



QUESTION WORKBOOK

# Circuits and Kirchhoff's laws

Electricity · Year 12

AQA 3.5.1.4 · CIE 9.2, 10.2 · OCR A 4.1.1, 4.2.5, 4.3.1

10 questions · 30 marks

NAVY SCREEN EDITION

**SECTION A** · Warm-up

**A1** State Kirchhoff's first law and the conservation principle it expresses. [2]

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**A2** Two resistors of  $20\ \Omega$  and  $30\ \Omega$  are connected in series. Calculate the total resistance. [2]

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**A3** Two  $20\ \Omega$  resistors are connected in parallel. Calculate the total resistance. [2]

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**SECTION B** · Standard

**B1** A  $6.0\ \Omega$  resistor and a  $3.0\ \Omega$  resistor are connected in parallel across a  $12\ \text{V}$  supply. Calculate (a) the total resistance and (b) the total current from the supply. [3]

- B2** A  $4.0\ \Omega$  and an  $8.0\ \Omega$  resistor are connected in series across a 12 V supply. Calculate (a) the current in the circuit and (b) the potential difference across each resistor. [4]

- B3** At a junction, currents of 3.0 A and 2.0 A flow in, and a single wire carries current out. Use Kirchhoff's first law to find the current in the output wire. [3]

- B4** A resistor of  $5.0\ \Omega$  carries a current of 2.0 A. Calculate the power dissipated in it. [3]

## SECTION C · Stretch

- C1** A  $4.0\ \Omega$  resistor is connected in series with a parallel combination of a  $6.0\ \Omega$  and a  $3.0\ \Omega$  resistor, across a  $12\ \text{V}$  supply. Calculate (a) the total resistance, (b) the total current and (c) the current in each of the parallel resistors. [4]

- C2** A  $60\ \text{W}$  lamp is switched on for  $5.0$  minutes while connected to a  $230\ \text{V}$  supply. Calculate (a) the energy it transfers and (b) the charge that flows through it. [4]

- C3** State Kirchhoff's second law and the conservation principle it expresses. [3]