Massachusetts Comprehensive Assessment System

Introductory Physics Formula Sheet

Formulas

Average Speed $= \frac{d}{\Delta t}$	$F = ma$	$p = mv$
Average Acceleration $= \frac{\Delta v}{\Delta t}$	$F = G\frac{m_1 m_2}{d^2}$	$V = IR$
Average Velocity $= \frac{\Delta x}{\Delta t}$	$F = k\frac{q_1 q_2}{d^2}$	$P = IV$
$v_f = v_i + a\Delta t$	$KE = \frac{1}{2}mv^2$	$Q = mc\Delta T$
$\Delta x = v_i\Delta t + \frac{1}{2}a\,\Delta t^2$	$PE = mg\Delta h$	$v = f\lambda$
$v_f^2 = v_i^2 + 2a\Delta x$	$W = Fd$	$\lambda = \frac{c}{f}$
Average Velocity $= \frac{v_i + v_f}{2}$	$P = \frac{W}{\Delta t}$	$T = \frac{1}{f}$

Variables

a = acceleration	q = charge of particle
c = specific heat	Q = heat
d = distance	R = resistance
f = frequency	Δt = change in time
F = force	ΔT = change in temperature
Δh = change in height	T = period
I = current	v = velocity
KE = kinetic energy	v_i = initial velocity
λ = wavelength	v_f = final velocity
m = mass	Δv = change in velocity
p = momentum	V = voltage
P = power	W = work
PE = gravitational potential energy	Δx = displacement

Definitions

c = speed of electromagnetic waves $= 3.00 \times 10^8$ m/s

G = Universal gravitational constant $= 6.67 \times 10^{-11}\ \frac{N \cdot m^2}{kg^2}$

k = Coulomb constant $= 8.99 \times 10^9\ \frac{N \cdot m^2}{C^2}$

$g \approx 10\ m/s^2$ $\quad 1\ N = 1\frac{kg \cdot m}{s^2}$ $\quad 1\ J = 1\ N \cdot m$ $\quad 1\ W\ (watt) = 1\frac{J}{s}$