**Study questions for Chapter 19 – Oxidation/Reduction**

1. In redox reactions involving acids or bases, how are oxygen atoms generally balanced?

By adding one or more H2O to one side

2. What is the oxidation number for each atom in NH4+? N: -3 H: +1

3. A redox reaction can easily be explained as:

a. the breakdown of glucose in cells

b the temporary storage of cellular energy

c. forming a bond by sharing electrons

d. an attraction between opposite charges

e. transferring electrons between reactants

4. Which equation is correctly labeled as either oxidation or reduction?

a. NaCl + AgNO3 ---> AgCl + NaNO3 (reduction)

b. Mn2+ ---> MnO4 -  (reduction)

c. H2S ---> S + 2e- + 2H+ (oxidation: S oxidized)

d. NH3 + HCl ---> NH4+ + Cl- (oxidation)

5. How are oxidation and reduction different?

a. Reduction is a reaction that removes an electron from a substance; oxidation is a reaction that adds electrons to a substance.

b. Reduction is when the total number of electrons increases in a reaction; oxidation is when the total number of electrons decreases in a reaction.

c. Oxidation is a reaction that removes an electron from a substance; reduction is a reaction that adds electrons to a substance.

d. Oxidation is when the total number of electrons increases in a reaction; reduction is when the total number of electrons decreases in a reaction.

6. Which of the compounds, CO or CO2, contain carbon in its most reduced form?

7. When electrons are gained it is called:

a: oxidation b: reduction c: redox d: none of these

8. A substance that loses electrons is called the oxidizing/reducing agent?

9. Identify the elements being oxidized and reduced in the following two reactions:

a. Cr+ + Sn4+ → Cr3+ + Sn2+ Cr is oxidized Sn is reduced

b. 2 As + 3 Cl2 → 2 AsCl3 As is oxidized Cl is reduced

10. Write the balanced half-reactions of the following reaction:   
  
 2 H+ + H2O2 + 2 Fe2+ http://www.chemistry.wustl.edu/~coursedev/Online%20tutorials/arrow.gif 2 Fe3+ + 2 H2O (in acidic solution)

Fe2+ http://www.chemistry.wustl.edu/~coursedev/Online%20tutorials/arrow.gif  Fe3+ + e-

H2O2 + 2 H+ + 2 e- http://www.chemistry.wustl.edu/~coursedev/Online%20tutorials/arrow.gif  2 H2O

11. For a galvanic cell, the cathode is the positive/negative electrode?

12. For a galvanic cell, the anode is the positive/negative electrode?

13. At the cathode, oxidation/reduction takes place?

14. At the anode, oxidation/reduction takes place?

15. In an oxidation reaction, electrons appear on the left/right side of the half-reaction?

16. In a reduction reaction, electrons appear on the left/right side of the half-reaction?

17. What does galvanized mean?

Galvanizing is the process of applying a protective zinc coating to steel or iron, to prevent rusting eg galvanized nails or metal ‘tin’ roofing (not really made from the element tin)

18. What is the Faraday constant?

The amount of electric charge carried by one mole, or Avogadro's number, of electrons.

F = 96,485 sA/mol

19. Consider the following reaction:

a. the oxidizing agent is Fe2O3

b. the reducing agent is Al

c. What is oxidized Al

d. What is reduced Fe2O3 (actually, it’s the Fe3+ in the compound that’s reduced)

Using the table of reduction potentials in the textbook (table 20.1, which will be provided for the exam) determine:

21. The strongest oxidizing agent in the table F2

22. The weakest reducing agent in the table F-

23. Predict if Cd will react with Ni2+ yes, because Cd is lower than Ni2+

24. Predict if Sn will react with Pb2+ yes, because Sn is lower than Pb2+

25. Predict if Co will react with Cr3+ no, because Co is higher than Cr3+

26. Calculate E°cell for the reaction: E°cell = −0.25−(−0.76)= +0.51V

Ni2+ + Zn 🡪 Ni + Zn2+