CHAPTER 6

SOLUTIONS

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Q1. <u>Define the following</u>

SOLUTION

A solution is a homogeneous mixture of two or more substances.

AQUEOUS SOLUTION

The aqueous solution is a type of solution, in which water used as a solvent.

SOLUTE

Component of solution which is present in small quantity and it can be dissolved in solvent is called "solute".

SOLVENT

Component of solution which is present in large quantity and it can dissolve solute is called "solvent".

DILUTED SOLUTION

Dilute solution contains a relatively small amount of a solute in a large amount of solvent like adding more water to a solution.

CONCENTRATED SOLUTION

Concentrated solution contains a relatively large amount of solute in a small amount of solvent.

Q2. <u>Differentiate between Saturated and Unsaturated Solution</u>

SATURATED	UNSATURATED
In saturated solution maximum amount of solute that can be dissolved at particular temperature.	In unsaturated solution more amount of solute that can be dissolved at particular temperature.
The solution has high concentration than unsaturated solution.	The solution has low concentration than saturated solution.
There is no formation of precipitation at the bottom of container.	There is also no precipitation at the bottom of container.
A solution having 20.9 gram of sodium sulphate 3 per 100cm of water at 20°C is the example of saturated solutions.	A solution having amount of salt less than 20.9 gram per 100cm3 of water at 20°C is the example of unsaturated solution.

Q3. Differentiate between Solution and suspension.

SOLUTION	SUSPENSION
Particle size less than 1 n m	Particle size greater than 1000 nm
Homogeneous (particles dissolve uniformly)	Heterogeneous (particles settle down after sometimes)
Particles cannot be distinctly seen with the naked eye.	Particles are big enough but can be seen with naked eyes.
Clear, transparent and homogeneous	Cloudy, but uniform and homogeneous
Transparent but often colored	Translucent and often opaque but can be transparent
Cannot be separated	Can be separated
Do not scatter light	Scatter light, but are not transparent
Particles can pass through filter paper	Particles pass through filter paper

Q4. What are colloid

COLLOID

1. Particle size 1 to 100 nm

2. Homogeneous and heterogeneous (Particles do not settle down for a long time)

3. Colloidal particles cannot be seen with the naked eye but can be seen through ultra-microscope

4. Cloudy, heterogeneous, at least two substances visible Often opaque, but can be transparent

5. Scatter light (Tyndall effect) Particles do not passthrough filter paper

Q5. What is supersaturated solution

SUPERSATURATED

1. In super saturated solution more amount of solute has been dissolved than its maximum capacity.

2. The solution has more concentration than saturated solution.

3. There is formation of precipitation at the bottom of container.

4. A solution having more amount than 20.9 gram of salt per 100cm3 of water at 20°C is the example of supersaturated solution.

Q6. Define solubility. Give the general principles of solubility.

SOLUBILITY

Solubility is defined as the maximum quantity of solute that can be dissolved in 100 grams of solvent to prepare saturated solution at a particular temperature

GENERAL PRINCIPLES OF SOLUBILITY
1. DISSOLUTION

The general, principle of solubility is "Like dissolves like". Its mean that two substances with similar intermolecular forces are likely to be soluble in one another.

2. SOLUTE-SOLVENT INTERACTION

A solute will dissolve in a solvent if the solute-solvent forces of attraction are greater enough to overcome the solute-solute and solvent-solvent forces of attraction. A solute will not dissolve if the solute-solvent forces of attraction are weaker than individual solute and solvent intermolecular attractions.

3. TEMPERATURES

Solubility is directly proportional to the temperature in solid & liquid. Solubility is increased by increasing the temperature because hot water molecules have greater kinetic energy and collide with solid solute more vigorously.

For all gases, the solubility decreases as the temperature of the solution increases.

FOR EXAMPLE,

A greater amount of sugar will dissolve in warm water than in cold water. The solubility of potassium chloride is 34.7g to 100g of water at 20°C. It will become 56.7gm/ cm^3 at 100°C.

Q1. What is the molarity of the solution prepared by dissolving 1.25 g of HCl gas into enough water to make 30 cm^3 of solution?

Q2. A solution of potassium chloride was prepared by dissolving 2.5 g of potassium chloride (KCl) in water and making the volume up to 100 cm^3. Find the concentration of solution in mol/ dm^3.

Q3. A flask contains 0.25 M NaOH solution. What mass of NaOH is present per dm^3 of solution?

Q4. What volume of 0.5M acid is needed to neutralize 200ml of 4M base?

Q5. A mineral water bottle contains 28 mg of calcium in 100 cm3 of solution. What is the concentration in g/dm^3?

Q6. A solution of 20cm^3 of alcohol is dissolved in 80cm^3 of water. Calculate the concentration (v/v) of this solution.

Q7. How much sodium hydroxide (NaOH) is required to prepare 400 cm^3 of 0.3M solution?

Q8. How do you prepare 100ml of 0.40M MgSO$_4$ from a stock solution of 2.0M MgSO$_4$?

Q9. How would you prepare 500 cm3 of 0.20 M NaOH (aq) from a stock solution of 1.5 M NaOH?

Q10. Calculate the percentage concentration (m/m) of the solution obtained by dissolving 15g salt in 110g water.

Q11. Calculate the volume/volume percent of solution obtained by mixing 25cm^3 of ethanol in water to produce 150cm^3 of the solution.

Q12. 20 gram of salt is dissolved in 500cm^3 of a solution. Calculate the molarity of that solution.

Q13. What is the mass of oxalic acid present in 100 cm^3 of 2 molar solutions?

Q14. A sample of Sulphuric acid has the molarity 20M. How many cm^3 of solution should you use to prepare 500 cm^3 of 0.5M H$_2$SO$_4$?