PHYSICS 20 Name _____

DATA / FORMULA SHEET

CONSTANTS

Acceleration due to Gravity *or* Gravitational Field near Earth	g or $a_g = 9.81\ m/s^2$ or $9.81\ N/kg$
Gravitational Constant	$G = 6.67 \times 10^{-11}\ Nm^2/kg^2$
Radius of Earth	$r_e = 6.37 \times 10^6\ m$
Mass of the Earth	$m_e = 5.98 \times 10^{24}\ kg$
Velocity of Sound in Air at 0°C	$v_{sound} = 331\ m/s$
Change in Sound Velocity/1.00°C	$\Delta v = 0.600\ m/s$
Kepler's Constant	$K = 1 yr^2/AU^3$

TRIGONOMETRY and GEOMETRY

Trig Ratios

$$Sin\theta = \frac{o}{h}\frac{(opposite)}{(hypotenuse)}$$

$$Cos\theta = \frac{a}{h}\frac{(adjacent)}{(hypotenuse)}$$

$$Tan\theta = \frac{o}{a}\frac{(opposite)}{(adjacent)}$$

Pythagorean Theorem $c^2 = a^2 + b^2$

Slope

$$m = \frac{\Delta y}{\Delta x} = \frac{rise}{run}$$

Circumference of a Circle

$$Cir = 2\pi r$$

Selected PREFIXES used with SI UNITS

Prefix	Symbol	Factor by which Base Unit is Multiplied	Exponential Value
giga	G	1 000 000 000	$= 10^9$
mega	M	1 000 000	$= 10^6$
kilo	k	1 000	$= 10^3$
hecto	h	100	$= 10^2$
deka	da	10	$= 10^1$
Common base unit*		1	$= 10^0$
deci	d	0.1	$= 10^{-1}$
centi	cm	0.01	$= 10^{-2}$
milli	m	0.001	$= 10^{-3}$
micro	u	0.000 001	$= 10^{-6}$
nano	n	0.000 000 001	$= 10^{-9}$

* meter (m), gram (g), mole (mol), liter (L)

KINEMATICS

Uniform Motion

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

$$\vec{v}_{av} = \frac{\Delta \vec{d}}{\Delta t}$$

Accelerated Motion

$$\vec{a} = \frac{\vec{v}_f - \vec{v}_i}{\Delta t}$$

$$\vec{d} = \vec{v}_i t + \frac{1}{2}\vec{a}t^2$$

$$\vec{v}_{av} = \frac{\vec{v}_f + \vec{v}_i}{2}$$

$$\vec{d} = \left(\frac{\vec{v}_f + \vec{v}_i}{2}\right)t$$

$$\vec{v}_f^2 = \vec{v}_i^2 + 2\vec{a}\vec{d}$$

$$\vec{d} = \vec{v}_f t - \frac{1}{2}\vec{a}t^2$$

DYNAMICS

Force and Weight

$$\vec{F}_{net} = m\vec{a}$$

$$\vec{F}_g = m\vec{g}$$

$$F_A = F_{net} + F_f$$

$$\vec{F}_{net} = \vec{F}_g + \vec{F}_N$$

$$F_{net\ top} = F_c - F_g$$

$$F_{net\ bottom} = F_c + F_g$$

$$F = (m_1 + m_2)a$$

$$F_{friction} = \mu_s F_N$$

$$F_{up} = W_a = m(g + a_{up})$$

$$W_a = m(g - a_{down})$$

$$W_{gain} = ma_{up}$$

$$W_{loss} = ma_{down}$$

$$\vec{F}_{net} = \vec{F}_g + \vec{F}_T$$

$$\vec{F}_c = \vec{F}_g + \vec{F}_T$$

PERIODIC MOTION

Circular Motion, Gravitation and Waves

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

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

$$F_c = ma_c = \frac{mv^2}{r} = m\left(\frac{4\pi^2 r}{T^2}\right)$$

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

$$n = \frac{\sin \angle i}{\sin \angle R} = \frac{v_1}{v_2} = \frac{\lambda_1}{\lambda_2}$$

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

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

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

$$\left(\frac{T_a}{T_b}\right)^2 = \left(\frac{r_a}{r_b}\right)^3$$

$$\Delta \vec{d}_{net} = \vec{d}_1 + \vec{d}_2$$

$$v = f\lambda$$

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

$$v = \sqrt{\frac{Gm_e}{r}}$$

$$T = 2\pi\sqrt{\frac{r^3}{Gm_e}}$$

$$\angle i = \angle r$$

$$F = kx$$

$$Ep = \frac{1}{2}kx^2$$

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

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

$$\frac{\lambda}{w}$$

$$\frac{1}{2}\lambda = \Delta l = l_2 - l_1$$

CONSERVATION OF ENERGY

Work and Energy

$$W = Fd$$

$$W = F\cos\theta d$$

$$P = \frac{W}{t} = \frac{\Delta E}{t}$$

$$P = Fv$$

$$E_p = mg\Delta h$$

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

$$E_m = E_p + E_k$$

$$E_p = \frac{1}{2}kx^2$$

$$E_{kf} = E_{ki} + W$$

$$E_{pf} = E_{pi} + W$$

$$W_{net} = \Delta E_k = E_{kf} - E_{ki}$$