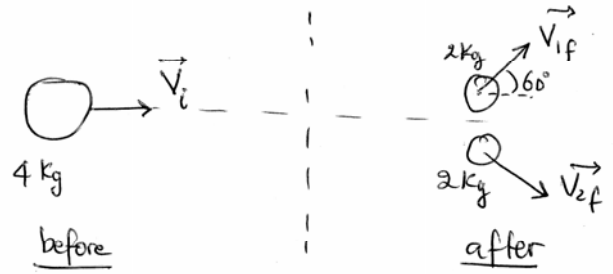
PHYS101.15
QUIZ#8- CHAPTER 9
DATE: 10/5/09

Name: Key Id#:

Consider a 4.0 kg mass having a velocity of (4.0 **i**) m/s that explodes into two 2.0 kg masses. After the explosion, one of the masses has a velocity of 3.0 m/s making an angle of 60 degrees with the positive x-axis.
(a) What is the magnitude of the velocity of the other mass after the explosion?
(b) What is the velocity of the center of mass?



a) No external forces $\Rightarrow \vec{P}_i = \vec{P}_f$

x-axis : $4 \times 4 = 2 \times 3 \cos 60^\circ + 2 \times V_{2x}$

$\Rightarrow V_{2x} = 6.5$ m/s

y-axis : $0 = 2 \times 3 \sin 60^\circ - 2 \times V_{2y}$

$\Rightarrow V_{2y} = 2.6$ m/s

$V_2 = \sqrt{(6.5)^2 + (2.6)^2} = \boxed{7 \text{ m/s}}$

b) $V_{cm} = \text{Const}$ $\qquad V_{cm} = 4$ m/s

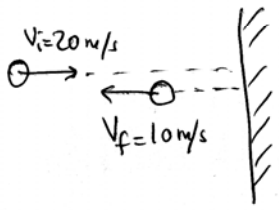
$\Rightarrow$ before $\vec{V}_{cm} = 4\,\hat{i}$ m/s

$\Rightarrow$ after $\vec{V}_{cm} = 4\,\hat{i}$ m/s

PHYS101.14
QUIZ#8- CHAPTER 9
DATE: 12/5/09

Name: Key Id#:

A 2.0 kg ball moving horizontally with a velocity 20 **i** (m/s) strikes a vertical wall. It bounces off with a velocity −10 **i** (m/s).
(a) What is the change in momentum of the ball?
(b) If the ball is in contact with the wall for 0.30 s, what is the magnitude of the average force exerted on the ball by the wall?



a) $\Delta\vec{p} = \vec{p_f} - \vec{p_i}$

$= m\,(\vec{v_f} - \vec{v_i}) = 2\,[-10\hat{i} - (20\hat{i})]$

$= \boxed{-60\,\hat{i} \quad kg.m/s}$

b) $\vec{F} = \frac{\Delta\vec{p}}{\Delta t} = \frac{-60\hat{i}}{0.3} = \boxed{-200\hat{i}\,(N)}$

PHYS101.13
QUIZ#8- CHAPTER 9
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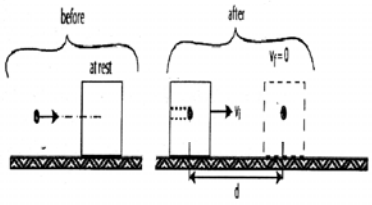
Name: Key Id#:

A 20 gram bullet is shot in the +x-direction with a speed of V_o = 600 m/s into a stationary block of wood that has a mass of 4.0 kg. The bullet embeds itself in the block. What distance (d) will the block slide on a surface having a coefficient of kinetic friction equal to 0.4?



No external forces

$$\vec{P}_i = \vec{P}_f$$

$$m V_b = (m+M) V$$

$$0.02 \times 600 = (0.02+4) V \Rightarrow \boxed{V = 2.98 \text{ m/s}}$$

$$\Delta K + \cancel{\Delta U_g}^{\,0} + \cancel{\Delta U_s}^{\,0} = W_f$$

$$0 - \frac{1}{2}(\cancel{m+M}) V^2 = -\mu_k (\cancel{m+M}) g d$$

$$d = \frac{V^2}{2 g \mu_k} = \boxed{1.1 \text{ m}}$$