PHYSICS PAPER 232/1 K.C.S.E 2005 QUESTIONS

1. Figure 1 shows the reading on a burette after 55 drops of a liquid have been used.

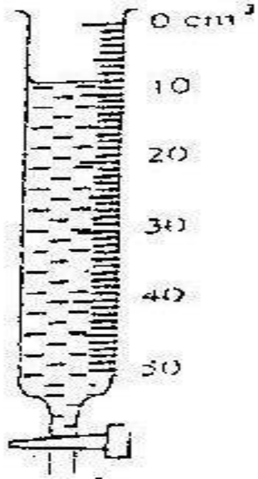


Figure 1

If the initial reading was at Zero mark, determine the volume of one drop. (2mks)

2. Fig 2 shows a solid cylinder standing on a horizontal surface. The cylinder is in stable equilibrium.

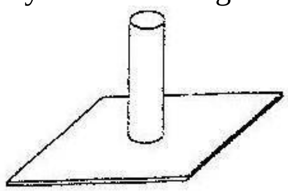


Fig 2

On the horizontal space provided, sketch the cylinder in neutral equilibrium. (1mk)

3. The light uniform bar in Fig 3 is equilibrium. The two beakers A and B contain water at the same temperature. The two blocks are made of the same material.

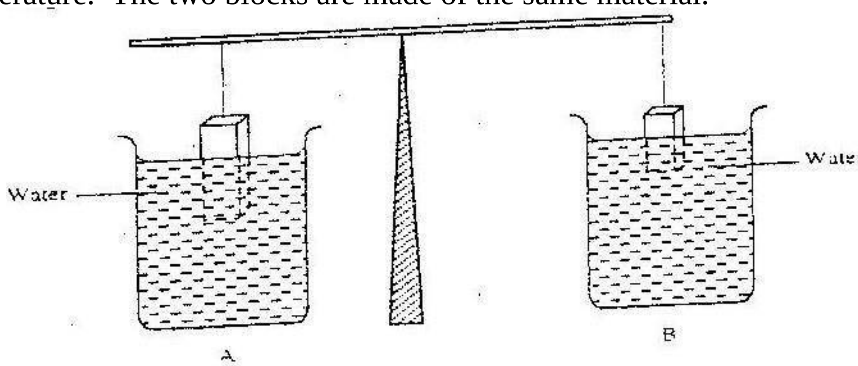
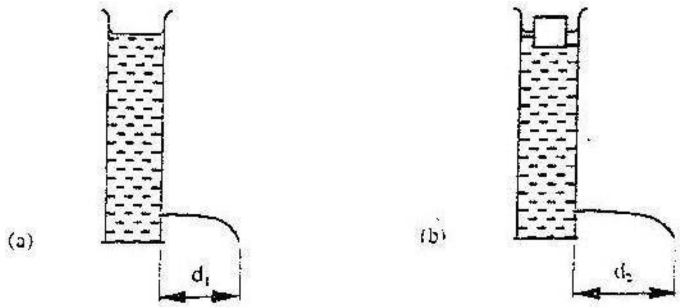


Figure 3

If the temperature of the water in beaker A is now raised, explain why the beam tips to side A. Assume the solid does not expand.

4. A can with a hole on the side is filled with water to a certain height. Water jets out as shown in Fig. 4(a). a second identical can is filled with water to the same height and a block of wood floated on the water as shown in Fig. 4 (b)



State the reason why the maximum distance of the jet, d2 is greater than d1 (1mk)

5. In a vacuum flask the walls enclosing the vacuum are silvered on the inside. State the reason for this. (1mk)

6. Fig 5. Shows an arrangement of a source of light, an opaque object and a screen.

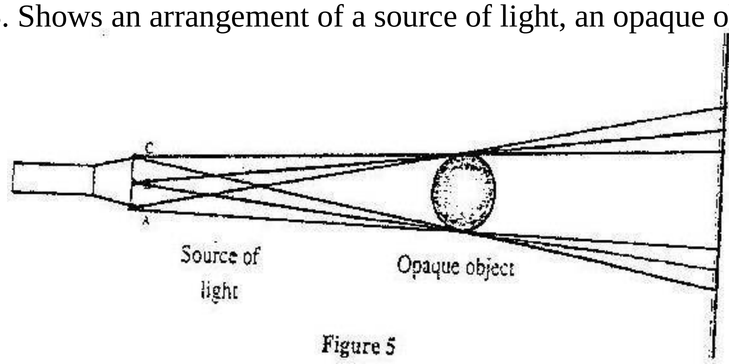
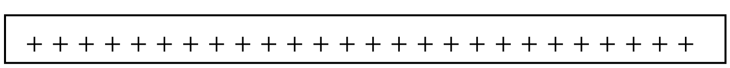


Figure 5

Using A, B and C as point sources, sketch on the same figure labeled ray diagram to show what is observed on the screen. (2mks)

7. Two identical tubes A and B held horizontally contain air and water respectively. A small quantity of coloured gas is introduced at one end of A while a small quantity of coloured water is introduced at one end of B. state with reason the tube in which the colour will reach the other end faster.

8. Sketch the electrostatic field pattern due to the arrangement of the charges shown in Fig 6



(1mk)

Fig 6

9. Fig 7 shows the features of a dry cell(Luclache'). Use the information in the figure to answer question 9 and 10

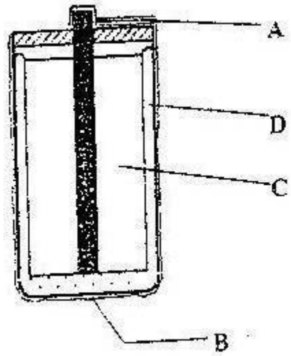


Fig 7

State the polorites of the parts labeled A and B. (1mk)

A……………..

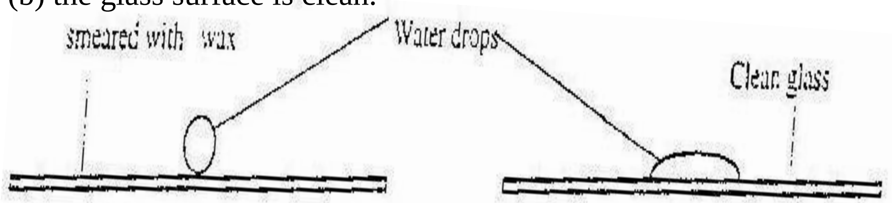
B……………..

10. Name the chemical substance in the parts labelled C and D (2mks)

C……………..

D……………...

11. Fig 8 shows water drops on two surfaces. In 8 (a) the glass surface is smeared with wax while in 8 (b) the glass surface is clean.



Fig

Explain the difference in the shapes of the drops. (2mks)

12. Fig 9 shows a current carrying coil in a magnetic field. The direction of the current and the resulting force are shown. Study the figure and answer questions 12 and 13.

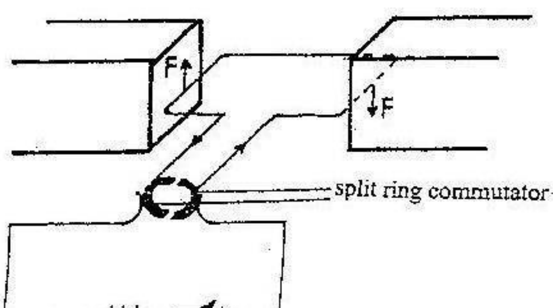


Fig 9

Label the poles of the magnets. (1mk)

13. Explain the purpose of the split ring commutator in the principle of the D.C motor shown in the diagram. (2mks)

14. A bullet is fired horizontally from a platform 15m high. If the initial speed is $300ms^{-1}$. Determine the maximum horizontal distance covered by the bullet. (3mks)

15. A certain machine uses an effort of 400N to raise a load of 600N. If the efficiency of the machine is 75%, determine its velocity ratio. (3mks)

16. Fig 10 represents a transverse wave of frequency 5 Hz traveling in the x direction.

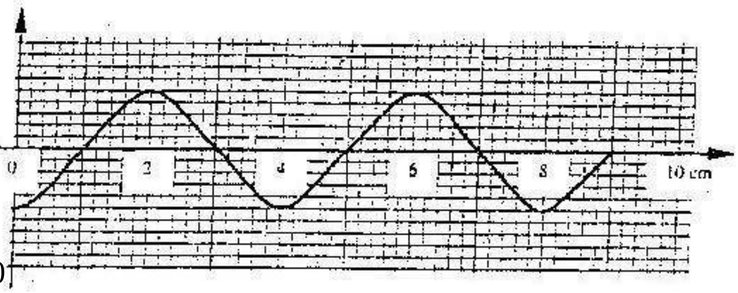


Fig 10

Determine the speed of the wave. (3mks)

17. An electronic siren producing sound continuously at a certain frequency is dropped from the top to a deep hole. State and explain what is observed about the pitch of the sound reaching the observer at the top. (3mks)

18. A student wishes to investigate the relationship between current and voltage for certain device X. In the space provided, draw a circuit diagram including two cells, rheostat, ammeter, voltmeter ad the device X that would be suitable in obtaining the desired results. (1mk)

19. A hair drier is rated 2500W, 240V. Determine its resistance. (3mks)

Fig 11 shows the variation of temperature,θ, with time t, when an immersion heater is used to heat a certain liquid. Study the figure and answer questions 20 and 21.

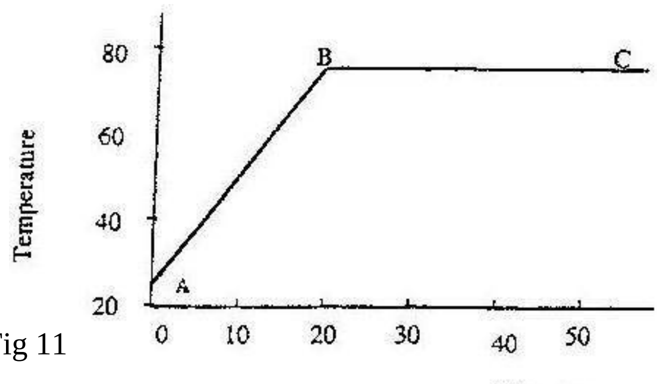


Fig 11

20. State the reason for the shape of graph in the section labeled BC (1mk)

21. Sketch on the same axes the graph for another liquid of the same mass but higher specific heat capacity when heated from the same temperature. (1mk)

22. Fig. 12 shows a vertical object, O, placed in front of a convex mirror.

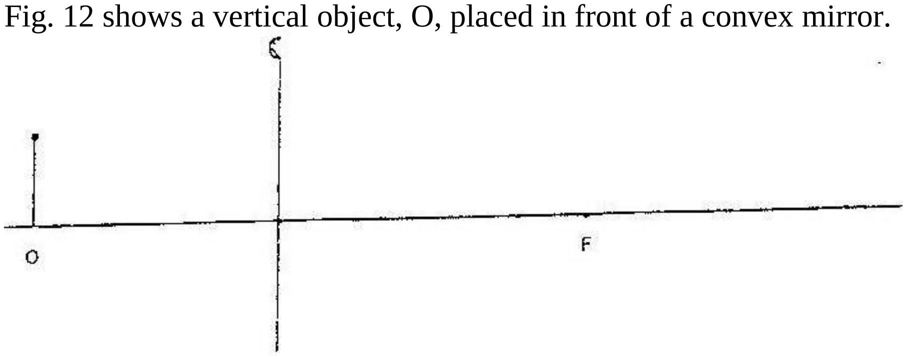


Fig 12
On the same diagram draw the appropriate rays and locate the image formed
(3mks)

23. Fig 13 shows rays of light AO,BO, and CO incident on a glass-air interface. OA' OB' and OC' are the corresponding emergent rays. Study and answer questions 23 and 24.

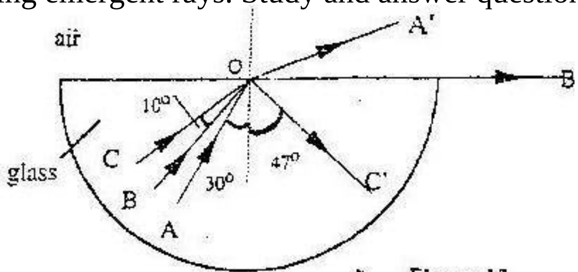
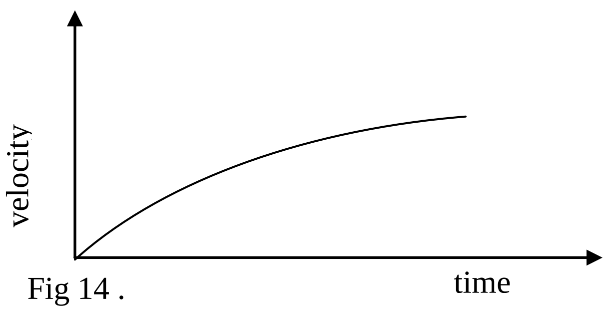


Figure 13

Determine the critical angles of the glass material

24. Determine the refractive of index of the glass material. (3mks)

25. Fig 14 shows the velocity- time graph for a small metal sphere falling through a viscous fluid.



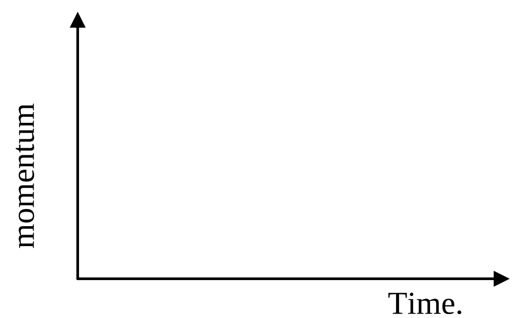


Fig 14 .
On the axes provided sketch the graph of momentum against time for the same mass.
(1mk)

26. State Bernoulli's principle. (1mk)

27. The melting point of oxygen is given as -281.3^0C. Covert this temperature to Kelvin (K)
(1mk)

28. Fig 15 shows an arrow which indicates the direction of travel of a wave in a medium. P is a particle of the medium that is in path of the wave.

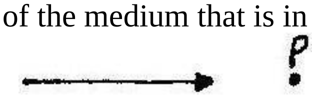


Fig 15
In the space provided sketch diagram to show how the particles P moves when the wave is
(i) A transverse wave
(ii) A longitudinal wave. (1mk)

29. A car of mass 800kg moves on a circular track of radius 20m. The force of friction between the tyres and the tarmac is 4800N Determine the maximum speed at which the car can be driven on the track without skidding.

30. An illuminated vertical object is initially placed on the principal axis of a converging lens and 32cm from it. The focal length of the lens 15cm. The object is new placed at a point 12cm from the lens and on the same side. State two changes other than magnification than magnification that that are observed on the image formed due to this change.

31. Explain how an "excited' hydrogen atom is able to emit radiations of different wavelengths.

32. Fig 16 shows wave fronts in a ripple tank approaching a shallow region in the tank.

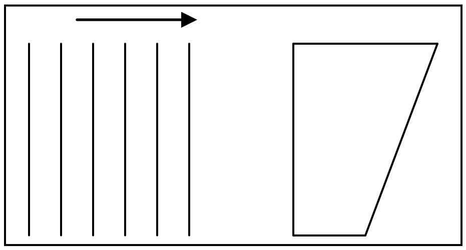


Figure 16

Complete the diagram to show the wave front as they pass over the shallow region and after leaving the regions. (1mk)

33. The target of X-ray tube s made of melting point. Give a reason for this (1mk)

34. Explain why a drop of methylated spirit on the back of the hand feels colder than a drop of water at the same temperature.

35. Draw appropriate symbols the circuit diagram of a junction diode in reverse bias. (1mk)

36. The following represents a nuclear reaction involving the nuclide polonium Po

$$ {}^{218}_{84}Po \xrightarrow{m} {}^{214}_{82}Pb \xrightarrow{n} {}^{214}_{83}Bi \longrightarrow {}^{214}_{84}X $$

(3mks)

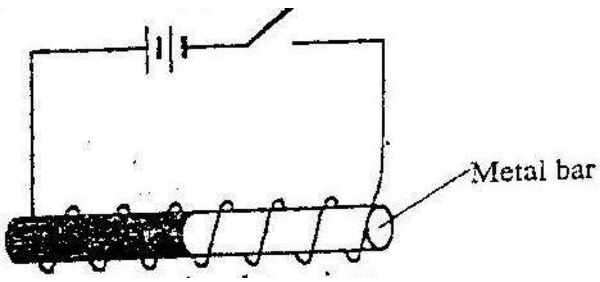
Identify m, n and X

m

n

X

37. In the set up Fig 17 the metal rod is made up of steel and iron pieces joined end. Your are provided with two iron nails.



Explain how you would use two nails provided to determine which side is iron (2mks)

38. Fig 18 shows two spherical materials one an insulation conductor, the other a conductor, Negative charge are introduced at point A in each case.

Figure 18

One the same figure indicate the final position of the charges. Explain your answer. (2mks)

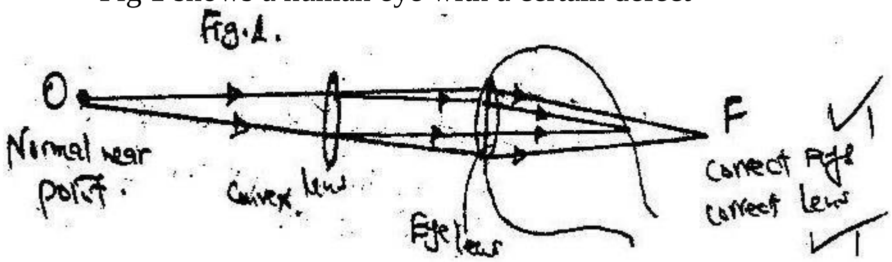
PHYSICS PAPER 232/2 K.C.S.E 2005 QUESTIONS

1. a) Describe with aid of a labeled diagram an experiment to determine the focal length of the lens when provided with the following; an illuminated object, convex lens, a lens, a lens holder, a plane mirror and a metre rule. (5mks)

   b) A small vertical object is placed 28cm in front of a convex lens of focal length 12cm. On the grid provided, draw a ray diagram to locate the image. The lens position is shown. (Use a scale; 1cm rep re 4cm) (5mks)

   Determine the image distance.

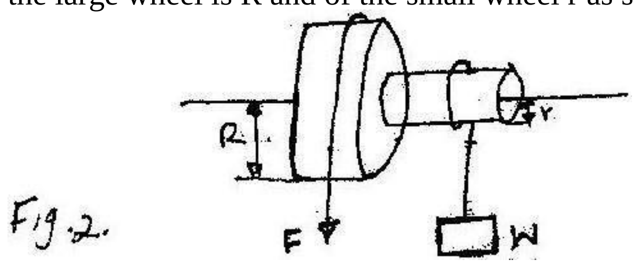
   c) Fig 1 shows a human eye with a certain defect



   (i) Name the defect

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

2. a) Fig 2. Shows a wheel and axle being used to raise a load W by applying an effort F The radius of the large wheel is R and of the small wheel r as shown.



   (i) Shows that the velocity ratio (V.R) of this machine is given by R/r (3mks)

   (ii) Given that r= 5cm, r=8cm, determine effort required to raise a load of 20N if the efficiency of the machine is 80% (4mks)

   (iii) It is observed that the efficiency of the machine increases when it is used to lift large loads. Give a reason for this. (1mk)

3 When the switch is closed determine the:

   (i) Ammeter reading

   (ii) Charge on each conductor (3mks)

4. Explain how doping producers an n-type semi-conductor for a pure semi-conductor material. (3 marks)

b) Fig 5. Shows the circuit of a rectifier using four diodes D1, D2, D3 and d4.

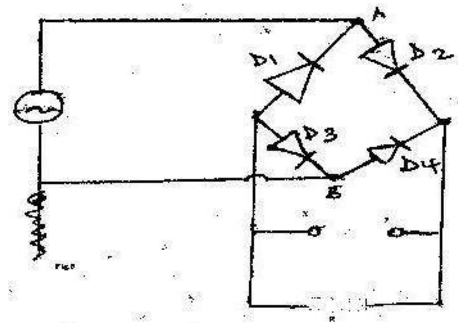


Fig 5.

(i) Explain how a rectified output is produced from the set – up when an a.c input is connected across AB (4 marks)

(ii) On the axis provided sketch the graph of output voltage against time for rectifier (1 mark)

(iii) A capacitor is now connected across XY. Explain the effect of the capacity on the output. (2 marks)

(c) A transistor in a common – emitter amplifier has life = 120. A signal in the input causes the base corresponding change in the output voltage if the load resistance is 100n. (4 marks)

5. (a) State Hooke's law (1 mark)

(b) One of a piece of a rubber was fixed to a rigid support and the other end pulled with a force of varying magnitude. The graph in fig 6 shows the relationship between the force (N) and the extension (cm)

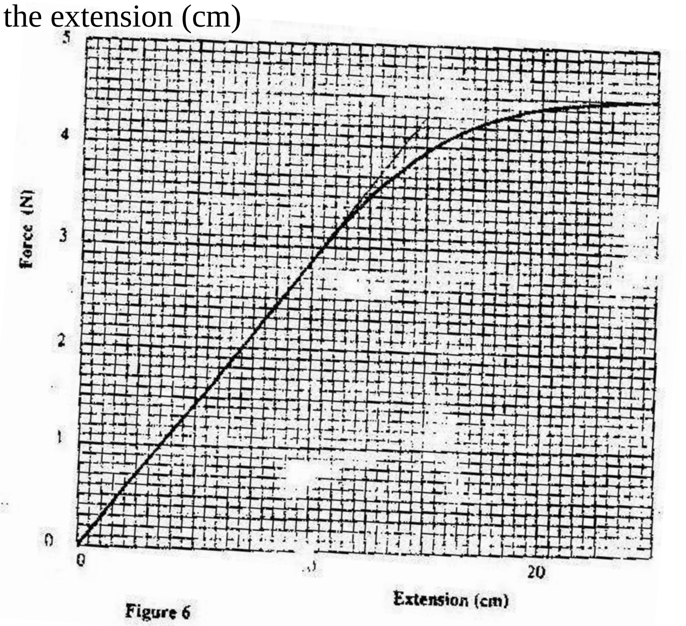


Figure 6

Using the graph, determine

(i) The stretching force at the elastic limit

(ii) The tensile stress in the rubber at an extension of 5 cm if the cross-section of the rubber is $0.25 cm^2$

(iii) The tensile in the rubber at an extension of 5cm if the original length was 2 m (3 marks)

(c) In Fig 7. girders AB, BC, CD, ED, EB and BD were joined to make the rigid structure shown. The load W hangs from the structure as shown.

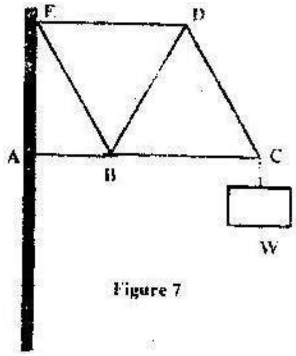


Figure 7

Which of the girders can be replaced with strings without affecting the structure? (2 marks)

SECTION II (15 MARKS)

Answer ONE question from this section in the spaces provided at the end of questions seven

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

(b) A body moving with uniform angular velocity is found to have covered an angular distance of 170 radians in t seconds. Thirteen seconds later it is found to have covered a total angular distance of 300 radians. Determine t. (3 marks)

(c) Fig 8 shows a body of mass m attached to the centre of a rotating table with a string whose tension can be measured. (The device for measuring the tension is not shown in the figure)

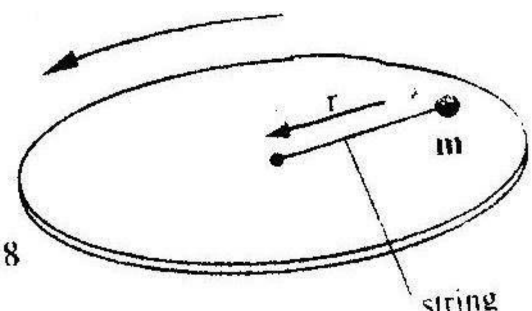


Figure 8

The tension, T on the string was measured for various values of angular velocity, w. The distance r of the body from the centre was maintained at 30cm. Table 1 shows the results obtained.

Table 1

W^2	4.0	9.0	16.0	25.0	36.0
Angular velocity w (radi^{-1})	2.0	3.0	4.0	5.0	6.0
Tension T (N)	0.04	0.34	0.76	1.30	1.96

(i) Plot the graph of T (y- axis against w^2) (5 marks)

(ii) From the graph, determine the mass, m of the body given that
$T = mw^2 - C$
Where C is a constant (4 marks)

(iii) Determine the constant C and suggest what it represents in the set up. (2 marks)

7. (a) What is meant by radioactivity (1 mark)

(b) With an aid of a labeled diagram explain the working of Geiger Muller tube as a detector of radiation (5 marks)

(c) In an experiment to determine the half of a certain radioactivity substance, the activity in disintegrations per minute was measured for sometime. Table 1 shows the results obtained

Time in Minutes	0	10	20	30	40	50	60	70	80
Activity indisintergrations	152	115	87	66	50	38	20	12	6

On the grid plot a suitable graph and sue it to determine the half life t ½ of the substance (7 marks)

(d) At time t = 40 minutes, the activity of a sample of a certain radioactive isotope with a half life 12 minutes if found to be 480 disintegration per minute.
Determine the time which activity was 3840 disintegrations per minute (2 marks)

K.C.S.E 2006 PHYSICS PAPER 1
SECTION A (25 MARKS)
Answer all questions in this section in the spaces provided

1. Figure 1 shows the change in volume of water in a measuring cylinder when an irregular solid is immersed in it.

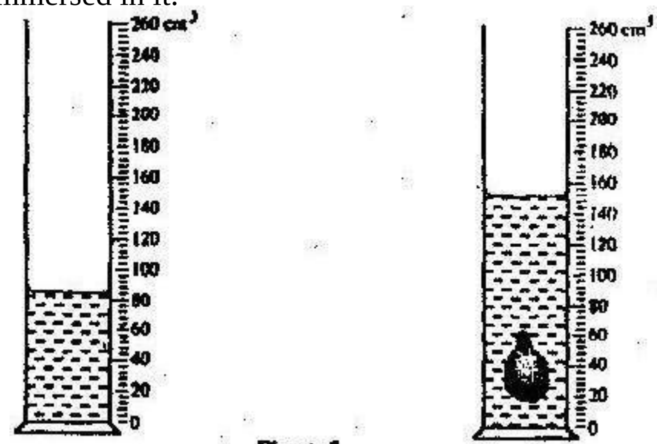
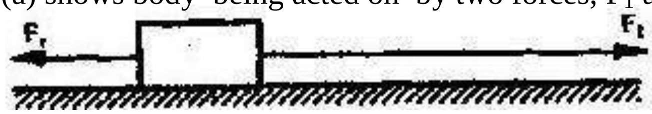


Figure 1

Given that the mass of the solid is 567 g, determine the density of the solid in gcm^{-3} (Give your answer correct to 2 decimal places) (3 marks)

2. Figure 2 (a) shows body being acted on by two forces, F_1 and F_2



On figure 2 (b) draw the force F_3 that has same effect on the body as the two forces (1 mark)

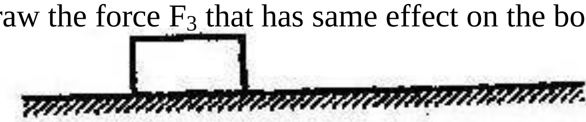


Figure 2

3. State Pascal's principle of transmission of pressure in fluids (1 mark)

4. Figure 3 shows a bimetallic strip with a wooden handle, suspended horizontally using a thin thread.

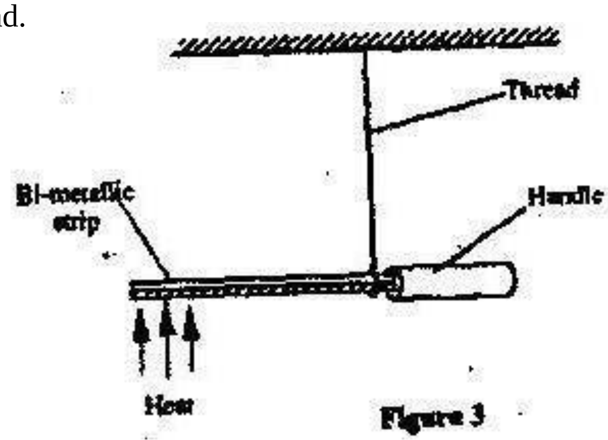
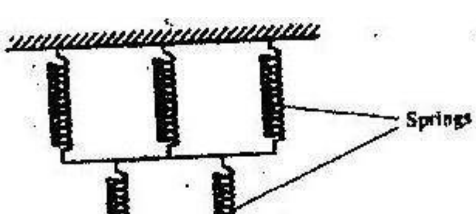


Figure 3

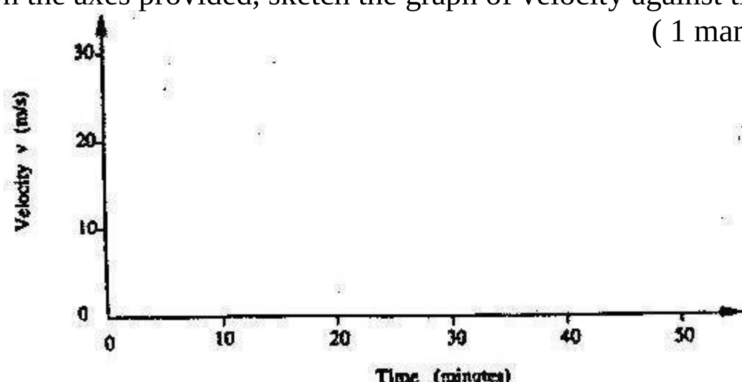
The strip is heated at the point shown. Explain why the system tips to the right

5. The spiral springs shown in figure 4 are identical. Each spring has a spring constant k= 300N/m

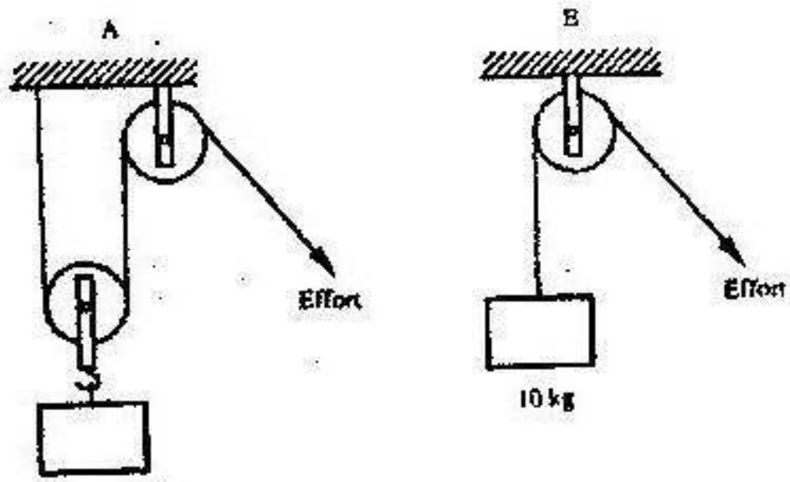


Determine the total extensions caused by the 90N weight. (ignore the weight of the spring and connecting roots) (3 marks)

6. A car starting from rest accelerates uniformly for 5 minutes to reach 30m/s. It continues at this speed for the next 20 minutes and then decelerates uniformly to come to stop in 10 minutes. On the axes provided, sketch the graph of velocity against time for the motion of the car. (1 mark)



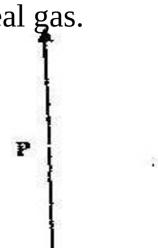
7. Figure 5 shows two pulleys systems being used to raise different loads. The pulleys identical.



State one reason why system B may have a higher efficiency than system A. (1 mark)

8. Beaker A contains 200g of water at 0^0 C while beaker B contains 200g of a mixture of ice and water at 0^0C. Two identical metal blocks are removed from a hot furnace. One block is dropped into beaker A while the other is dropped into beaker B at the same time. Explain why more water evaporates from beaker A than from beaker B (2 marks)

9. On the axes provided sketch the graph of pressure P against volume V for a fixed mass of an ideal gas. (1 mark)



10. Figure 6 shows the path taken by a matatu traveling on a horizontal ground (a winding road)

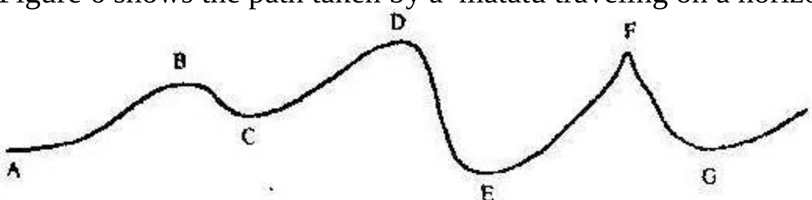
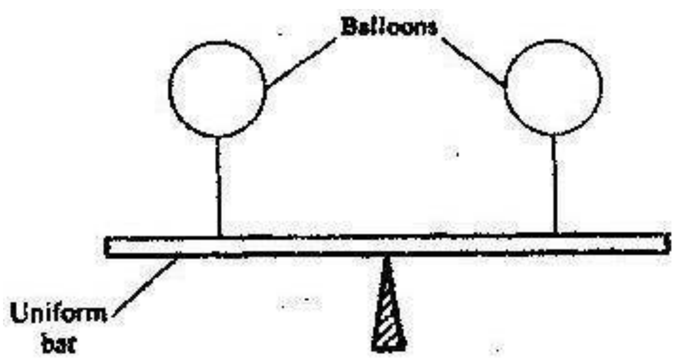


Figure 6

The speed of the matatu is constant. Identify with reason the point along the path which a load placed loosely on the rack (carrier) of the matatu is most likely to roll off.
(2 marks)

11. A pipe of radius 6 mm is connected to another pipe of radius 9 mm. If water flows in the wider pipe at the speed of 2 ms^{-1}, what is the speed in the narrower pipe?
(3 marks)

12. The uniform bar in figure 7 is provided at its midpoint. It is in equilibrium under the action of two identical balloons filled with equal volumes of different light gases at the same temperature.



Explain why the bar may not remain in equilibrium if the temperature of the surrounding changes.
(2 marks)

13. A footballer kicks a ball of mass 0.6 kg initially at rest using a force of 720N. If the foot was in contact with the ball for 0.1 seconds, what was the take off speed of the ball?
(3 marks)

SECTION B (55 MARKS)

Answer ALL questions in this section in the spaces provided

14. (a) Distinguish between solid and liquid states of matter in terms of intermolecular forces
(1 mark)

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

Determine

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

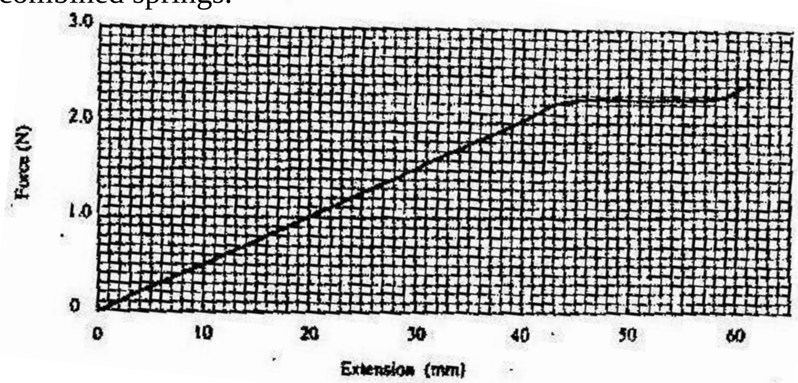
(ii) The area of the patch covered by the oil (2 marks)

(iii) The diameter of the oil molecule (3 marks)

(c) State
(i) Any assumption made in (b) (iii) above (1 mark)
(ii) Two possible sources of errors in this experiment (2 marks)

15. (a) You are provided with two wires of same material and same thickness. Describe how you would make two spiral springs of different springs constants (assume that other apparatus to make springs are available). (2 marks)

(b) In an experiment, two identical springs are attached end to end. One end of the combined springs is fixed to a rigid support such that the spring hangs vertically. Masses are then hang from the lower end.
The graph in figure 8 shows the relation between the force (weight) and the extension for the combined springs.



From the graph determine
(i) The elastic limit for the combined springs (1 mark)
(ii) The springs constant of the combined spring and hence for each spring (4 marks)
(iii) The work done in stretching the combined spring from 15 mm to 32 mm (3 marks)

16. (a) State what is meant by an ideal gas (1 mark)
(b) The pressure acting on a gas in a container was changed steadily while the temperature of the gas maintained constant. The value of volume V of the gas was measured for various values of pressure. The graph in figure 9 shows the relation between the pressure, p and the reciprocal of volume $\frac{1}{V}$

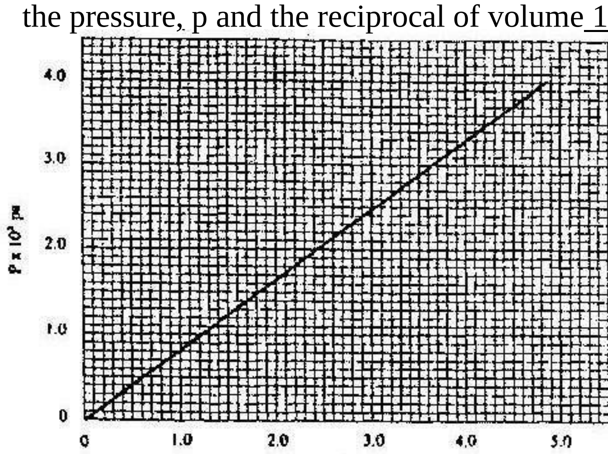


Figure 9

(i) Suggest how the temperature of the gas could be kept constant
(ii) Given that the relation between the pressure P_1 and the volume, V_1 of the gas is given by

$PV = k$

When k is a constant, use the graph to determine the value of k.

(iii) What physical quantity does k represent? (4 mark)

(iv) State one precautions you would take when performing such an experiment (1 mark)

(c) A gas occupies a volume of 4000 litres at a temperature of 37^0C and normal atmospheric pressure. Determine the new volume of the gas if it heated at constant pressure to a temperature of 67^0C (normal atmospheric pressure $P = 1.01 \times 10^5$ pa)

17. (a) state Archimedes principle (4 marks)

(b) in an experiment to determine the relative density of methylated spirit applying Archimedes Principal, the following were provided, a spring balance, some masses, a piece of thread, water in a beaker and methylated spirit in a beaker. The table below shows the results obtained.

Mass (g)	100	150	200
Weight in air (N)	1.00	1.50	2.00
Weight in water (N)	0.88	1.32	1.76
Weight in spirit (N)	0.91	1.36	1.82

(i) Draw labeled sketch diagrams to show how the readings in the table were obtained (1 mark)

(ii) For each mass, determine the upthrust in water and the upthrust in the spirit (2 marks)

(iii) Determine the average relative density of the spirit (3 marks)

(c) A weather balloon of volume $1.2m^3$ is tied to a rigid support while being filled with helium gas. The mass of the fabric making the balloon is 0.30kg.

Determine the maximum tension on the string trying the balloon to the rigid support

18. (a) Define specific latent heat of fusion of a substance (1 mark)

(b) Water of mass 200 g at a temperature of 60^0C is put well lagged copper calorimeter of mass 80g. A piece of ice at 0^0 C and mass 20 g is placed in the calorimeter and the mixture stirred gently until all the ice melts. The final temperature, T of the mixture is then measured.

Determine

(i) The heat absorbed by the melting ice at 0^0 C. (2 marks)

(ii) The heat absorbed by the melted ice (water) to rise to temperature T (answer may be given in terms of T) (2 marks)

(iii) The heat lost by the warm water and the calorimeter (2 marks) (answer may be given in terms of T) (2 mark)

(iv) The final temperature T of the mixture

(specific latent heat of fusion of ice = 334 000 J kg^{-1}

(specific heat capacity of water = 4 200 Jkg^{-1} k^{-1}

Specific heat capacity of copper = 900 J kg^{-1}) (4 marks)

K.C.S.E 2006 PHYSICS PAPER 2
SECTION A (25 marks)
Answer ALL the questions in this section in the spaces provided

1. Figure 1 shows two bar magnets placed with the south poles close together

Figure 1

In figure 1 sketch the magnetic field pattern between the two south poles
(1 mark)

2. In a certain pinhole camera, the screen is 10cm from the pinhole. When the camera is placed 6m away from a tree, a sharp image of the tree 16cm high is formed on the screen. Determine the height of the tree.
3. A metallic body shaped as shown in figure 2 is positively charged and insulted from the ground as shown in the figure.

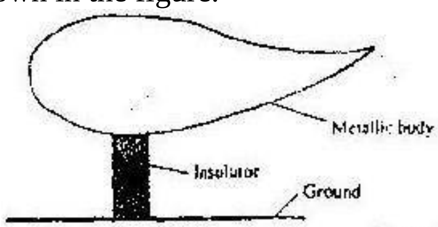


Figure 2

On the figure show the charge distribution (1 mark)

4. State a reason why the caps of the cells of a lead- acid battery are opened when charging the battery. (1 mark)

5. A long coil is attached to a vibrating blade as shown in figure 3

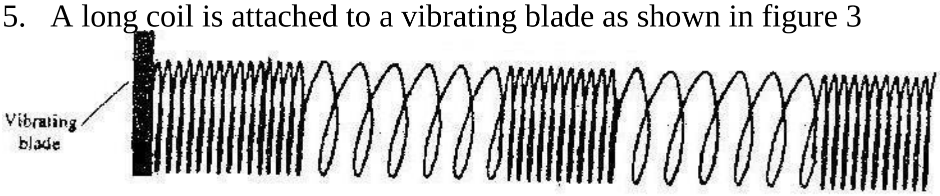


Figure 3

State the type of mechanical wave generated by the set - up and mark alongside the coil, the length corresponding to the wavelength, λ of the wave.
(2 marks)

6. Figure 4 shows a solenoid carrying an electric current.

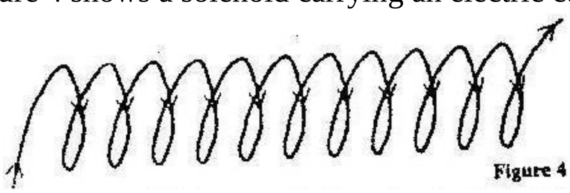


Figure 4

Sketch the magnetic field pattern inside and at the ends of the solenoid
(1 mark)

7. Figure 5 shows wave fronts approaching a concave surface

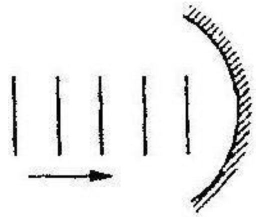


Figure 5

Complete the diagram to show the wave fronts formed after striking the surface. Show how the focal point of the surface is located (2 marks)

8. S soldier standing some distance from a wall, blows a whistle and hears its echo 1 seconds later. How far is the wall from the soldier? (speed of sound in air is $330ms^{-1}$) (3 marks)

9. State one condition under which Ohm's law is obeyed in a metal conductor (1 mark)

Use the information given below to answer questions 10 and 11
The Kinetic energy (K.E) of an electron, ejected from the surface of a metal illuminated by radiation of frequency f is given by

$K.E = hf - \varnothing$

Where h is Planck's constant and Ø is the work function of the surface

10. What is meant by the term work function? (1 mark)
11. If the frequency of the illuminating radiation is just equal to the threshold frequency of the surface explain why no photoelectric effect is observed (2 marks)

Figure 6 shows a tube for investing the properties of a beam of electrons. Use the *information in the figure to answer questions 12 and 13*

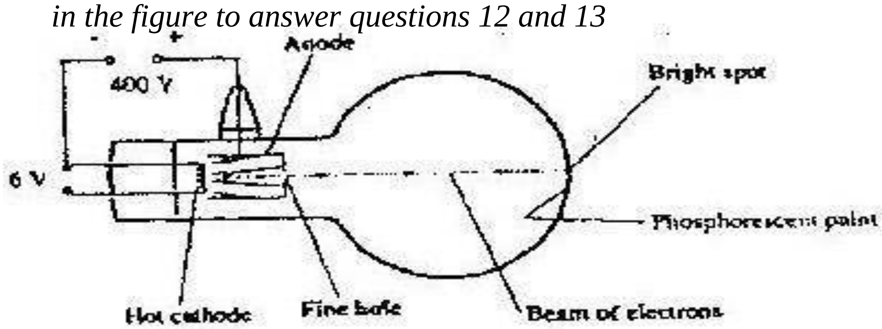


Figure 6

12. What property of the beam of electrons show that the electrons are traveling at a very high speed?
13. The beam of electrons is subjected to a strong magnetic field which is perpendicular to the path and into the paper. Sketch on the same figure, the new path of electrons. (1 mark)

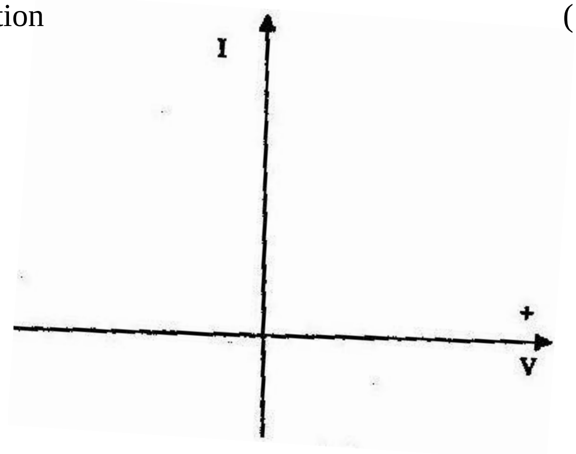
14. State with a reason the effect on the X- rays produced in a n X- ray tube, when the p.d across the tube is increased (2 marks)

15. A nuclear reaction is represented by the following equation

$$^{a}_{92}X \longrightarrow {}^{234}_{b}Y + \text{Alpha particle}$$

Determine the values of a and b (2 marks)

16. In the axes provided sketch the current – voltage characteristics for reverse – biased p- n junction (1 mark)



SECTION B (55 MARKS)

Answer all questions in this section in the spaces provided

17. Figure 7 shows a circuit where a battery of emf 4.5V, switches A and B, two capacitors $C_1 = 0.3\mu F$ and $C_2 = 0.5\ \mu$ F and a voltmeter are connected

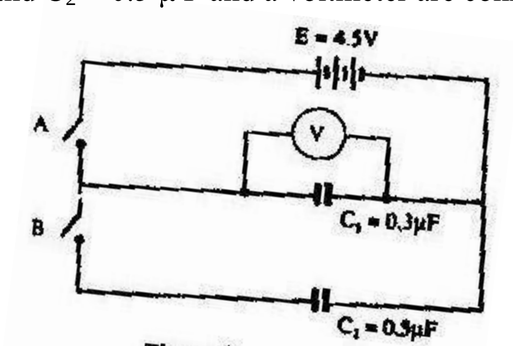


Figure 7

(a) Determine the charge on C_1 when switch A is closed and switch B is open (3 marks)

(b) What is the effective capacitance C_t when both switches A and B are closed?

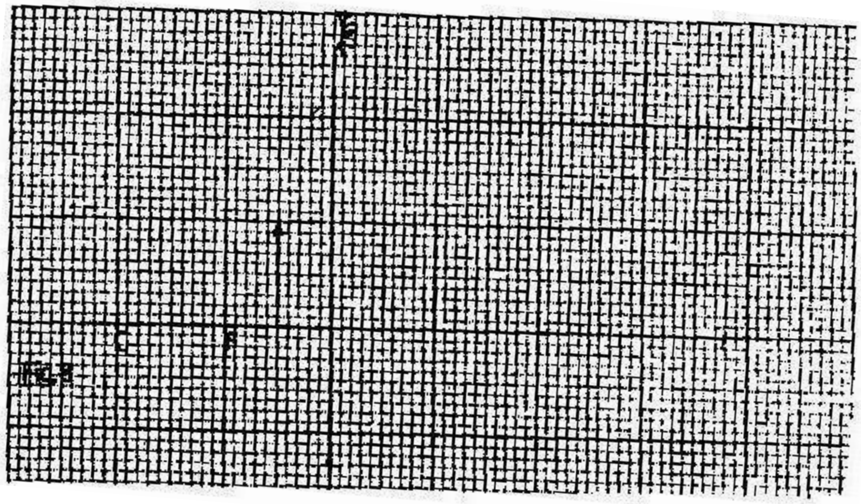
(c) State what is observed on the voltmeter when

(i) switch A is closed and switch B is open (1 mark)

(ii) Switch A is closed and opened, and then B is closed (1 mark)

(iii) Explain the observation made in c (ii) above (2 marks)

18. Figure 8 shows an object placed in front of a concave mirror of focal length 10cm. C is the centre of curvature.



(i) On the same figure draw a ray diagram showing the location of the image (4 marks)

Use the ray diagram drawn in (i) above to determine the

(ii) Image distance (2 marks)

(iii) Magnification (2 marks)

(b) A vertical object is placed 20cm in front of a convex lens of focal length 5 cm

(i) Determine

I. The image distance (3 marks)

II. The magnification (2 marks)

(ii) State two characteristics of the image (2 marks)

19. (a) Define the refractive index of a substance (1 mark)

(b) In an experiment to determine the refractive index of a liquid, the liquid was poured into a measuring cylinder. A pin was placed at the bottom of the cylinder and another pin was used to locate the apparent position of the first pin. The real depth and apparent depth were measured. The experiment was repeated with other values of real depth. The table below shows the results obtained.

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 (5 marks)

(ii) From the graph determine the refractive index of the liquid (4 marks)

(c) Figure 9 shows a ray of light incident on a glass – air interface

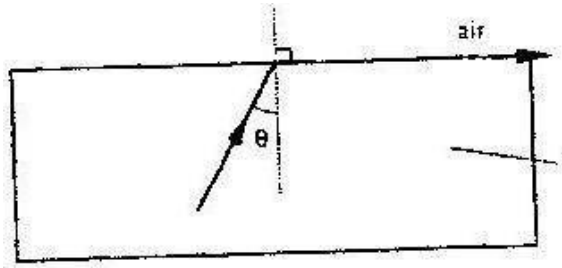


Figure 9

Given that the refractive index of the glass is 1.6. Determine angle θ (3 marks)

20. Figure 10 shows a simple electric generator

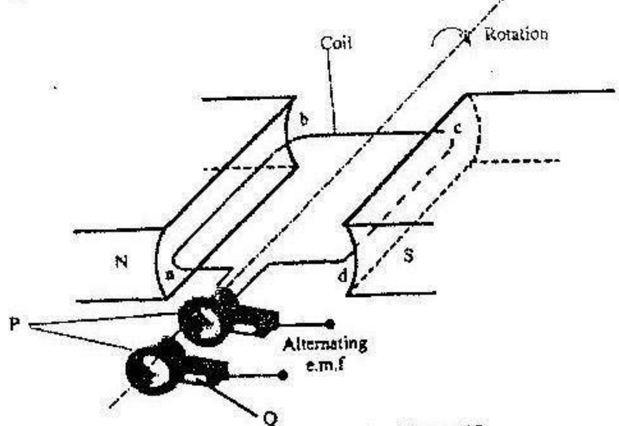


Figure 10

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

(ii) The e.m.f generated as the coil rotates is represented in the graph in figure

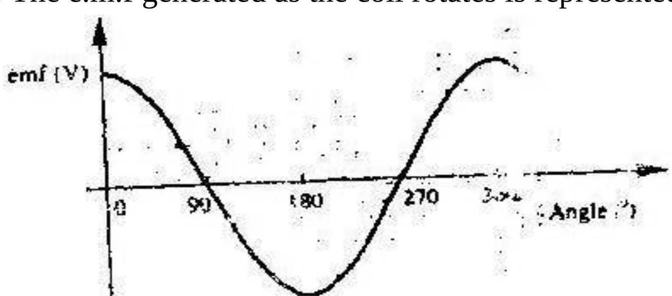


Figure 11

Give reasons for the changes in emf as the coil rotates from 0^0 to 90^0 and 90^0 180^0

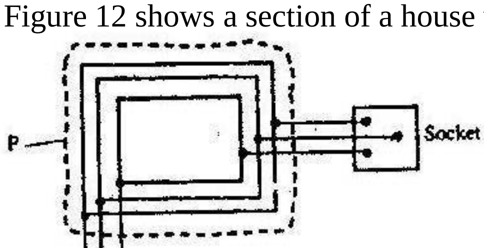
(b) The primary coil of a transformer has 1200 turns and the secondary coil has 60 turns. The transformer is connected to a 240V. a.c source.

Determine

(i) The output voltage (2 marks)

(ii) The output current when the primary coil has a current of 0.5A. (Assume there are no energy losses. (3 marks)

21. (a) Figure 12 shows a section of a house wiring system



(i) Name:
The circuit labeled P (1 mark)
The terminals labeled X and Y
X……………………………….Y…………………………… (2 marks)
II Give a reason why R is connected to Y but not to X (1 mark)

(ii) Why is the earthing necessary in such a circuit? (1 mark)

(b) Determine the cost of using an electric iron rated 1500W, for a total of 30 hours given that the cost of electricity per kWh is Kshs 8. (2 mark)

K.C.S.E 2007 PHYSICS PAPER 1
SECTION A (25 Marks)
Answer all questions in this section in the spaces provided

1. 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

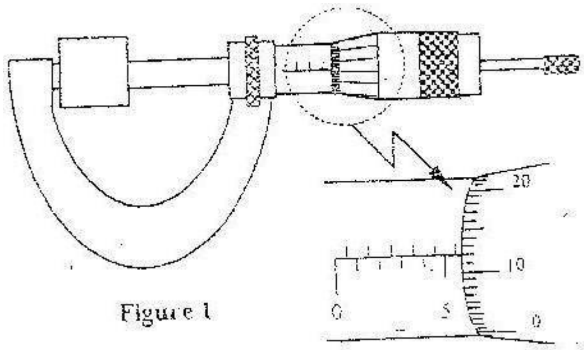


Figure 1

What is the length of the cube? (1 mark)

2. Determine the density of the metal cube giving your answer correct to three significant figures. (3 marks)

3. Figure 2 shows a tube of varying cross sectional area

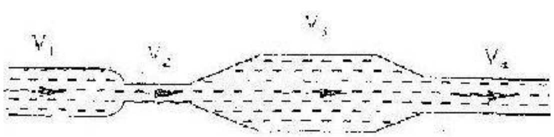
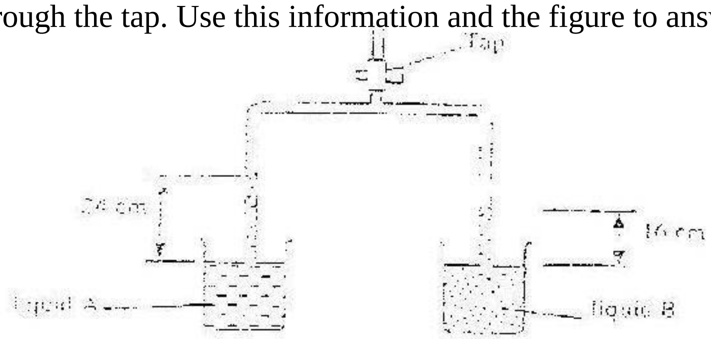


Figure 2

Arrange the speed $V_1V_2V_3$ and V_4 in decreasing order starting with the highest (1 mark)

4. 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.



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.

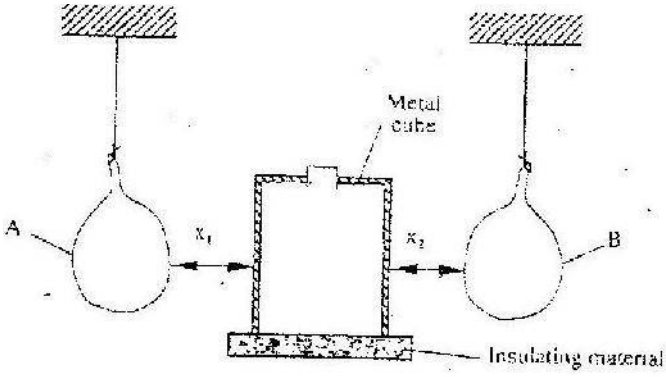


Figure 4

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.

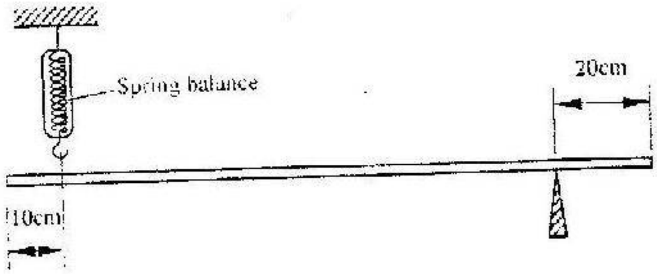


Figure 5

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.

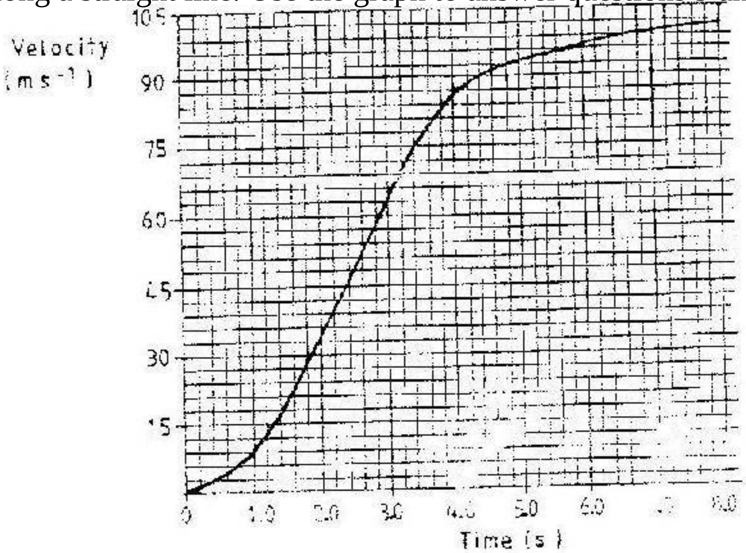


Figure 6

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

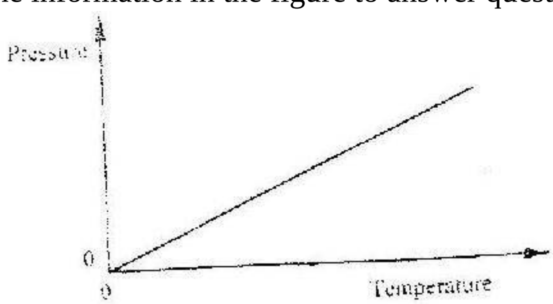


Figure 7

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

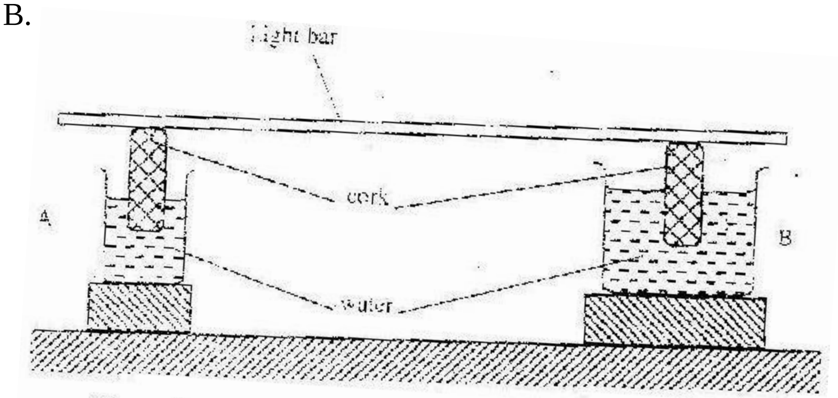


Figure 8

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 and then observed through the microscope.

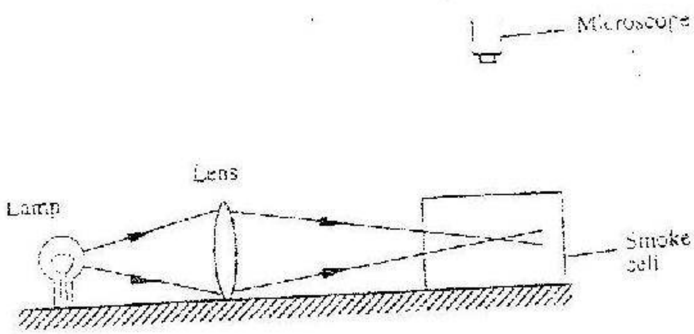


Figure 9

(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.

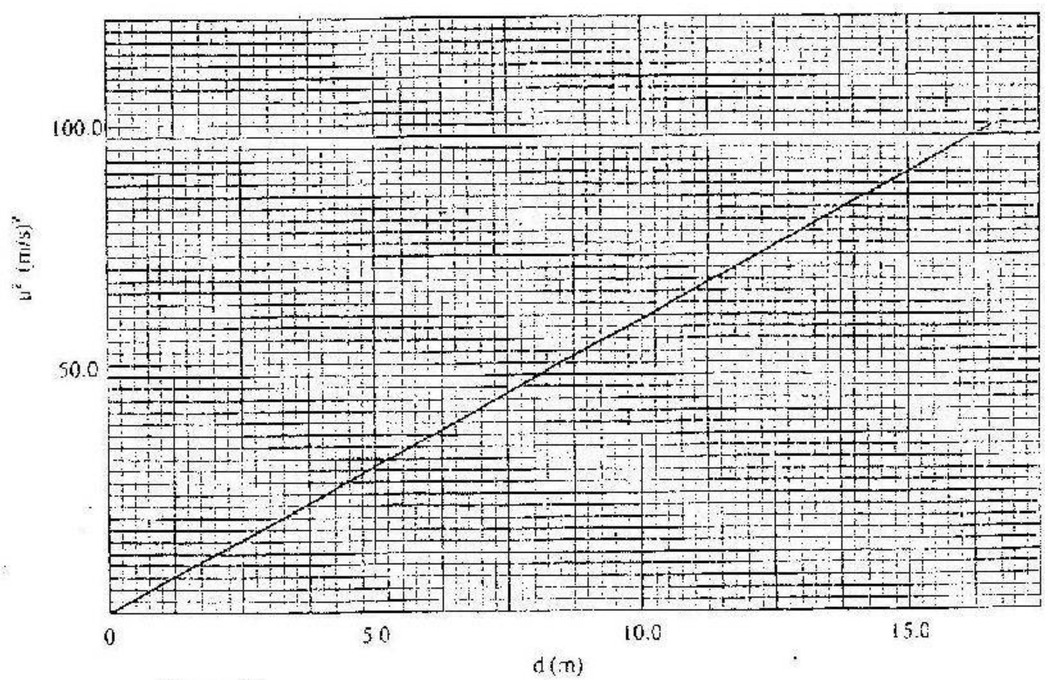


Figure 10

(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.

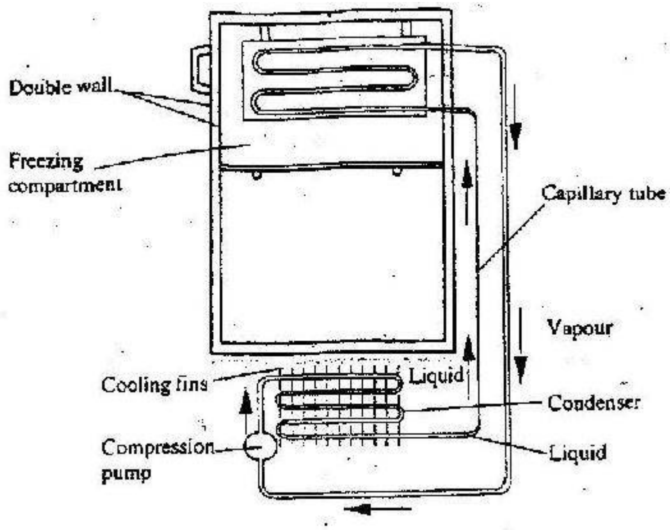


Figure 11

(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 100^0 C is passed into water of mass 400g at 10^0C. 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 = $4200 Jkg^{-1}K^{-1}$)

(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.

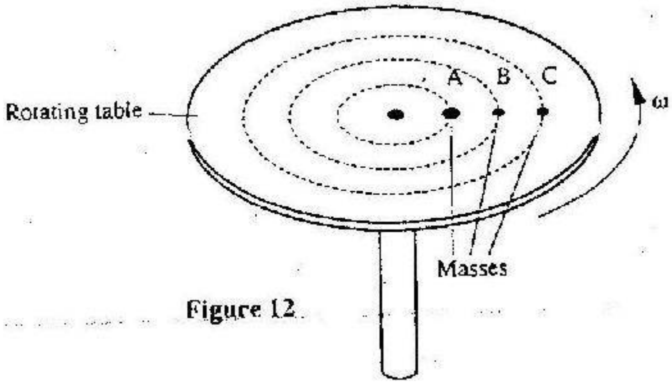


Figure 12

(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

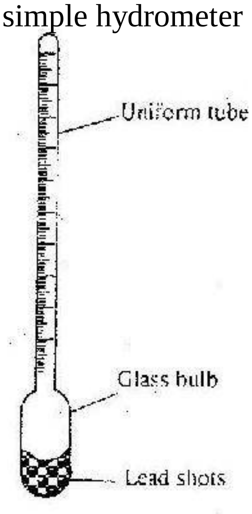


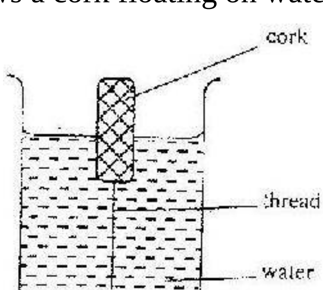
Figure 13

(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.



(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

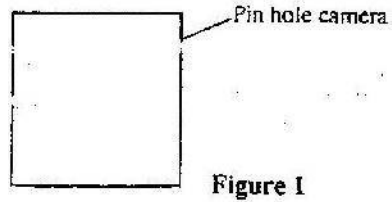


Figure 1

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

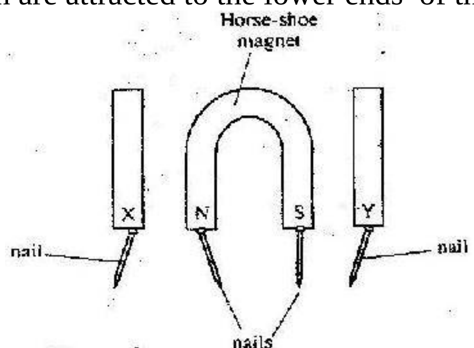


Figure 2

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.

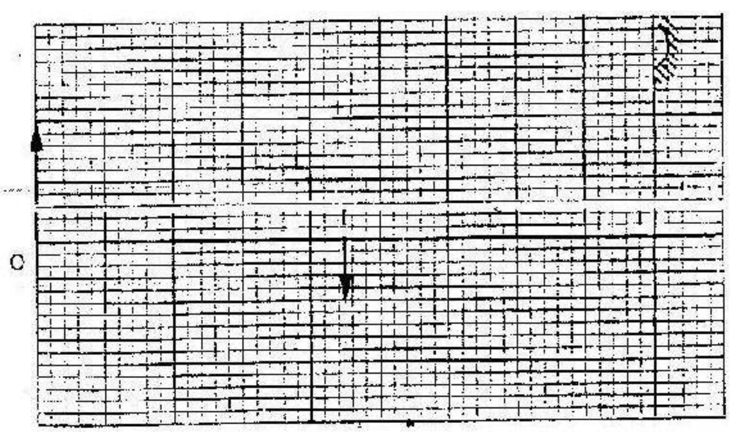


Figure 3

(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. shows the displacement – time graph for a certain wave

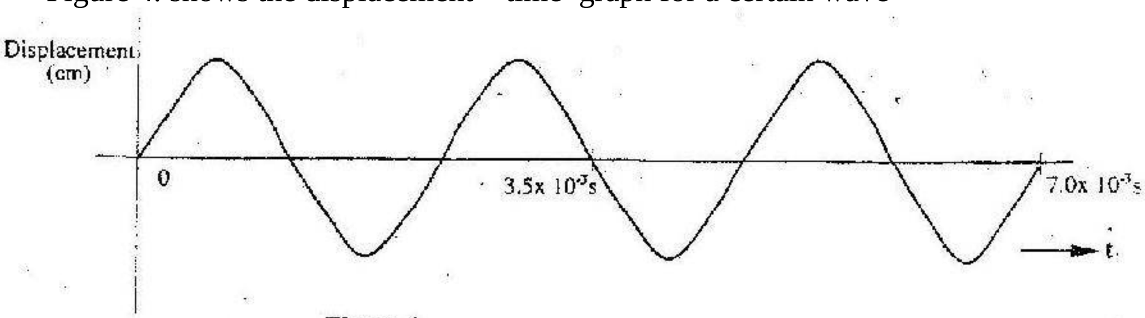


Figure 4

Determine the frequency of the wave (3 marks)

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

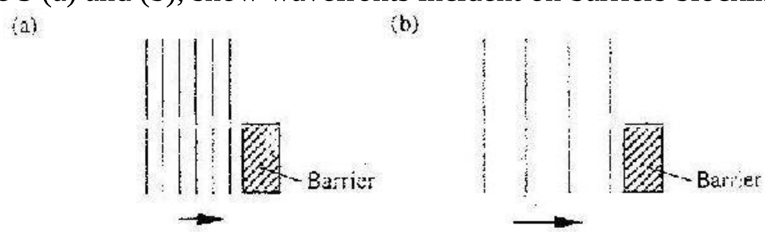


Figure 5

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

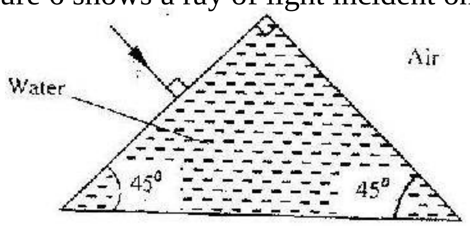


Figure 6

Sketch the path of the ray as it passes though the prism
Critical angle for water is 49^0 (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.

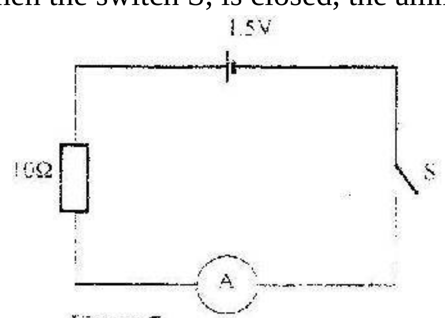


Figure 7

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, $^V/_2$ 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.

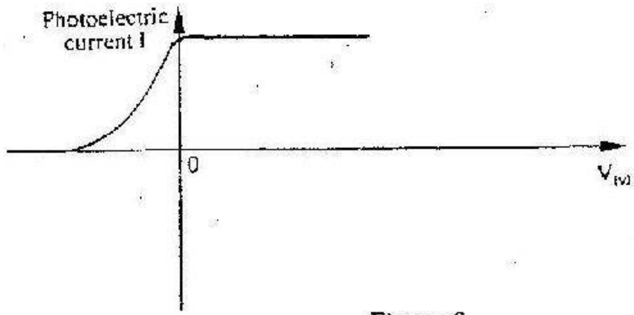


Figure 8

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

$$^{234}_{83}Bi \xrightarrow{\beta} {}^{a}_{84}X \longrightarrow {}^{230}_{b}Y$$

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

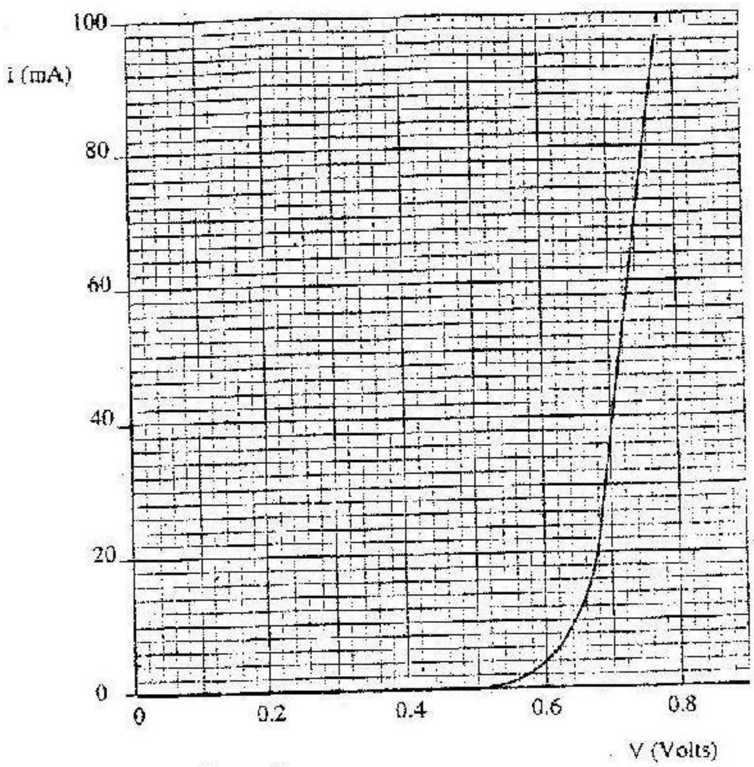
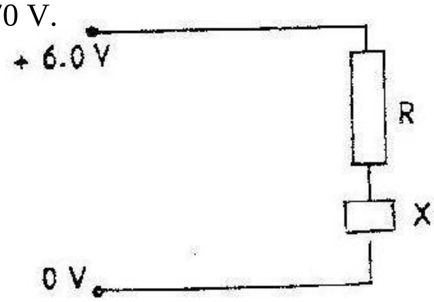


Figure 9

(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.

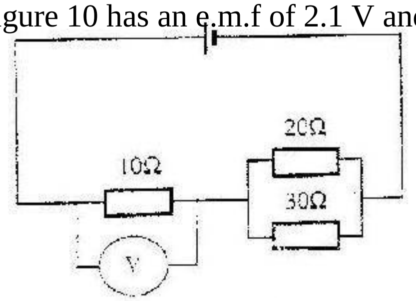


Figure 10

Determine the

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

(ii) Current in the circuit (1 mark)

(iii) Reading of the voltmeter (2 marks)

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

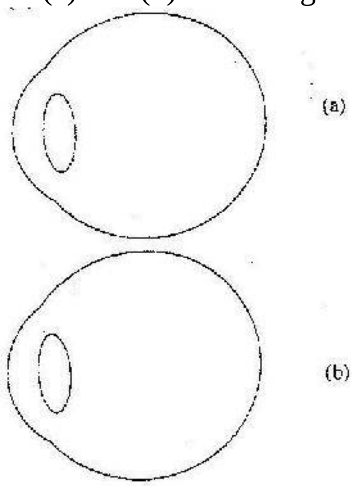


Figure 11

(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 12 shows the features of a simple camera

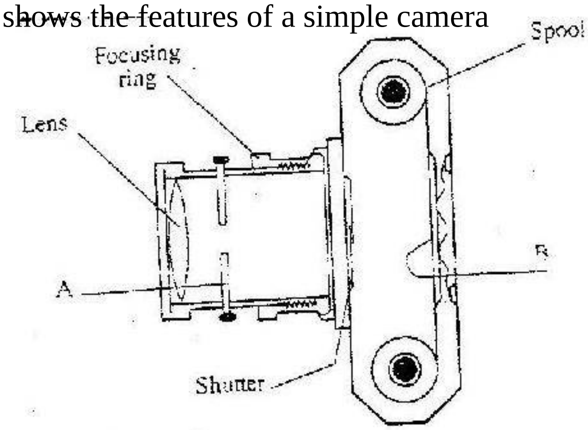


Figure 12

(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

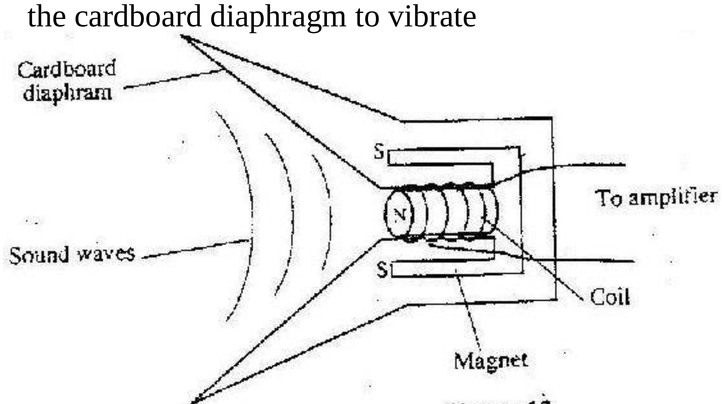


Figure 13

(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. (a) Figure 14 shows the features of a cathode ray tube

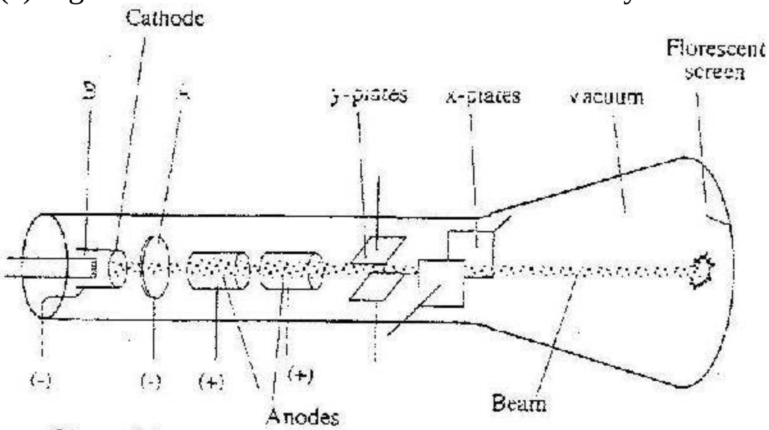


Figure 14

(i) Name the parts labeled A and B (2mks)

A ………………………………… B……………………………

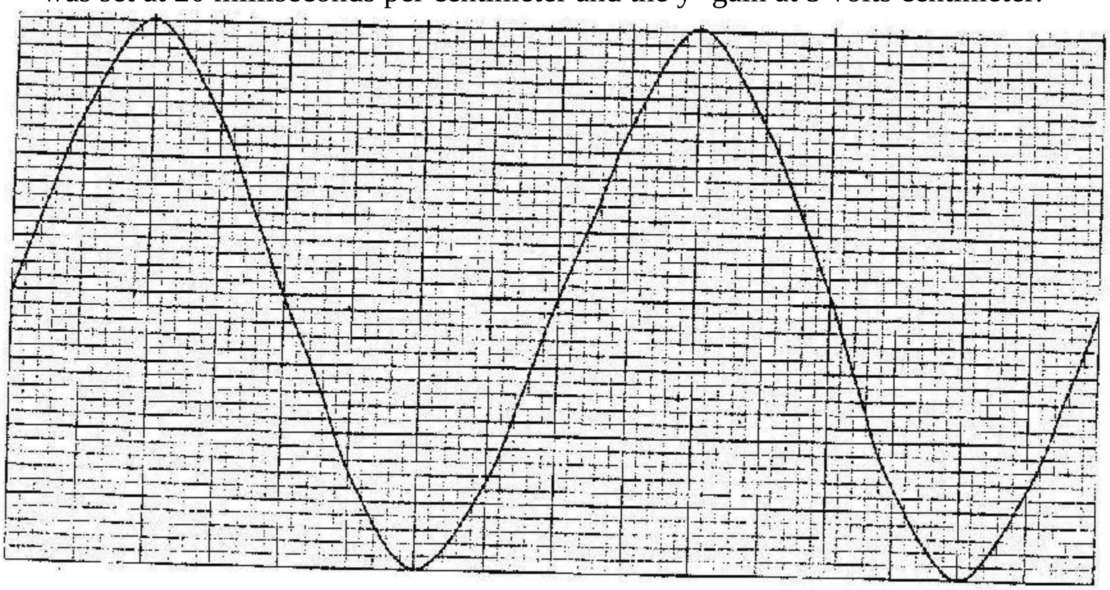
(ii) Explain how the electrons are produced in the tube (2 marks)

(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.



(i) Determine the pick voltage of the generator (2mks)

Figure 15

(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)

PHYSICS K.C.SE. YEAR 2008
PAPER 1
SECTION A (25 MARKS)

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

1. A drug manufacturer gives the mass of the active ingredient in a tablet as 5 mg. Express this quantity in kilogramme and in standard form. (1mk)

2. The masses of equal volumes of a certain liquid and of water were found to be m_v and m_w respectively. Given that the density of water is $1gcm^{-3}$, express the density, p, of the liquid in terms of m_v m_w (show your work) (2mks)

3. Fig. 1 shows a brick placed on a plane inclined at an angle θ to the horizontal. The weight, W, of the brick is shown.

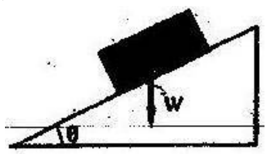


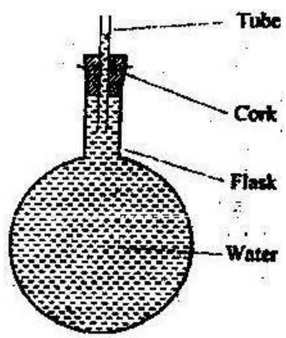
Figure 1

   a) On the same diagram show with arrows the other two forces acting on the brick and name them. (1mk)

   b) State how each of the two forces named (a) above is affected when the angle θ is reduced. (1mk)

4. Water is known to boil at 100^0C. A student heated some water and noticed that it boiled at 101^0C. State two possible reasons for this observation. (2mks)

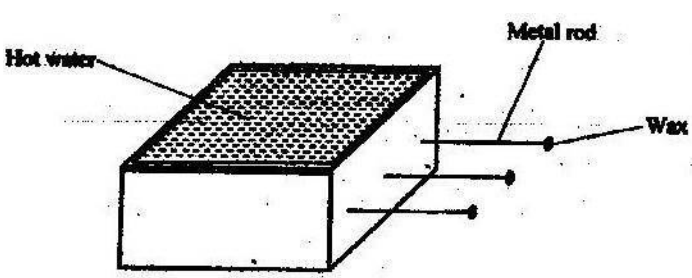
5. Fig: 2 shows a flask filled with water. The flask is fitted with a cork through which a tube is inserted. When the flask is cooled, the water level rises slightly, then falls steadily.



Explain observation. (3mks)

Figure 2

6. Fig. 3 shows a hot water bath with metal rods inserted through one of its sides. Some wax is fixed at the end of each rod. Use this information to answer questions 6 and 7.



What property of metals could be tested using this set-up? (1mk)

7. Besides the length of the rods that is kept constant, what else should be kept constant when comparing the property for the different metal rods? (1mk)

8. Fig. 4 shows a conical flask 15cm high, filled with a liquid of density $1200 kgm^{-3}$. The atmospheric pressure of the surrounding is 8.4×10^4 Pa.

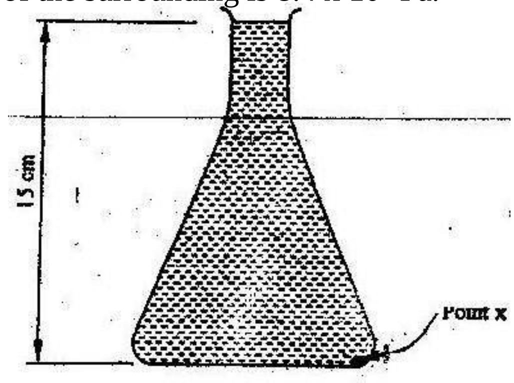


Figure 4

Determine the pressure at the point marked X, at the bottom of the flask. (3mks)

9. Explaining the difference between a liquid and a gas in terms of intermolecular distances and forces. (2mks)

10. Fig. 5 shows a toy resting on top of a closed bottle. Use the information on the figure to answer questions 10 and 11.

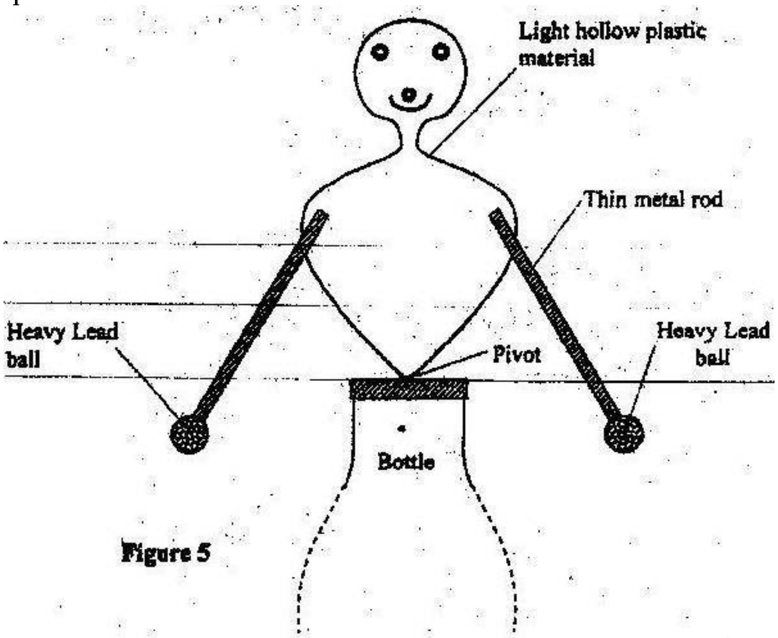


Figure 5

Mark on the diagram, point Q, the approximate centre of gravity of the toy. (1mk)

11. Giving a reason, name the state of equilibrium of the toy. (2mks)

12. Fig. 6 shows a sheet of paper rolled into a tube.

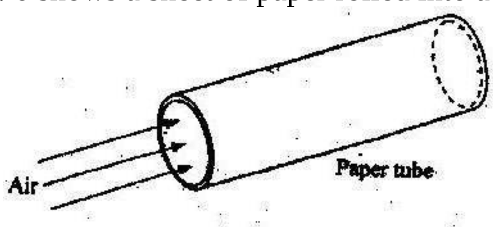


Figure 6

When a fast stream of air is blown into the tube as shown in the diagram the paper tube collapses. Explain the observation. (2mks)

13. The graphs in Fig. 7 represent the relations between extension e and mass m added on two springs x and y.

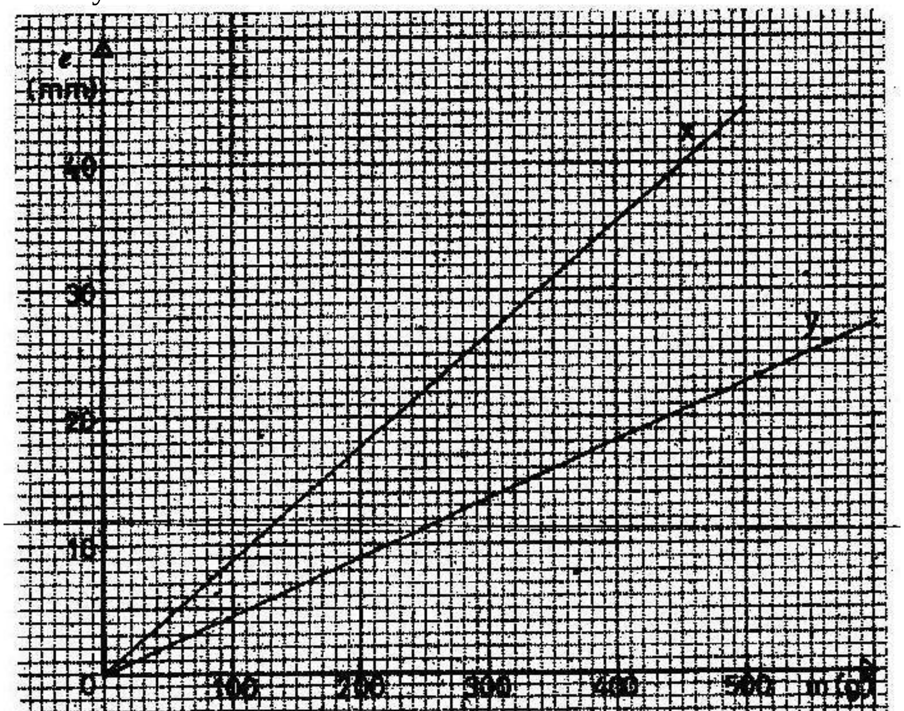


FIG 7

Given that the two springs are made of same materials, give a reason why the graphs are different. (1mk)

14. The system in Fig. 8 is in equilibrium

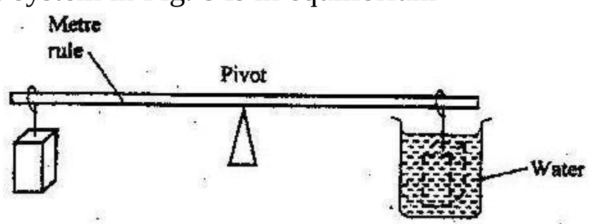


Figure 8

When the temperature of the water is raised the system is observed to tilt to the right, state the reason for this observation. (2mks)

SECTION B (55 MARKS)

Answer all questions in this section in the spaces provided.

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

b) A matatu starts from rest and accelerates to cover a distance of 49m in 7 seconds. Determine

(i) Its acceleration; (3mks)

(ii) Its velocity, after 7seconds (2mks)

c) A trolley moving on a horizontal bench of height 1.2m, strikes a barrier at the edge of the bench. The brass mass on the top of the trolley flies off on impact and lands on the ground 2.5m from the edge of the bench.

Determine:

(i) The time taken by the brass mass to reach the ground; (2mks)

(ii) The speed at which the trolley struck the barrier. (2mks)

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

b) You are provided with the apparatus shown in Fig. 9 and a stop watch.

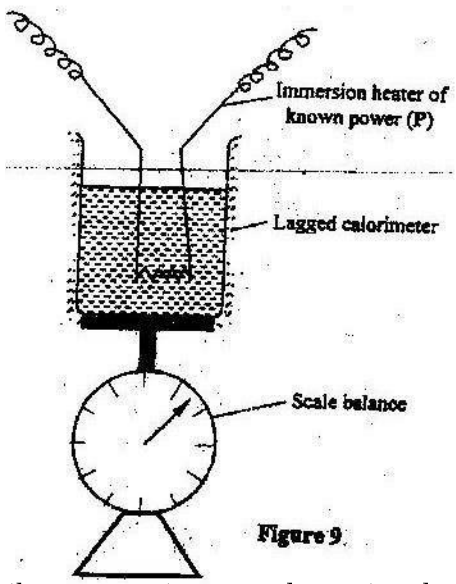


Figure 9

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)

c) A block of metal of mass 150g at 100^0C is dropped into a lagged calorimeter of heat capacity $40JK^{-1}$ containing 100g of water at 25^0C. The temperature of the resulting mixture is 34^0C. (Specific heat capacity of water=$4200JK^{-1)}$.

Determine:

(i) Heat gained by calorimeter; (2mks)

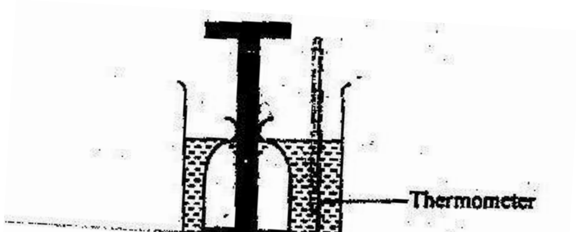
(ii) Heat gained by water; (1mk)

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

(iv) Specific heat capacity of the metal block (3mks)

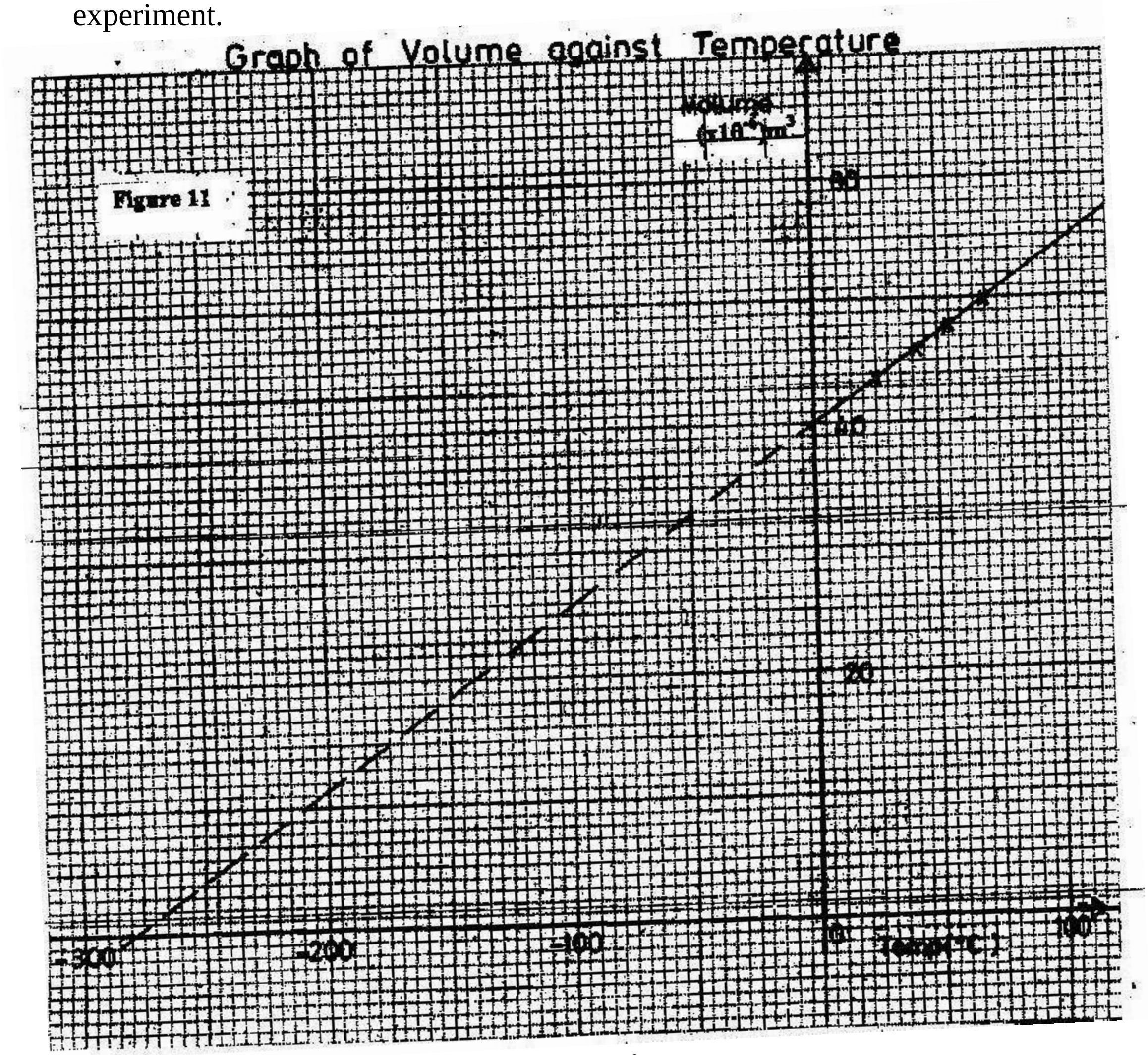
17. a) What is meant by absolute zero temperature? (1mk)

Fig. 10 shows a set up to investigate the relationship between temperature and volume for a certain gas.



b) State two factors that are kept constant, in order to determine the relationship. (2mks)

c) The graph in Fig. 11 shows the relationship between volume and temperature for the experiment.



(i) What was the volume of the gas at 0^0C? (1mk)

(ii) At what temperature would the volume of the gas be zero? (1mk)

(iii) Explain why the temperature in part (ii) above cannot be achieved. (2mks)

d) A sealed gas cylinder contains $300cm^3$ of certain gas at a temperature of 25^0C, and at a pressure of $9.5x\ 10^4pa$. the gas in the cylinder was then cooled to 10^0C.

Determine the new pressure of the gas in the cylinder. (4mks)

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

(b) Fig. 12 shows part of a hydraulic press. The plunger is the position where effort is applied while the Ram piston is the position where load is applied. The plunger has cross-section area, a m^2 while the Ram piston has cross-section area, a m^2.

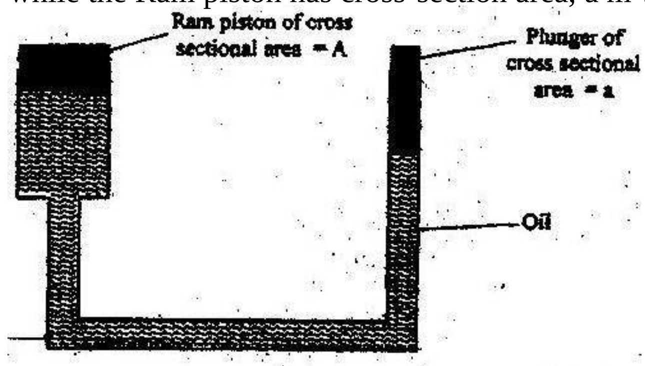


Figure 12

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

(i) State the property of liquid pressure on which the working of the hydraulic press works. (1mk)

(ii) Derive an impression for the velocity ratio (V.R) in terms of A and a. (4mks)

c) A machine of velocity ratio 45, overcomes a load of 4.5×10^3N when an effort of 135N is applied.

Determine:

(i) The mechanical advantage of the machine; (2mks)

(ii) Efficiency of the machine; (2mks)

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

19 a) State the principle of moments. (1mk)

b) A uniform metal strip is 3.0cm wide, 0.6cm thick d 100cm long. The density of the metal is 2.7 g/cm^3.

(i) Determine the weight of the strip. (3mks)

The strip placed n a pivot and kept in equilibrium by forces as shown in fig. 13

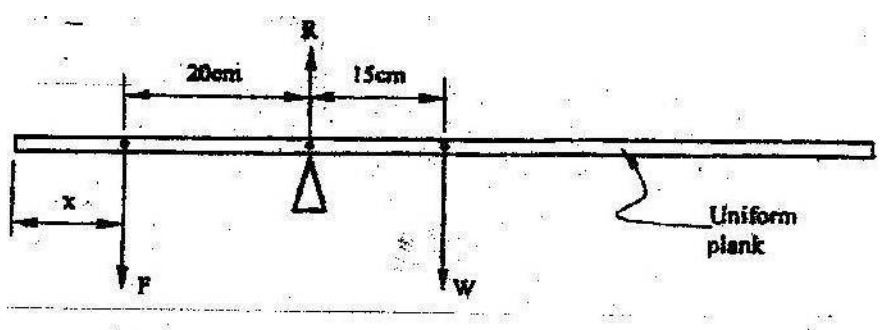
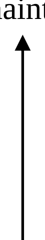


Figure 13

(ii) Determine the value of F and R (3mks)

(iii) X is the distance from the end of the plank to the point of application of force F. Force F is now applied at various points nearer to the pivot so that x increases. Equilibrium is maintained all the time. On the axes provided sketch the relation between force F and x.



(iv) Give a reason for the answer in (iii) above (1mk)

PHYSICS K.C.S.E YEAR 2008
PAPER 2
SECTION A (25 MARKS)
Answer all the questions in this section in the spaces provided.

1. Figure 1 shows three point sources of light with an opaque object placed between them and the screen.

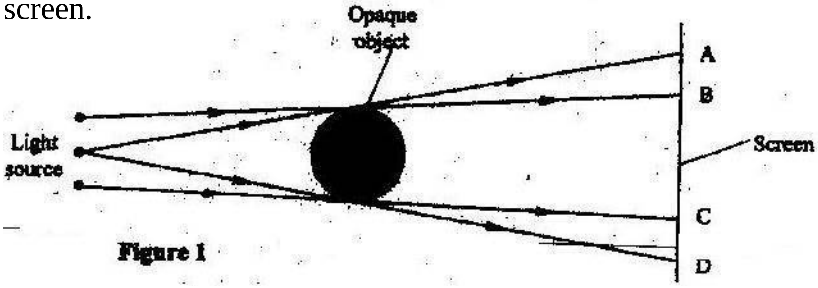


Figure 1

Explain the nature of the shadow formed along B and C. (2mks)

2. A leaf electroscope A is charged and placed on the bench. Another uncharged leaf electroscope B is placed on the same bench and moved close to A until the caps touch. State and explain what is observed on the leaves of A and B. (2mks)

3. You are provided with the following;
A cell and holder, a switch, a rheostat, an ammeter, a voltmeter and connecting wires. Draw a diagram for a circuit that could be used to investigate the variation of the potential difference across the cell with the current drawn from the cell. (1mk)

4. An un-magnetized steel rod is clamped facing North-South direction and then hammered repeatedly for some time. When tested, it is found to be magnetized. Explain this observation. (2mks)

5. The diagram in figure 2 shows an object O placed in front of a converging lens. F and F are the principal foci for the lens.

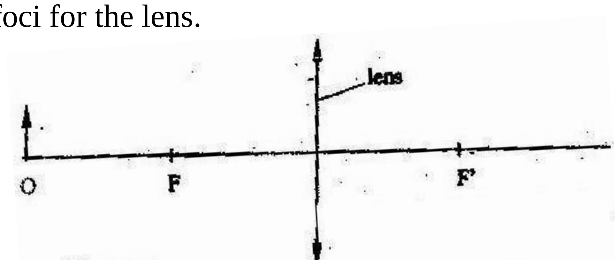
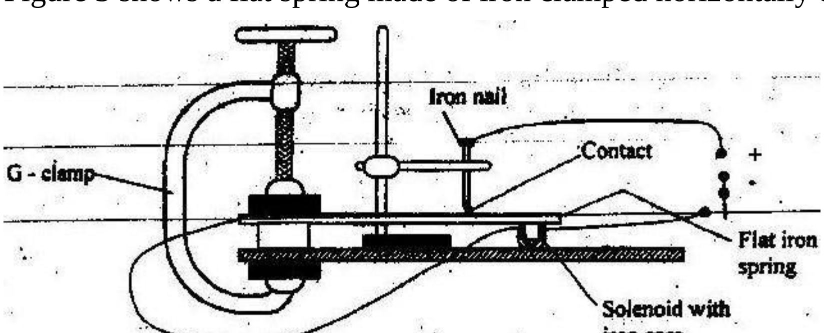


Figure 2

The object is now moved along the principal axis until a virtual image is produced.
On the same diagram:
(i) Draw the object O in the new position along the principal axis;
(ii) Sketch rays to show formation of the virtual image (1mk)

6. Figure 3 shows a flat spring made of iron clamped horizontally on the bench over a solenoid.



When the switch is closed, the spring vibrates. Explain this observation. (3mks)

7. Figure 4 shows a hack-saw blade clamped horizontally on a bench and the free end is made to vibrate about the rest position.

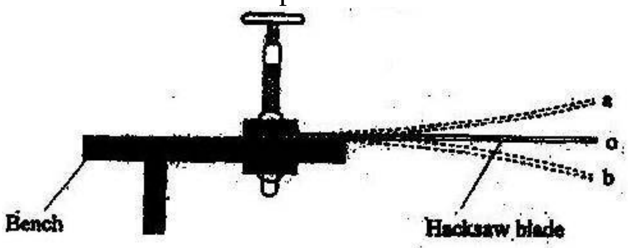


Figure 4

The movement o $\rightarrow$ a $\rightarrow$ 0 $\rightarrow$ b $\rightarrow$ 0 $\rightarrow$ a $\rightarrow$ 0 $\rightarrow$ b takes 0.7 seconds.
Determine the frequency of vibration of the blade. (2mks)

8. Figure 5 shows wavefronts approaching the boundary between two media.

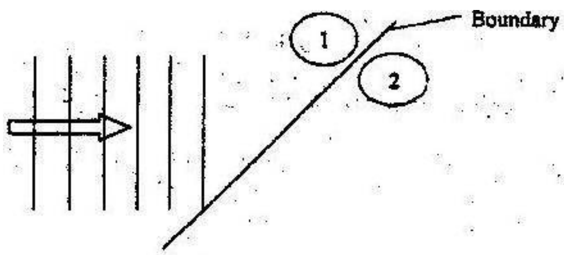


Figure 5

The speed of the waves in medium (2) is higher than that in medium (1). On the same diagram complete the figure to show the wavefronts after crossing the boundary.

(2mks)

9. Figure 6 shows a circuit in which a battery of negligible internal resistance, two resistors, a capacitor, a voltmeter and a switch are connected.

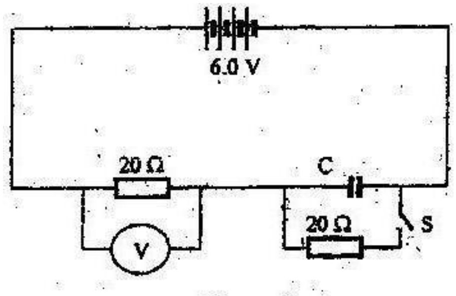


Figure 6

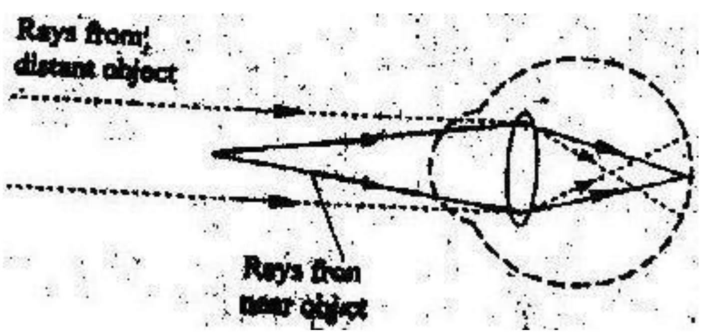
Giving a reason for your answer in each case, state the reading of the voltammeter, V, when the switch is (2mks)

(i) Open
V=…………………………………………………………………..
Reason…………………………………………………………..

(ii) Closed
V=………………………………………………………………….
Reason………………………………………………………….

10. A heating coil is rated 100W, 240V. At what rate would it dissipate energy if it is connected to a 220V supply? (3mks)

11. Figure 7 shows how rays from a distant and a near object are focused inside a human eye with a certain defect.



Name the defect and state the cause of this defect. (1mk)
Defect……………………………………………………………………..
Cause of defect…………………………………………………………….

12. A narrow beam of electrons in a cathode ray oscilloscope (CRO) strike the screen producing a spot. State what is observed on the screen if a low frequency a.c source is connected across the y-input of the CRO (1mk)

13. The accelerating potential of a certain X-ray tube is increased. State the change observed on the X-rays produced. (1mk)

14. A radioactive isotope of copper decays to form an isotope of Zinc as shown below

$$^{69}Cu \longrightarrow {}^{69}Zn + \text{radiation}$$

29 30 (2mks)

Name the radiation emitted and give a reason for your answer

Radiation………………………………………………………………………

Reason…………………………………………………………………………

SECTION B (55 MARKS)

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

15. a) State one factor that affects the speed of sound in a solid. (1mk)

b) An observer stands half-way between two vertical cliffs that are L metres apart. He moves directly towards one cliff and after a distance x=10cm from the centre, he strikes a gong and measures the time interval, t, between the echoes heard from the two cliffs. He moves a further 10m and again strikes the gong and measure the time interval between the echoes. The process is repeated several times. The graph in Figure 8 shows the relation between the time interval, t and the distance, x from the centre.

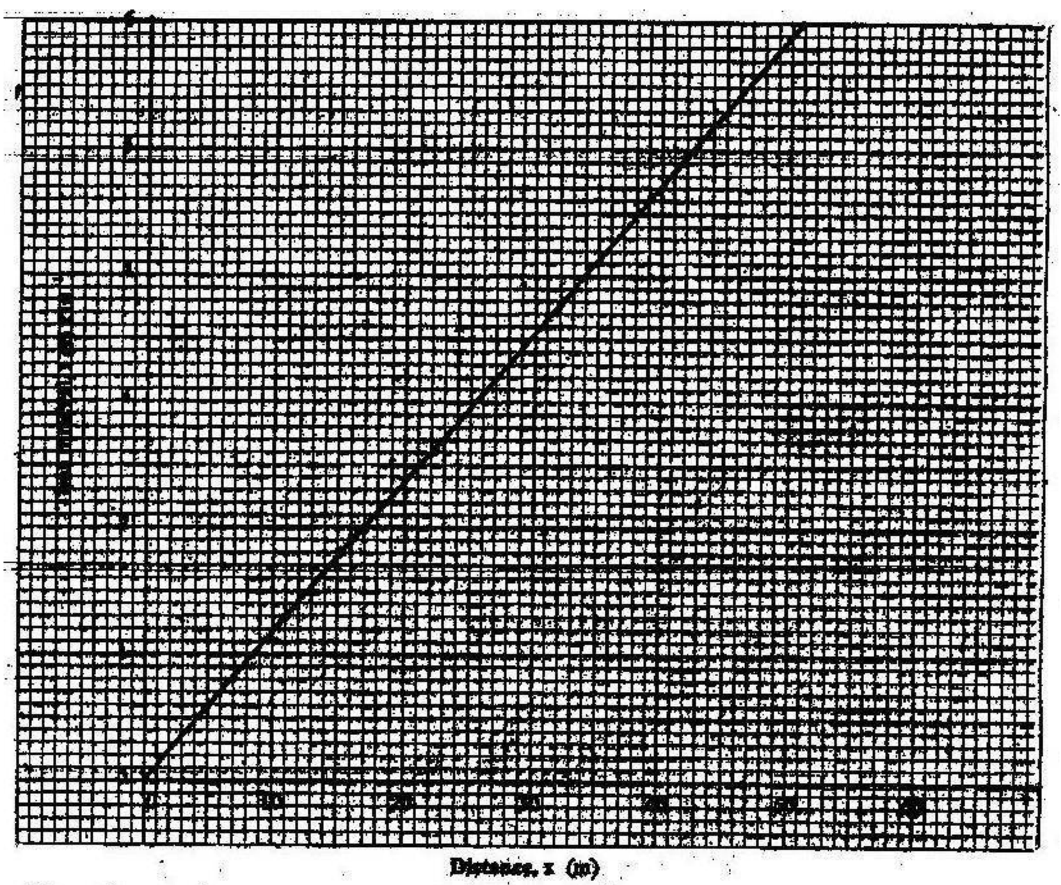


Figure 8

(i) From the graph, determine the value of x for which the time interval was 0.55.
(1mk)

(ii) Given that $t = {}^{4}/_{v}x$ where v is the speed of sound in air, determine the value of v from the graph. (3mks)

(iii) If the maximum time measured by the observer was t=4.7s, determine the distance L between the cliffs. (3mks)

(c) A search boat uses a signal of frequency 6.0×10^4 H_z to detect a sunken ship directly below. Two reflected signals are received; one after 0.1 seconds from sunken boat and the other after 0.14 seconds from the sea bed. If the sea bed is 98 m below the boat, determine:-

(i) The speed of the signal in water. (3mks)
You may use the value of v from (ii) above.
(ii) The depth of the sunken ship below the boat (2 mks)

16. (a) State two conditions necessary for total internal reflection to occur (2 mks)
(b) Figure 9 shows a ray of light incident on the boundary between two media 1 and at an angle θ

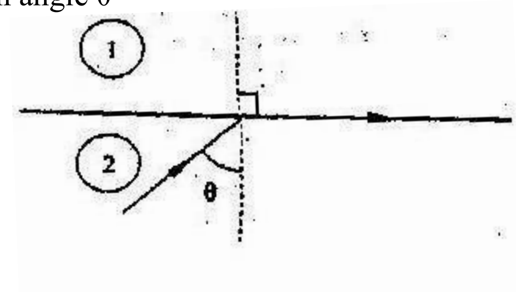


Figure 9

Show that the refractive index for a ray of light traveling from medium 1 to medium 2 is given by:

$$M_2 = \frac{1}{\sin\theta}$$ (2 mks)

(c) Figure 10 shows a ray of light incident on one face of a block of ice of refractive index 1.31 and totally reflected at the adjacent face

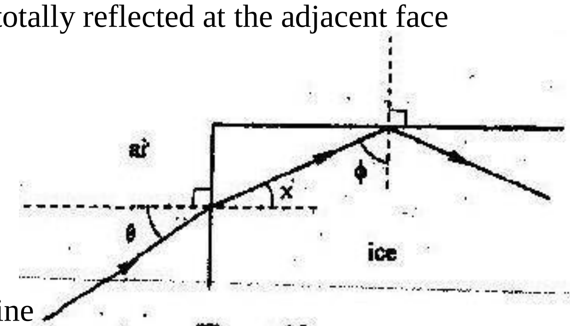
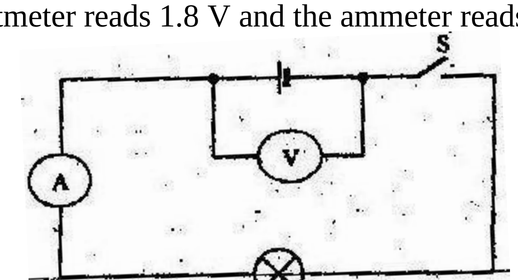


Figure 10

Determine
(i) Angle Φ (2 mks)
(ii) Angle x (1 mk)
(iii) Angle θ, the greatest angle for which the total internal reflection is possible (2 mks)

17. (a) Three resistors of resistance 2.0 Ω, 4.0 Ω and 6.0 Ω are connected together in a circuit.
Draw a circuit diagram to show the arrangement of the resistor which Gives
(i) Effective resistance of 3.0 Ω (1 mk)
(ii) Minimum resistance (1 mk)

(b) In figure 11 the voltmeter reads 2.1 V when the switch is open. When the switch is closed, the voltmeter reads 1.8 V and the ammeter reads 0.1A.



Determine:
(i) The e.m.f of the cell (1 mk)
(ii) The internal resistance of the cell (3 mks)
(iii) The resistance of the lamp (2 mks)

18. (a) Figure 12 shows two circuits close to each other

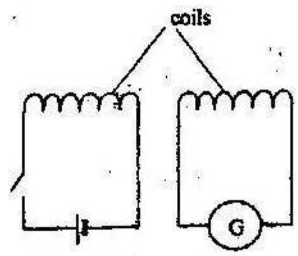


Figure 12

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

(b) Explain how energy losses in a transformer are reduced by having:
(i) A soft- iron core (2 mks)
(ii) A laminated core (2 mks)

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

19. (a) X- rays are used for detecting cracks inside metal beams
(i) State the type of the X- rays used (1 mk)
(ii) Give a reason for your answer in (i) above (1 mk)

(b) Figure 13 shows the features of an X- ray tube

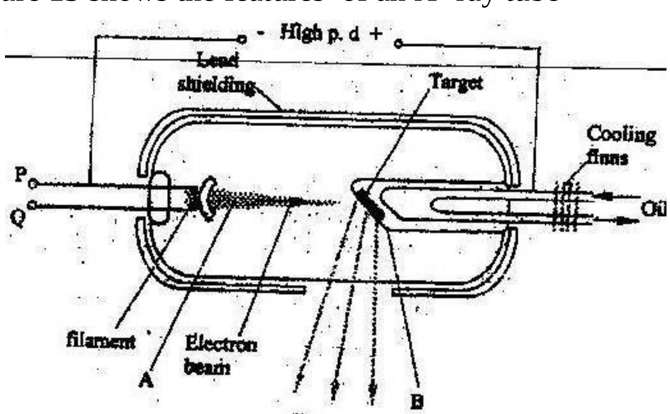


Figure 13

(i) Name the parts labeled A and B (2 mks)

A

B

(ii) Explain how a change in the potential across PQ changes the intensity of the X- rays produced in the tube. (2 mks)

(iii) During the operation of the tube, the target becomes very hot. Explain how this heat is caused (2 mks)

(iv) What property of lead makes it suitable for use as shielding material? (1 mk)

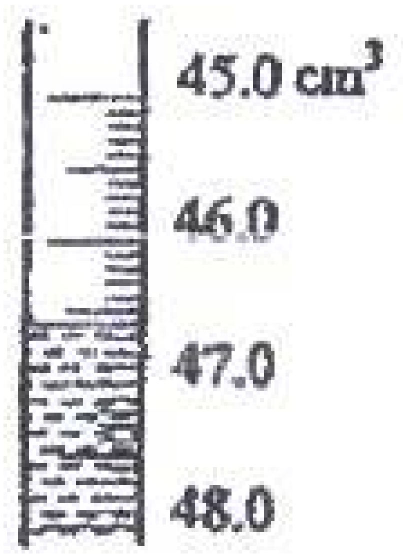
(c) In a certain X- ray tube, the electrons are accelerated by a Pd of 12000V. Assuming all the energy goes to produce X- rays, determine the frequency of the X- rays produced. (Plank's constant h= 6.62×10^{-34} Js and charge on an electron, e = 1.6×10^{-19}C). (4 mks)

PHYSICS PAPER 1 YEAR 2009

SECTION A (25 marks)

Answer all questions in this section in the spaces provide

1. In an experiment to measure the density of a liquid, a student filled a burette with a liquid to the 0 cm^3 mark. Figure 1 shows a section of the burette showing the level of the liquid after 54.5 g of the liquid had been run out



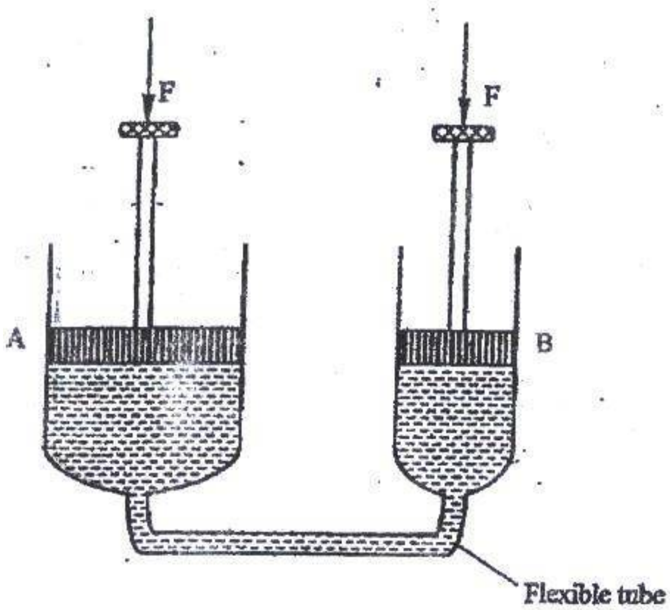
Determine the density of the liquid (3 mks)

2. In an experiment to determine the acceleration due to gravity g, a student measured the period, T and length L, of a simple pendulum. For a length L = 70.5 cm, the period T obtained as 1.7s. Given that $T = 2\pi \sqrt{L/g}$, determine the value of g correct to two significant figures

(2 mks)

3. A steel needle when placed carefully on water can be made to float. When a detergent is added to the water it sinks. Explain this observation

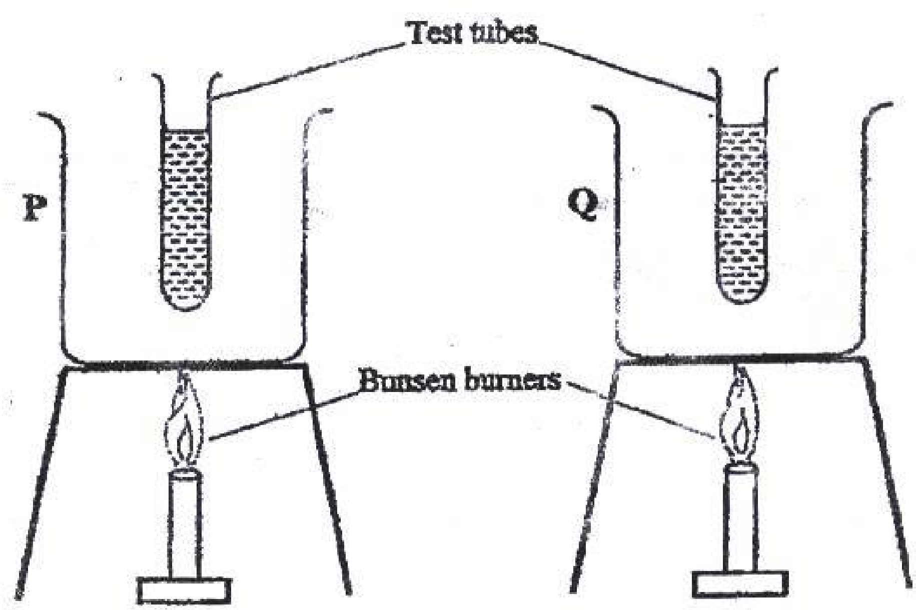
4. Figure 2 shows two cylinders containing a liquid and connected with a tight – fitting flexible tube. The cylinders are fitted with air- tight pistons A and B as shown



5. When equal forces, F are applied on the pistons as shown it is observed that piston A moves up while B moves down. Explain this observations (2 mks)

6. Two identical beakers A and B containing equal volumes of water are placed on a bench. The Water in A is cold while in B it is warm. Identical pieces of potassium permanganate are placed gently at the bottom of each beaker inside the water. It is observed that the spread of colour in B is faster than in A. Explain this observation. (2 mks)

7. A clinical thermometer has a constriction in the bore just above the bulb. State the use of this constriction.



Use the following information to answer questions 7 and 8

8. Two identical empty metal

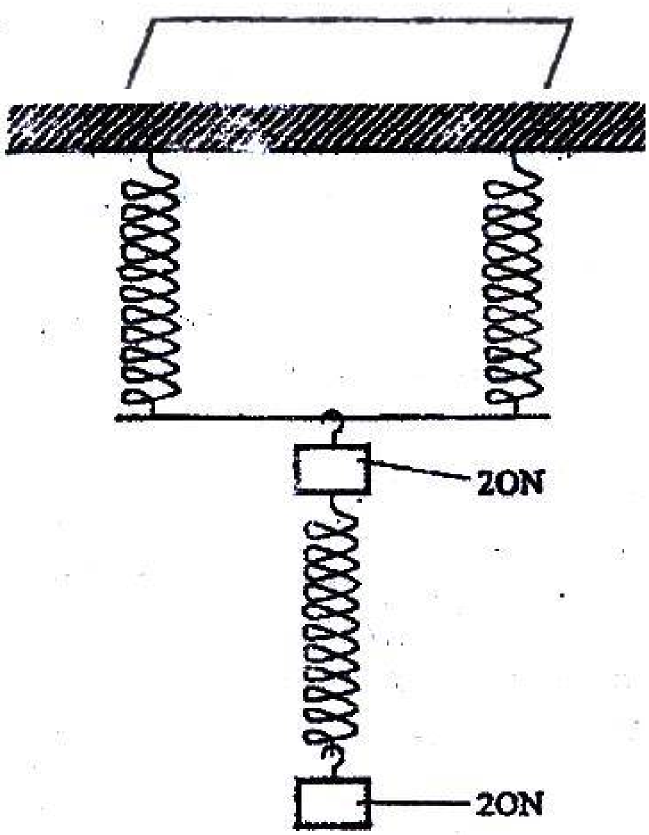
containers P and Q are placed over identical Bunsen burners and the burners lit. P is dull black while Q is shiny bright. After each container attains a temperature of 100^0C the burners are turned off. Identical test tubes containing water are suspended in each container without touching the sides as shown in figure 3

Explain why the container Q may become hot faster than P. (2 mks)

Explain why the water in test- tube in P becomes hot faster than in Q (2 mks)

9. Figure 4 shows a uniform cardboard in the shape of parallelogram

Locate the centre of gravity of the cardboard (1 mks)

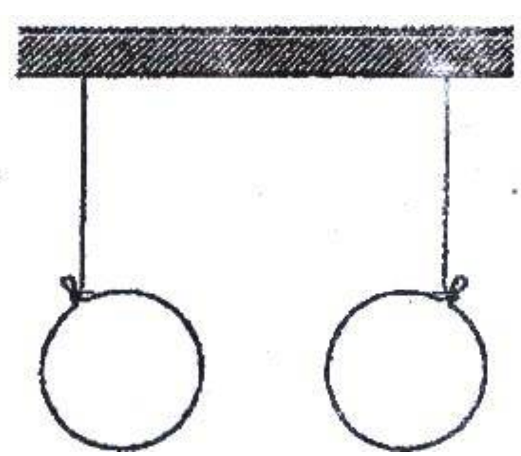


10. The three springs shown in figure 5 are identical and have

negligible weight. The extension produced on the system of springs is 20 cm.

Determine the constant of each spring (2 mks)

11. Figure 6 shows two inflated balloons hanging vertically on light threads



When a strea he space between the balloons, they are observed to move

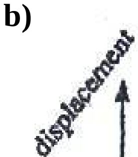
Figure 6

towards each other. Explain this observations (1 mk)

12. Figure 7 (a) shows the acceleration – time graph for a certain motion

a)

b)



On the axes provided in figure 7 (b), sketch the displacement – time graph for the same motion

(1 mks)

13. State what is meant by absolute zero temperature (zero Kelvin or 273^0C)
14. A turntable of radius 8 cm is rotating at 33 revolutions per second. Determine the linear speed of a point on the circumference of the turntable

SECTION B (55 MARKS)

Answer all the questions in this section in the spaces provided

15. (a) State two factors that affect the boiling point of a liquid (2 mks)

(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 8 shows the variation of the temperature of the liquid with time.

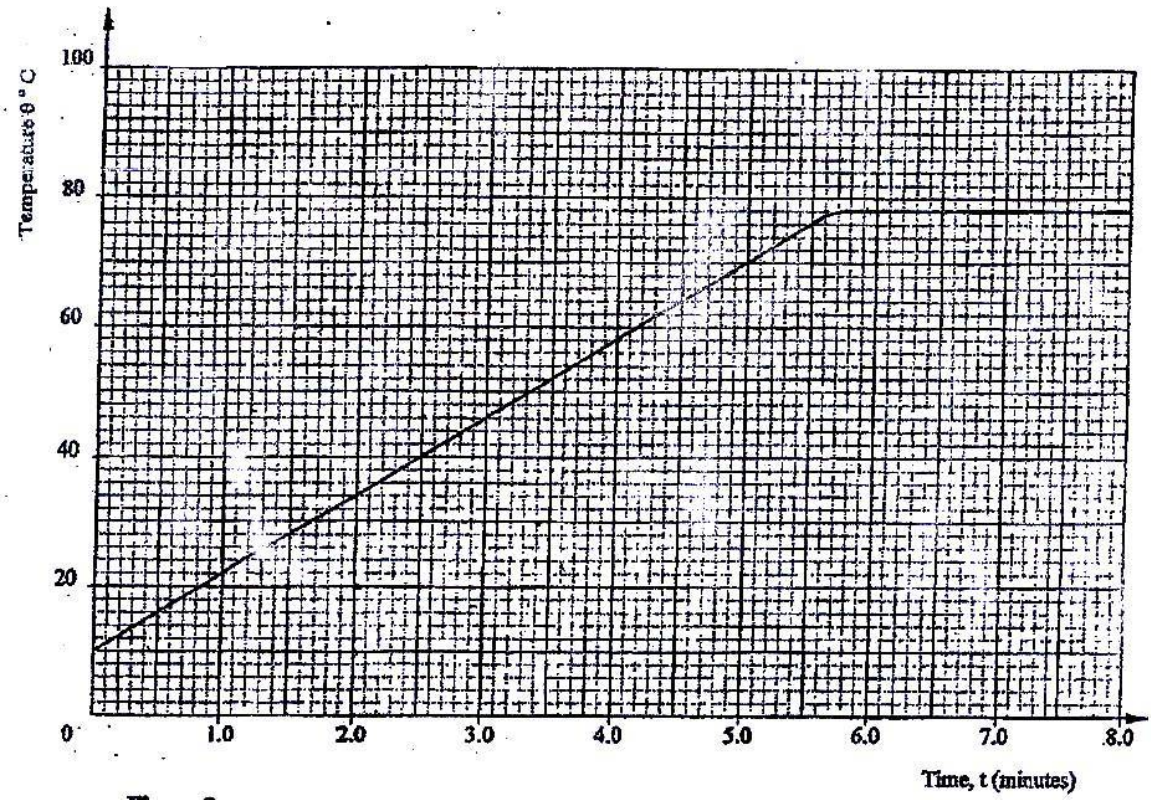


Figure 8

(i) From the graph, determine the boiling point of the liquid (1 mk)

(ii) (I) Determine the heat given out the by the heater between the times t= 0.5 minutes and t= 5.0 minutes (2 mks)

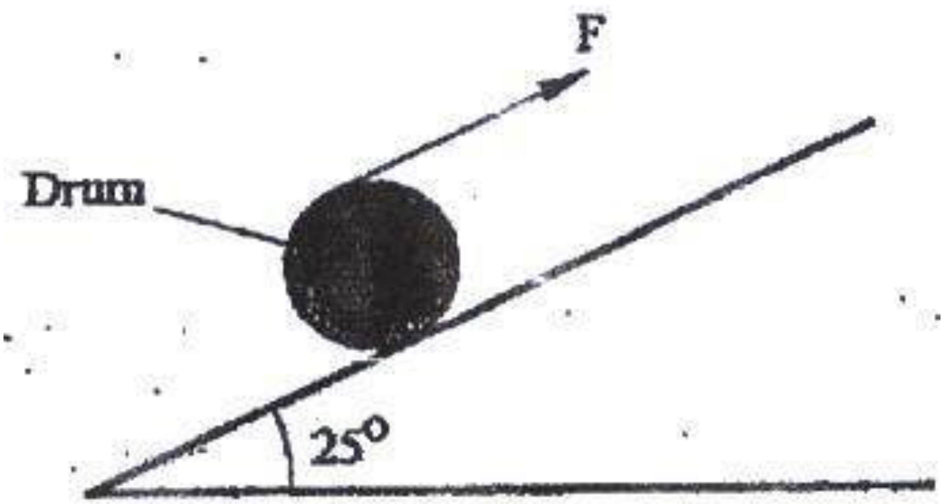
(II) From the graph determine the temperature change between the times t = 0.5 minutes and t= 5.0 minutes (1 mk)

(III) Hence determine the specific heat capacity of the liquid (2 mks)

(iii) 1.8 g of vapour was collected from above the liquid between the times t= 6.8 minutes and t= 7.3 minutes. Determine the specific latent heat of vaporization of the liquid (4 mks)

16. (a) Define the term efficiency of a machine (1 mk)

(b) Figure 9 shows a drum of mass 90 kg being rolled up a plane inclined at 25^0 to the horizontal. The force F applied is 420N and the distance moved by the drum along the plane is 5.2 m



Determine:

(i) The work done by the effort (3 mks)

(ii) The work done in raising the drum (3 mks)

(iii) The efficiency of the inclined plane as a machine (2 mks)

17. (a) State the law of flotation (1 mk)

(b) Figure 10 shows a rectangular metal block of density 10500 kgm^{-3} and dimensions 30 cm x 20 cm x 20 cm suspended inside a liquid of density 1200 kgm^{-3} by a string attached to a point above the liquid. The three forces acting on the block are the tension T, On the string, the weight W, of the block and the upthrust, U due to the liquid.

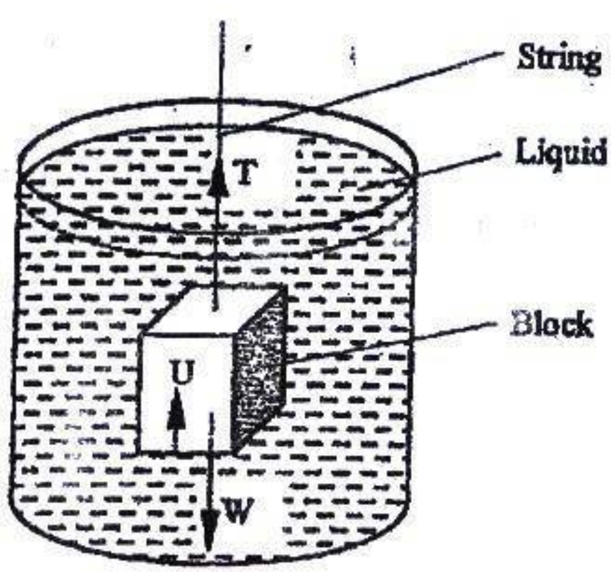


Figure 10

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

(1 mks)

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

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

(2 mks)

(iv) Hence determine the tension, T in the string (1 mk)

(c) A certain solid of volume 50 cm^3 displaces 10 cm^3 of kerosene (density 800 kgm^3) when floating. Determine the density of the solid. (4 mks)

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

(b) An air bubble is released at the bottom of a tall jar containing a liquid. The height of the liquid column is 80 cm. The volume of the bubble increases from 0.5 cm^3 at the bottom of the liquid to 1. 15 cm^3 at the top. Figure 11 shows the variations of pressure, P, on the bubble with the reciprocal of volume 1/v, as it rises in the liquid.

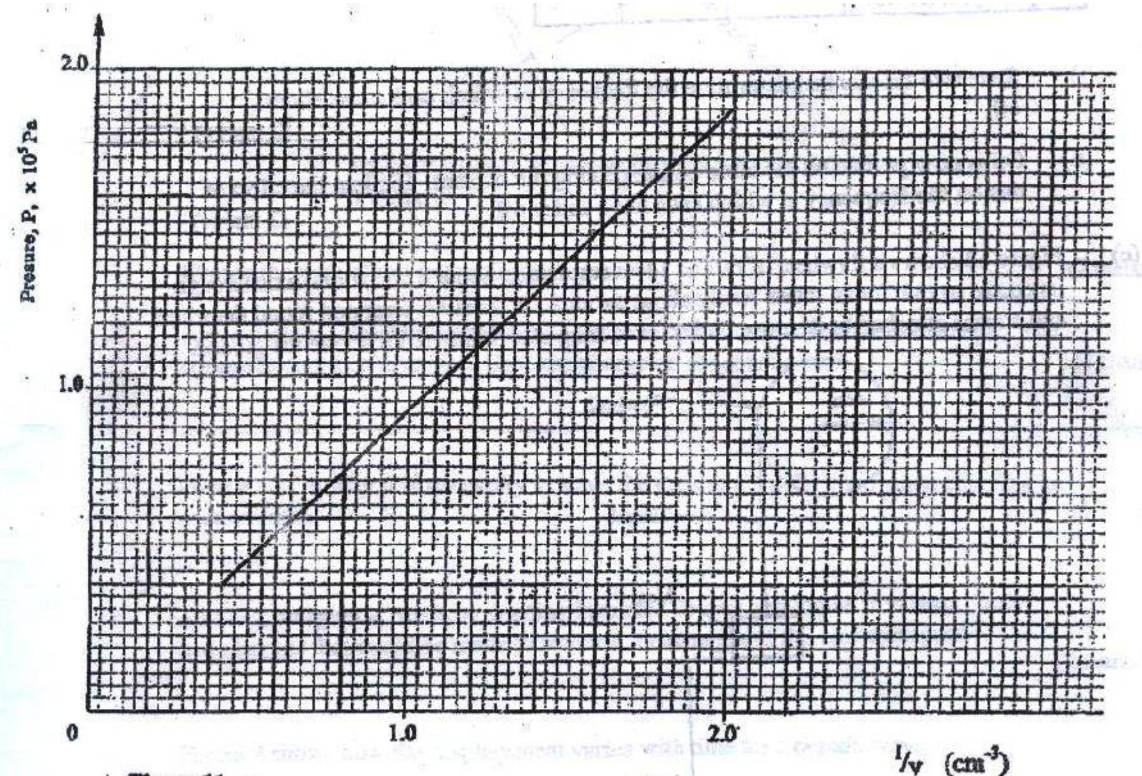


Figure 11

(i) State the reason why the volume increases as the bubble rises in the liquid Column (1 mk)

(ii) From the graph, determine the pressure on the bubble:

(I) At the bottom of the liquid column; (2 mks)

(II) At the top of the liquid column (1 mk)

(iii) Hence determine the density of the liquid in kgm^{-3} (3 mks)

(iv) What is the value of the atmospheric pressure of the surrounding? (1 mk)

(c) A rubber tube is inflated to pressure of 2.7×10^5 Pa and volume 3800 cm^3 at a temperature of 25^0C. It is then taken to another place where the temperature is 15^0C and the pressure 2.5×10^5 Pa. Determine the new volume. (4 mks)

19. (a) Define angular velocity (1 mk)

(b) Three masses are placed on a rotating table at distances 6 cm, 9 cm and 12 cm respectively from the centre of rotation. When the frequency of rotation is varied, it is noted that each mass slides off at a different frequency of rotation of the table. Table 1 shows the frequency at which each mass slides off.

Table 1

Radius r (cm)	12	9	6
Sliding off Frequency, f, (rev/s)	0.68	0.78	1.0

(i) State two factors that determine the frequency at which each mass slides off (2 mks)

(ii) Oil is now poured on the table before placing the masses. Explain the effect of this on the frequency at which each mass slides off. (2 mks)

(c) Figure 12 shows a flywheel of radius 14 cm suspended about a horizontal axis through its centre so that it can rotate freely about the axis. A thread is wrapped round the wheel and a mass attached to its loose end so as to hang at a point 1.2c above the ground.

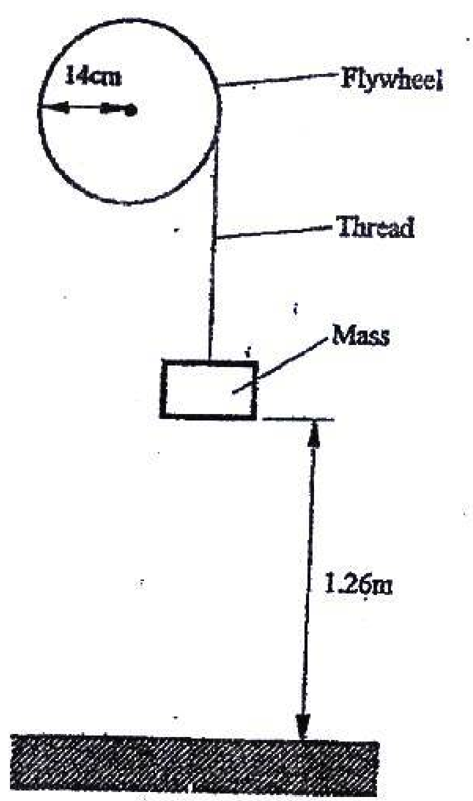


Figure 12

When the mass is released, it accelerates at 0.28 ms^{-2}. Determine the angular velocity of the wheel just before the mass strikes the ground.

(4 mks)

PHYSICS PAPER 2 YEAR 2009

SECTION A (25 MARKS)

Answer all the questions in this section in the spaces provided

1. State the number of images formed when an object is between two plane mirror placed in parallel

(1 mk)

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

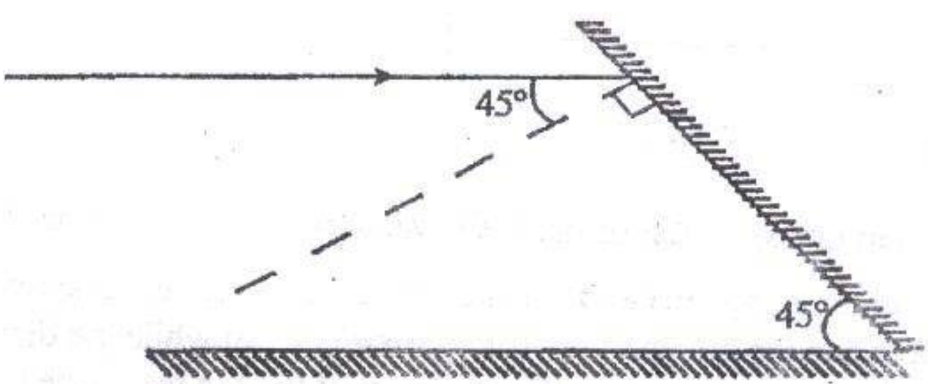


Figure 1

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

3. A conductor is slowly bought near the cap of a positively charged electroscope. The leaf first collapses and then diverges. State the charge on the conductor.

(1 mk)

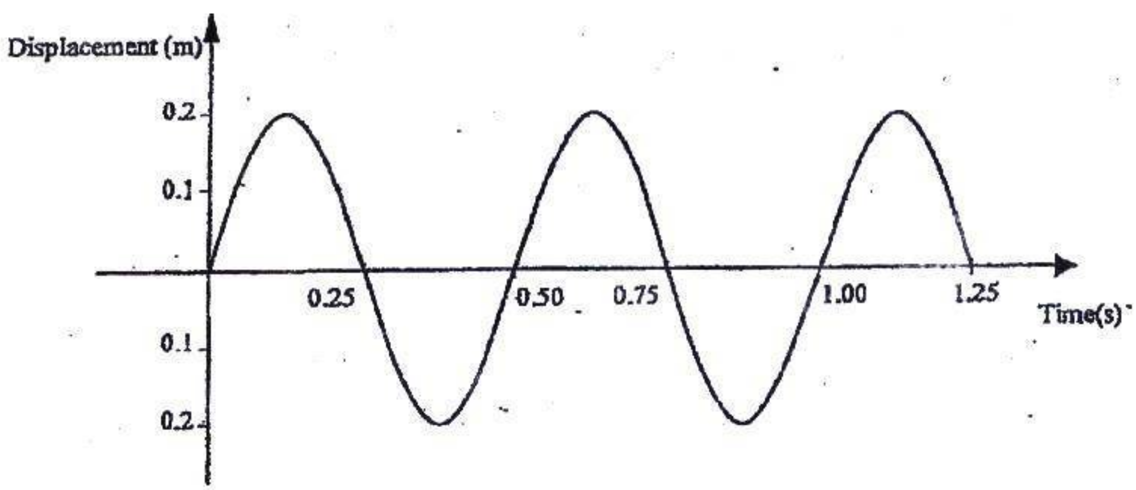
4. Give a reason why it is necessary to leave the caps of the cells open charging an accumulator.

(1 mk)

5. An electromagnet is made by winding insulated copper wire on an iron core. State two changes that could be made to increase the strength of the electromagnet.

(2 mks)

6. Figure 2 shows how the displacement varies with time for a certain wave



Determine the frequency of the wave (3 mks)

7. Determine the speed of light in water given that the speed of light in air is 3.0×10^8 ms^{-1} and the refractive index of water is 1.33 (3 mks)

8. Figure 3 shows part of an electrical circuit. The current through the 18Ω resistor is observed to be 2A.

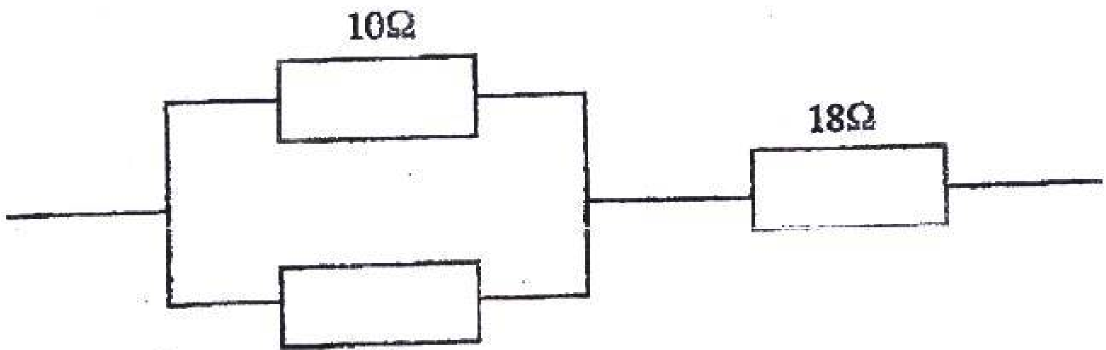
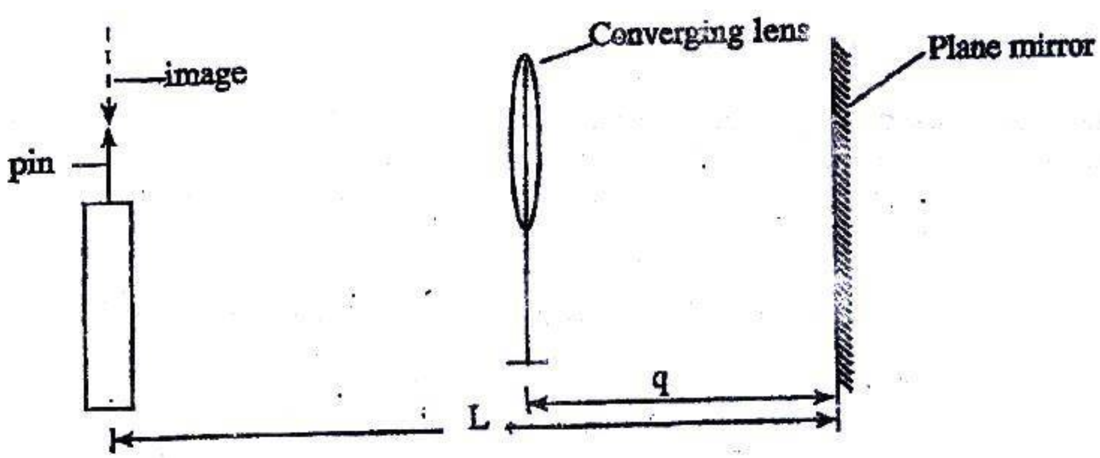


Figure 3

State the value of the current through each of the 10 Ω resistors (1 mk)

9. In an experiment, a pin a converging lens and a plane mirror are arranged as shown in figure 4. The distance between the pin and the plane mirror is L cm while the distance between the lens and the plane mirror is q cm. The position of the pin is adjusted until its tip coincides with its real image.



State the focal length of the lens (1 mk)

……………………………………………………………………………………………

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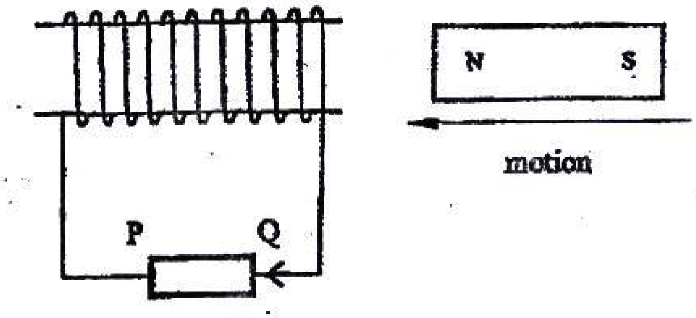
10. Figure 5 shows a magnet being moved towards a stationary solenoid. It is observed that a current flows through the circuit in a direction Q to P.



Explain:

(i) How the current is produced (2 mks)

(ii) Why the current flows from Q to P (1 mk)

11. In an X- ray tube it is observed that the intensity of X- rays increases when potential differences across the filament is increased. Explain this observation

(3 mks)

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

13. Figure 6 (a) and figure 6 (b) show a p-n junction to a battery. It is observed that the current in figure 6 (a) is greater than the current in figure 6 (b)

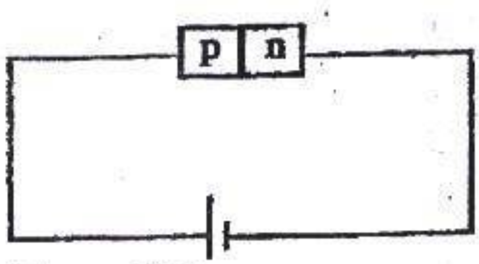


Figure 6(a)

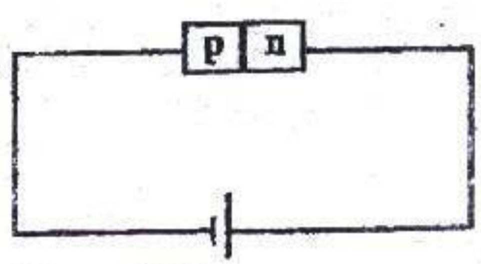


Figure 6(b)

SECTION B (55 MARKS)

Answer all the questions in this section in the spaces provided

14. (a) Figure 7 shows a pair of parallel plates of a capacitor connected to a Battery the upper plates is displaced slightly to the left.

Figure 7

State with reason the effect of this movement of the capacitance (2 mks)

(b) Figure 8 shows an electrical circuit with three capacitors A, B and C of capacitance 4.0 µF, 5.0 µF and 3.0 µF respectively connected to a 12V battery

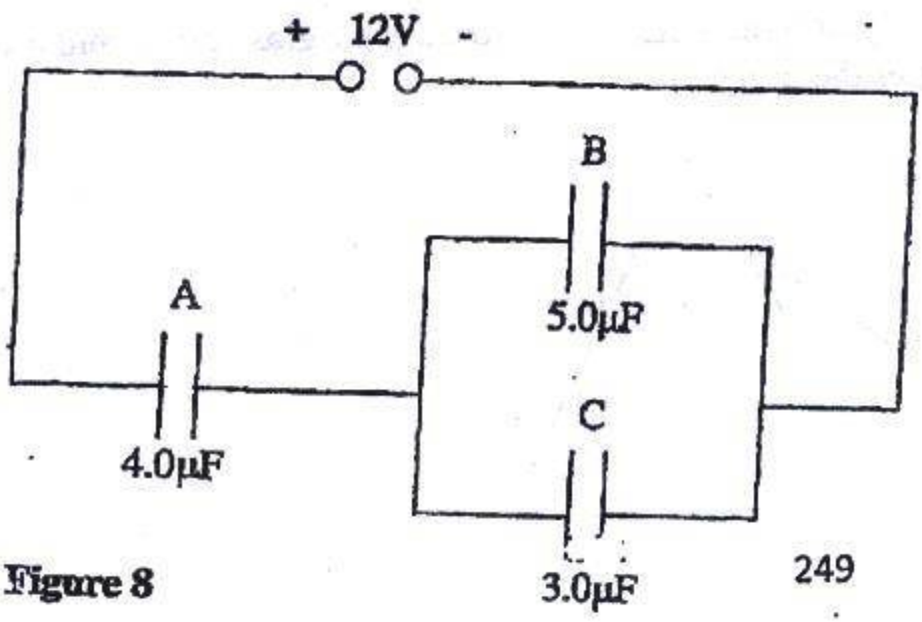


Figure 8

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Determine:

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

(ii) The charge of the capacitor A (2 mks)

(iii) The potential difference across the capacitors B (2 mks)

15. Figure 9 shows the graph of the relationship between current I and potential difference V for two trungsten filament lamps X and Y. The normal working voltages for the lamp X and lamp Y are 2.5V and 3.0V respectively.

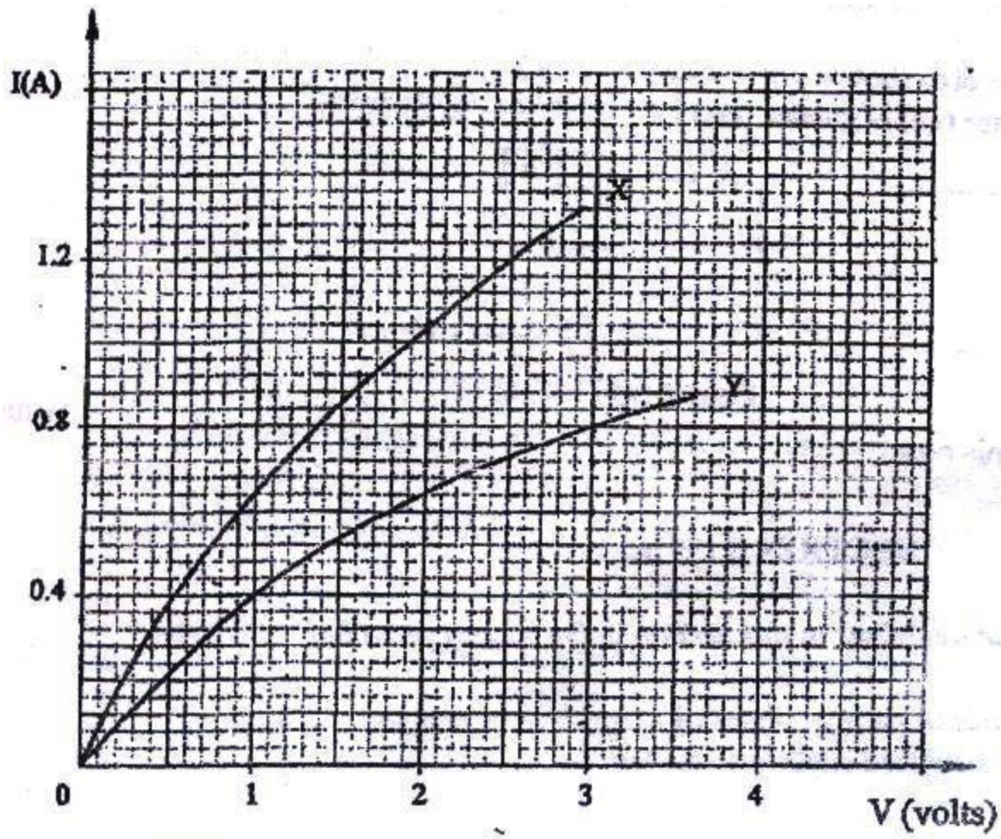

Figure 9

(2 mks)

(b) Determine the resistance of lamp X at the normal working voltage

(3 mks)

(c) The lamps are now connected in a series circuit in which a current of 0.4 A flows. Find the potential differences across lamp Y (1 mk)

(d) Determine the power at which lamp Y operates under normal working voltage

(2 mks)

16. (a) Figure 10 shows a ray of light incident on a triangular glass prism and white screen S placed after the prism

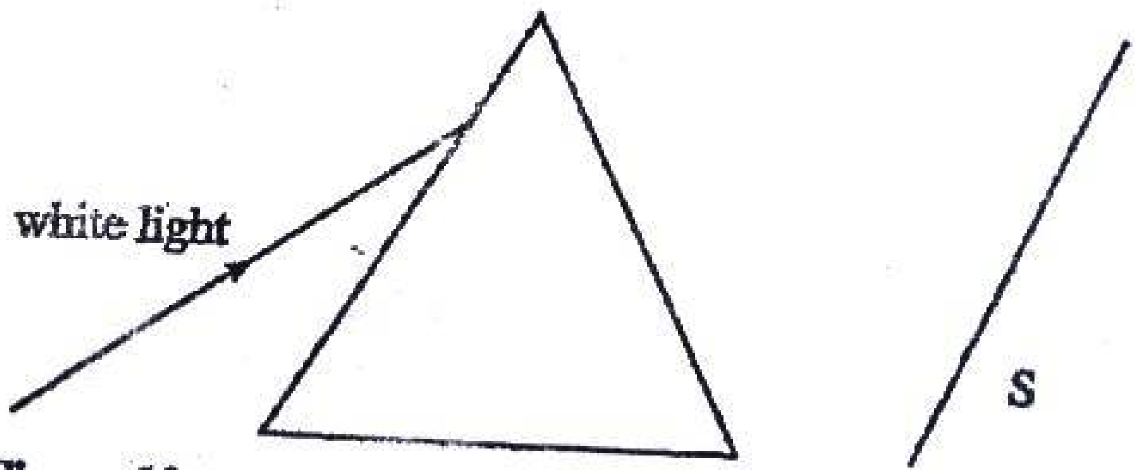

Figure 10

(i) Complete the path of the ray through the prism to show how a spectrum is formed on the screen (3 mks)

(ii) A thermometer with a blackened bulb is placed at various parts of the spectrum. State with reason the region where the thermometer indicates the highest reading (2 mks)

(b) A pin is placed at the bottom of a beaker of depth 11.5 cm. The beaker is then filled with kerosene. By using another on the side of the beaker and observing from the top, the distance of the image of the pin in the beaker is found to be 3.5 cm from the bottom. Determine the refractive index of kerosene. (4 mks)

17. (a) Figure 11 shows the path of radiation from a radioactive source. The field is perpendicular to the paper and directed out of the paper.

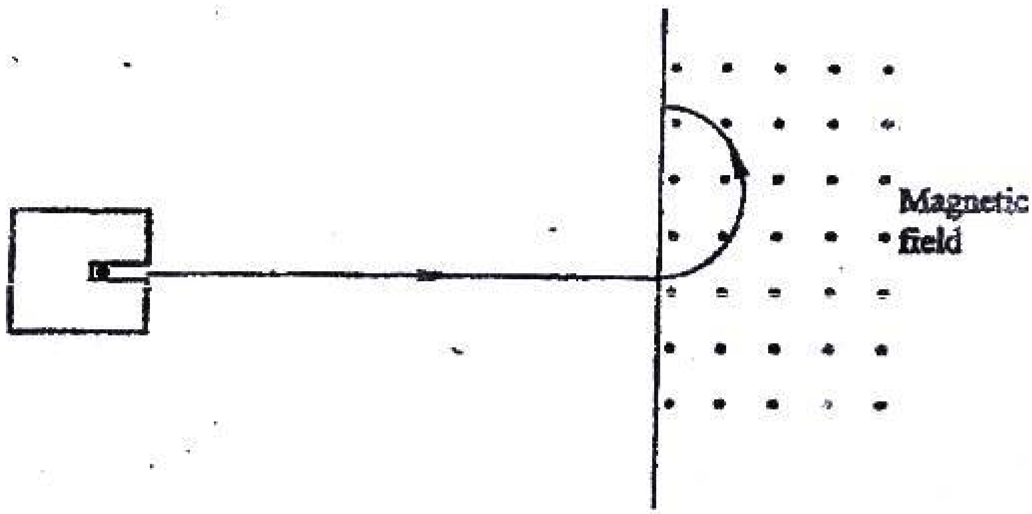

Figure 11

Identify the radiation (1 mk)

……………………………………………………………………………

(b) Radiation from a radioactive source enters a G.M tube

(i) State the effect of the radiation on the gas inside the tube (1 mk)

(ii) Explain hoe the large discharge current is created (2 mk)

(c) The following is a nuclear equation for a fission process resulting from the reaction of a neutron with a Uranium nucleus

1 235 141 y 1

0^{n+} 92^{U} $\rightarrow$ 56^{A+} x^{Q+3} 0^{n}

(i) Determine the values of x and y (2 mks)

(ii) State the source of the energy released (1 mk)

(iii) Explain how this reaction is made continuous in a nuclear reactor (2 mks)

18. (a) It is observed that when ultra- violet radiation is directed onto a clean zinc plate connected to the cap of a negatively charged leaf electroscope, the leaf falls

(i) Explain this observation (2 mks)

(ii) State why this observation does not occur if the electroscope is positively Charged (1 mk)

(iii) Explain why the leaf of the electroscope does not fall when infra- red radiation is directed onto the zinc plate (1 mk)

(b) State the effect on the electrons emitted by the photoelectric effect when:

(i) The intensity of incident radiation is increased (1 mk)

(ii) The frequency of the incident radiation is increased (1 mk)

(c) The maximum wavelength required to cause photoelectric emission on a metal surfaces is 8.0×10^{-7}m. The metal surface is irradiated with light of frequency 8.5×10^{14} Hz.

Determine:

(i) The threshold frequency (2 mks)

(ii) The work function of the metal in electron volts (3 mks)

(iii) The maximum kinetic energy of the electrons (2 mks)

Take: leV= 1.6×10^{-19}J.

Speed of light = 3.0×10^{8} ms^{-1}

Plank's constant, h = 6.63×10^{-34} Js

19. Figure 12 shows a set up for observing interference of waves from two sources S_1 and S_2. The points C and D represent positions of the constructive and destructive interference respectively as observed on the screen

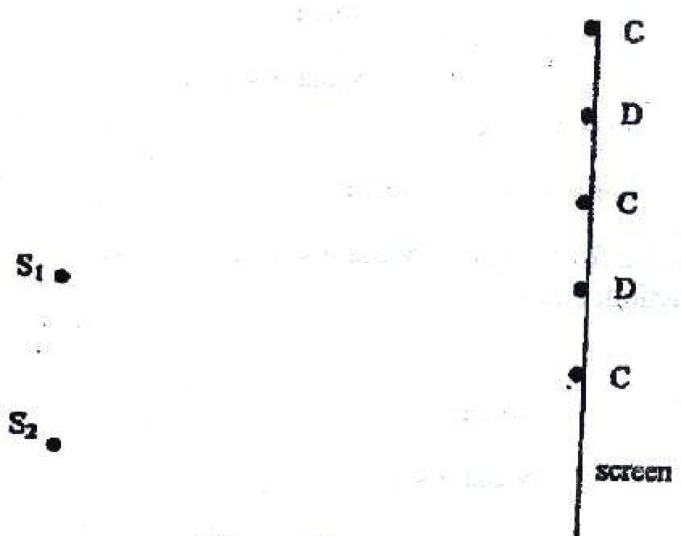

Figure 12

(a) If the observation was made in a ripple tank, describe:

(i) How the constructive and destructive interferences are identified (1 mk)

(b) Explain how the constructive interference C and the destructive interference D patterns are produced. (2 mks)

………………………………………………………………………………………

……………………………………………………………………………………….

Draw:

(i) The line joining all points where waves from S_1 and S_2 have traveled equal distance. Label it A (1 mk)

(ii) The line joining all points where waves from S_2 have traveled one wavelength further than the waves from S_1. Label it B. (1 mk)