FINAL EXAM **PHYSICS 103** **SPRING 2011** **A**

NAME: ______________________________SIGNATURE__________________________________

As a student at NJIT I ___________________________________, will conduct myself in a professional manner and will comply with the provisions of the NJIT Academic Honor Code. I also understand that I must subscribe to the following pledge on major work submitted for credit as described in the NJIT Academic Honor Code:
On my honor, I pledge that I have not violated the provisions of the NJIT Academic Honor Code.

The exam is closed book and closed notes. Choose the answer that is the closest to your result

$T(^0C) = \frac{5}{9}[T(^0F) - 32]$; $T(^0F) = \frac{9}{5}T(^0C) + 32$; $T(K) = [T(^0C) + 273]$; 1 m = 100 cm = 1000 mm 1 hr = 3600 s

$\rho = \frac{m}{V}$; $P = \frac{F}{A}$; $p_h = \rho gh$; 1 atm = 1.013×10^5 Pa, $F_B = \rho gV_{im}$, $A_1v_1 = A_2v_2$

Av -volume flow rate $p_1 + \frac{1}{2}\rho v_1^2 + \rho gh_1 = p_2 + \frac{1}{2}\rho v_2^2 + \rho gh_2$ flow in horizontal pipe: $p_1 + \frac{1}{2}\rho v_1^2 = p_2 + \frac{1}{2}\rho v_2^2$

$L - L_0 = \alpha L_0 (T-T_0)$ $\sigma = Y\alpha (T-T_0)$ $V - V_0 = \beta V_0 (T-T_0)$; 1 Liter = 10^{-3} m^3 $V_{cube} = a^3$ $A_{circle} = \pi r^2$

Heat: $Q = mc(T - T_0)$, $Q = mL$, c - specific heat L - latent heat heat lost = heat gained

$c_{water} = 4186 \frac{J}{kg \cdot {}^0 C}$; $L_F = 3.33 \times 10^5 \frac{J}{kg}$; $c_{ice} = 2100 \frac{J}{kg \cdot {}^0 C}$

$\sigma = 5.67 \times 10^{-8}$ W/m^{2}K^4 R = 8.313 J/mol·K; $Q = kA\frac{T_1 - T_2}{L}t$

$\frac{\Delta Q}{\Delta t} = e\sigma AT_1^4$ $\frac{\Delta Q}{\Delta t} = e\sigma A(T_1^4 - T_2^4)$ $n = \frac{mass}{molecular - mass}$

Ideal Gas $PV = nRT$ $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$; $N_{av} = 6.02 \times 10^{23}$/mol T - temp. in kelvins, $\rho = \frac{m}{V}$,

Oscillations $x = A\cos(\omega t)$ $v = -\omega A\sin(\omega t)$ $\omega = 2\pi f = \frac{2\pi}{T}$ $F = kx$ period: $T_{spring} = 2\pi\sqrt{\frac{m}{k}}$; $f = \frac{1}{T}$

$\omega = \sqrt{\frac{k}{m}}$ $v_{max} = A\omega$ $E = \frac{1}{2}mv^2 + \frac{1}{2}kx^2$; $E = \frac{1}{2}kA^2$; $E = \frac{1}{2}m(v_m)^2$ waves: $v = \lambda f$; linear mass $\mu = \frac{m}{L}$;

$v = \sqrt{\frac{F}{\mu}}$ **Sound:** v = 343 m/s $I_0 = 10^{-12}$ W/m^2

$I = \frac{P}{A} = \frac{P}{4\pi r^2}$ $\beta = 10dB\log\frac{I}{I_0}$ $\beta_2 - \beta_1 = 10dB\log\frac{I_2}{I_1}$ $f = f_0\frac{343m/s \pm v_D}{343m/s \pm v_S}$

$\lambda = \frac{2L}{n}$ $f = \frac{v}{2L}n$ open: $\lambda = \frac{2L}{n}$ $f = \frac{v}{2L}n$ closed: $\lambda = \frac{4L}{n}$ $f = \frac{v}{4L}n$

Light: $n = \frac{c}{v}$ $\lambda = \lambda_0/n$ $c = 3 \times 10^8$ m/s $n_1\sin\theta_1 = n_2\sin\theta_2$ $n_1\sin\theta_{cr} = n_2\sin 90^0$ $d\sin\theta = m\lambda$; $y = D\frac{m\lambda}{d}$

Electricity: $R = \rho\frac{L}{A}$; $R = R_0[1 + \alpha(T - T_0)]$; $V = I*R$; $P = \frac{E}{\Delta t}$ $I = \frac{\Delta Q}{\Delta t} = \frac{Ne}{t}$; $e = 1.6 \times 10^{-19}$ C

$P = I^2R = \frac{V^2}{R} = I*V$; $U = CV^2 = Q^2/C$ $I_{rms} = \frac{V_{rms}}{R}$ $P_{av} = V_{rms}*I_{rms} = I_{rms}^2R = \frac{V_{rms}^2}{R}$ $F = \kappa\frac{q_1 \cdot q_2}{r_{12}^2}$

$R_{par} = \left(\frac{1}{R_1} + \frac{1}{R_2} + ...\right)^{-1}$ $R_{series} = R_1 + R_2 + ...$ $C_{series} = \left(\frac{1}{C_1} + \frac{1}{C_2} + ...\right)^{-1}$ $C_{par} = C_1 + C_2 + ...$