CLASS IX : SCIENCE
Chapter 2 : Is Matter Arounds Us Pure

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Q1. What is meant by a pure substance?

Ans. A pure substance is one that cannot be separated into different constituents by physical or chemical process. A pure substance is one that contains particles of only one type of a substance.

Q2. List the points of differences between homogeneous and heterogeneous mixtures.

Ans. Homogeneous mixture :

(i) The composition of a homogeneous mixture is the same throughout. For example, if you make a solution of sugar in water and taste it by taking a spoonful of solution either from the surface or from somewhere underneath the surface, it tastes equally sweet.

(ii) A homogeneous mixture has no distinct boundaries, i.e., it consists of only one phase which may be solid, liquids or gaseous. For example, alloys such as brass (30% zinc and 70% copper) is a homogeneous mixture in the solid state. A solution of sugar or common salt in water is homogeneous mixture in the liquid state. Similarly, a solution of water and alcohol is a homogeneous mixture in the liquid state. Pure air (without dust particles and suspended impurities) is a homogeneous mixture in the gaseous state.

Heterogeneous mixture :

(i) The composition of a heterogeneous mixture is not the same throughout. For example, if we prepare a mixture of starch and sugar by thoroughly grinding it and taste it by picking up a few particles from the various portions of the mixture, it will not have the same sweetness.

(ii) A heterogeneous mixture has distinct boundaries of separation, i.e., it consists of two or more phases which can either be solids or liquids but not gaseous. For example, iron filings (greyish in colour) and sulphur powder (yellow) on mixing form a heterogeneous mixture (greyish yellow). When we examine this mixture under a microscope, we clearly see that every small portion of the mixture consists of two solid phases – one of greyish colour

consisting of iron filings and the other of yellow colour consisting of sulphur powder. Similarly, a mixture of oil in water is heterogeneous mixture, consisting of two liquid phases – one of oil and the other of water. In other words, oil in water has a distinct boundary separating oil from water.

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Q1. Differentiate between homogeneous and heterogeneous mixtures with examples.

Ans. Homogeneous mixture :

They have uniform compositions. The components of homogeneous mixtures are not physically distinct. Most solutions are homogeneous mixtures. Salt in water, sugar in water are examples of homogeneous mixtures.

Heterogeneous mixture :

They contain physically distinct parts and have non-uniform compositions. Mixtures of sodium chloride and iron filings, salt and sulphur, and oil and water are examples of heterogeneous mixtures. Suspensions and colloids are also heterogeneous mixtures.

Q2. How are sol, solution and suspension different from each other?

Ans. Refer to text.

Q3. To make a saturated solution, 36 g of sodium chloride is dissolved in 100 g of water at 293 K. Find its concentration at this temperature.

Ans. $\text{Concentration} = \frac{\text{Mass of solute}}{\text{Mass of solution}} \times 100$

Here, mass of solute = 36 g

and mass of solvent = 100 g

Therefore, Mass of solution = 100 + 36 = 136 g

Thus, concentration $= \frac{36}{136} \times 100 = 26.47\%$

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Q1. Classify the following as chemical or physical changes :

- Cutting of trees
- Melting of butter in a pan
- Rusting of almirah
- Boiling of water to form steam
- Passing of electric current through water and the water breaking down into hydrogen and oxygen gases
- Dissolving common salt in water
- Making a fruit salad with raw fruits, and
- Burning of paper and wood.

Ans. Physical changes : Cutting of trees, melting of butter in a pan, boiling water to form steam, making a fruit salad with raw fruits, dissolving common salt in water.

Chemical changes : Rusting of almirah, passing of electric current through water and the water breaking down into hydrogen and oxygen gases, burning of paper and wood.

Q2. Try segregating the things around you as pure substances or mixtures :

(a) distilled water	(b) curd	(c) diamond
(d) ice-cream	(e) kerosene oil	(f) cooking oil
(g) steel	(h) graphite	(i) raw rubber
(j) vulcanized rubber	(k) solder wire	(ℓ) glass
(m) iron nail.		

Ans. (i) Pure substances : distilled Water, glass, iron nail, graphite, diamond, raw rubber.

(ii) Mixture : curd, ice cream, kerosene oil, cooking oil, steel, vulcanized rubber, solder wire.

EXERCISES

Q1. Which separation techniques will you apply for the separation of the following ?

(a) Sodium chloride from its solution in water.

(b) Ammonium chloride from a mixture containing sodium chloride and ammonium chloride.

(c) Small piece of metal in the engine oil of a car.
(d) Different pigments from an extract of flower petals.
(e) Butter from curd.
(f) Oil from curd.
(g) Tea leaves from tea
(h) Iron pins from sand.
(i) Wheat grains from husk.
(j) Fine mud particles suspended in water.

Ans. (a) Evaporation
(b) Sublimation
(c) Filtration
(d) Chromatography
(e) Centrifugation
(f) Separating funnel
(g) Filteration
(h) Magnetic separation
(i) Sieving and winnowing
(j) Sedimentation, decantation and filtration.

Q2. Write the steps you would use for making tea. Use the words solution, solvent, solute, dissolve, soluble, insoluble, filtrate and residue.

Ans. Take some water in pan. Keep the pan over flame. The solutes tea leaves & sugar should be added to a pan containing water as solvent. Heat the water over the pan till the sugar, which is soluble in water dissolves in it. Tea leaves are insoluble in water and will remain suspended. Now add water to the sugar and tea leaves solution and bring the mixture to a boil. Filter the prepared tea through a sieve. Filtrate should be poured in a cup, while the residue can be thrown away.

Q3. Pragya tested the solubility of three different substances at different temperatures and collected the data as given below. Result are given in the following table, as grams of substance dissolved in 100 grams of water to form a saturated solution.

Substance Dissolved	Temperature in K				
	283	293	313	333	353
Potassium nitrate	21	32	62	106	167
Sodium chloride	36	36	36	37	37
Potassium chloride	35	35	40	46	54
Ammonium chloride	24	37	41	55	66

(a) Potassium nitrate would be needed to produce a saturated solution of potassium nitrate in 50 grams of water at 313 K ?
(b) Pragya makes a saturated solution of potassium chloride in water at 353 K and leaves the

solution to cool at room temperature. What would she observe as the solution cools ?

(c) Find the solubility of each salt at 293 K. Which salt has the highest solubility at this temperature ?

(d) What is the effect of change of temperature on the solubility of a salt ?

Ans. (a) Since 62 g of potassium nitrate is dissolved in 100 g of water to prepare a saturated solution at 313 K, 31 g of potassium nitrate should be dissolved in 50 g of water to prepare a saturated solution at 313 K.

(b) The amount of potassium chloride that should be dissolved in water to make a saturated solution increases with temperature. Thus, as the solution cools some of the potassium chloride will precipitate out of the solution.

(c) The solubility of the salt at 293 K are

Potassium nitrate - 32 g

Sodium chloride - 36 g

Potassium chloride - 35 g

Ammonium chloride - 37 g

Ammonium chloride has the highest solubility at 293 K.

(d) The solubility of a salt increases on increasing the temperature.

Q4. Explain the following by giving examples.

(a) Saturated solution

(b) Pure substance

(c) Colloid

(d) Suspension

Ans. (a) At any particular temperature, a solution that has dissolved as much solute as it is capable of dissolving is said to be a saturated solution. Few examples of saturated solutions are soft drinks and nitrogen in Earth's soil.

(b) A pure substance is one that cannot be separated into different constituents by physical

or chemical processes. A pure substance is one that contains particles of only one type of a substance. Pure substance can be elements or compounds. Some examples of pure substances are iron, water, oxygen, etc.

(c) Colloids are heterogeneous mixtures in which the particle size is too small to be seen with the naked eye, but is big enough to scatter light.

Smoke, paint, butter are few examples of colloids.

(d) Materials that are insoluble in a solvent and have particles that are visible to naked eyes form a suspension. A suspension is a heterogeneous mixture. Some examples of suspension are water with chalk particles, sandy water and water with stones.

Q5. Classify each of the following as a homogeneous or heterogeneous mixture.

soda, water, wood, air, soil, vinegar, filtered tea.

Ans. **Homogeneous** – soda, water, air, vinegar, filtered tea.

Heterogeneous – wood, soil.

Q6. How would you confirm that a colourless liquid given to you is pure water ?

Ans. If the boiling and freezing points of the given liquid comes out to be 100°C and 0°C respectively under one atmosphere pressure, it confirms that the given liquid is pure water.

Q7. Which of the following materials fall in the category of a "pure substance" ?

(a) Ice	(b) Milk	(c) Iron
(d) Hydrochloric acid	(e) Calcium oxide	(f) Mercury
(g) Brick	(h) Wood	(i) Air.

Ans. Ice, iron, hydrochloric acid, calcium oxide, and mercury are pure substances.

Q8. Identify the solution among the following mixtures.

(a) Soil	(b) Sea water	(c) Air
(d) Coal	(e) Soda water	

Ans. Sea water, air, and soda water are solutions.

Q9. Which of the following will show "Tyndall effect" ?

(a) Salt solution

(b) Milk

(c) Copper sulphate solution

(d) Starch solution

Ans. Colloids show Tyndall effect, Milk is a colloid. Thus, it will show Tyndall effect. Therefore the correct answer is (b).

Q10. Classify the following into elements, compounds and mixtures.

(a) Sodium
(b) Soil
(c) Sugar solution
(d) Silver
(e) Calcium carbonate
(f) Tin
(g) Silicon
(h) Coal
(i) Air
(j) Soap
(k) Methane
(ℓ) Carbon dioxide
(m) Blood

Ans. **Elements :** sodium, silver, tin and silicon

Compounds : calcium carbonate, soap, methane and carbon dioxide

Mixtures : soil, sugar solution, coal, air and blood.

Q11. Which of the following are chemical changes ?

(a) Growth of a plant

(b) Rusting of iron

(c) Mixing of iron filings and sand

(d) Cooking of food

(e) Digestion of food

(f) Freezing of water
(g) Burning of a candle

Ans. Rusting of iron, cooking of food, digestion of food, and burning of candle are chemical changes.