

Phys 202A

Quiz 2 - January 22, 2010

Points: 10

Name _____

- 1) A package of mass m is released from rest at a warehouse loading dock and slides down a 3.0m high frictionless chute to a waiting truck. Unfortunately, the driver went on a break without removing the previous package of mass $2m$ from the bottom of the chute.



- a) Suppose the packages stick together. What is their common speed after the collision? (2 points)

$$m v_{1A} + 0 = (m + 2m)V \quad mgh = \frac{1}{2} (m + 2m) v_{1A}^2$$

$$m \sqrt{2gh} = 3mV \quad v_{1A} = \sqrt{2gh}$$

$$v_{AB} = \frac{1}{3} \sqrt{2gh} = \frac{1}{3} \sqrt{6 \times 9.8 \text{ m/s}^2} = 2.6 \text{ m/s}$$

- b) Suppose the collision between the packages is elastic. To what height does the package of mass m rebound? (4 points)

$$v_{A2} = \frac{m_A - m_B}{m_A + m_B} v_{A1} + \frac{2m_B}{m_A + m_B} v_{B1}$$

$$v_{A2} = \frac{-m}{3m} v_{A1} = -\frac{1}{3} \left(\frac{m}{m} \sqrt{2gh} \right) = -\frac{1}{3} \sqrt{2gh}$$

$$\frac{1}{2} m v_{A2}^2 = mgh'$$

$$\frac{1}{2} \left(-\frac{1}{3} \sqrt{2gh} \right)^2 = gh'$$

$$\frac{1}{2} \left(\frac{1}{9} \right) 2gh = gh'$$

$$\Rightarrow \frac{1}{9} h = h' \quad \sim 33 \text{ cm}$$

$$h' = \frac{h}{9} \sim 33 \text{ cm}$$