

Is Matter Around Us Pure?

CHAPTER 2



ANSWERS

Topic 1

1. A substance is one which is made up of only one kind of atoms or molecules. Substance can be an element or a compound. *e.g.*, water is made up of only one kind of particles. So water is a substance.

2.

	Homogeneous mixture	Heterogeneous mixture
(i)	A mixture in which different constituents are mixed uniformly.	A mixture in which different constituents are not mixed uniformly.
(ii)	It cannot have physically distinct parts.	It has physically distinct parts.

4.

	Property	Sol	Solution	Suspension
(i)	Nature	Heterogeneous	Homogeneous	Heterogeneous
(ii)	Particle size (diameter)	Between 10^{-7} to 10^{-5} cm (10^{-9} to 10^{-7} m or 1 nm to 100 nm)	Less than 1 nm (less than 10^{-9} to 10^{-7} m)	More than 100 nm
(iii)	Appearance	Translucent	Clear	Opaque
(iv)	Visibility	Visible with ultramicroscope	Not visible	Visible with naked eyes
(v)	Diffusion	Diffuses very slowly	Diffuses rapidly	Does not diffuse
(vi)	Tyndall effect	Shows	Does not show	Shows
(vii)	Settling of particles	Settle only on centrifugation	Do not settle	Settle on their own

5. Mass of sodium chloride = 36 g

Mass of solution = 36 + 100 = 136 g

Concentration of solution

$$= \frac{\text{Mass of solute}}{\text{Mass of solution}} \times 100 = \frac{36}{136} \times 100 = 26.47 \% (w/w)$$

6. Homogeneous mixtures : Soda water, vinegar and filtered tea

Heterogeneous mixtures : Wood and soil

Air is a homogeneous mixture of different gases. However, if some dust or other particles are also present, then air becomes heterogeneous mixture.

(iii)	The constituents cannot be easily seen.	The constituents can be easily seen.
(iv)	The constituents cannot be easily separated.	The constituents can be easily separated.
(v)	Examples : Sugar solution, soda water, soft drinks, vinegar, air etc.	Examples : Sugar and sand mixture, milk, ink, paint, wood, blood etc.

3. Pure substances : Distilled water, diamond, graphite, raw rubber.

Mixtures : Curd, ice cream, kerosene oil, cooking oil, steel, vulcanised rubber, solder wire (alloy of lead and tin).

7. If the boiling point and freezing point of the given liquid comes out to be 100°C or 373 K and 0°C or 273 K respectively under one atmospheric pressure, it confirms that the given liquid is pure water.

8. Ice, iron, calcium oxide and mercury are pure substances since they contain particles of only one kind of matter. In contrast, milk, hydrochloric acid (hydrogen chloride gas dissolved in water), wood, brick and air cannot be called pure substances because they consist of particles of more than one kind of matter hence, they are mixtures.

9. A solution is a homogeneous mixture of two or more substances. In the light of this, the solutions among the given mixtures are (b) sea water, (c) air and (e) soda water.

10. Elements : (a) Sodium, (d) Silver, (f) Tin and (g) Silicon are elements.

Compounds : (e) Calcium carbonate, (k) Methane and (l) Carbon dioxide are compounds.

Mixtures : (b) Soil, (c) Sugar solution, (h) Coal, (i) Air, (j) Soap and (m) Blood are mixtures.

11. (a) Solubility of potassium nitrate at 313 K = $\frac{62}{100}$

\therefore 100 g of water contains potassium nitrate = 62 g

\therefore 50 g of water contains potassium nitrate
 $= \frac{62}{100} \times 50 = 31 \text{ g}$

Thus, 31 g potassium nitrate would be needed to produce a saturated solution of potassium nitrate in 50 g of water at 313 K.

(b) When a saturated solution of potassium chloride at 353 K is cooled, the solubility of potassium chloride in water decreases. As a result, the amount of potassium chloride which exceeds its solubility at lower temperature separates out as crystals.

(c) The maximum amount of the salt which is dissolved in 100 g of water to form a saturated solution at the given temperature, is known as solubility.

Solubility of potassium nitrate at 293 K = $\frac{32}{100}$

Solubility of sodium chloride at 293 K = $\frac{36}{100}$

Solubility of potassium chloride at 293 K = $\frac{35}{100}$

Solubility of ammonium chloride at 293 K = $\frac{37}{100}$

From the above data, it is clear that ammonium chloride has the highest solubility at 293 K.

(d) In general, the solubility of a salt increases with increasing the temperature. The increase is, however, different for different salts. For example, the solubility of potassium nitrate increases appreciably, that of ammonium chloride increases slightly, that of potassium chloride increases marginally while that of sodium chloride almost remains constant.

12. (a) Saturated solution : A solution in which no more solute can be dissolved in a given amount of solvent at a particular temperature is called saturated solution. For example, if we dissolve 40 g sodium chloride in 100 g of water at 293 K, it will form a saturated solution because the solubility of sodium chloride at 293 K is 36 g per 100 g of water.

(b) Pure substance : A substance made up of only one kind of atoms or molecules is called a pure substance. A pure substance has the same colour, taste and texture at a given temperature and pressure. A pure substance also has a fixed melting and boiling point at a constant pressure. For example, hydrogen gas, sodium chloride, water, etc.

(c) Colloid : A substance is said to be a colloid if the particle size lies between 1 to 100 nm. A colloidal solution is heterogeneous and consists of two phases. *i.e.*, dispersed phase (colloidal particles) and dispersion medium in which colloidal particles are suspended. For example, colloidal solution of sulphur or starch, milk, etc.

(d) Suspension : It is a heterogeneous mixture in which the particles of the solute do not dissolve but remain suspended throughout the bulk of the solvent. The size of the suspension particles is more than 10^{-7} or 100 nm. For example, chalk powder in water is a suspension.

13. Sea-water can be classified as a homogeneous mixture because it contains salts dissolved in water. It can be classified as a heterogeneous mixture also since it contains mud, sand and decayed parts of plants.

14. Sample 'B' which boils at 102°C contains impurities. It will not freeze at 0°C . There will be a depression in freezing point.

15. The size of colloidal particles in a colloidal solution is smaller than suspension. These particles are in a random motion hence do not settle down when left undisturbed. The particles of suspension are bigger and they tend to settle down under the effect of gravity.

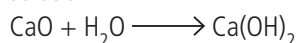
Topic 2

- (a) Growth of a plant,
 (b) rusting of iron,
 (d) cooking of food,
 (e) digestion of food,
 (g) burning of a candle are chemical changes.

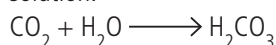
2. Calcium carbonate $\xrightarrow{\text{heat}}$ Calcium oxide + Carbon dioxide

(a) It is a chemical change in which new substances are formed.

(b) Calcium oxide when dissolved in water, forms a basic solution.



Carbon dioxide when dissolved in water, forms an acidic solution.



3. (a, b, e) : Physical changes because there is no change in chemical composition. (c, d) : Chemical changes because new substances are formed.

