

Exercises in Physics
Assignment # 12

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P1.

$$\begin{aligned}p &= mv \\&= 0.06 \times 600 \\&= 36 \text{ kg} \cdot \text{m/s} \\v &= \frac{p}{m} \\&= \frac{36}{20} \\&= 1.8 \text{ m/s}\end{aligned}$$

$$\begin{aligned}E_k &= \frac{1}{2}mv^2 \\E_k &= \frac{1}{2} \times 20 \times 1.8^2 \\&= 32.4 \text{ J}\end{aligned}$$

$$\begin{aligned}U &= mgh \\32.4 &= 20 \times 9.81h \\h &= 0.165 \text{ m} \\\theta &= \cos^{-1} \frac{2-0.165}{2} = 23.44^\circ\end{aligned}$$

P2.

$$\begin{aligned}p_1 &= mv \\&= 0.06 \times 15 \\&= 0.9 \text{ kg} \cdot \text{m/s}\end{aligned}$$

$$\begin{aligned}p_2 &= mv \\&= 0.06 \times 22 \\&= 1.32 \text{ kg} \cdot \text{m/s}\end{aligned}$$

$$\Delta p = 1.32 - 0.9 = 0.42 \text{ kg} \cdot \text{m/s}$$

$$F = \Delta p / \Delta t$$

$$= 8.4 \text{ N}$$

P3.

$$v_f^2 = v_i^2 + 2as$$

$$v_f^2 = 0 + 2 \times 9.81 \times 2.1$$

$$v_i = 6.42 \text{ m/s}$$

$$v_f^2 = v_i^2 + 2as$$

$$0 = v_i^2 - 2 \times 9.81 \times 1.1$$

$$v_i = 4.65 \text{ m/s}$$

E

$$E_k = \frac{1}{2}mv^2$$

$$\Delta E_k = \frac{1}{2}m6.42^2 - \frac{1}{2}m4.65^2$$

$$= 20.61m - 10.81m$$

$$= 9.8m \text{ J}$$

$$e = \frac{4.65}{6.42} = 0.72$$

P4.

$$(v_x)_1 = \cos \alpha \times 15$$

$$(v_x)_2 = \cos \alpha \times 7.5$$