

Solutions

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

2.1

- electrical power:

$$P = IV = (2.5 \text{ A})(12 \text{ V})$$

- $P = \mathbf{30 \text{ W}}$

2.2

- power in a resistor:

$$P = I^2 R = (3.0 \text{ A})^2 (10 \text{ } \Omega)$$

- $P = \mathbf{90 \text{ W}}$

2.3

- energy = power $\times$ time, with $t = 5.0 \times 60 = 300 \text{ s}$:

$$E = Pt = (100 \text{ W})(300 \text{ s})$$

- $E = \mathbf{3.0 \times 10^4 \text{ J}}$

3.1 A

- $I^2 R$.

3.2 B

- thermal energy.

3.3

(a)

- $P = I^2 R$, rearranged for R :

$$R = \frac{P}{I^2} = \frac{48 \text{ W}}{(4.0 \text{ A})^2}$$

- $R = \mathbf{3.0 \text{ } \Omega}$

(b)

- $V = IR = (4.0 \text{ A})(3.0 \text{ } \Omega) = \mathbf{12 \text{ V}}$

3.4

(a)

- power in a resistor, with $I = t$:

$$P(t) = I^2 R = t^2 (2.0 \text{ } \Omega) = \mathbf{2t^2 \text{ W}}$$

- at $t = 3.0 \text{ s}$: $P = 2(3.0)^2 = \mathbf{18 \text{ W}}$

(b)

- the power varies, so integrate it over time:

$$E = \int_0^{3.0} P \, dt = \int_0^{3.0} 2t^2 \, dt = \left[\frac{2t^3}{3} \right]_0^{3.0}$$

- $E = \mathbf{18 \text{ J}}$