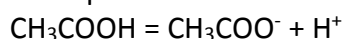


### Question #64116, Chemistry / Other

What will be the titration curve and pH for titrating 0.2 M acetic acid with 25 ml 0.2 M of NaOH.

#### Answer:

For the beginning you have only  $\text{CH}_3\text{COOH}$  in the solution. Initial pH is a pH of the weak monoprotic acid solution:



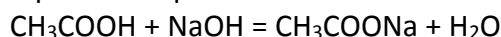
$$K_a = \frac{[\text{H}^+]^2}{c_0 - [\text{H}^+]}$$
$$[\text{H}^+]^2 + [\text{H}^+]K_a - K_a c_0 = 0$$
$$c_0 = 0.2 \text{ M}$$

$$K_a = 1.8 \times 10^{-5}$$

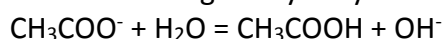
$$[\text{H}^+] = 1.89 \times 10^{-3}$$

$$\text{pH} = -\log[\text{H}^+] = -\log 1.89 \times 10^{-3} = 2.72$$

Equivalence point at 25 mL. All acid converted to salt:



This salt undergoes hydrolysis:



$$K_b = \frac{K_w}{K_a} = \frac{1.0 \times 10^{-14}}{1.8 \times 10^{-5}} = 5.6 \times 10^{-10}$$

$$K_a = \frac{[\text{OH}^-]^2}{c_0 - [\text{OH}^-]}$$

$$[\text{OH}^-]^2 + [\text{OH}^-]K_b - K_b c_0 = 0$$

$$K_b = 5.6 \times 10^{-10}$$

Due to dilution:

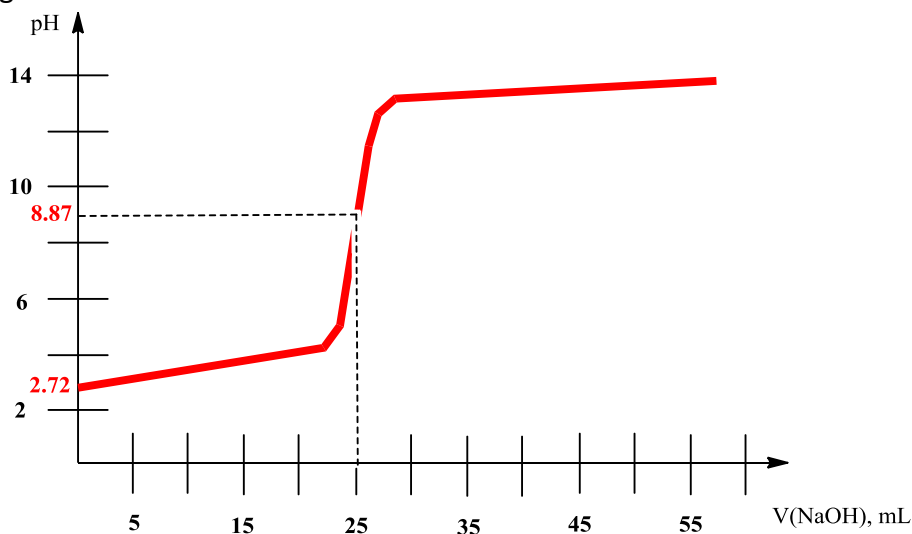
$$c_0 = 0.1 \text{ M}$$

$$[\text{OH}^-] = 7.48 \times 10^{-6}$$

$$\text{pOH} = -\log[\text{OH}^-] = -\log 7.48 \times 10^{-6} = 5.13$$

$$\text{pH} = 14 - \text{pOH} = 14 - 5.13 = 8.87$$

Before equivalence point pH will rise slowly, at equivalence point – sharp increase, after – again slow growth:



Answer provided by <https://www.AssignmentExpert.com>