Chapter 15 Worksheet 3 (ICE Tables)

Name: UGA ID:

Instructions:

- Please enter your first and last name as it appears on the eLC roster (do not use a nickname).
- Your UGA myID is a combination of letters and numbers (example: mine is wpe28548). **Do not use your 81x number.**
- If you do not have a printer, type your answers in the then upload the worksheet template to Gradescope by Friday, March 12 at 11:59 p.m. Write your work on separate sheets of paper, convert to a PDF and upload to eLC.
- If you have a printer download the worksheet, convert it to a PDF and upload to Gradescope by Friday, March 12 at 11:59 p.m. You do not need to upload anything to eLC.

1. On the basis of the equilibrium constant values, choose the reactions in which the products are favored:

A. $NH_3(aq) + H_2O(l) \leftrightharpoons NH_4^+(aq) + OH^-(aq)$ $K_c = 1.8 \times 10^{-5}$

B. $Au^+(aq) + 2CN^-(aq) \leftrightharpoons [Au(CN_2]^-(aq)$ $K_c = 2 \times 10^{18}$

C. $PbC_2O_4(s) \leftrightharpoons Pb^{2+}(aq) + C_2O_4^{2-}(aq)$ $K_c = 4.8$

D. $HS^-(aq) + H^+(aq) \leftrightharpoons H_2S(aq)$ $K_c = 1.0 \times 10^7$

2. Consider the isomerization of butane with an equilibrium constant of $K_c = 2.5$.

butane $\leftrightharpoons$ isobutane

The system is originally at equilibrium with [butane] = 1.0 *M* and [isobutane] = 2.5 *M*.

If 0.50 mol/L of isobutane is suddenly added and the system shifts to a new equilibrium position, what is the equilibrium concentration of butane?

3. $A(g) + B(g) \rightleftharpoons 2\ C(g)$

If 0.60 mole of A and 0.60 mole of B AND 1.5 mole C are placed into a 2.00 L flask and allowed to react, what are the concentrations of A and B at equilibrium? C at equilibrium? $K_c = 57$

[A] and [B] =

[C] =

4. At 2300 K the equilibrium constant for the formation of NO(g) is 1.7×10^{-3}.

$N_2(g) + O_2(g) \leftrightharpoons 2\ NO(g)$

If the initial concentration of nitrogen gas and oxygen gas are

0.880 mol/L and the initial concentration of nitrogen monoxide is 0.0620 mol/L, what is the equilibrium concentration of (A) nitrogen and (B) nitric oxide?

$[N_2]$ =

$[NO]$ =

5. A researcher places 1.500 atm of nitrogen dioxide in a flask at 25 °C. The researcher then monitors the total pressure of the flask over time as the nitrogen dioxide is allowed to react to produce dinitrogen tetroxide and reach equilibrium. Given the researcher's data, what is K_c for this reaction? (Hint: you'll need to begin by thinking about the definition of equilibrium and then use Dalton's law of partial pressures).

Time	Total P
0 min	1.500 atm
5 min	1.349 atm
10 min	1.198 atm
15 min	1.047 atm
20 min	0.896 atm
25 min	0.896 atm
30 min	0.896 atm

6. If 1.00 *M* A is allowed to react and reach equilibrium, what is the equilibrium concentration of B? K_c= 0.75

$$A \leftrightharpoons B$$

[B] =

7. Suppose 0.086 moles of bromine, Br_2, is placed in a 1.26-L flask and heated to 1756 K, a temperature at which the halogen dissociates to atoms.

$$Br_2(g) \leftrightharpoons 2\ Br(g)$$

If Br_2 is 3.7% dissociated at this temperature, calculate K_c.

8. The following pictures represent mixtures of *cis*-$C_2H_2X_2$ molecules and *trans*-$C_2H_2X_2$ molecules, which interconvert according to the equation *cis*-$C_2H_2X_2 \rightleftharpoons$ *trans*-$C_2H_2X_2$. If mixture (1) is at equilibrium, which of the other mixtures are also at equilibrium?