



QUESTION WORKBOOK

# Current-voltage characteristics

Electricity · Year 12

AQA 3.5.1.2 · CIE 9.3 · OCR A 4.2.3

10 questions · 30 marks

NAVY SCREEN EDITION

**SECTION A** · Warm-up

**A1** State Ohm's law. [2]

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**A2** A point on a component's I–V graph reads  $V = 4.0 \text{ V}$  and  $I = 0.20 \text{ A}$ . Calculate the resistance at that point. [2]

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**A3** Sketch the current–voltage characteristic of an ohmic conductor at constant temperature. [2]

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**SECTION B** · Standard

**B1** Describe the shape of the I–V characteristic of a filament lamp and explain its shape. [3]

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**B2** Describe the I–V characteristic of a semiconductor diode. [3]

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**B3** A filament lamp gives the readings  $V = 2.0 \text{ V}$ ,  $I = 0.40 \text{ A}$  and  $V = 8.0 \text{ V}$ ,  $I = 0.80 \text{ A}$ . Calculate the resistance at each point and comment on the change. [4]

**B4** A component gives currents of  $0.10 \text{ A}$ ,  $0.20 \text{ A}$  and  $0.30 \text{ A}$  at  $2.0 \text{ V}$ ,  $4.0 \text{ V}$  and  $6.0 \text{ V}$ . Show that it is ohmic. [3]

## SECTION C · Stretch

**C1** Describe how the resistance of a negative temperature coefficient (NTC) thermistor changes with temperature, and explain this in terms of charge carriers. [4]

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- C2** A filament lamp operates at 12 V with a current of 2.0 A. Calculate (a) its operating resistance and (b) its power. When barely lit it reads 1.0 V and 0.50 A; calculate its resistance then. [4]

- C3** Explain why a filament lamp does not obey Ohm's law. [3]