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*****BASIC CONCEPTS*****

Chapter 01:

Short Question With Answer

Q.1 Calculate the grams atoms in 0.4 gm of potassium.

Ans.

Gram atoms of potassium =

= = 0.01 grams atoms

Q.2 23 grams of sodium and 238 gram of uranium have equal number of atoms in them.

Ans.

Mass of sodium = 23 gms= 1mole=6.02 x 1023 atoms

Mass of uranium = 238g=1 mole= 6.02x 1023 atoms

Both the substances have equal number of atoms because they have same no.of moles.

Q.3 Mg atom is twice heavier than that of carbon.

Ans.

The atomic mass of Mg is 24 which is to twice as mass as compared to the atomic mass of carbon i.e. 12. So Mg atom is twice heavier than that of carbon.

Q.4 180 grams of glucose and 342 gram of sucrose have the same number of molecules but different number of atoms present in them.

Ans.

180 grams of glucose (C6H12O6) and 342 grams of sucrose (C12H22O11) are their molar masses indicating one mole of each (glucose and sucrose) one mole of a substance contains equal number of molecules i.e. 6.02 x 1023.

Mass of glucose ($C_6H_{12}O_6$)=180g=1mole=6.02x1023molecules

=24$N_A$atoms

Mass of Sucrose ($C_{12}H_{22}O_{11}$)=342g=1mole=6.02 x 1023 molecules

=45$N_A$atoms

Q.5 **4.9 g of H2SO4 when completely ionized in water have equal number of positive and negative ions, but the number of positively charged ions are twice the number of negatively charged ions.**

Ans.

$$H_2SO_4 \rightarrow 2H^+ + SO_4^{-2}$$

When one mole of H2SO4 ionizes, it produces 2H+ and SO4–2 ions. Hydrogen ions contains +1 charge while sulphate ions have – 2 charge. Hydrogen ions are twice in number than that of SO ion. Charges on both ions are equal (with opposite sign). Similarly ions produced by complete ionization of 4.9 grams of H2SO4 in water will have equal +ve and –ve charges but the number of H+ ions are twice than number of negatively charged sulphate ions.

Q.6 **One mg of K2CrO4 has thrice the number of ions than the number of molecules when ionized in excess of water.**

Ans. $K_2CrO_4 \rightarrow 2K^+ + CrO4–2$

When K2CrO4 ionizes in water, its one molecule gives three ions i.e. two K+ and one CrO4–2 (chromate) ions. The ratio between the number of molecules and number of ions than the number of molecules when ionized in water.

Q.7 **Two grams of H2, 16g of CH4 and 44 gram of CO2 occupy separately the volumes of 22.414 dm3 at STP, although the sizes and masses of molecules of three gases are very different from each other.**

Ans.

One mole of gas at STP occupies a volume of 22.4 dm3 sizes and masses of molecules of different gas do not affect the volume. Normally it is known that in the gaseous state, the distance between the molecules is 300 times greater that their diameter. Therefore two grams of H2, 16 grams of CH4 and 44 grams of CO2 (1 mole of each gas) separately occupy a volume of 22.4 dm3. This is called molar volume.

$2gH_2$=1mole, $16gCH_4$=1 mole, $44gCO_2$=1 mole

1mole=22.414dm^3

Q.8 **Define Stoichiometry ?**

Ans.

Stoichiometry is the branch of chemistry which gives a quantitative relationship between reactants and products in balanced chemical equation.

Q.9 What is limiting reactant? How does it control the quantity of the product formed? Explain with three examples. /Many chemical reactions taking place in our surroundings involve limiting reactants give examples?

Ans.

The reactant which controls (limits) the amount of product formed during a chemical reaction is called limiting reactant. **In our surrounding many chemical reactions take place which involve limiting reactants some of these reactions are:**

(i) Burning of coal to form CO2---Coal is limiting reactatnt $C + O_2 \rightarrow CO_2$

(ii) Burning of sui gas to form CO2 and H2O

$CH4 + 2O2 \rightarrow CO2 + 2H2O$

(iii) Rusting of iron----iron is limiting reactant

In above reactions oxygen is always in excess, while other reactants are consumed earlier. So other reactants are limiting reactants.

Q.10 One mole of H2O has two moles of bands, three moles of atoms, ten moles of electron and twenty–eight moles the total fundamental particles present in it.

Ans.

One molecule of H–O–H has two bounds between hydrogen and oxygen. There are three atoms i.e. two
H atoms and one O atom, therefore one mole of H2O contains two moles of bonds and three moles of atoms
(2 moles of H atoms and one mole of O atoms).

Similarly, there are eight elections in oxygen and one electron in each of the two, H atoms one molecule of H2O so has 10 electrons, so one mole of water contains 10 moles of electrons. There are 28 moles of all fundamental particles in one mole of water i.e.

10 moles of electrons.

10 moles of protons.

8 moles of neurons (8 neutrons in oxygen and there is no neutron in hydrogen) 28 moles of fundamental particles.

Q.11 One mole of H2SO4 should completely react with two moles of NaOH. How does Avogadro's number help to explain it?

Ans.

The balanced chemical equation between H2SO4 and NaOH

$H2SO4 + 2NaOH \rightarrow Na2SO4 + H2O$

$H2SO4 \rightarrow 2H^{+} + SO_4^{-2}$

$2NaOH \rightarrow 2Na^{+} + 2OH^{-}$

$2H^{+} + 2OH^{-} \rightarrow 2H_2O$

$2N_A \quad 2N_A$

This is an acid base reaction, one mole of H2SO4 releases two moles of H+ ion in solution. It needs two moles of OH ions for complete neutralization. So two moles of NaOH which releases two moles of OH are required to react with one mole of H2SO4. One mole of H2SO4 releases twice the Avogadro's number of H+ ions and it will need the Avogadro's number of OH ions for complete neutralization.

Q.12 N2 and CO have same number of electrons, protons and neutrons.

Ans.

Both N2 and CO have same number of electrons, protons and neutrons as it is clear from the following explanation.

For N2 No. of electrons in N2 = 7 + 7 = 14

No. of protons in N2 = 7 + 7 = 14

No. of neutrons = 7 + 7 = 14

For CO number of electrons

in C = 6

No. of electrons in O = 8

Total no. of protons = 6 + 8 = 14

No. of neutrons in C = 6

No. of neutrons in O = 8

Total no. of neutrons = 6 + 8 = 14

Q.13 How many molecule, of water are in 12 gram of ice?

Ans.

Mass of ice (water) = 12.0 gm

Molar mass of water = 18 g/mol

No. of molecules of water

=

=

No. of molecules of water = 0.66 x 6.02 x 1023

= 3.97 x 1023

Q.14 Differentiate between limiting and non–limiting reactant ?

Ans. Limiting Reactant:

A limiting reactant is a reactant and that controls the amount of the product formed in a chemical reaction.

Non–Limiting Reactant:

The reactant which produces the excess amount of the product is called non–limiting reactant.

Q.15 Distinguish between actual yield and theoretical yield ?

Ans. Actual Yield:

The amount of the products obtained in a chemical reaction is called actual yield based on experiment.

Theoretical (Experiment) Yield:

The amount of the products calculated from the balanced chemical equation is called theoretical yield.

Q.16 What do you mean by percent yield? Give its significance ?

Ans.

The yield which is obtained by dividing actual yield with theoretical yield and multiplying by 100 is called percent yield.

% yield = x 100

Significance:

(i) % yield indicates the efficiency of reaction.

(ii) More is the percent yield higher will be the efficiency of reaction.

Q.17 **Why actual yield is less than the theoretical yield?**

Ans.

(a) Side reaction may takes place

(b) All the reactant may not be converted into products

(c) Mecahanical loss may occur like during

e.g Filtration, evaporation, crystallization, distillation etc.

Q.18 Calculate the mass of 10–3 moles of MgSO4.

Ans.

$MgSO_4$ is an ionic compound. We will consider its formula mass instead of molecular mass.

Number of moles of substance

=

Formula mass of $MgSO_4$ = 120 gm/ml

Number of moles of $MgSO_4$ = 10–3 moles

Applying formula

10–3 =

Mass of $MgSO_4$ = 120 x 10–3 = 0.12 moles

Q.19 Define Avogadro's number ?

Ans.

Avogadro's number is the number of atoms, molecules and ions in one gram atom of an element, one gram molecule of a compound and one gram ion of substance, respectively. It is equal to 6.02 x 1023.

Q.20 Define mole ?

Ans.

The molecular mass of a substance expressed in grams is called molecule or gram mole or simply the mole of a substance.

Moles of substance =

1 mole of water = 18.0 g

1 mole of H_2SO_4 = 98.0 g

Q.21 Define isotopes ?

Ans.

Atoms of the same element which have different masses but same atomic numbers are called isotopes. For example carbon has three isotopes.

12C6 13C6 14C6 and expressed as C–12, C–13 and C–14. Similarly hydrogen has three isotopes H H H called protium, deuterium and tritium.

Q.22 Define (i) ions (ii) Positive ion (iii) Negative ion.

Ans. Ion

As specie having positive or negative charges are called ions. For example Cl–1, NO, Na+, Ca++.

Positive Ion (Cation):

A specie has +ve charge is called positive ion and attracted towards Cathode . For example Na+, K++, Ca++.

Negative Ion (Anion)

A specie which has negative charge is called negative ion and attracted towards anode . For example F–1,Cl–1,Br–1andS–2P–3,C–4,SO, Cr2O, CO.

Q.23 Define and explain the molecular ion ?

Ans.

When a molecule loses or gains an electron, molecular ion is formed. For example CH_4^+, CO^+, N_2^+. Cationic molecular, ions are more abundant than anionic ions.

The molecular ions find applications of in calculation of molecular mass of a compound. The molecular ions also help in the determination of structure of macro molecules.

The break down of molecular ions obtained from the natural products can give important information about their structure.

Q.24 What do understand by the relative atomic mass ?

Ans.

Relative atomic mass is the mass of an atom of element as compared to the mass of an atom of carbon taken as 12.

The unit used to express the relative atomic mass is called atomic mass unit (amu). It is th of the mass of one carbon atom. The relative atomic mass of $^{12}C_6$ is 12.00 amu. The relative atomic mass of H is 1.0078 amu.

Q.25 Define Gram atom ?

Ans.

The atomic mass of an element expressed in grams is called gram atom of an element.

Number of gram atoms of a meter an element

=

For example 1 gram atom of hydrogen = 1.008 gm

1 gram atom of carbon = 12.00 gm

1 gram at of uranium = 238 gm

Q.26 Define gram ion ?

Ans.

The ionic mass of an ionic specie expressed in grams is called one gram ion or one mole of ions.

Number of gram ions =

1 gram ion of OH^{-1} = 17 grams

1 gram ion of SO = 96 gram

1 gram ion of CO = 60 gram

Q.27 Define gram formula and moles ?

Ans.

The formula mass of an ionic compound expressed in grams is called gram formula of the substance.

Number of gram formula or moles of a substance

=

1 gram formula of NaCl = 58.50 gms

1 gram formula of Na_2CO_3 = 106 gm

1 gram formula of $AgNO_3$ = 170 gm

The atomic mass, molecular mass, formula mass or ionic mass of the substance expressed in grams is called moles of those substances.

Q.28 Define molar volume ?

Ans.

The volume occupied by one mole of an ideal gas at standard temperature and pressure (STP) is called molar volume. The volume is equal to 22.414 dm^3.

Q.29 Define and explain atomicity ?

Ans.

The number of atoms present in a molecule is called the atomicity. The molecule can be monoatomic, diatomic and triatomic etc. If the molecule contains one atom it is monoatomic, if it contains two atoms it is diatomic, and if it contains three atoms it is triatomic. Molecules of elements may contain one two or more same type of atoms. For example He, Cl_2, O_3, P_4, S_8. The molecules of compounds consist of different kind of atoms. For example HCl, NH_3, H_2SO_4, $C_6H_{12}O_6$.

Q.30 Define an atom and molecule ?

Ans. Atom:

Atom is now defined as the smallest particle of an element, which may or may not have independent existence. For example He and Ne atoms have independent existence. While atoms of hydrogen, nitrogen and oxygen do not exist independently.

Molecule:

A molecule is the smallest particle of a pure substance(element or Compound) which can exist independentally. For example N_2, O_2, Cl_2, HCl, NH_3 and H_2SO_4 are examples of molecules.

Q.31 What do you mean by empirical formula and molecular formula? How they are related to each other ?

Ans. Empirical Formula:

It is the simplest formula that gives information about the simple ratio of atoms present in a compound.

In an empirical formula of a compound Ax By, there are X atoms of an element A and y atoms of an element B.

Molecular Formula:

The formula of a substance which is based on the actual molecule is called molecular formula. It gives the usual number of atoms present in the molecule. For example molecular formula of benzene is C6H6, while that of glucose is C6H12O6. The molecular formula and empirical formula are related to each other by the following relationship.

Molecular formula = n x (Empirical formula)

Where "n" is simple integer.

Q.32 **Is it true many compounds have same empirical and molecular formula ?**

Ans.

There are many compounds, whose empirical formulas and molecular formulas are the same. For example H2O, CO2, NH3 and C12H22O11 have the same empirical and molecular formulas. Their simple multiple n is unity. Actually value of "n" is the ratio of molecular mass and empirical formula mass.

n =

Q.33 Ethylene glycol is used in automobile antifreeze. It has 38.7% carbon, 9.7% hydrogen and 51.6% oxygen. Its molar mass is 62 gms mole–1. Determine its empirical and molecular formula ?

Ans.

C = 38.7%, H = 9.7%, O = 51.6%

Dividing above %ages by atomic mass.

We get molar ratios

C = = 3.225

H = = 9.7

O = = 3.225

Dividing above molar ratio by least ratio we get atomic ratio.

C = = 1

H = = 3

O = = 1

Empirical formula is CH3O

Molar mass = 62

Empirical formula mass = 12 + 3 + 16 = 31

Now

n =

= = 2

Molar formula = n x Empirical formula

= 2 x CH3O

Molecular formula = C2H6O2

Hence molecular formula of Ethylene glycol = C2H6O2

Q.34 The combustion analysis of an organic compound shows it to contain 65.44% carbon 5.5% hydrogen and 29.06% of oxygen. What is the empirical formula of the compound? If the molecular mass of the compound is 110.15. Calculate the molecular formula of the compound.

Ans.

First of all divide the percentage of each element by its atomic mass to get the number of from atoms or moles.

No. of gram atoms of carbon =

= 5.45 gram atoms of C

No. of gram atoms of hydrogen =

= 5.45 gram atoms of H

No. of gram atoms of oxygen =

= 1.82 gram atoms of 0

Mole ratio C : H : O

4.45 5.45 1.82

Divide number of grams atoms by the smallest number

C : H : O

: :

3 : 3 : 1

Carbon, hydrogen and oxygen are present in the given organic compound in ratio of 3 : 3 : 1. So the empirical formula is C3H3O.

In order to calculate the molecular formula first calculate the empirical formula mass.

Empirical formula mass = 3 x 12 + 3 x 1 + 16

= 36 + 3 + 16 = 55.05

Molar mass of the compound = 110.15

η = = = 2

Molecular formula = n x empirical formula

= 2 x C3H3O

= C6H6O2

Q.35 Give relationships, between the amounts of substances and number of particles. There are three useful relationships ?

Ans.

1. Number of atoms of an element = x NA
2. Number of molecules of a compound

   = x NA
3. Number of ions of ionic species = x NA

NA is the Avogadro's number. The value is 6.02 x 1023.

Q.36 What are the types of relationships of stoichiometric calculations ?

Ans.

There are three types of relationships of stoichiometric calculations.

1. Mass–Mass Relationship

The relationship in which the mass of one substance is given and the mass of other substance is calculated.

2. Mass–mole or mole–mass relationship

The relationship in which mass of one substance is given and moles of other substance is to be calculated or vice versa.

3. Mass–volume or volume mass relationship

The relationship in which the mass of one substance is given and the volume of other substance is to be calculated or vice versa.

Q.37 Law of conservation of mass has to be obeyed during the stoichiometric calculations ?

Ans.

Stoichiometric calculations are based on balanced chemical equation and equation is balanced on the basis of Law of conservation of mass e.g

$C+O_2 \rightarrow CO$

In this equation stoichiometric calculations are not possible because it is not a balanced equation and it is not obeying Law of coseravtion.

Experimental Techniques In Chemistry

Chapter 02

SHORT QUESTIONS WITH ANSWERS

Q.1 Define analytical chemistry ?

Ans.

The branch of chemistry which deals with the qualitative and quantitative analyses of sample is called analytical chemistry.

Q.2 Define analysis and analyte ?

Ans. Analysis:

The determination of the composition of a sample is called analysis.

Analyte:

The sample being analyzed is called analyte.

Q.3 Differentiate between qualitative and quantitative analysis. What is analytical data ?

Ans. Qualitative analysis:

The analysis which deals with the detection or identification of the elements present in a compound is called qualitative analysis. It includes salt analysis and detection of functional groups.

Quantitative analysis:

The analysis in which the relative amounts of constituents are estimated is called quantitative analysis. For example combustion analysis.

Analytical data:

The results obtained by qualitative and quantitative analysis are called analytical data.

Q.4 Name the experimental techniques for purification of substances ?

Ans.

(1) Filtration.

(2) Crystalization.

(3) Sublimation.

(4) Solvent Extraction.

(5) Chromatography.

Q.5 Define filtration ?

Ans.

The process in which the insoluble particles are separated from the liquid by passing through several types of filter media is called filtration.

Q.6 Define the following.

(i) Filter (ii) Filtrate (iii) Residue

(iv) Filter Medium.

Ans. Filter:

Any water insoluble porous material having measurable degree of rigidity is called filtrate.

Filtrate:

The liquid which after passing the mixture through filter medium is collected is called filtrate.

Residue:

The solid left behind on the filter medium during filtration is called residue.

Filter medium:

The porous material used for filtration is called filter medium. It may be filter paper, cotton, woven wire, cloth etc.

Q.7 Give reasons that the funnel in filtration should be several inches long ?

Ans.

The stem of the funnel should be several inches long so that it can extend a few centimeters down into the receiving beaker and tip should touch the side of beaker in order to avoid splashing.

Q.8 Discus the points should be kept in mind during the folding of the filter paper ?

Ans.

1. Filter paper should be folded twice. The first fold should be along the diameter, and the second fold should be such that edges do not quite match.

2. Folded filter paper should be open slightly on the larger section. This provides a cone with three fold thickness half way and one thickness the other half way round.

3. The apex angle is greater than 60o.

4. The paper may be inserted in to 60 degree funnel moistened with water and firmly pressed down.

Q.9 Rate of filtration through funnel can be increased by using a fluted filter paper why ?

Ans.

A fluted filter paper is prepared by folding ordinary filter paper in such a way that fan like arrangement with alternate elevation and depression at various folds is formed.

Q.10 Differentiate b/w Gooch crucible and sintered glass crucible.

Ans.

(i) The filtering process can be done of the Gooch crucible is placed in suction filtering apparatus. But in filtration by sintered glass crucible no preparation is needed.

(ii) The reagents which react with paper e.g. HCl, KMnO4 etc. Cannot be filtered through Gooch crucible. But reactive solution like HCl, KMnO4 can be filtered with out any alteration in the sintered crucible.

(iii) Gooch Crucible for filtration of such types of precipitates which need to be heated at high temperature. But in sintered crucible while collecting the residue there is no contamination of filter paper.

Q .11 Define crystallization.

Ans.

The removal of a solid from solution by increasing its concentration above the saturation point in such a way that the excess solid separates out in the form of crystals is called crystallization.

Q.12 What is the principle of crystallization?

Ans.

The basic principle of crystallization is the fact that solute should be soluble in a suitable solvent at high temperature and the excess amount of the solute is thrown out as crystals when it is cooled.

Q.13 What is the objective of crystallization ?

Ans.

The preparation of chemical compound usually has a crude product and there is a need to purify it by crystallization from a suitable solvent

Q.14 Name the solvents commonly used for crystallization.

Ans.

The solvents which are mostly used for crystallization are, water, rectified spirit, (95% ethanol), absolute ethanol, diethylether acetone, chloroform, carbon tetrachloride, acetic acid and petroleum ether.

If none of the above solvents is found suitable for crystallization, a combination of two or more miscible solvents may be employed.

Q.15 Describe the preparation of saturated solution ?

Ans.

After selecting a suitable solvent the substance is then dissolved in a minimum amount of solvent and is heated directly or on a water bath with constant stirring. Add more solvent to the boiling solution, if necessary until all the solute has dissolved.

Q.16 What are the safe and reliable methods for drying the crystals ?

Ans.

1. Drying through vacuum desiccator

A safe and reliable method of drying crystals is through a vacuum desiccator. In this process the crystals are spread over water glass and kept in a vacuum desiccator for several hours. In the desiccator CaCl2, silica gel or **P2O5** are used as drying agents

2. Drying in an oven

The crystals are dried in an oven provided the substance does not melt or decompose on heating at 1000c.

Q.17 How the undesirable colours are removed in crystals ?

Ans.

Sometimes during the preparation of crude substance, the colouring matter or resinous products affect the appearance of product and it may appear coloured. Such impurities are conveniently removed by boiling the substance in a solvent with the sufficient quantity of finely powdered animal charcoal and the pure decolourized substance crystallizes out from the filtrate on cooling.

Q.18 Define mother liquor? How the crystals can be obtained from mother liquor ?

Ans.

The remaining solution after the formation of crystals is called mother liquor.

1. The mixture of crystals and mother liquor is filtered through a Gooch crucible connected with a vacuum pump.

2. After full suction to drain the mother liquor as effectively as possible. When the filter is rigid enough it is pressed carefully but by firmly by means of a cork in order to drain the left over liquid.

3. The crystals are then washed will small portion of cold solvent repeating this process many times.

4. The crude mother liquor is concentrated by evaporation and it get good crops of crystals.

Q.19 Define sublimation.

Ans.

When substance is heated it goes directly in to vapours without passing through the liquid state and vapours thus formed are condensed back it form the solid on cooling once again with out passing though liquid state is called sublimation.

Examples of such solids are iodine, ammonium chloride, naphthalene , benzoic acid and camphor.

Q.20 What is sublimand ?

Ans.

The compound which is sublimed is called sublimand.e.g In the mixture of benzoic acid in sand, benzoic acid is sublimand.

Q.21 What is the main function and limitation of sublimation ?

Ans.

By this process of sublimation certain substance can be purified. It is only suitable for those substances which have high V.P than their melting point.

Q.23 What is solvent extraction? When it is applicable ?

Ans.

It is a technique, in which a solute can be separated from a solution by shaking the solution with a solvent in which the solute is more soluble and added solvent does not mix with the solution.

The technique of solvent extraction is mostly applied to separate organic compounds from water.

Q.24 What is the most common solvent in solvent extraction method? Why we choose ether in solvent extraction?

Ans.

The common solvent is ether in the solvent extraction we choose ether in the solvent extraction because ether layer is separated and organic product is obtained by evaporating ether repeated extractions using small portions of solvent ether are more efficient than using single but larger volume of solvent.

Q.25 State distribution law or partition law ?

Ans.

Distribution law:

This law states that a solute distribute itself between two immiscible liquids in a constant ratio irrespective of the amount of solute added.

The ration of the amounts of solute dissolved in two immiscible liquids at equilibrium is called distribution coefficient.

Distribution coefficient KD =

Q.26 Discuss the importance of solvent extraction method.

Ans.

Separation can be carried out on macro as well as micro level.

2. There is no need of any instrumentation except separating funnel.

3. It can be used for preparation, purification and analysis on all scales of working.

Q.27 Define chromatography? What is the principle of chromatography?

Ans.

Chromatography is a technique used for separating the components of a mixture. These components are separated due to the relative affinity for stationary phase and mobile phase.

Q.28 Define and explain, stationary phase and mobile phase.

Ans.

Stationary phase:

The phase over which mobile phase flows in chromatography is called stationary phase.

The stationary phase may be a solid or liquid supported on a solid. It adsorbs the mixture under separation.

Examples of stationary phase are silica gel, alumina and filter paper etc.

Mobile phase:

The solvent or mixture of solvents for this separation of components is called mobile phase.

The mobile phase may be liquid or gas and while passing one the stationary phase, competes with it for the constituents of mixture.

Examples of mobile phase are, water, ethanol, ethanoic acid and propanone (acetone) etc.

Q.29 What is the principle of chromatography ?

Ans.

The principle involved in the chromatography depends upon the relative solubilities of the components, between the two phases. The distribution of the components mixture between the two phases is governed by the distribution coefficient KD, which is ratio of component in mobile phase to the concentration of component in stationary phase.

KD =

Q.30 What is the importance of distribution coefficient ?

Ans.

(i) The component of a mixture with a small value of KD mostly remains in the stationary phase as moving phase flows over it.

The component with a greater value of KD remains largely dissolved in the mobile phase and passes over the stationary phase quickly.

Q.31 Differentiate between adsorption chromatography and partition chromatography ?

Ans. Adsorption chromatography:

Type of Chromatography in which the stationary phase is solid, is called adsorption chromatography. Example of this chromatography is Thin layer chromatography.

Q.32 What is partition chromatography ?

Ans. Partition chromatography:

Type of Chromatography in which the stationary phase is liquid is called partition chromatography. Example of this chromatography is paper chromatography.

Q.33 Define and explain paper chromatography ?

Ans.

It is a technique of partition chromatography in which the stationary phase is water adsorbed on a paper. The mobile phase is usually an organic liquid.

In paper chromatography the adsorbed water behaves as an immiscible liquid towards the mobile phase, which passes over the paper.

Q.34 Name the different ways of paper chromatography.

Ans.

There are three ways of carrying out paper chromatography.

(i) Ascending chromatography

(ii) Descending chromatography

(iii) Radial/Circular chromatography.

Q.35 What do you mean by Rf value?

Ans.

Each component has specific retardation factor called Rf value. Rf value is related to distribution coefficient and is given by

Rf =

Q.37 What is chromatogram ?

Ans. Finished or Devolped paper obtained after Chromatography is called Chromatogram:

Q.38 Name the types of chromatography on the basis of phase.

Ans.

There are four types of chromatography.

(i) Liquid–liquid chromatography

(ii) Liquid–solid chromatography

(iii) Gas–liquid chromatography

(iv) Gas–solid chromatography

Q.39 Give uses of chromatography.

Ans.

The techniques of chromatography is very useful in organic synthesis for separation, isolation, and purification of the products.

Mostly used for the separation of amino acids.

Q.40 Why is there a need to crystallize the crude products ?

Ans.

When a chemical compound is synthesised, it is crude product. Therefore, there is need to purify the compound. This is done by crystallizing the compound.

Q.41 A water soluble organic compound aspirin is prepared by the reaction of salicylic acid with a mixture of acetic acid and acetic anhydride. How will you separate the product from the reaction mixture ?

Ans.

During the preparation of aspirin, it is obtained as only liquid which can be separated by solvent extraction technique using a non–polar solvent like CCl_4 and mixture is transferred to separating funnel where only layer is separated.

Q.42 A solid compound is soluble in water as well as in chloroform. During its preparation it remains in aqueous layer. Describe a method to obtain it from the layer.

Ans.

The compound can be extracted by solvent extraction technique. As it is mentioned that compound is soluble in polar solvents (water, chloroform). If a non–polar solvent is mixed and the mixture is transferred to a separating funnel, where two layers are formed. By separating water layer and evaporating it, organic compound is obtained.

Q.43 why repeated extractions using small portions of solvent are more efficient than using a single but larger volume of solvent?

Ans.

It has been observed that repeated extractions using small portions of solvent are more efficient than using a single but larger volume of solvent. Because more product is extracted with more extractions using small portions of solvent.

Q.44 Write down the main characteristics of a solvent selected for the crystallization of compound.

Ans.

A solvent should have the following characteristics

1. It should dissolve a large amount of solute in its boiling part.
2. It should have not reaction with the solute.
3. It should neither dissolve the impurities, nor crystallize them with the solute.
4. It should be perfectly safe to use.
5. It should be easily removable.
6. It should be inexpensive.