Final Exam Equation Sheet

Physics 100, Spring 2007

Monday, May 21st 2007

Exam #1 Material:

$$(distance\ traveled) = \frac{1}{2}\ acceleration \times time^{2}$$

$$(change\ in\ speed) = (acceleration) \times (time)$$

$$(speed) = \frac{(distance\ traveled)}{(time)}$$

$$(acceleration) = \frac{(change\ in\ velocity)}{(time)}$$

$$\overrightarrow{Force} = mass \times \overrightarrow{Acceleration}$$

$$(force\ of\ gravity) = (mass) \times (acceleration\ due\ to\ gravity)$$

Exam #2 Material:

$$\overrightarrow{Impulse} = \overrightarrow{Force} \times Time$$

$$\overrightarrow{Impulse} = \Delta\overrightarrow{Momentum}$$

$$Work = Force_{\parallel} \times Distance$$

$$Work_{net} = \Delta Kinetic\ Energy$$

$$Gravitational\ Potential\ Energy = Mass \times (Acceleration\ of\ Gravity) \times Height$$

$$Kinetic\ Energy = \frac{1}{2}\ mass \times (speed)^{2}$$

$$\overrightarrow{Momentum} = mass \times \overrightarrow{Velocity}$$

Exam #3 Material:

$$(wave\ speed) = wavelength \times frequency$$

$$frequency = \frac{1}{period}$$

$$(deep\ water\ wave\ speed) = 1.25 \times \sqrt{wavelength} = 5/4 \times \sqrt{wavelength}$$

$$(shallow\ water\ wave\ speed) = 3 \times \sqrt{depth}$$

$$distance\ to\ origin_1 = \Delta time \times 5\ miles/second$$

$$distance\ to\ origin_2 = \Delta time \times \frac{1}{5}\ miles/second$$

$$(beat\ frequency) = |f_1 - f_2|$$

Exam #4 Material:

$$Frequency_{max} = (Temperature\ in\ Kelvin) \times 10^{11}\ Hz/Kelvin$$

$$(Temperature\ in\ Kelvin) = (Temperature\ in\ Celsius) + 273$$

$$(Photon\ Energy) = (Planck's\ Constant) \times (frequency)$$

$$Angle\ of\ Incidence = Angle\ of\ Reflection$$

Relativity:

$$\Delta T = \gamma \Delta T_\circ \quad (\Delta T_\circ \equiv proper\ time)$$

$$L = \frac{L_\circ}{\gamma} \quad (L_\circ \equiv proper\ length)$$

$$Energy\ =\ mass \times (speed\ of\ light)^2$$

$$\gamma = \frac{1}{\sqrt{1 - \left(\frac{speed}{speed\ of\ light}\right)^2}}$$

γ Calculated!

speed	γ	$\frac{1}{\gamma}$
0.1 c	1.005	0.994
0.2 c	1.02	0.98
0.3 c	1.05	0.95
0.4 c	1.09	0.92
0.5 c	1.15	0.87
0.6 c	1.25	0.80
0.7 c	1.4	0.71
0.8 c	1.7	0.60
0.9 c	2.3	0.44
0.95 c	3.2	3.12
0.99 c	7.1	0.14
0.995 c	10.0	0.10
0.9990 c	22.37	0.045
0.9995 c	31.63	0.032
1.0 c	∞	0

Note: 'c' is the speed of light.
Example: speed $= 0.1\ c = 3 \times 10^7\ m/s$

Generally Useful Constants and Equations:

$$speed\ of\ light\ =\ 300,000,000\ m/s = 3 \times 10^8\ m/s$$

$$1\ light - year = (speed\ of\ light) \times (1\ year)$$

$$speed\ of\ sound\ in\ air = 340\ m/s$$

$$Planck's\ Constant = 6.62 \times 10^{-34}\ J/Hz$$

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

Acceleration due to gravity...
on Earth = 10 m/s^2
on Mars = 3.7 m/s^2
on the Moon = 1.6 m/s^2

$20\ m/s\ =\ 45\ mph$ | $1\ mile/minute\ =\ 60\ mph$

$1\ hour = 3,600\ seconds$ | $1\ km\ = 1,000\ m = 0.6\ miles$

$1\ minute = 60\ seconds$ | $1\ g\ =\ 10\ m/s^2$

$1\ m/s = 3.6\ km/hour$ | $1\ Newton\ =\ 1\ \frac{kg\ m}{s^2}$

$1\ m\ =\ 3.2\ feet$ | $\frac{4}{5} = 0.800$

$\sqrt{200} = 14.14$ | $\frac{5}{3} = 1.667$

$1\ Joule\ = 1\ kg\ m^2/s^2$ | $\frac{1}{6} = 0.167$

$1\ \underline{C}alorie = 4,200\ J$ | $1\ \underline{C}alorie = 1,000\ \underline{c}alories$

$1\ MHz\ =\ 1,000,000\ Hz = \ 10^6\ Hz$ | $1\ Hz = 1\ \frac{cycle}{sec} = \frac{1}{sec}$