CHEM112 Fall Data and Formula Sheet (to be provided with December exam)

Symbol	Value
R	8.31451 J·mol^{-1}·K^{-1} 0.08206 L·atm·mol^{-1}·K^{-1} 8.31451 kPa·L·mol^{-1}·K^{-1} 8.31451 Pa·m^3·mol^{-1}·K^{-1}
k_b	1.3807 × 10^{-23} J·K^{-1}
N_A	6.0221 × 10^{23} mol^{-1}
F	96485 C·mol^{-1}
e	1.6022 × 10^{-19} C
h	6.6261 × 10^{-34} J s
m_p	1.6726 × 10^{-27} kg
m_e	9.1094 × 10^{-31} kg
R_H	2.179 × 10^{-18} J or 1.09687 × 10^7 m^{-1}
c	2.9979 × 10^8 m·s^{-1}

1 atm = 101.325 kPa = 760 mm Hg = 760 torr

STP: P = 750 mm Hg = 100 kPa = 1 bar and T = 273.15 K

0 °C = 273.15 K

1 L =1 dm^3

$$d = \frac{m}{V}$$

$$n = \frac{m}{M} = \frac{\#\ particles}{N_A}$$

$$C = \frac{n_{solute}}{V_{solution}}$$

$$\left(P + \frac{n^2 a}{V^2}\right)(V - nb) = nRT$$

$$PV = nRT$$

$$P_1V_1 = P_2V_2$$

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$\chi_a = \frac{n_a}{n_{tot}} = \frac{P_a}{P_{tot}} = \frac{V_a}{V_{tot}}$$

$$\chi_a + \chi_b + \cdots = 1$$

$$u_m = \sqrt{\frac{2RT}{M}}$$

$$u_{av} = \sqrt{\frac{8RT}{\pi M}}$$

$$u_{rms} = \sqrt{\frac{3RT}{M}}$$

$$\ln\left(\frac{P_2^*}{P_1^*}\right) = -\frac{\Delta H_{vap}}{R}\left(\frac{1}{T_2} - \frac{1}{T_1}\right)$$

$$P_a = \chi_a P_a^*$$

$$q = C_p \Delta T$$

$$q = m\ c_p\ \Delta T$$

$$q = n\ C_{p,m}\ \Delta T$$

$$w = -P_{ex}\Delta V = -\Delta n_{gas} RT$$

$$\Delta U = q_V$$

$$\Delta H = q_P$$

$$C_V - C_P = R$$

$$\Delta U = q + w$$

$$\Delta H = \Delta U + P\Delta V$$

$$\Delta H^\circ = \sum \Delta H_F^\circ(P) - \sum \Delta H_F^\circ(R)$$

$$\Delta H^\circ = \sum_{broken} B.E. - \sum_{formed} B.E.$$

$$C_V = \frac{\Delta U}{\Delta T}$$

$$C_P = \frac{\Delta H}{\Delta T}$$

$$E = h\nu$$

$$c = \lambda\nu$$

$$\lambda = \frac{h}{mu}$$

$$E = h\nu = R_H \left|\frac{1}{n_1^2} - \frac{1}{n_2^2}\right|$$

$$KE = \frac{1}{2}mu^2$$

$$h\nu = KE + \phi$$

	1 1A	2 2A	3 3B	4 4B	5 5B	6 6B	7 7B	8 8B	9 8B	10 8B	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 6.941	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 32.065	17 Cl 35.453	18 Ar 39.948
4	19 K 39.098	20 Ca 40.078	21 Sc 44.956	22 Ti 47.867	23 V 50.942	24 Cr 51.996	25 Mn 54.938	26 Fe 55.845	27 Co 58.933	28 Ni 58.693	29 Cu 63.546	30 Zn 65.38	31 Ga 69.723	32 Ge 72.63	33 As 74.922	34 Se 78.96	35 Br 79.904	36 Kr 83.798
5	37 Rb 85.468	38 Sr 87.62	39 Y 88.906	40 Zr 91.224	41 Nb 92.906	42 Mo 95.96	43 Tc 98	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 127.6	53 I 126.90	54 Xe 131.29
6	55 Cs 132.91	56 Ba 137.33	57 La 138.9	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 210	85 At 210	86 Rn 222
7	87 Fr 223	88 Ra 226	89 Ac 227															

6	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm 145	62 Sm 150.36	63 Eu 151.96	64 Gd 157.25	65 Tb 158.93	66 Dy 162.5	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.05	71 Lu 174.97
7	90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np 237.05	94 Pu 244.06	95 Am 243.06	96 Cm 247.07	97 Bk 247.07	98 Cf 251.08	99 Es 252.08	100 Fm 257.1	101 Md 258.1	102 No 259.1	103 Lr 262.11