

Equations and Constants

$$F = ma \quad P = F/A \quad P_1V_1 = P_2V_2 \text{ or } P_iV_i = P_fV_f \quad \frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2} \quad PV = nRT$$

$$D = \frac{MP}{RT} \quad P_{total} = P_1 + P_2 + \dots \quad X_x = \frac{n_x}{n_{total}} \quad P_{soln} = X_x P_x \quad P_{total} = \sum_i X_i P_i$$

$$C_{gas} = k_H P_{gas} \quad u_{rms} = \sqrt{\frac{3RT}{M}} \quad \frac{u_x}{u_y} = \sqrt{\frac{M_y}{M_x}} \quad \frac{r_x}{r_y} = \sqrt{\frac{M_y}{M_x}} \quad P = \frac{nRT}{V - nb} - \frac{n^2 a}{V^2}$$

$$\ln\left(\frac{P_1}{P_2}\right) = \frac{\Delta H_{vap}}{R} \left(\frac{1}{T_2} - \frac{1}{T_1}\right) \quad \ln P = -\frac{\Delta H_{vap}}{RT} + Const$$

$$\pi = iMRT \quad \Delta T_b = iK_b m \quad \Delta T_f = iK_f m \quad R = 0.08206 \frac{L \cdot atm}{mol \cdot K} \quad R = 8.3145 \frac{J}{mol \cdot K}$$

1 H 1.008																	2 He 4.003
3 Li 6.941	4 Be 9.012											5 B 10.811	6 C 12.011	7 N 14.007	8 O 15.999	9 F 18.998	10 Ne 20.180
11 Na 22.990	12 Mg 24.305											13 Al 26.982	14 Si 28.085	15 P 30.974	16 S 32.066	17 Cl 35.453	18 Ar 39.948
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 65.39	31 Ga 69.723	32 Ge 72.59	33 As 74.922	34 Se 78.96	35 Br 79.904	36 Kr 83.30
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)	44 Ru 101.07	45 Rh 102.906	46 Pd 106.42	47 Ag 107.868	48 Cd 112.411	49 In 114.818	50 Sn 118.710	51 Sb 121.760	52 Te 127.60	53 I 126.904	54 Xe 131.29
55 Cs 132.902	56 Ba 137.327	57 La 138.906	72 Hf 178.49	73 Ta 180.948	74 W 183.84	75 Re 186.207	76 Os 190.23	77 Ir 192.217	78 Pt 195.078	79 Au 196.967	80 Hg 200.59	81 Tl 204.383	82 Pb 207.2	83 Bi 208.980	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89 Ac (227)	104 Rf (261)	105 Db (262)	106 Sg (263)	107 Bh (262)	108 Hs (265)	109 Mt (268)	110 Ds (271)	111 Rg (272)	112 Uub	113 Uut	114 Uuq	115 Uup			

58 Ce 140.116	59 Pr 140.908	60 Nd 144.908	61 Pm (145)	62 Sm 150.36	63 Eu 151.964	64 Gd 157.25	65 Tb 158.925	66 Dy 152.50	67 Ho 164.930	68 Er 167.26	69 Tm 168.934	70 Yb 173.04	71 Lu 174.967
90 Th 232.038	91 Pa 231.036	92 U 238.029	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (262)

Chemistry 1212
Monday 30, 2012
Exam #1

Name _____

Write very clearly and **show all of your work** for partial credit. A list of equations and constants as well as a periodic table are on the last two pages of your exam.

1.(20 points) Fill in the space with the correct response.

(a) Which lattice possesses the largest number of atoms simple, body-centered, or face-centered cubic?

(b) Name this law: $P_{\text{soln}} = X_{\text{solvent}} P_{\text{solvent}}^{\circ}$.

(c) What type of intermolecular force leads to the high boiling point of water?

(d) Circle the species which is **most** miscible with water.

HBr He CCl₄ CH₃COCH₃ All the same

(e) Circle the gas which experiences the **strongest** intermolecular force.

HF BF₃ O₂ CH₃CH₂CH₂CH₂CH₂OH

(f) Circle the species with the **lowest** vapor pressure.

NO I₂ HF CH₄ All the same

(g) Circle the species which is has the **highest** viscosity.

H₂S HF H₂O₂ NH₃ All the same

(h) Circle the species which has the **lowest** heat of vaporization.

H₂CO CH₃CH₃ CH₄ Xe All the same

(i) Circle the species which has the **largest** amount of hydrogen bonding.

H₂CO CH₃CH₃ CH₄ Xe All the same

(j) What is the ppm of a solution with 1L of water and 75mg of a solute?

2. (20 points) Benzene had a vapor pressure of 400 mm Hg at 60.6°C and a normal boiling point of 80.1°C. What vapor pressure will the species have at 100°C?

3. (20 points) Draw the phase diagram for methane. Label the axes, each phase, the triple point (90.5 K, 0.12 atm), the critical point (191 K, 45.8 atm), and the normal boiling and melting points are 111.7 K and 90.6 K, respectively.

4. (30 points) The boiling points of 1.000 m solutions of ammonium chloride, ammonium sulfate, and ammonium phosphate solutions are 101.0°C, 101.4°C, and 101.8°C atm, respectively. What are the van't Hoff factors for each of these salts? What are their percent dissociations? $k_b = 0.51 \frac{^\circ\text{C}\cdot\text{kg}}{\text{mol}}$

5. (10 points) What is the vapor pressure of a solution containing 20g of CaCl_2 and 100g of water? $P_{\text{H}_2\text{O}}^\circ = 23.8$ torr at 25°C