

**Exam 5, Part II**  
**CHEM 222, Spring 2011**  
**25 Points**

Name(s) \_\_\_\_\_  
Due *In Class*, March 18, 2011

You may complete the following individually, or with one (1) partner. You may use your textbook and notes, but may not receive assistance from your classmates or anyone other than Dr. Lamp. *This signed sheet must accompany the completed assignment.* By signing below, you certify that you completed the problems in accordance with these rules. No credit will be given to unsigned papers.

Signature(s) \_\_\_\_\_ Date \_\_\_\_\_

1. Consider a saturated aqueous solution of silver phosphate ( $\text{Ag}_3\text{PO}_4$ ). Write mass and charge balance equations that describe this system. *Include all equilibria operating in the solution.* (Subtle hint: Phosphate is the conjugate base of a weak acid.) (6 points)
2. Consider an aqueous solution that is saturated with silver chloride and silver chromate and also contains 0.20M  $\text{Na}_2\text{CrO}_4$  (a strong electrolyte). Write mass and charge balance equations that describe this system. *Include all equilibria operating in the solution.* (6 points)
3. You have prepared a solution by dissolving 0.20 mol maleic acid ( $\text{C}_4\text{H}_4\text{O}_4$ ,  $\text{pK}_{\text{a}1} = 1.92$ ,  $\text{pK}_{\text{a}2} = 6.27$ ) and 0.10 mol pyruvic acid ( $\text{C}_3\text{H}_4\text{O}_3$ ,  $\text{pK}_{\text{a}} = 2.48$ ) in 1.00 L of water. Write all equilibria occurring in solution as well as mass balance and charge balance expressions for this system. Determine the pH of this solution. You may make *valid* simplifying assumptions, use spreadsheets, or solve the system directly. If you use a computer to solve the system, be sure to attach a printout of the computer output. (13 points)