Senpai Corner

CIE IGCSE Physics Formula Sheet (2023, 2024 and 2025 Syllabus)

Chapter 1: General Physics	
Average speed (ms^{-1}) $= \frac{\text{distance (m)}}{\text{time (s)}}$	$s = \frac{d}{t}$
Average velocity (ms^{-1}) $= \frac{\text{displacement (m)}}{\text{time (s)}}$	$v = \frac{x}{t}$
Acceleration (ms^{-2}) $= \frac{\text{final velocity } (ms^{-1}) - \text{initial velocity} (ms^{-1})}{\text{time (s)}}$	$a = \frac{v - u}{t}$
Weight (N) = mass (kg) × gravitational field strength (ms^{-2}) Earth's gravitational field strength = 9.8 ms^{-2} (as of 2023)	$W = mg$
Force (N) = mass (kg) × acceleration (ms^{-2})	$F = ma$
Density (kgm^{-3}) $= \frac{\text{mass (kg)}}{\text{volume }^{3}}$	$\rho = \frac{m}{V}$
Hooke's law: Force (N) = constant (Nm^{-1}) × extension (m)	$F = kx$
Pressure(Pa) $= \frac{\text{Force (N)}}{\text{area } (m^2)}$	$P = \frac{F}{A}$
Fluid Pressure (Pa) = density (kgm^{-3}) × gravitational field strength (ms^{-2} or Nkg^{-1}) × height (m)	$P = \rho gh$
Work (J) = force (N) × distance moved (m)	$W = Fd$
Power (W) $= \frac{\text{work (J)}}{\text{time (s)}}$	$P = \frac{W}{t}$
Kinetic Energy (J) = ½ × mass (kg) × velocity² (ms^{-1})	$KE = \frac{1}{2}mv^2$
Gravitational potential energy (J) = mass (kg) × gravitational field strength (ms^{-2} or Nkg^{-1}) × height (m)	$GPE = mgh$
Efficiency (%) $= \frac{\text{useful power output (W or J)}}{\text{total power input (W or J)}} \times 100\%$	$\eta = \frac{P_{out}}{P_{in}} \times 100\%$
Moment (Nm) = Force (N) × perpendicular distance from pivot (m)	$M = Fd$
Sum of clockwise moments (Nm) = sum of anticlockwise moments (Nm)	$F_1d_1 = F_2d_2$
Momentum ($kgms^{-1}$) = mass (kg) × velocity (ms^{-1})	$p = mv$
Impulsive Force (N) $= \frac{\text{change in momentum } (kgms^{-1})}{\text{time (s)}}$	$F = \frac{\Delta p}{t}$
Impulse ($kgms^{-1}$ or Ns) = change in momentum ($kgms^{-1}$)	$\Delta p = mv - mu$
Chapter 2: Thermal Physics	
Boyle's Law for changes in gas pressure at constant temperature : pressure_1 (Pa) × volume_1 (m^3) = pressure_2 (Pa)× volume_2 (m^3)	$P_1V_1 = P_2V_2$
Energy (J) = mass (kg) × specific heat capacity ($Jkg^{-1}°C^{-1}$) × temperature change (°C)	$Q = mc\theta$
Celsius to Kelvin: Temperature in Celsius (°C) = Temperature in Kelvin (K) - 273.15	$C = K - 273.15$
Chapter 3: Waves	
Wave speed (ms^{-1}) = frequency (Hz) × wavelength (m)	$V = f\lambda$
Frequency (Hz) $= \frac{1}{\text{Period (s)}}$	$F = \frac{1}{T}$
Refractive index $= \frac{\text{sine of the angle of incidence, i}}{\text{sine of the angle of refraction, r}}$	$n = \frac{\sin i}{\sin r}$
Refractive index $= \frac{\text{speed of light in vacuum}}{\text{speed of light in material}}$	$n = \frac{c}{v}$
Refractive index $= \frac{1}{\text{sine of critical angle}}$	$n = \frac{1}{\sin c}$

Chapter 4: Electricity and Magnetism	
$\text{Current (A)} = \frac{\text{charge (C)}}{\text{time (s)}}$	$I = \frac{Q}{t}$
$\text{Voltage (V)} = \frac{\text{energy transferred (J)}}{\text{charge (C)}}$	$V = \frac{W}{Q}$
Voltage (V) = current (A) × resistance (Ω)	$V = IR$
Power (W) = current (A) × voltage (V)	$P = IV$
Power (W) = current^2 (A) × resistance (Ω)	$P = I^2R$
Energy transferred (J) = current (A) × voltage (V) × time (s)	$W = IVt$
Energy transferred (J) = power (W) × time (s)	$W = Pt$
Resistors in series: Total Resistance (Ω) = sum of individual resistors (Ω)	$R_{total} = R_1 + R_2 + R_3 + \ldots R_n$
Resistors in parallel: $\frac{1}{\text{total resistance }(\Omega)} = \frac{1}{\text{sum of individual resistors }(\Omega)}$	$\frac{1}{R_{total}} = \frac{1}{R_1} + \frac{1}{R_2} + \ldots \frac{1}{R_n}$
$\text{Resistance }(\Omega) = \frac{\text{resistivity }(\Omega\text{m}) \times \text{length (m)}}{area(\text{m}^2)}$ Wires have a circular cross section, area = π × radius^2	$R = \frac{\rho\, l}{A}$
Transformers: $\frac{\text{voltage in secondary coil (V)}}{\text{voltage in primary coil (V)}} = \frac{\text{turns on secondary coil}}{\text{turns on primary coil}}$	$\frac{V_s}{V_p} = \frac{N_s}{N_p}$
Transformers: $\frac{\text{voltage in secondary coil (V)}}{\text{voltage in primary coil (V)}} = \frac{\text{current in secondary coil (A)}}{\text{current in primary coil (A)}}$	$\frac{V_s}{V_p} = \frac{I_s}{I_p}$
Chapter 5: Nuclear Physics	
Alpha: $^{238}_{92}U \rightarrow {}^{234}_{90}Th + {}^{4}_{2}He$	$^{A}_{Z}X \rightarrow {}^{A-4}_{Z-2}Y + {}^{4}_{2}He$
Beta: $^{234}_{90}Th \rightarrow {}^{234}_{91}Pa + {}^{0}_{-1}e$	$^{A}_{Z}X \rightarrow {}_{Z+1}^{A}Y + {}^{0}_{-1}e$
Gamma	$^{A}_{Z}X \rightarrow {}^{A}_{Z}Y + \gamma$
Chapter 6: Space Physics	
$Average\ orbital\ speed\ (\text{ms}^{-1}) = \frac{2 \times \pi \times \text{average radius of the orbit (m)}}{\text{orbital period (s)}}$	$v = \frac{2\pi r}{T}$
$\frac{\text{distance of a far galaxy (m)}}{\text{speed away from us }(\text{m}s^{-1})} = \frac{1}{\text{Hubble Constant }(s^{-1})}$ Hubble Constant is 2.2 × 10^{-18} s^{-1}	$\frac{d}{v} = \frac{1}{H_0}$