

TOPICS INCLUDED AT GENERAL STUDIES PAPER - 3

Science

Technology

Emerging Technologies

Energy

Environment and Sustainable Development

Indian Economy

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Science & Technology

In this part, questions will test the candidate's awareness of the developments in the field of Science & Technology, Communication and space and also basic ideas of computers.

Matter in our surrounding

Everything in this universe is made up of material which scientists have named "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— each thing is matter.

Early Indian philosophers classified matter in the form of five basic elements –air, earth, fire, sky and water.

Modern day scientists have evolved two types of classification of matter based on their physical properties and chemical nature.

Characteristics of Particles of Matter

1. **PARTICLES OF MATTER HAVE SPACE BETWEEN THEM-** when we make tea, coffee or lemonade (nimbu paani), particles of one type of matter get into the spaces between particles of the other. This shows that there is enough space between particles of matter. Similarly particles of sugar, salt, Dettol, or potassium permanganate get evenly distributed in water.
2. **PARTICLES OF MATTER ARE CONTINUOUSLY MOVING-** Particles of matter are continuously moving, that is, they possess what we call the kinetic energy. As the temperature rises, particles move faster. So, we can say that with increase in temperature the kinetic energy of the particles also increases.
3. **PARTICLES OF MATTER ATTRACT EACH OTHER-** Particles of matter have force acting between them. This force keeps the particles together. The strength of this force of attraction varies from one kind of matter to another.

States of Matter

1. **THE SOLID STATE-** all solids have a definite shape, distinct boundaries and fixed volumes, that is, have negligible compressibility. Solids have a tendency to maintain their shape when subjected to outside force. Sol-

ids may break under force but it is difficult to change their shape, so they are rigid.

2. **THE LIQUID STATE-** Liquids have no fixed shape but have a fixed volume. They take up the shape of the container in which they are kept. Liquids flow and change shape, so they are not rigid but can be called fluid. The rate of diffusion of liquids is higher than that of solids. This is due to the fact that in the liquid state, particles move freely and have greater space between each other as compared to particles in the solid state.
3. **THE GASEOUS STATE-** Gases are highly compressible as compared to solids and liquids. The liquefied petroleum gas (LPG) cylinder that we get in our home for cooking or the oxygen supplied to hospitals in cylinders is compressed gas. In the gaseous state, the particles move about randomly at high speed. Due to this random movement, the particles hit each other and also the walls of the container.

Matter Can Change its State Water can exist in three states of matter—

- Solid, as ice,
- Liquid, as the familiar water, and
- Gas, as water vapour.

EFFECT OF CHANGE OF TEMPERATURE

On increasing the 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. The particles leave their fixed positions and start moving more freely. A stage is reached when the solid melts and is converted to a liquid. The temperature at which a solid melts to become a liquid at the atmospheric pressure is called its melting point.

The melting point of ice is 273.16 K. The process of melt-