

10, 11, 12, 13, 14, 15, 16

10 $\left\{ \begin{array}{l} v_i \\ h \end{array} \right\}$ v_i $h = 10.0 \text{ m}$
 $v_i = 2.00 \text{ m/s down}$

$$M E_i = M E_F$$

$$P E_i + K E_i = P E_F + K E_F$$

$$m g h_i + \frac{1}{2} m v_i^2 = \frac{1}{2} m v_F^2 \Rightarrow$$

$$v_F = \sqrt{2 g h_i + v_i^2}$$

$$= \sqrt{2 (9.8 \text{ m/s}^2) (10.0 \text{ m}) + (2 \text{ m/s})^2}$$

$$v_F = \boxed{14.1 \text{ m/s}}$$

11 $\left\{ \begin{array}{l} v_i \\ h \end{array} \right\}$ v_i $h = 0.25 \text{ m}$
 $v_i = ?$

$$M E_i = M E_F$$

$$P E_i + K E_i = P E_F + K E_F$$

$$\frac{1}{2} m v_i^2 = m g h_F$$

$$v_i = \sqrt{2 g h_F} = \sqrt{2 (9.8 \text{ m/s}^2) (0.25 \text{ m})}$$

$$v_i = \boxed{2.2 \text{ m/s}}$$

15 $\left\{ \begin{array}{l} v_i \\ h \end{array} \right\}$ v_i $h = 25.0 \text{ m}$
 $v_i = 17 \text{ m/s}$

(a) $w_g = F \cdot d = m \cdot g \cdot \Delta h = 1226 \text{ J}$
 (b) $\Delta K E = w_{\text{net}} = w_g = 1226 \text{ J}$
 (c) $K E_F = ?$

$$P E_i + K E_i = P E_F + K E_F$$

$$m g h_i + \frac{1}{2} m v_i^2 = K E_F = (5 \text{ kg}) (9.8 \text{ m/s}^2) (25 \text{ m}) + \frac{1}{2} (5 \text{ kg}) (17 \text{ m/s})^2$$

$$\boxed{K E_F = 1948 \text{ J}}$$



18 $m = 6.30 \text{ kg}$
 $F_{\text{app}} = 201 \text{ N}$
 $h = 1.3 \text{ m}$

$$v_F = ?$$

$$K E_F = \frac{1}{2} m v_F^2$$

$$w = \Delta E = K E_F - K E_i = 0$$

$$w = K E_F$$

$$w = K E_F$$

$$F \cdot d = \frac{1}{2} m v_F^2$$

$$v_F = \sqrt{\frac{2 F \cdot d}{m}} = \sqrt{\frac{2 (201 \text{ N}) (1.3 \text{ m})}{6.3 \text{ kg}}}$$

(a) $v_F = 4.17 \text{ m/s} = \boxed{4.2 \text{ m/s}}$

(b)

$v_i = 4.2 \text{ m/s up}$
 $h_F = ?$

$$M E_i = M E_F$$

$$\frac{1}{2} m v_i^2 = m g h_F$$

$$h_F = \frac{v_i^2}{2 g} = \frac{(4.2 \text{ m/s})^2}{2 (9.8 \text{ m/s}^2)} = \boxed{0.90 \text{ m}}$$