

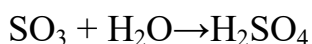
HW 26 Acids

Oxides are compounds made of two elements one of which is oxygen, e.g., SO₂, SO₃, CO₂, CaO, Fe₂O₃

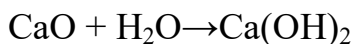
Many metals and non-metals burn rapidly when heated in oxygen or air, producing their oxides.

There are basic and acidic oxides.

1. When soluble acidic oxides react with water, they form acids. E.g.:

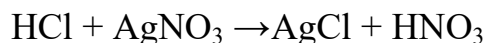
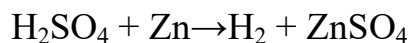


2. When soluble basic oxides react with water, they form bases. E.g.:



Insoluble oxides cannot react with water (such as CuO and ZnO), but insoluble basic oxides will react with an acid and produce salt and water, insoluble acidic oxides will react with base and produce salt and water.

Acids can provide H⁺ (proton) for reactions with other compounds.



An acid is composed from atoms of hydrogen and a conjugate base. The conjugate base reacts as an independent particle. (SO₄²⁻, Cl⁻, NO₃⁻ are conjugate bases of sulfuric H₂SO₄, hydrochloric HCl, and nitric HNO₃ acids respectively, notice these are, except Cl⁻, polyatomic ions).

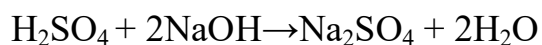
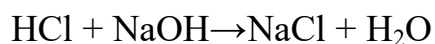
Examples of polyatomic ions:

Acetate	$C_2H_3O_2^-$	Sulfite	SO_3^{2-}
Ammonium	NH_4^+	Sulfate	SO_4^{2-}
Carbonate	CO_3^{2-}	Phosphite	PO_3^{3-}
Hypochlorite	ClO^-	Phosphate	PO_4^{3-}
Chlorite	ClO_2^-	Permanganate	MnO_4^-
Perchlorate	ClO_4^-	Iodate	IO_3^-
Nitrite	NO_2^-	Hydrogen carbonate	HCO_3^-
Nitrate	NO_3^-		

Bases can provide OH^- for reactions with other compounds.



Reactions where acids and bases react with each other are called **reactions of neutralization**. In these reactions a salt and water are formed. Below is a neutralization reaction between hydrochloric acid (HCl – acid) and sodium hydroxide (NaOH – base) with formation of salt (sodium chloride, NaCl) and water:



Questions:

1. We have solutions with the following pH: pH of 9, pH of 2, pH of 12, pH of 5, pH of 7. Which of the solution is a strong acid, weak acid, neutral, weak base, strong base.
2. Complete and balance the following reactions: $P_2O_5 + H_2O$; $CuO + HNO_3$;
 $CuO + H_2O$; $ZnO + HCl$; $ZnO + H_2O$.
3. Write the neutralization reactions between acids and bases that result in the following salts: $Al_2(SO_4)_3$, $NiCO_3$, $Fe(NO_3)_3$, $Mg_3(PO_4)_2$, Li_2SO_4