4.4 PHYSICS (232)

4.4.1 Physics Paper 1 (232/1)

SECTION A (25 marks)

*Answer **all** the questions in this section in the spaces provided.*

1. A micrometer screw gauge has a -0.03 mm error. State the reading that is observed on the instrument when used to measure the diameter of a wire whose actual diameter is 0.38 mm.
(1 mark)

2. **Figure 1** shows a defective straw used to suck milk from a glass.

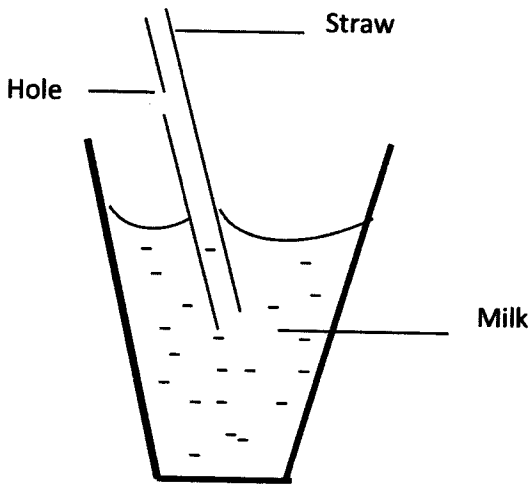


Figure 1

It was observed that upon sucking the straw, milk did **not** rise up the straw. Explain this observation.
(2 marks)

3. State **two** ways of reducing the surface tension of a liquid.
(2 marks)

4. **Figure 2** shows a round bottomed flask containing a coloured liquid. The flask is fitted with a capillary tube.

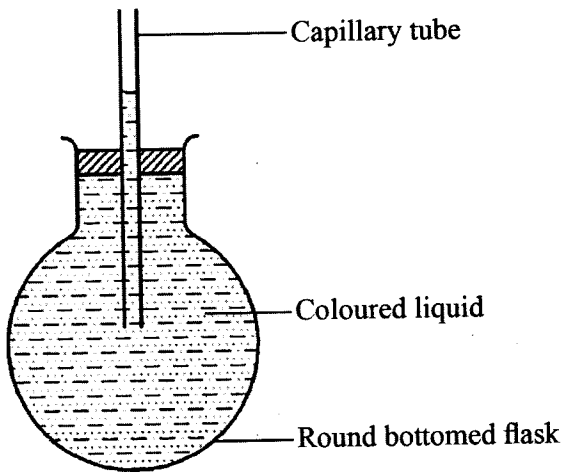


Figure 2

It is observed that on holding the flask with bare hands, the level of the liquid in the capillary tube initially drops slightly and then rises. Explain this observation. (3 marks)

5. **Figure 3** shows two metal rods A and B of equal length made of the same material but different diameters. Wax is attached at one end of each rod. A source of heat is placed between the two metal rods.

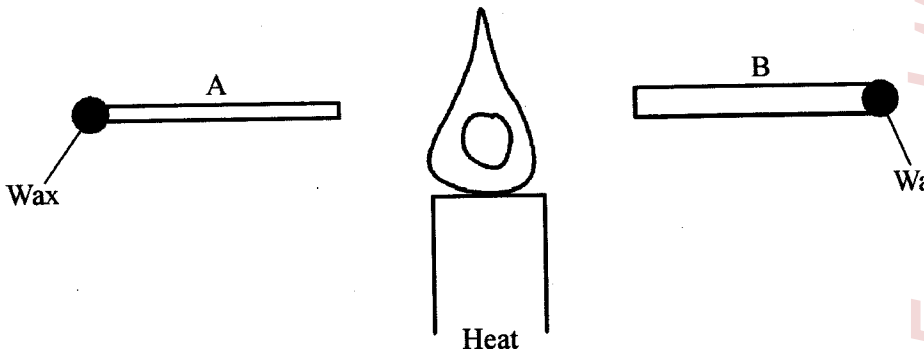
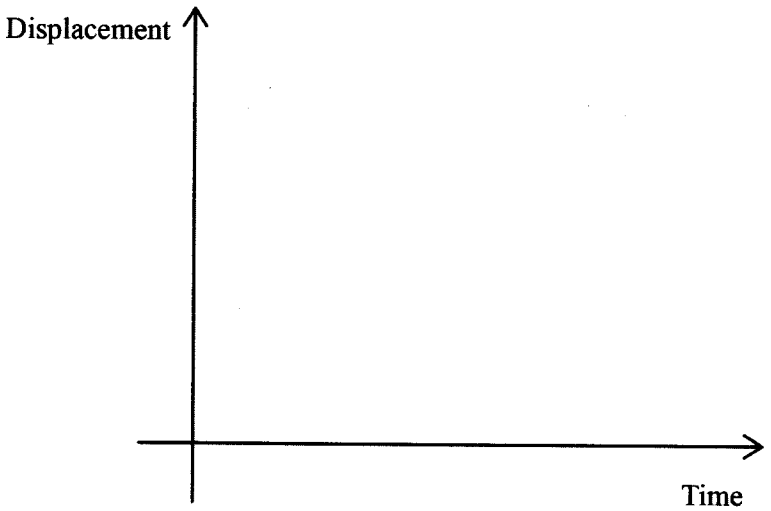


Figure 3

State with a reason, what is observed on the wax. (2 marks)

6. On the axes provided, sketch a displacement – time graph for a trolley moving down a frictionless inclined plane till it reaches the end of the incline. (1 mark)



7. A student carrying a heavy box using the right hand is observed to lean towards the left hand side. Explain this observation. (2 marks)

8. **Figure 4** shows a one meter long uniform rod of negligible weight supporting two weights.

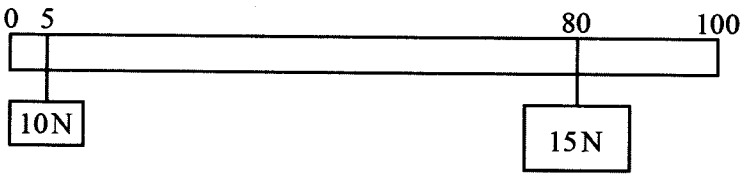


Figure 4

Determine the position of the fulcrum from 0 cm for the rod to remain in equilibrium. (3 marks)

9. State the meaning of the term "*radian*" as a unit of measurement. (1 mark)

10. For a fluid flowing at a velocity V in a tube of cross-sectional area A, VA = constant. State **two** assumptions made in deriving this equation. (2 marks)

11. A stone of volume 800 cm^3 experiences an upthrust of 6.5 N when fully immersed in a certain liquid. Determine the density of the liquid. (2 marks)

12. **Figure 5** shows two springs C and D of the same length and equal number of turns made from the same wire.

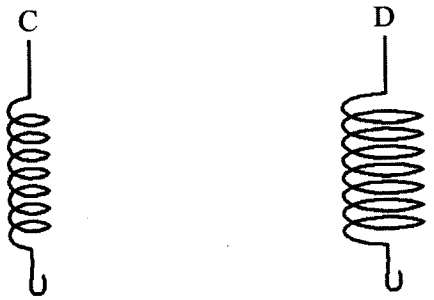


Figure 5

State with a reason which of the two springs can support a heavier load before attaining the elastic limit. (2 marks)

13. Two boxes E and F of masses 2.0 kg and 4.0 kg respectively are dragged along a frictionless surface using identical forces. State with a reason which box moves with a higher velocity. (2 marks)

SECTION B (55 marks)

*Answer **all** the questions in this section in the spaces provided.*

14. (a) A student is provided with five 20 g masses, a meter rule, a spring with a pointer, a stand, a boss and a clamp.

(i) In the space provided, sketch a labelled diagram of the set up that may be used in order to verify Hooke's law using these apparatus. (3 marks)

(ii) State **two** measurements that should be recorded in order to plot a suitable graph so as to verify Hooke's law. (2 marks)

(iii) Describe how the measurements made in (ii) can be used to determine the spring constant. (2 marks)

(b) A helical spring stretches by 0.6 cm when supporting a weight of 40 g. Determine the extension when the same spring supports a weight of 65 g. (3 marks)

15. (a) **Figure 6** shows a bottle top opener being used to open a bottle.

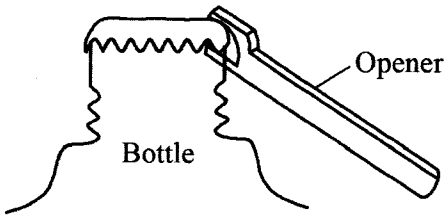


Figure 6

Indicate on the diagram the direction of the load and the effort. (2 marks)

(b) State **two** ways in which an inclined plane can be made to reduce the applied effort when pulling a load along the plane. (2 marks)

(c) A block and tackle system has three pulleys in the upper fixed block and two pulleys in the lower movable block.

(i) Draw a diagram to show how the system can be set up in order to lift a load and indicate the position of the load and effort. (3 marks)

(ii) State the velocity ratio of the set up. (1 mark)

(iii) In such a block and tackle system an effort of 200 N is required to lift a load of 600 N. Determine its efficiency. (3 marks)

16. (a) State the meaning of the term "*heat capacity*." (1 mark)

(b) State how pressure affects the melting point of a substance. (1 mark)

(c) **Figure 7** shows a set up of apparatus that may be used to measure the specific latent heat of vaporisation of steam.

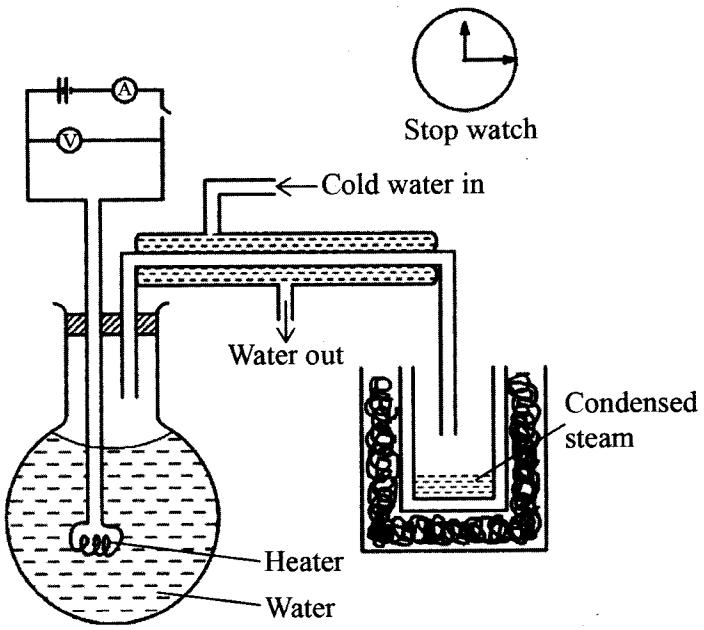


Figure 7

(i) Describe how the mass of condensed steam is determined. (3 marks)

(ii) Other than mass and time, state **two** other measurements that should be taken during the experiment. (2 marks)

(iii) Show how the measurements in (c)(ii) can be used to determine the specific latent heat of vaporisation of water. (2 marks)

(iv) State the precaution that should be taken so that the mass of the condensed steam measured corresponds to the actual mass of steam collected during the time recorded in the experiment. (1 mark)

(v) State why it is **not** necessary to measure temperature in this set up. (1 mark)

17. (a) State what is meant by *Brownian Motion*. (1 mark)

(b) **Figure 8** shows the graph of velocity against time for a small steel ball falling in a viscous liquid.

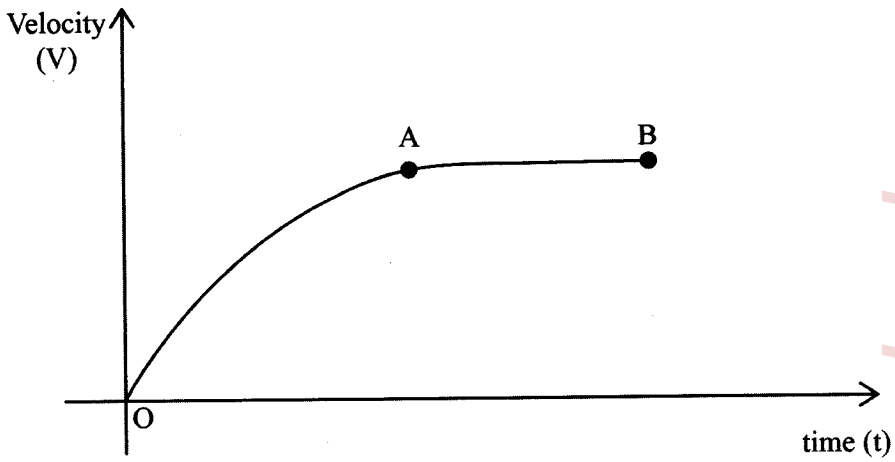


Figure 8

(i) Describe the motion of the steel ball as represented by part OA. (1 mark)

(ii) Explain why the velocity between A and B is constant. (3 marks)

(c) A student throws a tennis ball vertically upwards from the ground and it lands back after 8 seconds. (*acceleration due to gravity* $g = 10 ms^{-2}$)

Determine the:

(i) maximum height reached by the ball; (3 marks)

(ii) velocity with which the ball hits the ground. (3 marks)

18. (a) **Figure 9** shows a graph of pressure against temperature for a fixed mass of gas at constant volume.

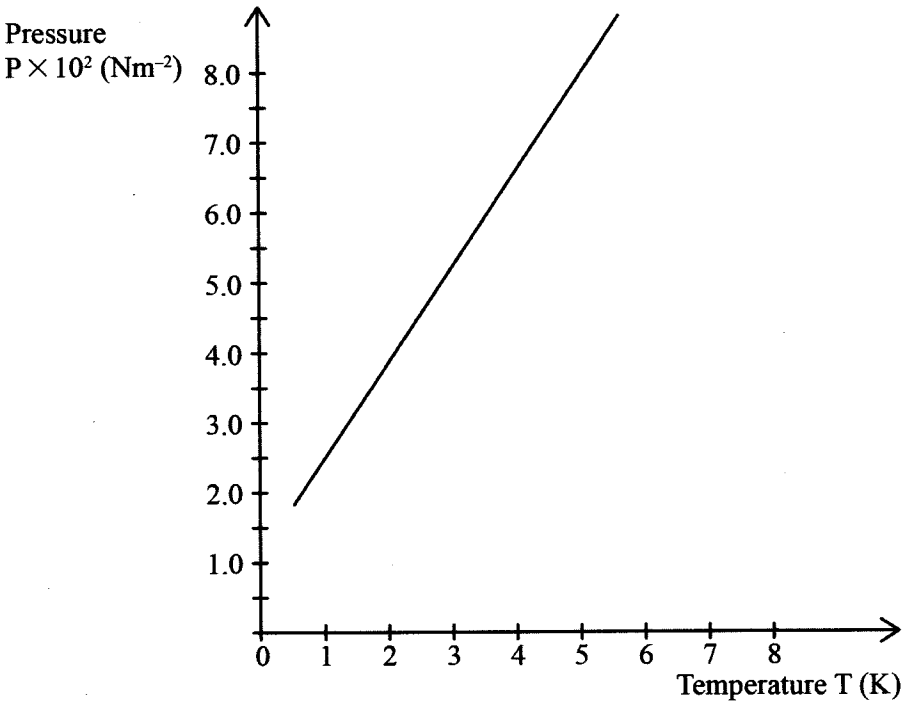


Figure 9

From the graph, determine the values of n and c given that P = nT + c where n and c are constants. (4 marks)

(b) Explain why it is **not** possible to obtain zero pressure of a gas in real life situation. (2 marks)

(c) A fixed mass of a gas occupies 1.5×10^{-3} m³ at a pressure of 760 mmHg and a temperature of 273 K. Determine the volume the gas will occupy at a temperature of 290 K and a pressure of 720 mmHg. (3 marks)

(d) State any **three** assumptions made in kinetic theory of gases. (3 marks)