

Electrochemical Cells Quiz Questions and Answers PDF

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What factors can affect the performance of an electrochemical cell? (Select all that apply)

- Temperature ✓
- Concentration of electrolytes ✓
- Pressure ✓
- Color of electrodes

The performance of an electrochemical cell can be influenced by several factors including temperature, concentration of reactants, surface area of electrodes, and the presence of catalysts or inhibitors.

Which of the following are components of a galvanic cell? (Select all that apply)

- Anode ✓
- Cathode ✓
- External power source
- Salt bridge ✓

A galvanic cell consists of two electrodes (anode and cathode), an electrolyte, and a salt bridge. These components work together to facilitate the redox reactions that generate electrical energy.

Which of the following is a characteristic of an electrolytic cell?

- It generates electrical energy spontaneously.
- It requires an external power source. ✓
- It uses a salt bridge.
- It has a positive anode.

An electrolytic cell is characterized by the use of an external power source to drive a non-spontaneous chemical reaction. This process involves the conversion of electrical energy into chemical energy, typically resulting in the decomposition of compounds.

What is the primary function of a galvanic cell?

- To convert electrical energy into chemical energy
- To convert chemical energy into electrical energy ✓**
- To store electrical energy
- To measure electrical resistance

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.

Which of the following are applications of electrochemical cells? (Select all that apply)

- Battery ✓**
- Electroplating ✓**
- Corrosion prevention ✓**
- Photosynthesis

Electrochemical cells are widely used in various applications, including batteries for portable electronics, fuel cells for clean energy, and electroplating for metal finishing.

Describe the process of writing a cell notation for a simple galvanic cell.

The cell notation for a simple galvanic cell is written as: anode | anode solution || cathode solution | cathode, where the anode is the site of oxidation and the cathode is the site of reduction.

Explain how corrosion is related to electrochemical cells and how it can be prevented.

Corrosion occurs when metals react with environmental elements, leading to oxidation, which is akin to the reactions in electrochemical cells. It can be prevented through methods such as applying protective coatings, using corrosion-resistant alloys, and implementing cathodic protection.

In an electrochemical cell, where does oxidation occur?

- Cathode
- Anode ✓
- Salt bridge
- Electrolyte

In an electrochemical cell, oxidation occurs at the anode, where electrons are released from the substance being oxidized. This process is essential for the flow of electric current in the cell.

Describe the function of a salt bridge in an electrochemical cell.

The function of a salt bridge in an electrochemical cell is to connect the two half-cells and allow the movement of ions, which helps to maintain charge balance and complete the circuit.

Which of the following best describes a primary battery?

- Rechargeable
- Non-rechargeable ✓
- Used in solar panels
- Used in fuel cells

A primary battery is a type of electrochemical cell that is designed to be used until it is depleted and then discarded, as it cannot be recharged. Common examples include alkaline batteries and zinc-carbon batteries.

Which component of an electrochemical cell maintains electrical neutrality?

- Anode
- Cathode
- Salt bridge ✓
- Electrolyte

The component of an electrochemical cell that maintains electrical neutrality is the salt bridge. It allows the flow of ions between the two half-cells, balancing the charge as the redox reactions occur.

What is the standard electrode potential of the standard hydrogen electrode (SHE)?

- 1.0 V
- 0.5 V
- 0 V ✓
- 1.0 V

The standard electrode potential of the standard hydrogen electrode (SHE) is defined as 0.00 volts. This value serves as a reference point for measuring the electrode potentials of other half-cells in electrochemistry.

What is the role of the electrolyte in an electrochemical cell?

- To conduct electrons
- To conduct ions ✓
- To prevent oxidation
- To provide a surface for reaction

The electrolyte in an electrochemical cell facilitates the movement of ions between the anode and cathode, allowing the cell to generate electrical energy through redox reactions.

Discuss the environmental impact of battery disposal and recycling.

Battery disposal poses serious environmental risks as they contain hazardous substances like lead, cadmium, and lithium, which can contaminate soil and water. Recycling batteries helps to

recover these materials, reduces pollution, and lessens the demand for raw materials, making it a crucial practice for environmental protection.

What does the Nernst equation calculate?

- Standard electrode potential
- Cell potential under non-standard conditions ✓
- Gibbs free energy
- Rate of reaction

The Nernst equation calculates the electrochemical potential of a cell based on the concentrations of reactants and products. It is used to determine the voltage of an electrochemical cell under non-standard conditions.

Explain the difference between a galvanic cell and an electrolytic cell.

The main difference between a galvanic cell and an electrolytic cell is that a galvanic cell converts chemical energy into electrical energy through spontaneous reactions, whereas an electrolytic cell requires an external power source to drive non-spontaneous reactions, converting electrical energy into chemical energy.

Which of the following are true for a cathode in a galvanic cell? (Select all that apply)

- It is the site of reduction. ✓
- It is the site of oxidation.
- It is positively charged.
- It is negatively charged. ✓

In a galvanic cell, the cathode is the electrode where reduction occurs, and it is the site of electron gain. It is also the positive terminal of the cell, attracting cations from the electrolyte.

What are the characteristics of a secondary battery? (Select all that apply)

- Rechargeable ✓

- Non-rechargeable
- Used in portable electronics ✓
- Used in single-use applications

Secondary batteries, also known as rechargeable batteries, are characterized by their ability to be recharged and reused multiple times, as well as their capacity to store and release electrical energy through reversible chemical reactions.

Which reactions occur in an electrochemical cell? (Select all that apply)

- Oxidation ✓
- Reduction ✓
- Neutralization
- Precipitation

In an electrochemical cell, both oxidation and reduction reactions occur, with oxidation taking place at the anode and reduction at the cathode.

How does the Nernst equation relate to cell potential and concentration?

The Nernst equation states that the cell potential (E) is directly related to the logarithm of the ratio of the concentrations of the products and reactants, expressed as $E = E^\circ - (RT/nF)\ln(Q)$, where E° is the standard cell potential, R is the gas constant, T is the temperature in Kelvin, n is the number of moles of electrons transferred, F is Faraday's constant, and Q is the reaction quotient.