# pH calculations worksheet

1. What is the pH of a 0.005 mol dm–3 solution of hydrochloric acid?

2. What is the pH of a 2 × 10–4 mol dm–3 solution of sulfuric acid?

3. A solution of hydrochloric acid has a pH of 1.3. What is its concentration?

4. What is the pH of 0.0002 mol dm–3 sodium hydroxide?  
*K*w = 1 × 10–14 mol2 dm–6.

5. A student mixes 30 cm3 of 1 mol dm–3 HC*l*(aq) with 20 cm3 of 1 mol dm–3 NaOH(aq). What is the final pH?

6. What is the pH of 0.03 mol dm–3 ethanoic acid?  
*K*a = 2 × 10–5 mol dm–3

7. What is the lowest possible pH?   
1 mol dm–3 HC*l* has a pH of zero. Can anything be lower?

8. What is the pH of a buffer solution containing 0.1 mol dm–3 ethanoic acid and 0.2 mol dm–3 sodium ethanoate?  
*K*a = 2 × 10–5 mol dm–3

9a. You can make a buffer solution by adding a little sodium hydroxide to a weak acid. This leaves some weak acid mixed with sodium salt, making it a buffer.

What would be the pH if you mix 20 cm3 of 2 mol dm–3 ethanoic acid with 20 cm3 of 1 mol dm–3 sodium hydroxide?

9b. Calculate the change in pH if you add 1 cm3 of 1 mol dm–3 HC*l* to

(i) 1 dm3 of water

(ii) 1 dm3 of the buffer solution made in (a).

In each case, you can assume the volume of the final solution is 1 dm3.

10. What happens to the pH of water when you heat it?

Hints:

* Write an expression for *K*w and the ionisation of water.
* What is the pH at 25 oC? (*K*w = 1 × 10–14 mol2 dm–6)
* Is the process endo- or exothermic? What will happen to the position of equilibrium when water is heated?