

**1. Name the two types of electric conduction.**

The two types of electrical conduction are:

- a) Electric conduction due to flow of delocalised electrons.
- b) Electrical conduction due to flow of ions.

**2. What is electronic conduction?**

The type of conduction which is due to the flow of delocalised electrons is known as electronic conduction.

**3. What is electrolytic conduction?**

The type of conduction in which cations and anions participate in the flow of electricity in molten state or aqueous solution of salt is called as electrolytic conduction.

**4. What is meant by electrolytic solutions?**

The aqueous solutions in which chemical reactions occur when direct current is passed are called electrolytic solutions.

**5. What is an electrolyte?**

The chemical substances that conduct electricity in aqueous state or molten state are called electrolytes.

**6. State the types of conduction of electricity.**

- a) Metallic conduction
- b) Electrolytic conduction

**7. Give examples of substances through which metallic conduction occur.**

- a) All metals Ex: Iron, Aluminium, Copper, Mercury etc.
- b) All alloys Ex: Brass, Bronze, and Steel etc.
- c) Graphite

**8. Give examples of substance through which electrolytic conduction occurs.**

- a) Salts in molten state Ex: Sodium chloride, Calcium chloride, lead bromide etc.
- b) Aqueous solutions of sodium sulphate, copper sulphate etc.
- c) Bases Ex: Sodium hydroxide, Potassium hydroxide etc.
- d) Aqueous solutions of acids Ex: Hydrochloric acid, sulphuric acid etc.

**1. Mention the differences between metallic conduction and electrolytic conduction.**

Metallic conduction	Electrolytic conduction
1. It is a physical change	1. It is a chemical change
2. Only electrons conduct electricity	2. Positive and negative ions conduct electricity
3. All metals and metallic alloys exhibit metallic conduction.	3. Ionic compounds exhibit electrolytic conduction in aqueous solution.

**2. How are electrolytes classified?**

Electrolytes can be classified into:

- a) Strong electrolytes
- b) Weak electrolytes
- c) Non electrolytes

**3. What are strong electrolytes? Give example**

Electrolytes that dissociate almost completely are called strong electrolytes. Ex: Ionic compounds like Sodium chloride, copper sulphate, covalent compounds, hydrochloric acid, nitric acid, sulphuric acid.

**4. What are weak electrolytes? Give example**

Electrolytes that dissociate partially are called weak electrolytes. Ex: Vinegar, carbonic acid, phosphoric acid and organic acids like acetic acid, formic acid etc.

**5. What are non-electrolytes? Give example**

Substances which do not conduct electricity are called non-electrolytes. Ex: Sugar solution, distilled water etc.

**6. Observe the diagram alongside and answer the questions.****a) When the electrodes are dip of sodium chloride. What do you observe?**

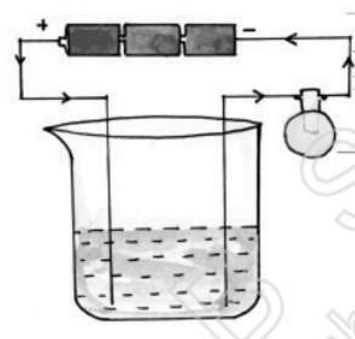
We observe the bulb glows brightly as sodium chloride is a strong electrolyte.

**What do you observe?**

We observe the bulb glows faintly as vinegar is a weak electrolyte

**b) When the electrodes are dip****What do you observe?**

We observe the bulb does not glow as sugar solution is a non-electrolyte.

**c) When electrodes are d****7. State Arrhenius theory of dissociation.**

“The molecules of an electrolyte in aqueous solution break into ions”

**8. What are ions?**

A group of charged atoms are called ions.

**9. What are anions?**

Anions are a group of atoms that have gained electrons. They have a negative charge.

**10. What are cations?**

Cations are atoms that have lost an electron to become positively charged.

11. Draw a neat diagram of the apparatus used in the electrolysis of copper chloride solution.
12. In the electrolysis of copper chloride, write the equation which takes place at the a) cathode b) anode.
- a) At cathode:  $\text{Cu}^{2+} \xrightarrow{+2e} \text{Cu} \downarrow$
- b) At anode:  $\text{Cl}^- \xrightarrow{-e} \text{Cl}$
- $$\text{Cl} + \text{Cl} \longrightarrow \text{Cl}_2$$
13. State Faraday's first law of electrolysis.
- "The mass of substance deposited or collected at either electrode during electrolysis is proportional to the current and to the time".
14. Write the mathematical form of Faraday's first law of electrolysis.
- $M \propto It$
- $M = Zit$  or  $M = ZQ$  where  $Q = It$
15. What is electro chemical equivalent?
- Electro chemical equivalent is defined as the mass in grams liberated by one Ampere of current in one second.
- $$\text{E.C.E} = \frac{\text{Mass of substance liberated}}{\text{Current} \times \text{time}}$$
16. On what factors does the amount of deposition in electrolysis depend?
- The amount of deposition depends on the
- a) Current b) Time c) Nature of substance
17. State Faraday's second law of electrolysis.

“The masses of different substances liberated by the same quantity of electricity are proportional to their chemical equivalents”.

**18. Define chemical equivalent.**

Chemical equivalent is defined as the ratio of atomic mass to its valency.

$$\text{Chemical Equivalent} = \frac{\text{Atomic Mass}}{\text{Valency}}$$

**19. Write the mathematical form of Faraday's second law of electrolysis.**

$$\frac{M_A}{M_B} = \frac{E_A}{E_B} = F \text{ or } \frac{E}{Z} = \text{Constant}$$

**20. Define Faraday's constant.**

Faraday's constant is defined as the ratio of chemical equivalent to electrochemical equivalent of a substance.

**21. Write the value of Faraday's constant.**

The value of Faraday's constant is 96,500 coulomb/mole.

**22. Mention the applications of electrolysis.**

- a) Electroplating
- b) Electrotyping
- c) Purification of metals
- d) Decomposition of salts
- e) Electro polishing
- f) Manufacture of certain chemicals like caustic soda.

**23. What is electroplating?**

Electroplating is the process of plating one metal onto another by passing current through the electrolyte.

**24. What is the aim of electroplating?**

The aim of electroplating is to give the articles made of one metal a coating of another metal either to improve the appearance or to protect it against rusting and tarnishing.

**25. Draw a neat diagram of apparatus used to electroplate a brass article with silver.**

**26. What is electro polishing?**

Electro polishing is an electrochemical process that removes material from a metallic article. It is the reverse of electroplating.

**27. Explain electro polishing.**

The article to be electro polished is taken as anode in the electrolytic bath with copper or lead cathode and a suitable electrolyte. When direct current is passed through the electrolyte, the metal is removed from the anode by the action of current. Thus the anode is electro polished.

Ex: Sandwiched cookers are manufactured by the electro polishing method.

**28. What mass of copper is deposited at the cathode in the copper voltameter by the passage of 2 amperes of current for 30 minutes?****29. How many amperes of current is required to deposit on cathode 5g of gold per hour? (E.C.E of the gold is equal to 0.000681g/coulomb)****30. How much time is required to deposit 1.1g of copper by passing 0.5 ampere of current? (E.C.E of copper is 0.00033 g/coulomb)**

31. To deposit 0.54g copper on cathode in a copper voltameter, how much quantity of electricity is required? (E.C.E of copper is 0.00033 g/coulomb)
32. Silver voltameter and copper voltameter are connected in series. The amount of silver and copper deposited are 0.31g and 0.091g respectively. If the E.C.E of copper is 0.00033 g/coulomb. Calculate the E.C.E of silver.

**Fill in the blanks:**

1. The type of conduction which is due to the flow of delocalised electrons is known as **electronic conduction**.
2. The type of conduction in which ions participate in the flow of electricity is called as **electrolytic conduction**.
3. The aqueous solutions in which chemical reactions occur when direct current is passed are called **electrolytic solutions**.
4. The chemical substances that conduct electricity in aqueous state or molten state are called **electrolytes**.
5. Metallic conduction is a **physical** change.
6. Electrolytic conduction is a **chemical** change.
7. An example of an electrolytic conductor is **Sodium chloride**.

8. Electrolytes that dissociate almost completely are called **strong electrolytes**.
9. An example of a strong electrolyte is **copper sulphate**.
10. Electrolytes that dissociate partially are called **weak electrolytes**.
11. An example of a weak electrolyte is **phosphoric acid**.
12. Substances which do not conduct electricity are called **non-electrolytes**.
13. An example of a non-electrolyte is **distilled water**.
14. According to Arrhenius theory of dissociation - The molecules of an electrolyte in aqueous solution **break into ions**.
15. A group of charged atoms are called **ions**.
16. A group of atoms that have gained electrons are called **anions**.
17. A group of atoms that have lost an electron to become positively charged are called **cations**.
18. The mass of substance deposited or collected at either electrode during electrolysis is proportional to **the current and to the time**.
19. Mathematical form of Faraday's first law of electrolysis is  **$M \propto It$  or  $M = Zit$** .
20. The mass in grams liberated by one Ampere of current in one second is called **Electro Chemical Equivalent (E.C.E)**.
21. The masses of different substances liberated by the same quantity of electricity are proportional to **their chemical equivalents**.
22. The ratio of atomic mass to its valency is called **Chemical equivalent**.
23. The mathematical form of Faraday's second law of electrolysis is 
$$\frac{M_A}{M_B} = \frac{E_A}{E_B} = F$$
24. The ratio of chemical equivalent to electrochemical equivalent of a substance is called **Faraday's constant**.
25. The value of Faraday's constant is **96,500 coulomb/mole**.
26. The process of coating one metal onto another by passing current through the electrolyte is called **electro plating**.
27. The aim of electroplating is to improve the appearance or to protect it against rusting and tarnishing.
28. The electrochemical process that removes material from a metallic article is called **Electro polishing**.
29. The process of electro polishing is the reverse of **electroplating**.
30. The article to be electro polished is taken as **anode**.