



Ion Formation



When brought together, atoms of elements in **Groups 1 and 2** (e.g. Li and Na) of the Periodic table, can **react** with atoms of elements in **Groups 16 and 17** (e.g. O and Cl) to form new particles called **ions**. Ions formed from groups 1 and 2 elements have a **positive charge** and ions formed from groups 16 and 17 elements have a **negative charge**.

Positive Ions

- If an atom has 3 or less electrons in its outer electron shell it will **lose electrons** and form a **positively charged ion**.
 - e.g. Sodium (Na), atomic number is 11, electron arrangement is 2,8,1.
 - A sodium atom will lose 1 electron to get a **full outer shell**. Full shells are more stable.
 - It will then have one less electron than protons, so sodium will have an overall **positive charge** of +1.
 - The symbolic way of representing this is **Na⁺**.

Negative Ions

- If an atom has 5 or more electrons in its outer electron shell, it will **gain electrons** and form a **negatively charged ion**.
 - e.g. Chlorine (Cl), atomic number is 17, electron arrangement is 2,8,7.
 - A chlorine atom will gain 1 electron to get a more **stable full outer shell**.
 - It will now have one more electron than protons, so chlorine will have an overall **negative charge** of -1.
 - The symbolic way of representing this is **Cl⁻**.

Polyatomic Ions

- Sometimes, ions are made up of more than one element.
- For example, the hydroxide ion, OH⁻, consists of one hydrogen atom bonded to one oxygen atom and the whole particle has a surplus of one electron which gives it a -1 charge overall.
- Here are some other examples of polyatomic ions – Learn their names!

ammonium ion	NH ₄ ⁺	overall charge +1
nitrate ion	NO ₃ ⁻	overall charge -1
hydrogen carbonate ion	HCO ₃ ⁻	overall charge -1
carbonate ion	CO ₃ ²⁻	overall charge -2
sulfate ion	SO ₄ ²⁻	overall charge -2
phosphate ion	PO ₄ ³⁻	overall charge -3

Question

What do all the polyatomic ions with the ending **-ate** have in common?