The Complete IGCSE Physics 0625 Equations List

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· Checked against the Cambridge IGCSE Physics (0625) syllabus · Updated 2026-06-12

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Cambridge gives 0625 candidates no formula sheet, and roughly 40% of theory-paper marks involve a calculation. So this list is the single highest-value page you can memorise: every examinable equation, by topic, in words and symbols with units. Equations marked **(S)** are Supplement, needed for Extended (Papers 2 and 4) only. Everything unmarked is Core, needed by everyone.

How should you use this list?

Do not read it; test against it. Cover the symbols column, write each equation from its word form, then write the units from memory. Two 20-minute sessions a week brings recall under three seconds per equation within a month, which is the speed exam pressure demands.

A note on g: use $g = 9.8\ \mathrm{N/kg}$ as standard for 0625, but some papers state $10\ \mathrm{N/kg}$, so read the question.

Topic 1: Motion, Forces and Energy

The biggest topic and the biggest equation load. These appear in almost every paper.

Equation in words	Symbols	Units
average speed = distance ÷ time	$v = \frac{s}{t}$	m/s, m, s
acceleration = change in velocity ÷ time taken	$a = \frac{\Delta v}{\Delta t}$	m/s^2, m/s, s
density = mass ÷ volume	$\rho = \frac{m}{V}$	kg/m^3, kg, m^3
weight = mass × gravitational field strength	$W = mg$	N, kg, N/kg
gravitational field strength = weight ÷ mass	$g = \frac{W}{m}$	N/kg
resultant force = mass × acceleration	$F = ma$	N, kg, m/s^2
spring constant = force ÷ extension	$k = \frac{F}{x}$	N/m, N, m
moment = force × perpendicular distance from pivot	$\text{moment} = Fd$	N m, N, m
momentum = mass × velocity **(S)**	$p = mv$	kg m/s
impulse = force × time = change in momentum **(S)**	$F\Delta t = \Delta(mv)$	N s = kg m/s
resultant force = change in momentum ÷ time **(S)**	$F = \frac{\Delta p}{\Delta t}$	N
kinetic energy = ½ × mass × speed² **(S)**	$E_k = \frac{1}{2}mv^2$	J, kg, m/s
change in gravitational potential energy = mass × g × change in height **(S)**	$\Delta E_p = mg\Delta h$	J, kg, N/kg, m
work done = force × distance moved	$W = Fd = \Delta E$	J, N, m
power = work done ÷ time = energy ÷ time	$P = \frac{W}{t} = \frac{\Delta E}{t}$	W, J, s
efficiency = (useful energy output ÷ total energy input) × 100%	no symbol	%

Equation in words	Symbols	Units
efficiency = (useful power output ÷ total power input) × 100%	no symbol	%
pressure = force ÷ area	$p = \frac{F}{A}$	Pa, N, m^2
change in pressure in a liquid = density × g × change in depth **(S)**	$\Delta p = \rho g \Delta h$	Pa, kg/m^3, N/kg, m

Watch the W trap: W means weight in $W = mg$ but work in $W = Fd$. Context and units tell you which.

Topic 2: Thermal Physics

A short list, but every equation here is Supplement, so Core candidates answer thermal questions qualitatively.

Equation in words	Symbols	Units
specific heat capacity = energy ÷ (mass × temperature change) **(S)**	$c = \frac{\Delta E}{m \Delta \theta}$	J/(kg °C), J, kg, °C
pressure × volume = constant, for fixed mass of gas at constant temperature **(S)**	$p_1 V_1 = p_2 V_2$	Pa, m^3 (or kPa, cm^3 consistently)
specific latent heat = energy ÷ mass **(S)**	$L = \frac{\Delta E}{m}$	J/kg, J, kg

For the gas law, any pressure and volume units work as long as both sides match. For latent heat, no temperature term appears because the change of state happens at constant temperature, a favourite explain mark.

Topic 3: Waves

Equation in words	Symbols	Units
wave speed = frequency × wavelength	$v = f\lambda$	m/s, Hz, m
refractive index = sin(angle of incidence) ÷ sin(angle of refraction) **(S)**	$n = \frac{\sin i}{\sin r}$	no unit
refractive index = 1 ÷ sin(critical angle) **(S)**	$n = \frac{1}{\sin c}$	no unit
linear magnification = image height ÷ object height **(S)**	$M = \frac{h_i}{h_o}$	no unit

Useful values to memorise: light travels at $3 \times 10^8\ \mathrm{m/s}$ in a vacuum, and sound travels at roughly 330-350 m/s in air. Echo questions use distance there-and-back, so the path is $2d$.

Topic 4: Electricity and Magnetism

The densest calculation territory on Paper 4, because equations chain together inside circuit questions.

Equation in words	Symbols	Units
charge = current × time	$Q = It$	C, A, s
resistance = potential difference ÷ current	$R = \frac{V}{I}$	Ω, V, A
e.m.f. = work done (by source) ÷ charge **(S)**	$E = \frac{W}{Q}$	V, J, C
potential difference = work done ÷ charge **(S)**	$V = \frac{W}{Q}$	V, J, C
electrical power = current × potential difference	$P = IV$	W, A, V
electrical power = current² × resistance **(S)**	$P = I^2R$	W, A, Ω
electrical energy = current × potential difference × time	$E = IVt$	J, A, V, s

Equation in words	Symbols	Units
combined resistance in series = sum of resistances	$R = R_1 + R_2$	Ω
combined resistance in parallel **(S)**	$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$	Ω
resistance is proportional to length and inversely proportional to cross-sectional area **(S)**	$R \propto l$, $R \propto \frac{1}{A}$	no unit
transformer voltage ratio = turns ratio	$\frac{V_p}{V_s} = \frac{N_p}{N_s}$	V, turns
ideal transformer: input power = output power **(S)**	$I_p V_p = I_s V_s$	A, V

Two reminders examiners exploit. Parallel resistance: after adding the reciprocals, flip the answer; forgetting the final flip is the most common Paper 4 circuit error. Cable power loss: use $P = I^2 R$ (it follows from combining $P = IV$ with $V = IR$) and it is why transmission uses high voltage and low current.

Topic 5: Nuclear Physics

Nuclear physics carries almost no equations, but two quantitative tools earn marks.

Tool in words	Symbols	Notes
nuclide notation: mass number A, proton number Z, element X	${}^{A}_{Z}\mathrm{X}$	A = protons + neutrons; Z = protons
after each half-life, activity (or undecayed nuclei) halves	$A \to \frac{A}{2} \to \frac{A}{4} \to \frac{A}{8}$	half-life in s, min, h, years

For half-life calculations, build a halving table rather than using formulas. Extended questions add background radiation: subtract the background count before halving **(S)**.

Topic 6: Space Physics

Equation in words	Symbols	Units
orbital speed = (2π × orbital radius) ÷ orbital period	$v = \frac{2\pi r}{T}$	m/s, m, s
Hubble constant = recession speed ÷ distance **(S)**	$H_0 = \frac{v}{d}$	s^{-1}, m/s, m
age of the Universe estimate = distance ÷ speed **(S)**	$t = \frac{d}{v} = \frac{1}{H_0}$	s

Cambridge quotes the Hubble constant as $2.2 \times 10^{-18}\ \mathrm{s}^{-1}$; the question supplies it, but recognising the rearrangement $\frac{1}{H_0}$ as the age estimate is on you.

What is the fastest way to memorise all of these?

Cold self-testing beats re-reading by a wide margin. Write the quantity name, produce the equation and units from memory, mark yourself, and recycle failures into tomorrow's list. Most students secure the full Core list in two weeks and the Supplement additions in two more.

Three drills that work:

1. **Blank-sheet Fridays:** reproduce one topic's full table from memory weekly.
2. **Reverse drill:** given the unit, name every equation that produces it. J has six.
3. **Triangle ban:** practise algebraic rearrangement instead of formula triangles, because Supplement equations like $E_k = \frac{1}{2}mv^2$ break the triangle method anyway.

A common worry: "There are too many to hold by exam day." There are about 35, and you already hold more song lyrics than that. Spaced self-testing, ten equations a session, makes the list automatic in under a month. Our tutors open most 1-to-1 classes with a three-minute equation cold test for exactly this reason; it is the cheapest grade insurance in the subject, and it is built into how we run weekly 1.5-hour lessons.

Memorising the list is step one; deploying it is step two. Pair this page with our calculation-method guide, which covers the substitute-rearrange-units routine examiners reward, and test yourself from the word column until the symbols write themselves.

Frequently Asked Questions

Do you get a formula sheet in IGCSE Physics 0625?

How many equations do I need to memorise for IGCSE Physics?

Which equations are Extended only?

What value of g should I use in 0625?

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REVISE THESE TOPICS

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Thermal Physics

Waves

Electricity and Magnetism

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