

Chapter -2- States of Matter

1. Case Study:

Inflating a Balloon

Riya blows air into a balloon and notices that the balloon expands.

Questions:

- a) Which state of matter is being added to the balloon?
- b) Why does the balloon expand when air is blown into it?
- c) What property of particles of matter does this activity demonstrate?
- d) What would happen if more and more air is forced into the balloon?

Answers:

- a) Air (gas) is being added to the balloon.
- b) The balloon expands because air occupies space.
- c) This demonstrates that particles of matter have spaces between them and matter occupies space.
- d) The balloon will continue to expand and may eventually burst if too much air is forced into it.

2. Situation-Based Question

A bottle filled completely with water is kept in a freezer overnight. The next morning, the bottle is found cracked.

Questions:

- a) Why did the bottle crack?
- b) What change of state occurred?
- c) How is water different from most substances when it freezes?
- d) Mention one practical application of this property of water.

Answers:

- a) The bottle cracked because water expands when it freezes.
- b) Freezing (liquid → solid) occurred.
- c) Unlike most substances, water expands on freezing due to the arrangement of its molecules.
- d) Aquatic life survives in winter because ice floats on water and acts as an insulating layer.

3. Observation and Analysis

A student sprays perfume in one corner of a room. After a few minutes, people in different parts of the room can smell it.

Questions:

- a) Which process is responsible for the spread of perfume smell?
- b) Why does this process occur faster in gases than in liquids?
- c) What does this tell you about the spaces between particles in gases?

Answers

- a) Diffusion is responsible for the spread of perfume smell.
- b) Diffusion occurs faster in gases because gas particles move rapidly and have large intermolecular spaces.

c) It shows that gases have very large spaces between their particles.

4. Real-Life Application

A shopkeeper stores LPG in cylinders under high pressure.

Questions:

- a) In what form is LPG stored inside the cylinder?
- b) Why is LPG compressed before storage?
- c) What property of gases makes this possible?
- d) What happens when LPG comes out of the cylinder?

Answers

- a) LPG is stored as a liquid under high pressure.
- b) It is compressed to reduce its volume so that more fuel can be stored.
- c) Gases are highly compressible.
- d) When LPG comes out of the cylinder, it changes into a gas.

5. Experimental Question

Three beakers contain equal amounts of ice, water, and steam respectively.

Questions:

- a) Which beaker contains particles with the highest kinetic energy?

b) Arrange the three states in increasing order of intermolecular force.

c) Which state has a definite shape and volume? Why?

d) Explain your answers using particle theory.

Answers

a) Steam contains particles with the highest kinetic energy.

b) Increasing order of intermolecular force: Steam < Water < Ice

c) Ice has a definite shape and volume because its particles are closely packed.

d) According to particle theory, particles in steam move fastest, while those in ice are tightly packed with strong attractive forces.

6. Problem-Solving Question

A student says, "Gas has no mass because it cannot be seen."

Questions:

a) Do you agree with the statement? Give reasons.

b) Suggest an activity to prove that air has mass.

c) Why is visibility not a criterion for determining whether something has mass?

Answers

a) No, the statement is incorrect. Air has mass even though it cannot be seen.

b) Weigh an inflated balloon and a deflated balloon. The inflated balloon is heavier.

c) Visibility does not determine mass. Many gases are invisible but possess mass.

7. Data Interpretation

A student records the following observations:

Substance ---A

Shape--Fixed

Volume---Fixed

Substance--B

Shape--Takes shape of container

Volume --Fixed

Substance--C

Shape---Takes shape of container

Volume--Fills entire container

Questions:

- a) Identify A, B, and C as solid, liquid, or gas.
- b) Which substance has the weakest intermolecular forces?
- c) Which substance is most compressible? Why?

Answers

a)

A = Solid

B = Liquid

C = Gas

b) C (Gas) has the weakest intermolecular forces.

c) C (Gas) is most compressible because its particles are far apart.

8. HOTS Question

During summer, wet clothes dry faster than during winter.

Questions:

a) Name the process involved.

b) Why does the rate of drying increase in summer?

c) How does temperature affect the particles of water?

d) Suggest two other ways to dry clothes faster.

Answers

a) Evaporation.

b) Higher temperatures increase the rate of evaporation.

c) Water particles gain kinetic energy and escape into the air more easily.

d)

Spread clothes out over a larger area.

Dry them under a fan or in windy conditions.

9. Assertion–Reason Type

Assertion (A): Gases can be compressed easily.

Reason (R): There are large spaces between gas particles.

Choose the correct answer:

i. Both A and R are true, and R is the correct explanation of A.

ii. Both A and R are true, but R is not the correct explanation of A.

iii. A is true, but R is false.

iv. A is false, but R is true.

Answers

Correct Answer: 1

Both Assertion and Reason are true, and the Reason correctly explains the Assertion.

10. Case Study: Dry Ice

A science teacher places a piece of dry ice in a beaker. After some time, it disappears without forming a liquid.

Questions:

- a) What is dry ice?
- b) Name the process by which it changes directly into gas.
- c) How is this process different from melting?
- d) Give one practical use of dry ice.

Answers

Dry ice is solid carbon dioxide (CO₂).

b) Sublimation.

c) In sublimation, a solid changes directly into a gas without becoming a liquid.

d) It is used for preserving food and medicines during transport.

,11. Critical Thinking Question

A student observes droplets of water on the outside surface of a cold glass containing ice water.

Questions:

a) From where do these water droplets come?

b) Which change of state is involved?

c) Why do droplets form only on the outer surface?

d) Explain this phenomenon using particle theory.

Answers

a) The droplets come from water vapour present in the air.

b) Condensation (gas → liquid).

c) The outer surface is cooled by the ice water inside the glass, causing water vapour to condense there.

d) Water vapour particles lose heat energy, slow down, and come closer together to form liquid droplets.

12. Competency-Based Integrated Question

A pressure cooker cooks food faster than an open vessel.

Questions:

- a) What happens to the pressure inside the cooker?
- b) How does increased pressure affect the boiling point of water?
- c) Why does food cook faster?
- d) Which state of matter inside the cooker is mainly responsible for the increased pressure?

Answers

Pressure inside the cooker increases.

- b) Increased pressure raises the boiling point of water.
- c) Water can reach a higher temperature before boiling, so food cooks faster.
- d) Steam (water vapour) is mainly responsible for the increased pressure.

Higher-Order Thinking Questions (HOTS)

Why can a diver swim through water but not through a block of ice, although both are forms of water?

Answers

Water is a liquid with weaker intermolecular forces, allowing particles to move past one another. Ice is a solid with tightly packed particles and strong intermolecular forces, making it rigid.

Explain why gases exert pressure on the walls of a container using the kinetic theory of matter.

Answers

Gas particles move randomly and continuously. Their collisions with the walls of the container exert force, producing pressure.

Why are railway tracks provided with small gaps between successive rails?

Answers

Metal expands when heated. The gaps provide space for expansion and prevent the tracks from bending or cracking.

How would life on Earth be affected if water did not expand on freezing?

Answers

Ice would sink instead of floating. Water bodies would freeze from the bottom upward, making survival difficult for aquatic organisms and severely affect

Chapter - Physical and Chemical change

Case Based questions.

A. Riya mixed a colourless solution of silver nitrate with a colourless solution of sodium chloride. After a few seconds, she noticed a white solid settling at the bottom of the test tube.

1. What evidence shows that a chemical reaction has taken place?

Answer: Formation of a white precipitate.

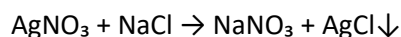
Q2. Name the precipitate formed.

Answer: Silver chloride (AgCl).

Q3. Which substance remains dissolved in the solution?

Answer: Sodium nitrate (NaNO₃).

Q4. Write balanced chemical equation for the reaction?



Q5. Define Precipitation?

A5. Precipitation: The process in which an insoluble solid substance (called a precipitate) is formed when two aqueous solutions react with each other is called precipitation.

B. Two colourless solutions, lead nitrate and potassium iodide, were mixed. A bright yellow solid was formed.

1. Name the yellow precipitate formed.

Answer: Lead iodide (PbI₂).

3. Why can this reaction be used to identify lead ions?

Answer: Because it produces a characteristic yellow precipitate.

4. Name the soluble product formed.

Answer: Potassium nitrate (KNO_3).

5. Write the balanced chemical equation.

Answer: $\text{Pb}(\text{NO}_3)_2 + 2\text{KI} \rightarrow 2\text{KNO}_3 + \text{PbI}_2 \downarrow$

Assertion Reasoning

Assertion–Reason Type Questions

1. Assertion: Silver chloride is obtained as a precipitate.

Reason: Silver chloride is insoluble in water.

Answer: Both A and R are true, and R is the correct explanation of A.

2. Assertion: Mixing ferrous sulphate and sodium hydroxide forms a dirty green precipitate.

Reason: Ferrous hydroxide is insoluble in water.

Answer: Both A and R are true, and R is the correct explanation of A.

3. Assertion: Lead iodide is yellow in colour.

Reason: All lead compounds are yellow.

Answer: Assertion is true, Reason is false.

4. Assertion: Formation of a precipitate indicates a chemical reaction.

Reason: A new insoluble substance is formed.

Answer: Both A and R are true, and R is the correct explanation of A.

5. Assertion: Sodium nitrate remains dissolved in the reaction between silver nitrate and sodium chloride.

Reason: Sodium nitrate is soluble in water.

Answer: Both A and R are true, and R is the correct explanation of A.

Competency based questions

A green solid A is heated strongly in a test tube. A black residue B is left behind and a gas C is evolved. Gas C turns lime water milky.

Q1. Identify gas A,B,C.

A-Copper Carbonate

B-Copper Oxide

C-Carbon dioxide

Q2. What observation suggests that a new substance has been formed?

Answer: Change in colour from green to black.

Q3. What characteristic of a chemical reaction is shown here?

Answer: Change in colour and evolution of gas.

Q4. How would you confirm the identity of gas C experimentally?

Answer: Pass it through lime water; it turns milky.

B. white crystalline compound X is heated strongly. A yellow solid Y, a reddish-brown gas Z, and a colourless gas P are produced.

1. What characteristic property helps identify gas Z?

Answer: Its reddish-brown colour and pungent nature.

2. Which evidence suggests that a chemical change has occurred?

Answer: Change in colour and evolution of gases.

3. Why should this experiment be performed in a well-ventilated area?

Answer: Gas Z is toxic and irritating.

4. Which product among Y, Z and P is most likely to support combustion?

Answer: Gas P (oxygen).

5. Identify X,Y,Z,P

X-lead nitrate

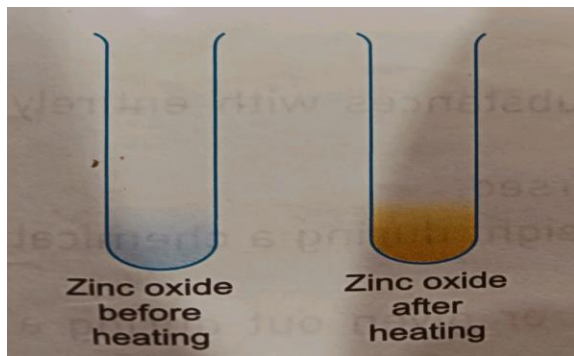
Y-lead monoxide

Z-Nitrogen dioxide

P-Oxygen

Picture Based Questions

A.



1. What change is observed when zinc oxide is heated?

Answer: The colour of zinc oxide changes from white to yellow.

2. Is a new substance formed when zinc oxide is heated? Give a reason.

Answer: No, no new substance is formed because the change is reversible.

3. What type of change is shown in the picture—physical or chemical?

Answer: Physical change.

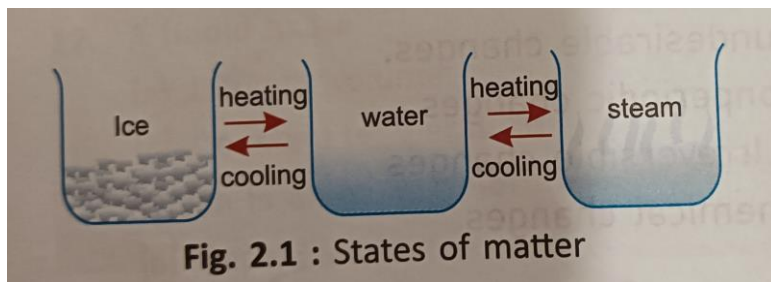
4. How can you prove that the change shown in the picture is reversible?

Answer: On cooling, the yellow zinc oxide turns white again, showing that the change is reversible.

5. A student says that every colour change indicates a chemical reaction. Does this picture support the statement? Explain.

Answer: No. Zinc oxide changes colour on heating, but no new substance is formed, so it is a physical change.

B.



Q1. The figure shows substance A changing into substance B on heating and substance B changing back into A on cooling. What does this indicate about the change?

Answer: The change is reversible and is a physical change.

Q2.

What happens to the particles of ice when it is heated to form water?

Answer: The particles gain energy and move more freely.

Q3. Identify the processes represented by: (a) Ice \rightarrow Water

(b) Water \rightarrow Steam

Answer:

(a) Melting

(b) Vaporisation (Boiling)

Q4. Which characteristic of a physical change is demonstrated by all the changes shown in the figure?

Answer: Only the state changes; no new substance is formed.

Q5. A student claims that a new substance is formed when water changes into steam. Is the student correct?

Answer: No. Steam is water in the gaseous state; no new substance is formed.