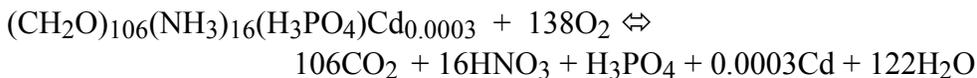


**CH217 Exam 2**  
**May 4, 2006**  
**Due at 5 PM on May 7, 2006**

Please label all text and plots with your initials and staple together all work. You may use your notes, the text, or other references to answer the test. You may not discuss the test with other students in the class. Please sign the last page of the test as an indication that the test is your own work. The time limit for the test is four hours.

- 1) Describe the chemistry of nitrogen oxides in the troposphere as it pertains to ozone production. Please provide specific reactions. Why is controlling NO<sub>x</sub> alone not sufficient to control tropospheric ozone?
- 2) Acid deposition is significantly influencing the chemistry of soil and lake systems throughout the Northeast United States. How is acid deposition changing the chemistry of these systems and what effects do these changes have on the natural ecosystems? Why are some areas more susceptible to acid deposition than others?
- 3) Why is the discovery of water on Mars so critical for the creation of an environment that may have sustained life on that planet?
- 4) The concentration of oxygen in Snow Pond this past Sunday was 12.3 ppm. What is the molar concentration of oxygen in the lake and would you expect oxygen to increase or decrease in the surface of the lake over the next month? What about the oxygen concentration in the deep water of the lake? Explain.
- 5) Cadmium is a bioactive metal. Because of the strong correlation of Cd and PO<sub>4</sub><sup>3-</sup> concentrations in the oceans several researchers have proposed that Cd should be included in the Redfield stoichiometry for respiration/photosynthesis:



- A) For a given area of the ocean the surface concentration of PO<sub>4</sub><sup>3-</sup> and Cd is zero. What is the concentration of Cd at 200 meters if the PO<sub>4</sub><sup>3-</sup> concentration is 2 μmol/liter?
- B) Given the vertical profile for PO<sub>4</sub><sup>3-</sup> shown below, sketch the predicted profile for Cd.
- C) If the total alkalinity of the surface seawater is 0.002M and the pH is 8.2, what is the expected pH of the ocean at 600 meters. You may assume a constant temperature and alkalinity (not true, but we will fake it!).

