

Nathan Eyoawo

9) $\Delta x = v_{ix} \Delta t + \frac{1}{2} a \Delta t^2$

$\Delta x = v_{ix} \Delta t$

$\Delta y = v_{iy} \Delta t + \frac{1}{2} a \Delta t^2$

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$PE_i + KE_i = PE_f + KE_f$

$PE_i = U_s = \frac{1}{2} k x^2$

$KE = \frac{1}{2} m v_{ix}^2$

$\frac{1}{2} k x^2 = \frac{1}{2} m v_{ix}^2$

$v_{ix} = \sqrt{\frac{k x^2}{m}}$

$\frac{0.011 \text{ m}}{x} = 1.43 \text{ m} \quad \left. \begin{array}{l} \\ \\ \end{array} \right\} 47\%$
 $x = 2.2 \text{ m}$

$x = 0.02065$

$\Delta x = 2.20 \text{ m}$

$g = 10 \text{ m/s}^2$

$x_i = 0.011 \text{ m}$

$a = 0$

$v_{iy} = 0$

$\Delta x_i = 1.43 \text{ m}$

$\Delta x = \sqrt{\frac{k x^2}{m}} \Delta t$

$\left(\frac{\Delta x_i}{\Delta t} \right)^2 = \frac{k}{m}$

Compress By 2.065 cm

10) $R = .2 \text{ m}$ $m = 2 \text{ kg}$ $h = 3 \text{ m}$ $g = 10 \text{ m/s}^2$

a) $U_g = mgh$

$mgh = \frac{1}{2} m v^2$

$v = \sqrt{2gh}$

$v = 7.75 \text{ m/s}$

$a_c = \frac{v^2}{r} = 300 \text{ m/s}^2$

b) $KE_R = \frac{1}{2} I \omega^2 = \frac{1}{2} \left(\frac{1}{2} m R^2 \right) \omega^2 = \frac{1}{4} m R^2 \left(\frac{v}{R} \right)^2 = 30 \text{ J}$

$\omega = \frac{v}{r}$

$$11) \frac{PV}{T} = \frac{P'V'}{T'}$$

$$a) T_C = 300 \text{ K}$$

$$P_C = 1 \text{ ATM}$$

$$V_C = 2 \text{ Liters}$$

$$P_A = 4 \text{ ATM}$$

$$V_A = 0.5 \text{ Liters}$$

$$P_B = 4 \text{ ATM}$$

$$V_B = 2 \text{ Liters}$$

$$\frac{P_C V_C}{T_C} = \frac{P_A V_A}{T_A}$$

$$\frac{P_C V_C}{T_C} = \frac{P_B V_B}{T_B}$$

$$T_A = \frac{P_A V_A T_C}{P_C V_C} = 300 \text{ K}$$

$$T_B = \frac{P_B V_B T_C}{P_C V_C} = 1200 \text{ K}$$

$$b) W_{\text{on Gas}} = -nRT \ln\left(\frac{V_f}{V_i}\right)$$

$$n = .08$$

$$W_{\text{on Gas}} = -P\Delta V$$

$$PV = nRT$$

$$\frac{1.0 \cdot 10^5 (2 \cdot 10^{-3})}{300 (8.31)} = n$$

$$W_{A \rightarrow B} = -P(V_f - V_i) = -600 \text{ J}$$

$$W_{B \rightarrow C} = -P(V_f - V_i) = 0 \text{ J}$$

$$W_{C \rightarrow A} = -nRT \ln\left(\frac{V_f}{V_i}\right) = 277.26 \text{ J}$$

$$c) E_{\text{int}} = \frac{3}{2} nRT$$

$$E_{\text{int } A \rightarrow B} = \frac{3}{2} nR(T_B - T_A) = 900 \text{ J}$$

$$E_{\text{int } B \rightarrow C} = \frac{3}{2} nR(T_C - T_B) = -900 \text{ J}$$

$$E_{\text{int } C \rightarrow A} = \frac{3}{2} nR(T_A - T_C) = 0 \text{ J}$$

$$d) Q_{\text{in } A \rightarrow B} = T_B - T_A = 900 \text{ K}$$

$$Q_{\text{in } B \rightarrow C} = T_C - T_B = -900 \text{ K}$$

$$Q_{\text{in } C \rightarrow A} = 0 \text{ K}$$

$$e) e = \frac{W}{|Q_H|} =$$

Nathan Eyayaw

$$12) L = 10.8 \text{ ly} \quad v = 0.3c \quad c = 3 \times 10^8$$

$$\gamma = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} \quad \gamma = \frac{1}{\sqrt{1 - .3^2}} = 1.04828$$

$$a) x' = \gamma (x - vt) \quad t' = \gamma (t - \frac{v}{c^2} x)$$

$$L \gamma' = L_P \quad L_P = 10.802$$

$$u' = \text{Earth} = \frac{u' + v}{1 + \frac{vu'}{c^2}} = \frac{u' + .3c}{1 + \frac{.3u'}{c}} = \frac{u' + .3c}{1 + \frac{.3u'}{c}}$$

$$b) u' = \text{Probe} = \frac{u - v}{1 - \frac{uv}{c^2}}$$

c)