

Lesson 8: Atoms and Ions

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(Nelson Textbook Page 174-175)

1. Neutral ATOMS

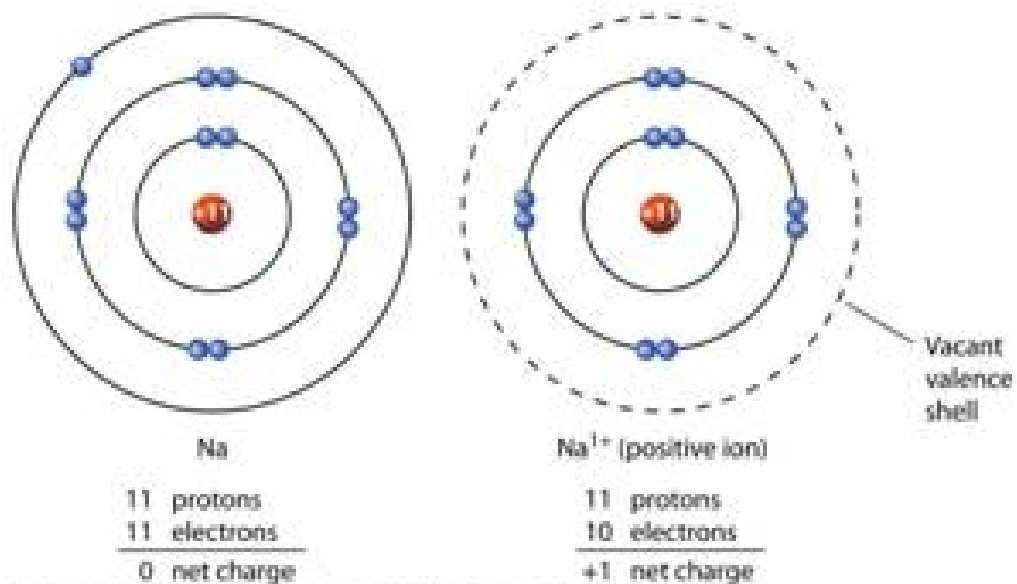
- **overall charge of zero (# of P = # of e⁻)**
- **LOSES or GAINS electron(s)**
 - → a charged atom (ION)
- **Movement of electrons allows atoms to form into compounds**
 - → chemical reactions
- **When atoms combine, fill their outer orbit with 8 electrons**
 - → become full and stable.

2. IONS

- A **charged atom (positive or negative)**
- **# of protons is different from the # of electrons.** ($\# \text{ of P} \neq \# \text{ of e}^-$)
- An ion is formed
 - \rightarrow an atom **GAINS** or **LOSES** at least 1 electron
- Only **electron(s)** at the **outermost orbit** can move.

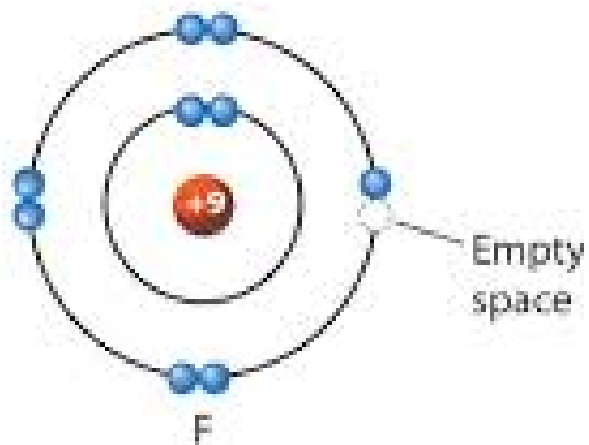
- Metals lose electrons to form positive ions.
- Non-metals gain electrons to form negative ions.

Positive Ions (cations)



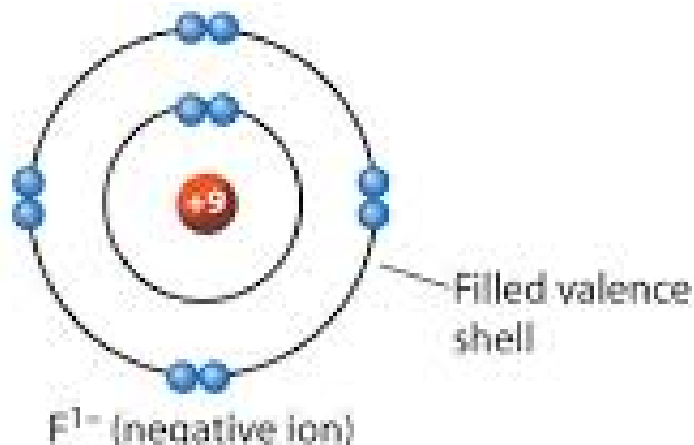
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Negative Ions (anions)



F
9 protons
9 electrons

0 net charge



F^{1-} (negative ion)
9 protons
10 electrons

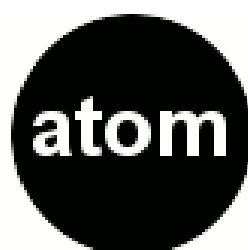
-1 net charge

- Atoms gain or lose electrons → have a full outer orbit of 8 electrons → most stable
- When elements form **compounds** → **more stable**.
- **Noble gases** (group 18) → **stable** → **outer orbits are full** → rarely form compounds

- All the other elements become **stable** in 1 of 3 ways:
 - Metals lose electrons → positive ions
 - Non-metals gains electrons → negative ions
 - Non-metals share electrons



←
**electron
loss**



→
**electron
gain**



Using Bohr-Rutherford Diagrams

- Fluorine - 9 protons, 7 electrons in the outer orbit. A fluorine atom **gains 1 electron** to become a **negative fluorine ion**, F⁻.

Example #2

- When a Calcium atom **loses 2 e⁻**, it would still have **20 protons** but only **18 electrons**. The calcium ion would have a **charge of 2+**.
- A calcium atom loses its **2 electrons** to become a positive calcium ion, **Ca²⁺**.