

CHAPTER 5 : **CHEMICAL BONDING**

Prepared by KML



At the end of this lesson, students should be able to :

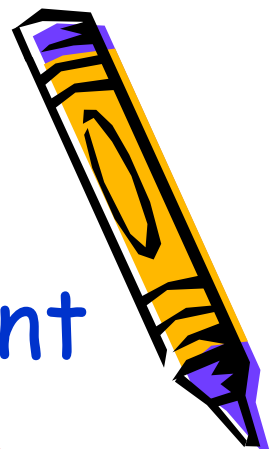
- (a) Write the Lewis dot symbol for an atom.**
- (b) State the octet rule and describe how atoms obtain the octet configuration.**



Valence electrons are the outer shell electrons of an atom. The valence electrons are the electrons that participate in **chemical bonding**.

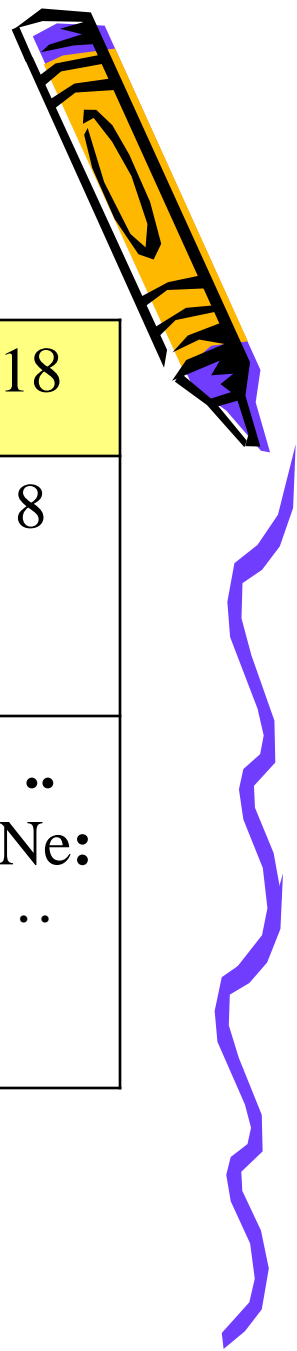
<u>Group</u>	<u>e⁻ configuration</u>	<u># of valence e⁻</u>
1	ns ¹	1
2	ns ²	2
13	ns ² np ¹	3
14	ns ² np ²	4
15	ns ² np ³	5
16	ns ² np ⁴	6
17	ns ² np ⁵	7

Lewis dot symbol



- Consist of the symbol of an element
- One dot for each valence electron in an atom of the element
- Element in the same group have similar outer electron configuration
 - Similar Lewis dot symbol





Group	1	2	13	14	15	16	17	18
Valence electron	1	2	3	4	5	6	7	8
Lewis dot symbol	Li·	: Be	: B ·	: C:	· N · ·	: O · ·	: F: ·	: Ne: ·



OCTET RULE

-Atoms combine in order to achieve a more stable electronic configuration.

-Maximum stability results when an atom is isoelectronic with a noble gas.

- Atom can achieve noble gas configuration through :

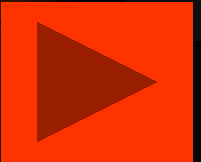
(a) transfer of electron (gaining or losing)

(b) sharing of electron

THE ELECTRON CONFIGURATION OF IONS

Ions have stable electronic configuration of either:

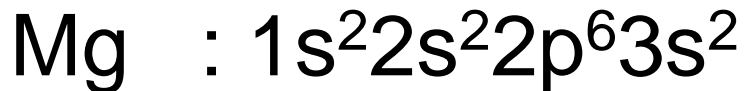
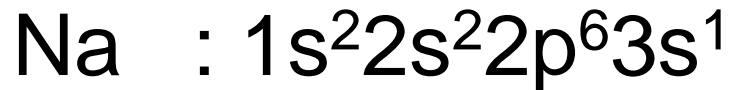
- ❖ The noble gas configuration
- ❖ Pseudonoble gas configuration
- ❖ Half-filled orbitals
- ❖ The inert pair effect



(a) Noble gas configuration

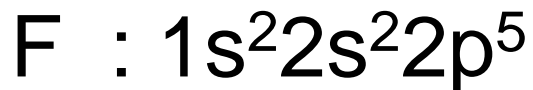
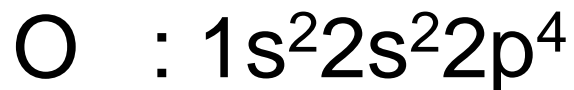
Group 1, 2 and 13 elements transfer valence e to form **cation** with noble gas configuration.

Example



Group 15, 16 and 17 elements accept e to form anion with noble gas configuration.

Example

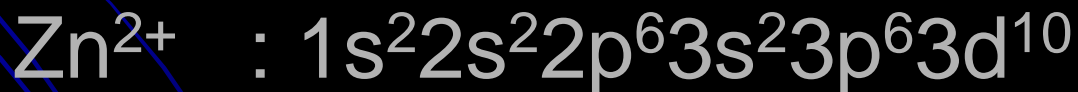


(b) Pseudo noble gas configuration

-For d block elements, e from $4s$ orbital will be transferred first before the $3d$ electrons.

- d block elements donate electrons to achieve pseudonoble gas configuration

• Example :



(pseudonoble gas configuration)

- **Pseudo means false** (palsu / menyammar)
- So, pseudonoble gas means that the atom has similar e configuration with noble gases
- The valence e configuration needed is either $ns^2np^6nd^{10}$ or $ns^2np^6nd^{10}nf^{14}$



(c) Half-filled orbital

-*d* block element can also donate or receive e to achieve half-filled orbitals which is stable

Example :



(stability of the half-filled orbital)



(stability of the half-filled orbital)



(d) The inert pair effect

- elements **Group 13 and 14 in Period 5 or 6** form cations with configuration of, $ns^2np^6nd^{10}(n+1)s^2$
- This is named the inert pair effect.

Example :



(the inert pair effect)

