

Solutions

Each answer shows the steps, then the **result**.

2.1

- known: $v_0 = 0$, $a = 2.0 \text{ m s}^{-2}$, $t = 6.0 \text{ s}$; use $v = v_0 + at$:

$$v = v_0 + at = 0 + (2.0 \text{ m s}^{-2})(6.0 \text{ s}) = \mathbf{12 \text{ m s}^{-1}}$$

2.2

- starting from rest, $v_0 = 0$, so $\Delta x = v_0 t + \frac{1}{2}at^2$ reduces to $\frac{1}{2}at^2$:

$$\Delta x = \frac{1}{2}at^2 = \frac{1}{2}(2.0 \text{ m s}^{-2})(6.0 \text{ s})^2$$

- $\Delta x = \mathbf{36 \text{ m}}$

2.3

(a)

- acceleration

(b)

- displacement

2.4

- dropped from rest, so $v_0 = 0$ and $a = g$:

$$v = v_0 + gt = 0 + (9.8 \text{ m s}^{-2})(3.0 \text{ s}) = \mathbf{29.4 \text{ m s}^{-1}}$$

3.1 B

- displacement.

3.2 B

- the speed is zero at the top but gravity still acts downward

3.3

(a)

- known: $v_0 = 25 \text{ m s}^{-1}$, $v = 0$, $\Delta x = 50 \text{ m}$; no time is given, so use $v^2 = v_0^2 + 2a\Delta x$, rearranged:

$$a = \frac{v^2 - v_0^2}{2\Delta x} = \frac{0 - (25 \text{ m s}^{-1})^2}{2(50 \text{ m})}$$

- $a = \mathbf{-6.25 \text{ m s}^{-2}}$ (the minus sign: it opposes the motion)

(b)

$$t = \frac{v - v_0}{a} = \frac{0 - 25 \text{ m s}^{-1}}{-6.25 \text{ m s}^{-2}} = \mathbf{4.0 \text{ s}}$$

3.4

(a)

- at the top $v = 0$; with up positive, $a = -g$, so $0 = v_0 - gt$:

$$t = \frac{v_0}{g} = \frac{20 \text{ m s}^{-1}}{10 \text{ m s}^{-2}} = \mathbf{2.0 \text{ s}}$$

(b)

- set $v = 0$ in $v^2 = v_0^2 - 2gh$, rearranged:

$$h = \frac{v_0^2}{2g} = \frac{(20 \text{ m s}^{-1})^2}{2(10 \text{ m s}^{-2})}$$

- $h = \mathbf{20 \text{ m}}$