

Solutions

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

2.1

- power is work done per unit time:

$$P = \frac{W}{t} = \frac{900 \text{ J}}{3 \text{ s}}$$

- $P = \mathbf{300 \text{ W}}$

2.2

- power delivered by a force at steady speed:

$$P = Fv = (20 \text{ N})(5 \text{ m s}^{-1})$$

- $P = \mathbf{100 \text{ W}}$

2.3

- The watt; $1 \text{ W} = 1 \text{ J s}^{-1}$

2.4

- Motor A (same work in less time means more power)

3.1 B

- power is the rate of doing work

3.2 B

- power delivered by a force at steady speed:

$$P = Fv = (3000 \text{ N})(20 \text{ m s}^{-1}) = 6.0 \times 10^4 \text{ W}$$

3.3

(a)

- at steady speed the upward force balances the weight:

$$F = mg = (500 \text{ kg})(10 \text{ m s}^{-2}) = \mathbf{5000 \text{ N}}$$

(b)

- power delivered by a force at steady speed:

$$P = Fv = (5000 \text{ N})(0.4 \text{ m s}^{-1})$$

- $P = \mathbf{2000 \text{ W}}$

3.4

(a)

- power is work done per unit time:

$$P = \frac{W}{t} = \frac{12\,000 \text{ J}}{40 \text{ s}}$$

- $P = \mathbf{300 \text{ W}}$

(b)

- energy = power $\times$ time:

$$E = Pt = (300 \text{ W})(60 \text{ s}) = \mathbf{18\,000 \text{ J}}$$