FORMULA SHEET

A Level Physics formula sheet: AQA data and formulae booklet

The AQA booklet prints the constants and most core equations plus all five options; you must still recall weight, momentum, charge, the potential divider and the meaning of every symbol.

IN THE BOOKLET printed in the official booklet or sheet in the exam LEARN IT students must recall it

Key data: fundamental constants and values

All of these are printed on page 1 of the AQA booklet, so you do not need to memorise them, but you must use the booklet values.

Speed of light in vacuo	$c = 3.00 \times 10^{8}\ \text{m s}^{-1}$	IN THE BOOKLET
Permeability of free space	$\mu_0 = 4\pi \times 10^{-7}\ \text{H m}^{-1}$	IN THE BOOKLET
Permittivity of free space	$\varepsilon_0 = 8.85 \times 10^{-12}\ \text{F m}^{-1}$	IN THE BOOKLET
Magnitude of electron charge	$e = 1.60 \times 10^{-19}\ \text{C}$	IN THE BOOKLET
Planck constant	$h = 6.63 \times 10^{-34}\ \text{J s}$	IN THE BOOKLET
Gravitational constant	$G = 6.67 \times 10^{-11}\ \text{N m}^2\ \text{kg}^{-2}$	IN THE BOOKLET
Avogadro constant	$N_\text{A} = 6.02 \times 10^{23}\ \text{mol}^{-1}$	IN THE BOOKLET
Molar gas constant	$R = 8.31\ \text{J K}^{-1}\ \text{mol}^{-1}$	IN THE BOOKLET
Boltzmann constant	$k = 1.38 \times 10^{-23}\ \text{J K}^{-1}$	IN THE BOOKLET
Stefan constant	$\sigma = 5.67 \times 10^{-8}\ \text{W m}^{-2}\ \text{K}^{-4}$	IN THE BOOKLET
Wien constant	$\alpha = 2.90 \times 10^{-3}\ \text{m K}$	IN THE BOOKLET
Electron rest mass Equivalent to 5.5 × 10^{-4} u.	$m_\text{e} = 9.11 \times 10^{-31}\ \text{kg}$	IN THE BOOKLET
Electron charge/mass ratio	$\frac{e}{m_\text{e}} = 1.76 \times 10^{11}\ \text{C kg}^{-1}$	IN THE BOOKLET
Proton rest mass Printed as 1.67(3), the last digit in brackets. Equivalent to 1.00728 u.	$m_\text{p} = 1.67(3) \times 10^{-27}\ \text{kg}$	IN THE BOOKLET
Proton charge/mass ratio	$\frac{e}{m_\text{p}} = 9.58 \times 10^{7}\ \text{C kg}^{-1}$	IN THE BOOKLET
Neutron rest mass Equivalent to 1.00867 u.	$m_\text{n} = 1.67(5) \times 10^{-27}\ \text{kg}$	IN THE BOOKLET
Gravitational field strength The booklet also lists g = 9.81 m s^{-2} as the acceleration due to gravity.	$g = 9.81\ \text{N kg}^{-1}$	IN THE BOOKLET
Atomic mass unit 1 u is equivalent to 931.5 MeV.	$u = 1.661 \times 10^{-27}\ \text{kg}$	IN THE BOOKLET
Mass and radius of the Sun	$M = 1.99 \times 10^{30}\ \text{kg},\ \ r = 6.96 \times 10^{8}\ \text{m}$	IN THE BOOKLET
Mass and radius of the Earth	$M = 5.97 \times 10^{24}\ \text{kg},\ \ r = 6.37 \times 10^{6}\ \text{m}$	IN THE BOOKLET

Electronvolt Not listed as a separate constant. It is the value of e, so learn the link.	$1\ \text{eV} = 1.60 \times 10^{-19}\ \text{J}$	LEARN IT

Algebra and geometry

Quadratic equation	$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	IN THE BOOKLET
Arc length θ in radians.	$\text{arc length} = r\theta$	IN THE BOOKLET
Circumference of a circle	$C = 2\pi r$	IN THE BOOKLET
Area of a circle	$A = \pi r^2$	IN THE BOOKLET
Curved surface area of a cylinder	$A = 2\pi rh$	IN THE BOOKLET
Area of a sphere	$A = 4\pi r^2$	IN THE BOOKLET
Volume of a sphere	$V = \frac{4}{3}\pi r^3$	IN THE BOOKLET
Straight line graph Gradient m and intercept c. Not in the booklet.	$y = mx + c$	LEARN IT
Resolving a vector Trigonometry is not printed in the booklet.	$F_x = F\cos\theta,\ \ F_y = F\sin\theta$	LEARN IT

Particle physics

The booklet prints rest energies and the quark and lepton properties below. You must still learn the conservation rules and the quark structure of each particle.

Rest energy of leptons Photon and neutrinos have zero rest energy.	$e^{\pm} : 0.510999\ \text{MeV},\ \ \mu^{\pm} : 105.659\ \text{MeV},\ \ \nu : 0$	IN THE BOOKLET
Rest energy of mesons	$\pi^{\pm} : 139.576,\ \ \pi^0 : 134.972,\ \ K^{\pm} : 493.821,\ \ K^0 : 497.762\ \ (\text{MeV})$	IN THE BOOKLET
Rest energy of baryons	$\text{p} : 938.257\ \text{MeV},\ \ \text{n} : 939.551\ \text{MeV}$	IN THE BOOKLET
Up quark (u) Antiquarks have opposite signs.	$Q = +\frac{2}{3}e,\ \ B = +\frac{1}{3},\ \ S = 0$	IN THE BOOKLET
Down quark (d)	$Q = -\frac{1}{3}e,\ \ B = +\frac{1}{3},\ \ S = 0$	IN THE BOOKLET
Strange quark (s)	$Q = -\frac{1}{3}e,\ \ B = +\frac{1}{3},\ \ S = -1$	IN THE BOOKLET
Lepton number	$L = +1\ (\text{e}^-, \nu_\text{e}, \mu^-, \nu_\mu),\ \ L = -1\ (\text{antiparticles})$	IN THE BOOKLET

Photons and energy levels

Photon energy	$E = hf = \dfrac{hc}{\lambda}$	IN THE BOOKLET
Photoelectric effect φ is the work function.	$hf = \phi + E_{\text{k(max)}}$	IN THE BOOKLET
Energy levels	$hf = E_1 - E_2$	IN THE BOOKLET
de Broglie wavelength	$\lambda = \dfrac{h}{p} = \dfrac{h}{mv}$	IN THE BOOKLET

Threshold frequency Set E_k(max) = 0 in the photoelectric equation.	$\phi = hf_0$	LEARN IT
Stopping potential Not printed. Learn the link between stopping potential and maximum kinetic energy.	$eV_\mathrm{s} = E_{\mathrm{k(max)}}$	LEARN IT

Waves and optics

Wave speed	$c = f\lambda$	IN THE BOOKLET
Period	$f = \dfrac{1}{T}$	IN THE BOOKLET
First harmonic on a string T is tension, μ is mass per unit length.	$f = \dfrac{1}{2l}\sqrt{\dfrac{T}{\mu}}$	IN THE BOOKLET
Fringe spacing (double slit) s is slit separation, D is distance to screen.	$w = \dfrac{\lambda D}{s}$	IN THE BOOKLET
Diffraction grating	$d\sin\theta = n\lambda$	IN THE BOOKLET
Refractive index	$n = \dfrac{c}{c_\mathrm{s}}$	IN THE BOOKLET
Law of refraction	$n_1 \sin\theta_1 = n_2 \sin\theta_2$	IN THE BOOKLET
Critical angle	$\sin\theta_\mathrm{c} = \dfrac{n_2}{n_1} \quad (n_1 > n_2)$	IN THE BOOKLET
Path difference for constructive interference For destructive interference use (n + 1/2) λ. Not in the booklet.	$\text{path difference} = n\lambda$	LEARN IT

Mechanics

Moment of a force	$\text{moment} = Fd$	IN THE BOOKLET
Velocity	$v = \dfrac{\Delta s}{\Delta t}$	IN THE BOOKLET
Acceleration	$a = \dfrac{\Delta v}{\Delta t}$	IN THE BOOKLET
Equations of motion	$v = u + at$	IN THE BOOKLET
Equations of motion	$s = \left(\dfrac{u+v}{2}\right)t$	IN THE BOOKLET
Equations of motion	$v^2 = u^2 + 2as$	IN THE BOOKLET
Equations of motion	$s = ut + \dfrac{at^2}{2}$	IN THE BOOKLET
Force	$F = ma$	IN THE BOOKLET
Force as rate of change of momentum	$F = \dfrac{\Delta(mv)}{\Delta t}$	IN THE BOOKLET
Impulse	$F\Delta t = \Delta(mv)$	IN THE BOOKLET
Work done	$W = Fs\cos\theta$	IN THE BOOKLET

Kinetic energy	$E_{\mathrm{k}} = \frac{1}{2}mv^2$	IN THE BOOKLET
Change in gravitational potential energy	$\Delta E_{\mathrm{p}} = mg\Delta h$	IN THE BOOKLET
Power	$P = \dfrac{\Delta W}{\Delta t}, \quad P = Fv$	IN THE BOOKLET
Efficiency	$\text{efficiency} = \dfrac{\text{useful output power}}{\text{input power}}$	IN THE BOOKLET
Weight Not in the AQA booklet. Edexcel IAL prints it.	$W = mg$	LEARN IT
Momentum Not in the AQA booklet. Edexcel IAL and OCR print it.	$p = mv$	LEARN IT

Materials

Density	$\rho = \dfrac{m}{V}$	IN THE BOOKLET
Hooke's law	$F = k\Delta L$	IN THE BOOKLET
Tensile stress	$\text{stress} = \dfrac{F}{A}$	IN THE BOOKLET
Tensile strain	$\text{strain} = \dfrac{\Delta L}{L}$	IN THE BOOKLET
Young modulus	$E = \dfrac{\text{tensile stress}}{\text{tensile strain}}$	IN THE BOOKLET
Energy stored in a stretched material	$E = \frac{1}{2}F\Delta L$	IN THE BOOKLET

Electricity

Current	$I = \dfrac{\Delta Q}{\Delta t}$	IN THE BOOKLET
Potential difference	$V = \dfrac{W}{Q}$	IN THE BOOKLET
Resistance	$R = \dfrac{V}{I}$	IN THE BOOKLET
Resistivity	$\rho = \dfrac{RA}{L}$	IN THE BOOKLET
Resistors in series	$R_{\mathrm{T}} = R_1 + R_2 + R_3 + \ldots$	IN THE BOOKLET
Resistors in parallel	$\dfrac{1}{R_{\mathrm{T}}} = \dfrac{1}{R_1} + \dfrac{1}{R_2} + \dfrac{1}{R_3} + \ldots$	IN THE BOOKLET
Power	$P = VI = I^2R = \dfrac{V^2}{R}$	IN THE BOOKLET
emf	$\varepsilon = \dfrac{E}{Q}$	IN THE BOOKLET
emf and internal resistance	$\varepsilon = I(R + r)$	IN THE BOOKLET
Charge A rearrangement of I = ΔQ / Δt, but only the second form is printed.	$Q = It$	LEARN IT

Potential divider In the specification (3.5.1.5) but not in the booklet.	$V_{\text{out}} = \dfrac{R_2}{R_1 + R_2} V_{\text{in}}$	LEARN IT

Circular motion

Angular speed	$\omega = \dfrac{v}{r}$	IN THE BOOKLET
Angular speed and frequency	$\omega = 2\pi f$	IN THE BOOKLET
Centripetal acceleration	$a = \dfrac{v^2}{r} = \omega^2 r$	IN THE BOOKLET
Centripetal force	$F = \dfrac{mv^2}{r} = m\omega^2 r$	IN THE BOOKLET

Simple harmonic motion

Acceleration	$a = -\omega^2 x$	IN THE BOOKLET
Displacement	$x = A\cos(\omega t)$	IN THE BOOKLET
Speed	$v = \pm\omega\sqrt{A^2 - x^2}$	IN THE BOOKLET
Maximum speed	$v_{\max} = \omega A$	IN THE BOOKLET
Maximum acceleration	$a_{\max} = \omega^2 A$	IN THE BOOKLET
Mass on a spring	$T = 2\pi\sqrt{\dfrac{m}{k}}$	IN THE BOOKLET
Simple pendulum	$T = 2\pi\sqrt{\dfrac{l}{g}}$	IN THE BOOKLET
Displacement starting from equilibrium Only the cosine form is printed.	$x = A\sin(\omega t)$	LEARN IT

Thermal physics

Energy to change temperature	$Q = mc\Delta\theta$	IN THE BOOKLET
Energy to change state	$Q = ml$	IN THE BOOKLET
Ideal gas law (moles)	$pV = nRT$	IN THE BOOKLET
Ideal gas law (molecules)	$pV = NkT$	IN THE BOOKLET
Kinetic theory model	$pV = \frac{1}{3}Nm(c_{\text{rms}})^2$	IN THE BOOKLET
Kinetic energy of a gas molecule	$\frac{1}{2}m(c_{\text{rms}})^2 = \frac{3}{2}kT = \dfrac{3RT}{2N_{\text{A}}}$	IN THE BOOKLET
Celsius to kelvin Not printed in the booklet.	$T/\text{K} = \theta/^\circ\text{C} + 273$	LEARN IT

Gravitational fields

Force between two masses	$F = \dfrac{Gm_1m_2}{r^2}$	IN THE BOOKLET

Gravitational field strength	$g = \frac{F}{m}$	IN THE BOOKLET
Radial field strength	$g = \frac{GM}{r^2}$	IN THE BOOKLET
Work done	$\Delta W = m\Delta V$	IN THE BOOKLET
Gravitational potential	$V = -\frac{GM}{r}$	IN THE BOOKLET
Field strength from potential	$g = -\frac{\Delta V}{\Delta r}$	IN THE BOOKLET
Orbital period (circular orbit) Not printed. Derive it by equating gravitational force to centripetal force.	$T^2 = \frac{4\pi^2 r^3}{GM}$	LEARN IT

Electric fields and capacitors

Coulomb's law	$F = \frac{1}{4\pi\varepsilon_0}\frac{Q_1 Q_2}{r^2}$	IN THE BOOKLET
Force on a charge	$F = EQ$	IN THE BOOKLET
Uniform field	$E = \frac{V}{d}$	IN THE BOOKLET
Work done	$\Delta W = Q\Delta V$	IN THE BOOKLET
Radial field strength	$E = \frac{1}{4\pi\varepsilon_0}\frac{Q}{r^2}$	IN THE BOOKLET
Electric potential	$V = \frac{1}{4\pi\varepsilon_0}\frac{Q}{r}$	IN THE BOOKLET
Field strength from potential	$E = \frac{\Delta V}{\Delta r}$	IN THE BOOKLET
Capacitance	$C = \frac{Q}{V}$	IN THE BOOKLET
Parallel plate capacitor	$C = \frac{A\varepsilon_0\varepsilon_\mathrm{r}}{d}$	IN THE BOOKLET
Energy stored	$E = \frac{1}{2}QV = \frac{1}{2}CV^2 = \frac{1}{2}\frac{Q^2}{C}$	IN THE BOOKLET
Charging	$Q = Q_0\left(1 - e^{-t/RC}\right)$	IN THE BOOKLET
Discharging	$Q = Q_0\, e^{-t/RC}$	IN THE BOOKLET
Time constant	$\tau = RC$	IN THE BOOKLET
Time for charge to halve Not printed. Follows from the discharge equation.	$t_{1/2} = RC\ln 2$	LEARN IT

Magnetic fields and electromagnetic induction

Force on a current The booklet prints no sin θ. Use F = BIl sin θ if the field is not at right angles to the current.	$F = BIl$	IN THE BOOKLET
Force on a moving charge Use F = BQv sin θ if the velocity is not at right angles to the field.	$F = BQv$	IN THE BOOKLET

Magnetic flux	$\Phi = BA$	IN THE BOOKLET
Magnetic flux linkage	$N\Phi = BAN\cos\theta$	IN THE BOOKLET
Magnitude of induced emf	$\varepsilon = N\dfrac{\Delta\Phi}{\Delta t}$	IN THE BOOKLET
emf in a rotating coil	$\varepsilon = BAN\omega\sin\omega t$	IN THE BOOKLET
Alternating current (rms)	$I_{\text{rms}} = \dfrac{I_0}{\sqrt{2}},\ V_{\text{rms}} = \dfrac{V_0}{\sqrt{2}}$	IN THE BOOKLET
Transformer	$\dfrac{N_\text{s}}{N_\text{p}} = \dfrac{V_\text{s}}{V_\text{p}}$	IN THE BOOKLET
Transformer efficiency	$\text{efficiency} = \dfrac{I_\text{s}V_\text{s}}{I_\text{p}V_\text{p}}$	IN THE BOOKLET

Nuclear physics

Inverse square law for gamma radiation	$I = \dfrac{k}{x^2}$	IN THE BOOKLET
Radioactive decay	$\dfrac{\Delta N}{\Delta t} = -\lambda N,\ \ N = N_0\,e^{-\lambda t}$	IN THE BOOKLET
Activity	$A = \lambda N$	IN THE BOOKLET
Half-life	$T_{1/2} = \dfrac{\ln 2}{\lambda}$	IN THE BOOKLET
Nuclear radius	$R = R_0 A^{1/3}$	IN THE BOOKLET
Energy-mass equation	$E = mc^2$	IN THE BOOKLET
Activity against time Not printed. It follows from A = λ N and the decay equation.	$A = A_0\,e^{-\lambda t}$	LEARN IT

Options: astrophysics

Paper 3 Section B asks about one option only (35 marks). The booklet prints the equations for all five options, so learn only the one your school teaches.

Astronomical distances	$1\ \text{AU} = 1.50\times10^{11}\ \text{m},\ \ 1\ \text{ly} = 9.46\times10^{15}\ \text{m}$	IN THE BOOKLET
Parsec	$1\ \text{pc} = 2.06\times10^{5}\ \text{AU} = 3.08\times10^{16}\ \text{m} = 3.26\ \text{ly}$	IN THE BOOKLET
Hubble constant	$H = 65\ \text{km s}^{-1}\,\text{Mpc}^{-1}$	IN THE BOOKLET
Angular magnification θi: angle subtended by the image at the eye. θo: angle subtended by the object at the unaided eye. The booklet writes it in words.	$M = \dfrac{\theta_i}{\theta_o}$	IN THE BOOKLET
Telescope in normal adjustment	$M = \dfrac{f_0}{f_\text{e}}$	IN THE BOOKLET
Rayleigh criterion	$\theta \approx \dfrac{\lambda}{D}$	IN THE BOOKLET
Magnitude equation	$m - M = 5\log\dfrac{d}{10}$	IN THE BOOKLET
Wien's law	$\lambda_{\text{max}}T = 2.9\times10^{-3}\ \text{m K}$	IN THE BOOKLET

Stefan's law	$P = \sigma A T^4$	IN THE BOOKLET
Schwarzschild radius	$R_\mathrm{s} \approx \dfrac{2GM}{c^2}$	IN THE BOOKLET
Doppler shift for v much less than c	$\dfrac{\Delta f}{f} = -\dfrac{\Delta \lambda}{\lambda} = \dfrac{v}{c}$	IN THE BOOKLET
Red shift	$z = -\dfrac{v}{c}$	IN THE BOOKLET
Hubble's law	$v = Hd$	IN THE BOOKLET

Options: medical physics

Lens power	$P = \dfrac{1}{f}$	IN THE BOOKLET
Lens magnification	$m = \dfrac{v}{u}$	IN THE BOOKLET
Lens equation	$\dfrac{1}{f} = \dfrac{1}{u} + \dfrac{1}{v}$	IN THE BOOKLET
Threshold of hearing	$I_0 = 1.0 \times 10^{-12}\ \mathrm{W\ m^{-2}}$	IN THE BOOKLET
Intensity level	$\text{intensity level} = 10 \log \dfrac{I}{I_0}$	IN THE BOOKLET
Absorption of X-rays	$I = I_0\, e^{-\mu x}$	IN THE BOOKLET
Mass attenuation coefficient	$\mu_\mathrm{m} = \dfrac{\mu}{\rho}$	IN THE BOOKLET
Acoustic impedance	$Z = \rho c$	IN THE BOOKLET
Ultrasound reflection	$\dfrac{I_\mathrm{r}}{I_\mathrm{i}} = \left(\dfrac{Z_2 - Z_1}{Z_2 + Z_1}\right)^2$	IN THE BOOKLET
Effective half-life	$\dfrac{1}{T_\mathrm{E}} = \dfrac{1}{T_\mathrm{B}} + \dfrac{1}{T_\mathrm{P}}$	IN THE BOOKLET

Options: engineering physics

Moment of inertia	$I = \Sigma m r^2$	IN THE BOOKLET
Angular kinetic energy	$E_k = \frac{1}{2} I \omega^2$	IN THE BOOKLET
Equations of angular motion	$\omega_2 = \omega_1 + \alpha t,\ \ \omega_2^2 = \omega_1^2 + 2\alpha\theta$	IN THE BOOKLET
Equations of angular motion (angle)	$\theta = \omega_1 t + \dfrac{\alpha t^2}{2},\ \ \theta = \dfrac{(\omega_1 + \omega_2)t}{2}$	IN THE BOOKLET
Torque	$T = I\alpha,\ \ T = Fr$	IN THE BOOKLET
Angular momentum and impulse	$\text{angular momentum} = I\omega,\ \ T\Delta t = \Delta(I\omega)$	IN THE BOOKLET
Rotational work and power	$W = T\theta,\ \ P = T\omega$	IN THE BOOKLET
First law of thermodynamics	$Q = \Delta U + W,\ \ W = p\Delta V$	IN THE BOOKLET
Adiabatic and isothermal change Adiabatic, then isothermal.	$pV^\gamma = \text{constant},\ \ pV = \text{constant}$	IN THE BOOKLET
Heat engine efficiency	$\text{efficiency} = \dfrac{W}{Q_\mathrm{H}} = \dfrac{Q_\mathrm{H} - Q_\mathrm{C}}{Q_\mathrm{H}}$	IN THE BOOKLET

Maximum theoretical efficiency	$\frac{T_\mathrm{H} - T_\mathrm{C}}{T_\mathrm{H}}$	IN THE BOOKLET
Engine power Also printed: work per cycle = area of loop; input power = calorific value x fuel flow rate; brake power P = T ω; friction power = indicated power minus brake power.	$\text{indicated power} = (\text{area of } p\text{-}V \text{ loop}) \times (\text{cycles per second}) \times (\text{number of cylinders})$	IN THE BOOKLET
Refrigerator	$\mathrm{COP}_\mathrm{ref} = \frac{Q_\mathrm{C}}{W} = \frac{Q_\mathrm{C}}{Q_\mathrm{H} - Q_\mathrm{C}}$	IN THE BOOKLET
Heat pump	$\mathrm{COP}_\mathrm{hp} = \frac{Q_\mathrm{H}}{W} = \frac{Q_\mathrm{H}}{Q_\mathrm{H} - Q_\mathrm{C}}$	IN THE BOOKLET

Options: turning points in physics

Electron in an electric field	$F = \frac{eV}{d}$	IN THE BOOKLET
Electron in a magnetic field	$F = Bev, \;\; r = \frac{mv}{Be}$	IN THE BOOKLET
Electron accelerated through a pd	$\frac{1}{2}mv^2 = eV$	IN THE BOOKLET
Millikan's experiment	$\frac{QV}{d} = mg, \;\; F = 6\pi\eta r v$	IN THE BOOKLET
Maxwell's formula	$c = \frac{1}{\sqrt{\mu_0 \varepsilon_0}}$	IN THE BOOKLET
de Broglie wavelength of an accelerated electron	$\lambda = \frac{h}{p} = \frac{h}{\sqrt{2meV}}$	IN THE BOOKLET
Time dilation	$t = \frac{t_0}{\sqrt{1 - \frac{v^2}{c^2}}}$	IN THE BOOKLET
Length contraction	$l = l_0\sqrt{1 - \frac{v^2}{c^2}}$	IN THE BOOKLET
Relativistic energy	$E = mc^2 = \frac{m_0 c^2}{\sqrt{1 - \frac{v^2}{c^2}}}$	IN THE BOOKLET

Options: electronics

Resonant frequency	$f_0 = \frac{1}{2\pi\sqrt{LC}}$	IN THE BOOKLET
Q-factor	$Q = \frac{f_0}{f_\mathrm{B}}$	IN THE BOOKLET
Op-amp, open loop	$V_\mathrm{out} = A_\mathrm{OL}(V_+ - V_-)$	IN THE BOOKLET
Inverting amplifier	$\frac{V_\mathrm{out}}{V_\mathrm{in}} = -\frac{R_\mathrm{f}}{R_\mathrm{in}}$	IN THE BOOKLET
Non-inverting amplifier	$\frac{V_\mathrm{out}}{V_\mathrm{in}} = 1 + \frac{R_\mathrm{f}}{R_1}$	IN THE BOOKLET
Summing amplifier	$V_\mathrm{out} = -R_\mathrm{f}\left(\frac{V_1}{R_1} + \frac{V_2}{R_2} + \frac{V_3}{R_3} + \ldots\right)$	IN THE BOOKLET
Difference amplifier	$V_\mathrm{out} = (V_+ - V_-)\frac{R_\mathrm{f}}{R_1}$	IN THE BOOKLET

Bandwidth for AM	$\text{bandwidth} = 2f_{\text{M}}$	IN THE BOOKLET
Bandwidth for FM	$\text{bandwidth} = 2(\Delta f + f_{\text{M}})$	IN THE BOOKLET

Edexcel IAL and OCR: what they give

Edexcel IAL prints a full equation list in every paper and says students need not memorise formulae. OCR prints a Data, Formulae and Relationships Booklet that is fuller than AQA's. The 'given' tick here is for AQA only.

Weight AQA: recall. Edexcel IAL: printed. OCR: not in the 2020 booklet copy I read.	$W = mg$	LEARN IT
Momentum AQA: recall. Edexcel IAL: printed. OCR: printed.	$p = mv$	LEARN IT
Ohm's law AQA: printed. Edexcel IAL: printed. OCR: not in the 2020 booklet copy I read, so recall it.	$R = \dfrac{V}{I}$	IN THE BOOKLET
Equations of motion Printed by AQA, Edexcel IAL and OCR.	$v = u + at$	IN THE BOOKLET
Intensity of a wave AQA: recall. Edexcel IAL and OCR: printed.	$I = \dfrac{P}{A}$	LEARN IT
Potential divider AQA: recall. OCR: printed. Edexcel IAL: not in its equation list.	$V_{\text{out}} = \dfrac{R_2}{R_1 + R_2} V_{\text{in}}$	LEARN IT
Orbital period AQA: derive. OCR: printed. Edexcel IAL: not in its equation list.	$T^2 = \dfrac{4\pi^2 r^3}{GM}$	LEARN IT

Learn these: not in the booklet

Weight

$W = mg$

Momentum

$p = mv$

Charge

$Q = It$

Potential divider

$V_{\text{out}} = \dfrac{R_2}{R_1 + R_2} V_{\text{in}}$

Interference

$\text{path difference} = n\lambda \text{ or } (n + \tfrac{1}{2})\lambda$

nλ gives constructive interference; (n + ½)λ gives destructive.

Straight line graph

$y = mx + c$

Resolving a vector

$F_x = F\cos\theta,\ F_y = F\sin\theta$

Threshold frequency and stopping potential

$\phi = hf_0, \quad eV_{\text{s}} = E_{\text{k(max)}}$

Orbital period (derive it)

$T^2 = \dfrac{4\pi^2 r^3}{GM}$

Celsius to kelvin

$T/\text{K} = \theta/^\circ\text{C} + 273$

Electronvolt

$1\ \text{eV} = 1.60 \times 10^{-19}\ \text{J}$

Using the sheet in the exam

- Learn the symbols and units. The booklet gives equations only, with no definitions, so you must know what each letter stands for.
- Several equations are printed in more than one form, such as P = VI = I^2 R = V^2 / R. Choose the form that matches the numbers you are given.
- Check the booklet before you answer, not after. Spotting that an equation is missing early tells you whether you need to derive it.

- Use the booklet's constants, not your calculator's stored values, and carry the full figures until the final line before rounding.
- The booklet prints F = BIl and F = BQv without sin theta. If the field is not perpendicular, include the sine.

Checked against the official documents: AQA A Level Physics (7408), A-level Physics data and formulae (version 1.6, for exams from the June 2017 series onwards); Pearson Edexcel International A Level Physics (XPH11, YPH11), List of data, formulae and relationships, and specification Appendix 7 (Equations) and Appendix 8 (Data sheet); OCR A Level Physics A (H556), Data, Formulae and Relationships Booklet. Updated 31 October 2026. Boards update their booklets from time to time: always practise with the version your exam uses. More free sheets and topic worksheets at curatedprep.com.