Matter

EXERCISE

Question 1.

Explain the meaning of the term 'matter'.

Answer:

Matter is defined as anything that has mass, occupies space and can be felt by the senses.

Question 2.

Matter in any state is composed of small particles – molecules, atoms or ions. Differentiate the terms above in Italics.

Answer:

Molecules : A molecule is the smallest particle of a substance that can normally exist separately and retain the characteristics of the substance, e.g. O_2 , H_2 , Cl_2 are molecules.

Atoms : An atom is the smallest particle of an element which can take part in a reaction and is considered the basic unit of matter, e.g. O, H, Cl are atoms.

Ions : An ion is any atom or a group of atoms which has a resultant charge due to loss or gain of electrons, e.g. O^{2-} , H^{1+} , CI^{1-} are ions.

Question 3.

Differentiate between the-two characteristics of matter – 'mass' & 'weight'.

Answer:

Mass :

- 1. The amount of matter in a body.
- 2. It is measured in Kilograms (kg).

Weight :

- 1. Due to the pull of gravity on a body.
- 2. It is measured in Newtons (N)

Question 4.

State which of the three states of matter Le. solids, liquids or gases – have

- (a) No definite volume
- (b) A definite shape
- (c) High density
- (d) No free surfaces
- (e) Particles which diffuse very easily.

Answer:

- (a) Gases
- (b) Solids

- (c) Solids
- (d) Gases
- (e) Gases

Question 5.

State the main postulates of the kinetic theory with special reference to -

- (a) Inter-particle space
- (b) Inter-particle attraction
- (c) Energy possessed by particles of matter.

Answer:

(a) **Inter-particle space :** The particles are arranged in a way such that they have spaces existing between them. i.e. inter molecular space.

(b) Inter-particle attraction : All particles attract each other with a force which is maximum if the particles are close to each other and minimum if the particles are at a distance from each other i.e. decreases with increase distance and vice-versa.

(c) Energy possessed by particles of matter : Since particles are in continuous motion, they, possess energy called kinetic energy. Application of heat increases kinetic energy of particles – which then move more randomly.

Question 6.

State in which of the following examples ie. a piece of wood, water, a light gas is the

- (a) Inter-particle space maximum
- (b) Inter-particle attraction maximum
- (c) Energy possessed by particles of matter, very large.

Answer:

- (a) A light gas
- (b) a piece of wood
- (c) a light gas

Question 7.

In which of the three states of matter – solids, liquids or gases is the movement of atoms about their own position. Give a reason for the same.

Answer:

Movement of atoms[molecules] in solids are about their own position.



This is because of Minimum Inter Particle space and very strong inter – particle attraction among atoms.

Question 8.

'Inter-particle attraction between atoms of gases is very weak'. State five properties of gases which correlate as a consequence of the weak inter-particle attraction between particles of gases.

Answer: Gases are

. . . .

- least rigid
 highly compressible
- Inter-Particles attraction between atoms of gases is very weak. The five properties of gases which correlate as a consequence of the weak inter-particle attraction between particles of gases are :
 - They have no definite volume.
 - They have no definite shape.
 - They have no free surface.

Gases Rapidly diffuse with other gas particles,



Question 9.

What is inter-conversion of matter. Give the meaning of the terms involved in inter-conversion of matter

- (a) Melting
- (b) Vaporisation
- (c) Liquefaction or condensation,
- (d) Solidification or freezing
- (e) Sublimation.

Answer:

INTERCONVERSION OF MATTER :

"Change of state of matter from one state to another state and back to its original state is called inter-conversion of matter."

(a) **MELTING** : Conversion of a solid into a liquid on heating e.g. ice to water.

(b) VAPORISATION : Conversion of a – liquid into vapours (or gas) on heating e.g. water to water vapour.

(c) LIQUEFACTION or CONDENSATION : Conversion of VAPOUR (or gas) into a LIQUID on cooling e.g. water vapour to water.

(d) **SOLIDIFICATION OR FREEZING :** Conversion of a LIQUID into a SOLID e.g. water to ice.

(e) **SUBLIMATION**: Conversion of a — SOLID directly in GASEOUS (vapour) state and on cooling directly back to SOLID e.g. Naphthalene sublimes at room temperature.

Question 10.

Draw a labelled schematic diagram representing the terms (a) to (e) involved in the interconversion of matter.

Answer:

(a) Melting





Question 11.

With reference to inter-conversion of matter – on the basis of kinetic theory – explain in brief the conversion of :

- (a) A solid into a liquid
- (b) A liquid into vapour [or gas]
- (c) Vapour [or gas] into a liquid
- (d) A liquid into a solid

With special reference to inter-particle space & inter particle attraction at the different stages of conversion.

Answer:

(a) A solid into a liquid : Kinetic energy increases

- 1. Heat energy is absorbed by the molecules and stored in the form of potential energy.
- 2. Inter-particle space-increases.
- 3. Inter-particle attraction-decreases.
- 4. Collision-increases and push apart. Solid changes into liquid.

(b) A liquid into vapour [or gas] :

- 1. Heat energy absorbed -stored as potential energy.
- 2. Inter-particle space-increases.
- 3. Inter-particle attraction-decreases (almost negligible).
- 4. Collision-increase and particles push apart become free and escapes gas. Liquid changes into vapours.

(c) Vapour [or gas] into a liquid :

- 1. Potential energy released in the form of heat energy.
- 2. Inter-particle space-decreases considerably.
- 3. Inter-particle attraction-increases.
- 4. Collision-decrease to negligible particles are not in a position to be free. Vapours changes into liquid state.

(d) A liquid into a solid :

- 1. Potential energy (stored) is-released.
- 2. Inter-particle space-decreases.
- 3. Inter-particle attraction-increases. Particles are not in position to be free.

4. Collision-decreases. Liquid changes into solid.

Question 12.

On the basis of kinetic theory explain why, ammonium chloride sublims and goes from solid state directly into vapour state.

Answer:

Ammonium Chloride sublimes and goes from solid state directly into vapour state because if low inter-particle attraction.

Sublimable solids have very low force of attraction between their particles.

Question 13.

State the 'law of conservation of mass'. State the main points of Landolt's experiment for experimental evidence of the law.

Answer:

Law of Conservation of Mass : "In any chemical reaction, the total mass of the reacting substances is equal to the total mass of the products of the reaction provided masses are measured under similar conditions."

Landolt's experiment : To illustrate the law of conservation of mass. Two solutions – NaCl in limb A and AgNO₃ sol. in limb B were taken in U-shaped tube and weighed.



Landolt's Experiment

Now tube was tilted so that two solutions get mixed and react with each other to form new products. Tube is weighed again

Weight after reaction was found to be same as before reaction.

 $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$

Total mass of reactants = Total mass of products This verifies the law.

Two other examples are :

1. We can take two solutions of lead acetate Pb $(CH_300)_2$ in limb A and sodium sulphate Na_2So_4 in limb B in the U-shaped tube. Pb $(CH_3COO)_2 + Na_3So_4 \rightarrow PbSo_4 + 2CH_3COONa$ 2. We can also take two solutions of iron [II] sulphate FeSo₄ in limb A and silver sulphate Ag₂So₄ in limb B in U- shaped tube still the result is found to be same. $2FeSo_4 + Ag_2So_4 \rightarrow 2Ag \downarrow + Fe_2(So_4)_3$

OBJECTIVE TYPE QUESTIONS

Q.1. Select the correct answer from A, B, C, D & E for each statement given below: A: Solid

B: Vaporization

C: Ion

- D: Gases
- E: Heat

Question 1.

An atom or group of atoms – having a resultant charge.

Answer:

C:Ion

Question 2.

The state of matter which has – least density & no free surfaces.

Answer:

D : Gases

Question 3.

In Landolt's experiment – the form in which the chemical energy stored up in the reactants – is released.

Answer:

E : Heat

Question 4.

The process of change of a liquid into vapour, [gas] on heating.

Answer:

B : Vaporization

Question 5.

The state of matter, where the inter-particle attraction between particles is maximum.

Answer:

A : Solid

Q.2. With reference to the liquid state of matter – answer the following

Question 1.

On heating the liquid, do the particles gain or lose energy.

Answer:

Gain energy.

Question 2.

The heat energy supplied to the liquid is absorbed by its molecule & stored as which form of energy.

Answer:

Potential energy.

Question 3.

How does the stored energy, have effect on inter-particles space.

Answer:

Stored potential energy increases the space.

Question 4.

State why the inter-particles attraction decreases to negligible.

Answer:

This is so because when distance between particles increases, and force of attraction decreases leading to Inter-particle attraction to almost negligible.

Question 5.

At what point will the particles become free and escape as gas.

Answer:

At boiling point.

Q.3. Complete the statement by filling the blanks with the correct word from the brackets.

Question 1.

In naphthalene, the inter-particle attraction is __ [high/low].

Answer:

In naphthalene, the inter-particle attraction is **low.**

Question 2.

The law of conservation of mass, is strictly valid if mass and __ [energy/volume] are considered together.

Answer:

The law of conservation of mass, is strictly valid if mass and **energy** are considered together.

Question 3.

When inter-particle space increases, the inter-particle attractive force ___ [decreases/increases].

Answer:

When inter-particle space increases, the inter-particle attractive force decreases.

Question 4.

Kinetic energy of molecules in helium is __ [large / very large] compared to the kinetic energy of molecules in water.

Answer:

Kinetic energy of molecules in helium is **large** compared to the kinetic energy of molecules in water.

Question 5.

Conversion of vapour [or gas] into a liquid is termed ___ [liquefaction/vaporization].

Answer:

Conversion of vapour [or gas] into a liquid is termed liquefaction.

Q.4. Give reasons for the following

Question 1.

Particles of matter possess energy called kinetic energy.

Answer:

Particles of matter are contiunously moving, that is, they possesses kinetic energy.

Question 2.

Solids cannot be compressed, but gases are highly compressible.

Answer:

- **In solids :** Particles are closely packed. Inter-particle space is minimum and hence cannot be compressed.
- **In gases :** Particles are least compact and inter-particle spaces are maximum. Hence are highly compressible.

Question 3.

Kinetic energy of molecules of gases is very large & of solids, the least.

Answer:

The Kinetic Energy of molecules of gases is very large because :

- 1. The inter-particle space between the particles is maximum.
- 2. The Inter-particle attraction between the particles is negligible. Whereas The kinetic energy of molecules of solids is least

because :

- 1. The Inter-particle space between the particles is maximum.
- 2. The Inter-particle attraction between the particles is very strong.

Question 4.

On heating a sublimable solid, the molecules break free & escape from surface of the solid directly into vapour.

Answer:

On heating a sublimable solid the inter-particle attraction is overcome and the molecules breakfree and escapes from the surface of the solid directly into the vapour.

Question 5.

Particles of matter move more rapidly on application of heat.

Answer:

Application of force increases the **K.E.** of particles and space increases and inter-particle attraction decreases. Thus particles

move rapidly.

Q.5. Complete the blanks with reference to interconversion of matter on basis of kinetic theory-with the word 'increase', 'decreases', 'gain', 'lose' or 'overcome' in each case.

- 1. During melting of solids, the inter-particles space increases.
- 2. During vaporization, the liquid particles **gain** energy.
- 3. During liquefaction, the particles **lose** energy.

- During soldification, the inter-particle space decreases gently.
 During sublimation the inter-particle attraction is overcome.