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1. Figure 1 shows a measuring cylinder containing some liquid

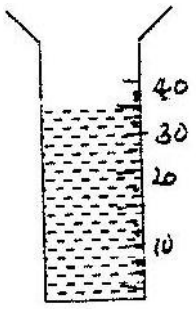


Fig. 1

Figure 1

Another 5cm^3 of the liquid is added into the cylinder. Indicate on the diagram the new level of the liquid.

2. Two identical spring balances R and S each weighing 0.5N are arranged as shown in Figure 2.

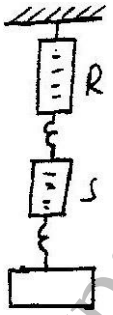


Figure 2

What is the reading on balance R?

3. Figure 3 shows two identical trolleys with loads A and B. The loads are identical in shape and size.

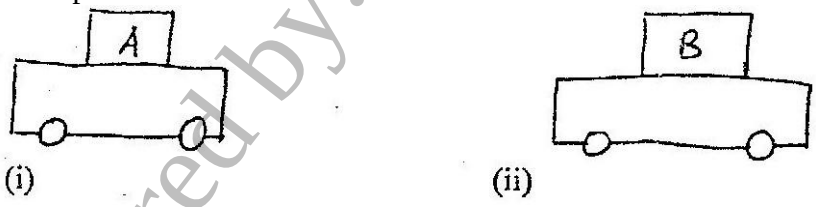


Figure 3

Given that the density of A is greater than that of B, explain why the trolley in figure 3(ii) is more suitable.

4. The reading on a mercury barometer at a place in 700mm. What is the pressure at the place Nm-2 (Density of mercury is 1.36 x 10^4 kgm^{-3})

5. Explain the cause of random motion of smoke particles as observed in Brownian motion experiment using a smoke cell.

6. In the set up shown in Figure 4, it is observed that the level of the water initially drops before starting to rise.

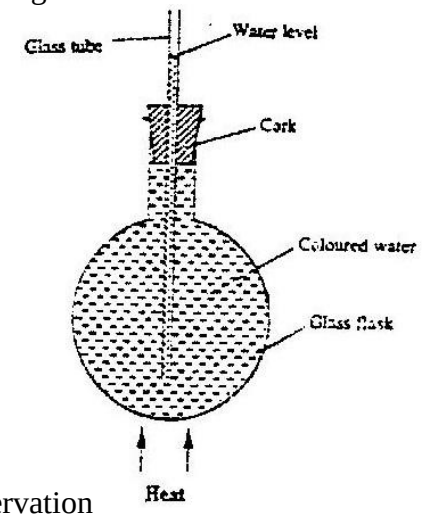


Figure 4
Explain this observation

7. When a Bunsen burner is lit below wire gauze, it is noted that the flame initially burns below the gauze as shown in Figure 5 (i).After sometime, the flame burns below as well as above the gauze as shown in Figure 5(ii).

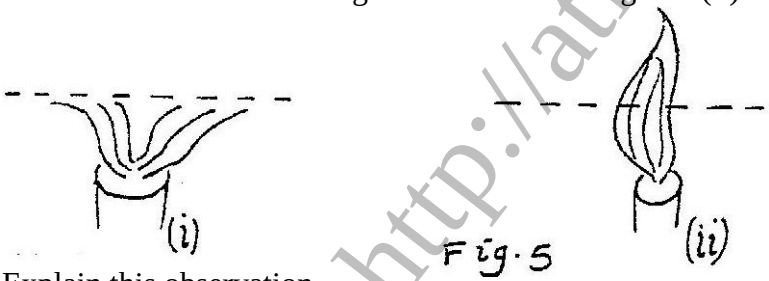


Fig. 5

Explain this observation

8. Figure 6 shows a ray of light being reflected from a mirror.

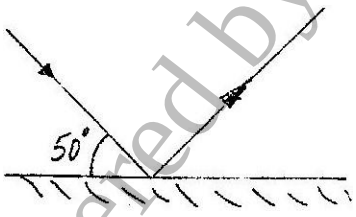


Figure 6
What is the angle of reflection?

9. Figure 7 shows a highly negatively charged rod being brought slowly near the cap of a positively charged leaf electroscope. It is observed that the leaf initially falls and then rises.

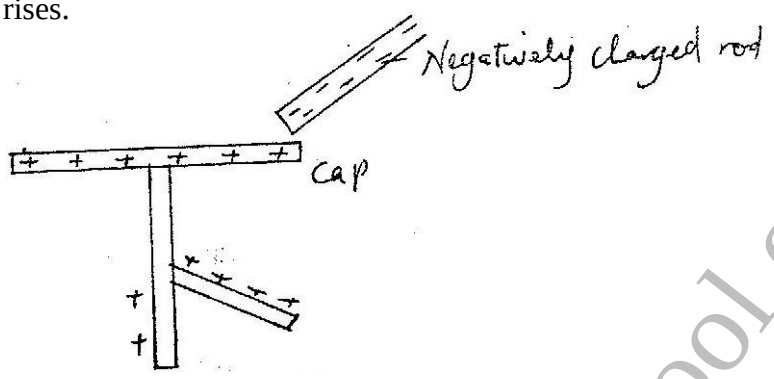


Figure 7
Explain this observation

10. State one advantage of a lead – acid accumulator over a nickel – iron (NiFe) accumulator.

11. One of the factors that affect the surface tension of a liquid is the presence of impurities. State one other factor.

12. Figure 8 shows a bar of soft iron placed near a magnet.

Figure 8
On the same diagram, sketch the magnetic field pattern due to the set up

13. Give a reason why the core of the electromagnet of an electric bell is made of soft iron and not steel.

14. Figure 9 shows a uniform bar in equilibrium under the action of two forces.

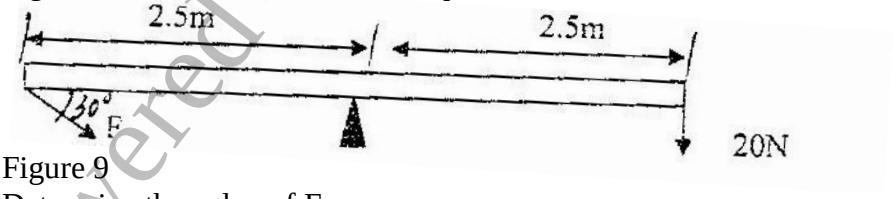


Figure 9
Determine the value of F

15. One of the conditions for total internal reflection to occur is that angle of incidence must be greater than the critical angle of the medium. State the other condition.

16. Figure 10 (draw to scale) shows an image I formed by a diverging lens, L.

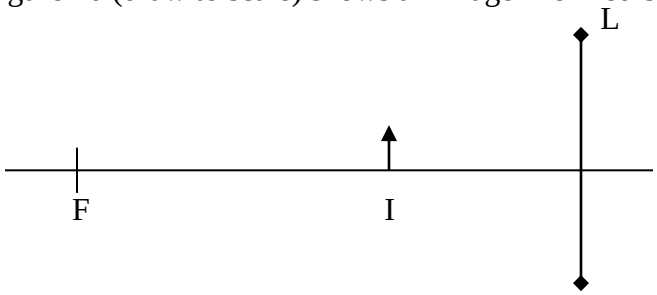


Fig 10

On the same diagram, draw appropriate rays to locate the position of object. Determine the object distance.

17. An electric bulb is rated 75W, 240V. Determine the resistance of the bulb

18. The following equation shows part of a radioactive decay process.

$$^{234}_{90}\mathbf{T} \xrightarrow{x} {}^{234}_{91}\mathbf{Pa}$$

Name the radiation x.

19. Pure silicon can be changed into p –type semiconductor by adding an impurity. Explain how this is achieved.

20. When a piece of metal is placed on water, it sinks. But when the same piece of metal is placed on a block of wood, both are found to float. Explain this observation.

21. A girl standing 600m away from a cliff bangs two pieces of wood together and hears and echo 3.5 seconds later. Determine the speed of sound in air at that place.

22. On the axes provided in Figure 11, sketch a graph of velocity (V0 versus time (t) for uniformly accelerated motion given that when t = 0, v s greater than zero

Figure 11

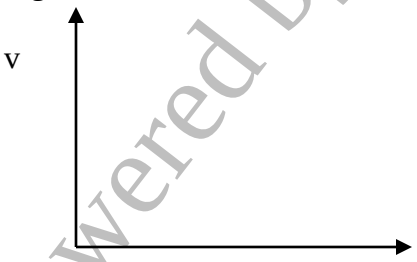


fig. 11

23. In the circuit diagram shown in fig. 12, the lamps are Identical and the cells are also identical.

Figure 12.

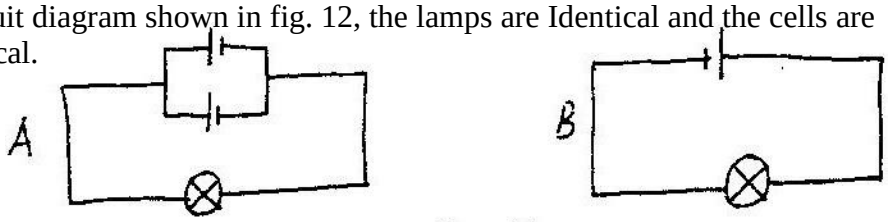


Fig. 12

State with reason, in which circuit the lamp will be lit for longer period.

24. On the axes provided in Fig. 13, sketch a graph of pressure(p) against reciprocal of volume(1/V) for a fixed mass of an ideal gas at constant temperature.

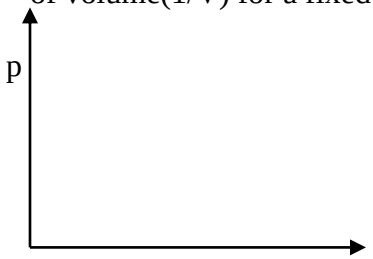
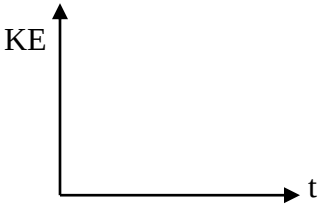


fig. 13

25. Give a reason why the target in an X-ray tube is made of tungsten or molybdenum.

26. Two identical stones A and B are released from the same height above the ground fall through air while A falls through water.
Figure 14.



On the axes provided in Figure 14, sketch the graphs of kinetic energy (KE) against time (t)

27. Figure 15 shows an experimental arrangement for determining the wavelength of light,

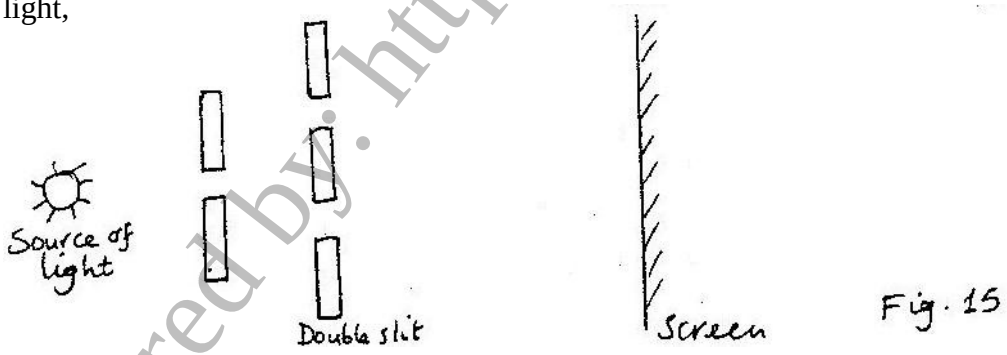
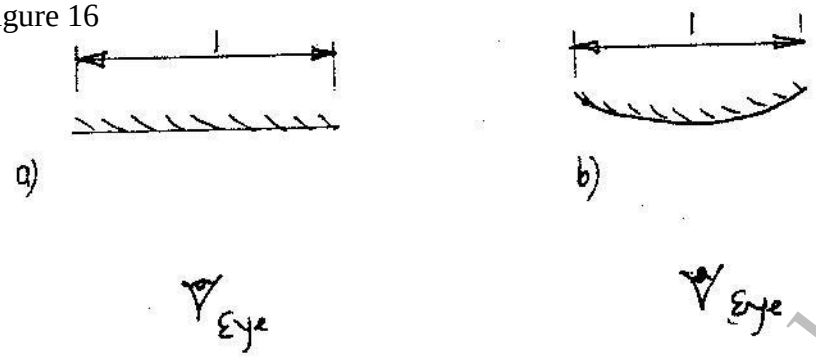


Fig. 15

State and explain the difference in the patterns observed on the screen other than the difference in colour when the source of red light is replaced by a source of violet light.

28. A heating element rated 2.5 kW is used to raise the temperature of 3.0kg of water through 500^{o}C. Calculate the time required to effect this. (Specific heat capacity of water is 4200 J/kgK)

29. Figure 16 (a) and (b) show a convex mirror and a plane mirror of equal aperture.
Figure 16



By sketching a pair of incident and reflected rays for each (a) and (b) show how the convex mirror provides to the eye, a wider field of view than the plane mirror.

30. A resultant force F acts on a body of mass m causing an acceleration a1 on the body. When the same force acts on a body of mass 2m, it causes an acceleration a_2. Express a_2 in terms of a.

31. Arrange the following gin order of increasing frequency:
Visible light, infrared radiation, X – rays, u. v. radiation, radio waves.

Two identical copper coils p and Q are placed close to each other as shown in Figure 17. Coil P is connected to a D>C power supply and coil Q is connected to a galvanometer, G.

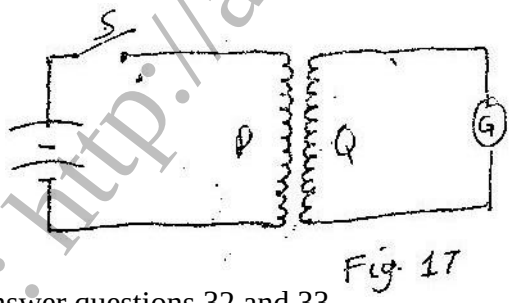


Fig. 17

Use this information to answer questions 32 and 33.

32. State and explain what would be observed on the galvanometer immediately the switch S is closed.

33. State with reason the difference that would be noted in the observation made in question 32 if the number of turns in coils Q were doubled.

34. Figure 18 shows the pattern produced by an A.C voltage on a CRO screen.
Figure 18.

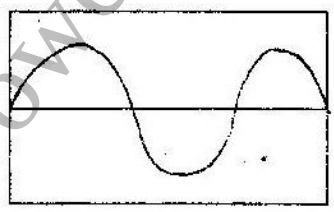


Fig. 18

On the same figure, sketch the pattern produced by the same voltage when the time base is switched off.

35. The minimum frequency of radiation necessary to cause photoelectric effect on a certain metal surface in 9.06×10^{14} Hz. Determine the work function fo the metal.(planks constant $h = 6.63 \times 10^{-34}$ Js)

36. Figure 19 shows a pith ball placed in a flask. When a jet of air is blown over the mouth of the flask as shown, the pith ball is observed to rise form the bottom

Figure 19

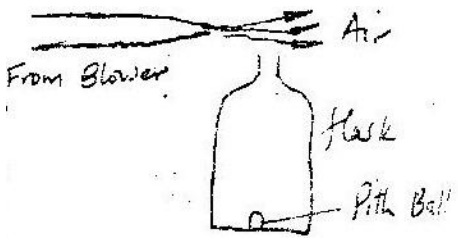
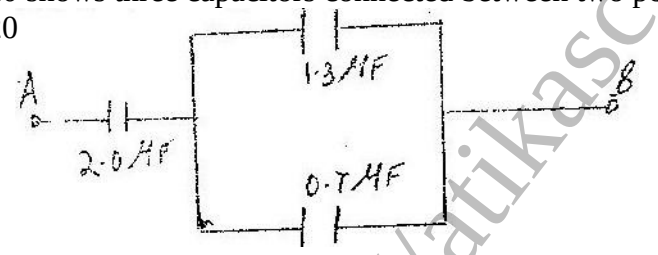


Fig. 19

Explain this observation

37. Figure 20 shows three capacitors connected between two points A and B.

Figure 20



Determine the capacitance across AB

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1a. Fig 1 shows the displacement time graph of the motion of a particle.

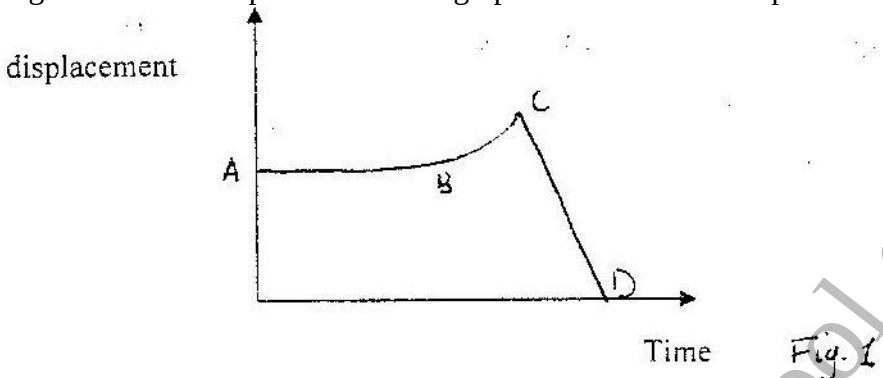


Fig. 1

State the nature of the motion of the particle between:

(i) A and B (ii) B and c (iii) C and D

b) A ball is thrown horizontally from the top of a vertical tower and strikes the ground at point 50m from the bottom of the tower. Given that the height of the tower is 45m, determine the :

i) Time taken by the ball to hit the ground.

ii) The initial horizontal velocity of the ball

iii) Vertical velocity of the ball just before striking the ground. (Take acceleration due to gravity g as $10ms^{-2}$) Total 13 marks

2a) A crane lifts a load of 200kg through a vertical distance of 3.0m in 6 seconds. Determine:

(i) Work done

(ii) Power development by the crane.

(iii) Efficiency of the crane given that it is operated by an electric motor rated 12.5kW.

(b) A child of mass 20kg sits on a swing of length 4m and swings through a vertical height of 0.9m as shown in figure 2..

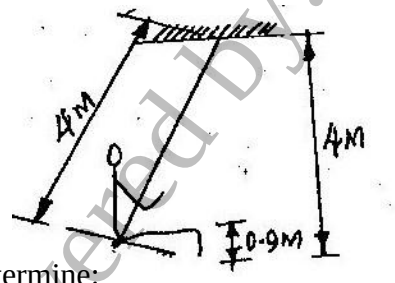


Fig. 2

Determine:

(i) Speed of the child when passing through the lowest point.

(ii) Force exerted on the child by the seat of swing when passing through the lowest point. (14mks)

3a) State what is meant by the term 'specific latent heat of vaporization'

b) In an experiment to determine the specific latent heat of vaporization of water, steam at 100^0C was passed into water contained in a well-lagged copper calorimeter. The following measurements were made;

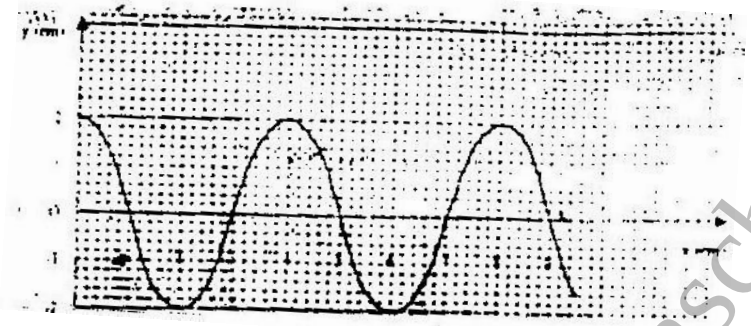
(i) Determine the:

I Mass of condensed steam

II Heat gained by water
Heat gained by calorimeter

(ii) Given that L is the specific latent heat of vaporization of steam,
I write an expression for the heat given out steam.
II Determine the value of L.

4 a) Figure 3 shows a transverse wave traveling along x-axis.



(i) Determine the:
I Wavelength of the wave
II Amplitude of the wave.

(ii) If the time taken by the wave to move from 0 to A is 0.09 seconds, determine the:
I Frequency of the wave.
II Speed of the wave

b) Figure 4 shows a Geiger muller (GM) tube

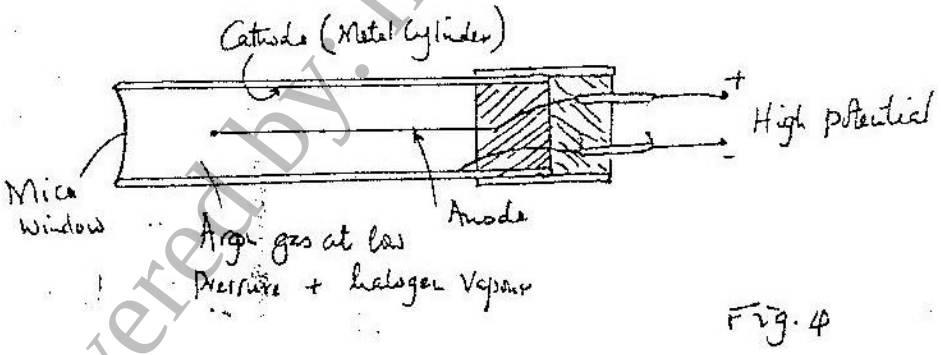
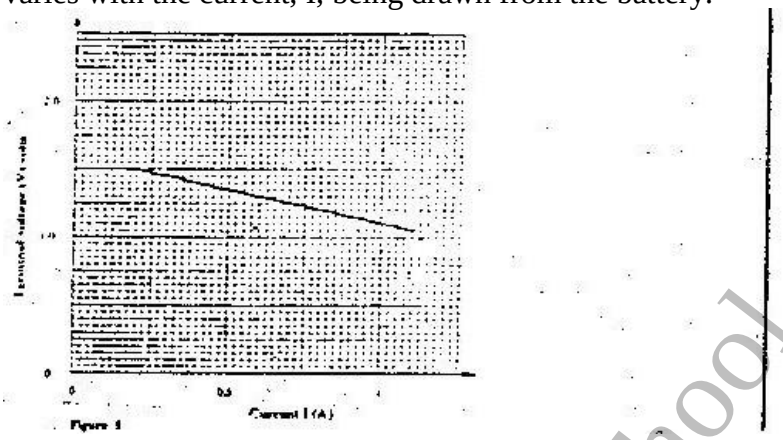


Fig. 4

(i) Give the reason why the mica window is made thin.
(ii) Explain how the radiation entering the tube through the window is detected by the tube.
(iii) What is the purpose of the halogen vapour

5 a) States what is meant by electromotive force (em.f) of battery.

b) The graph in figure 5 shows the terminal voltage, V, of a certain battery varies with the current, I, being drawn from the battery.



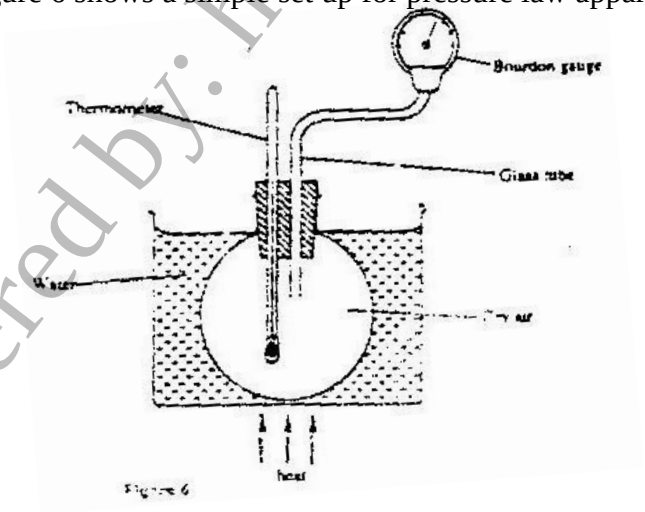
(i) Write an expression relating the e.m.f. E, terminal voltage, V, current, I and the internal resistance, r, of the battery for the circuit drawn in (i) above.

(iii) From the graph determine the; I internal resistance, r, of the battery.

(C) A galvanometer of resistance 10Ω gives a full-scale deflection when a current of 0.03A flows through it. Determine the resistance of the resistor, which would be required to convert the galvanometer to an ammeter reading up to 3.0a.

SECTION II

6 a) Figure 6 shows a simple set up for pressure law apparatus.



Describe how the apparatus may be used to verify pressure law. Initial reading of pressure and temperatures are recorded.

b) The graph in fig 7 shows the relationship between the pressure and temperature for a fixed mass of an ideal gas at a constant volume.

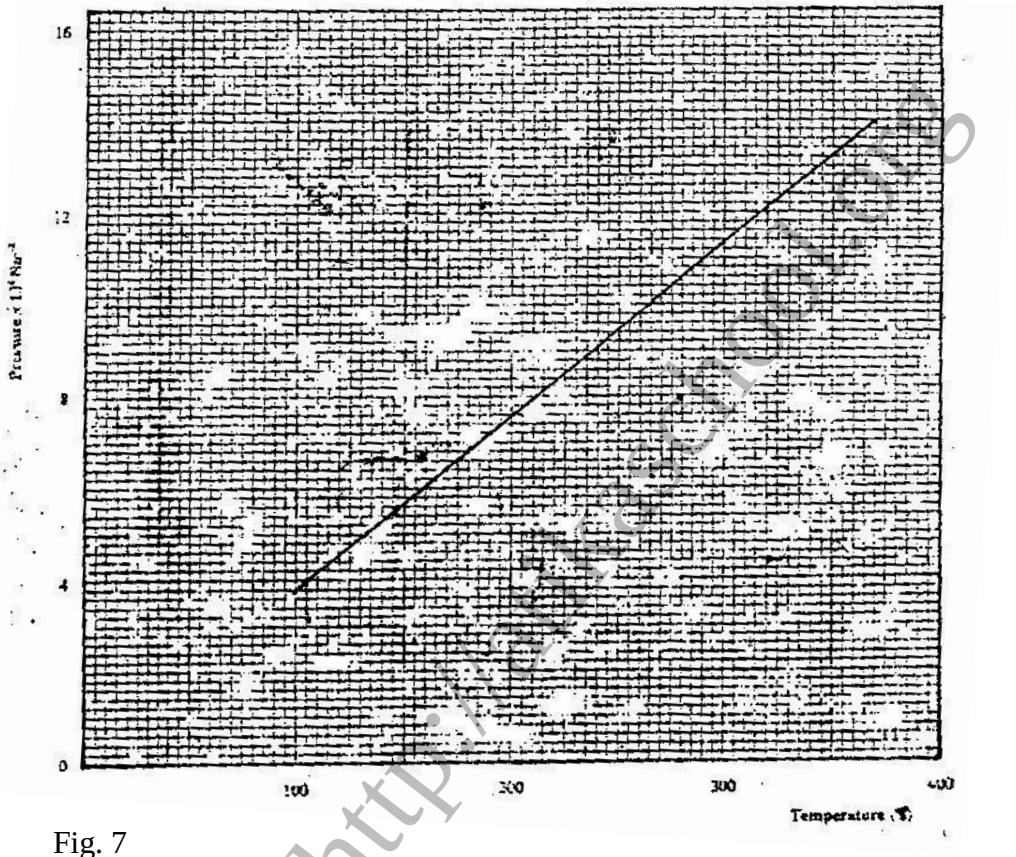


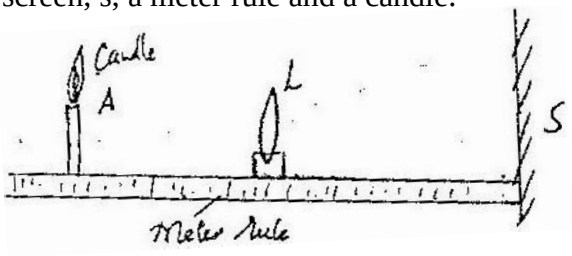
Fig. 7

(i) Given that the relationship between pressure, p, and temperature, T n Kelvin is of the form P = kT+ C where k and C are constants, determine from the graph, values of k and c.

(ii) Why would it be impossible for pressure of the gas to reduced to zero in practice?

(c) A gas is put into a container of fixed volume at a pressure of 2.1×10^5 Nm^{-2} and temperature 27^0C. the gas is then heated temperature of 327^0C. Determine the new pressure.

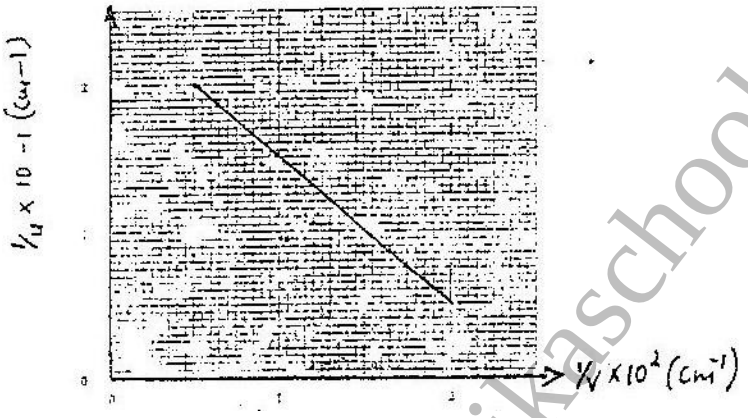
7. a) Fig. 8. shows an experimental set up consisting of a mounted lens. L, a screen, s, a meter rule and a candle.



(i) Describe how the set-up may be used to determine the focal length, f, of the lens.

(ii) State the reason why the set-up would not work if the lens were replaced with a diverging lens.

(b) The graph in figure 9. shows the relationship between $^1/_r$ and $^1/_v$ for converging lens where u and v are the object and image distances respectively.



For the graph, determine the focal length, f of lens.

(c) An object placed 15cm from a convex lens is magnified two times. Determine the focal length of the lens.