Chapter "1"

* experiment :- an observation of natural phenomena ...
* law :- a concise statement of mathematical equation
* hypothesis :- a tentative explanation of some regularity of nature
* theory :- a tested explanation of basic natural phenomena

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the law of conservation of mass ⇒ mass of reactants = mass of outcomes

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- Solid ⇒
  - fixed shape and volume
  - particles are close together
  - have restricted motion
- Liquid ⇒
  - fixed volume, but not shape
  - particles are close together
  - are able to flow
- Gases ⇒
  - expand to fill entire container
  - particles separated by lost of space.

- physical change :- a change in the form of matter but not in its chemical identity
  - examples :- (melting , boiling , electrical conductivity)
- chemical change :- a change in which one or more kinds of matter are transformed into new kind of matter or several new kinds of matter
  - examples :- (rust صدأ formation , burning butane gas in oxygen)

- Substance :- a kind of matter that cannot be separated into othe kinds by any physical process
- Mixture :- a kind of matter that can be separated by physical means into two or more sbs (can be heterogeneus mixture « different properites » // homgeneus mixture « uniform its properites »)
- Element :- a substance that cannot be decompused by any chemical reactions into smaller substance
- Compound :- a substance composed of two or more, elements chemically combined.

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* Accuracy :- How close a measurement is to the true value.
* precision :- How close a set of measurements to each other.

Significant figures :-

قواعد :-

① (1-9) ⇒ S.f تعتبر

② الصفر على اليسار الرقم لا يعتبر S.f

③ الاصفار على يمين العدد لا تعتبر S.f إلا اذا كان هناك فاصله عشرية

④ الاصفار بين الاعداد تعتبر S.f

Scientific Notation :-

- 602,200,000,000,000,000,000,000 ⇒ 6.022×10^{23}
- 0.0000000000000000000000199 ⇒ 1.99×10^{-23}

Rounding :-

* if the digit is 5 or greater, add 1 to the last digit.

ex :- 1.2151 ⇒ 1.22

* if the digit is less than 5, Simply drop it.

ex :- 1.2143 ⇒ 1.21

- Significant figures in calculations :-

* Multiplication and Division ⇒ الجواب يجب ان يقرب إلى اقل S.f

ex :- 10.54 X 0.02

4 S.f 1 S.f → 1 S.f الجواب لازم ⇒ 0.2108

((عادي لوما فكينا الأس)) ≈ 0.2 ✓✓

* Addition and Subtraction ⇒ الجواب يجب ان يكون نفس عدد dp الاقل

dp ⇐ decimal point ⇐ هي جميع الارقام على يمين الفاصله العشرية

((هون لازم نفك الأس)) 10^{Ex}

ex :- 397 − 273.15 = 123.85

0dp 2dp ≈ 124 ⇒ 0dp

((0 dp لازم يكون))

- exact numbers ⇒ that come from definitions, direct count

↳ dosen't determine the number of S.F

SI unit ⇒		Unit
length	→	meter (m)
Mass	→	Kilogram (kg)
time	→	Second (S)
Temperature	→	kelvin (K)
Amount of substance	→	mole (mol)
electric current	→	ampere (A)
luminous intensity	→	Candela (cd)

SI prefixes

mega	→	10^{6}
kilo	→	10^{3}
deci	→	10^{-1}
Centi	→	10^{-2}
milli	→	10^{-3}
micro	→	10^{-6}
nano	→	10^{-9}
pico	→	10^{-12}

Temperature ⇒ F° ⇒ Fahrenheit / C° ⇒ Celsius / K ⇒ Kelvin

* $K = C° + 273.15$
* $F° = (C \times \frac{9}{5}) + 32$
* $C° = \frac{5}{9} \times (F - 32)$

- freezing point of water? 0 c°
- boiling point of water? 100 c°

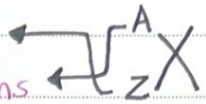
* (given unit × $\frac{\text{desired unit}}{\text{given unit}}$ = desired unit) *

Chapter "2"

* isotopes :- Atoms with the same number of protons but different number of neutrons.

identified by :-

- Atomic Number (Z) ⇒ number of protons.
- Mass number (A) ⇒ number of protons + neutrons



Chemical bonds ⇒

- Covalent bonds :-
  - Bonds form between atoms by sharing electrons
  - Resulting collection of atoms is called a molecule.
- ionic bonds :-
  - Bonds form due to force of attraction between oppositely charged ions
  - Ion - atom or group of atoms that has a net positive or negative charge →
    - * Cation : positive ion ; lost electrons
    - * anion : negative ion ; gained electrons.

Groups or family	→	charge
Alkali Metals (1A)	→	+1
Alkaline earth metals (2A)	→	+2
Halogens (7A)	→	-1
Noble gases (8A)	→	0

mono	→ 1	hexa	→ 6
di	→ 2	hepta	→ 7
tri	→ 3	octa	→ 8
tetra	→ 4	nano	→ 9
penta	→ 5	deca	→ 10

"Naming"

- Binary Compounds
  - Metal A + non metal (ide) / polyanions (ate)
    - ex: • NaCl ⇒ sodium chloride
    - • Cs_2SO_4 ⇒ Cesium sulfate
      - → poly atomic
  - Binary ionic compound: Metal B + non-metal (ide) / poly atomic
    - ex: • $CrCl_3$ ⇒ Chromium(III) Chloride
  - Binary covalent compound: non metal or metalloids + (ide)
    - num of atom
    - num of atom
    - ex: • PCl_5 : - phaphorus pentachloride

Chapter "3"

* relative atomic mass (Ar) = (mass no. x natural abundance 1st isotope) + (same ..... 2nd iso) + ...

Σ natural abundance = 100%

* molecular weight (MW) = (number of atom x atomic mass)

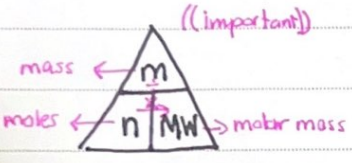
**((if we have more than one atom we calculate for each then multi them))

**((إذا كان عندنا أكثر من ذرة نحسب لكل وحدة منهم ثم نجمعهم معًا))

Chemical stoichiometry :-

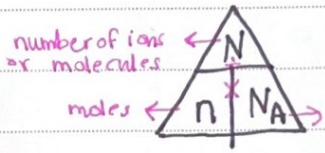
- Avogadro's number = 6.022×10^{23}

((important))



$m = n \times MW$

$\frac{m}{MW} = n$ / $MW = \frac{m}{n}$



$N = n \times N_A$

$N_A = \frac{N}{n}$ / $n = \frac{N}{N_A}$

* حل الأسئلة *

- * الحالات *

Case 1 :- (من المثلثات) • مادة واحدة في السؤال

Case 2 :- • مادتين في السؤال واحدة معطى عنها معلومات والأخرى مطلوب إيجاد مجهول: لها

• زي هيك منحل :-

(n) العدد المضروب ← بكل من المادتين

(m) المعطاة ⟷ (m) المطلوب •

(n) موازنة المادة المعطاة ⟷ X

• نجد X ⇐ عدد موازنات المطلوب المجهول ثم منطح المطلوب

Case 3 :- • مواد أو أكثر في السؤال اثنتان على الأقل معطى عنهم معلومات والثالثة مطلوب إيجاد مجهول: لها

(نجد الـ limiting هون في الحالة)

في Case 2 و Case 3 ← نستخدم المثلثان بجدين

* percentage yield ⇒

$$\frac{\text{Actual yield}}{\text{Theoretical yield}} \times 100\% = \text{percent yeild}$$

* Mass percentage ⇒

$$\text{mass \%} = \frac{\text{mass of element in compound}}{\text{mass of compound}} \times 100\%$$

Chapter "4"

Solubility rules :- ((important))

* Soluble :- → 1- Group 1A and ammonium are soluble ($1A + NH_4^+$)
2- Acetates and nitrates are soluble ($C_2H_3O_2^-$, NO_3^-)
3- (Cl^-, Br^-, I^-) are soluble except with (Ag , Hg , Pb) ⇒ insoluble
4- (SO_4^{-2}) Soluble , except with (Ca , Sr , Br , Ag , Hg , Pb)

* insoluble : ⇒ 1- (CO_3^{-2}) insoluble except with (1A group and NH_4^+) → soluble
2- PO_4^{-3} ⇒ insoluble except with (1A group and NH_4^+) → soluble
3- S^{-2} ⇒ insoluble except with (1A group and NH_4^+) → soluble
4- OH^- ⇒ insoluble except with (1A group and Ca , Sr , Ba) → soluble

---

molecular and ionic equations:-

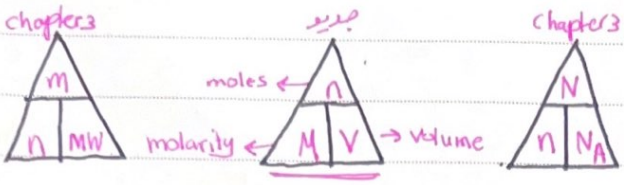
- molecular equation :- (balanced equation)
- Complete Ionic equation:- تفكك المواد الذائبة في الماء
- Net Ionic equation :- تقوم بحذف الايونات المتشابهة بطرفي المعادلة

---

types of reactions:-

- precipitation reactions :- In these reactions, one of the products is insoluble. ← precipitates
- Acid-Base reactions:- reactions in which (H^+) and (OH^-) are combine together to produce water.
- oxidation - reduction reactions :- reactions that involve electrons transfer.

* Stoichiometry of precipitation reactions



* حالات الحل (cases) نفس "chapter 3" *

• Diluting solutions ⇒

$$M_i \times V_i = M_f \times V_f$$

M_i: initial (original) — V_f: final (diluted)

• Acid - base reactions

Bronsted - lowry definitions of acid and base :-

Acid :- proton donar

Base :- proton acceptor

- Strong Base :- Li, Na, K, Ca, Sr, Ba
- Strong acids :- ClO_4, SO_4, I, Br, Cl

• Oxidation - reduction reactions

* rules of Assigning oxidation numbers :-

1- elements ⇒ oxidation number of an atom in element is zero

2- Monatomic ions ⇒ " " " " " equals th charge on the ion

3- oxygen ⇒ -2 in most compounds except in (H_2O_2 → -1)

4- hydrogen ⇒ mostly +1 except with binary compounds with metal such as CaH_2 ⇒ -1 it's charge.

5- halogens ⇒ always -1 except with oxygen changes and with each other

6- Compounds and ions → the total charge is zero, but in polyatomic ions the charge on the ion like (ClO_4^-)

* (ملاحظة مهمة) *

اذا طلب حجم الماء المضاف
منطرح حجم الماء ثم
منطرح من الحجم الكلي
للمحلول ليطلع معنا الحل صح

مثال :-

How many ml of water are required to be added to 100ml of 0.25 M NaOH solution in order to obtain a solution of 0.20 M?

منطلاق: $M_i V_i = M_f V_f$ ⇐ نجد حجم V_f

ثم نطرح

V_f - الحجم الكلي = حجم الماء المضاف

V_f - 100 = حجم الماء

- Oxidation ⇒ increase in oxidation state, it happens by loss of electrons (Reduction agent)
- Reduction ⇒ decrease in oxidation state it happens by gain of electrons (Oxidizing agent)

Chapter "5"

* atmaspheric pressures is measured by (barometer)
* pressure of a gas confined in a container is measured by (manometer) ← internal pressure

* $\text{pressure} = \frac{\text{force}}{\text{area}} = \frac{N}{m^2}$ → N/m^2 → pascal

pressure ⇒ atm, mmHg, torr, Pa

1 atm = 760 torr = 760 mmHg = 101,325 pa

1 atm = 101.325 kpa

* ideal gas law :- constant = 0.0821 atm / mole K (غالبا يعطى في الامتحان)

$PV = nRT$

P ← pressure, V ↓ volume, n ↓ moles

* (الوحدة لازم تكون موحدة للكل لكن الـ Temp لازم تكون ← بالـ (Kelvin))*

القوانين المشتقة من القانون :-

- combined gas law ⇒ $\frac{P_i V_i}{n T_i} = \frac{P_f V_f}{n T_f}$
- at constant pressure ⇒ $\frac{V_i}{T_i} = \frac{V_f}{T_f}$
- at constant temp ⇒ $P_i V_i = P_f V_f$
- at constant temp and pressure $\frac{V_i}{n_i} = \frac{V_f}{n_f}$

* Standard Molar volume of ideal Gas (SMV)

- SMV is the volume of one mole of a gas under STP
  - T = zero c° = 273K
  - P = 1atm
  - V = 22.42L
  - n = 1

n = 1 molar volume اذا ذكر انها

n ≠ 1 اذا ما ذكر

*

برضو قانون مشتق :-

$$d = \frac{(MM)\,x(P)}{RT}$$

(d→density/MM→molecular weight
P→pressure/R→constant/T→temp)

* Dalton's law of partial pressure

- for a mixture of gases, in container

$$P_{total} = P_1 + P_2 + P_3 + \dots$$

or

$$(P_{total}\,V = n_{total}\,RT) \rightarrow$$ ابسط للحل

*it's the total pressure exerted in the sum of the pressure that each gas would exert if it were alone under the same conditions of volume, temperature and number of moles.

Mole fraction :-

mole fraction of A = $\chi = \frac{n_A}{n} = \frac{P_A}{P}$ *

Note:- في مسائل يلي بكون في غازين وبينهم مهام [redacted] وبطلبوا عن الغاز محاصيل قبل وبعد فتح الصمام

- قبل فتحه منحسب حساب طبيعي
- بعد فتح الصمام الـ pressure رح يختلف ومنطلع لكل جزء منهم لحال ثم نجمع الـ pressure وبطلع معنا الـ pressure الجديد

نجد لكل طرف الـ pressure من هاد القانون :-

$$P_i V_i = P_f V_f$$

** ((وهذا النوع من الاسئلة مهم)) **

♡ (يعطيكم العافية وبعتذر على إي غلط او كلمه مش مفهومه) ♡