NOTES#12/Aq Chem H/"Funky" Redox Reactions/AP Chem

I. How do you recognize "funky redox" reactions?
- They don't fit any of the other types of reactions....
- They very often take place in an acidic or basic medium.
- They involve distinct reactants (listed below) that can easily be recognized.

II. How do we predict products for "funky" redox reactions?
a. You have to be familiar with the following lists of common oxidizers and common reducers.

Common Oxidizers (Things that get REDUCED)

Oxidizer	*What it turns into....*
MnO_4^-, acid soln	Mn^{2+}
MnO_2 (s), acid soln	Mn^{2+}
MnO_4^-, basic/neutral soln	MnO_2 (s)
$Cr_2O_7^{2-}$, acid soln	Cr^{3+}
$Cr_2O_7^{2-}$, base soln	CrO_4^{2-}
HNO_3, conc	NO_2 (g)
HNO_3, dilute	NO (g)
H_2SO_4, conc	SO_2 (g)
Free Halogen, Br_2	Halide Ion, Br^-
H_2O_2	H_2O

Common Reducers (Things that get OXIDIZED)

Reducers	*What it turns into....*
Halide ions, Br^-	Free Halogens, Br_2
Free Metals	Metal ions
SO_3^{2-} (or SO_2)	SO_4^{2-}
NO_2^-	NO_3^-
Free Halogens, Br_2 dil. base soln	Hypohalite ions, BrO^-
Free Halogen, Br_2 conc. base soln	Halate ion, BrO_3^-
Oxalate ion, $C_2O_4^{2-}$	CO_2
H_2O_2	O_2

b. Write out the reactants. When you predict your products, pick LOGICAL products (using the tables above and your chemistry common sense).
MAKE SURE THERE IS ONE REDUCTION AND ONE OXIDATION!!!

c. Detect whether the soln is acidic or basic (rarely will funky redox reactions take place in neutral solns). Be sure to add H^+ and OH^- appropriately.

d. Don't forget about the token water molecule! Add a water molecule *opposite* to the side where you added the H^+ or OH^-, usually on the product side.

e. Be sure to use correct net ionic format. **Practice, Practice, Practice!!!!**

EXAMPLES:

1. An acidified solution of potassium permanganate is added to a solution of sodium sulfite.

2. A solution of potassium permanganate is mixed with an alkaline solution of sodium nitrite.

3. A stream of chlorine gas is passed through a solution of cold, dilute sodium hydroxide.

Practice: Complete on a separate sheet of paper!

1. Potassium permanganate solution is added to concentrated hydrochloric acid.
2. Potassium dichromate solution is added to an acidified solution of sodium sulfite.
3. Solutions of potassium iodide and potassium iodate are mixed in an acidic solution.
4. Metallic copper is heated with concentrated sulfuric acid.
5. Manganese (IV) oxide is added to warm, concentrated hydrobromic acid.
6. Bromine gas is bubbled into a solution of cold, dilute sodium hydroxide solution.
7. Hydrogen peroxide solution is added to acidified potassium iodide solution.
8. Hydrogen peroxide solution is added to an acidified solution of potassium dichromate.
9. Sulfur dioxide gas is bubble through an acidified solution of potassium permanganate.
10. A solution containing tin (II) ions is added to an acidified solution of potassium dichromate.
11. Potassium permanganate solution is added to a solution of oxalic acid, H2C2O4, acidified with a few drops of sulfuric acid.
12. Concentrated hydrochloric acid solution is added to solid manganese (IV) oxide.
13. Solid sodium dichromate is added to an acidified solution of sodium iodide.
14. Hydrogen peroxide is added to an acidified solution of sodium bromide.
15. A solution of potassium iodide is added to an acidified solution of sodium dichromate.
16. A stream of chlorine gas is passed through a solution of warm, concentrated sodium hydroxide solution.

17. *Just for practice's sake.....*BALANCE (using the half reaction method) the following two redox reactions.

    a. MnO4- + Br- -----> Mn2+ + BrO3- (acidic medium)

    b. Cr2O72- + SO2 ----> CrO42- + SO42- (basic medium)

18. In letter a above, indicate what is the oxidizing agent? What is the reducing agent?

KEY FOR FUNKY REDOX RXNS (backside 1-18)

1. $16H^+ + 2MnO_4^- + 10Cl^- \rightarrow 2Mn^{2+} + 8H_2O + 5Cl_2$
2. $8H^+ + Cr_2O_7^{2-} + 3SO_3^{2-} \rightarrow 2Cr^{3+} + 4H_2O + 3SO_4^{2-}$
3. $2IO_3^- + 12H^+ 10I^- \rightarrow 6I_2 + 6H_2O$
4. $Cu + 4H^+ + SO_4^{2-} \rightarrow SO_2 + Cu^{2+} + 2H_2O$
5. $4H^+ + MnO_2 + 2Br^- \rightarrow Mn^{2+} + 2H_2O + Br_2$
6. $2Br_2 + 4OH^- \rightarrow 2Br^- + 2BrO^- + 2H_2O$
7. $2H_2O_2 \rightarrow 2H_2O + O_2$
8. $8H^+ + Cr_2O_7^{2-} + 3H_2O_2 \rightarrow 2Cr^{3+} + 7H_2O + 3O_2$
9. $2MnO_4^- + 5SO_2 + 2H_2O \rightarrow 2Mn^{2+} + 5SO_4^{2-} + 4H^+$
10. $3Sn^{2+} + 14H^+ + Cr_2O_7^{2-} \rightarrow 3Sn^{4+} + 2Cr^{3+} + 7H_2O$
11. $2MnO_4^- + 16H^+ + 5C_2O_4^{2-} \rightarrow 2Mn^{2+} + 8H_2O + 10CO_2$
12. $4H^+ + MnO_2 + 2Cl^- \rightarrow Mn^{2+} + 2H_2O + Cl_2$
13. $6I^- + 14H^+ + Na_2Cr_2O_7 \rightarrow 3I_2 + 2Cr^{3+} + 7H_2O + 2Na^+$
14. $2Br^- + 2H^+ + H_2O_2 \rightarrow Br_2 + 2H_2O$
15. $6I^- + Cr_2O_7^{2-} + 14H^+ \rightarrow 3I_2 + 7H_2O + 2Cr^{3+}$
16. $6Cl_2 + 12OH^- \rightarrow 2ClO_3^- + 6H_2O + 10Cl^-$
17. $6MnO_4^- + 18H^+ + 5Br^- \rightarrow 6Mn^{2+} + 9H_2O + 5BrO_3^-$
18. MnO_4^- is reduced to Mn^{2+} by Br^-, therefore, Br^- is the reducing agent
    Br^- is oxidized to BrO_3^- by MnO_4^-, therefore, MnO_4^- is the oxidizing agent.