IGCSE Physics formulae and ideas – not official

You don't get a formula sheet in the exams, though there may be some formulae in the questions

For constant motion:	$v = \frac{s}{t}$	*'v' is the velocity in m/s, 's' is the distance or displacement in meters and 't' is the time in seconds*
For acceleration 'a'	$a = \frac{v - u}{t}$	*u is the initial velocity, v is the final velocity and t is the time.*
Graph	*Area of a rectangular shaped graph = base × height.* *Area of triangular shaped graph = ½ × base × height*	*In velocity-time graph the area under the graph is the total distance covered by an object.*
Weight and mass	$w = m \times g$	*w is the weight in newton (N), m is the mass in kg and g is acceleration due to gravity = 10 m/s²*
Density 'ρ' in kg/m³	$\rho = \frac{m}{V}$	*m is the mass and V is the volume*
Force F in newton (N)	$F = m \times a$	*m is the mass and a is the acceleration*
Terminal Velocity	$Weight\ of\ an\ object(downward) = air\ resistance\ (upwards)$	
Hooke's Law	$F = k \times x$	*F is the force, x is the extension in meters and k is the spring constant.*
Moment of a force in N.m	$moment\ of\ force = F \times d$	*F is the force and d is the distance from the pivot*
Law of moment or equilibrium:	$Total\ clockwise\ moment = total\ anticlockwise\ moment$ $=> F_1 \times d_1 = F_2 \times d_2$	
Work done W joules (J)	$W = F \times d$	*F is the force and d is the distance covered by an object*
Kinetic Energy E_k in joules (J)	$E_k = \frac{1}{2} \times m \times v^2$	*m is the mass(kg) and v is the velocity (m/s)*

Potential Energy E_p in joules (J)	$E_p = m \times g \times h$	*m is the mass (kg) and g is the acceleration due to gravity and h is the height from the ground.*
Law of conservation of energy:	$Loss\ of\ E_p = gain\ of\ E_k$ $m \times g \times h = \frac{1}{2} \times m \times v^2$	
Power in watts (W)	$P = \frac{work\ done}{time\ taken}$ $P = \frac{Energy\ transfer}{time\ taken}$	*Power is the rate of doing work*
Pressure p in pascal (Pa)	$p = \frac{F}{A}$	*F is the force in newton(N) and A is the area in m²*
Pressure p due to liquid	$p = \rho \times g \times h$	*ρ is the density in kg/m³, g is the acceleration due to garvity and h is the height or depth of liquid in meters.*
Atmospheric pressure	*P=760mmHg = 76cm Hg =1.01x10⁵Pa*	

Pressure and volume relationship (Boyle's law)	*pV=constant* $p_1 \times V_1 = p_2 \times V_2$	*p_1 and p_2 are the two pressures in Pa and V_1 and V_2 are the two volumes in m³*
Gas Law: $\frac{pV}{T} = constant$	$\frac{p_1V_1}{T_1} = \frac{p_2V_2}{T_2}$	*In thermal physics the symbol θ is used of celsius scale and T is used for Kelvin scale.*
Specific Heat Capacity: *The amount of heat required to raise the temperature of 1 kg mass by 1°C.*	$c = \frac{Q}{m \times \Delta\theta}$	*c is the specific heat capacity in J/kg°C,* *Q is the total heat in joules (J),* *m is the mass in kg and* *Δθ is the change in temperature*
Thermal Capacity: amount of heat require to raise the temperature of a substance of any mass by 1°C	*Thermal capacity=m×c* $Thermal\ capacity = \frac{Q}{\Delta\theta}$	*The unit of thermal capacity is J/°C.*
Specific latent heat of fusion (from Ice to liquid)	$L_f = \frac{Q}{m}$	*L_f is the specific latent heat of fusion in J/kg or J/g,* *Q is the total heat in joules (J),* *m is the mass of liquid change from ice in kg or g.*
Specific latent heat of vaporization (from liquid to vapour)	$L_v = \frac{Q}{m}$	*L_v is the specific latent heat of vaporization in J/kg or J/g,* *Q is the total heat in joules (J),* *m is the mass of vapour change from liquid in kg or g.*
Thermal or heat transfer	*In solid = conduction* *In liquid and gas = convection and also convection current* *In vacuum = radiation*	
Emitters and Radiators	*Dull black surface = good emitter, good radiator, bad reflector* *Bright shiny surface = poor emitter, poor radiator, good reflector*	

Wave equation 1	$v = f \times \lambda$	*v is the speed of wave in m/s* *f is the frequency in Hz* *λ is the wavelength in meters*
Wave equation 2	$f = \frac{1}{T}$	*T is the time period of wave in seconds*
Movement of the particles of the medium	*Longitudinal waves=> back and forth in the direction of the waves* *Transverse waves=> perpendicular to the direction of the waves*	
Law of reflection	*Angle of incidence i = angel of reflection* $angle\ i^o = angle\ r^o$	
Refraction	*From lighter to denser medium → light bend towards the normal* *From denser to lighter medium →light bend away from the normal*	
Refractive index n	$n = \frac{\sin \angle i}{\sin \angle r}$	*Refractive index has no unit*
Refractive index n	$n = \frac{speed\ of\ light\ in\ air\ or\ vacuum}{speed\ of\ light\ in\ any\ other\ medium}$	
Image from a plane mirror	*Virtual, upright, same size and laterally inverted, same distance from the mirror inside*	
Image from a convex lens	*When close: virtual, enlarge, upright* *When far: real, small, upside down*	
Image from a concave lens	*Virtual, upright, small*	
Critical angle	*When light goes from denser to lighter medium, the incident angle at which the reflected angle is 90°,is called critical angle.*	
Total internal reflection(TIR)	*When light goes from denser to lighter medium, the refracted ray bend inside the same medium then this is called (TIR)*	
Electromagnetic Spectrum:→ this way the frequency decreases and wavelength increases *Gamma rays ↔ X-rays ↔ UV ↔ Visible light ↔ IR ↔ Micro waves ↔ Radio waves*		

Colours of visible spectrum (light)	VIBGYOR (from bottom-up)	
Speed of light	In air: 3×10^8 m/s	In glass: 2×10^8 m/s
Light wave	Electromagnetic waves	
Sound wave	longitudinal waves particle of the medium come close → compression particles of the medium far apart → rarefaction	
Echo	$v=\frac{2\times d}{t}$	v is the speed of sound waves, d is the distance in meters between source and the reflection surface and t is the time for echo
Properties of sound waves	Pitch means the frequency of the wave Loudness means the amplitude of the wave	
Speed of sound waves	Air : 330-340 m/s Water: 1400 m/s Concrete : 5000 m/s Steel: 6000 – 7000 m/s	

Ferrous Materials	Attracted by magnet and can be magnetized	Eg. iron, steel, nickel and cobalt
Non-ferrous materials	Not attracted by magnet and cannot be magnetized	copper, silver, aluminum, wood, glass
Electric field intensity	force exerted by the field on a unit charge placed at a point around another charge	E is the electric field intensity in N/C $E=\frac{F}{q}$
Current: Rate of flow of charges in a conductor	$I=\frac{Q}{t}$	I is the current in amperes (A), Q is the charge in coulombs (C) t is the time in seconds (s)
Current	In circuits the current always choose the easiest path	
Ohms law	Voltage across the resistor is directly proportional to current, $V\propto I$ or $\frac{V}{I}=R$	V is the voltage in volts (V), I is the current in amperes (A) and R is resistance in ohms (Ω)
Voltage	Energy per unit charge $V=\frac{Energy}{Q}$	Q is the charge in coulombs (C), V is the voltage in volts (V) Energy is in joules (J)
E.M.F. Electromotive force	e.m.f. = lost volts + terminal potential difference EMF=Ir+IR	
Resistance and resistivity	$R=\rho\frac{L}{A}$ ρ is the resistivity of resistor in Ω.m	R is the resistance a resistor, L is the length of a resistor in meters A is the area of cross-section of a resistor in m^2
Circuit	In series circuit→ the current stays the same and voltage divides In parallel circuit → the voltage stays the same and current divides	
Resistance in series	$R=R_1+R_2+R_3$	R, R_1, R_2 and R_3 are resistances of resistor in ohms
Resistance in parallel	$\frac{1}{R}=\frac{1}{R_1}+\frac{1}{R_2}+\frac{1}{R_3}$	
Potential divider	$\frac{V_1}{V_2}=\frac{R_1}{R_2}$	
Potential divider	$V_2=(\frac{R_2}{R_1+R_2})\times V$	$V_1=(\frac{R_1}{R_1+R_2})\times V$

Power	$P=I\times V$	$P=I^2\times R$	$P=\frac{V^2}{R}$	P is the power in watts (W)
Power	$P=\frac{Energy}{time}$			The unit of energy is joules (J)
Transformer	$\frac{V_p}{V_s}=\frac{n_p}{n_s}$			V_p is the voltage in primary coil, V_s is the voltage in secondary coil n_p is the no of turns in primary and n_s is the no of turns in secondary
Transformer	Power of primary coil = power of secondary coil $P_p=P_s$ $I_p\times V_p=I_s\times V_s$ $\frac{V_p}{V_s}=\frac{I_s}{I_p}$ I_p is the current in primary coil and I_s the current in secondary coil			
Cathode rays	Stream of electrons emitted from heated metal (cathode). This process is called thermionic emission.			

Alpha particles α-particles	Helium nucleus Stopped by paper Highest ionization potential	
Beta-particles β-particles	Fast moving electrons Stopped by aluminum Less ionization potential	
Gamma-particles γ-rays	Electromagnetic radiation Only stopped by thick a sheet of lead Least ionization potential	
Half-life	Time in which the activity or mass becomes half	
Atomic symbol	${}^{A}_{Z}X$	A is the total no of protons and neutrons Z is the total no of protons
Isotopes	Same number of protons but different number of neutrons	