CHEMICAL BONDING

IONIC BONDING

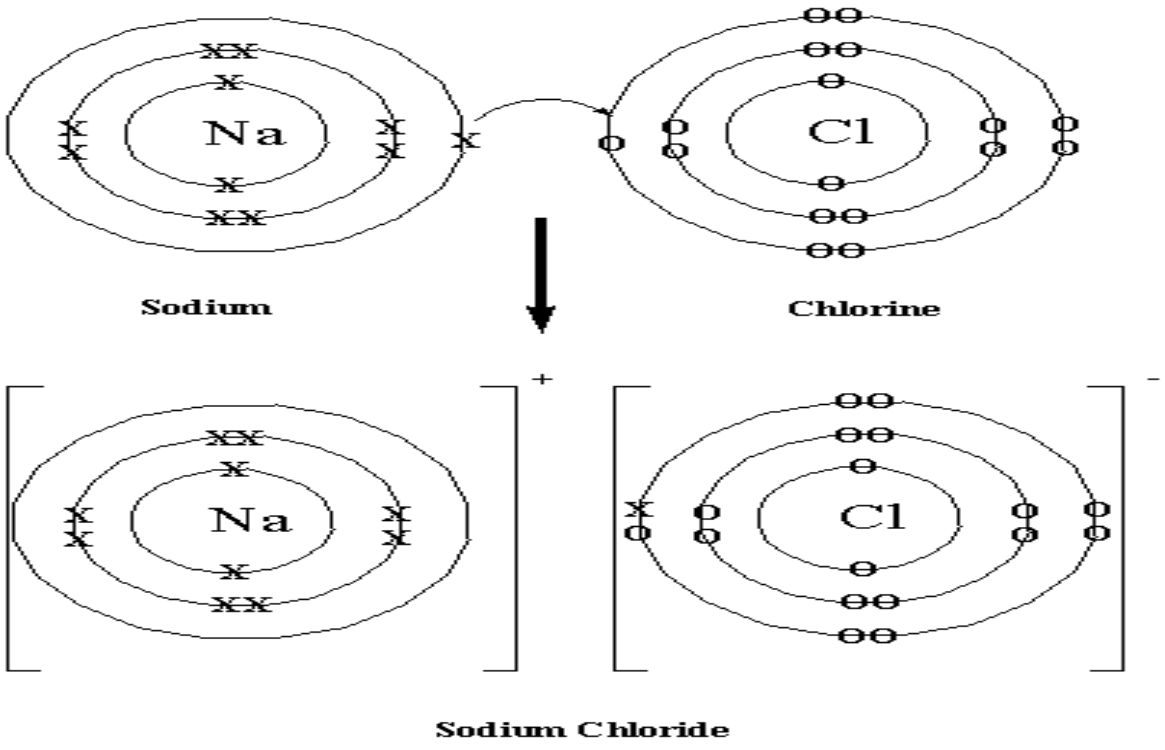
An **ionic bond** is a type of chemical bond that involves a metal and a nonmetal ion (or polyatomic ions such as ammonium) through electrostatic attraction. In short, it is a bond formed by the attraction between two oppositely charged ions.

The metal donates one or more electrons, forming a positively charged ion or cation with a stable electron configuration. These electrons then enter the non metal, causing it to form a negatively charged ion or anion which also has a stable electron configuration. The electrostatic attraction between the oppositely charged ions causes them to come together and form a bond.

For example, common table salt is sodium chloride. When sodium (Na) and chlorine (Cl) are combined, the sodium atoms each lose an electron, forming cations (Na^+), and the chlorine atoms each gain an electron to form anions (Cl^-). These ions are then attracted to each other in a 1:1 ratio to form sodium chloride (NaCl).

$$Na + Cl \rightarrow Na^+ + Cl^- \rightarrow NaCl$$

Mechanism of Sodium Chloride



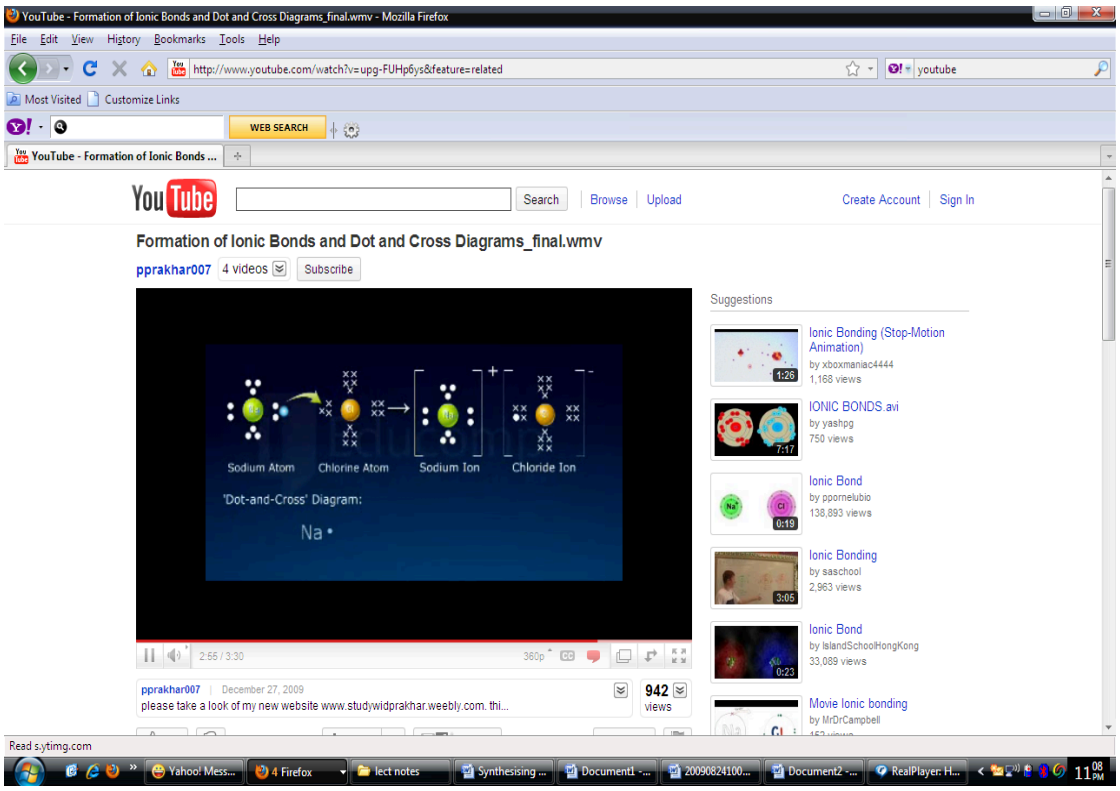
The essential features of ionic bonding are as follows:

1. Atoms of elements with low ionization energy and low electron affinity tend to form positive ions.
2. Atoms of elements with high ionization energy and high electron affinity tend to form negative ions.
3. Ion formation takes place by an electron transfer process.
4. The positive and negative ions are held together by the electrostatic force between ions of opposite charge in an ionic bond.
5. Reactions between representative metals and non-metals tend to result in ionic bonds.

Properties of Ionic Compounds

- Electrovalent / ionic compound contain no molecules. The ions occupy fixed positions in the ionic lattice.
- If the ions are made mobile by dissolving the ionic compound in water or melting it, it can conduct electricity.
- The strong electrostatic forces between the oppositely charged ions accounts for the high melting points of ionic compounds.
- Ionic compounds are rarely soluble in organic solvents, but many of them are soluble in water.

ENGAGE



1. How many valence electrons in sodium?
2. How many electron that sodium need to achieve stability?
3. What is the meaning of the positive and negative charge?

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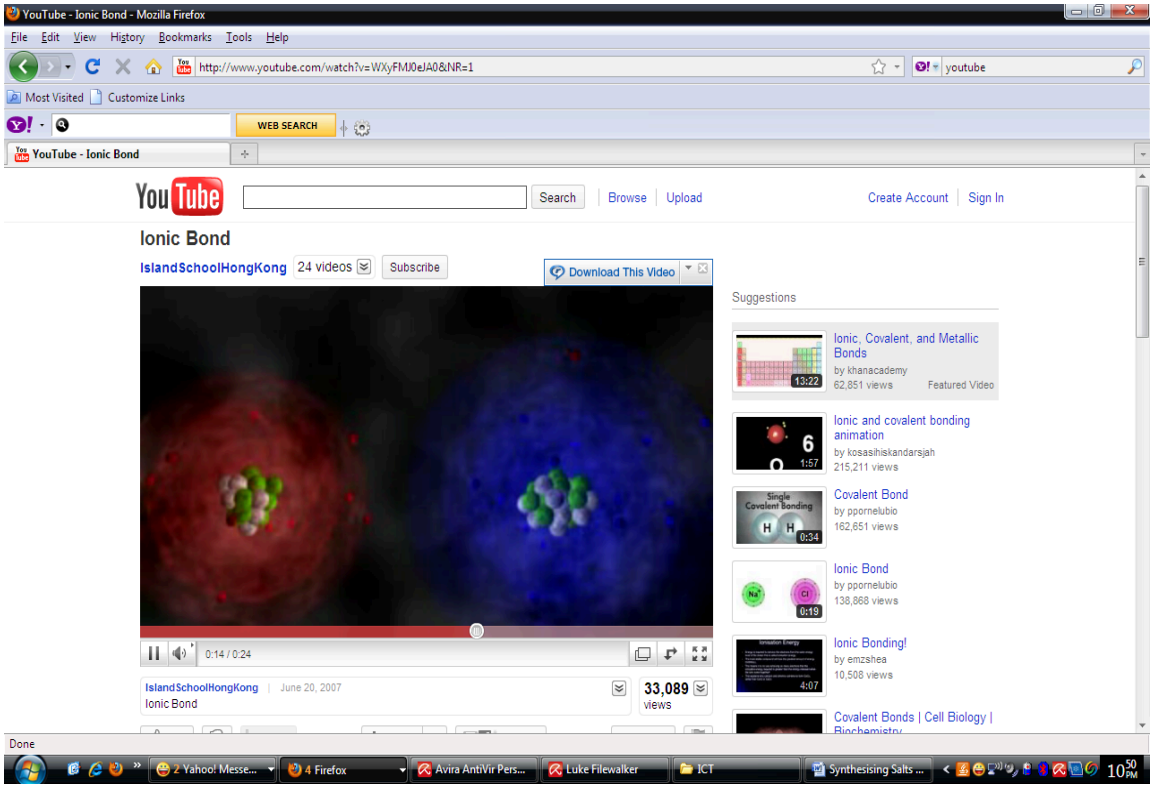
EMPOWER



QUESTIONS

1. Cation : Atom loses one (or more) electrons. Cations are _____ in charge. (metals = cations)
2. Anion : Atom gains one (or more) electrons. Anions are _____ in charge. (non-metals = anions)
3. Ionic bond : A chemical bond by the _____ between a cation and anion.
4. Draw dot and cross diagrams for the following ionic compounds. State the charges on the metal and the non-metal ions, and write the chemical formula for the compound.

a. Potassium Fluoride.
b. Sodium Oxide
c. Calcium Bromide

ANSWER

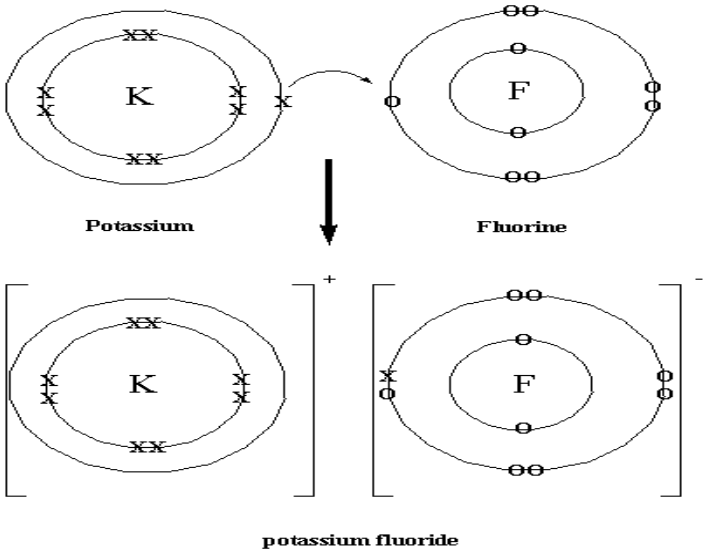
1. Positive
2. Negative
3. Electrostatic attraction

4. a) potassium fluoride

charge on metal = + 1

charge on non-metal = -1,

formula of compound = KF



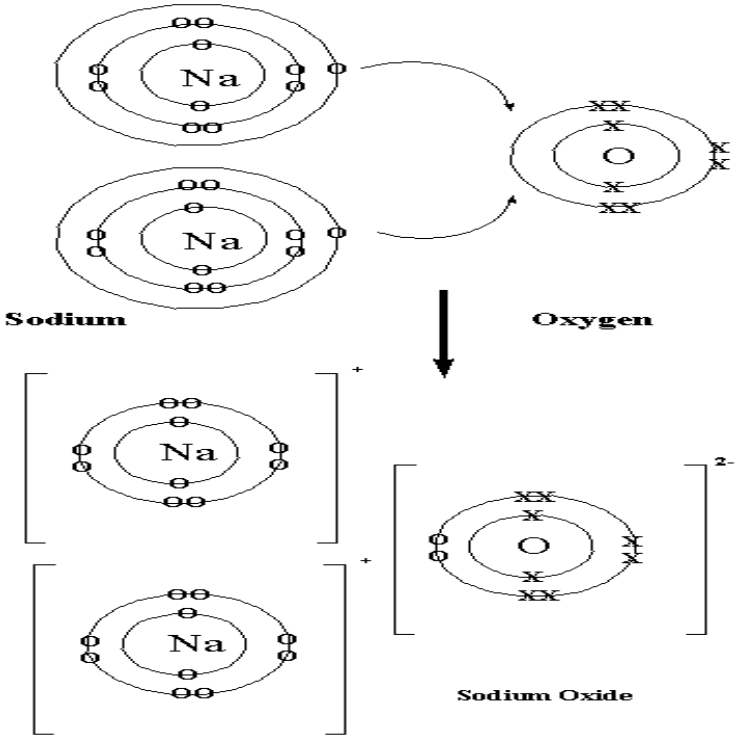
potassium fluoride

b) Sodium Oxide

charge on metal = + 1,

charge on non-metal = -2,

formula of compound =Na_20

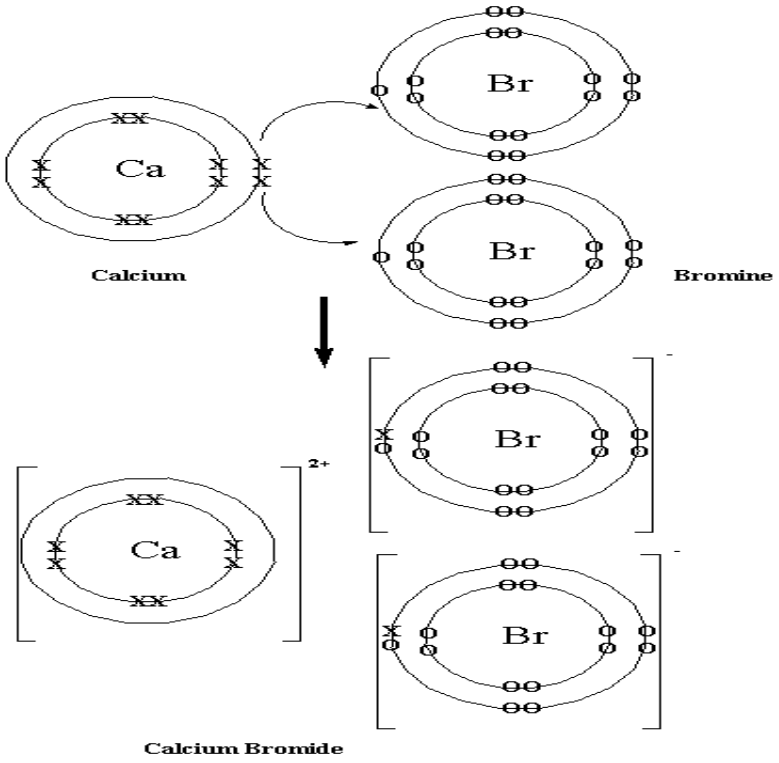


a. Calcium Bromide

charge on metal = + 2,

charge on non-metal = -1,

formula of compound =$CaBr_2$


Ca
Br
Br
Calcium
Bromine
Br
Ca
2+
Br
Calcium Bromide