



Chemistry Revision Sheets

Equations for AQA

Moles (amounts of substance)

Mass

$$\text{moles} = \frac{\text{mass}}{\text{molar mass}}$$

$\text{moles} = g$
 $\text{molar mass} = g \text{ mol}^{-1}$

Solution

$$\text{moles} = \text{concentration} \times \text{volume}$$

$\text{concentration} = \text{mol dm}^{-3}$
 $\text{volume} = \text{dm}^3$

Gas

$$pV = nRT$$

p = pressure (Pa) R = gas constant ($8.31 \text{ J K}^{-1} \text{ mol}^{-1}$)
 V = volume (m^3) T = temperature (K)

Energy, Enthalpy and Entropy

Calorimetry

$$q = mc\Delta T$$

q = energy change (J or kJ) c = specific heat capacity ($\text{J g}^{-1} \text{ K}^{-1}$)
 ΔT = temperature change (K or $^{\circ}\text{C}$)

Bond Enthalpies

$$\Delta H = \sum(\text{bond energies of reactants}) - \sum(\text{bond energies of products})$$

ΔH = change in enthalpy (kJ mol^{-1}), bond enthalpies = kJ mol^{-1}

Enthalpy

$$\text{enthalpy} = \frac{\text{moles}}{\text{energy change (q)}}$$

$\text{enthalpy} = \text{kJ mol}^{-1}$
 $\text{energy change (q)} = \text{kJ}$

Gibbs Free Energy

$$\Delta G = \Delta H - T\Delta S$$

ΔG = Gibbs Free Energy (kJ mol^{-1}) ΔH = enthalpy change (kJ mol^{-1})
 ΔS = entropy change ($\text{kJ K}^{-1} \text{ mol}^{-1}$) T = temperature (K)

Entropy Change

$$\Delta S = \sum S^{\circ}(\text{products}) - \sum S^{\circ}(\text{reactants})$$

ΔS = entropy change ($\text{J K}^{-1} \text{ mol}^{-1}$)
 S° = standard entropy ($\text{J K}^{-1} \text{ mol}^{-1}$)

Entropy

$$\Delta S_{(\text{Surroundings})} = \frac{-\Delta H}{T}$$

$\Delta S_{(\text{Surroundings})}$ = entropy change of surroundings ($\text{kJ K}^{-1} \text{ mol}^{-1}$)
 ΔH = enthalpy change (kJ mol^{-1})
 T = temperature (K)





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Equilibrium

Equilibrium Constant K_c

$$K_c = \frac{[C]^c[D]^d}{[A]^a[B]^b}$$

For the equilibrium $aA + bB \rightleftharpoons cC + dD$
[] = concentration

Equilibrium Constant K_p

$$K_p = \frac{(P_C)^c \times (P_D)^d}{(P_A)^a \times (P_B)^b}$$

For the equilibrium $aA_{(g)} + bB_{(g)} \rightleftharpoons cC_{(g)} + dD_{(g)}$
 P_x = partial pressure (Pa)

Rates of Reaction

Rate Equation

$$\text{rate} = k \times [A]^x[B]^y[C]^z$$

Rate = $\text{mol dm}^{-3} \text{ s}^{-1}$, [] = concentration
 x, y, z = orders with respect to A, B and C

Arrhenius Equation

$$k = Ae^{\frac{-E_a}{RT}}$$

k = rate constant

E_a = activation energy (kJ mol^{-1})

A = constant

T = temperature

e = base of natural log R = gas constant ($8.31 \text{ J K}^{-1} \text{ mol}^{-1}$)

$$\ln k = -\frac{E_a}{RT} + \ln A$$

$\ln$ = natural logarithm

Acids, Bases and pH

Acid Dissociation Constant K_a

$$K_a = \frac{[H^+]_{(aq)}[A^-]_{(aq)}}{[HA]_{(aq)}}$$

For the weak acid dissociation $HA \rightleftharpoons H^+ + A^-$
[] = concentration
 K_a = acid dissociation constant (mol dm^{-3})

pK_a

$$pK_a = -\log_{10} K_a$$

Ionic Product of Water K_w

$$K_w = [H^+]_{(aq)}[OH^-]_{(aq)}$$

K_w = ionic product of water ($\text{mol}^2 \text{ dm}^{-6}$)
at 298K, $K_w = 1.00 \times 10^{-14} \text{ mol}^2 \text{ dm}^{-6}$

pH

$$\text{pH} = -\log_{10} [H^+]_{(aq)}$$

$[H^+]_{(aq)}$ = concentration of H^+

$$[H^+]_{(aq)} = 10^{-\text{pH}}$$





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Electrochemistry

Electromotive Force E_{cell}

$$E_{\text{cell}} = E_{\text{reduction}} - E_{\text{oxidation}}$$

E_{cell} = EMF (electromotive force) of electrochemical cell (V)

$E_{\text{reduction}}$ = standard electrode potential of cathode

$E_{\text{oxidation}}$ = standard electrode potential of anode

Conditions for standard electrode potentials = 298K, 1 mol dm⁻³ and 100kPa

Chromatography

Retention Factor R_f

$$R_f = \frac{\text{Distance travelled by sample}}{\text{Solvent Front}}$$

R_f = no units

solvent front = distance travelled by solvent

Assorted

Atom Economy

$$\text{Atom Economy} = \frac{\text{relative formula mass of desired product}}{\text{relative formula mass of all reactants (sum of)}} \times 100$$

Percentage Yield

$$\text{Percentage Yield} = \frac{\text{actual yield}}{\text{theoretical mass}} \times 100$$

Relative Atomic Mass A_r

$$A_r = \frac{(\text{Isotope 1 mass} \times \% \text{ abundance}) + (\text{Isotope 2 mass} \times \% \text{ abundance})}{\text{total \% abundance (100)}}$$

Energy (waves)

$$\Delta E = h \nu$$

ΔE = change in energy (J)

h = planks constant (6.62×10^{-34} J s⁻¹)

ν = frequency (Hz, s⁻¹)

$$c = \nu \lambda$$

c = speed of light (3×10^8 m s⁻¹)

ν = frequency (Hz, s⁻¹)

λ = wavelength, m

Dilution

$$V_i C_i = V_f C_f$$

V_i = initial volume

C_i = initial concentration

V_f = final volume (after dilution)

C_f = final concentration (after dilution)

