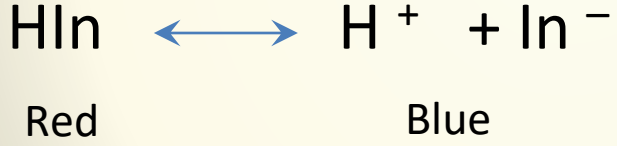
18.3 Indicators

18.5.1

- Describe qualitatively the action of an acid-base indicator.

- Indicators are themselves weak acids/bases who's equilibrium equation will shift according to their environment.



- What would happen if indicator was in the presence of an acid? Base?

18.5.1 Continued

Write the K_a expression for the generic indicator.

- Ratio of two colored forms (HIn: In^-) depends on $[H^+]$ and K_a.
- Different indicators change color over different pH ranges.

18.5.2

State and explain how the pH range of an acid-base indicator relates to its pK_a value.

- What happens when pH = pk_a?

- ½ equivalence point so [HIn] = [In^-]
  - Color?
  - Therefore in this range (+/- 1 pH), the environment will affect the color of the solution greatly.

Choosing the Right Indicator

- Color change (end point) must occur rapidly at the equivalence point.

- Match up the pH of the equivalence point with the pKa of the indicator.

Indicator	pKa	Useful range
Methyl orange	3.7	3.1 - 4.4
Bromophenol blue	4.0	3.0 - 4.6
Methyl red	5.1	4.2 - 6.3
Bromothymol blue	7.0	6.0 - 7.6
Phenol red	7.9	6.8 - 8.4
Phenolphthlein	9.3	8.2 - 10.0

Titration of a weak base with strong acid?
Weak acid with strong base?

Practice IB

Consider an acid-base indicator solution.

$$\underset{\text{colour A}}{HIn(aq)} \rightarrow \underset{\text{colour B}}{H^+(aq) + In^-(aq)}$$

What is the effect on this acid-base indicator when sodium hydroxide solution is added to it?

- A. Equilibrium shifts to the right and more of colour B is seen.
- B. Equilibrium shifts to the left and more of colour B is seen.
- C. Equilibrium shifts to the right and more of colour A is seen.
- D. Equilibrium shifts to the left and more of colour A is seen.

Practice IB

- The graph below shows the titration curve of 25 cm^3 of 0.100 mol dm^{-3} of hydrochloric acid with sodium hydroxide, of 0.100 mol dm^{-3} concentration. The indicator methyl orange was used to determine the equivalence point. Methyl orange has a pH range of 3.2–4.4.

  If the hydrochloric acid was replaced by ethanoic acid of the same volume and concentration, which property of the titration would remain the same?

A. The initial pH

B. The pH at the equivalence point

C. The volume of strong base, NaOH, needed to reach the equivalence point

D. The colour of the titration mixture just before the equivalence point is reached


"That's all Folks!"
Isberg

Calculator Update

- You DO have to clear your calculators before P2 and P3! Please have them cleared by 9 am Thursday as I will be checking them during your break.
  - I will be bringing in my box of calculators and rulers during this time.
  - PLEASE let 2nd period know about this as I found out after class today!