IV. Long Answer Type Questions

Question 1. With the help of an activity prove that the force acting on a smaller area exerts a larger pressure?

Answer:

Consider a block of wood kept on a table top. The mass of the wooden block is 5 kg. Its dimension is 40 cm x 20 cm x 10 cm.

Now, we have to find the pressure exerted by the wooden block on the table top by keeping it vertically and horizontally.

The mass of the wooden block = 5 kg

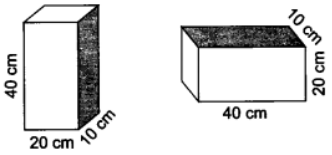
Weight of the wooden block applies a thrust on the table top

$$\therefore \quad \text{Thrust} = F = m \times g$$
$$= 5 \text{ kg} \times 9.8 \text{ m/s}^2 = 49 \text{ N}$$

(case *a*)—When the wooden box is kept vertically with sides 20 cm × 10 cm.

$$\text{Area of a side} = \text{length} \times \text{breadth}$$
$$= 20 \text{ cm} \times 10 \text{ cm}$$
$$= 200 \text{ cm}^2 = 0.02 \text{ m}^2$$

$$\text{Pressure} = \frac{\text{Thrust}}{\text{Area}} = \frac{49 \text{ N}}{0.02 \text{ m}^2} = 2450 \text{ N/m}^2$$



(case *b*)—When the block is kept horizontally with side 40 cm × 20 cm.

$$\text{Area} = \text{length} \times \text{breadth}$$
$$= 40 \text{ cm} \times 20 \text{ cm}$$
$$= 800 \text{ cm}^2 = 0.08 \text{ m}^2$$

$$\text{Pressure} = \frac{\text{Thrust}}{\text{Area}} = \frac{49 \text{ N}}{0.08 \text{ m}^2} = 612.5 \text{ N/m}^2$$

∴ The pressure exerted by the box in case (a) is more as compared to the pressure exerted in case (b).

The area is reduced and the pressure exerted is more.

This shows that pressure ∝ 1/area.

Pressure will be larger if the area is reduced.

Application:

- Nails have pointed tips.
- Knives have sharp edges.
- Needles have pointed tips.

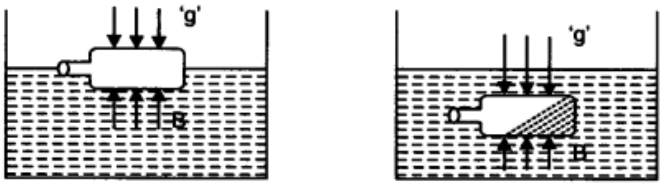
V. Activity - Based Questions

Question 1.

- Take an empty plastic bottle. Close the mouth of the bottle with an airtight stopper. Put it in a bucket filled with water. You see that the bottle floats.
- Push the bottle into the water. You feel an upward push. Try to push it further down. You will find it difficult to push deeper and deeper. This indicates that water exerts a force on the bottle in the upward direction. The upward force exerted by the water goes on increasing as the bottle is pushed deeper till it is completely immersed.
- Now, release the bottle. It bounces back to the surface.
- Does the force due to the gravitational attraction of the earth act on this bottle? If so, why doesn't the bottle stay immersed in water after it is released? How can you immerse the bottle

in water?

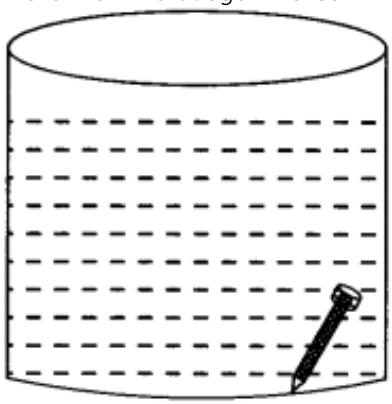
Answer: Yes, the bottle is attracted downwards by the earth's gravitational force. On pushing the bottle with force in the water it does not remain there but comes up because of'the upward force exerted by water on the bottle. This upward force is called upthrust or buoyant force. When the upward force or buoyant force is greater than the downward force 'g' the bottle will float. But if downward force is greater than upward force, the bottle will sink. The upward force (buoyant force) acting on the bottle can be reduced by increasing the force on the bottle or by filling the bottle with sand, water etc.



Question 2.

- Take a beaker filled with water.
- Take an iron nail and place it on the surface of the water.
- Observe what happens.

Answer: The iron nail sinks as the density of nail is more and the downward force exerted on nail is more than the buoyant force.



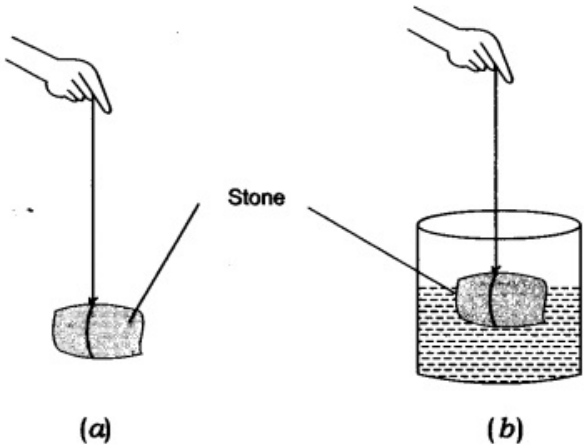
Question 3.

- Take a beaker filled with water.
- Take a piece of cork and an iron nail of equal mass.
- Place them on the surface of water.
- Observe what happens.

Answer: The iron nail sinks as.the density of nail is more and the downward force exerted on nail is more than the buoyant force. The cost floats as the density of cost is less and the buoyant force exerted on it is more than the downward force.

Question 4.

- Take a piece of stone and tie it to one end of a rubber string or a spring balance.
- Suspend the stone by holding the balance or the string as shown in the figure (a).



- Note the elongation of the string or the reading on the spring balance due to the weight of the stone.
- Now, slowly dip the stone in the water in a container as shown in Fig. (b).
- Observe what happens to the elongation of the string or the reading on the balance.
  Observations :
- In Fig. (a) the elongation of the string is 6 cm.
- In Fig. (b) when the stone is dipped in water the length of string reduced to 5 cm.
- The length of the string in case (b) decreases due to the upward force exerted by water on the stone called as buoyant force.

VI. Value - Based Questions
Question 1. A milkman sold his milk in the city and always carried lactometer with him. The customers trusted him and his business flourished.
(a) What is lactometer?
(b) What is the principle of working of lactometer?
(c) What value of milkman is seen in this case?
Answer.
(a) Lactometer is a device that measures the purity of milk.
(b) The principle of lactometer is 'Archimedes' principle'. It states that when a body is immersed fully or partially in a fluid, it experiences an upward force that is equal to the weight of the fluid displaced by it.
(c) Milkman is very honest and trustworthy.

Question 2. Reeta was wearing a high heel shoe for a beach party, her friend told her to wear flat shoes as she will be tired soon with high heels and will not feel comfortable,
(a) Why would one feel tired with high heel shoes on beach?
(b) Give the unit of pressure.
(c) What value of Reeta's friend is seen in the above act?
Answer:
(a) The high heel shoes would exert lot of pressure on the loose sand of beach and will sink more in the soil as compared to flat shoes. Hence large amount of force will be required to walk with heels.
(b) Unit of pressure is Pascal.
(c) Reeta's friend showed the value of being helpful, concerned and intelligent.

Question 3. In the school fair, there was a game in which one need to find the heaviest ball without holding them in hand. Three balls were given and few disposable glasses were kept. Tarun saw his friend struggling to win the game but he was unable to find the heaviest ball. Tarun helped him by dipping the three balls one by one in the glass'es full of water upto the brim and finally they won the game.
(a) Why did Tarun told his friend to dip the balls one by one in

completely filled glass of water?
(b) Name the principle used here.
(c) What value of Tarun is reflected in this case?
Answer:
(d) Tarun wanted to measure the amount of water displaced by each ball when dipped in water.
(b) The principle used is 'Archimedes' principle'.
(c) Tarun showed the value of being helpful, kind and intelligent.

********** END **********