

Some Common Polyatomic Ion

+1	-1	-2	-3
NH_4^+ (ammonium)	OH^- (hydroxide)	CO_3^{2-} (carbonate)	PO_4^{3-} (phosphate)
Hg_2^{2+} (mercury I)*	NO_3^- (nitrate)	SO_4^{2-} (sulfate)	
	ClO_3^- (chlorate)	CrO_4^{2-} (chromate)	
	ClO_4^- (perchlorate)	$\text{Cr}_2\text{O}_7^{2-}$ (dichromate)	
	CN^- (cyanide)	HPO_4^{2-} (hydrogen phosphate)	
	$\text{C}_2\text{H}_3\text{O}_2^-$ (acetate)		
	MnO_4^- (permanganate)		
	HCO_3^- (hydrogen carbonate)		
	H_2PO_4^- (dihydrogen phosphate)		

* Two atoms of Hg are united by a single covalent bond to form Hg_2^{2+} , Hg^+ does not exist.

Table 2.3 Oxoanions of Nitrogen, Sulfur and Chlorine.(Page 40, Masterton 6th edition)

Nitrogen	Sulfur	Chlorine
NO_3^- nitrate	SO_4^{2-} sulfate	ClO_4^- perchlorate
NO_2^- nitrite	SO_3^{2-} sulfite	ClO_3^- chlorate
		ClO_2^- chlorite
		ClO^- hypochlorite

Table 2.4 Greek Prefixes Used in Nomenclature.(Page 41, Masterton 6th edition)

Number	Prefix	Number	Prefix	Number	Prefix
2	di	5	penta	8	octa
3	tri	6	hexa	9	nona
4	tetra	7	hepta	10	deca

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For the final
ch-7 & 8
 KCl_2

Ch 2

Molecules

-2	-1	-1	-1	-1
SO_4^{2-} sulfate	ClO_4^- perchlorate	BrO_4^- periodate	I_0^- iodide	O_0^- hypochlorite
NO_3^- Nitrate	ClO_3^- chlorate	BrO_3^- bromate	I_2^- iodite	O_2^- hypobromite
NO_2^- Nitrite	ClO_2^- chlorine	BrO_2^- bromite	I_3^- iodite	
HCO_3^- hydrogen carbonate		CO_3^{2-} carbonate		
HPO_4^{2-} mono-hydrogen phosphate				
$H_2PO_4^-$ dihydrogen phosphate				

for Molecular compound

- mono I type
- di II
- III IV V
- tetra IV
- Penta V
- hexa VI
- hepta VII
- Octa VIII
- Nona IX
- deca X

Transition metal that don't need Roman number

$$Sc^{+3}, Cd^{+2}, Ag^{+}, Zn^{+2}, Hg^{+2}$$

Table for Max positive charge

Name of compound

Ionic comp: $m+n$. **Molecular comp**: $n+m$. **Hydrates**: $comp + nH_2O$. **Acid and Base**: $m+nO$. **Mixed**: $m+n$.

Isotopes: Atomic no. \neq p+e. Same no. different mass no. available.

Ch 3

Average atomic mass = $\frac{\sum (\text{Comp} \times \%)}{100}$

Empirical = $\frac{\text{Mass}}{\text{Molar Mass}}$

By HAMS

Ch 7

Absorption: e^- from Low Energy to high Energy

Emission: e^- from high Energy to Low Energy

Quantum numbers:

- N main level**: low \rightarrow High \downarrow
- L sub level**: $S^0, P^2, D^3, F^4 = n-1$ (جذل)
- M orbital range**: $-l \rightarrow +l$
- MAS spin**: $+ \frac{1}{2}, - \frac{1}{2}$
- Angular momentum**: $0, 1, 2, 3, 4, 5, 6, 7, 8$
- Start from 1s**

Orbitals: $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^10, 4s^2, 4p^6, 4d^5, 5s^2, 5p^6, 5d^4, 6s^2, 6p^6, 6d^3, 7s^2, 7p^6, 7d^2, 8s^2$

Energy levels: $1s < 2s < 2p < 3s < 3p < 3d < 4s < 4p < 4d < 5s < 5p < 5d < 6s < 6p < 6d < 7s < 7p < 7d < 8s$

Ch 11

Molarity: $\frac{\text{mass solute}}{\text{mass solution}} \times 1000$

$\text{ppm} = \frac{\text{mass solute}}{\text{mass solution}} \times 10^6$

$\text{ppb} = \frac{\text{mass solute}}{\text{mass solution}} \times 10^9$

$\text{molality} = \frac{\text{mole}}{\text{kg solution}} = 1 \text{ mole} \times 1000 \text{ g}$

$\text{Molality} + \text{Moles/l} = \text{Molality}$

Colligative properties

Molar concentration: $\frac{1000 \text{ g}}{1000 \text{ ml}} = 1 \text{ mole/l}$

Boiling point: $T_b = T_b^0 + K_b \Delta T_b$

Frosting point: $T_f = T_f^0 + K_f \Delta T_f$

Temperature of freezing for dilute for pure solvent: $K_f = \frac{T_f^0 - T_f}{\Delta T_f}$

Temperature of boiling for dilute for pure solvent: $K_b = \frac{T_b - T_b^0}{\Delta T_b}$

Molality: $M = \frac{\text{moles}}{\text{kg solution}}$

$\% \text{ mass solute} = \text{mass solute} / \text{mass solution} \times 100$

$\text{Moles} = \frac{\text{mass}}{\text{molar mass}}$

$\text{Mole fraction} = \frac{\text{moles}}{\text{total moles}}$

$\text{Molality} + \text{Moles/l} = \text{Molality}$

Ch 5

Boyle's Law : $P_1V_1 = P_2V_2$	G - Lussac's Law : $\frac{P_1}{T_1} = \frac{P_2}{T_2}$
Inverse : $V \propto \frac{1}{P}$	Direct : $P \propto T$
Charler Law : $V \propto T$	Avogadro Law : $V \propto n$

O **TIP**

V: Volume
P: Pressure
T: Temperature
n: no. of molecules
R: 0.0821
d: Density
Rules: $P_1V_1 = P_2V_2$
 $\text{No. of molecules} \propto \text{Volume} / \text{Pressure}$
 $P \propto nRT$
 $P \propto V$
 $P \propto T$
 $P \propto \frac{n}{V}$

STP: $P = 101325 \text{ Pa}$, $T = 273 \text{ K}$, $V = 22.4 \text{ L}$

$P_{\text{total}} = P_1 + P_2 + \dots + P_n = P_1 \cdot \frac{N_A}{M_{\text{mole}}} \cdot n$

Download: $P = P_1 + P_2 + \dots + P_{\text{gas}}$

Overwatered: $P = P_1 + P_2 + P_{\text{gas}}$

Ch 8 & 9

AX₂ Linear: 180°

AX₂E₁ bent: $< 120^\circ$

AX₂E₂ bent: $< 105^\circ$

AX₂E₃ linear: 180°

AX₃ trigonal planar: 120°

AX₃E₁: $> 109.5^\circ$

AX₃E₂ T-shape: $< 180^\circ$ Molecules

AX₄ tetrahedral: 109.5°

AX₄E₁ seesaw: $< 120^\circ$ Molecules

AX₄E₂ square planar: $< 120^\circ$ Molecules

AX₅ trigonal bipyramidal: 90° Molecules

AX₅E₁ square pyramid: $< 180^\circ$ Molecules

AX₆ octahedral: 90° Molecules

Ch 4

in-Soluble

S	SO₄	Cl	Rb	I
SO₄	Cl	Rb	I	
CO₃²⁻, CrO₄²⁻, SO₃²⁻, PO₄³⁻				

Acid \rightarrow weak: CH_3COOH , HF , HNO_3 , H_3PO_4 , H_2CO_3

Base \rightarrow weak: NH_3 , Mg(OH)_2 , Ca(OH)_2

S.A + S.B = $H^+ + OH^- \rightarrow H_2O$

$w_A + w_B = 100\%$

$S.A + w.B = H^+ + OH^- \rightarrow H_2O$

$w.A + S.B = OH^- + H^+ \rightarrow H_2O$

Ch 2

Molecules

-2	-1	-1	-1	-1
SO_4^{2-} sulfate	ClO_4^- perchlorate	BrO_4^- periodate	I_0^- iodide	O_0^- hypochlorite
NO_3^- Nitrate	ClO_3^- chlorate	BrO_3^- bromate	I_2^- iodite	O_2^- hypobromite
NO_2^- Nitrite	ClO_2^- chlorine	BrO_2^- bromite	I_3^- iodite	
HCO_3^- hydrogen carbonate		CO_3^{2-} carbonate		
HPO_4^{2-} mono-hydrogen phosphate				
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for Molecular compound

- mono I type
- di II
- III IV V
- tetra IV
- Penta V
- hexa VI
- hepta VII
- Octa VIII
- Nona IX
- deca X

peroxide: BrO_2^- (peroxide) Br_2O , I_2O (peroxide), I_3^- (peroxide), I_2O^- (peroxide)

Explanations:

- 1 alkali metal
- 2 alkali earth metal
- 3-12 Transition metal
- 17 halogen metal
- 18 noble gas

Metal Left: $NaCl$, $CaCl_2$, $MgCl_2$, K_2SO_4 , Na_2SO_4 , $MgSO_4$, $AlCl_3$, $FeCl_3$, $ZnCl_2$, $CoCl_2$, $NiCl_2$, $CrCl_3$, Al_2O_3 , Fe_2O_3 , Cr_2O_7 , Al_2S_3 , Na_2S , K_2S , MgS , CaS , Na_3PO_4 , Na_2PO_4 , $Mg_3(PO_4)_2$, $MgPO_4$, $Ca_3(PO_4)_2$, $CaPO_4$, Na_3AsO_4 , Na_2AsO_4 , $Mg_3(AsO_4)_2$, $MgAsO_4$, $Ca_3(AsO_4)_2$, $CaAsO_4$

Acids **Name**

H_2SO_4	Sulfuric acid
H_2PO_4	Phosphoric acid
H_2CO_3	Carbonic acid
H_3PO_4	Phosphate acid

Dilution Factor: $D.F. = \frac{V_f(\text{Conc})}{V_i(\text{Initial})}$

Count all

S.F. \Rightarrow non-zero zero before two zeros zero in right - with 25.0 in decimal

Count the numbers

100 = 2, 1
1000 = 0, 1
10000 = 0, 01

Roundup \Rightarrow last num > 5 odd before 5 up
Down \Rightarrow last num ≤ 5 even before 5 don't round

Test: $CO_2 \rightarrow CaCO_3$ Lime water
 $NaCl \rightarrow AgCl$
 $Cl^- \rightarrow AgCl$

Molarity: $Molar = \frac{Mass}{D.F.}$

Ch 7

Atomic Number: $Z = 18$

Ch 11

Colligative properties

Percent: $\frac{\text{mass solute}}{\text{mass solution}} \times 1000$

Moles/l: $\frac{\text{mass}}{\text{molar mass}} \times 1000 \text{ ml}$

Molality: $\frac{\text{moles}}{\text{kg solution}}$

Molality + Moles/l = Molality

Temperature: $T_f = T_f^0 + K_f \Delta T_f$

Temperature: $T_b = T_b^0 + K_b \Delta T_b$

Molar mass: $M = \frac{\text{mass}}{\text{moles}}$

Ch 12

Energy levels: $1s < 2s < 2p < 3s < 3p < 3d < 4s < 4p < 4d < 5s < 5p < 5d < 6s < 6p < 6d < 7s < 7p < 7d < 8s$

Electron configuration: $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^10, 4s^2, 4p^6, 4d^5, 5s^2, 5p^6, 5d^4, 6s^2, 6p^6, 6d^3, 7s^2, 7p^6, 7d^2, 8s^2$

Diagonal subshell: $1s, 2s, 3s, 4s, 5s, 6s, 7s$

Half shell: $2p, 3p, 4p, 5p, 6p, 7p$

Full shell: $2s, 3s, 4s, 5s, 6s, 7s$

Electrons: $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^10, 4s^2, 4p^6, 4d^5, 5s^2, 5p^6, 5d^4, 6s^2, 6p^6, 6d^3, 7s^2, 7p^6, 7d^2, 8s^2$

Rules: $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^10, 4s^2, 4p^6, 4d^5, 5s^2, 5p^6, 5d^4, 6s^2, 6p^6, 6d^3, 7s^2, 7p^6, 7d^2, 8s^2$

Quantum numbers:

- N main level**: low \rightarrow High \downarrow
- L sub level**: $S^0, P^2, D^3, F^4 = n-1$ (جذل)
- M orbital range**: $-l \rightarrow +l$
- MAS spin**: $+ \frac{1}{2}, - \frac{1}{2}$
- Angular momentum**: $0, 1, 2, 3, 4, 5, 6, 7, 8$
- Start from 1s**

Orbitals: $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^10, 4s^2, 4p^6, 4d^5, 5s^2, 5p^6, 5d^4, 6s^2, 6p^6, 6d^3, 7s^2, 7p^6, 7d^2, 8s^2$

formal charge

$$= \text{Valence } e^- - (\text{e}^- \text{ (أيونات)} + \frac{\text{e}^-}{2 \text{ (أيونات)}})$$

↓
الدوران المجموع

لكل عنصر
في المركب

لأنه

more stable $\rightarrow 0$

polarity of molecule \rightarrow (التجاذب)

non-polar \rightarrow (غير متجاذب)

all atoms have same dipole moment \rightarrow (كل الأدوار المتجاذبة هي نفس القوة وتساويها)

different \rightarrow different dipole moments \rightarrow (مختلفة \rightarrow مختلفات القوى)

AX_2E_3 , AX_4E_2 linear \rightarrow (AX₂E₃, AX₄E₂ خطية \rightarrow)

AX_3 , AX_4E_2 square planar \rightarrow (AX₃, AX₄E₂ مربعة مسطحة \rightarrow)

Chemical bond $\leftarrow \pi$ & power full

Valence $e^- \rightarrow$ 1 2 3 4 5 6 7 F 8
+ +2 +3 +4 -3 -2 -1 0

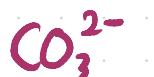
Covalent bond \rightarrow every bond is $2e^-$



central = ρ^2 max e^- 8
(المركزي = ρ^2 макс e^- 8)



Resonance \leftarrow ظاهرة الريزنس



Chapter 2

Expected

Table for $\frac{\text{Mass}}{\text{Atomic no}}$

Find cation⁻ and cation⁺

Find total number of p⁺ and e⁻

* Isotopes:

Atomic no, p⁺, e⁻ → Same

n^o → different

* periodic table division \leftarrow 18 gro \rightarrow 7 per or row

1 alkali metal

2 alkaline earth metal

3-12 Transition metal

13 post-transition metal

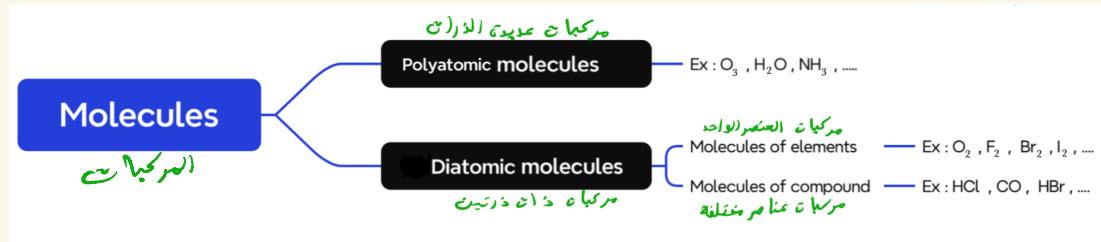
17 halogens

18 Noble gas

Metal Left

Non-metal Right

Metalloid $\frac{B}{P}$

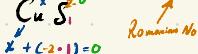


Naming of compound

Ionic comp

m + n.m

First ele \Rightarrow no charge
If its transition (Cu²⁺)



Romanian No

Molecular comp

n.m + n.m

First ele \Rightarrow no charge
Second ele \Rightarrow -ide
mono di tri tetra penta hexa hepta
octa nona deca

Hydrates

comp + NH₄O

mono di tri tetra penta hexa hepta
octa nona deca

-hydrate

Acid and Base

with O

ate \rightarrow ic acid
ite \rightarrow our acid

without O
ide \rightarrow hydro-ic acid

Name +
Hydroxide

One element-ide
Or table

Second ele

Same atom
-ide
table
-ate
-ite