# UCI General Chemistry Department Peer Tutoring Review Session Feedback Evaluation

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Date</th>
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<tbody>
<tr>
<td>Class</td>
<td>Circle One</td>
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<tr>
<td>Tutors’ Names</td>
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<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither Agree or Disagree</th>
<th>Agree</th>
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<tbody>
<tr>
<td>This review was interactive and engaging</td>
<td>☐</td>
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<td>Audience participation was encouraged.</td>
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<td>The presentation volume was acceptable.</td>
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<td>The presentation was visually clear and logically organized.</td>
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<td>The review increased your confidence in taking your exam.</td>
<td>☐</td>
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<td>The quality of the review packet was excellent.</td>
<td>☐</td>
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*Comments*

**ADDITIONAL QUESTIONS**

- What worked best?

- What would you like to see next time?

- What could be improved?

**ADDITIONAL COMMENTS**

- Tutor #1:

- Tutor #2:
1. If you dissolve 25.5 g KBr in enough water to make 1.75 L of solution, what is the molarity of the solution?

2. How many liters of a 0.125 M NaOH solution contain 0.255 mol of NaOH?

3. To what volume should you dilute 0.200 L of a 15.0 M NaOH solution to obtain a 3.00 M NaOH solution?

4. What volume (in L) of 0.150 M KCl solution will completely react with 0.150 L of a 0.175 M Pb(NO₃)₂ solution according to this balanced chemical equation?

   \[ 2 \text{KCl(aq)} + \text{Pb(NO₃)₂(aq)} \rightarrow \text{PbCl₂(s)} + 2 \text{KNO₃(aq)} \]

5. The equilibrium constant for the reaction A(g) ⇌ B(g) is 10. A reaction mixture initially contains [A] = 1.1 M and [B] = 0.0 M. Which statement about this reaction is true at equilibrium?

   (a) The reaction mixture contains [A] = 1.0 M and [B] = 0.1 M.
   (b) The reaction mixture contains [A] = 0.1 M and [B] = 1.0 M.
   (c) The reaction mixture contains equal concentrations of A and B.

6. Consider the following reaction: \( \text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2 \text{NO (g)} \) at 378 K. Initially, the partial pressures of \( \text{N}_2 \) and \( \text{O}_2 \) are 1.00 atm and 3.00 atm, respectively. At equilibrium, the pressure of NO is 1.50 atm. What is the \( K_p \) for this reaction? What is the \( K_c \) for this reaction?
7. $K_p$ is 10.5 at 250.°C for the following reaction: $\text{H}_2(\text{g}) + \text{Cl}_2(\text{g}) \rightleftharpoons 2 \text{HCl} (\text{g})$. A 4.0 L reaction vessel was charged with 0.20 atm of hydrogen, 0.20 atm of chlorine, and 0.80 atm of hydrogen chloride at 250.°C. What is the total pressure in the vessel at equilibrium?

8. Phosgene was used as a poisonous gas in World War I. At high temperatures it decomposes as follows: $\text{COCl}_2 (\text{g}) \rightleftharpoons \text{CO} (\text{g}) + \text{Cl}_2 (\text{g})$. At some temperature, $K_c = 4.6 \times 10^{-5}$

   a. A sample of 6.55 g of $\text{COCl}_2$ is placed in a 1.00-L reaction vessel. What are the equilibrium concentrations of all of the species?

   b. What fraction of $\text{COCl}_2$ has decomposed?

   c. If 3 g of carbon monoxide is inserted into the reaction vessel, what qualitative effect would this have on the fraction of $\text{COCl}_2$ that has decomposed?

9. Consider the following endothermic reaction at equilibrium: $\text{CCl}_4 (\text{g}) \rightleftharpoons \text{C} (\text{s}) + 2 \text{Cl}_2 (\text{g})$. Which way will the reaction shift if…

   a. temperature is increased

   b. partial pressure of $\text{CCl}_4$ is increased

   c. more C is added

   d. $\text{Cl}_2$ is removed

   e. the system is compressed
10. Consider the reaction: \( \text{PCl}_5 (g) \rightleftharpoons \text{PCl}_3 (g) + \text{Cl}_2 (g) \).

a. Calculate \( \Delta G^\circ \) and \( K_p \) for the above equilibrium reaction at 25°C using the data provided.

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<tr>
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<th>PCl(_5) (g)</th>
<th>PCl(_3) (g)</th>
<th>Cl(_2) (g)</th>
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<tr>
<td>( \Delta H^\circ ) (kJ/mol)</td>
<td>-374.9</td>
<td>-287.0</td>
<td>0</td>
</tr>
<tr>
<td>( \Delta S^\circ ) (J/K-mol)</td>
<td>364.6</td>
<td>311.8</td>
<td>223.1</td>
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b. Calculate \( \Delta G \) for the reaction if the partial pressures of the initial mixture are \( P_{\text{PCl}_5} = 0.0029 \text{ atm}, P_{\text{PCl}_3} = 0.27 \text{ atm}, \) and \( P_{\text{Cl}_2} = 0.40 \text{ atm} \).

c. What is the direction of spontaneous change for this system? Is it more or less spontaneous than at standard conditions?

d. What would be the value of \( \Delta G \) if the given data were equilibrium pressures? What would be the value of \( Q_p \) in that case?

11. Given this equation below predict what will happen if you:
\( \text{N}_2 + 3\text{H}_2 \rightleftharpoons 2\text{NH}_3 \quad \Delta H = -50.8 \text{ kJ/mol} \)

a) remove \( \text{NH}_3 \) gas  
b) decrease pressure  
c) add \( \text{N}_2 \) gas  
d) increase temperature

12. Given this equation below predict what will happen if you:
\( 2\text{SO}_2 + \text{O}_2 \rightleftharpoons 2\text{SO}_3 \quad \Delta H = -34.5 \text{ kJ/mol} \)

a) increase \( \text{SO}_2 \) concentration  
b) increase temperature  
c) remove \( \text{O}_2 \)

13. The following reaction is at equilibrium:
\( \text{I}_2(g) + \text{Cl}_2(g) \rightleftharpoons 2\text{ICl}(g) \)
The standard free energy of formation for ICl is -20.2 kJ/mol. Calculate the equilibrium constant (\( K_c \)) at 700 K. Use 2 significant figures.
14. In the following equations, label each species as an acid or a base. Show the conjugate acid–base pairs.
   a) \( \text{HCO}_3^-(aq) + \text{HF}(aq) \leftrightarrow \text{H}_2\text{CO}_3(aq) + \text{F}^-(aq) \)
   b) \( \text{HCO}_3^-(aq) + \text{OH}^-(aq) \leftrightarrow \text{CO}_3^{2-}(aq) + \text{H}_2\text{O}(l) \)

15. Obtain the pH corresponding to the following hydroxide- ion concentrations
   a) \( 5.25 \times 10^{-9} \text{ M} \)
   b) \( 8.3 \times 10^{-3} \text{ M} \)
   c) \( 3.6 \times 10^{-12} \text{ M} \)
   d) \( 2.1 \times 10^{-8} \text{ M} \)

16. What are the concentrations of nicotinic acid, hydrogen ion, and nicotinate ion in a solution of 0.10 M nicotinic acid, \(\text{HC}_6\text{H}_4\text{NO}_2\), at 25°C? What is the pH of the solution? What is the degree of ionization of nicotinic acid? The acid-ionization constant, \(K_a\), was determined in the previous example to be \(1.4 \times 10^{-5}\)

17. What is the pH at 25°C of the solution obtained by dissolving a 5.00-grain tablet of aspirin (acetylsalicylic acid) in 0.500 L of water? The tablet contains 5.00 grains, or 0.325 g, of acetylsalicylic acid, \(\text{HC}_9\text{H}_7\text{O}_4\). The acid is monoprotic, and \(K_a\) equals \(3.3 \times 10^{-4}\) at 25°C

18. Morphine, \(\text{C}_{17}\text{H}_{19}\text{NO}_3\), is administered medically to relieve pain. It is a naturally occurring base, or alkaloid. What is the pH of a 0.0075 M solution of morphine at 25°C? The base-ionization constant, \(K_b\), is \(1.6 \times 10^{-6}\) at 25°C.

19. Predict the relative strengths of the oxoacids in each of the following groups:
   (a) \(\text{HClO}, \text{HBrO}, \text{and HIO}\)
   (b) \(\text{HNO}_3\) and \(\text{HNO}_2\)

20. If 0.050 mL of 6.0 M HCl is added to 400 mL of \(10^{-5}\) M HCl, what is the resulting pH? The added HCl combines with the initial HCl to form a new strong acid solution.