Beckfoot

Chemistry	3.1.12 Acids and Bases	Year 13

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Equations

1	**pH**	$= -\log[H^+]$
2	**$[H^+]$**	$= 10^{-pH}$
3	**K_w**	$= [H^+][OH^-]$
4	**K_a (weak acid)**	$= [H^+]^2/[HA]$
5	**K_a (buffer)**	$= [H^+][A^-]/[HA]$
6	**pH**	$= pK_a$ at half the volume of equivalence point

Calculating pH

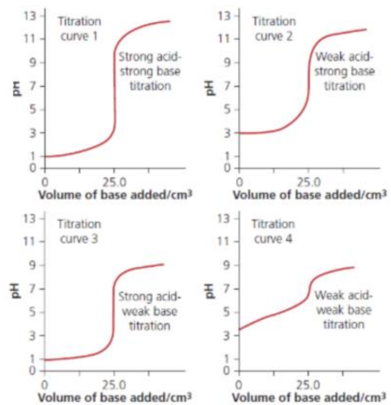
1	**Strong acids**	Use $pH = -\log[H^+]$ To find $[H^+]$: Monoprotic: $[H^+]$ = [acid] Diprotic: $[H^+]$ = [acid] x 2
2	**Strong bases**	Use $[H^+] = K_w/[OH^-]$, then use $pH = -\log[H^+]$ To find $[OH^-]$: Monobastic: $[OH^-]$ = [base] Dibasic: $[OH^-]$ = [base] x 2
3	**Weak acids**	Use $[H^+] = \sqrt{(K_a \times [HA])}$, then use $pH = -\log[H^+]$

Buffers

1	**Adding acid**	Additional H^+ reacts with A^- in buffer solution. Equilibrium of ($HA \leftrightharpoons H^+ + A^-$) shifts to right hand side, removing additional H^+
2	**Adding alkali**	OH^- reacts with H^+ in buffer solution. Equilibrium of ($HA \leftrightharpoons H^+ + A^-$) shifts to left hand side, replacing H^+

pH curves and indicators

1	**Starting and final pH on pH curve**	Can be calculated, but approx. pH 1 for strong acids, 4 for weak acids, 10 for weak bases and 14 for strong bases.
2	**Equivalence point**	Volume to be calculated, taking stoichiometry of reagents into account
3	**Choice of indicator**	pH range of colour change of indicator must lie within vertical section of pH curve



Key vocabulary

1	**Brønsted-Lowry acid**	Proton donor
2	**Brønsted-Lowry base**	Proton acceptor
3	**Alkali**	A soluble base
4	**Strong acid**	An acid that completely dissociates in aqueous solution
5	**Weak acid**	An acid that only partially dissociates in aqueous solution
6	**Monoprotic**	An acid which donates only one proton
7	**Diprotic**	An acid which donates two protons
8	**pH**	$pH = -\log[H^+]$
9	**K_w**	$K_w = [H^+][OH^-] = 1 \times 10^{-14}$ Unit: $dm^6\ mol^{-2}$
10	**Neutral**	A solution where $[H^+]=[OH^-]$
11	**Buffer**	A solution whose pH does not change when small amounts of acid or alkali are added
12	**Equivalence point**	The volume at which pH changes rapidly and shows a vertical inflection in a titration curve
13	**End point**	The point at which the indicator changes colour during a titration.
14	**Indicator**	A substance that changes colour depending on pH