

**2026**  
EXAMINATION



**CBSE**

# QUESTION & CONCEPT BANK

Chapter-wise & Topic-wise

**CLASS 9**



Chapter-wise

**CONCEPT MAPS**



Important Questions with Detailed Explanations

**NCERT & EXEMPLAR**



Handpicked & High yield from Renowned Schools

**PYQs**



Revision Blue Print & Solved Questions

**COMPETENCY FOCUSED**



As per Latest Pattern

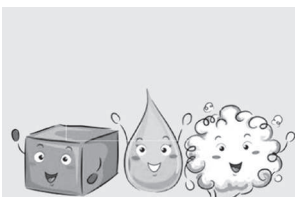
**MOCK TESTS**



# SCIENCE

# HOW TO USE THIS BOOK

This book is structured to support your learning journey of preparing for your exams through a variety of engaging and informative elements. Here's how to make the most of it:



"Everything in this universe is made up of material which is known by the name of 'matter'. The air we breathe, the food we eat, stones, clouds, stars, plants and animals, even a small drop of water or a particle of sand — everything is made up of matter. All the things that are mentioned above occupy space and have mass. In other words, they have both mass and volume. Modern day scientists have discovered two types of classification of matter based on their physical properties and chemical nature.

In this chapter, we will learn about matter based on physical properties."

Preview

At the start of every chapter, you'll find a thoughtfully chosen image and a quote that captures the main idea and motivation of the chapter. This approach aims to get your interest and give you a glimpse of the theme ahead.

Before diving into the details, we outline the syllabus to provide a structured overview of the chapter.

## SYLLABUS

### PHYSICAL NATURE OF MATTER, CHARACTERISTICS OF PARTICLES OF MATTER AND STATES OF MATTER

(Definition of Matter; Particulate Nature of Matter; States of Matter: Solid, Liquid and Gas and Their Characteristics; Change of State- Melting (Absorption of Heat), Freezing, Sublimation, Condensation)

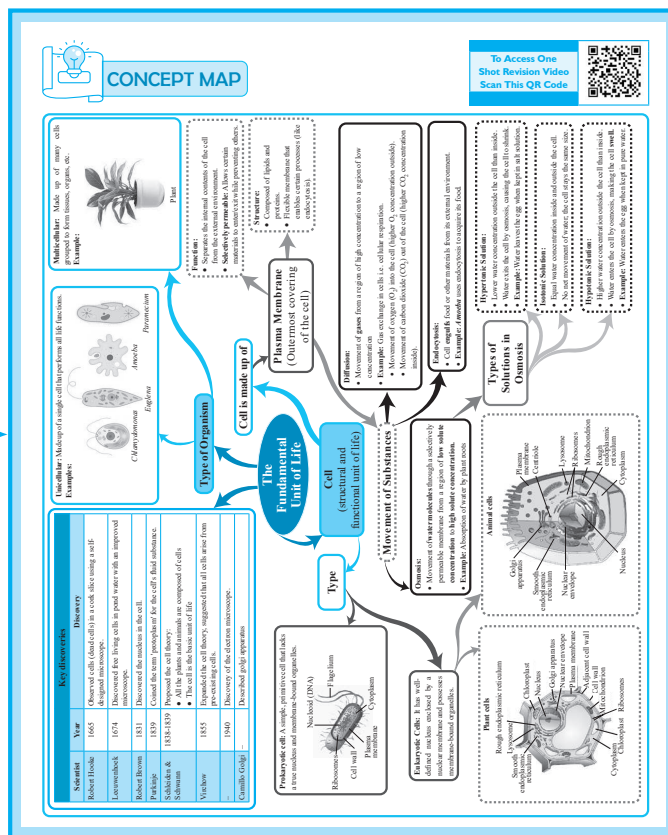
#### EVAPORATION

(Cooling by Evaporation)

The concept map appears to be a comprehensive study aid that outlines key concepts in a structured format. Use it to understand the chapter's structure and as a quick reference to recall important highlights.

A QR Code is given to access One Shot Revision Video of the chapter.

Concept Map



## 1 | DISCOVERY OF SUB-ATOMIC PARTICLES

### NCERT Definitions (Commonly asked in 1 mark)

- Atom:** Atom is the smallest particle of an element that can not be broken further.
- Electron:** A subatomic particle with a negative charge, found outside the nucleus of an atom.
- Proton:** A subatomic particle with a positive charge, found inside the nucleus of an atom.
- Canal Rays:** Positively charged radiations discovered in a gas discharge, leading to the discovery of protons.
- Nucleus:** The positively charged central core of an atom, consisting of protons and neutrons and containing nearly all its mass.
- Subatomic Particles:** Particles that are smaller than an atom, including protons, neutrons, and electrons.



### Important Facts

- 01 Electrons were discovered by J.J. Thomson in 1897.
- 02 Protons were discovered by E. Goldstein in 1886 through the observation of canal rays.
- 03 The mass of a proton is approximately 2000 times the mass of an electron.
- 04 Electrons move around the nucleus in specific orbits or energy levels.
- 05 Protons and electrons carry equal but opposite charges, making atoms electrically neutral.

**Classification:** It organizes complex information into clear categories, making it easier for students to grasp differences, recognize patterns, and predict properties or behaviors in their learning.

**Difference Between:** Side-by-side comparisons to help distinguish similar concepts.

**NCERT Definitions:** It simplifies complex topics into brief, easy-to-understand explanations.

**Important Facts:** Quick, bullet point facts that are crucial for exams.

### Classification

Types of Motion		
Types of Motion	Definition	Example
<b>Motion in a Straight Line</b>	Motion where an object moves along a straight path, covering equal or unequal distances in equal time intervals.	A car moving on a straight highway.
<b>Circular Motion</b>	Motion where an object moves along a circular path at a constant speed.	The motion of the Earth around the Sun or a satellite orbiting a planet.
<b>Rotational Motion</b>	Motion where an object turns around a fixed point or axis.	The rotation of the Earth about its own axis or a spinning top.
<b>Vibrational Motion</b>	Motion where an object moves back and forth about a fixed point or equilibrium position.	The motion of a guitar string when plucked or the vibration of a tuning fork.

### Difference Between

Distance vs. Displacement		
Aspect	Distance	Displacement
<b>Definition</b>	The total path length traveled by an object, regardless of direction.	The shortest distance between the initial and final positions, including direction.
<b>Scalar/Vector</b>	Scalar quantity (only magnitude).	Vector quantity (magnitude and direction).
<b>Can be Zero</b>	Cannot be zero if the object has moved.	Can be zero if the object returns to the starting point.
<b>Direction</b>	Does not take direction into account.	Take direction into account.
<b>Example</b>	A car traveling 5 km north and then 5 km south covers a distance of 10 km.	The displacement would be 0 km as the final position coincides with the starting point.

Uniform Motion vs. Non-Uniform Motion		
Aspect	Uniform Motion	Non-Uniform Motion
<b>Definition</b>	Motion where an object covers equal distances in equal intervals of time.	Motion where an object covers unequal distances in equal intervals of time.
<b>Speed</b>	Constant speed.	Variable speed.
<b>Graphical Representation</b>	Straight line on a distance-time graph.	Curved line on a distance-time graph.
<b>Acceleration</b>	No acceleration (zero acceleration).	Acceleration is present (positive or negative).
<b>Example</b>	A car moving at a constant speed of 50 km/h on a straight road.	A car accelerating or decelerating in traffic.

### Real Life Application Based Questions

1. Why doesn't the total mass of a burning candle change in a closed container?

**Ans.** Though the candle seems to "disappear," it reacts with oxygen to form gases like CO<sub>2</sub> and water vapor. In a closed system, these products are trapped, showing that total mass remains unchanged—proving the law of conservation of mass.

2. When water is purified or distilled, it is always found to consist of hydrogen and oxygen in a fixed mass ratio of 1:8. How does the Law of Constant Proportion help explain why this ratio never changes, regardless of the source of the water?

**Ans.** The Law of Constant Proportion explains that water always contains hydrogen and oxygen in a fixed mass ratio of 1:8, regardless of its source. This is because water is a chemical compound with a consistent molecular structure—2 hydrogen atoms bonded to 1 oxygen atom—ensuring that the ratio of hydrogen to oxygen remains the same in every sample.

### Myth Buster

**Myth:** In a chemical reaction, if gases are involved, the Law of Conservation of Mass doesn't apply.

**Fact:** The Law of Conservation of Mass applies to all phases of matter, including gases. Even if gases are released or absorbed during a reaction, the total mass of the system remains constant when measured appropriately.

**Myth:** The composition of a compound can vary based on the source or method of preparation.

**Fact:** The Law of Constant Proportions states that a given chemical compound always contains its component elements in fixed ratio by mass. For example, in ammonia, nitrogen and hydrogen are always present in the ratio 14 : 3 by mass, whatever the method or the source from which it is obtained.

**Myth:** Atoms are divisible particles, which can be created or destroyed in a chemical reaction.

**Fact:** Atoms are indivisible particles in the context of chemical reactions. They cannot be created or destroyed in chemical reactions. Instead, atoms rearrange during chemical reactions to form new substances, but the number of atoms remains constant.

**Myth:** Atoms of a given element are identical in mass but differ in chemical properties.

**Fact:** Atoms of a given element are identical in mass and chemical properties.

**Myth:** According to Dalton's atomic theory, atoms of the same element are identical in every way.

**Fact:** Atoms of the same element are not always identical. For example: Carbon-12 (<sup>12</sup>C) and Carbon-14 (<sup>14</sup>C) are both carbon atoms, but they have different numbers of neutrons (6 neutrons in Carbon-12 and 8 neutrons in Carbon-14), which makes them have different masses and slightly different properties, such as their behaviour in radioactive decay.

### Mnemonics

Each Coffee Feels Refreshing (ECFR)

- E → Elements
- C → Combine in
- F → Fixed
- R → Ratios

**Real-Life Application Based Questions:** Exercises that connect theory with practical scenarios. It will enhance your understanding and relevance of concepts.

**Myth Buster:** Clear up common misconceptions to ensure your understanding is accurate.

**Mnemonics:** Memory aids to help you retain and recall information.

## CONCEPT BASED SOLVED EXAMPLES

### Multiple Choice Questions

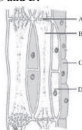
(1 M)

1. Rapid elongation of a bamboo stem is due to  
(a) Lateral meristem (b) Intercalary meristem  
(c) Apical meristem (d) Cambium

(Re) (KV 2023)

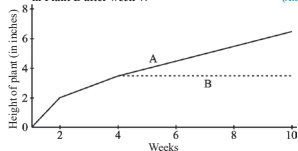


2. Parenchymatous tissue containing air cavities are called  
(a) aerenchyma (b) sclerenchyma  
(c) chlorenchyma (d) collenchyma
3. If the tip of the sugarcane plant is removed from the field, even then it keeps on growing in length. It is due to the presence of:  
(a) Cambium (b) Apical meristem  
(c) Lateral meristem (d) Intercalary meristem
4. Study the given diagram and select the correct statements regarding A, B, C and D. (An) (2024)



- (a) 'C' cells are made of dead cells and provides mechanical support to B.  
(b) 'D' is made of non-living and is involved in transportation of water.  
(c) 'B' is tubular cell involved in conduction of food.  
(d) 'A' cells are made of dead cells and is involved in transportation of water.

5. A hypothetical graph below shows the growth rate of two plants over 10 weeks. Plant A grows rapidly, while Plant B shows limited growth after week 4. Which tissue is most likely responsible for the limited increase in length in Plant B after week 4? (An)



- (a) Epidermis (b) Apical meristem  
(c) Aerenchyma (d) Lateral meristem
6. In a plant tissue experiment, students compare sections of various tissues. Under the microscope, they observe one tissue that has long and narrow cells with thickened walls, and no intercellular space. Which tissue was most likely observed?  
(a) Parenchyma (b) Collenchyma  
(c) Sclerenchyma (d) Epidermis

### Hints & Explanations

#### Multiple Choice Questions

1. (b) Rapid elongation of a bamboo stem is due to intercalary meristem. It is located at the base of internodes, allowing quick growth in length, especially in grasses like bamboo.
2. (a) Aerenchyma is a type of parenchyma tissue with large air cavities, which helps aquatic plants stay buoyant by allowing air storage.
3. (d) The growth of sugarcane continues even after the tip is removed due to the intercalary meristem, which is present at the base of the nodes, promoting elongation in length.
4. (c) In the given figure of the section of phloem, Sieve tube (B) is a tubular cell involved in the conduction of food, while A (sieve plates), C (phloem parenchyma), and D (companion cells) are living cells of phloem.
5. (b) The apical meristem is responsible for the primary growth of the plant, including the increase in stem length. If this tissue is defective or not functioning properly, the plant's growth in terms of height will be limited, as seen in Plant B after week 4.
6. (c) Sclerenchyma was most likely observed by students. Sclerenchyma cells are characterized by narrow and tall cells with thickened walls due to lignin deposition and often lack intercellular spaces, providing mechanical support to the plant.

### Solved Examples

For each topic, solved examples are provided including tagging of Competencies, PYQs, etc., that exemplify how to approach and solve questions. This section is designed to reinforce your learning and improve problem solving skills.

### MISCELLANEOUS EXERCISE



#### Multiple Choice Questions

(1 M)

1. During a chemistry class discussion on the history of atomic models, your teacher asks the class about an early model of the atom where the atom was imagined as a sphere of positive charge with negatively charged electrons embedded within it, much like raisins in a pudding. The teacher then asks who proposed this model. (Re)  
(a) J.J. Thomson (b) Ernest Rutherford  
(c) Niels Bohr (d) James Chadwick
2. Number of valence electrons in  $\text{Cl}^-$  ion are: (Re) (NCERT)  
(a) 16 (b) 8  
(c) 17 (d) 18
3. Which one of the following is a correct electronic configuration of sodium? (Re) (NCERT)  
(a) 2, 8 (b) 8, 2, 1  
(c) 2, 1, 8 (d) 2, 8, 1
4. The number of electrons in an element X is 15 and the number of neutrons is 16. Which of the following is the correct representation of the element? (Re) (NCERT Exemplar)  
(a)  $^{15}_{16}\text{X}$  (b)  $^{16}_{15}\text{X}$   
(c)  $^{15}_{15}\text{X}$  (d)  $^{16}_{16}\text{X}$

5. During your science class, your teacher explains that to understand an atom's identity, it's important to know the total number of protons and neutrons it contains. The teacher then asks the class what this total is specifically called.  
(a) Atomic number (b) Mass number  
(c) Isotopic number (d) Element number

6. Which radioactive element is used in the treatment of cancer? (Re) (DPS, 2024)  
(a) Iodine-131 (b) Uranium-234  
(c) Plutonium-239 (d) Cobalt-60

7. Which of the following are true for an element? (Re) (NCERT Exemplar)  
(i) Atomic number = number of protons + number of electrons  
(ii) Mass number = number of protons + number of neutrons  
(iii) Atomic mass = number of protons = number of neutrons  
(iv) Atomic number = number of protons = number of electrons  
(a) (i) and (ii) (b) (i) and (iii)  
(c) (ii) and (iv) (d) (ii) and (iv)

### ANSWER KEYS

#### Multiple Choice Questions

1. (a) 2. (b) 3. (d) 4. (a) 5. (b) 6. (d) 7. (d) 8. (a) 9. (b) 10. (d)
11. (b) 12. (c) 13. (a) 14. (c) 15. (c) 16. (b)

#### Assertion and Reason

1. (a) 2. (b) 3. (c) 4. (b) 5. (c) 6. (c) 7. (c) 8. (b) 9. (b) 10. (a)

### Miscellaneous Exercise

At the end of each chapter, you'll find additional exercises intended to test your grasp of the material. These are great for revision and to prepare for exams.

Answer Key and Explanations including Mistake 101, Nailing the right answer and Key takeaway can be accessed through QR code.

### Mock Test

**Mock Test Papers:** Test your preparedness with our Mock Test Papers designed to mirror the format and difficulty of real exams. Use the detailed explanations to identify areas of strength and opportunities for improvement.

## MOCK TEST PAPER-2

Time allowed: 3 hours

Maximum Marks: 80

#### NOTE:

- Please check that this question paper contains 39 questions.
- Please write down the serial number of the question in the answer-book before attempting it.
- 15 minutes time has been allotted to read this question paper. The students will read the question paper only and will not write any answer on the answer-book during this period.

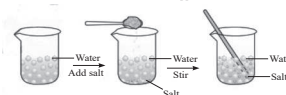
#### General Instructions:

Read the following instructions very carefully and strictly follow them:

- This question paper comprises 39 questions. All questions are compulsory.
- This question paper is divided into five sections - A, B, C, D and E.
- There is no overall choice. However, an internal choice has been provided in some sections. Only one of the alternatives has to be attempted in such questions.

#### SECTION - A

1. Priya is conducting an experiment in her science class to observe how substances dissolve in water. She adds a spoonful of salt to a beaker of water and stirs it. She notices that the salt seems to disappear and the water becomes clear again.



Based on Priya's experiment and the given information, which of the following statements best explains what happens when salt dissolves in water?

- The salt particles chemically react with the water particles to form a new substance.
- The salt particles become larger and settle at the bottom of the beaker.
- The salt particles occupy the spaces between the water particles, making the salt invisible.
- The salt particles evaporate into the air when mixed with water.

# CONTENTS

Questions have been categorized according to the Bloom's Taxonomy (as per CBSE Board).  
The following abbreviations have been used in the book:

(Un) - Understanding

(Re) - Remembering

(Ap) - Applying

(An) - Analysing

(Cr) - Creating

(Ev) - Evaluating

<b>1. Matter in Our Surroundings</b>	<b>1-17</b>	<b>7. Motion</b>	<b>158-179</b>
1. Physical Nature of Matter, Characteristics of Particles of Matter and States of Matter	3-8	1. Describing Motion	160-164
2. Evaporation	9-12	2. Measuring the Rate of Motion and Other Parameters	165-171
<b>2. Is Matter Around Us Pure?</b>	<b>18-51</b>	3. Equations of Motion, Uniform Circular Motion	172-176
1. Matter and Types of Changes	21-26	<b>8. Force and Laws of Motion</b>	<b>180-200</b>
2. Types of Pure Substances: Elements and Compounds	27-31	1. Balanced and Unbalanced Forces	182-185
3. Solutions and Types of Mixtures	32-39	2. First Law of Motion, Inertia and Mass	186-190
4. Concentration of A Solution and Solubility	40-45	3. Second and Third Law of Motion	191-197
<b>3. Atoms and Molecules</b>	<b>52-71</b>	<b>9. Gravitation</b>	<b>201-219</b>
1. Laws of Chemical Combination, Atoms and Atomic Mass	54-58	1. Universal Law of Gravitation	203-206
2. Molecules and Chemical Formulae of Common Compounds	59-64	2. Free Fall and Acceleration Due to Gravity	207-211
3. Molecular Mass and Formula Unit Mass	65-67	3. Thrust, Pressure and Buoyancy	212-216
<b>4. Structure of the Atom</b>	<b>72-96</b>	<b>10. Work and Energy</b>	<b>220-236</b>
1. Discovery of Sub-Atomic Particles	74-77	1. Work and its Principles	222-226
2. Atomic Models	78-84	2. Energy, Power, and Various Forms of Energy	227-233
3. Modern Atomic Theory	85-92	<b>11. Sound</b>	<b>237-258</b>
<b>5. The Fundamental Unit of Life</b>	<b>97-127</b>	1. Production and Propagation of Sound	239-246
1. Structure and Composition of Cells	100-111	2. Reflection and Applications of Sound	247-255
2. Cytoplasm and Cell Organelles	112-122	<b>12. Improvement in Food Resources</b>	<b>259-288</b>
<b>6. Tissues</b>	<b>128-157</b>	1. Improvement in Crop Yields	262-273
1. Plant Tissues	131-142	2. Animal Husbandry	274-284
2. Animal Tissues	143-153		

Mock Test Paper-1

291-296

Mock Test Paper-2

297-302



# MATTER IN OUR SURROUNDINGS

1



*“Everything in this universe is made up of material which is known by the name of “matter”. The air we breathe, the food we eat, stones, clouds, stars, plants and animals, even a small drop of water or a particle of sand — everything is made up of matter. All the things that are mentioned above occupy space and have mass. In other words, they have both mass and volume. Modern day scientists have discovered two types of classification of matter based on their physical properties and chemical nature.*

*In this chapter, we will learn about matter based on physical properties.”*

## SYLLABUS



### PHYSICAL NATURE OF MATTER , CHARACTERISTICS OF PARTICLES OF MATTER AND STATES OF MATTER

(Definition of Matter; Particulate Nature of Matter; States of Matter: Solid, Liquid and Gas and Their Characteristics;  
Change of State- Melting (Absorption of Heat), Freezing, Sublimation, Condensation)

### EVAPORATION

(Cooling by Evaporation)



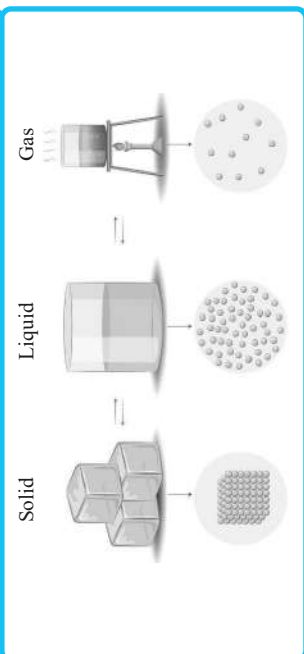
# CONCEPT MAP

To Access One  
Shot Revision Video  
Scan This QR Code



## States of Matter

Property	Solids	Liquid	Gases
Shape	Definite shape	No definite shape	No definite shape
Volume	Definite volume	Definite volume	No definite volume
Density	High	Moderate	Low
Compressibility	Negligible	Negligible to slight	Highly compressible
Fluidity	Rigid (no fluidity)	Fluid (can flow)	Fluid (can flow)
Diffusion	Very slow or negligible	Moderate	Rapid
Intermolecular Forces	Strongest	Weaker than solids	Very weak
Intermolecular Space	Very small	Moderate	Large
Examples	Ice, Sugar	Water, Milk	Oxygen, Carbon Dioxide



Anything that occupies space and has mass

**Physical Nature of Matter**

1. Matter is made up of particles
2. Particles of matter are very small

**Effect of change of Pressure:**

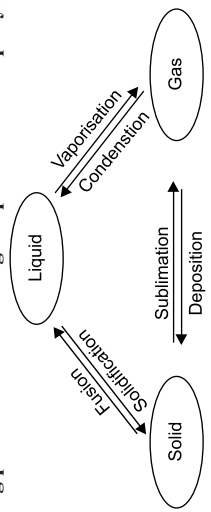
On applying pressure, particles can be brought close together

**Interconversion of Change of State of Matter**

**Effect of change of Temperature:**

Solid State  $\xrightarrow{\text{Heat}}$  Liquid State  $\xrightarrow{\text{Heat}}$  Gaseous State  
Gaseous State  $\xrightarrow{\text{Cool}}$  Liquid State  $\xrightarrow{\text{Cool}}$  Solid State

**Applying pressure and reducing temperature can liquefy gases.**



**Scales of Temperature:** The formulas to convert between the Kelvin scale (K) and the Celsius scale ( $^{\circ}\text{C}$ ) are:

1. To convert from Kelvin to Celsius:  
 $^{\circ}\text{C} = \text{K} - 273$
2. To convert from Celsius to Kelvin:  
 $\text{K} = ^{\circ}\text{C} + 273$

**Factors affecting evaporation:**

- (i) Surface area: Evaporation increases with the increase in surface area.
- (ii) Temperature: With the increase in temperature, evaporation increases.
- (iii) Humidity: As humidity increases, evaporation decreases.
- (iv) Wind speed: Evaporation increases with the increase in wind speed.

**How does evaporation causes cooling?**

- (i) Liquid keeps on evaporating in an open vessel.
- (ii) The particles of liquid absorb energy from the surrounding to regain the energy lost during evaporation.
- (iii) This absorption of energy from the surroundings makes the surroundings cold.
- (iv) Example: Water kept in an earthen pot become cold during summer due to evaporation

**Evaporation**

Evaporation is defined as the phenomenon of change of liquid into vapors at any temperature below its boiling point.

**Matter in Our Surroundings**

**Characteristics of Matter**

**Move continuously:**

Particles are always moving, their motion varies with the state of matter

**Attract each other:**

Particles exert forces of attraction that hold them together.

**Have space between them:**

Particles of one type of matter get into the spaces between particles of the other.

# 1 | PHYSICAL NATURE OF MATTER, CHARACTERISTICS OF PARTICLES OF MATTER AND STATES OF MATTER

## NCERT Definitions (Commonly asked in 1 mark)

- ☐ **Matter:** Anything that occupies space and has mass.
- ☐ **Solids:** Definite shape and definite volume.
- ☐ **Liquids:** No definite shape but have definite volume.
- ☐ **Gases:** Neither definite shape nor definite volume.
- ☐ **Melting point:** The minimum temperature at which solid melts to become a liquid at the atmospheric pressure is called its melting point.
- ☐ **Fusion:** The change of solid state into liquid state is known as fusion.
- ☐ **Latent heat of fusion:** The amount of heat energy that is required to change 1 kg of a solid into liquid at atmospheric pressure at its melting point is known as the latent heat of fusion.
- ☐ **Boiling point:** The temperature at which a liquid starts boiling at the atmospheric pressure is known as its boiling point.
- ☐ **Sublimation:** A change of state directly from solid to gas without changing into liquid state is called sublimation.
- ☐ **Deposition:** The direct change of gaseous state to solid state without changing into liquid state is called deposition.
- ☐ **Latent heat of vapourisation:** It is the heat energy required to change 1 kg of a liquid to gas at atmospheric pressure at its boiling point.
- ☐ **Diffusion:** The intermixing of particles of two different types of matter on their own is called diffusion.
- ☐ **Condensation:** The process of conversion of gas (generally water vapor) into liquid is known as condensation.

## Important Facts

- 01 Matter is made up of particles.
- 02 Particles of matter are very small.
- 03 Particles of matter have space between them.
- 04 Particles of matter continuously move.
- 05 Particles of matter attract each other.
- 06 Liquids flow and change shape, so they are not rigid but can be called fluid.
- 07 The rate of diffusion of liquids is higher than that of solids.
- 08 Applying pressure and reducing temperature can liquefy gases.
- 09 Pressure and temperature determine the state of a substance, whether it will be solid, liquid or gas.



## Important Concepts

- ❑ Particles of matter continuously move, that is they possess kinetic energy. As the temperature increases, particles move faster. So, it can be said that with an increase in temperature, the kinetic energy of particles also increases.
- ❑ The aquatic animals can breathe under water due to the presence of dissolved oxygen in water. Thus, it can be concluded that solids, liquids and gases can diffuse into liquids.
- ❑ With an increase in temperature of solids, the kinetic energy of the particles increases. Due to the increase in kinetic energy, the particles start vibrating with greater speed. The energy supplied by heat overcomes the forces of attraction between the particles due to particles leaving their fixed positions and starting moving more freely.
- ❑ Solid  $\text{CO}_2$  gets converted directly into a gaseous state on decreasing pressure to 1 atmosphere without coming into liquid state. This is the reason that solid carbon dioxide is also known by the name of dry ice.

## Difference Between

### Solid vs. Liquid vs. Gas

Basis	Solid	Liquid	Gas
<b>Rigidity</b>	Solids are rigid.	Liquids are not rigid.	Gases are not rigid.
<b>Fluidity</b>	Solids lack the ability to flow.	Liquids can flow from higher level to lower level.	Gases can flow in all directions.
<b>Volume and shape</b>	Solids have definite shape and volume due to their rigid structure.	Liquids have definite volume but it lacks definite shape and can take the shape of the container in which it is stored.	Gases neither have a definite shape nor a definite volume.
<b>Intermolecular interaction</b>	Particles in a solid are packed closely together, so they are only able to vibrate but not move.	Intermolecular interaction is comparatively less than that of solids, so the molecules or particles have enough energy to move around.	Here, the intermolecular interaction is least, so the gas molecules or particles can move freely and quickly.
<b>Compressibility</b>	One cannot compress solid appreciably.	Can be compressed.	Can be compressed significantly.

## Real Life Application Based Questions

### 1. Why can you smell hot food from a distance more easily than cold food?

**Ans.** The smell of hot food spreads more quickly than cold food because the particles in hot food have more kinetic energy. This increased movement allows the aroma particles to diffuse faster through the air, making the smell detectable from a greater distance.

### 2. When you add a drop of ink to a beaker of water, why does the ink spread throughout the water even without stirring?

**Ans.** The ink spreads in water due to the process of diffusion. The ink particles move from an area of higher concentration (where the ink is added) to an area of lower concentration (the rest of the water) until they are evenly distributed. This happens because the particles of ink and water are in constant motion.

### 3. Why do camphor tablets gradually disappear when left exposed to air?

**Ans.** Camphor tablets disappear over time due to sublimation in which a solid changes directly into a gas without passing through the liquid state.

### 4. Why does ice cream melt more quickly when it is hot outside?

**Ans.** Ice cream melts faster on a hot day because the higher temperature provides more heat energy to the ice cream which results in the increase in the kinetic energy of its particles. This causes the solid ice cream to change into liquid at a faster rate.

## Myth Buster

❑ **Myth: Matter is always visible.**

**Fact:** Not all matter is visible. Air, for example, is made up of matter, but we can't see it. Matter can exist in forms which are not visible to the naked eye, such as gases.

❑ **Myth: Particles of matter are static.**

**Fact:** Particles of matter are not static; they are always in motion.

❑ **Myth: Gases have no mass because they are less dense and spread out.**

**Fact:** Gases do have mass. Even though gases are less dense and spread out, their particles still have mass. For example, a balloon filled with air is heavier than an empty balloon, demonstrating that gases have mass.

❑ **Myth: Liquids and gases are essentially the same because they both flow and take the shape of their containers.**

**Fact:** While both liquids and gases flow and take the shape of their containers, they have distinct properties. Liquids have a definite volume but no definite shape, while gases have neither definite volume nor definite shape and can expand to fill any container.

❑ **Myth: Once a solid has melted into a liquid, it will never return to a solid state.**

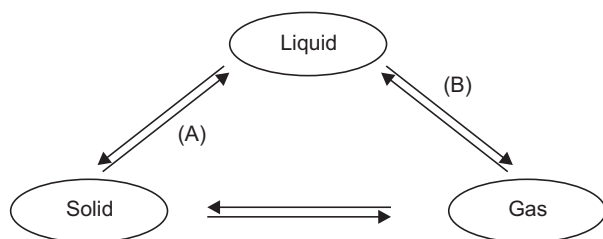
**Fact:** A liquid can solidify again if it is cooled down to the appropriate temperature. For instance, water can freeze back into ice when cooled below  $0^{\circ}\text{C}$ .

## CONCEPT BASED SOLVED EXAMPLES

### Multiple Choice Questions

(1 M)

1. Riya loves making her favourite dish, ice cream, at home. One day, she takes out a block of ice from the freezer and leaves it on the kitchen counter. After some time, she notices the ice melting into water. Curious, she heats the water on the stove, and soon it starts turning into steam. In this scenario, what process is represented by the melting of ice into water (A), and what process is shown when the water turns into steam (B)? (Un)



- (a) Fusion (A), Vaporisation (B)  
(b) Sublimation (A), Condensation (B)  
(c) Fusion (A), Condensation (B)  
(d) Vaporisation (A), Sublimation (B)
2. Seema visited a Natural Gas Compressing Unit and found that the gas can be liquefied under specific conditions of temperature and pressure. While sharing her experience with friends she got confused. Help her to identify the correct set of conditions. (Un) (NCERT Exemplar)
- (a) Low temperature, low pressure  
(b) High temperature, low pressure

(c) Low temperature, high pressure

(d) High temperature, high pressure

3. Which of the following is not a characteristic of particles of matter? (Re)

- (a) They have spaces between them.  
(b) They are in a continuous state of motion.  
(c) They attract each other.  
(d) They are stationary.

4. Aman is doing a science experiment at home. He places a piece of dry ice (solid carbon dioxide) on a plate and notices that instead of turning into a liquid, it disappears directly into the air, forming a misty cloud above the plate.

What is the term for the process Aman observes, where the solid dry ice changes directly into a gas without becoming a liquid first? (Re)

- (a) Evaporation (b) Sublimation  
(c) Condensation (d) Melting

5. A few substances are arranged in the increasing order of 'forces of attraction' between their particles. Which one of the following represents a correct arrangement? (Ap) (NCERT Exemplar)

- (a) Water, air, wind (b) Air, sugar, oil  
(c) Oxygen, water, sugar (d) Salt, juice, air

6. Which factor does not affect the rate of diffusion? (Un)

- (a) Temperature (b) Size of the particles  
(c) Nature of the medium (d) None of the above

7. Which of the following best explains why gases are easily compressible? (Un)

- (a) Gases have high densities.
- (b) The particles in gases are very closely packed.
- (c) The particles in gases are far apart.
- (d) Gases have definite shape and volume.

8. As the solid melts to form liquid, (Un) (DPS, 2023)

- (a) compressibility increases
- (b) interparticle force of attraction decreases
- (c) interparticle space increases
- (d) all of these

## Assertion and Reason

(1 M)

**Direction:** The following questions consist of two statements – Assertion (A) and Reason (R). Answer these questions by selecting the appropriate option given below:

- (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.

1. **Assertion (A):** Solids have a definite shape and volume.

**Reason (R):** The particles in solids are arranged in a fixed, closely packed pattern. (Un)

2. **Assertion (A):** Liquids can flow and take the shape of their container.

**Reason (R):** The intermolecular forces in liquids are stronger than in solids. (An)

3. **Assertion (A):** A gas completely fills the container it is placed in.

**Reason (R):** Gas particles move randomly and at high speeds, spreading out to occupy all available space. (Un)

4. **Assertion (A):** The rate of mixing of copper sulphate or potassium permanganate crystals is faster in hot water than in cold water.

**Reason (R):** The increased temperature of water decreases the kinetic energy of the water molecules, leading to faster movement and quicker dissolution of the crystals. (An)

5. **Assertion (A):** When a piece of Camphor is burnt, a lot of residue is left behind.

**Reason (R):** Camphor undergoes a change from solid to gas without going through the liquid state. (Un) (APS, 2023)

## Subjective Questions

### Very Short Answer Type Questions

(2 M)

1. The smell of hot sizzling food reaches you several metres away, but to get the smell from cold food you have to go close. Explain. (Un) (NCERT Intext) (KV, 2024)

**Ans.** Compared to cold food, the temperature of hot food is higher. (½ M)

Particles of matter that surround the hot food will have more kinetic energy. (½ M)

Higher the temperature, more will be its kinetic energy and hence, faster it will travel. (1 M)

2. Answer the following questions: (Re)

(a) What are the characteristics of the particles of matter? (NCERT Intext)

(b) Suggest a method to liquefy atmospheric gases. (NCERT Intext)

**Ans.** (a) 1. Particles of matter continuously move. (½ M)

2. Particles of matter attract each other. (½ M)

(b) The atmospheric gases can be liquefied either by decreasing temperature or by increasing pressure. (1 M)

3. (a) While performing an experiment, you notice that a gas is turning directly into a solid without becoming a liquid first.

Can you identify the term used for this process where a gas changes directly into a solid?

(b) In another experiment, you take an ice cube and place it on a hot plate. As the ice melts, it changes from a solid to a liquid. This process is known as fusion. During this phase change, the ice absorbs energy.

What is this energy called, which is required to change the ice from solid to liquid? Explain. (An)

**Ans.** (a) The direct change of state from gas to solid without changing into liquid is known as deposition. (1 M)

(b) Latent heat of fusion. (½ M)

The amount of heat energy that is required to change 1 kg of a solid into liquid at atmospheric pressure at its melting point is known as the latent heat of fusion. (½ M)

4. Convert the following temperature to celsius scale:

(a) 300 K

(b) 573 K (Ev) (NCERT Intext) (KV, 2024)

**Ans.** (a)  $300\text{ K} = (300 - 273)^\circ\text{C} = 27^\circ\text{C}$  (1 M)

(b)  $573\text{ K} = (573 - 273)^\circ\text{C} = 300^\circ\text{C}$  (1 M)

### Short Answer Type Questions

(3 M)

1. (i) What is the physical state of water at:

(a)  $250^\circ\text{C}$

(b)  $100^\circ\text{C}$  (NCERT Intext)

(ii) Why does temperature remain constant during melting of ice? (Un) (DAV, 2019)

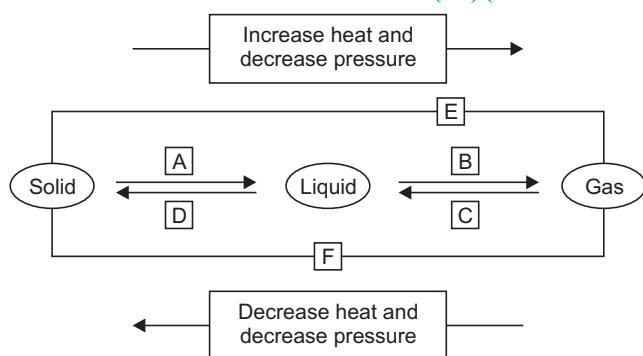
**Ans.** (i) (a) At  $250^\circ\text{C}$ , water exists in the gaseous state as the given temperature is beyond its boiling point. (1 M)

(b) At  $100^\circ\text{C}$ , water exist in both liquid and gaseous state. (1 M)

(ii) During melting of ice, the temperature remains constant because the heat provided to the system gets used up in the phase change process and hence, temperature remains constant. (1 M)

2. Identify A, B, C, D, E, and F in the following diagram that illustrates the changes in states of matter.

(An) (NCERT Exercise)



Ans. Here are the labels for the diagram showing the changes in states of matter:

- A: Fusion (Solid to Liquid) ( $\frac{1}{2}$  M)
- B: Vaporization (Liquid to Gas) ( $\frac{1}{2}$  M)
- C: Condensation (Gas to Liquid) ( $\frac{1}{2}$  M)
- D: Solidification (Liquid to Solid) ( $\frac{1}{2}$  M)
- E: Sublimation (Solid to Gas) ( $\frac{1}{2}$  M)
- F: Deposition (Gas to Solid) ( $\frac{1}{2}$  M)

3. (i) Imagine you have a rubber band in your hand. When you pull on the ends of the rubber band, you notice that it gets longer and thinner. After you let go, it goes back to its original shape. Explain.

- (ii) Consider a sponge that you use to clean dishes. When you press down on the sponge with your hand, it squashes down and becomes thinner. Once you release the pressure, the sponge returns to its original shape. Explain. (Ap)

Ans. (i) A rubber band returns to its original shape after being stretched because of its elasticity. (1 M)

On applying excessive force, it will break. ( $\frac{1}{2}$  M)

- (ii) The sponge squashes down because air is forced out of its pores and the flexible material compresses under pressure. (1 M)

When the pressure is released, the sponge's elasticity and re-entry of air allow it to return to its original shape. ( $\frac{1}{2}$  M)

4. State the difference between solid, liquid and gases on the basis of:

- (a) Volume (b) Shape (c) kinetic energy

(Un) (DPS, 2018)

Ans.

	Solid	Liquids	Gases
(a) Volume	Definite volume	Definite volume	No definite volume
(b) Shape	Definite shape	No definite shape	No definite shape
(c) Kinetic energy	Lowest kinetic energy	Moderate kinetic energy	Highest kinetic energy

(1 × 3 = 3 M)

## Long Answer Type Questions

(5 M)

1. (a) Tabulate the differences in the characteristics of states of matter.

- (b) Liquids generally have lower density as compared to solids. But you must have observed that ice floats on water. Find out why? (Un) (NCERT Intext)

Ans. (a)

Basis	Solid	Liquid	Gas
Rigidity	Solids are rigid.	Liquids are not rigid.	Gases are not rigid.
Fluidity	Solids lack the ability to flow.	Liquids can flow from higher level to lower level.	Gases can flow in all directions.
Volume and shape	Solids have definite shape and volume due to their rigid structure.	Liquids have definite volume but it lacks definite shape and can take the shape of the container in which it is stored.	Gases neither have a definite shape nor a definite volume.
Intermolecular interaction	Particles in a solid are packed closely together, so they are only able to vibrate but not move.	Intermolecular interaction is comparatively less than that of solids, so the molecules or particles have enough energy to move around.	Here, the intermolecular interaction is least, so the gas molecules or particles can move freely and quickly.
Compressibility	One cannot compress solid appreciably.	Can be compressed.	Can be compressed significantly.

(5 ×  $\frac{1}{2}$  M)

- (b) When water freezes to form ice, some empty spaces are created. ( $\frac{1}{2}$  M)

Ice has a large amount of spaces between its molecules which are larger than that of spaces present between the water molecules. (1 M)

Due to this, the volume of ice is more than that of water. ( $\frac{1}{2}$  M)

As a result, water has more density than ice and hence, ice floats on water. ( $\frac{1}{2}$  M)



### Nailing the Right Answer

While answering, students should clearly highlight that ice floats on water due to its lower density, which results from its molecular structure. Mention the presence of empty spaces between ice molecules and explain how this structure causes ice to have a greater volume than liquid water.



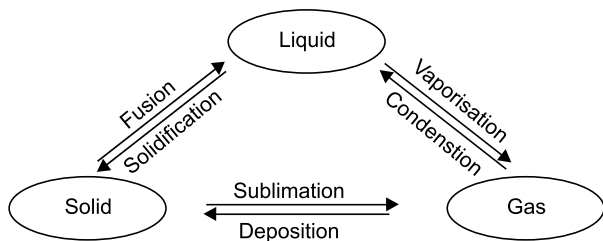
### Key Takeaways

Students should understand that the unusual structure of ice, with larger spaces between molecules, decreases its density compared to liquid water. This is why ice, despite being a solid, floats on water due to the greater volume and lower density of ice.

## Hints & Explanations

### Multiple Choice Questions

- (a) Melting of ice into water is called Fusion (solid to liquid).  
Conversion of water into steam is called Vaporisation (liquid to gas).



- (c) In order to liquefy a gas, low temperature and high pressure is required.
- (d) Particles of matter are never stationary; they are always in continuous motion. Hence, option (d) is correct.

- (b) Sublimation is the process where a solid changes directly into a gas without passing through the liquid state.
- (c) The correct order of force of attraction is:  
Solid > Liquid > Gas  
So, according to this, among the given options, correct order is given in option (c) that is:  
Oxygen < water < Sugar
- (d) All the given factors affect the rate of diffusion.
- (c) Gases are easily compressible because their particles are spaced far apart compared to solids and liquids. This large amount of empty space between gas particles allows them to be pushed closer together when pressure is applied.
- (d) When solid converts to liquid, force of attraction decreases, space between the particles increases and compressibility also increases.

### Assertion and Reason

- (a) Solids have a definite shape and volume because their particles are arranged in a fixed, closely packed pattern. The reason correctly explains the assertion.
- (c) The intermolecular forces in liquids are weaker than in solids.
- (a) A gas fills its container completely because the particles move randomly at high speeds, spreading out to fill the available space. The reason correctly explains the assertion.
- (c) Particles of matter are continuously moving, that is, they possess the kinetic energy. The rate of mixing of copper sulphate or potassium permanganate crystals is faster in hot water than in cold water because the increased temperature of the water increases the kinetic energy of the water molecules. This higher kinetic energy causes the water molecules to move more rapidly, which in turn helps the solid particles to disperse and dissolve more quickly.
- (d) Camphor sublimates (changes from solid to gas) without going through a liquid state, but it does not leave a significant residue when burnt.



# MISCELLANEOUS EXERCISE

Scan Me  
for Detailed  
Explanations



## Multiple Choice Questions

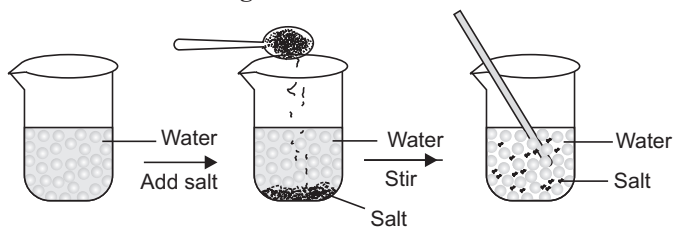
(1 M)

- 574 K in Celsius scale is: (Ev) (APS, 2023)  
(a) 300° (b) 301°  
(c) 500° (d) 575°
- Diffusion of which state of matter is maximum? (Un) (DPS, 2022)  
(a) Gas (b) Solid  
(c) Liquid (d) None of these
- Which one of the following sets of phenomena would increase on raising the temperature? (Un) (NCERT Exemplar)  
(a) Diffusion, evaporation, compression of gases  
(b) Evaporation, compression of gases, solubility  
(c) Evaporation, diffusion, expansion of gases  
(d) Evaporation, solubility, diffusion, compression of gases
- Arjun is playing with a marble and notices that it keeps its shape no matter how he handles it. He starts wondering about how the tiny particles inside the marble are arranged and how they behave.  
Which of the following best describes the behaviour and arrangement of the particles inside Arjun's marble? (Ap)  
(a) They move freely and are widely spaced.  
(b) They move past each other and are closely packed.  
(c) They vibrate in place and are closely packed.  
(d) They are spread out and move rapidly.
- At what temperature water changes to solid state? (Un) (2024)  
(a) 573 K (b) 473 K  
(c) 373 K (d) 273 K
- During summer, water kept in an earthen pot becomes cool because of the phenomenon of (Ap) (NCERT Exemplar) (DPS, 2020)  
(a) diffusion (b) transpiration  
(c) osmosis (d) evaporation
- What is the effect of increasing temperature on the kinetic energy of particles in a substance? (Un)  
(a) Kinetic energy decreases  
(b) Kinetic energy remains the same  
(c) Kinetic energy fluctuates  
(d) Kinetic energy increases
- The property to flow is unique to fluids. Which one of the following statements is correct? (Un) (NCERT Exemplar) (DPS, 2019)  
(a) Only gases behave like fluids  
(b) Gases and solids behave like fluids  
(c) Gases and liquids behave like fluids  
(d) Only liquids are fluids

- The boiling points of diethyl ether, acetone and n-butyl alcohol are 35°C, 56°C and 118°C respectively. Which one of the following correctly represents their boiling points in kelvin scale? (Ev) (NCERT Exemplar)  
(a) 306 K, 329 K, 391 K (b) 308 K, 329 K, 392 K  
(c) 308 K, 329 K, 391 K (d) 329 K, 392 K, 308 K
- At 100°C, the physical state of water is (Un) (DAV, 2023)  
(a) Liquid (b) Vapour  
(c) both (a) and (b) (d) Solid
- Which of the following is not a characteristic of a solid? (Un)  
(a) Definite shape (b) Definite volume  
(c) High compressibility (d) Rigid structure
- Choose the correct statement of the following: (Un) (NCERT Exemplar) (DPS, 2020)  
(a) conversion of solid into vapours without passing through the liquid state is called sublimation.  
(b) conversion of vapours into solid without passing through the liquid state is called vapourisation.  
(c) conversion of vapours into solid without passing through the liquid state is called freezing.  
(d) conversion of solid into liquid is called sublimation.
- A substance melts at – 15°C and boils at 150°C . What will be its physical state at room temperature (25°C)? (Un) (DAV, 2023)  
(a) Solid (b) liquid  
(c) gas (d) both solid and gas
- During a cooking class, Raj is asked to heat a pot of water on the stove. As the water heats up, he notices bubbles forming throughout the pot, and steam rising from the surface. His instructor explains that this is happening because the water has reached a specific temperature.  
What is the term for the change of state that Raj observes, where the water turns into steam throughout the pot at a specific temperature? (Ap)  
(a) Evaporation (b) Boiling  
(c) Condensation (d) Freezing
- The process by which water moves through a semipermeable membrane from a region of high concentration to a region of lower concentration, thereby equalising water concentration is called: (Un) (KV, 2023)  
(a) Evaporation (b) Diffusion  
(c) Osmosis (d) All of the above
- Which condition out of the following will increase the evaporation of water? (Un) (NCERT Exemplar)  
(a) Increase in temperature of water  
(b) Decrease in temperature of water  
(c) Less exposed surface area of water  
(d) Adding common salt to water



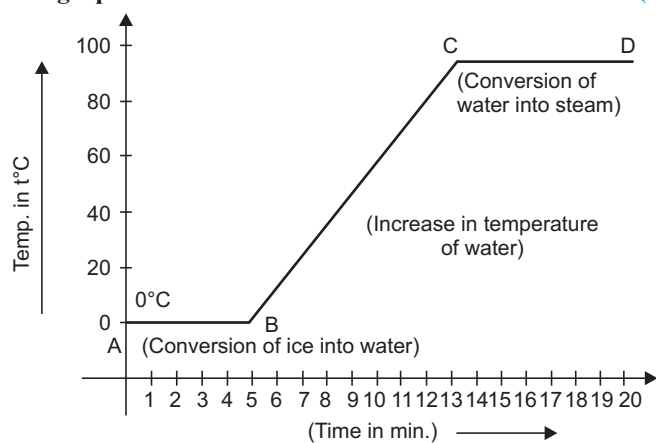
17. Priya is conducting an experiment in her science class to observe how substances dissolve in water. She adds a spoonful of salt to a beaker of water and stirs it. She notices that the salt seems to disappear and the water becomes clear again.



Based on Priya's experiment and the given information, which of the following statements best explains what happens when salt dissolves in water? (An)

- The salt particles chemically react with the water particles to form a new substance.
- The salt particles become larger and settle at the bottom of the beaker.
- The salt particles occupy the spaces between the water particles, making the salt invisible.
- The salt particles evaporate into the air when mixed with water.

18. The conclusions drawn from the temperature versus time graph are: (An)



- During the melting, the temperature of the substance does not change.
- Temperature rises after all amount of ice melts.
- At a specific temperature, water starts boiling and the temperature remains the same during the conversion of water into steam.

Which statement is correct with respect to the graph?

- Only (A) is correct
  - Only (B) is correct
  - All (A), (B), and (C) are correct
  - Only (C) is correct
19. In which of the following conditions, the distance between the molecules of liquid water would increase? (Un)
- Increasing the temperature of the liquid water
  - Increasing pressure on the liquid water contained in a closed container
  - Water evaporating into vapour

- Adding more liquid water to the container without increasing the volume of the container
- (i) and (ii)
  - (i) and (iii)
  - (ii) and (iv)
  - (iii) and (iv)

20. The forces of attraction between particles are maximum in: (Un) (2024)

- water
- ice
- water vapour
- neither maximum nor minimum but equal

21. Meera is performing an experiment in her chemistry lab where she needs to heat alcohol. Her instructor mention that she should heat the alcohol until it reaches its boiling point, which is  $78^{\circ}\text{C}$ . However, the thermometer in her lab measures temperature in Kelvin.

What temperature should Meera look for on her Kelvin thermometer to know that the alcohol has reached its boiling point of  $78^{\circ}\text{C}$ ? (Ev)

- 373 K
- 351 K
- 375 K
- 78 K

22. Which of the following will produce severe burns? (Un) (APS, 2023)

- Cold water
- Steam
- Hot water
- Boiling water

23. Which of the following conditions is most favourable for converting gas into liquid? (Un) (KV, 2024)

- High pressure, low temperature
- Low pressure, high temperature
- Low pressure, low temperature
- High pressure, high temperature

24. Evaporation of water will be faster (Un)

- near the sea
- far away from the sea
- both at equal rates
- None of the above

## Assertion and Reason

(1 M)

**Direction:** The following questions consist of two statements – Assertion (A) and Reason (R). Answer these questions by selecting the appropriate option given below:

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

- Assertion (A):** Evaporation is a surface phenomenon.  
**Reason (R):** Particles of liquid release energy to the surroundings to change into vapour. (Un)
- Assertion (A):** Cotton clothes are more comfortable in the summer.  
**Reason (R):** Cotton is a natural fibre. (Un)
- Assertion (A):** Increasing the surface area of a liquid increases the rate of evaporation.  
**Reason (R):** More particles from the surface can escape into the air when the surface area is larger. (Ap)

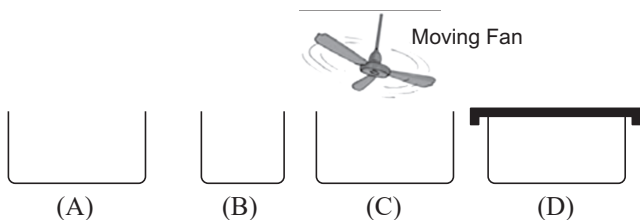
4. **Assertion (A):** Solids can be compressed easily.  
**Reason (R):** Particles in solids are closely packed. (Un)
5. **Assertion (A):** The rate of evaporation of a liquid decreases with an increase in humidity.  
**Reason (R):** High humidity means more water vapour in the air, increasing the rate of evaporation. (Ap)
6. **Assertion (A):** Evaporation of acetone from the skin causes a cooling effect.  
**Reason (R):** Evaporation requires heat, which is absorbed from the skin. (Ap)
7. **Assertion (A):** The smell of hot food reaches us faster than cold food.  
**Reason (R):** The kinetic energy of particles decreases with increase in temperature, aiding faster diffusion. (Un)
8. **Assertion (A):** The intermolecular forces in solids are stronger than in liquids.  
**Reason (R):** The space between the particles of matter is called intermolecular space. (Un)
9. **Assertion (A):** Naphthalene does not leave any residue when kept open for some time.  
**Reason (R):** The conversion of a solid directly into gas is called condensation. (Un)
10. **Assertion (A):** Ice floats on water.  
**Reason (R):** Ice is solid in nature. (Un)

## Subjective Questions

### Very Short Answer Type Questions

(2 M)

- The mass per unit volume of a substance is called density. (density = mass/volume). Arrange the following in order of increasing density – air, exhaust from chimneys, honey, water, chalk, cotton and iron. (Un) (NCERT Intext)
- Osmosis is a special kind of diffusion'. Comment. (Un) (NCERT Intext)
- To which physical state of matter do the following statements apply?
  - Incompressible, no fixed shape. (Un) (DAV, 2024)
  - Compressible, no definite volume. (Un) (DAV, 2024)
- Look at figure and suggest in which of the vessels A, B, C or D the rate of evaporation will be highest? Explain. (Ap) (NCERT Exemplar)



(NCERT Exemplar)

- Why does our palm feel cold when we put some acetone or petrol or perfume on it? (Ap) (NCERT Intext)

- In which rate of diffusion is higher - Solid or liquid? Explain. (Un)
- Write any two important precautions taken while measuring melting point of ice. (Un) (DAV, 2018)
- We can easily move our hands in air but to do the same through a solid block of wood we need a karate expert. Explain. (Un) (NCERT Intext)
- Ravi is working on a school project about the states of matter. His teacher has asked him to illustrate and explain the different processes involved in changing matter from one state to another. Ravi decides to create a diagram showing these processes.  
 Ravi needs to draw and label a diagram that shows the various processes involved in the interconversion of the three states of matter. What processes should he include in his diagram, and how should he label them? (Ap)
- Why are we able to sip hot tea or milk faster from a saucer rather than a cup? (Un) (NCERT Intext)
- A sample of water under study was found to boil at  $102^{\circ}\text{C}$  at normal temperature and pressure. Is the water pure? Will this water freeze at  $0^{\circ}\text{C}$ ? Comment. (Un) (NCERT Exemplar)
- Why does camphor disappear over time without leaving any residue?
  - What happens to the intermolecular spaces when a solid melts? (Un)

### Short Answer Type Questions

(3 M)

- Give reason for the following observations.
  - Naphthalene balls disappear with time without leaving any solid. (Un) (NCERT Exercise)
  - We can get the smell of perfume sitting several meters away. (Un) (NCERT Exercise)
- A student heats a beaker containing ice and water. He measures the temperature of the content of the beaker as a function of time. Which of the following (Fig. 1.1) would correctly represent the result? Justify your choice. (Un) (NCERT Exemplar) (DAV, 2024)

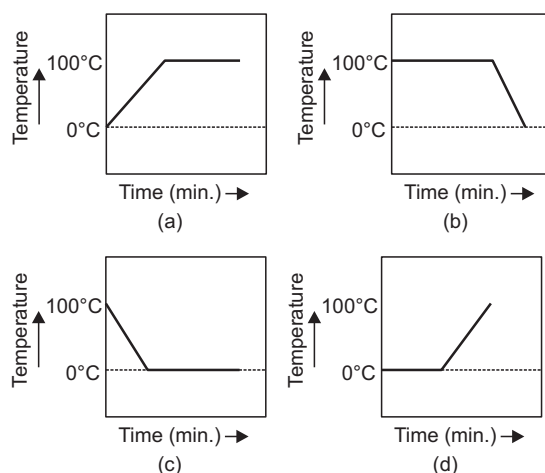


Fig. 1.1

3. A glass tumbler containing hot water is kept in the freezer compartment of a refrigerator (temperature  $< 0^{\circ}\text{C}$ ). If you could measure the temperature of the content of the tumbler, which of the following graphs (Fig. 1.2) would correctly represent the change in its temperature as a function of time.

(An) (NCERT Exemplar)

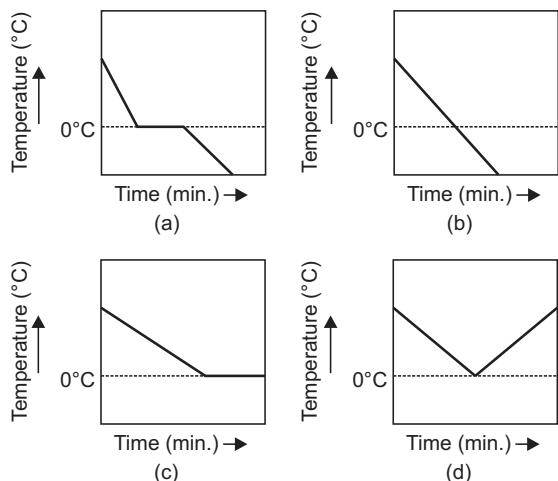


Fig. 1.2

4. Comment upon the following: rigidity, compressibility, fluidity, filling a gas container, kinetic energy and density.

(Un) (NCERT Intext)

5. (a) Oxygen is a gas. Justify the given statement by giving two reasons.  
(b) Explain any two factors affecting evaporation.

(Un) (DPS, 2023)

6. Give reason why: (DPS, 2024)

- (a) Evaporation causes cooling?  
(b) We see water droplets on the outer surface of a glass containing ice cold water?  
(c) Solids have a regular geometrical shape? (Un)

OR

- (a) Can a rubber band change its shape on stretching? Is it a solid?  
(b) Why steam at  $100^{\circ}\text{C}$  is better for heating purposes than water at  $100^{\circ}\text{C}$ ?  
(c) Which gas is called dry ice? Why? (Un)

7. (a) Convert  $50^{\circ}\text{C}$  into Kelvin. (DAV, 2018)

- (b) Why do gases exert more pressure on the walls of the container than solids? (Un)

8. Boiling point of distilled water is  $373\text{K}$ . Can we make it boil at  $370\text{K}$  or  $375\text{K}$ ? Justify your answer. (An) (DAV, 2024)

9. (a) How evaporation differs from vaporization?

(DAV, 2018)

- (b) Why is evaporation called a surface phenomenon?

- (c) What is meant by the statement that latent heat of fusion of water is  $3.34 \times 10^5 \text{ J/kg}$ ? (Un)

10. (a) Why is ice at  $273 \text{ K}$  more effective in cooling than water at the same temperature?

(NCERT Exercise) (DPS, 2018)

- (b) How the state of matter can be changed from one form to another by changing the temperature, Explain with the help of a diagram. (Un)

## Long Answer Type Questions

(5 M)

1. You are provided with a mixture of naphthalene and ammonium chloride by your teacher. Suggest an activity to separate them with a well labelled diagram.

(Un) (NCERT Exemplar)

2. (a) Convert the following temperature to Celsius scale:

(i)  $298 \text{ K}$  (ii)  $646 \text{ K}$  (iii)  $253 \text{ K}$

- (b) Give any two reasons to justify that water is a liquid at room temperature. (Un) (DPS, 2022)

3. (a) Give two practical examples of evaporation causing cooling in daily life.

- (b) Give reason for the following: (Un) (DAV, 2023)

- (i) Ice floats over water.  
(ii) Temperature remains constant during change of state of matter.  
(iii) A lighted agarbatti can be smelt from a large distance while to smell an unlit agarbatti we need to go very near.

4. (a) On dissolving a specific amount of salt/sugar into a given volume, we observe that there is no change in volume of water. This observation illustrates which characteristic of matter?

- (b) A balloon, when kept in the sun, bursts after some time. Why? (An)

5. (i) Write two uses of high compressibility property of gas.

- (ii) Give reason for the following:

- (a) A drop of Dettol is evenly distributed in a bucket of water without the need of stirring.  
(b) If the acetone bottle is left open, the bottle becomes empty within few hours.  
(c) Doctor advice to put the strips of wet cloth on the forehead of a person having high temperature.

(Ap) (DAV, 2023)

## Case Based Questions

**Case Based-I:** A matter is anything that has mass and occupies space. Pen, paper, clips, sand, air, ice, etc. are different forms of matter. Every matter is made up of small particles. These particles are so tiny that they can't be seen with naked eyes. Let's see about the different characteristics of particles of matter. All matter is made up of very small particles. Particles of matter has spaces between them. Particles of matter are continuously moving. Particles of matter attract each other. (Un) (KV, 2023)

- (i) Which of following is not matter?

- (a) Pen (b) air  
(c) smell of perfume (d) None of these (I M)



- (ii) Which of the following is true about particles of matter?
- Particles of matter has spaces between them
  - Particles of matter are continuously moving
  - Particles of matter attract each other
  - All of these
- (1 M)
- (iii) Give any four examples of matter in our surroundings
- (2 M)

**Case Based-II:** During a hot summer day, Meena noticed that the water level in the small pond near her house had decreased significantly over a few days, even though it hadn't been drained. Curious about what had happened, she remembered learning about the different states of matter and wondered the reason behind this. When she went near the pond, the air around it felt sticky and humid. One early morning, before sunrise, she noticed a thin mist forming just above the pond's surface, which faded away as the sun came up.

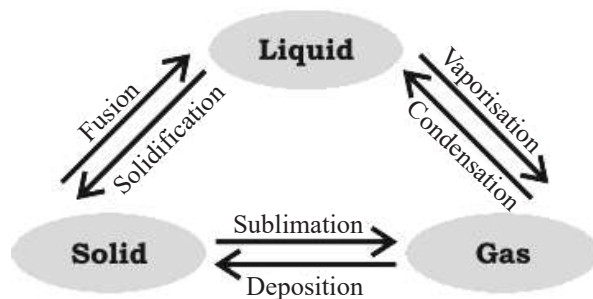
Based on this, answer the following questions: (An)

- What is the process responsible for the decrease in the water level in the pond? (1 M)
- Why does the air feel more humid and sticky near the pond? (1 M)
- Would the rate of evaporation be faster or slower on a cooler, cloudy day? Explain why. (2 M)

OR

What is the significance of the faint mist Meena saw rising from the pond's surface? (2 M)

**Case Based-III:** Matter exists in three primary states: solid, liquid, and gas. Solids have definite shape and volume, with particles tightly packed in a fixed arrangement. Liquids maintain a definite volume but take the shape of their container, with particles more loosely arranged than solids. Gases have neither definite shape nor volume, as particles are widely spaced and move freely. Changes in temperature and pressure can cause substances to transition between these states through processes like fusion, solidification, evaporation, condensation, sublimation and deposition, demonstrating the dynamic nature of matter across different physical conditions.



- How can solid  $\text{CO}_2$  be transformed into a gaseous state, and what is this process known as? (2 M)

OR

If melting is referred to as fusion, what is meant by the melting point and what does it indicate? (2 M)

- The property of flow is unique to fluids. Which states of matter exhibit fluid-like behavior? (1 M)
- Among diffusion, evaporation, gas compression, and gas expansion, which processes are increased by an increase in temperature? (1 M)

**Case Based-IV:** On a hot summer afternoon, Suman bought an ice cream cone. As she stepped outside the shop, she noticed the ice cream melting rapidly. She realized that the heat from the surroundings was causing the solid ice cream to turn into a liquid, making it difficult to enjoy her treat before it melted completely.

(Un)

- What process is responsible for the melting of the ice cream? (1 M)

OR

Suggest one way Suman could slow down the melting of her ice cream on a hot day. (1 M)

- How does the temperature of the surroundings affect the rate at which the ice cream melts? (2 M)
- Would the ice cream melt faster on a humid day or a dry day? Explain your reasoning. (1 M)

## ANSWER KEYS

### Multiple Choice Questions

- |         |         |         |         |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (b)  | 2. (a)  | 3. (c)  | 4. (c)  | 5. (d)  | 6. (d)  | 7. (d)  | 8. (c)  | 9. (c)  | 10. (c) |
| 11. (c) | 12. (a) | 13. (b) | 14. (b) | 15. (c) | 16. (a) | 17. (c) | 18. (c) | 19. (b) | 20. (b) |
| 21. (b) | 22. (b) | 23. (a) | 24. (b) |         |         |         |         |         |         |

### Assertion and Reason

- |        |        |        |        |        |        |        |        |        |         |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|
| 1. (c) | 2. (b) | 3. (a) | 4. (d) | 5. (c) | 6. (a) | 7. (c) | 8. (b) | 9. (c) | 10. (b) |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|



# MOCK TEST PAPER-1

**Time allowed: 3 hours**

**Maximum Marks: 80**

**NOTE:**

- (i) Please check that this question paper contains **39** questions.
- (ii) **Please write down the serial number of the question in the answer-book before attempting it.**
- (iii) 15 minutes time has been allotted to read this question paper. The students will read the question paper only and will not write any answer on the answer-book during this period.

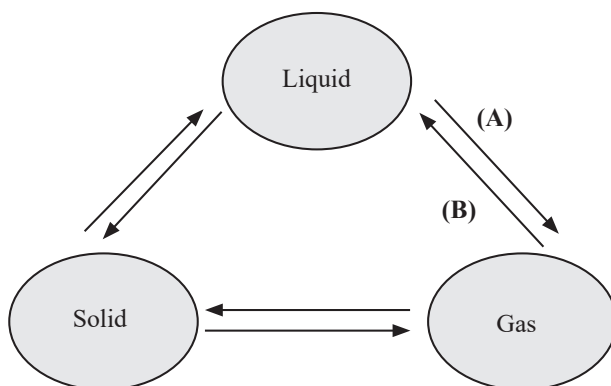
**General Instructions:**

**Read the following instructions very carefully and strictly follow them:**

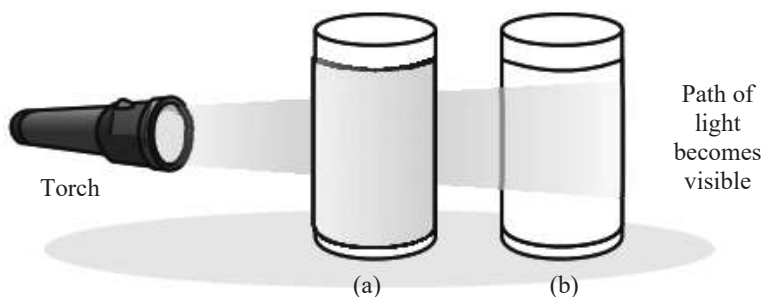
- (i) This question paper comprises **39** questions. **All** questions are compulsory.
- (ii) This question paper is divided into **five** sections - **A, B, C, D** and **E**.
- (iii) **Section A** - Questions No. **1** to **20** are multiple choice questions. Each question carries **1** mark.
- (iv) **Section B** - Questions No. **21** to **26** are very short answer type questions. Each question carries **2** marks. Answer to these questions should be in the range of 30 to 50 words.
- (v) **Section C** - Questions No. **27** to **33** are short answer type questions. Each question carries **3** marks. Answer to these questions should be in the range of 50 to 80 words.
- (vi) **Section D** - Questions No. **34** to **36** are long answer type questions. Each question carries **5** marks. Answer to these questions should be in the range of 80 to 120 words.
- (vii) **Section E** - Questions No. **37** to **39** are of **3** source-based/case-based units of assessment carrying **4** marks each with sub-parts.
- (viii) There is no overall choice. However, an internal choice has been provided in some sections. Only one of the alternatives has to be attempted in such questions.

## SECTION - A

1. The following figure illustrates the three states of matter and their interconversion. Identify the processes represented by A and B. 1



- (a) (A) Vapourisation, (B) Condensation (b) (A) Fusion, (B) Condensation  
 (c) (A) Sublimation, (B) Condensation (d) (A) Fusion, (B) Solidification
2. How many protons, electrons, and neutrons are present in  $X^-$  if the atomic number of X is 17 and the mass number is 35? 1  
 (a) P = 35, E = 35, N = 18 (b) P = 17, E = 17, N = 16  
 (c) P = 17, E = 18, N = 18 (d) P = 35, E = 18, N = 16
3. Ravi has prepared a 0.02% (by mass) solution of sodium chloride (NaCl) in water. Which of the following options correctly describes the composition of the solution? 1  
 (a) 2.00 g of NaCl + 100 g of water (b) 0.20 g of NaCl + 100 g of water  
 (c) 0.02 g of NaCl + 99.98 g of water (d) 0.40 g of NaCl + 99.60 g of water
4. The chemical symbol for copper is 1  
 (a) Co (b) Cu (c) Cp (d) K
5. According to the law of constant proportions, which of the following statements is true for a compound like carbon dioxide ( $CO_2$ )? 1  
 (a) The ratio of carbon to oxygen by mass is always 1 : 2, regardless of its source.  
 (b) The ratio of carbon to oxygen by mass varies depending on the preparation method.  
 (c) The ratio of carbon to oxygen by mass is 3 : 8 regardless of whatever the method or the source from which it is obtained.  
 (d) The ratio of carbon to oxygen by mass is not fixed and can vary widely.
6. In the given experiment, a torch is used to pass light through two beakers. Beaker (a) contains a solution of copper sulphate, and beaker (b) contains a mixture of water and milk. Why is the path of light visible in a beaker (b) but not in a beaker (a)? 1



- (a) The solution in a beaker (a) is opaque.  
 (b) The mixture in a beaker (b) is a colloid, which scatters light due to larger particles.  
 (c) Beaker (a) is made of a different material that absorbs light.  
 (d) The torch is brighter when directed at the beaker (b).
7. Which of the following statements about Rutherford's model of atom are correct? 1  
 (i) considered the nucleus as positively charged  
 (ii) established that the  $\alpha$ -particles are four times as heavy as a hydrogen atom  
 (iii) can be compared to solar system  
 (iv) was in agreement with Thomson's model  
 (a) (i) and (iii) (b) (ii) and (iii) (c) (i) and (iv) (d) only (i)

8. During an experiment, a scientist discovers that a bacterial cell lacks ribosomes. What critical cellular process would be primarily affected? 1

- (a) DNA synthesis                      (b) Protein synthesis                      (c) ATP synthesis                      (d) Nutrient absorption

9. Which characteristic of meristematic cells primarily contributes to their ability to continuously divide and form new tissues in plants? 1

- A. Presence of thin cellulosic cell walls  
B. Lack of vacuoles  
C. Dense cytoplasm and prominent nuclei  
D. Presence of thick cellulosic cell walls  
E. Presence of vacuoles

Choose the correct option:

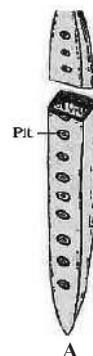
- (a) A and C                      (b) A, C and D                      (c) B and E                      (d) A, B and C

10. Which type of irrigation system is most suitable for areas with insufficient or irregular canal flow? 1

- (a) Dug wells                      (b) Tube wells                      (c) River lift systems                      (d) Tanks

11. If in a plant, the structure 'A' is damaged, which of the following would most likely occur? 1

- (a) The plant will not transport food properly.  
(b) The plant will not transport water and minerals vertically.  
(c) The plant's roots will not grow properly anymore.



- (d) The plant will not grow new leaves anymore.

12. A satellite is moving in a circular orbit around the Earth with constant speed. Which of the following statements is true? 1

- (a) The satellite is accelerating.                      (b) The satellite is in uniform motion.  
(c) The satellite is in non-uniform motion.                      (d) The satellite's velocity is zero.

13. A force of 10 N is applied to a mass of 2 kg at rest. What will be its velocity after 5 seconds? 1

- (a) 25 m/s                      (b) 10 m/s                      (c) 50 m/s                      (d) 100 m/s

14. Which of the following frequencies is beyond the human hearing range? 1

- (a) 10 Hz                      (b) 1000 Hz                      (c) 10 kHz                      (d) 100 kHz

15. Which of the following statements is true according to Newton's First Law of Motion? 1

- (a) An object at rest will remain at rest unless acted upon by an external force.  
(b) An object in motion will continue in motion with the same speed and in the same direction unless acted upon by an external force.  
(c) Both (a) and (b)  
(d) Neither (a) nor (b)

16. A solid cube of wood with a density of  $700 \text{ kg/m}^3$  and a volume of  $0.5 \text{ m}^3$  is placed in water. Will the cube float or sink, and why? 1

- (a) Float, because its density is less than that of water.  
(b) Sink, because its density is greater than that of water.  
(c) Float, because its volume is greater than its mass.  
(d) Sink, because its volume is less than its mass.

**Q. no. 17 to 20** are Assertion - Reasoning based questions. These consist of two statements – Assertion (A) and Reason (R). Answer these questions by selecting the appropriate option given below:

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

17. **Assertion (A):** The rate of mixing of copper sulphate or potassium permanganate crystals is faster in hot water than in cold water. 1

**Reason (R):** The increased temperature of water decreases the kinetic energy of the water molecules, leading to faster movement and quicker dissolution of the crystals.

18. **Assertion (A):** Chromosomes are composed of DNA and proteins. 1

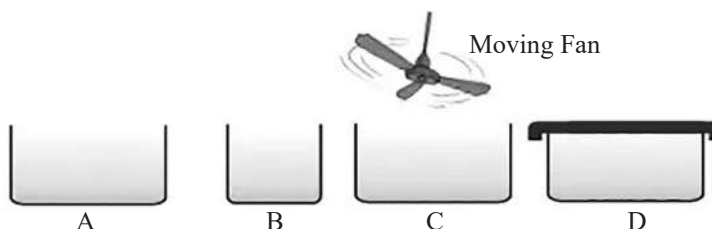
**Reason (R):** Chromosomes are visible as thread-like structures in non-dividing cells.

19. **Assertion (A):** In a velocity-time graph, the area under the graph represents the distance traveled by the object. 1  
**Reason (R):** The slope of a velocity-time graph gives the acceleration of the object.
20. **Assertion (A):** Nerve impulses allow us to move our muscles and enable rapid responses to stimuli in animals. 1  
**Reason (R):** Many nerve fibres bound together by connective tissue make up a nerve.

## SECTION - B

**Q. no. 21 to 26 are Very Short Answer Questions**

21. Imagine you are conducting an experiment to measure the rate of water evaporation under controlled conditions. You have four different vessels as shown below:



- In which vessel, rate of evaporation will be the highest? 2
22. Explain why sound travels faster in water than in air. Include a brief explanation related to the medium's properties. 2
23. What traits are aimed for the cross-breeding of Indian breeds like *Aseel* with foreign breeds like Leghorn? 2

**OR**

- What are the key practices involved in organic farming that promote sustainable agricultural systems? 2
24. What is an echo? Under what conditions can it be heard? 2
25. Define kinetic energy and provide its formula. 2

**OR**

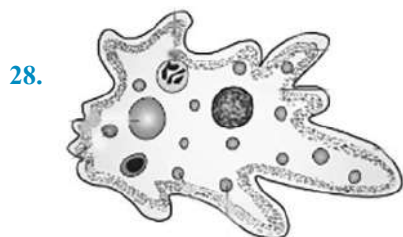
- A cyclist travels along a straight path with a constant acceleration of  $2 \text{ m/s}^2$ . If the cyclist's initial velocity is  $5 \text{ m/s}$ , what is the cyclist's velocity after 4 seconds? Also, calculate the total distance covered in this time. 2
26. (a) Explain the process of membrane biogenesis and the role of ER in it. 2  
 (b) How are chloroplasts and mitochondria similar in terms of genetic material?

## SECTION - C

**Q. no. 27 to 33 are Short Answer Questions**

27. Match the following animal tissues with their position/location: 3

	Tissue		Position/location
A.	Squamous epithelium	i.	Between skin and muscles
B.	Columnar epithelium	ii.	Inner intestinal lining
C.	Cuboidal epithelium	iii.	Kidney tubules
D.	Areolar tissue	iv.	Oesophagus
E.	Adipose tissue	v.	Nose
F.	Cartilage	vi.	Below skin and between internal organs



28. (a) Identify the type of organism shown in the image.  
 (b) What process does this organism use to acquire its food?  
 (c) These organisms have food vacuole. How does the food vacuole function in these organisms? 3

**OR**

How are chromatin, chromosomes, and genes structurally and functionally related within the nucleus, particularly during cell division? 3

29. A block of metal is submerged in water and experiences an upthrust of 10 N. If the density of the metal is  $8000 \text{ kg/m}^3$  and the volume of the block is  $0.001 \text{ m}^3$ , calculate the buoyant force acting on the block. 3
30. A car's velocity-time graph shows a straight line increasing from 0 to 20 m/s over 10 seconds. Calculate the car's acceleration and the total distance traveled. 3
31. Define the following terms: 3  
(a) Pasturage (b) Vermicompost (c) Crop rotation
32. (a) Under which category of mixtures will you classify suspensions and why?  
(b) A colloid is always a solid. Comment.  
(c) Can a colloid be homogeneous? 3
33. Provide explanations:  
(a) Imagine you are in a desert area during a hot summer day. You notice that your neighbour is using a desert cooler while others are using regular fans. Why do you think the neighbour finds the desert cooler more comfortable, and how does it work better than a fan in such conditions?  
(b) During a family picnic in the summer, you decide to bring along an earthen pot (matka) filled with water. After a few hours, you find the water in the pot to be cooler than the water from plastic bottles. Can you explain why the water in the earthen pot is cooler and how this cooling process works?  
(c) You're enjoying a cold drink on a hot day, and you notice that water droplets have formed on the outside of your glass. Your friend asks why this happens. How would you explain the process that causes these droplets to appear? 3

**SECTION - D**

**Q. no. 34 to 36 are Long Answer Questions**

34. (a) Classify each of the following on the basis of their atomicity. 5  
(i)  $\text{Cl}_2$  (ii)  $\text{SO}_2$   
(iii)  $\text{N}_2\text{O}_3$  (iv)  $\text{C}_3\text{H}_8$   
(v)  $\text{S}_8$  (vi)  $\text{H}_2\text{O}$   
(b) You start with a container that holds exactly 4 grams of nitrogen gas ( $\text{N}_2$ ). According to your lab manual, the reaction to form ammonia requires nitrogen and hydrogen to combine in a mass ratio of 14 : 3.  
Given this information, calculate the mass of hydrogen gas ( $\text{H}_2$ ) you need to react completely with your 4 grams of nitrogen gas.

**OR**

- (a) Give the names of the elements present in the following compounds. 5  
(i) Table salt (ii) Slaked lime  
(iii) Vinegar (iv) Baking powder  
(b) How many atoms are present in a  
(i)  $\text{CO}_2$  molecule (ii)  $\text{NH}_4^+$  ion  
(c) Write down the names of compounds represented by the following formulae:  
(i)  $\text{KNO}_2$  (ii)  $\text{H}_2\text{S}$   
(iii)  $\text{K}_2\text{SO}_4$  (iv)  $\text{MgCl}_2$
35. In brief, explain what happens when the following organelles are removed from a plant cell: 5  
(a) Nucleus (b) Cell wall (c) Cell membrane (d) Vacuole  
(e) Golgi apparatus

**OR**

Give reason for the following:

- (a) Meristematic cells possess a prominent nucleus and dense cytoplasm but are devoid of vacuoles. 5  
(b) Plants like cacti have thick epidermis.  
(c) Chewing a pear fruit gives a crunchy and granular sensation.  
(d) It is challenging to remove the husk from a coconut.  
(e) Bones are strong and non-flexible.



36. (a) A car accelerates uniformly from rest to a speed of 30 m/s in 10 seconds. Draw the velocity-time graph for this motion and calculate the acceleration of the car. 1
- (b) If the car continues to travel at a constant speed for an additional 20 seconds, calculate the total distance covered during the entire motion. 2
- (c) Explain how the distance-time graph for uniform motion differs from that of uniformly accelerated motion. 2

### SECTION - E

**Q. no. 37 to 39 are Case Based/Source-Based Questions with 2 to 3 short sub-parts.**

37. Isotopes and isobars are two important concepts in nuclear chemistry that help us understand the behaviour of elements. Isotopes are variants of the same element that have the same number of protons but different numbers of neutrons, resulting in different atomic masses. For example, carbon-12 and carbon-14 are isotopes of carbon, with six protons but different neutron counts. In contrast, isobars are atoms of different elements that have the same mass number but different atomic numbers, meaning they contain same sum of numbers of protons and neutrons. An example of isobars includes argon-40 and calcium-40, both having a mass number of 40 but differing in their elemental identity. Understanding isotopes and isobars is crucial in fields such as radiocarbon dating, nuclear medicine, and understanding the stability of atomic nuclei.

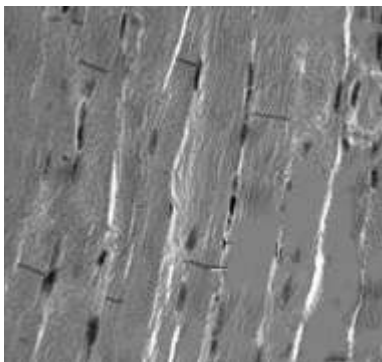
- (a) The average atomic mass of a sample of an element X is 16.2 u. What are the percentages of isotopes  $^{16}_8\text{X}$  and  $^{18}_8\text{X}$  in the sample? 2
- (b) The atomic numbers of potassium and calcium are 19 and 20 respectively, but the mass number of both these elements is 40. What is the name given to such a pair of elements? 1
- (c) The chemical properties of isotopes are similar, but their physical properties differ. Why? 1

**OR**

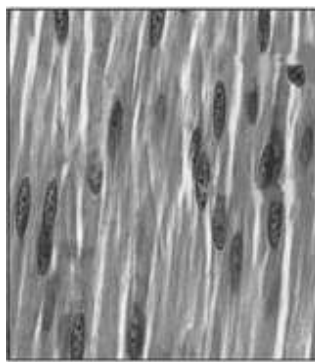
- (c) Which element's isotope is used in the treatment of cancer and goitre? 1
38. An astronaut named Alex is exploring a newly discovered planet, Xylon, which has a mass of  $5 \times 10^{24}$  kg and a radius of 6,400 km. Alex, with a mass of 80 kg, is on the surface of Planet Xylon. The planet is unique because it has only one-sixth of the density of Earth but the same surface gravity.
- (a) Calculate the acceleration due to gravity on the surface of Planet Xylon. 1
- (b) Alex notices that he weighs less on Xylon compared to Earth. Calculate Alex's weight on Xylon and compare it to his weight on Earth (using  $g_{\text{Earth}} = 10\text{m/s}^2$ ). 1
- (c) If the radius of Planet Xylon were to double while keeping its mass constant, how would the acceleration due to gravity change? 1

**OR**

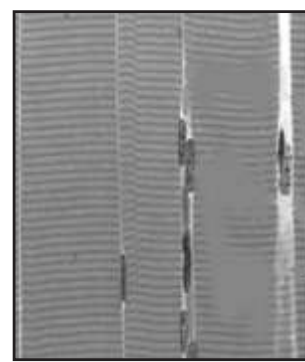
- (c) Alex is exploring the gravitational field at a height of 10,000 km above the planet's surface. How would the gravitational force on Alex change at this height compared to his weight on the surface? 1
39. While preparing for a practical exam, a student reviewed slides A, B and C of muscle tissues under a microscope. Observe these and answer the following questions:



**A**



**B**



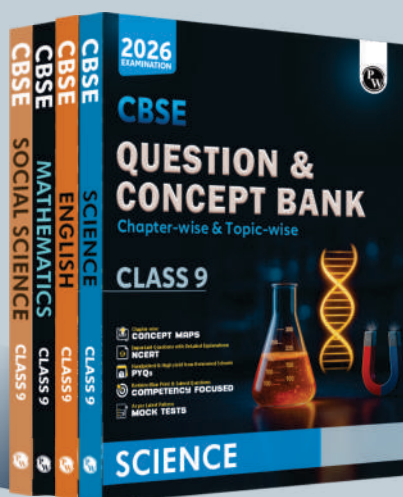
**C**

- (a) Identify and name the muscle tissue in each slide. 1
- (b) Which muscle type is responsible for the rhythmic contractions of the heart? 1
- (c) Which muscle type is striated and voluntary? Mention other characteristic features of cells of this type of muscle. 2

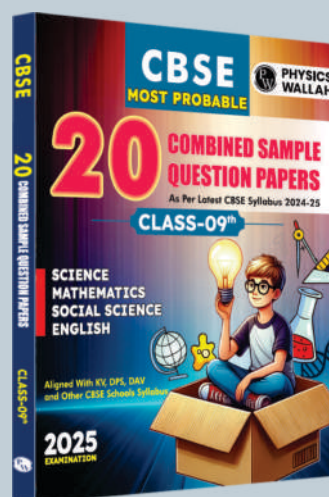
**OR**

- (c) Where is muscle B typically found? Mention the characteristic features of cells of this type of muscle. 2

# Other Helpful Books



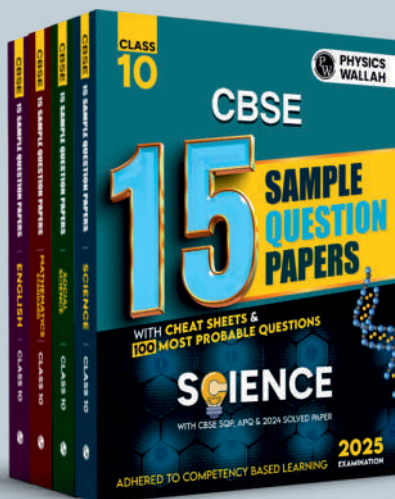
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