Chem 1B Final

Practice Test

Credit will only be given for answers on this sheet. Units must be included in your answers and points will be taken off for incorrect or missing units. No partial credit will be awarded. Calculators are allowed. Cell phones may not be used as calculators. **If any of the following occurs you will receive a 0 on your test: 1) your cell phone goes off or if 2) you are not following masking policies.**

Name:	**Perm Number**

Make sure writing is dark and large enough to be picked up by a scanner. Failure to do this results in the loss of 5 points on the exam.

If you are sitting next to someone with the same version of the test you both will lose 5 points.

Fundamentals	
Question (Points)	**Answer**
1 (7 pts)	$-1{,}374\ \frac{kJ}{mol}$
2 (6 pts)	3.02×10^{-7}
3 (5 pts) 2,3	-3,452 kJ
	-3,463 kJ
4 (6 pts)	0.65 A
5 (6 pts)	4.0×10^{-7}
6 (6 pts)	25°C

Challenge Problems	
Question (Points)	**Answer**
7 (12 pts) 4,4,4	0.5 mol
	0.78 mol
	0.36 mol
8 (16 pts) 7,3,6	37 J
	Work ○ is done by the system ● is done on the system
	$-3.0\ kJ$

Multiple Choice	
Question (Points)	**Answer**
9 (7 pts)	○ A ● B ○ C ○ D ○ E
10 (8 pts)	○ A ● B ○ C ○ D ○ E
11 (6 pts)	○ A ○ B ○ C ● D ○ E
12 (6 pts)	● A ○ B ○ C ○ D ○ E
13 (6 pts)	○ A ● B ○ C ○ D ○ E
14 (5 pts)	○ A ○ B ○ C ● D ○ E

Fundamental Questions

1) *7 pts* Calculate ΔG˚ (in $\frac{kJ}{mol}$) at 125˚C for the following reaction. Assume that ΔH˚ and ΔS˚ are temperature independent.

$$2CH_3OH(g) + 3O_2(g) \rightarrow 2CO_2(g) + 4H_2O(l)$$

2) *6 pts* The equilibrium constant K for the following reaction at 900°C is 0.0028. What is K_P at this temperature?

$$CS_2(g) + 4H_2(g) \rightleftharpoons CH_4(g) + 2H_2S(g)$$

3a) *2 pts* When 1 mol of a fuel burns at constant pressure it produces 3,452 kJ of heat and does 11 kJ of work. What is ΔH in kJ for the reaction?

3b) *3 pts* What is ΔE in kJ for the reaction?

4) *6 pts* What current is required to produce 2.5 g of chromium metal from chromium (VI) oxide in 12 h?

5) *6 pts* What is the molar solubility of CaF_2 in 0.010 M LiF?

6) *6 pts* A piece of iron of mass 20.0 g at 100.°C is placed in a vessel of negligible heat capacity but containing 50.7 g of water at 22.0°C. Calculate the final temperature of the water. Assume that there is no energy lost to the surroundings.

Challenge Problems

7) Calculate the number of moles of HCl(g) that must be added to 1.0 L of 1.0 M $NaC_2H_3O_2$ to produce a solution buffered at each pH.

7a) *4 pts* pH = pK_a

7b) *4 pts* pH = 4.20

7c) *4 pts* pH = 5.00

8a) *7 pts* A technician carries out the reaction $2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$ at 25˚C and 1.00 atm in a constant-pressure cylinder fitted with a piston. Initially, 0.0300 mol SO_2 and 0.0300 mol O_2 are present in the cylinder. The technician then adds a catalyst to initiate the reaction. Assume that the reaction goes to completion and the temperature of the system is constant. How much work (in J) takes place?

8b) *3 pts* Is it (work) done by the system or on the system?

8c) *6 pts* What is the change in enthalpy for the reaction in kJ?

Multiple Choice

9) *7 pts* The pH of 0.10 M solution of weak base is 9.82. What is the K_b for this base?

a. 6.6×10^{-4}
b. 4.3×10^{-8}
c. 2.0×10^{-5}
d. 2.1×10^{-4}
e. None of the above

10) *8 pts* Arrange the following 0.10 *M* solutions from lowest to highest pH: NaF, $NaC_2H_3O_2$, C_5H_5NHCl, KOH, HCN. (K_a for HCN is 6.2×10^{-10}; K_a for HF is 7.2×10^{-4}; K_a for $HC_2H_3O_2$ is 1.8×10^{-5}; and K_b for C_5H_5N is 1.7×10^{-9})

a. HCN, C_5H_5NHCl, NaF, $NaC_2H_3O_2$, KOH
b. C_5H_5NHCl, HCN, NaF, $NaC_2H_3O_2$, KOH
c. NaF, $NaC_2H_3O_2$, HCN, C_5H_5NHCl, KOH
d. KOH, $NaC_2H_3O_2$, NaF, HCN, C_5H_5NHCl
e. None of the above

11) *6 pts* Consider the freezing of liquid water at –10°C. For this process what are the signs for $\triangle H$, $\triangle S$, and $\triangle G$, respectively?

a. - + -
b. + - -
c. - + 0
d. - - -
e. + - 0

12) *6 pts* Calculate the ΔS associated with a process in which 5.00 mol of ideal gas expands reversibly at constant temperature T=25 ° C from a pressure of 10.0 atm to 1.00 atm.

a. $95.7 \frac{J}{K}$
b. $-95.7 \frac{J}{K}$
c. $-28{,}500 \frac{J}{K}$
d. $28{,}500 \frac{J}{K}$
e. None of the above

13) *6 pts* At 25°C the following heats of reaction are known:

$2C_2H_2 + 5O_2 \rightarrow 4CO_2 + 2H_2O$ $\triangle H = -2{,}600.0$ kJ

$C + O_2 \rightarrow CO_2$ $\triangle H = -394$ kJ

$2H_2 + O_2 \rightarrow 2H_2O$ $\triangle H = -572$ kJ

At the same temperature, calculate $\triangle H$ for the following reaction:

$2C + H_2 \rightarrow C_2H_2$

a. 2,422 kJ
b. 226 kJ
c. -2,422 kJ
d. -226 kJ
e. None of the above

14) *5 pts* Consider the equation $2A(g) \rightleftharpoons 2B(g) + C(g)$. At a particular temperature, $K = 1.6 \times 10^4$. Raising the pressure by lowering the volume of the container will:

a. Cannot be determined
b. Causes [B] to increase
c. Has no effect
d. Causes [A] to increase
e. None of the above