

Miscellaneous information for Chemistry 100

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



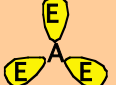
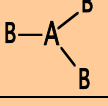
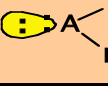

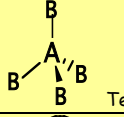
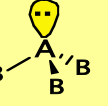
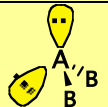
¹ Conversion information:

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 pt = 16 fl oz	1 ton = 2000 lb	
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 29.57 mL = 1 fl oz.	28.35 g = 1 oz 1 kg = 2.205 lb	
Misc. info	1 mole = $6.02 \cdot 10^{23}$		Density H ₂ O: 1.0 g / cc	

² 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		

³ Valence Shell Electron-Pair Repulsion Theory (VSEPR) :

Electron Domains (Regions)	AE _n	Electronic Geometry	# Bonded Atoms (Coord #)	Lone pair on central atom	AB _m E _n	Molecular Geometry	Bond angle & Hybridization
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 ₂ E	 Bent	< 120° sp ²
4	AE ₄	 Tetrahedral	4	0	AB ₄	 Tetrahedral	109.5° sp ³
			3	1	AB ₃ E	 Pyramidal	< 109.5° sp ³
			2	2	AB ₂ E ₂	 Bent	< 109.5° sp ³

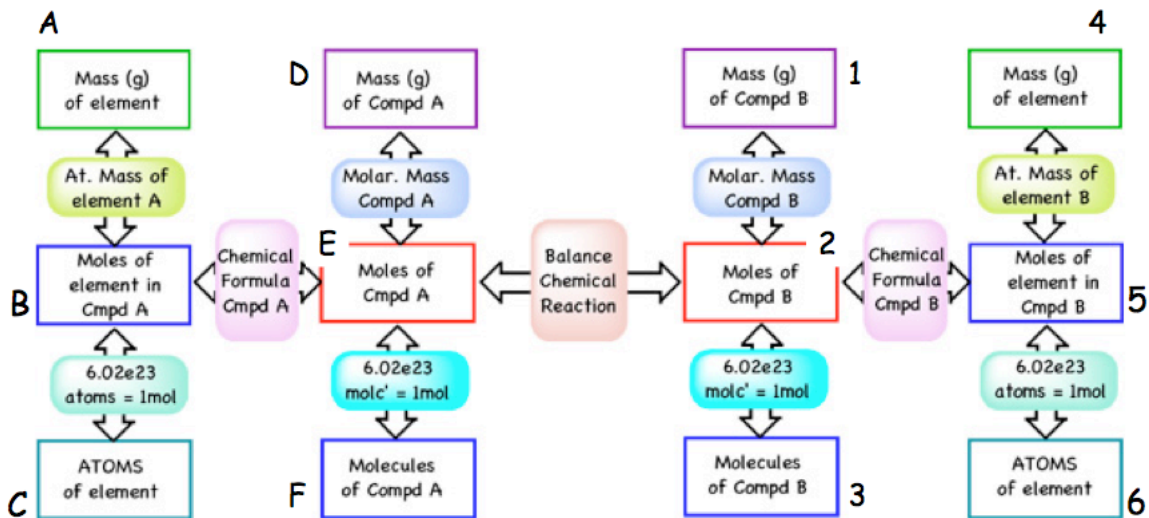
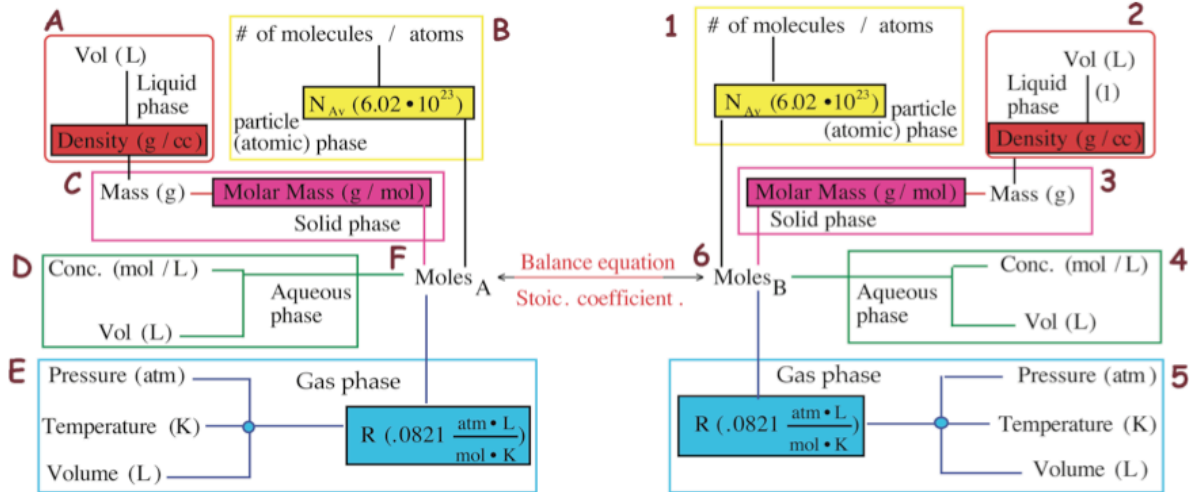
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Solution and Concentration equations:

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

5

Stoichiometry Map



6

Gas law equations

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

Henderson-Hasselbach: $\text{pH} = \text{pK}_a + \log \left[\frac{[A^-]}{[HA]} \right]$	$[H_3O^+] \cdot [OH^-] = K_w, K_w = 1.0 \cdot 10^{-14} @ 25^\circ\text{C}$ pH Calculations: $\text{pH} = -\log[H_3O^+], [H_3O^+] = 10^{-\text{pH}}$
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Organic: Nomenclature

Suffix			#C	prefix	C_nH_{2n+2} Alkane	C_nH_{2n} Alkene	C_nH_{2n-2} Alkyne
Alkane	single bond	-ane					
Alkene	double bond	-ene	1	meth	methane		
Alkyne	triple bond	-yne	2	eth	ethane	ethene	ethyne
Alcohol	OH group	-ol	3	prop	propane	propene	propyne
Ether	R-O-R	ether	4	but	butane	butene	butyne
Aldehyde	RCHO	-al	5	pent	pentane	pentene	pentyne
Ketone	R-CO-R	-one	6	hex	hexane	hexene	hexyne
carboxylic acid	RCOOH	-oic acid	7	hept	heptane	heptene	heptyne
Ester	RCOOR'	-ate	8	oct	octane	octene	octyne
Amine	RR'R"N	-amine	9	non	nonane	nonene	nonyne
Amide	RCONHR'	-amide	10	dec	decane	decene	decyne

Alkyl groups:	Reactivity: Alkene & Alkynes
n-propyl 	1 Halogenation (+ X ₂)
n-butyl 	2 Hydrogenation (+ H ₂)
sec butyl 	3 Hydrohalogenation (+ HX)
isopropyl 	4 Polymerization
isobutyl 	
tert butyl 	

← 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	3 Li 0.9	4 Be 1.5	5 B 2.0	6 C 2.5	7 N 3.0	8 O 3.5	9 F 4.0	10 Ne	11 Na 0.9	12 Mg 1.2	13 Al 1.5	14 Si 1.8	15 P 2.1	16 S 2.5	17 Cl 3.0	18 Ar
19 K 0.8	20 Ca 1.0	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb 0.8	38 Sr 1.0	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs 0.7	56 Ba 0.9	71* Lu	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr [223.02]	88 Ra [226.03]	103† Lr	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112		114 [289]		116 [292]		

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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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