OXIDATION NUMBERS

1. The oxidation number for oxygen is usually -2.
   **Exceptions:** O₂ and peroxides
   (\( \text{C} = \text{O} \) bond \( \Rightarrow \) ex. H₂O₂, Na₂O₂, and BaO₂ and etc.)

2. The oxidation number of hydrogen is usually +1.
   **Exceptions:** H₂ and hydrides Ex. NaH, BaH₂, and etc.

3. Oxidation numbers of an atom or group of atoms is equal to the charge on the species:
   a. The oxidation number on free elements is zero.
      Ex. H, Fe, Cr, Xn...etc.
   b. The oxidation number for elements when combined with themselves is zero
      Ex. H₂, S₈, Br₂...etc.)
   c. The oxidation number of a monatomic ion is equal to its charge.
      | ION | OXIDATION NUMBER |
      |-----|-----------------|
      | X⁺  | +1              |
      | Ca²⁺| +2              |
      | Fe³⁺| +3              |
      | S²⁻ | -2              |

d. The sum of the oxidation numbers of the elements in a compound is equal to zero
   \[ \text{SO}_2 \]
   \[ S = +4 \quad \text{SC}_3 \]
   \[ C = +3 \quad \text{CrCl}_3 \]
   \[ C = +6 \quad \text{CrCl}_6 \]
   \[ C₂O₂ \]
   \[ C = +4 \quad \text{CO}_2 \]
   \[ C = +2 \quad \text{CC} \]

e. The sum of the oxidation numbers of the elements in a polyatomic ion is equal to its net charge.
   \[ \text{CO}_3^{2⁻} \]
   \[ C = +4 \quad \text{C}_2\text{O}_4^{2⁻} \]
   \[ C = +3 \quad \text{BrO}⁻ \]
   \[ Br = +7 \quad \text{BrO}_3⁻ \]
   \[ S²⁻ \]
   \[ S = +6 \quad \text{SO}_4^{2⁻} \]
   \[ S = +4 \]

f. The sum of the oxidation numbers of the elements in a polyatomic ion is equal to its net charge.
   \[ \text{Na}_2\text{CO}_3 \]
   \[ C = +4 \quad \text{Fe}_2\text{O}_4 \]
   \[ C = +3 \quad \text{Sn}_2(\text{PO}_4)_4 \]
   \[ S_n = +4 \quad P = +5 \]
   \[ \text{HBrO} \]
   \[ Br = +1 \quad \text{Zn}(\text{BrO}_3)_2 \]
   \[ Br = +5 \quad \text{Cu}_2\text{SO}_3 \]
   \[ C_u = +1 \quad S = +4 \]