

Chemistry 1105 R11 Fall 2011 Test 3

Friday, November 25, 2011

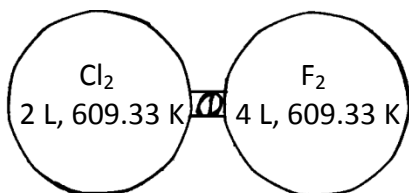
Time: 1 hour 50 minutes

Name: _____

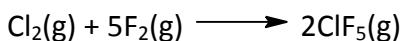
Student Number: _____

*This test consists of **seven** pages of questions, a periodic table, and a page of useful constants. Please ensure you have a complete paper and, if you do not, obtain one from me **immediately**. There are **31** marks available. Good luck!*

1) [3 marks] The following apparatus was assembled:



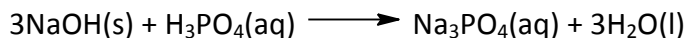
When the valve was opened, the following reaction occurred:



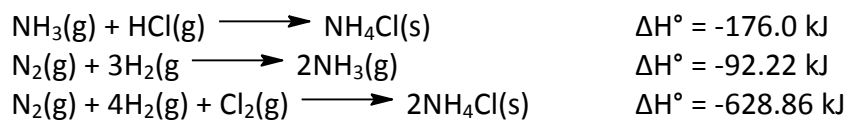
After reaction, the partial pressures of ClF_5 , Cl_2 , and F_2 , were found to be 2 atm, 0.5 atm, and 0 atm, respectively. What were the partial pressures of all species present *before* reaction?

2) **[3 marks]** A 500-gram piece of copper ($S = 0.385 \frac{J}{g \cdot ^\circ C}$) at $90.0^\circ C$ was immersed in 75 grams of water ($S = 4.184 \frac{J}{g \cdot ^\circ C}$) at $25.0^\circ C$. The water was contained in a cup with $C = 50.0 \frac{J}{^\circ C}$. What was the final temperature of the water?

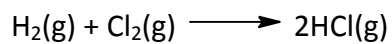
3) **[3 marks]** If 3.00 grams of NaOH (40.0 g/mol) are mixed with 100.0 mL of 0.500 M H_3PO_4 ($4.184 \frac{J}{g \cdot ^\circ C}$, 1.00 g/mL), the temperature of the solution increases from $21.605^\circ C$ before reaction to $30.310^\circ C$ after. Use this information to calculate ΔH° for the reaction:



4) **[3 marks total]** Given the following:

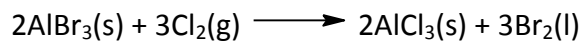


a) **[2 marks]** Calculate ΔH° for the reaction



b) **[1 mark]** What is the molar enthalpy of formation of $\text{NH}_4\text{Cl}(\text{s})$?

- 5) **[5 marks total]** Given that the enthalpy of formation for $\text{AlCl}_3(\text{s})$ is -674.8 kJ/mol , and that ΔH° for the reaction

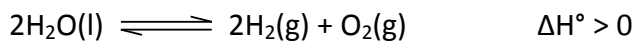


is -327.04 kJ :

- a) **[2 marks]** what is the molar enthalpy of formation of $\text{AlBr}_3(\text{s})$?

- b) **[3 marks]** How many kJ of heat will be liberated by the reaction of 266.7 g of AlBr_3 (266.7 g/mol) with 85.08 g of Cl_2 (70.9 g/mol)?

- 6) **[4 marks]** Predict the effect that each of the indicated changes would have on the equilibrium numbers of moles of $\text{H}_2\text{O}(\text{l})$ and on the value of K_c for the reaction:

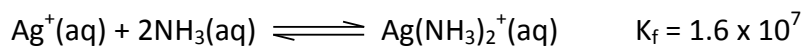


Your choices are **Increase** from the current value, **Decrease** from the current value, or **Not Change** the current value. Circle your choice. Unless explicitly stated otherwise, you may assume that all changes take place at constant temperature.

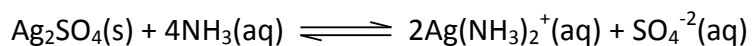
Change:	Effect on:					
	K_c			$\text{H}_2\text{O}(\text{l})$		
Add some $\text{H}_2(\text{g})$	I	D	NC	I	D	NC
Add some $\text{H}_2\text{O}(\text{l})$	I	D	NC	I	D	NC
Cool the reaction mixture	I	D	NC	I	D	NC
Decrease the volume of the reaction container	I	D	NC	I	D	NC

- 7) **[1 mark]** Write one possible reaction for which the equilibrium expression is $[\text{CO}_2]_e$

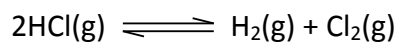
8) **[3 marks]** Given the two equilibria:



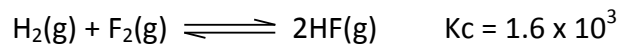
Calculate the value of K_c for the equilibrium:



9) **[2 marks]** 0.300 moles of H_2 and 0.450 mole of Cl_2 were placed in a 3.00 L flask and heated. At equilibrium, 60% of the Cl_2 had reacted. Calculate K_c for



10) **[4 marks total]** For the system:



If 1.00 mole of HF and 0.500 moles each of H_2 and F_2 are placed in a 10.0 L container and allowed to come to equilibrium:

a) **[1 mark]** In which direction will the reaction shift to attain equilibrium? How do you know?

b) **[3 marks]** What will be the concentrations of all the gases at equilibrium?