

Textbook

p. 237-239 "Problems" 1, 3ab, 4, 6, 8, 10, 13, 14, 16, 20, 24, 25, 30

1.  $E_k = \frac{1}{2}mv^2 = \frac{1}{2}(1600)(12.5)^2 = 125,000 \text{ J} \quad (1.25 \times 10^5 \text{ J})$

3. a)  $E_k = \frac{1}{2}(45)(10)^2 = 2250 \text{ J}$

b)  $E_k = \frac{1}{2}(45)(5)^2 = 562.5 \text{ J} = 563 \text{ J}$

4.  $m = 45 \text{ kg}$

$$v = \frac{1800 \text{ m}}{(10 \times 60 \text{ s})} = \frac{1800}{600} = 3 \text{ m/s} \quad E_k = \frac{1}{2}(45)(3)^2 = 202.5 \text{ J} = 203 \text{ J}$$

6.  $m = 40.0 \text{ kg}$

$v_i = 0$

$d = 22.0 \text{ m}$

$v_f = 62.0 \text{ m/s}$

a)  $F = ? \quad F \cdot d = \Delta E_k$

$F(22) = \frac{1}{2}(40)[(62)^2 - 0]$

$$\frac{22F}{22} = \frac{76880}{22}$$

$F = 3494.5 \text{ N}$

$$= 3495 \text{ N} \quad 3500 \text{ N}$$

b)  $E_{kf} = \frac{1}{2}(40)(62)^2$

$= 76,880 \text{ J}$

$$76,900 \text{ J}$$

8.  $m = 2.50 \times 10^4 \text{ kg}$

$F = 5.00 \times 10^5 \text{ N}$

$d = 500 \text{ m}$

a)  $W = F \cdot d = (5.00 \times 10^5)(500) = 2.5 \times 10^8 \text{ J}$

b)  $\Delta E_k = ? \quad W = \Delta E_k = 2.5 \times 10^8 \text{ J}$

c)  $\Delta E_k = E_{kf} - E_{ki} \quad E_{kf} = 2.5 \times 10^8 \text{ J}$

d)  $E_{kf} = \frac{1}{2}mv_f^2 \quad 2.5 \times 10^8 = \frac{1}{2}(2.50 \times 10^4)v_f^2$

$$v_f = \sqrt{20,000} = 141 \text{ m/s}$$

10.  $m = 15.0 \text{ kg}$

$v_i = 7.50 \text{ m/s}$

$F = -10.0 \text{ N}$

$v_f = 3.20 \text{ m/s}$

a)  $\Delta E_k = \frac{1}{2}m(v_f^2 - v_i^2) = \frac{1}{2}(15)(3.20^2 - 7.5^2) = -345.075$

$$= -345 \text{ J}$$

b)  $W = \Delta E_k = -345 \text{ J}$

c)  $d = ? \quad W = F \cdot d \quad d = \frac{-345.075}{-10.0} = 34.5 \text{ m}$

13.  $m = 6.4 \text{ kg}$   
 $h_f = 2.1 \text{ m}$

$$\Delta E_p = mg(h_f - h_i) = (6.4)(9.8)(2.1 - 0) = 131.7 \text{ J}$$

130 J

②

14.  $F_g = 500 \text{ N}$   
 $\Delta h = -5.50 \text{ m}$

$$\Delta E_p = mgh = (500)(-5.50) = -2750 \text{ J}$$

16.  $m = 10.0 \text{ kg}$   
 $E_{ki} = 1960 \text{ J}$   
 $h = ?$

$$E_{pi} + E_{ki} = E_{pf} + E_{kf}$$

$$1960 = mgh$$

$$h_f = \frac{1960}{(10.0)(9.8)} = 20 \text{ m}$$

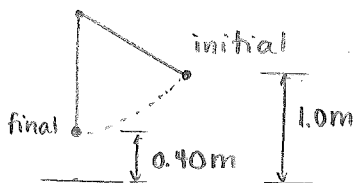
20.  $F_g = 98 \text{ N}$   
 $h_f = 50 \text{ m}$   
 $h_i = 0$

a)  $W = \Delta E_p = mg(h_f - h_i)$   
 $= (98)(50 - 0)$   
 $= 4900 \text{ J}$

b)  $W = \Delta E_p = 4900 \text{ J}$

c)  $E_{pi} + E_{ki} = E_{pf} + E_{kf}$   
 $4900 \text{ J} = E_{kf}$

24.  $F_g = 420 \text{ N} = mg$



$$m = \frac{420}{9.8} = 42.857$$

a)  $E_{pi} + E_{ki} = E_{pf} + E_{kf}$   
 $(V_i = 0)$

$$mgh_i = mgh_f + \frac{1}{2}mV_f^2$$

$$(420)(1.0) = (420)(0.40) + \frac{1}{2}(42.857)(V_f^2)$$

$$420 = 168 + 21.429 V_f^2$$

$$\frac{252}{21.429} = \frac{21.429}{21.429} V_f^2$$

$$V_f = \sqrt{11.76}$$
  
 $= 3.4 \text{ m/s}$

b) if  $V_f = 2.0 \text{ m/s}$  what is  $E_H$ ?

$$E_{pi} + E_{ki} = E_{pf} + E_{kf} + E_H$$
  
 $(V_i = 0)$

$$420 = 168 + \frac{1}{2}(42.857)(2.0)^2 + E_H$$

$$252 = 85.714 + E_H$$

$$E_H = 166.29 \text{ J}$$

$$E_H = 166 \text{ J}$$

25.  $m = 10.0g = 0.01 \text{ kg}$   
 $h_i = 2.0 \text{ m}$      $h_f = 0$   
 $V_f = 7.5 \text{ m/s}$   
 $V_i = ?$

$$E_{pi} + E_{ki} = \cancel{E_{pf}} + E_{kf}$$

( $h_f = 0$ )

$$\rho gh_i + \frac{1}{2} \rho V_i^2 = \frac{1}{2} \rho V_f^2$$

$$(9.8)(2.0) + \frac{1}{2} V_i^2 = \frac{1}{2} (7.5)^2$$

$$19.6 + 0.5 V_i^2 = 28.125$$

$$\begin{array}{r} -19.6 \\ \hline \end{array}$$

$$\frac{0.5 V_i^2}{0.5} = \frac{8.525}{0.5}$$

$$V_i = \sqrt{17.05}$$

$V_i = 4.1 \text{ m/s}$

30.  $h = ?$

$$V_f = 100 \text{ km/hr} = 27.7 \text{ m/s}$$

$$E_{pi} + \cancel{E_{ki}} = \cancel{E_{pf}} + E_{kf}$$

( $V_i = 0$ )    ( $h_f = 0$ )

$$\rho gh_i = \frac{1}{2} \rho V_f^2$$

$$9.8 h_i = 0.5 (27.7)^2$$

$$h_i = \frac{385.80}{9.8} = 39.37 \text{ m} = 39 \text{ m}$$

p. 262 "Problems" # 4, 6, 8

4.  $m = 50.0g = 0.050 \text{ kg}$   
 $t_i = 4.5^\circ\text{C}$      $t_f = 83.0^\circ\text{C}$   
 water

$$E_H = mc\Delta t = (0.050)(4180)(83 - 4.5)$$

$$= 16406.5 \text{ J} = 1.64 \times 10^4 \text{ J}$$

table 12-1

6.  $m = 5.00 \times 10^2 \text{ g} = 0.5 \text{ kg}$   
 $E_H = 5016 \text{ J}$   
 $t_i = 20.0^\circ\text{C}$      $t_f = 30.0^\circ\text{C}$

$$c = ?$$

$$E_H = mc\Delta t$$

$$5016 = (0.5)c(30.0 - 20.0)$$

$$\frac{5016}{5} = \frac{5c}{5}$$

$$c = 1003.2$$

$c = 1000 \frac{\text{J}}{\text{kg}\cdot^\circ\text{C}}$

8.  $m = 165g = 0.165 \text{ kg}$      $E_H = ?$   
 $t_i = 21^\circ\text{C}$      $t_f = 39^\circ\text{C}$   
 copper

$$E_H = mc\Delta t$$

$$= (0.165)(385)(39 - 21)$$

$$= 1143.45 \text{ J}$$

$E_H = 1140 \text{ J}$

table 12-1