PHYSICS PAPER 232/1 K.C.S.E 1999

1. What is the reading on the vernier calipers shown in figure 1?

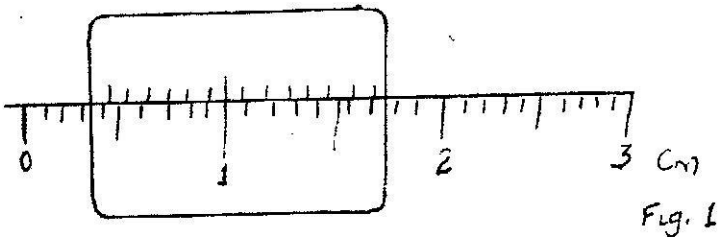


Fig. 1

2. Figure 2 shows forces f1 and F1 and F2 acting on a meter rule such that it is in equilibrium.

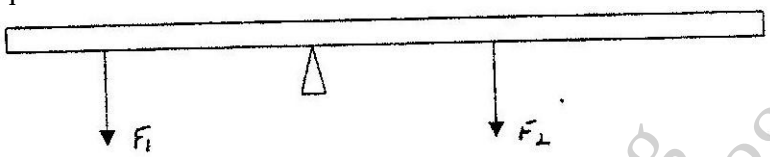


Fig. 2

Mark on the figure a third force F3 acting on the rule such that it is in equilibrium maintained.

3. state how the position of the centre of gravity of a body in stable equilibrium changes to that in the rest position when the body is slightly tilted and then released.

4. A vacuum pump was used to pump out air from the glass tube immersed in liquids as shown in figure3.

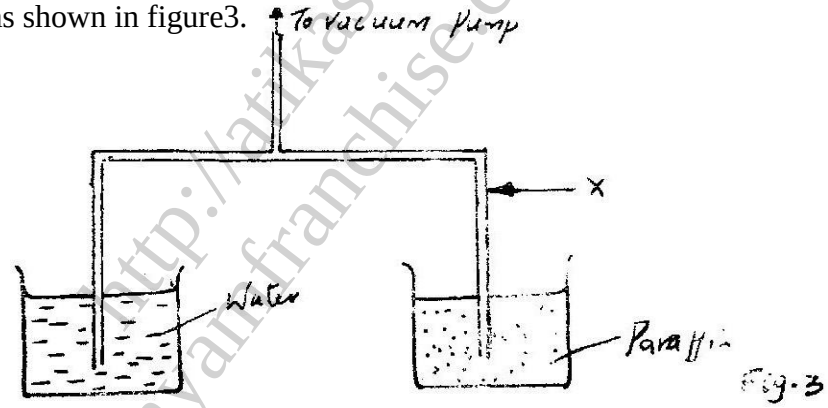


Fig. 3

After sometime the level of paranum rose to position A. Mark 1, the corresponding position for the water level. Give a reason for your answer.

5. Fig. 4 shows a capillary tube placed in though of mercury.

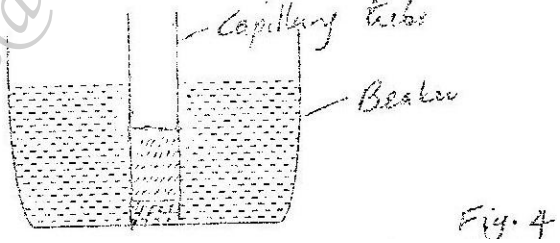


Fig. 4

Give a reason why the level of mercury in the capillary tube is lower than in the beaker.

6. Figure 5 shows a bimetallic strip at room temperature. Brass expands more than invar when heated equally.

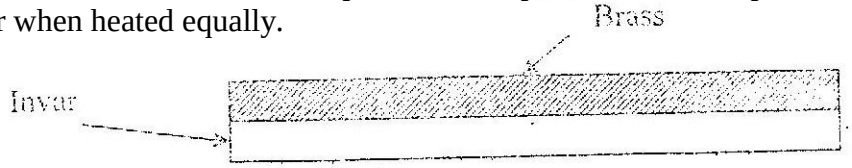


Fig. 5

Sketch the bimetallic strip after being cooled several degrees below room temperature.

7. In an experiment to study the atoms of gold, a beam of α- particles was directed onto a thin sheet of gold. The following observations were made:
   (i) Majority of the particles went straight through undeflected
   (ii) A few particles deflected through varying angles up to 180.

8. Figure 6 shows a ray of light incident on plane mirror at point O.

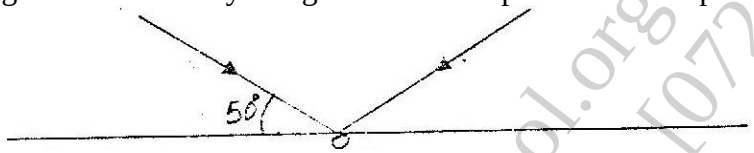


Fig. 6

The mirror is rotated clockwise through an angle 30^0 about an axis perpendicular to the paper. Determine the angle through which the reflected ray rotated.

9. Figure 7 shows a sharp pin fixed on a cap of leaf electroscope. The electroscope is highly charged and then left for sometime.

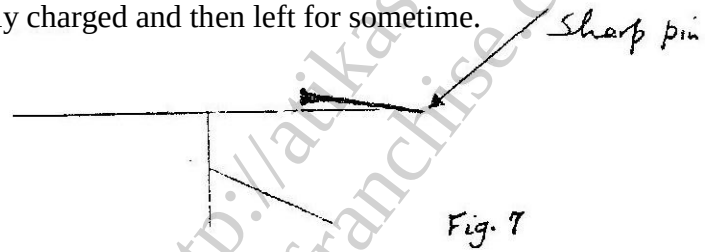


Fig. 7

Explain why the leaf collapses

10. Determine the ammeter reading when a p.d of 3.0 volts is applied across Pq in figure 8.

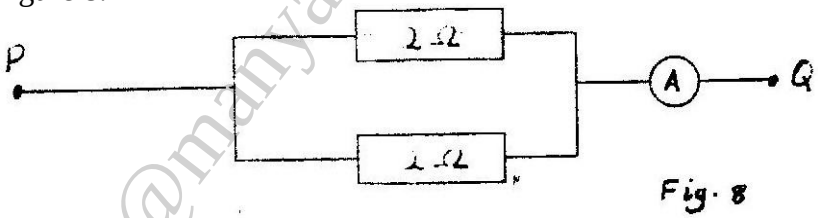
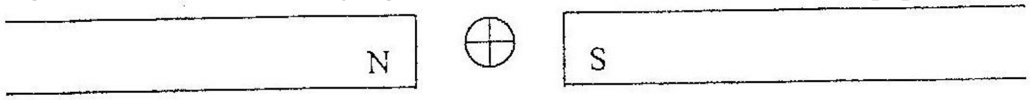


Fig. 8

11. A wire fixed at one end extends by 4mm when a load of 20N is suspended from the other end. Determine the load that would cause an extension of 1.5 mm on the wire (assume elastic limit is not exceeded)
12. How can it be shown that the strength of a magnet is concentrated at the poles?

13. Figure 9 shows a wire carrying a current whose direction is into the paper.



The wire is placed in a magnetic field. Fig. 9

Indicate on the figure the direction of the force acting on the wire.

14. Determine the moment of the couple shown in figure 10.

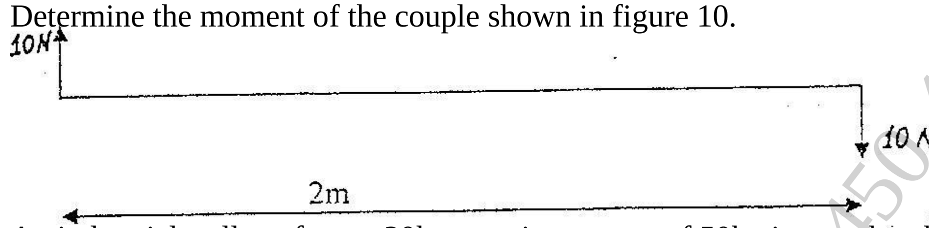


Fig: 10

15. An industrial trolley of mass 20kg carrying a mass of 50kg is acted on by a constant force. The trolley moves along a horizontal smooth surface with an acceleration of 0.5ms -2 . Determine the acceleration of the trolley after the mass falls off.

16. Figure 11 is a graph which shows how the vertical height through which a machine raises a mass 20kg varies with time.

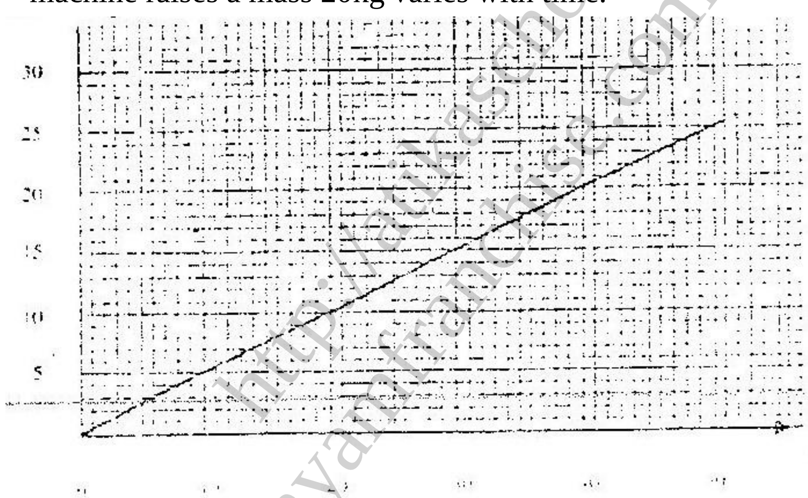


Fig. 11

Determine the power output of the machine after 40 seconds.

17. Figure 12 shows how displacement varies with time as a wave passes a fixed point.

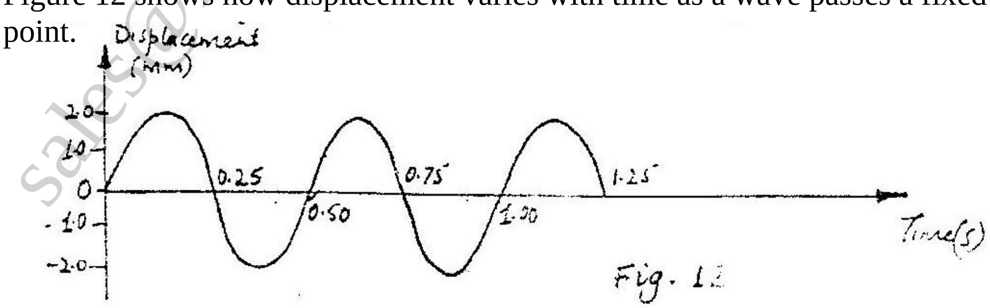


Fig. 12

Determine the frequency of the waves.

18 Two tuning forks of frequencies 256Hz and 258 Hz are sounded simultaneously and then placed close to each other, calculate the beat frequency.

19. When a current of 2.0 flows in a resistor for 10 minutes, 15,000 joules of electrical energy is displaced. Determine the voltage the resistor.

20. A substance of mass 2kg and specific heat capacity 400 Jkg K initially at 81^0C is immersed in water at 20^0C. If the final temperature is 21^0C. Determine the mass of water. (The specific heat capacity of water is 4200j/kgK). Give your answer to 1 decimal place.

21. A galvanometer of internal resistance 50Ω gives a full-scale deflection when a current of 10mA passes through it. Determine the value of the resistance required to convert the galvanometer to a voltmeter with full-scale deflection of 5 volts.

22. A microscope is focused on a mark on horizontal surface. A rectangular glass block 30mm thick is place on the mark. The microscope is then adjusted dd10mm upwards; to bring the mark back to focus, determine the refractive index of the glass.

23. State the energy transformation when fast moving electrons are suddenly stopped by a target in an X- ray tube.

24. A bullet is fired horizontally at a target. Neglecting air resistance give a reason why the horizontal acceleration of the bullet is zero.

25. Figure 13 shows a section of a pipe PQ. A constant pressure difference maintains a streamline flow of a liquid in the pipe.

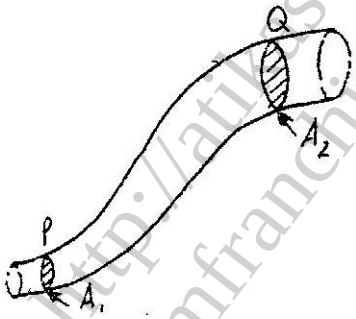


Fig. 13

If the cross-sectional area A_1 at P is less than A_2 at Q, state how the liquid velocity. V_2 at Q compares with velocity V_1 at P.

26. The figure 14 is a resistor-capacitor circuit. At time t=0, the switch is closed at A for sometime, and then opened. The switch is them closed at B for sometime.

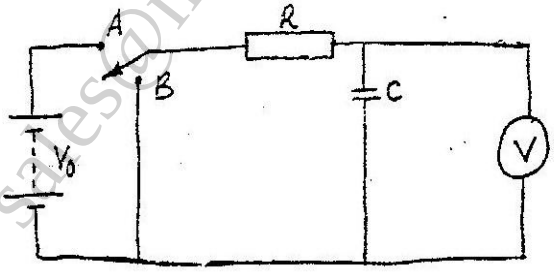
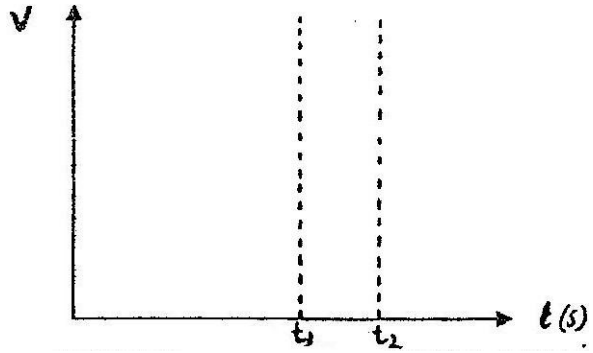


Fig. 14

On the axis provided, sketch the graph of voltage V across the capacitor against time t(t1 and t2 represents times for opening at A and closing at B respectively).



27. Determine the pressure required to compress a gas in a cylinder initially at 20^0C and at a pressure 1.03 x 10^{-5} to one-eight of its original volume.
28. Arrange the following in order of increasing frequencies –Gamma radiation, radio waves, infrared, and X –rays.
29. A concrete block of volume V is totally immersed in seawater of density p. Write an expression for the up thrust on the block..
30. It is observed that when ultraviolet light is shone onto a clean zinc plate connected to the cap of negatively charged leaf electroscope, the leaf collapse. Explain this observation.

31. Figure 15 shows two masses 0.1kg and 0.2kg connected by a string through a hole on a smooth horizontal surface.

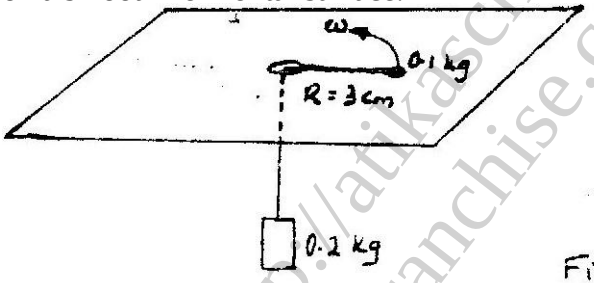


Fig. 15

The 0.1kg mass rotates in a horizontal circle of radius 3cm. Calculate the angular velocity of the mass when the system is in equilibrium. Use acceleration due to gravity g= 10ms-2

32. Sketch a diagram to show the position of an object, when a converging lens is used as an magnifying glass.

33. Figure 16 shows a wire XY at right angles to a magnetic field. XY is part of circuit containing a galvanometer.

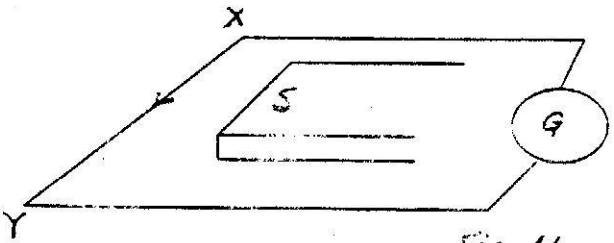


Fig. 16

XY is moved

34. Figure 17 shows the electric wiring of an electric heater A, B, C are the main wires.

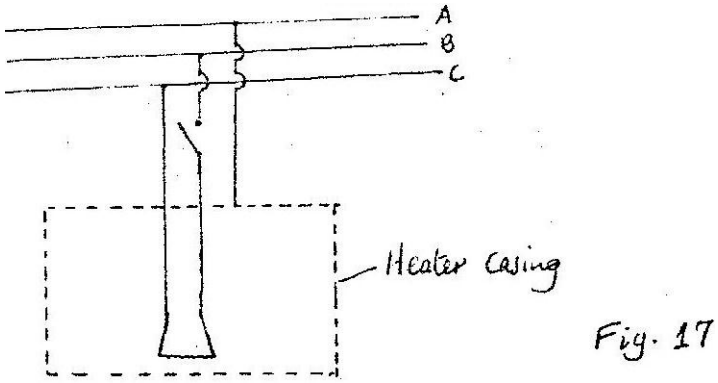


Fig. 17

Identify A ,B, and C.

35. A radioactive nuclide of atomic number z emits a beta particle and gamma rays. State the atomic number of the new nuclide.

PHYSICS PAPER 232/2 K.C.S.E 1999.

1 a) Distinguish between longitudinal and transverse waves
Longitudinal waves - Transverse waves –

b) In the Young's double slit experiment, and interference pattern of bright and dark fridges was formed as shown in figure 1 by alight of wavelength coming from two narrow slits X and Y.

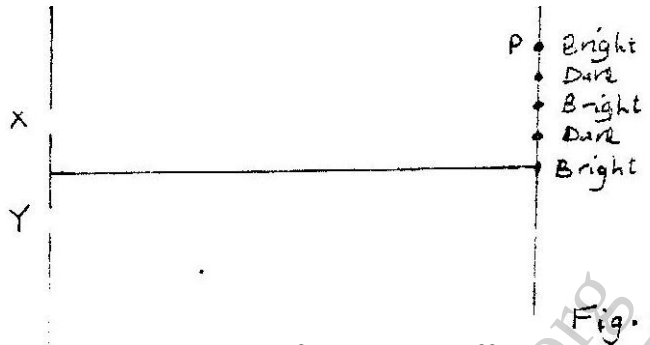


Fig. 1

i) Write an expression for the path difference between XP and YP where corresponds to the 2nd bright fringe.

ii) Explain how the dark and bright fringes are formed.

iii) State and explain what would be observed on the screen if the slits X and Y were made large.

c) Figure 2 represents a displacement – time graph for a wave.

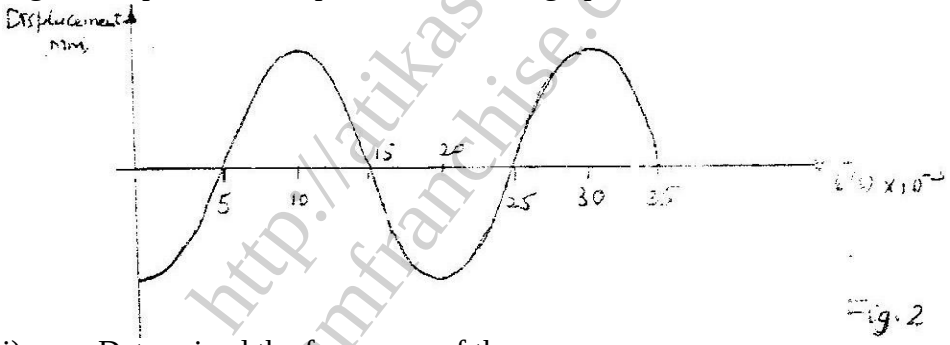


Fig. 2

i) Determined the frequency of the wave.

ii) Sketch on the same axes, the displacement – time graph of a wave of the same frequency but 180° out of phase and with a smaller amplitude.

2 a) An object O placed in front of a converging lens L^o forms an image 1 on the other side of the lens. Another converging lens L_C placed such that the two lenses form a compound microscope.

i) Draw a reason of the set up and sketch the rays to show how the final image is formed.

ii) Give a reason why the focal length of L_o must be greater than that of L_c

b) An object is placed 30cm from a converging lens. A focused image is formed on a screen placed 30cm from the same lens on the other side. The screen in now moved 5cm towards the lens. Determine the distance the object must be moved so that a focused image is formed on the screen.

3. A tape attached to a moving trolley is run through a ticker timer. Figure 3 shows a section of the tape after running.

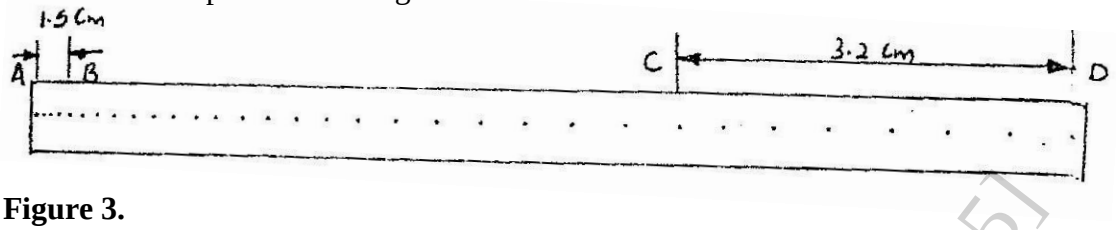


Figure 3.

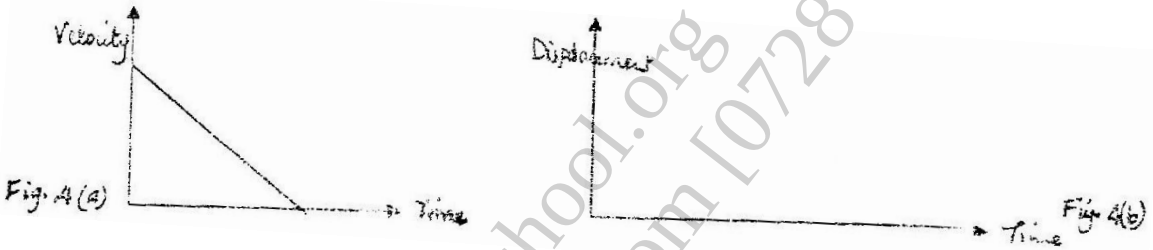
If the frequency of the ticker – timer is 50Hz, determine the:

i) Average velocity at intervals AB and CD.

ii) A average acceleration of the trolley.

b) A stone is released from a height, h. if the acceleration due to gravity is g, derive an expression of the velocity of the stone just before hitting the ground.

c) Figure 4 (a) shows a velocity – time graph of an object in motion.



Sketch on the axes provided in figure b4 (b0, the displacement – time graph of the Motion

(Motion upwards is taken as positive.

4. Figure 5 represents a simple voltage amplifier circuit.

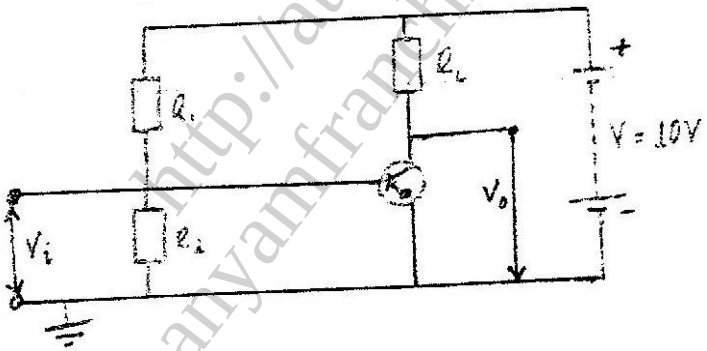


Figure 5

a) i) Identify the transistor in the circuit.

ii) Explain how the base bias is produced.

iii) Describe how an alternating signal that is fed in the input V1 is amplified.

b) When a signal is fed in the input, the collector current is 2.5mA. If the current gain is 62.5 and the voltage across the transistor (V_{CE}) is 4.5V determine the :

i) Power rating of the heater ii) Current flowing in the circuit.

5a) A circuit consists of a battery, a metal wire, an ammeter and a switch connected in series. The switch is closed and the ammeter reading noted. The metal wire is now heated. State the observations made on the ammeter reading and give a reason for your answer.

b) An electric heater is made of a wire of resistance 100Ω and connected to a 240V mains supply. Determine the:

i) Power rating of the heater ii) Current flowing in the circuit.

iii) Time taken for the heater to raise the temperature of 200g of water from 23°C to 95°C.(Specific heat capacity of water is $4200^{-1}K^{-1}$)

iv) Cost of using the heater for two hours a day for 30 days.(The power and lighting company charges Kshs 5.00 per kilowatt – hour).

SECTION II

6a) Explain the following observations: ice cube float on water and solid benzene sinks in liquid benzene.

bi) You are provided with the following:

-An overflow can - A beaker -A spring balance

- A metal block -Water and - String

Describe an experiment to verify Archimedes principle.

ii) A block of wood weighing 2.0N is held under water by a string attached to the bottom of a container. The tension in the string is 0.5N. Determine the density of the wood.

ci) Define half – life of a radioactive material.

ii) Figure 6 shows a graph of the variation of the number of atoms of a certain radioactive material with time.

Figure6: Determine the half – life of the material

7a) Figure 7 shows a photoelectric cell cirucuit:

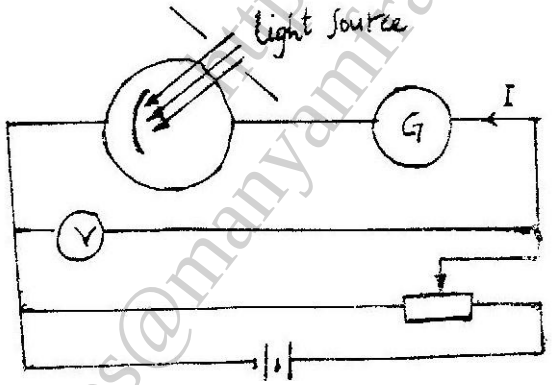


Fig. 7

The intensity of the light can be varied.

i) Describe how the circuit may be used to show how the current I varies with the potential difference V across the cell.

ii) Sketch on the same axis graphs of I versus V for three different values of light intensity E_1E_2 and E_3 such that $E_3>E_2>E_1$

b) Using a circuit similar to the one in figure 7. with the polarity of the batteries reversed, the frequency, of the light was varied at constant intensity. For each frequency, the potential difference was varied until the current was equal to zero. The value of this voltage, V_{co} was noted. The graph in figure 8 shows the relation between V_{co} and the frequency , of the incident light.Feom the graph, determine the:

i) Value of planks constant, h (charge an electron e = 1.6×10^{-19}Colubomb)

ii) Work function, φ , of the cathode surface of the cell . (Give your answers to 2 decimal places.)