Ch. 6 Homework Solutions

304
Phy 101

Ch. 6 Momentum

Homework ①

Questions
4, 7, 15, 18, 20, 27, 28,
33, 34, 37, 39

Exercises
1, 3, 5, 7, 9, 13, 14, 17, 18, 20

Questions:

(4.) A parked car has no velocity & thus no momentum.

(7.) Impulse = $F\Delta t = (ma)\Delta t = \Delta(mv)$

if the person was moving at the same speed & his or her mass is a constant, then the $\Delta(mv)$ is the same. — Same impulse

(15.) 12oz gloves have more stuffing & so would increase the time it takes to stop a blow, so there is less force for the same change in momentum.

(18.) The ball's momentum increases as it falls. When it strikes the floor, it reverses direction, as the floor provides the impulse. Then the ball's momentum decreases as it comes back up.

Ch. 6 HW

Q's

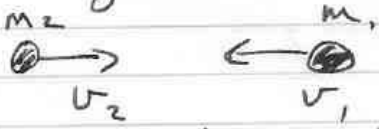
(20.) $F_1 = 6N$ for $\Delta t_1 = 3sec$

$F_2 = 4N$ for $\Delta t_2 = 5sec$

$Impulse_1 = F_1 \Delta t_1 = (6N)(3sec) = 18Nsec$

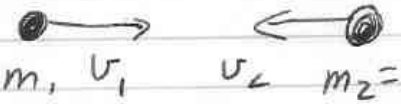
$Imp._2 = (4N)(5sec) = \boxed{20Nsec}$ larger

(27.) Two objects $m_1 = m_2$, $v_1 = v_2$



Result: If 2 stick together, their momentums are equal but in opposite directions initially so after collision the total momentum is zero & they stop moving.

(28.)



$v_2 = v_1$

$p_1 = m_1 v_1$ $\quad p_2 = m_2 v_2 = 3m_1 v_1$

$p_2 = 3p_1$

p_{before}

$\Sigma p = p_1 - p_2 = -2p_1$

$p_{after} = -2p_1 = -2m_1 v_1 = (m_1 + m_2) v_f$

They 2 balls will be moving to the left after colliding & sticking together.

Ch 6 HW

Q's

(33.)

Before Release $p_{bef} = 0$

after Release $p_{aft} = 0$

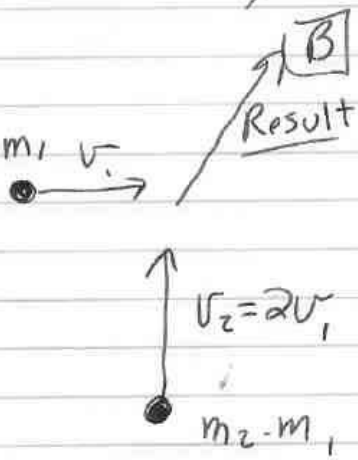
(34.)

$p_{after} = 0 = m_2 v_2 - m_1 v_1$

$0 = 2m_1 v_2 - m_1 (2\,m/s)$

$v_2 = \frac{2m_1\,(m/s)}{2m_1} = \boxed{1\,m/s = v_2}$

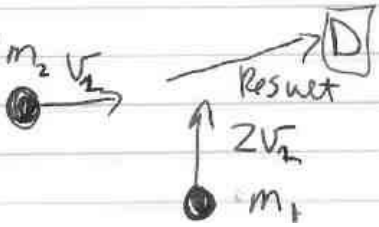
(37.)



$p_2 = 2p_1$ but in different directions

P total will be mostly North by East

(39.)



$p_2 = 3m_2 v_2$ $p_2 > p_1$

$p_1 = m_1 (2v_2)$

Result mostly East by North

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(4)

E's

(1.) $p = mv = 1200\,kg\,(30\,m/s) = \boxed{36000\,kg\,m/s = p}$

(3.) $p_{bullet} = mv = (0.01\,kg)(900\,m/s) = 9\,kg\,m/s$

$p_{baseball} = 9\,kg\,m/s = mv$

$v_{BB} = \frac{9\,kg\,m/s}{0.145\,kg} = \boxed{62\,m/s}$

(5.) $F\Delta t = Impulse = \Delta(mv)$

$F = \frac{\Delta(mv)}{\Delta t} = \frac{1500\,kg\,(30\,m/s - 0)}{8\,s} = \boxed{5625\,N}$

(7.) $Impulse = \Delta(mv) = 1400\,kg\,(25\,m/s - 0) = \boxed{35000\,kg\,m/s}$

(13.) Father $m = 80\,kg$, $v_f = ?$ Son $m_s = 40\,kg$, $v_s = -3\,m/s$

$p_{before} = 0 = p_{after} = m_f v_f - m_s v_s$

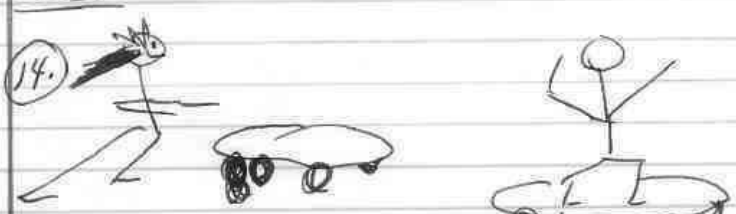
$v_f = \frac{m_s v_s}{m_f} = \frac{(40\,kg)(3\,m/s)}{80\,kg} = \boxed{1.5\,m/s = v_f}$

Ch 6e HW

SOY
Phy 101

E's

14.



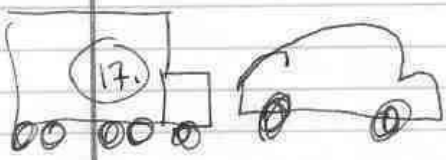
$v_w = 6\,m/s$ $\quad v_s = 0$ $\quad v_f = ?$

$m_w = 50\,kg$ $\quad m_s = 30\,kg$

$P_{before} = v_w m_w = 50kg(6m/s) = 300\ kg\ m/s$

$P_{after} = P_{bef} = 300\ kg\ m/s = (m_w + m_s)v_f$

$$v_f = \frac{300\,kg\,m/s}{80kg} = \boxed{3.75\,m/s}$$



17.

$P_{before} = m_T v_T + m_C v_C = (2000kg)25m/s + (1200kg)(14m/s)$

$P_{bef} = P_{aft} = \boxed{66\,800\ kg\ m/s}$

18. $P_{after} = 66,800\ kgm/s = (m_T + m_C)v_f$

$$v_f = \frac{66,800\ kgm/s}{(3200kg)} = \boxed{20.9\,m/s}$$

Ch. 6 HW

E's

(20.)

$v = 10\ m/s$ $\qquad$ $v = 0$

$m = 18{,}537\ kg$

$p_{bef} = m_1 v_1 = 18{,}537\ kg\,(10\ m/s) = 185{,}370\ kg\,m/s$

$p_{aft} = (4m)v_f = 185{,}370\ kg\,m/s$

$$v_f = \frac{185{,}370\ kg\,m/s}{4(18{,}537\ kg)} = \boxed{2.5\ m/s}$$