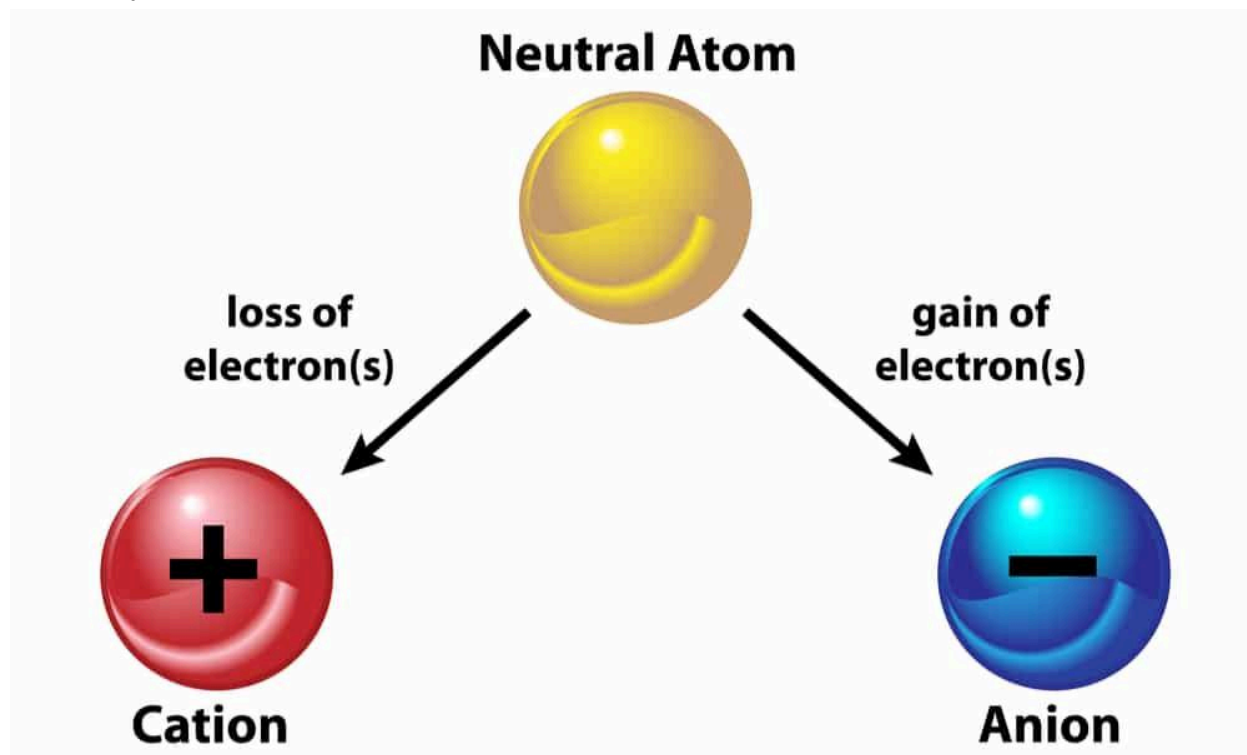


Unit 2: Atoms, Molecules, and Ions
Ions and Atomic Charges

The concept of ions, electrically charged particles, has its roots in the late 18th century with scientists like Lavoisier and Priestley, who pioneered the study of chemical reactions. Michael Faraday coined the term "ion" in the 19th century, describing charged species generated by electric currents during his electrolysis experiments. Cations and anions, positively and negatively charged ions, were classified later by Ostwald and Werner. Nomenclature evolved from traditional, often inconsistent naming based on properties or origins, to the modern, systematic approach established by IUPAC, making chemical naming more precise and universally accepted.



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1. As a scientist, you are working with table salt (NaCl) and you recognize that it is an ionic compound.
 - a. What is an ionic charge?
 - b. You know that Na has a positive charge and Cl has a negative charge. Which atom is the cation and which is the anion?

2. While doing an experiment in the lab, you create an ion composed of a single atom.
 - a. What is the term used to describe an ion composed of a single atom?
 - b. Provide an example of an ion composed of a single atom.

3. Explain the difference between a cation and an anion, and provide an example of each.

4. Differentiate between monatomic and polyatomic ions and provide an example of each.

5. Describe the transition from traditional nomenclature to modern nomenclature in the field of chemistry.

ANSWER KEY

1. As a scientist, you are working with table salt (NaCl) and you recognize that it is an ionic compound.
 - a. How does an ion get its charge?
 - b. You know that Na has a positive charge and Cl has a negative charge. Which atom is the cation and which is the anion?

- a. An ionic charge is the electric charge that results from the gain or loss of electrons by an atom.
- b. Sodium (Na) is the cation in table salt, and chlorine (Cl) is the anion in table salt.

2. While doing an experiment in the lab, you create an ion composed of a single atom.
 - a. What is the term used to describe an ion composed of a single atom?
 - b. Provide an example of an ion composed of a single atom.

- a. The term used to describe an ion composed of a single atom is "monatomic ion."
- b. An example of a monatomic ion is the sodium ion (Na^+), which is formed when a sodium atom loses one electron.

3. Explain the difference between a cation and an anion, and provide an example of each.

A cation is an ion with a positive charge, typically formed by the loss of electrons. An example is the sodium ion (Na^+), which is formed when a sodium atom loses one electron. An anion, on the other hand, is an ion with a negative charge, formed by the gain of electrons. An example is the chloride ion (Cl^-), which is formed when a chlorine atom gains one electron.

4. Differentiate between monatomic and polyatomic ions and provide an example of each.

Monatomic ions are ions composed of a single atom. An example is the sodium ion (Na^+). Polyatomic ions, on the other hand, are ions composed of multiple atoms bonded together. An example is the sulfate ion (SO_4^{2-}), which consists of one sulfur atom and four oxygen atoms bonded together.

5. Describe the transition from traditional nomenclature to modern nomenclature in the field of chemistry.

Traditional nomenclature in chemistry often relied on historical or common names for compounds, which could be inconsistent and lacked a standardized approach. In contrast, modern nomenclature, established by the International Union of Pure and Applied Chemistry (IUPAC), follows systematic rules to name chemical compounds based on their composition and structure. This transition to modern nomenclature has made chemical naming more precise and universally accepted.