

General Chemistry II Chapter-by-Chapter detailed learning objectives

Electrochemistry

1. Review redox reaction terminology (ex. Oxidizer, reducer, oxidation, reduction) and balance redox reactions in both acidic or basic solutions.
2. Recall quantities and relationships dealing with electrical current (A), potential(V), power(W) and charge capacity (Ah).
3. Calculate standard-state cell potential based on half-cell potentials.
4. Categorize electrochemical cells as galvanic (voltaic) or electrolytic.
5. Define terms such as “cell potential” (or electromotive force, EMF) and its units of measurement (volts).
6. Define the volt unit.
7. Draw cell diagrams, cell notation and show the direction of electron flow and categorize reactions as spontaneous, non-spontaneous or if already at equilibrium.
8. Work with the non-standard state cell conditions (non-standard concentrations and temperature) and calculate the E_{cell} using the Nernst equation.
9. Apply the Nernst equation to solve “concentration cell” type problems.
10. Apply the series and parallel cell connections for a boost in overall cell voltage and/or current capacity while setting cells into a battery.
11. Write common battery reactions (ex. Lead-acid battery) discussed in lecture and textbook.
12. Recall the design of the Laclanche (dry cell) battery and its modified (alkaline) version.
13. Recall the design (structure) of a typical fuel cell.
14. Relate the principles of electrochemistry to understanding corrosion of metals and the related reactions. (Review the case of corrosion of steel).
15. Apply ideas of cathodic protection and passivation and how they work to prevent corrosion.
16. Distinguish between electrolysis and galvanic cells and the use of power supply and the polarity of the wire (leads) connections.
17. Perform electrolysis calculations based on Faraday’s mole/charge equivalence.
18. Perform E_{cell} calculations for a battery or electrochemical cell.
19. Perform electrolysis-of-a-mixture calculations and sequence of reactions which take place upon increasing the applied potential
20. Review the concept of overpotential (or overvoltage).
21. Solve problems involving mixed reactions including redox, solubility and complex ion equilibrium reactions.