

B.Sc. (Honours) Part-I

Paper-I

Topic: Ionic Compounds and their formation

UG

Subject-Chemistry

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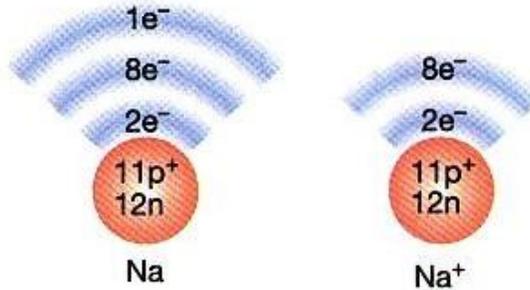
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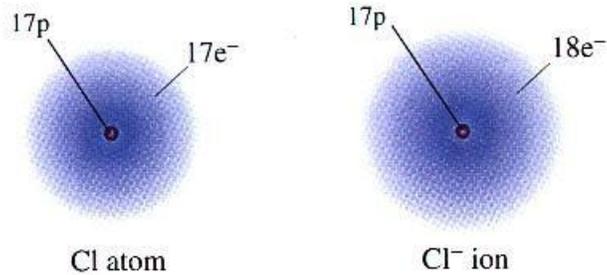
(Mokama, Patna)

Ionic Compounds and their formation

- An *ion* (charged particle) can be produced when an *atom gains* or *loses* one or more *electrons*.



- A *cation* (+ ion) is formed when a neutral atom *loses an electron*.
- An *anion* (- ion) is formed when a neutral atom *gains an electron*.

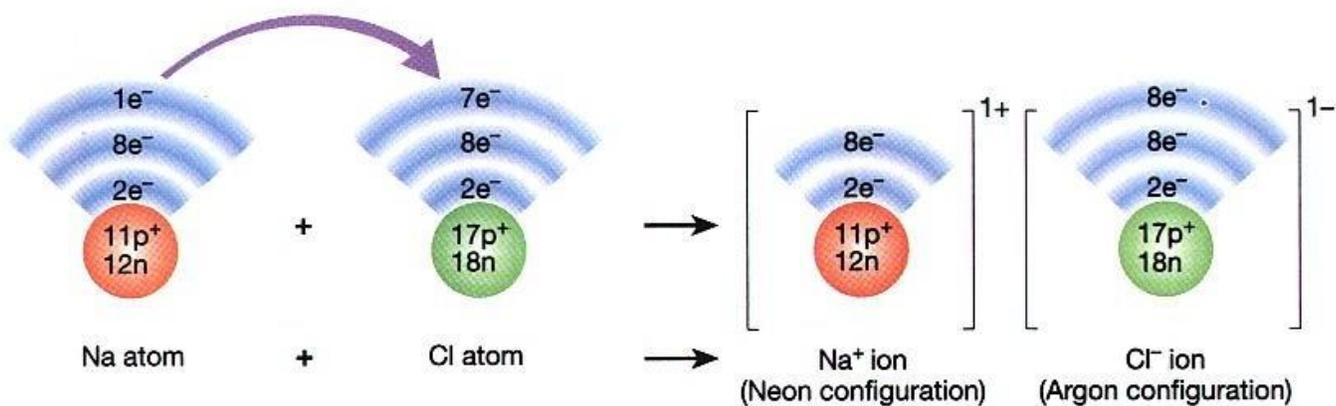


- The ionic charge of an ion is dependent on the number of electrons lost or gained to attain a noble gas configuration.
- For most main group elements, the ionic charges can be determined from their group number, as shown below:

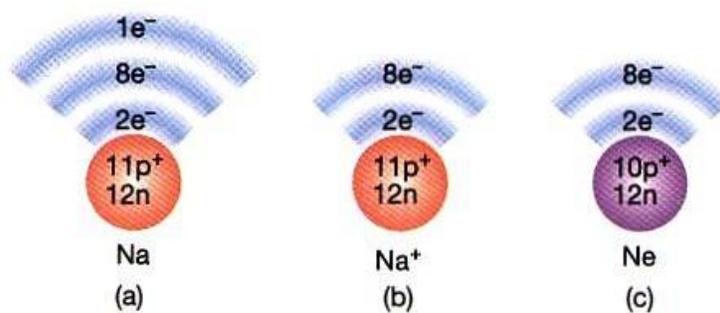
Noble Gases		Metals Lose Valence Electrons			Nonmetals Gain Valence Electrons				Noble Gases
		1A (1)	2A (2)	3A (13)	5A (15)	6A (16)	7A (17)		
He	←	Li ⁺							
Ne	←	Na ⁺	Mg ²⁺	Al ³⁺	N ³⁻	O ²⁻	F ⁻	→	Ne
Ar	←	K ⁺	Ca ²⁺		P ³⁻	S ²⁻	Cl ⁻	→	Ar
Kr	←	Rb ⁺	Sr ²⁺				Br ⁻	→	Kr
Xe	←	Cs ⁺	Ba ²⁺				I ⁻	→	Xe

- All other ionic charges need to be memorized and known in order to write correct formulas for the compounds containing them.

- *Ionic compounds* contain *ionic bonds*, which occur when electrons are *transferred* between two atoms.

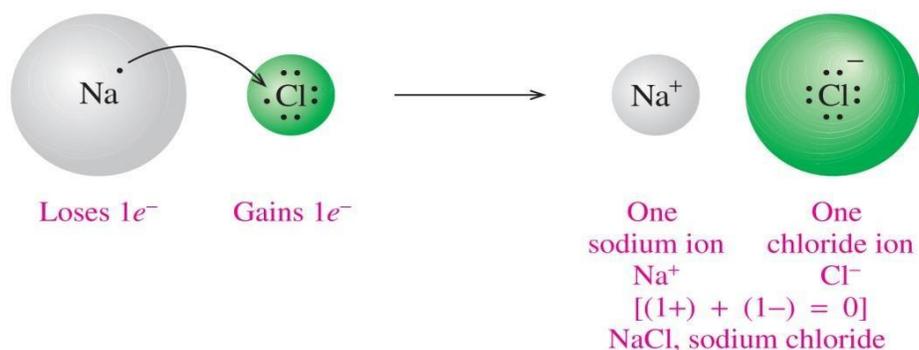


- *Ionic bonds* occur between *metals* and *non-metals*.
- Atoms that lose electrons (*metals*) form positive ions (*cations*).
- Atoms that gain electrons (*non-metals*) form negative ions (*anions*).
- The *smallest* particles of *ionic compounds* are *ions* (not atoms).



Comparison between sodium atom (a), sodium ion (b) and neon atom (c)

- The formula of an ionic compound indicates the number and kinds of ions that make up the ionic compound.
- The sum of the ionic charges in the formula is always zero, which indicates that the total number of positive charges is equal to the total number of negative charges.
- For example, the +1 charge on the sodium ion is cancelled by the -1 charge on the chloride ion, to form a net zero charge.



- When charges between the two ions do not balance, subscripts are used to balance the charges.
- For example, since each magnesium loses 2 electrons, and each chloride gains one electron, 2 chlorides are needed to balance the charge of the magnesium ion. Therefore, magnesium chloride is written as MgCl_2 .

