

### Formulas

$$s_{\text{average}} = \frac{d}{\Delta t}$$

$$p = mv$$

$$F_e = k \frac{q_1 q_2}{d^2}$$

$$Q = mc\Delta T$$

$$v_{\text{average}} = \frac{\Delta x}{\Delta t}$$

$$F\Delta t = \Delta p$$

$$KE = \frac{1}{2}mv^2$$

$$v = \lambda f$$

$$a_{\text{average}} = \frac{\Delta v}{\Delta t}$$

$$F_{\text{net}} = ma$$

$$\Delta PE = mg\Delta h$$

$$T = \frac{1}{f}$$

$$v_f = v_i + a\Delta t$$

$$F_g = mg$$

$$W = \Delta E = Fd$$

$$V = IR$$

$$\Delta x = v_i\Delta t + \frac{1}{2}a\Delta t^2$$

$$F_g = G \frac{m_1 m_2}{d^2}$$

$$\text{eff} = \frac{E_{\text{out}}}{E_{\text{in}}}$$

### Variables

a = acceleration

KE = kinetic energy

s = speed

c = specific heat

$\lambda$  = wavelength

$\Delta t$  = change in time

d = distance

m = mass

T = period

E = energy

p = momentum

$\Delta T$  = change in temperature

eff = efficiency

$\Delta PE$  = change in  
gravitational  
potential energy

v = velocity

f = frequency

q = charge of particle

V = potential difference (voltage)

F = force

Q = heat added or removed

W = work

g = acceleration due to gravity

R = resistance

$\Delta x$  = change in position  
(displacement)

$\Delta h$  = change in height

I = current

### Unit Symbols

ampere, A

hertz, Hz

meter, m

second, s

coulomb, C

joule, J

newton, N

volt, V

degree Celsius, °C

kilogram, kg

ohm,  $\Omega$

### Definitions

speed of electromagnetic waves in a vacuum =  $3 \times 10^8$  m/s

G = Universal gravitational constant =  $6.7 \times 10^{-11} \frac{\text{N} \cdot \text{m}^2}{\text{kg}^2}$

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

$g \approx 10$  m/s<sup>2</sup> at Earth's surface

1 N =  $1 \frac{\text{kg} \cdot \text{m}}{\text{s}^2}$

1 J = 1 N • m