

Equation Sheet for A-Level Chemistry

These are the equations you need to

memorise for your Chemistry A-Level



Amount of Substance

Moles

$$n = \frac{m}{M_r}$$

Concentration

$$c = \frac{n}{V}$$

Molar gas volume

$$V = n \times 24$$

Number of particles

$$= n \times N_A$$

Ideal gas Equation

$$pV = nRT$$

Atom economy

$$= \frac{\text{Mr of desired product}}{\text{Sum of } M_r \text{ of all reactants}} \times 100$$

% Yield

$$= \frac{\text{Actual yield}}{\text{Theoretical yield}} \times 100$$

Energetics

Enthalpy change

$$Q = mc\Delta T$$

Average bond enthalpy

$$\Delta H = \sum (\text{bond enthalpies in reactants}) - \sum (\text{bond enthalpies in products})$$

Electrode Potentials

EMF

$$E^\theta = E^\theta \text{ right hand side} - E^\theta \text{ left hand side}$$

Thermodynamics

Gibbs Free Energy Equation

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

Transition Metals

Coloured complex ions - difference in energy

$$\Delta E = h\nu = \frac{hc}{\lambda}$$

Chemical Equilibria

Equilibrium constant wrt concentration

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

Equilibrium constant wrt pressure

$$K_p = \frac{(D)^d (E)^e}{(A)^a (B)^b}$$

Rate Equations

$$\text{Rate} = k[A]^m [B]^n$$

Arrhenius is provided but you should be able to use:

$$k = Ae^{-E_a/RT}$$

$$\ln k = -E_a/RT + \ln A$$

Acids and Bases

$$\text{pH} = -\log_{10} [H^+]$$

$$K_w = [H^+][OH^-]$$

$$\text{p}K_a = -\log_{10} K_a$$

$$K_a = \frac{[H^+][A^-]}{[HA]}$$

These are the meaning of the symbols on the equation sheet



Amount of Substance

n = number of moles
 m = mass
 M_r = formula mass
 C = concentration
 V = volume
 N_A = Avogadro's constant
 p = pressure
 R = gas constant
 T = temperature

Rate Equations

k = rate constant
 $[A]$ = concentration of A
 $[B]$ = concentration of B
 a = order wrt A
 b = order wrt B
 A = Arrhenius pre exponential factor
 e = exponential
 E_a = activation energy
 T = temperature
 R = gas constant
 \ln = natural log

Energetics

q = heat energy
 m = mass
 c = specific heat capacity
 ΔT = change in temperature
 ΔH = enthalpy change

Electrode Potentials

E^\ominus = electrode potential

Thermodynamics

ΔG = Gibbs free energy
 ΔH = enthalpy change
 T = temperature
 ΔS = change in entropy

Transition Metals

ΔE = change in energy
 h = Planck's constant
 ν = frequency
 c = velocity of light
 λ = wavelength

Chemical Equilibria

K_c = Equilibrium constant (wrt concentration)
 K_p = Equilibrium constant (wrt pressure)
 $[A] / (A)$ = concentration/ partial pressure of reactant A
 $[B] / (B)$ = concentration/ partial pressure of reactant B
 $[D] / (D)$ = concentration/ partial pressure of product D
 $[E] / (E)$ = concentration/ partial pressure of product E
 a = moles of A from balanced equation
 b = moles of B from balanced equation
 d = moles of D from balanced equation
 e = moles of E from balanced equation

Acids and Bases

$[H^+]$ = concentration of H
 $[OH^-]$ = concentration of OH
 $[A^-]$ = concentration of salt
 $[HA]$ = concentration of acid
 K_w = ionic product of water
 K_a = acid dissociation constant