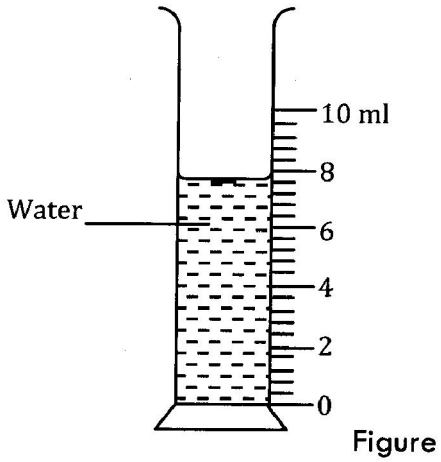
K.C.S.E 2012 PHYSICS PAPER 1
SECTION A (25 marks)

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

1 **Figure 1** shows a measuring cylinder containing some water.



Figure

Determine the reading on the measuring cylinder, after three drops of water each of volume 0.6 cm^3 are added. (2 marks)

2. A student pulls a block of wood along a horizontal surface by applying a constant force. State the reason why the block moves at a constant velocity. (1 mark)

3. A solid weighs 16.5 N on the surface of the moon. The force of gravity on the moon is 1.7 $Nkg"^1$. Determine the mass of the solid. (3 marks)

4. A bottle containing a smelling gas is opened at the front bench of a classroom. State the reason why the gas is detected throughout the room. (1 mark)

5 **Figure 2** shows a flat bottomed flask containing some water. It is heated directly with a very hot

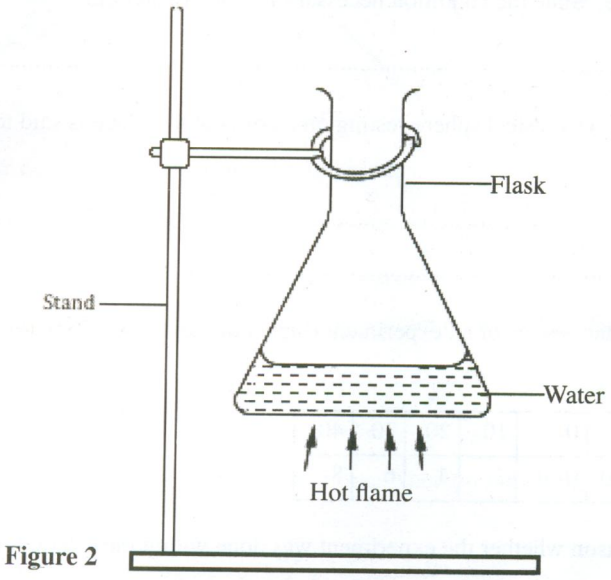


Figure 2

Explain why the flask is likely to crack. (2 marks)

6. State **two** environmental hazards that may occur when oil spills over a large surface area of the sea. (2 marks)

7 A balloon is filled with a gas which is lighter than air. It is observed to rise in air upto a certain height. State a reason why the balloon stops rising. (1 mark)

8 In verifying the pressure law of gases, the temperature and pressure of a gas are varied at constant volume. State the condition necessary for the law to hold. (1 mark)

9. State the reason why a steel sphere resting on a horizontal surface is said to be in neutral equilibrium. (1 mark)

10 **Table 1** shows the results of an experiment carried out to study the properties of a spring **Table 1**

Force (N)	0	10	20	30	40
Extension (cm)	0	2	4	6	8

State with a reason whether the experiment was done within the elastic limit of the spring. (2 marks)

11 **Figure 3** shows a graph of velocity against time for a moving body.

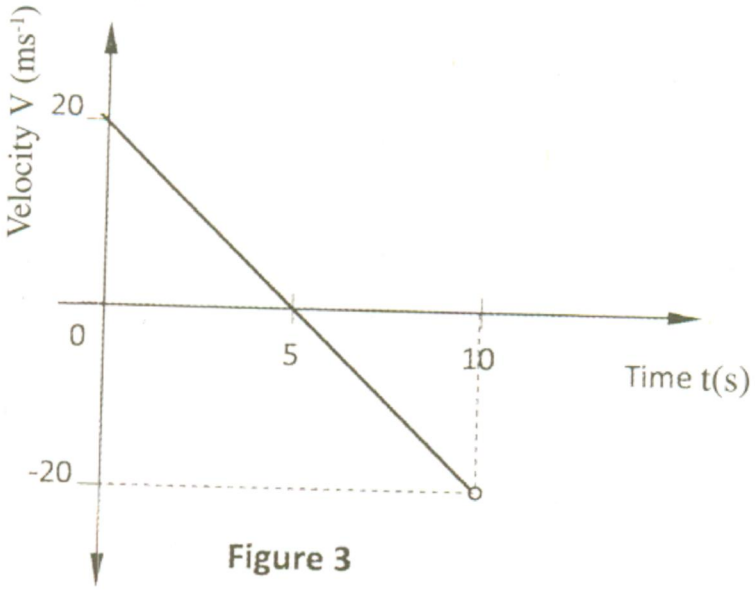


Figure 3

Describe the motion of the body during the 10 seconds. (2 marks)

12 State **two** reasons why the efficiency of a pulley system is always less than 100%. (2 marks)

13 **Figure 4** shows a graph of temperature against time when pure melting ice at 0°C is heated uniformly.

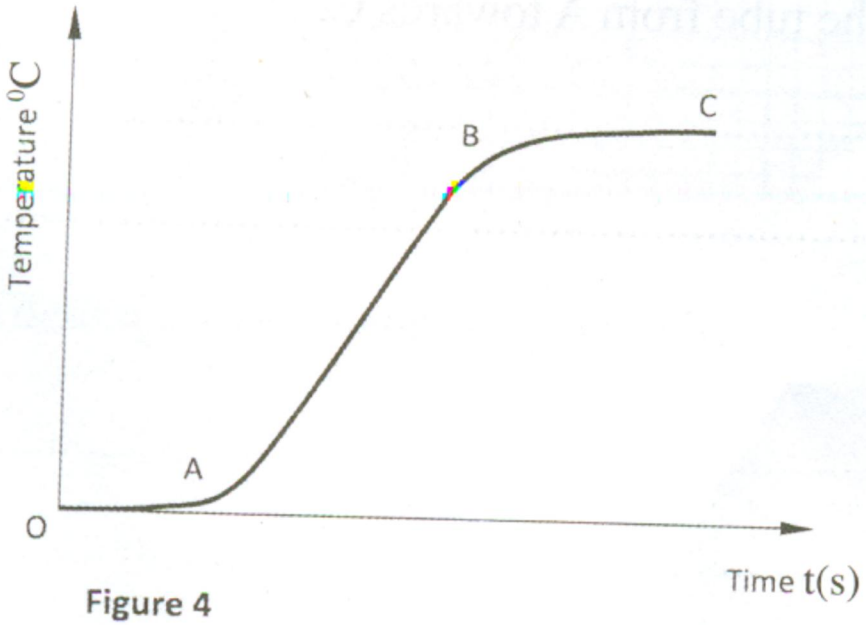


Figure 4

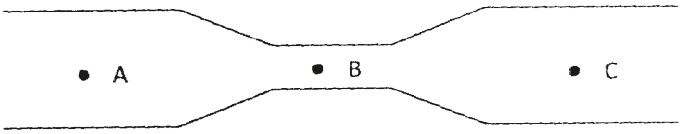
Explain what happens between parts:

i) OA: _____ (1 mark)

(ii) AB_____ (1 mark)

14 (a) An aeroplane is moving horizontally through still air at a uniform speed. It is observed that when the speed of the plane is increased, its height above the ground increases. State the reason for this observation. (1 mark)

(b) **Figure 5** shows parts A, B and C of a glass tube.



State with a reason the part of the tube in which the pressure will be lowest when air is blown through the tube from A towards C. (2 marks)

SECTION B (35MARKS)
Answer all the questions in this section in the spaces provided.

15. a) Figure 6 shows a graph of volume against temperature for a given mass of gas.

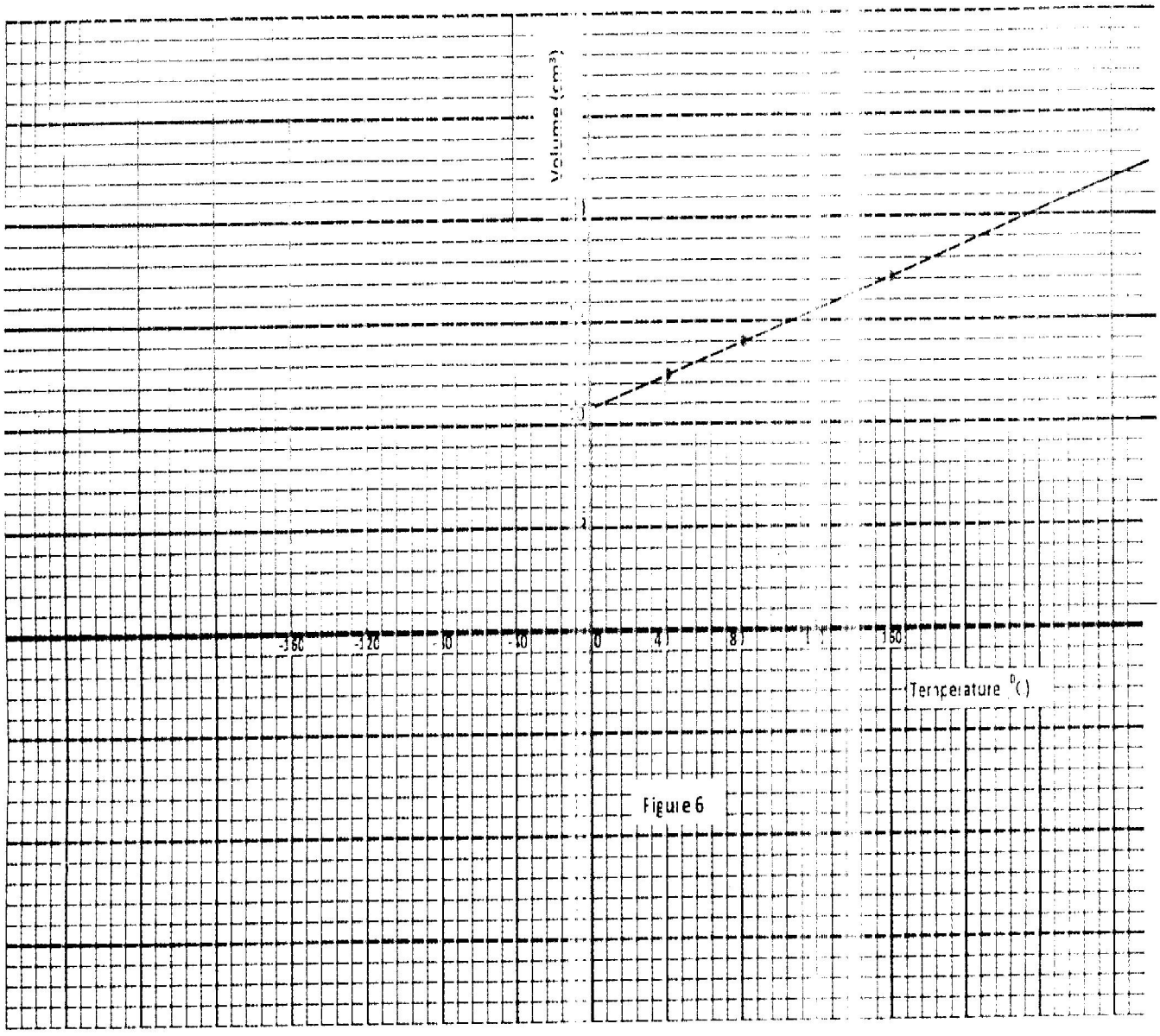
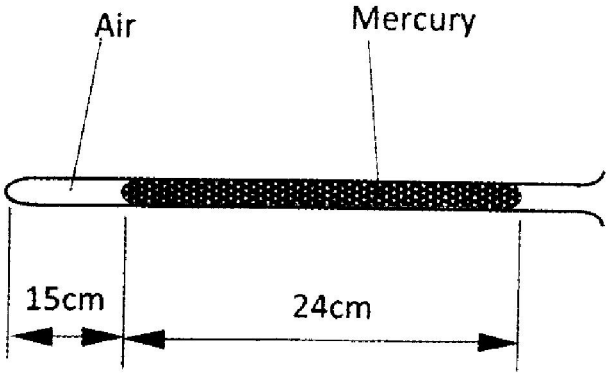


Figure 6

Use the graph to determine the absolute zero temperature in ºC. (2marks)

b) **Figure** 7 shows a horizontal tube containing air trapped by a mercury thread of length 24 cm. The length of the enclosed air column is 15 cm. The atmospheric pressure is 76 cm Hg.



(i) State the pressure of the enclosed air. (1 mark)

(ii) The tube is now held in a vertical position with the open end facing upwards as shown in **Figure 8.**

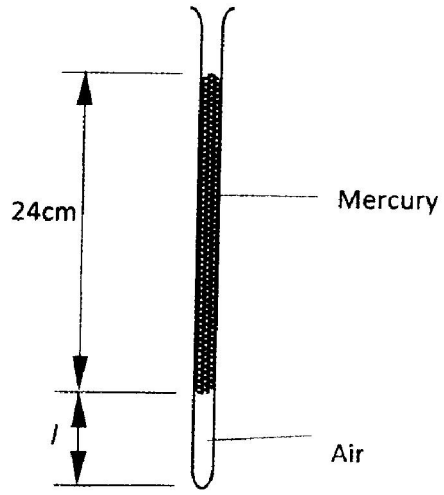


Figure 8

Determine:

(I) The pressure of the enclosed air. (1 mark)

(II) The length (ι) of the enclosed air column. (3 marks)

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

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

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

iii) Explain your answer in c (ii) (2marks)

16 (a) **Figure** 9 shows a trolley on a smooth surface being pulled by a constant force F.

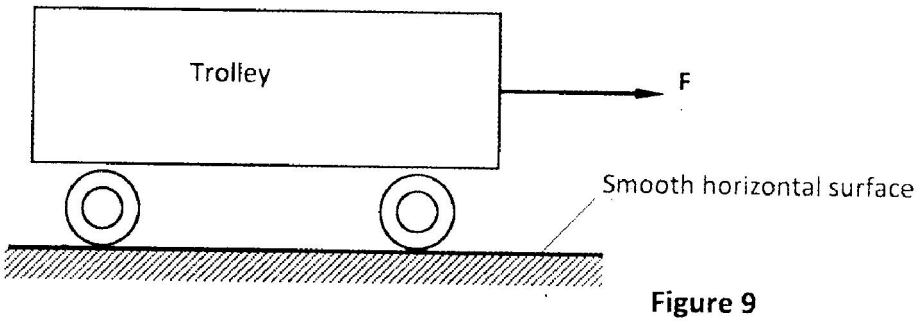
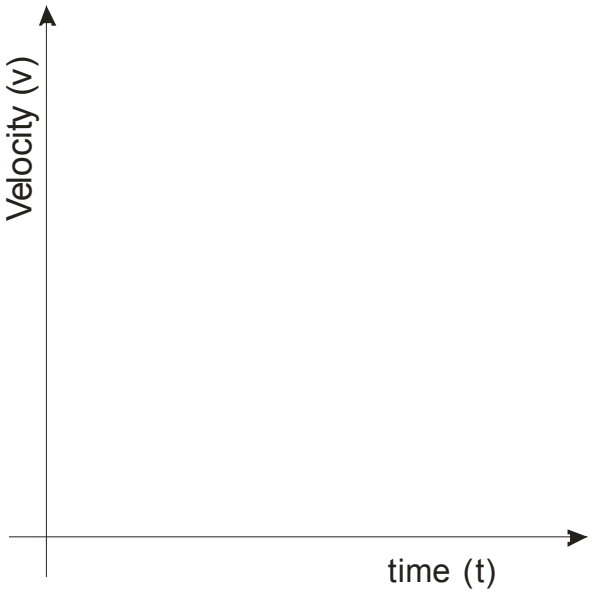


Figure 9

i) On the axis provided, sketch the velocity-time graph for the motion of the trolley. (2 marks)



ii) A parachute falling through the air attains terminal velocity after a short-time. State the reason why it attains terminal velocity. (1 mark)

(b) A ball of mass 200 g is thrown vertically upwards with velocity of 5 ms"[1]. The air resistance is 0.4 N.

Determine;

(i) The net force on the ball as it moves up;
(Take acceleration due to gravity g = 10 m^{-2}) (2 marks)

(ii) The acceleration of the ball; (3 marks)

(iii) The maximum height reached by the ball. (3 marks)

(c) **Figure 10** shows the path of an object of mass m attached to a string of length r when whirled in a vertical circle at a constant speed V. A is the highest point on its path.

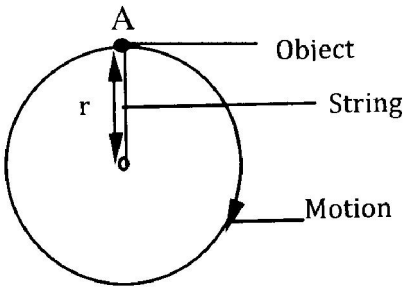


Figure 10

(i) State the forces that provide the centripetal force on the object when it is at point A. (2 marks)

(ii) Indicate with an arrow on the diagram the direction of the net force F acting on the object when it is at A. (1 mark)

17(a) **Figure 11** shows how an underground room was ventilated. It had two vents, one at A and the other at B. A fire was lit at point C.

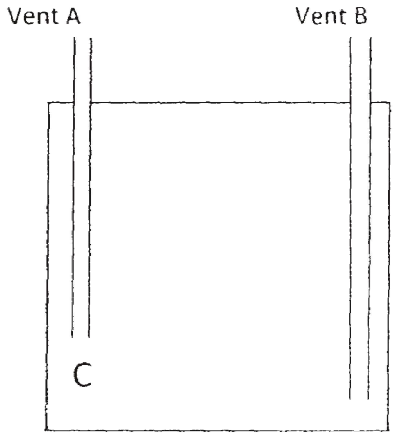
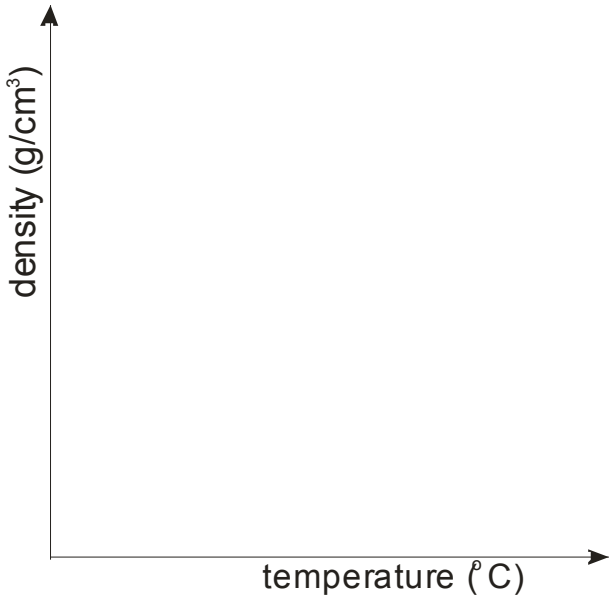


Figure 11

Explain what happened to the ventilation when the fire was lit. (3marks)

b) Explain how a vaccum flask minimizes loss of heat through radiation. (1mark)

c) In an experiment to investigate the unusual expansion of water, a fixed mass of water at 0°C was heated until its temperature reached 20°C. On the axis provided, sketch a graph of density against temperature of the water from 0°C to 20°C. (2marks)



d) An immersion heater rated 2.5kW is immersed into a plastic jug containing 2kg of water and switched on for 4 minutes. Determine;

i) the quantity of heat gained by the water (2marks)

ii) the temperature change for the water; (3marks)
(take specific heat capacity of water as 4.2 x $10^3 Jkg^{-1}K^{-1}$).

18. a) Figure 12 shows a set up used to determine the mass of a solid S. The rod is pivoted at its centre of gravity C.

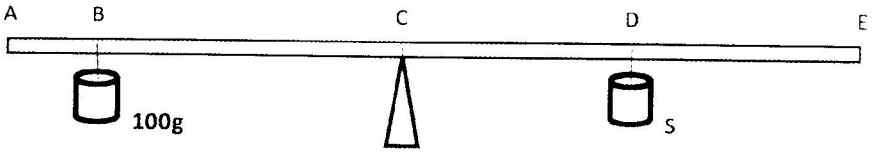


Figure 12

i) State two measurements that need to be made to determine the mass of solid S.
(1 mark)

ii) Write an expression to show how the measurements in (i) above are used to obtain the mass of S.
(2marks)

b) Figure 13 shows a log of wood of mass 20kg submerged in water in a pond and held in position by a string fixed to the bottom of the pond.

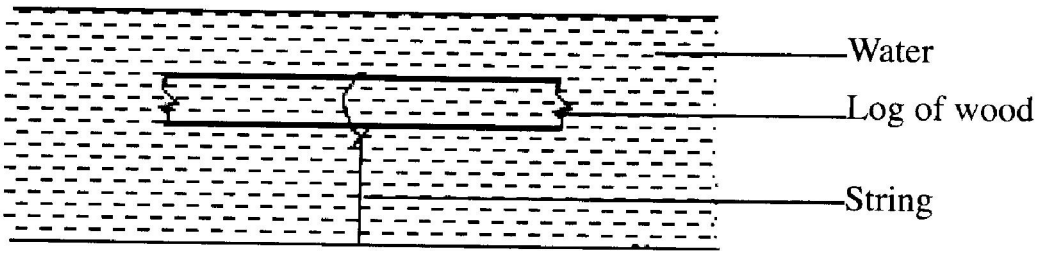


Figure 13

Given that the density of water is 1000kgm^{-3} and that of wood is 800kgm^{-3}, determine the;

i) Volume of the log. (3marks)

ii) Upthrust on the log.. (2marks)

iii) Tension in the string (2marks

19. a) Figure 14 shows a lift pump.

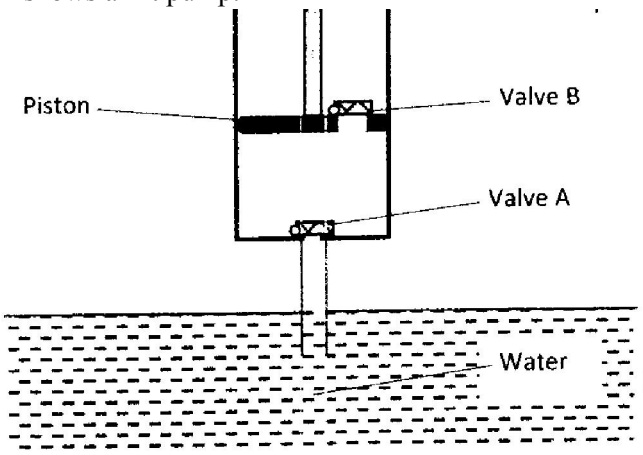


Figure 14

Explain why, when the piston is;
i) pulled upwards, valve A opens while valve B closes. (2marks)

ii) pushed downwards, valve A closes while valve B opens. (2marks)

b) After several strokes, water rises above the piston as shown in Figure 15.

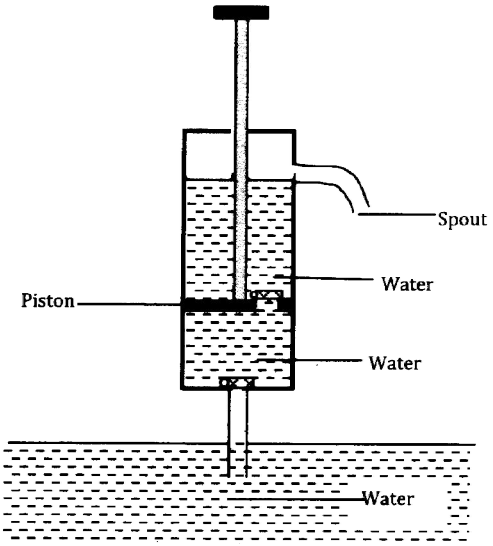


Figure 15

State how water is removed from the cylinder through the spout. (1mark)

c) A lift pump can lift water to a maximum height of 10m. Determine the maximum height to which the pump can raise paraffin.
(take density of paraffin as 800kgm-3 and density of water as 1000kgm-3). (3marks)

d) State one factor that determine the determines the height to which a force pump can lift water.

(1mark)

K.C.S.E 2012 PHYSICS PAPER 2

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

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Figure 1, shows a plane mirror XY placed equidistant from two parallel lines AB and PT.

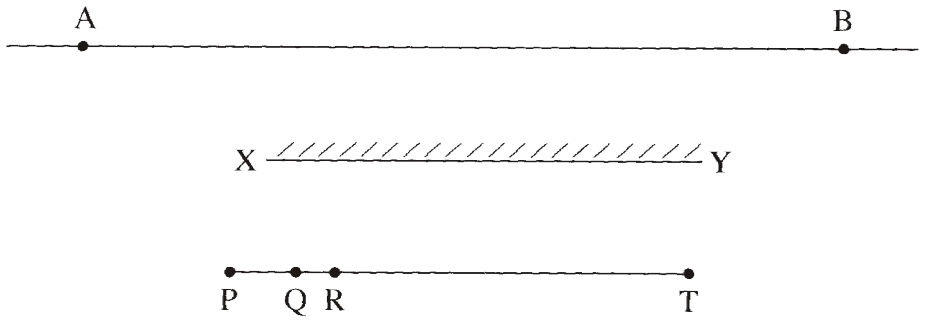


Figure 1

Four students stand at P, Q, R and T in front of the mirror

(a) Indicate the positions of the images of students at Q, R and T on line AB. (1 mark)

(b) State which of the three images are visible to the student standing at P. (1 mark)

(c) Using rays indicate on the figure, how (b) above is possible. (1 mark)

Figure 2, shows two mirrors PQ and QR inclined at an angle of 110°. A ray of light is incident on mirror PQ at an angle of 60°.

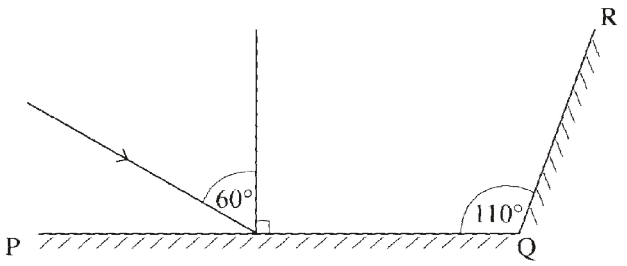


Figure 2

Complete the diagram to determine the angle of reflection of the ray in the mirror QR. (3 marks)

3. Figure 3, shows four identical light bulbs connected to a 15 volt battery whose internal resistance is negligible.

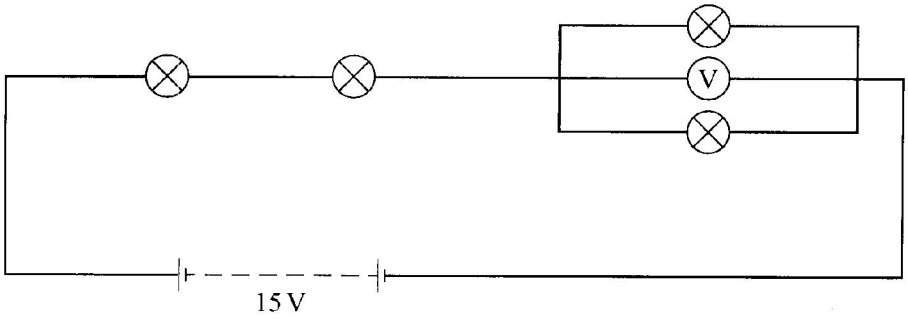


Figure 3

Determine the reading of the voltmeter V. (2marks)

4. Figure 4, shows a negative point charge placed near a positively charged rod.

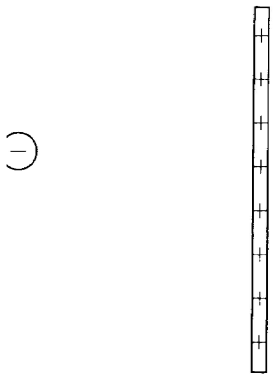


Figure 4

Draw on the diagram, the resulting electric field pattern. (2marks)

5. Figure 5, shows an object O at the bottom of a beaker full of a liquid. An observer above the beaker sees its image at point X inside the liquid.

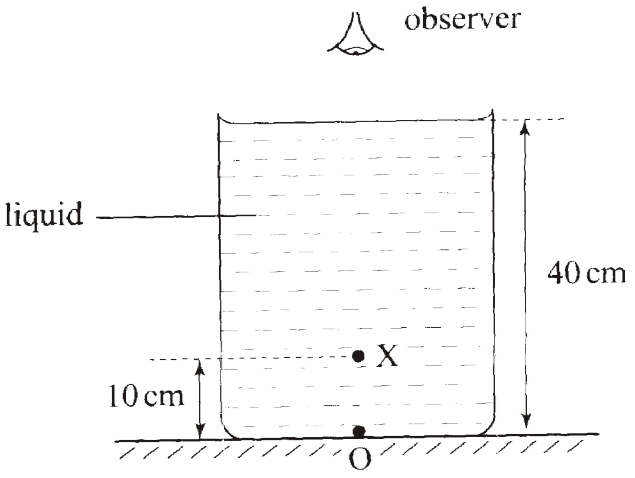


Figure 5

Determine the refractive index of the liquid. (3marks)

6. Figure 6, shows a narrow beam of radiation from a radioactive sources, incident to a postcard. The emergent radiation passes through a magnetic field which is perpendicular to the plane of the paper, and into the paper.

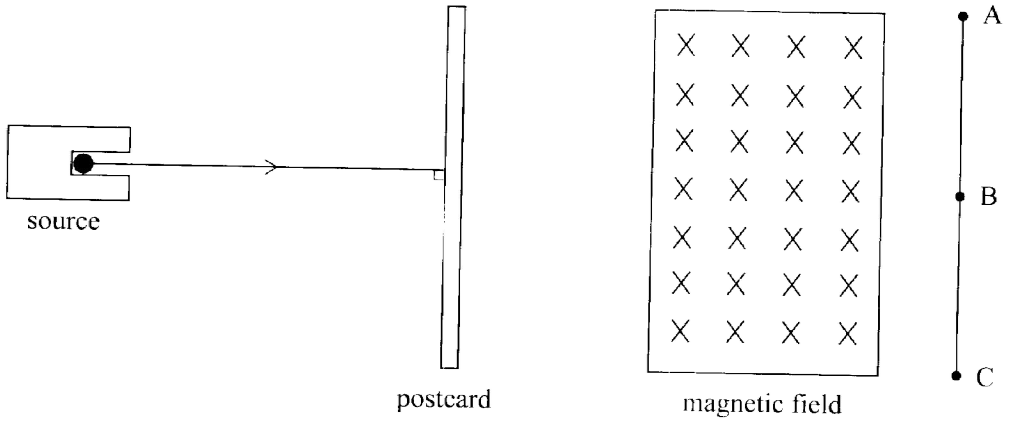


Figure 6

A detector moved along line AC detects radiations only at points B and C. State the two types of radiation detected. (1mark)

7. Figure 7, shows two similar coils P and Q around the end L and M of a piece of soft iron. A steady current passes through the coils.

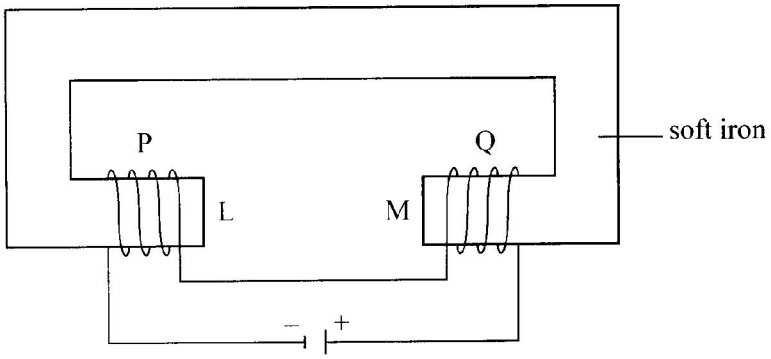


Figure 7

State the polarity of the resulting magnet at end L. (1mark)

8. Light from a lamp falls on the cap of a negatively charged electroscope. It is observed that the divergence of the leaf decreases. Explain the observation. (2 marks)

9. Figure 8, shows an object O placed in front of a diverging lens whose principal focus is F.

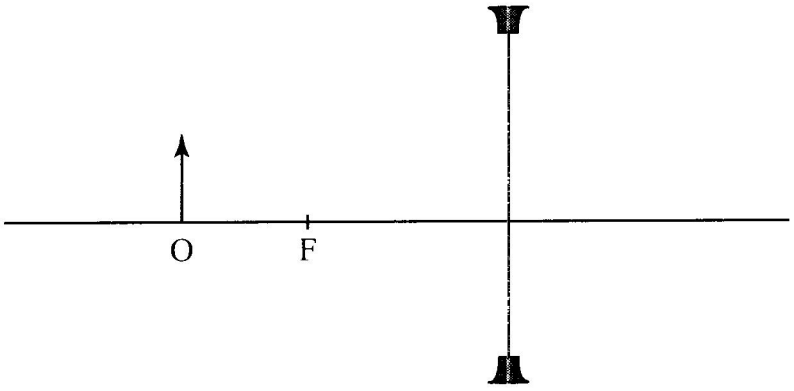


Figure 8

On the figure, draw a ray diagram to locate the image formed. (3marks)

10. Figure 9, shows the cross-section of an optical fibre made of two types of glass. A and B. The refractive index of B is lower than that of A.

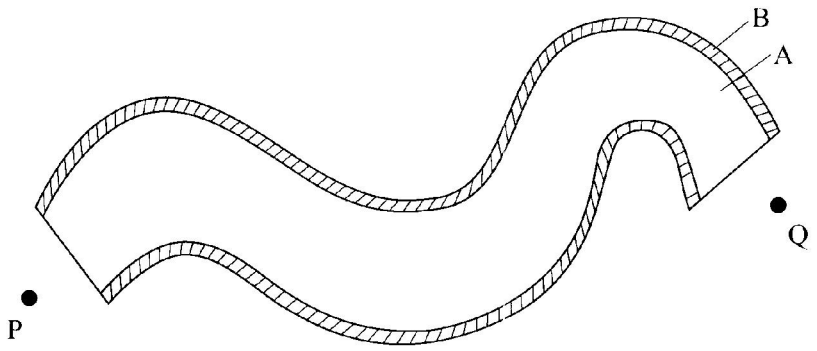


Figure 9

A ray of light enters the optical fibre at P and emerges from Q.
i) Sketch the path of the ray through the fibre. (1mark)

ii) State the reason why light travels through the fibre as in (i) above. (1mark)

11. Figure 10. Shows the cross section of a conductor held between two magnets and carrying a current out of the paper.

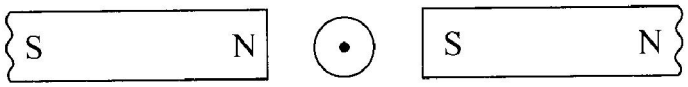


Figure 10

Indicate with an arrow on the diagram the direction in which the conductor will move when it is released. (1mark)

12. State why alternating current (a.c.) is used for transmitting electricity over long distances. (1marks)

13. Figure 11, shows an alternating current (a.c) connected across a diode D and a resistor R.

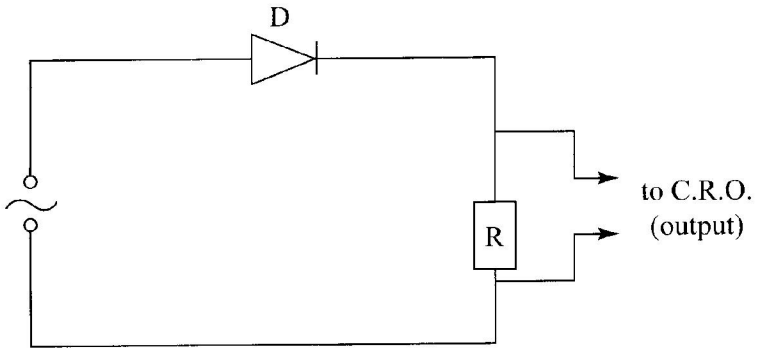
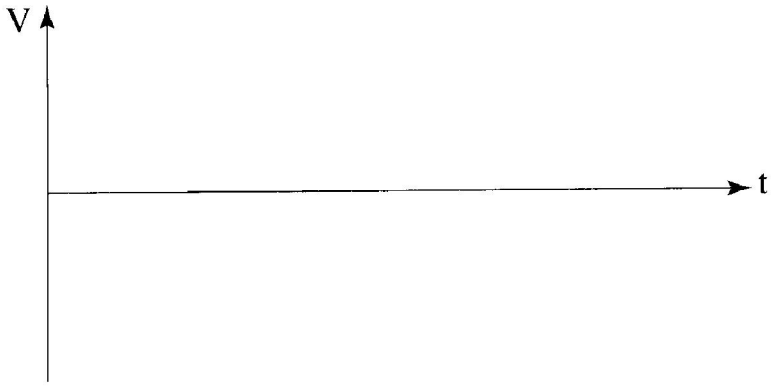


Figure 11

On the axes provided sketch the output as observed in the C.R.O. connected across R.
(1mark)



SECTION B (55 marks)
Answer All the questions in this section in the spaces provided.
14. a) Figure 12, shows a displacement – time graph for a progressive wave.

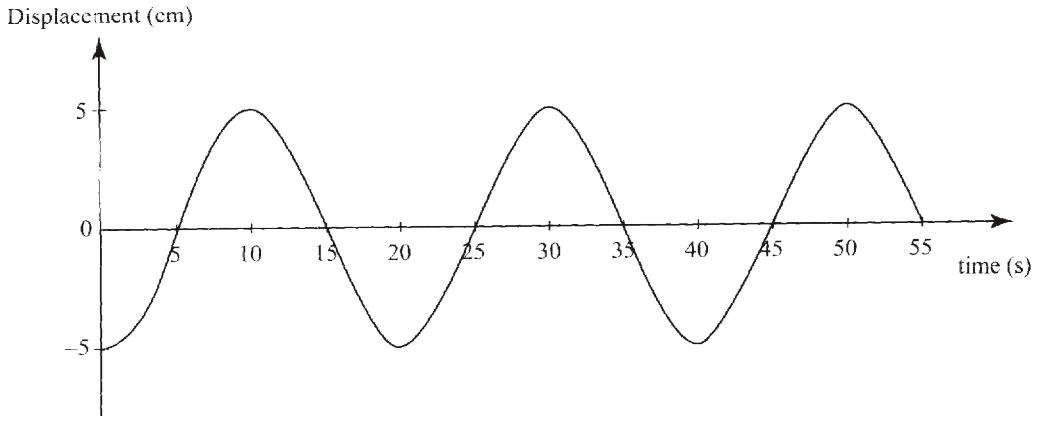


Figure 12

i) State the amplitude of the wave. (1 mark)

ii) Determine the frequency of the waves (4marks)

iii) Given that the velocity of the wave is 20ms-1, determine its wavelength. (3marks)

b) Figure 13, shows two identical dippers A and B vibrating in water in phase with each other. The dippers have the same constant frequency and amplitude. The waves produced are observed along the MN;

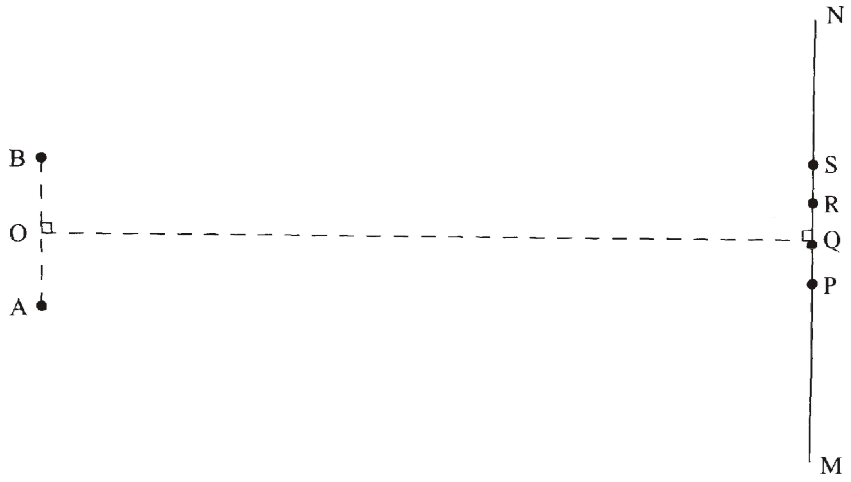


Figure 13

It is observed that the amplitudes are maximum at points Q and S, and minimum at points P and R.

i) Explain why the amplitude is maximum at Q. (2marks)

ii) State why the amplitude is minimum at R. (1mark)

iii) State what would happen if the two dippers had different frequencies (1mark)

15. Figure 14, shows a circuit in which a battery, a switch, a bulb, a resistor P, a variable resistor Q, a voltmeter V and two ammeters A_1 and A_2 of negligible resistance are connected.

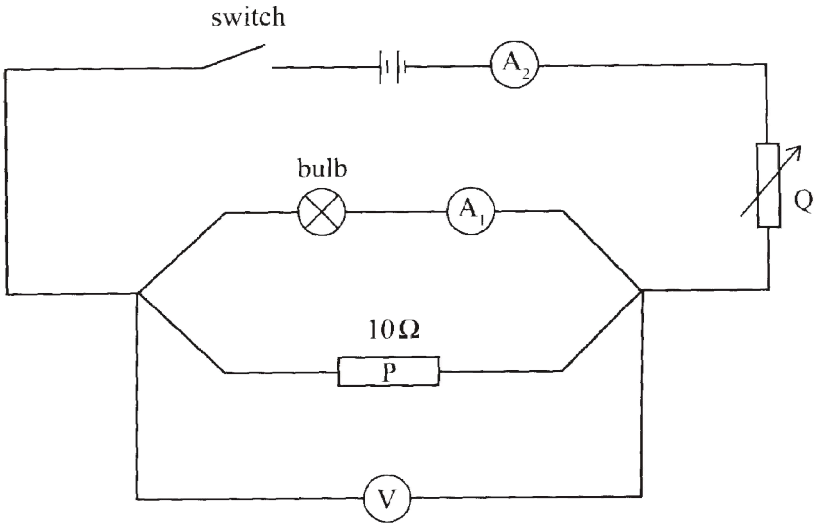


Figure 14

P has a resistance of 10Ω . When the switch is closed, A_1 reads 0.10A and the voltmeter reads 1.5V.

a) Determine;
i) the current passing through P; (3marks)

ii) the resistance of the bulb. (2marks)

b) The variable resistor Q is now adjusted so that a larger current flows through A2.

i) State how this will affect the resistance of the bulb (1mark)

ii) Explain your answer in b) (i) (2marks)

c) A house has one 100W bulb. Two 60W bulbs and one 30W bulb. Determine the cost of having all the bulbs switched on for 70 hours, given that the cost of electricity is 40cents per kilowatt hour. (3marks)

16. a) Figure 15, shows two coils A and B placed close to 3each other. A is connected to a steady D.C. supply and a switch, B is connected to a sensitive galvanometer.

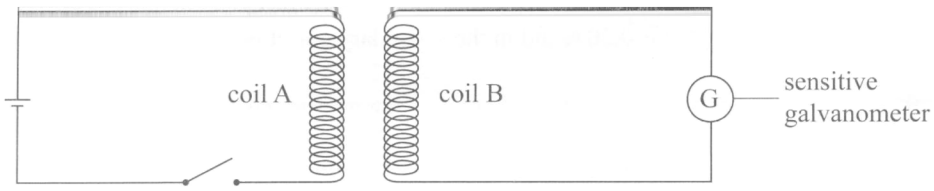


Figure 15

i) The switch is now closed, state the observation made on the galvanometer. (2marks)

ii) Explain what would be observed if the switch is then opened. (2marks)

b) The primary coil of a transformer has 1000 turns and the secondary coil has 200 turns. The primary coil is connected to a 240V ac. Mains supply.

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

ii)Determine the secondary voltage. (3marks)

iii) Determine the efficiency of the transformer given that the current in the primary coil is 0.20A and in the secondary coil it is 0.80A. (3marks)

17. a) Figure 16, shows a graph of magnification against object distance, for an object placed in front of a lens of focal length 20cm.

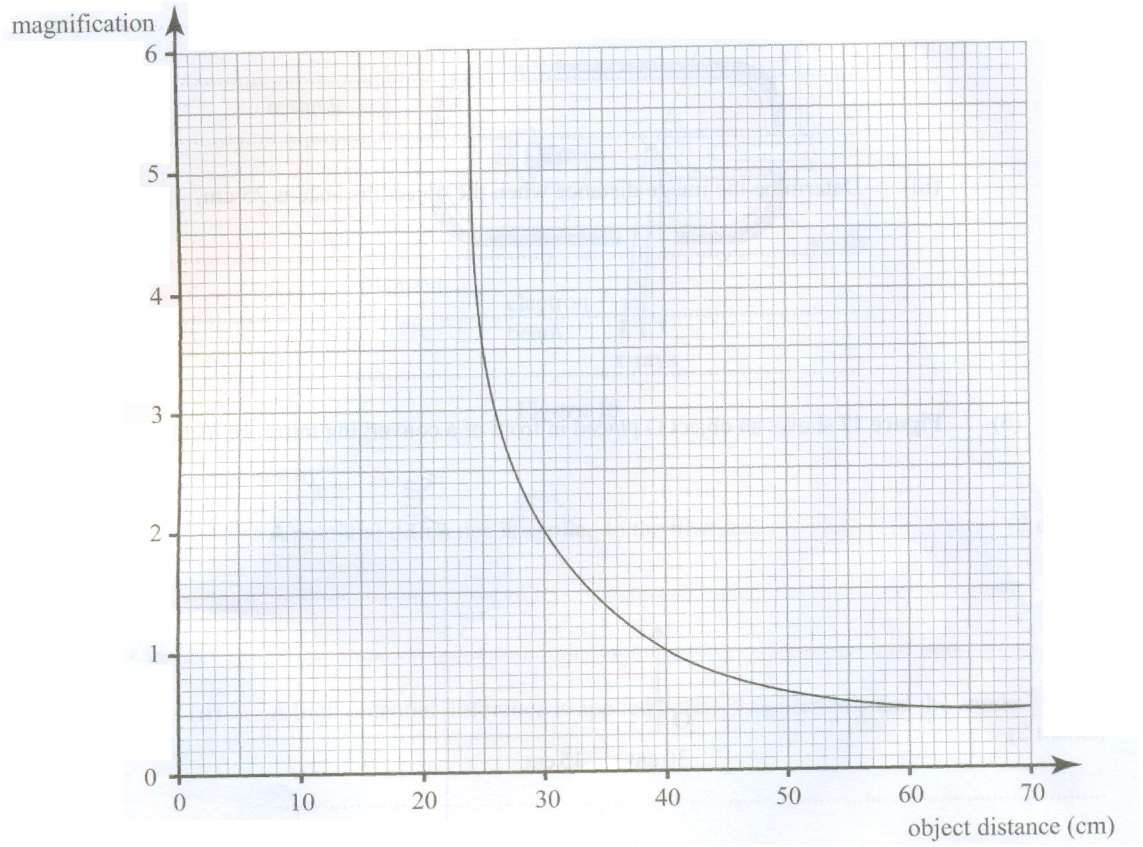


Figure 16

Using the graph;

i) State the effect on the size of the image when the object distance is increased from 25cm. (1mark)

ii) Determine the distance between the object and the lens when the image is the same size as the object. (2marks)

iii)Determine the image distance when the object distance is 25cm. (3marks)

b) Figure 17 shows an object O placed in front of a converging mirror of focal length 15cm.

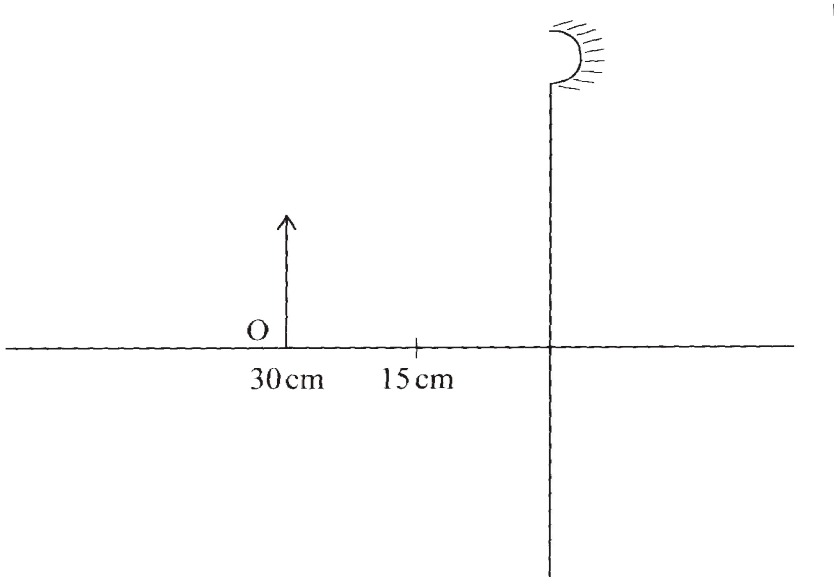


Figure 17

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

c) State why parabolic reflectors are used in car headlights. (1mark)

18. Figure 18 shows the parts of an x-ray tube.

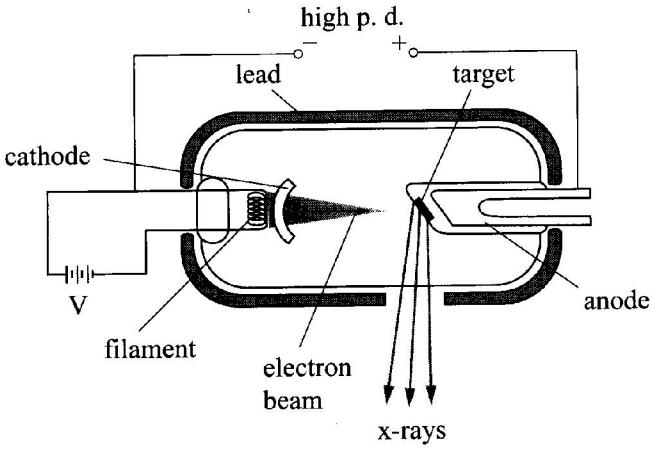


Figure 18

a) Explain why;
i) A potential difference is applied to the filament. (2marks)

ii) A high potential difference is applied between the cathode and the anode. (2 marks)

iii) Most of the tube is surrounded by lead. (1mark)

b) State how the resulting x-rays are affected by increasing the potential difference between the anode and the cathode. (1mark)

c) Light of frequency 7.5 x 10^{14} HZ strikes a metal surface whose work function is 4.0 x 10^{-19}J. Determine the kinetic energy of the emitted photoelectrons.
(take planks constant h = 6.63 x 10^{-34}Js) (4marks)

K.C.S.E 2012 PHYSICS PAPER 3
PRACTICAL

Question 1
You are provided with the following;

- Two biconvex lenses labeled A and B.
- A light source.
- Screen I with a hole and cross wire at its centre
- Screen II
- A metre rule.
- A plane mirror.
- A piece of cellotape.
- Two lens holders.
- A stand, boss and clamp

Proceed as follows;
Use the stand to hold the light source in line with the crosswires on screen I and lens A with the plane mirror as shown in figure 1.

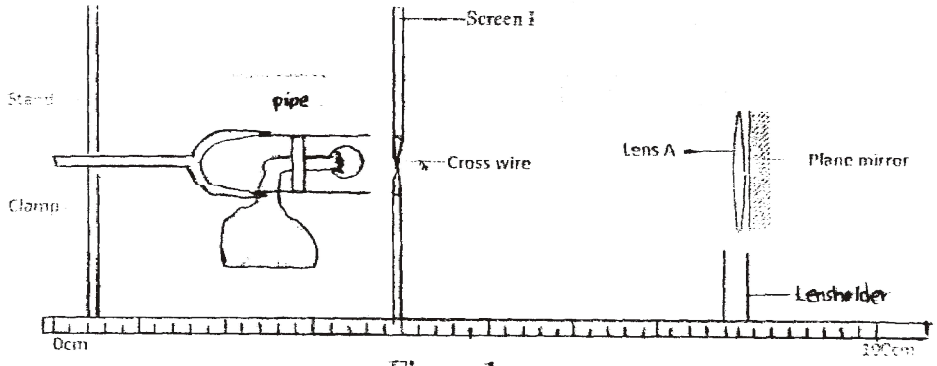


Figure 1

Adjust the position or the lens with the mirror until a sharp image of the cross wires is found on screen I beside the crosswires. Measure the distance between the screen and lens A.
ℓ_1 between the screen and lens A.

ℓ_1=_____

c) Replace lens A with lens B. Fix the plane mirror at the back of lens B. Repeat the procedure in (b) above. Measure the distance ℓ_2 between the screen and lens B.

ℓ_2 = _____cm

d) Remove the mirror from the lens holder.

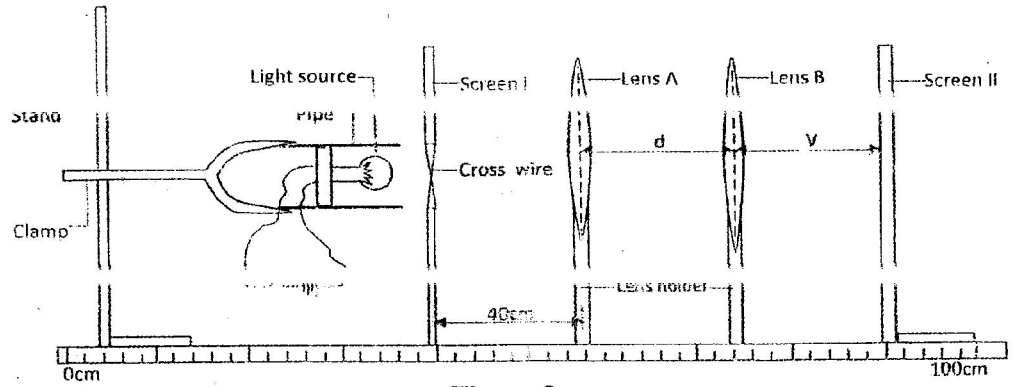


Figure 2

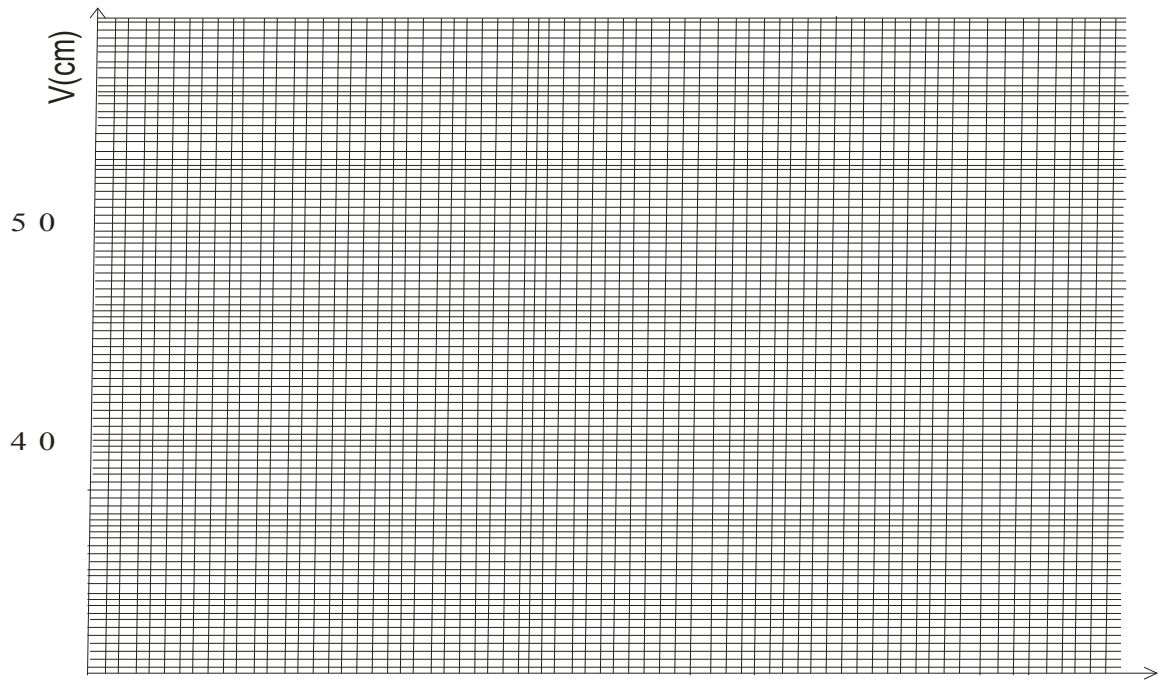
Set the distance d between lens A and lens B to be 65cm. Adjust the position of screen II to obtain a sharp image of the cross wires on it. Measure the distance V between lens B and screen II.

Repeat the experiment

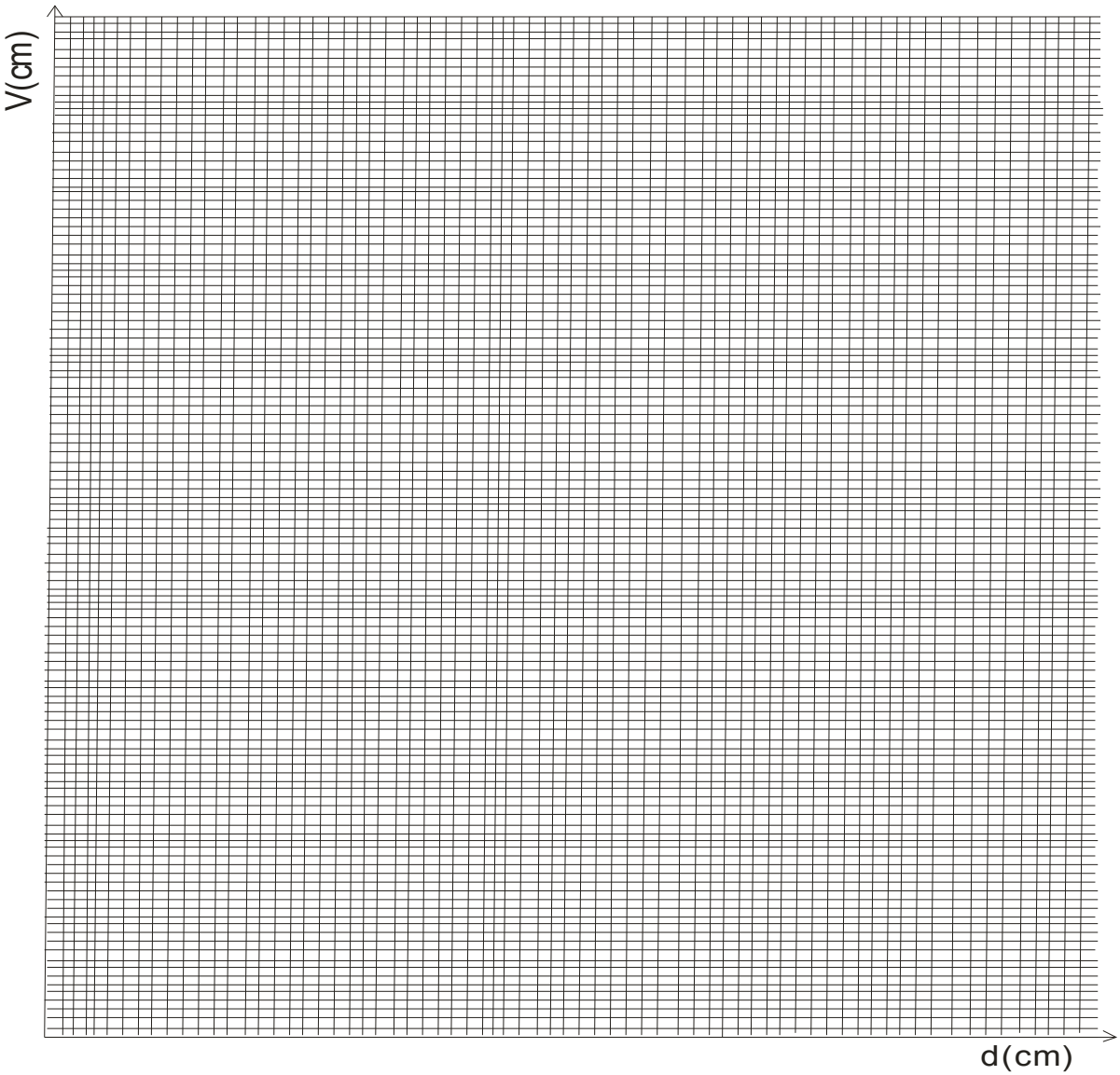
D(cm)	65	67	69	71	73	77	80
V(cm)							

(7marks)

f) On the axes provided below, plot the graph of v(y-axis) against d. (3marks)



f) On the axis provided below, plot the graph of v(y – axis) against d. (3marks)



g) I) From the graph, at d = 70cm. determine;

I. the value of v. (1mark)

II. the slope S of the graph. (3marks)

ii) Given that K = $\frac{-225}{(d-55)^2}$
determine the value of K. (2marks)

iii) determine the value of m given that m = $\frac{S}{K}$ (2marks)

Question 2
You are provided with the following;
- A voltmeter
- A diode with ends labelled B and C
- A 1k Ωresistor
- A 50Ω potentiometer
- 3 dry cells and a cell holder
- A switch
- 8 connecting wires (at least 4 with crocodile clips)
- Proceed as follows;

a) Set up the circuit as shown in figure 3.

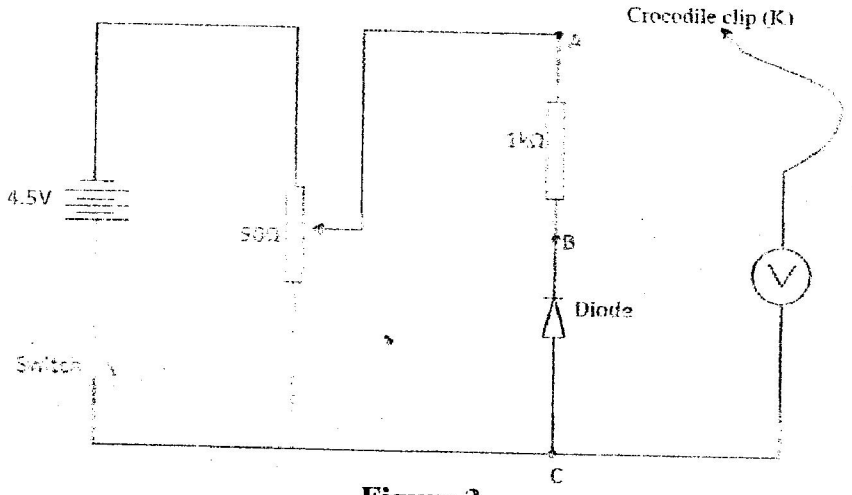


Figure 3

b) i) Connect the crocodile clip K to point A. Adjust the potentiometer by turning the knob until the voltmeter reading is maximum.

Maximum voltmeter reading = _____ volts. (1mark)

ii) Without adjusting the potentionmeter, disconnect the crocodile clip K from point A and connect it to point B. record the voltmeter reading.

Voltmeter reading = _____ volts. (1mark)

iii) Explain why the voltmeter reading in b(i) is different from that in b(ii). (2marks)

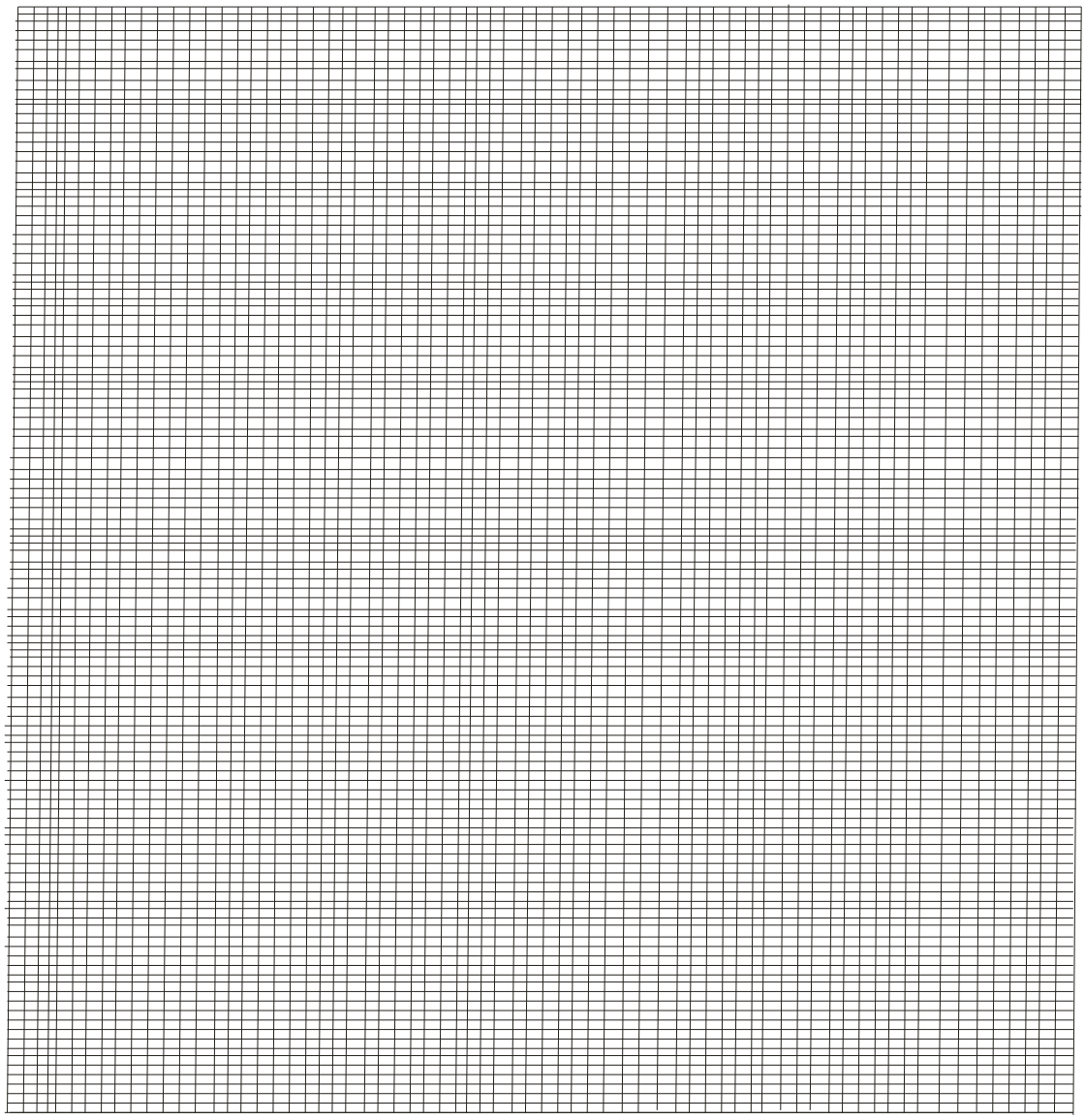
c) Disconnect the crocodile clip K from point B and connect it to point A. Adjust the potectiometer so that the voltmeter reading V_A is 1.0V. Disconnect the crocodile clip K from A and connect it to point B. Record the voltmeter reading V_B.

VB = _____volts. (1mark)

d) By adjusting the potentiometer to obtain other values of V_A(when K is at A) shown in table 2, repeat the procedure in (c) to obtain the corresponding values of V_B (when K is at B) and complete the table.

V_A(V)	V_B(V)	I= $\left(\frac{VA-VB}{1000}\right)(A)$
1.5		
2.0		
2.5		
3.0		
3.5		
4.0		

c) On the grid provided, plot a graph of I (y – axis) against V_B.



f) Use the graph to determine the resistance of the diode when the current is 0.45A.
(3marks)