

Equations and Constants

$$\Delta = hc/\lambda$$

$$\pi = iMRT$$

$$P = k_H X$$

$$P = k_H C$$

$$P_1 = X_1 P_1^\circ$$

$$P_{\text{total}} = X_1 P_1^\circ + X_2 P_2^\circ$$

$$\Delta T = i K_b m$$

$$\Delta T = i K_f m$$

$$R = 8.3145 \text{ J mol}^{-1} \text{ K}^{-1}$$

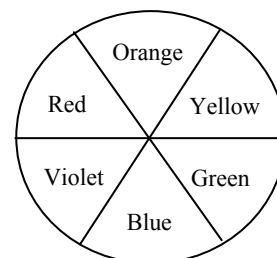
$$R = 0.08206 \text{ L atm mol}^{-1} \text{ K}^{-1}$$

$$1 \text{ atm} = 760 \text{ torr}$$

$$h = 6.626 \times 10^{-34} \text{ J s}$$

$$c = 3.0 \times 10^8 \text{ m/s}$$

$$\ln \left(\frac{P_{\text{vap}}^{T_1}}{P_{\text{vap}}^{T_2}} \right) = \frac{\Delta H_{\text{vap}}}{R} \left(\frac{1}{T_2} - \frac{1}{T_1} \right)$$



Selected Electronegativities

H = 2.1

C = 2.5

N = 3.0

O = 3.5

F = 4.0

P = 2.1

S = 2.5

Cl = 3.0

The visible region of the electromagnetic spectrum

	violet	blue	green	yellow	orange	red
λ (nm)	400		500	600		700

The Spectrochemical Series



weak field ligands (small Δ)

strong field ligands (large Δ)

Ligands bonding atoms in bold, charge indicated, unidentate unless noted otherwise

H₂O aqua

OH⁻ hydroxo

NO₂⁻ nitro

NH₃ ammine

CN⁻ cyano

SCN⁻ thiocyanato

NCS⁻ isothiocyanato

CO carbonyl

X⁻ halides (fluoro, chloro, bromo...)

en ethylenediamine (bidentate)

Periodic Table

		1A										7						8A																	
		1										A						2																	
		H																He																	
		1.008																4.003																	
		1A		2A		3		4		5		6		7		8		9		10		11		12		3A	4A	5A	6A	7	8A				
		3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
		Li	Be									Al	Si	P	S	Cl	Ar	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
		6.941	9.012									26.98	28.09	30.97	32.07	35.45	39.95	39.10	40.08	44.96	47.88	50.94	52.00	54.94	55.85	58.93	58.69	63.55	65.39	69.72	72.61	74.92	78.96	79.90	83.80
2																																			
3		Na	Mg									Al	Si	P	S	Cl	Ar	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
4		22.99	24.30									26.98	28.09	30.97	32.07	35.45	39.95	85.47	87.62	88.91	91.22	92.91	95.94	(98)	101.1	102.9	106.4	107.9	112.4	114.8	118.7	121.8	127.6	126.9	131.3
5		K	Ca	La-Lu								Al	Si	P	S	Cl	Ar	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
6		39.10	40.08									26.98	28.09	30.97	32.07	35.45	39.95	85.47	87.62	88.91	91.22	92.91	95.94	(98)	101.1	102.9	106.4	107.9	112.4	114.8	118.7	121.8	127.6	126.9	131.3
7		Cs	Ba	La-Lu	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn																
8		132.9	137.3		178.5	180.9	183.8	186.2	190.2	192.2	195.1	197.0	200.6	204.4	207.2	209.0	(209)	(210)	(222)																
9		Fr	Ra	Ac-Lr	Rf	Db	Sg	Bh	Hs	Mt	Uun	Uuu	Uub		Uuq		Uuh		Uuo																
10		(223)	(226)		(261)	(262)	(263)	(264)	(265)	(268)	(269)	(272)	(269)																						
		s block		d block										p block																					