

Solutions

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

2.1

- When no friction (or other non-conservative force) acts

2.2

- energy is conserved: the PE lost becomes KE, $mgh = \frac{1}{2}mv^2$:

$$v = \sqrt{2gh} = \sqrt{2(10 \text{ m s}^{-2})(2 \text{ m})}$$

- $v = \mathbf{6.3 \text{ m s}^{-1}}$

2.3

- 6 J (all PE becomes KE)

2.4

- It becomes thermal energy (heat)

3.1 B

- with no friction, total mechanical energy is constant

3.2 C

- all 40 J of PE becomes KE

3.3

(a)

- energy is conserved: the PE lost becomes KE, $mgh = \frac{1}{2}mv^2$, so the mass cancels:

$$v = \sqrt{2gh} = \sqrt{2(10 \text{ m s}^{-2})(1.8 \text{ m})}$$

- $v = \mathbf{6 \text{ m s}^{-1}}$

(b)

- No friction / energy is conserved

3.4

(a)

- the energy missing from the final KE was lost:

$$W_{\text{friction}} = U_{\text{top}} - K_{\text{bottom}} = 20 \text{ J} - 14 \text{ J} = \mathbf{6 \text{ J}}$$

(b)

- It was converted to thermal energy by friction