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# Sanjiv Refresher

# SCIENCE

**Based on Latest NCERT Text Book**

## For Class-9

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# Contents

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# Matter in Our Surroundings

## Basic Concepts

- Since early times, human beings have been trying to understand their nature. Earlier, matter was classified into five basic elements, the "*Pancha Tattva*"—Air, Earth, Fire, Sky and Water.
- **Matter :** Anything that occupies space and has mass is called matter. For example – Chair, table, cow, pencil, tree, etc.
- **Characteristics of Matter :**
  - Matter is made up of small particles. These small particles are called atoms.
  - These atoms are too small, so they cannot be seen by naked eye.
  - The atoms are constantly moving as they possess kinetic energy.
  - These particles have inter-spaces between them.
  - Particles of matter attract each other because of force of attraction.
  - Intermixing of particles of two different types of matter on their own is called diffusion.
- **Three states of Matter :**
  There are three states of matter –
  **(1) Solid :** Solids have fixed volume and shape. In solids, particles are closely packed and they have very less spacing between them. In solids, particles only vibrate at their mean position and they have less kinetic energy. The force of attraction between the particles of solids is very strong. For example – Stone, wood, sugar, coal, etc.
  **(2) Liquid :** Liquid has fixed volume but indefinite shape. In liquid, there is a weaker force of attraction and more spacing between the particles. In liquids, particles can move around and have high kinetic energy. For example – Milk, water, petrol, kerosene, etc.
  **(3) Gas :** Gases have indefinite shape and volume. Particles of gases have large space between them, but very weak attraction between them. Particles of gases move around very easily and have very high kinetic energy. For example – Air, hydrogen, nitrogen, etc.
- **Changes in states of Matter :**
  (i) Matter can be changed from one state to another state. A solid can be changed into liquid and a liquid can be changed into gas.
  (ii) Most of the metals, which are solid turn into liquid on heating and turn into vapour on further heating.

(iii) The change in states of matter mainly depends upon two factors :
(a) Temperature (b) Pressure

- **Temperature :** Generally, on heating temperature of substances increases. But, during the transformation, temperature remains the same.
  - **Melting point :** It is the temperature at which a solid changes into liquid.
  - **Boiling point :** It is the temperature at which a liquid changes into gas.
  - On heating—
    - **(i) Temperature increases :** When temperature increases, heat is used to increase the motion of the particles.
    - **(ii) State changes :** Particles use heat to overcome force of attraction to change the state.
  - **Latent heat :** It is the heat supplied to a substance during the change of its state.
    - **(i) Latent heat of fusion :** It is the amount of heat energy required to change 1 kg of solid into liquid at its melting point.
    - **(ii) Latent heat of vapourisation :** It is the amount of heat energy required to change 1 kg of a liquid to gas at atmospheric pressure at its boiling point.
- **Pressure :**

**Solid :** (i) There is no effect of pressure on solids.
(ii) Solids are non-compressible.
(iii) When pressure increases on solid, it is deformed and finally broken.

**Liquid :** (i) There is no effect of pressure on liquid.
(ii) Liquids are non-compressible.

**Gas :** (i) The volume of gas decreases with increase in pressure.
(ii) Since, there is lot of space between the particles of gas. Therefore, gas is compressible.

- **Evaporation :** Evaporation is a phenomenon in which a liquid changes into vapour below its boiling point.
- **Factors Affecting Evaporation :**
  (i) Temperature
  (ii) Surface area
  (iii) Humidity
  (iv) Wind
- **Cooling Effect of Evaporation :** Liquid needs latent heat of evaporation. It takes this heat from things in its surroundings. It means things in surroundings lose heat and thus they get cooled down.

## INTEXT QUESTIONS

**Page No. 3**

**Q. 1. Which of the following are matter?**
**Chair, air, love, smell, hate, almond, thought, cold, lemon water, smell of perfume.**

**Ans. :** Anything that occupies space and has mass is called matter. Matter can exist in three physical states—solid, liquid and gaseous. Chair and almond are forms of matter in solid state. Cold drink is a liquid state of matter. Air and smell of perfume are gaseous states of matter. Love, smell, cold are not matter, as they are feelings that do not have mass and don't occupy space.

**Q. 2. Give reasons for the following observation :**
**The smell of hot sizzling food reaches you several metres away, but to get the smell from cold food you have to go close.**

**Ans. :** The smell of hot sizzling food reaches us several metres away because food particles diffuse faster in air when temperature is high and we can smell it earlier, whereas cold food particles take time to diffuse so we have to go close to smell it.

**Q. 3. A diver is able to cut through water in a swimming pool. Which property of matter does this observation show?**

**Ans. :** This observation shows that the intermolecular space is high in liquid. So, the diver can easily pass through it.

**Q. 4. What are the characteristics of particles of matter?**

**Ans. :** The characteristics of particles of matter are :
→ Particles of matter have spaces between them.
→ Particles of matter are continuously moving.
→ Particles of matter attract each other.

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**Q. 1. 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 chimney, honey, water, chalk, cotton, and iron.**

**Ans. :** Air, exhaust from chimney, cotton, water, honey, chalk, and iron.

**Q. 2. (a) Tabulate the differences in the characteristics of states of matter.**
**(b) Comment upon the following : rigidity, compressibility, fluidity, filling a gas container, shape, kinetic energy and density.**

**Ans. :** (a) Differences in the characteristics of states of matter :

| Property | Solid | Liquid | Gas |
|---|---|---|---|
| Rigidity and compressibility | Rigid and cannot be compressed | Not rigid and can be compressed to a little extent. | Not rigid and can be easily compressed |
| Shape | Definite shape | Shape of container | No definite shape |
| Volume | Definite volume | Definite volume | No definite volume |
| Fluidity | Cannot flow | Can flow from higher to lower level | Flow in all direction |
| Diffusion | Almost nil | Diffuse slowly | Diffuse easily |
| Storage | Can be stored without container | Open/closed container is needed | Only closed container can store |
| Intermolecular space | Least | Greater than solid but lesser than gases | Maximum |

| | | | |
|---|---|---|---|
| Arrangement of molecules | Regular, close to each other | Random or irregular close to each other | Random and wide apart |
| Movement of molecules | Very little movement in the form of vibrations | Molecules can move around each other | Quick movement in random direction |
| Strength of bond between molecules | Strong bond | Weak bond | Very loose bonding |
| Examples | A rock | Water | Water vapour |

(b) **(i) Rigidity –** It is the property of matter to counter the change of its shape.
**(ii) Compressibility –** It is the property of matter in which its volume is decreased by applying force.
**(iii) Fluidity –** It is the ability of matter to flow.
**(iv) Filling a gas container –** On filling a gas or liquid, it takes the shape of the container.
**(v) Shape –** A shape is the form of an object or its external boundary.
**(vi) Kinetic energy –** The kinetic energy of an object is the energy that is due to its motion.
**(vii) Density –** Density of a substance is its mass per unit volume.

**Q. 3. Give reasons :**
**(a) A gas fills completely the vessel in which it is kept.**
**Ans. :** The force of attraction between particles of gas is negligible. Thus, the particles of gas can move in all directions and fills the vessel completely in which it is kept.
**(b) A gas exerts pressure on the walls of the container.**
**Ans. :** Particles of gas move randomly in all directions with high speed. Therefore, the particles collide with each other and also with the walls of the container with a force. Therefore, gas exerts pressure on the walls of the container.
**(c) A wooden table should be called a solid.**
**Ans. :** A wooden table has fixed shape and fixed volume, which are the main characteristics of solid. Thus, a wooden table should be called a solid.
**(d) We can easily move our hand in air, but to do the same through a solid block of wood, we need a karate expert.**
**Ans. :** In air, the inter-particle attractive forces are negligible and hence, it is easy to separate the particles in air and we can easily move our hand in air. The inter-particle forces are very strong in solids. So, it is not easy to separate the particles and it is not easy to move our hand through a solid block of wood.

**Q. 4. Liquids generally have lower density as compared to solids. But you must have observed that ice floats on water. Find out why.**
**Ans. :** Ice which is a solid has vacant spaces between water molecules making ice lighter than water. Thus, ice floats on water.

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**Q. 1. Convert the following temperature to Celsius scale :**
**(a) 300 K (b) 573 K**
**Ans. :** (a) 300 K = (300 – 273)°C = 27°C
(b) 573 K = (573 – 273)°C = 300°C