

Recitation Worksheet 7: Chemical Equilibrium I (13.1 – 13.5)

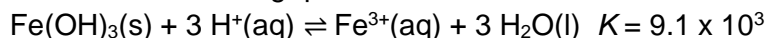
Name:

MyID:

Instructions:

1. Please enter your first and last name as it appears on the eLC classlist (do not use a nickname).
2. Your UGA myID is a combination of letters and numbers (example: Dr. Abdelrahman MyID is ema88805).
Do not use your 81x number.
 - a. If you do not have access to a printer, type your answers in the worksheet PDF and then upload it to **Gradescope** by Friday, March 17th at 11:59 pm. Write your work on separate sheets of paper, convert to a PDF and upload to the "Recitation Worksheet 7 Dropbox" on eLC.
 - b. If you are using an app to annotate the worksheet, make sure the pages are in the correct order and have the same layout as the original or Gradescope will not be able to read it.
 - c. If you have access to a printer, print out the worksheet, write your answer in the answer boxes, and show your work on it when appropriate. Then convert it to a PDF and upload to **Gradescope** by Friday, March 17th at 11:59 pm. You do not need to upload anything to eLC. The pages must be in the correct order and have the same layout as the original, or Gradescope will not be able to read it.
 - d. There is a **Gradescope App** available for both iOS and Android devices that allows you to scan and submit your printed work or you can submit your fillable PDF directly. Detailed instructions on how to access and use the app can be found on your CHEM 1212 class eLC page under content → Welcome module → Gradescope → Gradescope new mobile app.
3. Answers must be written in the corresponding answer box, or no credit will be awarded.
4. The instructions for uploading worksheets to Gradescope can be found in the Content area of eLC in the Welcome Module.

1. Use the equation below to answer the following questions:



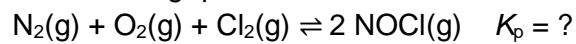
- A. The correct equilibrium constant expression for this reaction is

- i. $\frac{[\text{FeOH}_3][\text{H}^+]^3}{[\text{Fe}^{3+}][\text{H}_2\text{O}]^3}$
- ii. $\frac{[\text{Fe}^{3+}][\text{H}_2\text{O}]^3}{[\text{FeOH}_3][\text{H}^+]^3}$
- iii. $\frac{[\text{Fe}^{3+}][\text{H}_2\text{O}]}{[\text{FeOH}_3][\text{H}^+]}$
- iv. $\frac{[\text{Fe}^{3+}]}{[\text{H}^+]^3}$
- v. $\frac{[\text{FeOH}_3][\text{H}^+]}{[\text{Fe}^{3+}][\text{H}_2\text{O}]}$

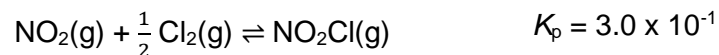
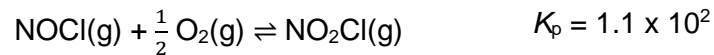
- B. What is the equilibrium concentration for $[\text{Fe}^{3+}]$ if the equilibrium concentration for $[\text{H}^+] = 2.5 \times 10^{-8}$?
Keep your answer to two significant figures and use scientific notation to report your answer.

$\times 10^{\text{$ M

2. Use the reaction below to answer the following questions



- A. Calculate K_p at 25 °C using the set of equations provided. Keep your answer to two significant figures and use scientific notation to report your answer.



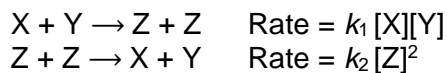
$\times 10^{\text{$

A diagram showing a rectangle and a square. The rectangle is labeled 'X 10' and the square is labeled 'X 1'.

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- 3

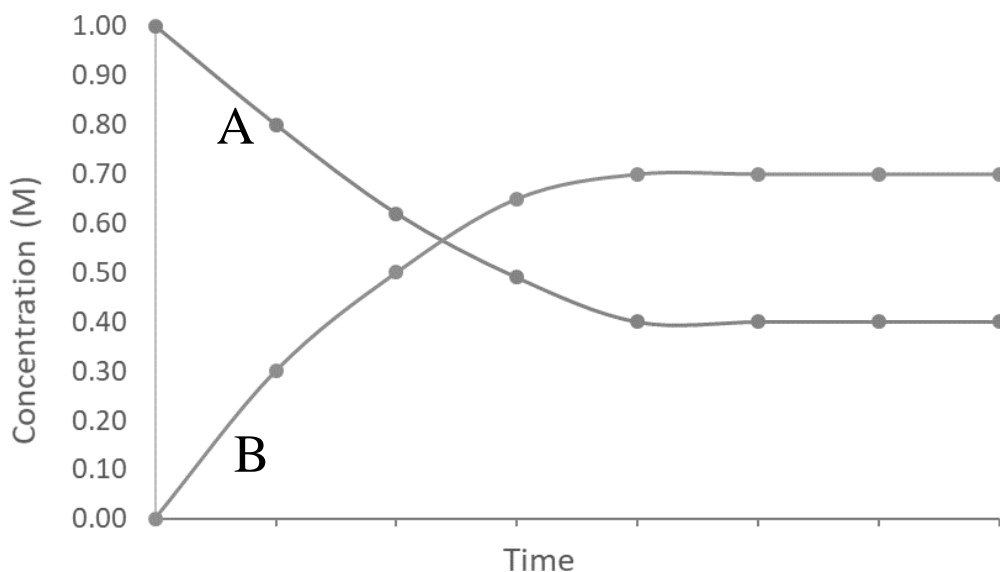
5. You are given two elementary reactions below which are the reverse of one another and the reaction rates for elementary reaction are provided as well. Which of the following statements about an equilibrium mixture of X, Y, and Z is **false**?



- A. At equilibrium, k_1 and k_2 can have different values
- B. At equilibrium, $k_1 [\text{X}][\text{Y}] = k_2 [\text{Z}]^2$
- C. At equilibrium, X and Y still react to form Z
- D. At equilibrium, the concentrations of X and Y must be the same
- E. At equilibrium, $\frac{[\text{X}][\text{Y}]}{[\text{Z}]^2}$ is a constant

6. A graph for the reaction $\text{A}(\text{g}) \rightleftharpoons 2\text{B}(\text{g})$ shows the change in concentration over time. What is the equilibrium constant for this reaction?

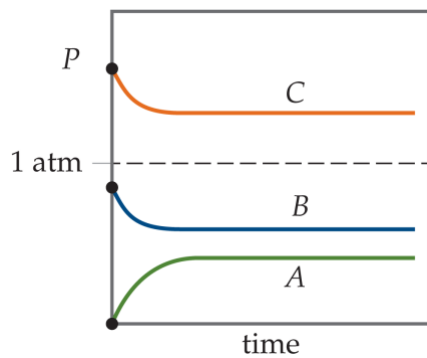
- A. 1.8
- B. 1.2
- C. 4.4
- D. 0.82
- E. 0.57



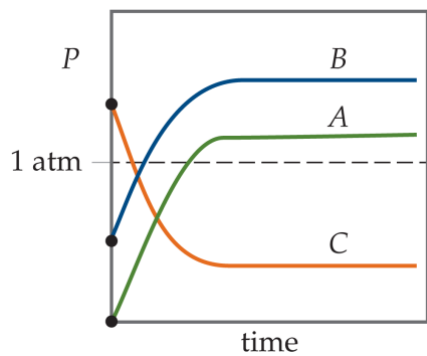
7. For the reaction $A(g) + B(g) \rightleftharpoons C(g)$, $K_p < 1$. Which of the following charts below describes the approach to equilibrium of a mixture of $B(g)$ and $C(g)$?



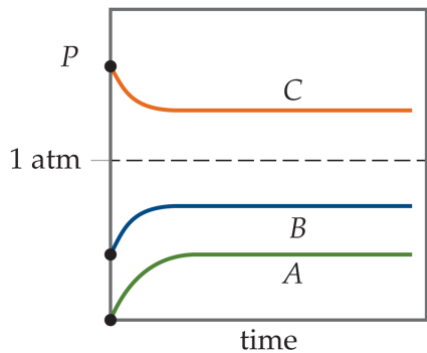
A.



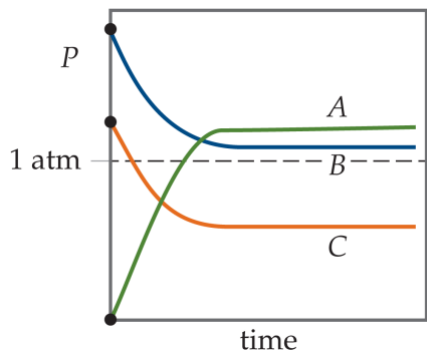
B.



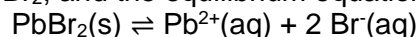
C.



D.



8. You prepare a saturated solution of PbBr_2 , and the equilibrium equation is written as follows:

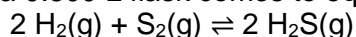


If solid PbBr_2 is added to this solution, which of the following statements is **true**?

☐

- A. The concentration of Pb^{2+} will increase more than the concentration of Br^{-}
- B. The concentration of Br^{-} will increase more than the concentration of Pb^{2+}
- C. The concentration of Pb^{2+} and Br^{-} will be the same as they were before more PbBr_2 was added
- D. The concentration of Pb^{2+} and Br^{-} will increase after more PbBr_2 was added
- E. The value of K_c will decrease

9. A mixture of 1.00 g H_2 and 1.06 g H_2S in a 0.500 L flask comes to equilibrium at 1670 K:



The equilibrium amount of $\text{S}_2(\text{g})$ found is 8.00×10^{-6} mol.

- A. What is the equilibrium concentration of H_2S ? Keep your answer to two significant figures and use scientific notation to report your answer.

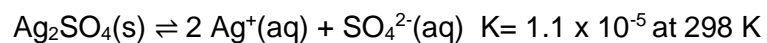
X 10

M

- B. What is the value of K_c ? Keep your answer to three significant figures.

C. What is the value of K_p ? Keep your answer to three significant figures.

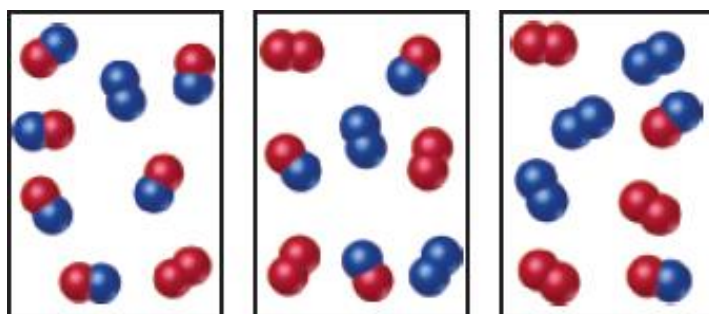
10. You are given a solution of silver sulfate and the ionization of silver sulfate in water can be represented by the equation below



If the solution a 1.5 L solution contains 6.55 g Ag_2SO_4 , and you attempt to dissolve additional solid silver sulfate in the solution will it dissolve?

- A. Yes
- B. No

11. The diagram below represents the reaction between $A_2(g) + B_2(g) \rightleftharpoons 2 AB(g)$, A_2 molecules are represented by red spheres, B_2 molecules are represented by blue spheres and the reaction has an equilibrium constant, $K_c = 1.5$. Which of the following diagrams a – c represents:



a

b

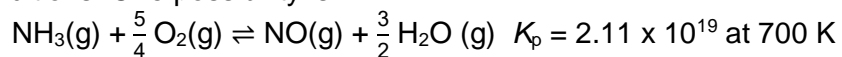
c

A. The reaction at equilibrium.

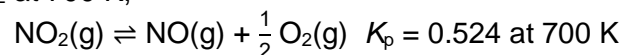
B. $Q_c < K_c$

C. $Q_c > K_c$

12. In the Ostwald process for oxidizing ammonia, a variety of products is possible – N_2 , N_2O , NO , and NO_2 – depending on the conditions. One possibility is:

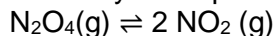


For the decomposition of NO_2 at 700 K,



What is K_p for the oxidation of $\text{NH}_3(\text{g})$ to $\text{NO}_2(\text{g})$? Keep your answer to three significant figures and use scientific notation to report your answer.

13. The decomposition of N_2O_4 to NO_2 is represented by the equilibrium reaction equation below



If 1.75 moles of N_2O_4 is injected in a 1.5 L vessel and at equilibrium 25% N_2O_4 is dissociated, what is the equilibrium constant for this reaction? Keep your answer to three significant figures.