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Particulate Nature of Matter

Fill in the Blanks

1. Matter is made up of extremely small _____.
2. The space between particles is called _____ space.
3. Interparticle attraction is _____ in solids.
4. Liquids have definite _____ but no definite shape.
5. Gases have _____ interparticle forces of attraction.
6. The temperature at which a solid changes into liquid is called _____ point.
7. The change of liquid into vapour is called _____.
8. Diffusion occurs fastest in _____ state.
9. Heating increases the _____ energy of particles.
10. Sugar dissolves in water because particles occupy _____ between water particles.

Multiple Choice Questions

1. The particles of matter are:
 - a) Stationary
 - b) Invisible and motion less
 - c) Always moving
 - d) Only vibrating in gases
2. Which state has maximum interparticle space?
 - a) Solid
 - b) Liquid
 - c) Gas
 - d) Plasma
3. Melting point is the temperature at which:
 - a) Liquid becomes gas
 - b) Solid becomes liquid
 - c) Gas becomes liquid
 - d) Liquid becomes solid
4. Which diffuses fastest?
 - a) Perfume in air
 - b) Ink in water
 - c) Sugar in water
 - d) Sand in water
5. The boiling point of water is:
 - a) 0°C
 - b) 50°C
 - c) 100°C
 - d) 273°C
6. Liquids flow because:
 - a) Particles are fixed
 - b) Particles can slide past each other
 - c) Particles are very far apart
 - d) There is no attraction
7. Compressibility is highest in:
 - a) All equal
 - b) Solids
 - c) Liquids
 - d) Gases
8. The fragrance spreading in a room is due to:
 - a) Evaporation
 - b) Condensation
 - c) Diffusion
 - d) Melting
9. Ice changing to water is:
 - a) Freezing
 - b) Melting
 - c) Condensation
 - d) Sublimation
10. Which has fixed volume and shape?
 - a) Gas
 - b) Liquid
 - c) Solid
 - d) Vapour

Short Answer Questions

1. What is matter?
2. Define interparticle space.
3. Why do solids have fixed shape?
4. What is melting point?
5. Why are gases compressible?
6. What is diffusion? Give one example.
7. Why do liquids take the shape of container?
8. What happens to particles on heating?
9. Why is smell of perfume detected from far away?
10. Why does sugar dissolve in water but sand does not?

Long Answer Questions

1. Explain particulate nature of matter with activities.
2. Differentiate solids, liquids and gases based on particle arrangement.
3. Explain interparticle forces and their effect on states of matter.
4. Explain effect of temperature on movement of particles.
5. Describe changes in particles during melting and boiling.
6. How does particulate nature explain dissolving of substances in water?
7. Explain real-life applications of particulate nature of matter.

Assertion – Reason Questions

Directions:

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

1. A: Gases are compressible.
R: Gas particles have large spaces.
2. A: Liquids have fixed shape.
R: Particles move freely.
3. A: Solids are rigid.
R: Particles are tightly packed.
4. A: Diffusion occurs faster in hot water.
R: Particles move faster at higher temperature.
5. A: Sugar disappears in water.
R: Sugar reacts chemically with water.

Answers

Fill in the blanks

1. particles
2. interparticle
3. strongest
4. volume
5. very weak
6. melting point
7. evaporation
8. gaseous
9. kinetic
10. spaces

MCQs

1. (c) Always moving
2. (c) Gas
3. (b) Solid becomes liquid
4. (a) Perfume in air
5. (c) 100°C
6. (b) Particles can slide past each other
7. (d) Gases
8. (c) Diffusion
9. (b) Melting
10. (c) Solid

Short Questions – Answers

Ans 1. Matter is anything that has mass and occupies space. All objects around us — air, water, wood, metal, food, and even our body — are made of matter. Matter exists in three main states: solid, liquid, and gas, depending on how its particles are arranged and how they move.

Ans 2. Interparticle space is the empty space present between the particles of matter. It is very small in solids, larger in liquids, and maximum in gases. Because of this space, substances like sugar or salt can dissolve in water by occupying the spaces between water particles.

Ans 3. Solids have a fixed shape because their particles are tightly packed together and held by strong interparticle forces of attraction. The particles cannot move freely and only vibrate about their fixed positions. Therefore, solids maintain a definite shape and volume.

Ans 4. The melting point is the temperature at which a solid changes into a liquid at atmospheric pressure. At this temperature, particles gain enough energy to overcome the attractive forces holding them in fixed positions and start moving more freely.
Example: Ice melts into water at 0°C.

Ans 5. Gases are compressible because the particles in gases are very far apart and there is a lot of empty space between them. When pressure is applied, these particles can be pushed closer together, reducing the volume. That is why gases can be stored in cylinders.

Ans 6. Diffusion is the process in which particles of one substance spread and mix with particles of another substance on their own due to their continuous motion.

Example: The smell of perfume spreading throughout a room after it is sprayed.

Ans 7. Why do liquids take the shape of container?

Liquids take the shape of their container because their particles are close together but not fixed. The particles can slide past one another due to weaker forces of attraction compared to solids. Therefore, liquids flow and adopt the shape of the container while keeping a fixed volume.

Ans 8. When a substance is heated, its particles gain kinetic energy and start moving faster.

- The distance between particles increases.
- The force of attraction decreases.
- This may cause a change of state, such as solid → liquid → gas.

Ans 9. Perfume evaporates and its particles mix with air particles. Since gas particles move freely and rapidly in all directions, the perfume particles spread throughout the room by diffusion. Therefore, we can smell it even from far away.

Ans 10. Sugar dissolves because its particles separate into very tiny particles and occupy the interparticle spaces between water particles.

Sand does not dissolve because its particles are larger and strongly held together, so water particles cannot pull them apart.

Long Questions – Answers

Ans 1. The particulate nature of matter means that all matter is made up of extremely small particles.

Activity 1 – Breaking chalk:

When a piece of chalk is broken into smaller and smaller pieces and finally powdered, each tiny speck still remains chalk. This shows matter is made of small particles.

Activity 2 – Dissolving sugar in water:

When sugar is added to water, it disappears but the water tastes sweet. This means sugar particles occupy the spaces between water particles and are too small to be seen.

Conclusion:

These activities prove that matter consists of tiny particles that cannot be seen with the naked eye.

Ans 2.

Property	Solid	Liquid	Gas
Arrangement	Closely packed	Less closely packed	Very far apart
Shape	Fixed	No fixed shape	No fixed shape
Volume	Fixed	Fixed	No fixed volume
Motion	Vibrate only	Slide past each other	Free movement
Force of attraction	Very strong	Moderate	Very weak

Ans 3. Interparticle forces are the forces of attraction between particles of matter.

- Solids: Strongest forces → particles tightly packed → fixed shape and volume
- Liquids: Moderate forces → particles move within limited space → fixed volume but no fixed shape
- Gases: Very weak forces → particles move freely → no fixed shape or volume

Thus, the strength of interparticle forces determines the state of matter.

Ans 4. Explain effect of temperature on movement of particles.

Temperature increases the kinetic energy of particles.

- Particles move faster when heated.
- Interparticle distance increases.
- Attraction between particles decreases.

Thus, heating can change the state of matter:

Solid → Liquid → Gas

Example: Ice melts to water and then changes into steam.

Ans 5. Describe changes in particles during melting and boiling.

Melting (solid → liquid):

Particles gain energy → vibrate faster → leave fixed positions → move freely.

Boiling (liquid → gas):

Particles gain more energy → overcome attraction → move far apart → become gas.

Thus, particle spacing and motion increase from solid to gas.

Ans 6. How does particulate nature explain dissolving of substances in water?

Water particles have spaces between them. When substances like sugar or salt are added, their particles separate and occupy these spaces. Therefore, the substance disappears but remains present in the solution.

Hence, dissolving supports the idea that matter has interparticle spaces.

Ans 7. Explain real-life applications of particulate nature of matter.

- Perfume smell spreading in air (diffusion)
- Sugar dissolving in tea
- Drying of clothes (evaporation)
- LPG stored in cylinders (compressibility of gases)
- Soap cleaning oil stains (particles surround oil particles)

These examples show matter is made of tiny moving particles.

Assertion – Reason

1. (a)
2. (d)
3. (a)
4. (a)
5. (c)