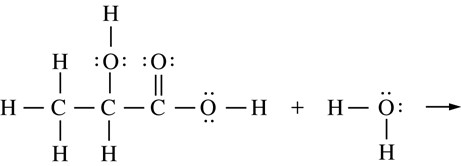
HC3H5O3(*aq*) ⇆ H+(*aq*) + C3H5O3−(*aq*)

Lactic acid, HC3H5O3 , is a monoprotic acid that dissociates in aqueous solution, as represented by the equation above.

*Shown below are the complete Lewis structures of the reactants. In the space provided, complete the equation by drawing the complete Lewis structures of the reaction products. (2pts) 2007B 5a*



Lactic acid is 1.66 percent dissociated in 0.50 *M* HC3H5O3(*aq*) at 298 K. For parts (a) through (d) below, assume the temperature remains at 298 K.

a) Write the expression for the acid-dissociation constant, *Ka* , for lactic acid and calculate its value. *(3pts)*

b) Calculate the pH of 0.50 *M*HC3H5O3 *(1pt)*

c) Calculate the pH of a solution formed by dissolving 0.045 mole of solid sodium lactate, NaC3H5O3 ,in 250. mL of 0.50 *M* HC3H5O3. Assume that volume change is negligible. *(3pts)*

d) A 100. mL sample of 0.10 *M* HCl is added to 100. mL of 0.50 *M* HC3H5O3. Calculate the molar concentration of lactate ion, C3H5O3−, in the resulting solution. *(3pts)*

|  |  |
| --- | --- |
| ***Volume of 0.250 M NaOH Added (mL)*** | ***pH of Titrated Solution*** |
| 0.00 | ? |
| 10.0 | 3.72 |
| 20.0 | 4.20 |
| 30.0 | ? |
| 40.0 | 8.62 |
| 50.0 | 12.40 |

A 1.22 g sample of a pure monoprotic acid, HA, was dissolved in distilled water. The HA solution was then titrated with 0.250M NaOH. The pH was measured throughout the titration, and the equivalence point was reached when 40.0 mL of the NaOH solution had been added. The data from the titration are recorded in the table. *2012 1*

a) Explain how the information above and the data in the table provide evidence that HA is a weak acid rather than a strong acid. *(1pt)*

b) Write a balanced net-ionic reaction for the reaction that occurs when the solution of NaOH is added to the solution of HA. *(1pt)*

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c) Calculate the molar mass of HA. *(2pts)*

d) Determine the Ka of HA. *(1pt)*

e) Determine the pH of the initial HA solution (before any NaOH was added).

The original sample was dissolved in 40.0mL of water. *(3pts)*

f) Calculate the [H+] ( or [H3O+] ) after 30.0mL of NaOH solution has been added to the original solution. What is the pH at this point? *(3 pts)*

g) How would your calculated value of molar mass be affected by the following?

i) An indicator that changes color at a pH of 5 was used for the titration instead of using a pH meter. *(1pt)*

ii) The concentration of the NaOH was actually lower than 0.250M. *(1pt)*