**Chemistry 30**

**Redox - Electrochemical Changes**

**Key Concepts and Learning Goals**

**Focusing Questions:** What is an electrochemical change? How have scientific knowledge andtechnological innovation been integrated into the field of electrochemistry?

**Key Concepts:**

* oxidation
* reduction
* oxidizing agent
* reducing agent
* oxidation-reduction (redox) reaction
* oxidation number
* half-reaction
* disproportionation
* spontaneity
* standard reduction potential
* voltaic cell
* electrolytic cell
* electrolysis
* standard cell potential
* Faraday’s law
* corrosion

**Learning Goal: You willexplain the nature of oxidation-reduction reactions**

|  |  |  |
| --- | --- | --- |
| **You Will:** | **Explanation/Definition:** (What is the concept?) | **Example:**(other than those from notes given in class) |
| 1. define oxidation and reduction operationally and theoretically |  |  |
| 2. define oxidizing agent, reducing agent, oxidation number, half-reaction, disproportionation |  |  |
| 3. differentiate between redox reactions and other reactions, using half-reactions and/or oxidation numbers |  |  |
| 4. identify electron transfer, oxidizing agents and reducing agents in redox reactions that occur in everyday life, in both living systems (*e.g., cellular respiration, photosynthesis*) and nonliving systems; i.e., corrosion |  |  |
| 5. compare the relative strengths of oxidizing and reducing agents, using empirical data |  |  |
| 6. predict the spontaneity of a redox reaction, based on standard reduction potentials, and compare their predictions to experimental results |  |  |
| 7. write and balance equations for redox reactions in acidic and neutral solutions by  using half-reaction equations obtained from a standard reduction potential table  developing simple half-reaction equations from information provided about redox changes  assigning oxidation numbers, where appropriate, to the species undergoing chemical change |  |  |
| 8. perform calculations to determine quantities of substances involved in redox titrations. |  |  |

**Learning Goal: You will apply the principles of oxidation-reduction to electrochemical cells.**

|  |  |  |
| --- | --- | --- |
| **You Will:** | **Explanation/Definition:** (What is the concept?) | **Example:**(other than those from notes given in class) |
| 1. define anode, cathode, anion, cation, salt bridge/porous cup, electrolyte, external circuit,power supply, voltaic cell and electrolytic cell |  |  |
| 2. identify the similarities and differences between the operation of a voltaic cell and that of an electrolytic cell |  |  |
| 3. predict and write the half-reaction equation that occurs at each electrode in an electrochemical cell |  |  |
| 4. recognize that predicted reactions do not always occur; *e.g., the production of chlorine gasfrom the electrolysis of brine* |  |  |
| 5. explain that the values of standard reduction potential are all relative to 0 volts, as set forthe hydrogen electrode at standard conditions |  |  |
| 6. calculate the standard cell potential for electrochemical cells |  |  |
| 7. predict the spontaneity or nonspontaneity of redox reactions, based on standard cellpotential, and the relative positions of half-reaction equations on a standard reduction  potential table |  |  |
| 8. calculate mass, amounts, current and time in single voltaic and electrolytic cells byapplying Faraday’s law and stoichiometry. |  |  |
| **Other resources for Organic Compounds Include:** | | |
| Vocabulary & Definitions for Unit: | | |