PHYSICS PAPER 1 2004 QUESTIONS

1. Figure 1 shows a micrometer screw gauge being used to measure the diameter of a ball bearing.
A magnified portion of the scale is shown.

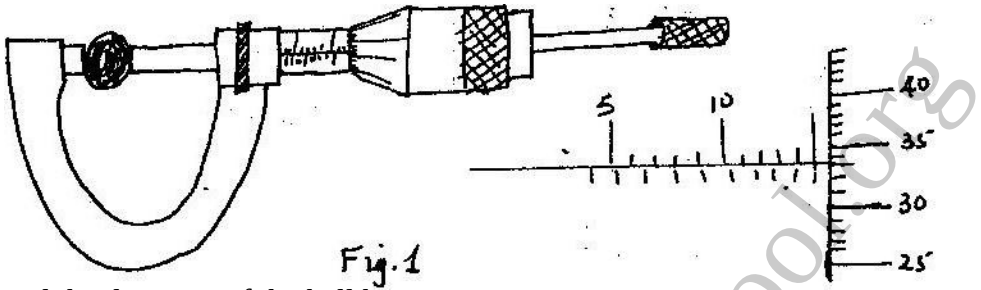


Fig. 1

Record the diameter of the ball bearing

……..

2. The system in figure 2 is in equilibrium at room temperature.
The system is taken outside where the temperature is 10^0c higher for sometime.

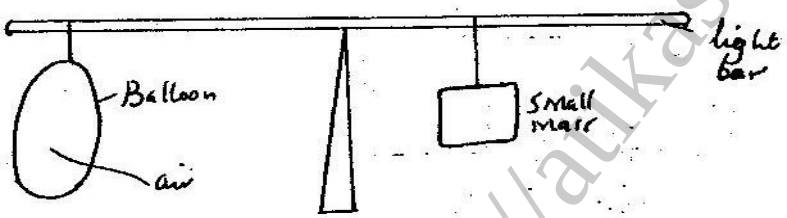


Fig. 2

Explain why it tips to the right immediately it is returned to the room.

3. Fig 3 shows a rectangular block of wood with a hollow section (inside) at the position shown.
The block is resting on a Horizontal bench
   (i) State the effected on the stability of the block when the hollow section is filled with water.
   ii) Explain your answer in (i) above.

4. Give a reason why water is not a suitable liquid for use in a barometer.

5. The temperature of water in a measuring cylinder is lowered from about 20^0 c to 0^0. On the axes provided, sketch the graph of the Volume against temperature assuming the water does not freeze.

6. Two identical aluminium rods as shown in figure 4. One rests on metal block the other on the wooden Block. The protruding ends are heated on a Bunsen burners shown.

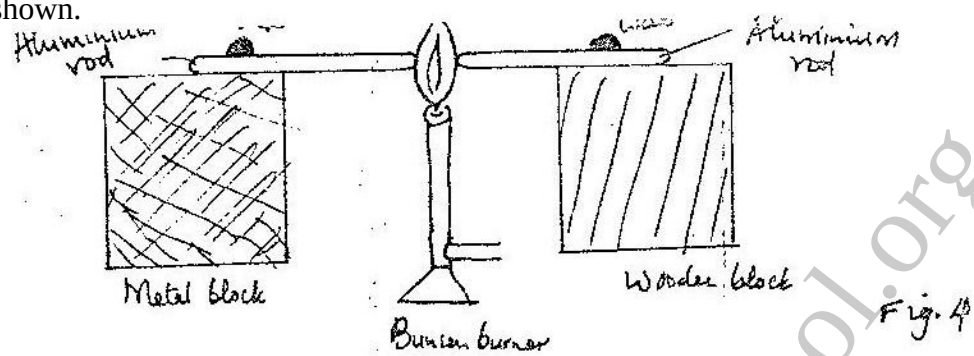


Fig. 4

State with reason on which bar the wax is likely to melt.

7. Figure 5 shows two mirrors inclined at an angle of 60^0 to each other. A ray of light is shown

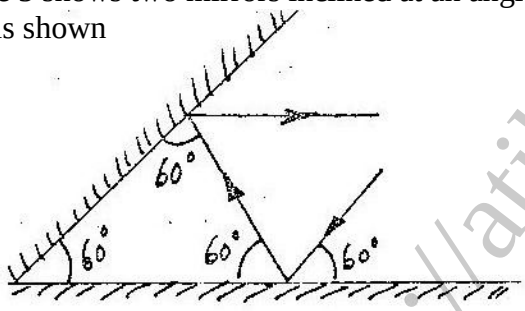


Fig. 5

Sketch the same diagram, the path of the ray until it leaves the two mirrors. Indicate the angles at each reflection.

8. Figure 6 (a) shows three spherical balls of the same size placed on insulating stands. Balls A and B are conductors while ball C is non conductor. Ball A was initially charged as shown. The quantity of charge is represented by the number of dashes.

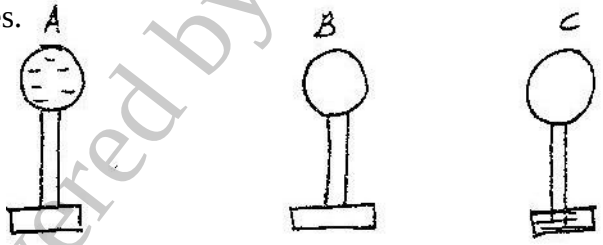


Fig 6(a)

Ball A is made to touch B momentarily and then C. Show on Figure 6(b), the final distribution of charge on the balls.

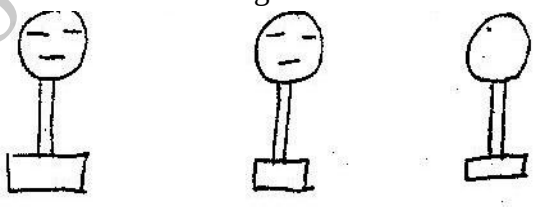


Fig. 6(b)

9. State the purpose of Manganese dioxide in a dry cell
10. State one way of reducing surface tension in water.
11. Figure 7 shows the poles of two magnets close together.

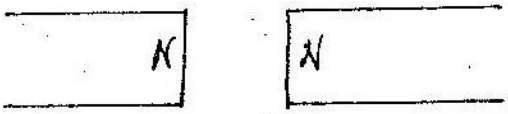


Fig 7

Figure 8 shows a current-carrying coil in a magnetic field.

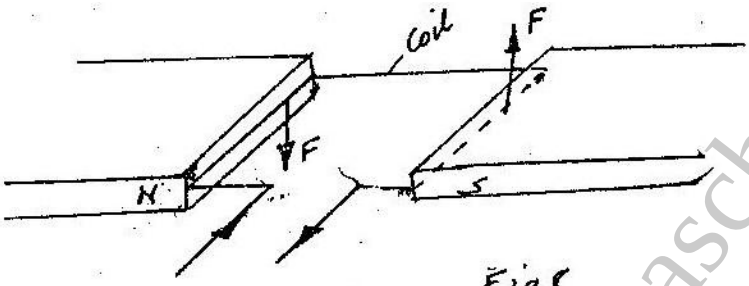


Fig.8

Use the information on the figure to answer question 12 and 13.

12. Mark on figure 8 the direction of the forces acting on the sides of the coil labeled
13. State two ways of increasing the force on the coil.
14. The system in figure 9 is in equilibrium.

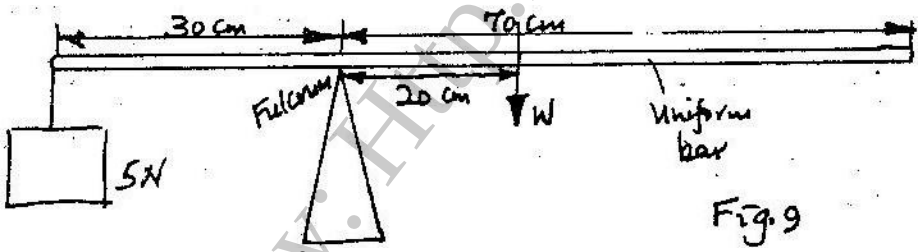


Fig. 9

Determine the weight if the bar.

15. Figure 10 show two circuits in which identical dry cells and identical bulbs are used. Use the information in the figure to answer questions 15 and 16.

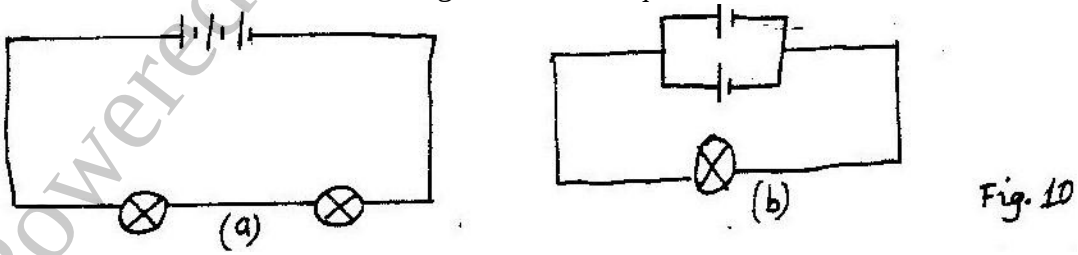
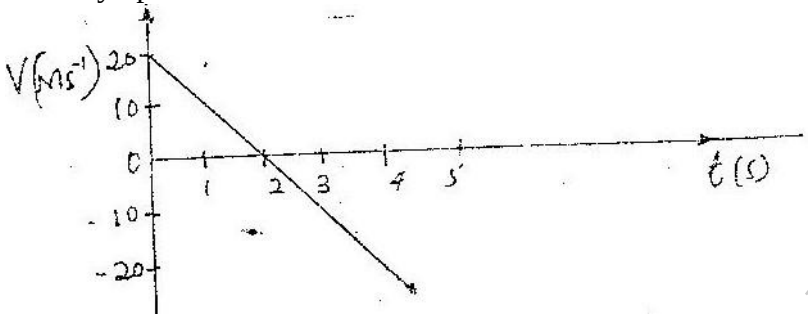


Fig. 10

Explain why the bulb in Figure 10(10) will be brighter than each of the bulbs in Figure 10 (a)

16. Give the reason why the cells in figure 10(b) can be used for a longer period than the cells in Figure 10 (a)

17. The graph below shows how the velocity varies with time for a body thrown vertically upwards.



Determine the total distance moved by the body.

18. A body of mass 60kg is pulled at a uniform velocity up smooth inclined surface as shown in Figure 11

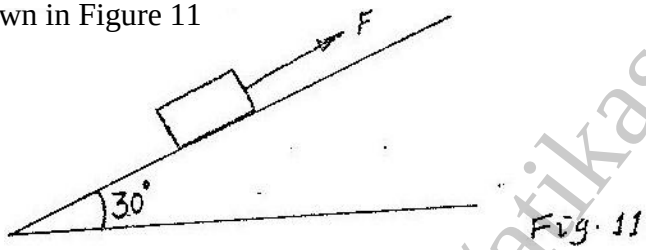
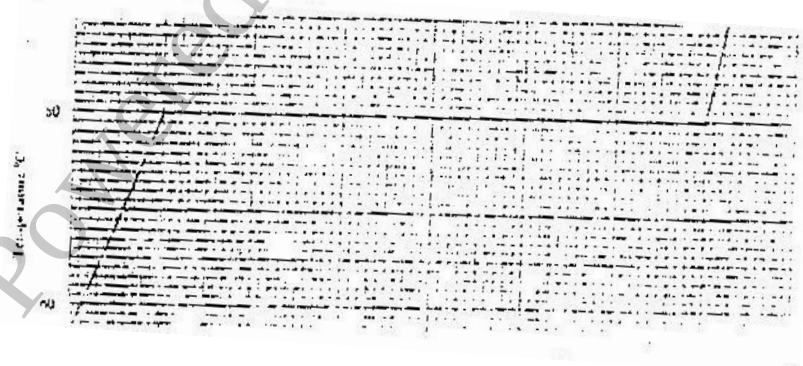


Fig. 11

If the distance moves along the incline is 4.0m, determine work done by the force F.

19. State the difference between mechanical and electromagnetic waves.
20. An electric heater is connected to the mains supply. A fault in the mains reduces the supply potential slightly.
Explain the effect on the rate of heating of the heater.

A certain powder of mass. 0.10kg was heated in a container by an electric heater rated 50 w for sometime. The graph below shows the variation of the temperature of the powder with time. Use this information and the graph to answer question 21 and 22.



21. Determine the quantity of heat by the heater from the time the power starts to melt to the time it has all melted.

22. Determine the specific latent heat of fusion of powder assuming the container absorbs negligible amount of heat.

23. Figure 12 shows a parabolic surface with a source of light placed at its focal point F

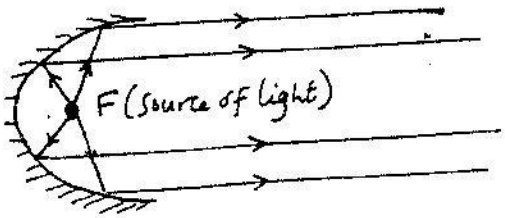


Fig. 12

Drarays to show reflection from the surface when rays from the source strike the surface at points ABC and D.

24. Figure 13 shows a coin placed in a large empty container. And observer looking into the container from the position shown is unable to see the coin.

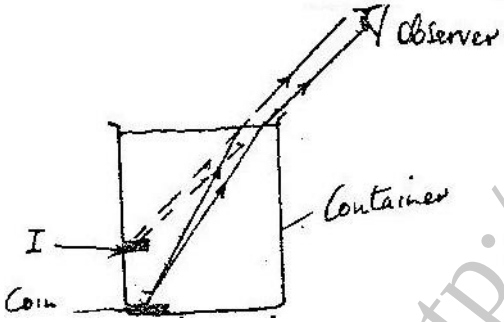


Fig. 13

Sketch two rays from a point on the coin to show how the observer is able to see the image of the coin after the container if filled with water.

25. A trolley is moving at a uniform speed along a track. A piece of plasticine is dropped on the trolley and sticks on it.
Explain why the trolley slows down.

26. The capacitors in the circuit in fig 14 are identical and initially uncharged.

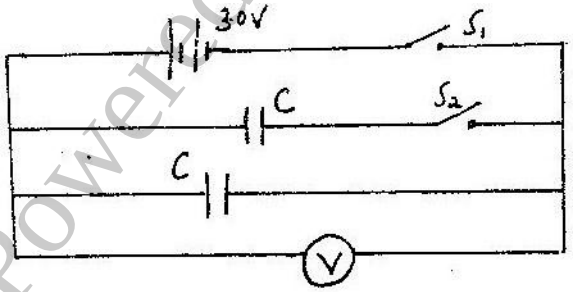


Fig. 14

Switch S_1 is closed while switch s_2 remains open. After sometime, switch s_1 is opened and switch s_2 closed. Determine the final reading of the voltmeter, V.

27. A balloon is filled with air to volume of 200ml at a temperature of 293K. Determine the volume when the temperature rises to 353K at the voltmeter, V.

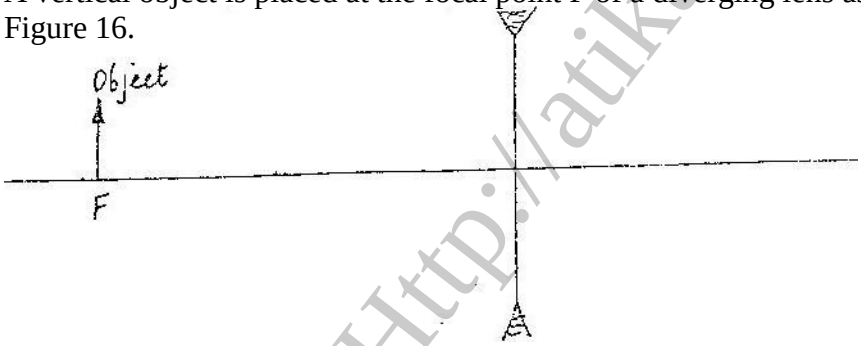
28. State the difference between X-rays and Gamma rays in the way in which they are produced.

29. A body mass 0.50kg is attached to the end of a string of length 50cm and whirled in a horizontal circle. If the tension in the string is 81N, determine the velocity of the body.

30. Fig. 15 shows water waves of different wavelengths incidentical apertures A and B.

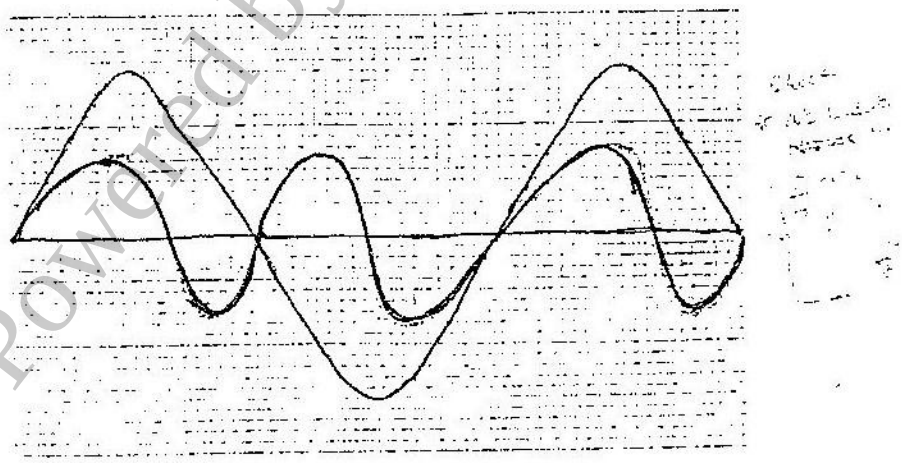
Complete the diagram to show the pattern of the waves beyond the aperture in each case.

31. A vertical object is placed at the focal point F of a diverging lens as shown in Figure 16.



Sketch a ray diagram to show the image of the object.

32. Figure 17 shows the appearance of an alternating signal on a screen of a cathode ray oscilloscope.



On the same diagram, sketch the appearance of the signal when the frequency is doubled and the voltage halved.

33. State the difference between hard X-ray and soft X-rays.

34. The work function of a certain material is 3.2 3V. Determine the threshold frequency for the material. (1 electron Volt (eV)= 1.6 $x10^{-19}$) and planks Constant h=6.62 x 10^{-34}Js)

Figure 18 shows the circuit of a npn-n transistor amplifier in common –emitter mode. Use the information on the figure to answer question 35 and 36

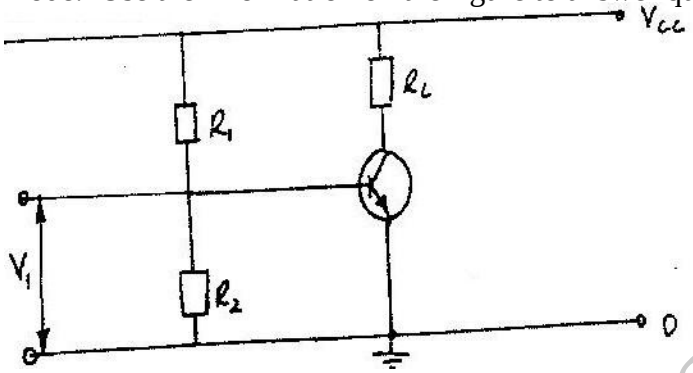


Fig 18

35. On the diagram
    a) Label the collector current, I_c and I_B
    b) Indicate the directions of 1_c and 1_B you have labeled in (a) above.

36. Indicate on the diagram, the position where the output V_0 would be tapped.

PHYSICS PAPER II 2004 QUESTIONS
SECTION 1 (65 MKS)

1. a) A test tube of uniform cross-section loaded so that it can float upright in water. With the aid of a labeled diagram, describe how the test tube may be calibrated to measure the density of liquid.

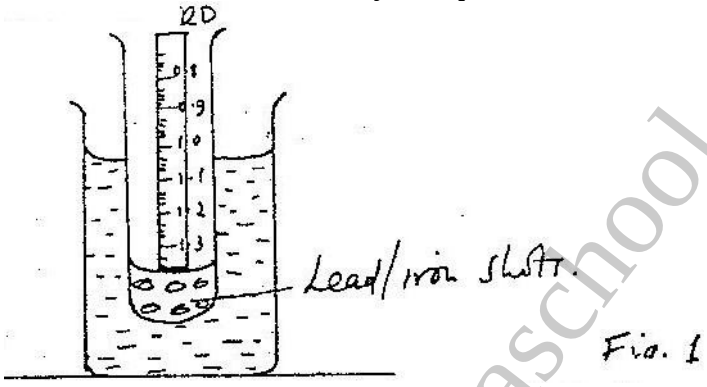
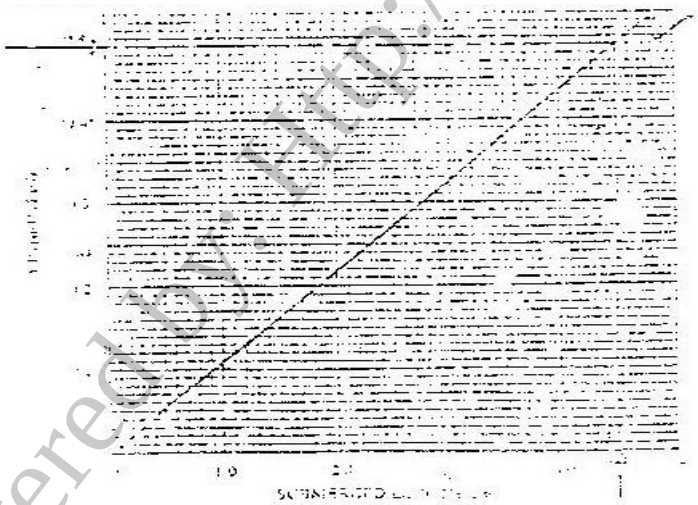


Fig. 1

b) In an experiment to determine the density of a liquid, a uniform metal cylinder of cross-section area 6.2cm was hang from a spring balance and lowered gradually into the liquid. The up thrust was determined for various submerged lengths. The results obtained are shown on the graph in Fig 1.



Using graph, determine;

(i) The value of the up thrust when the cylinder is fully submerged

(ii) The Density of the liquid

2. a) In an experiment to determine the power of an electric heater, melting ice was place in a container with an outlet and the heater placed in the ice as shown in Fig. 2. The melted ice was collected.

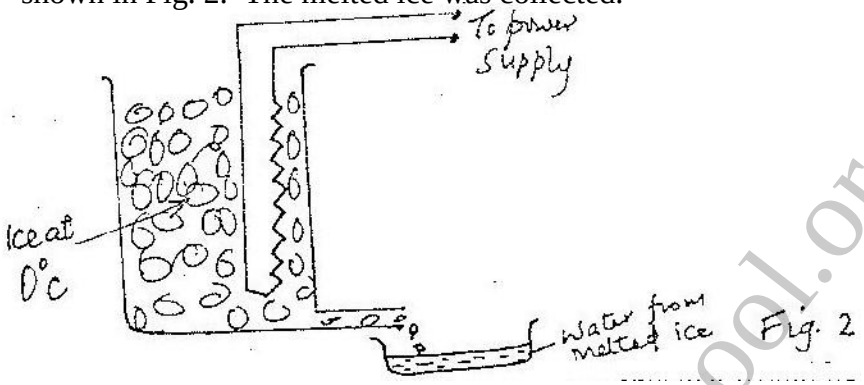


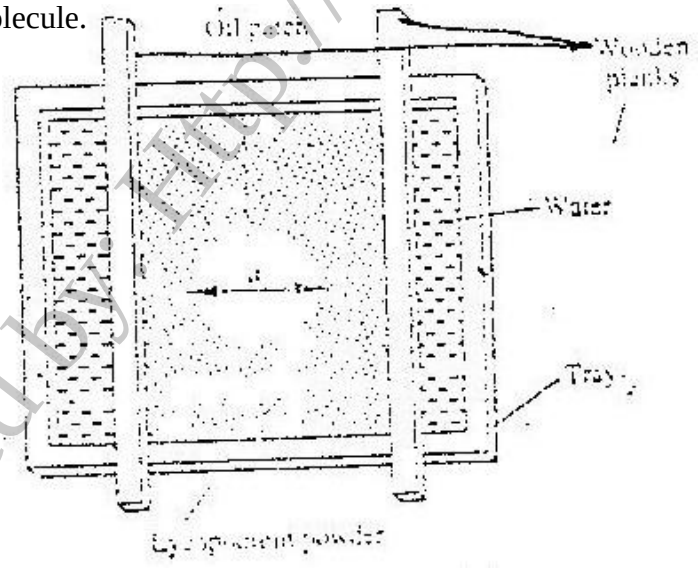
Fig. 2

i) Other than the current and voltage, state the measurement that would be taken to determine the quantity of heat absorbed by the melted ice in unit time.

(ii) If the latent heat of fusion of ice is L, show how measurement in (i) above would be used in determining the power P. of the heater.

(iii) It is found that the power determined in this experiment is lower than the manufacturer's value indicated on the heater.

b) Fig 3 shows part of an experimental set up for estimating the diameter of an oil molecule.



i) Describe how the oil patch is formed

ii) In an experiment the diameter a, of the patch was measured to be 200mm for an oil drop of radius 0.25mm. Determine the diameter of the molecule of the oil.

3. Figure 4 shows the cross-section of a diffusion cloud chamber used to detect radiation from radioactive sources.

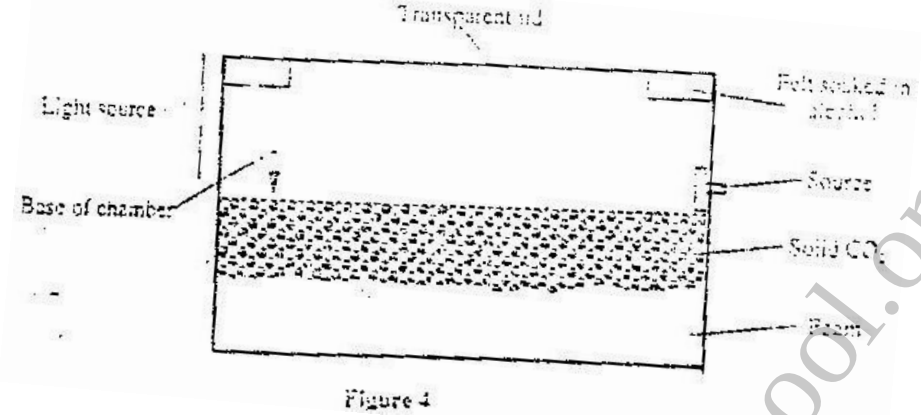


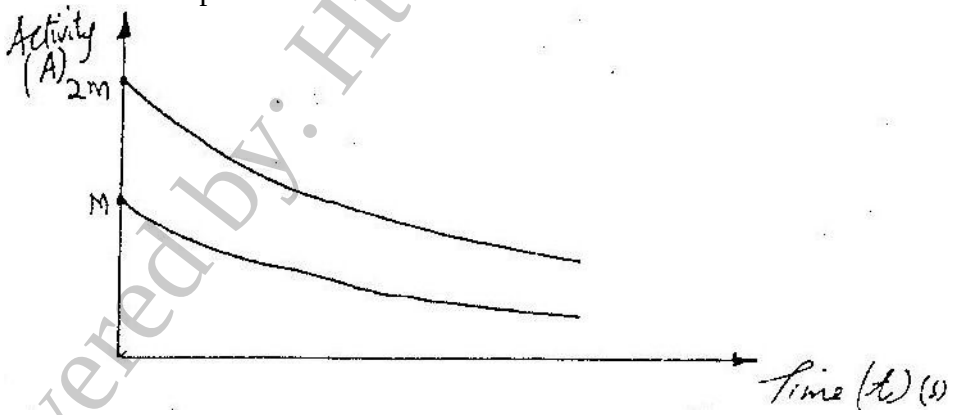
Figure 4

a) i) State one function of each of the following:
Alcohol
solid C_{o2}

ii) When radiation from the source enters the chamber, some white traces are observed. Explain how these traces are formed and state how the radiation is identified.

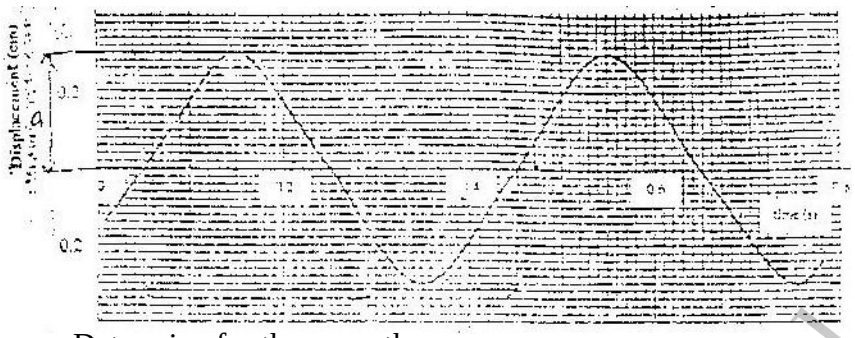
iii) A leaf electroscope can also be used as a detector of radiation. State two advantages of the diffusion cloud chamber over the leaf electroscope as a detector.

b) i) Two samples of the same radioactive material have initial masses M and 2M respectively. On the axes provided, sketch the graph of activity versus time for each sample. Label the graph for each sample.



ii) A radioactive sample of half-life 130 days initially has 1.0×10^{2c} radioactive atoms. Determine the number of radioactive atoms that have decayed after 390 days.

a) Fig 5 shows the displacement time graph of a wave traveling at 200cm/s



Determine for the wave the

i) Amplitude
ii) Period
iii) Frequency
iv) Wavelength

b) i) In the space provided below, sketch a labeled diagram to show how pinhole camera forms an image of a vertical object placed in front of the pinhole.

ii) a building standing 200m from a pinhole camera produces on the screen of the camera an image 2.5cm high 5.0cm behind the pinhole. Determine the actual height of the building.

5. a) Fig 6 shows a simple generator. The coils are rotated in the anticlockwise direction as shown.

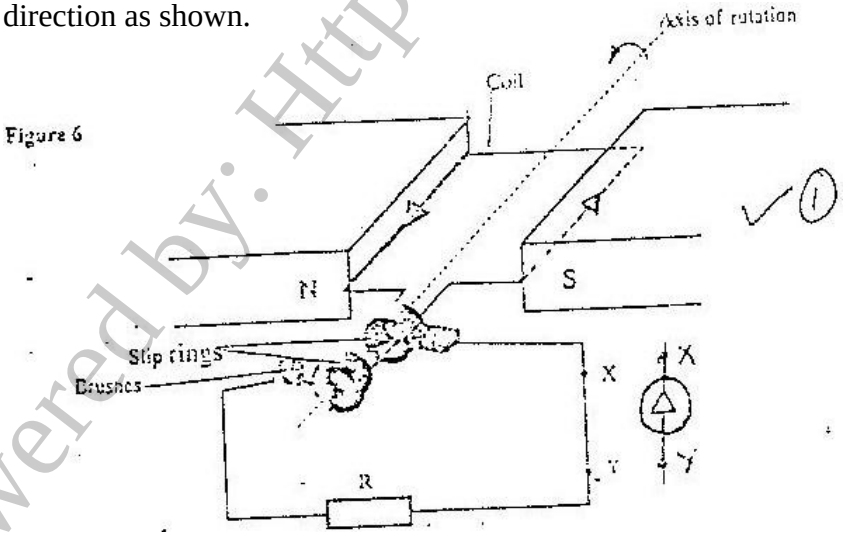


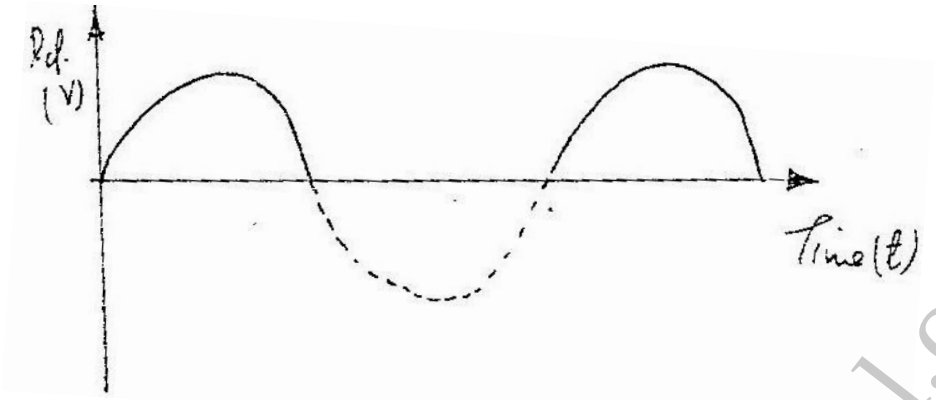
Figure 6

i) Indicate using an arrow on the figure, the direction of the induced current as the coil passes the position shown.

ii State two ways of increasing the magnitude of the induced current in this type of generator.

iii) On the axes provided, sketch the graph of the induced e.m.f with time.

iv) The section marked XY is cut off and a diode inserted. On the axes provided, sketch the graph of p.d across the resistor R, against time.



b) Fig 7 shows pendulum A and pendulum B freely suspended between the poles of identical magnets. Pendulum a is made of thick copper plate while B is made a copper plate with slots

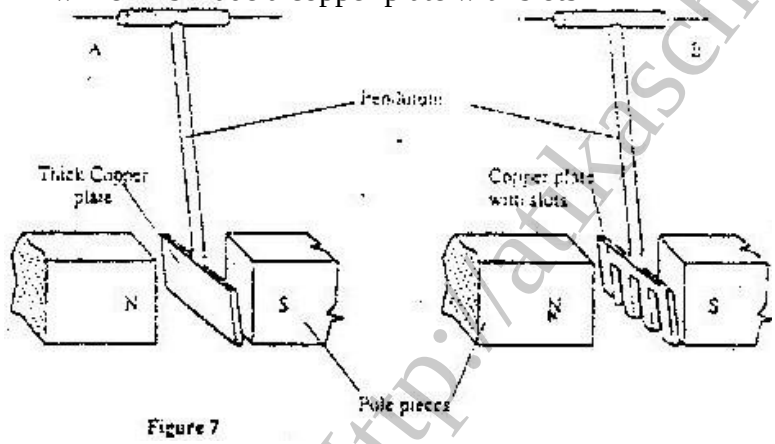


Figure 7

When the two are set to swing, it is observed that A slows down faster then B Explain this observation.

c) An alternating current source has a root-mean-square potential difference of 12,V, Determine the peak value of this potential difference.

SECTION II (15MKS)

Answer ONE question from this section on the spaces provided at the end of question seven.

6. a) You are provided with two identical tuning forks and some plasticine. Describe how you would demonstrate beats in sound.

b) Fig 8 shows a set up that was used in an experiment to determine the speed of sound air

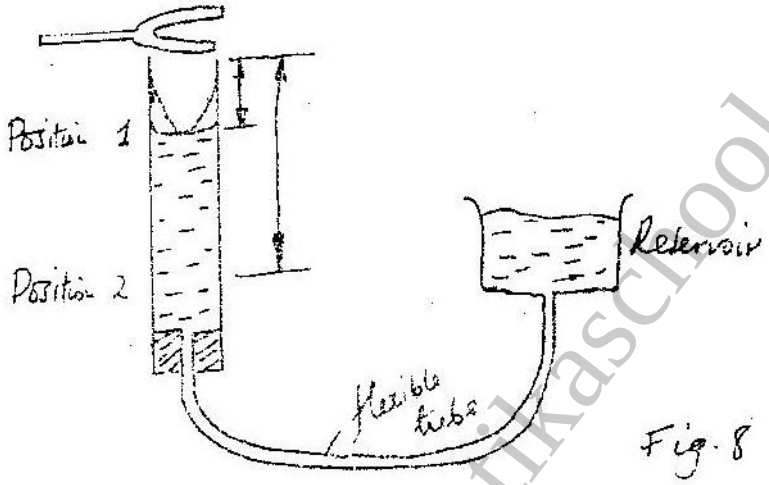


Fig. 8

Turning forks of different frequencies were sounded near the mouth of the open tube and by lowering the reservoir, the list two resonant lengthsL_1 L_2 were ensured for each frequency.
Table 1 shows the results obtained.

Frequency, f (HZ)	256	288	341	427	480	512
L_1(cm)	30.8	27.2	22.8	17.9	15.8	14.7
L_2(cm)	95.5	84.5	71.2	56.6	50.2	46.9
$^1/_f$ (HZ^{-1})						
$L_2 - l_{1(m)}$						

(i) Complete the table. On the grid provided, plot the graph of $l_2 - l_1$ (y-axis) against $^1/_f$

(ii) From the graph determine the speed V of sound in air given that 1_2-1_1 = v/2r. Therefore V= $2f(1_2 - 1_1)$

(iii) Explain how resonance is attained in this set up.

7. a) i) What is photoelectric effect?

ii) You are provided with the following:
a photocell, a source uv light, a rheostat, a source of e.m.f, a milliammeter, a voltmeter and connecting wires. Draw a circuit diagram to show how photoelectric effect may be demonstrated in the laboratory.

b) In a photoelectric effect experiment, a certain surface was illuminated with radiation of different frequencies and the stopping potential determined for each frequency.

Table 2 shows the results obtained.
Table 2.

Frequency, f ($x10^{14}$ HZ)	7.95	7.41	6.88	6.10	5.49
Stopping Potential, V_s (V)	1.35	1.15	0.93	0.62	0.36

(i) Plot the graph of the graph of stopping potential (y-axis) against frequency.

(ii) Determine Planks Constant, h, and the work function, θ,of the surface given that

$eV_s = hf - hf_o$

where $e = 1.6x\ 10^{-19}$ coulomb and $hf = \theta$
f_o is the lowest frequency that can cause photoelectric effect.

c) A surface whose work function$\theta = 6.4 \times 10^{-19}$ joules is illuminated with light of frequency 3.0 x 10 15Hz

Find the maximum Kinetic energy of the emitted photoelectrons (Use the Value of H obtained in b(ii)