**Vocabulary**

For each word, provide a short but specific definition from YOUR OWN BRAIN! No boring textbook definitions. Write something to help you remember the word. Explain the word as if you were explaining it to an elementary school student. Give an example if you can. Don’t use the words given in your definition!

Reduction: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Oxidation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Spectator Ion: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Half Reaction: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Redox Reaction: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Electrochemical Cell (Voltaic): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Anode: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Cathode: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Salt Bridge: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Electrolytic Cell: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Video 12.1 Oxidation Numbers**

**Oxidation Number Rules:**

1. All pure non-bonded elements have an oxidation number of \_\_\_\_\_\_. Elements are not charged.
2. All ions have the \_\_\_\_\_\_\_\_\_ charge and oxidation number.
3. All compounds must have a sum of oxidation numbers equal to \_\_\_\_\_\_. Compounds are not charged.
4. All group 1 elements have a \_\_\_\_\_\_ oxidation number as seen on the periodic table (except H). Similarly, group two must have \_\_\_\_\_\_. Aluminum is \_\_\_\_\_\_.
5. If a halogen (F, Cl, Br, I) is at the end of the molecule it is \_\_\_\_\_\_. Otherwise you have options for oxidation numbers if it is in the middle of the compound.
6. If Oxygen is the anion, it will have a charge of \_\_\_\_\_\_UNLESS it is with F or an alkali metal in a 1:1 (or 2:2) ratio.
7. H is \_\_\_\_\_\_ in the front and \_\_\_\_\_\_ in the back.
8. The sum of oxidation numbers for an ion must equal the ion’s charge.

Questions: Find the oxidation number of all elements below:

C2F2

H2O

Br2

HI

CaH2

MnCl2

Li2O2

MgO

H2S

NaH

Cr2O3

N2O5

OF2

CaSO4

NaClO

KClO

KClO2

KClO3

KClO4

SO2

SO3

Na2S

Na2SO4

Mg

AgNO3

Na2SO4

Ca(NO3)2

(Hint for the last one: distribute the two through the nitrate ion so you have the standard 3 elements to work with.)

**Video 12.2 RedOx reactions, spectators, and agents**

Key Ideas: Circle the best fit in the parenthesis or fill in the blanks.

* Elements oxidize because they (lose/gain) electrons and their charges (increase /decrease).
* Elements reduce because they (lose/gain) electrons and their charges (increase /decrease).
* Elements that do not change charges are known as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Redox reactions occur as long as reduction and oxidation both occur.
* Table \_\_\_\_\_\_ shows a list of the most active metals and nonmetals. Active metals tend to \_\_\_ electrons and therefore (oxidize/reduce). Metals at the top of this table (oxide/reduce) the best.
* Active nonmetals tend to \_\_\_\_\_\_\_ electrons and therefore (oxidize/reduce). Nonmetals at the top of this table (oxide/reduce) the best.

Questions:

1. For the following reactions, identify the redox reactions. For the redox reactions ONLY: identify the elements as reducing, oxidizing, or spectators.
   1. Cl2 + 2KBr 🡪 2KCl + Br2 Is it redox? \_\_\_\_\_ Spectator: \_\_\_\_\_

Reducing: \_\_\_\_\_ Oxidizing: \_\_\_\_\_

* 1. Cu + AgNO3 🡪 CuNO3 + Ag Is it redox? \_\_\_\_\_ Spectator: \_\_\_\_\_

Reducing: \_\_\_\_\_ Oxidizing: \_\_\_\_\_

* 1. Zn + 2HCl 🡪 H2 + ZnCl2 Is it redox? \_\_\_\_\_ Spectator: \_\_\_\_\_

Reducing: \_\_\_\_\_ Oxidizing: \_\_\_\_\_

* 1. CaCO3 + HCl 🡪 H2O + CO2 + CaCl2 Is it redox? \_\_\_\_\_ Spectator: \_\_\_\_\_

Reducing: \_\_\_\_\_ Oxidizing: \_\_\_\_\_

1. Identify redox reactions. For redox reactions ONLY: Use table J to determine if the reaction is spontaneous.
   1. Cu + 2HCl🡪 CuCl2 + H2 Which element oxidizes? \_\_\_\_\_

Which element reduces? \_\_\_\_\_

Should it according to table J? \_\_\_\_\_

* 1. Mg + 2HCl🡪 MgCl2 + H2 Which element oxidizes? \_\_\_\_\_

Which element reduces? \_\_\_\_\_

Should it according to table J? \_\_\_\_\_

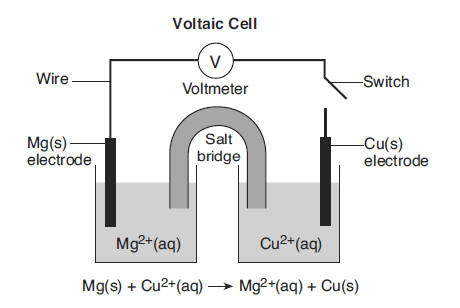
**Video 12.3 Electrochemical/Voltaic Cells**

Key Ideas:

* In a RedOx reaction, \_\_\_\_\_\_\_\_\_\_\_ are transferred from the oxidizing elements which loses to the reducing element which gains.
* LEO stands for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and GER stands for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* In a voltaic cell, or battery, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ occurs at the anode, which is \_\_\_\_\_\_\_\_\_ charged.
* In a voltaic cell, or battery, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ occurs at the cathode, which is \_\_\_\_\_\_\_\_\_ charged.
* Electrons flow from the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to the \_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the battery.
* The \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_ permits the flow of ions in the voltaic cell in order to maintain the charges of the anode and cathode.

Questions:

1. Why does it make sense that electrons flow from the anode to the cathode in terms of charge? Discuss the charges of electrons, the anode, and the cathode in your answer.
2. Using the diagram below, answer the following questions:



* 1. Which element is present at the anode? \_\_\_\_\_
  2. Which element is present at the cathode? \_\_\_\_\_
  3. Draw an arrow to show the direction of electron flow in the battery, through the wire.
  4. Where are spectator ions such as Cl- and Na+ located (They are not on the diagram labeled-you have to think about it)? What do they do?
  5. How many total electrons between one atom of each metal? \_\_\_\_\_
  6. Write the half reaction for magnesium including the electrons.
  7. Write the half reaction for copper including the electrons.

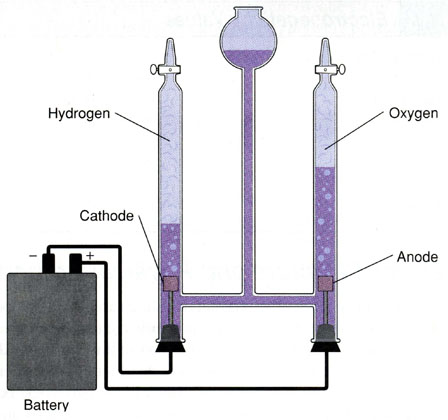
**Video 12.4 Electrolytic Cells**

Key Ideas:

* Electrolytic cells are not spontaneous so you must apply power.
* Electrolytic cells are different from voltaic cells (or batteries) because the electrodes charges are reversed (however, electrons still travel from \_\_\_\_\_\_\_\_\_\_\_\_ to \_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Questions:

1. What is the charge of a voltaic cell’s anode? \_\_\_\_\_\_
2. What is the charge of an electrolytic cell’s anode? \_\_\_\_\_\_
3. What is the charge of a voltaic cell’s cathode? \_\_\_\_\_\_
4. What is the charge of an electrolytic cell’s cathode? \_\_\_\_\_\_
5. Regardless of the cell, electrons always travel from which electrode? \_\_\_\_\_\_\_\_\_\_
6. Regardless of the cell, oxidation always occurs at the \_\_\_\_\_\_\_\_\_\_\_\_\_\_.
7. Regardless of the cell, reduction always occurs at the \_\_\_\_\_\_\_\_\_\_\_\_\_\_.
8. Use the diagram below to answer the following questions:



The picture to the left show what happens when water is exposed to an electric current. The water is literally ZAPPED with electric and decomposes into H2 and O2.

**2H2O 🡪 2H2 + O2**

1. The cathode has hydrogen gas generating from the water. Write the half reaction that shows the hydrogen atom’s oxidation number in water changing to normal H2 gas. Is this reaction oxidation or reduction?
2. The anode has oxygen gas generating from the water. Write the half reaction that shows the oxygen atom’s oxidation number in water changing to normal O2 gas. Is this reaction oxidation or reduction?
3. Why is a battery put in this picture? Does water simply become gaseous H2 and O2 spontaneously?