11.4 Electric Power

Name: _____ Class: _____ Date: _____ **Total: 16 marks**

KEY WORDS electric power • resistance

Objective

Build the skills to answer exam questions on **electric power**.

You must be able to:

- calculate **electric power** 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, $E = Pt$

1 Key knowledge and worked examples

Study these first. Each one shows the method for a question type used later.

■ **Power**

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

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

■ **Energy**

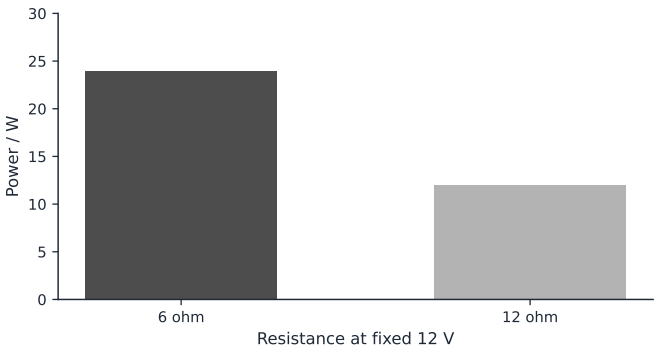
$E = Pt$ – power multiplied by time.

■ **Example**

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

■ **Worked application: Choose the power equation from what is held fixed**

A 6.0 Ω resistor is connected across a constant 12 V supply. First $I = V/R = 2.0$ A. Then $P = IV = 24$ W, agreeing with $V^2/R = 24$ W. Over 120 s, $E = Pt = 2880$ J. If the resistor is replaced by 12 Ω at the same voltage, power falls to 12 W. The expression I^2R does not mean power always rises with resistance: here current also changes. State the fixed quantity before predicting a change.



2 Practice

2.1 A device draws 3.0 A at 12 V. Find the power. [2]

2.2 A 6.0 Ω resistor carries 2.0 A. Find the power dissipated. [2]

2.3 A 60 W bulb runs for 120 s. Find the energy transferred. [2]

3 Exam-style questions

3.1 Electric power is [1]

- **A** IV
- **B** I/V
- **C** V/I
- **D** IR

3.2 The power dissipated in a resistor can be written as [1]

- **A** V^2R
- **B** V^2/R
- **C** I/R^2
- **D** IR^2

3.3 A 240 V heater has a resistance of 60 Ω.

(a) Find the current it draws. [2]

(b) Find the power it dissipates. [2]

3.4 A 9.0 Ω resistor has 18 V across it for 60 s. (a) Calculate the current and power. [2]

(b) Calculate the transferred energy and predict the power if resistance doubles at the same voltage. [2]