

### Prelab Questions--Experiment 7: Chemical Equilibrium

Answer **three** (3) of the following questions, based on the last digit of your student ID number.  
ID ending in: 0 or 1:a,b,&c 2 or 3:d,e,&f 4 or 5:g,h,&i 6 or 7:j,k,&l 8 or 9:m,n, &o

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*ID ending in 0 or 1*

- (a). Does addition of silver ions increase or decrease the  $\text{NCS}^-$  concentration?
- (b). In an endothermic reaction, the reaction (absorbs, releases) energy to its surroundings, which (increases, decreases) the temperature of the surroundings.
- (c). Calculate the concentration of  $\text{NCS}^-$  and  $\text{Fe}^{3+}$  in the following solution: 2.00 mL of 0.00200 M KNCS, 1.00 mL of 0.200 M  $\text{Fe}(\text{NO}_3)_3$ , and 7.00 mL of water are added to a cuvette.

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*ID ending in 2 or 3*

- (d). Does addition of hydrogen phosphate ions increase or decrease the  $\text{Fe}^{3+}$  concentration?
- (e). The molar absorption coefficient of crystal violet at a given pH is  $12,435 \text{ M}^{-1} \text{ cm}^{-1}$ . Calculate the concentration of crystal violet of a solution with an absorbance of 0.215 in a 1.00 cm path length cuvette.
- (f). Calculate the concentration of  $\text{NCS}^-$  and  $\text{Fe}^{3+}$  in the following solution: 2.00 mL of 0.00200 M KNCS, 5.00 mL of 0.00200 M  $\text{Fe}(\text{NO}_3)_3$ , and 3.00 mL of water are added to a cuvette.

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*ID ending in 4 or 5*

- (g). Does addition of  $\text{Sn}^{2+}$  ions increase or decrease the  $\text{Fe}^{3+}$  concentration?
- (h). The equation of the best fit line for a plot of the absorbance of a series of standard solutions is  $y = 32462x + 0.102$ . The concentrations of the standards are given as molar concentrations, M. What is the molar absorption coefficient of the chromophore? The uncertainty in the absorbance readings is about 1%.
- (i). Calculate the concentration of  $\text{NCS}^-$  and  $\text{Fe}^{3+}$  in the following solution: 4.00 mL of 0.00200 M KNCS, 5.00 mL of 0.00200 M  $\text{Fe}(\text{NO}_3)_3$ , and 1.00 mL of water are added to a cuvette.

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*ID ending in 6 or 7*

- (j). Does addition of  $\text{NH}_3$  increase or decrease the  $\text{Fe}^{3+}$  concentration?
- (k). In the study of the reaction  $\text{Fe}^{3+} + \text{NCS}^- \rightleftharpoons \text{FeNCS}^{2+}$ , the addition of a reagent causes the red color of the solution to vanish. Did the position of equilibrium shift to the right or left?
- (l). Calculate the concentration of  $\text{NCS}^-$  and  $\text{Fe}^{3+}$  in the following solution: 3.00 mL of 0.00200 M KNCS, 5.00 mL of 0.00200 M  $\text{Fe}(\text{NO}_3)_3$ , and 2.00 mL of water are added to a cuvette.

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*ID ending in 8 or 9*

- (m). Does addition of hydrogen phosphate ions increase or decrease the  $\text{Fe}^{3+}$  concentration?

(n). The equation of the best fit line for a plot of the absorbance of a series of standard solutions is  $y = 22462x + 0.102$ . The concentrations of the standards are given as molar concentrations, M. What is the molar absorption coefficient of the chromophore? The uncertainty in the absorbance readings is about 1%.

(o). Calculate the concentration of  $\text{NCS}^-$  and  $\text{Fe}^{3+}$  in the following solution: 2.00 mL of 0.00200 M  $\text{KNCS}$ , 1.00 mL of 0.200 M  $\text{Fe}(\text{NO}_3)_3$ , and 7.00 mL of water are added to a cuvette.

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\* The student ID number is the 6-digit number on the front of your ID card at the right-hand side