100 points Fall 2009 Name________________________

15% of overall Chemistry 111 grade

Chem. 111 Practice Final Exam

Show all work in an organized way. Show all units.

Question	Answer
Unit 1	
1. What is the formula for mercurous perbromate?	
2. What is the mass of carbon in a sample of sucrose $C_{12}H_{22}O_{11}$ that contains 9.87 X 10 ^{34} atoms of oxygen?	
3. Show the balanced equation with states for: Sodium metal is added to water	
4. What is the empirical formula of a compound if a sample of that compound contains .405 **moles** of carbon .591 **grams** of hydrogen and 2.71 X 10^{22} **atoms** of nitrogen?	
Unit 2	
1. Draw the electron dot structure for boron tri bromide in the box at right	

2. What kind of intermolecular bond exists between molecules of CH_4?	
3. Write the equation for the reaction showing the first electron affinity step in the formation of ferrous bromide, with states.	
4. What is the volume of the atom of an element that crystallizes as a **body-centered** cube if the volume of the unit cell is 1.97×10^{-22} cm^3?	
5. What is the mass of 2.54 ml of H_2 at 195 ^0C and 850 mmHg?	
6. It takes 59 seconds for .50L of nitrogen gas to effuse through an apparatus. How many seconds for the same volume of 2 liters of hydrogen gas to effuse through the same apparatus?	

Unit 3	
1. What Halogen has the highest electron affinity?	
2. Write the net ionic equation for the following reaction with states: Hydrochloric acid solution is added to silver acetate.	
3. Is $NH_4C_2H_3O_2$ a strong, weak or nonelectrolyte?	
4. What mass of calcium chloride must be added to 100 grams of water to make it freeze at 269 K?	
5. Which period 3 metal would have the largest radius?	
6. An aqueous solution that contains 115.662 g of a nonvolatile nondissociating solute in 1125 g of water boils at 102.50 ^{0}C. What is the molar mass of the solute?	

7. What is the molal concentration of sodium in a 20.5 % (m/m) aqueous solution of sodium phosphate?	
8. What is the temperature if the osmotic pressure of a solution is 2.07 atm, and the solution is made by adding 128 grams of a protein of molar mass 2,805 g/mol to enough water to make 1500.0 ml of solution?	
9. 205 ml of.45 M sucrose solution is made from .025 L of solution. What is the original molar concentration?	

10. What mass of precipitate is formed when 135.00ml .25 M calcium chloride is reacted with 145.00 ml of .55M potassium sulfate?	
Unit 4	
1. For the following equation write the equilibrium expression $N_2(g) + 3\ H_2\ (g) \Leftrightarrow 2\ NH_3\ (g)$	
2. What is the conjugate acid of PO_3^{-3}	
3. Is PCl_3 a Lewis acid or Lewis base	
4. What is the pH of a $5.34\ X10^{-5}$ M solution of NaOH? Set up:	
5. What is the hydronium ion concentration in a .00000236M KOH solution? Set up:	

6. What is the pH of a .01100 M solution of NH_3	
7. For the following equation will the equilibrium shift left, right or no change if hydrogen is added? $N_2(g) + 3\ H_2\ (g) \Leftrightarrow 2\ NH_3\ (g)$	
8. For the reaction $N_2(g) + 3\ H_2\ (g) \Leftrightarrow 2\ NH_3\ (g)$ At 300^{o}C, *K*c has a value of 9.6. Will the reaction go left, right or it is already at equilibrium if $[H_2] = 0.0400$ M $[N_2] = 0.025$ M and $[NH_3] = 2.50$ M	
9. For the following reaction label the conjugate acid base pairs $CH\ NH_3^{+}$ + HSO_3^{-} $\Leftrightarrow$	

Unit 5	
1. What is the pH of a solution that is 0.100M of NH_3 and .200 M NH_4Cl?	
2. Is a solution of $FeCl_3$ going to be acidic basic or neutral? Show reaction as proof.	
3. Would equimolar solutions of $KClO_3$ and $HClO_3$ be a buffer solution? Yes or no? Why?	
4. Would .05 moles of NH_3 mixed with .10 moles of HCl in one liter of water be a buffer solution? Yes or no? Setup:	

5. What is the pH of a solution of .0300 M $KHSO_4$?	
6. Would a precipitate form if 15.0 ml of .0010 M $Pb(NO_3)_2$ was mixed with 25.0 ml of .00030M NaBr (Ksp $PbBr_2 = 6.6X10^{-6}$)	

Acid Ionization Constants at 25 ^{o}C

Substnace	Formula	Ka
Acetic acid	$HC_2H_3O_2$	$1.7 X 10^{-5}$
Benzoic acid	$HC_7H_5O_5$	$6.3 X 10^{-5}$
Boric acid	H_3BO_3	$5.9 X 10^{-10}$
Carbonic acid	H_2CO_3	$4.3 X 10^{-7}$
	HCO_3^-	$4.8 X 10^{-11}$
Cyanic Acid	HOCN	
Formic acid	$HCHO_2$	$1.7 X 10^{-4}$
Hydrocyanic acid	HCN	$4.9 X 10^{-10}$
Hydroflouric acid	HF	$6.8 X 10^{-4}$
Hydrogen sulfate ion	HSO_4^-	$1.1 X 10^{-2}$
Hydrogen sulfide	H_2S	$8.9 X 10^{-8}$
	HS^-	$1.2 X 10^{-13}$†
Hypochlorous acid	HClO	$3.5 X 10^{-8}$
Nitrous acid	HNO_2	$4.5 X 10^{-4}$
Oxalic acid	$H_2C_2O_4$	$5.6 X 10^{-2}$
	$HC_2O_4^-$	$5.1 X 10^{-5}$
Phosphoric acid	H_3PO_4	$6.9 X 10^{-3}$
	$H_2PO_4^-$	$6.2 X 10^{-8}$
	HPO_4^{2-}	$4.8 X 10^{-13}$
Phosphorous acid	H_2PHO_3	$1.6 X 10^{-2}$
Pyruvic acid	$HC_3H_3O_3$	$1.4 x 10^{-4}$
Sulfurous acid	H_2SO_3	$7 X 10^{-7}$
	HSO_3^-	$6.3 X 10^{-8}$

Base Ionization constants

Base		Kb
Ammonia	NH_3	$1.76 X 10^{-5}$
Anniline	$C_6H_5NH_2$	$3.94 X 10^{-10}$
1-Butylamine	$CH_3(CH_2)\ _2CH_2NH_2$	$4.0 X 10^{-4}$
Dimethylamine	$(CH_3)\ _2NH$	$5.9 X 10^{-4}$
Ethanolamin	$HOC_2H_4NH_2$	$3.18 X 10^{-5}$
Ethylamine	$CH_3CH_2NH_2$	$4.28 X 10^{-4}$
Hydrazine	H_2NNH_2	$1.3 X 10^{-6}$
Hydroxlamine	$HONH_2$	$1.07 X 10^{-8}$
Methylamine	CH_3NH_2	$4.8 X 10^{-4}$
Piperidine	$C_5H_{11}N$	$1.3 X 10^{-3}$
Pyridine	C_5H_5N	$1.7 X 10^{-9}$
Trimethyl amine	$(CH_3)\ _3N$	$6.25 X 10^{-5}$