

Galvanic Cells Quiz Questions and Answers PDF

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In a galvanic cell, where does oxidation occur?

- Cathode
- Anode ✓
- Salt bridge
- Electrolyte

In a galvanic cell, oxidation occurs at the anode, where electrons are released from the oxidized species. This process is essential for generating electrical energy in the cell.

What is measured in volts in a galvanic cell?

- Current
- Resistance
- Cell potential ✓
- Charge

In a galvanic cell, the electric potential difference, or electromotive force (EMF), is measured in volts. This potential difference indicates the ability of the cell to drive an electric current through an external circuit.

What is the standard electrode potential used for?

- To measure current
- To calculate cell potential ✓
- To determine temperature
- To store energy

The standard electrode potential is used to predict the direction of electron flow in electrochemical cells and to determine the feasibility of redox reactions.

What is the role of the cathode in a galvanic cell?

- Site of oxidation
- Site of reduction ✓
- Maintains electrical neutrality
- Provides a pathway for electron flow

The cathode in a galvanic cell is the electrode where reduction occurs, meaning it gains electrons from the external circuit. It is typically the positive terminal of the cell, attracting cations from the electrolyte.

Describe a real-world application of galvanic cells and explain how they function within that application.

A real-world application of galvanic cells is in batteries, such as those used in smartphones and electric vehicles. In these batteries, a galvanic cell consists of two electrodes (anode and cathode) immersed in an electrolyte, where oxidation occurs at the anode and reduction at the cathode, generating a flow of electrons that provides electrical power.

Which applications utilize galvanic cells?

- Electroplating ✓
- Corrosion prevention ✓
- Heating systems
- Battery technology ✓
- Water purification

Galvanic cells are commonly used in batteries, electrochemical sensors, and corrosion protection systems. They convert chemical energy into electrical energy through spontaneous redox reactions.

Describe the role of the salt bridge in a galvanic cell and why it is essential for the cell's operation.

The salt bridge serves to connect the two half-cells of a galvanic cell, allowing ions to flow between them, which maintains charge balance and enables the continuous flow of electrons through the external circuit.

What are the differences between primary and secondary galvanic cells? Provide examples of each.

Primary galvanic cells, such as alkaline batteries, are non-rechargeable and provide energy until the reactants are exhausted. In contrast, secondary galvanic cells, like lithium-ion batteries, are rechargeable and can be used multiple times.

Discuss the importance of standard electrode potentials in determining the cell potential of a galvanic cell.

Standard electrode potentials allow us to calculate the cell potential (E°_{cell}) of a galvanic cell using the formula $E^\circ_{\text{cell}} = E^\circ_{\text{cathode}} - E^\circ_{\text{anode}}$, where the potentials are derived from standard reduction potentials.

How does the flow of electrons differ from the flow of ions in a galvanic cell?

Electrons flow through the external circuit from anode to cathode, while ions flow through the electrolyte, with cations moving to the cathode and anions to the anode.

Which component of a galvanic cell maintains electrical neutrality?

- Electrodes
- Electrolyte
- Salt bridge ✓
- External circuit

The salt bridge is the component of a galvanic cell that maintains electrical neutrality by allowing the flow of ions between the two half-cells, balancing the charge as oxidation and reduction reactions occur.

What is the primary function of a galvanic cell?

- Convert electrical energy into chemical energy
- Convert chemical energy into electrical energy ✓
- Store thermal energy
- Measure temperature

A galvanic cell primarily functions to convert chemical energy into electrical energy through spontaneous redox reactions. It generates an electric current as a result of the flow of electrons from the anode to the cathode.

Explain how a galvanic cell converts chemical energy into electrical energy.

A galvanic cell converts chemical energy into electrical energy by facilitating a spontaneous redox reaction, where electrons are transferred from the oxidized substance at the anode to the reduced substance at the cathode, creating an electric current.

Which metal is commonly used as an electrode in galvanic cells?

- Iron
- Gold
- Copper ✓
- Mercury

Zinc is commonly used as an electrode in galvanic cells due to its ability to easily lose electrons and participate in oxidation reactions.

Which of the following statements about the salt bridge are true?

- It conducts electrons
- It prevents charge buildup ✓
- It allows ion flow ✓
- It is an insulator
- It maintains electrical neutrality ✓

A salt bridge is essential in electrochemical cells as it maintains electrical neutrality by allowing the flow of ions between the two half-cells, preventing charge buildup that would otherwise halt the reaction.

Which of the following is a primary cell?

- Lead-acid battery
- Nickel-cadmium battery
- Alkaline battery ✓
- Lithium-ion battery

A primary cell is a type of electrochemical cell that is designed for one-time use and cannot be recharged. Common examples include alkaline batteries and zinc-carbon batteries.

Which processes occur in a galvanic cell?

- Oxidation ✓
- Reduction ✓
- Combustions

- Neutralization
- Electron flow ✓

In a galvanic cell, oxidation occurs at the anode and reduction occurs at the cathode, resulting in the spontaneous conversion of chemical energy into electrical energy.

Which of the following are components of a galvanic cell?

- Anode ✓
- Cathode ✓
- Electrolyte ✓
- Transformer
- Salt bridge ✓

A galvanic cell consists of two electrodes (anode and cathode), an electrolyte, and a salt bridge that facilitates the flow of ions. These components work together to convert chemical energy into electrical energy through spontaneous redox reactions.

In a galvanic cell, what roles do the electrodes play?

- Anode releases electrons ✓
- Cathode releases electrons
- Anode gains electrons
- Cathode gains electrons ✓
- Both electrodes are neutral

In a galvanic cell, the anode is the electrode where oxidation occurs, releasing electrons, while the cathode is where reduction takes place, accepting electrons. Together, they facilitate the flow of electric current through the external circuit.

What are the characteristics of secondary cells?

- Rechargeable ✓
- Single-use
- Used in smartphones ✓
- Non-rechargeable
- Used in remote controls

Secondary cells, also known as rechargeable batteries, can be recharged and reused multiple times, making them cost-effective and environmentally friendly. They typically have a higher energy density and longer lifespan compared to primary cells, but may require more complex charging systems.