Class VIII Physics

PRESSURE, WINDS, STORMS AND CYCLONES

A. Very Short Answer Type (2 Marks)

1. What is force per unit area?

Force per unit area is called pressure. Pressure = Force ÷ Area.

2. Name the instrument used to measure liquid pressure.

A manometer is used to measure the pressure of a liquid or gas.

3. How is pressure related to force and area?

Pressure is directly proportional to the force applied and inversely proportional to the area over which the force acts: P = F/A.

4. What is the unit of pressure?

The SI unit of pressure is the pascal (Pa). One pascal equals one newton per square metre (1 Pa = 1 N/m²).

5. What is wind? What is the cause of wind?

Wind is moving air. Unequal heating of Earth's surface creates differences in air pressure, causing air to move from high-pressure areas towards low-pressure areas.

6. What is a cyclone and how is it formed?

A cyclone is a large system of winds rotating around a low-pressure centre. It forms when warm, moist air rises, creating low pressure; surrounding air moves in, and Earth's rotation helps the winds spiral.

7. What are the different reasons for wind current?

Wind currents are caused mainly by unequal heating of Earth's surface by the Sun, differences in air pressure, Earth's rotation, and local differences between land and sea temperatures.

8. What are monsoon winds?

Monsoon winds are seasonal winds that change direction during different seasons, mainly because land and sea heat and cool at different rates. They often bring seasonal rainfall.

9. What is a thunderstorm?

A thunderstorm is a storm associated with thunder and lightning, usually accompanied by strong winds and heavy rain, and sometimes hail.

10. What precautions should be taken during thunderstorms?

Go indoors or into a hard-topped vehicle; stay away from trees, poles, open fields and water; avoid wired electrical appliances and plumbing; and do not use an umbrella in an exposed area.

11. What are the effects of pressure on the volume of gases?

At a constant temperature, increasing the pressure on a gas decreases its volume, while decreasing the pressure increases its volume.

12. State Boyle's law.

For a fixed amount of gas at constant temperature, its pressure is inversely proportional to its volume. Therefore, PV = constant, or $P_1V_1 = P_2V_2$.

B. Short Answer Type (3 Marks)

1. Why are the wheels of buses and trucks heavier/wider than those of cars or scooters?

Heavy vehicles exert a large force on the road. Wider tyres increase the area of contact and reduce pressure (P = F/A), helping prevent the tyres from sinking into soft ground and improving stability. The wheels and tyres are also built stronger to carry the greater load.

2. What is atmospheric pressure?

Atmospheric pressure is the pressure exerted by the weight of the air in Earth's atmosphere on the surface of Earth and on objects. At sea level, its average value is about 1.01×10^5 Pa.

3. If the area of your head is 15 cm × 15 cm, how much air (in weight) would you carry on your head?

Area = 15 cm × 15 cm = 225 cm^2 = 0.0225 m^2. Taking atmospheric pressure as 1.0×10^5 Pa, force = pressure × area = $1.0 \times 10^5 \times 0.0225 = 2250$ N. This is approximately the weight of 225 kg under g ≈ 10 m/s^2. Atmospheric pressure acts in all directions, so we do not normally feel this force as a load.

4. Press a pencil sharpened at one end between your fingers. Which end will hurt more and why?

The sharpened end hurts more because its contact area is much smaller. For the same force, pressure P = F/A is greater when the area is smaller.

5. Why do deep-sea divers wear special suits?

Water pressure increases with depth and can become extremely large. Special diving suits and equipment protect divers from the high pressure and help them breathe safely.

6. Why do some people suffer from nose bleeding at higher altitudes?

At high altitudes, atmospheric pressure is lower and the air is often cold and dry. The delicate blood vessels inside the nose can dry out and rupture more easily, causing bleeding.

7. What are tornadoes?

Tornadoes are violently rotating columns of air extending from a thunderstorm cloud to the ground. They can have very high wind speeds and cause severe damage.

8. What is the eye of a storm?

The eye is the relatively calm central region of a tropical cyclone. Winds are usually lighter there and skies may be clearer than in the surrounding eyewall, where the strongest winds and heaviest rain occur.

C. Long Answer Type (5 Marks)

1. State two experiences that show that air exerts pressure.

1. When we drink through a straw, sucking lowers the pressure inside the straw. Atmospheric pressure acting on the drink's surface pushes the liquid up the straw. 2. A suction cup sticks to a smooth surface because the air pressure outside presses it against the surface when much of the air underneath has been removed.

2. Show that the pressure exerted by water at the bottom of a container depends on the height of its column.

Take a container with small holes at different heights and fill it with water. Water from the lowest hole shoots the farthest, showing that pressure is greater at greater depth. The pressure at depth h is $P = \rho gh$, where ρ is the liquid density and g is gravitational acceleration. Thus, for the same liquid, pressure at the bottom is directly proportional to the height h of the water column. (This is gauge pressure; atmospheric pressure acts on the surface as well.)

3. Show that air has temperature with the help of an experiment.

Place a deflated balloon over the mouth of an empty bottle. Put the bottle in a bowl of warm water. The air inside the bottle warms up and expands, causing the balloon to inflate. Now place the bottle in cold water; the air cools and contracts, and the balloon deflates. This shows that air changes temperature and expands when heated and contracts when cooled.

4. Explain that a liquid exerts pressure on the walls.

Make small holes at the same height on the sides of a plastic bottle. Fill the bottle with water. Water streams out sideways through the holes, showing that the liquid pushes against the walls. If the holes are at different depths, water from the lower holes travels farther because liquid pressure increases with depth. Therefore, liquids exert pressure on the walls of their containers.

5. What planning is required in advance to deal with the situation created by a cyclone?

1. Follow official weather forecasts and warnings, and know the local evacuation routes and nearest cyclone shelter.
2. Keep an emergency kit with drinking water, dry food, medicines, a first-aid kit, a torch, batteries, a radio, important documents and a charged phone/power bank.
3. Secure roofs, doors and windows; bring loose objects indoors; and trim dangerous branches if there is time.
4. Arrange transport and help for children, older people, people with disabilities and pets.

5. When authorities advise evacuation, switch off electricity and gas if safe, leave early for a designated shelter, and stay away from the coast, floodwater and fallen power lines.