Solutions

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

2.1

- force and displacement are in the same direction, $\theta = 0$:

$$W = Fd\cos\theta = (20\text{ N})(4\text{ m})\cos 0^\circ$$

- $W = \mathbf{80}$ J

2.2

- Zero

2.3

- only the component along the displacement does work:

$$W = Fd\cos\theta = (50\text{ N})(2\text{ m})\cos 60^\circ$$

- $W = \mathbf{50}$ J

2.4

- The change in its kinetic energy

3.1 B

- $\cos 90^\circ = 0$, so no work

3.2 B

- net work equals the change in kinetic energy

3.3

(a)

- only the horizontal component of the pull acts along the displacement:

$$W = Fd\cos\theta = (30\text{ N})(5\text{ m})\cos 37^\circ$$

- $W = \mathbf{120}$ J

(b)

- The vertical component is perpendicular to the horizontal displacement

3.4

(a)

- change in kinetic energy:

$$\Delta K = \tfrac{1}{2}m\left(v^2 - u^2\right) = \tfrac{1}{2}(2\text{ kg})\left[(5\text{ m s}^{-1})^2 - (3\text{ m s}^{-1})^2\right]$$

- $\Delta K = \mathbf{16}$ J

(b)

- by the work-energy theorem, $W_{\text{net}} = \Delta K = \mathbf{16}$ J