Name(s) _____

Solubility Equilibria Workshop Bonus

1. Calculate the solubility of calcium carbonate. Show your calculation.

2. If carbonate ions were added to a saturated solution of calcium carbonate, what should occur to re-establish equilibrium? Show a chemical equation and briefly explain your answer.

3. Are the oceans currently at equilibrium in terms of calcium carbonate solubility? Show your calculation and briefly explain your answer.

4. Are the oceans currently saturated or unsaturated with calcium carbonate? Briefly explain your answer.

Coral formation of $CaCO_3(s)$ has been found to be as high as 10g/m^2/day on certain reefs that have had saturated local $CaCO_3$ ion concentrations. Although studies have shown that some coral species will form $CaCO_3(s)$ under unsaturated conditions, it is thought that saturation is important for healthy coral growth.

5. If corals were physiologically able to use all of the available material in one liter of surface sea water in one day, how many grams of $CaCO_3(s)$ would be formed per m^2. (Show your calculation using the current average ocean surface water concentrations of ions.)

6. How many grams of $CaCO_3(s)$ will dissolve when treated with one liter of swimming pool acid, 20.24% by weight HCl, d= 1.15 g/mL? Show your calculation and explain how this relates to ocean acidification and coral reef destruction.

7. *Computer models forecast a worst-case scenario for the concentration of carbonate ion to be as low as 130µmol/L and the pH~7.8 by the year 2100.*

   a) If this does occur, would the ocean average be saturated or unsaturated in $CaCO_3$? Show your calculation.

   b) What would you predict to be the global impact on 1) coral growth and 2) coral reefs? Briefly explain.

Further reading:
http://chemconnections.org/general/chem121/Worksheets/Reading/Science-2011-coral-418-22.pdf