

NOTES#10/AqChemF/TYPES OF REDOX REACTIONS/AP Chem

** There are 5 major types of REDOX reactions.

TYPE ONE: COMBINATION REACTIONS

a. Two or more substances combine to form a single product. DEMO:

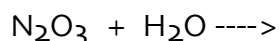
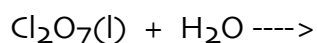
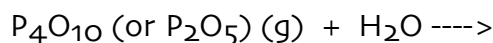
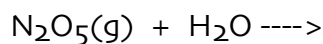
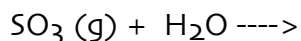
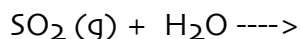
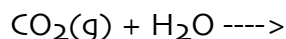
b. General Pattern: **A + B -----> AB** (1 product)
** Look for ONE product.
** Combination reactions don't HAVE to be redox.

c. Examples of combination reactions:

1. Two elements: _____

2. Water and metallic oxide. Product is metal hydroxide: _____
-the original oxide is often called a basic oxide or anhydride.

3. Water and nonmetallic oxide: Product is an acid: _____
-the original oxide is often called a basic oxide or basic anhydride:



4. A metallic oxide and a nonmetallic oxide form a salt: _____

TYPE TWO: DECOMPOSITION REACTIONS

a. The breakdown of a compound into two or more components. DEMO:

b. General Pattern: **AB -----> A + B**
** Look for just ONE reactant.
** Decomposition rxns don't HAVE to be redox.

c. Examples:

1. Electrolysis (breaks compound into ELEMENTAL forms):

2. Metallic chlorates decompose to metal chlorides + O₂ when heated:

3. Metal carbonates decompose to yield a metallic oxide and CO₂:

TYPE THREE: SINGLE DISPLACEMENT REACTIONS

a. An ion (or atom) in a compound is replaced by an ion (or atom) of another element.

b. General Pattern: $A + BC \rightarrow AC + B$

c. METAL DISPLACEMENT: A neutral metal (not an ion) will replace ANY other metal ion found BELOW it on the activity series.

ACTIVITY

SERIES

Li

K

Ba

Ca

Na

H₂O

Mg

Al

Zn

Cd

Ni

Sn

Pb

H⁺ (from acid)

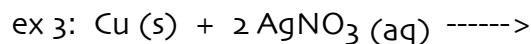
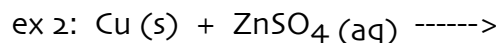
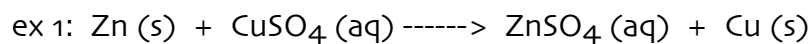
Cu

Hg

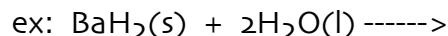
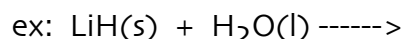
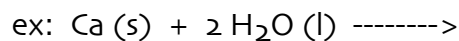
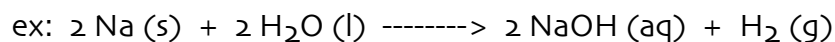
Ag

Pt

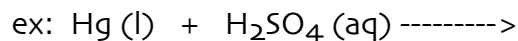
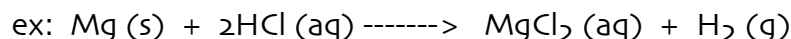
Au



d. HYDROGEN DISPLACEMENT: from water and acid
- Only the really reactive elements (or metal hydrides) can replace hydrogen from ACIDS. Ex:

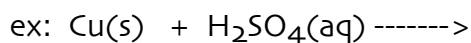
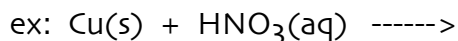


many more metals are able to replace H from an acid.



e. What about those elements that aren't reactive enough to displace H from acids? They still do react with acids. . . it's just the reaction is different. The reaction is not driven by H, but by electronegative elements in the acid's anion. As a result, No hydrogen gas is produced!

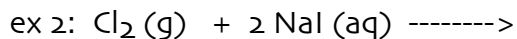
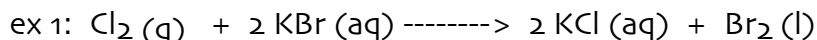
Unreactive metal + OxyAcid \rightarrow Nonmetallic oxide gas + H₂O + a salt
(ex: Cu, Hg, Ag, Pt, Au) (nitric, sulfuric, etc)



f. HALOGEN DISPLACEMENT: (like metals only halogens/halides)

$F_2 > Cl_2 > Br_2 > I_2$ Fluorine is the most reactive element and will replace ANY other halogen in

a compound. The elemental Halogen is always REDUCED (wants to gain e⁻...get it?) . The trend follows the P.T.

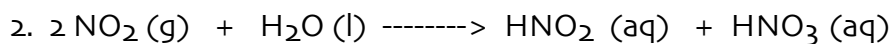


TYPES OF REDOX REACTIONS (CONT.)

TYPE FOUR: DISPROPORTIONATION REACTIONS:

a. An element in one oxidation state is simultaneously oxidized AND reduced.
(imagine THAT?)

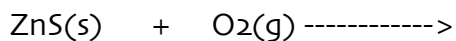
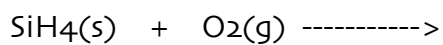
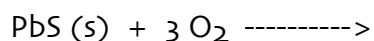
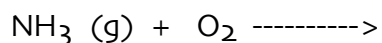
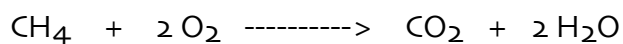
b. Examples:



TYPE FIVE: COMBUSTION REACTIONS:

a. Always involve a compound plus O_2 . If the compound involved has carbon and hydrogen in it, the product is ALWAYS CO_2 and H_2O .

b. Combustion Rxns are ALWAYS redox rxns and come in many forms.



NOTE: You will see many more redox reactions that don't easily fit into any of these major categories. Just be sure that you can recognize them by considering changes in oxidation number.