

## Newton's Second Law

$$\begin{aligned} \textcircled{1} \quad F &= ma \\ 2.03 \times 10^{20} &= (7.35 \times 10^{22}) a \\ \underline{a} &= \underline{0.0028 \text{ m/s}^2} \end{aligned}$$

$$\begin{aligned} \textcircled{2} \quad F &= ma \\ -65 &= .145 a \\ \underline{a} &= \underline{-448 \text{ m/s}^2} \end{aligned}$$

$$\begin{aligned} \textcircled{3} \quad F &= ma \\ 60 &= (1.5 \times 10^2) a \\ \underline{a} &= \underline{0.4 \text{ m/s}^2} \end{aligned}$$

$$\begin{aligned} \textcircled{4} \quad F &= ma \\ -1310 &= 214 a \\ \underline{a} &= \underline{-6.1 \text{ m/s}^2} \end{aligned}$$

$$\begin{aligned} \textcircled{5} \quad F &= ma \\ 3.6 &= m (9.8) \\ \underline{m} &= \underline{0.37 \text{ kg}} \end{aligned}$$

$$\begin{aligned} \textcircled{6} \quad F &= ma \\ 2.4 \times 10^4 &= m (1.25) \\ \underline{m} &= \underline{19200 \text{ kg}} \end{aligned}$$

$$\begin{aligned} \textcircled{7} \quad F &= ma \\ 2850 &= m(3) \\ \underline{m} &= \underline{950 \text{ kg}} \end{aligned}$$

$$\begin{aligned} v_i &= 0 \\ v_f &= 15 \text{ m/s} \\ t &= 5.0 \text{ s} \\ a &= \frac{\Delta v}{\Delta t} = \frac{15 - 0}{5} = 3.0 \text{ m/s}^2 \end{aligned}$$

$$\textcircled{8} \text{ (a)} \quad \begin{array}{c} \leftarrow \boxed{\phantom{00}} \rightarrow \\ F_f = 2.6 \text{ N} \quad F_a = 2.8 \text{ N} \end{array}$$

$$F_{\text{net}} = F_a - F_f = 2.8 - 2.6 = \underline{0.2 \text{ N}}$$

$$\begin{aligned} \text{(b)} \quad F &= ma \\ 0.2 &= m(0.11) \\ \underline{m} &= \underline{1.8 \text{ kg}} \end{aligned}$$

$$\textcircled{9} \quad F = ma = 1250(16.5) = \underline{20625 \text{ N}}$$

$$\textcircled{10} \quad F = ma = 5.22 \times 10^7 (-0.357) = \underline{-1.86 \times 10^7 \text{ N}}$$

$$\textcircled{11} \quad F = ma = 1.3 \times 10^4 (-27.6) = \underline{-3.6 \times 10^5 \text{ N}}$$

$$\textcircled{12} \quad F = ma = 2.0 \times 10^6 (0.85) = \underline{1.7 \times 10^6 \text{ N}}$$

$$\begin{aligned} \textcircled{13} \quad F &= ma \\ 7.23 \times 10^5 &= (7.7 \times 10^4) a \\ \underline{a} &= \underline{9.4 \text{ m/s}^2} \end{aligned}$$

$$\begin{array}{lll} \textcircled{14} \quad v_i = 1.3 \text{ m/s} & v_f = v_i + at & F = ma \\ v_f = 0 & 0 = 1.3 + a(1.3) & -65 = m(-4.3) \\ t = 0.3 \text{ s} & a = -4.3 \text{ m/s}^2 & \underline{m = 15.1 \text{ kg}} \\ a = ? & & \end{array}$$

$$\textcircled{15} \quad 15.8 \text{ km/s} = 15800 \text{ m/s}$$

$$v_i = 0$$

$$v_f = 15800 \text{ m/s}$$

$$t = 1.05$$

$$a = ?$$

$$v_f = v_i + at$$

$$15800 = a(1)$$

$$a = 15800 \text{ m/s}^2$$

$$F = ma$$

$$= (0.2 \times 10^{-3} \text{ kg})(15800 \text{ m/s}^2)$$

$$= \underline{3.16 \text{ N}}$$

$$\textcircled{16} \quad F = ma$$
$$7.07 \times 10^4 = (1.33 \times 10^5) a$$
$$a = \underline{0.53 \text{ m/s}^2}$$

$$\textcircled{17} \quad (a) \quad F = ma$$
$$-6.41 \times 10^{12} = m(-1 \times 10^8)$$
$$m = \underline{6.4 \times 10^4 \text{ kg}}$$

$$(b) \quad F = ma$$
$$-6.41 \times 10^{12} = m(-4.9 \times 10^9)$$
$$m = \underline{1.3 \times 10^3 \text{ kg}}$$

$$\textcircled{18} \quad 172 \text{ km/h} = 47.78 \text{ m/s}$$

$$(a) \quad v_i = 47.78 \text{ m/s}$$

$$v_f = 0$$

$$t = 2.72 \times 10^{-2} \text{ s}$$

$$a = ?$$

$$v_f = v_i + at$$

$$0 = 47.78 + a(2.72 \times 10^{-2} \text{ s})$$

$$a = \underline{-1757 \text{ m/s}^2}$$

$$(b) \quad F = ma = 70(-1757) = \underline{1.23 \times 10^5 \text{ N}}$$