

Physics 11 Formula Sheet

Kinematics

$$d = \bar{v}t \quad v = v_o + at \quad \bar{v} = \frac{v + v_o}{2}$$

$$v^2 = v_o^2 + 2ad \quad d = v_o t + \frac{1}{2}at^2$$

Forces

$$F_{net} = ma \quad F_g = mg \quad F_{fr} = \mu F_N$$

$$F = -kx \quad F_g = \frac{Gm_1m_2}{r^2}$$

Momentum

$$p = mv \quad \Delta p = m\Delta v \quad \Delta p = F_{net}t$$

Energy

$$W = Fd \quad W = \Delta E \quad E_k = \frac{1}{2}mv^2$$

$$E_p = mgh \quad P = \frac{W}{t} \quad \Delta E_{thermal} = mc\Delta T$$

$$efficiency = \frac{W_{out}}{W_{in}} = \frac{P_{out}}{P_{in}}$$

Waves & Optics

$$T = \frac{1}{f} \quad v = f\lambda \quad \frac{1}{d_i} + \frac{1}{d_o} = \frac{1}{f}$$

$$n_1 \sin(\theta_1) = n_2 \sin(\theta_2) \quad f = f_s \left(\frac{v}{v \pm v_s} \right)$$

Special Relativity

$$t = \frac{t_o}{\sqrt{1 - \frac{v^2}{c^2}}} \quad m = \frac{m_o}{\sqrt{1 - \frac{v^2}{c^2}}} \quad l = l_o \sqrt{1 - \frac{v^2}{c^2}}$$

$$v_{total} = \frac{v_1 + v_2}{1 + \frac{v_1 v_2}{c^2}} \quad E = mc^2$$

Table of Constants

Gravitational Constant..... $G = 6.67 \times 10^{-11} \text{ N}\cdot\text{m}^2/\text{kg}^2$

Acceleration due to gravity near Earth's surface. $g = 9.8 \text{ m/s}^2$

Earth

radius..... $6.38 \times 10^6 \text{ m}$
mass..... $5.98 \times 10^{24} \text{ kg}$
period of rotation..... $8.61 \times 10^4 \text{ s}$
radius of orbit around Sun*..... $1.50 \times 10^{11} \text{ m}$
period of revolution around Sun..... $3.16 \times 10^7 \text{ s}$

Moon

radius..... $1.74 \times 10^6 \text{ m}$
mass..... $7.35 \times 10^{22} \text{ kg}$
period of rotation..... $2.36 \times 10^6 \text{ s}$
radius of orbit around Earth*..... $3.84 \times 10^8 \text{ m}$
period of revolution around Earth..... $2.36 \times 10^6 \text{ s}$

* - also refers to distance between the objects

Sun

mass..... $1.98 \times 10^{30} \text{ kg}$

Speed of light..... $c = 3.00 \times 10^8 \text{ m/s}$

Specific heat capacity c

water..... $4.18 \times 10^3 \text{ J/kg}^\circ\text{C}$
ice..... $2.06 \times 10^3 \text{ J/kg}^\circ\text{C}$
iron..... $4.46 \times 10^2 \text{ J/kg}^\circ\text{C}$
aluminum..... $4.18 \times 10^3 \text{ J/kg}^\circ\text{C}$
copper..... $4.18 \times 10^3 \text{ J/kg}^\circ\text{C}$
methanol..... $4.18 \times 10^3 \text{ J/kg}^\circ\text{C}$

Index of refraction n

air..... 1.00
water..... 1.33
glass..... 1.52
diamond..... 2.42
ruby..... 1.54

Metric Prefixes

Basic unit (e.g., meter, gram , liter).....	1
centi- (c-).....	0.01
milli- (m-).....	0.001
micro- (μ -).....	0.000 001
kilo- (k-).....	1 000
mega- (M-).....	1 000 000
giga- (G-).....	1 000 000 000