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PHYS 211X
Lab 6: Momentum, 3/7/2023, Partners: Maite Valentin-Lugo, Seth Waln

1.

$$\begin{aligned} p_i &= m \cdot v_{ix} \\ p_f &= (M+m) \cdot v_{fx} \\ v_{ix} &= \frac{p_f}{m} \\ &= \boxed{\frac{(M+m) \cdot v_{fx}}{m}} \end{aligned}$$

2.

$$E_i = \frac{1}{2}(M+m)(v_{fx})^2$$

3.

$$\begin{aligned} E_f &= \frac{1}{2}(M+m)(g)(\Delta h) \\ E_i &= E_f \\ V_{ix} &= \sqrt{2g\Delta h} \\ v_{ix} &= \frac{(M+m) \cdot v_{fx}}{m} = \boxed{\frac{(M+m)\sqrt{2g\Delta h}}{m}} \end{aligned}$$

4.

$$\begin{aligned} y - y_0 &= y_1 \\ y_l &= \frac{1}{2}gt^2 \\ t &= \boxed{\sqrt{\frac{2y_1}{g}}} \end{aligned}$$

5.

$$\begin{aligned} \Delta x &= v_{ix} \cdot t \\ \Delta x &= \frac{(M+m)\sqrt{2g\Delta h}}{m} \cdot \boxed{\sqrt{\frac{2y_1}{g}}} \end{aligned}$$

6.

$$\begin{aligned} m &= 0.0661 \pm 0.00005kg \\ M &= 0.1648 \pm 0.00005kg \end{aligned}$$

7.

8.

9.

10.

$$\Delta x \overset{\text{Excel}}{=} 1.9187m$$

11. $\delta x = \sqrt{\left(\frac{2}{0.0661}\sqrt{1.9187 \cdot 1.282}(0.00005)\right)^2 + \left(\frac{-2(0.1648)}{0.0661^2}\sqrt{1.9187 \cdot 1.282}(0.00005)\right)^2 + \left(\frac{2}{0.0661}\sqrt{1.9187 \cdot 1.282}(0.00005)\right)^2 +}$