Chapter 11
Acids, bases and buffers

Print out and complete this worksheet to generate a summary for Chapter 11.

1 Consider the equation:

$$CH_3NH_2 + H_2O \rightleftharpoons CH_3NH_3^+ + OH^-$$

Use the equation to explain what you understand by the Brønsted–Lowry theory of acids and bases. Identify the acid–base conjugate pairs.

2 Using HNO_3 and HCOOH as examples, explain the difference between a strong acid and a weak acid.

3 For the weak acid, HCOOH, define each of the following:

a K_a

b pK_a

c pH

4 Calculate the pH of the following acid solutions:

a 0.035 mol dm^{-3} HCl

b 0.035 mol dm^{-3} CH_3COOH ($K_a = 1.7 \times 10^{-5}$ mol dm^{-3})

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5 Calculate the pH of a 0.080 mol dm^{-3} solution of potassium hydroxide.

6 a Explain what is meant by a *buffer solution*.

b Explain how a mixture of sodium butanoate and butanoic acid acts as a buffer solution.

7 Calculate the pH of a buffer solution made by dissolving 0.20 mol of benzoic acid and 0.010 mol of sodium benzoate to make 1.0 dm^3 of solution.
(K_a for benzoic acid = 6.4×10^{-5} mol dm^{-3})

8 Explain how the HCO_3^- ion acts as a buffer.

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9 Sketch a pH titration curve for the addition of a weak alkali to a strong acid.

10a Explain how the following indicator would work:

$$HIn(aq) \rightleftharpoons H^+(aq) + In^-(aq)$$

Yellow Blue

b If the indicator has a pK_{In} value of 4.9, for which type of titration could it be used?

11 Define enthalpy of neutralisation.

12 Explain why the value of the enthalpy of neutralisation of a weak acid and a strong base is less than the enthalpy of neutralisation of a strong acid and a strong base.