10th Science Lesson 9 Questions in English

9] Solutions

1. Assertion (A): Smoke released from wood burning is a mixture of carbon and gases like CO2 and CO.
Reasoning (R): A mixture may exist in one or more than one physical state.
a) Both A and R is True and R is the correct explanation of A.
b) Both A and R is True but R is not the correct explanation of A.
c) A is True but R is False.
d) Both A and R is False.
Explanation
The substances present in a mixture may exist in one or more physical state. For example, when we burn wood, the smoke released is a mixture of solid carbon and gases like CO2, CO, etc.

2. What type of mixtures is called as solutions?
a) Non-dilute
b) Heterogeneous
c) Compound
d) Homogenous
Explanation
The kind of homogenous mixtures are termed as “solutions”.

3. What is the important characteristic of a solute?
a) Lesser weighing component
b) Easily Dilatable
c) Compounds
d) More than one physical state
Explanation
A solution is a homogeneous mixture of two or more substances. In a solution the component which is present in lesser amount (by weight), is called solute and the component, which is present in a larger amount (by weight) is called solvent.

4. Which of the following acts as a dissolving medium in a solution?
a) Solute
b) Heterogeneous compounds
c) Solvent
d) Salts
Explanation

The solute gets distributed uniformly throughout the solvent and thus forming the mixture homogeneous. So, the solvent acts as a dissolving medium in a solution.

5. Define dissolution.
a) Complete dissolvent in solutions.
b) Uniform distribution of solute into solvent.
c) Partial solute into solvent.
d) Dissolving process of solute.
Explanation
The process of uniform distribution of solute into solvent is called dissolution.

6. What is the name of solutions containing two components?
a) Binary solutions
b) Mono solutions
c) Dual solutions
d) All the above
Explanation
A solution must at least be consisting of two components (a solute and a solvent). Such solutions which are made of one solute and one solvent (two components) are called binary solutions.

7. How many solvents are present in ternary solutions?
a) One
b) Three
c) Two
d) More than two
Explanation
A solution may contain more than two components. For example if salt and sugar are added to water, both dissolve in water forming a solution. Here two solutes are dissolved in one solvent. Such kinds of solutions which contain three components are called ternary solutions.

8. Which of these determine the characteristics of the binary solution?
a) Solute
b) Physical state
c) Solvent
d) Dissolution
Explanation
In binary solutions, both the solvent and solute may exist in any of these physical states. But the solvent constitutes the major part of the solution. Its physical state is the primary factor which determines the characteristics of the solution.

9. Match

A. Gaseous solutions	i) Mercury with Sodium
B. Liquid solutions	ii) Water vapor in air
C. Solid solutions	iii) Sodium chloride in water

a) ii, iii, i
b) i, iii, ii
c) ii, i, iii
d) iii, ii, i

10. What is the state of solvent in Copper dissolved in gold?
a) Solid
b) Liquid
c) Gas
d) All the above
Explanation
Types of Binary Solutions

Solute	Solvent	Example
Solid solution		
Solid	Solid	Copper dissolved in gold (Alloys)
Liquid	Solid	Mercury with sodium (amalgam)
Liquid solution		
Solid	Liquid	Sodium chloride dissolved in water
Liquid	Liquid	Ethyl alcohol dissolved in water
Gas	Liquid	carbon-di-oxide dissolved in water (Soda water)
Gaseous solution		
Liquid	Gas	Water vapour in air (cloud)
Gas	Gas	Mixture of Helium-Oxygen gases,

11. Which is called as the Universal solvent?
a) Water
b) Air
c) Carbon dioxide
d) Water vapor
Explanation
Most of the substances are soluble in water. That is why, water is called as 'Universal solvent".

12. How many types of solutions are classified based on solvent?
a) 3
b) 5

c) 2
d) 4
Explanation
On the basis of type of solvent solutions are classified into two types. They are aqueous solutions and non-aqueous solutions.

13. Which of the following is not an aqueous solution?
a) Copper sulphate in water
b) Water vapor in air
c) Common salt in water
d) Sugar in water
Explanation
The solution in which water acts as a solvent is called aqueous solution. E.g. Common salt in water, Sugar in water and Copper sulphate in water.

14. Assertion (A): Non-aqueous solution has liquids other than water as solvent.
Reasoning (R): Solvent other than water is referred as non-aqueous solvent.
a) Both A and R is True and R is the correct explanation of A.
b) Both A and R is True but R is not the correct explanation of A.
c) A is True but R is False.
d) Both A and R is False.
Explanation
The solution in which any liquid other than water acts as a solvent is called non-aqueous solution. Solvent other than water is referred to as non-aqueous solvent.

15. What are the non-aqueous solvents?
a) Ethers
b) Acetone
c) Benzene
d) All the above
Explanation
Generally alcohols, benzene, ethers, carbon disulphide, acetone, etc., are used as non-aqueous solvents.

16. Which of these is an example for non-aqueous solutions?
a) Ethyl alcohol in water
b) Iodine dissolved in carbon tetrachloride
c) Soda water
d) Sodium chloride dissolved in water

Explanation
Examples for non-aqueous solutions: Sulphur dissolved in carbon disulphide, Iodine dissolved in carbon tetrachloride.

17. How many types of solutions are classified based on the amount of solvent?
a) 5
b) 2
c) 4
d) 3
Explanation
Based on the amount of solute in the given amount of solvent, solutions are classified into the following types as, saturated solution, unsaturated solution and Super saturated solution.

18. What are the characteristics and conditions for a saturated solution?
a) No more solute
b) Definite amount of solvent
c) Temperature
d) All the above
Explanation
Saturated solution: A solution in which no more solute can be dissolved in a definite amount of the solvent at a given temperature is called saturated solution. e.g. 36 g of sodium chloride in 100 g of water at 25°C forms saturated solution.

19. Which of the following statement is correct for an unsaturated solution?
a) Less solvent and solute in room temperature.
b) Less solute than the super saturated solution.
c) Less solute than the saturated solution at given temperature.
d) Less solute and major solvent in ideal temperature.
Explanation
Unsaturated solution: Unsaturated solution is one that contains less solute than that of the saturated solution at a given temperature. e.g. 10 g or 20 g or 30 g of Sodium chloride in 100 g of water at 25°C forms an unsaturated solution.

20. Name the solution which has more solute than the saturated solution?
a) Dissolution
b) Non-aqueous solution
c) Unsaturated solution
d) Super saturated solution
Explanation

Super saturated solution is one that contains more solute than the saturated solution at a given temperature. e.g. 40 g of sodium chloride in 100 g of water at 25°C forms super saturated solution.

21. Choose the Incorrect statements regarding the super saturated solution.
i) Temperature and pressure conditions are altered.
ii) Super saturated solutions are stable.
iii) The solute reappears as crystals if the solution is disturbed.
a) i only
b) ii only
c) iii only
d) All the above
Explanation
Super saturated solution state can be achieved by altering any other conditions liken temperature, pressure. Super saturated solutions are unstable, and the solute is reappearing as crystals when the solution is disturbed.

22. Which of the following is the classification of unsaturated solutions?
a) Ternary, Binary solutions
b) Concentrated, Dilute solutions
c) Compounds, Mixture solutions
d) Percentage, Volume solutions
Explanation
Concentrated and dilute solutions: It is another kind of classification of unsaturated solutions. It expresses the relative concentration of two solutions with respect to their solutes present in the given amount of the solvent.

23. Which of the solution has higher amount of solute per given solvent?
a) Concentrated solution
b) Dilute solutions
c) Saturated solutions
d) Super saturated solutions
Explanation
When we compare two solutions having same solute and solvent the one which contains higher amount of solute per the given amount of solvent is said to be 'concentrated solution'.

24. Assertion (A): Dilute and concentration solution does not decide the quality of the solute.
Reasoning (R): Dilute solution or concentration solution is the quantitative representation.
a) Both A and R is True and R is the correct explanation of A.
b) Both A and R is True but R is not the correct explanation of A.
c) A is True but R is False.

d) Both A and R is False.

Explanation

Differentiating solutions as dilute and concentrated is a qualitative representation. It does not imply the quantity of the solute. This difference is observed by means of some physical characteristics such as color, density, etc.

25. Which of these factors is measured by the solubility?

a) Extent of dissolution

b) Quality of solution

c) Quantity of solvent

d) Physical characteristics of solution

Explanation

The extent of dissolution of a solute in a solvent can be better explained by its solubility. Solubility is a measure of how much of a solute can be dissolved in a specified amount of a solvent.

26. Choose the correct statements.

i) Solubility is defined as the number of grams of a solute dissolved in 100g of a solvent.

ii) Solubility is measured at a given temperature and pressure.

a) i only

b) ii only

c) Both i and ii

d) None of the above

Explanation

Solubility is defined as the number of grams of a solute that can be dissolved in 100 g of a solvent to form its saturated solution at a given temperature and pressure.

27. What is the mathematical expression for solubility?

a) (Mass of the solute / Mass of the solvent) * 100

b) Mass of the solvent / Mass of the concentration

c) Total concentration of solvent / Total mass of the solution

d) (Mass of the concentration / Mass of solvent) * 100

Explanation

The solubility is mathematically expressed as,

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

28. Match

A. Sodium hydroxide	i) 91
B. Ammonia	ii) 48

C. Calcium carbonate iii) 80
D. Glucose iv) 0.0013
a) iv, i, iii, ii
b) ii, i, iii, iv
c) iii, ii, iv, i
d) i, iii, ii, iv

29. What is the solubility of sodium iodide in water at 25°C?
a) 184
b) 36
c) 95
d) 89
Explanation
Solubility's of some common substances in water at 25°C

Name of the solute	Formula of the solute	Solubility g/100 g water
Calcium carbonate	$CaCO_3(s)$	0.0013
Sodium chloride	NaCl (s)	36
Ammonia	$NH_3(g)$	48
Sodium hydroxide	NaOH(s)	80
Glucose	$C_6H_{12}O_6(s)$	91
Sodium bromide	NaBr(s)	95
Sodium iodide	NaI(s)	184

30. What are the governing factors for solubility of a solute?
a) Temperature
b) Nature of solvent
c) Pressure
d) All the above
Explanation
There are three main factors which govern the solubility of a solute. They are Nature of the solute and solvent, Temperature and Pressure.

31. Choose the correct statements.
i) Water dissolves all substances.
ii) The nature of solvent is an important factor in solubility.

a) i only
b) ii only
c) Both i and ii
d) None of the above
Explanation
Nature of the solute and solvent: The nature of the solute and solvent plays an important role in solubility. Although water dissolves an enormous variety of substances both ionic and covalent, it does not dissolve everything.

32. Assertion (A): Non-polar compounds are soluble in non-polar solvents.
Reasoning (R): Polar compounds do not dissolve in non-polar solvents.
a) Both A and R is True and R is the correct explanation of A.
b) Both A and R is True but R is not the correct explanation of A.
c) A is True but R is False.
d) Both A and R is False.
Explanation
Non-polar compounds are soluble in non-polar solvents. For example, Fat dissolved in ether. But non-polar compounds do not dissolve in polar solvents; polar compounds do not dissolve in non-polar solvents.

33. Which of these increase the solubility of solute in liquid solvents?
a) Temperature rise
b) Mass of solvent
c) Concentration of solute
d) All the above
Explanation
Generally solubility of a solid solute in a liquid solvent increases with increase in temperature. For example, a greater amount of sugar will dissolve in warm water than in cold water.

34. In which of these process solubility decrease with increase in temperature?
a) Endothermic
b) Equilibrium
c) Exothermic
d) Ideal process
Explanation
The solubility of the endothermic process increases with increase in temperature. Exothermic process solubility decreases with increase in temperature.

35. What is the effect of temperature rise in liquids?
a) Increase of concentration of solvent

b) Decrease in solubility of gas
c) Increase in pressure
d) Decrease of solvents
Explanation
The Solubility of gases in liquid decrease with increase in temperature. Generally, water contains dissolved oxygen. If water is heated the solubility of oxygen in water decreases so oxygen escapes in the form of bubbles.

36. Assertion (A): Aquatic animals use the dissolved oxygen in cold water.
Reasoning (R): Oxygen has high solubility at low temperatures.
a) Both A and R is True and R is the correct explanation of A.
b) Both A and R is True but R is not the correct explanation of A.
c) A is True but R is False.
d) Both A and R is False.
Explanation
Aquatic animals live more in cold regions because more amount of dissolved oxygen is present in the water of cold regions. This shows that the solubility of oxygen in water is more at low temperatures.

37. Which of these factor increases the solubility of a gas in liquid?
a) Mass of solute
b) Surface tension
c) Pressure
d) Concentration of solution
Explanation
Effect of pressure is observed only in the case of solubility of a gas in a liquid. If the pressure is increased the solubility of a gas in liquid increases.

38. What are the examples for gas solubility in liquids?
a) Carbonated beverages
b) Household cleaners
c) Formalin aqueous solution
d) All the above
Explanation
The common examples for solubility of gases in liquids are carbonated beverages, i.e. Soft drinks, household cleaners containing aqueous solution of ammonia, formalin aqueous solution of formaldehyde, etc.

39. Define the Henry's law of solubility of gas in liquid.
a) Solubility of gas is directly proportional to the pressure of gas at definite temperature.

b) Solubility of liquid is directly proportional to the temperature of solvent.
c) Solubility of gas is equal to the solubility of liquid.
d) Solubility of gas and liquid are inversely proportional.
Explanation
The effect of pressure on the solubility of a gas in liquid is given by Henry's law. It states that, the solubility of a gas in a liquid is directly proportional to the pressure of the gas over the solution at a definite temperature.

40. Which is used to quantify the solute in a solution?
a) Temperature
b) Solubility
c) Concentration
d) All the above
Explanation
Most of the chemical reactions take place in solutions form. So it is essential to quantify the solute in solvent to study the reactions. To quantify the solute in a solution, we can use the term "concentration".

41. Define concentration of a solution.
a) Amount of solute in given amount of solution or solvent.
b) Mass of the solvent in a solution.
c) Ratio of mass of solvent and solution.
d) Amount of solute in a solution.
Explanation
Concentration of a solution may be defined as the amount of solute present in a given amount of solution or solvent.

42. Which of these is used to represent the quantity of the concentration of a solution?
a) % Pressure
b) % Mass
c) % Kilogram
d) % Quality
Explanation
Quantitatively, concentration of a solution may be expressed in different methods. But here we shall discuss percentage by mass (% mass) and percentage by volume (% volume).

43. What percentage value is used to describe the liquid solvent and solutes?
a) Surface tension
b) Mass
c) Pressure

d) Temperature

Explanation

Mass percentage of a solution is defined as the percentage by mass of the solute present in the solution. It is mostly used when solute is solid and solvent is liquid.

Mass Percentage = (Mass of the solute / Mass of the solution) * 100

44. Which of this property is independent of mass percentage?

a) Temperature

b) Pressure

c) Solvent

d) Liquidity

Explanation

Usually, mass percentage is expressed as w/w (weight / weight); mass percentage is independent of temperature.

45. Calculate the volume percentage of a solution made from 35 ml of ethanol and 65 ml of water.

a) 70%

b) 35%

c) 100%

d) 30%

Explanation

Volume of the ethanol = 30 ml and Volume of the water = 70 ml

Volume percentage = (Volume of the solute / Volume of the solution)* 100

= Volume of the solute / (Volume of the solute + Volume of the solvent) * 100

Volume percentage = 30 / (30+ 70) * 100 = 30%

46. Find the mass percentage of solute and solvent for 16 grams of NaOH dissolved in 100 grams of water at 25°C to form a saturated solution.

a) 16.67%, 83.33%

b) 83.33%, 23.45%

c) 16.67%, 87.33%

d) 12.67%, 88.21%

Explanation

Mass of the solute (NaOH) = 20 g and Mass of the solvent H2O = 100 g

Mass percentage of the solute **=** Mass percentage of solute / (Mass of the solute +Mass of the Solvent)*100

= 20 * 100 / (20+100) = 16.67 %

Mass percentage of solvent = 100 – (Mass percentage of the solute) = 100- 16.67 = 83.33%

47. Which of this factor is decreased in liquids with increase in temperature?
a) Volume percentage
b) Pressure percentage
c) Concentration percentage
d) Mass percentage
Explanation
Usually volume percentage is expressed as v/v (volume / volume). It is used when both the solute and solvent are liquids. Volume percentage decreases with increases in temperature, because of expansion of liquid.

48. Which of these commercial products concentration is expressed as w/w?
a) Ointments
b) Soaps
c) Antacid
d) All the above
Explanation
In the commercial products that we come across in our daily life such as a solution of syrups, mouth wash, antiseptic solution, household disinfectants etc., the concentration of the ingredients is expressed as v/v. Similarly, in ointments, antacid, soaps etc., the concentration of solutions are expressed as w/w.

49. Which of this solution is involved in hydration process?
a) Unsaturated solution
b) Saturated aqueous solution
c) Super saturated gaseous solution
d) Saturated gaseous solution
Explanation
When ionic substances are dissolved in water to make their saturated aqueous solution, their ions attract water molecules which then attached chemically in certain ratio. This process is called hydration.

50. Choose the correct statements.
i) Hydrated salts have indefinite number of water molecules.
ii) The number of water molecules in the crystalline substance is called as the water of crystallization.
a) i only
b) ii only
c) Both i and ii

d) None of the above

Explanation

The ionic substances crystallize out from their saturated aqueous solution with a definite number of molecules of water. The number of water molecules found in the crystalline substance is called water of crystallization. Such salts are called hydrated salts.

51. Assertion (A): Hydrated crystalline salts lose their water of crystallization on heating.
Reasoning (R): On heating the hydrated crystalline salts it become amorphous and loses its color.

a) Both A and R is True and R is the correct explanation of A.

b) Both A and R is True but R is not the correct explanation of A.

c) A is True but R is False.

d) Both A and R is False.

Explanation

On heating these hydrated crystalline salts they lose their water of crystallization and become amorphous or lose their color (if they are colored).

52. Identify the Incorrect match.

A. Green vitriol	i) Iron sulphate hepta hydrate
B. Gypsum	ii) Calcium sulphate dihydrate
C. White vitriol	iii) Magnesium sulphate hepta hydrate
D. Blue vitriol	iv) Copper sulphate pentahydrate

a) i only

b) ii only

c) iii only

d) iv only

Explanation

Hydrated salts

Common Name	IUPAC Name	Molecular Formula
Blue Vitriol	Copper (II) sulphate pentahydrate	$CuSO_4 \cdot 5H_2O$
Epsom Salt	Magnesium sulphate heptahydrate	$MgSO_4 \cdot 7H_2O$
Gypsum	Calcium sulphate dihydrate	$CaSO_4 \cdot 2H_2O$
Green Vitriol	Iron (II) sulphate heptahydrate	$FeSO_4 \cdot 7H_2O$
White Vitriol	Zinc sulphate heptahydrate	$ZnSO_4 \cdot 7H_2O$

53. What is the number of water molecules in blue vitriol?

a) 5

b) 7

c) 9

d) 11

Explanation

The number of water molecules in blue vitriol is five. So its water of crystallization is 5. When blue colored copper sulphate crystals are gently heated, it loses its five water molecules and becomes colorless anhydrous copper sulphate.

54. Which of these has seven water molecules?

a) Epsom salt

b) Blue vitriol

c) Copper Chloride

d) Sodium Hydroxide

Explanation

Magnesium sulphate hepta-hydrate MgSO4.7H2O (Epsom salt) water of crystallization is 7. When magnesium sulphate hepta-hydrate crystals are gently heated, it loses seven water molecules and becomes anhydrous magnesium sulphate.

55. What are the conditions for the hygroscopic substances?

a) Ordinary temperature

b) No change in physical state

c) Absorbs air moisture

d) All the above

Explanation

Certain substances when exposed to the atmospheric air at ordinary temperature absorb moisture without changing their physical state. Such substances are called hygroscopic substances and this property is called hygroscopy.

56. Which of these is not a hydroscopic agent?

a) H_2SO_4

b) P_2O_5

c) HCl

d) SiO_2

Explanation

Hygroscopic substances are used as drying agents. Example: Con Sulphuric acid (H2SO4), Phosphorus Pentoxide (P2O5), Quick lime (CaO) and Silica gel (SiO2).

57. Which of this solution is obtained by the dissolved deliquescent substances?

a) Unsaturated solution

b) Heterogeneous solution

c) Saturated solution

d) Concentrated solution

Explanation

Deliquescent substances lose their crystalline shape and ultimately dissolve in the absorbed water forming a saturated solution.

58. In which of this condition deliquescence property has maximum value?

a) Low temperature

b) Low pressure

c) Humid atmosphere

d) Both a and c

Explanation

Deliquescence is at its maximum when the temperature is low and the atmosphere is humid.

59. Which of these are the examples of deliquescence?

a) Caustic potash

b) Caustic soda

c) Ferric chloride

d) All the above

Explanation

Examples for deliquescence are Caustic soda (NaOH), Caustic potash (KOH) and Ferric chloride (FeCl3).

60. Choose the Incorrect statements.

i) The hygroscopic substances do not change its physical state on air exposure.

ii) Deliquescent substances absorb moisture and dissolve if exposed to atmospheric air.

iii) Hygroscopic substances are crystalline solids.

a) i only

b) ii only

c) iii only

d) All the above

Explanation

Hygroscopic substances	Deliquescence substances
When exposed to the atmosphere at ordinary temperature, they absorb moisture and do not dissolve.	When exposed to the atmospheric air at ordinary temperature, they absorb moisture and dissolve.
Hygroscopic substances do not change its physical state on exposure to air.	Deliquescent substances change its physical state on exposure to air.
Hygroscopic substances may be amorphous solids or liquids.	Deliquescent substances are crystalline solids.