Worksheet 20.2

Weak acids and buffers

1 The pH values of two different acids are shown in the table below.

Acid	Concentration / mol dm^{-3}	pH
hydrochloric (HCl)	0.01	2.00
propanoic	0.01	3.44

a How does the above data show you that hydrochloric acid is a strong acid whilst propanoic acid is a weak acid? [5]

b What is the dissociation constant of propanoic acid? [2]

2 Calculate the pH of the following solutions.

a 20.0 cm^3 of 1.00 mol dm^{-3} nitrous acid ($pK_a = 3.34$) added to 40.0 cm^3 of 0.500 mol dm^{-3} sodium nitrite solution [4]

b 10.0 cm^3 of 1.00 mol dm^{-3} nitrous acid added to 20.0 cm^3 of 2.00 mol dm^{-3} sodium nitrite solution [3]

3 **a** What is the pH of a solution containing 0.100 mol dm^{-3} of ethanoic acid ($K_a = 1.74 \quad 10^{-5}$ mol dm^{-3}) and 0.100 mol dm^{-3} of sodium ethanoate? [3]

b How many moles of sodium ethanoate must be added to 1.00 dm^3 of 0.010 mol dm^{-3} ethanoic acid to produce a buffer solution of pH 5.40? [4]

4 **a** Calculate the pH of a solution of 0.200 mol of ethanoic acid ($K_a = 1.74 \quad 10^{-5}$ mol dm^{-3}) in 1.00 dm^3 of solution. [3]

b What does the pH of the solution become after the addition of 0.100 mol of sodium ethanoate? [3]

5 The K_a value of methanoic acid is $1.60 \quad 10^{-4}$ mol dm^{-3}.

a Calculate the pH of a methanoic acid solution of concentration 0.100 mol dm^{-3}. [3]

b What is the pH of a solution of 3.40 g of sodium methanoate in 1.00 dm^3 of methanoic acid of concentration 0.100 mol dm^{-3}?
[A_r values: H = 1.0, C = 12.0, O = 16.0, Na = 23.0] [4]

c Calculate the pH of the solution obtained when 14.9 cm^3 of 0.100 mol dm^{-3} sodium hydroxide solution has been added to 25.0 cm^3 of methanoic acid of concentration 0.100 mol dm^{-3}. [7]