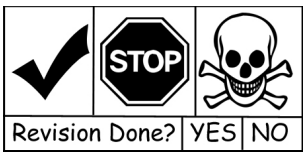
Unit 14 Acids & Bases (Paper 1 & 3)

14.1 pH & Definitions

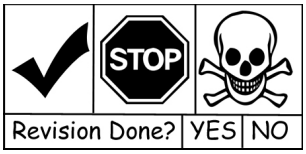
Brønsted–Lowry acid–base equilibria in aqueous solution
An acid is a proton donor.
A base is a proton acceptor.
Acid–base equilibria involve the transfer of protons.

Definition and determination of pH
The concentration of hydrogen ions in aqueous solution covers a very wide range. Therefore, a logarithmic scale, the pH scale, is used as a measure of hydrogen ion concentration.
$pH = -\log_{10}[H^+]$
You should be able to:
• convert concentration of hydrogen ions into pH and vice versa
• calculate the pH of a solution of a strong acid from its concentration.



14.2 The ionic product of water, K_W

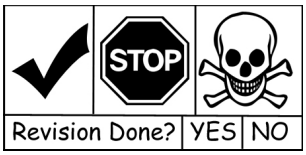
Water is slightly dissociated.
K_W is derived from the equilibrium constant for this dissociation.
$K_W = [H^+][OH^-]$
The value of K_W varies with temperature.
You should be able to use K_W to calculate the pH of a strong base from its concentration.



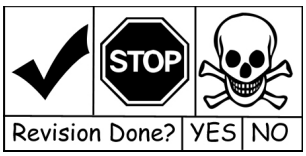
Weak acids and bases K_a for weak acids
Weak acids and weak bases dissociate only slightly in aqueous solution.
K_a is the dissociation constant for a weak acid.

$pK_a = -\log_{10} K_a$

You should be able to:
• construct an expression for K_a
• perform calculations relating the pH of a weak acid to the concentration of the acid and the dissociation constant, K_a
• convert K_a into pK_a and vice versa.



pH curves, titrations and indicators
Titrations of acids with bases.
You should be able to perform calculations for these titrations based on experimental results.
Typical pH curves for acid–base titrations in all combinations of weak and strong monoprotic acids and bases.
You should be able to:
• sketch and explain the shapes of typical pH curves
• use pH curves to select an appropriate indicator.



14.3 Buffer action

A buffer solution maintains an approximately constant pH, despite dilution or addition of small amounts of acid or base.
Acidic buffer solutions contain a weak acid and the salt of that weak acid.
Basic buffer solutions contain a weak base and the salt of that weak base.
Applications of buffer solutions.
You should be able to:
• explain qualitatively the action of acidic and basic buffers
• calculate the pH of acidic buffer solutions.