Mr. Renwick's Physics 11

Physics 11 Formula Sheet

Kinematics

$v_{avg} = \frac{\Delta d}{\Delta t}$ $\quad v_{avg} = \frac{v_0 + v_1}{2}$ $\quad d = \left(\frac{v_0 + v_1}{2}\right) t$ $\quad a_{avg} = \frac{\Delta v}{\Delta t}$

$v_1 = v_0 + at$ $\quad {v_1}^2 = {v_0}^2 + 2ad$ $\quad d = v_0\, t + \frac{1}{2} a t^2$ $\quad d = v_1\, t - \frac{1}{2} a t^2$

Dynamics (Forces)

$F_g = mg$ $\quad F_g = G\frac{m_1 m_2}{r^2}$ $\quad F_f = \mu F_N$ $\quad F_s = k\Delta x$

$F_{net} = ma$ $\quad F_{net} = \Sigma F$

Work, Energy, and Power

$\Sigma E_i = \Sigma E_f$ $\quad W = F \parallel d$ $\quad W = \Delta E$ $\quad P = \frac{W}{\Delta t} = \frac{\Delta E}{\Delta t}$

$E_k = \frac{1}{2} m v^2$ $\quad E_p = mgh$ $\quad E_p = -G\frac{m_1 m_2}{r}$ $\quad E_s = \frac{1}{2} k (\Delta x)^2$

$E = mc^2$ $\quad MA = \frac{F_{out}}{F_{in}} = \frac{d_{in}}{d_{out}}$ $\quad MA = \frac{r_{out}}{r_{in}} = \frac{D_{out}}{D_{in}}$ $\quad Q = mc\Delta T$

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

Waves, Light, and Sound

$v = f\lambda$ $\quad T = \frac{1}{f}$ $\quad T = 2\pi\sqrt{\frac{L}{g}}$ $\quad V_{air} = \frac{3}{5} T + 331$

$n = \frac{c}{v}$ $\quad \frac{\sin\theta_1}{\sin\theta_2} = \frac{v_1}{v_2} = \frac{n_2}{n_1}$ $\quad \frac{1}{d_i} + \frac{1}{d_o} = \frac{1}{f}$ $\quad f = f_0\left(\frac{v \pm v_r}{v \pm v_s}\right)$

$d \sin\theta_m = m\lambda$

Electric Circuits

$I = \frac{\Delta Q}{\Delta t}$ $\quad R = \frac{\rho l}{A}$ $\quad V = IR$ $\quad P = IV$

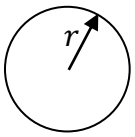
$R_s = \Sigma \mathrm{R}$ $\quad \frac{1}{R_p} = \Sigma \frac{1}{R}$ $\quad V_{terminal} = \varepsilon \pm IR$

Quadratic Equation

If $ax^2 + bx + c = 0$, then

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Circle Diameter, Area, and Circumference



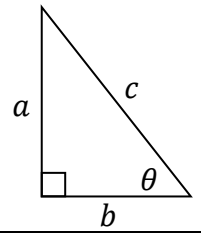
$d = 2r$

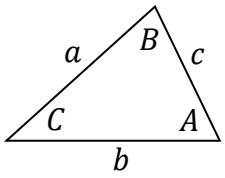
$area = \pi r^2 = \pi\frac{d^2}{4}$

$circumference = 2\pi r = \pi d$

See over →

Physics 11 Formula Sheet

Right Triangles		
	$\sin\theta = \frac{a}{c}$	$a^2 + b^2 = c^2$
	$\cos\theta = \frac{b}{c}$	$area = \frac{1}{2}ab$
	$\tan\theta = \frac{a}{b}$	

All Triangles	
	$c^2 = a^2 + b^2 - 2ab\cos C$
	$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$
	$area = \frac{1}{2}base \times height$

Metric Prefixes

Symbol	Prefix	Factor
P	peta	10^{15}
T	tera	10^{12}
G	giga	10^{9}
M	mega	10^{6}
k	kilo	10^{3}
h	hecto	10^{2}
da	deca	10^{1}
-	-	10^{0}
d	deci	10^{-1}
c	centi	10^{-2}
m	milli	10^{-3}
µ	micro	10^{-6}
n	nano	10^{-9}
p	pico	10^{-12}

Fundamental Constants and Physical Data

Gravitational constant	G = 6.67 x 10^{-11} N·m^2/ kg^2
Elementary charge	e = 1.60 x 10^{-19} C
Speed of light in a vacuum	c = 3.00 x 10^{8} m/s
Gravity on Earth's surface	g_{Earth} = 9.81 m/s^2
Earth radius	r_{Earth} = 6.38 x 10^{6} m
Earth mass	m_{Earth} = 5.98 x 10^{24} kg
Moon radius	r_{moon} = 1.74 x 10^{6} m
Moon mass	m_{moon} = 7.35 x 10^{22} kg
Sun radius	r_{Sun} = 6.96 x 10^{8} m
Sun mass	m_{Sun} = 1.98 x 10^{30} kg

Unit Conversions

Distance
1 mile = 1,760 yards ≈ 1.609 km
1 yard = 3 feet
1 foot = 12 inches
1 inch = 25.4 mm
Mass
1 metric tonne = 1000 kg
1 ton = 2000 pounds
1 pound = 16 ounces
1 pound ≈ 453.6 g
Volume
1 US gallon = 4 US quarts
1 US quart = 2 US pints
1 US pint = 16 US fluid ounces
1 US fluid ounce ≈ 29.6 mL
Temperature
$F = \frac{9}{5}C + 32$
$C = \frac{5}{9}(F - 32)$
Energy
1 calorie ≈ 4,184 J