PHYSICS PAPER 232/2 K.C.S.E 2000

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.

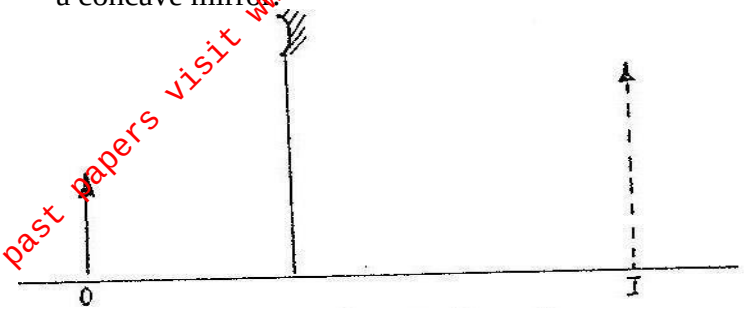
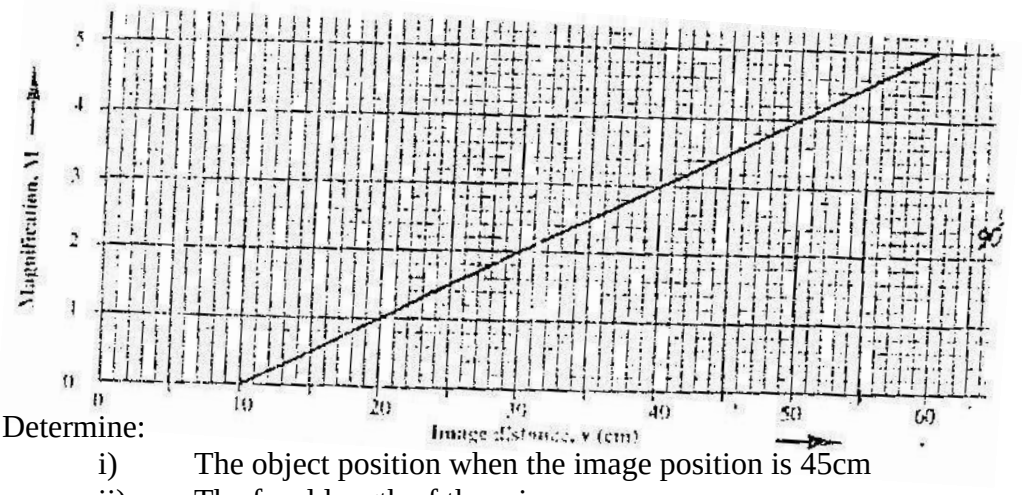


Fig. 1

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.

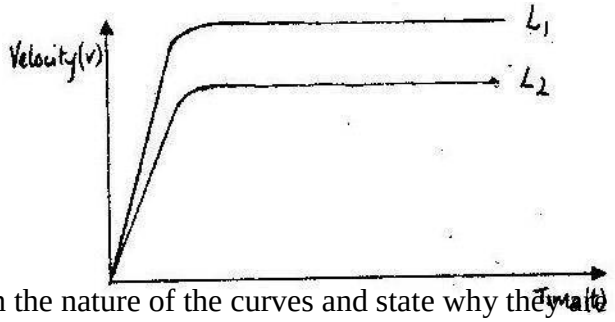
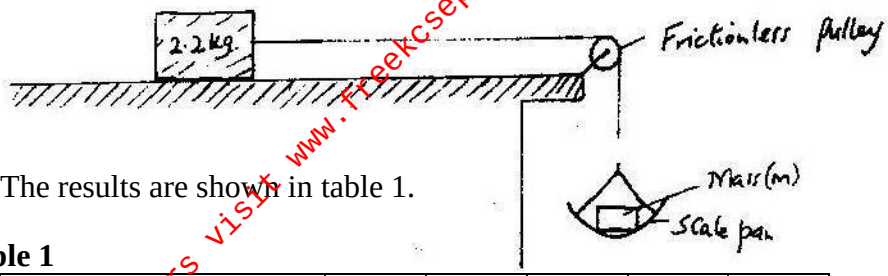


Fig. 3

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)

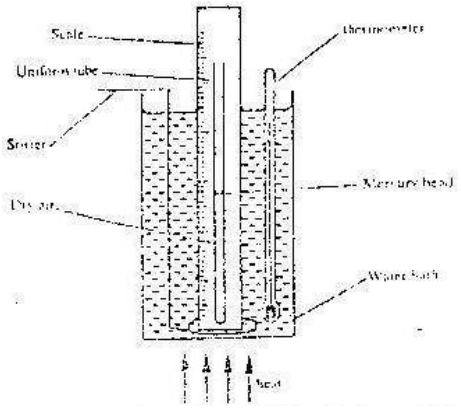
$$M = \frac{2.80 \pm 0.2}{10}$$

$$M = 0.28 \pm 0.02$$

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 12^{o}C. Determine its volume when the temperature is O^{o}C at a pressure of 1.0 x 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.

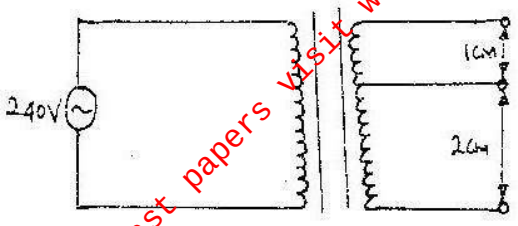


Fig. 6

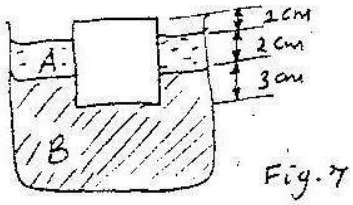
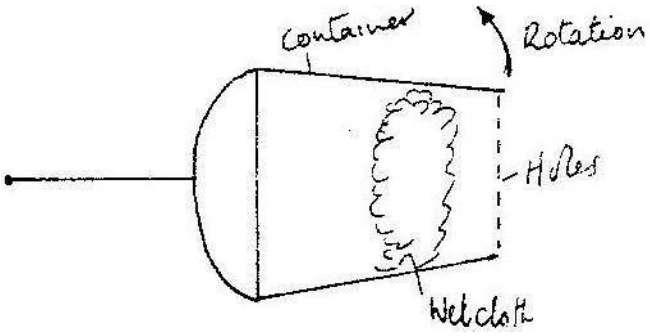


Fig. 7

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.

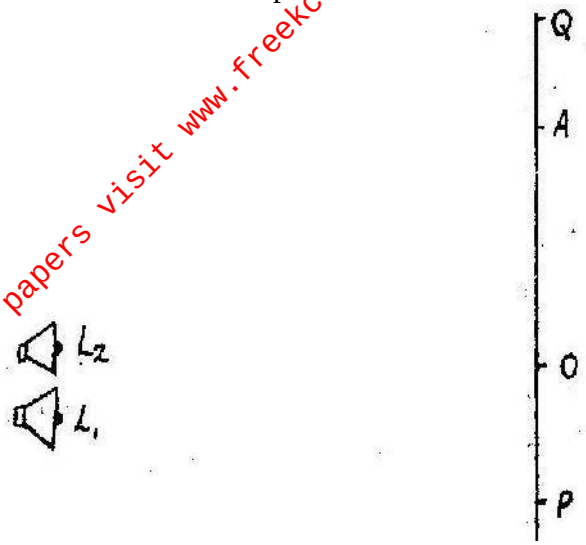
(I) The angular velocity of the table
(II) The force required to hold the block at a distance of 12 cm from the centre of the table.

(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.



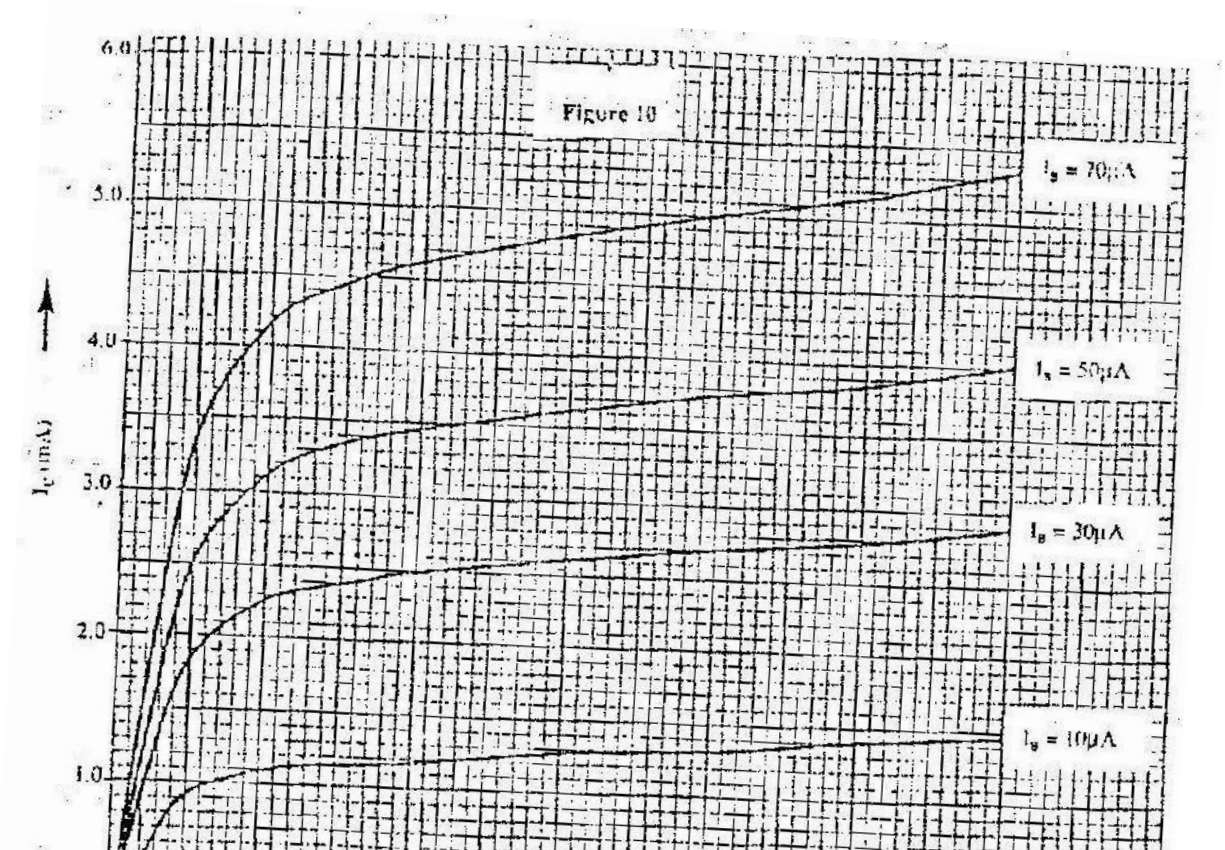
(i) Explain how the observations made are caused

(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 $I_B = 30\mu A$, An alternating signal is fed into the base so that the base current changes by $\pm 20\mu A$. Use the graph to determine the corresponding change in collector current I_c and hence determine the current gain β.