# SCIENCE PRACTICE WORKSHEET — SOLUTION KEY

## Chapter: Pressure, Winds, Storms, and Cyclones

ANSWER KEY

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| **Subject:** Science (NCERT) | **Class:** VIII | **Total Questions:** 30 | **Max Marks:** 80 |

## SECTION A — Multiple Choice Questions (10 Marks)

**Q1.** (1 Mark)

**Which of the following correctly shows the relation between pressure, force and area?**

(a) Pressure = Force × Area
(b) Pressure = Force / Area
(c) Pressure = Area / Force
(d) Pressure = Force + Area

**CORRECT ANSWER:**

**(b) Pressure = Force / Area**

*Explanation:* Pressure is defined as force exerted per unit area. Mathematically, $P = F / A$.

**Q2.** (1 Mark)

**Assertion (A): Overhead water tanks are placed at a height on the rooftops of buildings.**
**Reason (R): The pressure exerted by a liquid increases with the height of its column.**

(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

**CORRECT ANSWER:**

**(a) Both A and R are true and R is the correct explanation of A.**

*Explanation:* Placing water tanks at higher elevations increases the height of the liquid column ($h$), which increases liquid pressure ($P = hpg$), causing water to flow faster through taps on lower floors.

**Q3.** (1 Mark)

**When a rubber sucker is pressed firmly against a smooth surface and then pulled, it is difficult to remove because:**

(a) atmospheric pressure outside is less than inside the sucker.
(b) atmospheric pressure outside is greater than inside the sucker.
(c) the sucker has no air inside it initially.
(d) the surface exerts an upward force on the sucker.

**CORRECT ANSWER:**

**(b) atmospheric pressure outside is greater than inside the sucker.**

*Explanation:* Pressing the sucker forces most air out from beneath it. The external atmospheric pressure pushes strongly on the outside of the rubber cup, holding it firmly to the surface.

**Q4.** (1 Mark)

**Assertion (A): High-speed winds can sometimes blow off the roofs of houses.**
**Reason (R): High-speed winds are accompanied by reduced air pressure.**

(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

**CORRECT ANSWER:**

**(a) Both A and R are true and R is the correct explanation of A.**

*Explanation:* High-speed winds moving over a roof lower the air pressure above it. The higher air pressure inside the house exerts an upward force, lifting and blowing off the roof.

**Q5.** (1 Mark)

**In Activity 6.5, when one balloon is inflated and connected to an uninflated balloon through a straw, air moves from the inflated balloon to the uninflated one because:**

(a) air always moves from low pressure to high pressure.
(b) air moves from high pressure to low pressure.
(c) the balloons have different volumes initially.
(d) the straw creates a vacuum.

**CORRECT ANSWER:**

**(b) air moves from high pressure to low pressure.**
*Explanation:* Air flows naturally from a region of higher pressure (inflated balloon) to a region of lower pressure (uninflated balloon) until pressure equilibrium is reached.

**Q6.** (1 Mark)

**The base of a dam is made broader than its top because:**

(a) it increases the weight of the dam.
(b) water pressure is higher at greater depths and acts horizontally.
(c) broader base reduces evaporation.
(d) it helps in faster construction.

**CORRECT ANSWER:**

**(b) water pressure is higher at greater depths and acts horizontally.**
*Explanation:* Liquid pressure increases with depth and acts in all directions, including horizontally on the dam walls. A wider base withstands the massive lateral thrust of water near the bottom.

**Q7.** (1 Mark)

**Which of the following is NOT a safety measure during lightning?**

(a) Staying inside a car or bus.
(b) Crouching in a low-lying open area.
(c) Holding an umbrella with a metallic rod.
(d) Moving away from tall trees and buildings.

**CORRECT ANSWER:**

**(c) Holding an umbrella with a metallic rod.**
*Explanation:* Metallic rods on umbrellas conduct electricity easily and attract lightning discharges, making them hazardous during a thunderstorm.

**Q8.** (1 Mark)

**The region of lowest pressure in a cyclone is called:**

(a) the eye of the cyclone.
(b) the wall of the cyclone.
(c) the land breeze region.
(d) the thunderstorm centre.

**CORRECT ANSWER:**

**(a) the eye of the cyclone.**
*Explanation:* The calm central area of a tropical cyclone is known as the "eye", characterized by extremely low pressure and light winds.

**Q9.** (1 Mark)

**When warm moist air rises over land during the day, it creates:**

(a) high pressure over land and sea breeze.
(b) low pressure over land and sea breeze.
(c) high pressure over sea and land breeze.
(d) low pressure over sea and land breeze.

**CORRECT ANSWER:**

**(b) low pressure over land and sea breeze.**
*Explanation:* During the day, land heats up faster than water. Air above the land becomes warm and rises, creating a low-pressure zone over land. Cooler air from the sea rushes toward land, forming a sea breeze.

**Q10.** (1 Mark)

**The SI unit of pressure is:**

(a) newton
(b) pascal
(c) joule
(d) metre

**CORRECT ANSWER:**

**(b) pascal**
*Explanation:* The SI unit of pressure is Pascal (Pa), which is equal to 1 Newton per square metre (***N/m²***).

## SECTION B — Very Short Answer Questions (12 Marks)

**Q11.** (2 Marks)

**Define pressure. Write its SI unit and one everyday example where increasing area reduces pressure.**

**MODEL ANSWER:**

• **Definition:** Pressure is the thrust (perpendicular force) acting per unit area of a surface (***P = Force / Area***).
• **SI Unit:** Pascal (Pa) or ***N/m²***.
• **Example:** School bags are provided with broad, wide shoulder straps so that the weight of the bag acts over a larger area, reducing the pressure on the student's shoulders.

**Q12.** (2 Marks)

**Why do the two balloons in Activity 6.1 bulge equally when water columns of equal height but different diameters are used?**

**MODEL ANSWER:**

Liquid pressure depends strictly on the **height of the liquid column** (***h***) and liquid density, not on the total volume or cross-sectional area of the container. Since both pipes have equal water column heights, they exert equal hydrostatic pressure at the bottom, causing identical bulging in both balloons.

**Q13.** (2 Marks)

**State two observations from Activity 6.2 that show liquids exert pressure on the sides of a container.**

**MODEL ANSWER:**

1. The rubber membrane attached to a side tube projecting from a plastic pipe bulges outwards when water is poured into the pipe.
2. The extent of bulging increases as more water is added to the pipe (increasing the water level/height).

**Q14.** (2 Marks)

**What happens to the size of two balloons connected by a straw when air pressure in one is higher? Why does the flow of air stop after some time?**

**MODEL ANSWER:**

• Air flows from the inflated balloon (higher air pressure) into the uninflated balloon (lower air pressure), causing the uninflated balloon to expand while the inflated balloon shrinks slightly.
• The flow stops when the air pressure inside both balloons becomes **equal** (pressure equilibrium is attained).

**Q15.** (2 Marks)

**Why is it advised to keep doors and windows open during a storm with high-speed winds?**

**MODEL ANSWER:**

High-speed winds blowing over a roof reduce atmospheric pressure above it. If doors and windows are closed, high pressure trapped inside pushes upward, which can blow the roof off. Keeping windows/doors open allows air pressure inside and outside to equalize, preventing structural damage.

**Q16.** (2 Marks)

**Name the instrument used to protect tall buildings from lightning and state one feature of its installation.**

**MODEL ANSWER:**

• **Instrument:** Lightning Conductor.
• **Installation Feature:** A thick copper rod with pointed metal spikes at the top is installed higher than the roof. Its lower end is connected to a heavy copper plate buried deep in the earth to safely discharge electrical current.

## SECTION C — Short Answer Questions (15 Marks)

**Q17.** (3 Marks)

**Explain with a labelled diagram how the pressure exerted by a liquid depends on the height of its column. (Use the setup of two pipes with balloons.)**

**MODEL ANSWER:**

• **Concept:** Liquid pressure at any point inside a liquid is directly proportional to the depth or height of the liquid column above it (***P ∝ h***).
• **Setup & Observation:** Take a transparent glass/plastic pipe with a rubber balloon stretched over its bottom opening. When water is poured to a height $h_1$ = 5 cm, the balloon bulges slightly. When more water is added to reach height $h_2$ = 15 cm, the bulge in the balloon expands significantly.
• **Conclusion:** Greater water column height exerts greater weight and force, demonstrating that liquid pressure increases with height.

### Q18. (3 Marks)

**Differentiate between sea breeze and land breeze on the basis of (i) time of occurrence and (ii) direction of air flow. Give the reason for the difference.**

**MODEL ANSWER:**

| Feature | Sea Breeze | Land Breeze |
|---|---|---|
| **(i) Time** | Daytime | Nighttime |
| **(ii) Direction** | From Sea towards Land | From Land towards Sea |

• **Reason:** Land heats up and cools down much faster than water. During the day, warm air rises over heated land creating low pressure; cool air from sea blows landward. At night, land cools faster than sea; warm air rises over the sea, so cool air from land blows seaward.

### Q19. (3 Marks)

**Describe the formation of lightning in a thunderstorm. How does charge separation occur inside a cloud?**

**MODEL ANSWER:**

• **Charge Separation:** In a developing storm cloud, violent upward air currents carry water droplets upward while freezing temperature causes ice crystals to move downward. Their repeated collisions cause static electric charge separation: positive charges accumulate near the upper edges, while negative charges gather near the lower base of the cloud.
• **Discharge (Lightning):** As accumulated charges grow huge, the electric field breaks down the insulating property of air. A massive flow of electric current shoots between clouds or between cloud and ground, producing bright streaks of light and shockwaves known as thunder and lightning.

### Q20. (3 Marks)

**A force of 150 N is applied on a surface of area 3 m². Calculate the pressure exerted. If the same force is applied on a surface of area 0.5 m², what will be the new pressure? Show calculations.**

**MODEL ANSWER:**

**Case 1:** Given Force (***F***) = 150 N, Area ($A_1$) = 3 m²
• Formula: ***Pressure ($P_1$) = F / $A_1$ = 150 N / 3 m² = 50 Pa (or N/m²)***

**Case 2:** Given Force (***F***) = 150 N, Area ($A_2$) = 0.5 m²
• Formula: ***Pressure ($P_2$) = F / $A_2$ = 150 N / 0.5 m² = 300 Pa***
• **Conclusion:** Decreasing surface area by a factor of 6 increases the pressure six-fold (from 50 Pa to 300 Pa).

### Q21. (3 Marks)

**Why does the base of a dam need to be broader? Relate your answer to the pressure exerted by stored water.**

**MODEL ANSWER:**

• Liquid pressure formula is $P = h\rho g$, which shows that liquid pressure increases linearly with depth (***h***).
• At the bottom of a dam reservoir, depth is maximum, so stored water exerts extremely high horizontal pressure against the dam wall.
• A thick, broad base provides a larger structural footprint to withstand this immense lateral force and prevents the dam from cracking or overturning.

## SECTION D — Long Answer Questions (15 Marks)

### Q22. (5 Marks)

**(a) Draw a neat labelled diagram of the activity that shows air moves from a region of high pressure to a region of low pressure using two balloons and a straw.**
**(b) Explain the observations and the conclusion drawn from this activity.**

**MODEL ANSWER:**

• **(a) Description of Diagram Setup:** Two balloons (Balloon A fully inflated, Balloon B uninflated or inflated to a smaller size) are connected together via a rigid hollow drinking straw fitted with a clamp/pinch valve in the center.
• **(b) Observations:** 1. When the clamp is released, air immediately flows through the straw from Balloon A into Balloon B.
2. Balloon A shrinks in volume, while Balloon B expands.
3. The movement of air continues until both balloons reach equal inflation size and pressure.
• **Conclusion:** Air always travels spontaneously from a high-pressure zone to a low-pressure zone. Air movement ceases when pressure is equalized.

**Q23.** **(5 Marks)**

**Explain the complete process of formation of a cyclone. Draw a labelled diagram showing the eye of the cyclone, direction of winds and pressure conditions. Why does a cyclone lose strength after reaching land?**

**MODEL ANSWER:**

• **Formation Process:** 1. Solar heating warms ocean surface waters above 27°C, causing moist air above the sea to warm up and rise rapidly.
2. Rising air leaves behind a very low-pressure area near the ocean surface.
3. Cooler high-pressure air from surrounding areas rushes inward toward the low-pressure center.
4. Earth's rotation (Coriolis effect) causes these rushing winds to spin spirally around the center.
5. Warm moist air rising continually condenses, releasing latent heat of condensation, which further warms the air and accelerates the cyclone system.
• **Structure:** Center is the calm, low-pressure "Eye". Around it is the "Eye Wall" with intense spiralling high-speed winds and rain clouds.
• **Loss of Strength over Land:** Land cuts off the supply of warm, moist sea vapor (which acts as the main heat engine/fuel source) and land surface friction slows down wind speeds.

**Q24.** **(5 Marks)**

**A water tank is placed at a height of 10 m above the ground floor of a building.**
**(a) Calculate the pressure exerted by the water at the ground-floor tap if the density of water is taken as 1000 kg/m³ and g = 10 m/s² (use P = hρg).**
**(b) If another identical tank is placed at 15 m height, calculate the new pressure.**
**(c) A person living on the first floor receives a stronger stream of water than a person on the second floor. Give reason.**

**MODEL ANSWER:**

• **(a) Height $h_1$ = 10 m:**
$P_1 = h_1 \times \rho \times g = 10\ m \times 1000\ kg/m^3 \times 10\ m/s^2 = 1,00,000\ Pa\ (100\ kPa)$.

• **(b) Height $h_2$ = 15 m:**
$P_2 = h_2 \times \rho \times g = 15\ m \times 1000\ kg/m^3 \times 10\ m/s^2 = 1,50,000\ Pa\ (150\ kPa)$.

• **(c) Reason:** The vertical distance from the roof tank down to the 1st floor tap is greater than the distance down to the 2nd floor tap ($h_{1st\ floor} > h_{2nd\ floor}$). Since hydrostatic liquid pressure increases with depth below the free surface, water pressure at the 1st floor tap is higher, producing a faster and stronger stream.

## SECTION E — Case/Source-Based Questions (8 Marks)

### Case Study 1: Overhead Water Tanks

In many localities, overhead water tanks are placed on the roofs of buildings. Water from these tanks reaches the taps with good pressure. When the height of the water column increases, the pressure at the bottom also increases. This helps water flow out with greater force from the taps on lower floors.

**Q25.** **(4 Marks)**

**Based on the passage above, answer the following:**

**MODEL ANSWERS:**

**(i)** Overhead tanks are placed at height to increase the elevation/height ($h$) of the water column, thereby generating higher hydrostatic pressure at lower outlets.
**(ii)** The higher tank tap will give a stronger stream because pressure increases with vertical column height ($P \propto h$).
**(iii)** In the balloon experiment, equal liquid column heights produced equal balloon bulges regardless of width; similarly, water pressure depends on vertical tank height, not the width of the supply pipe.
**(iv)** At ground level, height $h \approx 0$ relative to taps, so water pressure would be too low for water to flow upward or forcefully through taps without external pumps.

### Case Study 2: Lightning Conductor

A lightning conductor is a metallic rod fixed along the wall of a tall building. One end is pointed and kept higher than the building; the other end is buried deep in the ground. It provides an easy path for electric charges to reach the earth safely.

**Q26.** **(4 Marks)**

**Based on the passage above, answer the following:**

**MODEL ANSWERS:**

**(i)** Pointed ends concentrate intense electric fields, facilitating easy ionization and attraction of atmospheric static charges.
**(ii)** It acts as a low-resistance path, conducting heavy surge currents directly into the ground without passing through the building's concrete or brick structure.
**(iii)** Lightning would strike the building frame directly, generating massive heat, fire, and structural collapse.
**(iv)** Squat down low on knees with hands on knees and head tucked in (lightning position); stay away from tall trees and metallic structures.

## SECTION F — HOTS and Application Questions (12 Marks)

**Q27.** **(3 Marks)**

**Predict-and-justify: What would happen to the two identical balloons hanging close to each other if air is blown very fast between them? Justify your answer using the concept of air pressure.**

**MODEL ANSWER:**

• **Prediction:** The two balloons will move **towards each other** (attract together).
• **Justification:** Blowing air rapidly between the balloons increases air velocity, which creates a localized **low-pressure zone** in the space between them (Bernoulli's principle). The normal high atmospheric pressure acting on the outer sides of the balloons pushes them inward into the low-pressure gap.

**Q28.** **(3 Marks)**

**Analyse an unexpected or anomalous observation: In an experiment, two bottles with holes at the same height from the bottom are filled with water to different levels. Water comes out faster and farther from the bottle with higher water level. Analyse this observation and explain what it indicates about liquid pressure.**

**MODEL ANSWER:**

• **Analysis:** Although both holes are located at the same height from the bottom, the bottle filled to a higher level has a greater vertical column of water above the hole (***h_high > h_low***).
• **Indication:** Liquid pressure at any outlet depends on the depth of liquid above the outlet. Greater liquid height exerts greater pressure, forcing water jet streams out at higher speed and longer horizontal distance.

**Q29.** **(3 Marks)**

**Apply the concept to an unfamiliar real-life situation: A person living near the coast observes that on a hot summer afternoon the wind is blowing from the sea towards the land. Apply the concept of pressure difference to explain this observation in an unfamiliar coastal situation.**

**MODEL ANSWER:**

• During a hot summer afternoon, land surface absorbs heat quickly and gets hotter than sea water.
• Air over the land becomes warm and expands, becoming lighter and rising upward. This forms a low-pressure region over the coastal land.
• The air over the ocean remains relatively cooler and denser, maintaining a high-pressure zone.
• Air flows from high-pressure ocean areas towards low-pressure land areas, producing the afternoon sea breeze.

**Q30.** **(3 Marks)**

**Compare two situations: Compare the following two situations and justify which outcome differs and why:**
***Situation 1:*** **A person carries a heavy suitcase with thin straps on the shoulder.**
***Situation 2:*** **The same person carries the same suitcase with broad padded straps.**
**In which situation is the pressure on the shoulder less and why?**

**MODEL ANSWER:**

• **Outcome:** Pressure on the shoulder is **less in Situation 2** (broad padded straps).
• **Justification:** Both situations involve the same force (weight of the heavy suitcase, ***F***). Pressure is inversely proportional to contact area (***P = F / A***). Broad straps in Situation 2 distribute the force over a larger contact surface area on the shoulder, significantly reducing pressure and making it comfortable to carry.