Name: _______________

Physics 12 Comfort Blanket

Relativity

$t_r = \frac{t_o}{\sqrt{1-\frac{\vec{v}^2}{\vec{c}^2}}}$ $m_r = \frac{m_o}{\sqrt{1-\frac{\vec{v}^2}{\vec{c}^2}}}$ $l_r = l_o \cdot \sqrt{1-\frac{\vec{v}^2}{\vec{c}^2}}$ $\vec{v}_{total} = \frac{\vec{v}_1+\vec{v}_2}{1+\frac{\vec{v}_1\vec{v}_2}{\vec{c}^2}}$

$E = m\vec{c}^2$ $\beta = \frac{\vec{v}}{\vec{c}}$

Forces, Dynamics, Collisions, & Equilibrium

$\overrightarrow{F_g} = m\vec{g}$ $\vec{g} = G\frac{m}{r^2}$ $\overrightarrow{F_g} = G\frac{m_1m_2}{r^2}$ $\overrightarrow{F_{net}} = m\vec{a}$ $\overrightarrow{F_f} = \mu\overrightarrow{F_N}$

$\vec{\rho} = m\vec{v}$ $\overrightarrow{Impulse} = \vec{F}\Delta t$ $\vec{F}\Delta t = m\Delta\vec{v}$ $\Sigma\overrightarrow{\rho_\iota} = \Sigma\overrightarrow{p_f}$ $\vec{\tau} = \overrightarrow{F_\perp}d$

Energy & Orbital Mechanics

$E_p = m\vec{g}h$ $E_k = {}^1/_2\, m\overrightarrow{v^2}$ $E_p = -G\frac{m_1m_2}{r}$ $T = {}^1/_f$ $\overrightarrow{a_c} = \frac{v^2}{r} = \frac{4\pi^2r}{T^2}$

$\overrightarrow{F_c} = m\overrightarrow{a_c} = m\frac{v^2}{r} = m\frac{4\pi^2r}{T^2}$ $\vec{v}_{esc} = \sqrt{\frac{2Gm}{r}}$ Top: $\overrightarrow{F_c} = T + F_g$ Bottom: $\overrightarrow{F_c} = T + F_g$

Electrostatics

$\overrightarrow{F_e} = k\frac{Q_1Q_2}{r^2}$ $\vec{E} = \frac{\vec{F}}{Q}$ $\vec{E} = k\frac{Q_1}{r^2}$ $\Delta V = \frac{\Delta E_p}{Q}$ $\vec{E} = \frac{\Delta V}{d}$

$E_p = \pm k\frac{Q_1Q_2}{r}$ $V = k\frac{Q}{r}$

Electromagnetism

$\overrightarrow{F_m} = \overrightarrow{B_\perp}Il$ $\overrightarrow{F_m} = Qv\overrightarrow{B_\perp}$ $\vec{B} = \mu_0 nI = \mu_0\frac{N}{l}I$ $\varepsilon = \overrightarrow{B_\perp}lv$

$\Phi = \overrightarrow{B_\perp}A$ $\varepsilon = -N\frac{\Delta\Phi}{\Delta t}$ $V_{back} = \varepsilon - Ir$ $\frac{V_s}{V_p} = \frac{N_s}{N_p} = \frac{I_p}{I_s}$

Kinematics

$\vec{v} = \frac{\overrightarrow{\Delta d}}{\Delta t}$ $\vec{a} = \frac{\overrightarrow{\Delta v}}{\Delta t}$ $\vec{d} = \left(\frac{\overrightarrow{v_f}+\overrightarrow{v_\iota}}{2}\right)\Delta t$ $\vec{d} = \overrightarrow{v_\iota t} + {}^1/_2\,\vec{a}t^2$ $\overrightarrow{v_f^2} = \overrightarrow{v_\iota^2} + 2\vec{a}\vec{d}$

$\overrightarrow{v_f} = \overrightarrow{v_\iota} + \vec{a}t$

Work Power Energy Momentum

$$W = Fd \qquad E_p = mg\Delta h \qquad E_k = \frac{1}{2}mv^2 \qquad P = \frac{W}{\Delta t} \qquad \vec{p} = mv \qquad \Delta\vec{p} = F_{net}\Delta t$$

$$\Delta\vec{p} = m\Delta v \qquad \Delta E_H = F_{fric}d \qquad W = \Delta E \qquad Efficiency = \frac{W_{out}}{W_{in}}\ x\ 100\% = \frac{P_{out}}{P_{in}}\ x\ 100\%$$

PREFIX	SYMBOL	MULTIPLIER	EXPONENT FORM
exa	E	1, 000, 000, 000, 000, 000, 000	10^{18}
peta	P	1, 000, 000, 000, 000, 000	10^{15}
tera	T	1, 000, 000, 000, 000	10^{12}
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}
deca	da	10	10^{1}
Basic Unit	Basic Unit	1	10^{0}
deci	d	0.1	10^{-1}
centi	c	0.01	10^{-2}
milli	m	0. 001	10^{-3}
micro	μ	0. 000, 001	10^{-6}
nano	n	0. 000, 000, 001	10^{-9}
pico	p	0. 000, 000, 000, 001	10^{-12}
femto	f	0. 000, 000, 000, 000, 001	10^{-15}
atto	a	0. 000, 000, 000, 000, 000, 001	10^{-18}

Useful Constants and Physical Data:

Gravitational Acceleration at Earth's surface…… $\vec{g} = -9.80\frac{m}{s^2}$

Universal Gravitational Constant ………………..$G = 6.67\ x\ 10^{-11} N\frac{m^2}{kg^2}$

Speed of light in a vacuum……………………..…$c = 3.00\ x\ 10^8\frac{m}{s}$

Coulomb's Constant……………………………..…..$k = 9.00\ x\ 10^9 N\frac{m^2}{C^2}$

Elementary charge………………………………..$e = \pm 1.60\ x\ 10^{-19}C$

Mass of a proton……………………………….…$m_{p^+} = 1.67\ x\ 10^{-27}kg$

Mass of an electron……………………………….$m_{e^-} = 9.11\ x\ 10^{-31}kg$

Mass of an alpha particle………………………...$m_{\alpha^{2+}} = 6.65\ x\ 10^{-27}kg$

Permeability of free space……………………… $\mu_0 = 4\pi \times 10^{-7}T\frac{m}{A}$

Earth Data:

Mass of the Earth……………………………….. $m_E = 5.98\ x\ 10^{24}\ kg$

Radius of the Earth ………………………….….$r_E = 6.38\ x\ 10^6 m$

Orbital Radius around the Sun ………………...….$r = 1.50\ x 10^{11} m$

Orbital Period around the Sun ……………….…$T = 3.16\ x\ 10^7 s$

Period of Rotation on axis (length of day) ……......$T = 8.61\ x\ 10^4 s$

Moon Data:

Mass of the Moon……………………………….. $m_M = 7.35\ x\ 10^{22}kg$

Radius of the Moon ……………………………….$r_M = 1.74\ x\ 10^6 m$

Period of orbit around Earth ……………………..$T = 2.36\ x\ 10^6 s$

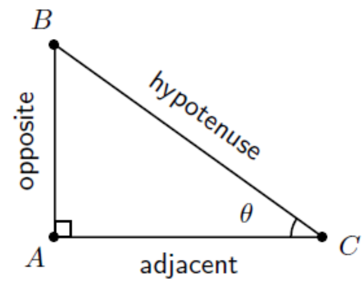
Radius of orbit around Earth…………………….. $r = 3.84\ x\ 10^8 s$

Period of rotation on axis (length of day)………. $T = 2.36\ x\ 10^6 s$

Sun Data:

Mass of Sun…………………………………….... $m_s = 1.98\ x\ 10^{30}kg$

90° Triangle Geometry



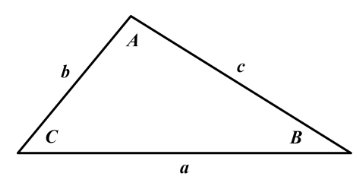
$$Sin\ \theta = \frac{Opposite}{Hypotenuse}$$

$$Cos\ \theta = \frac{Adjacent}{Hypotenuse}$$

$$Tan\ \theta = \frac{Opposite}{Adjacent}$$

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

Non 90° Triangle Geometry (Or all triangles)



Cosine Law

$$\boldsymbol{c^2 = a^2 + b^2 - (2ab \cdot cos\ C)}$$

Sine Law

$$\boldsymbol{\frac{Sin\ A}{a} = \frac{Sin\ B}{b} = \frac{Sin\ C}{c}}$$

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

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