9 Appendix A: Physics equations

In solving quantitative problems, students should be able to recall and apply the following equations, using standard SI units.

Equations required for Higher Tier papers only are indicated by HT in the left hand column.

Equation number	Word equation	Symbol equation
1	weight = mass × gravitational field strength (g)	$W = m\,g$
2	work done = force × distance (along the line of action of the force)	$W = F\,s$
3	force applied to a spring = spring constant × extension	$F = k\,e$
4	moment of a force = force × distance (normal to direction of force)	$M = F\,d$
5	pressure = $\frac{\text{force normal to a surface}}{\text{area of that surface}}$	$p = \frac{F}{A}$
6	distance travelled = speed × time	$s = v\,t$
7	acceleration = $\frac{\text{change in velocity}}{\text{time taken}}$	$a = \frac{\Delta v}{t}$
8	resultant force = mass × acceleration	$F = m\,a$
9 HT	momentum = mass × velocity	$p = m\,v$
10	kinetic energy = 0.5 × mass × (speed)^2	$E_k = \frac{1}{2}m\,v^2$
11	gravitational potential energy = mass × gravitational field strength (g) × height	$E_p = m\,g\,h$
12	power = $\frac{\text{energy transferred}}{\text{time}}$	$P = \frac{E}{t}$
13	power = $\frac{\text{work done}}{\text{time}}$	$P = \frac{W}{t}$
14	efficiency = $\frac{\text{useful output energy transfer}}{\text{total input energy transfer}}$	
15	efficiency = $\frac{\text{useful power output}}{\text{total power input}}$	
16	wave speed = frequency × wavelength	$v = f\,\lambda$
17	charge flow = current × time	$Q = I\,t$
18	potential difference = current × resistance	$V = I\,R$
19	power = potential difference × current	$P = V\,I$
20	power = (current)^2 × resistance	$P = I^2\,R$
21	energy transferred = power × time	$E = P\,t$
22	energy transferred = charge flow × potential difference	$E = Q\,V$
23	density = $\frac{\text{mass}}{\text{volume}}$	$\rho = \frac{m}{V}$