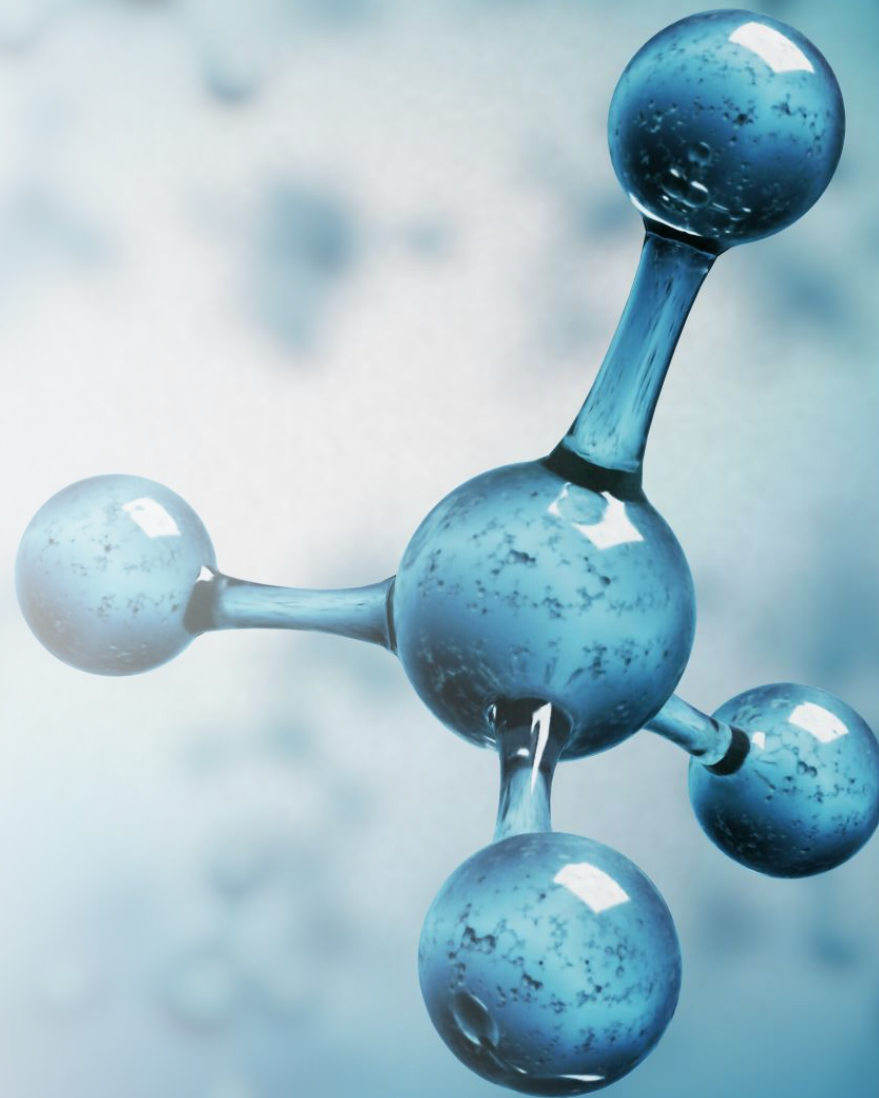


How to Determine the Charge of an Ion



Step 1
Metal or
Nonmetal?

Which side of the stair-step line?

- **Nonmetals** – to the **right**
- **Metals** – to the **left**

Step 2 Cation or Anion?

- **Nonmetals**
 - Gain electrons
 - Protons < Electrons
 - Negative Charge → **Anion**
- **Metals**
 - lose electrons
 - Protons > Electrons
 - Positive Charge → **Cation**

Step 3
**Determine
the Valence
electrons**

• **Group Number → Valence Electrons**

- Group 1 → 1
- Group 2 → 2
- Group 13 → 3
- Group 14 → 4
- Group 15 → 5
- Group 16 → 6
- Group 17 → 7
- Group 18 → 8

Step 4

How many
electrons
lost or
gained?

- **Metals** lose their valence electrons
 - Electrons lost = **group number**
- **Nonmetals** gain electrons to reach a total of 8 valence electrons
 - **8 – group number** = electrons gained

Step 5 Put it All Together!

- Write the **symbol** for the element
- Write the number of **electrons gained or lost**
- Follow the number with the **charge (+ or -)**

Example: Calcium (20)

Calcium = Metal

Metal = Cation (+)

Group 2

Electrons lost = 2

ION = Ca²⁺

Example: Phosphorus (15)

Phosphorous = Nonmetal

Nonmetal = Anion (-)

Group 15 = 5 valence electrons

Electrons gained = $8 - 5 = 3$

ION = P³⁻

Charges of Ions Worksheet:

Elements with roman numerals in parentheses

- These elements don't follow the normal rules
- Use the roman numeral as the number of electrons gained or lost
- **Roman Numerals**
 - I = 1
 - II = 2
 - III = 3
 - IV = 4
- **Example:** Iron (III) → Fe³⁺

