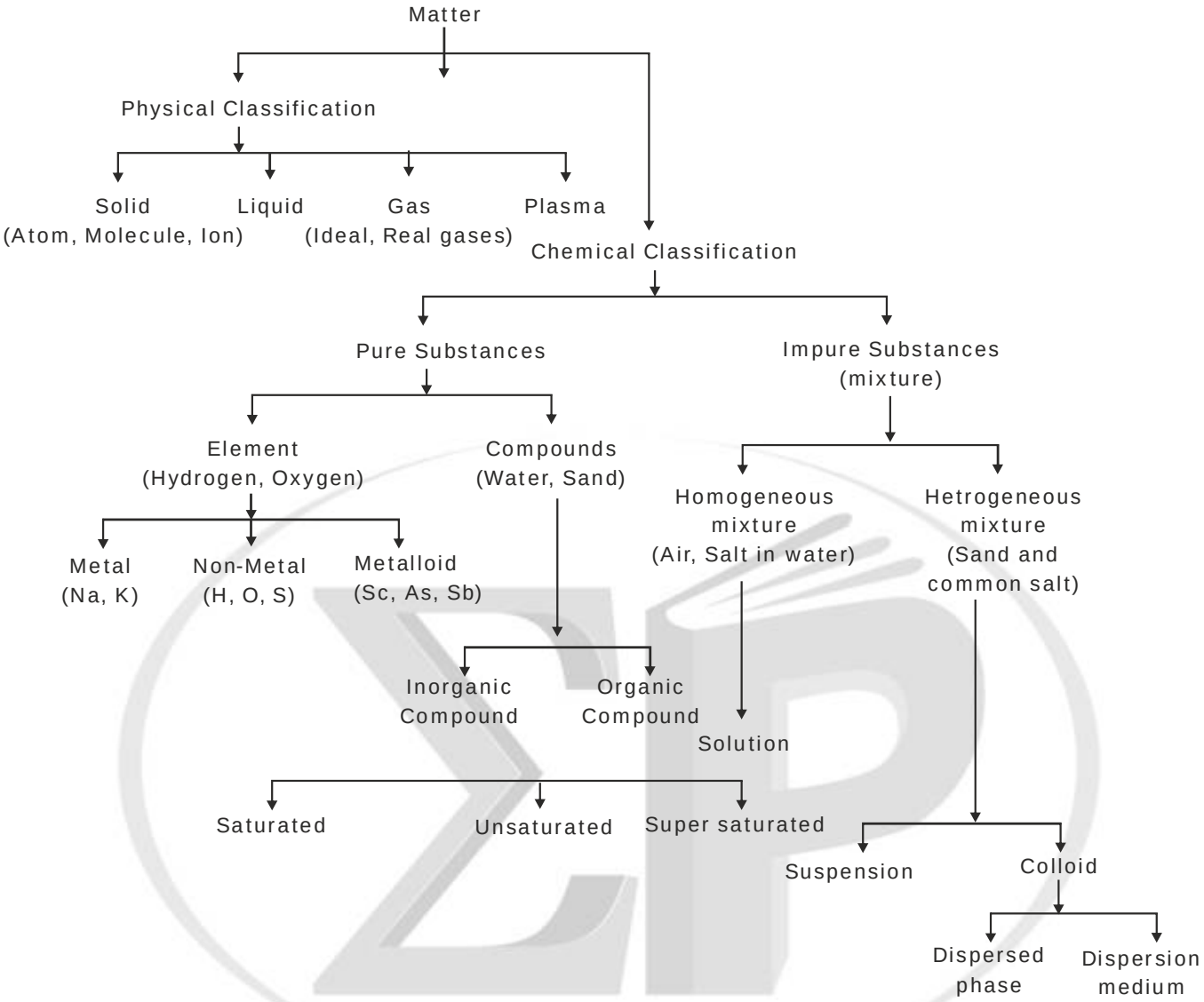
CHAPTER-2 IS MATTER AROUND US PURE

CHAPTER REVIEW



DEFINITIONS

ACTIVITY-1

- Let us divide the class into groups A, B, C and D.
- Group A takes a beaker containing 50 mL of water and one spatula full of copper sulphate powder. Group B takes 50 mL of water and two spatula full of copper sulphate powder in a beaker.
- Groups C and D can take different amounts of copper sulphate and potassium permanganate or common salt (sodium chloride) and mix the given components to form a mixture.
- Report the observations on the uniformity in colour and texture.
- Groups A and B have obtained a mixture which has a uniform composition throughout. Such mixtures are called homogeneous mixtures or solutions. Some other examples of such mixtures are: (i) salt in water and (ii) sugar in water. Compare the colour of the solutions of the two groups. Though both the groups have obtained copper sulphate solution but the intensity of colour of the solutions is different. This shows that a homogeneous mixture can have a variable composition.

- Groups C and D have obtained mixtures, which contain physically distinct parts and have non-uniform compositions. Such mixtures are called heterogeneous mixtures. Mixtures of sodium chloride and iron filings, salt and sulphur, and oil and water are examples of heterogeneous mixtures.

  CONCLUSION: *Beakers A and B have homogeneous mixtures of variable composition. Beakers C and D have heterogeneous mixtures of variable composition.*

ACTIVITY-2

- Let us again divide the class into four groups – A, B, C and D.
- Distribute the following samples to each group :
  – Few crystals of copper sulphate to group A.
  – One spatula full of copper sulphate to group B.
  – Chalk powder or wheat flour to group C.
  – Few drops of milk or ink to group D.
- Each group should add the given sample in water and stir properly using a glass rod. Are the particles in the mixture visible?
- Direct a beam of light from a torch through the beaker containing the mixture and observe from the front. Was the path of the beam of light visible?
- Leave the mixtures undisturbed for a few minutes (and set up the filtration apparatus in the meantime). Is the mixture stable or do the particles begin to settle after some time?
- Filter the mixture. Is there any residue on the filter paper?
  Discuss the results and form an opinion.
- *Groups A and B have got a solution.*
- *Group C has got a suspension.*
- *Group D has got a colloidal solution.*

  CONCLUSION:

  a. *Beaker A contains true solution. True solutions are homogeneous and stable.They do not show Tyndall effect and are not separated by filtration.*

  b. *Beaker B contains suspension. Suspensions are heterogeneous, opaque, unstable and exhibit Tyndall effect. They are separated by filtration.*

  c. *Beaker C contains colloidalsolution. Colloids are also heterogeneous, translucent, stable and exhibit Tyndall effect. They are not separated by filtration.*

SOLVED QUESTIONS

1. What is meant by a pure substance?

Ans. A pure substance is a single substance or matter which can not be separated into other kind of matter by any physical process. All elements and compounds are pure substances.

2. Differentiate between homogeneous and heterogeneous mixtures with examples.

Ans.

Homogeneous mixture	Heterogeneous mixture
1. In it the constituents are uniformly mixed and there are no boundaries of separation.	1. In it constituents may not be uniformly mixed and there are clear boundaries of separation.
2. We can not easily see various constituents.	2. We can easily see different.
3. We can not easily separate the constituent of such a mixture. We need special methods for separation of constituents of such a mixture.	3. We can easily separate the constituents of such a mixture by ordinary methods of separation of mixtures.

Examples : Homogeneous mixture : Air, a well mixed solution of vinegar.

Heterogeneous mixture : A mixture of salt and pepper, a mixture of iron fillings and sulphur.

3. Which of the two will scatter light-soap solution or salt solution? **(CCE 2012)**

Ans. Soap solution will scatter light because soap solution is a colloid. Salt solution is a true solution so, it will not scatter light.

4. What happens when saturated solution is allowed to cool? **(CCE 2012)**

Ans. If a saturated solution available at a particular temperature is cooled to a lower temperature, then some of its dissolved solute will separate out in the form of solid crystals.

5. How can you convert a saturated solution into an unsaturated solution? **(CCE 2014)**

Ans. By adding more solvent or by applying heat.

TRY YOURSELF

1. Define a saturated solution.
2. Define a mixture.
3. Name the suspension used for diagnostic X-ray.
4. Write the definition of an element.
5. Name the first scientist who used the term element.
6. Is sodium chloride or sugar a pure substance ? If so, why ?
7. How would you confirm that a colourless liquid given to you in pure water ?
8. Are soft drinks mixtures or pure compounds ?
9. Is 22 carat gold a mixture or an element ? Comment.
10. Give two examples of homogeneous mixtures.
11. Write the definition of an element.
12. Name a metal and a non metal which exist as liquid under normal conditions.
13. Is brass a mixture or a compound ? Comment.
14. Define a compound.
15. Mention the characteristics of a mixture.

TEST YOUR CONCEPT

1. What is the volume percentage of a solution prepared by mixing 100 ml of alcohol and 400 ml of water?
2. Which of the following materials cold be a pure substance? butter, ghee, water, ink, glass, paper, sugar, banana, orange, marble, blood, wood.
3. State why we cannot call any vegetable or fruit a pure substance?
4. Differentiate between saturated, unsaturated and supersaturated solutions.
5. Why is Tyndall effect not shown by true solutions?

SOLUTIONS

SOLVED QUESTIONS

1. 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. Mass of common salt dissolved (solute) = 36 g.

Mass of water taken (solved) = 100 g

$$\text{Concentration of solution } \frac{\text{Mass of solute}}{\text{Mass of solvent}} \times 100 = \frac{36}{100} \times 100 = 36\%$$

2. A solution contains 50 g of common salt in 450 g of water. Calculate the concentration of the solution.

Ans. Concentration of solution = $\frac{\text{Mass of solute}}{\text{Mass of solution}} \times 100$ $\Rightarrow$ Mass of common salt (solute) = 50 g

Mass of water = 450 g $\Rightarrow$ Mass of solution = 50 + 450 = 500 g

$$\text{Concentration of solution} = \frac{50}{500} \times 100 = 10\%$$

3. Calculate the masses of cane sugar and water required to prepare 250g of 25% solution of cane sugar.

Ans. Given, mass per cent = 25%, mass of the solution = 250 g

$\Rightarrow$ Mass per cent = $\frac{\text{Mass of the solute}}{\text{Mass of the solution}} \times 100$

$25 = \frac{\text{Mass of the solute}}{250\text{ g}} \times 100$

$\Rightarrow$ Mass of the solute (cane sugar) = $\frac{25 \times 250}{100}$ = 62.5 g

Mass of the solvent (water) = 250 – 62.5 = 187.5 g

4. Calculate the strength of a solution in g L^{-1} that is made by dissolving 5 g of glucose in 200 mL of the solution.

Ans. Mass of solute (glucose) = 5 g

$\Rightarrow$ Volume of solution = 200 mL = 0.2 L [$\because$ 1 L = 1000 mL]

Strength of the solution = $\frac{\text{Mass of solute}}{\text{Volume of solution}} = \frac{5\text{ g}}{0.2\text{ L}}$ = 25 g L^{-1}

5. 4 g of a solute is dissolved in 40 g of water to form a saturated solution at 25°C. Calculate the solubility of the solute at 25°C.

Sol. Solubility = $\frac{\text{Mass of solute}}{\text{Mass of solvent}} \times 100$

$\Rightarrow$ Mass of solute = 4 g, Mass of solvent = 40 g,

Solubility = $\frac{4}{40} \times 100 = 10\text{ g}$

TRY YOURSELF

1. Write the definition of a solution.

2. What is the effect of temperature on solubility ?

3. Identify solute and solvent in 10% ethyl alcohol in water.

4. Write units of solubility.

5. Define concentration of a solution.

6. Name two elements which become liquid slightly above 30°C?

7. Give an example of a non-aqueous solution ?

8. Give one example of a solution in which liquid is a solute as well as the solvent.

9. Give an example of a solution in which solid is a solute as well as the solvent.

TEST YOUR CONCEPT

1. Will the solubility of common salt in water decrease or increase with increase in temperature? Explain your answer.

2. Differentiate between a saturated solution and an unsaturated solution. How will you test whether a given solution is saturated or not?

3. Calculate the concentration of a solution in volume per cent made when 56g of water is mixed with 0.17 L of ethanol.

4. A sample of bronze is made by mixing 85 kg of molten tin with 942 kg of molten copper. What is the mass percent tin in this bronze?

5. A solution of alcohol in water has been prepared by mixing 100 mL of alcohol in 300 mL of water. Calculate the volume percentage of the solution. **(CCE 2015)** [**Ans.** 25%]

6. Calculate the mass of water and mass of glucose required to make 250 gm of 40% solution of glucose.

(CCE 2014) [**Ans.** 150 g, 100 g]

SOLVED QUESTIONS

1. How sols, solutions and suspension differ from each other?

Ans. Difference between sols (i.e., colloidal solutions), solutions (i.e. true solution) and suspension are listed below :

S.No.	Property	Sol	Solution	Suspension
1.	Nature	Appears to be homogeneous homogeneous but actually heterogeneous	Homogeneous	Heterogeneous
2.	Particle size	1 nm to 100 nm	Less than 1 nm	More than 100 nm
3.	Visibility	Particles are visible through an ultramicroscope but not with naked eye.	Particles are not visible even with microscope.	Particles are visible with naked eye.
4.	Tyndall effect	Light is scattered	No scattering of light	Light is scattered
5.	Sedimentation	Settle on centrifugation	Do not settle down	May settle due to gravity
6.	Brownian	Show Brownian movement	Do not show movement	May or may not Brownian movement

2. Name the dispersed phase, dispersion medium and type of colloid in the following: **(CCE 2014)**

(i) Fog, (ii) Milk

Ans. (i) **Fog** – Dispersed phase – Water droplets (liquid); Dispersion medium – Air (gas), Type – Aerosol

(ii) **Milk** – Dispersed phase – Tiny droplets of oil (cream); Dispersion medium – Water (liquid), Type – Emulsion

3. What is meant by aerosol?

Ans. An aerosol is a colloid in which a solid or liquid is dispersed in a gas (including air). The examples of aerosols in which a solid is dispersed in a gas are smoke.

4. Give two examples of each (i) Aerosol, (ii) Emulsion.

Ans. (i) **Aerosol** – Smoke, mist, fog, etc. (ii) **Emulsion** – Milk and face cream.

TRY YOURSELF

1. What is the reason for the difference in properties of solutions, colloids and suspensions?
2. Which will boil at a higher temperature; tap water or sea water?
3. Define and give examples of aerosol.
4. Define and given examples of foam.
5. Name the mixtures where filtration is employed?
6. Define and give examples of colloid.
7. Name the components of colloid.
8. Define and give examples of emulsion.
9. Define and give examples of gel.
10. A saturated solution of potassium chloride is prepared in water at 353 K. This solution is allowed to cool up to 300 K. Explain what you would observe in the solution ?
11. A solution contains 16 g of urea in 120 g of the solution. What is mass by mass percentage of solution?
12. 100 mL of alcohol has been dissolved in 400 mL of water. Calculate the volume percentage of the solution.
13. What happens when strong beam of light is passed through a colloidal solution?

TEST YOUR CONCEPT

1. Which one shows Tyndall effect and why? True solution or colloidal solution.
2. Why does the beam of light illuminated when it enters a room through a small hole?
3. What are colloids? State their characteristics.
4. You are provided with solution of substance X. How will you test whether it is saturated or unsaturated with respect to X at a given temperature? What happens when a hot saturated solution is allowed to cool? **(CCE 2014)**

SOLVED QUESTIONS

1. Classify the following as a chemical or physical change :

i. Cutting of trees ii. Melting of butter in a pan

iii. Rusting of almirah iv. Boiling of water to form water to form steam

v. Passing of electric current through water and the water breaking down into hydrogen and oxygen gases.

vi. Dissolving common salt in watervii. Making a fruit salad with raw fruits

viii. Burning of paper wood etc.

Ans. i. Chemical change (It is irreversible) ii. Physical change (no new substance formed)

iii. Chemical change (rust is oxide of iron) iv. Physical change (no new substance formed)

v. Chemical change (Hydrogen and Oxygen are formed) vi. Physical change (no new substance formed)

vii. Physical change (no new substance formed) viii. Physical change (It is irreversible)

2. Write the name of any two substances that sublime.

Ans. Camphor and ammonium chloride.

3. A housewife churned full cream milk with a milk churner.

(i) What did she observe after churning milk? (ii) What could be the possible reason for this observation?

Ans. (i) Cream separated from milk.

(ii) When milk is churned, the lighter fat particles colloid with each other to forms cream which stays on the surface while the heavier particles of milk are forced to come to the bottom.

4. Which technique will you use to separate a mixture of carbon tetrachloride and water? Using this technique, can you separate alcohol from water? Explain.

Ans. Carbon tetrachloride and water are immiscble liquids and hence can be separated by a separating funnel. The mixture is placed in a separating funnel and shaken vigorously and then allowed to stand. Carbon tetrachloride being heavier than water forms the lower layer from where it can be withdraw in a beaker. In contrast, alcohol and water are miscible and hence cannot be separated by a separating funnel.

5. What type of mixtures can be separated by technique of crystallization?

Ans. The technique of crystallization can be used to separate components of a mixture in which one component is less soluble in a particular solvent as compared to the other component. i.e. it makes use of the difference of solubility of a substance. It is used to purity substances.

TRY YOURSELF

1. A mixture contains naphthalene and sodium chloride? Suggest a method for their separation.

2. Write the method to separate the components of a mixture of oil and water.

3. Write the principle of filtration.

4. Name the process you would use to separate a mixture of water and alcohol.

5. In the process of chromatography, an ink drop splits up into three spots on filter paper strip. What do you conclude from this observation ?

6. Name the process used by milkman to separate cream from milk.

7. Define a solute.

8. Why and how the Tyndall effect is caused ?

9. What is the principle of sedimentation ?

10. Write the principle of evaporation.

11. What is the application of evaporation ?

12. Name the substance which can be separated from a mixture by sublimation.

13. What do you understand by distillation ?

14. Name the types of distillation.

15. What is fractional distillation ?

16. Which type of mixtures are separated by the process of sedimentation ?

17. How will you test whether the given solution is a colloidal solution?

18. Paints often need to be stirred thoroughly before use. Why?

19. Define a solvent.

TEST YOUR CONCEPT

1. During fractional distillation how does the process of distillation continue and the separation of liquid is done on the basis of repeated distillation?

2. Give an example each for a mixture having following characteristics:

(i) Two or more coloured constituents soluble in a solvent.

(ii) Two immiscible liquids.

(iii) One of the components changes directly to the gaseous state.

Suggest a suitable method of separate the components of these mixtures. **(CCE 2013)**

3. What is a centrifuge? What is the advantage of distillation over evaporation?

4. Oxygen, organ and nitrogen boil at –182°C, –186°C and –196°C respectively.

Answer the following questions:

a. Arrange the gases in the increasing value of boiling point.

b. Which gas forms the liquid first as the air is cooled?

c. Which gas is obtained first when liquid air boils up?

5. Give two examples of solutions containing a non-volatile component and a volatile component. How will you obtain non-volatile component from such a solution?

PRACTICE QUESTIONS

SHORT ANSWER TYPE QUESTIONS [TWO MARKERS]

1. Define the terms compound and mixture giving examples of each.

2. Give one example of each of the following : (a) aerosol (b) solution

3. Explain the term element with examples.

4. Write the principle of separation of the components of air.

5. Name the technique of techniques to separate the components of a mixture of salt, camphor and saw dust.

6. What is sublimation?

7. What is the purpose of separation of the components of mixtures?

8. Differentiate between homogeneous and heterogeneous mixtures with examples.

9. Define mass percent of solution.

10. Define mass by volume percent of solution.

11. Define unsaturated solution.

12. Write the principle of fractional distillation.

13. Describe the method of separation of pure copper sulphate from an impure sample by crystallization.

14. Given a flow chart to separate ammonium chloride and sodium chloride from a mixture.

15. What is chromatography?

16. What is the difference between a pure substance and a mixture? Give one example in each case.

17. How can a saturated solution be made unsaturated?

18. Give two reasons to support that water is a compound and not a mixture.

19. Write the properties of a suspension.

20. What is centrifugation and what is centrifuging machine?

21. Given one example each of (i) homogeneous mixture and (ii) heterogeneous mixture of a liquid in a solid.

22. Water in a stream after rain contains air bubbles, salt, calcium bicarbonate, sand grains, straw pieces and unfilterable clay particles. Select from amongst these one example each of a solvent, a solute, a suspension and a colloid.

23. Suggest a way to determine whether a colourless liquid is pure water or a solution of salt (or sugar) in water, without wasting the liquid.

24. Differentiate between physical & chemical changes with examples.

SHORT ANSWER TYPE QUESTIONS [THREE MARKERS]

1. How would you separate the constituents of gun powder?

2. How will you separate the constituents of a mixture containing water and oil? Name other mixture which can be separated by similar method.

3. Give the properties of a suspension.

4. State three prominent properties of metals which are generally not shown by non-metals.

5. How will you distinguish between a compound and a mixture ?

6. Describe the method of evaporation to isolate dye (coloured material) from link.

7. What are the merits of crystallization over evaporation?

8. Given a flow chart to separate the components of a mixture of sulphur, charcoal and potassium nitrate.

9. Is air a mixture or a compound? Give three reasons.

10. How can you separate a mixture of two miscible liquids such as acetone and water?

11. Give one example each of (a) mixture of elements (b) mixture of compounds (c) mixture of elements and compounds.

12. Give the properties of a colloidal solution.

LONG ANSWER TYPE QUESTIONS [5 MARKERS]

1. Draw a flow chart of the separation of the components of air.

2. Give the outlines of the following methods which are generally employed for the separation of the constituents of a mixture. (a) Sedimentation and decantation (b) Filtration (c) Sublimation (d) Distillation (e) Separating funnel

3. Compare the properties of a true solution, a suspension and a colloidal solution.

4. Discuss briefly the principle, theory and applications of the techniques used for the separation of following mixtures:

(a) Two immiscible liquids (b) Two miscible liquids whose boiling points differ by more than 25°C

(c) Two miscible liquids whose boiling points differ by less than 25°C

PAST ARCHIVES

1. *(i) You are given a mixture of sand, water and mustard oil. How will you separate the components of this mixture. Explain it with the help of different separation methods involved in it.*

(ii) Give flow diagram showing the process of obtaining gases from air. ***[CCE 2015]***

2. *Define distillation. What types of liquids (substances) can be separated by this process?* ***[CCE 2015]***

3. *List the two conditions essential for using distillation as a method for separation of the component from a mixture.* ***[CCE 2014]***

4. *110 g of salt is present in 550 g of solution. Calculate the mass percentage of the solution.* ***[CCE 2014]***

5. *You are provided with a mixture containing sand, iron fillings, napthalene and sodium chloride. Describe the procedures you would use to separate these constituents from the mixture.* ***[CCE 2014]***

6. *Describe the various steps involved in the purification of water for city water supply.* ***[CCE 2014, 13]***

7. *Smoke and fog both are aerosols. In what way are they different?* ***[CCE 2013,]***

8. *Rahul's mother mixed oil and water in kitchen by mistake. Rahul told her that he can separate the mixture. Name the technique used by Rahul and explain how he will do it? Draw the diagram and write the principle of this technique.* ***[CCE 2014]***

9. *Take three test tubes and label them as A, B and C. Fill upto two thirds with sugar solution, muddy water and milk respectively. Allow these to stand on test tube stand for some time.* ***[PBQ]***

(i) In which of the test tubes will you observe particles settle down?

(ii) Which of the test tube will look transparent? (iii) Which of the test tube will look translucent?

10. *In an experiment to separate the components of a mixture of sand, common salt and ammonium chloride, which component will be removed by filtration?* ***[PBQ]***