UNIQUE STUDY POINT BY SUMEET SAHU

A Journey through States of Water

Class 6 — Science — Chapter 8

NCERT Comprehensive Notes 2025-26

SECTION 01

Overview

Chapter 8 of the NCERT Class 6 Science textbook "Curiosity" takes students on an exciting journey through the different states of water. Through the curious eyes of two young characters — Aavi and Thirav — the chapter explores how water exists in three different states: solid (ice), liquid (water), and gas (water vapour). The chapter introduces the fundamental processes of evaporation, condensation, melting, and freezing through hands-on activities and simple experiments that students can perform at home or in the classroom. It also explains how clouds form and how rain occurs, completing the picture of the water cycle. The chapter emphasises that water and ice are the same substance in different forms and that heating or cooling causes water to change its state.

⭐ USP Key Points

- ⭐ Water exists in 3 states: solid (ice), liquid (water), and gaseous (water vapour)
- ⭐ The chapter includes 11 hands-on activities (Activity 8.1 to Activity 8.11) for experiential learning
- ⭐ Evaporation occurs continuously even at room temperature — it is the conversion of water into vapour
- ⭐ Condensation is the reverse process — water vapour converts back to liquid when it contacts a cold surface
- ⭐ The mass of a cold glass tumbler increases over 30 minutes due to condensation of water vapour from air
- ⭐ Factors affecting evaporation speed: exposed surface area, temperature, wind speed, and humidity
- ⭐ The water cycle involves evaporation from oceans → cloud formation → rain/snow → water flows back to oceans

SECTION 02

Investigating Water's Disappearing Act

Ice and Water — Same Substance, Different States

The chapter begins with Aavi and Thirav enjoying shikanji (lemonade) on a summer afternoon. Thirav notices that ice feels hard and can be held in hands, while water cannot — so he thinks they must be different substances. However, Aavi disagrees and suggests putting water in a freezer to check. When an ice cube is placed in a cup and left on a table (Activity 8.1), it melts and converts into water, proving that ice and water are indeed two forms (states) of the same substance.

Key Concept: Ice and water are the same substance. They are two different states of the same material. Water flows and splashes, but ice does not. These differences arise because of their different physical states, not because they are different substances.

Where Does the Puddle Water Go?

On a rainy morning, Aavi and Thirav observe many water puddles in the playground. By evening, much of the puddle water had disappeared. While some water seeps into the ground (absorption by soil), a significant portion disappears through a process called evaporation — the conversion of liquid water into water vapour (gaseous state).

Activity 8.2 — The Steel Plate Experiment

To investigate where water goes, a tablespoon of water is placed on a steel plate. The plate is observed at regular intervals. The water does not seep through the steel plate (steel is impervious to water), yet the water completely disappears over time. This proves that the water has been converted into water vapour — an invisible gaseous state of water.

Evaporation

The process of conversion of water (liquid) into its vapour (gaseous) state is called evaporation. Evaporation takes place continuously, even at room temperature.

Steam vs Water Vapour: Water vapour is actually invisible. When we see what appears to be "steam" rising from a hot pan, the visible part is actually tiny water droplets formed when water vapour cools slightly. Pure water vapour cannot be seen with our eyes.

Everyday Examples of Evaporation

Evaporation is happening all around us. Wet clothes drying on a clothesline, a mopped floor becoming dry, sweat disappearing from our body, and hand sanitiser vanishing after rubbing — all these are examples of evaporation. When water is sprinkled on a hot dosa pan, it quickly converts into steam (water vapour with tiny water droplets), which is another demonstration of rapid evaporation.

☆ Key Facts about Evaporation

- ☆ Evaporation occurs at ALL temperatures, not just when water boils
- ☆ Water from puddles disappears due to BOTH seeping into ground AND evaporation
- ☆ Water vapour is invisible — the visible "steam" contains tiny water droplets
- ☆ Hand sanitiser disappears from hands because it evaporates quickly

SECTION 03

The Condensation Mystery

Water Droplets on a Cold Glass — Activity 8.3

Aavi and Thirav take cold water in a glass tumbler and add ice cubes. After a few minutes, they notice something exciting — water droplets appear on the outer surface of the glass tumbler! Where do these droplets come from? Various possible reasons are discussed: maybe water seeped through the glass wall, maybe ice came out and melted, or maybe something else is happening entirely.

Chain of Reasoning — Scientific Thinking

The students apply a chain of reasoning to investigate this phenomenon. One student suggests the water seeped out, but another notes the water level inside has not decreased. They propose using a tall narrow bottle to detect even small level changes. They suggest taking room temperature water in another tumbler for comparison. This process of questioning, reasoning, and experimenting is at the heart of scientific inquiry.

Condensation

The process of conversion of water vapour into its liquid state is called condensation. When water vapour present in the air comes in contact with a cold surface, it forms water droplets.

Proving Condensation — Activity 8.4

In Activity 8.4, a glass tumbler half-filled with cold water and ice cubes is covered with a small steel plate and placed on a digital weighing balance. The mass is recorded every 5 minutes for 30 minutes. The result: the mass increases over time! This increase happens because water vapour from the surrounding air condenses on the cold outer surface of the glass, adding extra water (and hence extra mass) to the system.

TIME	OBSERVATION
0 min	Initial mass recorded; no droplets on outer surface
5 min	Tiny water droplets begin appearing on outer surface
10 min	More droplets visible; mass shows slight increase
15 min	Droplets combine to form bigger drops
20–30 min	Mass continues to increase; confirming condensation

Confirming That Water Does Not Seep Out

To further confirm that the water is not seeping through the glass wall, Activity 8.4 is modified — the water level inside the glass is marked with a permanent marker or visible tape. After waiting, the water level does not go down, but extra water collects on the outer surface. This proves conclusively that the water on the outside comes from condensation of water vapour in the air, not from water seeping through the glass.

Humidity Fact: The amount of water vapour in the air is called humidity. Daily humidity data for your area is reported in newspapers and weather apps. Humidity varies throughout the year — it is higher during the rainy season and lower during winter and summer.

Other Examples of Condensation

Dew drops on plants in the morning are a beautiful example of condensation — the air cools at night, and water vapour condenses on the cool surfaces of leaves and flowers. When we boil water in a utensil and cover it with a steel plate, water drops accumulate on the inner side of the plate — this is also condensation. The water vapour rising from the boiling water hits the relatively cooler plate and condenses back into liquid droplets.

SECTION 04

Three States of Water

Identifying Properties of Each State — Activity 8.5

Water can exist in three different states in our daily life: solid (ice), liquid (water), and gas (water vapour). Activity 8.5 explores the properties of each state by transferring ice and water between containers of different shapes and observing their behaviour.

PROPERTY	ICE (SOLID STATE)	WATER (LIQUID STATE)	WATER VAPOUR (GASEOUS STATE)
Shape	Fixed shape; does not change with container	No fixed shape; takes shape of container	No fixed shape; fills entire available space
Ability to Flow	Does not flow	Flows easily from one place to another	Spreads in all directions
Ability to Spread	Does not spread	Spreads on a surface but volume remains constant	Spreads out in the entire available space
Volume	Fixed volume	Fixed volume (constant)	No fixed volume; expands to fill container
Visibility	Visible (opaque/translucent)	Visible (transparent)	Invisible at room temperature

Important: Water vapour exists even at room temperature — it is present in the air around us, though invisible. The water that evaporates from drying clothes, mopped floors, and other sources contributes to the water vapour in the air.

Examples of Solids, Liquids, and Gases

Besides water, many other substances also exhibit three states. Wax, oil, and ghee are common examples. Solids include stones, wood, and glass. Liquids include milk, oil, vinegar, and juice. Gases include oxygen, carbon dioxide, and nitrogen. The smell of food cooking in the kitchen reaches us even in another room because the gaseous particles spread through the air — this is a property of gases.

⭐ State Properties Summary

- ⭐ Solids: Fixed shape, fixed volume, do not flow or spread (e.g., ice, stone, wood)
- ⭐ Liquids: No fixed shape (take container's shape), fixed volume, can flow and spread (e.g., water, milk, oil)
- ⭐ Gases: No fixed shape, no fixed volume, spread out to fill entire space (e.g., water vapour, oxygen, CO_2)
- ⭐ You can smell food from the kitchen because gas molecules spread in all directions

SECTION 05

Changing States of Water

How Can We Change the State of Water?

The state of water can be changed by heating or cooling. To change ice into water and water into water vapour, we need to supply heat. To change water into ice, we need to cool it — for example, by placing water in a freezer. When we take ice out of the freezer, it melts back into water.

Melting

The process of conversion of a solid into its liquid state is called melting. Example: Ice melting into water when heated or left at room temperature.

Freezing

The process of conversion of a liquid into its solid state is called freezing. Example: Water converting into ice when placed in a freezer.

Activity 8.6 — State Conversion Diagram

The chapter provides a diagram showing how the three states of water are interconnected through different processes:

PROCESS	CHANGE OF STATE	REQUIRES
Melting	Solid → Liquid (Ice → Water)	Heating
Freezing	Liquid → Solid (Water → Ice)	Cooling
Evaporation	Liquid → Gas (Water → Water Vapour)	Heating (or even room temperature)
Condensation	Gas → Liquid (Water Vapour → Water)	Cooling

The completed diagram from Activity 8.6: A (Solid) →[1. Melts]→ B (Liquid) →[2. Evaporates]→ C (Gas). In reverse: C (Gas) →[4. Condenses]→ B (Liquid) →[3. Freezes]→ A (Solid).

Other Examples of Melting: Candle wax melts when heated by the flame. Coconut oil, which solidifies during the winter season, melts when warmed. Ghee (clarified butter) melts when heated. When these liquids are cooled, they solidify again — proving that changing states by heating and cooling is a reversible process.

Atmospheric Water Generator (AWG): These modern machines collect water from humid air to produce drinkable water. They work by cooling the air, causing water vapour to condense — similar to how water droplets form on a cold glass tumbler. This technology is especially useful in areas with limited freshwater access.

SECTION 06

Faster & Slower Evaporation

What Affects How Fast Water Evaporates?

Several conditions determine the rate of evaporation. These can be investigated through simple experiments that change one condition while keeping others the same (a fair test).

Activity 8.7 — Effect of Exposed Surface Area

Equal amounts of water are placed in a small bottle cap and a wide plate. Both are kept near each other in the same conditions. The water on the plate (larger exposed area) evaporates much faster than the water in the bottle cap (smaller exposed area). This is because a larger surface area allows more water molecules to escape into the air simultaneously.

FACTOR	EFFECT ON EVAPORATION	EXAMPLE
Exposed Surface Area	More area = Faster evaporation	Water in a plate dries faster than in a bottle cap
Temperature / Sunlight	Higher temperature = Faster evaporation	Water in sunlight evaporates faster than in shade
Wind / Air Movement	More wind = Faster evaporation	Clothes dry faster on a windy day
Humidity	Higher humidity = Slower evaporation	Clothes dry slowly on a rainy (humid) day

Activity 8.8 — Effect of Sunlight

Two identical bottle caps with equal amounts of water are placed in different locations — one in sunlight and one in shade. The water in sunlight evaporates significantly faster. This confirms that higher temperature (from sunlight) increases the rate of evaporation. This is why clothes dry faster on a hot, sunny day compared to a cloudy day.

Effect of Wind

Clothes dry faster on a windy day because the moving air carries away the water vapour from near the surface of the wet clothes, making room for more water to evaporate. This is also why we feel cooler when sitting under a fan — the fan increases air movement, which speeds up the evaporation of sweat from our skin, producing a cooling sensation.

Effect of Humidity

On rainy days, the amount of water vapour in the air is already high (high humidity), so water evaporates slowly. This is why clothes take longer to dry on a rainy or very humid day. If the air is already "full" of water vapour, it becomes harder for more water to evaporate into it.

⭐ Factors Affecting Evaporation Speed

- ⭐ Larger exposed surface area → FASTER evaporation
- ⭐ Higher temperature (sunlight, heat) → FASTER evaporation
- ⭐ More wind or air movement → FASTER evaporation
- ⭐ Higher humidity (more moisture in air) → SLOWER evaporation
- ⭐ On a rainy day, dry clothes faster by using a fan or keeping them in a well-ventilated area

SECTION 07

Cooling Effect & Water Cycle

8.6 — Cooling Effect of Evaporation

Aavi's mother replaces a stainless steel pot with a matka (earthen pot) for drinking water. Aavi notices the earthen pot water is much colder. The reason: water seeps through the porous surface of the earthen pot and evaporates from the outer surface. This evaporation absorbs heat from the water inside, creating a cooling effect. This is why earthen pots (matkas) and surahis have been used in India for centuries to keep water cool without electricity.

Cooling Effect Examples: Sprinkling water on the floor or roof during summer cools the area because the evaporating water absorbs heat. Rubbing hand sanitiser on your hands feels cold because the sanitiser evaporates rapidly, absorbing heat from your skin. Sitting under a fan feels cool because the fan speeds up evaporation of sweat.

Activity 8.9 — Pot-in-Pot Cooler

A pot-in-pot cooler is an electricity-free refrigeration system. A smaller earthen pot is placed inside a larger one, with the gap filled with sand. Water is poured into the sand, and a lid or wet jute sack covers the top. Over 4–5 hours, the evaporation of water from the sand and outer pot creates a cooling effect inside. Vegetables and fruits stored in this cooler stay fresh for several days.

Surahi

A traditional Indian clay pot with a long neck, used in summers to keep water cold. The porous clay allows water to seep out and evaporate, producing a natural cooling effect.

8.7 — How Do Clouds Give Us Rain?

Condensation plays a crucial role in bringing evaporated water back to Earth. When air containing water vapour rises higher above the Earth's surface, it becomes cooler. At certain heights, the air gets so cool that the water vapour condenses into tiny droplets, which generally form around dust particles. These droplets float in the air and form clouds. When many droplets join together, they form bigger, heavier drops that fall as rain. Under special conditions, precipitation may also occur as hail or snow.

Why Does Water Vapour Rise? Water vapour is lighter than air. Just like gas balloons containing lighter gases float upward, water vapour naturally rises into the atmosphere. As it rises higher, the temperature drops, eventually causing the vapour to condense.

Activity 8.10 — Cloud Formation in a Bottle

A simple experiment demonstrates cloud formation: Pour water into a plastic bottle, close the lid, and squeeze and release repeatedly for 2–3 minutes. Then, add a small burnt piece of newspaper (which provides tiny dust particles) and repeat. This time, haziness (mini clouds) appears above the water in the bottle. This shows that water vapour condenses around dust particles to form clouds — exactly what happens in the atmosphere.

The Water Cycle

The water from oceans and the Earth's surface evaporates into the atmosphere as water vapour, rises, cools, condenses to form clouds, and returns to Earth as rain, hail, or snow. The water ultimately flows through rivers, streams, and underground back to the oceans, completing the cycle. This continuous circulation of water between the Earth's surface and the atmosphere is known as the water cycle.

STAGE	PROCESS	WHAT HAPPENS
1	Evaporation	Water from oceans, rivers, lakes evaporates into the atmosphere
2	Rising & Cooling	Water vapour rises; air gets cooler at higher altitudes
3	Condensation	Water vapour condenses around dust particles to form tiny droplets
4	Cloud Formation	Tiny droplets float in air and form clouds
5	Precipitation	Droplets combine, become heavy, and fall as rain, hail, or snow
6	Collection	Water flows through rivers/streams back to oceans; cycle repeats

Water Conservation: Only a small portion of Earth's water is fit for use by plants, animals, and humans. Most water is in the oceans and cannot be used directly. With increasing population, water demand grows while supply remains limited. It is very important to use water wisely, avoid wasting it, and keep our water bodies free from pollution.

SECTION 08

Glossary

Evaporation
The process of conversion of water (liquid) into its vapour (gaseous) state. It occurs continuously, even at room temperature.

Condensation
The process of conversion of water vapour into its liquid state when it comes in contact with a cold surface.

Melting
The process of conversion of a solid into its liquid state by heating. Example: ice converting to water.

Freezing
The process of conversion of a liquid into its solid state by cooling. Example: water converting to ice in a freezer.

Water Vapour
The gaseous state of water. It is invisible and present in the air around us at all times.

Water Cycle
The continuous circulation of water between the Earth's surface and the atmosphere through evaporation, condensation, precipitation, and collection.

Humidity
The amount of water vapour present in the air. Higher humidity means more moisture in the air, which slows down evaporation.

Steam
A mixture of water vapour and tiny water droplets visible to the naked eye. Often seen rising from boiling water or hot surfaces.

Precipitation
Water falling from clouds to the Earth's surface in the form of rain, hail, or snow. It is a key part of the water cycle.

Dew
Water droplets that form on cool surfaces like leaves and grass in the early morning due to condensation of water vapour from the air.

Atmosphere
The thin layer of air (containing gases including water vapour) that surrounds the Earth. Temperature

Pot-in-Pot Cooler
An electricity-free cooling device using two earthen pots with sand between them. Evaporation of water from the

decreases with increasing height.

sand cools the inner pot.

SECTION 09

Q&A + MCQs

NCERT Exercise Questions with Answers

Q1. Which of the following best describes condensation?

(i) The conversion of water into its vapour state.
(ii) The process of water changing from a liquid into gaseous state.
(iii) The formation of clouds from tiny water droplets.
(iv) The conversion of water vapour into its liquid state.

Answer: (iv) The conversion of water vapour into its liquid state.
Condensation is the process where water vapour (gas) changes back into liquid water when it comes in contact with a cold surface. Option (i) and (ii) describe evaporation. Option (iii) describes cloud formation, which is a result of condensation but does not define the process itself.

Q2. Identify in which of the given processes, evaporation is very important.

(i) Colouring with: (a) crayons (b) water colours (c) acrylic colours (d) pencil colours
Answer: (b) Water colours — Water colours use water as a medium. After applying them on paper, the water evaporates, leaving the colour pigment behind on the paper. Evaporation is essential for the paint to dry.

(ii) Writing on paper with: (a) pencil (b) ink pen (c) ball point pen
Answer: (b) Ink pen — Ink from an ink pen (fountain pen) is water-based or liquid-based. After writing, the liquid part evaporates, leaving the ink markings on the paper. A pencil leaves graphite marks (no evaporation needed), and a ball point pen uses thick, oil-based ink that dries differently.

Q3. We see green coloured plastic grass at many places these days. Space around natural grass feels cooler than space around the plastic grass. Can you find out why?

Natural grass absorbs water from the soil and releases it through its leaves in a process called transpiration. This water evaporates from the leaf surfaces, and since evaporation causes a cooling effect, the area around natural grass feels cooler. Plastic grass, on the other hand, does not absorb or release water. There is no evaporation happening from its surface, so it does not produce any cooling effect. In fact, plastic grass may absorb heat from sunlight and make the surrounding area warmer.

Q4. Give examples of liquids other than water that evaporate.

Several liquids other than water evaporate easily: (1) **Hand sanitiser (alcohol-based)** — evaporates rapidly when rubbed on hands. (2) **Nail polish remover (acetone)** — evaporates quickly with a strong smell. (3) **Petrol/Gasoline** — evaporates easily even at room temperature. (4) **Perfume/Cologne** — the fragrance spreads because the liquid evaporates and the scent molecules spread through the air. (5) **Rubbing alcohol (isopropanol)** — evaporates faster than water. These liquids generally evaporate faster than water because their molecules have weaker attractions to each other.

Q5. Fans move air around, creating a cooling sensation. It might seem strange to use a fan to dry wet clothes since fans usually make things cooler, not warmer. Normally, when water evaporates, it requires heat, not cold air. What do you think about this?

This is an excellent observation! Fans do not actually lower the air temperature — they increase air movement (wind speed). When air moves faster over a wet surface, it carries away the water vapour more quickly, making space for more water molecules to evaporate. The fan does not provide heat; instead, the heat required for evaporation is taken from the clothes themselves and from the surrounding air. The increased air circulation speeds up evaporation by continuously replacing the humid air near the clothes with drier air. So the fan helps clothes dry faster not by warming them, but by increasing the rate at which water vapour is removed from the surface.

Q6. Usually, when sludge is removed from drains, it is left in heaps next to the drain for 3–4 days. Afterward, it is transported to a garden or field where it can be used as manure. This approach reduces transportation cost of the sludge and enhances the safety of individuals handling it. Reflect upon it and explain how.

When sludge is removed from drains, it contains a large amount of water, making it very heavy and messy to transport. By leaving the sludge in heaps for 3–4 days, the water in the sludge evaporates. This reduces both the weight and volume of the sludge significantly, which lowers the cost of transportation (less weight = less fuel and fewer trips). Additionally, the evaporation of water makes the sludge less slimy and easier to handle, reducing the risk of slipping and contact with contaminated water. The drier sludge is also less likely to produce foul smell and is safer and more hygienic for the workers who handle and transport it.

Q7. Observe the activities in your house for a day. Identify the activities that involve evaporation. How does understanding the process of evaporation help us in our daily activities?

Household activities involving evaporation include: (1) **Drying clothes** after washing — we hang them in sunlight or in a well-ventilated area. (2) **Mopping the floor** — the floor dries because water evaporates. (3) **Cooking** — water evaporates from food being cooked, concentrating flavours and thickening gravies. (4) **Drying utensils** after washing. (5) **Applying hand sanitiser**. (6) **Using a cooler or matka** for cold water. (7) **Drying hair** after bathing.

Understanding evaporation helps us in many ways: we know to spread clothes out (more surface area) for faster drying, we prefer sunny and windy days for laundry, we store water in earthen pots for natural cooling, and we understand why sweating cools our body.

Q8. How is water present in the solid state in nature?

Water is present in the solid state in nature in several forms: (1) **Snow** — frozen water that falls from clouds in cold regions. (2) **Ice** — found on the surface of frozen lakes, rivers, and ponds during winter. (3) **Glaciers** — massive bodies of ice formed from compacted snow, found in mountains and polar regions. (4) **Hailstones** — balls of ice that fall during severe thunderstorms. (5) **Frost** — thin layer of ice crystals that forms on surfaces when the temperature drops below freezing point. (6) **Ice caps** — permanent ice covering at the North and South Poles.

Q9. Reflect on the statement "Water is our responsibility before it is our right." Share your thoughts.

This statement highlights that while every living being needs water to survive, we must take responsibility for conserving and protecting this precious resource. Only a very small fraction of Earth's water is suitable for drinking and daily use. With growing population and pollution, clean water is becoming scarcer. Before demanding water as our right, we should fulfil our responsibility by: not wasting water, fixing leaking taps, harvesting rainwater, keeping water bodies clean, not polluting rivers and lakes, reusing water where possible, and educating others about water conservation. If we all act responsibly, there will be enough clean water for everyone — now and in the future.

Q10. The seat of a two-wheeler parked on a sunny day has become very hot. How can you cool it down?

You can cool down the hot seat by sprinkling some water on it. When water is sprinkled on the hot seat, the water absorbs heat from the hot surface and evaporates. This evaporation process removes heat from the seat, making it cooler. This is an application of the cooling effect of evaporation. The same principle works when we sprinkle water on floors, rooftops, or terraces during summer to cool them down.

Additional Short Answer Questions

Q11. Why does a matka (earthen pot) keep water cool?

A matka (earthen pot) is made of porous clay, which has tiny holes. Water slowly seeps through these tiny pores to the outer surface of the pot. This water then evaporates from the outer surface. Since evaporation is a cooling process (it absorbs heat), it removes heat from the water stored inside the pot, keeping it cool. A stainless steel pot does not have pores, so no water can seep out and evaporate, which is why water stays at room temperature in a steel container.

Q12. Why do we see dew drops on plants more in the morning?

During the night, the temperature drops significantly. The surfaces of plants (leaves, flowers, grass) become cooler than the surrounding air. When the water vapour present in the air comes in contact with these cold surfaces, it condenses and forms tiny water droplets called dew. We see more dew in the morning because the temperature is lowest just before and after sunrise. As the sun rises and the temperature increases, the dew drops evaporate again.

Q13. What is the role of dust particles in cloud formation?

Dust particles play a crucial role in cloud formation. When water vapour rises high in the atmosphere and the air becomes cold enough for condensation, the water vapour needs tiny surfaces (nuclei) to condense upon. Dust particles present in the atmosphere serve as these condensation nuclei. Tiny water droplets form around these dust particles. These droplets are very small and light, so they float in the air, forming clouds. Without dust particles, condensation would be much more difficult and cloud formation would be significantly reduced. Activity 8.10 in the chapter demonstrates this using a burnt piece of newspaper in a bottle to provide dust particles for cloud formation.

Q14. Explain the difference between evaporation and boiling.

Evaporation and boiling both convert liquid water into water vapour, but they differ in important ways. Evaporation is a surface phenomenon — it occurs only at the surface of the liquid and happens at ANY temperature, even at room temperature. It is a slow and continuous process. Boiling, on the other hand, occurs throughout the entire body of the liquid (not just the surface) and happens only at a specific temperature called the boiling point (100°C for water at sea level). Boiling is rapid and vigorous with bubbles forming throughout the liquid. For example, wet clothes drying involves evaporation (slow, at room temperature), while cooking water on a stove involves boiling (rapid, at 100°C).

Q15. Draw and explain the water cycle in your own words.

The water cycle is a continuous process with these stages: (1) **Evaporation:** The sun heats water in oceans, rivers, lakes, and other water bodies. Water evaporates and enters the atmosphere as invisible water vapour. (2) **Rising and Cooling:** The warm, moist air rises because water vapour is lighter than air. As it rises higher, the temperature drops. (3) **Condensation and Cloud Formation:** The cooled water vapour condenses around dust particles to form tiny water droplets, which float in the air as clouds. (4) **Precipitation:** When many droplets join and become too heavy to float, they fall to Earth as rain, hail, or snow. (5) **Collection:** The water collects in rivers, lakes, and oceans, or seeps underground as groundwater. The cycle then repeats endlessly, ensuring water is continuously recycled on Earth.

Multiple Choice Questions (MCQs)

1. The process of conversion of water into its vapour state is called:

(a) Condensation

(b) Melting

(c) Evaporation

(d) Freezing

✅ **Answer: (c) Evaporation**

2. Water vapour in the air is also known as:

(a) Steam

(b) Humidity

(c) Fog

(d) Dew

✅ **Answer: (b) Humidity — The amount of water vapour in the air is called humidity.**

3. Which of the following will make clothes dry faster?

(a) Keeping them folded in a pile

(b) Hanging them on a rainy day inside a closed room

(c) Spreading them out on a sunny, windy day

(d) Keeping them in a humid bathroom

✅ **Answer: (c) Spreading them out on a sunny, windy day — More surface area, higher temperature, and wind all increase evaporation.**

4. The conversion of solid into liquid state is called:

(a) Evaporation

(b) Condensation

(c) Freezing

(d) Melting

✅ **Answer: (d) Melting**

5. Which state of water has no fixed shape and no fixed volume?

(a) Solid (ice)

(b) Liquid (water)

(c) Gas (water vapour)

(d) Both solid and liquid

✅ **Answer: (c) Gas (water vapour) — Gases have neither fixed shape nor fixed volume.**

6. Water droplets appear on the outer surface of a cold glass because of:

(a) Water seeping through the glass

(b) Ice melting outside the glass

(c) Condensation of water vapour from air

(d) Evaporation of water from inside

✅ **Answer: (c) Condensation of water vapour from the air on the cold surface of the glass.**

7. Which of the following is an example of the cooling effect of evaporation?

(a) Boiling water on a stove

(b) Matka (earthen pot) keeping water cool

(c) Water freezing in a refrigerator

(d) Ice melting in summer

✅ **Answer: (b) Matka (earthen pot) keeping water cool — evaporation from the pot's surface causes cooling.**

8. In the water cycle, clouds form due to:

(a) Evaporation of ocean water

(b) Condensation of water vapour at high altitudes

(c) Freezing of river water

(d) Melting of glaciers

✅ **Answer: (b) Condensation of water vapour at high altitudes around dust particles.**

9. On a rainy day, evaporation is slower because:

(a) Temperature is very high

(b) Wind speed is too fast

(c) Humidity in the air is already high

(d) There is no water to evaporate

✅ **Answer: (c) Humidity in the air is already high — when air already contains a lot of moisture, it can absorb less water, slowing evaporation.**

10. The continuous circulation of water between the Earth's surface and the atmosphere is called:

(a) Precipitation

(b) Condensation cycle

(c) Water cycle

(d) Evaporation cycle

✅ **Answer: (c) Water cycle**

Case-Based Questions

Case Study 1: The Earthen Pot Experiment

Riya noticed that her grandmother always stored drinking water in a matka (earthen pot) during the summer months instead of using a steel or plastic container. One day, Riya touched the outer surface of the matka and found it to be slightly damp. She also noticed that the water inside the matka was much cooler than the water kept in a steel jug on the same table. Her grandmother explained that this was a traditional Indian method of cooling water without electricity.

1. Why was the outer surface of the matka slightly damp?
2. Why is the water in the matka cooler than the water in the steel jug?
3. Name the process responsible for the cooling effect.
4. Would this method work equally well on a very humid (rainy) day? Why or why not?

Answers:

1. The outer surface of the matka was damp because the earthen pot is porous (has tiny holes). Water seeps through these pores from inside to the outer surface.

2. The water seeping out of the matka evaporates from the outer surface. Evaporation absorbs heat from the water stored inside the pot, cooling it down. The steel jug is not porous, so no evaporation occurs on its surface, and the water remains at room temperature.

3. The process responsible is **evaporation**, which causes a cooling effect.

4. No, this method would not work as effectively on a very humid (rainy) day. When humidity is high, the air already contains a lot of water vapour, so evaporation from the matka's surface slows down significantly. Less evaporation means less cooling effect on the water inside.

Case Study 2: The Cold Glass Mystery

During a birthday party, Arjun poured cold lemonade into glass tumblers and added ice cubes. After about 10 minutes, he noticed that the outer surfaces of all the glass tumblers were covered with tiny water droplets. Some of his friends suggested that the glass was leaking. Arjun decided to investigate by marking the water level inside the glass with a marker and observing it after 15 minutes. He found that the water level had not decreased, and if anything, it seemed to have slightly increased.

1. Why did water droplets appear on the outer surface of the glass tumblers?
2. Why did Arjun mark the water level inside the glass?
3. Why did the water level seem to increase slightly instead of decreasing?
4. Name the process that caused the water droplets on the glass surface.

Answers:
1. Water droplets appeared on the outer surface because the glass tumbler was very cold (due to ice and cold lemonade). Water vapour present in the surrounding air came in contact with the cold glass surface and condensed into tiny water droplets.
2. Arjun marked the water level to test whether the water was seeping out through the glass wall. If water was leaking out, the level inside would decrease.
3. The water level increased slightly because the ice cubes inside the glass were melting, adding more water. Also, some condensed water droplets from the outer surface may have dripped into the glass. The water was definitely NOT seeping out.
4. The process is called **condensation** — the conversion of water vapour (gas) into liquid water when it contacts a cold surface.

Case Study 3: Drying Clothes in Different Conditions

Meera washed her school uniform on a Saturday evening. She hung the wet clothes on the clothesline outside. The next morning was a sunny and windy day, and her clothes were completely dry by 10 AM. The following week, she washed her uniform again on Saturday evening but this time, Sunday was a rainy and cloudy day. Her clothes were still damp by evening and she had to use a fan to dry them overnight.

1. Why did the clothes dry quickly on the sunny, windy day?
2. Why did the clothes take much longer to dry on the rainy day?
3. How did the fan help in drying the clothes?
4. List two more things Meera could do to dry clothes faster on a rainy day.

Answers:
1. On the sunny, windy day, two factors increased the rate of evaporation: (a) higher temperature from sunlight provided more energy for water to evaporate, and (b) wind carried away the water vapour from near the clothes, allowing more water to evaporate quickly.
2. On the rainy day, the humidity was very high (lots of water vapour already in the air). Since the air was already saturated with moisture, it could not absorb much more water vapour from the clothes, making evaporation very slow. Also, the temperature was lower due to cloud cover.
3. The fan increased air movement around the clothes. This moving air carried away the water vapour from the surface of the wet clothes and replaced it with drier air, speeding up evaporation.
4. (a) She could spread the clothes out more to increase the exposed surface area. (b) She could iron the damp clothes — the heat from the iron would increase the rate of evaporation significantly.

🎯 Exam Tips

- 🎯 Remember the 4 key processes: Evaporation, Condensation, Melting, and Freezing — know the definition and direction of each change of state
- 🎯 Evaporation is liquid → gas; Condensation is gas → liquid; Melting is solid → liquid; Freezing is liquid → solid — memorise this conversion chart
- 🎯 Know the 4 factors affecting evaporation rate: surface area, temperature, wind speed, and humidity — and whether each makes evaporation faster or slower
- 🎯 Water vapour is INVISIBLE — visible "steam" actually contains tiny water droplets, which is a common exam trick question
- 🎯 The cooling effect of evaporation is a frequently asked concept — be ready with 3-4 examples (matka, fan, sanitiser, sprinkling water)
- 🎯 For the water cycle, remember all 6 stages in order: Evaporation → Rising → Condensation → Cloud Formation → Precipitation → Collection
- 🎯 Dust particles are essential for cloud formation as condensation nuclei — this is a commonly tested fact
- 🎯 The mass of a cold glass increases due to condensation — not because of water seeping out; know how to explain Activity 8.4
- 🎯 Humidity = amount of water vapour in air; HIGH humidity = SLOW evaporation — this inverse relationship is frequently tested
- 🎯 For diagram questions, practise drawing and labelling the water cycle and the state conversion diagram (Solid ↔ Liquid ↔ Gas)

UNIQUE STUDY POINT

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