

p. 240 19, 20

p. 245 27, (30), (31)

p. 250 38, 40, (42), (52), 53, (54), 55

p. 252 73, 74, 77, 78, 80, 84

(19) $(m_r + m_f) = 4.00 \text{ kg}$
 $m_f = .050 \text{ kg}$
 $m_r = 3.95 \text{ kg}$
 $v_{if} = 0 \text{ m/s}$
 $v_{ir} = 0 \text{ m/s}$
 $v_{ff} = 625 \text{ m/s}$

$$m_f v_{if} + m_r v_{ir} = m_f v_{ff} + m_r v_{fr}$$

$$(m_f + m_r) v_i = m_f v_{ff} + m_r v_{fr}$$

$$v_{fr} = \frac{-m_f v_{ff}}{m_r}$$

$$= \frac{-(.050)(625)}{3.95}$$

$$= -7.91 \text{ m/s}$$

(20) $m_1 = 1.5 \text{ kg}$
 $m_2 = 4.5 \text{ kg}$
 $v_i = 0 \text{ m/s}$
 $v_{f1} = -.27 \text{ m/s}$
 $v_{f2} = ?$

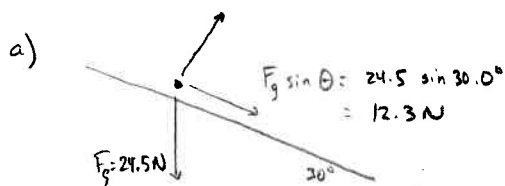
$$(m_1 + m_2) v_i = m_1 v_{f1} + m_2 v_{f2}$$

$$v_{f2} = \frac{-m_1 v_{f1}}{m_2}$$

$$= \frac{-(1.5)(-.27)}{4.5}$$

$$= .09 \text{ m/s}$$

(27) $F_g = 24.5 \text{ N}$ $m_1 = 2.50 \text{ kg}$
 $F_{g2} = 36.8 \text{ N}$ $m_2 = 3.76 \text{ kg}$
 $\Delta d = 1.00 \text{ m}$



$$\Sigma F = ma$$

$$12.3 = 2.50 a$$

$$a = 4.92 \text{ m/s}^2$$

$$\Delta d = 1.00 \text{ m}$$

$$v_{f1}^2 = v_i^2 + 2a\Delta d$$

$$v_f = 3.13 \text{ m/s}$$

b) $m_1 = 2.50 \text{ kg}$
 $m_2 = 3.76 \text{ kg}$
 $v_{i1} = 3.13 \text{ m/s}$
 $v_{i2} = 0 \text{ m/s}$
 $v_f = ?$

$$m_1 v_{i1} + m_2 v_{i2} = (m_1 + m_2) v_f$$

$$v_f = \frac{m_1 v_{i1} + m_2 v_{i2}}{(m_1 + m_2)}$$

$$= \frac{(2.50)(3.13)}{(2.50 + 3.76)} = 1.25 \text{ m/s}$$

(73) $m_f = 95 \text{ kg}$ $m_d = 128 \text{ kg}$
 $v_{if} = 8.2 \text{ m/s}$ $v_{id} = ?$
 $v_f = 0 \text{ m/s}$

b) $P_{if} = m_f v_{if}$
 $= (95)(8.2)$
 $= 780 \text{ kg} \cdot \text{m/s}$

c) $F \Delta t = m_f v_{ff} - m_f v_{if}$
 $= 0 - 780$
 $= -780 \text{ kg} \cdot \text{m/s}$

d) same impulse in a collision
 $780 \text{ kg} \cdot \text{m/s}$

e) $-780 \text{ kg} \cdot \text{m/s}$

f) $P_{id} = m_d v_{id}$

$$-780 = (128) v_{id}$$

$$v_{id} = -6.1 \text{ m/s}$$

(74) $m_c = .005 \text{ kg}$ $m_D = .010 \text{ kg}$
 $v_{ic} = .20 \text{ m/s}$ $v_{iD} = .10 \text{ m/s}$
 $v_{fc} = .08 \text{ m/s}$ $v_{fD} = ?$

b) $P_{ic} = m_c v_{ic}$
 $= (.005)(.20)$
 $= .001 \text{ kg} \cdot \text{m/s}$

$P_{iD} = m_D v_{iD}$
 $= (.010)(.10)$
 $= .001 \text{ kg} \cdot \text{m/s}$

c) $P_{fc} = (.005)(.08)$
 $= .0004 \text{ kg} \cdot \text{m/s}$

d) $m_c v_{ic} + m_D v_{iD} = m_c v_{fc} + m_D v_{fD}$
 $.001 + .001 = .0004 + (.010) v_{fD}$
 $v_{fD} = \frac{.002}{.010}$
 $= .2 \text{ m/s}$

77. $m_b = .012 \text{ kg}$ $m_c = 8.5 \text{ kg}$
 $v_{ib} = 150 \text{ m/s}$ $v_{ic} = 0 \text{ m/s}$
 $v_{fb} = -100 \text{ m/s}$ $v_{fc} = ?$

$$m_b v_{ib} + m_c v_{ic} = m_b v_{fb} + m_c v_{fc}$$

$$v_{fc} = \frac{m_b v_{ib} - m_b v_{fb}}{m_c}$$

$$= \frac{(.012)(150) - (.012)(-100)}{8.5}$$

$$= \frac{(1.8) + (1.2)}{8.5}$$

$$= .35 \text{ m/s}$$

78. $m_k = 42.00 \text{ kg}$ $m_b = 2.00 \text{ kg}$
 $v_i = 1.20 \text{ m/s}$
 $v_{fk} = ?$ $v_{fb} = 0 \text{ m/s}$

$$(m_k + m_b) v_i = m_k v_{fk} + m_b v_{fb}$$

$$v_{fk} = \frac{(m_k + m_b) v_i}{m_k}$$

$$= \frac{52.8}{42.00}$$

$$= 1.26 \text{ m/s}$$

80. $m_v = 2575$ $m_c = 825 \text{ kg}$
 $v_{iv} = ?$ $v_{ic} = 0 \text{ m/s}$
 $v_f = 8.5 \text{ m/s}$

$$m_v v_{iv} + m_c v_{ic} = (m_v + m_c) v_f$$

$$v_{iv} = \frac{(m_v + m_c) v_f}{m_v}$$

$$= \frac{(2575 + 825) 8.5}{2575}$$

$$= \frac{27000}{2575}$$

$$= 11 \text{ m/s}$$

84. $m_c = 625 \text{ kg}$
 $v_{ic} = 10.0 \text{ m/s}$
 $v_{fc} = 44.0 \text{ m/s}$
 $\Delta t = 68.0 \text{ s}$

a) $\Delta m v = m v_{fc} - m v_{ic}$

$$= (625)(44.0 - 10.0)$$

$$= 21300 \text{ kg} \cdot \text{m/s}$$

b) $F \Delta t = 21300 \text{ kg} \cdot \text{m/s}$

$$F = \frac{21300}{68.0}$$

$$= 313 \text{ N}$$