InkPhysics

QUESTION WORKBOOK

Resistivity and superconductivity

Electricity · Year 12

AQA 3.5.1.3 · CIE 9.3 · OCR A 4.2.4

10 questions · 30 marks

NAVY SCREEN EDITION

© 2026 InkPhysics. All rights reserved.
inkphysics.co.uk

SECTION A · Warm-up

A1 State the equation relating the resistance of a wire to its resistivity, and give the unit of resistivity. [2]

A2 A copper wire (resistivity $1.7 \times 10^{-8}\ \Omega\ \text{m}$) has length 2.0 m and cross-sectional area $1.0 \times 10^{-6}\ \text{m}^2$. Calculate its resistance. [2]

A3 State what is meant by superconductivity. [2]

SECTION B · Standard

B1 A wire of length 1.5 m and diameter 0.40 mm has a resistance of 0.50 Ω. Calculate (a) its cross-sectional area and (b) the resistivity of its material. [4]

© 2026 InkPhysics. All rights reserved.

B2 A wire of resistivity 2.8×10^{-8} Ω m and cross-sectional area 2.0×10^{-6} m^2 is to have a resistance of 0.10 Ω. Calculate the length required. [3]

B3 A wire's length is doubled and its cross-sectional area is halved. State the factor by which its resistance changes, and explain why. [3]

B4 Describe qualitatively how the resistance of a metal wire changes as its temperature increases, and why. [3]

SECTION C · Stretch

© 2026 InkPhysics. All rights reserved.

C1 Two wires are made of the same material. Wire B has twice the length and twice the diameter of wire A. If wire A has a resistance of 8.0 Ω, calculate the resistance of wire B. [4]

C2 A heating element is made from wire of resistivity 1.1×10^{-6} Ω m, length 5.0 m and cross-sectional area 2.0×10^{-7} m^2. Calculate its resistance and its power when connected to a 230 V supply. [4]

C3 Describe what happens to a superconductor at its critical temperature and give one practical use of superconductors. [3]

© 2026 InkPhysics. All rights reserved.