Geochemistry 428/628 Homework 2 Answer on a separate sheet
North Dakota State University

1. For the H_2S speciation diagram handed out in class, show how to calculate the concentration and pH of all three crossing points.

2. Assume pure water, closed to the atmosphere.
   a) Calculate the solubility of calcite at 25 °C as
      1. moles Ca/liter
      2. g $CaCO_3$/100 ml
      3. ppm Ca

   b) Calculate the solubility of calcite in a solution of 0.05 M $CaCl_2$ at 25°C.

3. The solubility of amorphous silica in water is about 120 ppm of SiO_2 at 25°C. The solution contains silicic acid, H_4SiO_4.

   a) Use the shortcut discussed in class to calculate the pH of a saturated silica solution.

   b) Go to the web-phreeq homepage at https://www.ndsu.edu/webphreeq/
      Choose "Advanced speciation" and "Continue"
      Under "Equilibrium Species" "Phase 1" enter "SiO2(a)" which means amorphous SiO_2.
      For "Desired Saturation Index" enter "0" which means the solution is saturated with the phase.
      Choose "Full Output" and "Continue"
      Inspect the bottom of the output page.

      1. What is the calculated pH of the solution? How does this compare to the shortcut method?
      2. What is the calculated concentration of H_4SiO_4 in the solution, expressed as molality?
      3. Show how to convert the calculated molality of H_4SiO_4 to mg/L SiO_2 and compare the results to Faure, Fig. 9.4.