

## Frank Solutions Class 9

### Chemistry

#### Chapter 1 Matter and Its Composition: the Law of Conservation of Mass

##### Exercise

**1. Define matter. Give five examples of matter.**

**Ans:** Everything around us which occupies space and has a definite mass is called matter.

For example Books, Aluminium, Oil, Kerosene, Oxygen, nitrogen, etc.

**2. What are the conditions for something to be called matter?**

**Ans:** There are two main conditions for something to be called matter:

- It should occupy some space
- It must have a definite mass.

**3. Light and sound are not considered to be matter. Why?**

**Ans:** Both Light and sound do not have any mass and also not cover space, these both are the main conditions for something to be called matter. Hence light and sound are not considered as matter.

**4. State two characteristic properties each of**

- a. A solid**
- b. A liquid**
- c. A gas**

**Ans:** The properties of matter are as follows:

- a. Solid**

- The intermolecular space is very less in them and hence the force of attraction between the molecules is higher.
- They have definite mass, shape and volume.

b. Liquid

- The intermolecular space is greater as compared to solids and hence, the force of attraction is lesser.
- They have definite mass and volume but their shape is not definite. It takes the shape of a container.

c. Gas

- The intermolecular space is higher as there is a very weak intermolecular force present.
- They only have definite mass, but do not have definite volume and shape. Like liquids they also take the shape of the container.

**5. Give two reasons for saying that wood is solid.**

**Ans:** Wood is a solid, this can be said on the basis of following reasons

- Wood has a definite mass, volume and shape.
- Their intermolecular forces are so high that they do not float.
- It is rigid.
- It cannot be compressed.

**6. Why do gases have neither a fixed shape nor a fixed volume?**

**Ans:** Gases do not have fixed shape and a fixed volume because the intermolecular space is very high and the force of attraction is weakest between them, so have least density. Due to this, they can flow easily. Hence, gases have no fixed shape and volume.

**7. Out of solids, liquids and gases which one has**

**a. Maximum movement of particles**

**b. Maximum interparticles attractions****c. Maximum spaces between particles**

**Ans:** The answers are as follows:

- Matter with maximum movement of particles: Gases
- Matter with maximum interparticle attractions: Solid
- Matter with maximum spaces between particles: Solid

**8. Compare properties of solids, liquids and gases.**

**Ans:** The difference between solid, liquid and gases are as follows:

Sr. no.	Properties	Solids	Liquids	Gases
1	Appearance	Have definite mass, volume and a fixed shape	Have only definite mass and volume but does not have fixed shape	Only have definite mass. Neither volume nor shape is fixed in them.
2.	Compression	They cannot be compressed.	They can be compressed but requires a large pressure	They can compressed easily
3.	Density	Have higher density	Lesser density as compared to solids.	Least density among all states of matter
4.	Intermolecular Forces of attraction	They have the highest Intermolecular Forces of attraction.	Comparatively less Intermolecular Forces of attraction than solids.	Weakest Intermolecular Forces of attraction.

5.	Intermolecular space	Negligible intermolecular space	There is some more intermolecular space in them.	The space between gas molecules is largest
6.	State of packing	The particles are closely packed and their position is fixed	The particles are loosely packed and their position is not fixed.	The particles are wide apart and their positions are also not fixed.
7	Energy associated	Particles can vibrate only to and fro about their mean positions. Therefore, they have kinetic energy due to their motion	The particles can move about more freely and have considerable kinetic energy due to their motion.	The particles move about freely and have maximum kinetic energy due to their motion.

### 9. Fill in the blanks

- Solid, liquid, and ..... Are the three states for the matter?
- In the solid state of a substance, the force of attraction is very .....
- The conversion of a solid directly into gas is called .....
- ..... is a process in which vapor is changed into a liquid.
- In ..... state of a substance, the cohesive force is much weaker compared to the separating force.

**Ans:** The answers are as follows:

- Solid, liquid, and gas are the three states of matter.
- In the solid state of a substance, the force of attraction is very strong.
- The conversion of a solid directly into gas is called Sublimation.
- Condensation is a process in which a vapor is changed into a liquid.

- e. In gaseous state of substance, the cohesive force is much weaker compared to the separating force.

**10. State the postulates of kinetic theory of matter.**

**Ans:** The postulates of kinetic theory of matter are as follows:

- Composition of matter: Matter whether in the solid, liquid or gaseous state is composed of very small particles which may be molecules, atoms or ions.
- Arrangement of particles: These particles have spaces lying between them and these spaces are referred to as intermolecular spaces or interparticle spaces.
- Force of attraction: The force of attraction between molecules of a given substance are called intermolecular forces. The magnitude of this force depends upon the state of the substance and on the magnitude of the intermolecular spaces. As the intermolecular spaces increases the intermolecular force decreases
- The motion of the constituent particles. The particles are always in a state of motion. In solids, they vibrate about their mean positions, and in liquids and gases, they move randomly.
- The kinetic energy of the particles increases with rise in temperature. As the temperature increases, the particles undergo motion vigorously and more randomly.

**11. On the basis of kinetic theory, explain the conversion of**

- Solid to liquid**
- Gas to liquid**
- Liquid to gaseous state**
- Liquid to solid state**

**Ans:** The explanation for conversion is as follows:

- Solid to liquid state conversion: The kinetic energy increases as the solid is heated to convert into liquid. The heat energy is absorbed by the

molecules of solid and stored in the form of potential energy. The interparticle spaces between molecules increase. As the space between molecules increases, they move around more, increasing the collision. The inter-particle attraction decreases as the molecules move away from each other.

- b. Gas to liquid: The kinetic energy increases as the liquid is heated to convert into solid. The heat energy is absorbed by the molecules of liquid and stored as potential energy. The interparticle spaces between molecules of liquid increase. As the space between molecules increases, they move around more freely. This increases the collision between molecules, they push apart and escape gas. The inter-particle attraction decreases as the molecules move away from each other
- c. Liquid to gaseous state: The potential energy stored by vapour molecules is released in the form of heat energy. The interparticle spaces between molecules decrease and they become compact. As the space between molecules decreases, they cannot move around as freely as before. The inter-particle attraction increases as the molecules come closer to each other
- d. Liquid to solid state: The potential energy stored by liquid molecules is released in the form of heat energy. The interparticle spaces between molecules decrease and they are now closely packed. As the space between molecules is negligible, they cannot move around at all. The inter-particle attraction increases rapidly as the molecules come closer to each other.

## 12. Define

- a. Freezing
- b. Evaporation
- c. Boiling point
- d. Melting point

**Ans:** The definitions are as follows

- a. Freezing: The process of changing a liquid into a solid by cooling is called freezing. Freezing means solidification. It occurs at a definite temperature called freezing point.
- b. Evaporation: Evaporation is the process by which a liquid turns into a gas. It is also one of the three main steps in the global water cycle.
- c. Boiling point: The temperature at which the pressure exerted by the surroundings upon a liquid is equalled by the pressure exerted by the vapour of the liquid; under this condition, the addition of heat results in the transformation of the liquid into its vapour without raising the temperature.
- d. Melting point: The temperature at which the solid and liquid forms of a pure substance can exist in equilibrium. As heat is applied to a solid, its temperature will increase until the melting point is reached. More heat then will convert the solid into a liquid with no temperature change.

**13. Which phenomena occur during the following changes?**

- a. **Size of naphthalene balls decreases**
- b. **Drying of wet clothes**
- c. **Wax melts in the sun**
- d. **Formation of clouds**

**Ans:** The answers are as follows:

- a. Size of naphthalene balls decreases: This phenomenon is called sublimation. Sublimation is the transition of a substance directly from the solid phase to the gas phase without passing through the intermediate liquid phase. Sublimation is an endothermic phase transition that occurs at temperatures and pressures below the triple point of a chemical in the phase diagram.

- b. Drying of wet clothes: This phenomenon is called evaporation. Evaporation happens when a liquid turns into a gas. It can be easily visualized when rain puddles “disappear” on a hot day or when wet clothes dry in the sun. In these examples, the liquid water is not actually vanishing—it is evaporating into a gas, called water vapour.
- c. Wax melts in the sun: This phenomenon is called melting. Melting is a physical process that results in the phase transition of a substance from a solid to a liquid. This occurs when the internal energy of the solid increases, typically by the application of heat or pressure, which increases the substance's temperature to the melting point.
- d. Formation of clouds: This phenomenon is called evaporation and condensation. The process of evaporation followed by condensation causes the formation of clouds. Water present on the earth's surface gets evaporated due to sunlight, and then rises up in the atmosphere. On reaching a certain height, water vapour present in air condenses to form tiny droplets of water. These water droplets collect to form clouds that float in air.

**14. Name three compounds which are sublimates.**

**Ans:** Three sublimate compounds are as follows:

- Camphor
- Naphthalene
- Iodine

**15. Draw the “states of matter triangle” to show the interconversion of states of matter.**

**Ans:** The diagram is as follows:



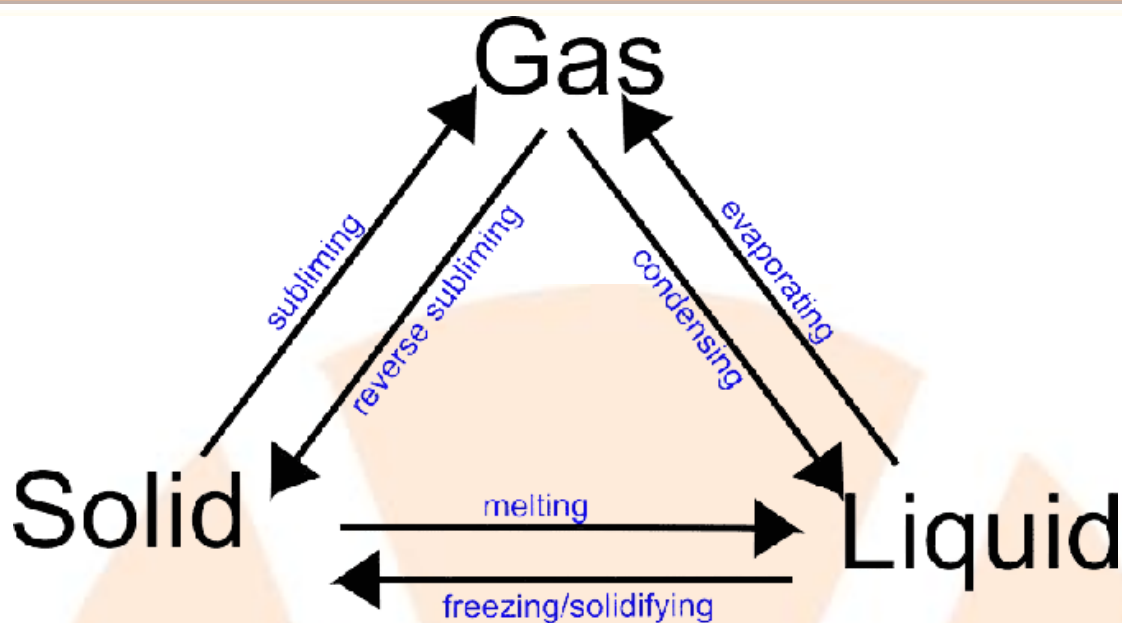


Image: States of Matter Triangle

**16. What is evaporation? Why does evaporation cool a liquid?**

**Ans:** Evaporation is the process by which a liquid turns into a gas. When evaporation occurs liquid absorbs heat from the surroundings to get converted to its vapour form as a result, there is an overall decrease in the heat leading to cooling of the liquid.

**17. State whether the statements are true or false?**

- Sublimation occurs only when the solid is heated.**
- Ans increase in pressure rises the melting point of solid**
- Intermolecular spaces are maximum in solids.**
- Gases do not have any free surfaces.**

**Ans:** The answers are as follows:

- Sublimation occurs only when the solid is heated.
- The above-given statement is TRUE. Sublimation is the transition of a substance directly from the solid phase to the gas phase without passing through the intermediate liquid phase.

b. An increase in pressure rises the melting point of a solid

The above-given statement is TRUE. The melting point of most solid substances increases with an increase in pressure. However, ice melts at a temperature lower than its usual melting point when pressure is increased.

c. Intermolecular spaces are the maximum in solids.

The above-given statement is FALSE. Intermolecular space is maximum in gases less in liquids and the least in solids.

d. Gases do not have any free surfaces.

The above-given statement is TRUE. The intermolecular force of attraction of gases is the least compared to solids and liquids. The intermolecular force of attraction is very less in gases and does not allow gases to form free surfaces.

**18. State the law of conservation of mass.**

**Ans:** The law of conservation of mass states that in a chemical reaction mass is neither created nor destroyed. For example, the carbon atom in coal becomes carbon dioxide when it is burned. The carbon atom changes from a solid structure to a gas but its mass does not change.

**19. Give one example of each physical change and chemical change to illustrate the law of conservation of mass.**

**Ans:** The law of conservation of mass states that in a chemical reaction mass is neither created nor destroyed. For example, the carbon atom in coal becomes carbon dioxide when it is burned. The carbon atom changes from a solid structure to a gas but its mass does not change.

**20. Name the following:**

- a. That which occupies space and has mass.
- b. The mass of matter has definite mass, volume, and shape.
- c. The state of matter has no definite volume and shape.

- d. The state of matter that has the highest intermolecular attraction.**
- e. The state of matter that has negligible intermolecular attraction.**
- f. The state of matter has very high compressibility.**
- g. The state of matter has only one surface.**
- h. The kind of matter that has fluidity.**
- i. The change in state from solid to liquid.**
- j. The change in state from liquid to gas.**

**Ans:** The answers are as follows:

- a. That which occupies space and has mass is called Matter
- b. The mass of matter that has definite mass, volume, and shape is Solid
- c. The state of matter that has no definite volume and shapes Gas
- d. The state of matter that has the highest intermolecular attraction Solid.
- e. The state of matter that has negligible intermolecular attraction is Gas
- f. The state of matter that has very high compressibility Gas
- g. The state of matter that has only one surface is Liquid.
- h. The kind of matter that has fluidity is Fluid.
- i. The change in state from solid to liquid Melting.
- j. The change in state from liquid to gas Vapourisation.