

A2 chemistry definitions



**ASSIGN
BUSTER**

-1A2 CHEMISTRY MODULE 4 definitions (aqa) Rate of Reaction The rate of change of concentration with time (mathematically $d[X]/dt$). Units are $\text{mol. dm}^{-3} \text{ s}^{-1}$ (moles per cubic decimetre per second) Initial Rate This is the rate at the very beginning of the reaction when all the starting concentrations are known exactly. Rate Equation Rate Expression A mathematical expression which relates the rate to the concentrations of substances involved in the reaction Rate Constant, k This is the multiplying constant in the rate equation, e. g., $\text{Rate} = k [A].[B]^2$ It has a constant numerical value as long as temperature does not change. Rate constants increase as temperature increases. Order of Reaction This is the numerical power to which the concentration of a substance is raised in the rate equation. The overall order is the sum of all the individual powers, e. g., $\text{Rate} = k [A].[B]^2$ is 1st order with respect to A, 2nd order with respect to B and 3rd order overall

Homogeneous system A chemical system where all components in the mixture are in the same phase, e. g., all liquids or all gases Heterogeneous system A chemical system where components in the mixture are in different phases. Equilibrium Constant, K_C This is the ratio of the product concentrations raised to the powers of their respective stoichiometric coefficients to the reactant concentrations raised to the powers of their respective stoichiometric coefficients. Stoichiometric coefficients are the balancing numbers in the chemical equation. Concentrations must be in units of mol. dm^{-3} The numerical value of K_C changes only with temperature. Equilibrium Constant, K_P This is similar to K_C , except that partial pressures are used instead of concentrations. This applies only for gases (since vapour pressures of solids and liquids are negligible compared to gases). The numerical value of K_P changes only with temperature. Partial

Pressure The sum of the individual partial pressures of gaseous components in a mixture of gases equals the total pressure. Each gas exerts the same pressure as it would if it occupied the whole volume by itself. If the total pressure is known, the partial pressure of a component is the total pressure multiplied by its mole fraction: $p_A = p_T \times x_A$

Mole fraction This is the number of moles of a component divided by the total number of moles in the mixture, e. g., $x_A = n_A / n_{\text{total}}$

Strong Acid A proton (H^+) donor — a strong acid is one which is completely dissociated into ions (easily donates protons)

Weak Acid A proton acceptor

Conjugate Base The “ other half” of the acid after the H^+ has been donated, e. g., A^- for acid HA (HA and A^- are known as a conjugate acid-base pair). A strong acid has a weak conjugate base and vice versa.

Conjugate Acid The species formed when a base has accepted a proton, e. g., BH^+ for base B

pH This is defined as $\text{pH} = -\log_{10} [\text{H}^+(\text{aq})]$

Ionic Product of Water, K_w Pure water dissociates slightly into H^+ and OH^- ions. $K_w = [\text{H}^+] \times [\text{OH}^-]$ and has the value $1 \times 10^{-14} \text{ mol}^2 \cdot \text{dm}^{-6}$ at 25°C

p K_w $\text{p}K_w = -\log_{10} K_w = 14$

Acid Dissociation Constant, K_a For an acid $\text{HA}(\text{aq}) \rightleftharpoons \text{H}^+(\text{aq}) + \text{A}^-(\text{aq})$ then $K_a = \frac{[\text{H}^+(\text{aq})] \times [\text{A}^-(\text{aq})]}{[\text{HA}(\text{aq})]}$ Units are $\text{mol} \cdot \text{dm}^{-3}$

p K_a This is $-\log_{10} K_a$ and so $K_a = 10^{-\text{p}K_a}$

Indicator Often a weak acid, the associated acid and its conjugate base have different colours, so respond to different pH values

p K_{in} For an indicator $\text{HIn}(\text{aq}) \rightleftharpoons \text{H}^+(\text{aq}) + \text{In}^-(\text{aq})$ then $K_{\text{in}} = \frac{[\text{H}^+(\text{aq})] \times [\text{In}^-(\text{aq})]}{[\text{HIn}(\text{aq})]}$ and $\text{p}K_{\text{in}} = -\log_{10} K_{\text{in}}$ When $[\text{In}^-(\text{aq})] = [\text{HIn}(\text{aq})]$ the colour is intermediate between the two colours and at $\text{pH} = \text{p}K_{\text{in}}$ Effectively, $\text{p}K_{\text{in}}$ tells you the pH value where the indicator is at its mid colour point.

Indicator range This is the pH range over which the indicator changes colour. A guide is to use $\text{p}K_{\text{in}} \pm 1$.

The ideal choice of indicator for a titration is one which has a $\text{p}K_{\text{in}}$ value at

the equivalence point. Equivalence point This is the point (pH) at which stoichiometric amounts (equivalent moles) of acid and alkali have reacted exactly with each other. It is the mid point of the vertical section of the pH curve and is not always 7. It is only at pH 7 for a strong acid-strong base titration. It is > 7 for a weak acid-strong base and