

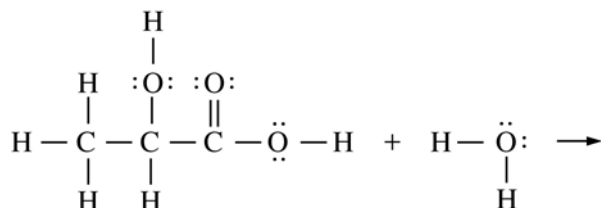
2007 AP[®] CHEMISTRY FREE-RESPONSE QUESTIONS (Form B)

Answer Question 5 and Question 6. The Section II score weighting for these questions is 15 percent each.

Your responses to these questions will be graded on the basis of the accuracy and relevance of the information cited. Explanations should be clear and well organized. Examples and equations may be included in your responses where appropriate. Specific answers are preferable to broad, diffuse responses.

5. Answer the following questions about laboratory situations involving acids, bases, and buffer solutions.

- (a) Lactic acid, $\text{HC}_3\text{H}_5\text{O}_3$, reacts with water to produce an acidic solution. Shown below are the complete Lewis structures of the reactants.



In the space provided above, complete the equation by drawing the complete Lewis structures of the reaction products.

- (b) Choosing from the chemicals and equipment listed below, describe how to prepare 100.00 mL of a 1.00 *M* aqueous solution of NH_4Cl (molar mass 53.5 g mol⁻¹). Include specific amounts and equipment where appropriate.

NH ₄ Cl(s)	50 mL buret	100 mL graduated cylinder	100 mL pipet
Distilled water	100 mL beaker	100 mL volumetric flask	Balance

- (c) Two buffer solutions, each containing acetic acid and sodium acetate, are prepared. A student adds 0.10 mol of HCl to 1.0 L of each of these buffer solutions and to 1.0 L of distilled water. The table below shows the pH measurements made before and after the 0.10 mol of HCl is added.

	pH Before HCl Added	pH After HCl Added
Distilled water	7.0	1.0
Buffer 1	4.7	2.7
Buffer 2	4.7	4.3

- Write the balanced net-ionic equation for the reaction that takes place when the HCl is added to buffer 1 or buffer 2.
- Explain why the pH of buffer 1 is different from the pH of buffer 2 after 0.10 mol of HCl is added.
- Explain why the pH of buffer 1 is the same as the pH of buffer 2 before 0.10 mol of HCl is added.