InkPhysics

QUESTION WORKBOOK

EMF and internal resistance

Electricity · Year 12

AQA 3.5.1.6 · CIE 10.1 · OCR A 4.2.2, 4.3.2

10 questions · 30 marks

PRINT EDITION

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SECTION A · Warm-up

A1 Define the electromotive force (emf) of a source. [2]

A2 A battery of emf 6.0 V and internal resistance 1.0 Ω supplies a current of 0.50 A. Calculate its terminal potential difference. [2]

A3 State the equation linking emf, current, external resistance and internal resistance. [2]

SECTION B · Standard

B1 A cell of emf 12 V and internal resistance 1.0 Ω is connected to an external resistor of 5.0 Ω. Calculate the current in the circuit. [3]

B2 A battery of emf 9.0 V and internal resistance 0.50 Ω is connected to a 4.0 Ω resistor. Calculate (a) the current, (b) the terminal potential difference and (c) the power dissipated inside the battery. [4]

B3 A cell of emf 1.5 V delivers a current of 0.30 A, and its terminal potential difference falls to 1.35 V. Calculate the internal resistance of the cell. [3]

B4 A cell of emf 6.0 V has an internal resistance of 0.20 Ω. Calculate the current if its terminals are short-circuited (R = 0). [3]

SECTION C · Stretch

C1 A graph of terminal potential difference V against current I for a cell is a straight line with a V-axis intercept of 1.5 V and a gradient of −0.5 V A^{-1}. State the emf and internal resistance, and calculate the terminal pd when the current is 1.0 A. [4]

C2 A battery of emf 12 V and internal resistance 2.0 Ω is connected to a variable resistor. Calculate the resistance value that makes the terminal potential difference equal to 10 V. [4]

C3 Explain why the terminal potential difference of a battery falls as it supplies a larger current. [3]