

Introduction to Oxidation Reduction

Name _____ Lab Section # _____

- 1a. Identify each of the chemical equations below as to the reaction type (combustion, formation, or decomposition).

Chemical equation	Reaction type
$S(s) + O_2(g) \rightarrow SO_2(g)$	formation
$2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$	combustion
$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(l)$	combustion
$2HgO(s) \rightarrow 2Hg(l) + O_2(g)$	decomposition

- b. Identify two characteristics common to these equations.

The first three reactions show an element, in this case oxygen, converted to the combined form of oxygen in a compound. An element was converted to a compound in the reactions. In the fourth reaction, a compound decomposed into its elements. General statement-*the reactions show the disappearance or appearance of an element.* The other characteristic is the change in the number of oxygen atoms around the non-oxygen elements in the reactions.

- c. Explain the historic interpretation of oxidation and reduction in chemical reactions.

Historically oxidation was defined as occurring when the number of oxygen atoms bonded to an element increased. In the first three reactions above, sulfur, sulfur dioxide and methane were all oxidized.

Reduction was characterized by a loss of oxygen atoms. Mercury (II) oxide was reduced in the fourth reaction.

- d. Define the terms *oxidation*, *reduction*, *oxidizing agent* and *reducing agent*.

Oxidation is characterized by the loss of electrons.

Reduction is characterized by the gain of electrons.

An oxidizing agent is a chemical which causes another chemical to be oxidized and itself to be reduced.

A reducing agent is a chemical which causes another chemical to be reduced and itself to be oxidized.

2. Summarize the steps required to balance an oxidation-reduction reaction in aqueous solution.

1. Write the two half-reactions separating the oxidized and reduced species.

Acidic Solution:

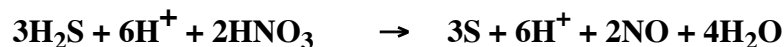
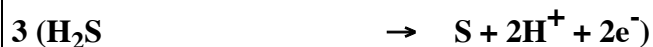
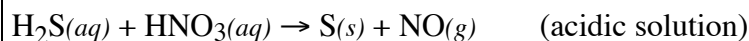
2. Balance all atoms, except hydrogen and oxygen, in each half-reaction.
3. Balance oxygen atoms by adding water to the side with the fewest number of oxygen atoms.
4. Balance hydrogen atoms by adding H^+ to the side with the fewest number of hydrogen atoms.
5. Balance the charge by adding electrons to the side with the most positive charge.
6. If needed, multiply each half-reaction by a whole number which will produce an equal number of electrons transferred in the two half-reactions.
7. Add the half-reactions and simplify by canceling species common to both sides.

Basic Solution:

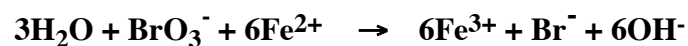
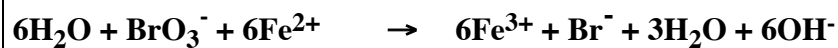
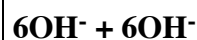
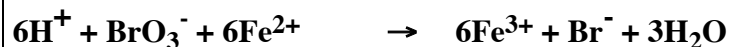
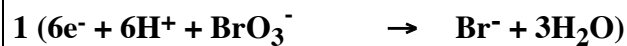
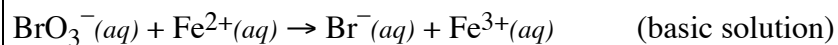
Follow steps 1 - 7, add a number of OH^- ions equal to the number of H^+ ions to both sides of the equation. On the side of the equation with the H^+ ions, H^+ ions and OH^- ions combine to form H_2O . Water which appears on both sides of the equation can be canceled out.

NOTE: No electrons should appear in the final balanced equation!

- a. Balance the following oxidation-reduction equation



b. Balance the following oxidation-reduction equation



c. Balance the following oxidation-reduction equation

