

SCIENCE 1206 - COMPOUNDS

1. MOLECULAR

- composed of neutral groups of atoms called molecules held together by sharing electrons (covalent bonding)

A. Molecular Elements - eg. H_2 , N_2 , O_2 , F_2 , Cl_2 , Br_2 , I_2 , P_4 , S_8 , O_3

B. Molecular Compounds - composed of two or more nonmetals

(i) Binary molecular compounds - have two different kinds of nonmetallic atoms

naming: Use Prefixing System - eg. N_2O_4 - dinrogen tetraoxide

OR Trivial Names (memorized) eg. NH_3 - **ammonia** (See memory sheet)

(ii) Other molecular compounds - 3 or more different nonmetallic atoms

naming: Memorized - eg. $C_{12}H_{22}O_{11}$ - **sucrose** (See memory sheet)

Physical Properties of Molecular Compounds

(a) solid, liquid or gas

(b) some soluble in water

(c) form only colorless solutions

(d) **solutions are non- conductors of electricity.**
(Non-electrolytes)

2. IONIC

- composed of array of oppositely charged ions called a crystal lattice. Ions form when electrons are transferred from one atom to another. Ions are then held together by ionic bonding.

Ionic Compounds - composed of positive ions (metal or NH_4^+) and negative ions (simple or polyatomic) Positive ions are called **cations** and negative ions are called **anions**.

Naming: Name the positive ion and the negative ion. (no prefixes)

Determining formula: Balance charges on ions in the compound by using whole-number subscripts. Eg. calcium chloride - $CaCl_2$

THINGS TO LOOK OUT FOR:

(a) Polyatomic ions followed by a subscript greater than 1 must be bracketed - $(NH_4)_2SO_4$

(b) Metal ions with 2 or more possible charges must be identified by a Roman numeral in the name. Eg. $Fe_2(SO_4)_3$ = iron (III) sulfate $FeSO_4$ = iron (II) sulfate

(c) Hydrated Compounds - water of hydration is named after the ionic name.
Eg. $CoCl_2 \cdot 5H_2O$ - cobalt (II) chloride pentahydrate

(d) Be careful of negative ions with similar names - eg. nitrate, nitrite, nitride

Physical Properties of Ionic compounds:

(a) All solids at room temperature

(b) all soluble in water to some extent (use solubility table to determine high or low solubility)

(c) form colored or colorless solutions

(d) **solutions are conductors of electricity (Electrolytes)**

3. **ACIDS** - Molecules that ionize in water to produce hydrogen ions, $H^+(aq)$, ions which give acids their properties

Acids have properties of molecular compounds (made of 2 or more nonmetals) and ionic compounds (form conductive solutions)

Acids are hydrogen compounds in water (aq). An acid formula has either H at the beginning or -COOH at end, followed by (aq)

- **Properties of acids:**
- Conduct electricity
- Turn blue litmus paper red
- Taste sour
- React with many metals to produce hydrogen gas, $H_2(g)$
- Have a pH value of less than 7
- Neutralize or partially neutralize bases

Rules for Naming Acids:

A. Given the acid formula, determine the name of the negative ion in the formula. Use the rules on the right to determine acid name.

<u>Acid Naming Rules:</u>	
<u>Ionic Name Ending</u>	<u>Acid Name</u>
_____ide	Hydro_____ic acid
_____ate	_____ic acid
_____ite	_____ous acid

Eg. (a) $HF(aq)$ (aqueous hydrogen fluoride) = hydrofluoric acid

(b) $HNO_3(aq)$ (aqueous hydrogen nitrate) = nitric acid

(c) $H_2SO_3(aq)$ (aqueous hydrogen sulfite) = sulfurous acid

B. Given the acid name, use the rules above to determine which negative ion is part of the acid. Find the charge on the ion, and balance the charge with the matching number of H^+ ions

Eg. Hydrocyanic acid - Negative ion is cyanide (CN^-) Acid formula = $HCN(aq)$

4. **BASES** - Most are ionic compounds that contain the hydroxide ion, OH^- , an ion that gives bases their properties

- **Properties of bases:**
- Conduct electricity
- Turn red litmus paper blue
- Taste bitter
- Feel slippery
- Have a pH value greater than 7
- Neutralize or partially neutralize acids

Writing names and formulas for Bases:

- Follow the general rules given for ionic compounds

Examples: $NaOH$ = sodium hydroxide

NH_4OH = ammonium hydroxide