**Chemistry 3.6 AS 91392** Demonstrate understanding of equilibrium principles in aqueous systems



Writing Excellence answers to **Titration Curve – After the Start pH** questions

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| **Titration Curve – after the Start pH QUESTION** | |
| **Question:**   **:** 20.0 mL of 0.0896 mol L–1 ethanoic acid is titrated with 0.100 mol L–1 sodium hydroxide. p*K*a (CH3COOH) = 4.76  Calculate the pH of the titration mixture after 5.00 mL of NaOH has been added.  Kw = 1 x 10-14 | |
| **ANSWER** | |
| **1.** determine if starting solution is acid or base (will it accept or donate H+) – strong or weak  And write down all available information | Starting solution of ethanoic acid is weak acid  v(CH3COOH) = 20mL = 0.0200L  c(CH3COOH) = 0.0896 mol L–1  v(NaOH) = 5mL = 0.00500L  c(NaOH) = 0.100 mol L–1  total volume = 25mL = 0.0250L |
| **2.** Write down neutralisation equation | NaOH(*aq*) + CH3COOH(*aq*) → NaCH3COO(*aq*) + H2O(*l*) |
| **3.** calculate  *n*(CH3COOH at start)  n = cv  *3sgf and units* | n = cv  n = 0.0896 × (20 ×10–3)  n = 1.79 × 10–3 mol |
| **4.** calculate *n*(NaOH) and therefore n(CH3COO-)  n = cv  *assume n*(NaOH) =  *n*(CH3COO-)  *3sgf and units* | n = cv  n = 0.1 × (5 × 10–3)  n = 5 × 10–4 mol  *assume n*(NaOH) =  *n*(CH3COO-)  *n*(CH3COO-) = 5 × 10–4 |
| **5.** calculate  *n*(CH3COOH) After 5 mL NaOH added: (total 25mL)  =n(CH3COOH – n(CH3COO-) after 5mL  *3sgf and units* | *n*(CH3COOH) After 5 mL = n(CH3COOH – n(CH3COO-) after 5mL  *n*(CH3COOH) After 5 mL = (1.79 × 10–3 mol – 5 × 10–4 mol )  *n*(CH3COOH) After 5 mL = 1.29 × 10–3 mol |
| **6**. calculate c(CH3COOH)  c = n/v  *3sgf and units* | c = n/v  c = 1.29 × 10–3 mol / 0.0250L  c = 0.0516 mol L–1 |
| **7**. calculate [H3O+]  Ka = 10-pKa  [H3O+] = √ Ka x c(HA)  *3sgf and units* | [H3O+] = √ Ka x c(HA)  [H3O+] = √ 10-4.76 x 0.0516 mol L–1  [H3O+] = 4.48 × 10–5 mol L–1 |
| **8**. Calculate pH  pH = -log [H3O+]  *3sgf*  *Check pH against estimate on curve* | pH = -log [H3O+]  pH = -log [4.48 × 10–5 mol L–1]  pH = 4.35 |

NOTE: The white column is how your answer would appear on your test paper so make sure you **write out complete sentences**. The grey area is just to help you structure your answer and would not appear in the question.