GET BETTER AT PHYSICS · MARK SCHEME

Resistivity: tiered multiple choice

AQA A-level Physics · 7407 / 7408 · Specification 3.5.1.3 · 5 questions · 5 marks

1 mark per correct letter | Worked reasoning for every question | **How students did** = from AQA examiner reports, where available

Answer key

Q1	Q2	Q3	Q4	Q5
B	A	B	D	D

Easy

Question 1

1 **B**

Scaling resistance with length and area · AQA June 2023 · AS Paper 2 · Q19

Same metal and temperature, so ρ is the same and $R \propto L / A$. $R_Y = 6.0 \times (23 / 47) \times (0.10 / 0.40) = 6.0 \times 0.489 \times 0.25 = 0.73\ \Omega$.

How students did: At least 65% of students got this right in June 2023.

Medium

Questions 2–5

2 **A**

Resistance from length and volume · AQA June 2024 · AS Paper 2 · Q28

Cross-sectional area A = volume / length = $3.7 \times 10^{-4} / 0.12 = 3.1 \times 10^{-3}\ m^2$. $R = \rho L / A = 2.7 \times 10^{-8} \times 0.12 / 3.1 \times 10^{-3} = 1.1 \times 10^{-6}\ \Omega$.

Watch out: Convert 12 cm to 0.12 m. The volume is not the area: divide it by the length first.

How students did: In June 2024 the correct answer was the most popular choice.

3 **B**

Doubling length and radius · AQA June 2017 · AS Paper 2 · Q32

$R = \rho L / A$ and $A = \pi r^2$. Doubling L doubles R. Doubling r makes A four times larger, which divides R by 4. Overall: 2 / 4 = ½, so the resistance becomes R / 2.

How students did: 40% of students got this right in June 2017.

4 **D**

Voltmeter across one of two wires · AQA November 2021 · A-level Paper 1 · Q29

Y's diameter is twice X's, so its area is 4 times larger and its resistance is a quarter of X's: $R_Y = R_X / 4$. In series the pd divides in proportion to resistance: $V_X = 30 \times R_X / (R_X + R_X/4) = 30 \times 4/5 = 24$ V.

Watch out: 20 V (C) uses a ratio of 2 : 1. Resistance depends on area, which goes as diameter squared.

How students did: Under 30% of students got this right in November 2021.

5 **D**

Two putty cylinders in series · AQA June 2018 · A-level Paper 1 · Q27

Same material and length, so $R \propto 1 / A$. Y has twice the diameter, so 4 times the area: $R_X = 4R$. In series the total is 4R + R = 5R.

Watch out: 4R/5 (A) is the parallel combination. These cylinders are joined end to end, so they are in series.

How students did: 46.1% of students got this right in June 2018.

End of mark scheme. Answers from AQA's published keys; explanations written for this pack. AQA material is © AQA. More free packs and 1-to-1 tuition: **www.getbetteratphysics.co.uk**

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