

# 11.3 Resistance, Resistivity, and Ohm's Law

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_ **Total: 11 marks**

**KEY WORDS** resistance 电阻 • resistivity 电阻率 • ohm's law 欧姆定律 • ohmic 欧姆性  
• series 串联

## Objective

Build the skills to answer exam questions on **resistance, resistivity, and Ohm's law**.**You must be able to:**

- state **Ohm's law** 欧姆定律,  $V = IR$ , and identify ohmic behaviour
- relate **resistance** 电阻 to geometry,  $R = \frac{\rho L}{A}$
- distinguish **resistivity** 电阻率 (a material property) from resistance (an object property)
- calculate **equivalent resistance** in series and parallel

## 1 Worked examples

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

### ■ Ohm's law

 $V = IR$ . A device is **ohmic** if  $R$  is constant (a straight  $I$ - $V$  line).

### ■ Resistance and resistivity

 $R = \frac{\rho L}{A}$ : **resistivity**  $\rho$  is a property of the **material**; **resistance**  $R$  also depends on the length  $L$  and area  $A$  of the object.

### ■ Combining

Series:  $R = R_1 + R_2 + \dots$ ; parallel:  $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \dots$ 

## 2 Practice

2.1 A 12 V supply drives 3.0 A through a resistor. Find its resistance. [2]

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2.2 State how doubling a wire's length changes its resistance (same material and area). [1]

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2.3 State the difference between resistivity and resistance. [2]

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## 3 Exam-style questions

3.1 Resistance relates to geometry by [1]

- |   |   |
|---|---|
| A | B |
| C | D |
- A**  $\frac{\rho A}{L}$   
**B**  $\frac{\rho L}{A}$   
**C**  $\frac{L}{\rho A}$   
**D**  $\rho L A$

3.2 Resistivity is a property of the [1]

- |   |   |
|---|---|
| A | B |
| C | D |
- A** object's shape  
**B** material  
**C** current  
**D** voltage

**3.3** A wire has resistivity  $1.7 \times 10^{-8} \, \Omega \text{ m}$ , length 2.0 m, and area  $1.0 \times 10^{-6} \text{ m}^2$ .

(a) Find its resistance. [2]

(b) The wire is stretched to twice its length (its volume unchanged, so its area halves). Find the new resistance. [2]

