Exercise walk-through

Electric Power ▪ 11.4

eXercise

You must be able to

- calculate **electric power 电功率** delivered to a device, $P = IV$
- rewrite power for a resistor as $P = I^2R = \dfrac{V^2}{R}$
- relate power to the **energy** transferred over time, $E = Pt$

Method — Power

$P = IV$, in watts. For a resistor, using $V = IR$ gives two more forms:

$$P = I^2R = \frac{V^2}{R}.$$

Method — Energy

$E = Pt$ — power multiplied by time.

Method — Example

A device drawing 2.0 A at 12 V: $P = 24$ W.

Practice 2.1 ▪ 2 marks

A device draws 3.0 A at 12 V. Find the power.

Solution 2.1

Method: Example

Worked steps

$P = IV = 3.0 \times 12 = 36$ W M1 A1.

Practice 2.2 ▪ 2 marks

A $6.0\ \Omega$ resistor carries 2.0 A. Find the power dissipated.

Solution 2.2

Method: Power

Worked steps

$P = I^2R = (2.0)^2 \times 6.0 = 24$ W **M1** **A1**.

Practice 2.3 ▪ 2 marks

A 60 W bulb runs for 120 s. Find the energy transferred.

Solution 2.3

Worked steps

$E = Pt = 60 \times 120 = 7200$ J **M1** **A1**.

Exam-style 3.1 ▪ 1 mark

Electric power is

A IV

B I/V

C V/I

D IR

Solution 3.1

A IV ✓

B I/V

C V/I

D IR

Worked steps

A.

Exam-style 3.2 ▪ 1 mark

The power dissipated in a resistor can be written as

A $V^2 R$

B V^2 / R

C I / R^2

D $I R^2$

Solution 3.2

Method: Power

A $V^2 R$

B V^2/R ✓

C I/R^2

D IR^2

Worked steps

B.

Exam-style 3.3 ▪ 2 marks

A 240 V heater has a resistance of $60\ \Omega$.
(a) Find the current it draws.
(b) Find the power it dissipates.

Solution 3.3

Worked steps

(a) $I = \dfrac{V}{R} = \dfrac{240}{60} = 4.0$ A M1 A1. (b) $P = IV = 4.0 \times 240 = 960$ W M1 A1.