Final Exam for Physics 131 on Thursday, 30 June 2011 Name_____

Your course grade will be posted as soon as possible (probably Friday) on "One Port." If you would like your final course grade also sent to you by e-mail, please list your preferred e-mail address here

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I will grade all ten (10) problems. Your grade will be based on the best seven of the first eight. Problem 9 and problem 10 are optional and are each worth 4 points each for correct answers, with only a little partial credit for physics discovered.

$v_{xf} = v_{xi} + a_x t$

$x_f - x_i = v_x t = (1/2)(v_{xi} + v_{xf})\, t$

$x_f - x_i = v_{xi} t + (1/2) a_x t^2$

$v_{xf}^2 = v_{xi}^2 + 2a_x (x_f - x_i)$

$\omega_f = \omega_i + \alpha t$

$\theta_f - \theta_i = \omega t = (1/2)(\omega_i + \omega_f)\, t$

$\theta_f = \theta_i + \omega_i t + (1/2)\, \alpha\, t^2$

$\omega_f^2 = \omega_i^2 + 2\alpha(\theta_f - \theta_i)$

Read all the words!

Check all the units!

Distinguish between diameter and radius!

Conservation of angular momentum, $I_i \omega_i = I_f \omega_f$

Volume of sphere, $V = (4/3)\, \pi\, r^3$

Mass of earth, $M_E = 5.98 \times 10^{24}$ kg

Mean radius of earth, $R_E = 6.37 \times 10^6$ m

Gravitational Constant, $G = 6.672 \times 10^{-11}\ N \cdot m^2/kg^2$

Moment of inertia, I_{cm}, of cylinder/pulley/wheel, $\frac{1}{2} MR^2$

Moment of inertia, I_{cm}, of hoop, MR^2

$R = 8.31451$ J/mol K

Energy Transfer by Conduction, $\text{Power} = k A (T_{hot} - T_{cold}) / L$

Energy Transfer by Radiation, $\text{Power}_{net} = \sigma A e (T^4 - T_o^4)$

Linear expansion, $\alpha\, \Delta T = \Delta L / L_o$

Volume expansion, $\beta\, \Delta T = \Delta V / V_o$

Calorimetry, $\Delta Q = 0$

Torricelli, $v^2 = 2\,g\,h$

Bernoulli, $P_1 + (1/2)\rho v_1^2 + \rho g y_1 = P_2 + (1/2)\,\rho v_2^2 + \rho g y_2$

Pascal, $P_1 = P_2$, or $F_1 / A_1 = F_2 / A_2$

Continuity, $A_1\, v_1 = A_2\, v_2$

Pendulum, $T = 2\pi\,(L / g)^{1/2}$

Transverse waves, $v = (\text{Tension} / \mu)^{1/2}$

Carnot heat engine efficiency $e_c = 1 - (T_{cold} / T_{hot})$

Mass on spring, $T = 2\pi\,(m / k)^{1/2}$

Simple Harmonic Motion (SHM), $x = A \cos (2\,\pi\, f\, t)$

$PE_{spring} = \frac{1}{2}\, k\, x^2$

$N_A = 6.022 \times 10^{23}$ particles per mole

$v_{sound} = [331\ m/s]\ \{T\,(K) / 273\,K\}^{1/2}$

$K = {}^{o}C + 273.15$

Work <u>on</u> the gas: $W = -\,P\,\Delta V$. Work <u>by</u> the gas, $W = P\,\Delta V$.

$\Delta U = Q + W$, Q energy <u>to</u> the gas by heat from environment.

Ideal gas, $PV = nRT$

Volume of sphere = $4/3\,\pi\, r^3$

Pipe open both ends, $f_n = nv/2L$, $n = 1,2,3\ \ldots$

Pipe open one end, closed one end, $f_n = nv / 4L$, $n = 1,3,5\ldots$

$$f_{observer} = f_{source} \left\{ \begin{array}{l} v_{sound} + v_{observer} \text{ (if observer moving toward source)} \\ \quad \textbf{or} \\ v_{sound} \text{ (if observer not moving)} \\ \quad \textbf{or} \\ v_{sound} - v_{observer} \text{ (if observer moving away from source)} \end{array} \right\} \Big/ \left\{ \begin{array}{l} v_{sound} - v_{source} \text{ (if source is moving toward observer)} \\ \quad \textbf{or} \\ v_{sound} \text{ (if source not moving)} \\ \quad \textbf{or} \\ v_{sound} + v_{source} \text{ (if source is moving away from observer)} \end{array} \right\}$$