

Name _____

Student # _____

Chemistry 301 - MIDTERM EXAM #1

Friday, October 3, 2008, 9:00 am

Explain your answers whenever possible.

Only the standard UBC Science calculator (Sharp 510B) is permitted.

Worth 24 points (20% of course)

- 1) (8 points) True or false? And briefly explain why (for both T and F). If the statement is false, correct it. *No credit is given for T or F alone!* (2 points each)
- (a) When anthropogenic ligands, such as EDTA or NTA, are released into the environment, dissolved metal levels are lowered.
- (b) Gases are more soluble in freshwater than in seawater at the same temperature and pressure.
- (c) Water is a good solvent due to hydrogen bonds.
- (d) The water in Vancouver is “soft” due to the large amount of carbonate minerals in the region. (Be sure to define “soft” in your answer).

2) (4 points) Given a choice of typical, naturally occurring ligand atoms (list them), which do you think is/are the most likely candidates for Cd^{+2} and Ca^{+2} , respectively, to bind with? Explain why.

3) (4 points) In the summer, when the water at the surface of a temperate lake is warmer than the deeper water, the lake is stratified. In winter, when the water at the surface is colder than the deeper water, the lake is also stratified. Explain how this can be true, and why it is true. Make sure to define what it means for a lake to be “stratified”.

Name _____

Student # _____

4) For an alkaline lake where $\text{pH} = 9$ and a carbonate alkalinity = 0.1 meq/L answer, the following. *(If you are doing this without a calculator, you may round off all $\text{pK}'\text{s}$ to the nearest whole number, and round off other numbers as needed.)*

(a) (2 points) Calculate the expected $[\text{Pb}^{2+}]$ based on equilibrium with $\text{Pb}(\text{OH})_2(\text{s})$.

(b) (3 points) Calculate the expected $[\text{Pb}^{2+}]$ based on equilibrium with $\text{Pb}(\text{CO}_3)(\text{s})$.

(c) (3 points) If the measured concentration of dissolved Pb in this lake is 10^{-8}M , do you think that Pb will be precipitating in this lake? If yes, what precipitate would be forming? Why?