Rules for Assigning Oxidation Numbers	Summary
1) the oxidation number of the atom or molecule of a free element is zero	Element = 0
2) the oxidation number of a monatomic ion equals its charge	
3) In compounds, oxygen has an oxidation number of -2, except in peroxides, where it is -1	Oxygen = -2
4) In compounds containing hydrogen, hydrogen has an oxidation number of +1	Hydrogen = +1
5) In compounds, fluorine is ALWAYS assigned an oxidation number of -1	Fluorine = -1
6) The sum of the oxidation states for an electrically neutral compound must be zero	

Practice:

Assign oxidation numbers to each element in each of the following substances.

1. Mg^{2+} _____
2. N^{3-} _____
3. H_2O _____
4. HCl _____
5. O_2 _____
6. NO_3^- _____
7. H_2O_2 _____
8. $AlBr_3$ _____
9. H_2SO_4 _____
10. CrO_4^{2-} _____
11. $Cr_2O_7^{2-}$ _____
12. C_2H_5OH _____
13. K_2SO_3 _____
14. K_2SO_4 _____
15. NH_4OH _____
16. NH_3 _____
17. $Ca(OH)_2$ _____
18. P_4 _____
19. $LiNO_3$ _____
20. $MgCO_3$ _____

Redox Reaction Prediction

Important Oxidizers	Formed in reaction
MnO_4^- (acid solution)	Mn(II)
MnO_4^- (basic solution)	MnO_2
MnO_2 (acid solution)	Mn(II)
$Cr_2O_7^{2-}$ (acid)	Cr(III)
CrO_4^{2-}	Cr(III)
HNO_3, conc	NO_2
HNO_3, dilute	NO
H_2SO_4, hot conc	SO_2
Metallic Ions	Metallous Ions
Free Halogens	Halide ions
$HClO_4$	Cl^-
Na_2O_2	OH^-
H_2O_2	O_2

Important Reducers	Formed in Reaction
Halide Ions	Halogens
Free Metals	Metal Ions
Metalous Ions	Metallic ions
Nitrite Ions	Nitrate Ions
Sulfite Ions	SO_4^{2-}
Free Halogens (dil, basic sol)	Hypohalite ions
Free Halogens (conc, basic sol)	Halate ions
$C_2O_4^{2-}$	CO_2

Redox reactions involve the transfer of electrons. The oxidation numbers of at least two elements must change. Single replacement, some combination and some decomposition reactions are redox reactions.

To predict the products of a redox reaction, look at the reagents given to see if there is both an oxidizing agent and a reducing agent. When a problem mentions an acidic or basic solution, it is probably a redox reaction.

Steps in Balancing Redox Reactions (acidic solution)

Step #1 - Write the half-reactions
Step #2 - Balance the elements that are NOT oxygen and hydrogen
Step #3 - Balance oxygen with water
Step #4 - Balance hydrogen with hydrogen ions, H^+
Step #5 - Balance charges with electrons, e^-
Step #6 - Balance electrons lost and gained
Step #7 - Sum the two half-reactions

Steps in Balancing Redox Reactions (basic solution)

Step #1 - Write the half-reactions
Step #2 - Balance the elements that are NOT oxygen and hydrogen
Step #3 - Balance oxygen with water
Step #4 - Balance hydrogen with hydrogen ions, H^+
Step #5 - Balance charges with electrons, e^-
Step #6 - Balance electrons lost and gained
Step #7 - Sum the two half-reactions
**Step #8 - Neutralize H^+ ion with OH^- ion. Remember to add equal amount of OH^- to EACH side.
**Step #9 - Remove water molecules that are common to both sides of the equation

** Only steps that differ from acidic solution