# Physics Equations Sheet
# GCSE Physics (8463)
## FOR USE IN JUNE 2022 ONLY

**HT = Higher Tier only equations**

| | |
|---|---|
| kinetic energy = 0.5 × mass × (speed)$^2$ | $E_k = \frac{1}{2} m v^2$ |
| elastic potential energy = 0.5 × spring constant × (extension)$^2$ | $E_e = \frac{1}{2} k e^2$ |
| gravitational potential energy = mass × gravitational field strength × height | $E_p = m g h$ |
| change in thermal energy = mass × specific heat capacity × temperature change | $\Delta E = m c \Delta\theta$ |
| power = $\frac{\text{energy transferred}}{\text{time}}$ | $P = \frac{E}{t}$ |
| power = $\frac{\text{work done}}{\text{time}}$ | $P = \frac{W}{t}$ |
| efficiency = $\frac{\text{useful output energy transfer}}{\text{total input energy transfer}}$ | |
| efficiency = $\frac{\text{useful power output}}{\text{total power input}}$ | |
| charge flow = current × time | $Q = I t$ |
| potential difference = current × resistance | $V = I R$ |
| power = potential difference × current | $P = V I$ |
| power = (current)$^2$ × resistance | $P = I^2 R$ |
| energy transferred = power × time | $E = P t$ |
| energy transferred = charge flow × potential difference | $E = Q V$ |
| density = $\frac{\text{mass}}{\text{volume}}$ | $\rho = \frac{m}{V}$ |

| | | |
|---|---|---|
| | thermal energy for a change of state = mass × specific latent heat | $E = m L$ |
| | For gases: pressure × volume = constant | $p V = constant$ |
| | weight = mass × gravitational field strength | $W = m g$ |
| | work done = force × distance (along the line of action of the force) | $W = F s$ |
| | force = spring constant × extension | $F = k e$ |
| | moment of a force = force × distance (normal to direction of force) | $M = F d$ |
| | pressure = $\frac{\text{force normal to a surface}}{\text{area of that surface}}$ | $p = \frac{F}{A}$ |
| **HT** | **pressure due to a column of liquid = height of column × density of liquid × gravitational field strength** | $\boldsymbol{p = h \rho g}$ |
| | distance travelled = speed × time | $s = v t$ |
| | acceleration = $\frac{\text{change in velocity}}{\text{time taken}}$ | $a = \frac{\Delta v}{t}$ |
| | (final velocity)$^2$ – (initial velocity)$^2$ = 2 × acceleration × distance | $v^2 - u^2 = 2 a s$ |
| | resultant force = mass × acceleration | $F = m a$ |
| **HT** | **momentum = mass × velocity** | $\boldsymbol{p = m v}$ |
| **HT** | **force =** $\boldsymbol{\frac{\text{change in momentum}}{\text{time taken}}}$ | $\boldsymbol{F = \frac{m \Delta v}{\Delta t}}$ |
| | period = $\frac{1}{\text{frequency}}$ | $T = \frac{1}{f}$ |
| | wave speed = frequency × wavelength | $v = f \lambda$ |
| | magnification = $\frac{\text{image height}}{\text{object height}}$ | |
| **HT** | **force on a conductor (at right angles to a magnetic field) carrying a current = magnetic flux density × current × length** | $\boldsymbol{F = B I l}$ |
| **HT** | $\boldsymbol{\frac{\text{potential difference across primary coil}}{\text{potential difference across secondary coil}} = \frac{\text{number of turns in primary coil}}{\text{number of turns in secondary coil}}}$ | $\boldsymbol{\frac{V_p}{V_s} = \frac{n_p}{n_s}}$ |
| **HT** | **potential difference across primary coil × current in primary coil = potential difference across secondary coil × current in secondary coil** | $\boldsymbol{V_p I_p = V_s I_s}$ |



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