

## Analytical Cumulative Exam

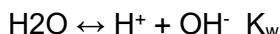
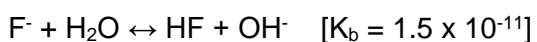
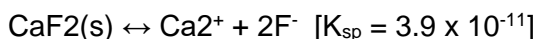
March 2017

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**Topic: Solution Equilibria. Show your work to receive full credit.**

1. Why is the solubility of  $\text{CaF}_2$  lower in a solution of  $\text{NaF}$  than a solution of  $\text{NaClO}_4$ ?
2. The mineral fluorite ( $\text{CaF}_2$ ) can take on many colors depending on impurities. Using coupled equilibria, determine the concentration of  $\text{F}^-$  and  $\text{HF}$  from  $\text{CaF}_{2(s)}$  in solution at pH 3.00.

Useful equations:



3. In the show *Breaking Bad*, Jesse Pinkman uses a solution of  $\text{HF}$  to remove "evidence". Determine the pH of a solution of  $\text{HF}$  (4.5mM;  $K_a$ :  $6.8 \times 10^{-4}$ ).
4. Rank the following in order of increasing basicity: Squaric acid ( $K_a = 0.29$ ), Glycolic acid ( $K_a = 1.48 \times 10^{-4}$ ), Dichloroacetic acid ( $K_a = 0.05$ ), O-anisidine ( $K_a = 2.67 \times 10^{-5}$ ).
5. (a) Write the Henderson-Hasselbalch Equation. (b) If you have a solution of hypochlorous acid ( $K_a = 3.0 \times 10^{-8}$ ) with a pH of 7.53, what can you say about this solution in terms of the dissociation of the acid?
6. Your colleague down the hall stops by and needs to borrow a reagent. You have a stock solution of sodium dodecylsulfate (288.37 g/mol) that is 5% (wt/v). Your colleague needs a 15mM working solution. How would you help your colleague make the solution?
7. What is the pH of an 8uM solution of hydrobromic acid ( $K_a$ :  $1.0 \times 10^9$ )?