

CHAPTER 2

Is Matter Around Us Pure

1. NCERT INTEXT QUESTIONS

1. What is a pure substance?

Ans :

A pure substance is one, which contains only one type of atoms or molecules in a specific arrangement in any part of the sample taken. Example : Water, diamond.

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

Ans :

Homogeneous Mixture	Heterogeneous Mixture
Mixture which has a uniform composition throughout. Example : Sugar in water.	Mixture which contain physically distinct parts and have non-uniform composition. Example : Mixture of salt and sulphur.

3. Differentiate between homogeneous and heterogeneous mixtures with examples.

Ans :

Homogeneous Mixture	Heterogeneous Mixture
Components are uniformly distributed throughout the mixture.	Components are not completely mixed and can be identified.
No visible boundaries of separation.	Visible boundaries of separation.
Same composition.	Different composition.
Examples : Rainwater, vinegar, etc.	Examples : Seawater, pizza, etc.

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

Ans :

Property	Solution	Suspension	Sol
Nature	Homogeneous	Heterogeneous	Heterogeneous
Particle size	Less than 1 nm	More than 100 nm	$10^{-7} - 10^{-5}$ cm
Stability	Very stable	Unstable	Quite stable
Tyndall effect	No	Yes/No	Yes

Appearance	Clear	Opaque	Generally clear
Visibility	Not visible	Visible with naked eye	Visible by microscope
Diffusion	Fast diffusion	Do not diffuse	Slow diffusion
Settling	Do not settle	Settle on their own	Settled in centrifugation
Example	Salt and sugar in water	Sand in water, dusty air	Milk, blood, smoke

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

Ans :

$$\text{Mass of solute (NaCl)} = 36 \text{ g}$$

$$\text{Mass of solvent (H}_2\text{O)} = 100 \text{ g}$$

$$\text{Mass of solution (NaCl + H}_2\text{O)} = 136 \text{ g}$$

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

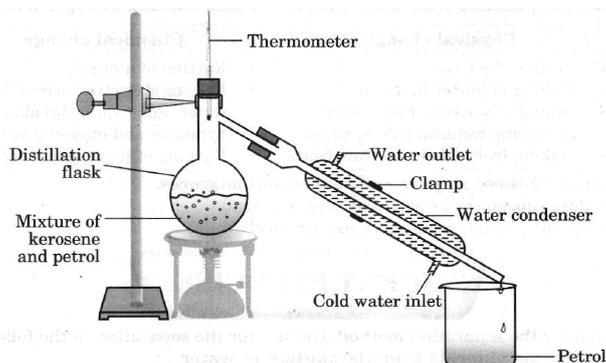
$$\text{Concentration} = \frac{36}{136} \times 100 = 26.47\%$$

Hence, the concentration of the solution is 26.47%.

6. 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?

Ans :

The mixture of miscible liquids whose boiling point difference is more than 25°C such as kerosene and petrol can be separated by a technique called simple distillation. The principle of separation is based on the volatility of the substances.



The process of distillation is as follows :

- Take the mixture in a distillation flask.
- Fit it with a thermometer and heat the mixture.

- (c) Petrol has a lower boiling point and evaporates first.
- (d) As the vapour rises up and reach the condenser, the temperature is decreased and the vapour is condensed into liquid and is collected in a flask.
- (e) The kerosene that has relatively higher boiling point remains in the flask in the liquid form.
- (f) Hence, the liquids are separated.

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7. Name the techniques used to separate the following :
- (a) Butter from curd
 - (b) Salt from seawater
 - (c) Camphor from salt

Ans :

- (a) The butter is separated from the curd by the process of centrifugation.
- (b) Simple evaporation is used to separate salt from seawater.
- (c) Camphor does not undergo liquid phase during the phase change. Therefore, sublimation process is used for the separation of camphor from the other substance.

8. What type of mixtures can be separated by crystallization?

Ans :

Crystallization is a technique of separation of solid from a liquid solution. It can be used to purify solid with some impurities in it. Example : Salt from seawater.

9. Classify the following as physical or chemical change : 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 water breaking down into hydrogen and oxygen gases, Dissolving common salt in water, making fruit salad with raw fruits, burning of paper and wood.

Ans :

	Physical change		Chemical change
1.	Cutting the trees	1.	Rusting of almirah
2.	Melting of butter in a pan	2.	Passing of electric current through water and water breaking into hydrogen and oxygen gases
3.	Boiling of water to form steam	3.	Burning of paper and wood
4.	Dissolving common salt in water		
5.	Making fruit salad with raw fruits		

10. Separate these as pure substances and mixtures.

Ans :

- 1. Pure substances : water, salt, iron, diamond
- 2. Mixture : sand, salad, concrete, air, steel

2. NCERT EXERCISE QUESTIONS

1. Identify the separation method, you use 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 pieces 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 water
 - (g) Tea leaves from tea
 - (h) Iron pins from sand
 - (i) Wheat grains from husk
 - (j) Fine mud particles suspended in water

Ans :

	Substance	Separation Method
(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
(d)	Different pigments from an extract of flower petals	Chromatography
(e)	Butter from curd	Centrifugation
(f)	Oil from water	Separating funnel
(g)	Tea leaves from tea	Filtration
(h)	Iron pins from sand	Magnetic separation
(i)	Wheat grains from husk	Winnowing/ Sedimentation
(j)	Fine mud particles suspended in water	Decantation and filtration

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

Ans :

- (a) We take a cup of milk in a vessel that acts as a solvent and heat it.
- (b) We drop in the tea leaves or the powdered tea leaves into the milk as solute and continue heating.
- (c) The tea leaves or the powdered tea leaves used is insoluble in the milk and is visible even after the heating.
- (d) Now, to the boiling solution, add sugar and stir it.
- (e) The sugar acts yet another solute, but in this case, it is soluble in the solvent.

- (f) Due to continued stirring, the sugar completely becomes soluble in the tea solution and a saturation level is reached.
- (g) After enough heating, filter the solution using a medium. When done, the insoluble tea leaves stays behind as residue and the soluble essence and sugar passes through the filter medium and is collected as the filtrate.

3. Pragma tested the solubility of three different substances at different temperatures and collected the data, which is given in the following table. (As grams of substance dissolved in 100 grams of water to form a saturated solution)

Substance Dissolved	Temperature in Kelvin and solubility				
	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) Pragma 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 down? Explain.
- (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) Mass of KNO_3 required to produce a saturated solution of KNO_3 in 100 g of water at 313 K = 62g
 Mass of potassium nitrate required to produce a saturated solution in 50 g of water = $62 \times 50 \div 100 = 31$
 Hence, 31 g of potassium nitrate is required.
- (b) Crystals of potassium chloride will be obtained on cooling the solution.
- (c) Solubility of each salt at 293 K is as follows :
- Potassium nitrate = 32 g
 Sodium chloride = 36 g
 Potassium chloride = 35 g
 Ammonium chloride = 37 g
- Thus, ammonium chloride salt has the highest amount of solubility when compared to any other salt at 293 K.
- (d) Solubility of salts increases with temperature.

4. Define the terms :

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

Ans :

- (a) **Saturated solution** : A saturated solution is a solution in which the maximum amount of solute has been dissolved at a particular temperature.
- (b) **Pure substance** : Pure substance consist only one type of atoms or molecules or compounds.
- (c) **Colloid** : A colloid is heterogeneous mixture in which one substance is scattered as very fine particles in a continuous medium of another substance. These particles cannot be seen by naked eye. Example : Ink, Blood.
- (d) **Suspension** : A suspension is a heterogeneous mixture containing solid particles that are big enough to settle down. Particles of suspension are visible to the naked eye. Example : Chalk powder, Paints, etc.

5. Classify the following as a homogeneous/heterogeneous mixture : soda water, wood, air, soil, vinegar, filtered tea.

Ans :

Homogeneous : soda water, vinegar, filtered tea.
 Heterogeneous : wood, air, soil.

6. How would you prove that any colourless liquid, given to you is pure water?

Ans :

If the colourless liquid boils at 100°C , then it is pure water. This is because any pure substance has fixed boiling and melting point.

7. Which of the following materials fall into the category of pure substances?

- (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 the pure substances.

8. Identify the solutions among the following mixtures :

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

Ans :

Seawater, air and soda water are the solution.

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

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

Ans :

Milk and the starch solution shows 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 | |

Ans :

Elements	Compounds	Mixtures
Sodium	Calcium carbonate	Soil
Silver	Soap	Sugar solution
Tin	Methane	Coal
Silicon	Carbon dioxide	Air, Blood

11. Which of the following are chemical changes?

- Growth of a plant
- Rusting of iron
- Mixing of iron fillings and sand
- Cooking of food
- Digestion of food
- Freezing of water
- Burning of candle

Ans :

The following changes are chemical changes :

- Growth of a plant
- Rusting of iron
- Cooking of food
- Digestion of food
- Burning of candle

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3. NCERT EXEMPLAR

Objective Type Questions

1. Which of the following statements are true for pure substances?

- Pure substances contains only one kind of particles.
 - Pure substances may be compounds or mixtures.
 - Pure substances have the same composition throughout.
 - Pure substances can be exemplified by all elements other than nickel.
- (a) (i) and (ii) (b) (i) and (iii)
 (c) (iii) and (iv) (d) (ii) and (iii)

Ans : (b) (i) and (iii)

2. Rusting of an article made up of iron is called :

- corrosion and it is a physical as well as chemical change.

- dissolution and it is a physical change.
- corrosion and it is a chemical change.
- dissolution and it is a chemical change.

Ans : (c) corrosion and it is a chemical change.

3. A mixture of sulphur and carbon disulphide is :

- heterogeneous and shows Tyndall effect.
- homogeneous and shows Tyndall effect.
- heterogeneous and does not show Tyndall effect.
- homogeneous and does not show Tyndall effect.

Ans : (d) homogeneous and does not show Tyndall effect.

4. Tincture of iodine has antiseptic properties. This solution is made by dissolving :

- Iodine in potassium iodide
- Iodine in vaseline
- Iodine in water
- Iodine in alcohol

Ans : (d) Iodine in alcohol.

5. Which of the following are homogeneous in nature?

- Ice
 - Wood
 - Soil
 - Air
- (a) (i) and (iii) (b) (ii) and (iv)
 (c) (i) and (iv) (d) (iii) and (iv)

Ans : (c) (i) and (iv)

6. Which of the following are physical changes?

- Melting of iron metal
 - Rusting of iron
 - Bending of an iron rod
 - Drawing a wire of iron metal
- (a) (i), (ii) and (iii) (b) (i), (ii) and (iv)
 (c) (i), (iii) and (iv) (d) (ii), (iii) and (iv)

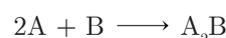
Ans : (c) (i), (iii) and (iv)

7. Which of the following are chemical changes?

- Decaying of wood
 - Burning of wood
 - Sawing of wood
 - Hammering of a nail into a piece of wood
- (a) (i) and (ii) (b) (ii) and (iii)
 (c) (iii) and (iv) (d) (i) and (iv)

Ans : (a) (i) and (ii)

8. Two substances, A and B were made to react to form a third substance, A_2B according to the following reaction



Which of the following statements concerning this reaction are incorrect?

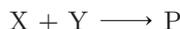
- The product A_2B shows the properties of substances A and B.
- The product will always have a fixed composition.
- The product so formed cannot be classified as a

compound.

- (iv) The product so formed is an element.
 (a) (i), (ii) and (iii), (b) (ii), (iii) and (iv)
 (c) (i), (iii) and (iv) (d) (ii), (iii) and (iv)

Ans : (c) (i), (iii) and (iv)

9. Two chemical species X and Y combine together to form a product P which contains both X and Y



X and Y cannot be broken down into simpler substances by simple chemical reactions. Which of the following concerning the species X, Y and P are correct?

- (i) P is a compound.
 (ii) X and Y are compounds.
 (iii) X and Y are elements.
 (iv) P has a fixed composition.
 (a) (i), (ii) and (iii) (b) (i), (ii) and (iv)
 (c) (ii), (iii) and (iv) (d) (i), (iii) and (iv)

Ans : (d) (i), (iii) and (iv)

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Short Answer Questions

10. Suggest separation technique(s) one would need to employ to separate the following mixtures :

- (i) Mercury and water
 (ii) Potassium chloride and ammonium chloride
 (iii) Common salt, water and sand
 (iv) Kerosene oil, water and salt

Ans :

- (i) Separation by using separating funnel (used for separating two immiscible liquids). The principle is that immiscible liquids separate out in layers depending on their densities.
 (ii) Sublimation : It is a process by which solid changes directly into gas and vice versa without passing through the liquid state. Ammonium chloride is sublime.
 (iii) Filtration followed by evaporation or centrifugation followed by evaporation/distillation.
 (iv) Separation by using separating funnel to separate kerosene oil followed by evaporation or distillation.

11. Salt can be recovered from its solution by evaporation. Suggest some other technique for the same.

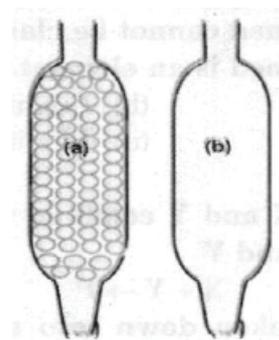
Ans :

Salt can be recovered from its solution by crystallization process also. Crystallisation is a process employed for separating solute in the form of crystals from its saturated solution on cooling.

In this process, the impure sample is dissolved in minimum amount of suitable solvent. The formed solution is heated to get a saturated solution. On cooling, this saturated solution produce pure crystals of the sample.

12. Which of the tubes in figure given here (a) and (b)

will be more effective as a condenser in the distillation apparatus?



Ans :

The tube (a) will be more effective as a condenser in the distillation apparatus. This is because a simple fractionating column is a tube packed with glass beads where the beads provide surface for the vapours to collide and lose energy so that they can be quickly condensed and distilled.

13. The 'sea water' can be classified as a homogeneous as well as heterogeneous mixture. Comment.

Ans :

A mixture which has a uniform composition throughout is called a homogeneous mixture or solution. A mixture which does not have a uniform composition throughout is called a heterogeneous mixture.

- (i) Sea water looks like a single substance, i.e., salt, water and the gases are mixed together so completely that they cannot be differentiated as individual substances. The particles of a solution are smaller than 1 nm (10⁻⁹ metre) in diameter. So, they cannot be seen by naked eyes. Therefore, we can classify sea water as homogeneous mixture.
 (ii) Sea water can be classified as a heterogeneous mixture because when we view it under the microscope we can find bits of dirt, and other impurities like mud, decayed plant, etc. floating in it. It is mixture of many salts, water and other many impurities. Apart from these, many gases (air) are also dissolved in sea water. Because of salt and some other bigger size of impurities, sea water is classified as heterogeneous mixture.

14. While diluting a solution of salt in water, a student by mistake added acetone (boiling point 56°C). What technique can be employed to get back the acetone? Justify your choice.

Ans :

Simple distillation can be employed to get back the acetone. Since acetone is more volatile, it will separate out first.

Simple distillation is a procedure by which two liquids with different boiling points can be separated. The process of heating a substance until it vaporizes, cooling the vapours, and collecting the condensed liquid is the basis of a commonly used purification technique called distillation.

Simple distillation can be used effectively to separate liquids that have at least more than 25 K

difference in their boiling points.

Since, the boiling point of acetone is 56°C (329.15 Kelvin) and boiling point of water is 100°C (373.15 Kelvin), and for distillation the minimum difference in temperature should be at least 50°C . Thus, by the process of distillation acetone can be separated.

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15. What would you observe when :

- A saturated solution of potassium chloride prepared at 60°C is allowed to cool at room temperature?
- An aqueous sugar solution is heated to dryness?
- A mixture of iron filings and sulphur powder is heated strongly?

Ans :

- The given solution is a saturated solution of potassium chloride prepared at 60°C which is above the room temperature (20°C). Therefore, when it is allowed to cool at room temperature, some of the potassium chloride will settle down at the bottom, because saturation decreases with decrease in temperature and vice versa.
- When an aqueous solution of sugar is heated to dryness, the water will evaporate and the sugar will be left behind in the container. But, the sugar left in the container may be burnt because of more heating.
- When a mixture of iron filings and sulphur powder is heated strongly, compound FeS (Ferrous Sulphide) is formed.

16. Explain why particles of a colloidal solution do not settle down when left undisturbed, while in the case of a suspension they do.

Ans :

Colloid particles resist settling rapidly to the bottom of a vessel due to Brownian motion. Brownian motion is the random movement of colloidal particles suspended in a liquid or gas, caused by collisions with molecules of the surrounding medium. The particles in colloids are in constant motion. It has strong intermolecular forces of attraction between the particles. But, in a suspension, the particles are bigger than that of a colloid and also molecular interaction in a suspension is not strong enough to keep the particles suspended, and hence they settle down.

17. Smoke and fog both are aerosols. In what way are they different?

Ans :

Both smoke and fog are aerosols that has gas as its dispersion medium.

Smoke : Smoke is mixture of gases. It is formed by the incomplete combustion of fossil fuels such as coal, oil, and natural gas and carried on the hot air from burning. Dispersed phase in smoke is solid.

Fog : Fog is the natural phenomenon when the humidity reaches 100%, in other words, the air is saturated with moisture and contains many tiny liquid water droplets collecting into the air at the surface of the Earth. The

fog may rise to form a low layer of stratus. It is non-polluting. Dispersed phase in fog is liquid.

18. Classify the following as physical or chemical properties :

- The composition of a sample of steel is : 98% iron, 1.5% carbon and 0.5% other elements.
- Zinc dissolves in hydrochloric acid with the evolution of hydrogen gas.
- Metallic sodium is soft enough to be cut with a knife.
- Most metal oxides form alkalis on interacting with water.

Ans :

Physical properties — (i) and (iii)

Chemical properties — (ii) and (iv)

19. The teacher instructed three students 'A', 'B' and 'C' respectively to prepare a 50% (mass by volume) solution of sodium hydroxide (NaOH). 'A' dissolved 50 g of NaOH in 100 ml of water, 'B' dissolved 50 g of NaOH in 100 g of water while 'C' dissolved 50 g of NaOH in water to make 100 ml of solution. Which one of them has made the desired solution and why?

Ans :

'C' was right.

The water changes its volume, when the NaOH is dissolved in it. So, the volume needs to be adjusted.

$$\text{Mass by volume (\%)} = \frac{\text{Mass of solute}}{\text{Volume of solution}} \times 100$$

$$= 50\% \text{ mass by volume}$$

20. Name the process associated with the following:

- Dry ice is kept at room temperature and at one atmospheric pressure.
- A drop of ink placed on the surface of water contained in a glass spreads throughout the water.
- A potassium permanganate crystal is in a beaker and water is poured into the beaker with stirring.
- An acetone bottle is left open and the bottle becomes empty.
- Milk is churned to separate cream from it.
- Settling of sand when a mixture of sand and water is left undisturbed for some time.
- Fine beam of light entering through a small hole in a dark room, illuminates the particles in its paths.

Ans :

- Sublimation
- Diffusion
- Dissolution/diffusion
- Evaporation, diffusion
- Centrifugation
- Sedimentation
- Scattering of light (Tyndall effect)

21. You are given two samples of water, labelled as 'A' and 'B'. Sample 'A' boils at 100°C and sample 'B' boils at 102°C . Which sample of water will not freeze at 0°C ? Comment.

Ans :

The boiling point of pure water is 100°C. The melting point and boiling point of a given substance changes with the presence of soluble impurities.

Addition of impurities to a pure substance decreases its melting point but increases its boiling point.

For example : Boiling point of water is 100°C under normal atmospheric pressure. If we add sugar or salt to this water its vapour pressure becomes lower and boiling point increases. Therefore, we can say that the sample 'B' is not pure water as its boiling point is 102°C.

Since the sample 'B' is not pure, therefore, the water will not freeze at 0°C. It will freeze at a lower temperature as the presence of impurities lowers (depresses) the freezing point of a liquid.

22. What are the favourable qualities given to gold when it is alloyed with copper or silver for the purpose of making ornaments?

Ans :

Pure gold is very soft, very malleable and very dense metal. Therefore, in order to impart strength and hardness to this soft metal and to make it less dense, it is alloyed with silver or copper.

23. An element is sonorous and highly ductile. Under which category would you classify this element? What other characteristics do you expect the element to possess?

Ans :

As the given element is sonorous and highly ductile, it should be kept under the category of metals. Other characteristics possessed metals are :

- (i) Good conductor of heat and electricity
- (ii) Lustrous
- (iii) Malleable

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24. Give an example each for the mixture having the following characteristics. Suggest a suitable method to separate the components of these mixtures.

- (i) A volatile and a non-volatile component.
- (ii) Two volatile components with appreciable difference in boiling points.
- (iii) Two immiscible liquids.
- (iv) One of the components changes directly from solid to gaseous state.
- (v) Two or more coloured constituents soluble in some solvent.

Ans :

- (i) Evaporation or distillation
- (ii) Distillation
- (iii) Separation by using separating funnel
- (iv) Sublimation
- (v) Chromatography

25. Fill in the blanks

- (i) A colloid is a _____ mixture and its components can be separated by the technique known as _____

- (ii) _____ Ice, water and water vapour look different and display different _____ properties but they are _____ the same.
- (iii) A mixture of chloroform and water taken in a separating funnel is mixed and left undisturbed for some time. The upper layer in the separating funnel will be of _____ and the lower layer will be that of _____
- (iv) A mixture of two or more miscible liquids, for which the difference in the boiling points is less than 25K can be separated by the process called _____
- (v) _____ When light is passed through water containing a few drops of milk, it shows a bluish tinge. This is due to the _____ of light by milk and the phenomenon is called _____. This indicates that milk is a _____ solution.

Ans :

- (i) heterogenous, centrifugation.
- (ii) physical, chemically.
- (iii) water, chloroform.
- (iv) fractional distillation.
- (v) scattering, Tyndall effect, colloidal.

26. Sucrose (sugar) crystals obtained from sugarcane and beetroot are mixed together. Will it be a pure substance or a mixture? Give reasons for the same.

Ans :

It is a pure substance because chemical composition of sugar crystals, i.e., sucrose is same irrespective of its source.

27. Give some examples of Tyndall effect observed in your surroundings.

Ans :

- (a) Tyndall effect can also be observed when a fine beam of light enters a room through a small hole. This happens due to the scattering of light, by the particles of dust and smoke in the air.
- (b) Mixture of water and milk shows Tyndall effect.
- (c) Tyndall effect can be observed when sunlight passes through the canopy of a dense forest. In the forest, mist contains tiny droplets of water, which act as particles of colloid dispersed in air.

28. Can we separate alcohol dissolved in water by using a separating funnel? If yes, then describe the procedure. If not, explain.

Ans :

The mixture of alcohol and water cannot be separated using a separating funnel, since these are not immiscible liquids.

The mixture of alcohol and water can be separated by the process of distillation.

29. On heating calcium carbonate gets converted into calcium oxide and carbon dioxide.

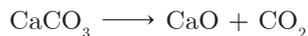
- (i) Is this a physical or a chemical change?
- (ii) Can you prepare one acidic and one basic solution by using the products formed in the above process?

If so, write the chemical equation involved.

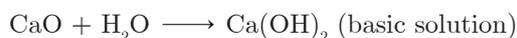
Ans :

(i) It is a chemical change

Calcium carbonate \longrightarrow Calcium oxide + Carbon dioxide



(ii) Acidic and basic solutions can be prepared by dissolving the products of the above process in water



30. Non-metals are usually poor conductors of heat and electricity. They are non-lustrous, non-sonorous, non-malleable and are coloured.

- Name a lustrous non-metal.
- Name a non-metal which exists as a liquid at room temperature.
- The allotropic form of a non-metal is a good conductor of electricity. Name the allotrope.
- Name a non-metal which is known to form the largest number of compounds.
- Name non-metals other than carbon which show allotropy.
- Name a non-metal which is required for combustion.

Ans :

- | | |
|-------------------------|-------------|
| (a) Iodine | (b) Bromine |
| (c) Graphite | (d) Carbon |
| (e) Sulphur, Phosphorus | (f) Oxygen |

31. Classify the substances given in figure into elements and compounds :

Cu	Sand	H ₂ O	CaCO ₃
O ₂	Zn	NaCl _(aq)	F ₂
Hg	Diamond (C)	Wood	

Ans :

Elements	Compounds
Cu	CaCO ₃
Zn	H ₂ O
F ₂	
O ₂	
Diamond (C)	
Hg	

32. Which of the following are not compound?

- | | |
|--------------------|------------------------|
| (a) Chlorine gas | (b) Potassium chloride |
| (c) Iron | (d) Iron sulphate |
| (e) Aluminium | (f) Iodine |
| (g) Carbon | (h) Carbon monoxide |
| (i) Sulphur powder | |

Ans :

Chlorine gas, Iron, Aluminium, Iodine, Carbon, and Sulphur powder are not compound.

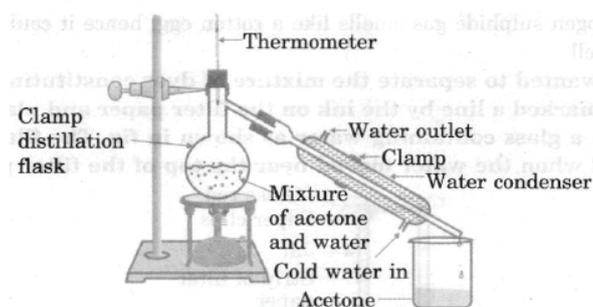
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Long Answer Questions

33. Fractional distillation is suitable for separation of miscible liquids with a boiling point difference of about 25 K or less. What part of fractional distillation apparatus makes it efficient and possess an advantage over a simple distillation process. Explain using a diagram.

Ans :

Apparatus used for fractional distillation has a fractionating column. A simple fractionating column has glass beads in it which provide additional surface area because of which the vapours can spread and cool rapidly. Hence, fractionating column is used to provide the additional surface and to facilitate the cooling of vapour in many cycles.



34. (i) Under which category of mixtures will you classify alloys and why?
 (ii) A solution is always a liquid. Comment.
 (iii) Can a solution be heterogeneous?

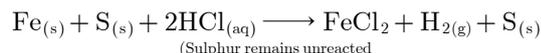
Ans :

- (i) When constituent particles of a combination of two or more element or compound retains their properties, then it is called mixture. In an alloy the constituent particles lose, hence alloys are classified as homogeneous mixture. For example : Steel is an alloy of carbon and iron.
- (ii) Since, a solution is the homogeneous mixture of two or more substances, thus it is not necessary that a solution would always a liquid.
 A solution can be in all the three states of matter. A solution is a homogeneous mixture and can be in all the three states of matter.
 Example : Solution of alcohol in water is a liquid. Air is a solution of different gases. Alloy is a solution which is in the form of solids.
- (iii) Solution is defined as the homogeneous mixture, hence a solution cannot be heterogeneous. But, when a mixture becomes heterogeneous, it cannot be fall under the definition of solution.

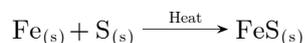
35. Iron filings and sulphur were mixed together and divided into two parts, 'A' and 'B'. Part 'A' was heated strongly, while part 'B' was not heated. Dilute hydrochloric acid was added to both the parts and

evolution of gas was seen in both the cases. How will you identify the gases evolved?

Ans :



Hydrogen gas is released, when dilute hydrochloric acid is added to part 'B'. Hydrogen gas can be tested by bringing a burning matchstick or candle near it. When a burning matchstick is placed near the hydrogen gas, it burns with a pop sound, which is a test for hydrogen gas.



Hydrogen sulphide gas released when dilute hydrochloric acid was added to part 'A'. Hydrogen sulphide gas smells like a rotten egg, hence it could be confirmed by its smell.

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36. A child wanted to separate the mixture of dyes constituting a sample of ink. He marked a line by the ink on the filter paper and placed the filter paper in a glass containing water as shown in fig. The filter paper was removed when the water moved near the top of the filter paper.

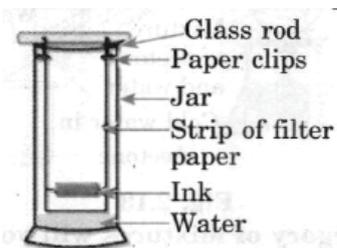


Figure: Chromatography

- What would you expect to see, if the ink contains three different coloured components?
- Name the technique used by the child.
- Suggest one more application of this technique.

Ans :

- Streaks of different colours can be seen on the filter paper.
- Chromatography.
- Chromatography is used for separating pigments present in chlorophyll.

37. A group of students took an old shoe box and covered it with a black paper from all sides. They fixed a source of light (a torch) at one end of the box by making a hole in it and made another hole on the other side to view the light. They placed a milk sample contained in a beaker/ tumbler in the box as shown in the fig. They were amazed to see that milk taken in the tumbler was illuminated. They tried the same activity by taking a salt solution but found that light

simply passed through it.

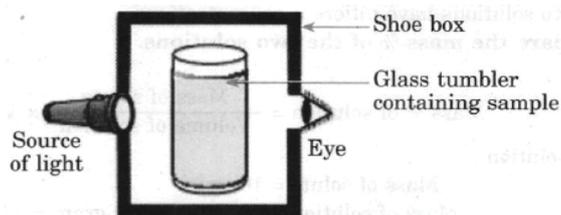


Figure: Tyndall effect

- Explain why the milk sample was illuminated. Name the phenomenon involved.
- Same results were not observed with a salt solution. Explain.
- Can you suggest two more solutions which would show the same effect as shown by the milk solution?

Ans :

- Since, milk is a colloid and when light scattered from the particles of colloids, it was illuminated, thus light was illuminated when passed through the milk. This is known as Tyndall effect.
- For scattering of light the size of particles should be large enough. Since the particles of solution were not enough to scatter the beam of light, hence same results were not observed.
- Soap bubbles and fog are the colloids, hence same effect, i.e. scattering of light is shown by these. This is known as Tyndall effect.

38. Classify each of the following, as a physical or a chemical change. Give reasons.

- Drying of a shirt in the Sun.
- Rising of hot air over a radiator.
- Burning of kerosene in a lantern.
- Change in the colour of black tea on adding lemon juice to it.
- Churning of milk cream to get butter.

Ans :

- Drying of shirt in the Sun is a physical change. As, in this change no new substance is formed.
- Since, in rising of hot air over a radiator no new substance is formed, hence it is a physical change.
- While burning of kerosene in a lantern, carbon dioxide and water vapour is formed, hence it is a chemical change.
- In this change a new substance is formed, hence it is a chemical change.
- While churning of milk cream to get butter, no new substance is formed, hence it is a physical change.

39. During an experiment, the students were asked to prepare a 10% (Mass/Mass) solution of sugar in water. Ramesh dissolved 10 g of sugar in 100 g of water while Sarika prepared it by dissolving 10 g of sugar in water to make 100 g of the solution.

- Are the two solutions of the same concentration?
- Compare the mass % of the two solutions.

Ans :

- No, the two solutions have different concentrations.

(ii) We know,

$$\text{Mass \% of solution} = \frac{\text{Mass of solute}}{\text{Volume of solution}} \times 100$$

For first solution :

$$\text{Mass of solute} = 10 \text{ gram}$$

$$\begin{aligned} \text{Mass of solution} &= 100 \text{ gram} + 10 \text{ gram} \\ &= 110 \text{ gram} \end{aligned}$$

Hence,

$$\text{Mass \% of solution} = \frac{10}{110} \times 100 = 9.99\%$$

For second solution :

$$\text{Mass of solute} = 10 \text{ gram}$$

$$\text{Mass of solution} = 100 \text{ gram}$$

Hence,

$$\text{Mass \% of solution} = \frac{10}{100} \times 100 = 10\%$$

Mass percent of first solution : Mass percent of second solution = 9.99 : 10

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40. You are provided with a mixture containing sand, iron filings, ammonium chloride and sodium chloride. Describe the procedures you would use to separate these constituents from the mixture.

Ans :

The given mixture can be separated using the following process :

(i) **Magnetic Separation** : Using magnetic separation the iron filings can be separated from the given mixture.

In this, a magnet is moved just above the mixture, since iron is a magnetic substance it is attracted by magnet and stuck with it. By this, first of all iron filings are separated.

(ii) **Sublimation** : After the separation of iron filings, ammonium chloride is separated by the process of sublimation.

Since, ammonium chloride is a sublimate and it turns into vapour directly without changing into liquid, thus when the mixture is sublimated, the ammonium chloride is deposited over the inner wall of funnel leaving the sodium chloride and sand in the watch glass. Ammonium chloride is separated by scratching from the inner wall of the funnel.

(iii) **Filtration** : Now the left mixture of sand and sodium chloride is put in water, after stirring the sodium chloride is dissolved in water. The solution is separated by the process of filtration. The sand leftover is separated out by using the filter paper.

(iv) **Vaporisation** : By the process of vaporization, the liquid so obtained is vapourized and crystals of ammonium chloride can be obtained.

Hence, by using the methods of magnetic separation, sublimation, filtration, vaporisation and crystallization the component of given mixture of sand, iron filings, ammonium chloride and sodium chloride can be separated.

chloride in water. Which of the following correctly represents the composition of the solutions?

- 1.00 g of NaCl + 100 g of water
- 0.11 g of NaCl + 100 g of water
- 0.01 g of NaCl + 99.99 g of water
- 0.10 g of NaCl + 99.90 g of water

Ans :

(iii) 0.01 g of NaCl + 99.99 g of water

42. Calculate the mass of sodium sulphate required to prepare its 20% (mass percent) solution in 100 g of water.

Ans :

In a 20% solution containing 100 g water; the mass percentage of water

$$= 100 - 20 = 80\%$$

80% of solution is 100 gram

100% of solution is $\frac{100}{80}$ gram

20% of solution is $\frac{100}{80} \times 20 = 25$ gram

Hence, to prepare 20% (w/w) solution in 100 gram of water 25 gram of sodium sulphate is needed.

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41. Arun has prepared 0.01% (by mass) solution of sodium

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Science IX

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