

1 <b>H</b> 1.008	$N_A = 6.02214 \times 10^{23} \text{ mol}^{-1}$ $R = 0.08206 \text{ (L}\cdot\text{atm)} / (\text{mol}\cdot\text{K}) = 8.314 \text{ J} / (\text{mol}\cdot\text{K})$ $c = 2.9979 \times 10^8 \text{ m/s}$ $F = 9.65 \times 10^4 \text{ C/mol} = 9.65 \times 10^4 \text{ J} / (\text{V}\cdot\text{mol})$ $K_w = 1.00 \times 10^{-14} \text{ at } 25 \text{ }^\circ\text{C}$ $1 \text{ atm} = 760 \text{ torr} = 760 \text{ mmHg}$																2 <b>He</b> 4.0026												
3 <b>Li</b> 6.94	4 <b>Be</b> 9.0122	5 <b>B</b> 10.81	6 <b>C</b> 12.011	7 <b>N</b> 14.007	8 <b>O</b> 15.999	9 <b>F</b> 18.998	10 <b>Ne</b> 20.180	11 <b>Na</b> 22.990	12 <b>Mg</b> 24.305	13 <b>Al</b> 26.982	14 <b>Si</b> 28.085	15 <b>P</b> 30.974	16 <b>S</b> 32.06	17 <b>Cl</b> 35.45	18 <b>Ar</b> 39.948														
19 <b>K</b> 39.098	20 <b>Ca</b> 40.078	21 <b>Sc</b> 44.956	22 <b>Ti</b> 47.867	23 <b>V</b> 50.942	24 <b>Cr</b> 51.996	25 <b>Mn</b> 54.938	26 <b>Fe</b> 55.845	27 <b>Co</b> 58.933	28 <b>Ni</b> 58.693	29 <b>Cu</b> 63.546	30 <b>Zn</b> 65.38	31 <b>Ga</b> 69.723	32 <b>Ge</b> 72.630	33 <b>As</b> 74.922	34 <b>Se</b> 78.971	35 <b>Br</b> 79.904	36 <b>Kr</b> 83.798												
37 <b>Rb</b> 85.468	38 <b>Sr</b> 87.62	39 <b>Y</b> 88.906	40 <b>Zr</b> 91.224	41 <b>Nb</b> 92.906	42 <b>Mo</b> 95.95	43 <b>Tc</b> (98)	44 <b>Ru</b> 101.07	45 <b>Rh</b> 102.91	46 <b>Pd</b> 106.42	47 <b>Ag</b> 107.87	48 <b>Cd</b> 112.41	49 <b>In</b> 114.82	50 <b>Sn</b> 118.71	51 <b>Sb</b> 121.76	52 <b>Te</b> 127.60	53 <b>I</b> 126.90	54 <b>Xe</b> 131.29												
55 <b>Cs</b> 132.91	56 <b>Ba</b> 137.33	57–71	72 <b>Hf</b> 178.49	73 <b>Ta</b> 180.95	74 <b>W</b> 183.84	75 <b>Re</b> 186.21	76 <b>Os</b> 190.23	77 <b>Ir</b> 192.22	78 <b>Pt</b> 195.08	79 <b>Au</b> 196.97	80 <b>Hg</b> 200.59	81 <b>Tl</b> 204.38	82 <b>Pb</b> 207.2	83 <b>Bi</b> 208.98	84 <b>Po</b> (209)	85 <b>At</b> (210)	86 <b>Rn</b> (222)												
87 <b>Fr</b> (223)	88 <b>Ra</b> (226)	89–103	104 <b>Rf</b> (267)	105 <b>Db</b> (268)	106 <b>Sg</b> (269)	107 <b>Bh</b> (270)	108 <b>Hs</b> (277)	109 <b>Mt</b> (278)	110 <b>Ds</b> (281)	111 <b>Rg</b> (282)	112 <b>Cn</b> (285)	113 <b>Nh</b> (286)	114 <b>Fl</b> (289)	115 <b>Mc</b> (290)	116 <b>Lv</b> (293)	117 <b>Ts</b> (294)	118 <b>Og</b> (294)												
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57 <b>La</b> 138.91	58 <b>Ce</b> 140.12	59 <b>Pr</b> 140.91	60 <b>Nd</b> 144.24	61 <b>Pm</b> (145)	62 <b>Sm</b> 150.36	63 <b>Eu</b> 151.96	64 <b>Gd</b> 157.25	65 <b>Tb</b> 158.93	66 <b>Dy</b> 162.50	67 <b>Ho</b> 164.93	68 <b>Er</b> 167.26	69 <b>Tm</b> 168.93	70 <b>Yb</b> 173.05	71 <b>Lu</b> 174.97	72 <b>Hf</b> 178.49	73 <b>Ta</b> 180.95	74 <b>W</b> 183.84	75 <b>Re</b> 186.21	76 <b>Os</b> 190.23	77 <b>Ir</b> 192.22	78 <b>Pt</b> 195.08	79 <b>Au</b> 196.97	80 <b>Hg</b> 200.59	81 <b>Tl</b> 204.38	82 <b>Pb</b> 207.2	83 <b>Bi</b> 208.98	84 <b>Po</b> (209)	85 <b>At</b> (210)	86 <b>Rn</b> (222)
89 <b>Ac</b> (227)	90 <b>Th</b> 232.04	91 <b>Pa</b> 231.04	92 <b>U</b> 238.03	93 <b>Np</b> (237)	94 <b>Pu</b> (244)	95 <b>Am</b> (243)	96 <b>Cm</b> (247)	97 <b>Bk</b> (247)	98 <b>Cf</b> (251)	99 <b>Es</b> (252)	100 <b>Fm</b> (257)	101 <b>Md</b> (258)	102 <b>No</b> (259)	103 <b>Lr</b> (266)															

1.  $\Pi = iMRT$

2.  $\Delta T_f = K_f i m$

3.  $\Delta T_b = K_b i m$

4.  $C_{gas} = k_H \cdot P_{gas}$

5.  $P_{solution} = x_{solvent} \cdot P_{solvent}^o$

6.  $\Delta S_{univ} = \Delta S_{sys} + \Delta S_{surr}$

7.  $\Delta S = \frac{q_{rev}}{T}$

8.  $\Delta S_{rxn}^o = \sum nS^o (\text{products}) - \sum nS^o (\text{reactants})$

9.  $\Delta G_{rxn}^o = \Delta H_{rxn}^o - T\Delta S_{rxn}^o$

10.  $\Delta E = q + w$

11.  $\Delta G_{rxn}^o = \Delta G_{rxn}^o + RT \ln Q$

12.  $\Delta G_{rxn}^o = -RT \ln K$

13.  $[X]_t = -kt + [X]_0$  (zero order)

14.  $\ln[X]_t = -kt + \ln[X]_0$  (first order)

15.  $\frac{1}{[X]_t} = kt + \frac{1}{[X]_0}$  (second order)

16.  $t_{1/2} = \frac{0.693}{k}$  (first order)

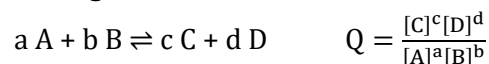
17.  $t_{1/2} = \frac{1}{k[X]_0}$  (second order)

18.  $k = Ae^{-E_a/RT}$

19.  $\ln(k) = -\frac{E_a}{R} \left(\frac{1}{T}\right) + \ln(A)$

20.  $\ln\left(\frac{k_2}{k_1}\right) = -\frac{E_a}{R} \left(\frac{1}{T_2} - \frac{1}{T_1}\right)$

21. For a generalized reaction:



22.  $K_w = [H_3O^+][OH^-]$

23.  $\text{pH} = -\log[H_3O^+]$

24.  $K_w = K_a K_b$

25.  $\text{pH} = \text{p}K_a + \log \frac{[\text{base}]}{[\text{acid}]}$

26.  $\ln K_p = -\frac{\Delta H_{rxn}^o}{R} \left(\frac{1}{T}\right) + \frac{\Delta S_{rxn}^o}{R}$

27.  $\Delta G_{cell}^o = -nFE_{cell}^o$

28.  $E_{cell} = E_{cell}^o - \frac{0.0592}{n} \log Q$

29.  $E_{cell} = E_{cell}^o - \frac{RT}{nF} \ln Q$

30.  $PV = nRT$