HW27 Acids

Acids were first recognized as a class of substances that taste sour.

There are several definitions of acids:

Arrhenius concept – acids produce hydrogen ions (H^+) in aqueous solutions, while bases produce hydroxide ions (OH^-).

The Bronsted-Lowery definition – an acid is a proton donor; a base is a proton acceptor.

If we look at the formulas of some common acids, we can see that they contain at least one hydrogen atom. When proton is lost, the remaining part of the acid is called a conjugate base. For example, in hydrochloric acid HCl, where Cl^- is the conjugate base (note, conjugate acid-base pair always differ by one proton).

Acids can provide H^+ (proton) for reactions with other compounds. Hydrogen atoms in acids can be replaced with metal atoms in a lot of reactions:

Reaction with metals

$H_2SO_4 + Zn \rightarrow H_2 + ZnSO_4$

Reaction with basic oxides

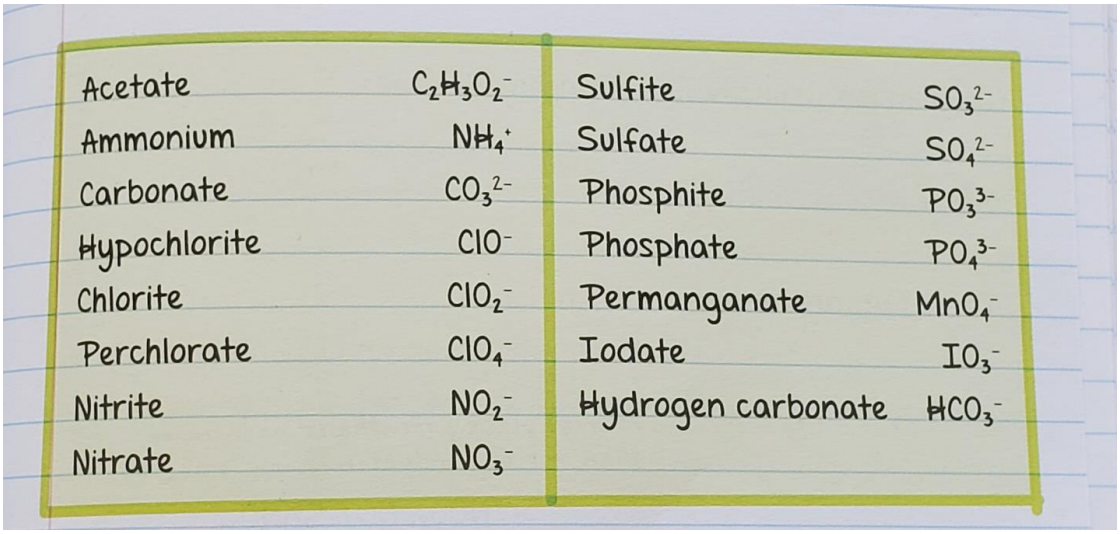
$HCl + MgO \rightarrow MgCl_2 + H_2O$

Reaction with salts

$HCl + AgNO_3 \rightarrow AgCl + HNO_3$

An acid is composed from atoms of hydrogen and a conjugate base. The conjugate base reacts as an independent particle. (SO_4^{2-} , Cl^- , NO_3^- are conjugate bases of sulfuric, hydrochloric, and nitric acids respectively, notice SO_4^{2-} , NO_3^- are 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^-		

Questions:

1. Write the structural formula and the Lewis structure for hydrochloric acid.

2. How many kg of P2O5 is necessary to obtain 98 kg of phosphoric acid H3PO4?