

Topic 11: Oxidation-Reduction Reactions Outline

1. In all chemical reactions there is a conservation of mass, energy, and charge.

2. An oxidation-reduction (redox) reaction involves the transfer of electrons (e⁻).

3. Reduction is the gain of electrons.

- ✓ A half-reaction can be written to represent reduction.



4. Oxidation is the loss of electrons.

- ✓ A half-reaction can be written to represent oxidation.



5. Oxidation numbers (states) can be assigned to atoms and ions. Changes in oxidation numbers indicate that oxidation and reduction have occurred.

- ✓ Be able to use an activity series (Reference Table J) to determine whether a redox reaction is spontaneous.

6. In a redox reaction the number of electrons lost is equal to the number of electrons gained.

- ✓ This supports the fact that charge is always conserved!

7. An electrochemical cell can be either voltaic or electrolytic. In an electrochemical cell, oxidation occurs at the anode and reduction at the cathode.

- ✓ Be able to compare and contrast voltaic and electrolytic cells.

8. A voltaic cell spontaneously converts chemical energy to electrical energy.

- ✓ Identify and label the parts of a voltaic cell (cathode, anode, salt bridge) and direction of electron flow, given the reaction equation.
- ✓ Since this reaction is spontaneous, use Ref. Table J to help you determine what is the anode (oxidation) and the cathode (reduction). The most reactive metal will oxidize, the most reactive non-metal will reduce.

9. An electrolytic cell requires electrical energy to produce a chemical change. This process is known as electrolysis.

- ✓ Identify and label the parts of an electrolytic cell (cathode, anode) and direction of electron flow, given the reaction equation
- ✓ Since this reaction is non-spontaneous, use Ref. Table J to help you determine what is the anode (oxidation) and the cathode (reduction). The most reactive metal will reduce, the most reactive non-metal will oxidize. (NOTE: This is the opposite of what metals/non-metals want to do!)