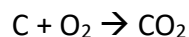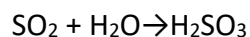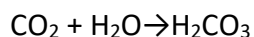HW25

Oxides are chemical compounds that have two elements in their composition. One of these two elements must be oxygen. They can be metal oxides (Na_2O, MgO) and non-metal oxides (CO, SO_2).

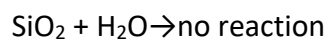Most common method to obtain an oxide is a direct combination with oxygen (combustion):

$C + O_2 \rightarrow CO_2$

Oxides are classified as acidic and basic oxides.

Most **acidic oxides** are soluble in water:

$CO_2 + H_2O \rightarrow H_2CO_3$

$SO_2 + H_2O \rightarrow H_2SO_3$

Some are not:

$SiO_2 + H_2O \rightarrow$ no reaction

All acidic oxides are soluble in bases:

$SiO_2 + 2NaOH \rightarrow Na_2SiO_3 + H_2O$
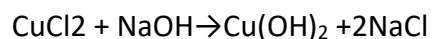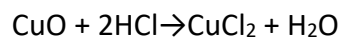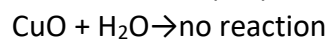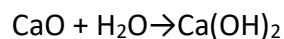
$CO_2 + KOH \rightarrow K_2CO_3 + H_2O$
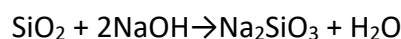
To each acidic oxide an acid corresponds.
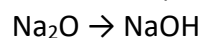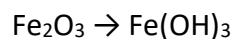
General definition of acidic oxides is:

"Oxides that interact with bases forming salt and water are called acidic oxides"

Acidic oxides are mostly formed by non-metals. Some metals can form acidic oxides in their highest oxidation state: $Cr(VI) \rightarrow H_2CrO_4$ chromic acid; $Mn(VII) \rightarrow HMnO_4$ permanganic acid.
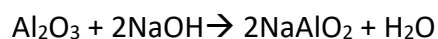
Basic oxides are formed only by metals. Some react with water, some don't. All basic oxides react with acids. Definition: oxides that react with acids forming salt and water are called basic oxides.

$CaO + H_2O \rightarrow Ca(OH)_2$

$CuO + H_2O \rightarrow$ no reaction

$CuO + 2HCl \rightarrow CuCl_2 + H_2O$

$CuCl2 + NaOH \rightarrow Cu(OH)_2 + 2NaCl$

To each basic oxide, a base corresponds:

$MgO \rightarrow Mg(OH)_2$

$Fe_2O_3 \rightarrow Fe(OH)_3$

$Na_2O \rightarrow NaOH$

Amphoteric oxides can react with acids and bases, example Al_2O_3

$Al_2O_3 + 6HCl \rightarrow 2AlCl_3 + 3H_2O$

$Al_2O_3 + 2NaOH \rightarrow 2NaAlO_2 + H_2O$

Questions

1. Write chemical equations for the following transformations: $Ca \rightarrow CaO \rightarrow Ca(OH)_2$;

   $S \rightarrow SO_2 \rightarrow SO_3 \rightarrow H_2SO_4$
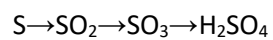
2. Basic oxide CaO reacts with hydrochloric acid (HCl) forming the salt of calcium chloride $CaCl_2$ and water. Write the chemical reaction, balance the equation, and calculate how many grams of this salt will form from 73 g HCl.