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Sanjiv Refresher

SCIENCE

CLASS IX

(Based on the Latest CBSE Syllabus & NCERT Textbook)

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Contents

1

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.
- **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 ACTIVITIES SOLUTION

Activity 1.1

For Activity and Figure : Refer NCERT Textbook

Q. 1. What do you think has happened to the salt?

Ans. Salt is dissolved in water.

Q. 2. Where does it disappear?
Ans. Particles of salt filled in the gaps between the particles of water.
Q. 3. Does the level of water change?
Ans. No, there is no change in level of water.

Activity 1.2

For Activity and Figure : Refer NCERT Textbook
Q. Is the water still coloured?
Ans. Yes, water is still coloured. With every dilution, though the colour becomes light, it is still visible. This happens because matter is made of very small particles, which are spread in the water.

Activity 1.3

- **Put an unlit incense stick in a corner of your class.**

Q. 1. How close do you have to go near it so as to get its smell?
Ans. One has to go very close to get the smell of the unlit incense stick.
Q. 2. Now, light the incense stick. What happens?
Ans. After lighting the incense stick, smoke starts coming out of it.
Q. 3. Do you get the smell sitting at a distance?
Ans. Yes, now we can get smell of incense stick sitting at a distance.
Conclusion : This shows that, matters consists of small particles which are moving continuously. This means that particles of matter possess kinetic energy.
Smell of lighted incense stick diffuse, with air present around and reaches to us sitting at a distance.

Activity 1.4

For Activity : Refer NCERT Textbook
Q. 1. What do you observe immediately after adding the ink drop?
Ans. Ink started mixing with water immediately after adding, which is visible in the form of many thread–like structures.
Q. 2. What do you observe immediately after adding a drop of honey?
Ans. Honey slowly get directed towards bottom of water.
Q. 3. How many hours or days does it take for the colour of ink to spread evenly throughout the water?
Ans. It takes about one hour to spread colour of ink throughout the water.
Conclusion : This happens because ink has about equal or slightly higher density than that of water, so ink started immediately mixing with water, because particles of matter are moving continuously.
Density of honey is very high than that of water, so honey first starts to direct towards bottom.

Activity 1.5

- **Drop a crystal of copper sulphate or potassium permanganate into a glass of hot water and another containing cold water. Do not stir the solution. Allow the crystals to settle at the bottom.**

PRACTICALS

EXPERIMENT 1

Aim :
To prepare (a) a true solution of common salt, sugar and alum, (b) a suspension of soil, chalk powder and fine sand in water, (c) a colloidal solution of starch in water and egg albumen/milk in water and distinguishing between these on the basis of (i) transparency, (ii) filtration and (iii) stability.

Q. 1. What is a solution?
Ans. : A homogeous mixture of two or more substances is called a solution.
Q. 2. What are components of a solution?
Ans. : The components of a solution are solute and solvent.
Q. 3. What is a colloid?
Ans. : A colloid is a heterogeneous mixture of small particles having size in the range 1 to 100 nm distributed in a continuous medium of another substance.
Q. 4. Give important types of colloids.
Ans. : Aerosols, gels, emulsion, sols, etc.
Q. 5. What is a suspension?
Ans. : A suspension is a heterogeneous mixture in which solid particles having size greater than 100 nm are distributed in a fluid (liquid or gas) without dissolving in it.
Q. 6. Give some important characteristics of a solution that you have proposed by dissolving common salt in water.
Ans. : (a) The solution is homogenous, transparent and stable.
(b) The particles of NaCl cannot be seen in the solution.
(c) The solution passes as a whole through the filter paper.
Q. 7. Nimisha prepares a mixture by shaking chalk powder with water. What will be her observation?
Ans. : (a) The mixture is heterogeneous (not same throughout) opaque and unstable.
(b) The particles of chalk can be seen in the mixture with naked eye.
(c) The chalk particles settle when the mixture is left undisturbed for some time.
Q. 8. What is tyndall effect?
Ans. : Scattering of light by colloidal particles or suspended particles and thus making the path of the light visible, is called tyndall.
Q. 9. Why are the particles of a true solution not visible to naked eye?
Ans. : The particles of a true solution are very small to be seen with naked eye.
Q. 10. What is the order of size of particles that can be seen by naked eyes?
Ans. : The particles with the size order of more than 1000 nm which are visible through our naked eyes.
Q. 11. What will be the effect of passing light through colloidal solution of sulphur?
Ans. : When light is flashed on the colloidal solution of sulphur it will get scattered.

EXPERIMENT 2

Aim :
To prepare : (a) a mixture, (b) a compound using iron filings and sulphur powder and distinguish between these on the basis of :
(i) appearance, *i.e.* homogeneity and heterogeneity.
(ii) behaviour towards a magnet
(iii) behaviour towards carbon disulphide as a solvent.
(iv) effect of heat.

Q. 1. What is a mixture?
Ans. : A mixture is a material system made up of two or more different substances which are physically mixed but are not combined chemically.

Q. 2. What are the types of mixture?
Ans. : The two types of mixtures are – (a) homogeneous and (b) heterogeneous mixtures.

Q. 3. Define homogeneous mixture giving two examples.
Ans. : A homogenous mixture has a uniform composition and appearance throughout its mass, *e.g.* common salt dissolved in water, gasoline, etc.

Q. 4. Define heterogeneous mixture. Give two examples.
Ans. : A heterogeneous mixture does not have uniform composition throughout its mass. A heterogeneous mixture is made up of visibly different substances that remain physically separate, *e.g.* a mixture of ferrous sulphide and sulphur chalk powder added to water, etc.

Q. 5. What is a compound?
Ans. : A compound is formed when two or different elements combine chemically, *e.g.* a mixture of sulphide, water, etc.

Q. 6. Give some important characteristics of a compound.
Ans. : (a) The constituents of a compound are always present in a definite, fixed ratio by mass.
(b) The constituent elements lose their identity on forming the compound.
(c) The properties of the compound are entirely different from the constituent (combining) elements.

Q. 7. What happens when iron filings and sulphur powder are mechanically mixed together?
Ans. : A heterogeneous mixture of iron filings and sulphur is obtained in which yellow particles sulphur and greyish-black iron particles can be seen with the naked eye.

Q. 8. A student mixes iron filings and sulphur powder with sulphuric acid. What will be his observation?
Ans. : Iron filings will react with sulphuric acid to release hydrogen gas. The bubbles of gas will be observed in the test tube containing the mixture.

Q. 9. What would be the observation when a mixture of sulphur powder and iron filings heated for a longer time?