Date:_____ AP Chemistry

Chapter 20 – Electrochemistry (Syllabus)

Chemistry: The Central Science

1. Read the chapter (pgs. 849-890) and review Section 4.4 (Oxidation-Reduction Reactions).

2. 20.1-20.2 (Redox Reactions & Balancing Redox Reactions):
   - Review Section 4.4 (espec. the assignment of oxidation numbers).
   - Be able to:
     a. Identify whether a rxn. is redox or not.
     b. Identify oxidized substance, oxidizing agent (oxidant), reduced substance, reducing agent (reductant)
     c. Balance redox eqns. by Half-Rxn. method
     d. Balance redox eqns. in acidic solutions
     e. Balance redox eqns. in basic solutions

3. 20.3 (Voltaic Cells):
   - Terms: voltaic (galvanic) cell, electrode, anode, cathode, salt bridge
   - Be able to: Label each part of a voltaic cell (anode, sign of anode, anode cell, cathode, sign of cathode, cathode cell, voltmeter, salt bridge, etc,) and indicate direction of electron and ion flows. Include the solutions used in the beakers and the materials used as electrodes.

4. 20.4 (Cell EMF under standard conditions):
   - Terms: volt, emf (cell potential), standard emf (standard cell potential), standard reduction potential, SHE (standard hydrogen electrode)
   - Be able to use: Eqn. 20.8 (calculating cell potential)
   - Watch your signs (+/-) for calculations of potentials

5. 20.5 (Free Energy and Redox Reactions):
   - ✓ How can potentials be used to determine the spontaneity of a reaction?
   - ✓ Be able to use: Eqn. 20.11 (calculating Gibbs free energy in a redox reaction)
   - ✓ Faraday's constant

6. 20.6 (Cell EMF under Nonstandard Conditions):
   - Nernst equation (Eqns. 20.16-20.18): How can you tell if a cell reaction is at equilibrium?
   - Concentration cells: How does the emf vary with concentration?

7. 20.7 – 20.8 (Batteries, Fuel Cells, & Corrosion): Just read over (applications of previous concepts and problems.).

8. 20.9 (Electrolysis):
   - ❖ Terms: electrolyis rxn., electrolytic cell, electroplate, watt (W)
   - ❖ Perform calculations relating the quantity of electrical charge and the amounts of substances oxidized or reduced (See Fig. 20.30).

9. Labs:
   - ❖ Cont. "Experiment 17-Electrochemical Cells and Thermodynamics"

10. Chapter 20 Exercises:
    - Visualizing Concepts & Exercises: #'s 15, 17, 21, 23, 25, 3, 29, 35, 37, 43, 4, 53, 55, 63, 65, & 91
    - Additional Exercises: #'s 98, 99, 101, & 104
    - Integrative Exercises: # 111

11. Ch. 20 Test: We will have the test in about 1 week.

The Baghdad Batteries

The Mystery:

The Baghdad Batteries are a series of artifacts found in the area of Mesopotamia dating from the early centuries AD. When archaeologists stumbled upon the batteries, they assumed they were just regular old clay pots for storage, but that theory quickly went out the window since they each contain a copper rod that shows evidence of acid corrosion. Now, in case you weren't the biggest nerd in school, this means that the pots probably contained a liquid that would interact with the copper and produce an electrical charge. If true, they predate the first known modern battery by hundreds of years. And that's all well and good, but what were they using these batteries for?

Theories:

There are many theories that attempt to explain their function. Some stone reliefs called the "Dendera light" depict what some believe to be electrical arc lights, which would require something like the Baghdad Batteries to power. Others say the batteries may have been used to electroplate items with gold. Another theory is that medicine men could have used the batteries to shock people (giving the impression they had mystical powers).