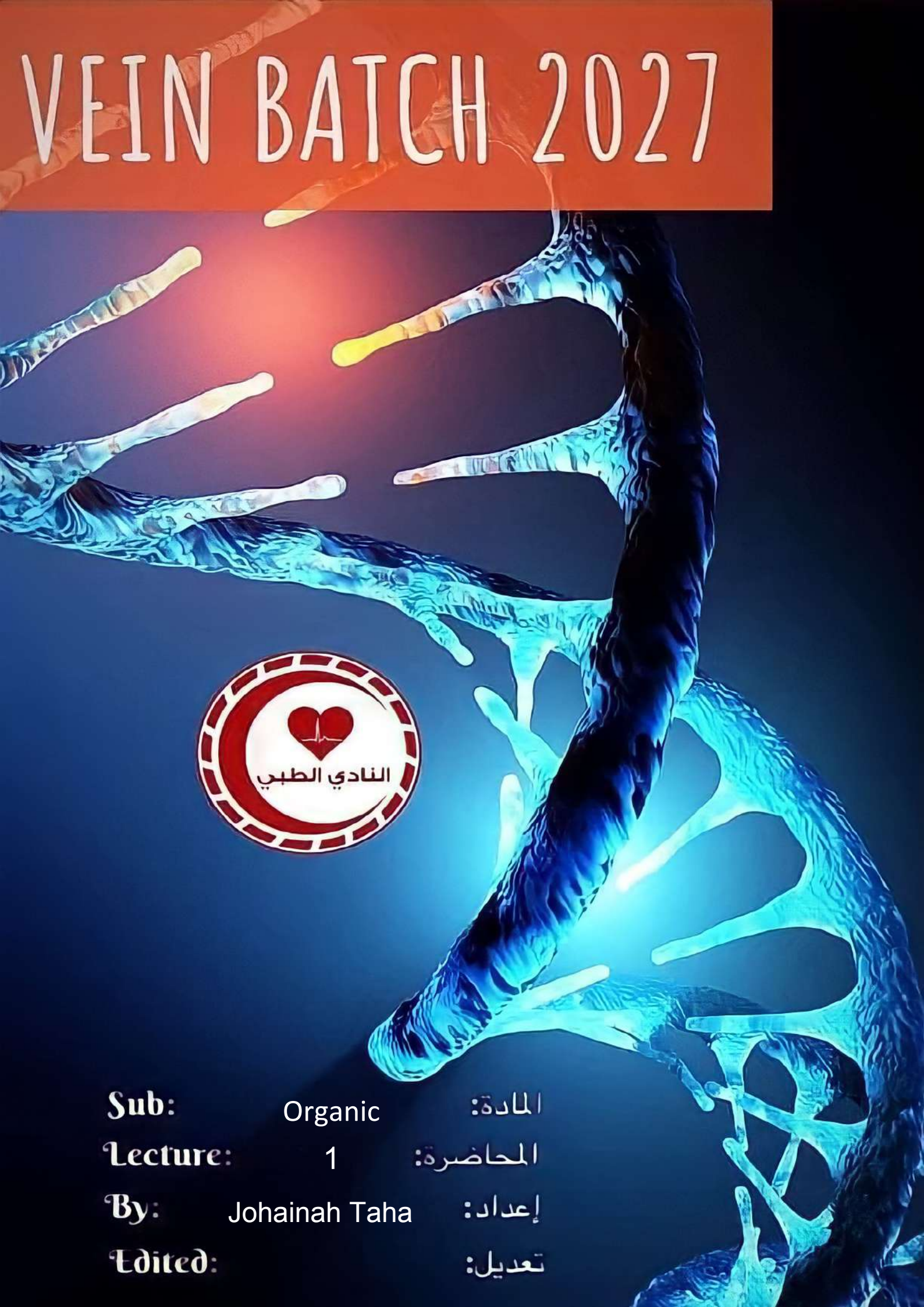
VEIN BATCH 2027



النادي الطبي

Sub: Organic المادة:

Lecture: 1 المحاضرة:

By: Johainah Taha إعداد:

Edited: تعديل:

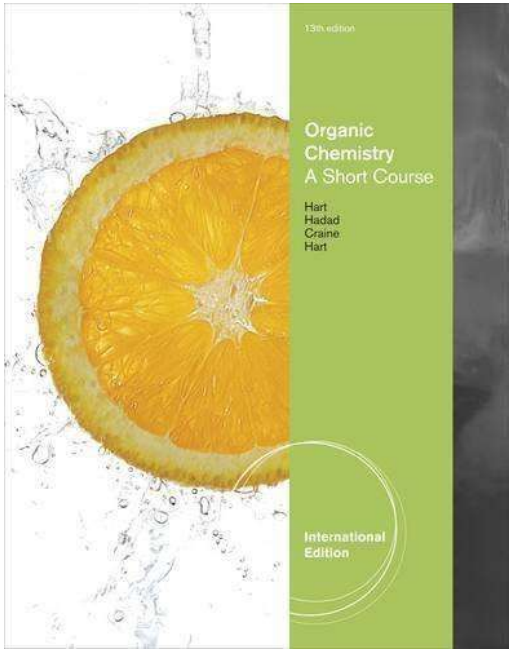
Chem 237 Basics of Organic Medicinal Chemistry

- **Course description**

This is the first year organic chemistry course, introducing basic concepts and principles of organic chemistry (chapters 1 – 11).

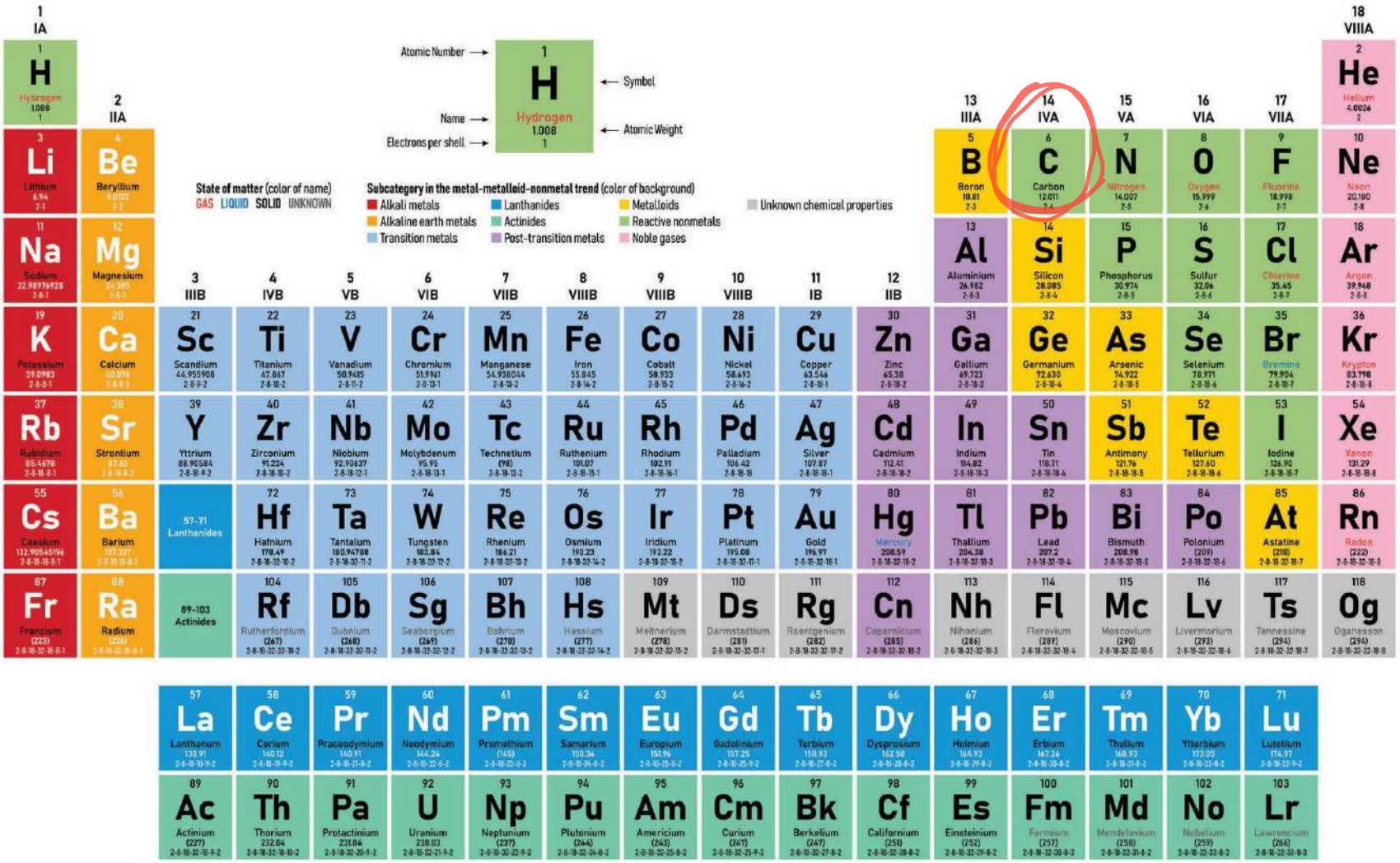
- **Texts**

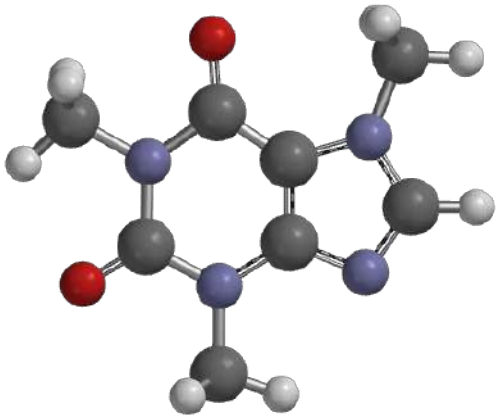
Hart, Craine, Hart and Hadad, Organic Chemistry, A Short Course,13th Edition (Brooks/Cole, Cengage Learning, CA 94002-3098 USA, 2012).

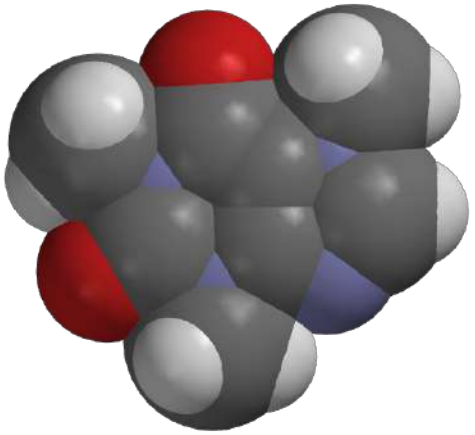


Dr. Eyad Younes

Periodic Table of the Elements

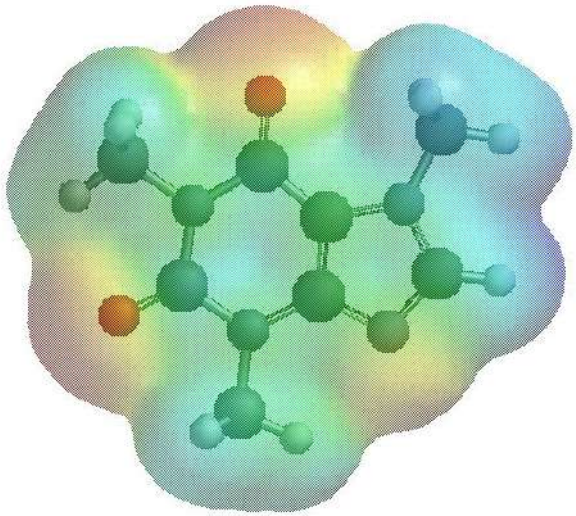






Chapter 1: Bonding and Isomerism

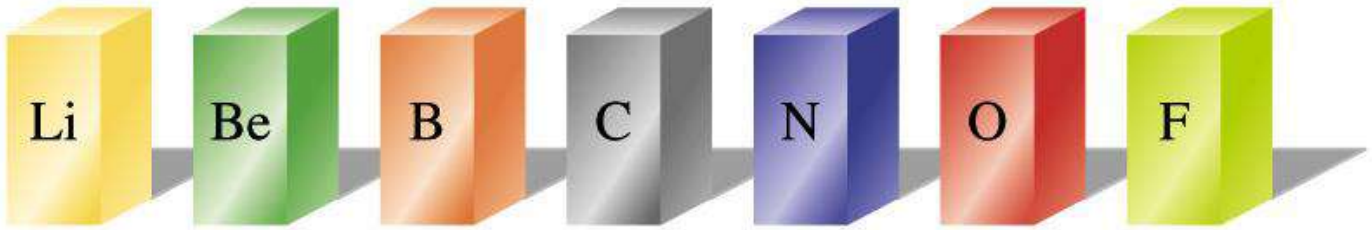
Compounds with the same formula but different arrangement of atoms.



Done by : Johainah Taha

Organic Chemistry

- Organic compounds are compounds containing carbon



the second row of the periodic table

- Atoms to the left of carbon give up electrons.
- Atoms to the right of carbon accept electrons.
- Carbon shares electrons.

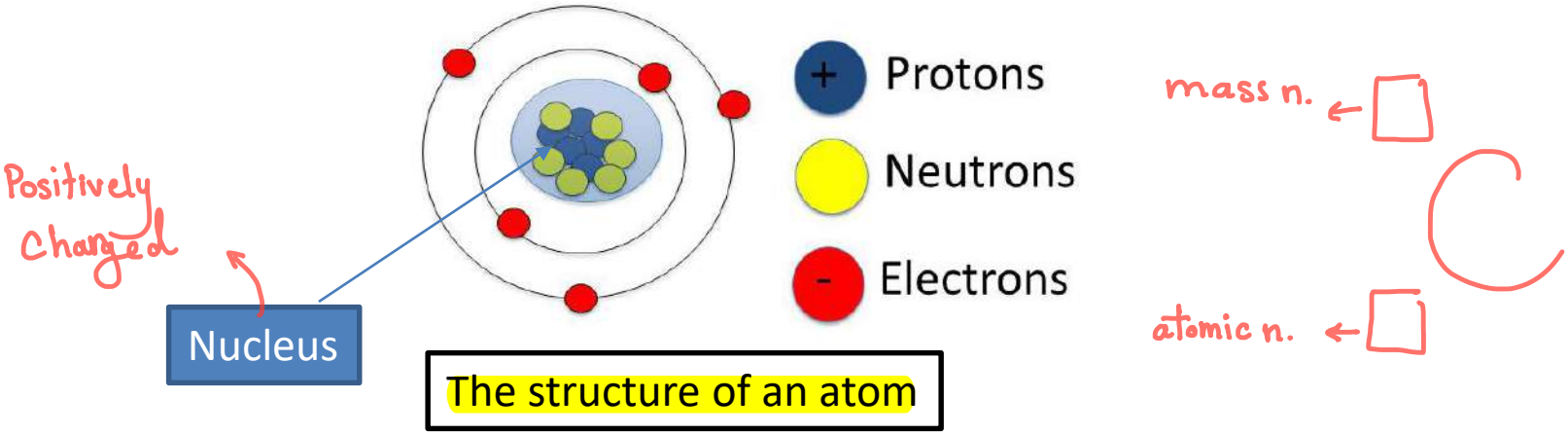
وهاي الخاصية بتخليه يكون عدد كبير من المركبات

Bonding and Isomerism

1.1 How Electrons Are Arranged in Atoms

- An atom is: the *smallest particle* of an element that retains all of the chemical properties of that element.

•An atom consists of negatively charged electrons, positively charged protons, and neutral neutrons



The structure of an atom

• **Atomic number**: numbers of protons in its nucleus and it's the number of electrons in the neutral atom. = num of p^+ = num of e^-

• **Mass number**: the sum of the protons and neutrons of an atom. = $p^+ + n^\pm$

(Protons and neutrons are ~1837 times the mass of an e^-)

•Isotopes have the same atomic number but different mass numbers (^{12}C and ^{13}C)

- Electrons are located in atomic orbitals (S, P, d, f).
- Orbitals tell us the energy of the electron and the volume of space around the nucleus where an electron is most likely to be found.
- Orbitals are grouped in shells .

Each orbital can hold a maximum of 2e- and the two electrons have opposite spin

Table 1.1 Distribution of Electrons in the First Four Shells That Surround the Nucleus

	First shell	Second shell	Third shell	Fourth shell
Atomic orbitals	*s*	*s*, *p*	*s*, *p*, *d*	*s*, *p*, *d*, *f*
Number of atomic orbitals	1	1, 3	1, 3, 5	1, 3, 5, 7
Maximum number of electrons	2	8	18	32

Example :

^{1}H: $1s^1$

^{6}C: $1s^2, 2s^2, 2p^2$

Note
كل ما كان المستوى (shell) أقرب الى النواة كل ما كان:
١. High stablity
٢. Low energy

أشرح الكم بلغة أبسط :- (تخيلوا معي)

- المستويات اللي حول النواة ← اسمهم Shell ← خلينا نعتبر انه الـ Shell هو طابق وكل طابق فيه أقسام وكل قسم فيه عدد من الغرف وكل غرفة بتوسع شخصين ، بشرط يكونوا عكس بعض.

- هساكل قسم الـ ه عدد من الغرف ، مثلاً:
  - الـ S ← فيه غرفة وحدة.
  - الـ P ← فيه ٣ غرف.
  - الـ d ← فيه ٥ غرف.
  - الـ f ← فيه ٧ غرف.

بناءً على هاد الكلام ، الطابق الأول فيه قسم واحد اللي هو S واللي S يعني غرفة وحدة بتوسع شخصين ، إذاً المستوى الأول بيوسع $2e^-$.
الطابق الثاني فيه قسمين S و P ، قسم S فيه غرفة ، وقسم P فيه ٣ غرف وكل غرفة بتوسع شخصين إذاً طابق ٢ بيوسع $8e^-$

الملخص

Shell = طابق
Atomic orbital = اسم القسم (S, P, d, f)
Number of atomic orbital = عدد الغرف بكل قسم
Maximum number of e^- = كم شخص بوسع بالطابق

$^{8}O : 1S^{2}, 2S^{2}, 2P^{4}$

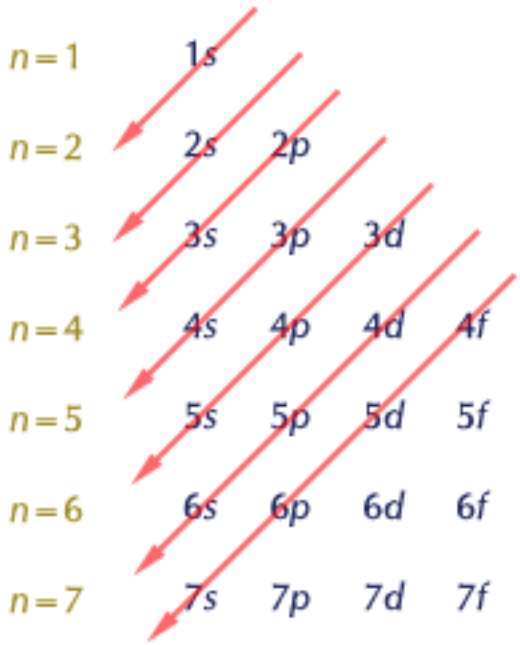
كم شخص بالقسم

4

2P

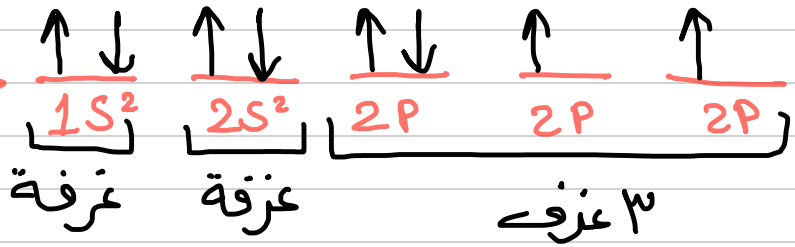
رقم الطابق (Shell)

نوع القسم



في أثناء الحل
ضروري نلتزم
بالمخطط الي اخذناه
بالاول ثانوي

$^{8}O : 1S^{2}, 2S^{2}, 2P^{4}$ →

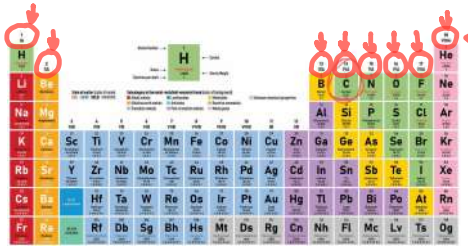


الكترونات التكافؤ — المستوى الأبعد

Valence electrons (VE) are located in the outermost shell. They are involved in chemical reactions.

VE = Group number

له والتي تساوي عدد e^- المدار الأخير أو الطابق الأخير



Examples:		VE	Lewis symbol of atom
^1H:	$1s^1$ ← $1e^-$	1	H·
^8O:	$1S^2\ 2S^2\ 2P^4$ (2+4=6)	6	·· :O: ··
^6C:	$1s^2, 2s^2, 2p^2$	4	·C·

رقم الطابق — آخر طابق

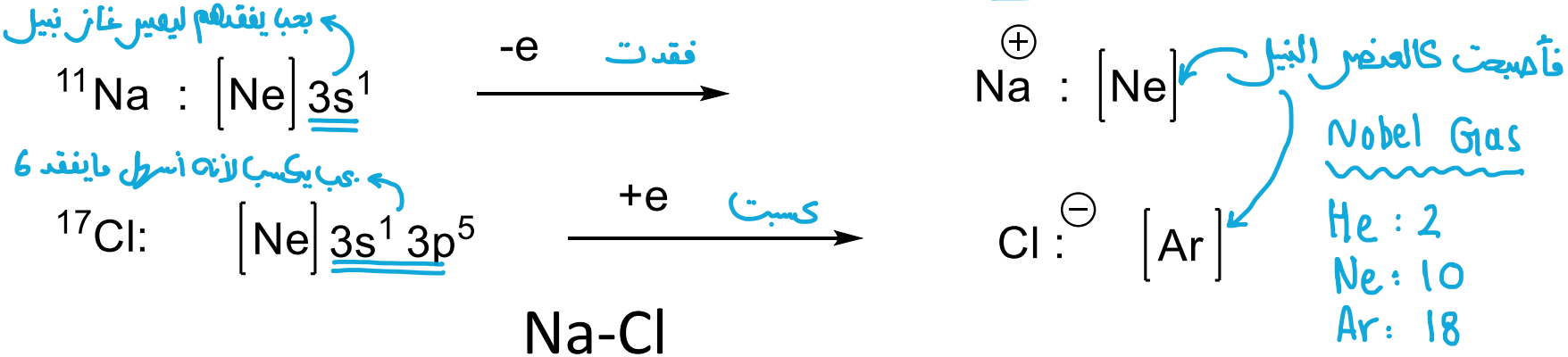
Table 1.3 Valence Electrons of the First 18 Elements

Group	I	II	III	IV	V	VI	VII	VIII
	H·							He:
	Li·	Be·	·B·	·C·	·N:	·O:	:F:	:Ne:
	Na·	Mg·	·Al·	·Si·	·P:	·S:	:Cl:	:Ar:

- **Chemical Bonds**
  - Ionic.
  - covalent.
  - Hydrogen.
  - Metalic.

1. Ionic Bonding

An ionic bond is an electrostatic attraction between positive & negative ions resulting from e^- transfer.



The resulting e^- configuration of both ions are those of the nearest noble gas, Ne and Ar respectively, both satisfy the octet rule.

Nobel gas are elements which are unreactive and stable
Ex: He . Ne . Ar

$^{2}He : 1s^2$
$^{10}Ne : 1s^2, 2s^2, 2p^6$
$^{18}Ar : 1s^2, 2s^2, 2p^6, 3s^2, 3p^6$

2. Covalent Bonding

- Ionic bonds occur when an e^- is transferred between a metal and nonmetal.
- Covalent bonds are resulting from sharing e^-

$$2\,H\cdot \longrightarrow H{:}H$$

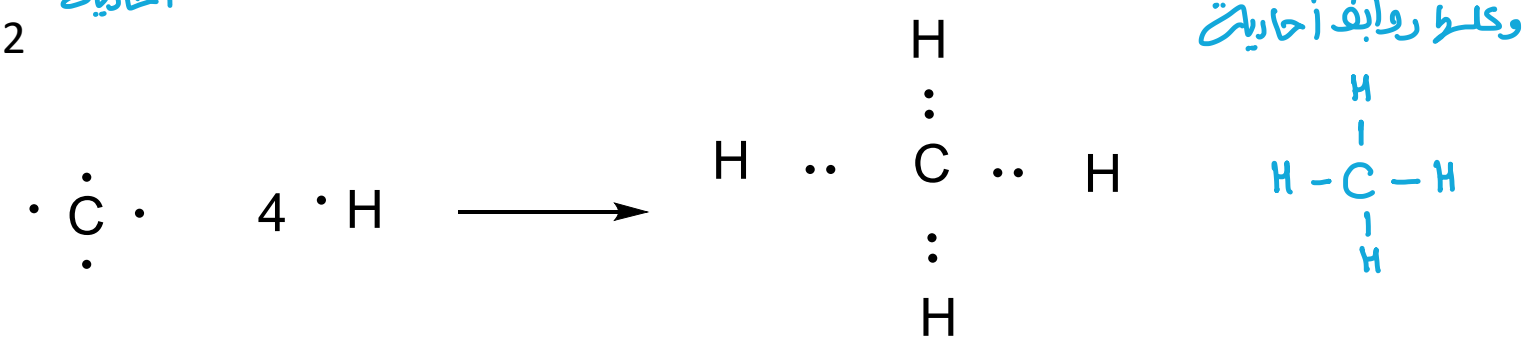
The result is both atoms have a [He] e^- configuration, *i.e.*

The bond is commonly display as a line rather than a pair of e^- (:), *i.e.* H–H rather than H : H

عرض

رابطة تساهمية أحادية

Example 2



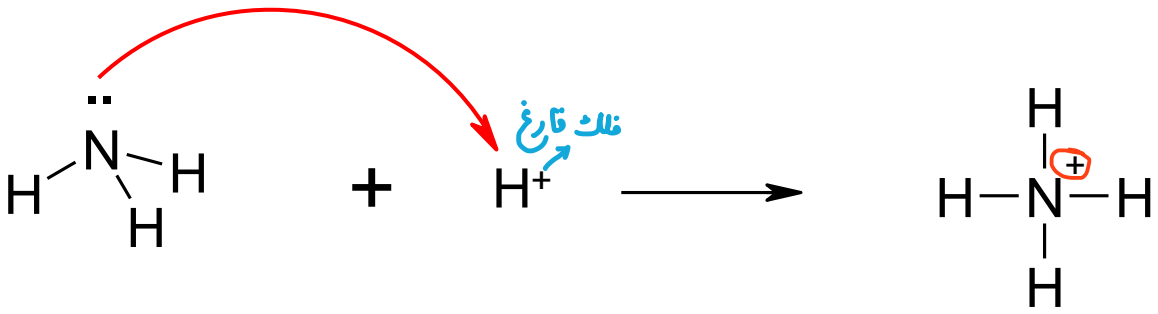
A second general version of a covalent bond is possible. This occurs when BOTH e^- come from one atom: a coordinate covalent bond

رابطة تساهمية تناسقية

i.e.

الآخر عنده فلك فارغ

$$NH_3 + H^+ \rightarrow NH_4^+$$



Chemical bond	When does it occure	Result
Ionic bond	when an e^- is transferred between 2 elements one of them is metal and the other is nonmetal	e^- configuration of both atoms
Covalent bond	Sharing e^-	e^- configuration of both atoms
Coordinate Covalent bond	2 atoms, one of them has an empty shell, and the other one will share the e^-. So both e^- come from one atom	e^- configuration of both atoms

Electronegativity (EN) : measures the tendency of an atom to attract a shared pair of electrons (or electron density).

ميل — جذب — كثافة

* الحجم مو كبير بأثر

↑ EN ↓ بسحب e⁻ أكثر

بين اي حيسحب ؟ النواة لانو شحنتو موجبة فبتجذب الالكترونات

TABLE 1.3 The Electronegativities of Selected Elements[a]

IA	IIA	IB	IIB	IIIA	IVA	VA	VIA	VIIA
H 2.1								
Li 1.0	Be 1.5			B 2.0	C 2.5	N 3.0	O 3.5	F 4.0
Na 0.9	Mg 1.2			Al 1.5	Si 1.8	P 2.1	S 2.5	Cl 3.0
K 0.8	Ca 1.0							Br 2.8
								I 2.5

بتزيد بروتونات موجبة بقل الحجم

حطها

الأرقام موحفظ بس H_2C

increasing electronegativity

increasing electronegativity

[a]Electronegativity values are relative, not absolute. As a result, there are several scales of electronegativities. The electronegativities listed here are from the scale devised by Linus Pauling.

Covalent bonds can be classified as

A. Nonpolar covalent bond (Δ EN = 0-0.5)

غير قطبية — الفرق

* بتكون e⁻ تقريباً بالنص

A-A أو A-B

Examples C-C C-H

H-H

Cl-Cl

B. Polar covalent bond (Δ EN = 0.5 1.9)

dipole moment (D) = μ = *e* x *d*

(*e*) : magnitude of the charge on the atom

(*d*) : distance between the two charges

A polar bond has a negative end and a positive end

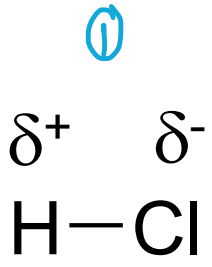
Table 1.4 The Dipole Moments of Some Commonly Encountered Bonds			
Bond	**Dipole moment (D)**	**Bond**	**Dipole moment (D)**
H—C	0.4	C—C	0
H—N	1.3	C—N	0.2
H—O	1.5	C—O	0.7
H—F	1.7	C—F	1.6
H—Cl	1.1	C—Cl	1.5
H—Br	0.8	C—Br	1.4
H—I	0.4	C—I	1.2

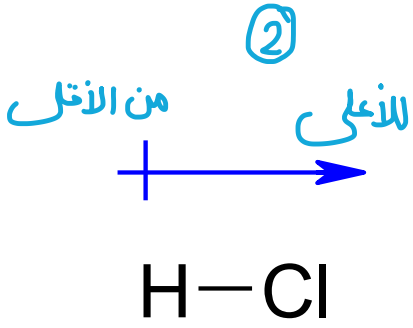
if The Δ EN increases the polarity increases

Note : If Δ EN is more than 1.9then the bond is ionic Ex: Li-F ΔEN = 3

Bond Polarity & Electronegativity (cont'd)

The result of polar covalent bonding is that the e^- pair spend more time near the more EN atom. This means it will acquire a permanent excess negative charge. The other atom acquires a permanent excess positive charge. This is indicated by a δ^+ or δ^- (where δ means a "partial charge") or a dipole arrow which points from the positive end of the bond to the negative end.





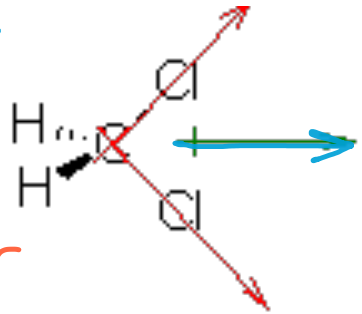
Bond Polarity & Electronegativity (cont'd)

The more polar the molecule the stronger the dipole moment. The molecular dipole moment is the vector sum of the bond moments, *i.e.*

net dipole moment

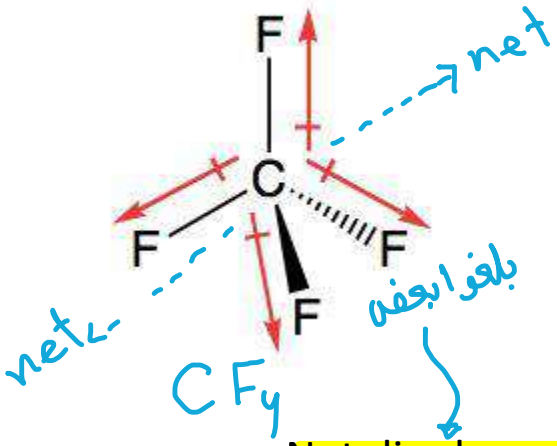
= 0 → non Polar

≠ 0 → Polar



Net dipole moment ≠0 → polar

CH4 : non polar



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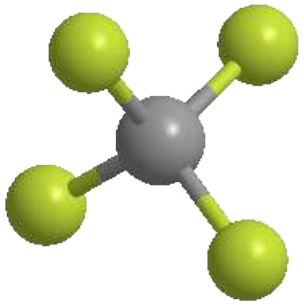

Net dipole moment =0 → non polar

Important terms from the first lecture:

- give up : يخسر
- accept : يستقبل و يحصل
- retain : يحافظ
- atomic number : العدد الذري
- mass number : العدد الكتلي
- atomic orbital : مدار ذري زي spdf
- shell : المستوى
- outermost shell : المستوى و المدار الابعد
- Valence electron : الكترونات التكافؤ
- configuration: الترتيب
- coordinate covalent bond : رابطة تساهمية تناسقية
- acquire : تكسب
- permanent : دائم
- attract :جذب