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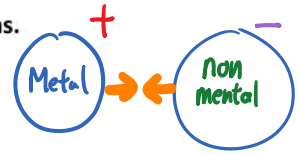
Science 9 – Chemistry Topic 2.4 – Concept 1: Compounds account for the huge variety of matter on Earth.

All the compounds that exist on Earth are built from elements

- 118 elements are on the periodic table; only 80 commonly form compounds
- 10 million known compounds; billions of possible compounds

Concept 2: Ionic compounds are made of ions.



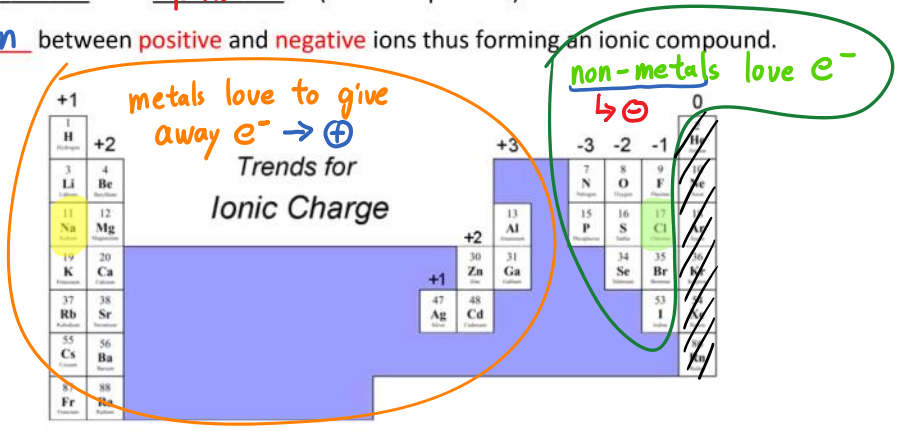
PART A: What are Ionic compounds made of?

- Made up of **ions** which are charged atoms
  - In an Ion, the number of protons Does not equal the number of electrons
- Ions are held together with Ionic Bond (a very strong attraction between oppositely charged ions)
- Contains two elements: metal (positive ion) and non-metal (negative ion)

PART B: Formation of Ionic Compounds. Why are ions attracted to one another?

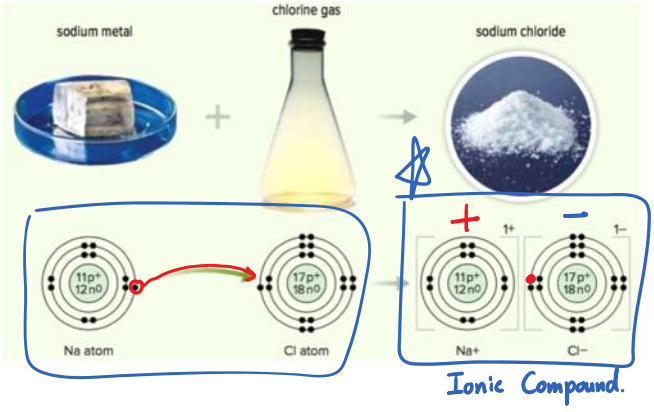
- Metals lose electrons to form (+) cations (positively charged ions)
- Non-metals gain electrons to form (−) anions (negatively charged ions)
- The charge is the result of how many electrons are lost or gained

  Remember.... Cat have paws ☺ (cations = positive)
- Attraction between positive and negative ions thus forming an ionic compound.



Example: Sodium chloride (salt)

- Sodium (metal) reacts with chlorine (gas)
- Forms when sodium atoms each transfer one electron to chlorine atoms
- Each sodium atom becomes positive ion (Na^+)
- Each chlorine atom becomes a negative ion (Cl^-)
- Valence shells of both the sodium ion (Na^+) and chlorine ion (Cl^-) are full
- Recall: The stability of a full valence shell drives the formation of compounds



PART C: The Structure of Ionic Compounds

- Ionic compounds consist of positive and negative ions arranged in regular repeating patterns called Lattices
- Example: Sodium chloride crystals consist of sodium and chloride ions arranged in a lattice

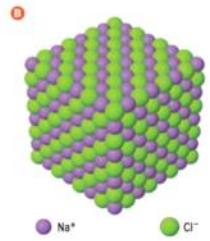


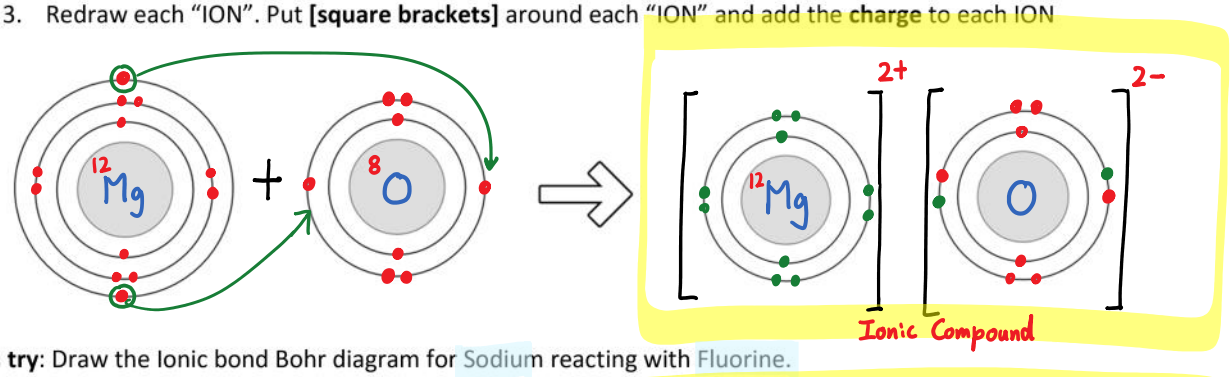
Figure 2.24: A) Cubic structure of sodium chloride crystals. B) Sodium chloride crystals consist of sodium and chloride ions arranged in a repeating pattern.

PART D: Ionic Compounds and Bohr Diagram

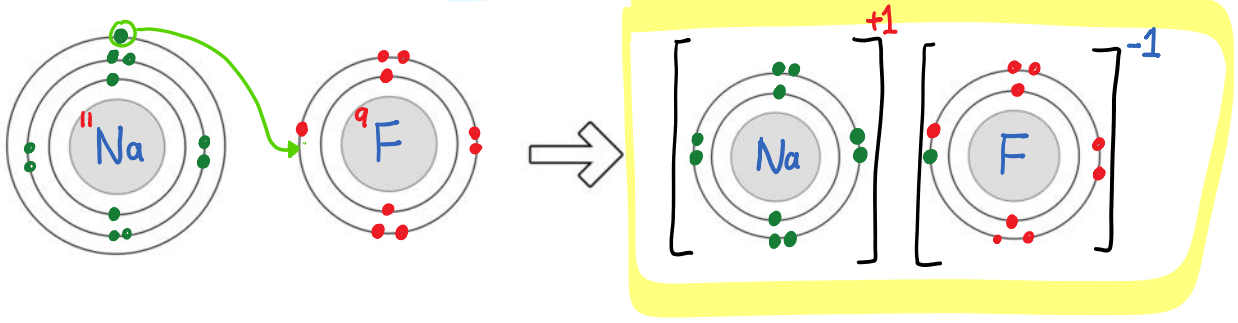
- **Ionic Compounds** are neutral
- Electrons lost by the metal are Equal to the electrons gain by the non-metal.

There are 3 steps to show ionic bond with Bohr Models: (Let's try Magnesium reacting with Oxygen)

1. **Draw** the metal and non-metal atoms
2. Add an **arrow** to show the electron leaving the metal and going to a non-metal atom. Repeat as needed until every atom has **a complete outer shell**. You might need more than one metal or non-metal atoms!
3. Redraw each "ION". Put **[square brackets]** around each "ION" and add the **charge** to each ION

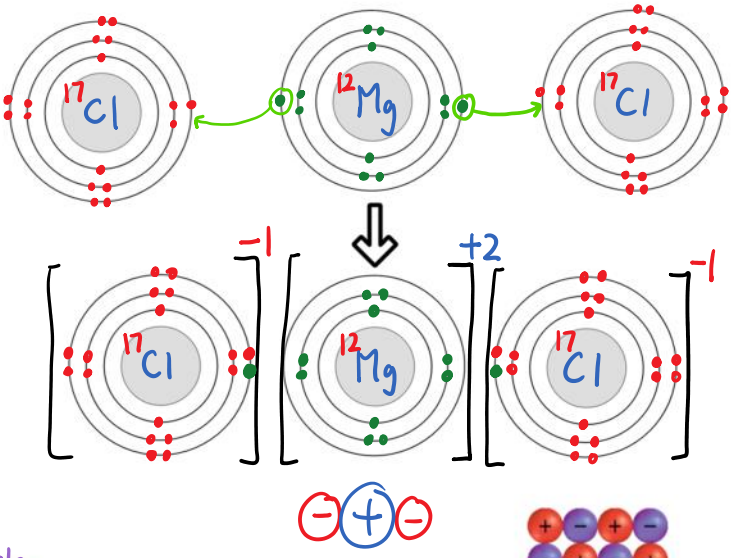


You try: Draw the Ionic bond Bohr diagram for Sodium reacting with Fluorine.



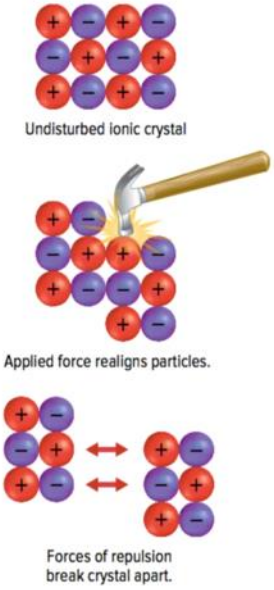
Lets try one more, this will be a bit more challenging:

- Draw the Ionic bond Bohr diagram for Magnesium reacting with Chlorine.



PART E: Characteristics of Ionic Compounds

1. Generally solids – Hard and Brittle
   - Hard because ionic bonds are **very** strong
   - Brittle because when enough force is applied, **ions** will shift
     - Causes ions with the same **charge** to be close together
     - Results in repulsive forces that break the solid apart



2. High melting points
   - Melting requires breaking ionic bonds: the strong forces holding the ions together in the lattice structure
   - A large amount of energy is required to break ionic bonds
   - Example: Melting point of sodium chloride is 801°C

3. Conduct electricity when dissolved
   - Electric current: the flow of charged particles
   - Solid form: do not conduct electric current since ions are held rigidly in place
   - Dissolved or liquid form: ions are free to move, and can conduct electric current