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Home-work

Chapter-2 (Is Matter Around Us Pure)

Classification of Matter on the basis of Chemical Composition

Pure

* Similar kind of particles.
* Can't be separated physically.

Element

* Consist of same kind of particles with respect to their size, shape, etc.
* They can't be separated physically or chemically.

Compound

* Matter which consist of 2 or more kind of atoms in fixed mass ratios.
* Can be separated chemically.

Impure / Mixtures

* diff. kind of particles exist.
* Can be separated physically.

- Homogeneous
- Heterogeneous.

ELEMENTS

METALS	NON-METALS	METALLOIDS
○ Malleable.	• Non-Malleable (Brittle)	• Subs which can show properties of both metals & non-metals.
○ Ductile	• Non-Ductile	
○ Sonorous	• Non-Sonorous	
○ Lustrous	• Non-Lustrous	
○ High melting & boiling point	• Low melting & boiling point	

Good Write

• Good conductor of heat & electricity.	• Bad conductor of heat & electricity
• Hard & rigid or solid at room temp.	• Soft (solid, liquid & gas)
• High density	• Low density
• Ex- copper (Cu), Aluminium (Al)	Ex- Hydrogen (H), oxygen (O_2), carbon (C), Ex- Boron, silicon, germanium, etc.

COMPOUNDS

⇒ Energy is either evolved or absorbed during the formation of compounds.

Ex: H_2O (Water) H:O = 2:16 = 1:8

H_2O_2 (Hydrogen Peroxide) H:O = 2:32 = 1:16

C:O = 12:32 = 3:8 → CO_2

C:O = 12:16 = 3:4 → CO (Carbon Monoxide)

Organic Compounds

Substance which consist of carbon, hydrogen and are derived from living matter. (plants & animals). C+H ±E

Ex: Methane (CH_4)
Butane (C_4H_{10})

Inorganic Compounds

Substance which may or may not consist of carbon and can be derived from minerals or rocks

Ex- CO_2, SO_2, NO_2, H_2O, Calcium Carbide (CaC_2), Carbon Disulphide (CS_2), etc

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⇒ Impure Substances / Mixtures

- Consist of elements which are not in fixed mass ratio
- They can be separated physically. (filteration)
- They don't require energy for their preparation or separation
- They can be of two types:
  - Homogeneous – • Uniform Composition → Ex- sugar solution
    • No separating boundary
  - Heterogeneous – • Non-Uniform Composition
    • It has separating boundary.
    • Ex- sand in water.

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⇒ Components of Solutions

Solute: Substance, which is dissolved in solvent

Solvent: Substance in which solute is dissolved.

⇒ Classification of solution

(1) On the basis of amount of solute dissolved

a) Dilute solution: A solution in which less amount of solute is dissolved in a given amount of solvent

b) Concentrated solution- A solution in which more amount of solute is dissolved in a given amount of solvent

(2) On the basis of solubility

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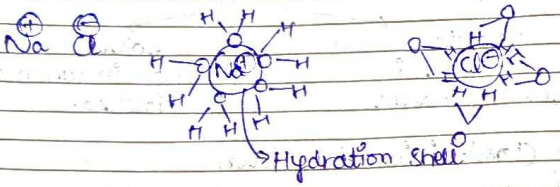
a) Miscible liquids (soluble) – Solution in which solute can be dissolved completely.

b) Immiscible liquids (insoluble) – Solution in which solute can't be dissolved in solvent.

Polar – Substances with oppositely charged particles (+,−)
Non-polar – Substances with like charged particles (−,−) or (+,+)

• (Like dissolves in like)
for eg: salt solution = salt + water
$NaCl + H_2O$
Na (+) Cl (−) + H_2 (+) O (−)
(Metal) (Non-Metal) (Metal) (Non-Metal)



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⇒ Concentration of a sol^n:-
Concentration is the amount of solute present in a given amount of solution or solvent.

Concentration of sol^n = $\frac{\text{Amount or mol of solute}}{\text{Volume of sol}^n \text{ or amount of solvent}}$

↳ Concept of concentration

NOTE: If volume is associated in calculating the concentration ⟶ it depends on temp.

Good Write

If mass is associated in calculating the concentration ⟶ it doesn't depend on temp

⇒ Methods to find concentration
1. Molality or Molal Concentration
2. Molarity or Molar Concentration
3. % [→ Mass, → Volume]
4. Mole fraction
5. Mass fraction

③ (Mass)
% of solute = $\frac{\text{Mass of solute}}{\text{Mass of sol}^n} \times 100$

% of solvent = $\frac{\text{Mass of solvent}}{\text{Mass of sol}^n} \times 100$

(Volume)
% of solute = $\frac{\text{Vol of solute}}{\text{Vol of sol}^n} \times 100$

% of solvent = $\frac{\text{Vol of solvent}}{\text{Vol of sol}^n} \times 100$

Calculate the mass % of contituents/concentration present in a salt sol^n formed by mixing 20g salt in 80g of water.

⇒ Mass of solute (salt) = 20g
Mass of solvent (water) = 80g
Mass of sol^n = 100g (20+80)

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Mass % of solute = $\frac{\text{Mass of solute}}{\text{Mass of sol}^n} \times 100$

$= \frac{20}{100} \times 100 = 20\%$

#Q. Find the concentration of sol^n formed by dissolving 20g of ethyl alcohol in 100g of water.

⇒ Mass of solute (~~sol~~ethanol) = 20 g
Mass of solvent (water) = 100g
Mass of sol^n = 120g

Mass % of solute = $\frac{\text{Mass of solute}}{\text{Mass of sol}^n} \times 100$

$= \frac{20}{120} \times 100 = 16.67\%$

#Q. Calculate the mass of sodium sulphate (Na_2SO_4) required to prepare 20% of sol^n in 100g of H_2O.

⇒ Mass % of sol^n = 20%
Mass of solute = x g
Mass of solvent = 100 g
Mass of sol^n = (x+100) g

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

$20\% = \frac{x}{x+100} \times 100$

$\frac{20}{100_5}(x+100) = 100x$

$0.2(x+100) = 100x$

$0.2x + 20 = 100x$

$\frac{20}{100} = \frac{x}{x+100} \times \frac{100}{100}$

$0.2 = \frac{x}{x+100}$

$0.2(x+100) = x$

$0.2x + 20 = x$

$20 = x - 0.2x$

$20 = 0.8x$

$\frac{20}{0.8} = x$

⇒ $x = 25$

∴ Mass of Na_2SO_4 is 25 g.

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③ 3rd Classification of sol^n:
⇒ On the basis of size of particles.

a) True sol^n – • Size of particles less than 1nm. (10^{-9}m)
• Homogeneous mixture
• No separation boundary
• No filtration
• Ex- NaCl sol^n

b) Colloidal sol^n – • Size of particles between 1-100 nm
• Appears to be homogeneous but Heterogeneous
• No visible separation boundary
• No filteration possible through filter paper
• Ex- Milk in water.

Good Write

c) Colloidal Soln – • Particle size is more than 100 nm.
• Heterogeneous mixture.
• Separation boundary is there.
• Filteration is possible.
• Ex – sand in water.

Q. Why do colloidal particles do not settle at the bottom of the container?

Ans- Brownian motion is the reason which is why the particles of a colloid remain suspended in the sol^n due to intermediate particle size and do not settle at the bottom of the container.
(It is the random movement of particles suspened in a fluid (liquid or gas) caused by collisions with the fluid molecules.)

⩥ In true sol^n : There is constant Brownian Motion but due to small particle size they occupy the intermolecular space of solvent. (H_2O).

⩥ In Supension sol^n : The Brownian Motion is also there but on achieving a point their velocity decreases and the particles down

★ for detailed and informative diff. b/w the 3 sol^n refer → Portfolio.

Good Write

Home-work

NCERT Solutions & Intext Ques.

⩥ Intext Ques (Pg 15).

Q1 What is meant by a substance?

Ans1: A substance is a matter which consists of a single type of particles and has specific properties. for example tin, sulphur, pure sugar (sucrose) etc.

Q2 List the points of differences b/w homogeneous and heterogeneous mixtures.

HOMOGENEOUS	HETEROGENEOUS
1) It has uniform composition.	1) It does not have a uniform composition.
2) No visible boundaries of separation.	2) Visible boundaries of separation.
3) It consists of only one phase.	3) They consist of more than one phase.
4) Examples – sugar + water = sugar sol^n.	4) Ex – sugar + sand = sugar + sand.

⩥ Intext Ques (Pg 18).

Q1 Already done!

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

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Sol (Colloids)	Suspension	Solutions
1) Heterogeneous mixture.	1) Heterogeneous mixture.	1) Homogeneous mixture
2) We cannot see the size of the particle with a naked eye.	2) Particles are visible by the human naked eye.	2) The particles are not visible to a naked eye.
3) They can scatter the beam of light passing thr-ough them.	3) Scatters the beam of light passing through them.	3) Unable to scatter the beam of light.
4) Solute particles cannot be separ-ated by filtera-tion and sedimentation.	4) Solute particles can be separated by filteration.	4) Solute particles cannot be sepa-rated by filtera-tion and sedim-entation.

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

Ans 3: Given that,
Mass of solute (sodium chloride) = 36g = w_1
Mass of water (as a solvent) = 100g = w_2

Therefore, the total mass of solution = 100+36
= 136g = W

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A/Q: Concentration = $\frac{w_1}{w_2} \times 100$

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

Hence, the concentration of the solution at 293 K is 26.47%.

Intext Ques (Pg-19)

Q1 Classify the following as physical or chemical changes:

- cutting of trees – Physical
- melting of butter in a pan – Physical
- rusting of almirah – Chemical
- boiling of water to form steam – Physical
- passing of electric current, through water and the water breaking down into H_2 & O_2.
  ↳ Chemical
- dissolving common salt in water – Physical
- making a fruit salad with raw fruits – Physical
- burning of paper & wood – Chemical

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

Good Write

Ans 2: Pure substance – water, sugar, gold.
Mixtures – plastics, papers, air and milk

Back Exercises-

Q1 (Omitted)

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

Ans 2: The steps for making a tea-

1. Use water as a solvent and boil it for few minutes.
2. Now, add some tea leaves, sugar and milk (if you want) as a solute.
3. Again, boil it for few minutes so that sugar will dissolve in it.
4. At last, filter the solution collect the filter in a cup. The insoluble tea leaves left behind as a residue.

Q3 (a) What mass of potassium nitrate would be needed to produce a saturated solution of potassium nitrates in 50 grams of water at 313K?

Ans 3: (a) We have,
Mass of potassium nitrate = 62g in 100g of water
∴ A/Q,

Mass of potassium nitrate in 50g of water at 313K = $\frac{62 \times 50}{100}$ = 31g

(b) Pragya makes a saturated sol^n of potassium chloride in water at 353K and leaves the sol^n to cool at room temp. What would she observes as the sol^n cools? Explain.

⇒ Pragya will observe that on cooling the saturated sol^n, the crystals of potassium chloride will be obtained.

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

⇒ Ammonium Chloride (37g) > Sodium Chloride (36g) > Potassium Chloride (35g) > Potassium nitrate (32g).

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

Ans: Solubility is directly proportional to the temp.
∴ on increasing temp, the solubility of salt increases

Q4 Explain the following giving examples
(a) saturated sol^n – In a given solvent, when no more solute can be dissolved in a sol^n

Good Write

at a given temp is called a saturated soln.

(b) pure substance - A pure substance is a matter which consists of a single type of particles and has specific properties. for ex- tin, sulphur, pure sugar (sucrose), etc.

(c) colloid - A colloid is a solution in which the particles is bigger in size as compared to the true solution. It is a heterogeneous mixture. Because of the small size of colloidal particles, we cannot see them with the naked eyes. for example, milk & blood.

(d) suspension - It is a heterogeneous solution in which the solute particles do not dissolve in solvent remain suspended throughout the bulk of the medium. Particles are visible by naked eyes. for ex- chalk-water.

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

[soda, water, wood, air, soil, vinegar, filtered tea]

Ans - Homogeneous - soda, water, vinegar, filtered tea as there is no separating boundaries in their solution.

Heterogeneous - wood, air and soil as we can easily see the separating boundaries.

Good Write

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

Ans6 By boiling the given colourless water we can check that it is pure or not. If it's pure then then the water boils at 100°C at atmospheric pressure. This is because the melting & boiling point of a pure substance doesn't change.

Good Write