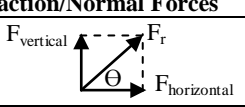


‘O’ Level Physics Formula Sheet

Measurements	
Base SI Units	
Kg	SI Unit for mass: Kilogram
m	SI Unit for length: metre
s	SI Unit for time: second
A	SI Unit for current: Ampere
K	SI Unit for Temperature: Kelvin
mol	SI Unit for Amount of substance: molar
Number Prefix	
n (10^{-9})	nano
μ (10^{-6})	micro
m (10^{-3})	milli
c (10^{-2})	centi
d (10^{-1})	deci
K (10^3)	Kilo
M (10^6)	Mega
Kinematics	
Average Speed $s = \Delta d / \Delta t$	Δd = total distance travelled (area under speed-time graph) Δx = total displacement
Average Velocity $v = \Delta x / \Delta t$	Δt = total time taken Δv = change in velocity
Acceleration $a = \Delta v / \Delta t$	Velocity (slope of displacement-time graph) Acceleration (slope of velocity-time graph)
$v = u + at$ $x = ut + \frac{1}{2} at^2$ $v^2 = u^2 + 2ax$	u = initial velocity v = final velocity t = time a = acceleration x = displacement h = height g = gravitational constant = 9.81 m/s^2
$v_{\text{free fall}} = \sqrt{2gh}$	
Dynamics	
Newton's First Law $\sum \vec{F} = 0$ at equilibrium	A body continues to stay in its state of rest or uniform motion in a straight line as long as there is no net force/moment acting on the body.
Newton's Second Law $F = ma$	The acceleration of an object is directly proportional to the net force acting on it and inversely proportional to its mass.
Newton's Third Law	For every force object A acts on object B, object B will exert an equal and opposite force on object A giving rise to Reaction/Normal Forces
Resolving forces $F_{\text{horizontal}} = F_r \cos \theta$ $F_{\text{vertical}} = F_r \sin \theta$	
Mass, Weight, Density	
Weight $w = mg$	w = Weight m = mass g = gravitational field strength
Density $\rho = \frac{m}{V}$	ρ = density m = mass V = volume
Turning effect of Force	
Moment of Force $M = F d$	M = Moment F = force d = \perp distance from force to pivot

Principle of Moment Σ Anticlockwise Moment = Σ Clockwise Moment	For a body in rotational equilibrium, Sum of ACW Moment = sum of CW Moment
Pressure	
Pressure $P = \frac{F}{A}$	P = Pressure F = Force over area, A A = Area
Pressure of liquid column $P = h\rho g$	P = Pressure ρ = density, h = height of liquid column g = gravitational field strength.
Energy, Work and Power	
Work Done $W = Fd$	W = work done F = force d = distance in direction of force
Power $P = W/t = Fv$	Work done per unit time, t
Kinetic Energy $E_k = \frac{1}{2} mv^2$	E_k = Kinetic Energy m = mass v = velocity
Gravitational Potential Energy $E_p = mgh$	g = gravity = 9.81 m/s^2 h = height m = mass
Conservation of Energy $E_1 = E_2$	E_1 = Total Energy Before E_2 = Total Energy After Energy cannot be created or destroyed. It can only be transformed or converted into other forms.
Kinetic Model of Matter	
Ideal Gas Law $PV \propto T$ $P_1 V_1 = P_2 V_2$	P = pressure of fixed mass of gas V = volume occupies by fixed mass of gas T = Temperature of gas Subscript 1 = initial state Subscript 2 = final state
Thermal Properties of Matter	
Specific Heat Capacity $E = m c \Delta T$	c = Specific heat capacity (Energy required to raise the temperature of 1kg of the object by 1°C) m = mass ΔT = change in temperature.
Latent Heat For melting, $E = m L_{\text{fusion}}$ For boiling, $E = m L_{\text{vaporization}}$	L_{fusion} = latent heat of fusion (Energy required to change 1kg of solid to liquid at the constant temp) $L_{\text{vaporization}}$ = latent heat of vaporization (Energy required to change 1kg of liquid to gas at the constant temp) m = mass
General Wave Properties	
Wave Velocity $v = f \lambda$	v = velocity of a wave f = frequency λ = wavelength
Wave frequency $f = \frac{1}{T}$	T = Period f = frequency

‘O’ Level Physics Formula Sheet

Light	
Law of Reflection $\Theta_i = \Theta_r$ Θ_i = angle of incidence Θ_r = angle of reflection	
Snell's Law (refraction) $n_1 \sin \Theta_i = n_2 \sin \Theta_r$ Θ_i = angle of incidence Θ_r = angle of refraction	
Critical angle $\sin \Theta_c = \frac{n_2}{n_1}$ (special case of Snell's law where $\Theta_r = 90^\circ$)	
Refractive Index $n = \frac{c}{v}$ (n of air ≈ 1)	c = speed of light in vacuum. v = speed of light in medium Higher refractive index of a medium means light travel slower in the medium
Magnification $M = \frac{h_i}{h_o} = \frac{d_i}{d_o}$	M = magnification h = height d = distance from lens Subscript i = image Subscript o = object
Current of Electricity	
Current $I = Q / \Delta t$	Current = rate of flow of charges Q = Charge t = time
Ohm's Law Resistance $R = V / I$	V = voltage, R = resistance I = current
Resistance of a wire $R = \rho L / A$	ρ = resistivity L = length of wire A = cross sectional area
D.C. Circuits	
Kirchoff's 1st Law $\sum I_{in} = \sum I_{out}$	Conservation of charges. $\sum I_{in}$ = Sum of current going into a junction $\sum I_{out}$ = Sum of current going out of a junction
Kirchoff's 2nd Law $\sum V = E.M.F$	$\sum V$ = Sum of potential difference V across all components in a circuit E.M.F = Voltage supplied by the power supply.
Resistance in Series $R_{total} = R_1 + R_2 + R_3$	
Resistance in Parallel $\frac{1}{R_{total}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$	

Practical Electricity	
Electric Power $P = VI = V^2/R = I^2R$	P = Power V = voltage R = resistance I = current
Electrical Energy $E = Pt = (VI)t$	E = energy output P = power t = time V = voltage I = current
Electromagnetism	
Transformer $\frac{V_p}{V_s} = \frac{N_p}{N_s}$ (ideal transformer) $V_p I_p = V_s I_s$	V = voltage N = number of coils I = current Subscript p = primary coil Subscript s = secondary coil
Right hand grip	
Fleming's Right Hand Rule	
Fleming's Left Hand Rule	

