

Objective Type Questions

1. Name the following:

(a) Pressure (b) Blood (c) Typhoon (d) Thunderstorm
(e) Thunder

2. Fill in the following blanks with suitable words:

(a) increases (b) atmosphere (c) wind (d) pressure
(e) high, low (f) eye (g) safe place

3. State whether the following statements are true or false:

(a) False (b) True (c) False (d) False (e) True (f) True

Short Answer Type Questions

1. Holes are made in banners and hoardings so that air can pass through them easily. This reduces the pressure exerted by strong winds on the banner. As a result, the banner does not tear or get blown away during windy conditions.

2. When water is filled into the bottle up to a certain height, both balloons A and B will bulge. Since the two balloons are at the same level, they will bulge equally. This is because liquid pressure at the same depth is the same in all directions, so both balloons experience equal pressure from the water.

3. Formula used:

$$\text{Pressure} = \text{Force} / \text{Area}$$

(a) Area = 10 m²

$$\text{Pressure} = 200 / 10$$

$$\text{Pressure} = 20 \text{ Pa}$$

(b) Area = 5 m²

$$\text{Pressure} = 200 / 5$$

$$\text{Pressure} = 40 \text{ Pa}$$

Given:

$$\text{Pressure} = 500 \text{ Pa}$$

$$\text{Area} = 0.5 \text{ m}^2$$

$$\text{Formula: Force} = \text{Pressure} \times \text{Area}$$

$$\text{Force} = 500 \times 0.5$$

$$\text{Force} = 250 \text{ N}$$

4. When we blow air into the bottle, the air in the neck of the bottle moves with high speed, which reduces the air pressure in the neck of the bottle. The air pressure inside the bottle is

higher, so it pushes the paper ball outward. As a result, the paper ball remains unaffected and does not go inside the bottle. This shows that high-speed air produces low air pressure.

5. If high-speed winds blow over a house having a weak tin roof, the roof may be lifted up and blown away. This happens because fast-moving air over the roof creates a low-pressure region above it, while the air inside the house is at higher pressure. The pressure difference pushes the roof upward, and if the roof is weak, it can be carried away by the strong winds.

6. During the daytime on a summer afternoon, there is a sea breeze that blows from sea to land. This happens because the land gets heated faster and the air above land rises resulting in low pressure region over land. Cooler air over sea moves from a high-pressure region towards the land. The bending of trees due to winds, as shown in the figure, suggests that wind is blowing in the direction from B to A. This suggests 'A' side is land.

Long Answer Type Questions

1. Take two similar balloons made of thin rubber, and a straw. Insert one end of the straw into the mouth of one balloon and tie it tightly with a thread. Now inflate the second balloon and insert the other end of the straw into its mouth. Tie its mouth carefully so that no air leaks out. On observation, it is seen that the size of both balloons' changes. Air flows from the inflated balloon into the uninflated balloon. This happens because the air pressure inside the inflated balloon is higher than the air pressure inside the uninflated balloon. Air pressure continues to flow from the region of high pressure to the region of low pressure until the pressure in both balloons becomes equal. Finally, both balloons become of the same size.

2. (a) Pressure is defined as the force acting per unit area of a surface.

The relation between pressure, force and area is:

$$\text{Pressure} = \text{Force} / \text{Area}$$

From this relation, it is clear that pressure increases if force increases or if the area over which the force acts decrease.

The SI unit of pressure is pascal (Pa).

One pascal is the pressure exerted when a force of one newton acts on an area of one square metre.

(b) School bags are provided with wide straps because wide straps cover a larger area of the shoulders. When the same weight of the bag acts on a larger area, the pressure exerted on the shoulders is reduced. According to the formula $P=F/A$, pressure decreases when the area increases. Therefore, wide straps reduce pressure on the shoulders and make the bag more comfortable to carry.

3. A thunderstorm is a storm in which we hear loud sounds called thunder and see bright flashes of light called lightning, along with heavy rain or sometimes hail. Hail is the pellets of frozen rain or ice that fall from clouds. Thunderstorms are produced by dark clouds that form at a fairly low altitude in the atmosphere. Such storms occur very frequently in hot and humid tropical regions like India.

A thunderstorm is formed due to the combined effect of heat and humidity. As the air near the Earth's surface gets heated, it becomes light and rises upward. As the warm air rises, it cools down and the water vapour condenses to form dark clouds. Inside these clouds, strong air movements take place, leading to the formation of lightning and thunder. The condensed water falls as heavy rain or hail, resulting in a thunderstorm.

4. Given:

Weight of the elephant = 20000 N

Area covered by one foot = 0.25 m²

Total area covered by four feet:

$$4 \times 0.25 = 1.0 \text{ m}^2$$

Using the formula:

Pressure = Force / Area

$$\text{Pressure} = 20000 / 1.0 = 20000$$

Therefore, the pressure exerted by the elephant on the ground is 20000 Pascal.

5. The boy sinks more when he stands vertically on the loose sand.

When the boy stands vertically, the area of contact of his feet with the sand is small. This produces a large pressure on the sand. When the boy lies horizontally, the area of contact with the sand increases. Due to the larger area, the pressure exerted on the sand is less. According to the pressure formula, pressure is inversely proportional to area. Hence, the boy sinks more when standing than when lying down.

Multiple Choice Questions (MCQ)

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| 1. (b) earthquake | 2. (c) moves over land |
| 3. (d) rotation of Earth | 4. (a) low air pressure |
| 5. (d) in all directions | 6. (b) rapidly rotating winds |
| 7. (d) equal in all three vessels | 8. (c) M will stick but N will not stick |

9. (a) very low air pressure of mercury

10. (c) 76 cm tall column

11. (d) mm of mercury

12. (c) 100 cm²

13. (c) do not sit in a car

14. (a) 3000 N

15. (c) 0.01cm²

16. (a) increase the height

‘H’ at which the tank is placed

17. (b) $P_a = P_\beta$, $F_a < F_\beta$

21st Century Skills

1. From this observation, we conclude that liquid pressure increases with depth. The hole near the bottom of the bucket is at a greater depth than the hole near the middle. Therefore, the pressure of water at the bottom hole is higher, causing water to rush out with greater force. This shows that liquid pressure increases with depth in the liquid.

2. Both students are correct. Water exerts pressure in all directions—on the bottom as well as on the sides of the bucket. This is because liquid pressure acts equally in every direction at a given depth. The pressure exerted on the sides of the bucket increases with depth, just like the pressure at the bottom.

3. No, staying under a tree during lightning is not safe. Tall and isolated trees are more likely to be struck by lightning because they are closer to the clouds. If lightning strikes the tree, the electric current can pass through the tree and spread through the ground, causing serious injury or death of the people standing nearby. Therefore, it is safer to take shelter inside a building or a car during lightning.