

25. When it reaches its highest point, its velocity is zero at that instant; however, the acceleration is due to gravity which is constant.

B is the answer.

DYNAMICS

Lesson 1—Newton's Second Law of Motion

1. $F = ma$

$$\begin{aligned} a &= \frac{F}{m} \\ &= \frac{9.0 \text{ N}}{20.0 \text{ kg}} \\ &= 0.45 \text{ m/s}^2 \text{ east} \end{aligned}$$

2. $F = ma$

$$\begin{aligned} m &= \frac{F}{a} \\ &= \frac{15.0 \text{ N}}{8.0 \text{ m/s}^2} \\ &= 1.9 \text{ kg} \end{aligned}$$

3. $F = ma$
 $= (16.0 \text{ kg})(2.0 \text{ m/s}^2)$
 $= 32 \text{ N}$

4. $F = ma$

$$\begin{aligned} a &= \frac{F}{m} \\ &= \frac{10.2 \text{ N}}{12.0 \text{ kg}} \\ &= 0.850 \text{ m/s}^2 \text{ east} \end{aligned}$$

5. $F = ma$
 $= (5.2 \text{ kg})(6.0 \text{ m/s}^2)$
 $= 31 \text{ N}$

6. $F = ma$

$$\begin{aligned} a &= \frac{F}{m} \\ &= \frac{2.0 \text{ N}}{18 \text{ kg}} \\ &= 0.11 \text{ m/s}^2 \text{ south} \end{aligned}$$

7. $a = \frac{v_f - v_0}{t}$
 $= \frac{25.0 \text{ m/s} - 0}{10.0 \text{ s}}$
 $= 2.50 \text{ m/s}^2$
 $F = ma$
 $= (925 \text{ kg})(2.5 \text{ m/s}^2)$
 $= 2.31 \times 10^3 \text{ N south}$

8. $d = v_0 t + \frac{1}{2} a t^2$

$$\begin{aligned} 132 \text{ m} &= \frac{1}{2} (a)(12.0 \text{ s})^2 \\ a &= 1.83 \text{ m/s}^2 \end{aligned}$$

$$\begin{aligned} F &= ma \\ &= (1.08 \times 10^3 \text{ kg})(1.83 \text{ m/s}^2) \\ &= 1.98 \times 10^3 \text{ N north} \end{aligned}$$

9. $v_f^2 = v_0^2 + 2ad$
 $(12 \text{ m/s})^2 = (5.0 \text{ m/s})^2 + 2(a)(94 \text{ m})$
 $a = 0.633 \text{ m/s}^2$

$$\begin{aligned} F &= ma \\ &= (1.20 \times 10^3 \text{ kg})(0.633 \text{ m/s}^2) \\ &= 7.6 \times 10^2 \text{ N east} \end{aligned}$$

10. Change 48 km/h to m/s:

$$48 \text{ km/h} \times \frac{1000 \text{ m/km}}{3600 \text{ s}} = 13.3 \text{ m/s}$$

$$\begin{aligned} a &= \frac{v_f - v_0}{t} \\ &= \frac{13.3 \text{ m/s} - 0}{5.0 \text{ s}} \\ &= 2.66 \text{ m/s}^2 \end{aligned}$$

$$\begin{aligned} F &= ma \\ m &= \frac{F}{a} \\ &= \frac{2.5 \times 10^3 \text{ N}}{2.66 \text{ m/s}^2} \\ &= 9.4 \times 10^2 \text{ kg} \end{aligned}$$

11. a) $F = ma$

$$\begin{aligned} a &= \frac{F}{m} \\ &= \frac{6.6 \text{ N}}{9.0 \text{ kg}} \\ &= 0.73 \text{ m/s}^2 \text{ east} \\ v_f^2 &= v_0^2 + 2ad \end{aligned}$$