

# CHAPTER "2"

« Atoms, Molecule, and Ions »

## \* Section (2.5) «An Introduction»

- Atoms
  - $e^-$  → Electrons ÷ -ve charge, outside nucleus.
  - $p$  → protons ÷ +ve charge, inside nucleus.
  - $n^0$  → Neutrons ÷ no charge, inside nucleus.

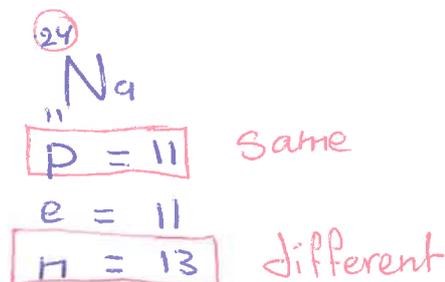
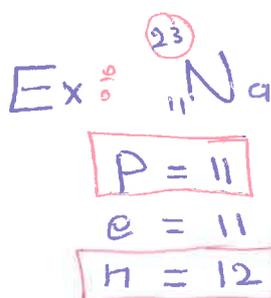
- Mass number ÷ (A) →  $A = p + n$  « دائماً يكون له عدد كبير »  
العدد الكتلي

- Atomic number ÷ (Z) →  $Z = p = e^-$   
العدد الذري  
« دائماً يكون له الأحيض »  
فقط في لذرة المتعادلة

- Isotopes ÷ « النظائر »

→ Atoms with the same number of protons but different number of neutrons.

→ In nature most elements contain mixtures of isotopes.

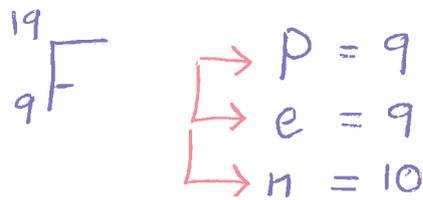


Ex: 2.2 / P. (48)

→ write the symbol for the atom that has an atomic number of 9 and mass number of 19.

→ How many p, e, and n dose this atom have ?

من جدول دوري لعنصر اذني عدد اذني = 9 هم اقلو



\* Ex: Find the mass number of these isotops then find the element.



$$A = p + n \quad \text{• بما ان اذني لذرة متعادلة اذن عدد } e^{-} = p$$

$$= 20 + 21$$

$$A = 41$$

$$Z = p = 20$$

« Ca »

• نبحث في الجدول دوري عن لعنصر  
الذي كمل اعدده اذني 20  
• هذه هي ذرة نظير لعنصر  
الكالسيوم.



$$A = p + n$$

$$= 17 + 21$$

$$= 38$$

Cl

• بما ان اذني لذرة غير متعادلة اذن  
عدد  $e^{-} \neq p$  علينا ان نجد عدد  $e^{-}$   
قبل انكتب ويساوي (17)

$$\boxed{3} X^{+5} \longrightarrow 20 \bar{e}, 21 H$$

$$A = P + n$$

$$= \boxed{23} + 21$$

$$20 + 3$$

$$= 44$$

V

\* Section (2.6) «Molecules and Ions»

## Chemical Bonds

### Covalent Bond

«رَبْطَةٌ تَسَاهِيَّةٌ»

- non metal - non metal
- metalloid - non metal
- Form by sharing electrons.
- Molecule

Ex:  $\text{SF}_6$

### Ionic Bond

«رَبْطَةٌ أَيُونِيَّةٌ»

- metal - non metal
- Form due to the force attraction between oppositely charged ions.
- Ionic Compound

Ex:  $\text{NaCl}$

## Ions

### mono atomic ion

«نوع واحد من الذرات»

#### Cation

- +ve charge.
- Lost electron.
- From metals.

Ex:  $\text{Al}^{+3}$ ,  $\text{Ca}^{+2}$

#### Anion

- -ve charge.
- gained electron.
- non metal.

Ex:  $\text{Cl}^-$ ,  $\text{O}^{-2}$

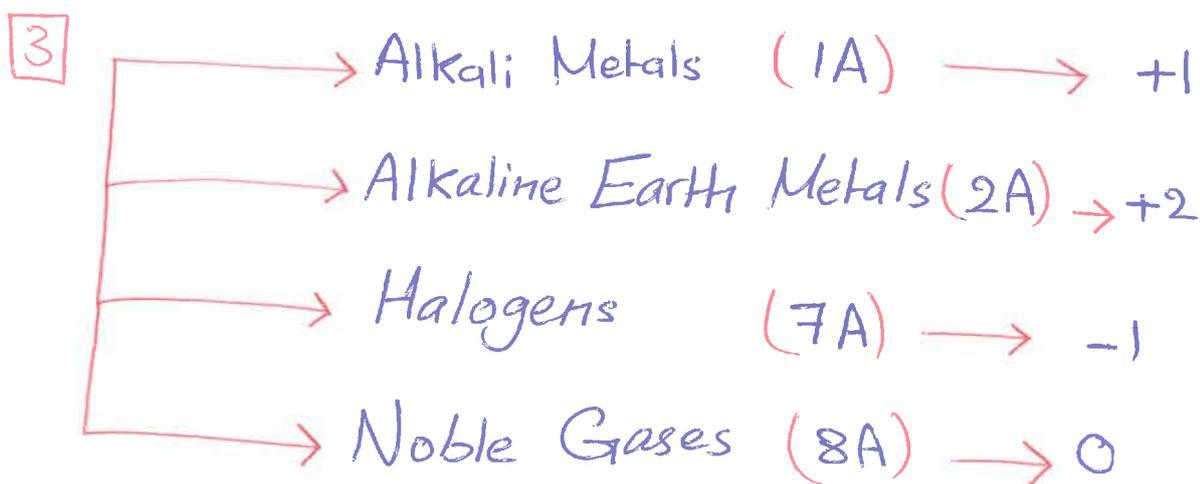
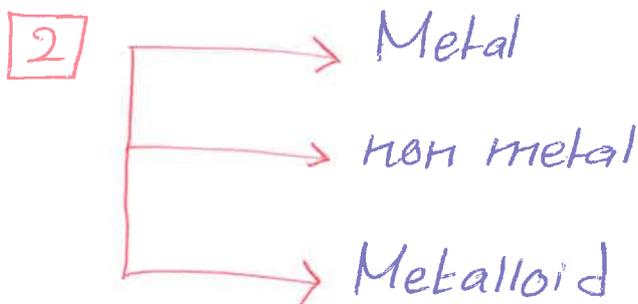
### Poly atomic ion

«أكثر من نوع من الذرات»

$\text{NH}_4^+$ ,  $\text{SO}_4^{-2}$

Table (2.5) page (58)

\* Section (2.7) An Introduction to the Periodic Table.



# Periodic Table of The Elements

A Main-Group Elements

A

Main-Group Elements

		Atomic number										Symbol										Atomic mass																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
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## \* Section (2.8) : Naming Simple Compounds

### \* How To Find the Charge on monoatomic ion ?

→ Charge = no. of  $e^-$  in the last orbital that an element loses or gains.

◀ عدد الإلكترونات الموجودة في مدار الأخير التي يكتسبها أو يفقدها العنصر.

Ex: Al • موجود في المجموعة الثالثة.  
• تحتوي مداره الأخير على  $3e^-$ .  
• ليصل إلى حالة الاستقرار يفقد  $(3e^-)$   
يصبح  $Al^{+3}$

Ex: Cl • ضمن عناصر المجموعة السابعة.  
• تحتوي مداره الأخير  $(7e^-)$ .  
• ليصل إلى حالة الاستقرار يكسب  $(1e^-)$   
يصبح  $(Cl^-)$

# \* 1] Binary Ionic Compound Type (I) and Type (II).

ions

monoatomic

polyatomic ions

من جدول كاهن  
Table: 2.5 page 58

Cation

Anions

one cation

« له شحنة واحدة فقط »

« Type I »

• The same name

Ex Al<sup>+</sup> Aluminum ion

more than  
1 cation

« له أكثر  
من شحنة »

« Type II »

نستخدم الأرقام الرومانية

Fe<sup>+2</sup> → iron II

Fe<sup>+3</sup> → iron III

Fe<sup>+2</sup> → Ferrous ion

Fe<sup>+3</sup> → Ferric ion

From stem name

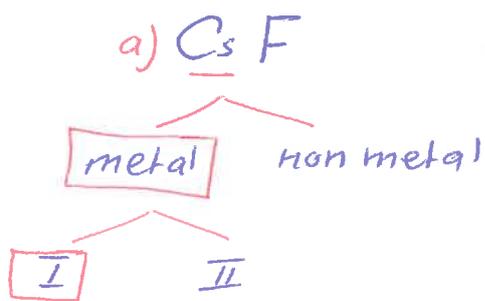
→ ide

• Br<sup>-</sup> → Bromide

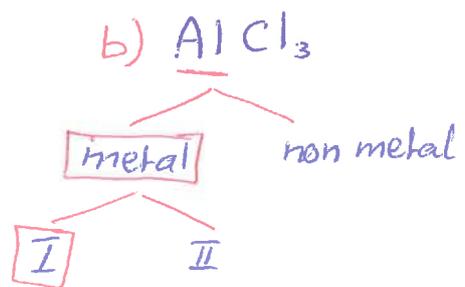
• Cl<sup>-</sup> → Chloride

\* Example (2.3) page (54) :

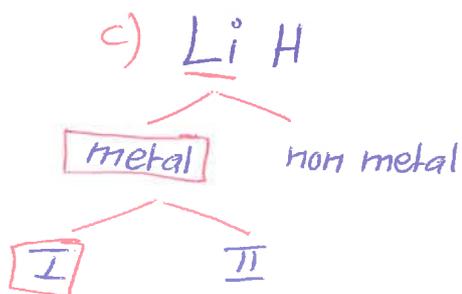
↳ Name each binary compound



→ Cesium fluoride



→ Aluminum chloride

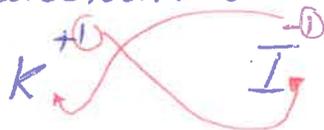


→ Lithium hydride

\* Ex: 2.4 (p. 55)

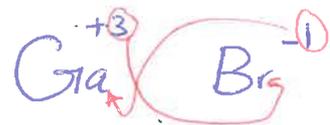
↳ write the formula for each compound.

a. Potassium iodide



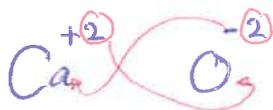
→  $\text{KI}$

c) Gallium bromide



→  $\text{GaBr}_3$

b. Calcium oxide



→  $\text{CaO}$

\* Example: (2.5) p (55)

1 Give the systematic name for each of the following compound.



metal non metal



→ Copper(I) Chloride



metal non metal

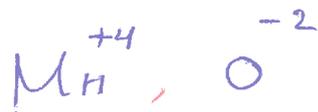


→ Iron III oxide



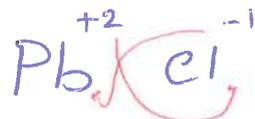
2 write the formula for each compound

a. Manganese(IV) oxide



→ MnO<sub>2</sub>

b. Lead(II) chloride



→ PbCl<sub>2</sub>

1 Give the systematic name for each of the following compound.



metal non metal

I II

→ Cobalt(II) bromide



metal non metal

I II

Calcium chloride



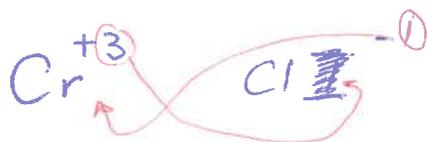
metal non metal

I II

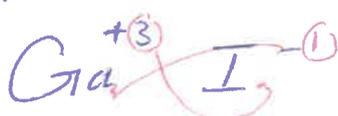
→ Aluminum oxide.

2 write the formula for each compound.

a. Chromium(III) chloride



b. Gallium iodide



## 2 Binary Covalent Compounds (Type III)

\* How to write the molecular compound?

B, Si, C, Sb, As, P, N, H, Te, Se, I, Br, Cl, O, F

• Ex: CH<sub>4</sub> not H<sub>4</sub>C

NF<sub>3</sub> not F<sub>3</sub>N

نکات ترکیبات  
حسب ترتیب اولیاد

\* Rules for naming molecular compound

• The first element in the formula is named first using the full element name.

• The second element is named as if it were an anion.

• Prefixes are used to denote the numbers of atoms present, «Table <2.6> page (60)»  
(mono, di, tri)

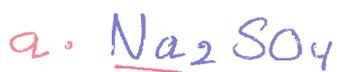
\* note \* The prefix mono- is never used for naming the first element

Ex: CO → Carbon monoxide ✓

monocarbon monoxide ✗

\* Ex: 2.7, P (58)

1 Name the following compound.



metal non metal

I II

Sodium Sulfate

(2.5) من كبريت

b. X



metal non metal

I II

Iron III nitrate

2 write the formula for each compound.

b. Cesium perchlorate.



d. Sodium selenate.



\* Ex: 2.8, P (60)

1 Name each of the following compound.



nonmetal

→ phosphorus pentachloride.



→ Sulfur dioxide

\* Answer Ex 2.9 page 61

### 3 Acids

## Acids

if the anion  
does not contain  
oxygen

- HCl → Hydrochloric acid
- HCN → Hydrocyanic acid

if the anion  
does contain  
oxygen

if the anion  
end with ate  
~~ate~~ → ic

ex: HNO<sub>3</sub>

nitrate  
→ nitric acid

if the  
anion end  
with ite  
~~ite~~ → ous

ex: HNO<sub>2</sub>

nitrite  
→ nitrous acid

\* Ex: what are the name and formula  
of the anion corresponding to the:

a] Chloric acid, HClO<sub>3</sub>

↳ Chlorate, ClO<sub>3</sub><sup>-</sup>

Table 2.8, 2.7

b] phosphoric acid, H<sub>3</sub>PO<sub>4</sub>

↳ phosphate, PO<sub>4</sub><sup>-3</sup>

Q: 57 P 67a

metal

Mg

Ti

Au

Bi

non metal

Si

Ge

B

At

Rn

Br

\* Answer Q: 59, 61, 62, 65, 67, 68  
75, 76, 82, 89, 92