

Chemistry 210

Exam 1

Be sure to put your name on each page. This page can be removed from your exam so that you will have a Periodic Table handy throughout the exam, it does not need to be turned in. Show all your work for problems which require any sort of calculation, no credit will be given for answers without work shown. If you have shown a significant amount of work or multiple drawings for a problem, draw a box around what you consider your final answer.

$$\text{Avogadro's Number} = 6.022 \times 10^{23} \text{ units/mol}$$

$$32.00^\circ\text{F} = 0.000^\circ\text{C} = 273.15\text{K}$$

$$\text{Density of Water} = 1.000 \text{ g/mL}$$

$$R = 0.08206 \text{ L}\cdot\text{atm/mol}\cdot\text{K}$$

$$PV = nRT$$

$$\Delta T_{\text{fp/bp}} = k_{\text{fp/bp}} \cdot m \cdot i$$

$$\text{For water, } k_{\text{fp}} = -1.86^\circ\text{C/m}; k_{\text{bp}} = 0.52^\circ\text{C/m}$$

$$P_1 = X_1 P_1^\circ$$

$$P = cRTi$$

$$C_1 V_1 = C_2 V_2$$

1 H 1.0079																	2 He 4.0026				
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
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
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 58.69	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				
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 102.91	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				
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)	85 At (210)	86 Rn (222)				
87 Fr (223)	88 Ra 226.03	89 Ac 227.03	104 Rf (261)	105 Db (262)	106 Sg (263)	107 Bh (262)	108 Hs (265)	109 Mt (266)	110 Hs (269)	111 Hs (272)	112 Hs (277)	114		116							

58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.97	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.94	70 Yb 173.04	71 Lu 174.97
90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np 237.05	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (258)	101 Md (258)	102 No (259)	103 Lr (260)

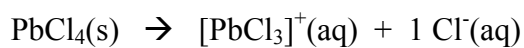
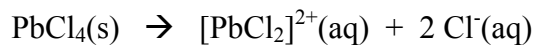
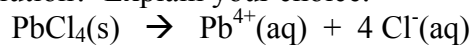
Multiple Choice: Circle the letter of the most correct response. (8pts. per question)

- Rank the 3 states of matter from lowest kinetic energy to highest kinetic energy.
 - Solid, liquid, gas
 - Gas, solid, liquid
 - Solid, gas, liquid
 - Liquid, gas, solid
 - Gas, liquid, solid
- When dissolving a solid in a liquid:
 - The freezing point of the solution will be lower than that of the pure solvent
 - The enthalpy of solution is always positive
 - Energy is released (exothermic) by breaking solvent-solvent and solute-solute interactions
 - The boiling point of the solution will be lower than that of the pure solvent
 - Formation of solvent-solute interactions is endothermic
- Which of the following is **not** a correct gas law relationship?
 - $PV = nRT$
 - $V_1P_1 = V_2P_2$
 - $V_1/T_1 = V_2/T_2$
 - $V_1n_1 = V_2n_2$
 - $P_1/T_1 = P_2/T_2$
- The volume of a gas:
 - Increases as the pressure increases
 - Decreases as the kinetic energy increases
 - Is always a constant
 - Increases as the temperature increases
 - Remains constant as the amount of gas is increased
- Carbon tetrabromide (CBr_4) has a higher boiling point than carbon tetrafluoride (CF_4) because:
 - The bonds in CF_4 are polar but the bonds in CBr_4 are not
 - CBr_4 has a higher molecular weight than CF_4
 - CF_4 is a polar molecule but CBr_4 is not
 - CF_4 has stronger intermolecular forces than CBr_4
 - CF_4 is a gas at room temperature

Colligative Properties: (15pts each)

11. What is the boiling point of a solution made by dissolving 12.952g of potassium bromide in 100.0g of water?

12. Some compounds we call “ionic” do not completely dissociate in water. The extent to which they dissociate can be explored using freezing point depression. When 0.839mols of lead(IV) chloride is dissolved in 750.0g of water, the freezing point of the resulting solution is -6.24°C . Which of the following equations is most consistent with the observed freezing point depression in this solution? Explain your choice.



Gas Laws: (15pts each)

13. You have a 7.50L sample of a pure ideal gas at 1.00atm pressure and 25.35°C. If the gas has a mass of 26.288g, what is the molecular weight of the gas?

14. You have a 38.24L rubber balloon filled with an ideal gas at 3.186°C and 1.00atm pressure with a large weight tied to it. How many mols of gas are in the balloon? If you heat the balloon to 35.821°C, what will be the volume of the balloon (assume pressure does not change)?