

# Unlocking the Mysteries: Solved Questions on Electrochemistry

Electrochemistry, the branch of chemistry that deals with the study of chemical reactions involving electric charges, is a fascinating subject that finds applications in various fields, including energy storage, corrosion prevention, and electroplating, among others. To understand the principles behind this captivating branch of chemistry, let's dive into some solved questions on electrochemistry.

## The Role of Electrolytes

The first question delves into the concept of electrolytes and their role in electrochemical reactions.

### Question 1:

Why are electrolytes essential in a redox reaction?



## Some Solved Questions On ElectroChemistry

by Purnendu Nandy(Kindle Edition)

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Answer: Electrolytes play a vital role in redox reactions as they enable the electric charges to be transported between the electrodes. Without electrolytes, the flow of electric current would be impeded, and the reaction could not proceed. Electrolytes provide ions that carry the charges necessary for the flow of electricity.

## **Quantifying Electrochemical Cells**

Next, let's explore the calculations involved in measuring different aspects of electrochemical cells.

### **Question 2:**

How can we determine the standard electrode potential of a cell?

Answer: The standard electrode potential of a cell can be determined through the use of reference electrodes. By connecting the cell under study to a standard hydrogen electrode (SHE), the potential difference between the two electrodes can be measured using a voltmeter. This potential difference represents the standard electrode potential of the cell.

## **Beyond Standard Conditions: Nernst Equation**

Now, let's delve into the Nernst equation, which allows us to calculate electrode potentials under non-standard conditions.

### **Question 3:**

How does the Nernst equation help in calculating the cell potential at non-standard conditions?

Answer: The Nernst equation relates the cell potential to the reactant concentrations and temperature. It allows us to calculate the cell potential when

the concentrations of reactants deviate from standard conditions. The equation is as follows:

by nernst equation,  $E_{cell} = E_{ocell} - (RT/nF)\ln Q$  given  $E_{cell} = 1.03 \text{ V}$   $E_{ocell} = 1.1 \text{ V}$   
 $R = 8.3145 \text{ J/mol.K}$   $n = 2$   $T = 298.15 \text{ K}$   $F = 96487 \text{ C/mol}$  put all values, you will get  $\ln Q = 5.45$  so  $Q = 232.55$   $Q = [\text{Zn}^{2+}]/[\text{Cu}^{2+}]$  given  $[\text{Zn}^{2+}] = 1$  so,  $[\text{Cu}^{2+}] = 1/Q = 0.0043 \text{ M}$   
option(B) is correct

**Solution**

by nernst equation,  $E_{cell} = E_{ocell} - (RT/nF)\ln Q$  given  $E_{cell} = 1.03 \text{ V}$   $E_{ocell} = 1.1 \text{ V}$   
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option(B) is correct

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Where  $E_{cell}$  is the cell potential under non-standard conditions,  $E^{\circ}_{cell}$  is the standard electrode potential,  $R$  is the ideal gas constant,  $T$  is the temperature in Kelvin,  $n$  is the number of electrons involved in the reaction,  $F$  is the Faraday constant, and  $Q$  is the reaction quotient.

## Applications of Electrochemistry

Lastly, let's examine some real-life applications of electrochemistry that demonstrate the significance of this field.

### Question 4:

How is electrochemistry utilized in the production of aluminum?

Answer: The production of aluminum involves the extraction of aluminum from its ore, bauxite. Electrolysis is used to dissolve aluminum oxide ( $\text{Al}_2\text{O}_3$ ) into a molten salt electrolyte, which facilitates the transportation of aluminum ions. The electrolyte is composed of a mixture of cryolite ( $\text{Na}_3\text{AlF}_6$ ) and alumina ( $\text{Al}_2\text{O}_3$ ), reducing the overall energy requirements compared to other extraction methods.

### Question 5:

What role does electrochemistry play in rechargeable batteries?

Answer: Electrochemistry plays a fundamental role in rechargeable batteries. These batteries rely on reversible redox reactions to store and release electrical energy. When the battery discharges, the reactants in the electrochemical cell undergo oxidation and reduction reactions, thus releasing electrical energy. During recharging, the reactions are reversed, allowing the battery to store energy for future use.

## Unlocking the World of Electrochemistry

By exploring these solved questions on electrochemistry, we have gained valuable insights into the principles and applications of this captivating field. Electrochemistry not only helps us understand chemical reactions involving

electric charges but also contributes to the development of technologies that power our modern world.

So dive deeper into the world of electrochemistry and unlock its boundless potential!



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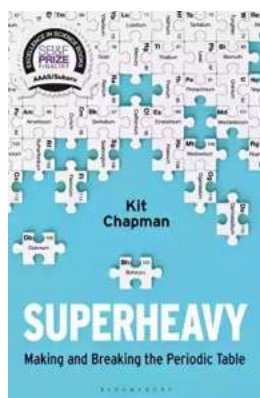
Problems in electrochemistry appear really difficult to most of the students of chemistry, physics, and engineering. One of the reasons may be the vast area of its applicability i.e. inorganic-physical chemistry, physics, general, and basic engineering, and chemical engineering from secondary to postgraduate level. Most of the problems are unique and vary on a tiny thread in this area. Considering this, I thought of writing a book on problems alone so that the student can find the answer to typical questions systematically irrespective of their grade and specialization. Very few books are available on this topic and perhaps none of them cover the entire grade of the subject relies on. The first half of the book precisely describes the related topic of discussion in very few words.

The questions are chosen from several specialized books and entrance examination question papers irrespective of the grade. Most of the problems are in traditional units and a few are in SI unit. However, considering the importance to have a piece of basic knowledge of the subject, the related concept to solve the problem is discussed in detail in the . The potentials are considered reduction potentials and most of the equations are only written in a reduced manner except for some typical examples. I think if the reader goes through the introductory concept with attention they will not find any issue to understand the concept to resolve the problems. The lucid way of representation in this book can ease difficulty on understanding the topic moreover to solve the problems related this area of chemistry.



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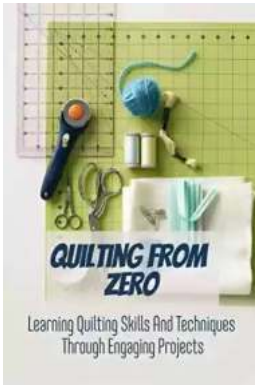
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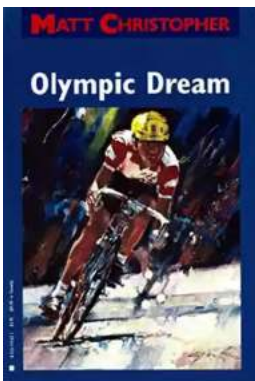
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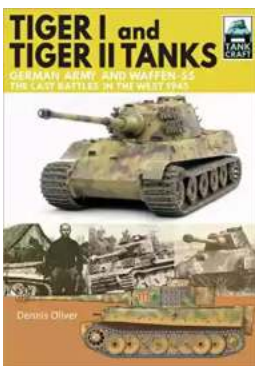
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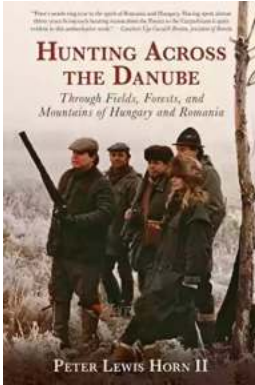
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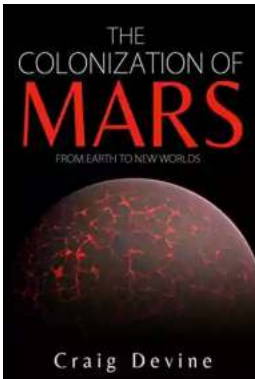
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