SPH3U Exam Review

Thermal Energy

NOTES

- Updated Marks
  - Markbook report
  - Some redos are included others have yet to be marked
- Labs
  - If they aren't ready to return tomorrow, see me next week and I'll have them
- Exam
  - Bring a pencil (needed for scantron card)
  - Bring a calculator
  - Bring your textbook to return

THERMAL ENERGY

- A 200.0 g bar of silver is heated to 90.0 ^{0}C. The hot silver is then placed into 300.0g of ethyl alcohol that has an initial temperature of 5.0 ^{0}C. Determine the final temperature of the mixture.

c ethyl alcohol 2.46×10^3 J/kg°C

c silver 2.4×10^2 J/kg°C

$$Q = mc\Delta T$$

$$\Delta T = T_f - T_i$$

$$Q_{lost\ (silver)} + Q_{gained\ (ethyl\ alcohol)} = 0$$

$$(0.2\,kg)\left(240 \frac{J}{kg\,^\circ C}\right)(T_f - 90) + (0.3\,kg)\left(2460 \frac{J}{kg\,^\circ C}\right)(T_f - 5) = 0$$

$$48 \frac{J}{^\circ C}(T_f - 90^\circ C) + 738 \frac{J}{^\circ C}(T_f - 5^\circ C) = 0$$

$$48\,\frac{J}{^\circ C}\,T_f - 4320\,J + 738\,\frac{J}{^\circ C}\,T_f - 3690\,J = 0$$

$$786\,\frac{J}{^\circ C}\,T_f = 8010\,J$$

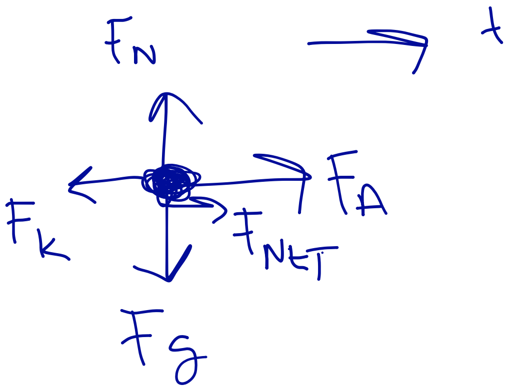
$$T_f = \frac{8010\,\cancel{J}}{786\,\cancel{J}/^\circ C}$$

$$T_f = 10.2\,^\circ C$$

$$\boxed{T_f = 1.0 \times 10^{1}\,^\circ C}$$

ANY OTHER QUESTIONS

Pg. 203 #49



$$F_{NET} = ma$$

$$F_N = F_g$$

$$F_N = mg$$

$$F_{NET} = F_A - F_k$$

$$ma = F_A - \mu_k mg$$

$$\left(2.53 \frac{m}{s^2}\right) m = 150 \text{ kg} \frac{m}{s^2} - (0.15)\left(9.8 \frac{m}{s^2}\right) m$$

$$\left(2.53 \frac{m}{s^2}\right) m = 150 \text{ kg} \frac{m}{s^2} - \left(1.47 \frac{m}{s^2}\right) m$$

$$\left(2.53 \frac{m}{s^2} + 1.47 \frac{m}{s^2}\right) m = 150 \text{ kg} \frac{m}{s^2}$$

$$\left(4 \ m/s^2\right) m = 150 \text{ kg } m/s^2$$

$$\mu_k = \frac{F_k}{F_N}$$

$$\mu_k = 0.15$$

$$F_k = \mu_k F_N$$

$$= \mu_k mg$$

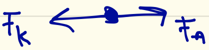
$$m = \frac{150\ \text{kg}\ \text{m/s}^2}{4\ \text{m/s}^2}$$

$$m = 37.5\ \text{kg}$$

$$m = 38\ \text{kg}$$

b) constant speed ∴ no acceleration

$$F_k = F_A$$



$$F_k = \mu_k F_N$$

$$150\ \text{kg}\frac{\text{m}}{\text{s}^2} = \mu_k m g$$

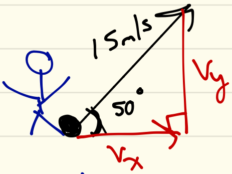
$$150\ \text{kg}\frac{\text{m}}{\text{s}^2} = \mu_k (37.5\ \text{kg})\left(9.8\frac{\text{m}}{\text{s}^2}\right)$$

$$150\ \text{kg}\ \text{m/s}^2 = \mu_k \left(367.5\ \text{kg}\frac{\text{m}}{\text{s}^2}\right)$$

$$\mu_k = \frac{150\ \text{kg}\ \text{m/s}^2}{367.5\ \text{kg}\ \text{m/s}^2}$$

$$\mu_k = 0.41$$

Pg 93 #39



$V_y = (15\,m/s)\sin 50°$

$V_y = 11\,m/s$

$V_x = (15\,\frac{m}{s})\cos 50°$

$V_x = 9.6\,m/s$

Pg 311 #35

$T_i = 28°$
$T_f = 440° C$
$Q = 1.2 \times 10^6 \ J$

glass $c = 8.4 \times 10^2 \ J/kg°C$

$Q = mc\Delta T$

$m = \frac{Q}{c\Delta T}$

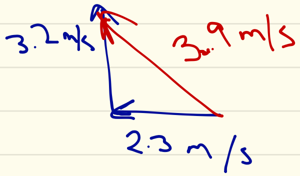
$= \frac{1.2 \times 10^6 \ J}{\left(8.4 \times 10^2 \frac{J}{kg°C}\right)(440 - 28°C)}$

$m = \frac{1.2 \times 10^6}{346\ 080} kg$

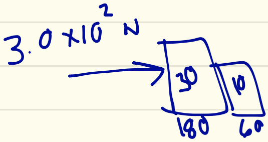
$m = 3.467 \ kg$

$m = 3,5 \ kg$

Pg 99 # 15



Pg 157 # 53



$\Delta t = 5.0\,s$ (pushing)

$F_{NET} = ma$

$F_{NET} = 300\,N - 240\,N$

$F_{NET} = 60\,N$

$F_{NET} = ma$

$ma = 60\,N$

$(40\,kg)\,a = 60\,kg\,m/s^2$

$a = \frac{60\,\cancel{kg}\,m/s^2}{40\,\cancel{kg}}$

$a = 1.5\,m/s^2 \rightarrow$

Average speed

$= \frac{dist}{time}$

Distance

① while force is applied

② while friction stops the boxes.

$F_{NET} = 240\,N \leftarrow$

$a = \frac{F_{NET}}{m}$

$a = \frac{240\,N \leftarrow}{40\,kg}$

$a = 6\,m/s^2 \leftarrow$

$\oplus \rightarrow$ $\leftarrow \ominus$

(1)

$a = 1,5\ m/s^2$

$\Delta t = 5.0\ s$

$v_i = 0\ m/s$

$v_f = ?$

$\Delta d = ?$

$v_f = v_i + a\Delta t$

$v_f = 0\ m/s + \left(1,5\ \frac{m}{s^2}\right)(5\ s)$

$v_f = 7,5\ m/s$

$v_f^2 = v_i^2 + 2a\Delta d$

$(7.5)^2 = 0 + 2(1.5)\Delta d$

$\Delta d = \frac{56,25}{3}$

$\Delta d = 18,75\ m$

(2)

$a = -6\ \frac{m}{s^2}$

$v_f = 0$

$v_i = 7.5\ m/s$

$\Delta d = ?$

$v_f^2 = v_i^2 + 2a\Delta d$

$0 = (7.5)^2 + -12\Delta d$

$12\Delta d = 56.25$

$\Delta d = 4.7\ m$

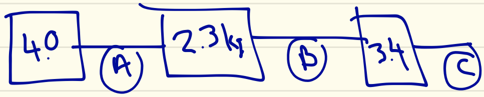
$\Delta d = 18.8\ m + 4.7\ m$

$\Delta d = 23.5\ m$

$\Delta d = 24\ m$

Pg 158 #67

$a = 1.1 m/s^2$



(C) $F_T = F_{NET}$

$= ma$

$= (9.7 kg)(1.1 m/s^2)$

$F_T = 11 N$

(B) $F_T = F_{NET}$

$= (6.3 kg)(1.1 m/s^2)$

$= 7 N$

$6.9 N$

(C) $F_T = F_{NET}$

$= (4 kg)(1.1 m/s^2)$

$= 4.4 N$

$= 4 N$