

## Classification of Chemical Compounds

### 1. Molecular/Covalent Compounds

- A. Formed by the combination of **two or more nonmetals**.  
Ex.  $\text{CH}_4$ (methane),  $\text{SiH}_4$ (silane),  $\text{PH}_3$ (phosphine)  
 $\text{CO}_2$ ,  $\text{C}_{12}\text{H}_{22}\text{O}_{11}$ (sugar),  $\text{XeF}_4$ ,  $\text{PCl}_3$
- B. Consist of **discrete molecules** that move about as a unit.
- C. Smallest bit of a molecular compound is referred to as a **molecule**.
- D. Chemical formula is referred to as a **molecular formula**.
- E. Atoms in a molecule are held together by **covalent bonds**.  
**Covalent bonds** are due to the **sharing** of a pair of electrons between two atoms.

### 2. Ionic Compounds

- A. Formed by the combination of a **metal cation** with a **nonmetal anion** (or polyatomic ion).  
Ex.  $\text{KCl}$ ,  $\text{MgCl}_2$ ,  $\text{AlBr}_3$ ,  $\text{Mg}_3(\text{PO}_4)_2$ ,  $\text{CaO}$ ,  $\text{Na}_2\text{S}$
- B. Consist of a **three-dimensional array of ions** such that no particular cation belongs to a particular anion.
- C. Smallest bit of an ionic compound is referred to as a **formula unit**.
- D. Chemical formula is referred to as a **formula unit**. The **formula unit** specifies the smallest whole number ratio of the cation to anion.
- E. Ions are held together by **ionic bonds**.  
**Ionic bonds** are due to the **electrostatic forces of attraction** between the positive cations and the negative anions.

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## CHARGES

Charges of ions in **ionic compounds** :

» Metals				Nonmetals <sup>o</sup>				
<u>IA</u>	<u>IIA</u>	<u>B-Groups</u>	<u>IIIA</u>	<u>IVA</u>	<u>VA</u>	<u>VIA</u>	<u>VIIA</u>	<u>VIIIA.0</u>
+1	+2	Variable	+3	-4	-3	-2	-1	0

NOTE: Post-transition metals (metals in Groups IIIA through VIA) also have variable charges.