VOCABULARY

Unit -1

Concept map

1. Postulated - அனுமானங்களை
2. Binding energy - பிணைப்பு ஆற்றல்
3. Hypothesis - கருதுகோள்
4. Agitation - கிளர்ச்சி
5. Fragments – துண்டுகளால்
6. Bombardment – தாக்குதல்களுக்கு
7. Progressively - படிப்படியாக
8. Staked - பணயம்
9. Malleability - தகடாகுமை
10. Ductility - நீண்மை
11. Metallic luster- உலோக காந்தி
12. Forbidden – தடைசெய்யப்பட்ட
13. Antichlor – குளோரின்
14. Annihilated – அழிந்திருப்பதைக்
15. **Tremendous -** கச்சிதமான
16. **Emphasis -** வலியுறுத்தல்

**Section A**

1. **Define the terms:**

Isotopes:

An element which are identical in atomic number but differ in atomic mass are called isotopes.

Isobars:

Atoms of different elements having the same mass number but different atomic number,

Isotones:

Atoms having same number of neutrons but differing in their mass numbers are called isotones.

Isomers:

1. **What are fundamental particles of nucleus?**
2. **What are Radioactive series?**
3. **Comparision of nuclear fission and nuclear fusion.**
4. Similarities:

Both release very large amount of energy.

1. Differences:

|  |  |
| --- | --- |
| Nuclear Fission | Nuclear fusion |
| Breaking up of a heavy nucleus into lighter nuclei. | Combining of two lighter nuclei into one heavy nucleus. |
| The links of the fission process are neutrons | The links of a fusion process are protons. |
| Proceed with thermal neutrons where thermal means room temperature | Proceeds with thermal particles where thermal means millions of degrees in Kelvin scale. |

1. **Differences between chemical reactions and nuclear reactions.**

(1) Nuclear reactions involve a change in an atom's nucleus, usually producing a different element ,along with the emission of radiations like α,βandγ etc rays. Chemical reactions, on the other hand, involve only a rearrangement of electrons and do not involve changes in the nuclei. **So nuclear reaction is nuclear phenomenon and chemical reaction is extra-nuclear phenomenon.**

(2) Different [isotopes](https://socratic.org/chemistry/a-first-introduction-to-matter/isotopes) of an element normally behave similarly in chemical reactions as their extra-nuclear electronic configurations are same. The [nuclear chemistry](https://socratic.org/chemistry/nuclear-chemistry/nuclear-chemistry) of different isotopes vary greatly from each other.

(3) Rates of chemical reactions are influenced by external effect like temperature,pressure and catalysts. Rates of nuclear reactions are spontaneous and are unaffected by such factors.

(4) Nuclear reactions are independent of the chemical form of the element.This means both in elemental and in compound state same amount of radio-element shows similar radioactivity.

(5) Energy changes accompanying nuclear reactions are much larger. This energy comes from destruction of mass.

(6) In a nuclear reaction, mass is not strictly conserved. Some of the mass is converted into energy,according to the equation E = mc2 and the order of energy evolved during a nuclear reaction is much higher than that of a chemical reaction.

1. **What do you understand by ”Brillouin Zones”?**

When two atoms are brought together, a more stable molecular orbital and less stable molecular orbital are formed. The energy levels are very large and they are very close to each other. These energy levels and called Brillouin zones.

1. **Distinguish between n-type and p-type semiconductors.**

|  |  |
| --- | --- |
| n- Type semiconductors | p- Type semiconductors |
| Conduction by electrons in the normal way | Conduction by positive holes. |
| Current is carried in one direction .E.g., As doped Ge | Current is acquired in the opposite direction. E.g., In doped Ge. |

1. **How is intrinsic semiconductor converted to a n- type or p-type semiconductor?**

When an intrinsic semiconductor is heated it becomes n-type semiconductor. When it is doped with an element from the next group on the left hand side, in the periodic table it becomes a p-type semiconductor.

1. **Compare the properties of Caro’s acid with Marshall’s acid.**

|  |  |  |
| --- | --- | --- |
| Reaction |  |  |
| 1. **Similarties** |  |  |
| State | Crystalline solid | Crystalline solid |
| Oxidising nature | Oxidising agent | Oxidising agent |
| 1. **Differences** |  |  |
| Action with KI | I2 is liberated immediately | I2 is liberated slowly |
| Action with aniline | Forms nitroso benzene | Forms aniline black. |

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1. **Mention four important applications of sodium thiosulphate.**

* It is used in photography (to fix negatives) under the name “hypo”
* In the laboratory for volumetric estimation of iodine
* In textile industry as antichlor (for removing the last traces of chlorine from bleached fabrics)
* In medicine (for skin diseases)
* In the extraction of gold and silver.

Section –B

1. **Explain free electron theory of metals. What are the defects of free electron theory of metallic state?**
2. Theory

* This theory is also known as electrons pool theory of drude Lorentz theory.
* According to this theory, metals are supposed to consist of metal ions situated at lattice points. Their valency electrons form a pool.
* The positively charged metal ions are held by the electron gas. They do not float randomly in the sea of electron. But they occupy definite positions at measurable distances from each other in the crystal lattice.
* The valence electrons are not attached to any individual ions. They belong to the crystal as a whole.
* They move freely throughout the lattice from one part of the crystal to the other, as gas molecules.

1. Electron gas model and metallic properties:

* Metallic luster
* Electron conductivity
* Thermal conductivity
* Malleability and ductility

1. Defects of this theory

* It does not explain vast variations In properties of certain metals.

E.g.,

1. Mercury melts at -39oC while tungsten melts at 3300 oC
2. Copper conducts electricity 50 times more than bismuth.
3. While sodium and potassium are soft while osmium is so hard that it scratches glass.
4. **Describe Pauling’s theory of metals for metallic bonds.**

* This theory was introduced by pauling.
* According to this theory the metallic bonding is covalent in nature.
* The metallic structure involves resonance of covalent bonds between each atom and its neigbours.
* This theory also known as the valence bond theory.

Example:



Resonance structures of lithium

* This theory also explains high electrical and thermal conductivities, malleability, ductility etc., because the mobile electrons help passage of current and heat.
* The ions can exchange positions without disturbing lattice structure. This explains malleability and elasticity.
* Close packing of atoms explains high density.

1. **How does the band theory account for the conductors and insulators/ bad conductors.**
2. **Theory**

* This theory was introduced by Hund and Mulliken. This is also known as the molecular orbital theory (MOT).
* According to this theory when two atoms are brought together, a more stable molecular orbital and less stable molecular orbital are formed. It ‘n’ atoms are brought together ‘n’ new energy states are formed.
* In crystals ‘n’ is very large in the order of 1023 PER cm3.
* Therefore the energy levels are also very large and they are very close to each other. These energy levels and called brillouin zones.
* The energy band occupied by the valence electrons is called valence band.
* The band which lied next to the valencies band is called conduction band.
* The valency band and the conduction band are separated by a gap known as forbidden energy gap.

The filling of these bands and the width of forbidden energy gap determine whether a substance is a conductor, semiconductor or insulator.

**B.Insulators:**

* The forbidden energy gap is very large. Hence a very large amount of energy must be supplied to the valence electron to enable to move to the conduction band. Therefore conduction is not possible and it is behaves as as insulator. E.g. diamond.

**C. Conductors:**

* In this case there is no forbidden energy gap. Hence the valency band merges into an empty band under the influence of an applied electric field, the electron ay acquire additional and move into higher energy state.
* These mobile electrons conducts current and this substance behaves as a conductor. E.G., all metals

**D. Semi conductors:**

* a substance for which the width of the forbidden energy gap is relatively small is called semiconductors. Hence the valence band remains full and the conduction band is empty. Therefore at low temperature, the substance is an insulator.
* At higher temperature, the electrons from the valence band move to the conduction band and conducts current. The positive holes left by the electrons migrate in the other direction and conducts current. The substance is called intrinsic semiconductors. E.g., germanium and silicon.

Section –C

1. Give brief account of per acids of sulphur.

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Permonosulphuric acid (H2SO5)** | **Perdisulphuric acid H2S2O8** | **Sodium thio sulphate Na2S2O3** |
| **1** | **Otherwise called peroxy sulphuric acid or caro’s acid** | **Peroxydisulphuric acid or Marshall’s acid** | **Otherwise called ‘hypo’** |
| **2** | **Preparation:**   * **Action of sulphuric acid** * **Hydrogen peroxide** * **Con. Sulphuric acid** | * **Anodic oxidation of sulphuric acid** * **Sulphonation of hydrogen peroxide** | * **From sodium carbonate** * **Ground sulphur** |
| **3** | **Properties: Physical**   * **It is a white crystalline solid** * **Oxidizing agent**   **Chemical**   * **With hydrogen peroxide it gives oxygen** * **Distilled with dilute sulphuric acid it gives hydrogen peroxide** * **It bleaches indigo immediately** * **It liberates halogens from halides** | **Properties: Physical**   * **It is a white crystalline solid** * **Oxidizing agent** * **Colourless** * **Hygroscopic** * **It is fairly stable at ordinary temperatures and melts at 338 K**   **Chemical**   * **Strong heating it decomposes into SO2 and O2** * **Hydrolysis** * **It liberates iodine from KI slowly.** * **It bleaches indigo slowly.** * **it oxidizes FeSO4 to Fe2(SO4)3** | **Properties: Physical**   * **It is a white crystalline solid** * **Soluble in water and has tendency to form saturated solution.**   **Chemical**   * **Action of heat** * **With dilute acids** * **With AgNO3** * **With silver halide** * **With FeCl3 solution** * **With cupric salts** * **With iodine** * **Reducing action** |
| **4** | **Structure:** |  | **-** |
| **5** | **Application:**   * **It is used in the manufacture of H2O2** * **It is used as oxidizing agent in the dyeing industry.** | * **Its salts are powerful oxidizing agents** * **It is used in dyeing industry as an oxidizing agent** * **Perdisulphates are used in the preparation of H2O2.** | * **It is used in photography under the name ‘hypo’** * **In the laboratory for volumetric estimation of iodine** * **In textile industry as antichlor** * **In medicine** * **In the extraction of gold and silver.** |

1. Write a brief notes on semiconductors.

What are they?

* They are solids which are insulators at absolute zero but which conduct electricity by the passage of electrons at normal temperatures. E.g., germanium and silicon.

Semiconductors and band theory:

* Unlike normal metallic conduction the conduction of a semiconductor increases with a rise in temperature. Thus they are insulators at low temperatures and are conductors at elevated temperatures.
* The behavior of semiconductors can be explained by the band theory of solids.
* According to this theory, solids have both permitted zones or brillouin zones and forbidden zones.
* In a semi conductor all low energy permitted zones are completely occupied by electrons.
* As the bandsare completely filled up at low temperatures, the electrons fail to conduct electricity, as sufficient energy is not available for them to cross the forbidden zone and jump to the next empty permitted zone.
* When the temperature is raised, the thermal energy of the electrons increase.
* Some valence electrons cross the forbidden band and reach the higher permitted, empty band called conduction band.
* Thus when electric field applied, these few electrons are free to flow through the crystal.
* Thus the semiconductors exhibit a limited electrical conductance at the higher temperature.

Different types of semiconductor:

|  |  |
| --- | --- |
| Intrinsic semiconductors | Extrinsic semiconductor |
|  |  |
|  |  |
|  |  |

1. Write a brief notes on nuclear fission
2. Nuclear fission

Definition:

Splitting of a nucleus into nearly equal parts with release of energy is called nuclear fission.

Explanation:

It is a type of disintegration. For example when uranium-235 is bombarded with slow moving neutrons, first a neutron is captured by the uranium nucleus. Then the whole nucleus splits into two nuclei, one of barium and other of krypton. In this process 3 extra neutrons are released. Such a process is known as nuclear fission. Some of the liberated neutrons attack other uranium nuclei and thus cause a chain reaction, while the others get annihilated and are converted into energy.

92U235 + 0n1 92U\*236 56Ba141 +36Kr92 +30n1+ Energy

Importance of nuclear fission

In fission reactions there is a low of mass. This is converted into energy. The energy produced in nuclear fission is extremely large as compared to conventional sources. For example, when 92U235 undergoes fission reaction on bombardment with slow moving neutrons about 0.2 units of mass per gram atom of uranium 235, is annihilated. It amounts 0.2 X [3X1010]2 ergs according to Einsteins equations [E = mc2]. This equal to six million horse power hours.

The large amount of energy liberated in nuclear dission can be utilized in two important ways:

1. Preparation of the super explosive of atom bomb (destructive purpose).
2. Super power plant (constructive purpose)

The atom bomb works on fast neutron chain. It is accomplished bringing together two pieces of fissionable material (U235 or Pu239) into intimate contact. When these two pieces are kept separted they are stable. But when they are put together by a mere mechanical operation, they explode violently.

* Controlled fission reaction

Atom bomb explosion is due to an uncontrolled chain reaction, if this chain reaction is put under control, after some time, a steady state is established.

* When such a steady state is established the number of neutrons produced and the number of neutrons consumed becomes nearly equal. The energy produced attains a constant level. Such a reaction is known as **controlled fission reaction.**
* **How is this brought about?**
* Controlled fission reactions are brought about in nuclear reactors. In nuclear reactions the fissionable material also called nuclear fuels like U235 or Pu 239 is staked with heavy water or graphite called moderators, the neutrons produced in the fission pass through the moderators and they lose some of their energies. So they start moving slowly. Thus fission reactions are controlled.

Applications

It is used for preparing radioisotopes or generating electricity.

1. Write a brief notes on nuclear fusion

Definition:

It is the process of combining or fusing two lighter nuclei into a stable and heavier nuclide with release of energy is called nuclear fusion.

Explanation:

The formation of helium nucleus it is formed by the combination of two hydrogen atos (i.e., 2 protons and 2 electrons) and two neutrons. In this case also an enormous amount of energy is released by the formation of a heavier nucleus from those of lighter elements on account of loss of mass.

Importance of nuclear fusion:

Nuclear fusion can take place by allowing highly accelerated protons and deuterons, etc, to fall on nuclei of lighter elements. Such processes occur at reasonable rates only at very high temperatures of the order of a million degree centigrade which exist only in the interior of stars.

Therefore, such processes are called thermo-nuclear reaction, once a fusion reaction is initiated, the energy released is sufficient to maintain the temperature and to keep the process going.

**The energy of the sun is supposed to arise from the following thermo-nuclear reactions.**

1. **1H1 + 1H1 1H2 + +1e0 + Energy**
2. **1H2 + 1H1 2He3 + Energy**
3. **2He3 + 2He3 2He4 +2 1H1 + Energy**

**In the above reaction 26.7 MeV of energy is released. This is a tremendous quantity.**

**Unit –II**

1. Fermentation - நொதித்தல்
2. Denaturation - இயல்புநீக்கம்

**SECTION – A**

1. What are amino acids? Give example.

They are organic compounds which contain both NH2 and –COOH groups. They are the building blocks of proteins and polypeptides. Thus these are biologically significant. E.g., Glycine NH2CH2COOH; alanine CH3CH (NH2) COOH.

1. How are carbohydrates classified? Give example for each.

* Carbohydrates are divided into main classes, viz., sugars and polysaccharides.
* Sugars are further subdivided into two groups namely monosacharides (e.g., glucose and fructose ) and oligosaccharides (e.g. sucrose, maltose)
* Polysaccharides are carbohydrates which yield a large number of monosaccharide molecules on hydrolysis e.g., starch, cellulose etc.

1. How does glucose react with acetic anhydride?

It reacts with acetic anhydride giving a penta acetyl derivative of glucose.

1. What happens when glucose is oxidized by mild oxidizing agents?

Glucose on treatment with bromine water (mild oxidizing agent) is oxidized to gluconic acid. The bromine water is decolorized.

1. Glucose and fructose give the same osazone. Why?

Both fructose and glucose give the same osazone because

* In both reactions condensation with phenylhydrazine is followed by oxidation and then another condensation.
* In both reactions only the first two carbons are involved.
* The configuration of C3, C4, C5 and C6 oof both glucose and fructose are the same.

1. What is the number of asymmetric carbon atoms in glucose? How many optically active isomers are possible?

They are four asymmetric carbon atoms. Hence it must have 24 = 16 optically active forms. All of them are known.

1. What is the difference between a polypeptide and protein?

|  |  |  |
| --- | --- | --- |
|  | polypeptide | Protein |
| Molecular weight | Below 10,000 | Above 10,000 |
| Nature of chain | Many units of only one amino acid | Combination of many amino acids or modified derivatives of amino acids. |

1. What is peptide linkage? Illustrate with an example.

As a result of the reaction of the acid group of one amino acid with the basic NHgroup of another amino acid, a linkage is formed between the two. This linkage is called peptide linkage.

**-COOH + H2N- -H2O -CO NH-**

**Acid group Basic group peptide linkage**

1. What is fermentation?

When a solution of fructose is treated with yeast we get ethanol. The enzyme zymase present in yeast converts fructose into ethanol and carbon dioxide.

1. What is muta rotation?

When a monosaccharide is dissolved in water, the specific rotation of the solution gradually changes and reaches a constant value. This change in the value of specific rotation is know as mutarotation. All reducing sugars except some ketoses undergo mutarotation.

**SECTION – B**

1. Compare and contrast the properties of glucose and fructose.
2. **Similarities:**
3. With phenyl hydrazine both give the same osazone.
4. Both reduce Tollen’s reagent and Fehling’s solution.
5. On fermentation with yeast both give ethanol.
6. Both are acetylated to give pentacetyl derivatives.
7. Both exhibit mutarotation.
8. **Distinctions:**

|  |  |  |
| --- | --- | --- |
| **Reaction** | **Glucose** | **Fructose** |
| 1. **Optical activity** | **Dextro - rotatory** | **Leavo – rotator** |
| 1. **With concentrated alkali** | **Resin is formed** | **No resin is formed** |
| 1. **With lime** | **Forms glucosate soluble in water oxidised.** | **Forms fructosate insoluble in water** |
| 1. **Oxidation with bromine (mild oxidizing agent)** | **Oxidised . Gluconic acid is got. Bromine water is decolourised.** | **No reaction** |

1. Describe the amino acid synthesized by Gabriel and Strecker methods?

**SECTION – C**

1. Elucidate the structure of Glucose.
2. Open chain structure for glucose:
3. Molecular formula C6H12O6.
4. On treatment with acetic anhydride it gives a penta acetyl derivative. Therefore it contains five ‘OH’ groups.
5. It is not easily dehydrated. Therefore each hydroxyl group must be linked to different carbon atoms.
6. It forms cyanohydrins with HCN and an oxime with hydroxyl amine. This shows the presence of a carbonyl group in glucose.
7. Glucose decolourises bromine water. It is oxidized to gluconic and glucose and gluconic acid have the same number of carbon atoms. Therefore the carbonyl group present is an aldehydic group. Aldehyde group us monovalent. Therefore it must be present at one end of the molecule.
8. When glucose is reduced with concentrated hydriodic acid and red phosphorus at 100oC we get a mixture of 2-iodohexane and hexane. Thus all the six carbon atoms in glucose are in a straight chain.

From the above evidences Baeyer suggested an open chain structural formula for glucose.

CH2OH - C\*HOH - C\*HOH - C\*HOH - C\*HOH – CHO

They are asymmetric carbon atoms. Hence it must have 24 = 16 optically active forms. All of them are known.

1. Cyclic structure for glucose:

The open chain structure for glucose does not explain the following reactions of glucose.

1. It does not add sodium bisulphate and NH3. This raises a doubt whether the aldehyde group is actually present or not.
2. When glucose is crystallised form an alcoholic solution or from acetic acid solution we get a glucose with specific rotation +110o. but when glucose is crystallized from pyridine solution we get a glucose with specific rotation -19.7o. This shows that glucose exists in two stereoisomeric forms.
3. When an aqueous solution of glucose is allowed to stand, its specific rotation slowly decreases from 110o to +52.5o . This is called mutarotation.
4. When glucose is treated with methyl alcohol and dry HCl gas, we get two stereoisomeric methyl -1- glucoses.

To account for the above observations the following ring structure have been assigned to glucose.

Α-glucose β-glucose

Hawarth structure:

1. Discuss the classification of proteins based on: (1) physical properties (2) biological functions. **Classification based on physical properties:**
2. Fibrous proteins:

They are long and thread like. They tend to lie side by side to form fibres. They are insoluble in water because the intermolecular forces in these proteins are strong. They serve as the chief structural material of animal tissues. E.g., i) keratin a fibrous protein in skin, hair, nails, wool etc ii) myosin, a protein which connects and muscles. Iii) fibroin, the protein, in skin.

1. Globular proteins:

They are spherical in shape. They are soluble in water or in aqueous solutions of acids, bases or salts. This is because the intermolecular forces in these proteins are weak. They maintain and regulate life process. E.g., enzymes, harmones, heamoglobine, albumin etc.

1. Conjugated proteins:

These proteins on hydrolysis yield α- amino acids and an non-protein group. The non-protein group in called prosthetic group. E.g., nucleoproteins, heamoproteins.

**Classification based on biological functions:**

1. Structural proteins:

They are responsible for the bodily structure. E.g., collagen found in skin, bone etc.

1. Contractile proteins:

They responcible for the movements in the body by contraction and expansion. E.g., myosin and actin present in skeletal muscle.

1. Enzymes:

They are catalysis responsible for several biochemical reaction in the body. E.g.,

1. The enzyme amylase present in saliva of the mouth hydrolyses starch into maltose.
2. The enzyme pepsin present in gastric juice in stomacy hydrolyses proteins into proteoses and peptones.
3. Harmones:

Harmones are secretions of endocrine (ductiess) glands. They regulate the chemical processes taking place in the body. E.g.,

1. Adrenaline secreated by adrenal medulla maintains blood processes, releases glucose from glycogen and releases fatty acids from fats.
2. Insulin secreated by pancreas regulates the metabolism of glucose.
3. Antibodies:

They are produced in the body to destroy antigens (foreign bodies). E.g., gamma globulins.

1. Blood proteins:

E.g., fibrinogen for clotting blood.

1. Discuss the primary and secondary structures of proteins.

It is the sequence of the amino acids present in the molecule. The molecule will have two ends. The end with NH2 group, i.e the amino –end is known as the ‘N terminal’ and the end with –COOH group. i.e., the carboxyl –end is known as the ‘C-terminal’. By convention the sequence of amino acids in a polypeptide or protein is written with the terminal amino group at the end.

**Primary structure determination:**

1. The peptide or protein is isolated in a pure state.
2. Whether the protein consists of single peptide chain or whether it is composed of a number of sub-units is determined.
3. The protein is completely hydrolysed into its constituent amino-acids and their nature and amounts are determined.
4. The molecular weight is determined.
5. End group analysis is carried out to determine the nature of the N- and C-terminal groups.
6. After the determination of the nature of the N-T-AA and C-T-AA, the amino acid sequence is determined. This gives the primary structure of the protein.

**Secondary structure of proteins**

The conformation of the polypeptide is called the secondary structure. That is, the secondary structure is the way in which the protein chain is coiled.

**Α-Helix model:**

Pauling suggested –helix model for conformation of proteins.

Some evidences in favor of –helix conformation for proteins.

1. The peptide group is planar.
2. Hydrogen bonding stabilizes the conformation. This model permits the maximum number of hydrogen bonds.

**Salient features of the model:**

1. There are about 3.7 amino acid residues per turn.
2. Each hydrogen bond is formed between the CO group of one residue and the NH group of the fourth residue in the chain.
3. The hydrogen bonding prevents free rotation. therefore the helix is rigid.
4. Moffitt has shown that the right handed helix is more stable. Therefore the right handed helix is expected to occur naturally.

Unit -5

1. Specific conductance - குறிப்பிட்ட நடத்தை
2. Buffer solution - இடையக தீர்வு

**SECTION-A**

1. What is meant by specific conductivity? What is its unit?

* ĸ = 1 X l

R a

Where R= specific resistance of the solution and l/a = cell constant. ĸ = specific conductance, i.e., the conductance of a unit volume of a solution.

* The resistance offered by a conductor to the passage of electricity through it, is directly proportional to its length (l) and inversely proportional to its area of cross section (a).

1. Mention the limitations of Oswald’s dilution law.

Oswald’s dilution law is strictly obeyed only by weak electrolytes. It fails in the case of strong electrolytes. When a strong electrolyte is dissolved in water, it remains completely as ions. But the electrostatic forces are acting between the ions in solution and the forces are greater in concentrated solutions than in dilute solutions. In very dilute solutions these forces become negligible.

1. Write an account of conductometric titrations.

The electrical conductance of a solution depends upon the number and mobility of ions. So, the conductance measurements can be used to find out the end-points of acid-base titrations and precipitation titrations.

1. Mention the advantages of conductometric titrations.

* The titrations which cannot be carried out by ordinary methods can be carried out successfully under conductometric method.
* Even titrations with turbid and coloured solutions, where indicators cannot be used, can be done.
* Reactions in which precipitates are formed can also be titrated.
* A weak acid can be titrated against a weak base.
* Very dilute solutions can also be titrated.

1. What is meant by Equivalent conductivity? What is its unit?

˄ = ĸ X 1000

C

Where ĸ = specific cinductance; C = concentration in equivalents per litre, i.e., normality.

Equivalent conductance is the conductance of the solution containing one gram equivalent of the substance.

1. What is the importance of Kohlrausche’s law?

* To determine the equivalent conductance at infinite dilution of weak electrolytes. The ˄o of the weak electrolytes cannot be evaluated from direct experimental data. The extrapolation to infinite dilution of the graph obtained by plotting the equivalent conductivities and the concentrations of the solution is not possible for a weak electrolyte. But it can be evaluated using kohulrausch’s law.

1. Why is Arrhenius theory of electrolytic dissociation not applicable to strong electrolytes?

This is because strong electrolytes completely dissociate. Thus there is no equilibrium between the dissociated ions and undissociated moles as postulated by Arrhenius.

1. Define the term pH of a solution.

The pH of a solution is defined as the negative logarithm to the base 10 of the hydrogen ion concentration (expressed in moles per litre).

pH = -log10 [H+]

pH indicates whether a solution is acidic, basic or neutral. Thus we find that if

* pH =7 the solution is neutral
* if pH < 7 the solution is acidic and
* if pH > 7 the solution is basic

1. Kohlrausch’s law?

“At infinite dilution, each ion contributes a definite amount of conductance to the total conductance of the electrolyte, irrespective of the nature of the other ion’. This law is also known as the law of independent migration of ions. It may be represented as

˄o = λo + + λo –

It is strictly correct only if the electrolyte is at infinite dilution. λo +  and λo – are the equivalent ionic conductances at infinite dilution of the cation and anion respectively.

1. Oswald’s dilution law?

K= α2

(1-α)V

This expression which correlates the variation of the degree of dissociation of an electrolyte with dilution is known as Ostwald’s dilution law.

**SECTION-B**

1. Discuss the postulated of Arrhemius theory of electrolytic dissociation?

The theory of electrolytic dissociation was put forward by Arrhenius and its important postulates

are:

1. All electrolytes, when dissolved in water spontaneously dissociate into charged particles called “ions”.

AB A+ +B-

1. The total charge on the cations is equal but opposite to that on the anions. Hence the solution is electrically neutral.
2. These ions are constantly reuniting to form undissociated molecules until an equilibrium is established.

AB  A+ +B-

1. The ions are free to move and under the influence of electricity are directed towards the oppositely charged electrodes. (Electric current does not produce ions, it only has a directive effect).
2. The electrolyte may not be completely ionized. The ratio of the number of dissociated molecules to the total number of molecules is termed “ degree of dissociation”. It is denoted by the symbol a.
3. The ions act like molecules in the depression of freezing point, elevation of boiling point, lowering of vapour pressure, increase in osmotic pressure etc. thus a molecule which gives two ions exert twice the normal effect on the above mentioned colligative properties which are dependent on the number of particles present in them.

1. Describe the method of determining the specific conductivity of a solution.

**SECTION-C**

1. Write a brief note on conductometric titrations.
2. Describe the method of determination of pH of solution.