PRESSURE

A. Give reasons for the following:

1. Needles have a sharp point.

Ans) Decreasing the area over which a particular force acts increases the pressure produced. Therefore needles have a sharp point for easy penetration.

2. A balloon bursts when too much air is blown into it.

Ans) The air inside the balloon exerts pressure on the inner wall of the balloon. If we blow in too much air, and the material of the balloon is not capable of expanding further, increasing the pressure inside can cause the wall of the balloon to break at one or more points. This is why a balloon bursts when too much air is blown into it.

3. We have to put an effort to push down an open and inverted glass bottle into a bucket full of water.

Ans) The air trapped inside the inverted bottle gets compressed, with no escape. This exerts pressure on the water, making it difficult for the water to rise inside the bottle, thus also making it difficult to push the bottle in. The water in the bucket is exerting pressure on the air that is inside the glass bottle.

4. Atmospheric pressure decreases as we go up in altitude.

Ans) The atmospheric pressure at a place is the pressure exerted by the weight of the air column above that place. As we go up, the length of the air column above us decreases. This means its weight decreases, and, therefore, the atmospheric pressure is lower at higher places.

III Short Answer questions:

1. What is pressure in physics?

Ans) Pressure is defined as force per unit area.

2. Do fluids exert pressure? In what direction ?

Ans) Fluids exert pressure on all bodies immersed in them and on the walls of the containers that hold them.

3. What is the approximate value of atmospheric pressure on the surface of the earth at sea level?

Ans) The atmospheric pressure on the Earth's surface at sea level is about one hundred thousand pascal.

4. Name the instrument used to measure atmospheric pressure.

Ans) Atmospheric pressure is measured using an instrument called barometer.

5. How does atmospheric pressure vary with altitude?

Ans) The atmospheric pressure at a place is the pressure exerted by the weight of the air column above that place. As we go up, the length of the air column above us decreases. This means its weight decreases, and, therefore, the atmospheric pressure is lower at higher places.

6. How does the pressure in a liquid vary with depth?

Ans) The pressure exerted at a point under a liquid is due to the weight of the liquid above it. Therefore, as we go deeper beneath the surface of a liquid , pressure increases.

IV) Answer in detail:

1. Describe an activity to show that the pressure produced increases when the surface area is decreases, for the same force applied.

Ans) The following activity will prove that pressure produced increases when the surface area decreases. Aim: To observe the effect of pressure Materials needed: A sheaf (bundle) of paper and a sharpened pencil.

Method: Press the papers very hard with the blunt end of the pencil.

Now, turn the pencil around and press very hard on the paper with the pointed end of the pencil. Observation: You will find that if you press very hard, you may be able to make an impression on the paper with the blunt end of the pencil. However, with much less effort you could even make a hole in the paper with the pointed end.

Conclusion: The surface area of the blunt end is larger than the surface area of the pointed end. Therefore, with a much smaller force, a greater pressure is produced with the pointed end of the pencil.

2. Briefly outline an activity to demonstrate the presence of atmospheric pressure.

Ans) Aim: To show the presence of atmospheric pressure Materials needed: A glass tumbler (with a smooth edge at the mouth, and without a rim), a piece of stiff cardboard (a little bigger than the mouth of the tumbler), and water.

Method: Fill the tumbler with water to the brim. Cover the tumbler with the cardboard piece. Place the palm of your hand over the piece of cardboard, and quickly invert the tumbler. Slowly remove your hand supporting the piece of cardboard.

Observation: You will observe that the cardboard piece will not fall.

Conclusion: Atmospheric pressure provides enough force to support a full glass of water.

3. Draw a simple diagram and explain the working of an open tube manometer.

Ans) * A very simple type of pressure gauge is an open-tube manometer.

- It consists of a tube placed in the form of a 'U' with a liquid in it.
- One arm of the tube is open to air and the other arm is connected to a rubber tube which can be connected to the point where the pressure is to be measured.
- For example, it could be inserted under a liquid surface at a certain depth (taking care that the liquid does not flow back into the tube), or it could be connected to a gas chamber, whose pressure is to be measured.
- When there is a difference in pressure at the ends of the two arms of the U-tube, the liquid levels in the two arms will no longer be the same.
- The liquid in the arm that experiences a higher pressure will be pushed down, and this pushes up the liquid in the other arm.
- There is a scale provided, on which the pressure (or pressure difference) can be read. Diagram from text book.

4. Why are dams thicker at the base than at the top?

Ans) Dams are made stronger and thicker at the bottom than at the top to withstand the high pressures at greater depths.

5. Describe two everyday applications where the area over which a force applied is reduced in order to increase the pressure produced.

Ans) a. The area of the edge of a knife's blade is extremely small. This creates a pressure high enough for the blade to cut through a material.

b. The pressure under the studs on the soles of football shoes is high enough for them to sink into the ground, which gives extra grip.

Extra Questions:

1. Define the term Pressure. Describe some examples of pressure from everyday life.

Ans) Pressure is defined as the force acting on a unit area of a surface. Pressure is inversely proportional to the area of contact. Therefore, if the area of contact is smaller, the pressure exerted will be greater.
The following are some applications of pressure in real life:
• Cutting instruments like knives and scissors have sharp edges. The reason for this is because sharp edges have less area of contact and hence a small force results in a large pressure, helping us to cut the objects easily.
• It is easier to hammer a sharp nail into a wall. The sharp edge has a very small area of contact. This results in a large pressure being created at the point of contact. So the nail easily enters the wall.

2. What is atmospheric pressure?
Ans) The pressure exerted by the atmosphere on the objects is called atmospheric pressure. This pressure is exerted on an object due to the weight of the air column above it.

Q3. How do you represent pressure numerically? What is the SI unit of pressure? Define it.

Ans) Numerically, Pressure= Force/ area

The Si unit of pressure is N/m^2. It is also known as pascal (Pa)

1 Pa is the pressure exerted on an object when a force of 1 N acts on the area of 1 m^2 surface of the object.

Q5. Show the presence of atmospheric pressure with the help of an activity.

Ans) **Activity**: To demonstrate atmospheric pressure

Things required: Airtight tin container, water, and gas burner

- **Method**: Take the airtight tin container. Pour some water in it and boil.
- When the steam starts coming out, close the lid tightly after removing the container from the fire.
- Now pour some cold water on the hot tin container.

Observation: The tin container deforms.

Conclusion: The steam drives out air from the container. On pouring cool water, the steam inside the container condenses and changes into water. This creates a vacuum inside the can. The atmospheric pressure forces the container to deform.