Potentially Useful Equations

$c = \lambda\nu$ $E = h\nu$ $KE = h\nu - W$

$$\frac{1}{\lambda} = 1.09737\times10^{-2}\ \text{nm}\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$$

$$V \propto \frac{Q_+ Q_-}{d}$$

$$\text{AVEE} = \frac{xIE_s + yIE_p + zIE_d}{x + y + z}$$

(valence shell electrons only)

Potentially Useful Constants

$c = 2.998\times10^{8}$ m/s $h = 6.626\times10^{-34}$ Js $N_A = 6.022\times10^{23}$ mol^{-1}

Slater's Rules for Calculating Z_{eff}

The effective nuclear charge, Z_{eff}, is given as $Z - S$ where Z is the actual charge on the nucleus and S is a shielding constant the value of which is determined using the following set of rules:

1. write out the electron configuration in groups using the following order

   (1s) (2s, 2p) (3s, 3p) (3d) (4s, 4p) (4d) (4f) (5s, 5p) …

2. identify the group in which the electron of interest lies; ignore electrons to the right of this group
3. if the electron of interest is an *s* or *p* electron, then each additional electron in its (*ns, np*) group contributes 0.35 to S, each electron in the $n - 1$ shell contributes 0.85 to S, and each electron further to the left contributes 1.00 to S
4. if the electron of interest is a *d* or *f* electron, then each additional electron in its (*nd*) or (*nf*) group contributes 0.35 to S and each electron further to the left contributes 1.00 to S

Periodic Table of Elements

	1 1A	2 2A	3 3B	4 4B	5 5B	6 6B	7 7B	8	9 8B	10	11 1B	12 2B	13 3A	14 4A	15 5A	16 6A	17 7A	18 8A
1	1 **H** 1.0079																	2 **He** 4.0026
2	3 **Li** 6.94	4 **Be** 9.0122											5 **B** 10.811	6 **C** 12.011	7 **N** 14.007	8 **O** 15.999	9 **F** 18.998	10 **Ne** 20.180
3	11 **Na** 22.990	12 **Mg** 24.305											13 **Al** 26.982	14 **Si** 28.086	15 **P** 30.974	16 **S** 32.066	17 **Cl** 35.453	18 **Ar** 39.948
4	19 **K** 39.098	20 **Ca** 40.078	21 **Sc** 44.956	22 **Ti** 47.88	23 **V** 50.942	24 **Cr** 51.996	25 **Mn** 54.938	26 **Fe** 55.847	27 **Co** 58.933	28 **Ni** 58.693	29 **Cu** 63.546	30 **Zn** 65.39	31 **Ga** 69.723	32 **Ge** 72.61	33 **As** 74.922	34 **Se** 78.96	35 **Br** 79.904	36 **Kr** 83.80
5	37 **Rb** 85.468	38 **Sr** 87.62	39 **Y** 88.906	40 **Zr** 91.224	41 **Nb** 92.906	42 **Mo** 95.94	43 **Tc** 98.906	44 **Ru** 101.07	45 **Rh** 102.91	46 **Pd** 106.42	47 **Ag** 107.87	48 **Cd** 112.41	49 **In** 114.82	50 **Sn** 118.71	51 **Sb** 121.76	52 **Te** 127.60	53 **I** 126.90	54 **Xe** 131.29
6	55 **Cs** 132.91	56 **Ba** 137.33	57 **La** 138.91	72 **Hf** 178.49	73 **Ta** 180.95	74 **W** 183.84	75 **Re** 186.21	76 **Os** 190.23	77 **Ir** 192.22	78 **Pt** 195.08	79 **Au** 196.97	80 **Hg** 200.59	81 **Tl** 204.38	82 **Pb** 207.2	83 **Bi** 208.98	84 **Po** 209.98	85 **At** 209.99	86 **Rn** 222.02
7	87 **Fr** 223.02	88 **Ra** 226.03	89 **Ac** 227.03	104 **Rf** 257	105 **Db** 260	106 **Sg** 263	107 **Bh** 262	108 **Hs** 265	109 **Mt** 266	110 **Ds** 271	111 **Rg** 272	112 **Cn** 285	113 **Uut** 284	114 **Uuq** 289	115 **Uup** 288	116 **Uuh** 293	117 **Uus** 294	118 **Uuo** 294

s *p* *d* *f*

Lanthanide series	58 **Ce** 140.12	59 **Pr** 140.91	60 **Nd** 144.24	61 **Pm** 146.92	62 **Sm** 150.36	63 **Eu** 151.96	64 **Gd** 157.25	65 **Tb** 158.93	66 **Dy** 162.50	67 **Ho** 164.93	68 **Er** 167.26	69 **Tm** 168.93	70 **Yb** 173.04	71 **Lu** 174.97
Actinide series	90 **Th** 232.04	91 **Pa** 231.04	92 **U** 238.03	93 **Np** 237.05	94 **Pu** 239.05	95 **Am** 241.06	96 **Cm** 244.06	97 **Bk** 249.08	98 **Cf** 252.08	99 **Es** 252.08	100 **Fm** 257.10	101 **Md** 258.10	102 **No** 259.10	103 **Lr** 262.11