CHAPTER "2"

« Atoms, Molecule, and Ions »

*Section (2.5) «An Introduction»

- Atoms
  - $\bar{e}$ → Electrons ÷ −ve Charge, out side nucleus.
  - P → protons ÷ +ve Charge, inside nucleus.
  - $n^{\pm}$ → Neutrons ÷ no Charge, inside nucleus.

- Mass number ÷ (A) → $A = P + n$ «دائماً يكون لعدد كبير»
  العدد الكتلي

- Atomic number ÷ (Z) → $Z = P = \bar{e}$
  العدد الذري — لـه دائماً — فقط في الذرة المتعادلة
  «دائماً يكون لعدد الأصغر»

- Isotopes ÷ «النظائر»
  - Atoms with the same number of protons but different number of neutrons.
  - In nature most elements Contain mixtures of isotopes.

Ex ÷ $^{23}_{11}Na$
P = 11
e = 11
n = 12

$^{24}_{11}Na$
P = 11 Same
e = 11
n = 13 different

• 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 الجدول الدوري العنصر الذي عدده الذري = 9 هو الفلور

$^{19}_{9}F$ → p = 9, e = 9, n = 10

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

1) $X \longrightarrow 20e^-$, 21 n

$A = p + n$

$= 20 + 21$

$A = 41$

• بما أن الذرة متعادلة اذن عدد p = عدد e

$Z = p = 20$

• نبحث في الجدول الدوري عن العنصر الذي كتلته العدد الذري 20.

∴ هذه هي ذرة نظيرة العنصر الكالسيوم.

«Ca»

2) $X^{-3} \longrightarrow 20e^-$, 21 n

$A = p + n$

$= 17 + 21$

$= 38$

Cl

• بما أن الذرة غير متعادلة إذن عدد $e \neq p$ علينا أن نجد عدد e قبل الحساب ويساوي (17)

3 $X^{+3} \longrightarrow 20\,\bar{e}, \; 21\,n$

$A = P + n$

$= \boxed{23} + 21$ → $20 + 3$

$= 44$

V

* Section (2.6) «Molecules and Ions»

Chemical Bonds

Covalent Bond
«رابطة تساهمية»

- non metal - non metal
- metalliod - non metal
- Form by sharing electrons.
- molecule

Ex: SF_6

Ionic Bond
«رابطة أيونية»

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

Ex: NaCl

Ions

monoatomic ion
«نوع واحد من الذرات»

Cation
- +ve Charge.
- Lost electron.
- From metals.

Ex: Al^{+3}, Ca^{+2}

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

Ex: Cl^-, O^{-2}

Poly atomic ion
«أكثر من نوع من الذرات»

NH_4^+, SO_4^{-2}

- Table (2.5) Page (58)

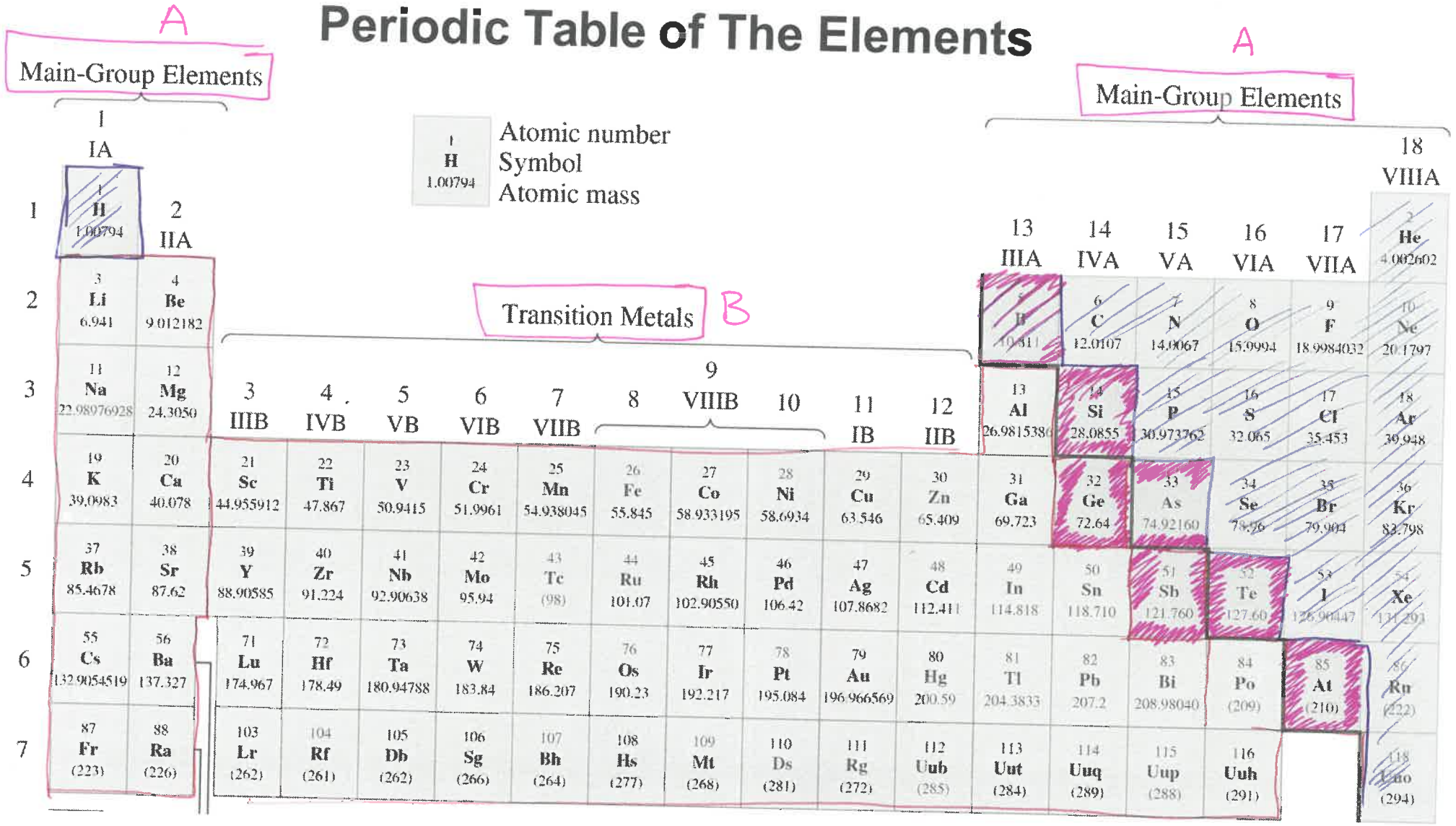
* Section (2.7) An Introduction to the Periodic Table.

1 → Main-Group Elements (A)
→ Transition Elements (B).

2 → Metal
→ non metal
→ Metalloid

3 → Alkali Metals (1A) → +1
→ Alkaline Earth Metals (2A) → +2
→ Halogens (7A) → -1
→ Noble Gases (8A) → 0

Periodic Table of The Elements



Red

Metal

Pink

Metalloid

7 element

Blue

Nonmetal

18

* Section (2.8) : Naming Simple Compounds

* How To Find the Charge on monoatomic ion ?

→ Charge = no. of $\bar{e}$ in the Last orbital that an element Loses or gains.

◄ عدد الإلكترونات الموجودة في المدار الأخير التي يكتسبها أو يفقدها العنصر.

Ex: Cl

- ضمن عناصر المجموعة السابعة
- تحتوي مدار الأخير ($7\bar{e}$)
- ليصل إلى حالة الإستقرار
  يكسب ($1e^-$)
- يصبح (Cl^-)

Ex: Al

- موجود في المجموعة الثالثة.
- تحتوي مدار الأخير على $3\bar{e}$
- ليصل إلى حالة الإستقرار
  يفقد ($3\bar{e}$)
  يصبح ← Al^{+3}

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

ions

- monoatomic
  - Cation
    - one Cation «له شحنة واحدة فقط» «Type I»
    - more than 1 Cation «له أكثر من شحنة» «Type II» تستخدم الأرقام الرومانية
      - Fe^{+2} → iron II
      - Fe^{+3} → iron III
      - Fe^{+2} → Ferrous ion
      - Fe^{+3} → Ferric ion
  - Anions
    - From steam name ↳ ide
      - Br^- → Bromide
      - Cl^- → Chloride
- polyatomic ions ← من الجدول كما هي Table: 2.5 page 58

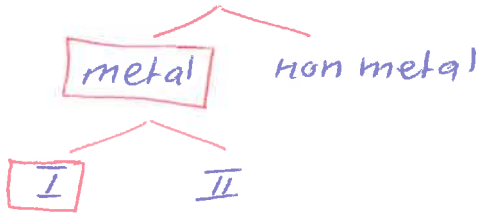
- The same name

Ex Al: Aluminum ion

* Example (2.3) page (54) :

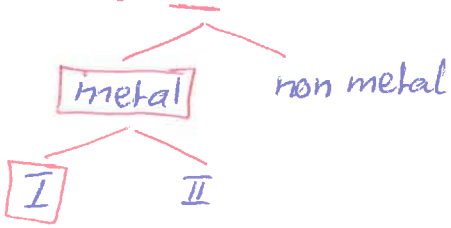
↳ Name each binary compound

a) CsF



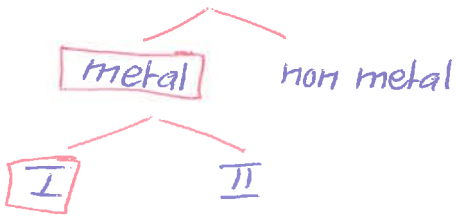
→ Cesium fluoride

b) $AlCl_3$



→ Aluminum Chloride

c) LiH

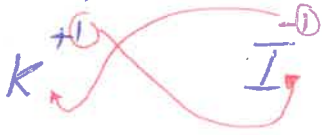


→ Lithium hydride

* Ex : 2.4 (P. 55)

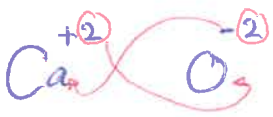
↳ write the formula for each compound.

a. Potassium iodide



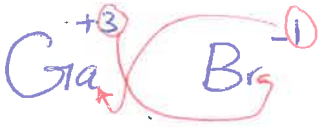
→ KI

b. Calsium oxide



→ CaO

c) Gallium bromide

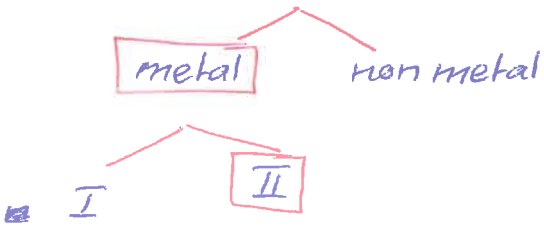


→ $GaBr_3$

* Example (2.5) p (55)

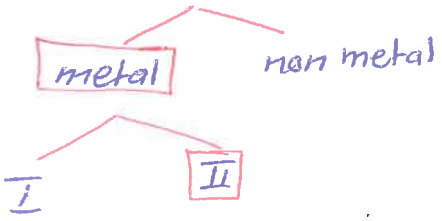
↳ [1] Give the systematic name for each of the following compound.

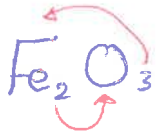
a. $CuCl$



→ Copper(I) Chloride

c. Fe_2O_3





→ Iron III oxide

[2] write the formula for each Compound

a. Manganese(IV) oxide

Mn^{+4} , O^{-2}

→ MnO_2

b. Lead(II) chloride

Pb^{+2} Cl^{-1}

→ $PbCl_2$

* Example (2.6) : Page (57)

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

a] $CoBr_2$

metal — non metal

I — II

→ Cobalt(II) bromide

b) $CaCl_2$

metal — non metal

I — II

Calcium chloride

c] Al_2O_3

metal — non metal

I — II

→ Aluminum oxide.

2 write the formula for each compound.

a. Chromium(III) Chloride

Cr^{+3} Cl^{-1}

$Cr Cl_3$

b. Gallium iodide

Ga^{+3} I^{-1}

→ GaI_3

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_4 not H_4C

  NF_3 not F_3N

نكتب المركبات حسب ترتيب السلسلة.

* 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

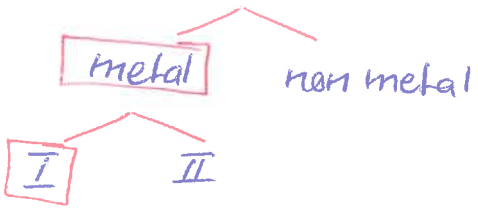
Ex: CO → Carbon monoxide ✓

monocarbon monoxide ✗

* Ex: 2.7, P (58)

1 Name the following Compound.

a. Na_2SO_4

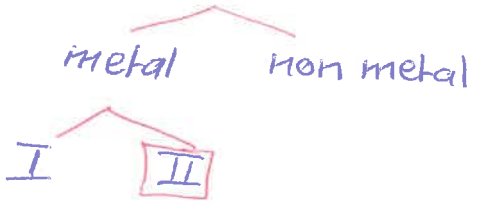


Sodium Sulfate

(2.5) من الجدول

b. X

c. $Fe(NO_3)_3$



Iron III nitrate

2 write the formula for each compound.

b. Cesium perchlorate.

→ $CsClO_4$

d. Sodium Selenate.

→ Na_2SeO_4

* Ex: 2.8, P(60)

1 Name each of the following Compound.

a] PCl_5

nonmetal

→ phosphorus pentachloride.

c] SO_2

→ Sulfer dioxide

* Answer Ex 2.9 page 61

3 Acids

Acids

- if the anion does not contain oxygen
- if the anion does contain oxygen

- HCl → Hydro chloric acid
- HCN → Hydro cyanic acid

if the anion does contain oxygen:

- if the anion end with ate → ate → ic
  - ex: HNO_3 → nitrate → nitric acid
- if the anion end with ite → ite → ous
  - ex: HNO_2 → nitrite → nitrous acid

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

a] Chloric acid, $HClO_3$
↳ Chlorate, ClO_3^-

b] phosphoric acid, H_3PO_4
↳ phosphate, PO_4^{-3}

table 2.8, 2.7

Q: 57 P 67a

metal	non metal
Mg	Si
Ti	Ge
Au	B
Bi	Al
	Rn
	Br

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