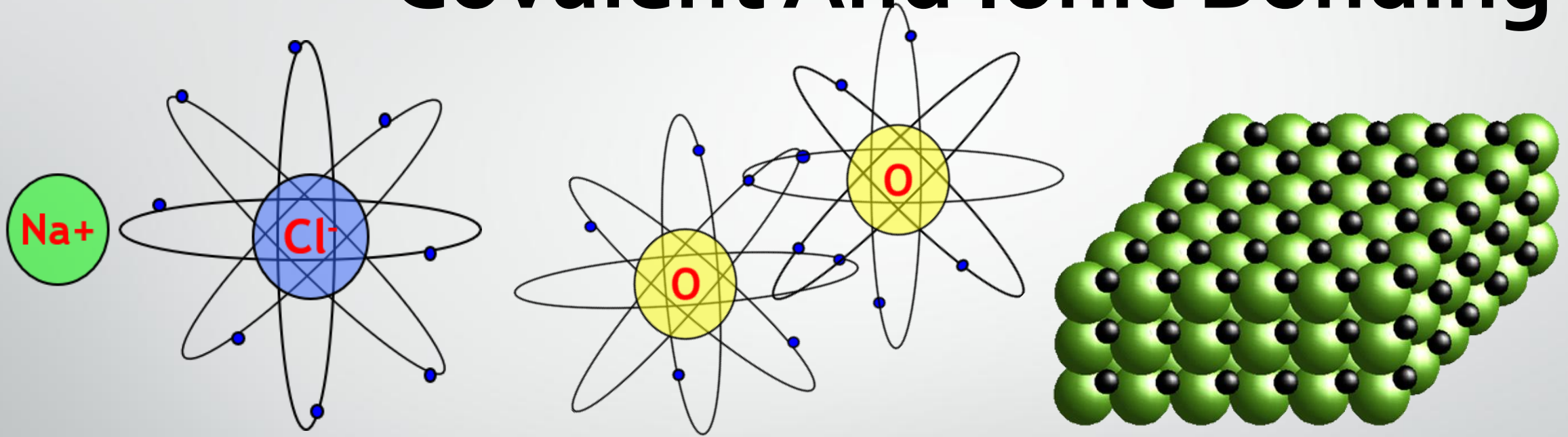


Covalent And Ionic Bonding



Auburn Mountainview

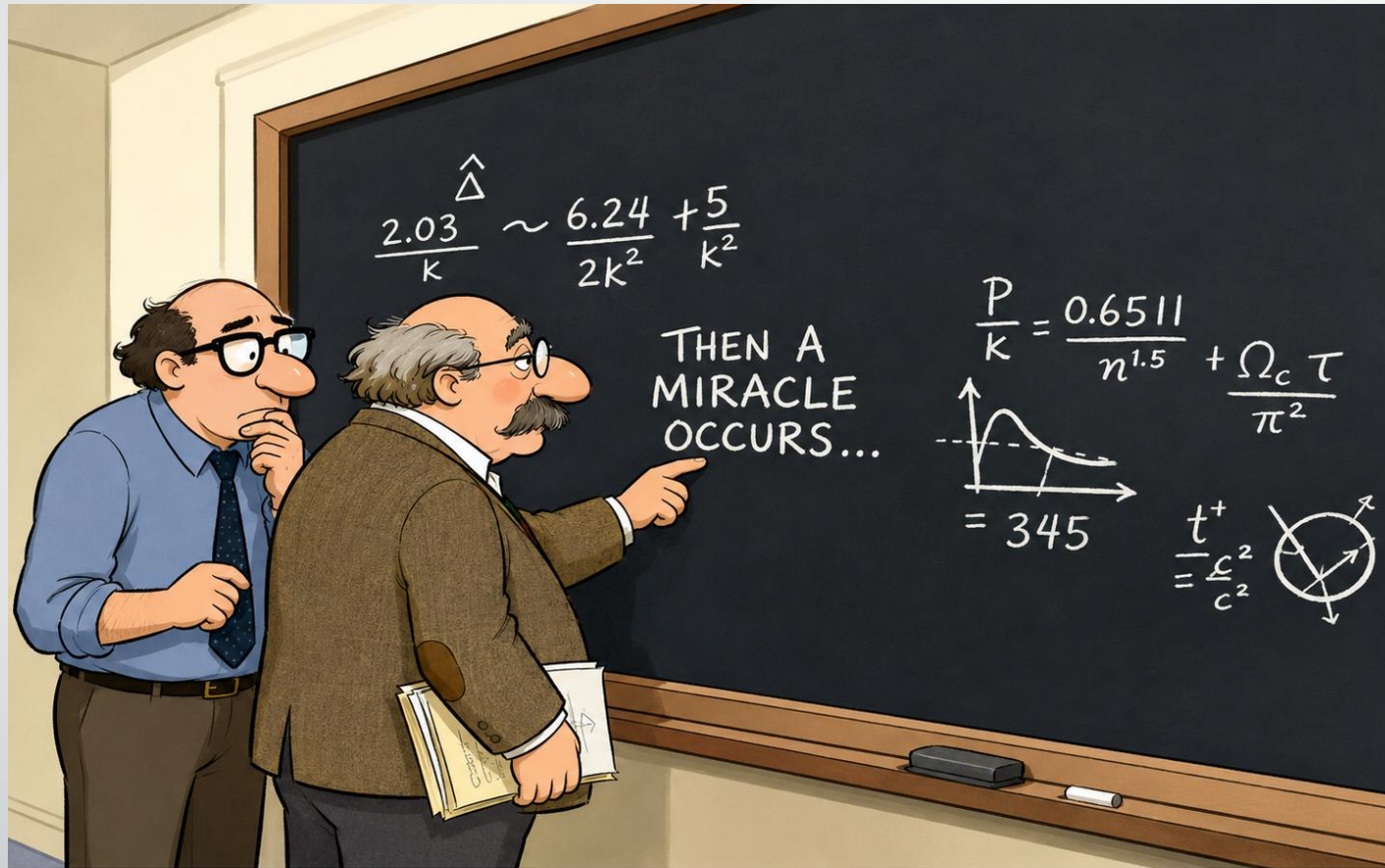
Karl Steffin, 2001

7/29/2026

By end of this unit I can...

- **A.1 Create and/or evaluate a claim about the type of bonding in a compound based on its component elements and its macroscopic properties.**
- **B.1 Interpret the results of an experiment to determine the type of bonding present in a substance.**
- **C.1 Explain the relationship between the relative strength of attractions between cations and anions in an ionic solid in terms of the charges of the ions and the distance between them.**
- **D.1 Create and/or evaluate representations of ionic and covalent compounds.**

Formulas: Writing and Naming



“I think you should be more explicit here in step two.”

The best way to show is through examples and practice.

Covalent Molecules

Subscript	Prefix
1	mono
2	di
3	tri
4	tetra
5	penta
6	hexa
7	septa
8	octa
9	nona
10	deca

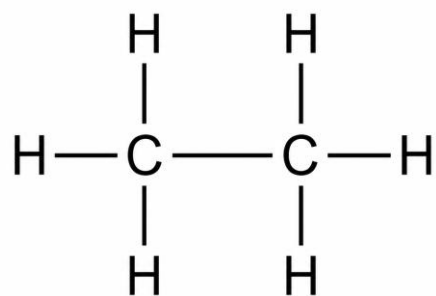
nonmetal-nonmetal(s)

- Many have trivial names (NH_3 : Ammonia)
- Never write a subscript 1
 - This is true for all chemical formulas.
- Writing the name:
 - First: use subscript if more than one.
 - Others: Always use subscript.
- Last: end in 'ide'
- Hydrogen placed at end. (H_2O 😞)

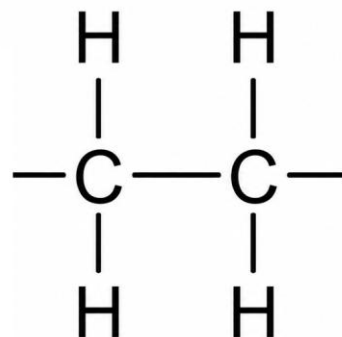
Covalent Molecules

Subscript	Prefix
1	Meth
2	Eth
3	Prop
4	But

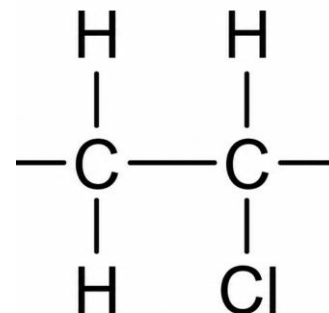
- Hydrocarbon: Carbons chained together with many hydrogen terminals.
- Alkanes: Single Carbon Bonds: $C_xH_{(2x+2)}$
 - Subscript based on how many Carbons
 - Ends: ane (single bonds)
- Replacing an H changes properties.



Ethane



Polyethylene



Polyvinyl Chloride

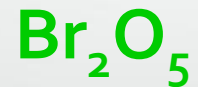
Covalent Examples: Formulas

1. What is formula for Carbon Dioxide?

- Carbon is C, Oxygen is O. Di = two O.



2. What is formula for Dibromine Pentaoxide?



Covalent Examples: Names

1. What is the name of CO?

- Carbon is C, Oxygen is O.

Carbon Monoxide

- No capitalization when led by a prefix. Carbon MonOxide 😞

2. What is the name of H₂O?

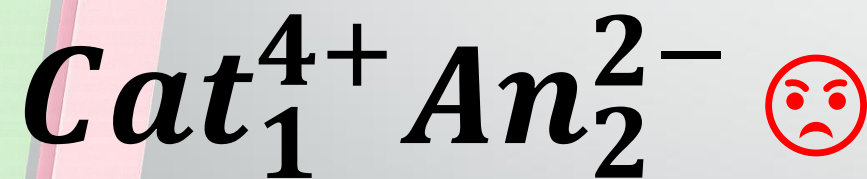
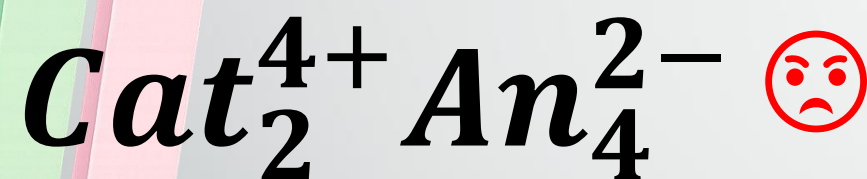
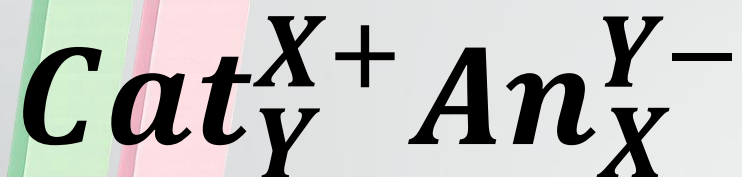
- Dihydrogen Monoxide... but its trivial name is Water.

3. What is the name of C₃H₈?

- Tricarbon Octahydride 😞 ... This is a Hydrocarbon: Propane.

Ionic Compounds

metal-nonmetal(s)



- Most form salts
- Positive (Cations) charges must be balanced with negative (Anion) charges.
 - Use least common multiple.
 - Do not distribute subscripts.
 - Polyatomic: Shown Later
- Charges not written in final answer.

Ionic: Cations

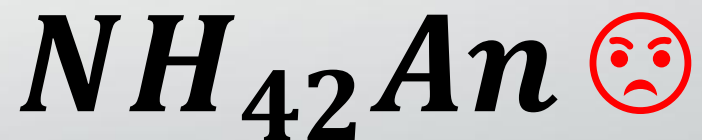
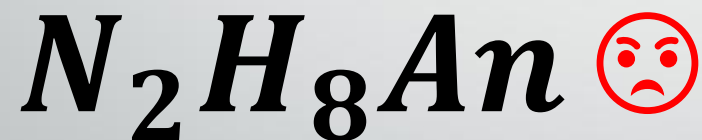
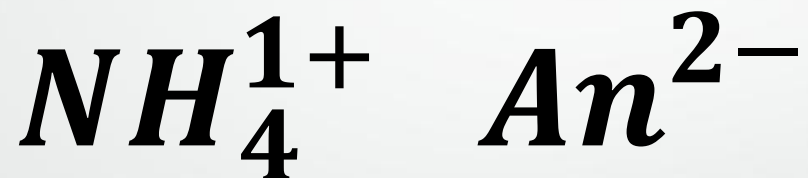
- **Monatomic:** Consist of only one element.
 - Have the same name as the root element.
- Transition Metals have multiple positive charges.
 - Place charge after the name in roman numerals.
 - Cu^+ is Copper (I) while Cu^{2+} Copper (II).
 - Exceptions: Silver (Ag^+) and Zinc (Zn^{2+}) have one charge only.
- **Polyatomic:** Consists of two elements (Only four cations).
 - The one used in this class Ammonium: NH_4^+ (yes, it is covalent).

Ionic: Anions

- **Monatomic:** Suffix is replaced with 'ide'.
 - Chlorine: $\text{Cl} \rightarrow \text{Chloride: } \text{Cl}^-$ (O_2 : Peroxide will be avoided in class).
- **Polyatomic:** Very common (covalent bond).
 - No Oxygen: end in ide (CN^- , SCN^- , C^{2-} , H^-).
 - Binary: Two elements, the second being O, end in 'ate' or 'ite'.
 - Chlorate (ClO_3) or Chlorite (ClO_2).
 - Ternary: Three elements, last normally O, end in 'ate'.
 - Acetate ($\text{C}_2\text{H}_3\text{O}_2^-$ or CH_3OO^-).

Ionic: Polyatomic

- You may never modify any polyatomic ion.
 - Use a parenthesis and then the subscript number.



Ionic Examples: Formulas

1. What is the formula for Mercury (I) Carbonate?

- Mercury (I) is Hg^+ , Carbonate is CO_3^{2-} Hg_2CO_3 .
- $\text{Hg}^+\text{CO}_3^{2-}$ 😞 $\text{Hg}_2(\text{CO}_3)_1$ 😞

2. What is the formula for Lead (IV) Phosphate?

- Lead (IV) is Pb^{4+} , Phosphate is PO_4^{3-} $\text{Pb}_3(\text{PO}_4)_4$
- PbPO_{44} 😞

3. What is the formula for Magnesium Oxide?

- Magnesium is Mg^{2+} , Oxide is O^{2-} MgO
- Mg_2O_2 😞

Ionic Examples: Names

4. What is the name of NH_4Cl ?

- NH_4 is Ammonium, Cl is Chloride.

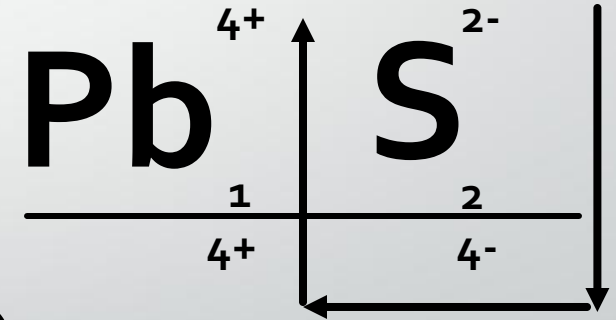
Ammonium Chloride

5. What is name of PbS_2 ?

- Pb is a transition metal Lead (?), S is Sulfide.
- Sulfide has a 2- charge so S_2 is 4- total.
- To balance the one Lead must be a +4 cation. ($? \times 1 = +4$)

Lead (IV) Sulfide

Lead (II) Sulfide 😞 $\rightarrow \text{PbS}$



Final Thought

Covalent	Ionic	Metallic
Type	Type	Type
Nonmetal-Nonmetal	Metal-Nonmetal	Metal-Metal
Strength (Greater=)	Strength (Greater=)	Naming
Atomic size: Smaller atom Multiplicity: More shared bonds Electronegativity Bigger difference	Charge: Bigger charge Atomic size: Smaller atom	One Element: Name of element No charge in () Two+ Elements: Generic: Alloys All Trivial