CHM 1143 Exam 3

TUD Department of Chemistry

20 points each

Fall 2017

1) A vessel contains 0.50 M CO, 0.05 M H_2O, 0.30 M CO_2 and 0.10 M H_2. All are gasses. At the temperature of the vessel K= 88 for the reaction below. In what direction will the reaction proceed in order to reach equilibrium? (You must show your calculation of Q to justify your answer. Simply stating a direction will receive no credit).

$$CO + H_2O = CO_2 + H_2$$ (all species in the gas phase)

2) Calculate the pH and pOH of the following aqueous solutions:

a) 0.0035 M HNO_3

b) 0.005 M $Ba(OH)_2$

3) Calculate the pH of 0.25 M HF (Ka= 6.8×10^{-4})

4) Calculate the pH of 0.30 M potassium fluoride.

5) Titration of a 0.301 g sample of our blue copper complex required 13.67 mL of 0.254 M HCl to react with the NH_3 in the sample. How many mmoles of NH_3 are present per gram of the complex?

$$NH_3 + H^+ = NH_4$$

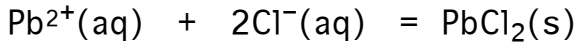
6) Data for the aqueous reaction below are given in the table:

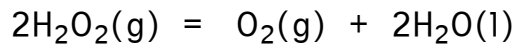
$$S_2O_8^{2-} + 3\ I^{1-} = 2\ SO_4^{2-} + I_3^{1-}$$

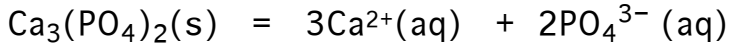
Determine the order of the reaction with respect to $S_2O_8^{2-}$ and to I^{1-} and write the rate expression. Determine the numeric value (with correct units) of k, the specific rate constant.

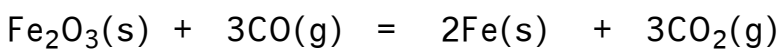
Exp #	$[S_2O_8^{2-}]$	$[I^{1-}]$	Rate M/sec
1	0.012	0.050	7.0×10^{-6}
2	0.024	0.050	1.4×10^{-5}
3	0.024	0.10	2.8×10^{-5}

7) a) Write the equilibrium constant expression for the following reactions:









8) The half-life of phenobarbital in the blood is 60 hours. If your epileptic black and white cocker spaniel receives a dose of 75 mg at 8 am, how much is still in his body 7 hours later?

9) Fill in the table:

$[H^+]$	$[OH^-]$	pH	pOH
0.005 M			
			3.00
		11.00	

10) a) Circle the compounds which would result in basic solutions when dissolved in water:

HCl $NaNO_3$ NH_3 KBr $MgCl_2$ KF FeI_3 $Mg(ClO)_2$ $Mg(ClO_4)_2$

b) Calculate the pH of a solution of 4.0 g HF plus 8.4 g of NaF in enough water to make 250 mL of solution.