

Chapter 2: Is Matter Around Us Pure Science

In Text Questions

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1. What is meant by a pure substance?

Answer

A pure substance consists of single type of particles that is all the constituent particles of a pure substance have same chemical nature.

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

Answer

Homogeneous mixtures	Heterogeneous mixtures
Homogeneous mixtures have uniform composition.	Heterogeneous mixtures have non uniform composition.
It has no visible boundaries of separation between its constituents.	It has visible boundaries of separation between its constituents.

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1. Differentiate between homogeneous and heterogeneous mixtures with examples.

Answer

A homogeneous mixture is a mixture having a uniform composition throughout the mixture. For example, mixtures of salt in water, sugar in water, copper sulphate in water, iodine in alcohol, alloy, and air have uniform compositions throughout the mixtures.

On the other hand, a heterogeneous mixture is a mixture having a non-uniform composition throughout the mixture. For example, composition of mixtures of sodium chloride and iron fillings, salt and sulphur, oil and water, chalk powder in water, wheat flour in water, milk and water are not uniform throughout the mixtures.

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

Answer

Sol	Solution	Suspension
They are heterogeneous in nature.	They are homogeneous in nature.	They are heterogeneous in nature.
They scatter a beam of light and hence show Tyndall effect.	They do not scatter a beam of light and hence do not show Tyndall effect	They do not scatter a beam of light and hence do not show Tyndall effect.
They are quite stable.	Examples of solution are: salt in water, sugar in water.	Examples of suspension are: sand in water, dusty air

3. 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.

Answer

Mass of solute (sodium chloride) = 36 g (Given)

Mass of solvent (water) = 100 g (Given)

Then, mass of solution = Mass of solute + Mass of solvent

= (36 + 100) g

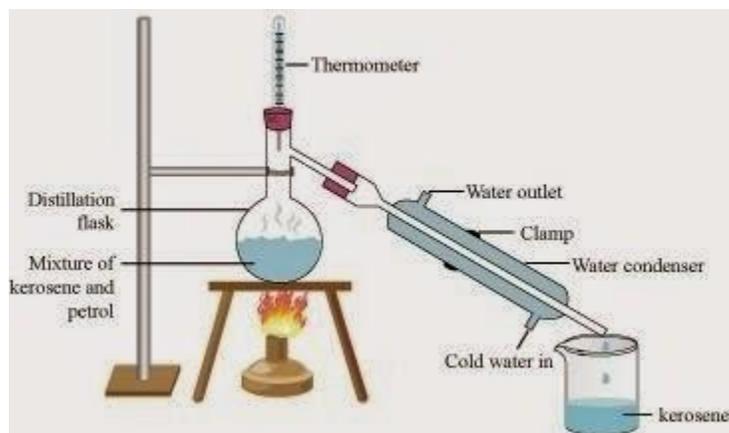
= 136 g

$$\begin{aligned} &= \frac{\text{Mass of Solute}}{\text{Mass of Solvent}} \times 100\% \\ &= \frac{36}{136} \times 100\% \\ &= 26.47\% \end{aligned}$$

1. How will you separate a mixture containing kerosene and petrol (difference in their boiling points is more than 25°C), which are miscible with each other?

Answer

Kerosene and petrol are miscible liquids also the difference between their boiling point is more than 25°C so they can be separated by the method of distillation.



In this method, the mixture of kerosene and petrol is taken in a distillation flask with a thermometer fitted in it. We also need a beaker, a water condenser, and a Bunsen burner. The apparatus is arranged as shown in the above figure. Then, the mixture is heated slowly. The thermometer should be watched simultaneously. Kerosene will vaporize and condense in the water condenser. The condensed kerosene is collected from the condenser outlet, whereas petrol is left behind in the distillation flask.

2. Name the technique to separate

(i) butter from curd

► By Centrifugation

(ii) salt from sea-water

► By Evaporation

(iii) camphor from salt

► By Sublimation

3. What type of mixtures is separated by the technique of crystallization?

Answer

The crystallisation method is used to purify solids.

1. Classify the following as chemical or physical changes:

- Cutting of trees
▶ Physical change

- Melting of butter in a pan
▶ Physical change

- Rusting of almirah
▶ Chemical change

- Boiling of water to form steam
▶ Physical change

- Passing of electric current through water, and water breaking down into hydrogen and oxygen gas
▶ Chemical change

- Dissolving common salt in water
▶ Physical change

- Making a fruit salad with raw fruits
▶ Physical change

- Burning of paper and wood
▶ Chemical change

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Excercises

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

- (a) Sodium chloride from its solution in water.
▶ Evaporation

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

► Sublimation

(c) Small pieces of metal in the engine oil of a car.

► Filtration or Centrifugation or decantation

(d) Different pigments from an extract of flower petals.

► Chromatography

(e) Butter from curd.

► Centrifugation

(f) Oil from water.

► Using separating funnel

(g) Tea leaves from tea.

► Filtration

(h) Iron pins from sand.

► Magnetic separation

(i) Wheat grains from husk.

► Winnowing

(j) Fine mud particles suspended in water.

► Centrifugation

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

Answer

First, water is taken as a **solvent** in a saucer pan. This water (solvent) is allowed to boil. During heating, milk and tea leaves are added to the solvent as **solutes**. They form a solution. Then, the solution is poured through a strainer. The insoluble part of the solution remains on the strainer as **residue**. Sugar is added to the **filtrate**, which dissolves in the filtrate. The resulting **solution** is the required tea.

3. Pragya tested the solubility of three different substances at different temperatures and collected the data as given below (results 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) What mass of 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? Explain.
- (c) Find the solubility of each salt at 293 K. What salt has the highest solubility at this temperature?
- (d) What is the effect of change of temperature on the solubility of a salt?

Answer

(a) Since 62 g of potassium nitrate is dissolved in 100g 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 salts 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 with temperature.

4. Explain the following giving examples:

- (a) Saturated solution
 (b) Pure substance
 (c) Colloid

(d) Suspension

Answer

(a) Solution in which no more solute can be dissolved at a particular temperature is known as saturated solution. For example in aqueous solution of sugar no more sugar can be dissolved at room temperature.

(b) A pure substance is a substance consisting of a single type of particles i.e., all constituent particles of the substance have the same chemical properties. For example water, sugar, salt etc.

(c) A colloid is a heterogeneous mixture whose particles are not as small as solution but they are so small that cannot be seen by naked eye. When a beam of light is passed through a colloid then the path of the light becomes visible. For example milk, smoke etc.

(d) A suspension is a heterogeneous mixture in which solids are dispersed in liquids. The solute particles in suspension do not dissolve but remain suspended throughout the medium. For example Paints, Muddy water chalk water mixtures etc.

5. Classify each of the following as a homogeneous or heterogeneous mixture.
Soda water, wood, air, soil, vinegar, filtered tea

Answer

Homogeneous mixtures: Soda water, air, vinegar

Heterogeneous mixtures: Wood, soil, filtered tea

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

Answer

Take a sample of colourless liquid and put on stove if it starts boiling exactly at 100 °C then it is pure water. Any other colourless liquid such as vinegar always have different boiling point. Also observe carefully that after some time whole liquid will convert into vapour without leaving any residue.

7. 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

Answer

The following materials fall in the category of a "pure substance":

- (a) Ice
- (c) Iron
- (d) Hydrochloric acid
- (e) Calcium oxide
- (f) Mercury

8. Identify the solutions among the following mixtures:

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

Answer

The following mixtures are solutions:

- (b) Sea water
- (c) Air
- (e) Soda water

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

- (a) Salt solution
- (b) Milk
- (c) Copper sulphate solution
- (d) Starch solution

Answer

Tyndall effect is shown by colloidal solution. Here milk and starch solution are colloids therefore milk and starch solution will show Tyndall effect.

10. 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

Answer

Elements: Sodium, Silver, Tin and Silicon.

Compounds: Calcium carbonate, Methane and carbon dioxide.

Mixtures: Soil, Sugar, Coal, Air, Soap and Blood.

11. Which of the following are chemical changes?

- (a) Growth of a plant
- (b) Rusting of iron
- (c) Mixing of iron fillings and sand
- (d) Cooking of food
- (e) Digestion of food
- (f) Freezing of water
- (g) Burning of candle

Answer

The following changes are chemical changes:

- (a) Growth of a plant
- (b) Rusting of iron
- (d) Cooking of food
- (e) Digestion of food
- (g) Burning of candle