

Recitation Worksheet 6 (3/9/2021)

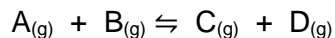
Name:

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Instructions:

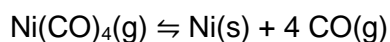
- Please enter your first and last name as it appears on the eLC roster (do not use a nickname).
- Your UGA myID is a combination of letters and numbers (example: mine is wpe28548). **Do not use your 81x number.**
- If you do not have a printer, type your answers in the then upload the worksheet template to Gradescope by Tuesday, March 16 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 Tuesday, March 16 at 11:59 p.m. You do not need to upload anything to eLC.
- For full credit, **show your work.**

1. At equilibrium, a 1.0-liter container was found to contain 0.20 moles of A, 0.20 moles of B, 0.40 moles of C and 0.40 mole of D. If 0.10 moles of A and 0.10 moles of B are added to this system, what will be the new equilibrium concentration of A?



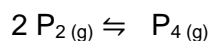
- A. 0.37 M
- B. 0.47 M
- C. 0.87 M
- D. 0.23 M
- E. 0.15 M

2. Adding nickel to this reaction will cause the equilibrium to



-
- A. shift toward products.
 - B. shift toward reactants.
 - C. remain unchanged.
 - D. change based on the amount added.

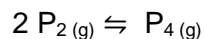
3. For the reaction



What happens if an inert gas is added to the container increasing the total pressure at constant temperature and volume?

-
- A. The reaction shifts right (toward products).
 - B. The reaction shifts left (toward reactants).
 - C. Nothing.

4. For the reaction



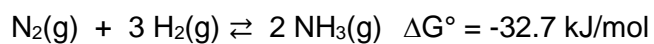
What happens if an inert gas is added to the container but the total pressure and temperature are kept constant?

-
- A. The reaction shifts right (toward products).
 - B. The reaction shifts left (toward reactants).
 - C. Nothing.

5. For which of the following systems at equilibrium will doubling the volume cause a shift to the right? (Select all that apply).

-
- A. $\text{H}_{2(\text{g})} + \text{Cl}_{2(\text{g})} \rightleftharpoons 2 \text{HCl}_{(\text{g})}$
 - B. $2 \text{CO}_{(\text{g})} + \text{O}_{2(\text{g})} \rightleftharpoons 2 \text{CO}_{2(\text{g})}$
 - C. $\text{N}_{2(\text{g})} + 3 \text{H}_{2(\text{g})} \rightleftharpoons 2 \text{NH}_{3(\text{g})}$
 - D. $\text{PCl}_{5(\text{g})} \rightleftharpoons \text{PCl}_{3(\text{g})} + \text{Cl}_{2(\text{g})}$

6. Calculate ΔG for the reaction under the following conditions:



$P \text{N}_2 = 2.00 \text{ atm}$

$P \text{H}_2 = 7.00 \text{ atm}$

$P \text{NH}_3 = 0.021 \text{ atm}$

$T = 100 \text{ }^\circ\text{C}$

A. Calculate Q .

B. Is Q _____ than/to K ?

1) $>$

2) $<$

3) $=$

C. Calculate ΔG .

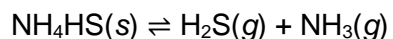
D. Does the reaction proceed spontaneously to the right?

1) yes

2) no

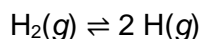
7. What is K if $\Delta G^\circ = -19.0 \text{ kJ}$ for a reaction at $25 \text{ }^\circ\text{C}$?

8. Find K_p at 25 °C for the reaction and indicate whether K_p should increase or decrease as the temperature rises.

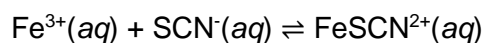


$$\Delta H^\circ = 83.47 \text{ kJ and } \Delta G^\circ = 17.5 \text{ kJ at } 25^\circ\text{C}.$$

9. According to Le Châtelier's principle, if the volume of the vessel containing the equilibrium system shown below is decreased, there will be an increase in the concentration of and a decrease in the concentration of .

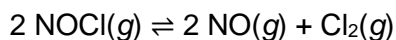


10. If additional SCN^- is added to the equilibrium system shown below, Le Châtelier's principle predicts a net reaction from to , causing the red color to become .



yellow colorless red

11. At an elevated temperature, $K_p = 0.19$ for the reaction



If the initial partial pressures of NOCl, NO, and Cl_2 are 0.50 atm, 0.25 atm, and 0.45 atm, respectively, a net _____ reaction must occur in order to achieve equilibrium.

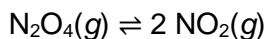
A. Forward

B. Reverse

C. Not enough information is given

D. The reaction is at equilibrium

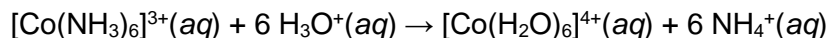
12. For the reaction shown below the value of K_p is _____ than the value of K_c , because $\Delta n =$ _____.



13. Which of the following statements about a catalyst is true?

- ☐
- A. A catalyst decreases the position of the equilibrium in a reaction.
 - B. A catalyst increases the pressure of a reaction.
 - C. A catalyst is consumed in a chemical reaction.
 - D. A catalyst provides a lower energy pathway for a reaction.

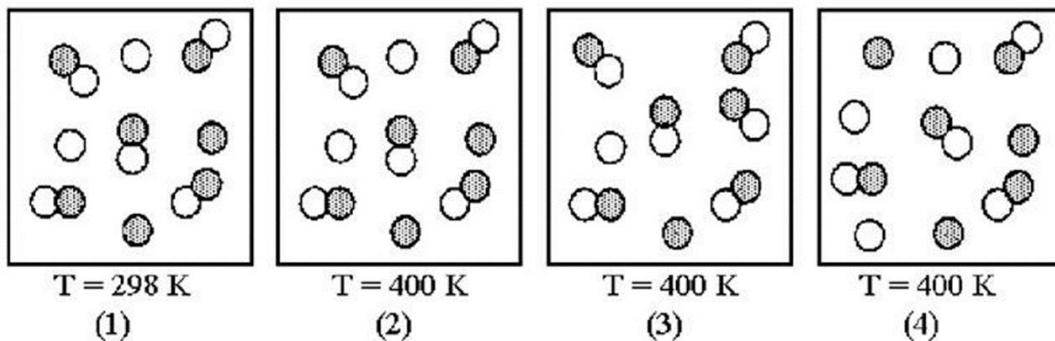
14. The hexaammine cobalt(III) ion is very unstable in acidic aqueous solution:



However, solutions of hexaammine cobalt(III) can be stored in acidic solution for months without noticeable decomposition. Which statement below about the equilibrium constant and the activation energy for the reaction is true?

- ☐
- A. $K_{\text{eq}} < 10^3$ and E_a is very small.
 - B. $K_{\text{eq}} > 10^3$ and E_a is very small.
 - C. $K_{\text{eq}} < 10^3$ and E_a is very large.
 - D. $K_{\text{eq}} > 10^3$ and E_a is very large.

15. Picture (1) represents the equilibrium mixture for the reaction $\text{A} + \text{B} \rightleftharpoons 2 \text{AB}$ at 298 K.



If this reaction is exothermic, which picture (2)-(4) represents the equilibrium mixture at 400 K?

- ☐
- A. picture (2)
 - B. picture (3)
 - C. picture (4)
 - D. none of these