

Miscellaneous information for Chemistry 100

¹Conversion ²Nuclear Chem ³Solubility ⁴VSEPR ⁵Solution ⁶Gas laws ⁷Stoichiometry ⁸Acid-base ⁹Periodic table

1 Conversion information:

System	LENGTH:	VOLUME	MASS	Temperature
English:	1 ft = 12 in	1 gal = 4 qt	1 lb = 16 oz	$T_{\circ F} = 1.8T_{\circ C} + 32$
	1 mile = 5280 ft	1 qt = 2 pints	1 ton = 2000 lb	
		1 pt = 16 fl oz		
SI- English:	2.54 cm = 1 in	0.946 L = 1 qt	453.6 g = 1 lb	$T_{\circ C} = \frac{(T_{\circ F} - 32)}{1.8}$
	1.609 km = 1 mi	3.785 L = 1 gal	28.35 g = 1 oz	
		29.57 mL = 1 fl oz.	1 kg = 2.205 lb	
Misc. info	1 mole = $6.02 \cdot 10^{23}$		Density H ₂ O: 1.0 g / cc	


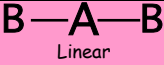
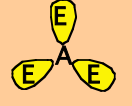
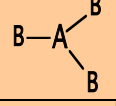
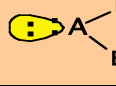

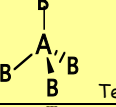
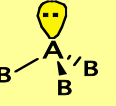
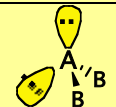
2 Nuclear Chemistry

Particle	Charge	Mass(g)	Nomenclature	
alpha	2+	6.64e-24	$\begin{matrix} 4 & \text{He} \\ 2 & \end{matrix}$	$\begin{matrix} 4 & \alpha \\ 2 & \end{matrix}$
beta	1-	9.11e-28	$\begin{matrix} 0 & e \\ -1 & \end{matrix}$	$\begin{matrix} 0 & \beta \\ -1 & \end{matrix}$
gamma	0	0	$\begin{matrix} 0 & \gamma \end{matrix}$	
proton	1+	1.673 e-24	$\begin{matrix} 1 & \text{H} \\ 1 & \end{matrix}$	$\begin{matrix} 1 & p \\ 1 & \end{matrix}$
neutron	0	1.675 e-24	$\begin{matrix} 1 & n \\ 0 & \end{matrix}$	
electron	1-	9.11e-28	$\begin{matrix} 0 & e \\ -1 & \end{matrix}$	
positron	1+	9.11e-28	$\begin{matrix} 0 & e \\ +1 & \end{matrix}$	

3 Solubility rules:

Soluble Substances		Insoluble Substances	
Containing-	Exceptions	Containing-	Exceptions
Nitrates (NO ₃ ⁻) Perchlorates (ClO ₄ ⁻) Acetates (CH ₃ CO ₂ ⁻)	None	Carbonates (CO ₃ ²⁻) Chromates (CrO ₄ ²⁻) Phosphates (PO ₄ ³⁻) Sulfides (S ²⁻)	Alkali and NH ₄ ⁺
Halogens (X ⁻) Cl ⁻ , Br ⁻ , I ⁻	Ag, Hg & Pb.	Hydroxides (OH ⁻)	Ca, Ba, Sr, Alkali & NH ₄ ⁺
Sulfates (SO ₄ ²⁻)	Ca, Ba, Hg and Pb	Soluble - dissolve, no precipitate (aq -phase) insoluble (or slightly sol.) - does not dissolve, precipitate forms. (s-phase)	
Alkali (Group 1A) NH ₄ ⁺	None		

4 Valence Shell Electron-Pair Repulsion Theory (VSEPR) :

Electron Domains (Regions)	AE_n	Electronic Geometry	Bond Pair (Coord #)	non-bond pair	AB_mE_n	Molecular Geometry	Bond angle Hybrid
2	AE_2	 Linear	2	0	AB_2	 Linear	180° sp
3	AE_3	 Trigonal	3	0	AB_3	 Trigonal	120° sp^2
			2	1	AB_2E	 Bent	$< 120^\circ$ sp^2
4	AE_4	 Tetrahedral	4	0	AB_4	 Tetrahedral	109.5° sp^3
			3	1	AB_3E	 Pyramidal	$< 109.5^\circ$ sp^3
			2	2	AB_2E_2	 Bent	$< 109.5^\circ$ sp^3

5 Solution and Concentration equations:

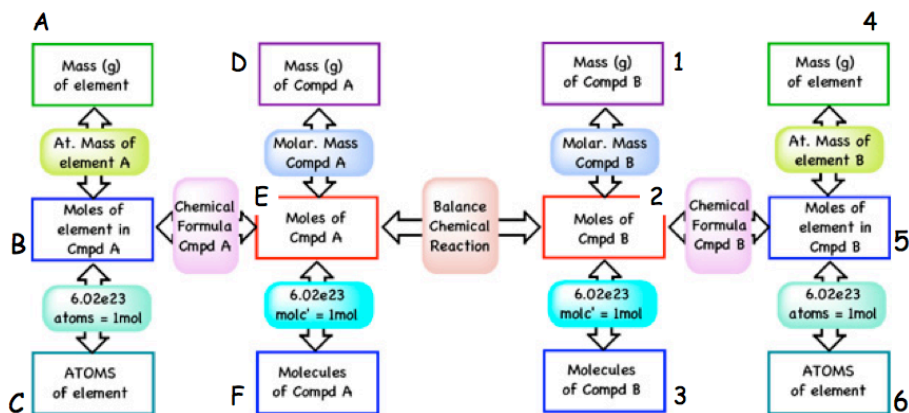
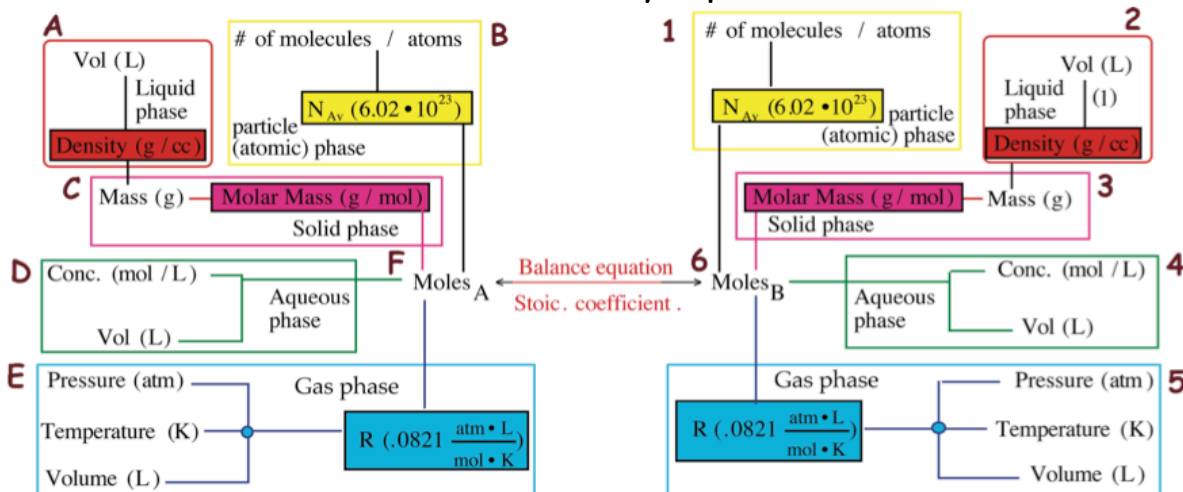
Solution	Molarity = moles solute / Liters solution Dilution : $C_1V_1 = C_2V_2$
Concentrations	Molarity = moles solute / Liters solution $w/v = g \text{ solute} / ml \text{ solution}$ $w/w = g \text{ solute} / g \text{ solution}$ $v/v = ml \text{ solute} / ml \text{ solution}$

6 Gas law equations

Ideal Gas Law	$PV = nRT$ $R = 0.08206 \frac{L \cdot atm}{mol \cdot K}$
STP: $P = 1.0 \text{ atm}, T = 0^\circ C, 1 \text{ mole} = 22.4 \text{ L}$	Density (D) = $\frac{\text{mass} \cdot P}{n R T}$ Mol. Wt. ($\frac{g}{mol}$) = $\frac{\text{mass} \cdot R T}{V \cdot P}$
Dalton's Law of Partial Pressure	$P_T = P_a + P_b + P_c + \dots$ $P_T = \frac{(n_a + n_b + n_c + \dots)R \cdot T}{V_T}$
Graham's Law of effusion	$\frac{\text{rate}_a}{\text{rate}_b} = \frac{\text{time}_b}{\text{time}_a} = \sqrt{\frac{M_b}{M_a}}$

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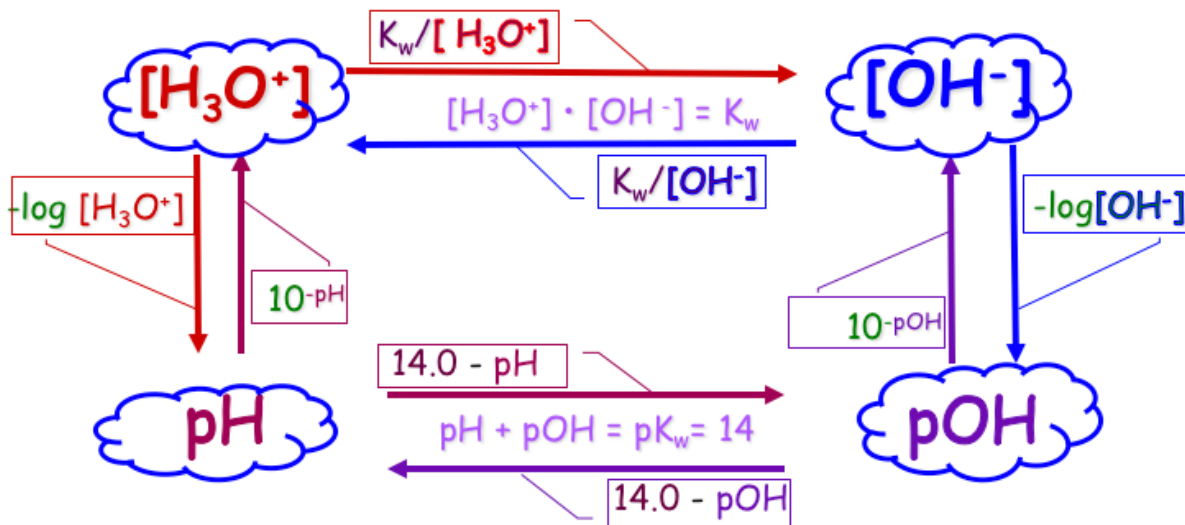
Stoichiometry Map



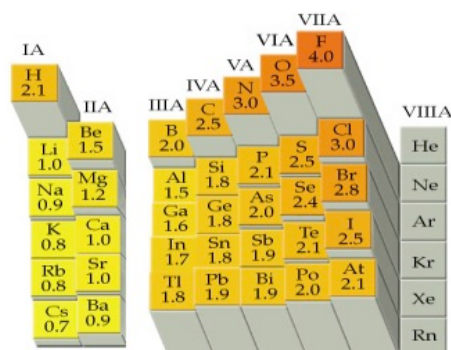
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Acid Base:

Henderson-Hasselbach: $\text{pH} = \text{pK}_a + \log \left[\frac{[\text{A}^-]}{[\text{HA}]} \right]$ pH Calculations: $\text{pH} = -\log[\text{H}_3\text{O}^+]$, $[\text{H}_3\text{O}^+] = 10^{-\text{pH}}$



DO NOT WRITE on this equation Page, it will be recycled for future exams



←Electronegativity Values

1 IA	2 IIA	3 IIIB	4 IVB	5 VB	6 VIB	7 VIIB	8 VIIIB	9 VIIIB	10 VIIIB	11 IB	12 IIB	13 IIIA	14 IVA	15 VA	16 VIA	17 VIIA	18 VIIIA
1 H 1.00797	2 He 4.0026											5 B 10.811	6 C 12.0112	7 N 14.0067	8 O 15.9994	9 F 18.9984	10 Ne 20.179
2 Li 6.939	4 Be 9.0122											13 Al 26.9815	14 Si 28.086	15 P 30.9738	16 S 32.064	17 Cl 35.453	18 Ar 39.948
3 Na 22.9898	12 Mg 24.305											31 Ga 69.72	32 Ge 72.59	33 As 74.9216	34 Se 78.96	35 Br 79.909	36 Kr 83.80
4 K 39.102	20 Ca 40.08	21 Sc 44.956	22 Ti 47.90	23 V 50.942	24 Cr 51.996	25 Mn 54.938	26 Fe 55.847	27 Co 58.9332	28 Ni 58.71	29 Cu 63.54	30 Zn 65.37	49 In 69.72	50 Sn 72.59	51 Sb 74.9216	52 Te 78.96	53 I 79.909	54 Xe 83.80
5 Rb 85.47	38 Sr 87.62	39 Y 88.905	40 Zr 91.22	41 Nb 92.906	42 Mo 95.94	43 Tc [99]	44 Ru 101.07	45 Rh 102.905	46 Pd 106.4	47 Ag 107.870	48 Cd 112.40	81 Tl 114.82	82 Pb 118.69	83 Bi 121.75	84 Po 127.60	85 At 126.904	86 Rn 131.30
6 Cs 132.905	56 Ba 137.34	71* Lu 174.967	72 Hf 178.49	73 Ta 180.948	74 W 183.85	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.09	79 Au 197.0	80 Hg 200.59	81 Tl 204.37	82 Pb 207.19	83 Bi 208.980	84 Po [210]	85 At [210]	86 Rn [222]
7 Fr [223.02]	88 Ra [226.03]	103† Lr [260]	104 Rf [261.11]	105 Db [262.11]	106 Sg [266.12]	107 Bh [264.12]	108 Hs [269.13]	109 Mt [268.14]	110 Ds [271]	111 Rg [272]	112 [277]		114 [289]		116 [292]		

*
Lanthanide Series

57 La 138.91	58 Ce 140.115	59 Pr 140.9077	60 Nd 144.24	61 Pm (145)	62 Sm 150.368	63 Eu 151.965	64 Gd 157.25	65 Tb 158.9254	66 Dy 162.50	67 Ho 164.9303	68 Er 167.26	69 Tm 168.9342	70 Yb 173.04
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Actinide Series

89 Ac [227.03]	90 Th 232.0381	91 Pa 231.0359	92 U 238.0289	93 Np 237.048	94 Pu [244]	95 Am [260]	96 Cm [247]	97 Bk [247]	98 Cf [251]	99 Es [252]	100 Fm [257]	101 Md [258]	102 No [259]
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