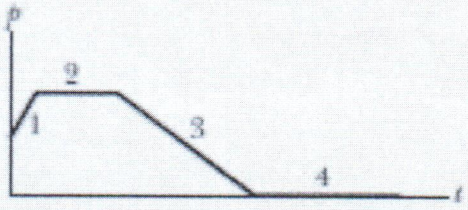
QUIZ#8- CHAPTER 9
DATE: 4/11/19

Name: Key Id#: Sect.#:

1.

The figure gives the magnitude p of the linear momentum versus time t for a particle moving along an axis. A force directed along the axis acts on the particle. (a) Rank the four regions indicated according to the magnitude of the force, greatest first. (b) In which region is the particle slowing?

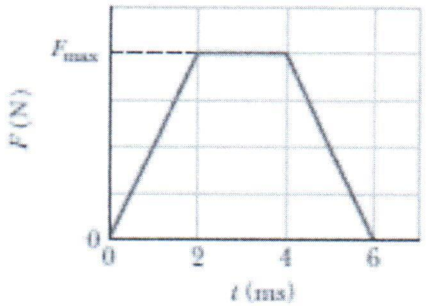


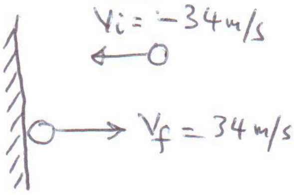
a) $F = \frac{dp}{dt}$ = slope of P vs. t curve

1, 3, 2 & 4 tie

b) 3, momentum is decreasing in this region.

2. The figure shows an approximate plot of force magnitude F versus time t during the collision of a 58 g ball with a wall. The initial velocity of the ball is 34 m/s perpendicular to the wall; the ball rebounds directly back with the same speed, also perpendicular to the wall.
What is F_{max}, the maximum magnitude of the force on the ball from the wall during the collision?





$\Delta p = m v_f - m v_i$ = area

$0.058(34 - (-34))$ = area

$3.944 = 10^{-3}\left(\frac{1}{2} \times 2 \times F_{max} + 2 \times F_{max} + \frac{1}{2} \times 2 \times F_{max}\right) = 4 F_{max} 10^{-3}$

$\boxed{F_{max} = 986\text{ N}}$

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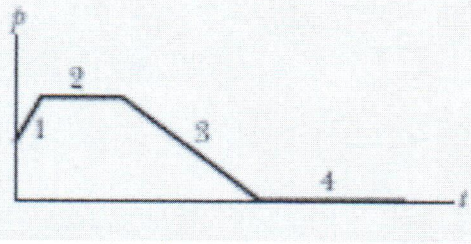
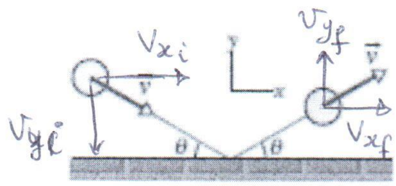


a) $F = \frac{dp}{dt}$ = slope of the curve p vs. t

1, 3, 2 & 4 tie

b) 3 because momentum is decreasing

2. In the overhead view of the figure, a 300 g ball with a speed v = 6.0 m/s strikes a wall at an angle $\theta = 30^0$ and then rebounds with the same speed and angle. It is in contact with the wall for 10 ms. In unit vector notation, what are:
   (a) the impulse on the ball from the wall



$\vec{J} = \Delta\vec{p}$ < $J_x = \Delta p_x$, $J_y = \Delta p_y$

$J_x = m(v_{xf} - v_{xi}) = 0.3(6\cos 30^\circ - 6\cos 30^\circ) = 0$

$J_y = m(v_{yf} - v_{yi}) = 0.3(6\sin 30^\circ - (-6\sin 30^\circ)) = 1.8\ \text{kg}\cdot\frac{m}{s}$

$\boxed{\vec{J} = 0\hat{i} + 1.8\hat{j}}$ kg. m/s

(b) the average force on the wall from the ball?

$\vec{F}_{avg} = \frac{\vec{J}}{\Delta t} = \frac{1.8}{10\times10^{-3}}\hat{j} = \boxed{180\hat{j}}$ N

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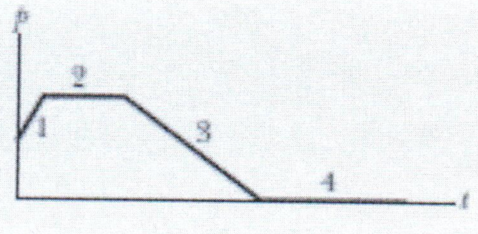


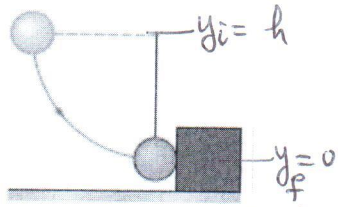
a) $F = \frac{dp}{dt}$ = slope of p vs. t curve

1, 3, 2 & 4 tie

b) 3 momentum decreasing.

2. A ball of mass m_1 =0.50 kg is fastened to a cord that is 70 cm long and fixed at the far end. The ball is then released when the cord is horizontal. At the bottom of its path, the ball strikes a block of mass m_2 = 2.50 kg initially at rest on a frictionless surface. The collision is elastic. Find:

(a) the speed of the ball just after collision.



ball : $\Delta K + \Delta U_g = 0$ (before the collision)

$\left(\frac{1}{2} m_1 v_f^2 - 0\right) + m_1 g (0 - h) = 0$

$v_f = \sqrt{2gh} = 3.7$ m/s ⇐ this velocity becomes initial during the collision

$v_{1f} = \frac{m_1 - m_2}{m_1 + m_2} v_{1i} + \frac{2 m_2}{m_1 + m_2} v_{2i}^{\;0} = \boxed{-2.47 \text{ m/s}}$

(b) the speed of the block just after the collision.

$v_{2f} = \frac{2 m_1}{m_1 + m_2} v_{1i} + \frac{m_2 - m_1}{m_1 + m_2} v_{2i}^{\;0} = \boxed{1.23 \text{ m/s}}$