SECTION A:

Answer ALL the questions in this section

1. Figure 1 shows a micrometer with a negative error of 0.02 mm, used to measure the diameter of a ball bearing.

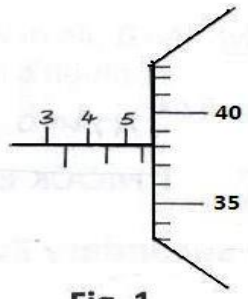


Fig. 1

Record the diameter of the ball (1 mark KRC)

2. The figure 2 below shows the behaviour of mercury in a capillary tube.

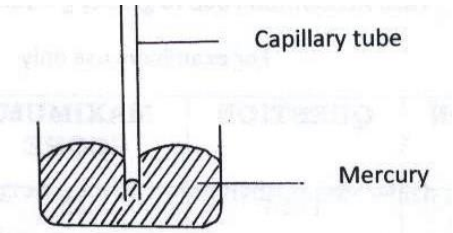
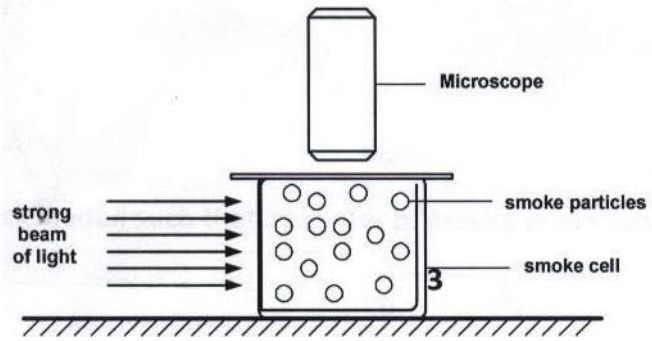


Fig. 2

Explain the behaviour. (1mark KRC)

3. Figure 3 shows apparatus used to observe the behaviour of smoke particles in a smoke cell.



a) Explain what was observed (1mark KRC)

b) Explain what would happen if the temperature was raised. (1mark KRC)

4. The figure 4 below shows two horizontal pipes A and B connected to two identical vertical

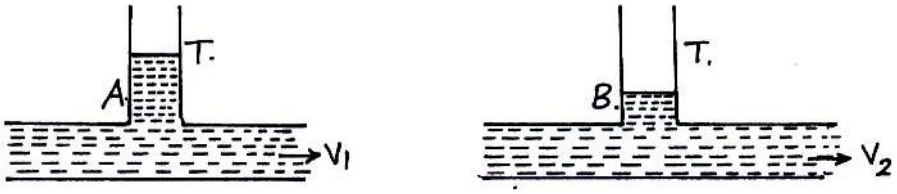


Fig. 4

tubes. Water flows in pipe A at a velocity V_1 and in pipe B at a velocity V_2. Explain why the level of water in tube T in B is lower than that of tube T in A (1mk KRC)

5. Two l0g masses are fixed onto two similar aluminum plates, one polished and the other painted black, using wax as shown in the figure below. A Bunsen flame is placed mid way between the plates.

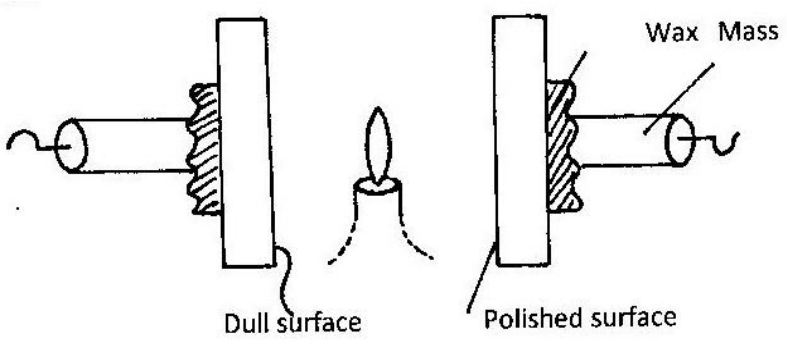


Fig. 5

Give and explain the observation made (2mks KRC)

6. Figure 6(a) represents a Voltmeter before being connected across a battery while figure 6(b) represents the same Voltmeter after being connected across a battery.

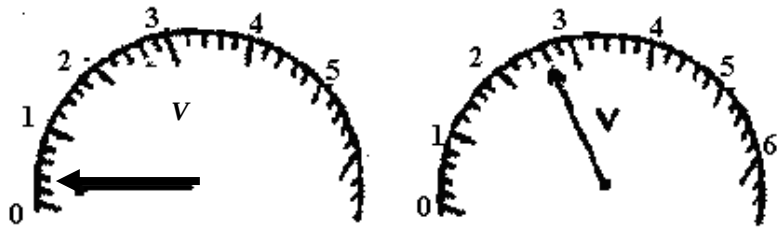


fig 6.

(a) (b)

Determine the voltage of the battery (1mk KRC)

7. The diagram shown in the figure 7 below shows a system in equilibrium with the rule horizontal.

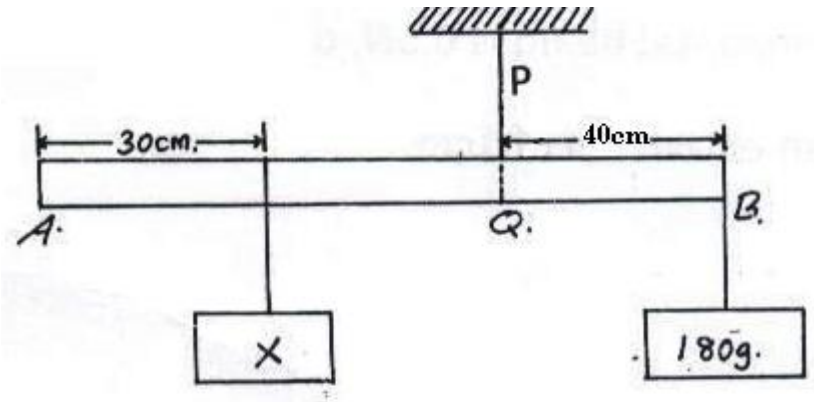


Fig. 7

AB is a uniform rule of length 1.0m and weight 1.8N. Calculate the weight of the block X.

(2mks KRC)

8. Fig. 8 shows a track loaded such that its center of gravity is as shown with a dot.

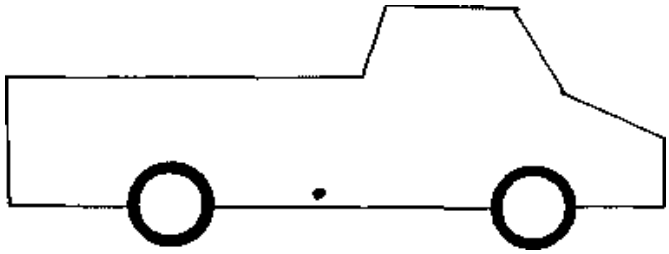


Fig. 8

More weights are added on the top of the first load. Indicate on the diagram, the relative position of the new center of gravity. (1mk KRC)

9. Three identical springs A, B and C are used to support a 15.5N weight as shown in the figure 9 below.

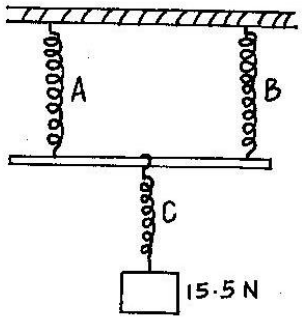


Fig. 9

If the weight of the horizontal beam is 0.5N, determine the extension of each spring given that 4N causes an extension of 1cm. (3mks KRC)

10. Figure **10** below shows a machine being used to raise a load. Use the information given in the figure to answer questions 4(a) and 4(b) below

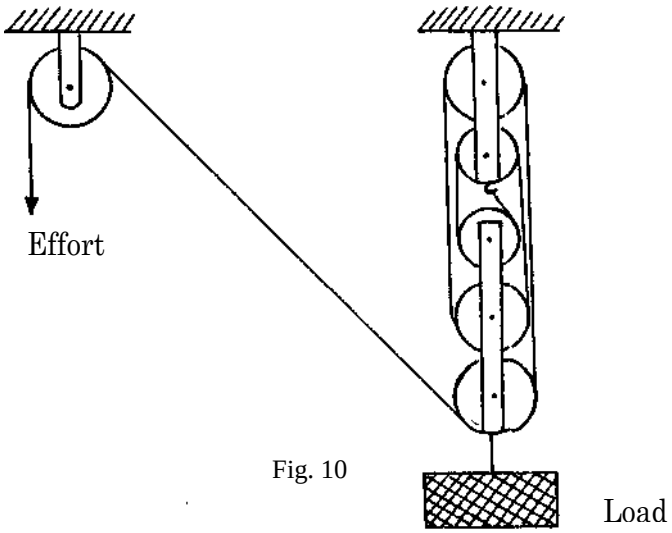


Fig. 10

a) Determine the velocity ratio (V.R) of the machine. (1mk KRC)

b) If a load of 800N is raised by applying an effort of 272N, determine the efficiency of the machine. (2mks)

11. Figure **11** below shows two identical beakers A and B. Beaker A contains water at 0°C while B contains water and pieces of ice at 0°C. Both contents have the same mass.

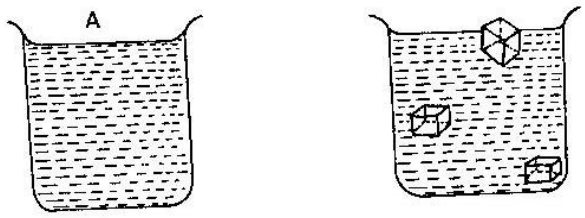


Fig. 11

Two identical metal blocks are removed from the same hot furnace and dropped into each of the beakers. Identify which of the two beakers would experience more evaporation and give a reason for your answer. (2mks KRC)

12. (i) State Boyles law (1mk KRC)

(ii) When an inflated balloon is placed in a refrigerator, it is noted that its volume reduces. Use kinetic theory to explain this observation. (1mk KRC)

13. Figure 12 shows dots which were made by a ticker timer-tape attached to a trolley. The trolley was moving in the direction shown.

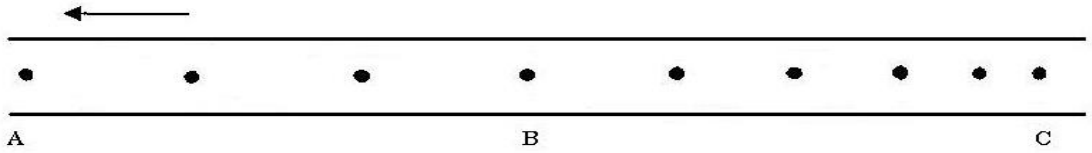


Fig. 12

If the frequency used was 50 Hz, determine

a) the velocities between AB and BC (2mk KRC)

b) the acceleration of the trolley. (1mk KRC)

14. Give **one** application of moments of force (1mk KRC)

SECTION B

Answer ALL the questions in this section

15. a) Figure 13 below represents a car hydraulic braking system.

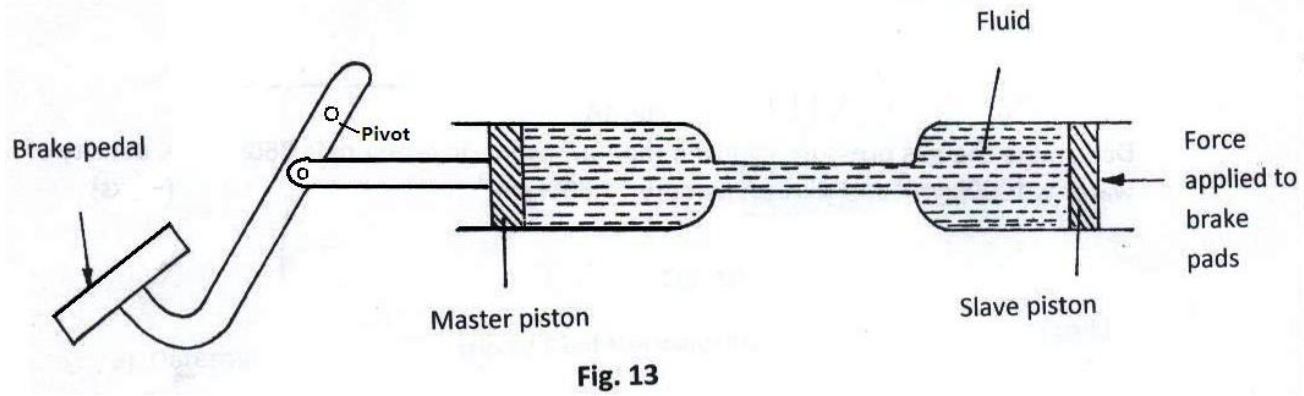


Fig. 13

Use the information given in the diagram above to answer questions 3(a) and 3(b).

(i) State **one** property the fluid should have. (1mk KRC)

(ii) Explain briefly how the system operates. (3mks KRC)

b) Figure 14 below shows a manometer used to measure gas pressure.

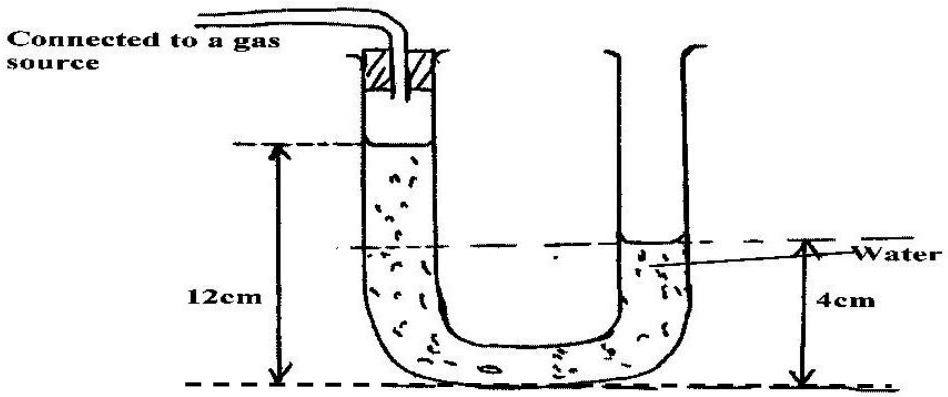


Fig. 14

Determine the gas pressure Pg given that atmospheric pressure is 760mmHg, density of water is l000kgm^{-3} and that of mercury 13,600kgm^{-3} (3mks KRC)

c) The barometric height in a town is 65cmHg. Given that the standard atmospheric pressure is 76cmHg and the density of mercury is 13600kg/m^3, determine the altitude of the town. (Take density of air = 1.25kg/m^3) (3mks KRC)

16. (i) **State** Bernoulli's principle of fluids (1mk KRC)

(ii)Figure **15** below shows cross - sections of two submerged bodies A and B inside water in a swimming pool. The bodies were then fast pulled in the direction shown by the arrows.

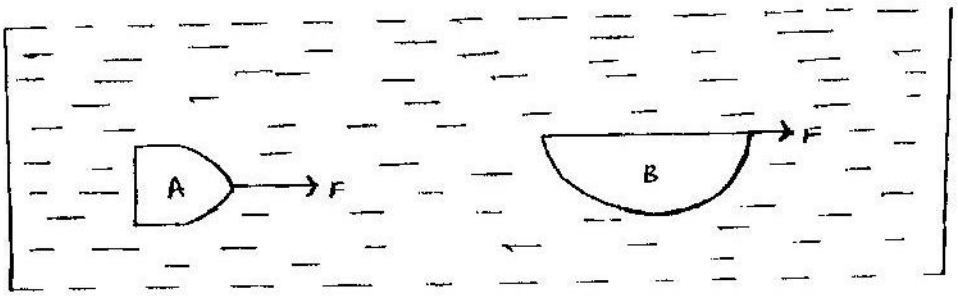


Fig. 15

Use the figure to answer questions (a) and (b) below.

(a) **State** with a **reason** which body is easier to pull if they have equal volume and density. (2mks KRC)

(b) On the same diagram show the path followed by each body (2mks KRC)

(iii) Water flows steadily in a pipe as shown in figure **16** below. The diameters at A and B are given.

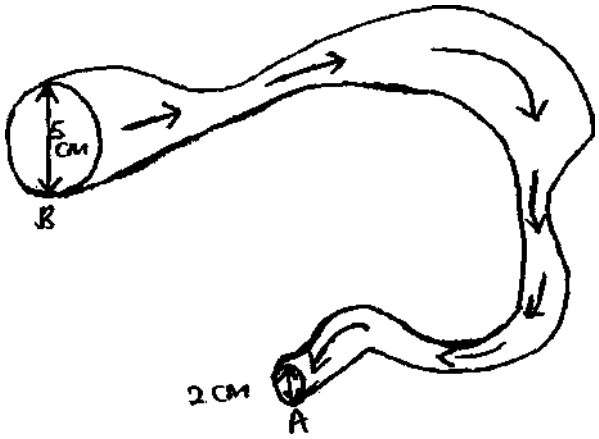


Fig. 16

If the volume flux at A is 45cm^3/s, find the speed of the water at B. (3mks KRC)

17. (a) Define the terms

(i) Inelastic collisions (1mk KRC)

(ii) Momentum (1mk KRC)

(b) A bullet of mass 20g moving with a velocity of l000m/s hits stationery wooden block of mass 12kg. The bullet imbeds and the two move in one direction. Calculate its final velocity (3mks KRC)

(c) Block of mass 200g rests on a rough horizontal table. A force of 0.6N pulls the blocks so that it moves with a constant acceleration of lm/s^2 calculate:

(i) The time it takes to travel a distance of 200m (2mks KRC)

(ii) The frictional force between the block and the table (2mks KRC)

(iii) The coefficient of kinetic friction between the two forces (2mks KRC)

(iv) A part from the normal reaction and frictional force, name any other force (lmkKRC)

18. a)i) Define Archimedes's Principle. (1mk KRC)

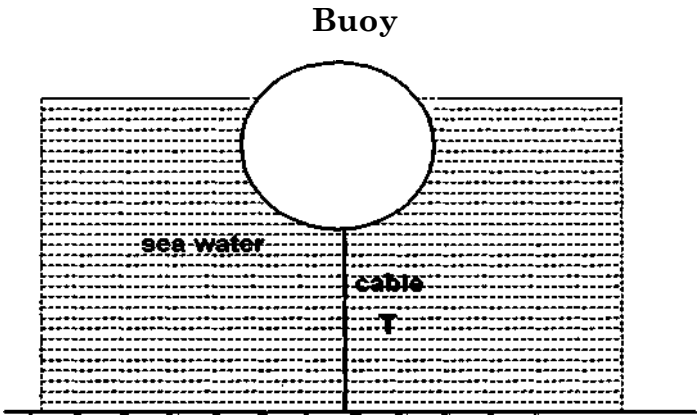
(ii) An object weighs 1.04N in air, 0.64N when fully immersed in water and 0.72N when fully immersed in a liquid. If the density of water is 1000 kg m^{-3} find the density of the liquid. (4 marks KRC)

b) i) Define the law of floatation (1mk KRC)

ii) Give a reason why a steel rod sinks in water while a ship made of steel floats on water. (1mk KRC)

iii) Draw a clearly labeled diagram of a common hydrometer which is suitable for measuring the densities of liquids varying between 1.0 and 1.2 g cm^{-3}. (2mks KRC)

iv) Figure 13 shows a buoy, B, of volume 40 litres and mass 10 kg. It is held in position in sea water of density 1.04 g cm^{-3} by a light cable fixed to the bottom so that 3/4 of the volume of the buoy is below the surface of the sea water. Determine the tension T in the cable. (4 marks KRC)



19. a) (i) Figure **18** below shows a ball being whirled in a clockwise direction in a vertical plane. Sketch on the figure the path followed by the ball if the strings cuts when the ball is at position A (1mk KRC)

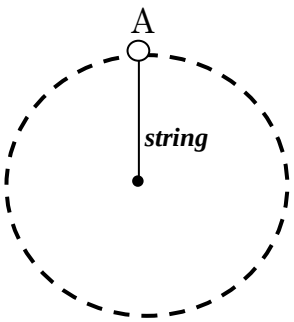


Fig. 18