PHYSICS 20 FORMULA SHEET

SI PREFIXES

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	deka	10^{1}
d	deci	10^{-1}
c	centi	10^{-2}
m	milli	10^{-3}
μ	micro	10^{-6}
n	nano	10^{-9}
p	pico	10^{-12}
f	femto	10^{-15}

LINEAR MOTION:

$$v = \frac{\Delta d}{\Delta t}$$

$$v_{ave} = \left(\frac{v_f + v_i}{2} \right)$$

$$a = \frac{\Delta v}{\Delta t} = \frac{\left(v_f - v_i \right)}{\Delta t}$$

$$v_f = v_i + at$$

$$\Delta d = \left(\frac{v_f + v_i}{2} \right) t$$

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

$$v_f{}^2 = v_i{}^2 + 2a\Delta d$$

$$\Delta d = v_f t - \frac{1}{2} a t^2$$

WORK, POWER AND ENERGY:

$$W = Fd\cos(\theta)$$

$$P = \frac{W}{t} = F \cdot v_{average}$$

$$E_k = \frac{1}{2} mv^2 \qquad E_p = mgh$$

$$E_T = E_P + E_k$$

$$E_{ki} + E_{pi} + \sum W = E_{kf} + E_{pf}$$

$$E_{in} - E_{out} = \Delta E_p - \Delta E_k$$

$$E_p = \frac{1}{2} kx^2 \quad \text{Elastic PE}$$

Trignometry

$$F_x = F\cos(\theta) \qquad F_y = F\sin(\theta)$$

$$F = \sqrt{F_x^2 + F_y^2}$$

$$\tan\theta = \frac{F_y}{F_x} \qquad \theta = \tan^{-1}\left(\frac{F_y}{F_x} \right)$$

$$\sin\theta = \frac{F_y}{F} \qquad \theta = \sin^{-1}\left(\frac{F_y}{F} \right)$$

$$\cos\theta = \frac{F_x}{F} \qquad \theta = \cos^{-1}\left(\frac{F_x}{F} \right)$$

Constants:

$g = 9.81 \ m/s^2$

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

1 hp =745.7 W

$m_E = 5.98 \times 10^{24} kg$

$r_E = 6.37 \times 10^6$ m

K=$2.95 \times 10^{-19} s^2 / m^3$

1 rev = $360^\circ = 2\pi$ rad

Newton's Three Laws of Motion:

Equilibrium: $\sum \vec{F} = 0$, $\sum \vec{F}_x = 0$, $\sum \vec{F}_y = 0$

$$\sum \vec{F} = m\vec{a}$$

$$F_g = mg$$

$$F_f = \mu F_N$$

Newton's Law Of Universal Gravitation

$$F = \frac{Gm_1 m_2}{r^2}$$

$$g = \frac{GM}{r^2}$$

$$v = \sqrt{\frac{GM}{r}} = \sqrt{gr}$$

$$T^2 = \frac{4\pi^2}{GM} r^3$$

$$\frac{T_a^2}{r_a^3} = \frac{T_b^2}{r_b^3} = K$$

Angular Motion/Circular Motion

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

$$v = \frac{2\pi r}{T}$$

$$a_c = \frac{v^2}{r} = \frac{4\pi^2 r}{T^2}$$

$$F_c = ma_c = \frac{mv^2}{r} = \frac{4\pi^2 mr}{T^2}$$

Simple Harmonic Motion

$$\vec{F} = -k\vec{x}$$

$$\vec{a} = -\frac{k\vec{x}}{m}$$

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

$$v_{\max} = \frac{2\pi A}{T} = A\sqrt{\frac{k}{m}}$$

$$a_{\max} = \frac{4\pi^2 A}{T^2}$$

$$T = 2\pi\sqrt{\frac{m}{k}} \quad \text{spring-mass system}$$

$$T = 2\pi\sqrt{\frac{l}{g}} \quad \text{pendulum}$$

$$F_R = F_g \sin(\theta)$$

Waves:

$$v = \lambda f$$

$$c = \lambda f$$

$$c = 3.0 \times 10^{+8} \ m/s$$

$$n_1 \sin\theta_1 = n_2 \sin\theta_2$$

$$f_d = \left(\frac{v_w}{v_w \mp v_s} \right) f_s$$

Speed of sound = 330 m/s