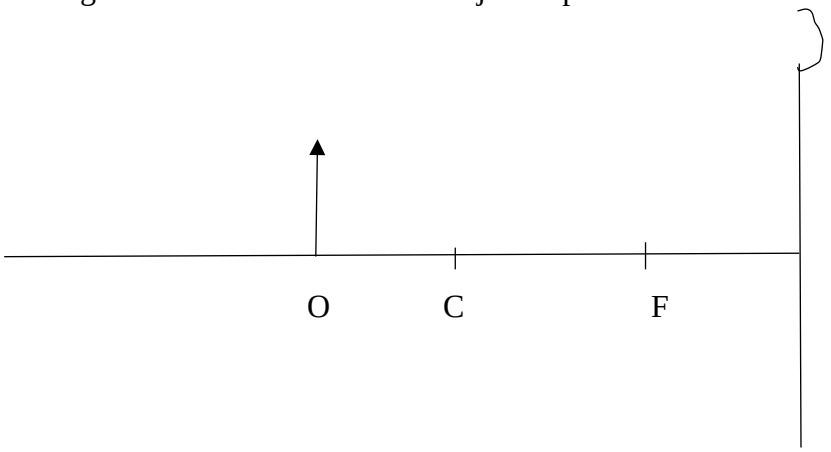
PAPER 2

SECTION A **(25mrk)**

1.Distinguish between real and virtual image (1mrk)

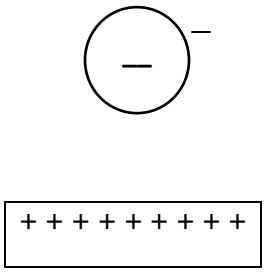
……
……
……

2.The figure below shows a vertical object O placed in front of concave mirror whose principal focus is at F



Complete a ray diagram above to show how the image is formed (3mrk)

3.The figure below shows a negative point charge close to positively charged rod. Sketch the electric field pattern (2mrk)



4a) State one main reason why the bulb's filament is made of a tungsten. (1mrk)

……..

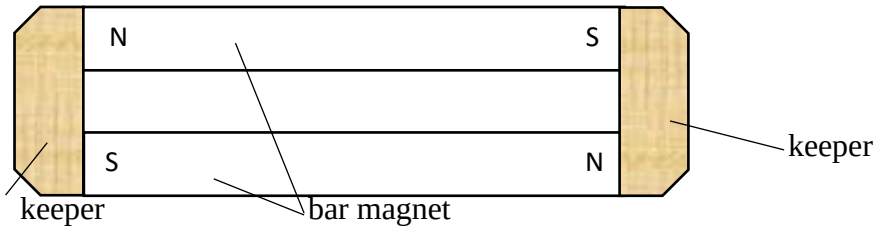
b). A hair drier rated 2700W ,240V is connected to a 240 mains supply through a 10A fuse. Determine whether or not the fuse is suitable (2mrk)

5.It is advisable to top up acid level of an accumulator with a distilled water and not acid. Give a reason for this (1mrk)

……
……..

6.A girl claps her hands one every second and hears the echo from a tall building. when she is 85m away from the building, she hears the echo of each clap mid- way between it and the next clap. Calculate speed of sound (2mrk)

7.The figure below how magnets are stored in pairs with keepers at the ends



Explain how this method of storing helps in retaining magnetism longer (2mrk)

……
……

8.The table below shows the electromagnetic spectrum.

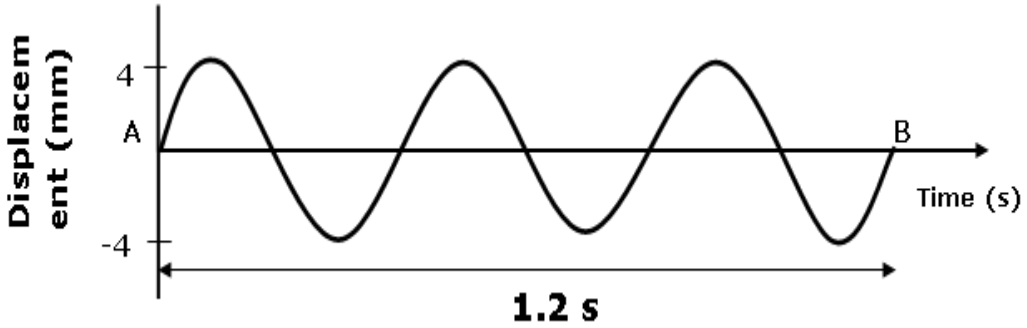
p	x-rays	Q	R	Infrared waves	S	T

i.Identify the radiation marked (2mrk)

P-- …… …
R—……

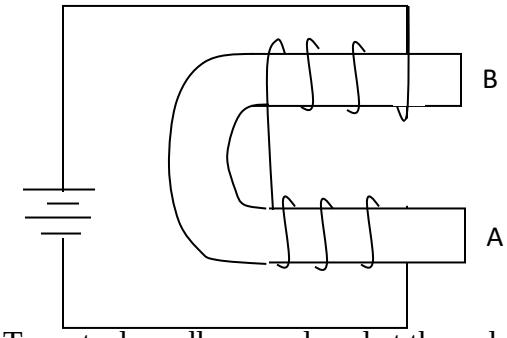
9.Differentiate between electromagnetic wave and mechanical wave (2mrk)
……
……
……

10.The sketch is a displacement – time graph of a wave traveling at 320ms-1. The wave takes 1.2 seconds to move from point **A** to **B**.



Determine the wavelength (3mrk)

11. a) The figure below shows a horse shoe electromagnet. Determine the polarity at the ends A and B. (1mrk)



(b) Two steel needles are placed at the poles A and B state and explain what happens to the needles. (2mrk)

……
……
……

c) Give ONE factor that increases the magnitude of an electromagnet (1mrk)

……
……

SECTION B (55 MARKS)

12. (a) Define the term *principal focus of diverging lens* (1mrk)

……
……,…….....

(b) **State** two similarities between the operation of a lens camera and the eyes (2mrk)

……
……

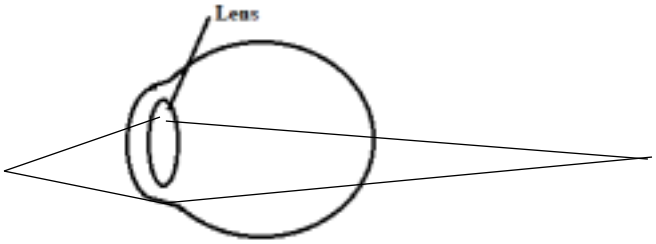
c)(i)State the conditions under which a convex lens forms a virtual image (1mrk)

……

ii)State one practical use **of** concave lens under the conditions you have stated in (i) above (1mrk)

……

d)The figure below shows how rays from a near object are focused behind the retina in human eye with a certain defect



i)**Name** the defect (1mrk)

……

ii)**State** the cause of the defect (1mrk)

……

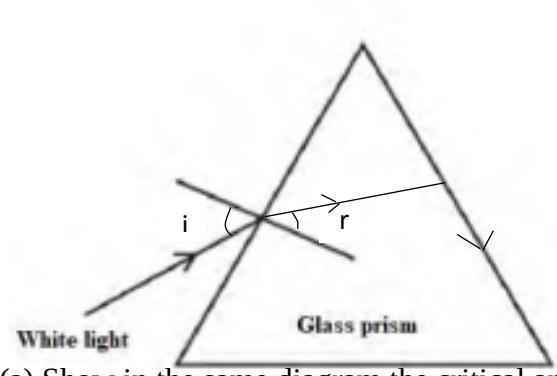
(iii) State how the defect can be corrected (1mrk)

……..

13.(i)In the deviation of light by a glass prism red light is found to be the least deviated while the violet the most deviated. Explain this observation (1mrk)

……
……
……

ii)The diagram below shows the path of a ray of light through a glass prism whose refractive index is 1.525



(a) Show in the same diagram the critical angle, c and determine its value (3mrk)

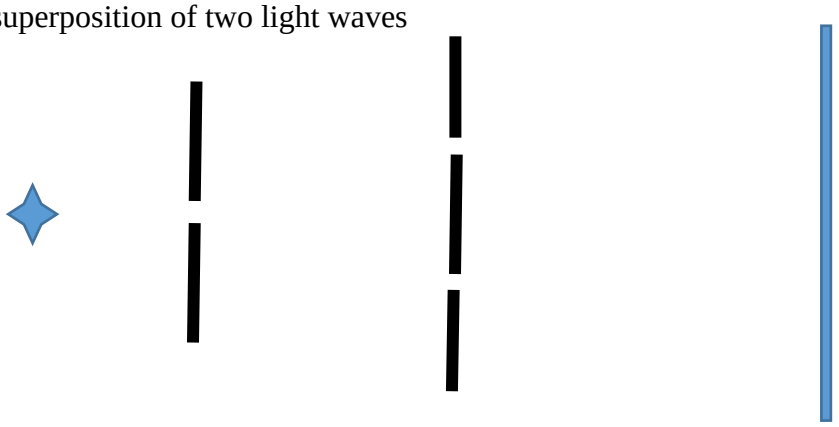
b) Given that angle r is 27°, determine angle i (2mrk)

c) Sketch on the same diagram, the path of the same ray after striking the prism, if the prism were replaced by another of the same size and shape but of a lower refractive index (use a dotted line for this answer) (1mrk)

d) State two reasons for total internal reflection to occur (2mrk)

……
……

14(a)The diagram below shows an arrangement (not to scale) for observing the interference pattern produced by the superposition of two light waves



S1 and S2 are two very narrow slits. The single slit S ensures that the light leaving the slit S1 and S2 is coherent,

i)Define coherent source (1mrk)

……

ii)Explain how dark and bright fridges are formed (2mrk)

……
……
……..

ii)Explain why the slits S1 and S2 need to be very narrow (2mrks)

……
……

(b)An example of longitudinal wave is sound wave. longitudinal waves consist of compressions and refractions as in the medium. Explain with the aid of diagrams the meaning of the following

(i)longitudinal wave (2mrk)

……
……
……
……

(ii)compressions (2mrk)

……
……
……
……

(c)A source produces sound of frequency 550Hz.The speed of sound in air is 330m/s.Calculate the wavelength of the waves produced (3mrk)

15.(a)State ohm's law (1mrk)

……
……
……

(b) Provide with the following apparatus voltmeter ,ammeter ,rheostat dry cell connecting wires and a fixed resistor describe an experiment to verify Ohm's law (4mrk)

……
……
……
……
……
……
……

(c)What current flows through an 80Ω lamp operating on240V supply? (2mrk)

(d)A current of 0.7A flows through awire when a pontential of 0.35V is applied at the ends of the wire.If the wire is 0.5m long and a cross-sectional area of 8.0×10^{-3} m^2.determine its resistivity (3mk)

16.(a)Define the following terms

(i) Electric field (1mrk)

……
……

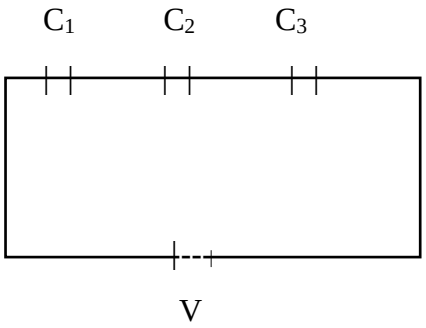
(ii) Electric field line (1mrk)

…

b)State how a highly negatively charged body with a sharp-pointed edge gets discharged by itself (2mrk)

…

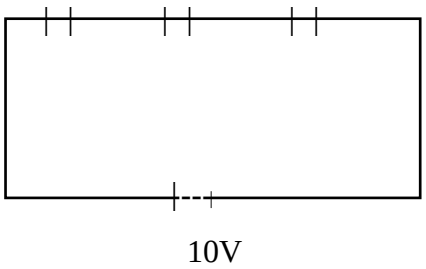
c) Show that when capacitors are connected in series ,the total capacitance is given by:



$\frac{1}{CT} = \frac{1}{C1} + \frac{1}{C2} + \frac{1}{C3}$ (3mrk)

…

(d)



b) In the circuit above, determine:

(i)Total capacitance (3mrk)

(ii)voltage across the 2μF capacitor (3mrk)

(iii)Energy stored by the 3μF capacitor (3mrk)

PREDICTION 6

PAPER 3

Question 1

You are provided with the following

- A meter rule
- A retort stand, clamp and boss
- A 500 ml beaker ¾ full of water
- A 50g mass
- Liquid **L** in a beaker
- 10 cm cello tape
- Three 50cm sewing thread
- Tissue paper

Proceed as follows:

a) Balance the meter rule horizontally by suspending it from the stand and clamp with one of the threads.

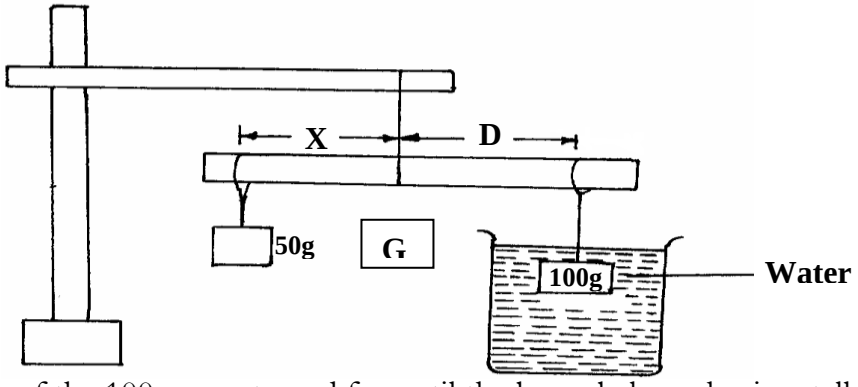
Record the balance point **G.**

G = …… cm mark (1mrk)

Note

For the rest of the experiment the position of the thread through **G** does not change, use cello tape to fix the position of thread.

b) Using a 100g mass and a 50g mass, set up the apparatus as shown below. The thread suspending the masses should be looped such that their positions of support can be adjusted.



Move the position of the 100g mass to and fro until the beam balance horizontally.

Note:

Distance **X** and **D** are measured from **G.**

Read and record the values of **X** and **D**

X=…… cm 1mrk)

D=…… cm (1mrk)

Work out the weight W_1 of the 100g mass

W_1 = …… (1mrk)

Apply principle of moments to determine the upthrust U_w in water. (1mrk)

U_w_____

Remove the 100g mass from the water and dry it using the tissue paper, then suspended it

a) Now balance the metre rule when the 100g mass is fully submerged in liquid **L**
Record distance **X.**

X =_____cm (1mrk)

Apply principle of moment to work out the upthrust U_L in the liquid (1mrk)

b) Determine the relative density r.d of the Liquid L given that

$$\text{r.d} = \frac{U_L}{U_W}$$ (2mrks)

Maintaining the 100g mass in liquid **L** , replace the 50g mass with the other 100g mass and adjust distance **D** to **D** =100mm. Adjust distance **X** until equilibrium is attained and record distance **X**. Adjust **D** to the values indicated in the table below and record corresponding distance **X** that maintain equilibrium when the 100g mass is **fully submerged**. Complete the table(4mrks)

D(mm)	100	150	200	250	300	350	400
X mm							

Plot a graph of **X** (vertical axis) against **D** on the grid provided (5mkrs)

Determine the gradient **S** of the graph (2mrks)

Question 2 PART A

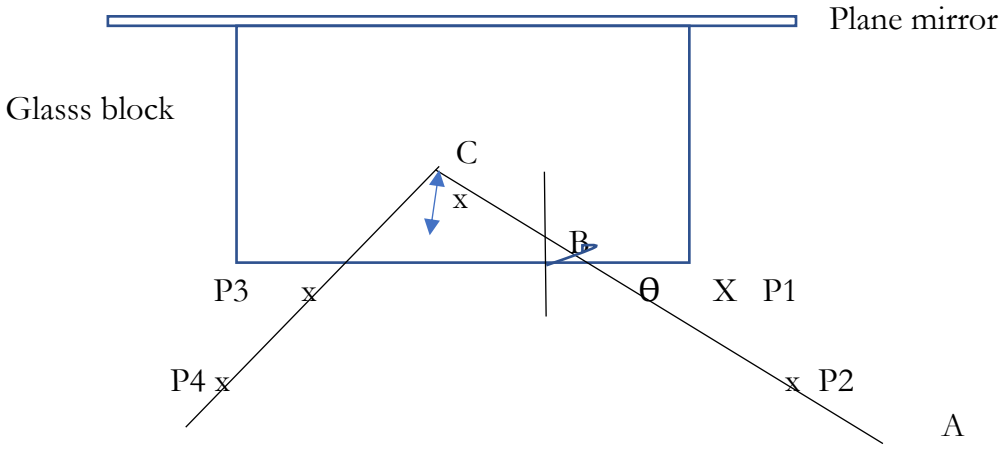
a) You are provided with the following apparatus

- a glass block
- a plane mirror
- 4 optical pins
- a soft board

- A sellotape (about 15cm long)
- 2 white – plain sheets of paper
- a ruler or half metre rule
- a protractor
- 4 office pins

Proceed as follows: -

(i) Using the cello tape provided fix the plane mirror to the glass block alongside as shown in the figure below.



(ii) The reflecting surface to face the glass block.

(iii) With the use of the office pins, secure firmly a white plain paper on the board and place the block together with attached mirror.

(iv) Draw the outline of the glass block together with the mirror

(v) Remove the block and the mirror and draw a normal at B somewhere a quarter- way the length of the outline you drew in (iv) above.

(vi) Draw a rays AB incident at B and extended to C. The incident rays should make an angle of 10° with the normal

(vii) Replace the glass block together with the attached mirror so as exactly fit the outline

(viii) Place two object pins P1 and P2 along the 10° line. Locate the images of pinsP1 and P2 as they appear by non-parallax (the images of the pins appear to be in a straight line when viewed through the glass block). Place pins P3 and P4 so that the images of pins P1 and P2 are not seen.

(ix) Remove the glass block together with the attached mirror from the outline and produce the lines joining P1 to P2 and P3 to P4 so that the they intersect at C. Measure and record the distance x in the table below. (3 Marks)

(x) Repeat procedure (vi) to (ix) for angles of 20^0, 30^0 and 40^0.

NB. It may be necessary for you to draw another outline so as to avoid congestion of (construction) lines. Submit the outlines.

Angle θ	10º	20º	30º	40º
Distance X (cm)				

(xi) Now measure the breadth b of the glass block.
b=_____(1mark)

(xii) Calculate the average Ax of the values of x in table 3 above Ax
_____ (1mark)

(xiii) Determine the refractive index of the glass block using the formula. Refractive index n of glass $n = b/Ax$
(3 marks)

PART B

You are provided with the following apparatus,

- A voltmeter
- An ammeter
- A resistance wire labeled W
- A wire mounted on a mm scale and labeled T
- A micrometer screw gauge (to be shared)
- Six connecting wire with crocodile clips

Proceed as follows:

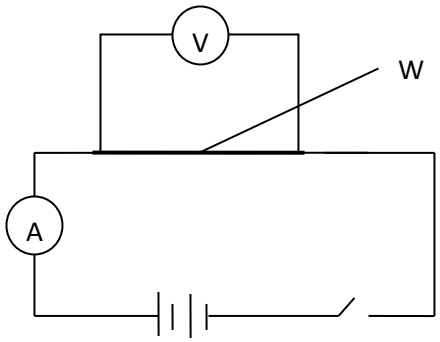
a) Using the micrometer screw gauge provided measure the diameter of the wire labeled T

d ……. mm (1mk)

Determine the radius r of the wire

r = …… m (1mk)

b) Set up the apparatus as shown below



i) Record the voltmeter (V) and ammeter (I) readings

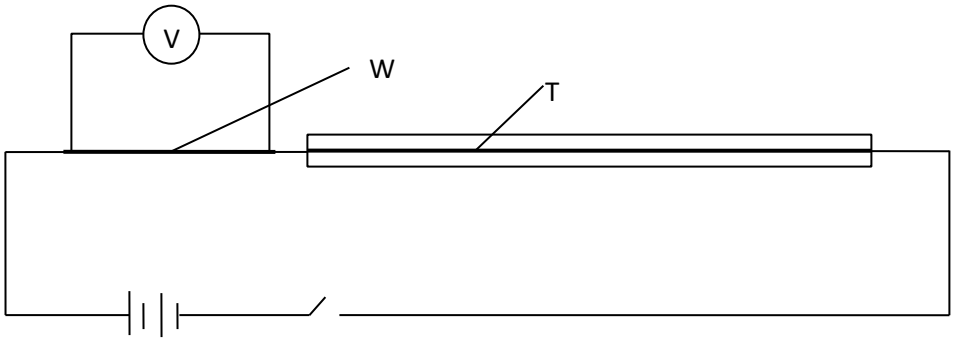
V ……V (1mk)

I …… A (1mk)

ii) Determine the resistance R_w of the wire W (1mk)

R_w = ...

c) Set up your apparatus as shown below



i) Use the voltmeter provided to measure the p.d V_w across W and V_T across T when the switch is closed.

Vw = …….. V (1mk)

V_T = …….. V (1 mk)

Open the switch.

ii) Use the value of R_w calculated in b (ii) and the value of V_w to calculate the current I flowing through W when the switch was closed.

I = …….. (1 mk)

iii) Determine the constant K and its units given that, (2mk)

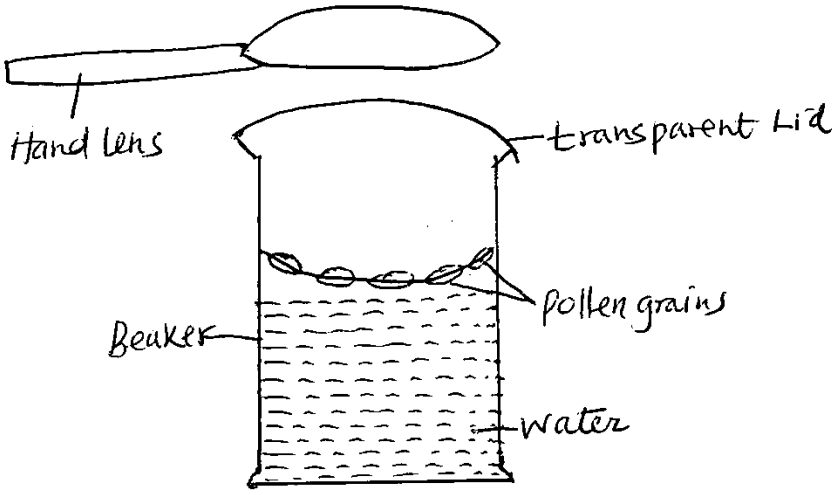
$K = \frac{R_W \, .I}{VT}$

PREDICTION 7

PAPER 1

SECTION A (25MKS) Answer all the Questions

1. The figure below shows a setup used to study Brownian motion in liquids

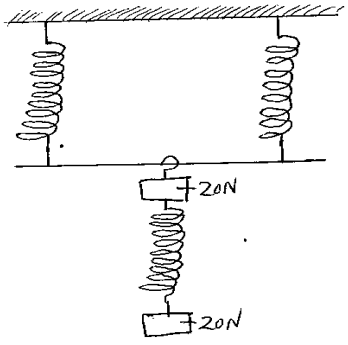


(i) State the functions of the hand lens (1mk)

(ii) State what is observed on the pollen grains (1mk)

2. An object placed on the surface of water in a beaker starts to sink immediately. It is observed that it stops sinking when half of its volume is below the water surface. State the reason for these observations (1mk)

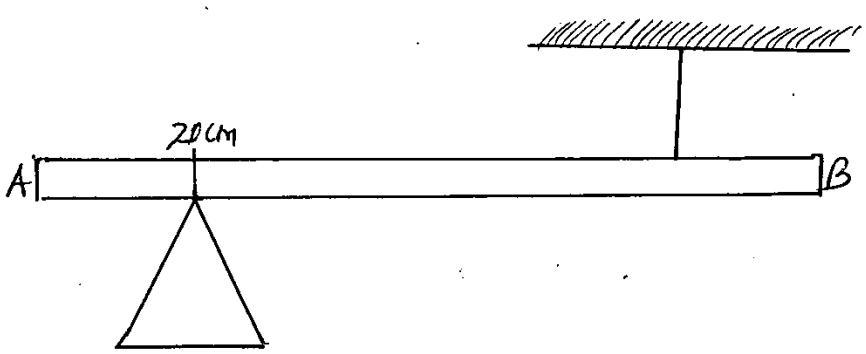
3. The three springs shown in the figure below are identical and have negligible weight. The extension produced on the system of springs is 20cm.



Determine the constant of each spring. (2mks)

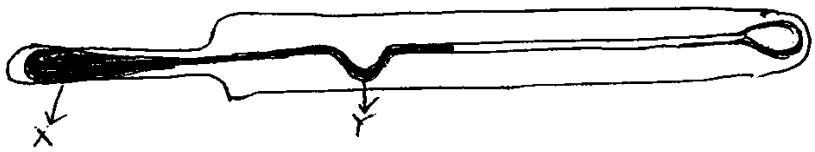
4. A particle starts from rest and accelerates uniformly in a straight line. After 3 seconds it is 9m from the starting point. Determine the acceleration of the particle (3mks)

5. The figure below shows a uniform rod AB of length 1m and weight 8N pivoted at 20cm from one end. It is balanced by supporting it with a string attached to a fixed support. The tension in the string is 4N. Determine the position of the string from end A. (3mks)



6. State the reason why the speed of water at the narrow section of a river is higher than at the wider section (1mk)

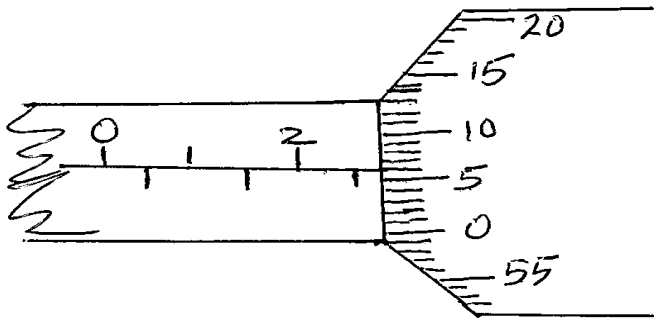
7. The figure below shows a clinical thermometer which is not graduated



(i) Name the part indicated with letter x (1mk)

(ii) State the function of the part labelled y (1mk)

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



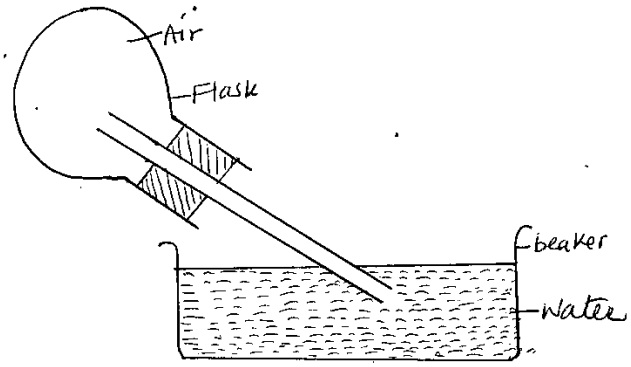
If the micrometer screw gauge has a negative zero error of 0.01mm, determine

(i) The thickness of the slips as shown by the micrometer screw gauge (1mk)

(ii) The actual thickness of the slips (1mk)

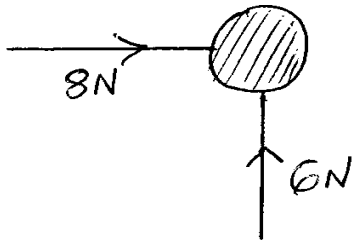
9. State one factor affecting stability of a body (1mk)

10. The figure below shows a glass flask filled with a narrow tube dipped into a beaker containing water at room temperature. State and explain what is observed when ice cold water is poured on the flask (2mk)



11. Given that pressure at the deepest point in a lake is 400,000N/m², determine the depth of this point. (Density of water is 1000kg/m3 (2mks)

12. Two forces 8N and 6N acts on a body at 90° to each other as shown.



Determine the resultant force acting on the body and sketch the direction of the resultant force (1mk)

13. The potential difference across a lamp is 12v. Determine the electrical energy changed to heat and light when a current of 12A flows through the lamp for 10 seconds. (2mks)

14. What is the purpose of the vacuum in thermos flask (vacuum flask) (1mk)

SECTION B 55 MARKS

15. (a) State the law of conservation of linear momentum. (1mk)

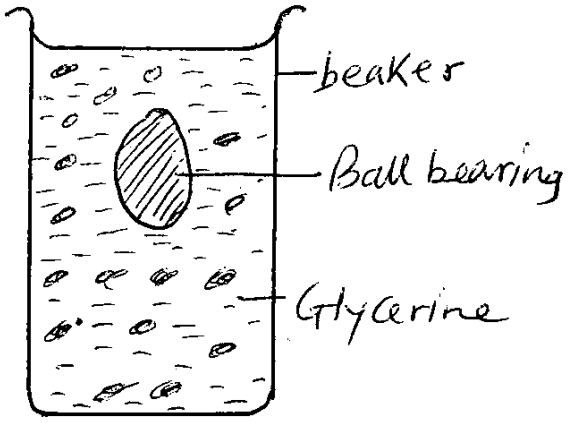
(b) Distinguish between elastic and inelastic collision (1mk)

(c) A lorry of mass 2000kg travelling at 20m/s collides with a car of mass 800kg travelling at 30m/s in the opposite direction. The impact takes 2 seconds before the two bodies move with a common velocity.
Determine

(i) The common velocity (3mks)

(ii) The impulsive force (2mks)

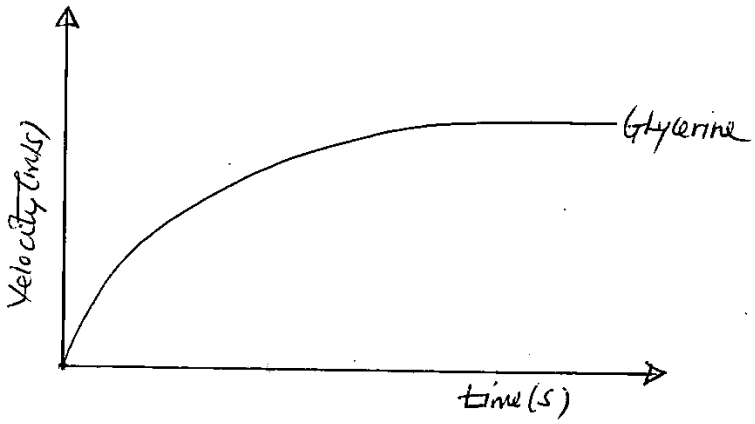
(d) The figure below shows a ball bearing falling through glycerin



(i) Name the two forces acting on the ball bearing. (2mks)

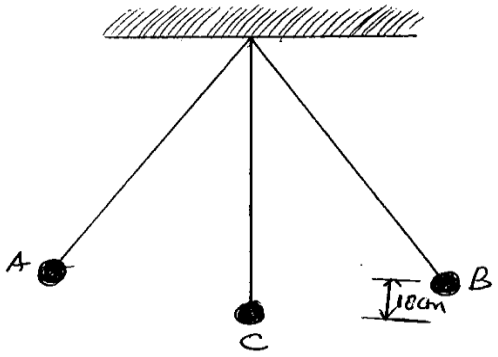
(ii) Write down an equation relating all the forces in (I) above when the ball bearing attains a constant velocity. (1mk)

(iii) The graph below shows the motion of the ball bearing through the above liquid



On the same axes above, sketch the graph to represent the motion of the ball bearing through alcohol and explain your graph (1mk)

16. The figure below shows a simple pendulum of length 80cm. The pendulum bob whose mass is 50g oscillates between points A and B through its rest position C, A and B are both 10cm higher than C.



a. (i) Indicate with an arrow, on the path A,C,B the direction of the greatest velocity of the bob as it moves from A and B (1mks)

(ii) State the form of energy possessed by the pendulum bob at point A. (1mk)

b. Determine

i. The velocity of the bob at point C (3mks)

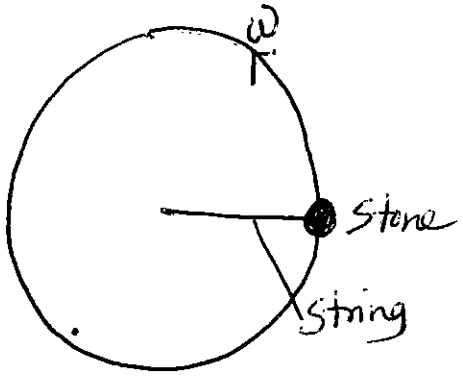
ii. The tension in the string as the bob passes point C. (Take g =10m/s^2) (3mks)

c. After sometime, the pendulum comes to rest at point C. State what happens to the energy it initially possessed. (1mk)

17. (a) Define the term centripetal force (1mk)

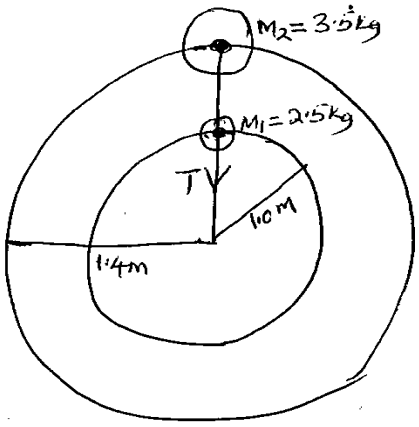
(b) When a car is travelling on muddy road, mud flies off the fast spinning wheels, explain this observation. (1mk)

(c) The figure below shows the path of a stone attached to a string whirled in a space in a horizontal circle.



Sketch on the diagram the path the body follows if the string breaks when the body is at the position shown. (1mk)

(d) Two masses M1=2.5kg and m2=3.5kg are connected by a light string and are in uniform circular motion on a horizontal frictionless surface as shown in the figure below. The masses describe circles of radius r1= 1.0m and r2=1.4m respectively and the angular velocity of the masses is 5.0 rad/s



(i) Which of the two masses is moving faster? Give a reason for your answer (2mks)

(ii) Determine the:

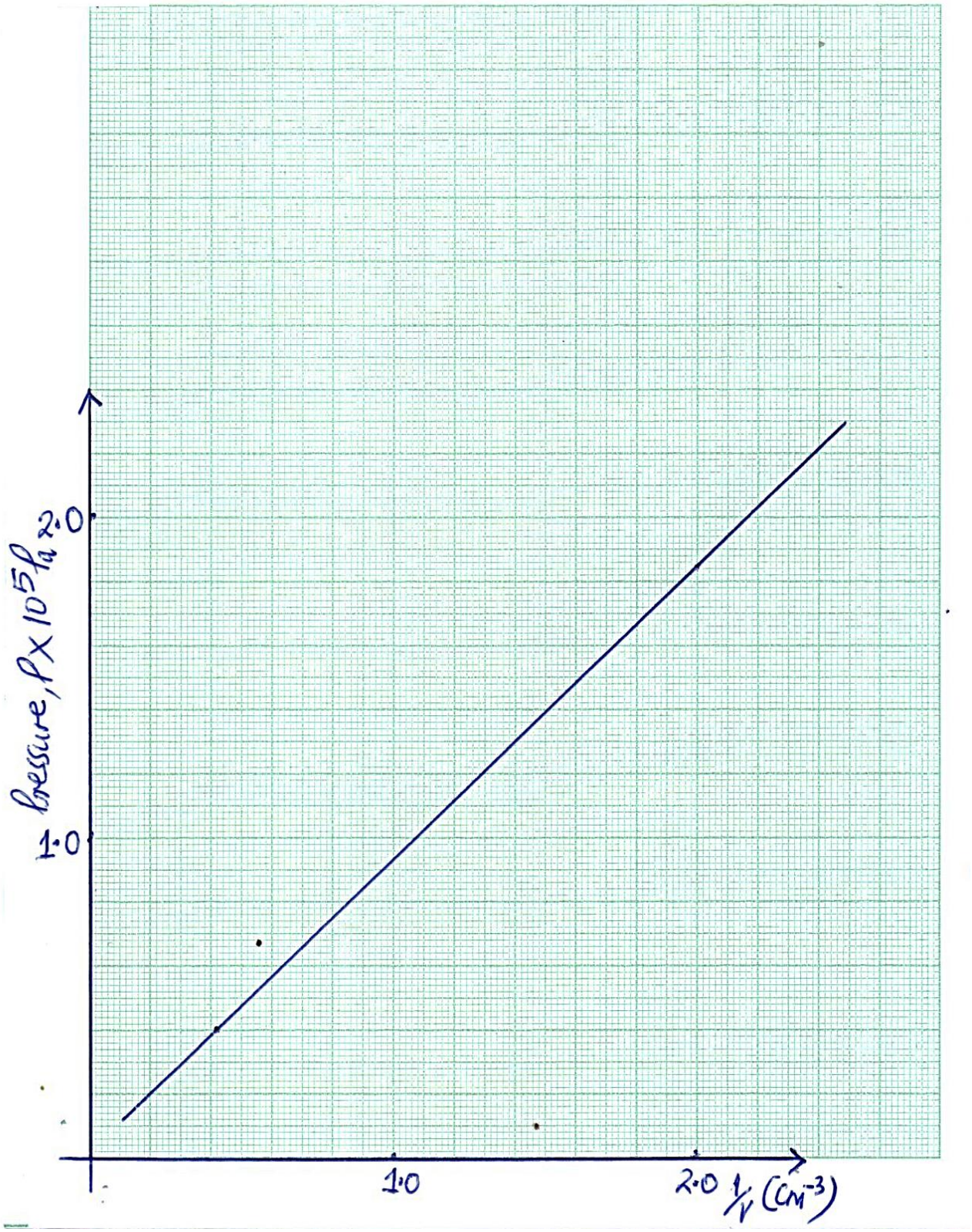
I. Centripetal force on m1. (2mks)

II. Centripetal force on m2 (2mks)

III. The tension T on the string (2mks)

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

(b) An air bubble is released at the bottom of a tall jar containing a liquid. The height of the liquid column is 80cm. The volume of the bubble increases from 0.5cm^3 at the bottom of the liquid to 1.15cm^3 at the top. The figure below shows the variation of pressure, p on the bubble with the reciprocal of volume, I/v as it rises in the liquid.



(i) State the reason why the volume increases as the bubble rises in the liquid column (1mk)

(ii) From the graph, determine the pressure on the bubble

I. At the bottom of the liquid column (2mks)

II. At the top of the liquid column (1mk)

(iii) Hence determine the density of the liquid in kg/m^3. (3mks)

(iv) What is the value of the atmospheric pressure of the surrounding (1mk)

(c) A rubber tube is inflated to pressure of $2.7x10^5$pa and volume 3800cm3 at temperature of 25°C. It is then taken to another place where the temperature is 15c and the pressure $2.5x10^5$ Pa. Determine the new volume. (4mks)

19. (a) What is meant by the term SPECIFIC LATENT HEAT OF VAPORIZATION (1mk)

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

Mass of calorimeter =50g
Initial mass of water = 70g
Final mass of calorimeter+ water + condensed steam =123g
Initial temperature of water + calorimeter = 5°c
Final temperature of mixture = 30°c
Specific heat capacity of water = 4200j/kg/k-1
Specific heat capacity of copper = 390j/kg-1/k-1

Determine

(i) Mass of the condensed steam .(2mks)

(ii) Heat gained by calorimeter and water (3mk)

(iii) Given that Lv, is the specific latent heat of vaporization of steam.

I. Write a simplified expression for the heat given out by steam. (2mk)

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

PREDICTION 7
PAPER 2

SECTION A (25 MARKS)

Answer all the questions in this section

1. A plane mirror suspended from a vertical wall makes an angle of 20^0 with the wall. Determine the angle of reflection for a ray incident on the mirror and parallel to the horizontal (3mks)

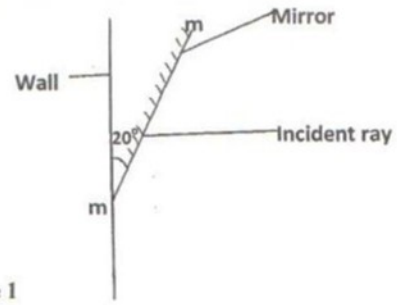
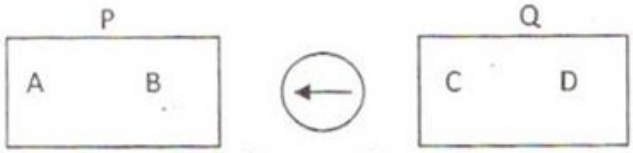


Figure 1

2. Figure 2 shows a plotting compass placed between two strong magnets **P** and **Q**

Figure.2



(a) State the polarity of the end D of magnet Q (1mk)

……
……
……

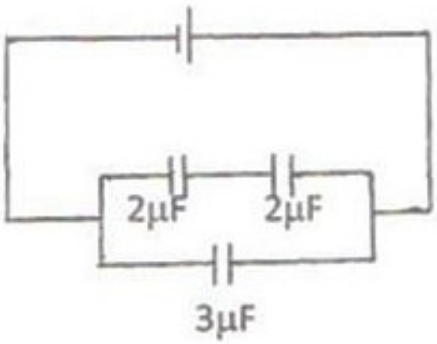
(b) Draw on the diagram the resulting magnetic field pattern between B and C (2mks)

3. Name one major defect of a simple cell and state how it can be minimized. (2mks)

……
……
……

4. Figure 3 shows capacitors connected a12V d.c supply

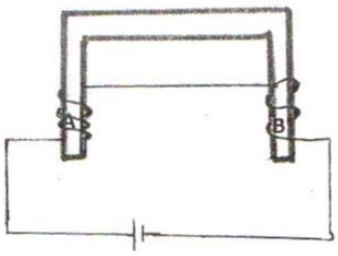
Figure 3



Calculate the charge stored in one of the 2μF capacitor (3marks)

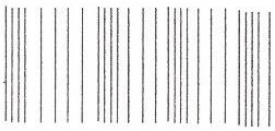
5. Ann measured the height of Madam Ashley's shadow and found it to be 4m long. She also measured the length of the shadow of net ball goal post and found it to be 6 m long. If Ashley's height is 1.76 m estimate the height of the goal post to the nearest metre (2 marks)

6. Figure 4 shows a coil of insulated wire wound on a horse shoe soft core **AB** and connected to a power supply (1 mark)



Name the polarity at **A** and **B** (1mark)

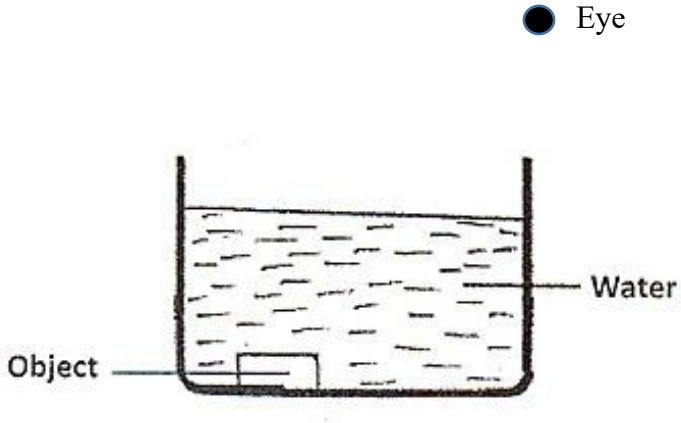
7. Figure 5 shows sound waves passing through air. Study it and answer the questions that follow



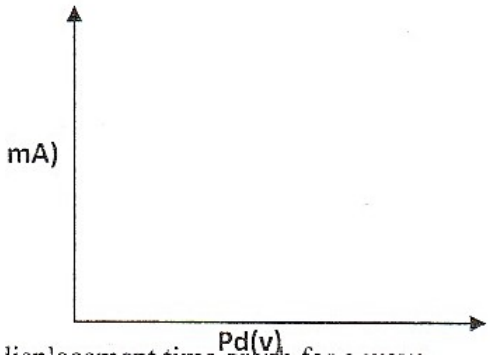
Label the following on the diagram

i) Rarefaction (1 mark)
ii) Wavelength (1mark)

8. Figure 6 shows an object at the bottom of water in a container. Draw rays on the diagram to show how the eye views that object from its position shown. (2 marks)

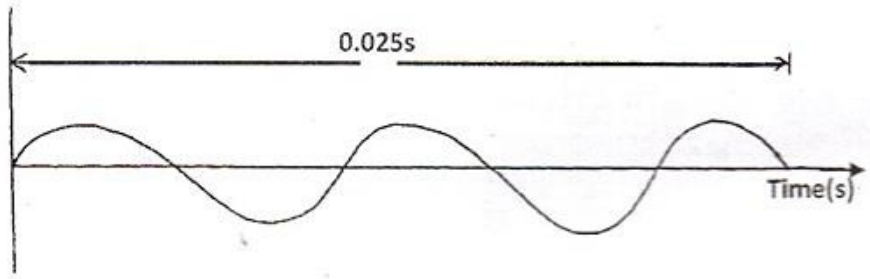


9. In the axes below, sketch the characteristic curve for a forward biased p-n junction diode (1mk)



10. Figure 7 shows a displacement time graph for a wave.

Fig 7.



Determine the frequency of the wave. (2mks)

11. Determine the values of a and b in the nuclear equation below. (2mks

$$ {}^{a}_{b}X = {}^{230}_{90}Y + 2\alpha $$

12. The table below shows a section of the electromagnetic spectrum in descending wavelength.

Radiowave	Microwave	A	Visiblelight	U.V	X-Rays	B

Name (2mks)

(i) A

_____

(ii) One use of B

_____

13. A lens forms an image that is four times the size of object on a screen. State with reason what type of Lens was used. (1mk)

_____

_____

_____

SECTION B(55 MARKS)

14. (a)A student set up a mass attached to spring such that when it oscillates it taps on the water surface in a wide shallow tank as shown in figure 9

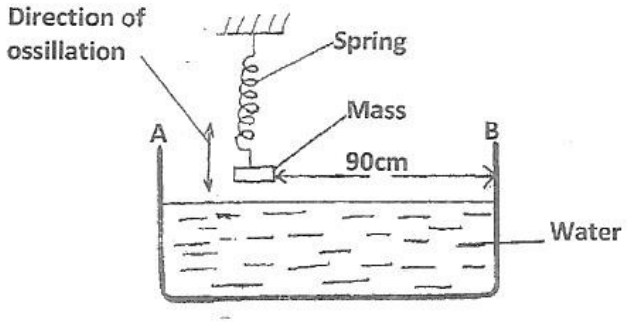


Fig 9.

The student measured time for 20 oscillations and found it as 36 seconds
Determine;

i) The periodic time for the oscillation (2mks)

ii) ii) The frequency of the waves produced on the water surface (2mks)

iii) The speed of the waves if there were four ripples between the mass and end B of the tank

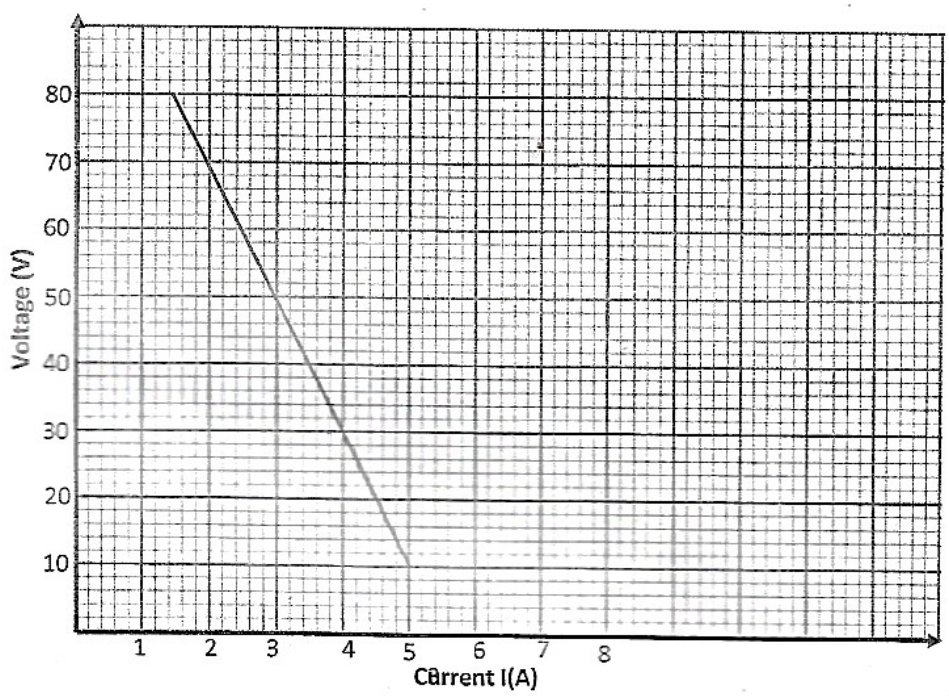
(3mks)

(b) 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 (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 reef. (3mks)

15 (a) Figure 10 shows the voltage - current relation for a certain battery used in an electrical circuit.

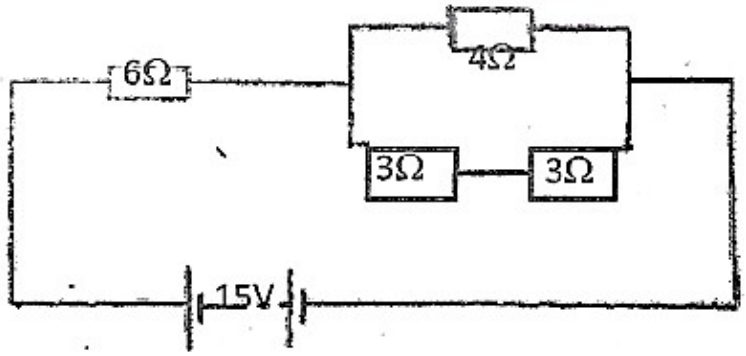


Given that the equation graph is V =E - Ir from the graph determine

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

ii) The internal resistance of the battery used

b) Figure 11 shows a network of resistors connected to a power supply of 15V. (3mks)



Determine:

i) The effective resistance of the network (2mks)

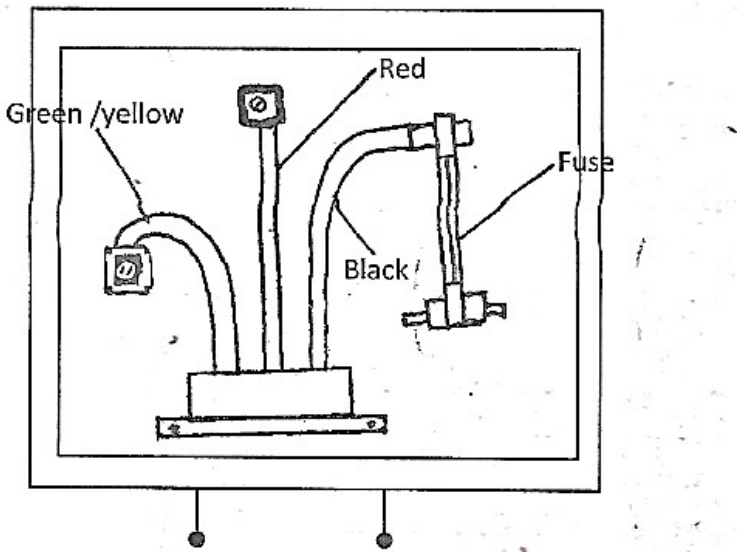
ii) The voltage across the 3Ω resistor. (3mks)

16. (a) A heater rated 2000W is used to heat water for 5hours

Calculate the cost of electricity used if it is charged at Ksh. 6.70 per unit. (3mks)

(b) Give a reason why transmission of electricity is done at very high voltage. (1mk)

(c) Figure 12 below shows a connection of three pin plug

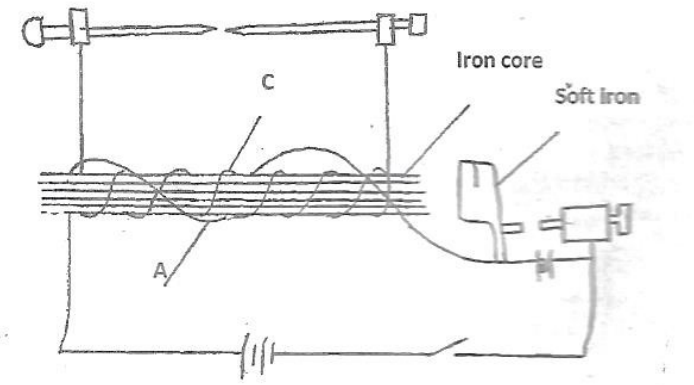


(i) Identify one mistakes in the wiring (1mark)

(ii) Suggest what is likely to happen if this plug was connected to the mains socket. (1mark) .

(iii) Why is the earth pin made longer in the plug (1mk)

(b) Figure 13 shows an induction coil used for producing sparks



(i) Name the parts labeled A,B, and C (3mks)

(iii) Briefly explain how induction coils works (3mks)

_____

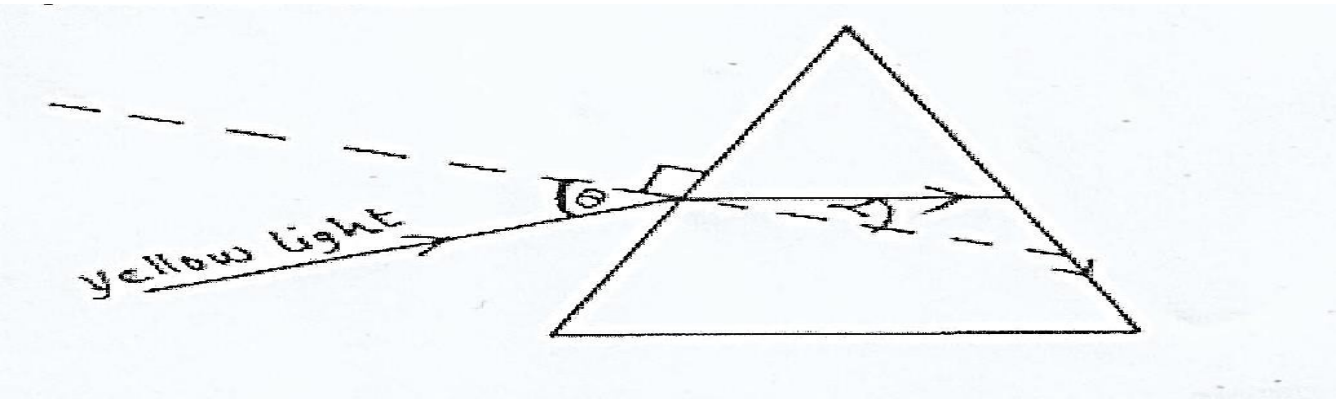
_____

_____

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

(b) Define the term critical angle as used in refraction of light. (1mk)

(c) The figure **below** shows the path of a ray of light through a glass prism. The speed of yellow light in the prism is 1.88 × 108m/s



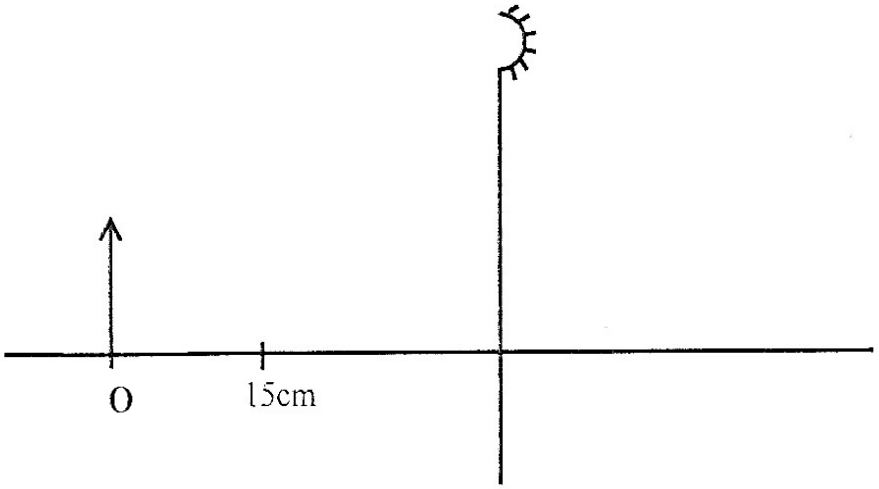
(i) Determine the refractive index of the prism material for the light (speed of light in vacuum, c=3.0 × 108m/s) (3marks)

(ii) Show on the figure, the critical angle, c, and determine its value. (4marks)

(iii) Given that r= 21.2˚, determine the angle. (3marks)

18. (a) State the advantages of using a convex mirror as a driving mirror. (1mark)

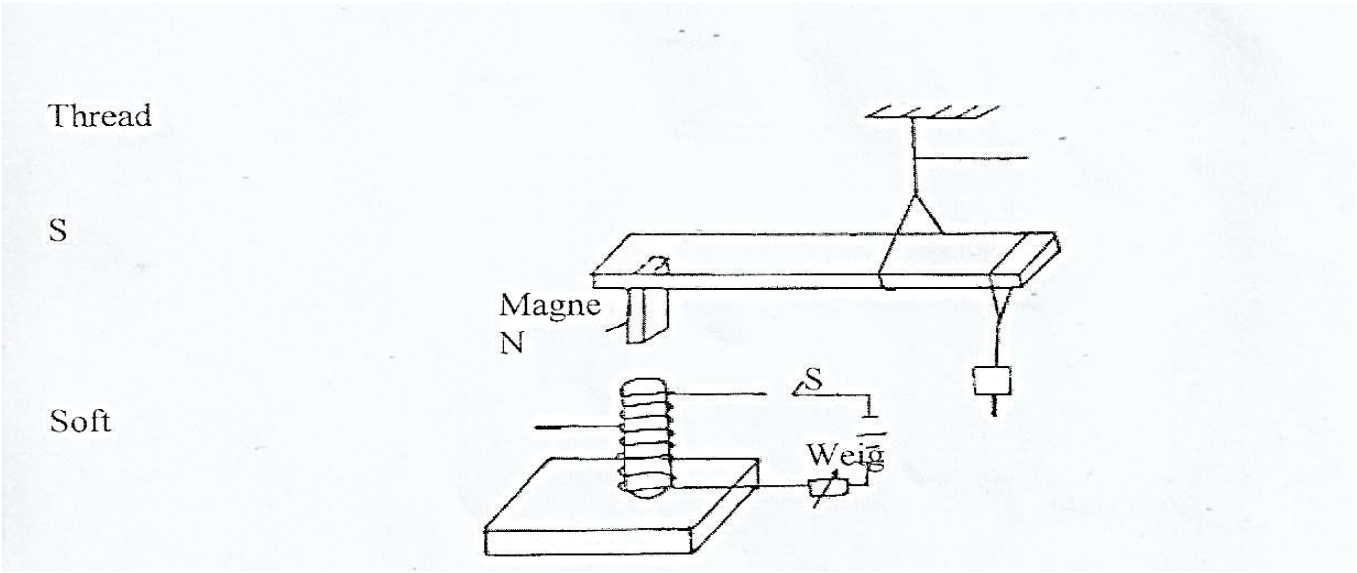
(b) The figure below shows an object O placed in front of a converging mirror of local length 15cm.



Draw on the figure a ray diagram to locate the image formed. (2marks)

c) State three factors that affect the strength of an electromagnet. (2marks)

d) In the set up below, the suspended metre rule is in equilibrium balanced by the magnet and the weight shown. The iron core is fixed to the bench



(i) State and explain the effect on the metre rule when the switch S, is closed. (2marks)

(ii) State the effect of reversing the battery terminals (1mark)

(c) The figure below shows two parallel current carrying conductors A and B placed close to each other. The direction of the current is into the plane of the paper.

On the same figure.
(i) Sketch the magnetic field pattern. (1mark)
(ii) Indicate the force F due to the current on each conductor. (1mark)

PREDICTION 7
PAPER 3

QUESTION 1

You are provided with the following:

- A glass marble
- A stop watch
- A 105cm plastic tube split open with a mark near one end.
- Vernier calipers (to be shared)
- A meter rule of half meter rule.
- A balance (to be shared)
- Retort stand one boss and one clamp.
- Wooden block (for blocking the marble from rolling away.)

Proceed as follows:

a) Use the vernier calipers provided to measure the diameter of the marble hence determine the radius.

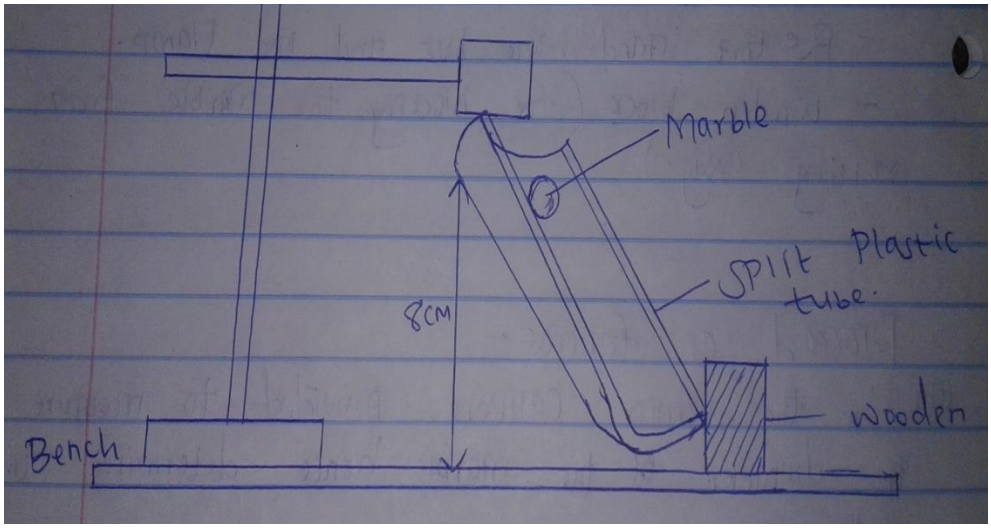
i) Diameter of the marble 'd' = (1mk)

ii) Radius of the marble 'r' = (1mk)

bi) Using the balance provided obtain the mass of the marble. (1mk)

ii) Determine the constant 'p' given that $p = 0.4mr^2$ (1mk)

c) The experiment involves timing a marble as it rolls down the split tube as a runway, lamp the marked end of the split tube with the inside uppermost. Ensure the end with the mark is on the greater slope. Raise this end such that the mark is at a height h = 8cm above the bench level. The other end should rest on the bench as shown in the figure below.



Place the marble at the mark on the runway and hold it in place gently with the finger as shown in the figure. By simultaneously releasing the ball and starting the stop watch measure and record in the table below the time taken by the marble to reach the lower end of the runway. (It is advisable to measure the time twice and record the average value.)
Vary the height h to other values shown in the table below. Measure and record in the table the corresponding average value of t.
Complete the table. (6mks)

Height h (cm)	8	9	10	11	12	13	14	15
Average time t (s)								
T^2 (s^2)								
$1/h$ (cm^{-1})								

d)i) On the grid provided plot the graph of t^2 (y – axis) against $1/h$ (5mks)

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

iii) Determine the constant G ffor the marble given that; (2mks)

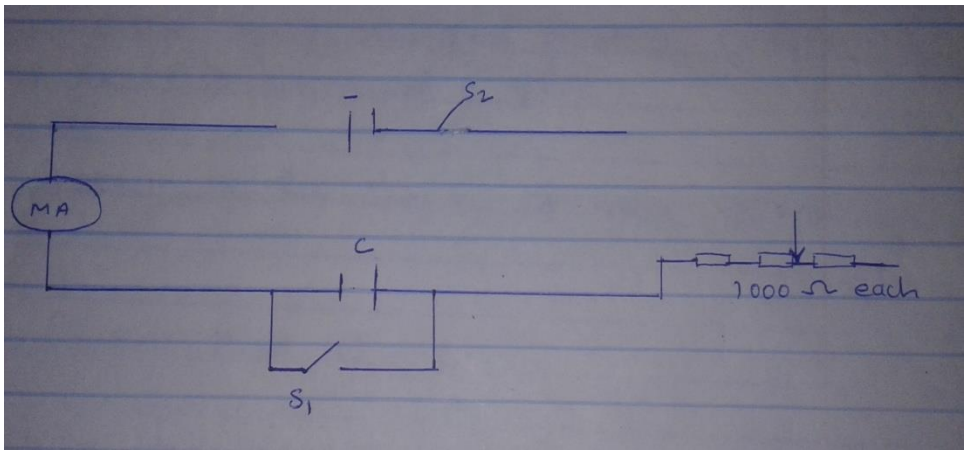
$$G = Mr^2 (S/20 - 1)$$

Question 2
You are provided with the following.
- A stop watch.
- A milliameter

- A capacitor
- Two switches S_1 and S_2
- Six 1000 ohms resistors.
- A dry cell and a cell holder.
- Seven pieces connecting
- At least six crocodile clips

Proceed as follows.

a) Connect the circuit as shown in figure 1.0 below.



(make sure the positive terminal of the capacitor connects to the positive terminal of the cell and negative to negative)

b) Close switch S_1 and then switch S_2 and record the maximum reading of the milliameter in the table 1.0 below.

c) Open switch S_1 and at the same instant, start the stop clock. Record the time taken for the value of current to fall to a half of its original value.

d) Repeat step (b) and (c) with other values R (Ω)

Resistance R(Ω)	2000	3000	4000	5000	6000	7000
Maximum current I (mA)						
Time t (s)						

e)i) On the grid provided, plot a graph of R (Ω) against t (s)

ii) Determine the slope of your graph.

iii) given that $R = {}^{t}/_{k}$ use the graph to determine the constant k.

f) Why should the switch S_1 be closed first and S_2 later?

g) What is happening to the capacitor when the milliameter reading is decreasing?

PREDICTION 8
PAPER 1

SECTION A (25 marks)

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

1. **Figure 1** shows a section of a vernier calipers used to measure the external diameter of tube. The vernier calipers has a zero error of 0.3cm

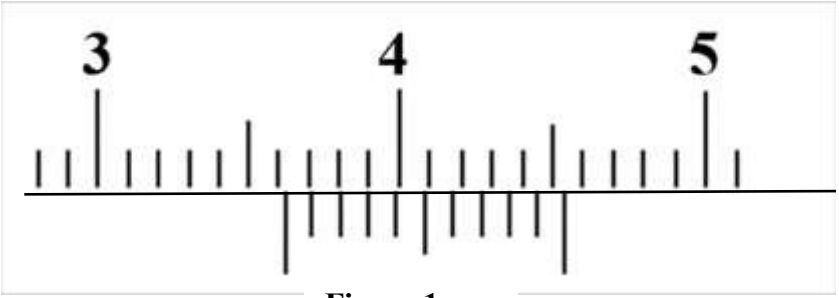


Figure 1

Determine the actual diameter of the tube. (1 mark)

……

2. A student used a container of mass **x** grams in an experiment to determine the density of a liquid. The following data was obtained:
Mass of empty container = **x**g
Mass of container when full of water = 80g
Mass of container when full of the liquid = 70g
The student obtained the density of the liquid to be 0.8gcm^{-3}. If the density of water is 1gcm^{-3}, determine the value of **x**. (3marks)

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3. Figure 2 shows an open horizontal tube filled with water.

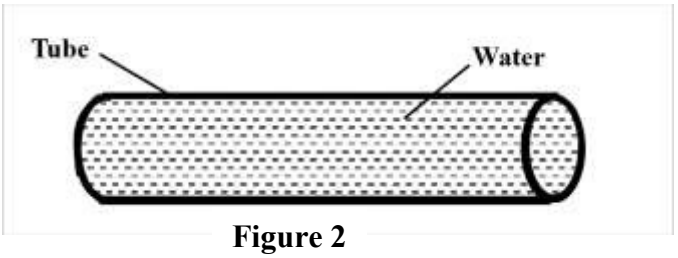

Figure 2

Explaining why the water does not flow out of the tube. (2 marks)

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Turn Over

4. Two ice blocks are pressed together then released. It is observed that they join together to form a single block. Explain the observation. (2 marks)

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5. **Figure 3** shows a circuit used in cars.

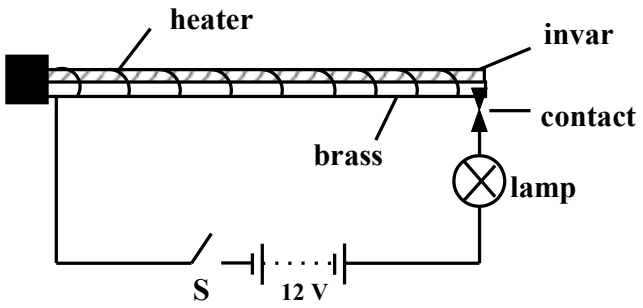

Figure 3

When the switch, S, is closed, the lamp flashes on and off. Explain this observation. (2 marks)

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……

……

6. The displacement **s** of an object in time, **t** may be given by the equation $\mathbf{s = ½at^2}$, where a is the acceleration of the object. State **two** conditions that must be satisfied for this equation to apply. (2 marks)

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7. A small stone hangs by a sewing thread from a support. A section of the same thread dangles from the lower part of the stone as shown in **figure 4**.

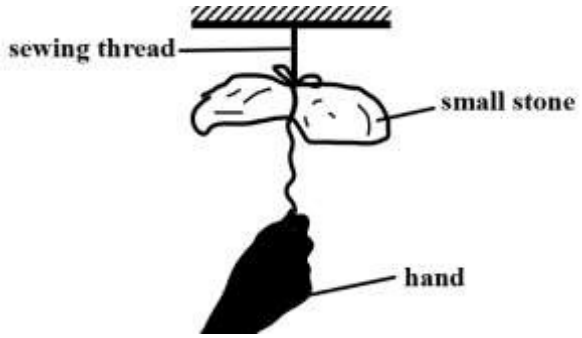

Figure 4

The thread is given very sharp jerk. Explain why the sewing thread is more likely to break below the stone. (2 marks)

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……..……

8. **Figure 5** shows a non-uniform bar balanced on a knife edge. The centre of gravity G is 10 cm from the knife edge.

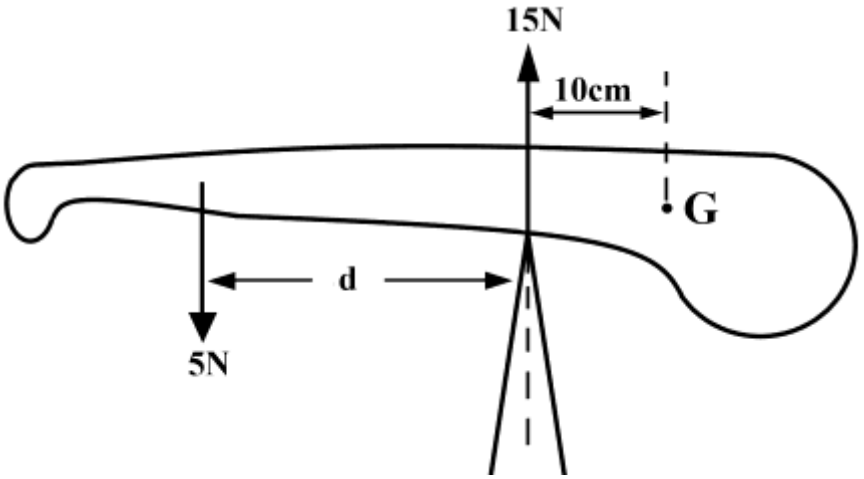

Figure 5

(a) Determine the weight of the bar. (2 marks)

……

……

(b) Find the value of **d**. (2 marks)

……

……

……

9. A pipe of diameter 3 cm is connected to another pipe of diameter 6 cm. Water flows in the narrower pipe at a speed of 2 ms^{-1}. Determine the speed of the water in the wider pipe. (2 marks)

……

……

……

10. Explain how diffusion is evidence that matter is made of tiny particles. (1 mark)

……

……

11. It is easier to drag a boulder in sea water than in fresh water. Given a reason for this. (1 mark)

……

……

12. A spring balance which was calibrated in Mombasa is used by a shopkeeper to measure amount of meat sold to customers. State who benefits; shopkeeper or customer? (1 mark)

……

……

13. Water in an earthen pot placed out in the sun, on a hot day, remains cold. Explain this observation (2 marks)

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……

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Turn Over

Section B (55 marks)

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

14. (a) The set up shown in **figure 6** is to be used to determine acceleration due to gravity at a certain place.

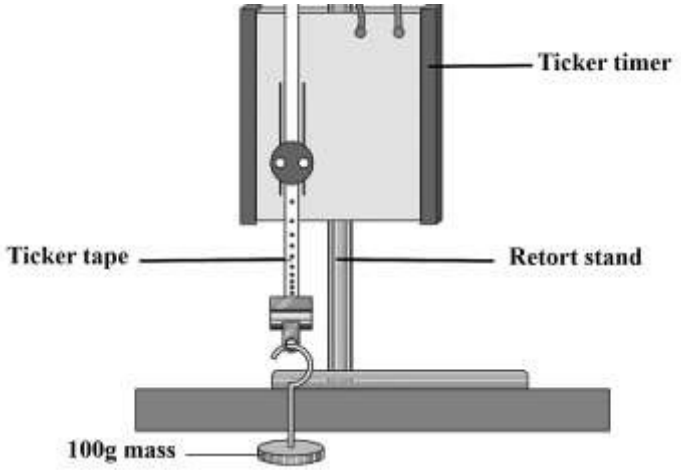

Figure 6

Briefly describe how the set up can be used determine the value of acceleration due gravity at the place. (4 marks)

……

……

……

……

……..…….

(b) In a set up similar to the one in figure 8, the mass took 20 seconds to reach the floor of the laboratory. (Take g = 10ms^{-2})

(i) Determine the initial height of the mass. (ignore air resistance)

(2 marks)

……

……

……

(ii) State the reason why the height might be less than the value calculated in (b)(i).

(1 mark)

……

……

(iii) Calculate the initial potential of energy of the mass. (2 marks)

……

……

……

(iv) Determine the velocity of the mass just before it hits the floor. (2 marks)

……

……

……

15. (a) A piece of metal weighs 0.52 N in air, 0.32 N when completely immersed in water and 0.18 N when immersed in another liquid. (Density of water = 1000 kgm^{-3})

Calculate:

(i) upthrust in water (2 marks)

……

……

(ii) upthrust in the other liquid (1 mark)

……

……

(iii) density of the metal. (2 marks)

……

……

……

(iv) density of the other liquid (2 marks)

……

……

……

(b) A balloon of capacity 2.0 m^3 is filled with a gas of density 0.5 kgm^{-3}. It accelerates upwards from rest at 2ms^{-2}. The mass of the fabric of the balloon is 0.2 kg.
(Take density of air to be1.2 kgm^{-3} and acceleration due gravity g = 10ms^{-2})

(i) Calculate the:
(I) upthrust on the balloon (2 marks)

……

……

……

(II) the weight of the gas in the balloon. (2 marks)

……

……

……

(ii) Determine the air resistance to the balloon's motion (3 marks)

……

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16. (a) A car is travelling on a circular horizontal track.

(i) State what provides the centripetal force on the car. (1 mark)

……

……..

Turn Over

(ii) State the effect on the required centripetal force if:

(I) the car moves faster. (1 mark)

……

……

(II) the number of passengers reduces. (1 mark)

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……..

(b) **Figure 7** shows a rubber bung of mass 50g whirled in a horizontal circle of radius 20cm.

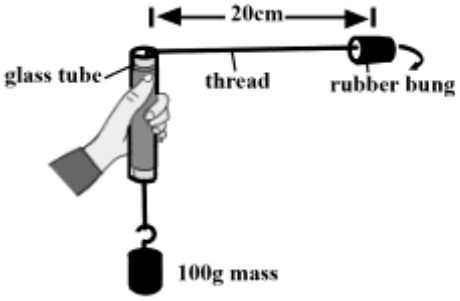

Figure 7

Determine:

(i) the tension in the thread. (Take g =10ms^{-2}) (2 marks)

……

……

(ii) the centripetal force on the rubber bung. (1 mark)

……

(iii) the angular velocity of the rubber bung (2 marks)

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……

(iv) the linear velocity of the rubber bung (2 marks)

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17. (a) **Figure 8** shows an experimental set-up that may be used to investigate one of the gas laws.

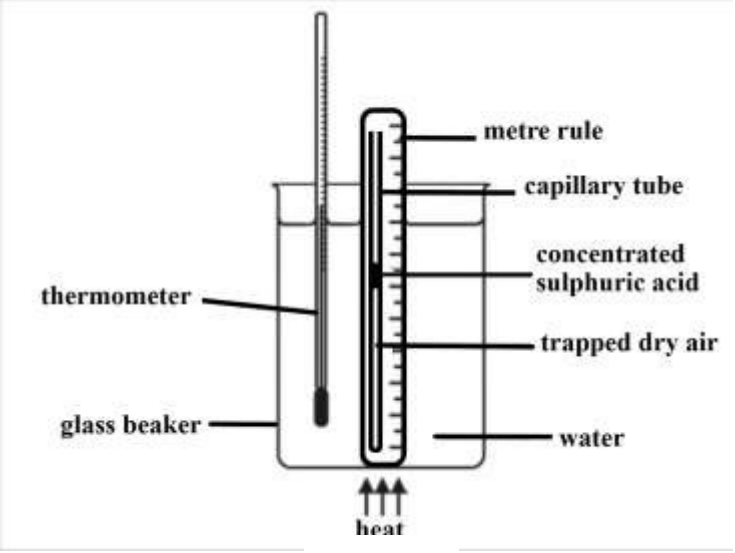

Figure 8

(i) State the gas law which is under investigation. (1 mark)

……

(ii) Briefly describe how the set-up is used to verify the law. (4 marks)

……

……

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……..

(iii) State one use of the concentrated sulphuric acid. (1 mark)

……

……

Turn Over

(b) On a day when the atmospheric pressure is102 kPa and the temperature is 8 ^{o}C, the pressure in a car tyre is 190 kPa above the atmospheric pressure. After a long journey, the temperature of the air in the tyre rises to 29^{o}C. Calculate the pressure in the tyre. (4 marks)

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18. (a) A toy car on an inclined plane is under two forces as shown in **figure 9**.

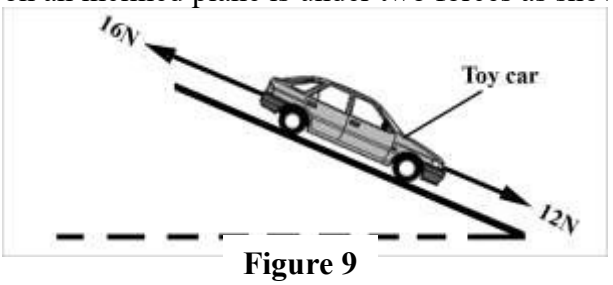

Figure 9

(i) Calculate the resultant force on the car. (2 marks)

……

……

(ii) State the effect of the resultant force on the car's motion. (1 mark)

……

……

(b) (i) Two identical containers **A** and **B** are carrying equal amounts of water and both are left in the sun for some time. A student then measures temperature of water in both containers. If **A** is plastic while **B** is metallic respectively, state and explain the observation in the thermometer readings. (2 marks)

……

……

……

……..

(ii) State the SI unit of heat **capacity**. (1 mark)

……

……

(c) A piece of copper of mass 170g is cooled in a freezer. It is then dropped into water 0°C making 4.0g of water to freeze. Determine the temperature inside the freezer. (Take specific heat capacity of copper = 390J/(kgK), specific latent heat of fusion of ice = 3.36×10^5 J/kg (3 marks)

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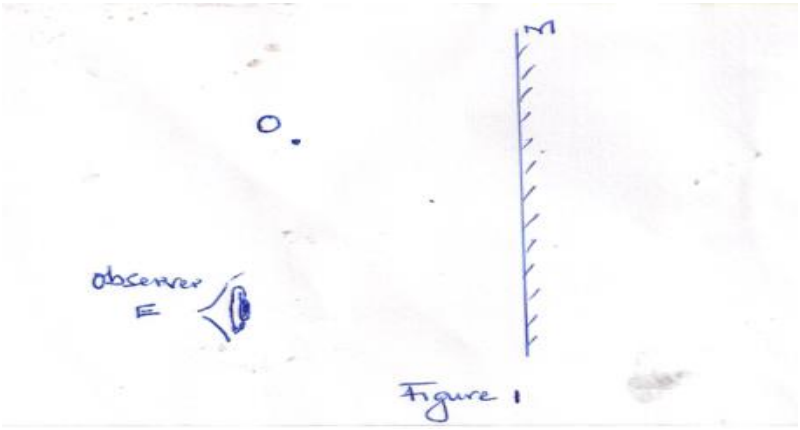
PREDICTION 8

PAPER 2

SECTION A(25MKS)

ANSWER ALL QUESTIONS IN THIS SECTION IN THE SPACES PROVIDED.

1. Figure 1 shows a point object O in front of a plane mirror M.

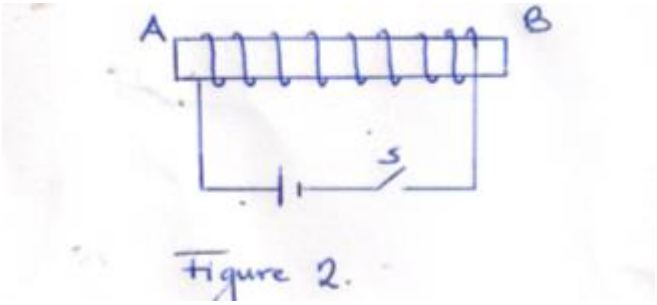


On the same diagram locate the position of the image as observed by the observer E. 3mks

2. A positively charged sphere is suspended by an insulating thread .A negatively charged conductor is suspended near it. The conductor is first attracted ,after touching the sphere it is repelled .Explain this observation. (2mks)

3. A current of 0.5 A flows through an electric circuit. Determine the quantity of change that passes a point in the circuit in 6 minutes.(2mks)

Figure 2 shows a wire wound on a magnetic material, and then connected to direct current source. Use to answer question 4 and 5.



4. Determine the polarity of A and B when the switch is closed.(1mk)

5. State two ways of increasing the strength of the magnet formed through the method in number 4.(2mks)

6. An object is placed in front of a concave mirror as shown in figure 3.

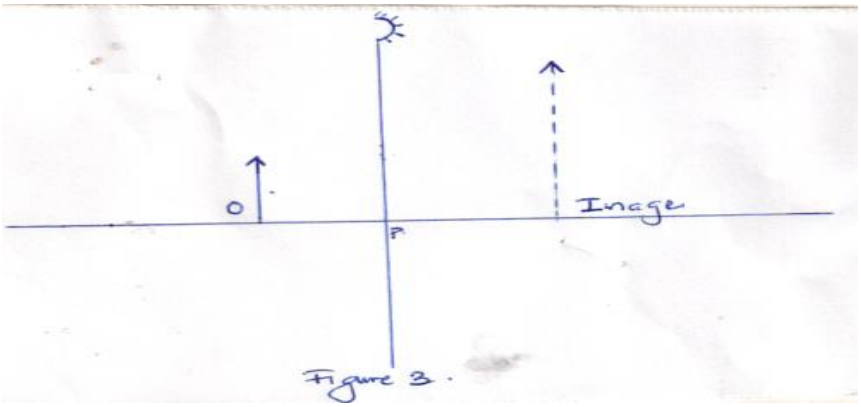


Figure 3.

The image of the object is formed as shown above. Locate the principal focus of the mirror and determine its focal length.(3mks)

7. Figure 4 shows a displacement time graph of a wave travelling at 200 cm/s.

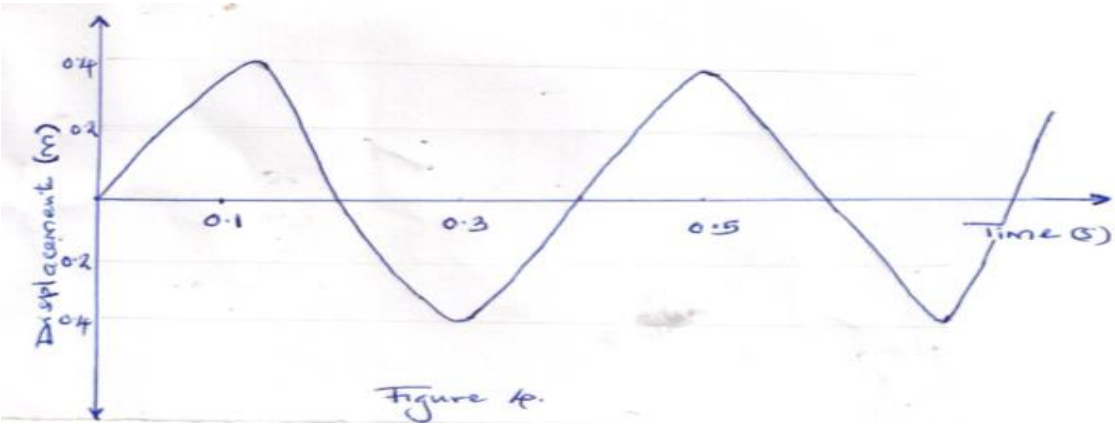


Figure 4.

Determine the wavelength of the wave.(3mks)

8. A solder standing between two cliffs fires a gun. He heard the first echo after 2.0 seconds and the next 5.0 seconds later. Determine the distance between the two cliffs.(Speed of sound in air is 320 m/s.(3mks)

9. An electric heater rated 1.5 kw, 240 v is used to heat water for 6 minutes. Determine the energy consumed by the heater in this time.(2mks)

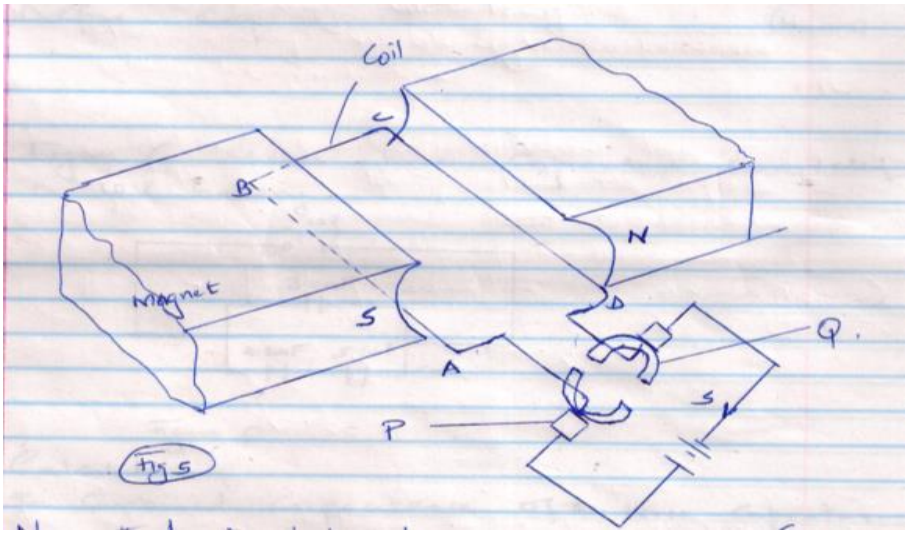
10. State two conditions necessary for two progressive waves moving in opposite direction to produce a stationary wave.(2mks)

11. Arrange the following radiations in order of decreasing wavelength.
Gamma rays, visible light, Radio waves, ultraviolet radiation.(1mk)

12. State one detector of Gamma rays.(1mk)

(SECTION B:55 MARKS)
Answer all questions in this section in the spaces provided.
13. (a) Sate what is meant by the term " electromagnet"(1mk)

(b) Figure 5 shows a simple electric motor.



i.
ii. Name the parts labeled
P-
Q-
iii. The switch s is closed ,indicate the direction of current in the coil and how the motor works.(4mks)

iv. State three ways in which the speed of the motor can be increased.(3mks)

14. (a) Define capacitance.(1mk)

(b) Figure 6 shows three capacitors connected to 10V battery .

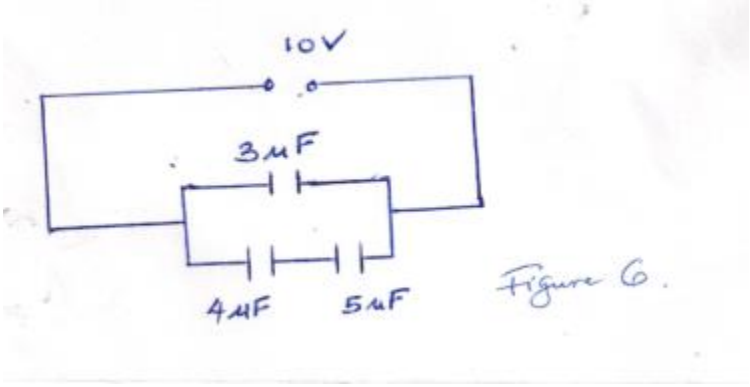


Figure 6.

Calculate

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

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

15. (a) State what is meant by " refractive index".(1mk)

(b) In an experiment to determine the refractive index of a liquid, a student measured the real and apparent depths of a coin in a beaker.
The results were as shown.

Real depth(cm)	5	10	15	20	25
Apparent depth (cm)	3.3	6.7	10	13.3	16.7

i. Plot the graph of real depth against apparent depth.(5mks)

ii. From the graph ,determine the refractive index of the liquid.(3mks)

(c)Figure 7 shows a ray of light incident on glass air interface.

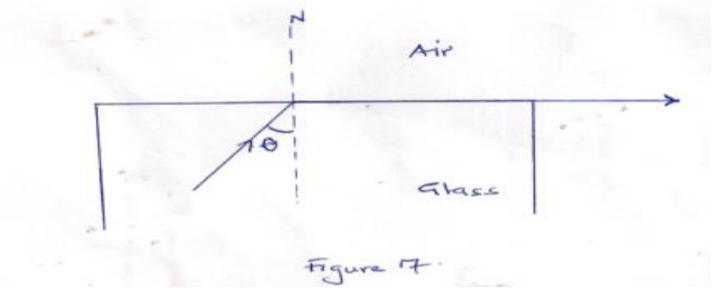
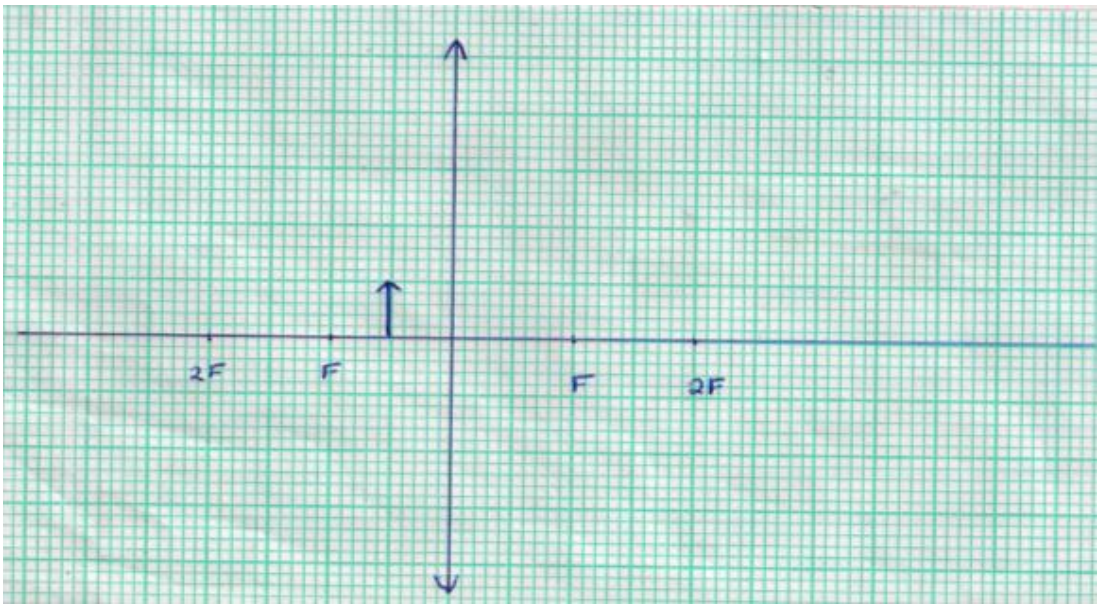


Figure 7.

Given that the refractive index of glass is 1.6, determine angle O.(3mks)

16. (a) Figure 8 shows an object in front of a convex lens of focal length 10cm.



i. On the same figure draw a ray diagram showing the location of image .(4mks)
Use the ray diagram drawn in (i) above to determine the
ii. Image distance (2mks)

iii. The magnification(2mks)

(b) A vertical object is placed 20cm in front of a convex lens of focal length 5cm.
i. Determine
I the image distance (3mks)

II the magnification (2mks)

ii.State two characteristics of the image (2mks)

17. (a) Figure 9 shows a cell in series with a 3 resistor and a switch .A high resistance voltmeter is connected across the cell.

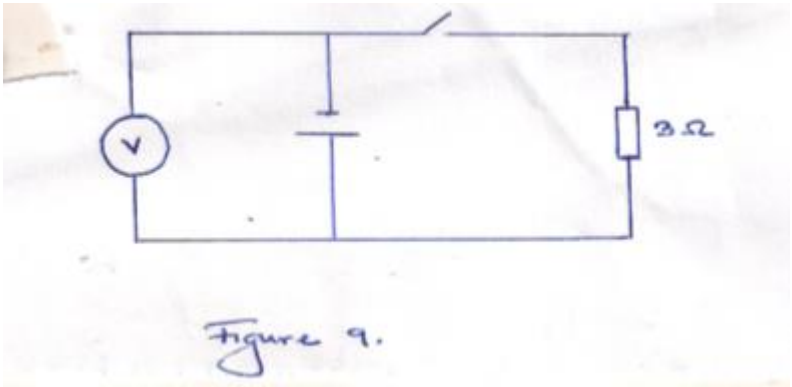


Figure 9.

The voltmeter reads 1.5v with switch open and 1.2 v with the switch closed.(1mk)

i. State the e.m.f of the cell.(1mk)

ii. Determine the current through the 3 resistance of the cell.(2mks)

(b) Another resistor R is connected in series with the 3 resistor so that a current of 0.15 A flows when the switch is closed. Determine the resistance R.(3mks)

PREDICTION 8

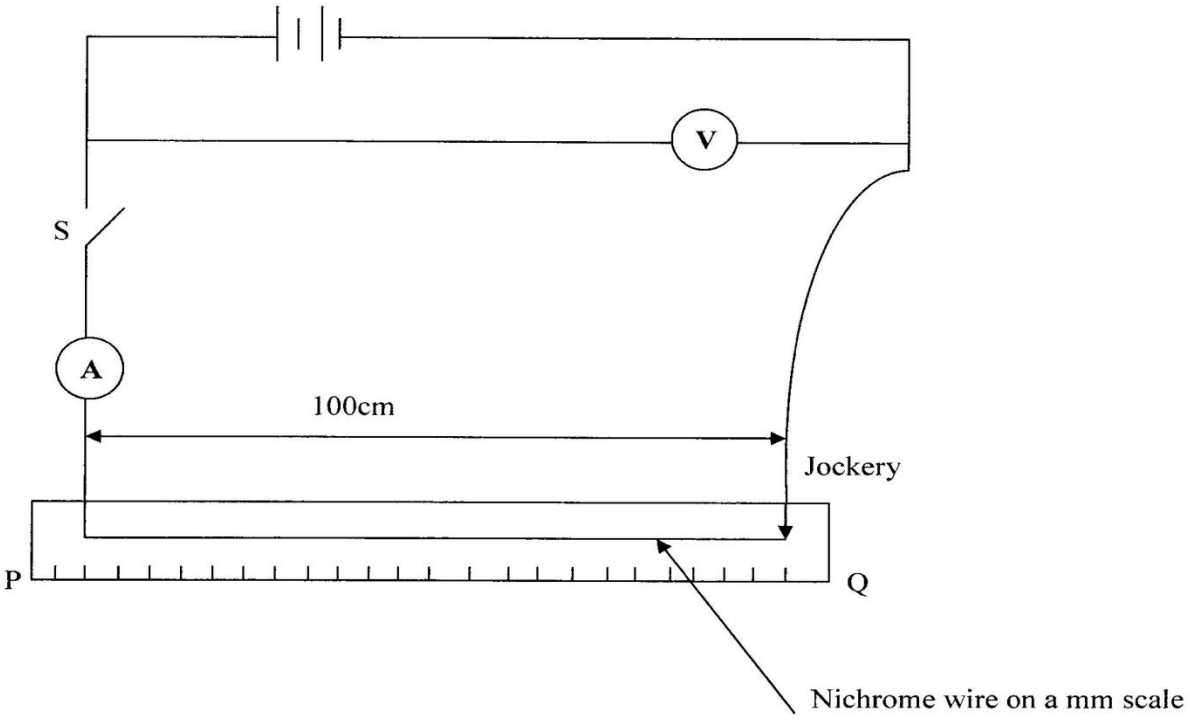
Question one.

You are provided with the following

- Two new dry cells (size D)
- A nichrome wire mounted on a mm scale labeled PQ
- Ammeter 0-1.0 or 0-2.5 A
- Cell holder(s)
- A switch
- A voltmeter 0-2.5A or 0-5.0V or 0-3.0V
- 8 connecting wires with at least 4 with crocodile chips.
- A jockey (a crocodile may be used)

Proceed as follows

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



b) (i)With the switch open, measure the e.m.f, E of the cells.

E= _____V (1mk)

(ii) With PQ-100, close the switch and record the ammeter and voltmeter reading.

Ammeter reading, I= _____A (1mk)

Voltmeter reading, V= _____V (1mk)

(iii) Move the jockery towards P, such that PQ=80cm and record the voltmeter and ammeter reading. Repeat with values of PQ=60cm, 50cm, 40cm, 30cm, and 20cm.

Enter the results in Table 1

Table 1

Lenth PQ (cm)	100	80	60	50	40	30	20
Ammeter reading, I (A)							
Voltmeter reading, V (V)							
(E-V)							

Complete the table (6mks)

b) (i) Plot a graph of (E-V) (y-axis) against I. (5mks)

Graph paper

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

(iii) Given that the graph is governed by the equation, E=V+Ir, determine the internal resistance of the cells. (3mks)

Question two

This question consists of two parts A and B.

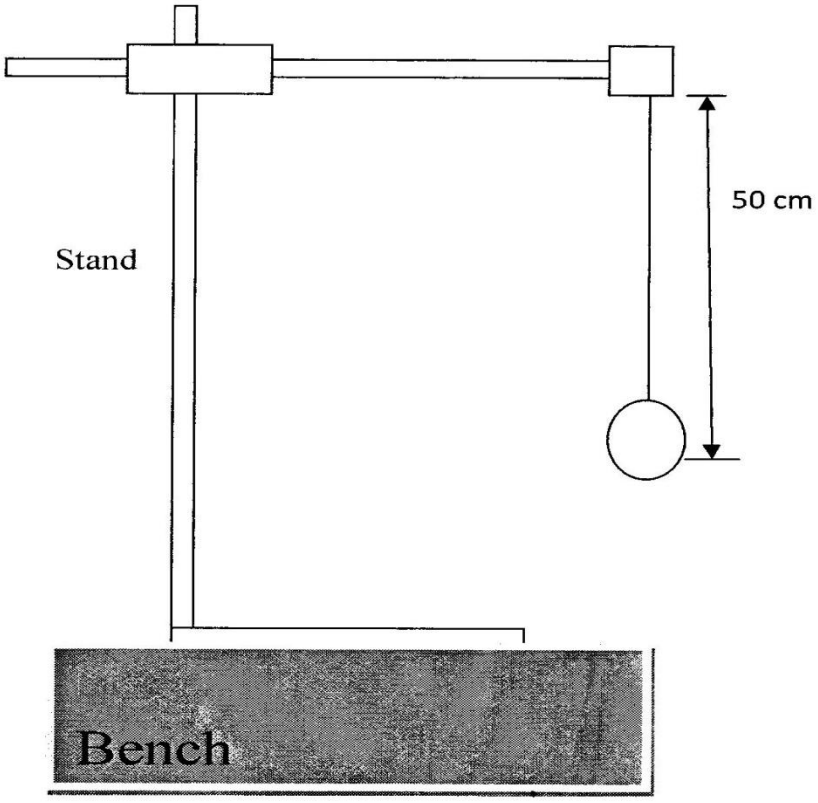
Part A

You are provided with the following.

- A stop watch
- A 70 cm long piece of thread.
- A retort stand, clamp and boss
- Two small pieces of wood (wooden claps)
- A metal bob

Proceed as follows.

a) Using the thread provided, tie the marble to be used as the pendulum.
Clamp the thread so that the length of the pendulum to the center of the marble is 50cm.
See figure 2.



(i) Displace the marble slightly (Amplitude less than 10^0) so that it swings in a vertical plane. Record time, t. for 20 oscillations.

T= _____S (1mk)

(ii) Find T, the time for one oscillation. (1mk)

b) Given that the following relation is obeyed.

$T = 2\pi\sqrt{\frac{l}{g}}$ where l is the length of the pendulum.

Determine the value of g. (3mks)

Part B

You are provided with the following,

- A wooden half meter rule.
- 10cm long cotton thread.
- Masses of 10g and 20g.
- Knife edge- approximately 20cm high.

Proceed as follows.

a) Balance the half meter rule on the knife edge when there is no mass suspended. The knife edge is at the centre of gravity (c.o.g)
Record this position.

Position of c.o.g = _____cm (1mk)

PREDICTION 8

b) Arrange the apparatus as shown in figure 3.

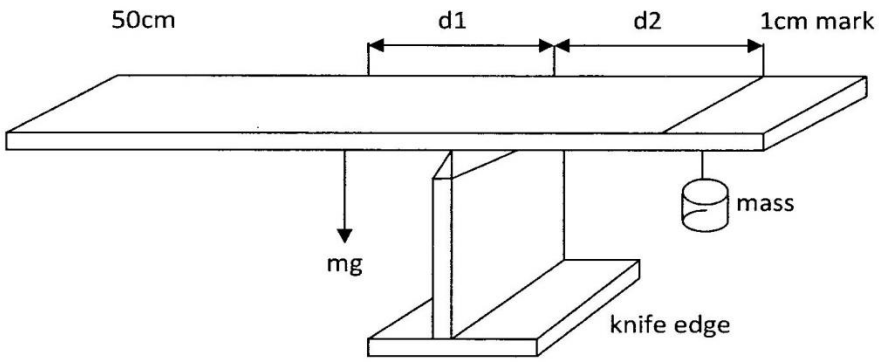


figure 3

Hang a mass of 10g at 1cm mark. Adjust the knife edge until the half meter rule balances again at a new mark. (figure 3). Record the length d1 and the corresponding distance d2 when the system is in balance.

Repeat the procedure for different masses shown on table 2.

Table 2

Mass, m (g)	10	20	30	40	50	60
Distance d1 (cm)						
Distance, d2 (cm)						
m×d2						

Complete the table 2 above.

i. Plat a graph of md2 (y-axis) against d2 (5mks)

Graph paper

ii. Determine the slopes of the graphs. What does it represent? (2mks)

PREDICTION 9
PAPER 1

SECTION A (25 MARKS)

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

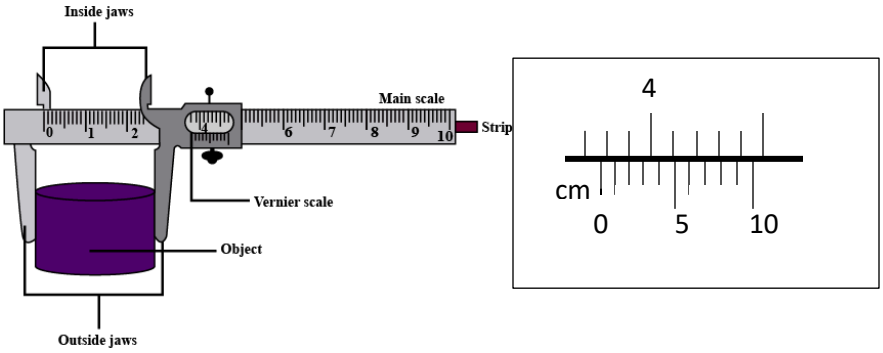


Figure 1

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

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

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

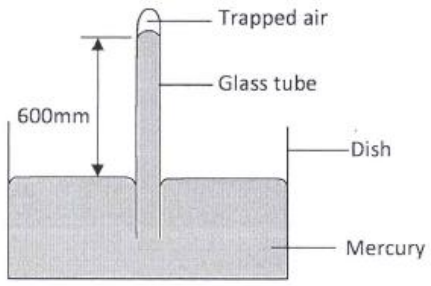


Figure 2

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

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

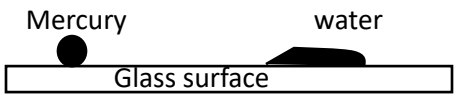


Figure 3

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

6. Explain o**ne** advantage of mercury over alcohol as a thermometric liquid. (1mark)

7. A body of mass **M** is allowed to slide down an inclined plane. State **two** factors that affect its final velocity at the bottom of the inclined plane. (2marks)

8. A stopwatch reads 08:10:84 and 09:10: 90 before and after an experiment respectively. Determine the duration of the event in SI units. (2marks)

9. Explain the meaning of thermodynamics as a branch of physics. (1 mark

10.
   a. State the Hooke's Law. (1mark)
   b. **Figure 4** shows identical spiral springs supporting a load of 90N. Each spring has a spring constant k = 200N/m

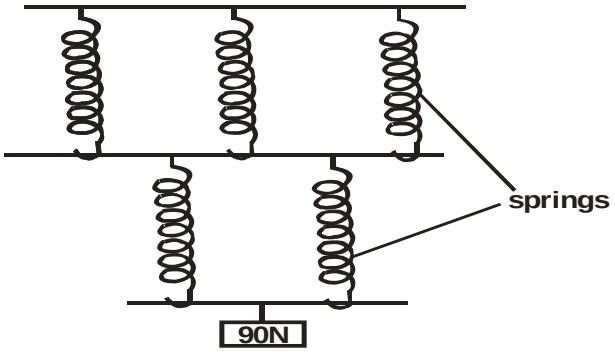


Figure 4

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

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

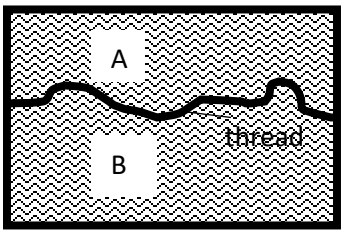


Figure 5

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

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

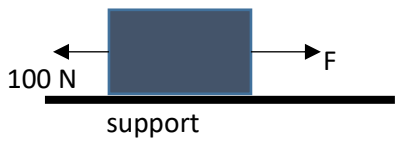


Figure 6

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

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

SECTION B (55 MARKS)

14.

a) Explain why bodies in circular motion undergo acceleration even when their speed is constant. (1mark)

b) A particle moving along a circular path of radius 5cm describes an arc of length 2cm every second. Determine:

i. Its angular velocity. (1mark)

ii. Its periodic time. (2marks)

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

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

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

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

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

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

15.

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

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

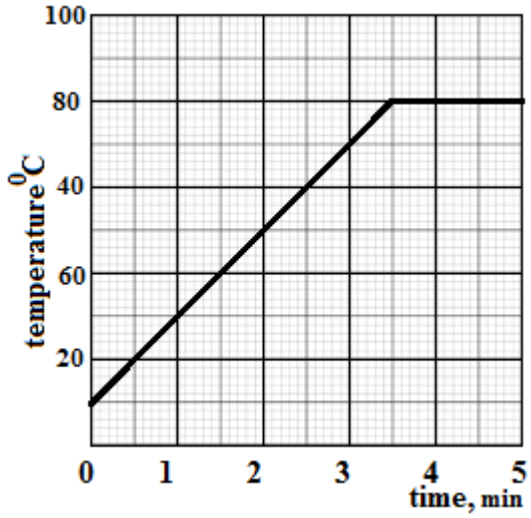


Figure 7

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

80^0C ;

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

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

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

16.

a) State the law of floatation (1 mark)

b) Figure 8 below shows a simple hydrometer

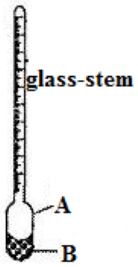


Figure 8

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

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

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

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

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

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

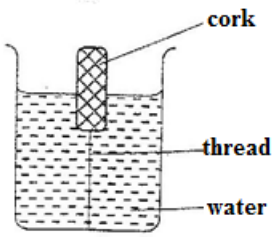


Figure 9

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

17.

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

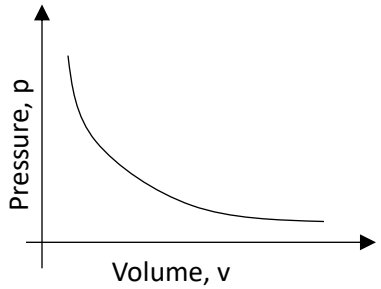


Figure 10

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

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

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

18.

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

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

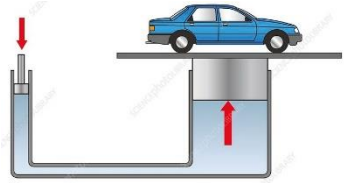


Figure 11

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

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

ii. Efficiency of the machine (3 marks)

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

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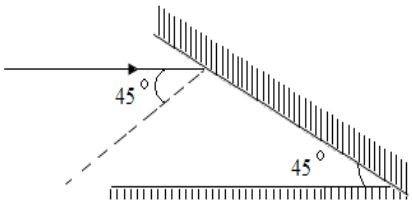
PREDICTION 9
PAPER 2

SECTION A 25 MARKS

Answer all the questions in the spaces provided.

1. The figure below shows a ray of light incident on a mirror at an angle of 45°. Another mirror is placed at an angle of 45° to the first one as shown. Sketch the path of the ray until it emerges. (2 marks)



2. State any two ways of reducing the magnetic force of attraction of a magnet (2 marks)

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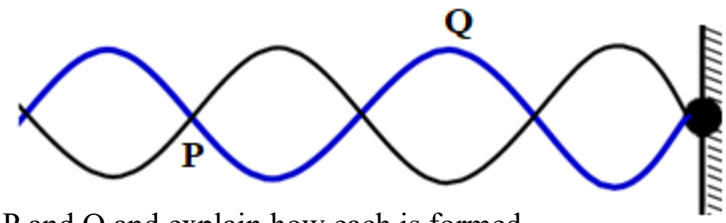
3. The figure below shows a transverse stationary wave along a string.



Name P and Q and explain how each is formed. (3 marks)

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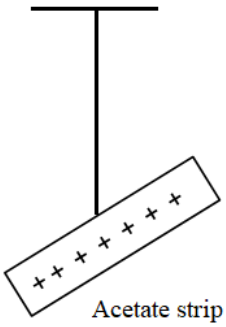
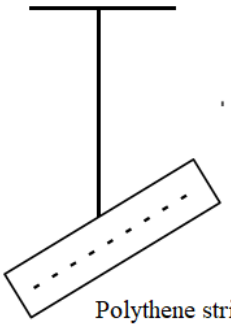
4. The diagrams below show a positively charged acetate strip and a negatively charged polythene strip freely suspended and isolated.



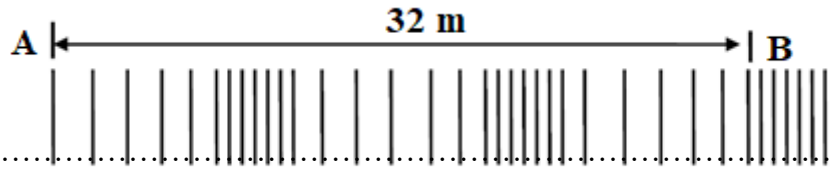


Two rods X and Y are brought up in turn to these strips. X attracts the acetate strip but repels the polythene strip. Rod Y does not repel either the acetate or the polythene. State the type of charge on each rod.

X ..... (1 mark)

Y ..... (1 mark)

5. The diagram below shows waves generated from a tuning fork. If the wave takes 0.1 second to move from point A to B. determine the frequency of the wave. (4 marks)



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6. Name two detectors of microwave (2 marks)

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7. Other than current state two other factors that affect the magnitude of force on a current carrying conductor placed in a magnetic field. (2 marks)

……

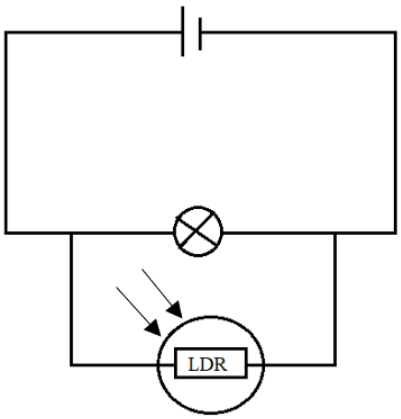
……..

8. Give a reason why a concave mirror is not preferred as a driving mirror. (1 mark)

……

……

9. A student connected the set up below in the laboratory. Explain the observation made on the bulb when the set-up below is taken to a dark room (2 marks)



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10. A person standing 110 m from the foot of a cliff claps his hands and hears a sound 0.75 seconds later. Find the speed of sound in air. (3 marks)

11. The figure below is part of electromagnetic spectrum.

A		Visible light	UV	

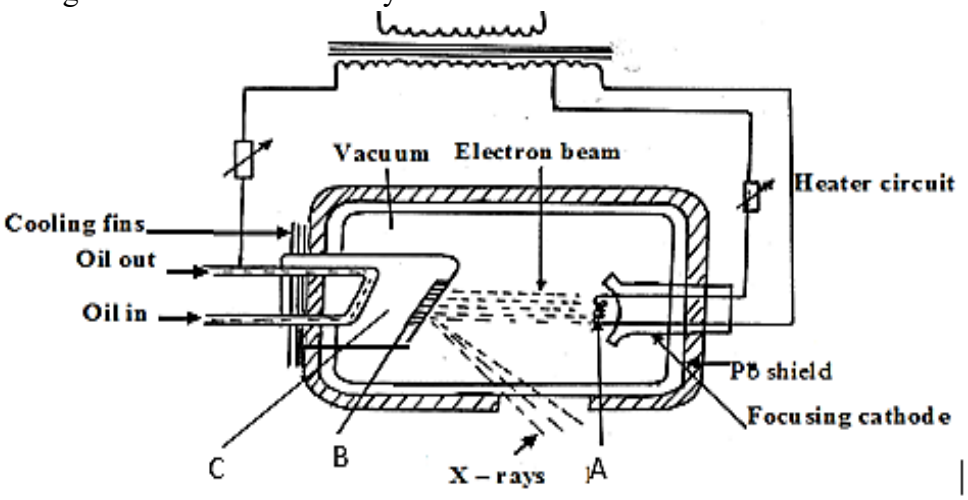
Identify radiation A and state its source. (2 marks)

……

SECTION B 55 MARKS

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

12. (a) The figure below shows a X-ray tube.



(i) Name the part labelled C (1 mark)

……

(ii) State the property of the material labelled B on the diagram which makes it suitable for use in the X-ray tube. (1 marks)

……

……

(iii) Why is C inclined at an angle of 45º? (1 mark)

……

……

(iv) State the adjustment that can be made to vary

I. The quality of X-rays (1 mark)

……

……

II. The quantity of the X-rays. (1 mark)

……

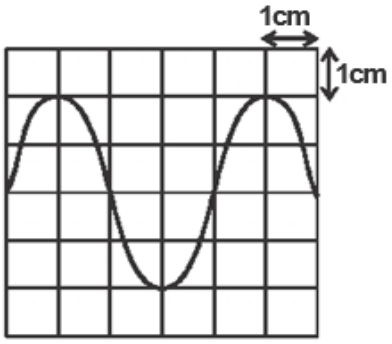
……

(v) An x-ray tube has an accelerating potential of 100KV. Determine the maximum frequency of the x-rays produced.
(Plank's constant = 6.63×10^{-34} Js, e = 1.6×10^{-19}C) (3 marks)

……

……

(b) In a CRO, waveform given below was displayed on the screen when the sensitivity at the Y plate was10V/cm and time base set at 20 milliseconds/cm.



Determine:

(i) peak voltage (2 marks)

……

……

(ii) frequency of the signal (2 marks)

……

……

13. a) $88226\ Ra$ decays into $86222\ Rn$ by emission of an alpha particle. Write a nuclear equation for the decay (1 marks)

b) i)What do you understand by the term half-life of a radioactive substance? (1 mark)

……

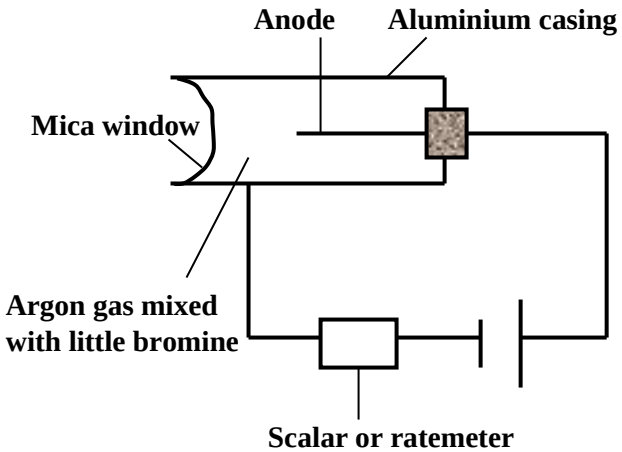
……

ii)A G.M tube registers 20 counts. When a radioactive source is brought close to it, it registers 3220 counts and 120 counts 30 hours later. What is the half-life of this substance? (3 marks)

……

……

c) The figure below shows a G.M tube.



i) What is the purpose of the mica window? (1 mark)

……

……

……

ii) Explain the purpose of the bromine (2 mark)

……

……

iii) Why should argon gas be kept at low pressure (1 mark)

……

iv) What is meant by the term "*dead time"* as used in GM tube (1 mark)

……

……

v) Briefly explain how GM tube works. (2 marks)

……

14. (a) State the Ohm's Law (1 mark)

……

(b) You are provided a rheostat, 2 cells, a voltmeter, an ammeter, a switch and a fixed resistor.

i) Draw a circuit diagram that can be used to verify Ohm's law. (2 marks)

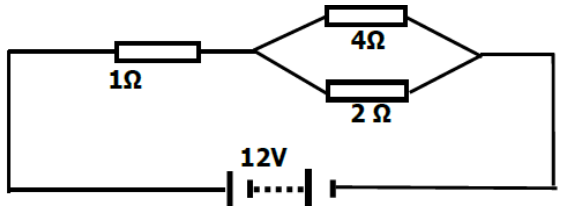
ii) Describe how the above set up can be used to determine Ohms law. (4 marks)

……

……

……

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



Calculate

(i) Determine the total resistance in the circuit. (2 marks)

……

(ii) The current through the 4Ω resistor (3 marks)

……

……

……

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

……

……

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 $= \frac{4}{3}$. Refractive index of glass $= \frac{3}{2}$ (3 marks)

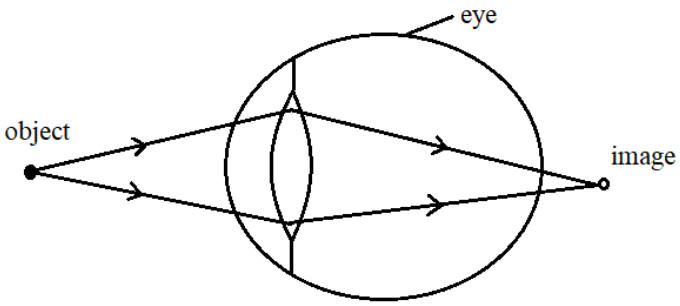
……

……

c) State the necessary and sufficient conditions for total internal reflection to occur. (2 marks)

……

d) The figure below shows a human eye defect.



(i) State one possible cause of this defect. (1 mark)

……

……

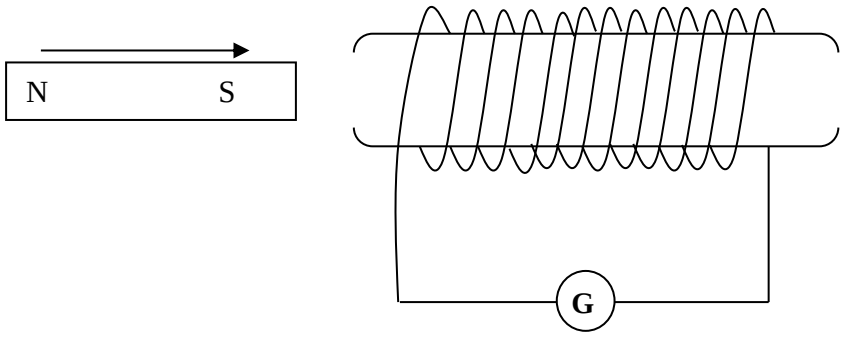
(ii) On the diagram, show how the defect is corrected. (2 mark)

16. (a) State the Lenz's law of electromagnetic induction. (1 mark)

……

……

(b) A bar magnet is moved into a coil of an insulated copper wire connected to a zero centre galvanometer as shown below



(i) Show on the figure above the direction of the induced current in the coil
(1 mark)

(ii) State and explain what is observed on the galvanometer when the south pole of the magnet is moved into and then withdrawn from the coil. (2 marks)

……

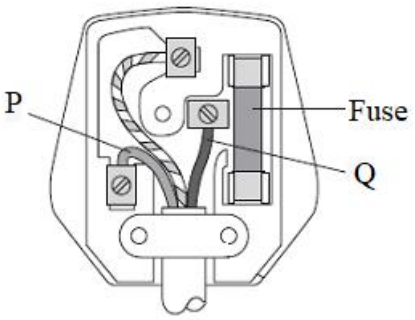
……

(c) A transformer has 800 turns in the primary and 40 turns in the secondary winding. The alternating voltage connected to the primary is 240V and current of 0.5.A. If 10% of the power is dissipated as heat within the transformer, determine the current in the secondary coil.
(3 marks)

……

……

(d) The diagram below shows a three-pin plug.



(i) Name the colour of conductors P and Q (2 marks)

P……

Q……

(ii) Why is the earth pin longer than the rest in the three-pin plug shown above?
(1 mark)

……

……

……

……

……

PREDICTION 9

PAPER 3

QUESTION 1

This question consists of part A and B.

Attempt both parts.

PART A

You are provided with the following:

- *A bare copper wire of diameter 0.71 mm (SWG 22) and length 50cm.*
- *A retort stand, boss and clamp*
- *An optical pin mounted on a cork*
- *A stop watch*
- *Wire cutters /pliers(to be shared)*
- *A metre rule or half metre rule*

Proceed as follows:

(a) Clamp the cork so that optical pin is horizontal. Hang the copper wire from the pin by the loop as shown in figure 1. Ensure the wire is straight and the length X between the lower tip and the optical pin is 32 cm. if the length exceeds 32 cm reduce by cutting at the lower tip using the wire cutters provided.

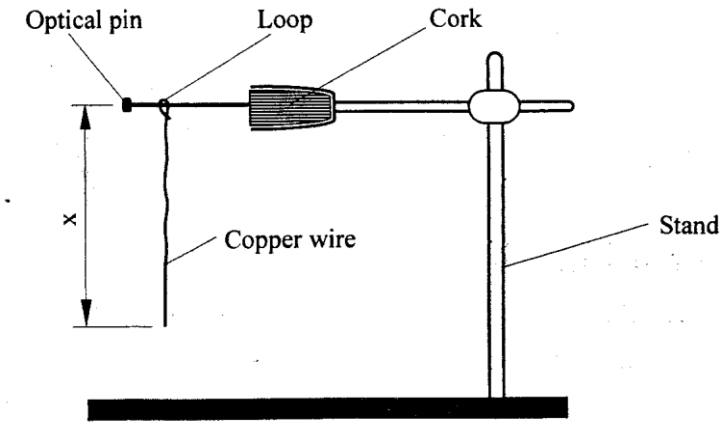


Figure 1

(b) Displace the lower tip of the wire slightly in a plane perpendicular to the optical pin and then release it. Measure the time t=10 oscillations of the wire and record the value in table 1.

(c) Repeat the procedure in (b) above for other values of X shown in the table. (*Note that each length X is obtained by cutting off an appropriate length from the lower tip of the wire. For example to get X= 28 cm cut off 4 cm from the lower end).* Complete the table.

(5 Marks)

Table 1

Length X cm	32	28	24	20	16	12

Time t for 10 oscillations (s)						
Period T=$\frac{t}{10}$ (s)						
T^2 (S^2)						

(d) Plot a graph of T^2 (y-axis) against X (metres) on the graph paper provided. (5 marks)

(e) i) Determine the slope, S, of the graph. (3 marks)

ii) Obtain the value of K in the equation S= $\frac{8\pi}{3k}$ (2marks)

PART B

You are provided with the following:

- *A cylindrical container (about 20cm high and diameter 8cm or more)- used plastic containers can be used by cutting the upper section*
- *Some water*
- *A stop watch*
- *A metre rule or half-metre rule*
- *A boiling tube*
- *Some sand (in 100ml beaker)*
- *Spatula*
- *A rubber band*

Proceed as follows:

(f) Tie the rubber band round the boiling tube so that it is at a distance L =12 cm from the bottom of the tube (see fig 2a). Pour water into the cylindrical container until the level is about 2.0 cm from the top of the beaker. Float the boiling tube in the water in the container. Add sand gradually into the boiling tube until the tube sinks to the 12 cm mark. See figure 2(b).

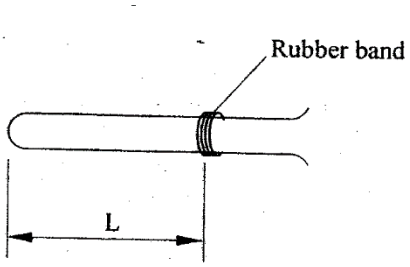


Figure 2(a)

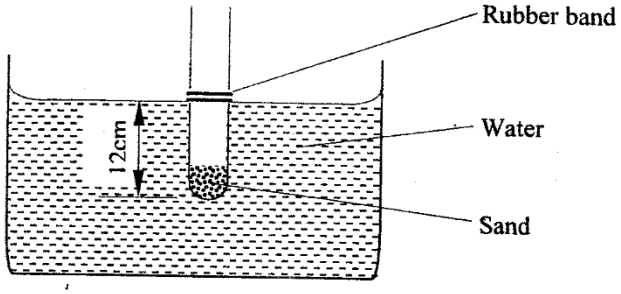


Figure 2(b)

(g) Depress the boiling tube slightly and release so that it oscillates vertically without touching the sides of the container. Measure and record in table 2 the time t_1, for **five** oscillations of the boiling tube. Repeat the procedure two more times to obtain t_2 and t_3 and record the values in table 2. Complete the table. (3 marks)

Table 2

t_1((s)	t_2(s)	t_3(s)	Average t(s) $t=\left(\frac{t_1+t_2+t_3}{3}\right)$	$T=\frac{t}{5}$(s)

(h) Evaluate $P=\frac{40L}{T^2}$ given that L is the length of the tube in metres up to the rubber band in part (f) and T is the value obtained in (g) above. (2 marks)

P=

QUESTION TWO

You are provided with the following.

- *A 250 cm^3 beaker*
- *Water*
- *a metre rule*
- *Screen*
- *Candle*

i) Add 200cm^3 of water to the vessel and obtain 'h' the height in centimetres of the water above the base of the vessel. Determine the appropriate value of R, the internal radius in centimetres from the formulae;

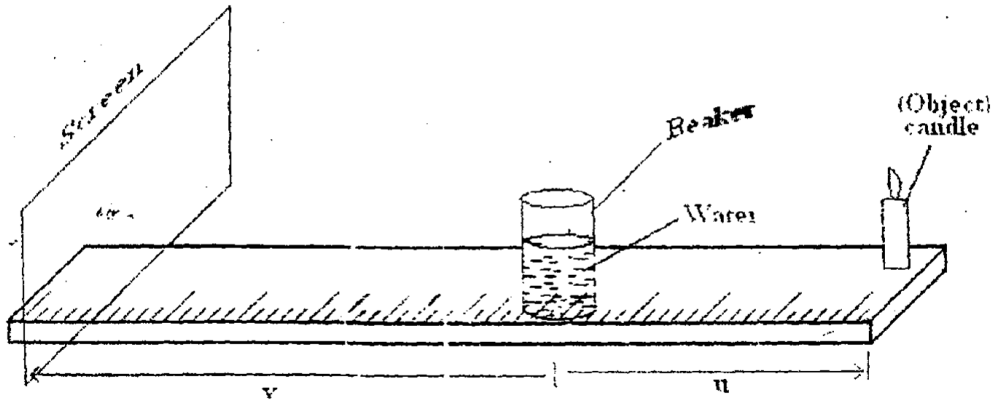
h= _____ cm (1 Marks)

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

R=_____cm (1 Marks)

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

ii) Set the apparatus as shown in diagram below:



Set u to be about 10R away from the Centre of the 'lens' and adjust the position of the screen to locate the image formed. The image is a sharp vertical line. Measure u and v from the Centre of the vessel. Repeat the experiment with the follow multiples of R. and record all values of u and V in the table below:

(8 marks)

	10R	9R	8R	7R	6R	5R	4R	3R
U (cm)								
V (cm)								

NB: Any other appropriate value of u depending on the value of R obtained can be awarded.

iii) Plot a graph of u (cm) against v (cm). (5 marks)

iv) From the graph determine

a) 'V' the value of V for which v=u (1 Mark)

b) 'U' the value of U for which u=2v (1 Mark)

v) **Determine** the effective focal length of the 'lens' from the formulae f=$\frac{\square' u' + \prime v \prime}{5}$ (2 Marks)

vi) Hence determine the value of $\frac{R}{f}$ (1 Mark)

PREDICTION 10

PAPER 1

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

1. Figure 1(a) represents a Voltmeter before being connected across a battery while figure 1(b) represents the same Voltmeter after being connected across a battery. Determine the voltage of the battery. (1mk)

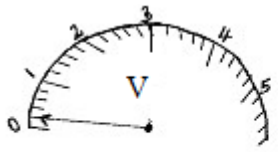
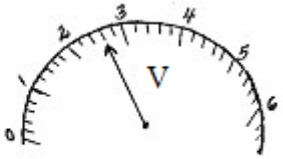


Fig.1(a)



1(b)

2. State the principle of conservation of energy. (1mk)

3. Figure 2 represents a garden sprinkler.

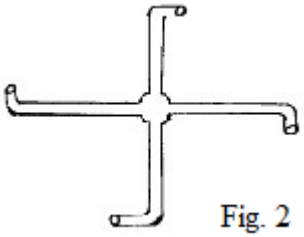


Fig. 2

On the same figure indicate the direction of rotation of the sprinkler when water is ejected through the nozzles at a high velocity (1mk)

4. Figure 3 shows a uniform cuboid block of mass 600g on which a weightless 50cm long wooden plank is fixed.

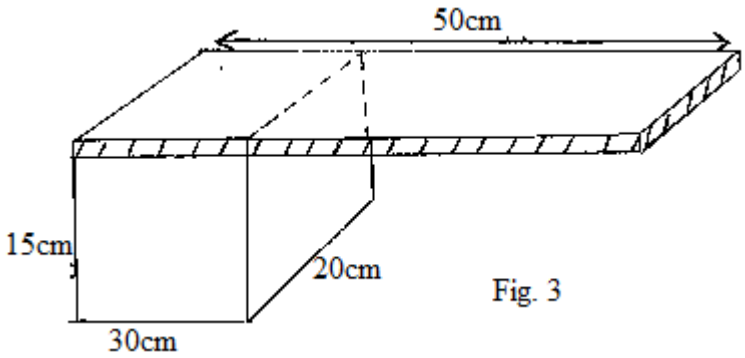


Fig. 3

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If the cuboid block is of dimensions 30cm x 20 cm x 15 cm, find the minimum force F applied at the end of the plank as shown, to tilt the cuboid block. (3mks)

5. Use the kinetic theory to explain thermal expansion of solids. (3mks)

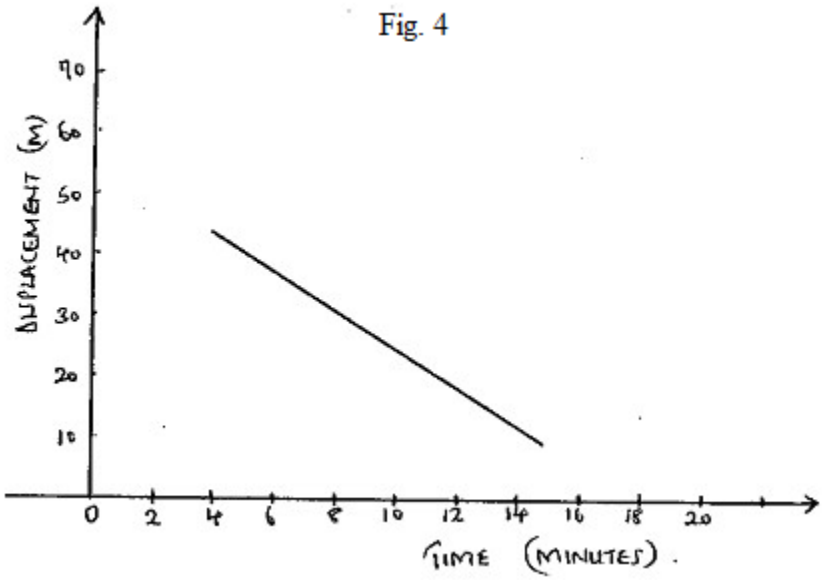
6. Apart from the angle of banking and the radius of the curve, name one other factor that affects the critical velocity of a vehicle negotiating a bend. (1mk)

7. A body weighs 1960N on the surface of the earth. The same body weighs 1470N on the surface of another planet. Determine the acceleration due to gravity on the surface of the planet. Take acceleration due to gravity on the surface of earth, g =10N/Kg. (3mks)

8. Explain why metals are better thermal conductors than non-metals. (1mk)

9. The graph in figure 4 represents part of a displacement – time graph of a motion described by a body moving at constant velocity.

Fig. 4



(a) Use the graph to determine the initial displacement of the body. (1mk)

(b) Describe the motion of the body (2mks)

10. The atmospheric pressure at the foot of Mt. Longonot is 760mm of mercury while at the peak of the mountain, the atmospheric pressure is 580mm of mercury. Given that the density of mercury is 13600Kg/m^3, calculate the height of the mountain (density of air = 1.3 Kg/m^3)(3mks)

11. Figure 5 shows a bimetallic strip.

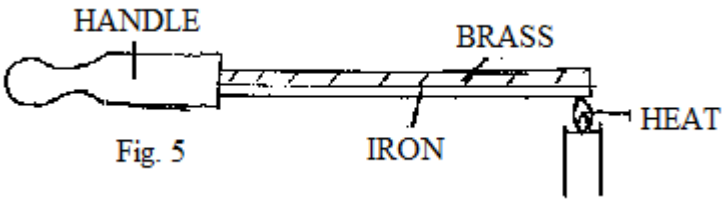


Fig. 5

Draw the final shape of the bimetallic strip when heated at its tip as shown. (1mk)

12. Figures 6 (i) and 6(ii) show two identical pulleys A and B supporting equal loads.

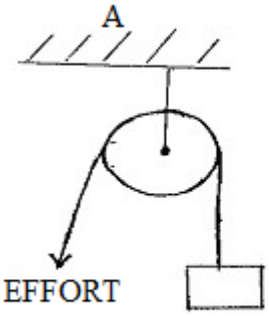


Fig. 6(i)

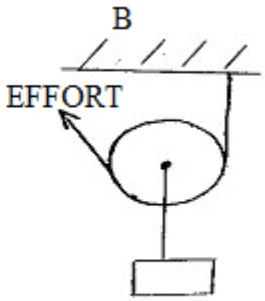


Fig. 6(ii)

State with reason(s) which of the two pulleys is easier to operate (3mks)

13. State one assumption made when estimating the size of an oil molecule using the oil-patch experiment. (1mk)

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

14. (a) State Charles' Law of gases (1mk)

(b) You are provided with a capillary tube sealed at one end containing concentrated Sulphuric acid index, a thermometer, a rule, a stirrer, source of heat, retort stand, rubber band and a water bath.

(i) Using a well labeled diagram briefly describe an experiment you can perform using the apparatus to verify Charles Law. (6mks)

(ii) Explain the other use of concentrated Sulphuric acid other than a pointer and trap of air. (1mk)

(c) The volume of a gas at 70°C is 6×10^{-3} m^3. The gas is cooled at constant pressure until its volume is $0.0014m^3$. Find the final temperatures of the gas. (3mks)

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

(b) Define the term spring constant. (1mk)

(c)(i) State two factors that determine spring constant. (2mks)

(ii) The graph in figure 7 shows the relationship between force and extension of a given spring.

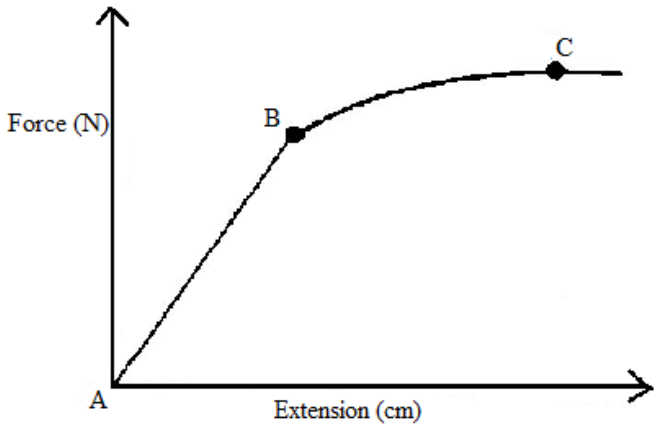


Fig. 7

Explain the shape of the graph between the points:

(I) AB (1mk)

(II). BC (1mk)

(iii) State the significance of the gradient of the graph between the points A and B. (1mk)

(d) The pointer of a spring reads 32cm when there is no load. When loaded with 120g, the pointer reads 38cm, when a pan containing 210g mass is loaded onto the spring, the pointer reads 48cm. Determine the mass of the pan. (4mks)

16 (i) State Bernoulli's principle of fluids (2mks)

(ii) Figure 8 below shows cross – sections of two submerged bodies A and B inside water in a swimming pool. The bodies were then fast pulled in the direction shown by the arrows.

Fig. 8

Use the figure to answer the questions below.

(a) State with a reason which body is easier to pull if they have equal volume and density.(2mks)

(b) On the same diagram show the path followed by each body. (2mks)

(iii)Water flows steadily in a pipe as shown in figure 9 below. The diameters at A and B are given.

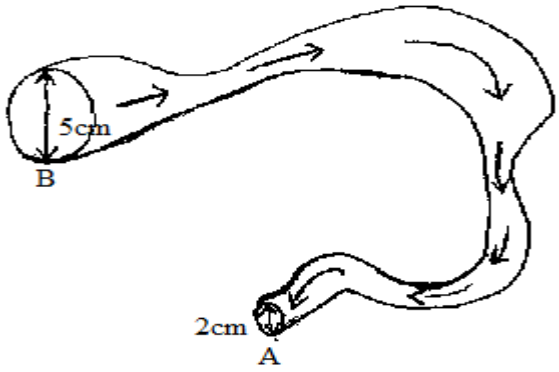


Fig. 9

If the volume flux at A is 45cm^3 /s, find the speed of the water at B. (3mks)

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

(b) Figure 10 shows a solid cylinder floating between two liquids A and B of densities 0.8g/cm^3 and 1.2g/cm^3 respectively. Half of its volume sinks in liquid B as shown. The cylinder has a diameter of 7cm and a length of 12cm. Use it to answer questions that follows.

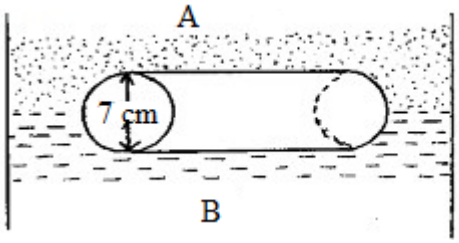


Fig. 10

Find; (i) The volume of the liquid B displaced (2mks)

(ii) Upthrust on the cylinder due to liquid B (3mks)

(iii) Upthrust on the cylinder due to liquid A (3mks)

(iv) The mass of the cylinder (3mks)

18 (a) i) Define latent heat of fusion of a substance (1mk)

(ii) 83.6 kilojoules of heat was lost in cooling an amount of water at 15^0C to ice at -10^0C. Find mass of the water cooled. *(Take specific heat capacity of water 4.2 x 10^{-3} $JKg^{-1}K^{-1}$, specific heat capacity of ice = 2.1 x 10^2 $JKg^{-1}K^{-1}$, Latent heat of fusion of water = 3.3 x 10^5 JKg^{-1})* (5mks)

Figure 11 shows a Six's maximum and minimum thermometer in a room. Use it to answer questions that follow.

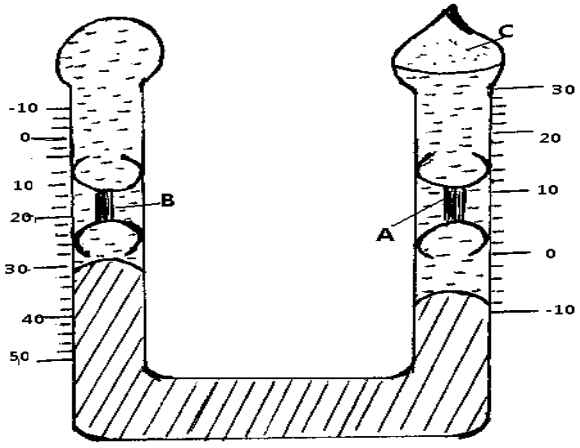


Fig. 11

(i) State the function of part marked A. (1mk)

(ii) State and explain the function of part C. (2mks)

(iii) Explain what is observed in the thermometer if it is placed in a colder refrigerator. (2mks)

(iv) State the type of material suitable for part B. (1mk)

SECTION A (25 MARKS)

Answer ALL the question in this section in the spaces provided

1. State the condition under which the p.d across the terminals of a cell is equal to its e.m.f. (1 mark)

   ……..

   ……..

   ……..

2. Explain why radio wave signals are easier to receive than TV waves signals in a place surrounded by hills. (2 marks)

   …. ……

   ……..

   ……..

   ……..

3. Kiss FM is broadcasting at a frequency of 70MHz. What is the wavelength of the waves, if the speed of the waves is 3.0×10^8 m/s? (2 marks)

   ……

   ……

   ……

   ……

   ……

4. How can it be shown that the strength of a magnet is concentrated at the poles? (1 mark)

   ……..…

   ……..

   ……..

5. **Figure 1** shows a fuse.

Figure 1

a) Explain how the fuse works in an electric circuit. (2 marks)

……

……

……

……

b) What modification can be made on the above fuse so that it can be used in a circuit supplying a higher current? (1 mark)

……

……

……

6. State the Snell's law of refraction. (1 mark)

……

……

……

7. Give **two** reasons why soft iron is used as a core of the coil in an electric bell. (2 marks)

……

……

……

……

8. A real object of height 1cm placed 50mm from a concave mirror forms a virtual image 100mm from the mirror. Determine the focal length of the mirror. (3 marks)

……

……

……

……

9. **Figure 2** shows a p-n junction diode in series with a small bulb. Complete the diagram to show how a battery should be connected so that the diode is forward biased. (1 mark)

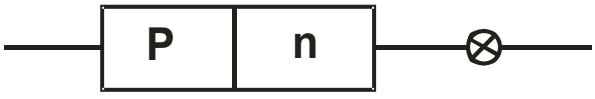


Figure 2

10. Alpha and beta particles from a radioactive source deviate by different amounts when moving in a magnetic field. Give **two** reasons why alpha particles deviate less. (2 marks)

……..

……..

……..

11. Arrange the following in order of increasing frequency. Visible light, infrared radiation, X-rays, U.V radiation, Radio waves. (1 mark)

……..

……..

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

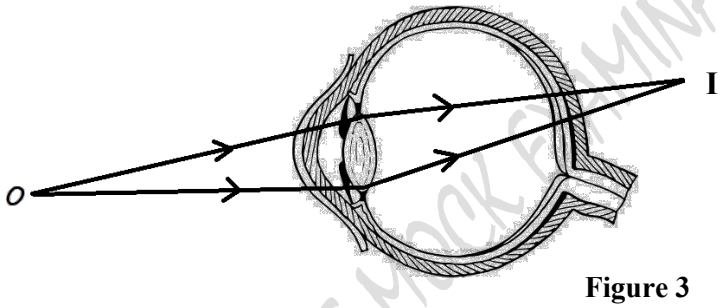


Figure 3

a) Name the defect. (1 mark)

……..

b) On **Figure 3**, sketch the appropriate lens to correct the defect and sketch the rays to show the effect of the lens. (2 marks)

13. Give the difference in the deflection system of a cathode ray oscilloscope and a television set. (1 mark)

……..

……..

……..

14. **Figure 4** below shows a single phase demonstration transformer intended to converted 24V, 50Hz as AC supply to 240V, 50Hz.

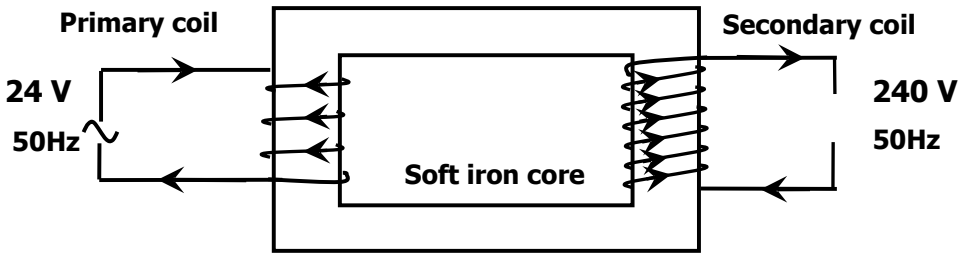


Figure 4

If the primary core has 50 turns of coil, how many turns of coils should the secondary have?

(2 marks)

……

……

……

SECTION B (55 MARKS)

Answer ALL the questions in this section in the spaces provided

15. a) **Figure 5** shows ultraviolet light striking a clean zinc plate placed on a positively charged leaf electroscope.

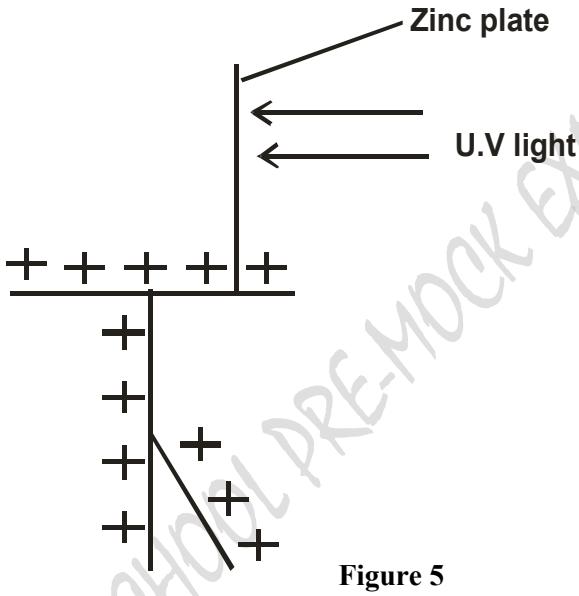


Figure 5

Explain the following observations;

i) The leaf does not fall. (1 mark)

……

……

……

ii) When the same experiment is carried out with a negatively charged electroscope, the leaf falls. (1 mark)

……

……

……

b) State **two** factors that affect photoelectric emission. (2 marks)

……..

……..

……..

……..

c) In an experiment on photoelectric emission, a metal surface was illuminated by light of different 20 frequencies but of constant intensity. The maximum kinetic energy (K.E. $_{max}$) of the photoelectrons emitted for each frequency f, was measured. The graph below shows how the K.E. $_{max}$ varied with frequency.

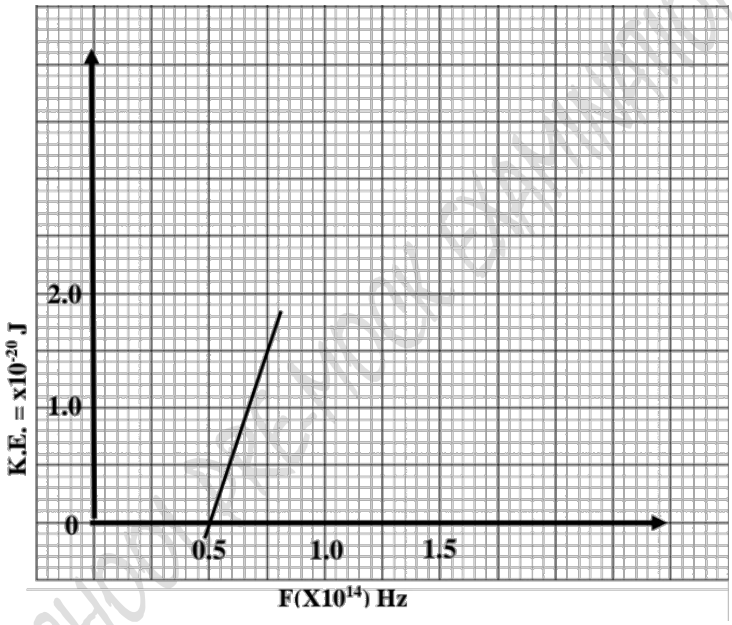


Figure 6

Use the graph and Einstein's equation of photoelectric effect to determine the value of;

i) Planck's constant. (3 marks)

……

……

……

……

……

ii) Work function of the metal surface. (3 marks)

……

……

……

……

16. a) **Figure 7** below shows a goldleaf electroscope

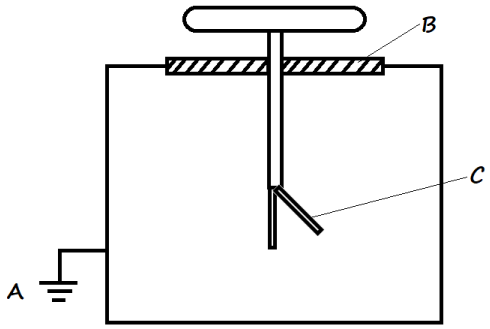


Figure 7

i) Identify the part labeled A (1 mark)

……

ii) State the function of the parts labelled

I. B – (1 mark)

……..

II. C – (1mark)

……..

b) A highly negatively charged rod is brought close to a lightly positively charged gold leaf electroscope

i) State what is observed on the gold leaf (1 mark)

……

……

……

ii) Explain the observation made in **b i)** (2 marks)

……

……

……

c) **Figure 8** shows a thin wire connected to a highly positively charged rod and placed close to a candle flame.

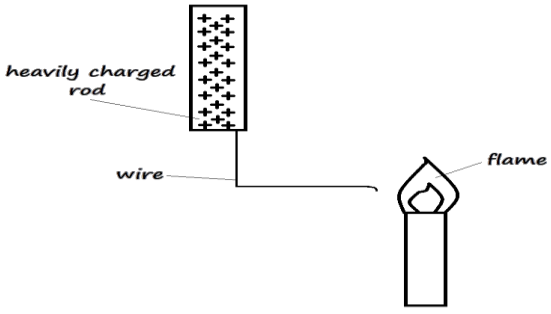


Figure 8

i) State what is observed on the flame when the wire is brought closer (1 mark)

……

……

……

ii) Explain the reason for the observation in **c i)** (1 mark)

……

……

……

……

d) The **figure 9** shows an arrangement of **three** capacitors in a circuit.

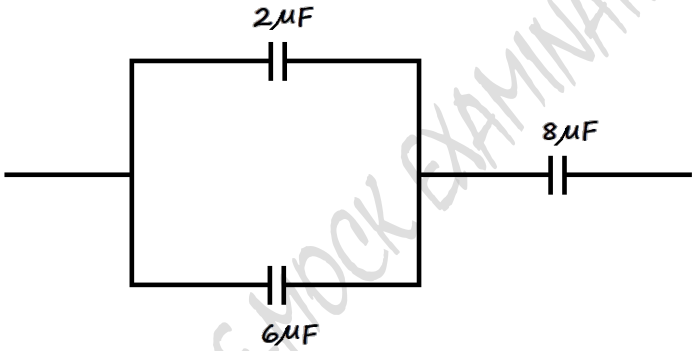


Figure 9

Determine the effective capacitance of the arrangement (3 marks)

……

……

……

17. a) When power stations generate electricity, it is always stepped up to very high voltages so as to be transmitted over long distances.

i) Explain why it is necessary to do so. (1 mark)

……

……

……

ii) State any **two** dangers of this high voltage transmission. (2 marks)

……

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b) **Figure 10** shows a section of a house wiring system.

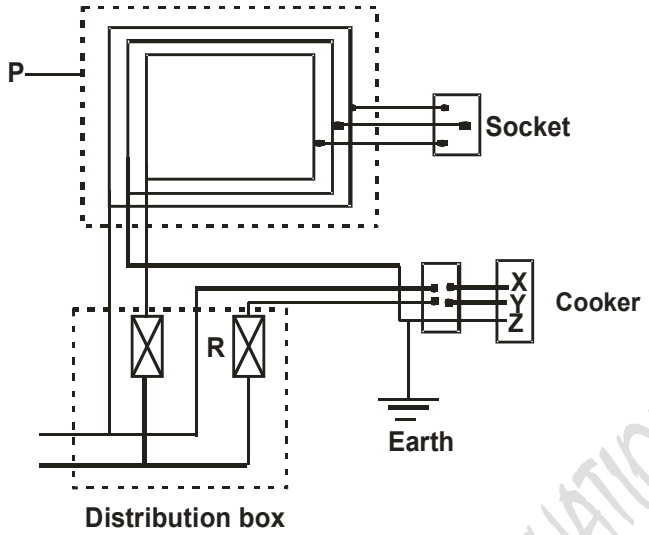

Figure 10

i) Name the circuit labeled **P**. (1 mark)

……

ii) Name the terminals labeled **X** and **Y**. (2 marks)

X ……

Y ……

iii) State the purpose of **R** in the circuit. (1 mark)

……

……

iv) Give a reason why **R** is connected to **Y** but not to **X**. (1 mark)

……

……

……

v) Why is the earthing necessary in such a circuit? (1 mark)

……

……

……

c) Determine the cost of using an electric iron box rated 1500W, for a total of 30 hours, given that, the cost of electricity is Ksh. 8 per unit. (2 marks)

……

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……

d) **Figure 11** shows a Geiger-muller tube:

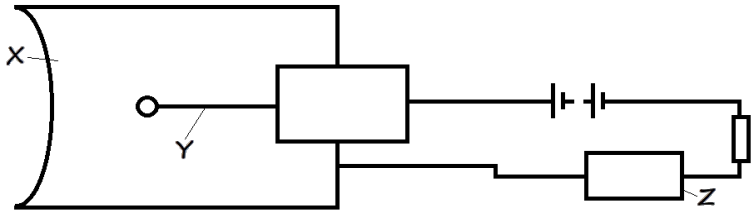

Figure 11

Name the parts labelled **X**, **Y**, **Z** (3 marks)

X ……

Y ……

Z ……

18. a) State **two** differences between hard and soft X-rays (2 marks)

……

……

……

……

b) **Figure 12** shows the features of an X-ray tube.

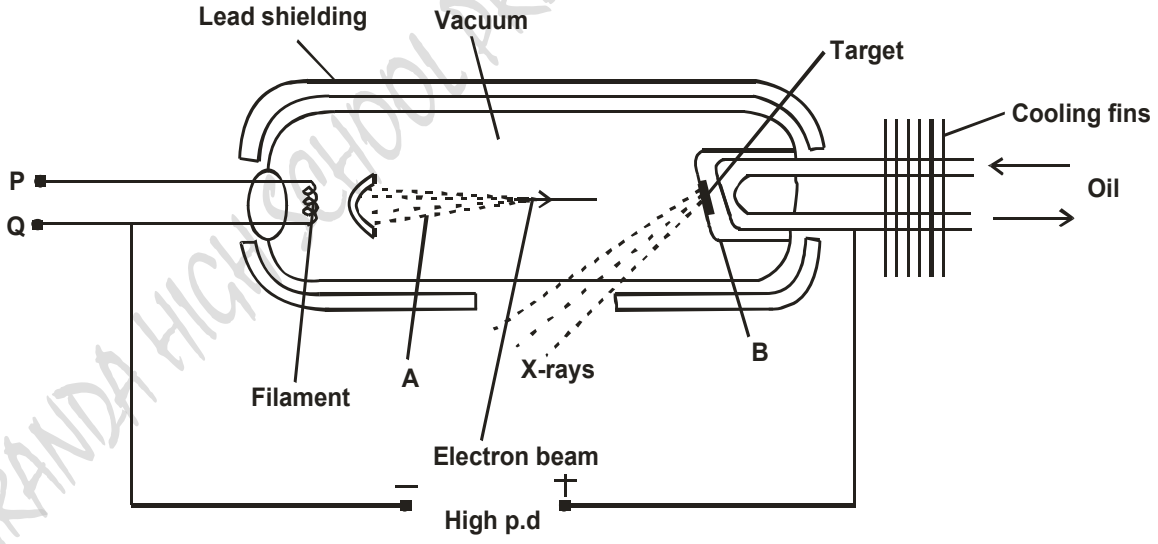

Figure 12

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

A……

B……

ii) Explain how a change in the potential across **PQ** changes the intensity of the X-rays produced in the tube. (2 marks)

……

……

……

……

iii) During the operation of the tube, the target becomes very hot. Explain how this heat is caused. (1 mark)

……

……

……

iv) What property of lead makes it suitable for use as a shielding material? (1 mark)

……

c) In a certain X-ray tube, the electrons are accelerated by a potential difference (P.d.) of 12000V. Assuming all the energy goes to produce X-rays, determine the frequency of the X-rays produced. (3 marks)

(Planck's constant h = 6.62 x 10^{-34}Js, and charge of an electron **e** = 1.6 x 10^{-19}C)

……

……

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……

19. a) State Fleming's left hand rule (1 mark)

……

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b) **Figure 13** shows an electric motor with a coil **ABCD** in the magnetic field

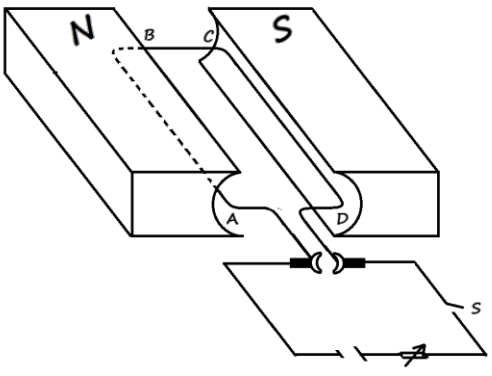

Figure 13

i) Indicate with an arrow on the coil **ABCD**, the direction of the current **I** when switch S is closed

ii) State the direction in which the coil rotates when the switch is closed (1 mark)

……

iii) Explain what makes the coil to rotate (3 marks)

……

……

……

……

iv) State **three** ways in which the power of this motor can be increased (3 marks)

……

……

……

……

v) State the purpose of the rheostat in the setup (1 mark)

……

……

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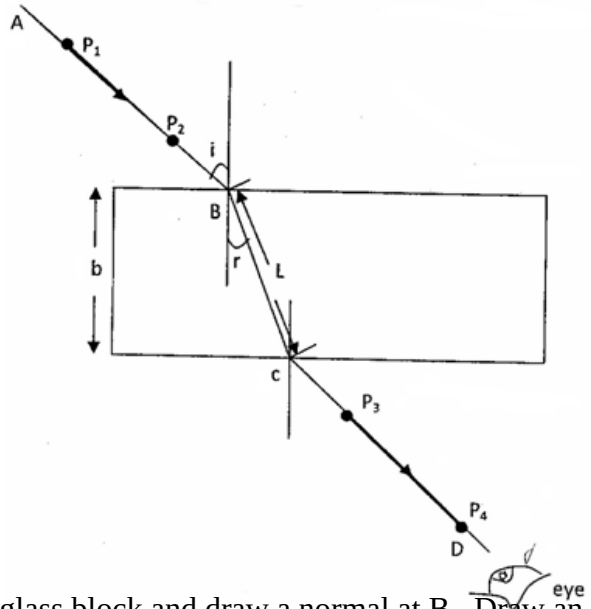
PREDICTION 10

PAPER 3

1. You are provided with the following:
   - A rectangular glass block.
   - 4 optical pins.
   - A softboard.
   - A plain paper.

   Proceed as follows:

   (a) Place the glass block on the plain paper with one of the largest face upper most. Trace round the glass block using a pencil as shown below.



   (b) Remove the glass block and draw a normal at B. Draw an incident ray AB of angle of incidence, i = 20°.

   (c) Replace the glass block and trace the ray ABCD using the optical pins.

   (d) Remove the glass block and draw the path of the ray ABCD using a pencil. Measure length L and record it in the table below.

Angle i°	L(cm)	$L^2(cm^2)$	$\frac{1}{L^2}\left(cm^{-2}\right)$	Sin^2 i
20				0.1170
30				0.2500
40				0.4132
50				0.5868
60				0.8830
70				

(6 marks)

e) Repeat the procedure above for the angles of incidence given.

Calculate the value of L^2 and $\frac{1}{L^2}$; Record in the table.

(e) Plot a graph of $\frac{1}{L^2}$ (y-axis) against $Sin^2 i$ (χ-axis). (5 marks)

(F) Calculate the gradient, S. (4 marks)

(i) Given that the equation of that graph: $\frac{1}{L^2} = -\left(\frac{1}{n^2 b^2}\right) Sin^2 i + \frac{1}{b_2}$

Determine the $\left(\frac{1}{L^2}\right)$ intercept C and the (Sin^2 i) intercept B. (4marks)

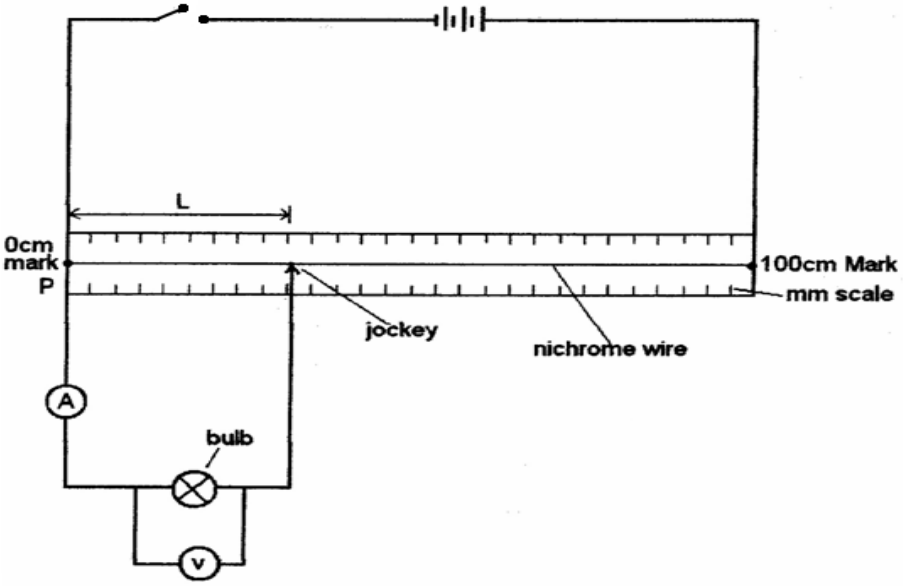
(j) Calculate the value of Q given by: (3 marks)

$$Q = -\left(\frac{C}{S}\right) \div B$$

(k) Hand in your constructions on the plain paper together with the answer script. (2marks)

2. You are provided with the following apparatus:
   - 2 size D dry cells.
   - 100cm nichrome wire on a mm scale.
   - A bulb (2.5v) and a bulb holder.
   - 8 conductivity wires (at least 4 with crocodile clips).
   - Cell holder.
   - A switch.
   - A voltimeter (0 – 5v).
   - An ammeter (0 – 1A).
   - A jockey.

   (a) Connect the apparatus provided as show in the diagram below.



Procedure

(b) Place the jockey at χ = 20cm from P, then close the switch.
Record the ammeter reading and the voltmeter reading in the table below.

(c) Repeat the experiment by placing the jockey at χ = 40, 60, 70 and 80cm from P.
Record your readings and complete the table below. 5marks

Length L(cm)	1(A)	Pd V(v)	1(mA)	Pd V(mv)	Log 1	Log V
20						
30						
40						
50						
60						
80						

d)Plot a graph of log I (y-axis) against log V. (5 marks)

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

(f) Given that Log I = n log v + log k where k and n are constants of the lamp.
(i) Determine using your graph the value of

K _____(2 marks)
N _____(1 mark)

PREDICTION 11
PAPER 2

SECTION A: (25 MARKS)

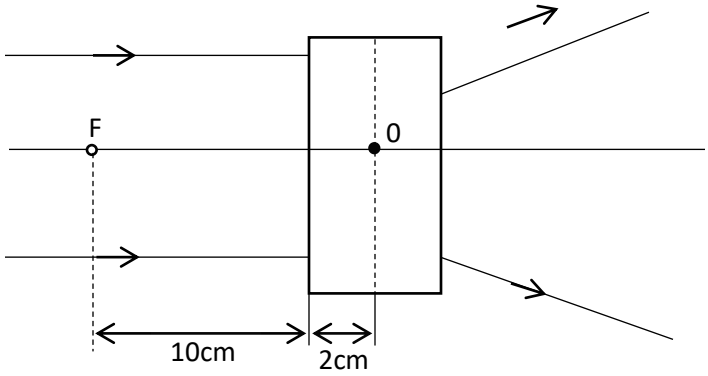
1. Explain why repulsion method is the sure test for polarity of a magnet as opposed to attraction. (1 mark)

2. Define the following;

   (i) the direction of an electric field. (1 mark)

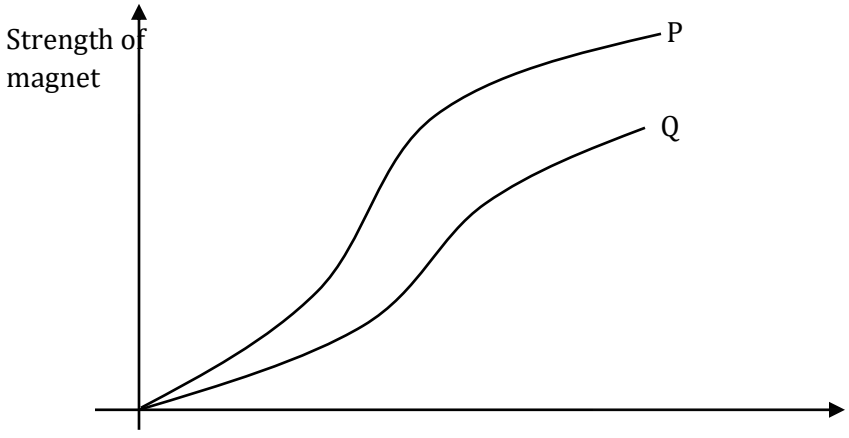
   (ii) the capacitance of a capacitor. (1 mark)

3. The diagram below shows a set of parallel rays of light incident on a thin lens and emerging out from the lens. The lens is placed inside a black box with narrow opening on both sides.



   (a) State the type of the lens in the box and explain your answer. (2 marks)

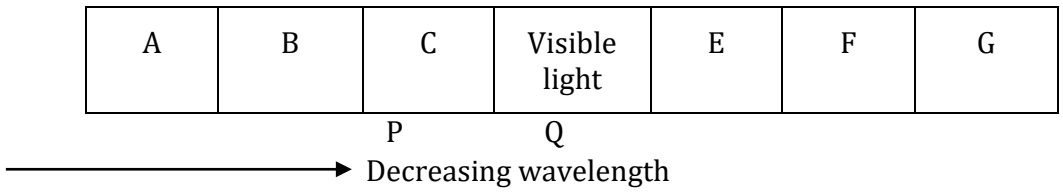
4. In an experiment to magnetize two substances P and Q using electric currents, two curves were obtained as shown below.



   (i) Explain the difference between substances P and Q with reference to domain theory. (1 mark

(ii) State and explain which of the two substances in (i) above would be suitable for use as a core of an electromagnet. (1 mark)

5.The letters in the figure below represents different types of radiations in the electromagnetic spectrum.



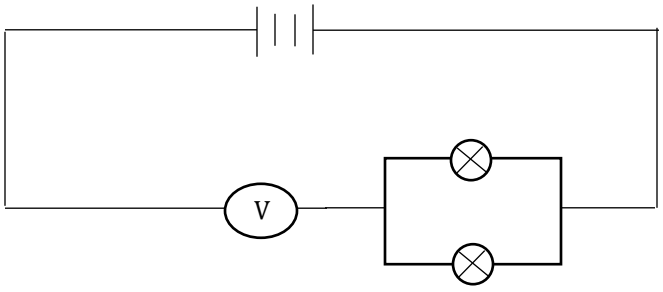
(i) Which colours of spectrum appears at P and Q?

P - …… (1 mark)

Q - …… (1 mark)

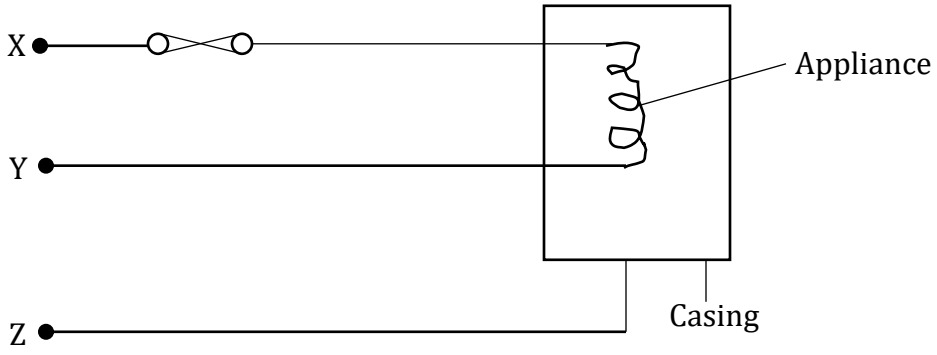
(ii) How is radiation marked C detected? (1 mark)

6.The diagram below shows a circuit that was connected by a form one student. Comment with a reason on the brightness of the bulbs. (2 marks)



7.A car battery requires topping up with distilled water occasionally. Explain why this is necessary and why distilled water is used. (2 marks)

8. The figure below shows the wiring in a modern mains appliance.



Identify the wires X, Y and Z. (2 marks)

X - ……

Y - ……

Z - ……

9. Three resistors of resistance 2.0Ω, 4.0Ω and 6.0Ω are connected together in a circuit. Draw a circuit diagram to show the arrangement to the resistors which gives;

(i) An effective resistance of 3.0Ω (2 marks)

(ii) A minimum resistance. (1 mark)

10.When rod X was rubbed with material Y, it was observed that the material acquired a negative charge.

(i) State the charge on the rod X. (1 mark)

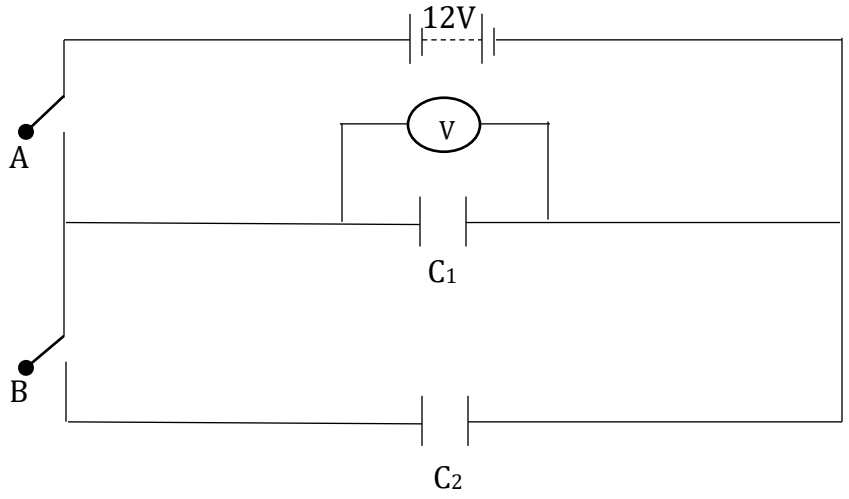
(ii) Explain how the rod X acquired the charge. (1 mark)

(iii) Explain briefly how you would test the nature of the charge on rod X using an electroscope. (2 marks)

11. Distinguish between intrinsic semi-conductor and extrinsic semiconductor. (1 mark)

SECTION B: (55 MARKS)

12. The following figure shows a circuit where a battery of an e.m.f. 12v, switches A and B, two capacitors C_1 = 9.0μF and C_2 = 3.0μF and a voltmeter connected as shown below.



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

(ii)What is the voltmeter reading when switch A is closed and switch B open?
(Assume capacitor C_1 is fully charged). (1 mark)

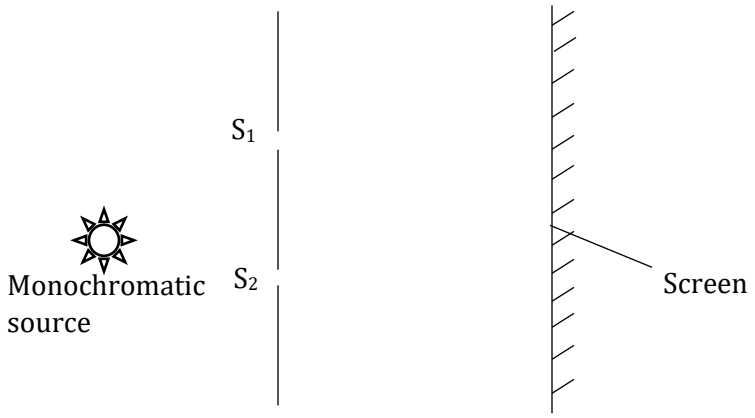
Suppose both Switch A and switch B are closed. Determine:

(iii) The effective capacitance of C_1 and C_2. (2 marks)

(iv) The voltmeter reading V. (3 marks)

(v) The energy stored by C_1 (2 marks)

13. (a) In an experiment to study one of the properties of waves, a double slit was placed close to the source of monochromatic light as shown below.



(i) What property of waves is being investigated? (1 mark)

(ii) State the function of the double slit. (1 mark)

(iii) State and explain the observation made on the screen. (2 marks)

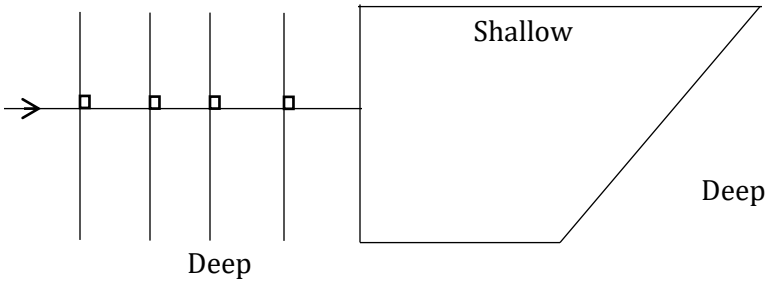
(iv) State what is observed on the screen when;

(I) the slit separation S_1 S_2 is decreased. (1 mark)

(II) White source of light is used in place of monochromatic source. (1 mark)

(III) S_1 and S_2 are made larger. (1 mark)

(b) The diagram below shows plane wave fronts in a ripple tank incident on a boundary between a deep to shallow region.



On the same diagram, sketch the wave pattern in and beyond the shallow region. (2 marks)

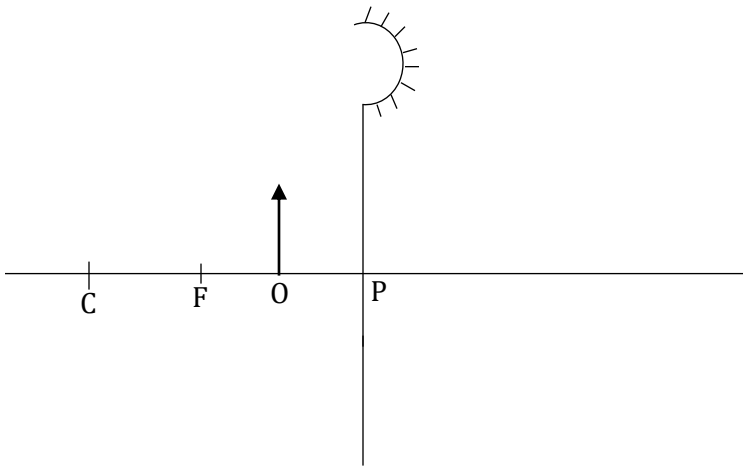
(c) The equation below represents a nuclear decay. (1 mark)

$$^{232}_{90}W \xrightarrow{A} {}^{228}_{88}X$$

Identify the radiation A.

A - ……

14. (a) The diagram below shows an object O placed in front of a concave mirror as shown.

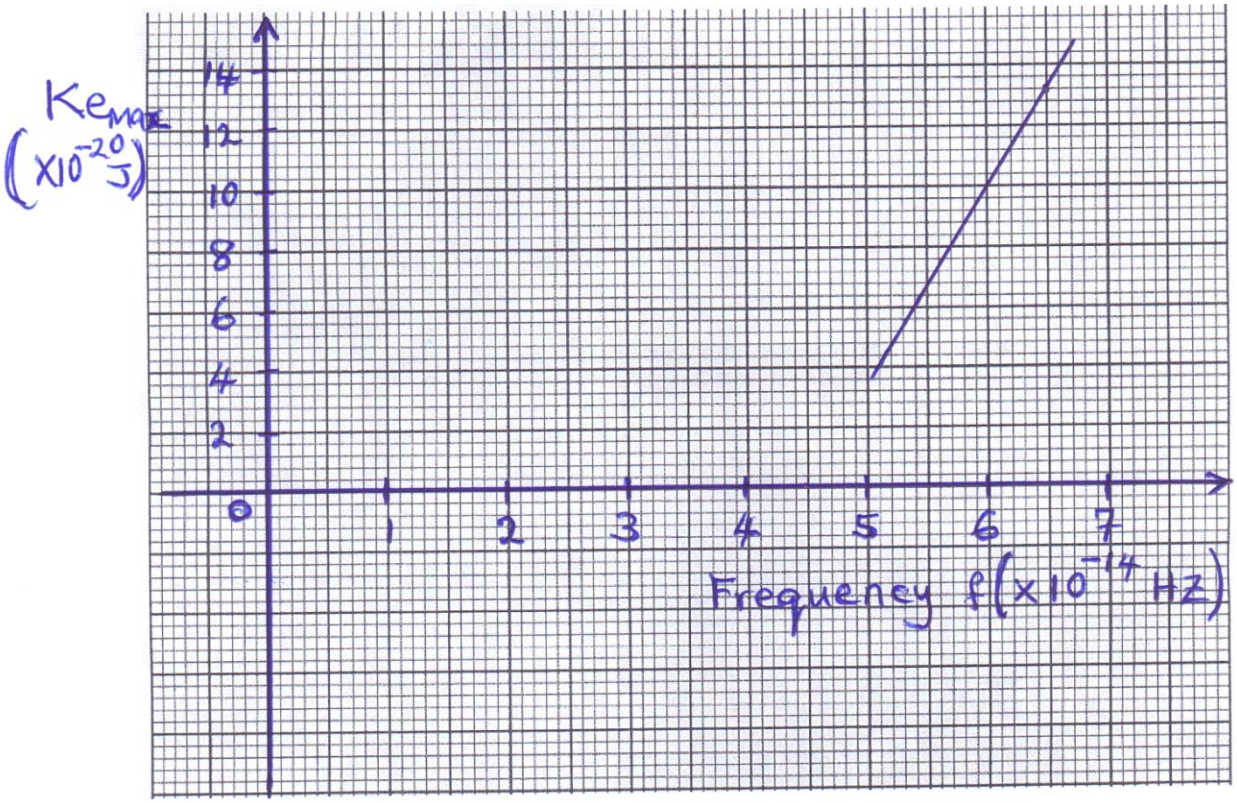


(i) Complete the diagram to show the image formed. (2 marks)

(ii) State two characteristics of the image formed. (1 mark)

(b) (i) State two factors that determine the speed by which electrons are emitted from metal surface by light falling on it. (2 marks)

(ii) In an experiment using a photocell, light of varying frequency but constant intensity was shone onto the surface of a metal. The maximum kinetic energy, $(Ke)_{max}$ emitted for each frequency, was determined. The graph below shows how Ke_{max} varies with frequency f.



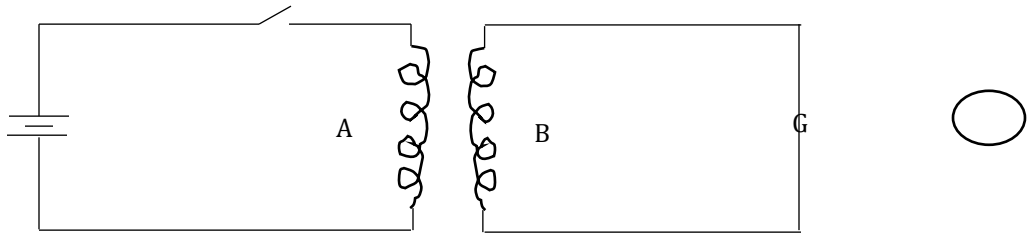
From Einstein's equation, $hf = \Theta + Ke_{max}$, where Θ is the work function. Determine.

(i) The threshold frequency, f_0 from the graph (1 mark)

(ii) the planks constant, h (2 marks)

15. (a) An electric cooker has an oven rated 3KW, a grill rated 2KW and two rings each rated at 500W. The cooker operates from 240V mains. What is the cost of operating all the parts for 30 minutes if electricity cost Ksh.6.50 per unit? (3 marks)

(b) Fig. below shows identical copper coils A and B placed close to each other. Coil A is connected to a d.c. power supply while coil B is connected to a galvanometer.



(i)State and explain what is observed on the galvanometer when the switch is closed. (2 marks)

(ii) State what is observed on the galvanometer when the switch is opened. (1 mark)

(iii) State what would be observed if the number of turns of coil B is doubled. (1 mark)

(c)A transformer with 2000 turns in the primary circuit and 150 turns in the secondary circuit has a primary circuit connected to a 800V ac source. It is found that when a heater is connected to the secondary circuit, it produces heat at the rate of 1000w. Assuming 90% efficiency, determine the;

(i) Voltage in the secondary circuit. (2 marks)

(ii) the current in the primary circuit. (2 marks)

(iii) Current in the secondary circuit (1 mark)

(d)A cell drives a current of 5A through a 1.6Ω resistor. When connected to a 2.8Ω resistor, the current that flows is 3.2A. Determine the e.m.f. (E) and internal resistance (r) of the cell. (4 marks)

16. (a) State how each of the following can be increased in an x-ray tube.

(i) Intensity of x-rays. (1 mark)

(ii) Penetrating power of x-rays. (1 mark)

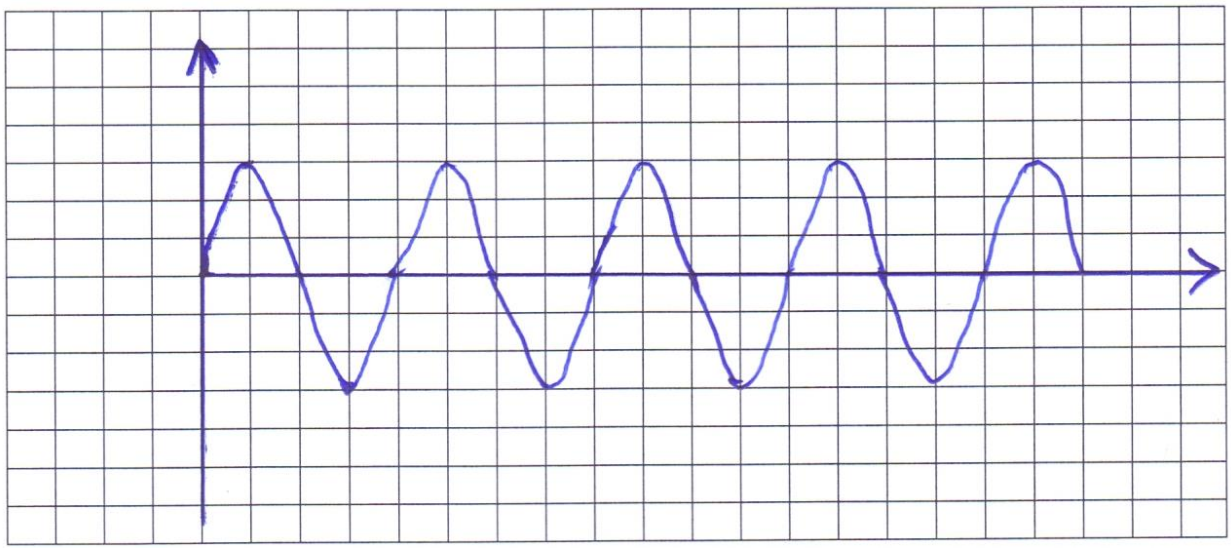
(b)An x-ray tube has an electron beam current of 10mA and is accelerated through a p.d of 60KV. The efficiency is 99.5%. Calculate;

(i) The input power (2 marks)

(ii) The quantity of heat produced per second. (1 mark)

(ii) the number of electrons hitting the target per second.(take e=1.6×10^{-19}C) (2 marks)

(c) The fig. below shows an a.c. signal on the C.R.O screen.



Determine:

(i) The frequency of the signal given that the time base is set at 10ms/div. (2 marks)

(ii) The peak voltage of the signal given that the y-gain is set at 50v/div (2 marks)