ملخص كيمياء سنة تحضيري

Chapter 2

الأستاذة : سامية النجار
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Chapter 2 : atoms , molecules , ions , and periodicity

The three most important laws that led to the development and acceptance of the atomic theory are:

1. •Law of the Conservation of Mass
2. •Law of Definite Proportions
3. •Law of Multiple Proportions

2.2 modern atomic theory and the law that led to it :

1- law of conservation of mass: (A. lavoisier)

in chemical reaction matter is neither created nor destroyed .

total mass of reactance = total mass of products

or total number of reacting atoms = total number of products atoms

example :

7.7 g Na + 11.9 g cl_2 = 19.6 Na cl_2

2- the law of definite proportions by(joseph proust) (قانون النسب الثابتة):

All samples of a give compound regardless of their source or how they are prepared have the same proportion of their constituent element . this law by(joseph proust)

ان كل مركب كيميائي مهمها اختلفت طرق تحضيره فانة يتركب من عناصره نفسها متحدة مع بعضها البعض بنسب ثابتة والذي توصل لهذا القانون العالم بروست

مثلا ملح الطعام سواء حصلنا عليه من مياه البحر او تم تحضي كيميائيا فانة يحتوي دائما على 39.3 من كتلته صوديوم و60.7 من كتلته كلور

For example : 18 g of water result of 16 g of oxygen and 2 g of hydrogen the ratio

Mass ratio = 16\2 =8 or 8 : 1

Example 1 page 44

Answer : for water 1.5 +12= 13.5 g

mass ratio = 12\1.50 = 8 or 8:1

3- the law of multiple proportions (قانون النسب المتضاعفة)by john Dalton للعالم جون دالتون

When two element from two different compound the masses of element B that combine with 1g of element A can be expressed as a ratio of small whole number .

عند اتحاد عنصران كيميائيان وتكوين اكثر من مركب واحد فان النسبة بين الكتل المختلفة من احد العنصرين التي تتحد مع كتلة ثابتة من العنصر الاخر تكون نسبة عددية صحيحه وبسيطة

مثال توضيحي : عندما يتحد كربون مع الأوكسجين ويكون مركبين يحتوي منها 4.82 جرام كربون لكل 6.44 جرام ويحتوي المركب الثاني على 20.13جرام كربون لكل 53.7 جرام فما نسبة في المركبين ؟

قانون النسب المتضاعفة = نسبة الكتلة لعنصر ما في مركب / نسبة الكتلة لنفس العنصر في مركب اخر

للمركب الاول للكربون = كتلة الكربون \كتلة الاوكسجين = 6.44\4.82 = 0.748

المركب الثاني للكربون = كتلةالكربون \ كتلة الاوكسجين = 53.7\20.13 = 0.374

ومن ثم نقسم النواتج في حال اعطانا عدد صحيح فان الحل صحيح

2 = 0.374\0.748

سؤال في الامتحان : اي من العبارات التالية ينطبق عليها قانون النسب المتضاعفة

Which of the following is the law of multiple proportions:

NO,NO2,N2Oهذه العبارة صحيحه لانه لدينا عنصرين وكون اكثر من مركب

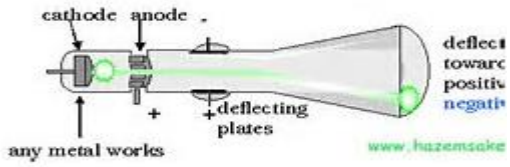
John Dalton and atomic theory : النظرية الذرية لدالتون(solid bullet model)

1- Atoms are small discrete indivisible piece of matter
المادة تتكون العديد من ذرات غير قابلة للتجزئة
2- All element are made up of particle called atoms
جميع العناصر مكونه من الذرات
3- An element's atoms are identical in size ,mass and chemical properties
ذرات العنصر الواحد لها نفس الحجم والكتلة والخواص الكيميائية
4- Molecules are simple whole number ratios of the combined element
ذرات العناصر ترتبط مع بعضها بنسب عددية صحيحه
5- Atoms of one element cannot change into atoms of another element in chemical reaction atoms change the way that they are bound together with other atoms to form a new substance
الاتحاد الكيميائي عبارة عن تغيير في توزيع الذرات[1]

2.3 the discovery of the electron : اكتشاف الالكترون

1- Thomson's experiment :

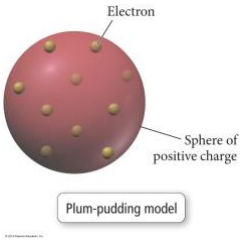
[1] (0580957642 - أ. سامية النجار (المدينة المنورة



Thomson using cathode rays (negative charge) conducted an experiment in which -ve charged electron(ray cathode) is placed near to magnetic field and detector is placed at the other side to detect the electron

اجرى تومسون تجربه بحيث انحرفت الأشعة الناتجة من الكاثود عندا تعرضت لمجال مغناطسي الي ناحية الانود مما ادى الي اكتشاف الالكترون

Discovered the electron and determined the electron's charge-to-mass ratio
اكتشف الالكترون و حدد شحنه الالكترون الى حجمه



plum – pudding model of the atom (j.j. Thomson)

The atom is composed of positive cloud of matter in which electrons are embedded

ان الذرة متكونه من سحابة موجبه يتغلل من خلالها الالكترونات

Explains the positive , negative charged behavior of matter

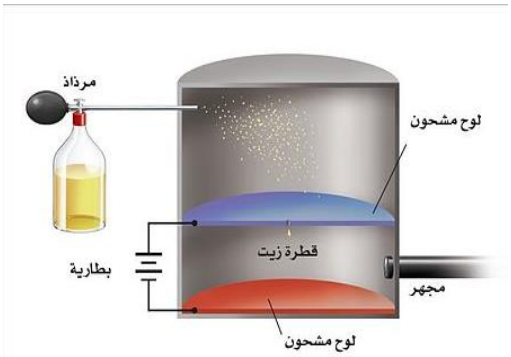
2- Millikan oil experiment :

This experiment conducted to measure the charge of electron

هذه التجربة تم اكتشاف شحنه الالكترون

The result :

1- Electron charge = -1.60×10^{19} c negative charge
2- Electron mass = 9.1×10^{-28} g is so small

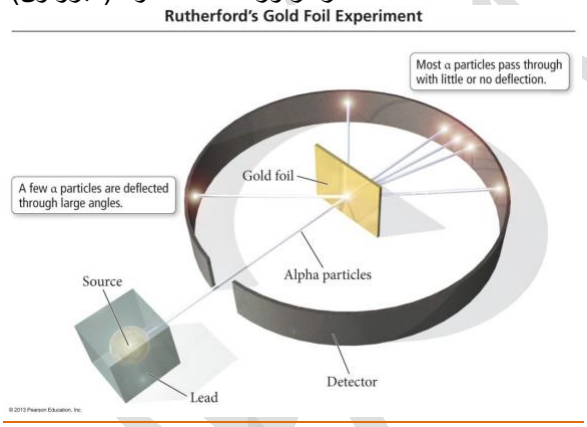


Led to determining the charge of the electron. التجربة حددت شحنه الالكترون

2-4 : the structure of the atom شكل الذرة

1- John Dalton : the atoms are solid bullet(كرة صماء)
2- Thomson : (plum – pudding model) the atom is composed of positive cloud of matter in which electron are embedded
نموذج طومسون للذرة هو ان الذرة عباره سحابه موجبة يتخللها الالكترونات
3- **Rutherford gold foil (using α rays it is positive charge)**

Discovered the atom's nucleus (protons)& disapproved the plum-pudding model.
راذرفورد اكتشف النواة (البروتون)



The result from experiment : نتائج التجربة

1- The atom contain a tiny ,dense center called nucleus
الذرة لها مركز صغير جدا يدعى النواه
2- The nucleus has essentially the entire mass of atom and the electron weigh so little they give practically no mass to the atom.
تتركز كتلة الذرة في النواة (لأن كتلة الالكترونات صغيرة جدا مقارنة بكتلة النواه ة
3- The nucleus is positively charged
النواه موجبة الشحنة ^{2}
4- The mount of positive charge balance the negative charge the electron .

الذرة متعادلة كهربيا لأن عدد الشحنات الموجبة يساوي عدد الشحنات السالبة (الالكترونات).

5- The electron are dispersed in empty space of the atom surrounding the nucleus.
ينتشر الالكترونات في مساحة فارغه من الذرة المحيطة بالنواه

6- Rutherford model (solar system) the atom is mostly empty space with dense center of mass (nucleus) and circling electron that had the same amount of charge as electron but opposite sign
نموذج رذرفور هو النظام الشمسي وان الذرة غالبا عن فراغ وتتركز الكتلة في النواه والالكترونات تدور حولها وان النواه لها نفس كمية شحنه الالكترونان ولكن مختلفة بالإشارة
And these particle are called protons
Charge = + 1.60×10^{19}c
Mass= 1.67262×10^{-24}
Since the proton and electron have the same amount of charge
عدد البروتونات = عدد الالكترونات

2-5 subatomic particles proton , neutrons and electrons in atoms ;

Rutherford's student (**J. Chadwick**) developed the nuclear theory and proposed that there are neutral particles within the nucleus called neutrons (uncharged)
العالم جيمس شادويك اكتشف النيترون و هو ليس له شحنه
The number of protons in the nucleus of an atom is called the" **atomic number**" and is referred to as **"Z",** it's considered as the "**finger print "**of any element
.

Elements: Defined by their Number of Protons

طالب ررفورد طور نظرية النواه واستنتج انه يوجد جسيم في النواة ويدعى نيترون وهو متعادل الشحنة

Atoms (particles) are composed of three subatomic particles :[3]

Subatomic particle	Charge	Mass (g)	Mass (amu)
Proton	+1	1.67262×10^{-24}	1
Neutron	0	1.67262×10^{-24}	1
electron	-1	9.1×10^{-28} g	Negligible

Proton and neutron are located within the nucleus (mass of atom) but the electron are moving outside around the nucleus .

البروتونات والنيترونات موجودان في النواه والتي تشكل كتلة الدرة والالكترون يتحرك بالخارج حول النواه

The number of protons located in an atom's nucleus determines the **element's identity.**
عدد البر ونوتات الموجودة في النواه هي التي تحدد هوية العنصر

Atomic number (Z): it is number of protons inside the nucleus that determines the element identity

عدد البروتونات في اي ذرة و يحدد العدد الذري للعنصر

Mass number (A) :the sum of the number of proton and neutron in an atom

[3] (0580957642 - أ. سامية النجار (المدينة المنورة

عدد الكتلة : هو مجموع عدد البروتونات والنيترونات في الذرة

Each element has unique name and symbol.

كل عنصر له اسم ورمز

The element are arranged on the periodic table in order in of their atomic number

العناصر مرتبة في الجدول الدوري بناء على العدد الذري

Isotopes : النظائر

Some element have atoms of different mass only because these atoms fifer in the number of neutron

They differ in mass because these elemental atom have different number of neutron

الاختلاف في الكتلة لأنه يختلف في عدد النيترونات

They are same element because they have the same number of proton

التشابه بسبب له نفس عدد البروتونات

Isotopes are atoms of an element have the same number of protons (atomic number) and different number of neutrons.

النظائر هي ذرات تحتوي على نفس عدد البروتونات او العدد الذري وتختلف في عدد النيترونات

They differ in mass and mass number because these element atoms have different number of neutrons

Isotopes are identified by their mass numbers(e.g. C-12 , C-13 , C-14)

Protons + neutrons = mass number

Isotopic symbol:

Isotopes: When The Number of Neutrons Varies

Isotopic symbol :

$^{A}_{Z}X$**.....A= MASS number , ...Z= ATOMIC number**

AL^{13}_{27} **..... 27 is atomic number (Z) .....13 atomic mass**

MASS NUMBER = number of proton + number of neutron

Mass number= proton +neutron

how many proton and neutron are in the following :[4]

	Proton	Electron	Neutron
S_{16}^{32}	16	16	32-16=16
Cu_{29}^{65}	29	29	65-29=36
U_{92}^{240}	92	92	240-92=148

Ions losing and gain electron :

The charge of an ion is shown in the upper right corner of the symbol.

IONS: are atoms or groups of atoms with a positive (+) or negative (-) charge and they are formed by losing or gaining electrons .
الايون هو عبارة عن ذرة او مجموعه من الذرات وتحمل شحنه سالبه او موجبة و يكون اما ان يكسب او يفقد الكترون

Example:

for losing :

$11\ Na^{+} \rightarrow e^{-} + 10\ Na^{+}$ (cation) عند فقدان الكترون يحمل شحنه موجبه ويسمي

METALS tend to form cations to achieve the "FULL SHELL" look
الفلزات تميل دائما الي فقدان لكي تصل الاستقرار

A CATION:
forms when an atom loses one or more electrons from its outer (valence) shell (energy level).
الايون الموجب هو فقدان الكترون او اكثر من مستوى الطاقة
Cations are positively charged because the atom has more protons (+) than electrons (-)
الايون الموجب يحمل شحنه موجبة الان عدد البروتونات في الدرة اكثر من الالكترونات
.

For example :

Mg atom has 12 protons & 12 electrons.
المغنسيوم له 12 بروتون و12 الكترون
Mg^{+2} ion has 12 protons & 10 electrons.
عند فقد الكترونين تصبح عدد البروتونات 12 و10 الكترون

An ANION:
forms when an atom gains one or more electrons into its outer (valence) shell (energy level).
الايون السالب هو كسب الكترون او اكثر من مستوى الطاقة
Anions are negatively charged because the atom has fewer protons (+) than electrons (-).
الايون السالب يحمل الشحنة السالبة لان عدد البروتونات اقل من عدد الالكترونات
F atom has 9 protons & 9 electrons

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الفلور لدية 9 بروتونات و9 الكترونات.

F^{-1}ion has 9 protons & 10 electrons.

For gaining (adding): $Cl_{17} + e^{-} \rightarrow Cl_{18}$ (anion عند كسب الكترون يحمل ش[5]حنه سالبة ويسمى

NONMETALS tend to form anions to achieve the "FULL SHELL" look.

اللافلزات تميل دائما الي كسب الكترون لكي تصل للاستقرار

2-6 : the periodic law and periodic table :

Dmitri Mendeleev (ماندليف): developed the first periodic table he proposed that :

1- When the element are arranged in order of increasing **atomic mass** certain set of properties recur periodically
   ترتب العناصر من ناحية التزايد في الكتلة الذرية وتوضع في مجموعه
2- Some element have similar physical and chemical properties be arranged them in columns.
   بعض العناصر لها نفس الصفات الفيزيائية والكيميائية توضع في عمود

To be periodic means to exhibit a **repeating pattern.**

The Periodic Law : When the elements are arranged in order of increasing mass ; certain sets of properties recur periodically.

القانون الدوري هو ان العناصر مرتبة في الجدول الدوري بناء عن الزيادة في العدد الكتلي قديما (مندليف)

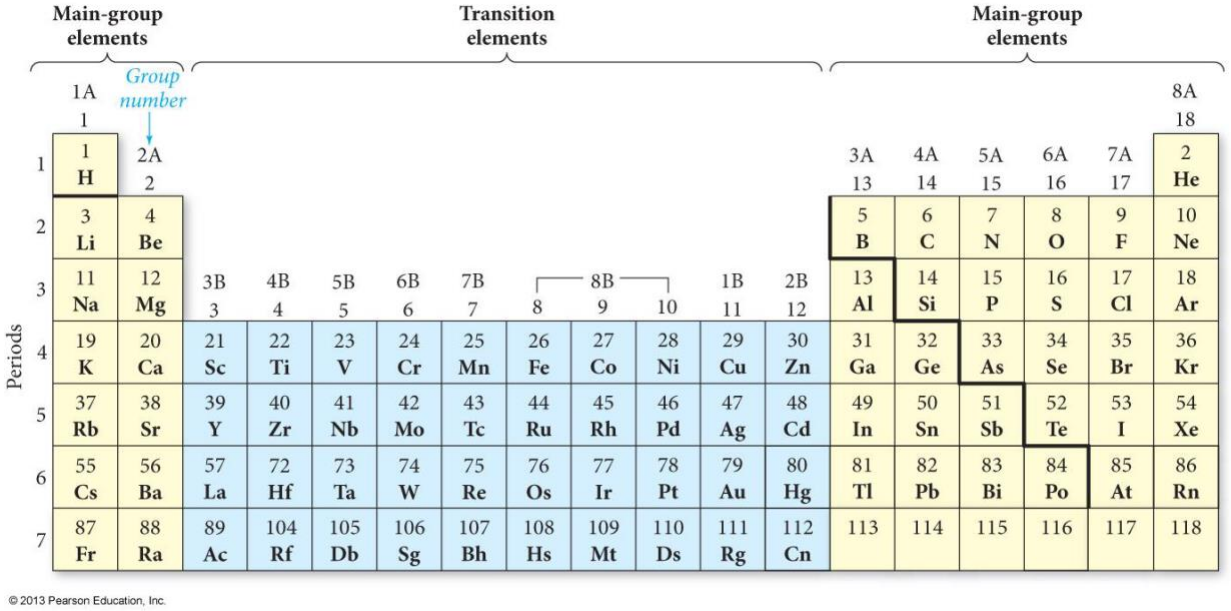
الجدول الدوري الحديث: Modern periodic table

Using atomic number instead of atomic mass as the organizing principle was first proposed by the British chemist **Henry Moseley in1913.**

Henry Moseley (باستخدام العدد الذري بدل من العدد الكتلي نظمه العالم)

1- Element are arranged from left to right in increasing atomic number (number of proton Z) rather than atomic mass as Mendeleev
   العناصر مرتبة من اليسار الى اليمين بازدياد العدد الذري بخلاف الجدول الدوري لماندليف
2- Rows in periodic table are called periods
   الصفوف في الجدول الدوري تسمى دوره
3- Columns in periodic table are called groups or families of element with similar properties
   الأعمدة في الجدول الدوري تسمى مجموعه او عائلة ولها نفس الخواص
4- The modern periodic table is organized in 8 main groups with latter A1….8A
   في الجدول الدوري الحديث مرتبة بمجموعات من 1-8
5- There are series of element lie between the main group 2 and 3 are called transition element with latter B
   العناصر التي بين المجموعة 2 والمجموعة 3 تسمى العناصر الانتقالية وتعبر بالحرف B
6- Main-group elements tend to form ions that have the same number of valence electrons as the nearest noble gas
   تميل عناصر المجموعة الرئيسية إلى تكوين أيونات لها نفس عدد إلكترونات التكافؤ كأقرب للغاز الخامل كما في المجموعة الثامنة

[5] أ. سامية النجار (المدينة المنورة - 0580957642)



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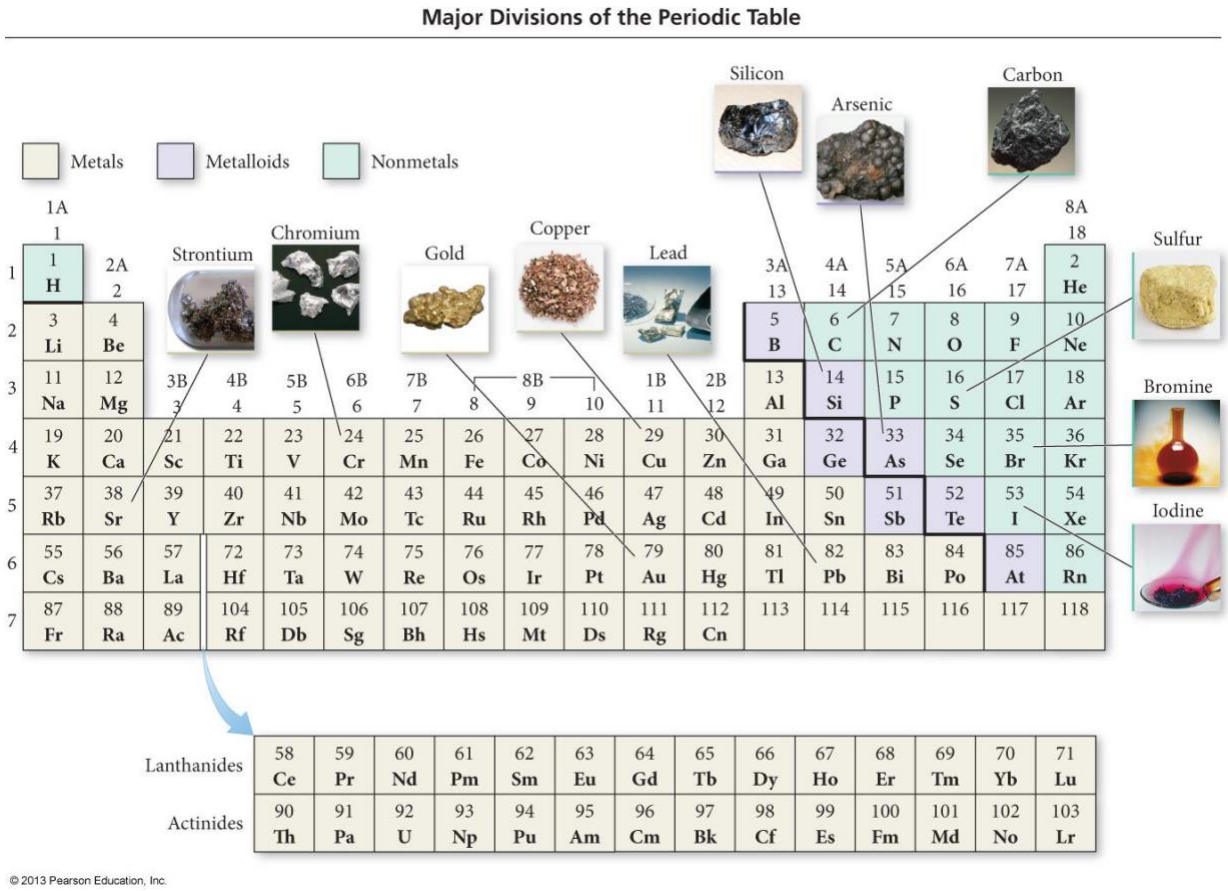

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Metals : الفلزات

They lie on lower left side and middle of periodic table they are:

1- Conduct heat and electrical current (موصل جيد للحرارة والكهرباء)
2- Malleable and ductile (shaped in sheet and wire قابل للطرق واسحب ويشكل منة صفائح واسلاك
3- About 75% of the elements in the period table are metals. 75 % العناصر الموجوده في الجدول الدوري هي فلزات
4- Lose electrons and form cations تفقد الكترونات لتكون الكيتونات
5- Shiny لامعه
6- Solids at room temperature, **except Hg is liquid** صلبة في حرارة الغرفة ماعدا الزئبق هو سائل

Nonmetals : اللافلزات

They lie on the upper right said of the periodic table.

1- Can be found in all three states (gas, liquid, & solid) of matter يمكن ان تجدها في الثلاث حالات الصلبة والسائلة والغازية

[7] (0580957642 - أ. سامية النجار (المدينة المنورة

2- Poor conductors of heat & electricity غير موصلة للحرارة او الكهرباء
3- Solids are brittle صلابتها هشة
4- Gain electrons to become anions تكتسب الإلكترونات لتصبح انون
5- Except for H, found mostly in the upper right of the periodic table ماعدا الهيدروجين موجود في الجزء العلوي من جهة اليمين في الجدول الدوري

Metalloids اشباه الفلزات
semiconductors :

They lie along zigzag line between metals and nonmetals , so
1- They have mixed properties they are solid لها خواص مختلفة وتكون صلبة
2- They are poor of conductor of heat غير موصلة للكهرباء او الحراره
3- They are known **semiconductors** **تعرف**
4- Solid at room temperature صلبة في حرار الغرفة العادية

Ions of the main group element :

In general :
1- Alkali metals (group A 1) are very reactive and have a tendency to lose one electron and +1ions
2- Alkaline earth metals (2A group 2)are reactive but less than group 1A they have tendency to lose two electron and form+2

They are fairly reactive ,but not quite as reactive as the alkali metals (group1A). Calcium ,for example ,reacts fairly vigorously with water.
Other alkaline earth metals include magnesium(a common low-density structur almetal),strontium ,and barium

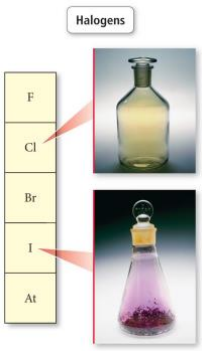
3- Halogens (group 7A)are very reactive and tend to gain one electron and form -1 ions

They are always found in nature as a salt.
المجموعة السابعة دائما توجد في الطبيعة كملح

Chlorine, a greenish-yellow gas with a pungent odor

Bromine, a red-brown liquid that easily evaporates into a gas

Iodine, a purple solid



Fluorine, a pale-yellow gas

4- Noble gas or inert gases (group 8 A)are unreactive so they have no tendency to lose or gain electron
الغازات الخاملة في المجموعة الثامنة وهي غير نشطة كيميائيا في لاتميل لان تفقد او تكتسب الكترونات

5- The most familiar noble gas is probably helium, used to fill buoyant balloons .Helium is chemically stable (it does not combine with other elements to form compounds),and is there for safe to put into balloons. واكثر عناصر الغازات النبيلة شيوعا هو الهيليوم ويستخدم في تعبئة البالونات
وهو كيميائيا مستقر أي لا تتفاعل مع عناصر اخرى وهو اكثر امانا

6- Other noble gases are neon(often used in electronic signs)

7- Main group element that form cation (metals) carry charge equal to group number
For example :
Na in group 1A form cation with one charge Na^{+1}
Main group element that form anions (nonmetal)carry charge equal to (group -8)
Cl =7-8= -1
Transition element from various ions with different charge so no rules to predict
Finally :
Metal and nonmetal tend to lose or gain electron to reach the electron configuration of nearest noble gas
[8]

2-7 : Atomic mass and isotopes:

The atomic mass of element is not a simple whole number of atomic mass unite (amu) but it is an average mass of all of its atoms (isotopes)

Atomic mass = $\sum natural\ abundance\ of\ isotope * mass\ of\ isotope$

Example[9] :

Calculate the atomic weight of Mg isotopes given that 79% Mg-24 10% Mg – 25 11%Mg-26?

First: convert percent(to $\div 100$) decimal

Atomic weigh = (0.79*24)+ (0.10*25)+(0.11*26)= 24.3

2.8. Molar Mass: Counting Atoms by Weighing Them:

The Mole: The "Chemist's Dozen": Chemistry is quantitative in nature;
Its unit is the mole.
Mole : to calculate the a mount of substance in chemical reaction chemists use the stander quantity called mole where:

1 mole of any substance contains Avogadro's number ($6.022\times 10^{23}\ partical$)

1 mole= $6.022\times 10^{23}\ partical$)

[8] (0580957642 - أ. سامية النجار (المدينة المنورة
[9] (0580957642 - أ. سامية النجار (المدينة المنورة

In periodic table each element has molar mass (e.g carbon has atomic mass 12) it means the mass of element per one mole

So, **mole =** $\frac{mass}{molar\ mass}$

Mass : the mass given for element or compound molar mass is the atomic mass of element (from periodic table)or molecular mass of compound (sum of atomic masses of all molecule atoms) .

Example : how many Mg atoms in 0.200g ?

mole = $\frac{mass}{molar\ mass}$ = $\frac{0.200g}{24.31}$ = 8.23 $\times 10^{-3}$ mole (24.31 from periodic table)

we know :

1 mole= 6.022$\times 10^{23}$ $partical$)

8.23 $\times 10^{-3}$ mole = ??????? atom

= $\frac{6.022\times10^{23}\times 8.23\ \times10^{-3}}{1\ mole}$ = 4.95 $\times 10^{21}$ atoms

How many H_2O molecules are in 5 g?

Molecular mass = $\sum number\ of\ element * atomic\ mass\ of\ element$

Molar mass = (1*2)+(1*16)= 18 g

Moles = 5\18 = 0,278 mol

Convert mole to molecules

1 mole= 6.022$\times 10^{23}$ $partical$)

0.278 mole = ??????? atom

$\frac{6.022\times10^{23}\times 0.278}{1\ mole}$ = 1.67$\times 10^{23}$ molecules

How many grams of Co_2 are in 6.75$\times 10^{22}$ molecules of Co_2?

Convert molecules to mole :

1 mole ..... 6.022×10^{23} molecules

???? mole .....6.75$\times 10^{22}$ molecules

حاصل ضرب وسطين في طرفين

$\frac{1*6.75\times10^{22}}{6.022\times10^{23}}$ = 1.12×10^{-1} moles Co_2

Molar mass $(Co_2) = 1 * 12 + 2 * 16 = 44g\backslash mol$

Mass $(Co_2) = (1.12 \times 10^{-1})(44) = 4.93g$

How many moles of CL_2 are present in 71.0 g CL_2?

Relation between moles and mass is mole = mass\ molar mass

So the molar mass for $CL_2 = 2 * 35.5 = 71g\backslash mole$

Moles = 71.0\71 = 1mole

2-10 : Electron Configuration: التوزيع الالكتروني

Niels Bohr's Model: the electrons move in spherical orbits at fixed distances from the nucleus (similar to structure of the solar system).
نموذج بور ان الالكترونات تدور في مدارات وبمسافات ثابت عن النواة مثل النظام الشمسي

Erwin Schrödinger develops mathematical equations to describe the motion of electrons in atoms. His work leads to the electron cloud model. شوجندر طور المعادلات الحسابية التي تصف حركه الالكترونات في الذرة وهذا العمل نتج عنه ما يلي:

quantum mechanics الاعداد الكم:

electrons location in atom is described by four quantum number (n ,l , ml, ms)

n (principle energy level) مستوى طاقة الرئيسي

l (orbital type: s, p, d, f…) الفرعية

ml(orientation of orbital)

ms (spin of electron in orbital)

where according to(pauli exclusion principle) مبدا باولي للاستبعاد
(no two electrons in an atom can have the same four quantum number)
ينص هذا المبدأ على أنه لا يمكن أن تتساوى الأعداد الكمية الأربعة لأي إلكترونين في ذرة واحد[10]
مثلا :
لا يمكن لإلكترونين في ذرة واحدة أن يكون لهم ذات أعداد الكم الأربعة؛
يجب أن يكون مختلفاً ms متشابهين بين إلكترونين أو أكثر، فإن mℓ، وℓ، وn فإذا كان
بمعنى أن كل واحد منهم يدور باتجاه معاكس للآخر،

1- **quantum number (n): المدارات الرئيسية**
It indicates the electrons principal **energy level** …. n = 1 …..7
مستويات الطاقة الرئيسية يتراوح عددها من 1 الي 7
The number of electron in principal energy level
e=$2n^2$ for example number of electron in level 2 …. E= 2(2)^2=8 electrons

2- **Angular quantum number(L) مستويات الطاقة الفرعية او الثانوية او الزاوي**
It indicates the electrons **orbital type** (s ,p ,d ,f)
L = 0 to n-1
اي عدد المستويات الفرعية التي تحت المستويات الرئيسة تنحصر من
0 الي n-1

L –value	0	1	2	3
Orbital	s	p	d	F

مثال بناء على الجدول السابق :

Principal quantum name	Principal quantum number	Angular quantum number(L)	Orbital
K	1	0	s
L	2	0,1	S, p
M	3	0,1,2	S ,p, d
N	4	0,1,2,3	s, p ,d, f

3- **Magnetic quantum number : (ml) عدد الكم المغناطسي**
مهم في تحديد عدد الأوربتل في كل مستوى فرعي
S 1 orbital(2 electron) , p 3 orbital(6 electron) , d 5 orbital(10 electron) , f 7 orbital (14 electron)
If L=1 , Ml=-1, 0,+1

1-	0	1+

If L=2 , ML= -2,-1,0,1,2

-2	-1	0	1	2

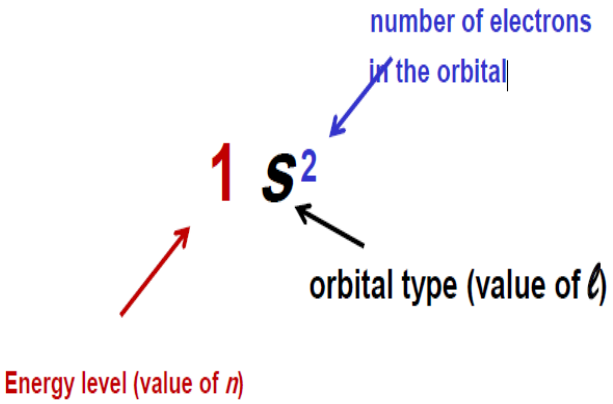
[10] (0580957642 - المدينة المنورة) أ. سامية النجار

4- Spin quantum number (ms) عدد الكم المغزلي:

It indicates the direction of electron spin in its orbital ($\frac{+1}{2}$, $\frac{-1}{2}$) اتجاه الالكترون مع عقارب الساعه او عكسها

مثال شامل لإيجاد الارقام الاربعة للإلكترون عند التوزيع الالكتروني .

	Principal quantum number(n)**or** level energy	Angular quantum number(L) **or** orbital type	Magnetic quantum number : (ml)	number of electrons in the orbital	Spin quantum number (ms)
Mg(12)= $1s^2 2s^2 2sp^6 3s^2$	3	L= S = 0	If L=0 ML=0	2	($\frac{+1}{2}$, $\frac{-1}{2}$)
P(15)= $1s^2 2s^2 2sp^6 3s^2 3p^3$	3	L= P = 1	If L= 1 ml= -1,0,1	3	($\frac{+1}{2}$, $\frac{-1}{2}$)



➢**The number of orbitals and maximum number of electrons in each sublevel:**

✓Each **orbital** in any sublevel is able to hold a maximum of 2 electrons:

–The **s** sublevel has only one orbital and can therefore hold only 2 electrons. في مستوى الطاقة الفرعي س لة مدار واحد يحمل 2 الكترون

–The **p** sublevel has three orbitals and can therefore hold 6 electrons.

في مستوى الطاقة الفرعي بي لة 3 مدارت ويحمل 6 الكترونات

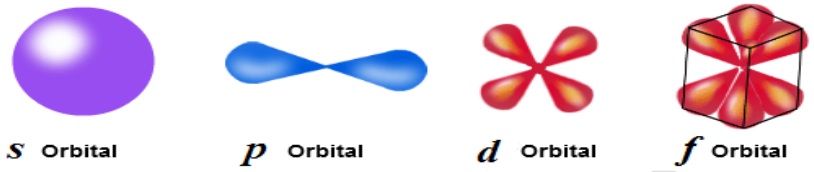
–The **d** sublevel has five orbitals and can therefore hold 10 electrons.

–The **f** sublevel has seven orbitals and can therefore hold 14 electrons.

✓The maximum number of electrons that can occupy a specific energy level can be calculated using the following formula:
اكبر عدد ممكن من الالكترونات في مستوى الطاقة الرئيسي يعطى بالعلاقة التالية

Electron Capacity = $\mathbf{2n^2}$

where **n** = the principal quantum number (the number of the energy level).



Electron Configurations:

For the above quantum mechanics there are four different type of orbitals the atom :

(s , p ,d ,f) the maximum number of electron in these orbitals s^2 , p^6 , d^{10} , F^{14}

Energy of ordering of electron : مستويات الطاقة للإلكترون

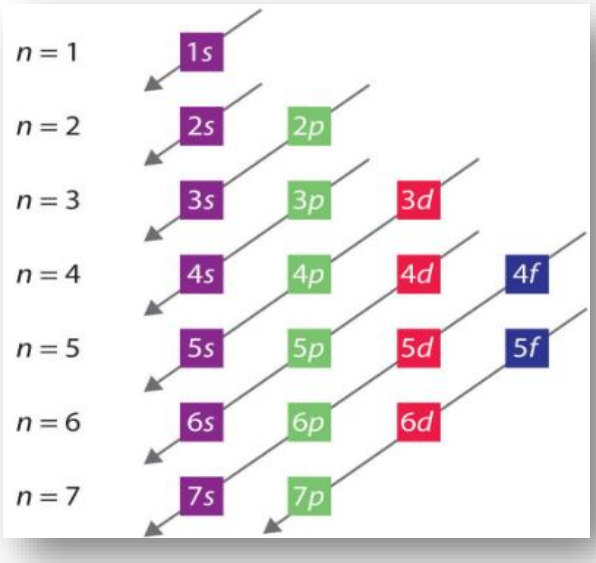
Electrons are arranged around an atom's nucleus according to the Aufbau principle or building up Principal . الالكترونات مرتبة حول نواه الدرة على مبدأ اوف باو او البناء التصاعدي

Electrons enter the lowest energy level (n) and orbitals (ℓ) available
n +L rule

تدخل الإلكترونات في مستويات الطاقة الفرعية ذات الطاقة المخفضة .

Aufbau principle or building up Principal : مبدا اوف باو او مبدأ البنية

The electron fill the orbital s in order of increasing energy started with the lowest energy level orbital available. الالكترونات تتوزع بازدياد الطاقة مبتدأ بالأقل في الطاقة ثم الاعلى



according to the (n + L) :

2S = n+L = 2+0 =2

2P = n+L = 2+1 =3 that mean s filled with electrons befor p.

Example Electron Configurations with noble gas : التوزيع الالكتروني بدلالة الغازات الخاملة

noble gas notation

التركيب الإلكتروني	العدد الذري	الرمز	التركيب الإلكتروني بدلالة المتصر النبيل
Na : $1s^2$ $2s^2$ $2p^6$ $3s^1$	١١	Na	[Ne] $3s^1$
Mg : $1s^2$ $2s^2$ $2p^6$ $3s^2$	١٢	Mg	[Ne] $3s^2$
Al : $1s^2$ $2s^2$ $2p^6$ $3s^2 3p^1$	١٣	Al	[Ne] $3s^2$ $3p^1$
Si : $1s^2$ $2s^2$ $2p^6$ $3s^2 3p^2$	١٤	Si	[Ne] $3s^2$ $3p^2$
P : $1s^2$ $2s^2$ $2p^6$ $3s^2 3p^3$	١٥	P	[Ne] $3s^2$ $3p^3$
S : $1s^2$ $2s^2$ $2p^6$ $3s^2 3p^4$	١٦	S	[Ne] $3s^2$ $3p^4$
Cl : $1s^2$ $2s^2$ $2p^6$ $3s^2 3p^5$	١٧	Cl	[Ne] $3s^2$ $3p^5$
Ar : $1s^2$ $2s^2$ $2p^6$ $3s^2 3p^6$	١٨	Ar	[Ne] $3s^2$ $3p^6$
K: $1s^2$ $2s^2$ $2p^6$ $3s^2 3p^6$ $4s^1$	١٩	K	[Ar] $4s^1$
Ca : $1s^2$ $2s^2$ $2p^6$ $3s^2 3p^6$ $4s^2$	٢٠	Ca	[Ar] $4s^2$

Na has an atomic number of 11, so to be neutral it must have 11 electrons.

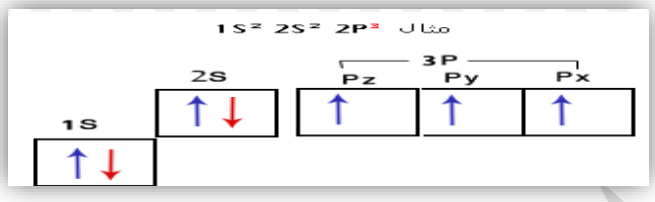
Na : $1s^2$ $2s^2$ $2p^6$ $3s^1$

Another way to write its electron configuration is using “noble gas notation”:

$[Ne]\ 3s^1$

Hund’s Rule: If two or more orbitals with the same energy are available, one electron goes into each until all are half-full. The electrons in the half-filled orbitals all have the same value of their spin quantum number. لا يحدث ازدواج بين الكترونين في مستوى فرعي الا بعد ان تشغل اوربيتالاته فرادي و في نفس الاتجاه

In another way : when placing electron in an orbital of same energy the electrons are first placed singly



Valance electron : the sum of electron that are present in the outer energy level of the atom **or**

electrons in all the sublevels within the highest principal energy level (**n**).

عدد الأكسدة او اعداد التكافؤ : هي مجموع الالكترونات الموجود في مستوى الطاقة الخارجي او الاخير

For example :

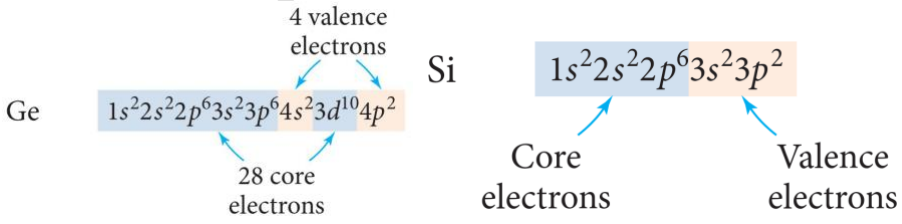
Na^{11} = $1s^2$, $2\ s^2 2\ p^6$, $3\ s^1$

The valance electron = 1

The core electron = 10

The core electron :with the nearest noble gas (the sum of electron 2+2+6= 10) **or**

electrons in all lower energy levels (i.e. all shells except the valence shell).



Transition metals العناصر الانتقالية

- Their valence shell contains d electrons
- d electrons first appear in the 4th period
- 3d electrons in 4th period

– 4d electrons in 5th period

– 5d electrons in 6th period

– 6d electrons in 7th period

● Inner transition metals العناصر الانتقالية الداخلية

− Their valence shell contains f electrons

• f electrons first appear in the 6th period

– 4f electrons in 6th period

– 5f electrons in 7th period

Electron Configuration for Ions: التوزيع الالكتروني للأيونات

During the chemical reaction the electrons are removed from or added to the valence shell (outer most energy level) forming cation or onions بما ان التفاعلات الكيمائية هي عبارة عن اضافة او نزع الكترونات من المدارات الخارجية مكونة الكيتونات والانيون

Ions :

1- Cations

Number of electron < number of proton عدد الالكترونات اقل من عدد البروتونات

Metals form cation

Na^{11} = $1s^2$, $2\,s^2 2\,p^6$, $3\,s^1$

Na^{+1} =$1s^2$, $2\,s^2 2\,p^6$ التوزيع الالكتروني للكتيون فقد الكترون واحد من المدار الخارجي

Na lose one electron to be stable like Ne^{10} وهي تفقد الالكترون محاولة الوصول الي حالة الاستقرار اي شبيه الغازات الخاملة

$Na^{+} = Ne^{10}$

2- Onions

Number of electron > number of proton عدد الالكترونات االكبر من عدد البروتونات

non Metals form Onions

Cl^{17} = $1s^2$, $2\,s^2 2\,p^6$, $3\,s^2$ $3p^5$

Ne^{10} $3\,s^2$ $3p^5$

Cl atoms gain one electron to be stable Ar^{18}

$cl^{-} = Ne^{10}$ $3\,s^2$ $3p^6$ or Ar^{18}

*The number of valence electrons largely determines the behavior of an element.

Chemical and some physic l and reactivity عدد الكترونات التكافؤ تحدد سلوك العنصر الكيميائية والفيزيائية ونشاطها

The number of valence electrons follows a periodic pattern; the properties of the elements should also be periodic عدد الكترونات التكافؤ تتبع النمط الدوري من ناحية الخصائص للعناصر

Effective nuclear charge (Z_{eff}) فعالية شحنة النواة

It is the pull/force an electron OUTER shell "feels" from the nucleus (protons).
هي قوة سحب الالكترون الموجود في المدار الخارجي الي النواه

Or Is the amount of charge that actually affects the nucleus on the electron in its external field
هي مقدار الشحنة المؤثرة فعليا من النواه على الالكترون في مجاله الخارجي

The closer the electrons are to the nucleus, the greater the "pull" on the electrons.
كلما اقتربت الالكترونات من النواه زادت قوة السحب الإلكترونات

The greater the Z_{eff} the more tightly the electrons are held and the more energy needed to remove the electrons. كلما زادت قيمة فعالية الشحنة هدا يعني ان الالكترونات اكثر قوة وبالتالي نحتاج لطاقة اكبر لإزالة الالكترون

Energy of The electron in valence shell have less Z_{eff} so they are easily removed

Z_{eff} explains the reason for the periodic properties and trends of the elements. فاعيلة الشحنة تشرح الخصائص الدورية للعناصر

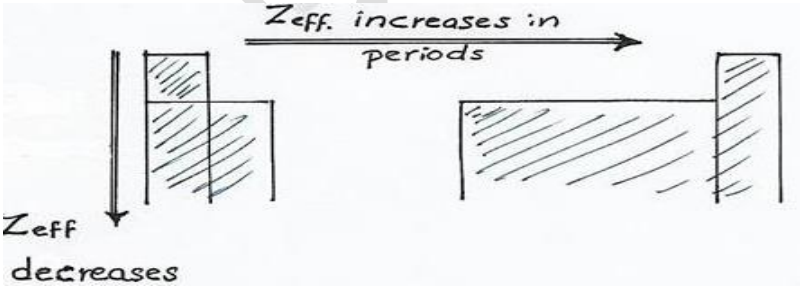
- Z_{eff}f general trend: فاعلية الشحنة بشكل عام

Z_{eff} increases going across periods **or** in the period the atomic number increases thus increasing the number of proton and increasing Z_{eff} and increases attract or pull external electrons
في الدورات يزداد العدد الدري وبالتالي يزادا عدد البروتونات ومنه تزداد الشحنة الفعالة وتزداد جدب الالكترونات الخارجية

Z_{eff}decreases going down periods. تقل فاعلية الشحنة في المجموعات من اعلى الي اسفل

Or

One group as we move from the top of the group downwards increases the orbits so increasing the number of electrons to the nucleus from the external electrons (so the inner electrons increase and Z_{eff}decreasing
المجموعة الواحدة كلما انتقلنا من اعلى المجموعة لا سفلها تزيد المدارات بالتالي يزداد عدد الالكترونات القريبة من للنواة عن الالكترونات الخارجية



We can found the Z_{eff} :

= [Z (atomic #) - (# inner electrons)] العدد الذري – عدد الالكترونات الداخلية

مثلا عنصر المغنسيوم العدد الذري له 12 وهو في المجموعة الثانية وعدد التكافؤ له +2وبالتالي عدد الالكترونات الداخلية 10

فتصبح المعادلة كالتالي :

$$Z_{eff} = 12 - 10 = 2$$

Example 2 :

Z_{eff} = [Z (atomic #) - (# inner electrons)]
Pull felt by 2s electron in Li $Z_{eff} = 3 - 2 = 1$

Nuclear charge shielding effect :

The inner (core) electron in an atoms shielding the outer electrons from the positive nuclear charge .

But Z_{eff} increases across the period due to the incomplete shielding by core electron in subshell

Shielding ability of subshell

s > p > d > f

Ionization Energy : طاقة التأين

IE is the energy required to remove an electron from an a tome هي الطاقة الازمة لنزع الكترون من الذرة

Ionization energy is increased in period due to an increase in the atomic number . The increase in the number of protons thus increases the strength of the Z_{eff} to attract electrons.

طاقة التأين تزداد في الدورات ودلك بسبب ازدياد في العدد الدري اي ان زياده في عدد البروتونات فالتالي تزيد قوة شحنة الفعالة لجذب الإلكترونات

For one group from up to down , the ionization energy is increased as the radius increases (as the atomic number increases and the orbits increase), the external electrons move away from the nucleus ... to make it easy to lose, you need small ionizing energy to remove it.

لمجموعة الواحدة من اعلى الى اسفل.. حتقل طاقة التأين لإنو يزداد نصف القطر (عشان العدد الذري ازداد فزادت المدارات) فابتعدت الكترونات الخارجية عن النواة ... لدلك يسهل فقدها تحتاج لطاقة تأين صغيرة لنزعها .

Atomic radius : نصف قطر الذرة

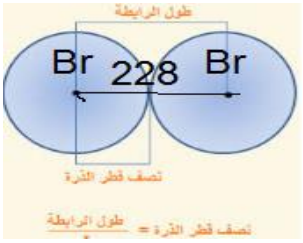
هي نصف المسافة بين نواة درتين متماثلتين في جزئ ثنائي

The bonding atomic radius or covalent radius (نصف قطر الذرة بين ذرتين متشابهتين)

1- Metals : one – half distance between two of the atoms next to each other in a crystal of the metal .
2- Nonmetals : one – half distance between two of the atoms next to each other

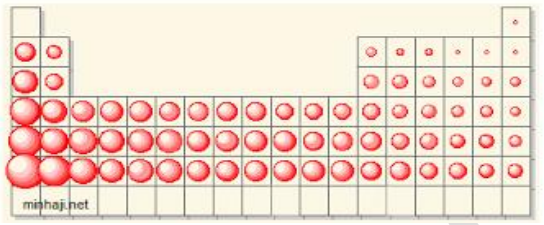
Example : the distance between Br atoms in Br_2 = 228 pm find the atomic radius?

atomic radius = $\frac{\text{distance between two of the atoms}}{2} = \frac{228}{2}$ = 114 pm



-as you move down a Colum (or group) in periodic table atomic radius increases

- as you move to the right across a raw (or period) in periodic table atomic radius decreases



عند التحرك من اعلى المجموعة الي الاسفل يزداد نصف قطر الذرة لأنه تزداد عدد المدارات وتعمل المدارات المكتملة على حجب قوة جدب النواه للإلكترونات بعكس الدورات يزيد عدد البروتونات ولا تزيد المدارات ولكن يزيد الكترون واحد في نفس المدار فتزداد قوة جذب النواه للإلكترون

When moving from the top of the cluster to the bottom, the radius of the atom increases as it increases the number of orbits. The completed orbits act to block the force of the nucleus of the nucleus. In contrast, the cycles increase the number of protons and the orbits do not increase, but one electron increases in the same orbit and The power of attraction of the nucleus increases

Electron Affinity (EA) :it is the change in energy when a atom gain an electron to form or to accept electrons into the valence shell

Electron Affinity depend on the electron repulsions and the volume of the atom

Electron Affinity increases in the period from left to right because the size of the atom is decreases and easy to pull the electron to the nucleus and because it will reach the state of stability and stability as inert gases and therefore will seek to add electron and thus increase Electron Affinity

In the groups the Electron Affinity is reduced due to the increase in the number of electrons and the radius

تزيد الالفة الالكترونية في الدورة من اليسار لليمين لانة حجم الذرة يقل فيسهل جدب الالكترون للنواة لأنها سوف تصل لحالة الثبات والاستقرار كالغازات الخاملة وبالتالي سوف تسعى لإضافة الكترون وبالتالي تزيد الالفة الالكترونية

في المجموعات تقل الالفة الإلكترونية بسبب زيادة عدد الالكترونات ونصف القطر

EA greatest for halogens

EA greater for nonmetals vs. metals

A LARGER EA value means a very STABLE ion.

Larger EA is more negative energy

More stable

EA(nonmetals) for anions > EA(metals) for cation

EA is greatest for halogens group so halogens from highly stable anions

EA for fluorine < EA for chlorine because f atom has smaller volume so greater electron repulsion

EA(group1) > EA (group2)

Because group 2 element have a full valance shell

EA (group 8) = 0 because noble gas have full valance shell so they are quite stable energetically

Metallic Character:

Metallic character of an element is about how closely its properties match the ideal properties of a metal.

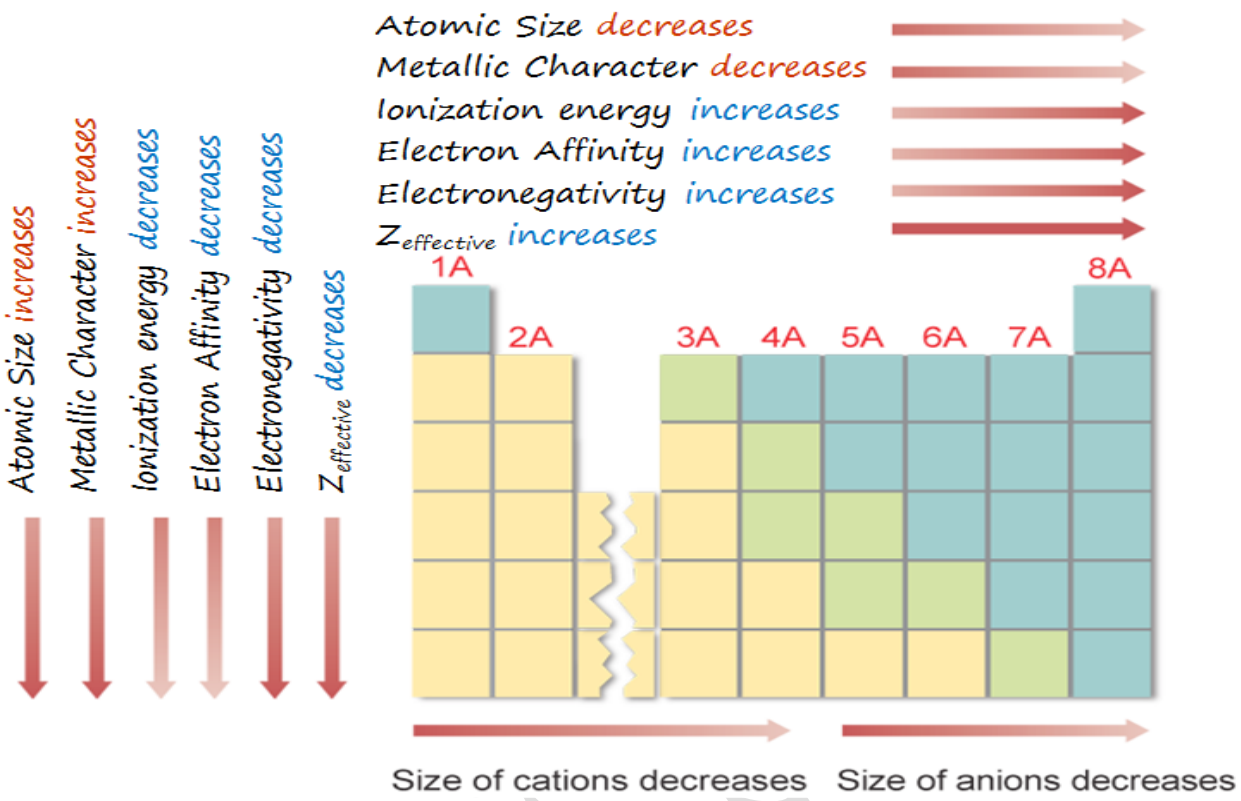
The more malleable and ductile, the better the conductor and easier to ionize.

Metallic character decreases from left to right across a period. الخواص الفلزية تنقص من اليسار الى اليمين في الدورة

Metals are found at the left of the period and nonmetals are to the right.

Metallic character increases down the column.

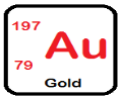
Nonmetals are found at the top of the middle main- group elements and metals are found at the bottom



اسئلة امتحانات على الفصل الثاني

Choose the most correct answer:

Q 1. How many protons, neutrons, and electrons ingold atom?



A. 79, 79, 79.

B. 79, 97, 118.

C. 79, 79, 118. Proton 79 , electron =79 , neutrons= 197-79=118
D. 79, 89, 99.
Q 2. The element's identity is determined by its number of …….. .
A. electrons.
B. protons. الدي يحدد هوية العنصر هو عدد البروتونات
C. neutrons.
D. mass.
Q 3. …… are elemental atoms that differ in their mass due to different number of neutrons.
A. Atoms.
B. molecules.
C. compounds.
D. isotopes. يختلف في عدد الكتلة ويؤدي الي الاختلاف في عدد النيترونات ويتشابه في البروتونات
Q 4. Millikan oil drop experiment determined the …… .
A. charge of electron.
B. mass of electron.
C. charge of proton.
D. mass of proton.
Q 5. From Rutherford's gold foil experiment, the …… has essentially the entire mass of the atom.
A. electron.
B. proton.
C. neutron.

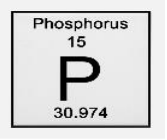
D. nucleus.

Q 1. Metalloids are good conductors of heat and electricity.
A. True. **B. False**.
Q 2. The molar mass of the element is the mass of …….. .
A. 10 molecules.
B. 100 atoms.
C. 6.02×10^{23} units.
D. 12 units.
Q 3. In the Periodic Table, elements within the same …….. have similar properties.

A. row.
B. period.
C. family.
D. none.
Q 4. Cations of group 2A elements carry …….. .
A. +1 charge.
B. +2 charge.
C. – 1 charge.
D. – 2 charge.
Q 5. Mendeleev arranged the elements of the periodic table in order of increasing the ……. .
A. atomic mass.
B. atomic number.
C. number of electrons.

D. number of protons.

Q 1. From Avogadro's law, 1 mole of any substance contains ……. units.
A. 10 units.
B. 100 units.
C. 6.02×10^{23} units.
D. 12 units.
Q 2. Molecular mass of H_2SO_4 is equal to …….. (From the periodic table, atomic masses of the elements are: H = 1; S = 32; O = 16).
A. 49 g/mol.
B. 98 g/mol. (2*1)+(32)+(16 *4) = 98
C. 64 g/mol.
D. 34 g/mol.
Q 3. Same number of moles of different substances has the same number of units (atoms or molecules).
A. true. B. false.
Q 4. A 240 g of bromine (Br) contains ….. atoms (Br = 79.9 g/mol).
A. 6.02×10^{23} atoms.
B. 1.2×10^{24} atoms.
C. 1.8×10^{24} atoms. **Mole=240\79.9= 3.003 mole then 3.003*6.02 x 1023 =1.8×10^{24} atoms**
D. 1.8×10^{23} atoms.



Q 5. Give the complete electronic configuration for Phosphorus.

A. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^3$. 15 = العدد الذري للفسفور

B. $1s^2\ 2s^2\ 2p^6\ 3s^1\ 3p^4$.

C. [Ne] $2p^6\ 3s^2\ 3p^3$.

1. The number of orbitals inside the 4^{th} energy level is …….. .

A. 1.

B. 2.

C. 3.

D. 4.

Q 2. The orbital diagram of the ground state of $_8O_{16}$ is …… .

A. $1s^2\ 2s^2\ 2p^6$.

B. $1s^2\ 2s^2\ 2p^4$.

C. $1s^2\ 2s^2\ 2p^5$.

D. $1s^2\ 2s^2\ 2p^3$.

Q 3. The valence electrons in Al – atom equal to …….. electrons.

A. 2.

B. 3.

C. 4.

D. 5.

Q 4. The number of valence electrons in any element equals to …….. .

A. The period number.

B. The group number

C. The atomic mass.

D. The atomic number.

Q 5. ……. stated that when filling degenerate orbitals, the electrons fill them singly first and with parallel spins.

A. Aufbau's building up principle.

B. Pauli's exclusion principle.

C. Hund's rule.

D. Dalton's atomic theory

1. Place the following elements in order of increasing atomic radius:

Na; Cl; Li; Br.

A. Na < Li < Cl < Br.

B. Li < Na < Cl < Br.

C. Li > Na > Cl > Br.

D. None.

Q 2. Which reaction below has the highest ionization energy?

A. $Ca_2^+(g) + e^- \rightarrow Ca^+(g)$

B. $Ca\ (g) \rightarrow Ca^+\ (g) + e^-$

C. $Ca^+(g) \rightarrow Ca_{2+}(g) + e^-$

D. $Ca^+(g) + e^- \rightarrow Ca\ (g)$

Q 3. Of the following, which element has the highest first ionization energy?

A. S.

B. O.

C. Na.

D. Mg.

Q 4. Place the following in order of increasing metallic character:

F Ca Cs N

A. F > N > Cs > Ca.

B. N > F > Cs > Ca.

C. F < N < Ca < Cs.

D. N < F < Ca < Cs.

Q 5. Which one of the following has the largest size?

A. Mg.

B. Mg_+.

D. Mg_{2+} .

- matter is neither created nor destroyed in a chemical reaction, but transform from one form to another. this is the definition of			
A	Law of definite proportions	B	Law of multiple proportion
C	Law of conservation of matter	D	Law of conservation of energy
- total mass of used reactants _____ total mass of products produced			
A	More than	B	Less than
C	Equal to	D	Equal or more than
- total number of reactant atoms _____ total number of product atoms			
A	More than	B	Less than
C	Equal to	D	Equal or more than
- if the reactants' mass ($H_2O + Na$) is 18.68g, the mass of products will be			
A	12.45g	B	18.68g
C	47.12g	D	Cannot be determined

- law of conservation of mass was found out by			
A	Jozeph Prust	B	Antonie Lavoisir
C	James Chadwick	D	Jhon Dalton
- law of definite proportion was found out by			
A	Jozeph Prust	B	Antonie Lavoisir
C	James Chadwick	D	Jhon Dalton
- water samples from different sources are follow_____			
A	Law of definite proportions	B	Law of multiple proportion
C	Law of conservation of matter	D	Law of conservation of energy
- the reaction between Fe and O is follow _____			
A	Law of definite proportions	B	Law of multiple proportion
C	Both	D	None

- the scientist who discover the electrons and determine its charge is			
A	J.J. Thomson	B	Antonie Lavoisir
C	James Chadwick	D	Jhon Dalton
- Cathode ray tube experiment was done by			
A	J.J. Thomson	B	Milickan
C	James Chadwick	D	Jhon Dalton

- the gold foil experiment led to the discovery of			
A	The nucleus	B	The electrons
C	The cell	D	The elements
- which of the following is a subatomic particle?			
A	Proton	B	Electron
C	Neutron	D	All of them
- which of the following is right about Protons?			
A	Positively charged	B	Negatively charged
C	Located in the atom's empty space	D	All answers are right
- which of the following is right about Electrons?			
A	Positively charged	B	Negatively charged
C	Located in the atom's nucleus	D	All answers are right

- neutron was the last discovered particle in the atom because_____			
A	It's neutral (has no charge)	B	It's invisible
C	It's smaller than the electron	D	All answers are correct
- the atomic number is the number of _____ in the atom.			
A	Electrons	B	Neutrons
C	Protons	D	The sum of them
- the fingerprint of an element is its_____			
A	Atomic number	B	Atomic weight
C	Electrons number	D	Name

- an element's symbol has _____ letters.			
A	One or Two	B	One or more
C	More than two	D	Only one

- isotopes are identified by their			
A	Atomic number	B	Atomic mass
C	Elements	D	All are correct
- neutral atoms will have the same number of			
A	Protons as Neutrons	B	Neutrons as Electrons
C	Electrons as Protons	D	Protons, electrons, and neutrons
- which of the following are isotopes			
A	$C_6^{12}.C_7^{12}.C_8^{12}$	B	$C_6^{12}.C_6^{12}.C_6^{12}$
C	$C_6^{12}.C_6^{13}.C_6^{14}$	D	$C_6^{12}.O_6^{12}.Fe_6^{12}$
- when calculating the atom's mass, we can neglect the _____ mass			
A	Protons	B	Neutrons
C	Electrons	D	Electrons and protons
- when calculating the atom's charge, we can neglect the _____ charge			
A	Protons	B	Neutrons
C	[illegible]	D	[illegible]

- for $(F_{26}^{56})^{+3}$ find the number of Protons (P), Electrons (e), and Neutrons (N)			
A	P= 26, e= 23, N= 30	B	P= 26, e= 26, N= 30
C	P= 26, e= 23, N= 26	D	P= 56, e= 23, N= 30
- which of the following is right about neutral atoms?			
A	Electrons = protons	B	Electrons = neutrons
C	Neutrons = protons	D	Electrons > protons
- when neutral atoms lose electrons, it become_____			
A	Cation	B	Anion
C	Both	D	None
- negatively charged atoms are called			
A	Cation	B	Anion
C	Both	D	None

- Mendeleev arrange the elements in order of increasing _____			
A	Atomic number	B	Atomic mass
C	Properties	D	Alphabet
- in the modern table, elements are arranged from left to right in order of			
A	Increasing atomic number	B	Increasing mass number
C	Decreasing atomic number	D	Decreasing mass number
- in the modern table, each vertical column is called			
A	Period	B	Group/family
C	Main-group	D	Transition elements
- in the modern table, each horizontal row is called			
A	Period	B	Group/family
C	Main-group	D	Transition elements
- which of the following properties isn't a metal property?			
A	Reflective surface	B	Conduct heat and electrical current
C	Lose electrons and form cations	D	Can be found in all three states
- which of the following isn't true about nonmetals property?			
A	Poor conductors of heat	B	Gain electrons to become anions
C	Solids are brittle	D	Ductility
- which of the following can exhibit properties of metals and/or nonmetals?			
A	Nobel gases	B	Transition metals
C	Actinides	D	Metalloid/semimetal
- metalloids are usually act as			
A	Metals	B	Nonmetals
C	Actinides	D	Lanthanides
- group 1A elements are called			
A	Halogens	B	Nobel gases
C	Alkali metals	D	Alkali earth metals
- group 2A elements are called			
A	Halogens	B	Nobel gases
C	Alkali metals	D	Alkali earth metals
- when atoms lose or gain electrons they form			
A	Elements	B	Ions
C	Isotopes	D	None

- the letter A in 3A represent _____			
A	Transition group	B	Main group
C	Ions	D	Isotopes
- the atomic mass for each element is represented by			
A	Its highest isotope atomic mass	B	Its lowest isotope atomic mass
C	Its isotopes average atomic mass	D	Its property
- how many grams of CO_2 are in 6.75×10^{30} molecules?			
A	1.1×10^{7} g	B	4.8×10^{8} g
C	4.93 g	D	110 g
- how many grams are in 10^{30} molecules of Iodine?			
A	4.2×10^{8} g	B	1.6×10^{6} g
C	256 g	D	6.022×10^{23} g
- 0.100 mole of lithium weighs			
A	3 g	B	0.694 g
C	0.3 g	D	6.94 g
- how many moles and atoms of Zinc are in a sample weighing 34.9g ?			
A	0.533 mole, 8.85×10^{-25} atoms	B	1.87 mole, 1.13×10^{24} atoms
C	0.533 mole, 3.21×10^{23} atoms	D	1.87 mole, 1.13×10^{-24} atoms
- each group/column's elements have			
A	Similar properties	B	Different properties
C	Nothing in common	D	Same atomic mass
- each period/row's elements have			
A	Similar properties	B	Different properties
C	Nothing in common	D	Same atomic mass
- Na, P this pair of elements have			
A	Similar properties	B	Different properties
C	Nothing in common	D	Same atomic mass

- how many protons, electrons, and neutrons in an oxygen ion?			
A	P= 8, e= 10, N= 8	B	P= 8, e= 8, N= 8
C	P= 8, e= 6, N= 8	D	P= 8, e= 8, N= 6
- Germanium has these properties EXCEPT			
A	Solid at room temperature	B	Semiconductor of electricity
C	Is a metalloid	D	Insulator
- which of the following can be easily broken?			
A	Nickle	B	Technetium
C	Bromine	D	Potassium
- which of the following is right about GOLD			
A	Semiconductor	B	Can be found in all three states
C	Gain electrons to become anion	D	Can be shaped
- energy levels and sublevels fill from lowest energy to high, this is			
A	Hound principal	B	Aufbau principal
- which of the following configurations is correct			
A	$1s\ 2s\ 3s\ 4s\ 5s$	B	$1s\ 2s\ 2p\ 3p$
C	$1s\ 2s\ 2p\ 3s\ 3p\ 4s$	D	$1s\ 2p\ 3d\ 4f$
- the valence electrons represent the _____			
A	Group's number	B	Period's number
C	Protons' number	D	Neutrons' number
- the periodic number is the same as the _____ number			
A	Energy level	B	Orbital type
C	Valence electrons	D	Protons
- which of the following is the right configuration for lithium?			
A	$1s^2 2s^2 2p^1$	B	$1s^2 2s^1$
C	$1s^2 2p^1$	D	$1s^2 2s^2 2p^6$
- ↑↓ ↑↓ ↑↓ ↑↓ **in this figure arrows represent**			
A	Neutrons	B	Atoms
C	Electrons	D	Protons
- which of the following violate Hund's rule?			
A	↑↓ ↑↓ ↑↓ ↓	B	↑↓ ↑↓ ↑↓
C	↑↓ ↑↓ ↑↓ ↑↑	D	↓↑ ↑↓ ↑ ↑↓

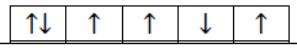
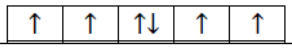
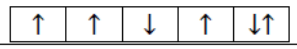
- for ($1s^2 2s^2 2p^6\ 3s^2 3p^5$) the valence electrons are

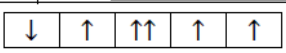
A	2	B	5
C	7	D	3

- valence electrons are responsible for

A	Boiling	B	Making ions
C	The atom's behavior	D	All answers are correct

- which of the following is wrong

A		B	
C		D	

 **This configuration violates _____ rule.**

A	Huok	B	Pauli
C	Hound	D	Aufbau

- how many valence electrons are in (carbon)?

A	3	B	2
C	5	D	4

- how many valence electrons are in (Al)?

A	2	B	3
C	4	D	5

- which of the following has 8 valence electrons?

A	Ar	B	Br
C	As	D	Ac

- for ions, electrons are added or removed to the

A	Lowest energy level	B	Valence shell
C	S orbital type only	D	Nobel gases

- which of these elements' ions have fewer electrons than protons?

A	Sr	B	Xe
C	Te	D	Tl

- which of these elements has the smallest atomic radius?

A	O	B	S
C	Se	D	Po

- which of these elements has the largest atomic radius?

A	K	B	Ca
C	Ga	D	Ge

- the net positive charge that is attracting a particular electron is called			
A	The effective nuclear charge	B	The ionic radius
C	Ionization energy	D	Electron affinity
- Ion size _____ down the column.			
A	Decrease	B	Increase
C	Does not change	D	Not related
- cations are _____ the neutral atom.			
A	Same as	B	Larger than
C	Smaller than	D	Not related
- anions are _____ the neutral atom.			
A	Same as	B	Larger than
C	Smaller than	D	Not related
- the energy heeded to remove an electron from an atom or ion is called			
A	The effective nuclear charge	B	The ionic radius
C	Ionization energy	D	Electron affinity
- which of the following is NOT correct			
A	Li atom is larger than Li ion	B	Fr atom is larger than Fr ion
C	At ion is smaller than At atom	D	Br atom is smaller than Br ion
- which of the following orders is correct for IE?			
A	Mg > Si > P > Cl	B	Cl > P > Si > Mg
C	Si > P > Cl > Mg	D	P > Si > Mg > Cl
- which of the following orders is correct for IE?			
A	N < P < As < Bi	B	Bi > As > P > N
C	Bi < As < P < N	D	As > P < N < Bi

- the metallic character _____ across a period.			
A	Increase	B	Decrease
C	Stay the same	D	Undefined
- the willingness to accept electrons into the valence shell is called			
A	The effective nuclear charge	B	The ionic radius
C	Ionization energy	D	Electron affinity
- which of the following elements is the most stable one?			
A	Ba	B	Pb
C	Po	D	Rn
- which of the following elements is the most stable one?			
A	H	B	Li
C	Na	D	K
- which group/family has the lowest EA?			
A	Halogens	B	Alkali metals
C	Noble gases	D	Alkaline earth metals

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