

K.C.S.E 2007 PHYSICS PAPER 1

SECTION A (25 Marks)

Answer all questions in this section in the spaces provided

- Figure 1 shows a metal cube of mass 1.75g placed between the jaws of a micrometer screw gauge. The magnified portion of the scale is also shown. The reading on the gauge when the jaws were fully closed without the cube was 0.012 cm. Use this information and the figure to answer questions 1 and 2

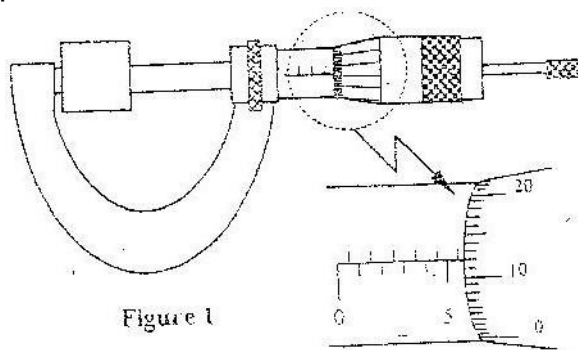


Figure 1

- What is the length of the cube? (1 mark)
- Determine the density of the metal cube giving your answer correct to three significant figures. (3 marks)
- Figure 2 shows a tube of varying cross sectional area

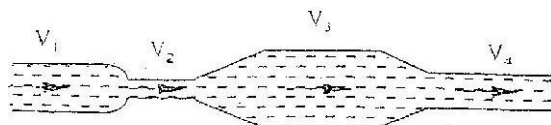


Figure 2

- Arrange the speed V_1 , V_2 , V_3 and V_4 in decreasing order starting with the highest (1 mark)

- Figure 3 shows the levels of two liquids A and B after some air has been sucked out of the tubes through the tap. Use this information and the figure to answer questions 4 and 5.

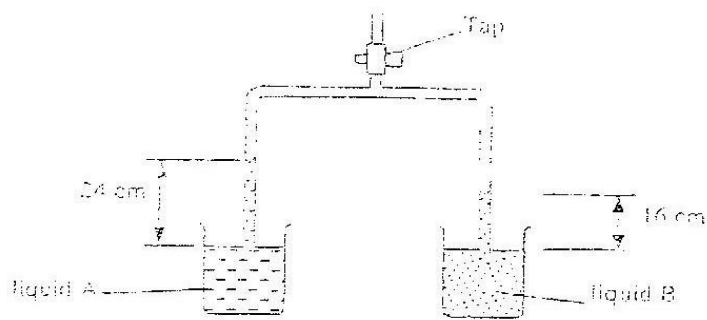


Figure 3

State the reason for the rise in the levels of the liquids when air is sucked from the tubes

5. Given that the density of liquid B is 1200 kgm^{-3} , determine the density of liquid A. (3 marks)
6. Figure 4 show two identical balloons A and B. The balloons were filled with equal amounts of the same type of gas. The balloons are suspended at distances X_1 and X_2 from a metal cube filled with boiling water and placed on an insulating material. Use this information to answer questions 6 and 7.

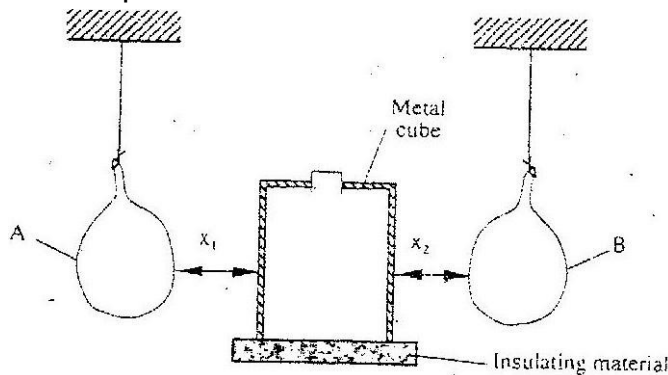


Figure 4

State the mode by which heat travels from the cube to the balloons (1 mark)

7. The face of the cube towards A. is bright and shiny and the face towards B is dull black. State with reason the adjustments that should be made on the distances X_1 and X_2 so that the rate of change of temperature in both balloons is the same. (2 marks)
8. Figure 5 shows a uniform bar of length 1.0 m pivoted near one end. The bar is kept in equilibrium by a spring balance as shown.

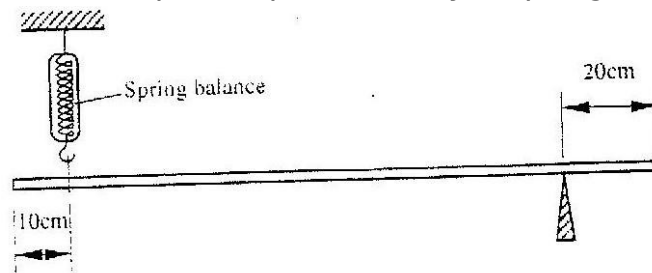


Figure 5

Given that the reading of the spring balance is 0.6 N. Determine the weight of the bar. (3 marks)

9. The graph in figure 6 shows the velocity of a car in the first 8 seconds as it accelerates from rest along a straight line. Use the graph to answer questions 9 and 10.

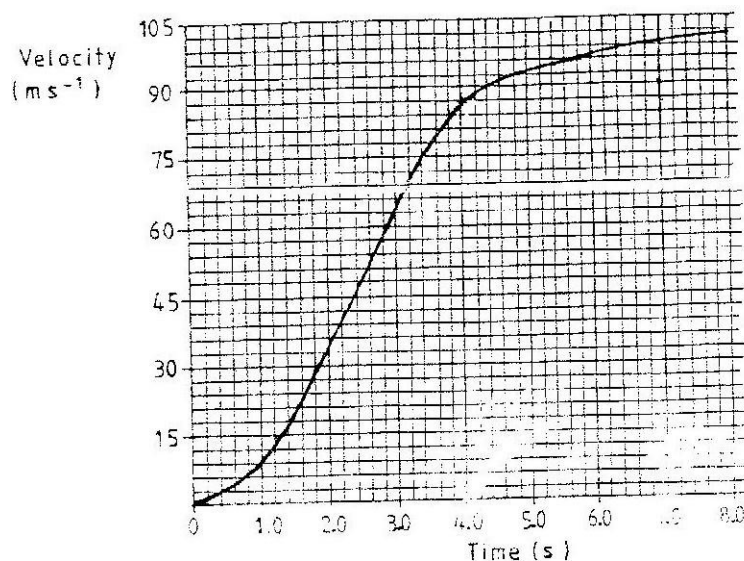


Figure 6

Determine the distance traveled 3.0 seconds after the start

10. Determine the acceleration of the car at 4.0 seconds (2 marks)
11. State two factors that effect the melting point of ice (2 marks)
12. The graph in figure 7 shows the relationship between the pressure and temperature for an ideal gas. Use the information in the figure to answer questions 12 and 13

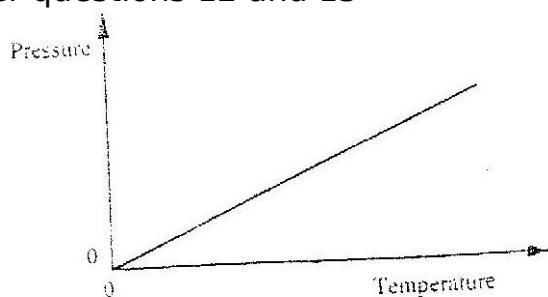


Figure 7

State the unit of the horizontally axis (1 mark)

13. Write a statement of the gas law represented by the relationship (1 mark)

14.

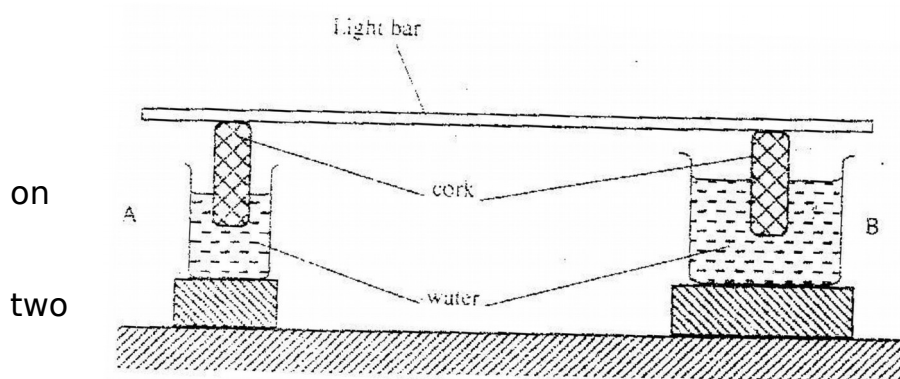


Figure 8

Figure 8 shows a uniform light bar resting horizontally on two corks floating on water in beakers A and B.

Explain why the bar tilts towards side A when equal amount of heat is supplied to each beaker
(2 marks)

SECTION B (55 MARKS)

Answer all questions in this section in the spaces provided

15. Brown motion of smoke particles can be studied by using the apparatus shown in figure 9 to observe the motion, some smoke is enclosed in the smoke

cell

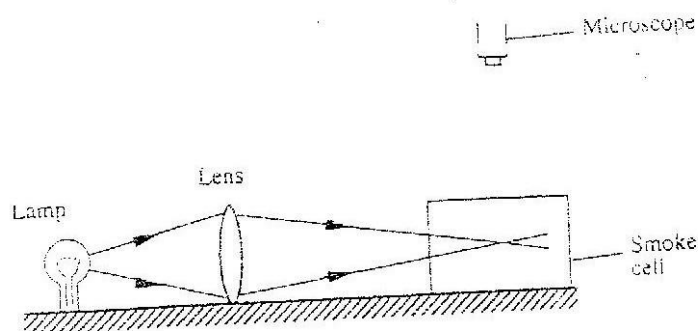


Figure 9

and then observed through the microscope.

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

Smoke particles

Lens

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

(3 marks)

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

(1 mark)

16. (a) State Newton's first law of motion (1 mark)

- (b) A wooden block resting on a horizontal bench is given an initial velocity, u , so that it slides on the bench surface for a distance d , before coming to a stop. The values of d were measured and recorded for various values of initial velocity. Figure 10 shows the graph of u^2 against d .

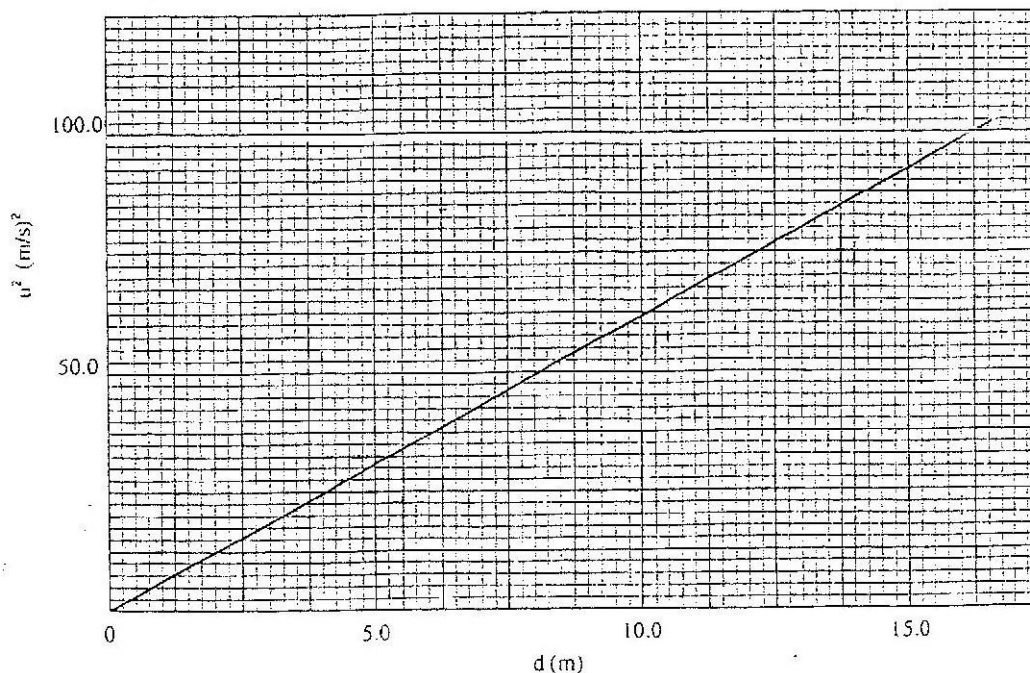


Figure 10

- (i) Determine the slope, S of the graph (3 marks)
- (ii) Given that $u^2 = 20 kd$, where k is a constant for the bench surface, determine the value of k from the graph (2 marks)
- (iii) State how the value of k would be affected by a change in the roughness of the bench surface (1 mark)
- (c) A car of mass 800 kg starts from rest and accelerates at 1.2 ms^{-2} . Determine its momentum after it has moved 400 m from the starting point (4 marks)

17. (a) Define the term specific latent heat of vaporization of a substance

(b) Figure 11 shows the features of a domestic refrigerator. A volatile liquid circulates through the capillary tubes under the action of the compression pump.

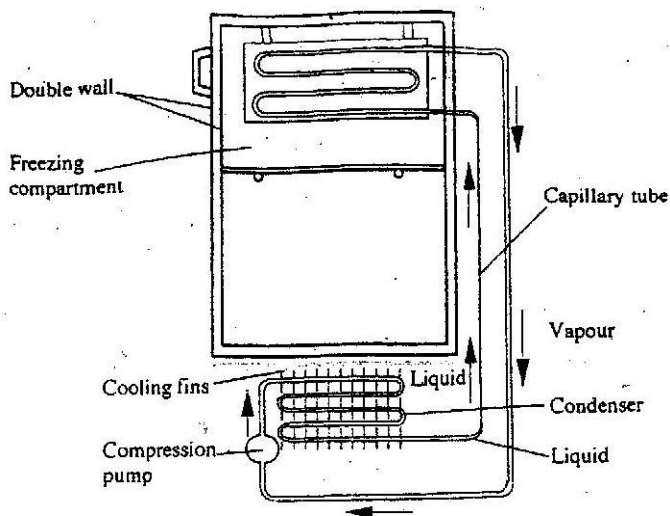


Figure 11

(i) State the reason for using a volatile liquid (1 mark)

(ii) Explain how the volatile liquid is made to vaporize in the cooling compartment and to condense in the cooling fins (2 marks)

(iii) Explain how cooling takes place in the refrigerator (3 marks)

(iv) What is the purpose of the double wall? (1 mark)

(c) Steam of mass 3.0 g at 100°C is passed into water of mass 400g at 10°C . The final temperature of the mixture is T. the container absorbs negligible heat. (Specific latent heat of vaporization of steam = 2260 kJ/ kg, specific heat capacity of water = $4200\text{Jkg}^{-1}\text{K}^{-1}$)

(i) Derive an expression for the heat lost by the steam as it condenses to water at temperature T. (3 marks)

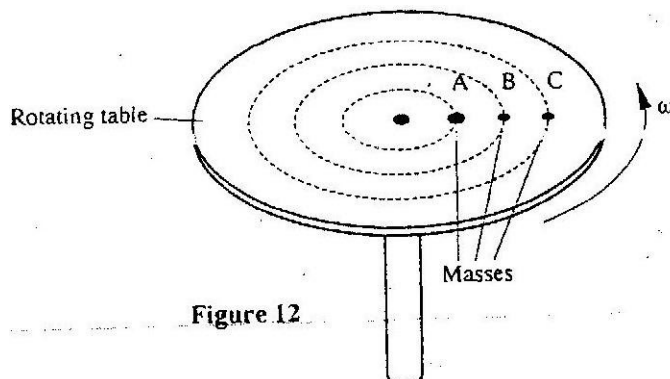
(ii) Derive an expression for the heat gained by water (2

marks)

(iii) Determine the value of T

(2 marks)

18. (a) State what is meant by centripetal acceleration
- (b) Figure 12 shows masses, A, B and C placed at different points on a rotating table. The angular velocity, ω , of the table can be varied.



- (i) State two factors that determine whether a particular mass slides off the table or not
(2 marks)
- (ii) It is found that the masses slide off at angular velocities ω_A , ω_B , and ω_C respectively. Arrange the values of ω_A , ω_B , ω_C in decreasing order.
- (c) A block of mass 200g is placed on a frictionless rotating table while fixed to the centre of the table by a thin thread. The distance from the centre of the table to the block is 15 cm. If the maximum tension the thread can withstand is 5.6N. Determine the maximum angular velocity the table can attain before the thread cuts.
(4 marks)

19. (a) State the law of floating (1 mark)
- (b) Figure 13 shows a simple hydrometer

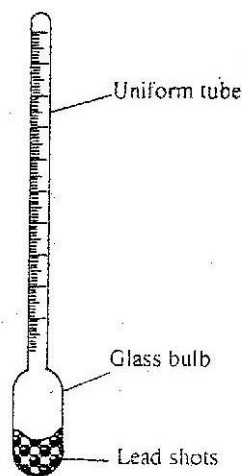


Figure 13

(i) State the purpose of the lead shots in the glass bulb (1 mark)

(ii) How would the hydrometer be made more sensitive? (1 mark)

(iii) Describe how the hydrometer is calibrated to measure relative density

(c) Figure 14 shows a cork floating on water and held to the bottom of the beaker by a thin thread.

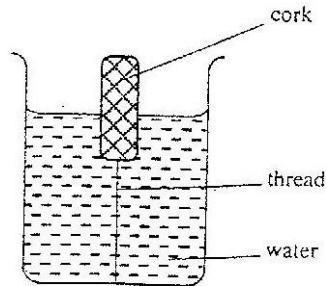


Figure 14

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

(ii) Describe how each of the forces mentioned in (i) above changes when water is added into the beaker until it fills up. (3 marks)

K.C.S.E 2007 PHYSICS PAPER 2
SECTION A (25 MARKS)

Answer all the questions in this section in the spaces provided

1. Figure 1 represents a pinhole camera

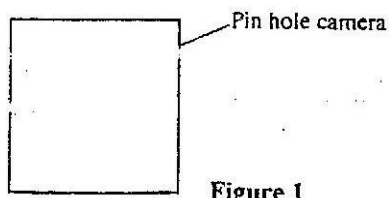


Figure 1

Sketch rays to show the formation of an enlarged image in the camera.
 Label both the object and the image
 (2 marks)

2. State one advantage of an alkaline cell over a lead - acid cell (1 mark)

3. Figure 2 shows a horse - shoe magnet whose poles are labeled and two other magnets near it.

of Iron are attracted to the lower ends of the magnets as shown.

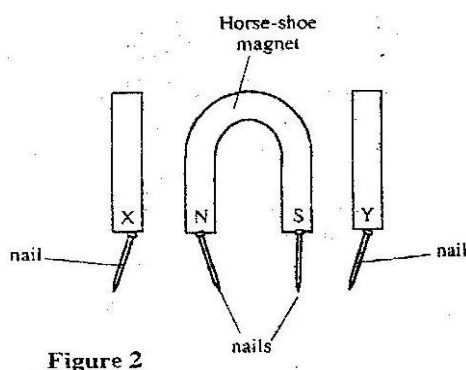


Figure 2

Identify the poles marked X and Y (1 mark)

X Y

4. Figure 3 shows an object, O in front of a concave mirror and its image, I formed after reflection.

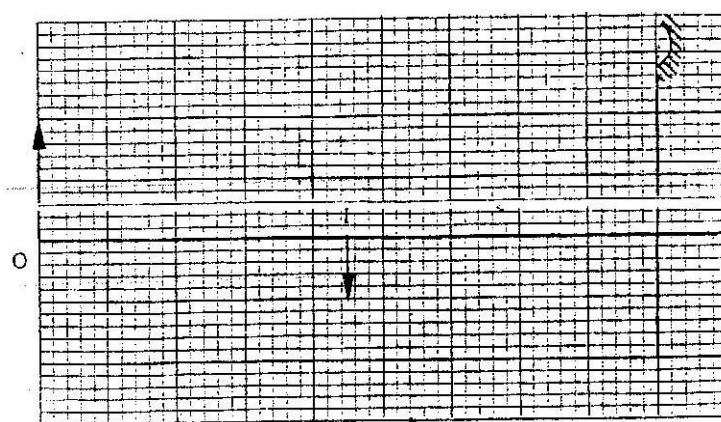


Figure 3

I formed after reflection.

- (a) On the same diagram draw appropriate ray (s) to locate the principal focus, F, of the mirror. (2 marks)
- (b) Determine the focal length of the mirror (scale 1: 5) (1 mark)

5.

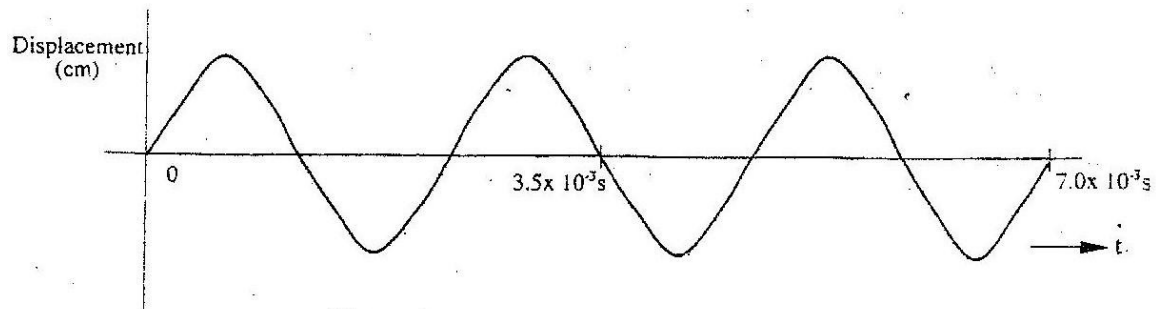


Figure 4

Figure 4. shows the displacement - time graph for a certain wave

Determine the frequency of the wave (3 marks)

6.

and (a)

the

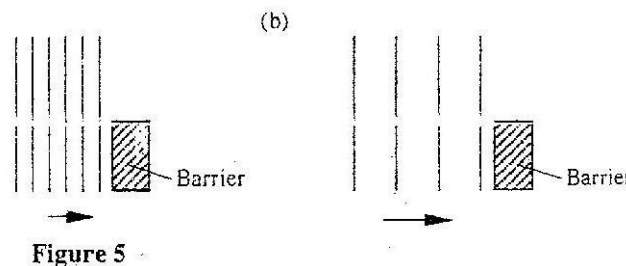


Figure 5

Figure 5 (a) (b), show wavefronts incident on barriers blocking part of path.

On the same figures sketch the wavefronts to show the behavior of the waves as they pass each barrier and after passing the barrier.

(1 mark)

7.

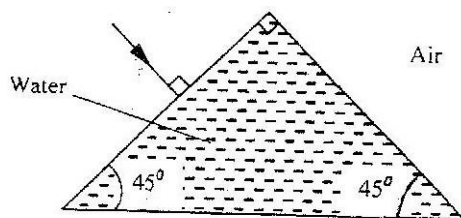


Figure 6

Figure 6 shows a ray of light incident on the face of a water prism

Sketch the path of the ray as it passes through the prism
Critical angle for water is 49° (1 mark)

8. In the circuit diagram shown in figure 7, the ammeter has negligible resistance
When the switch S, is closed, the ammeter reads 0.13 A.

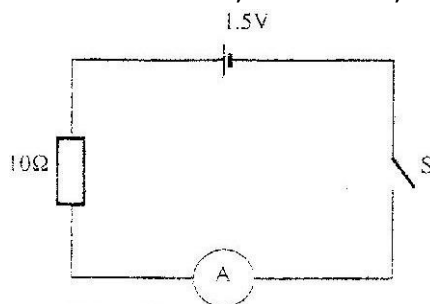


Figure 7

- Determine the internal resistance of the cell (3 marks)
9. A heater of resistance R_1 is rated P watts, V volts while another of resistance R_2 is rated $2P$ watts, $\frac{V}{2}$ volts. Determine R_1 / R_2 (3 marks)

10. State what is meant by the term accommodation as applied to the human eye.

(1 mark)

11. The graph in figure 8 shows the variation of photoelectric current with applied voltage when a surface was illuminated with light of a certain frequency. Use the information in the figure to answer questions 11 and 12.

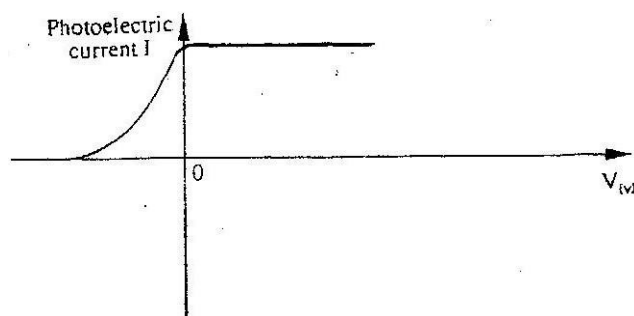


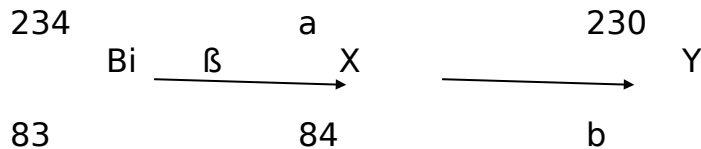
Figure 8

On the same axes, sketch the graph when light of higher intensity but same frequency is used to illuminate the surface.

(1 mark)

12. Explain your answer in 11 above (1 mark)

13. The following is part of radioactive decay series



Determine the values of a and b (2 marks)

a = b =

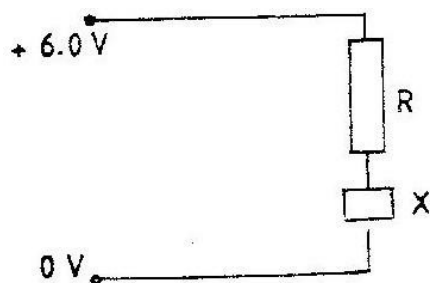
14. You are provided with a diode, a resistor R, an a.c source of low voltage and connecting wires.
In the space provided, sketch the circuit diagram for a half - wave rectifier and indicate the terminals where the output voltage V_0 may be connected. (2mks)

SECTION B (55 MARKS)

Answers ALL the questions in this section in the spaces provided.

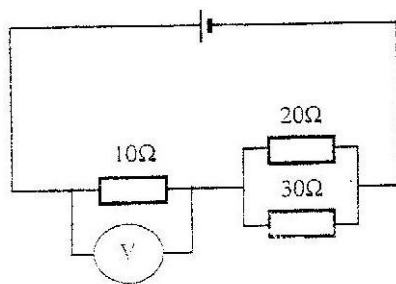
15. (a) State Ohm's Law (1 mark)
- (b) The graph in figure 9 shows the current - voltage characteristics of a certain device, X

- (i) State with a reason whether the device obeys Ohm's law (2 marks)
- (ii) Determine the resistance of the device, X, when the current through it is 60 mA.
- (iii) When the device, X is connected in the circuit below, the voltage across it is 0.70 V.



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

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



Determine

(i)

Figure 10

the

Total resistance in the circuit

(2 marks)

(ii) Current in the circuit

(1 mark)

(iii) Reading of the voltmeter

(2 marks)

16. (a) Figures 11 (a) and (b) show diagrams of the human eye

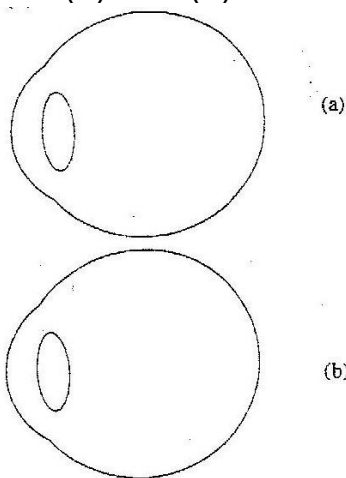


Figure 11

(i) Sketch in figure 11 (a) a ray diagram to show shortsightedness (1 mark)

(ii) Sketch in figure 11 (b) a ray diagram to show how a lens can be used to

correct the shortsightedness

(2 marks)

- (b) Figure
of a

12 shows the features
simple camera

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

A

B

- (ii) A still object is placed at a certain distance from the camera. Explain the adjustments necessary for a clear image of the object to be formed.

- (iii) State the functions of the shutter and the parts labeled A and B (3 marks)

Shutter

A.....

B

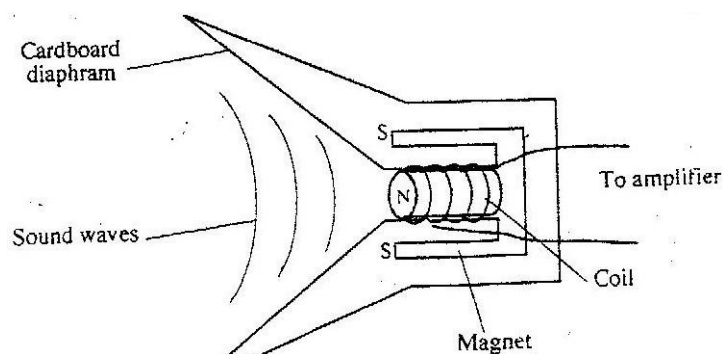
- (c) A lens forms a clear image on a screen when the distance between the screen and the object is 80cm. If the image is 3 times the height of the object, determine.

- (i) The distance of the image from the lens (3 marks)

- (ii) The focal length of the lens (2 marks)

17. (a) State Lenz's Law of electromagnetic induction (1 mark)

- (b) Figure 13 shows a simple microphone in which sound waves from the person talking cause the cardboard diaphragm to vibrate



- (i) Explain how a varying current is induced in the coil when the diaphragm vibrates (3 marks)

- (ii) State two ways in which the induced current in (i) above can be increased

- (c) A transformer with 1200 turns in the primary circuit and 120 turns in the secondary circuit has its primary circuit connected to a 400V a.c source. It is found that when a heater is connected to the secondary circuit, it produces heat at the rate of 600w. Assuming 100% efficiency, determine the:
- (i) Voltage in the secondary circuit (2 marks)
 - (ii) Current in the primary circuit (2 marks)
 - (iii) The current in the secondary circuit (1 mark)

18.
of a

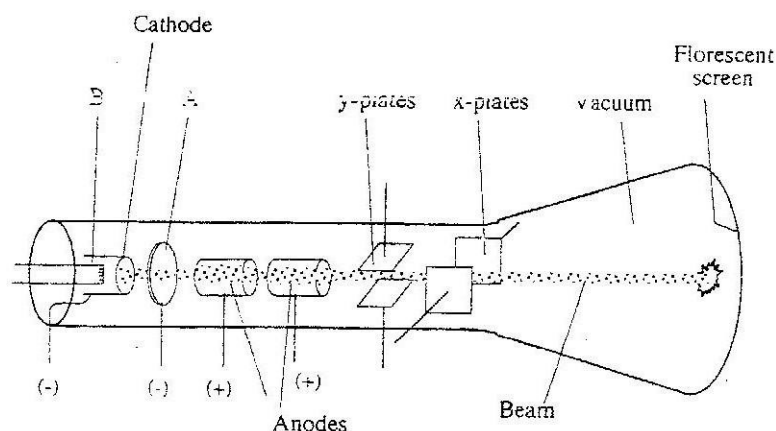


Figure 14

(a) Figure 14
shows the features
cathode ray tube

- (i) Name the parts labeled A and B (2mks)
A B.....
 - (ii) Explain how the electrons are produced in the tube (2 marks)
 - (iii) State two functions of the anodes (2 marks)
 - (iv) At what part of the cathode ray tube would the time be connected?
 - (v) Why is a vacuum created in the tube? (1 mark)
- (b) The graph in figure 15 was obtained on a cathode ray oscilloscope (CRO) screen when the output of an a.c generator was connected to the input of the CRO. The time- base calibration of the CRO was set at 20 milliseconds per centimeter and the y- gain at 5 volts centimeter.

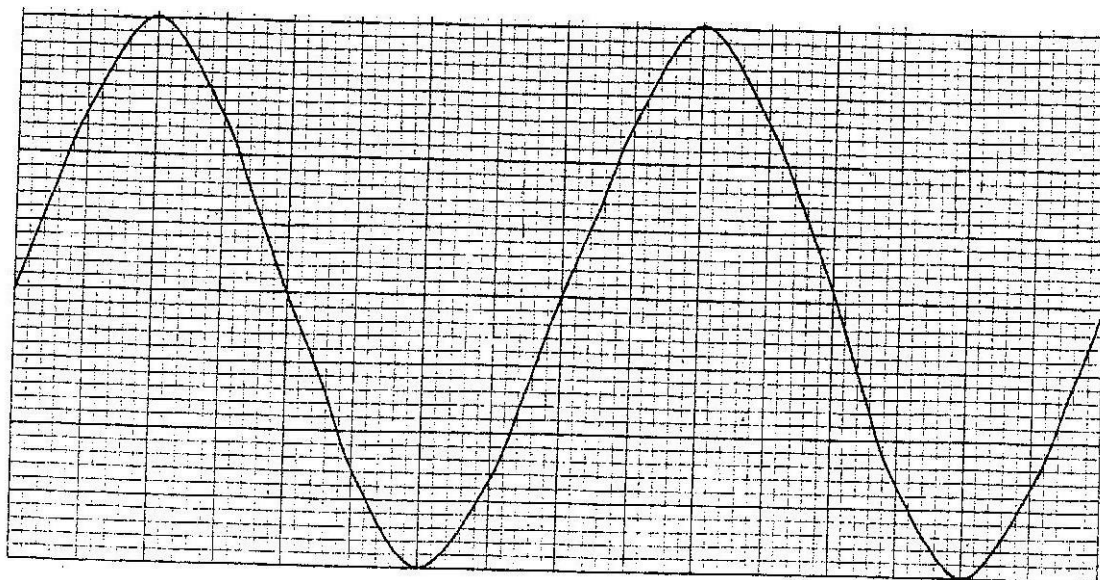


Figure 15

- (i) Determine the peak voltage of the generator
(2mks)
- (ii) Determine the frequency of the voltage (3 marks)
On the same grid, redraw the graph for the same voltage when the time base calibration is set at 40 milliseconds per centimeter and y- gain at 10 volts per centimeter. (Show at least one complete cycle) (2 marks)