

Electrolytic Cell Chemistry Questions with Solutions

Q1. Electrolytes conduct electric current

- (a) By the movement of electrons from the anode to the cathode
- (b) By the movement of electrons from the cathode to the anode
- (c) By the movement of atoms
- (d) All of the above

Answer: (b) Electrolytes conduct electric current by the movement of electrons from the cathode to the anode.

Q2. When the salt bridge is removed from a cell, its voltage will

- (a) Decrease to zero
- (b) Decrease to half
- (c) No change
- (d) None of the above

Answer: (a) When the salt bridge is removed from a cell, its voltage will decrease to zero.

Q3. Which of the following statement is true for an electrolytic cell?

- (a) Migration of ions along with oxidation reaction at cathode and reduction reaction at the anode.
- (b) Electrons flow from cathode to anode within the electrolytic solution.
- (c) Electrons flow from cathode to anode through the external battery.
- (d) Migration of ions along with oxidation reaction at the anode and reduction reaction at the cathode.

Answer: (d) Migration of ions along with oxidation reaction at the anode and reduction reaction at the cathode is true for an electrolytic cell.

Q4. What is the condition for an electrochemical cell to behave like an electrolytic cell?

- (a) $E_{\text{ext}} > E_{\text{cell}}$
- (b) $E_{\text{ext}} < E_{\text{cell}}$
- (c) $E_{\text{ext}} = E_{\text{cell}}$
- (d) None of the above

Answer: (a) E_{ext} should be greater than E_{cell} for an electrochemical cell to behave like an electrolytic cell

Q5. In an electrolytic cell, oxidation and reduction occur at?

- (a) Cathode and Anode respectively
- (b) Anode and Cathode respectively
- (c) Both (a) and (b)
- (d) Neither (a) nor (b)

Answer:

Q6. In an electrolytic cell, electron flows from?

- (a) Anode to Cathode through the external supply
- (b) Cathode to Anode through the external supply
- (c) Anode to Cathode through the internal supply
- (d) Cathode to Anode through the internal supply

Answer: (d) In an electrolytic cell, electron flows through cathode to the anode by internal supply.

Q7. What is an electrolytic cell?

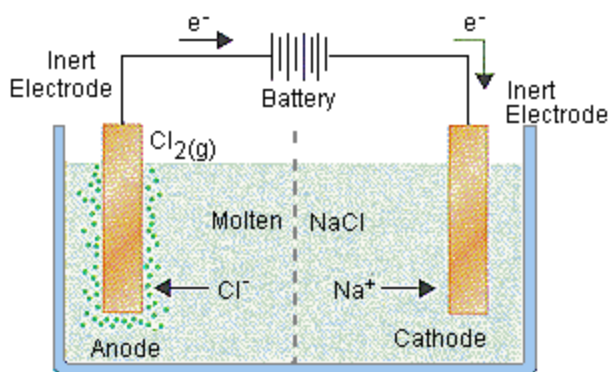
Answer: An electrolytic cell is a type of electrochemical cell in which non-spontaneous redox reactions convert the electric energy to chemical energy. In it, an anode is a positive electrode where oxidation takes place and the cathode is the negative electrode where reduction takes place.

Example: Electrolysis of water.

Q8. Explain the working of an electrolytic cell with a neat and clean diagram.

Answer: An electrolytic cell is a type of electrochemical cell in which non-spontaneous redox reactions convert the electric energy to chemical energy.

Diagram of an electrolytic cell:



Working of an electrolytic cell:

Electrolysis of molten sodium chloride can be explained through an electrolytic cell. We dip two inert electrodes into molten sodium chloride. When current flows through the circuit, the cathode becomes electron-rich and occupies a negative charge. Positively charged sodium ions move towards the negative cathode and form metallic sodium at the cathode.

On the other hand, negatively charged chloride ions move towards the positive cathode. Chloride ions lose their extra electron and liberate in the form of chlorine gas.

The chemical reaction of an electrolytic cell:

Reaction at Cathode: $[\text{Na}^+ + \text{e}^- \rightarrow \text{Na}] \times 2$

Reaction at Anode: $2 \text{Cl}^- \rightarrow \text{Cl}_2 + 2 \text{e}^-$

Overall Cell Reaction: $2 \text{NaCl} \rightarrow 2 \text{Na} + \text{Cl}_2$

Thus, electrolysis of molten sodium chloride in an electrolytic cell lead to the formation of metallic sodium and chlorine gas.

Q9. What are the applications of an electrolytic cell?

Answer: An electrolytic cell is a type of electrochemical cell in which non-spontaneous redox reactions convert the electric energy to chemical energy. An electrolytic cell plays a crucial role in our everyday life. It helps in the

1. Electrolysis of water to liberate hydrogen and oxygen gas.
2. Extracting aluminium from bauxite ore.
3. Electroplating.
4. Electrorefining of non-ferrous metals.

Q10. Can you store copper sulphate solution in a zinc pot?

Answer: No, we can not store copper sulphate solution in a zinc pot because zinc is more reactive than copper. Therefore, it will displace copper from the copper sulphate solution and will form zinc sulphate.

Reaction: $\text{Zn} + \text{CuSO}_4 \rightarrow \text{ZnSO}_4 + \text{Cu}$

Q11. What happens if the external potential applied is greater than the E_{cell} of an electrochemical cell?

Answer: If the external potential applied is greater than the E_{cell} of an electrochemical cell then the electrochemical cell behaves like an electrolytic cell. All the chemical reactions will be flipped and the electrical energy will be transformed into the chemical energy.

Q12. What are the three prior components of an electrolytic cell?

Answer: The three prior components of electrolytic cells are as follows.

1. Cathode
2. Anode
3. Electrolyte

The anode is the positive electrode and the cathode is the negative electrode in an electrolytic cell.

Q13. What is the cell representation for the cell reaction $\text{Zn} + \text{Cu}^{2+} \rightarrow \text{Zn}^{2+} + \text{Cu}$?

Answer: Cell reaction: $\text{Zn} + \text{Cu}^{2+} \rightarrow \text{Zn}^{2+} + \text{Cu}$

Reaction at Cathode: $\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}$

Reaction at Anode: $\text{Zn} - 2\text{e}^- \rightarrow \text{Zn}^{2+}$

Hence, the cell representation will be: $\text{Zn} | \text{Zn}^{2+} || \text{Cu}^{2+} | \text{Cu}$.

Q14. Distinguish between electrolytic and electrochemical cells.

Answer:

S. No.	Electrolytic cell	Electrochemical cell
1.	An electrolytic cell is a type of	An electrochemical is a cell in

	electrochemical cell in which non-spontaneous redox reactions convert the electric energy to chemical energy.	which non-spontaneous redox reactions convert chemical energy into electrical energy or vice versa.
2.	The anode is the positive electrode and the cathode is the negative electrode.	The cathode is the positive electrode and the anode is the negative electrode.

Q15. Distinguish between electrolytic and galvanic cells.

Answer:

S. No.	Electrolytic cell	Galvanic cell
1.	An electrolytic cell is a type of electrochemical cell in which non-spontaneous redox reactions convert the electric energy to chemical energy.	A galvanic cell is a cell in which spontaneous redox reactions convert chemical energy to electric energy.
2.	In it, electric energy brings a chemical reaction with the help of an external source.	In it, electric energy is generated by redox reactions.
3.	The anode is the positive electrode and the cathode is the negative electrode.	The cathode is the positive electrode and the anode is the negative electrode.
4.	Oxidation occurs at the anode while the reduction takes place at the cathode.	The oxidation takes place at the anode and the reduction occurs at the cathode
5.	Electrodes are kept in the same container in a molten state.	Half cells are set up in different containers and are connected through salt bridges.
6.	It is used in purifying copper and electroplating.	It is used in batteries.

Practise Questions on Electrolytic Cell

Q1. What is the main objective of a salt bridge?

Answer: The aim of the salt bridge is to operate as a source of spectator ions that can migrate into each of the half cells to maintain neutrality.

Q2. What is a primary cell? Give examples.

Answer: A primary cell is a battery that is devised to be used once and discarded. It can not be recharged with electricity or reused.

Examples: Leclanche cells and Mercury cells are examples of primary cells.

Q3. What sorts of charges are occupied by the electrodes of an electrolytic cell?

Answer: The anode is the positive electrode and the cathode is the negative electrode in an electrolytic cell.

Q4. What type of solution is filled in an electrolytic cell?

Answer: The electrolyte is usually a solution of water or other solvents in which ions are disbanded. Molten salts such as sodium chloride are also used as an electrolyte.

Q5. What is a salt bridge?

Answer: A salt bridge is a pivotal part of any voltaic or galvanic electrochemical cell. It is a tube filled with an electrolytic solution such as potassium chloride (KCl).