



QUICK CHECK

ACIDS & BASES (C)

- 1 Calculate the pH of a 0.500 mol dm⁻³ aqueous solution of propanoic acid. (K_a for propanoic acid = 1.34×10^{-5} mol dm⁻³)

$$[H^+]^2 = K_a [HA]$$

$$[H^+] = \sqrt{K_a [HA]} = \sqrt{(1.34 \times 10^{-5}) \times 0.500} = 2.59 \times 10^{-3}$$

$$pH = -\log[H^+] = -\log 2.59 \times 10^{-3} = 2.59$$

- 2 The acid dissociation constant for two acids are shown.

acid	ethanoic acid	chloroethanoic acid
K_a / mol dm ⁻³	1.76×10^{-5}	1.40×10^{-3}

a Which acid is stronger? **chloroethanoic acid**

b Calculate pK_a for chloroethanoic acid.

$$pK_a = -\log K_a = -\log 1.40 \times 10^{-3} = 2.86$$

- 3 Calculate the pH of a mixture of 20 cm³ of 0.200 mol dm⁻³ methanoic acid ($pK_a = 3.75$) and 50 cm³ of 0.040 mol dm⁻³ sodium hydroxide solution.

$$\text{mol HA} = 0.200 \times \frac{20}{1000} = 0.0040$$

$$\text{mol OH}^- = 0.040 \times \frac{50}{1000} = 0.0020$$

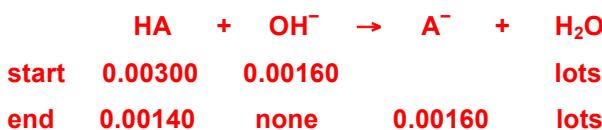
HA is half neutralised $\therefore pH = pK_a$

$$pH = 3.75$$

- 4 Calculate the pH of a mixture of 30 cm³ of 0.100 mol dm⁻³ lactic acid ($pK_a = 3.86$) and 10 cm³ of 0.080 mol dm⁻³ calcium hydroxide solution.

$$\text{mol HA} = 0.100 \times \frac{30}{1000} = 0.00300$$

$$\text{mol OH}^- = 2 \times 0.080 \times \frac{10}{1000} = 0.00160$$



$$K_a = \frac{[H^+][A^-]}{[HA]}$$

$$[H^+] = \frac{K_a [HA]}{[A^-]} = \frac{10^{-3.86} \left[\frac{0.00140}{40} \right]}{\left[\frac{0.00160}{1000} \right]} = 1.21 \times 10^{-4}$$

$$pH = -\log[H^+] = -\log 1.21 \times 10^{-4} = 3.92$$