GET BETTER AT PHYSICS · MARK SCHEME

Series & Parallel Circuits: tiered multiple choice

AQA A-level Physics · 7407 / 7408 · Specification 3.5.1.4 · 7 questions · 7 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	Q6	Q7
B	A	D	C	A	D	B

Easy

Questions 1–3

1 **B**

Current in one parallel branch · AQA June 2017 · AS Paper 2 · Q12

$1/R_T = 1/4 + 1/2 + 1/1 = 1.75$, so $R_T = 0.571\ \Omega$ and the pd across each branch = $10 \times 0.571 = 5.71$ V. Current in the 2.0 Ω resistor = 5.71 / 2.0 = 2.86 A.

How students did: Nearly 80% of students got this right in June 2017.

2 **A**

Ranking three resistor networks · AQA June 2023 · AS Paper 2 · Q21

X: R ∥ R = R/2, plus 2R in series = 2.5R. Y: (R + R) ∥ 2R = 2R ∥ 2R = R. Z: $1/R_T = 1/R + 1/R + 1/2R = 2.5/R$, so $R_T = 0.4R$. Largest to smallest: X, Y, Z.

Watch out: Adding a branch in parallel always lowers the total resistance.

3 **D**

pd from a point to earth · AQA June 2019 · A-level Paper 1 · Q23

By Kirchhoff's first law the current in the 20 Ω resistor is 2 + 4 = 6 A, giving 6 × 20 = 120 V. The 10 Ω resistor carries 2 A, giving 20 V. The pd from P to earth = 20 + 120 = 140 V.

Watch out: 120 V (C) is only the pd across the 20 Ω resistor.

Medium

Questions 4–6

4 **C**

Closing a switch that shorts a resistor · AQA June 2025 · A-level Paper 1 · Q28

Switch open: $R_1 = 2R_2$, so with 12 V across R_1 there is 6 V across R_2 and the emf is 18 V. R_1 = 12 V / 12 mA = 1.0 kΩ. Switch closed: R_2 is shorted, so all 18 V is across R_1 and the current is 18 V / 1.0 kΩ = 18 mA.

Watch out: B keeps the current at 12 mA, but removing R_2 from the circuit lowers the total resistance, so the current must rise.

How students did: In June 2025, 43% of students chose B, more than chose the correct answer.

5 **A**

Current in one branch of two · AQA June 2019 · AS Paper 2 · Q34

Both branches have the full 3.0 V across them. The lower branch is 5 Ω + 3 Ω = 8 Ω in series, so the current in the 5 Ω resistor is 3.0 / 8 = 0.375 A ≈ 0.38 A.

> **Watch out:** 0.60 A (B) uses 3.0 / 5 and ignores the 3 Ω resistor in series with it.

How students did: About 35% of students got this right in June 2019.

6 **D**

Voltmeter reading as a switch closes · AQA November 2021 · A-level Paper 1 · Q27

Switch open: the voltmeter is in series with the two 40 Ω resistors (20 Ω in parallel). An ideal voltmeter draws no current, so there is no pd across the resistors and the voltmeter reads the full 4.2 V. Switch closed: the voltmeter is across the 10 Ω resistor, which is in series with 20 Ω. V = 4.2 × 10 / 30 = 1.4 V.

> **Watch out:** The two 40 Ω resistors are in parallel (20 Ω), not in series.

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

Hard

Question 7

7 **B**

Voltmeter in series with a resistor · AQA June 2018 · AS Paper 2 · Q34

The voltmeter is in series with the 20 Ω resistor. An ideal voltmeter has infinite resistance, so no current flows in that branch and the voltmeter reads the full 1.50 V. The current flows only through the two 10 Ω resistors: I = 1.50 / 20 = 0.075 A.

> **Watch out:** Treating the voltmeter as if it were measuring the pd across the 20 Ω resistor gives 0.75 V. Always ask where current can actually flow.

How students did: 28.3% 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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