

Electrochemistry Quiz Answer Key PDF

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Discuss the role of Gibbs free energy in determining the spontaneity of an electrochemical reaction.

The spontaneity of an electrochemical reaction is determined by the change in Gibbs free energy (ΔG). If ΔG is negative, the reaction is spontaneous; if ΔG is positive, the reaction is non-spontaneous.

What is the main purpose of electroplating?

- A. To generate electricity
- B. To prevent corrosion ✓**
- C. To increase weight
- D. To produce hydrogen gas

Describe the process of electroplating and its industrial applications.

Electroplating involves immersively placing an object in a solution containing metal ions and applying an electric current, which causes the metal ions to reduce and deposit onto the object's surface. Industrial applications include jewelry making, automotive parts coating, electronic components, and creating corrosion-resistant surfaces.

What is the primary function of a salt bridge in a galvanic cell?

- A. To generate electrons
- B. To maintain electrical neutrality ✓**
- C. To increase cell potential
- D. To provide a surface for the reaction

Explain how Faraday's laws of electrolysis are used to calculate the mass of a substance deposited at an electrode.

To calculate the mass of a substance deposited at an electrode using Faraday's laws of electrolysis, use the formula $m = (Q * M) / (n * F)$, where m is the mass, Q is the total electric charge, M is the molar mass of the substance, n is the number of electrons involved in the reaction, and F is Faraday's constant (approximately 96485 C/mol).

Describe how the Nernst equation is used to calculate cell potential under non-standard conditions.

The Nernst equation is given by $E = E^\circ - (RT/nF) \ln(Q)$, where E is the cell potential, E° is the standard cell potential, R is the universal 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. By substituting the actual concentrations of the reactants and products into the equation, one can calculate the cell potential for the reaction under non-standard conditions.

Which of the following is a characteristic of a galvanic cell?

- A. Requires an external power source
- B. Converts chemical energy into electrical energy ✓**
- C. Involves the electrolysis of water
- D. Has no salt bridge

Which of the following statements about corrosion are true?

- A. It is a redox reaction ✓**
- B. It can be prevented by electroplating ✓**
- C. It only occurs in metals
- D. It can be minimized by cathodic protection ✓**

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.

Discuss the mechanisms and methods used to prevent corrosion in metals.

The primary mechanisms to prevent corrosion include applying protective coatings (like paint or galvanization), utilizing cathodic protection systems (such as sacrificial anodes), and incorporating

corrosion inhibitors in the environment to reduce the electrochemical reactions that lead to corrosion.

Which of the following are components of a galvanic cell?

- A. Anode ✓
- B. Cathode ✓
- C. Salt bridge ✓
- D. External power source

What does the Nernst equation calculate?

- A. Standard cell potential
- B. Gibbs free energy
- C. Cell potential under non-standard conditions ✓
- D. Equilibrium constant

In a redox reaction, which component is reduced?

- A. The oxidizing agent ✓
- B. The reducing agent
- C. The catalyst
- D. The electrolyte

Which of the following metals is used as the standard electrode in electrochemical cells?

- A. Copper
- B. Zinc
- C. Silver
- D. Hydrogen ✓

In an electrolytic cell, the anode is:

- A. Positively charged ✓
- B. Negatively charged
- C. Neutral

D. Not part of the cell

Which of the following is a secondary battery?

- A. Alkaline battery
- B. Lead-acid battery ✓**
- C. Zinc-carbon battery
- D. Lithium primary battery

Which processes occur at the cathode in an electrochemical cell?

- A. Oxidation
- B. Reduction ✓**
- C. Electron gain ✓**
- D. Electron loss

What are the characteristics of a fuel cell?

- A. Converts chemical energy into electrical energy ✓**
- B. Requires continuous fuel supply ✓**
- C. Is rechargeable
- D. Produces water as a byproduct ✓**

Which of the following are applications of electrochemistry?

- A. Electroplating ✓**
- B. Fuel cells ✓**
- C. Corrosion prevention ✓**
- D. Photosynthesis

What factors affect the cell potential of an electrochemical cell?

- A. Temperature ✓**
- B. Concentration of solutions ✓**
- C. Pressure ✓**
- D. Type of salt bridge