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1. Fig 1 shows part of a measuring cylinder calibrated in cm^3 containing water whose level is indicated. Some 3.0cm of is added into the cylinder. Indicate on the diagram the new level of water.

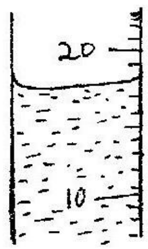


Fig. 1

2. A bag of sugar is found to have the same weight on planet earth as an identical bag of dry sawdust on planet Jupiter. Explain why the masses of the two bags must be different.

3. Fig. 2 shows a beaker placed on a bench. of ice is placed in the beaker as shown.

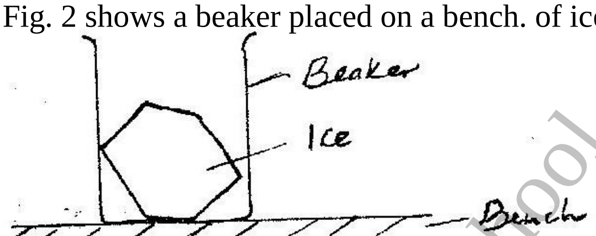


Fig. 2

State and explain the change in the stability of the beaker when the ice melts.

4. A positively charged rod is brought near the cap of a leaf electroscope. The cap is the earthed momentarily by touching with the finger. Finally the rod is withdrawn. The electroscope is found to be negatively charged. Explain how this charge is acquired.

5. Fig. 3 shows a device for closing a steam outlet.

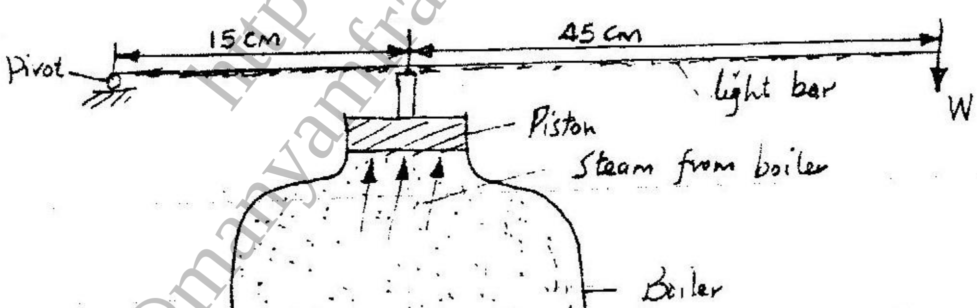


Fig. 3

The area of the position is 4.0 x 10-4 m2 and the pressure of the steam in the boiler is 2.0 x 105 Nm^3. Determine the weight W that will just hold the bar in the horizontal position shown.

6. State the reason why gases are easily compressible while liquids are solids are not?

7. Fig. 4 shows a bimetallic thermometer.

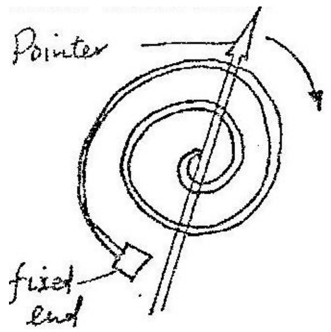


Fig. 4

Explain how a rise in temperature causes the pointer to move in the direction shown.

8. A wooden bench and a metal bench are both left in the sun for along time. Explain why the metal bench feels hotter to touch.

9. Fig. 5 shows an object O placed infront of a plane mirror.

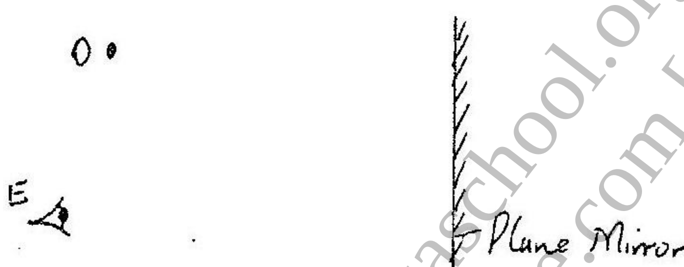


Fig. 5

On the same diagram draw rays to locate the position of the image I, as seen from the eye E.

10. State one advantage of an alkaline accumulator over a lead – acid accumulator.

11. The structure in fig. 6 is in equilibrium. Identify the struts and the ties in the structure.

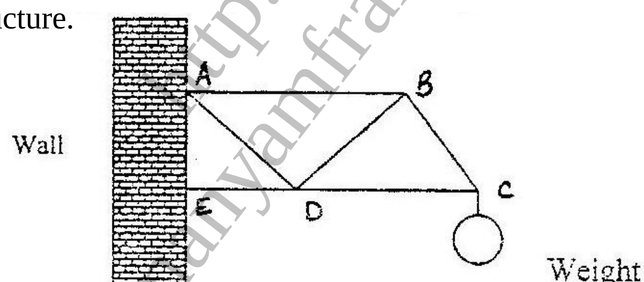


Fig 6

12. Fig. 7 shows how magnets are stored in pairs with keepers at the ends

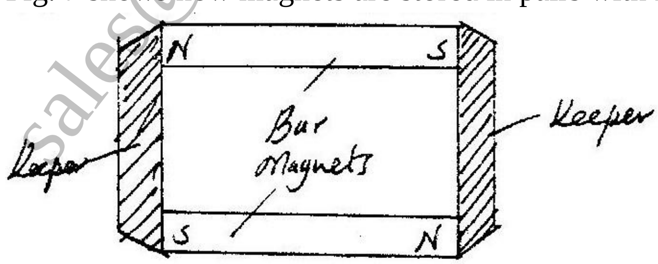


Fig. 7

Explain how this method of storing helps in retaining magnetism longer.

13. In fig 8 the arrow indicates the directions of the current in the conductor.

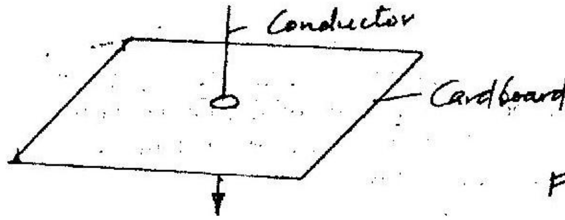


Fig. 8

Sketch on the diagram the magnetic field pattern due to the current.

14. In fig 9 the couple represented by forces F1 is acting on light uniform bar.

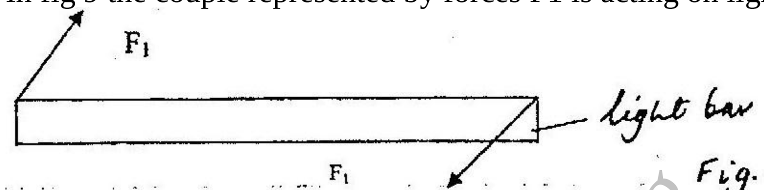


Fig. 9

Sketch on the figure a couple represented by forces F2 such that the bar is in equilibrium. And the forces F2 have minimum magnitude.

15. Fig 10 shows a pulley system being used to raise a load. Use the information given in the figure to answer the questions 15 and 16.

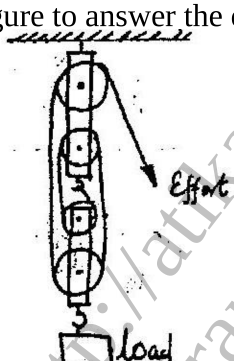


Fig. 10

Determine the velocity ratio (VR) of the system.

16. If a load on 100N is raised by applying an effort of 28N, determine the efficiency of the system.

17. Give one example of a longitudinal wave.

18. In fig. 11 ammeters have negligible resistance and the cells are all identical.

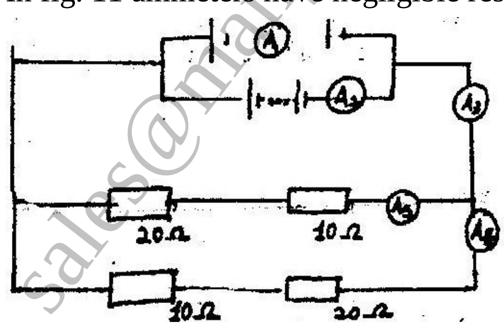
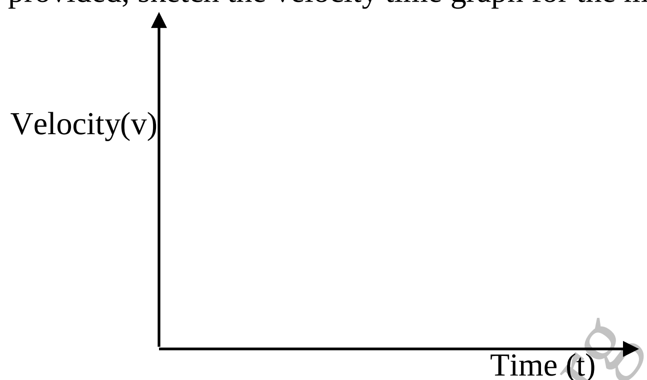


Fig. 11

Show that all the ammeters A1, A2, and A5 have the same reading.
Let A's represent current thought the ammeters using the Kirchoffs law.

19. An electric bulb rated, 40W is operating on 240V mains. Determine the resistance of its filament.

20. A body initially resting on horizontal surface is accelerated by a constant force. It passes over a small region where it experiences a force of friction equal to the accelerating force before returning to the frictionless horizontal surface. On the axes provided, sketch the velocity time graph for the motion of the body.



21. A wire is stretched between two fixed points such that when it is plucked, it produces sound. Explain why the pitch of the sound produced may become lower when the temperature of the surrounding rises.

22. Two identical blocks of copper are taken from the same furnace. One block is dropped into a well - lagged calorimeter containing 200g of methylated spirit. Both water and spirit were initially at the same temperature. After being given time to stabilize the temperature, it was found that more spirit than water had evaporated.
State two factors that could have caused this difference.

23. Fig. 12 shows a ray of light incident on a convex mirror.

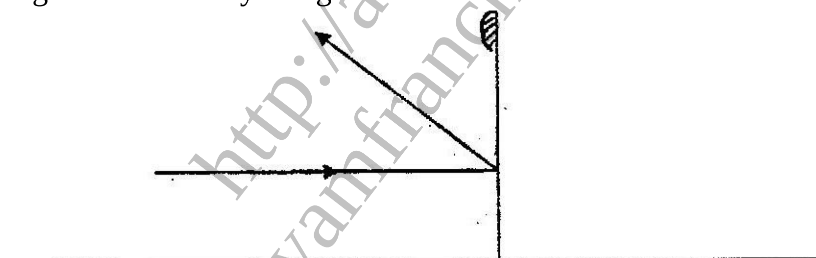
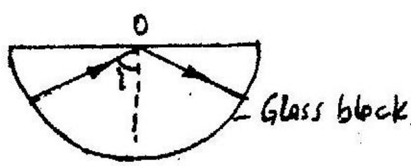


Fig.12

Using a suitable construction on the same diagram determine the radius of curvature of the mirror.

24. Fig 13. Shows a semicircular glass block placed on a bench. A ray of light is incident at point O as shown. The angle of incidence, I , is just greater than the critical angle of glass.



A drop of water is now placed on the bench so as to make contact with the glass at point O. Sketch on the same figure the path followed by the ray after placing the drop of water.

25. A student holds a sheet of paper at one end so that it hangs in the position A shown in fig. 14

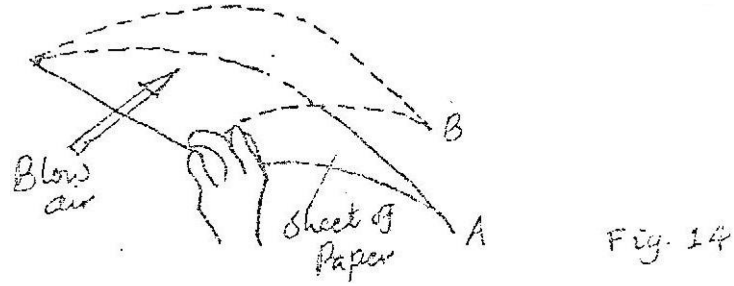
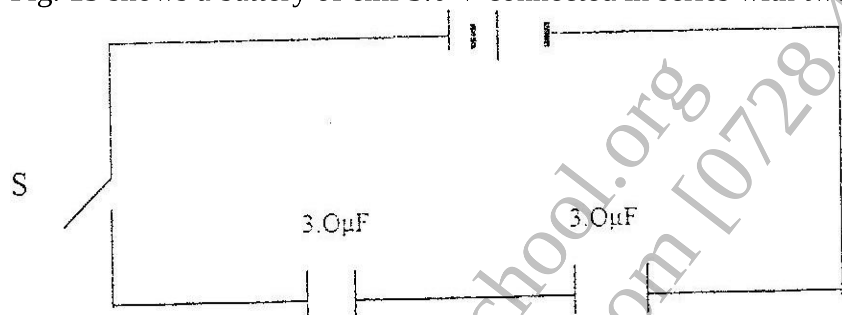


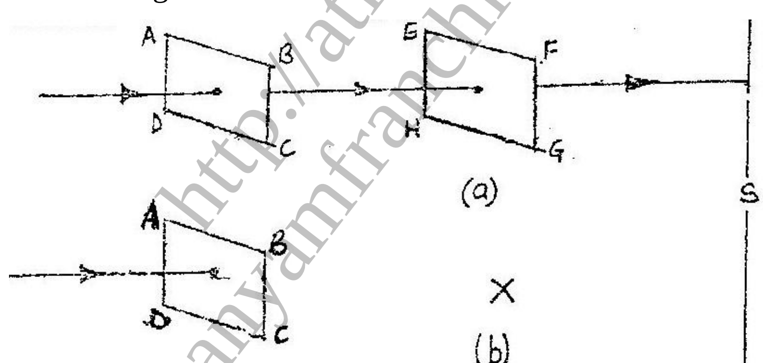
Fig. 14

Explain why the paper rises to the position B when the student blows air in the direction shown by the arrow.

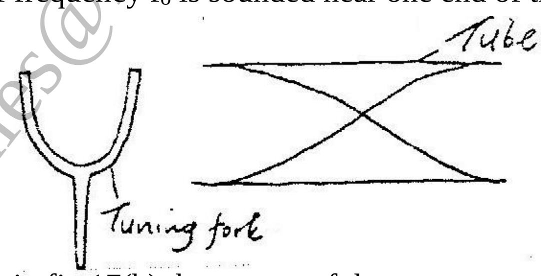
26. Fig. 15 shows a battery of emf 3.0 V connected in series with two capacitors.



27. In fig 16.(a) the Polaroids ABCD and EFGH are oriented such that maximum light reaches the screen S. Sketch at X on Fig. 16 (b) the orientation of EFGH such that no light reaches S.



28. Fig 17 (a) shows the wave pattern at resonance in an open tube when a turning fork of frequency f_o is sounded near one end of the tube.



Sketch in fig 17(b) the pattern of the wave at resonance when a fork of frequency $3f_o$ is sounded near one end of an identical tube.

29. State two uses of microwaves.

30. In fig. 18 ultra – violet (u,v) light falls on a zinc plate placed on a charged leaf electroscope. It is observed that the leaf collapses.

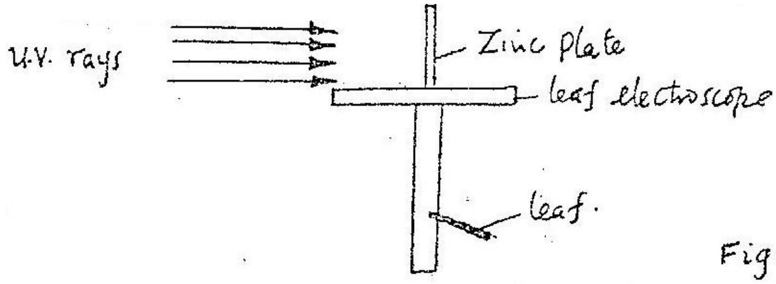


Fig. 18

31. Fig (19) drawn to scale) shows the image, I, formed by a diverging lens. F is principal focus of the lens.

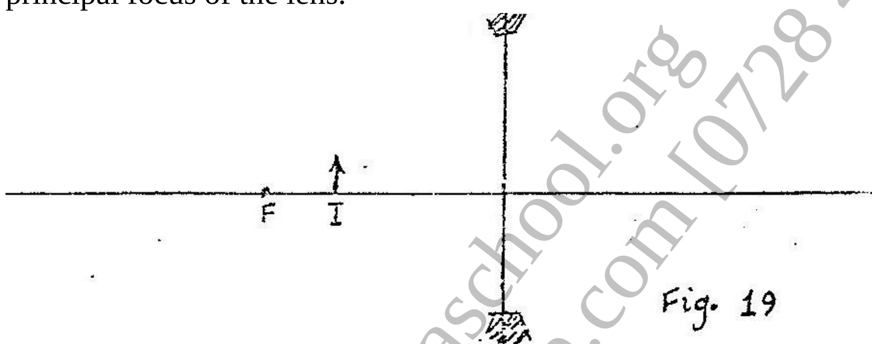


Fig. 19

By drawing the appropriate rays on the same diagram, locate the position of the object.

An armature composed of turns of insulated copper wire would on laminated soft –iron core is rotated in a magnetic field to generate an e.m.f. Use this information to answer questions 31 and 32.

32. State tow factors other than the speed of rotation that affect the molecule of the e.m.f generated.

33. State the reason why soft iron is laminated.

34. An atom changes from an excited state to an unexcited state releasing energy. State one factor that affects the frequency of the radiation released.

35. State and explain the effect of increasing the E.H.T in an x-ray tube on the X-rays produced.

36. The graph in Fig 20 shows the disintegration per second versus time in seconds, s for a sample of radioactive material; determine the half – life of the sample.

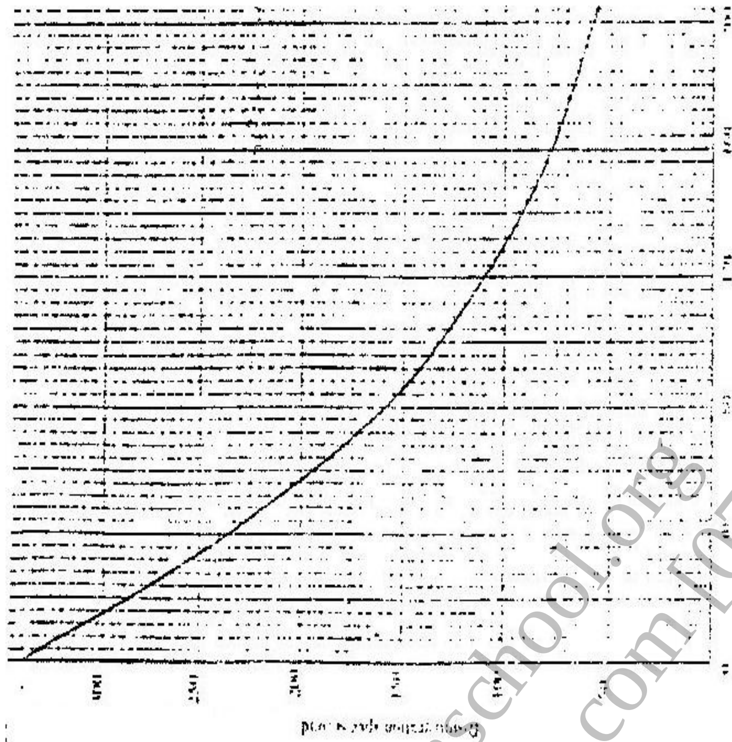


Fig. 20

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1a) i) State one application of each of the following.
Convex mirror- Parabolic mirror –

ii) Fig. 1, which is drawn to a scale of 1:5, represents an object O and its image 'I' formed by a concave mirror.

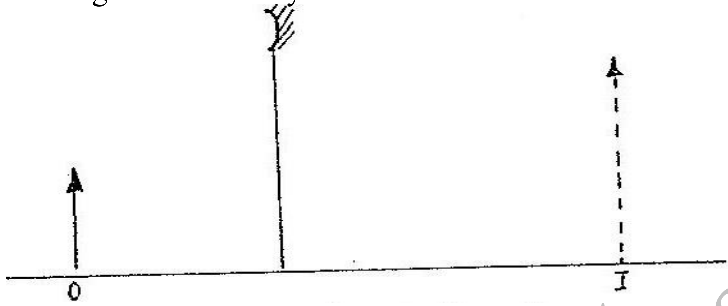
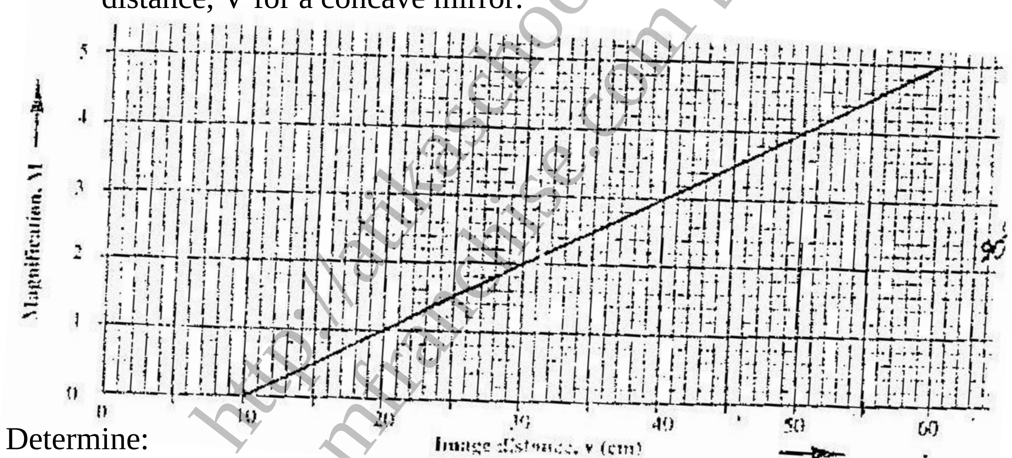


Fig. 1

By drawing suitable rays, locate and mark on the figure the position of the principal focus 'F' of the mirror. Determine the focal length f.

b) The graph in Fig. 2 shows the variation of magnification, M with image distance, V for a concave mirror.



Determine:

i) The object position when the image position is 45cm

ii) The focal length of the mirror.

2a) Two identical spherical steel balls are released from the top of two tall jars containing liquids L_1 and L_2 respectively. Fig 3 shows the velocity – time graph of the option of the balls.

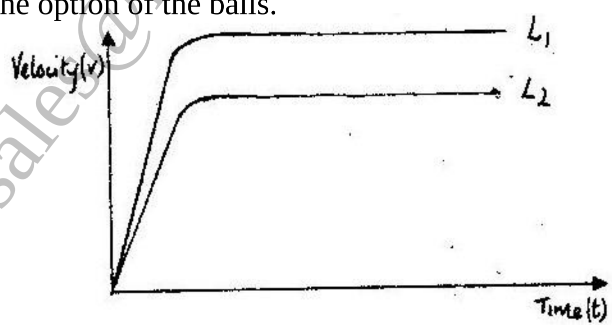
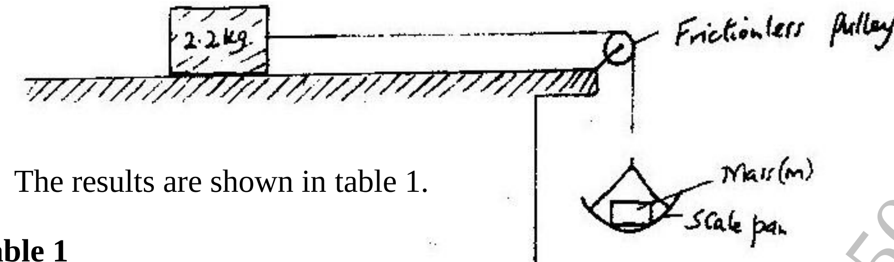


Fig. 3

Explain the nature of the curves and state why they are different.

b) In an experiment to determine the proportionality constant, μ between two wooden surfaces sliding on each other, a block of mass 2.20kg was placed on a horizontal bench. The block was then made to slide by adding mass 'M' On the scale as shown in Fig 4. The experiment was repeated for other values of 'm'.The acceleration of the block was measured for each mass added.



The results are shown in table 1.

Table 1

Mass, m (kg)	0.70	1.00	1.50	2.00	2.50
Acceleration, a,(m/s^2)	0.38	1.74	4.02	6.29	8.56

i) Name and indicate on figure 4 the forces acting on the 2.20kg mass.

ii) Plot the graph of acceleration, a against the mass m

iii) Given that $a = \frac{mg}{2.20} - \mu g$, where g = 10ms-2, use the graph to

Determine μ. Intercept = μg

Intercept = 2.80 ± 0.2 (from graph)

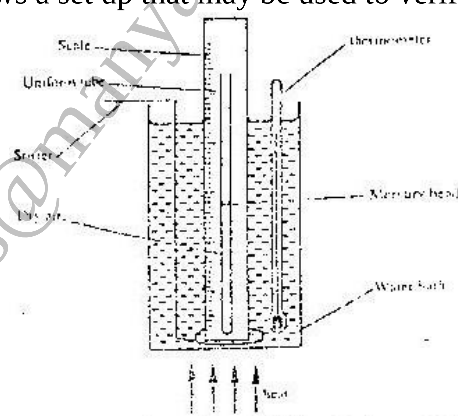
$M = \frac{2.80 \pm 0.2}{10}$

M = 0.28 ± 0.02

3a) Using the kinetic theory of gases, explain how a rise in the temperature of a gas causes a rise in the pressure of the gas if the volume is kept constant.

b) Fig. 5 shows a set up that may be used to verify Charles Law.

Figure 5.



i) State the measurements that should be taken in the experiment.

ii) Explain how the measurements taken in (i) above, may be used to verify Charles Law.

iii) What is the purpose of the water bath.

c) A certain mass of hydrogen gas occupies a volume of 1.6m3 at a pressure of 1.5 x 105 pa and temperature 12ºC. Determine its volume when the temperature is OºC at a pressure of 1.0×10^5 pa.

4. 6(a) (i) State one property of soft iron that makes it suitable for use as a transformer core.

(ii) Fig 6 represents a step- down transformer with 500 turns in the primary and 50 turns in the secondary. The turns are wound uniformly on the core. The lengths of PQ and QR are indicated. Determine the p.d across PQ.

(b) Fig 7 represents a block of uniform cross sectional area of $6.0cm^2$ floating on two liquids A and B. The lengths of the block in each liquid are shown.

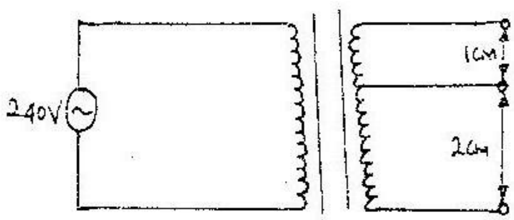


Fig.6

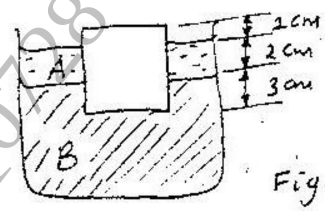


Fig.7

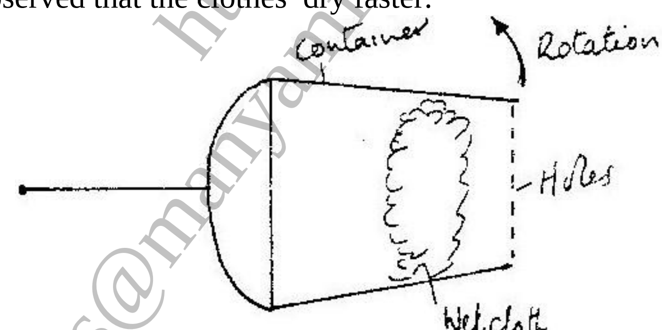
Given that the density of liquid A is $800kgm^{-3}$ and that of liquid B is $1000kgm^3$ determine the:

(i) b weight of liquid A displaced

(ii) Weight of liquid B displaced

(iii) Density of the block

5. (a) Fig 8 shows a container with small holes at the bottom in which wet clothes have been put. When the container is whirled in air at high speed as shown, it is observed that the clothes dry faster.



Explain how the rotation of the container causes the clothes to dry faster.

(b) (i) A glass block of mass 100g is placed in turn at various distances from the centre of a table which is rotating at constant angular velocity. It is found that a distance of 8.0 cm from the centre, the block just starts to slide off the table. If the force of the friction between the block and the table is 0.4 N determine.

(I) The angular velocity of the table

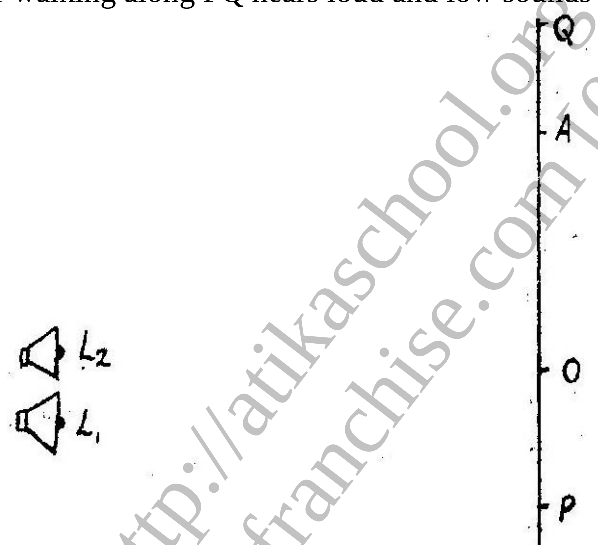
(II) The force required to hold the block at a distance of 12 cm from the centre of the table.

(ii) A glass of mass 200 g is now placed at a distance of 8.0 cm from the centre of the table in (i) above, and the table rotated at the same constant angular velocity. State with a reason whether or not the block will slide.

SECTION II

6a) State the necessary conditions for interference to occur in waves

b) Fig 9. Drawn to scale of 1: 200 shows two speakers L_1 and L_2 connected to a signal generator (not shown) producing sound waves of frequency 350Hz. An observer walking along PQ hears loud and low sounds at alternative positions.



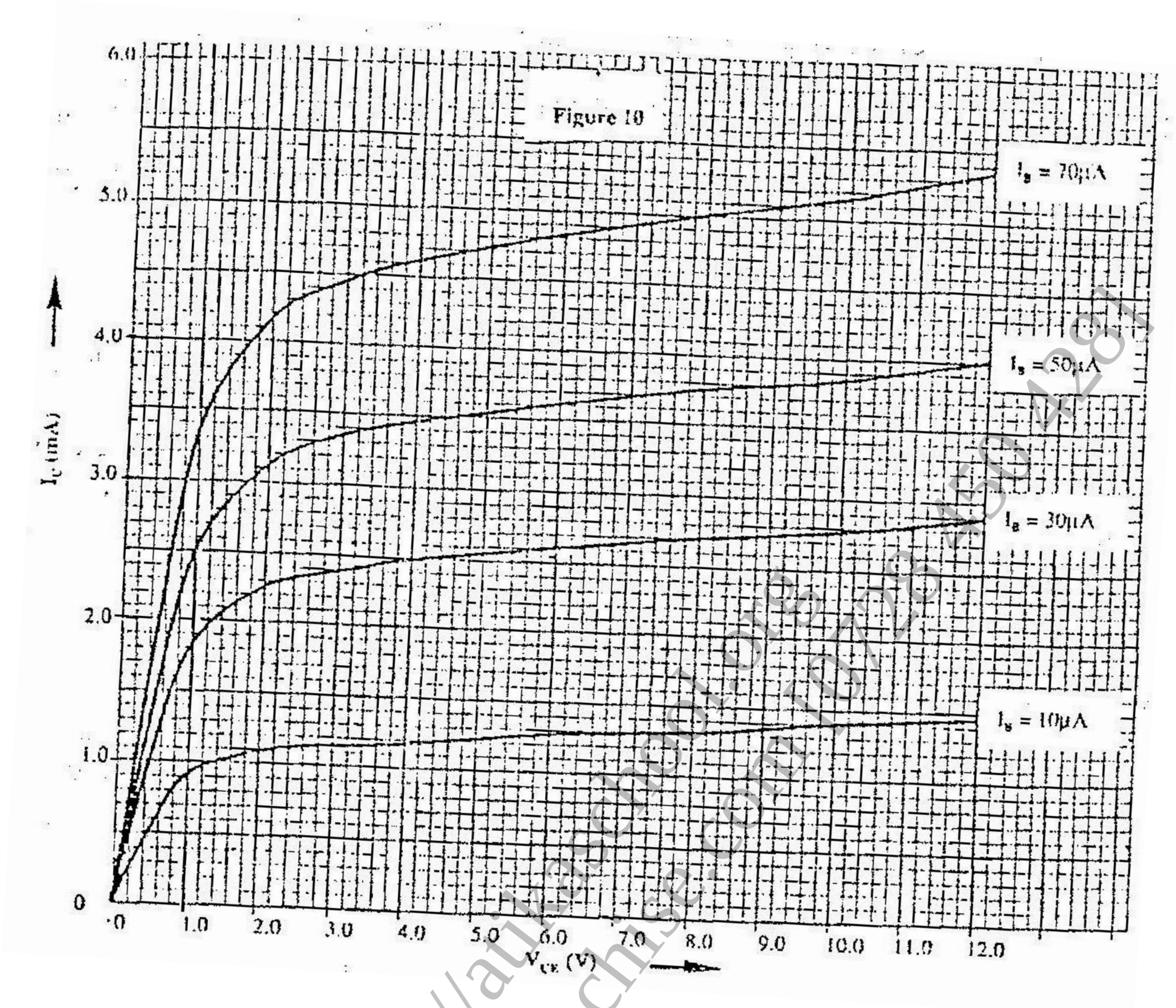
(i) Explain how the observations made are caused

(ii) At point O a loud sound is heard and at point A, the next loud sound is heard. Use this information and the diagram to determine the velocity of sound in air.

(iii) State and explain the effect of increasing the frequency of the signal generator on the distance OA.

7. (a) Explain how a p- type semiconductor is made from a pure a semiconductor

(b) The curves in fig 10. Show the output characteristics of a n – p-n transistor in common emitter mode. The p.d of the battery, V_{cc} is 9.0V and the load resistors R_L is 1.8 k Ω



i. Draw the circuit diagram for the experiment set- up that may be used to obtain the curves in the figure.

ii. Given that ohm's law for the circuit is $V_{CE} = V_{cc} - I_cR_L$, draw on the same axes, the load line for the circuit (hint: load - line passes through. (V_{CE} = 0 and I_c = 0)

Drawing load line on graph (see graph)

When I_B = 30μA, An alternating signal is fed into the base so that the base current changes by ± 20μA. Use the graph to determine the corresponding change in collector current I_c and hence determine the current gain β.