UNIT 3 - Notes #1

I) Chemical Bonding

(A) IONIC BONDS - Atoms gain or lose electrons = creates a charge.

→ Attracted to each other by Coulombic force (electrostatic)

Ex: Na lose an e^- = Na^+ ← Metal or cation

Cl gain an e^- = Cl^- ← Anion or Non Metal

$NaCl$

Form IONIC Compounds called SALTS

Ex: $K^{+} + NO_3^{-} \rightarrow KNO_3$

Properties of Ionic Salts:

- Very hard (each ion bonded to several ions)
- High Melting Points (many bonds to break)
- Brittle (w/ enough force, like atoms brought close to each other repel)

★ Writing Formulas of Ionic Compounds ★

- **Chemical Formula**: Shows type of each atom & how many of each
  Has a neutral charge

- To write **IONIC** formula, we need:
  1. The 2 types of ions
  2. The charge of each ion. ←

EX: Na^{+} and F^{-} = NaF

Ba^{2+} and O^{2-} = BaO

Na^{+} and O^{2-} = Na_2O

Ba^{2+} and F^{-} = BaF_2

- **"Criss-Cross" Rule** Charge on cation becomes subscript of the anion

★ → Reduce to lowest ratio

WHY? Acct for neutral charge

Al^{3+} and O^{2-} → Al_2O_3

Ba^{2+} and S^{2-} → Ba_2S_2 → BaS

In^{3+} and Br^{-} → $InBr_3$

Writing Formulas w/ Polyatomic Ions

Parentheses required when you have more than one polyatomic ion.

Ba^{2+}	SO_4^{2-}	→	$BaSO_4$
Mg^{2+}	NO_2^-	→	$Mg(NO_2)_2$
NH_4^+	ClO_3^-	→	NH_4ClO_3
Sn	SO_4^{2-}	→	~~$SnSO_4$~~
Fe^{3+}	$Cr_2O_7^{2-}$	→	$Fe_2(Cr_2O_7)_3$
NH_4^+	N^{3-}	→	$(NH_4)_3N$

Nomenclature of Ionic Compounds

1) Single charge Cations w/ Elemental Anions

↑ (Group I, II, 13, Ag^+)

Rules:
1. Use name of cation
2. Use name of anion (change ending to -IDE)

EX:

NaF	Sodium Fluoride
BaO	Barium Oxide
Na_2O	Sodium Oxide
BaF_2	Barium Fluoride
Zn_3P_2	Zinc Phosphide

② Multiple-Charge Cations w/ Elemental Anions

↑ Transition elements (not Ag or Zn)
Sn^{2+}/Sn^{4+} Pb^{2+}/Pb^{4+}

Rules:
1) Charge of cation
2) Name the cation
3) Write Roman numeral in ( ) to show charge.
4) Write Anion (w/ ide)

Ex:
Fe O
Fe_2O_3
Cu Br
$CuBr_2$

Cobalt (III) Chloride
Tin (IV) oxide
Tin (II) Oxide

Traditional System of Naming

- Used primarily in historical context
- Still used to name compounds w/ multi-charge cations

Rules:

1) Use Latin root of cation
2) Use -ic ending for higher charge
   -ous for lower charge
3) Use name of anion (w/ -ide)

ROOTS (partial list)

		IC	OUS
Gold (Au) =	Aur-	Au^{3+}	Au^{+}
Lead (Pb) =	Plumb-	Pb^{4+}	Pb^{2+}
Tin (Sn) =	Stann-	Sn^{4+}	Sn^{2+}
Copper (Cu) =	Cupr-	Cu^{2+}	Cu^{+}
Iron (Fe) =	Ferr-	Fe^{3+}	Fe^{2+}

Write Formulas

Ex: Cuprous Sulfide
Cu^{+} S^{2-} Cu_2S

Auric Nitride
Au^{3+} N^{3-} AuN

Ferrous Fluoride
Fe^{2+} F^{-} FeF_2

Write Names

Ex: Pb_3P_4 = 3 Pb 4 P^{3-}
Plumbic Phosphide

Pb_3P_2
Plumbous Phosphide

$SnCl_4$

Summary of Ionic

Tron (III) Nitrate

↳ Fe^{3+} NO_3^- = $Fe(NO_3)_3$

$(NH_4)_3P$ Ammonium Phosphide

$Fe_3^{2+}(PO_4^{3+})_2$ Tron (II) Phosphate

Lead (II) Permanganate

↳ Pb^{2+} MnO_4^- $Pb(MnO_4)_2$