GET BETTER AT PHYSICS · MARK SCHEME

Capacitance & Energy Stored: tiered multiple choice

AQA A-level Physics · 7408 · Specification 3.7.4.1, 3.7.4.3 · 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
C	C	A	C	A

Easy

Questions 1–4

1 **C**

Energy after charging with a constant current · AQA June 2019 · A-level Paper 2 · Q20

$Q = It = 10 \times 10^{-6} \times 20 = 2.0 \times 10^{-4}$ C. Energy $= Q^2 / (2C) = (2.0 \times 10^{-4})^2 \div (2 \times 1.0 \times 10^{-6}) = 2.0 \times 10^{-2}$ J.

Watch out: Using QV without the ½ gives 4.0×10^{-2} J (D).

2 **C**

What a straight V–Q graph shows · AQA June 2018 · A-level Paper 2 · Q25

pd is proportional to charge, so Q / V is the same at every point: the capacitance is constant.

Watch out: The graph has no time axis, so it says nothing about whether the current was constant.

How students did: 54.0% of students got this right in June 2018.

3 **A**

Capacitance from a constant charging current · AQA November 2020 · A-level Paper 2 · Q19

$Q = It = 10 \times 10^{-6} \times 0.100 = 1.0 \times 10^{-6}$ C. $C = Q / V = 1.0 \times 10^{-6} \div 5.0 \times 10^{3} = 2.0 \times 10^{-10}$ F.

Watch out: Convert 100 ms to 0.100 s and 5.0 kV to 5000 V.

4 **C**

Change in energy when the pd doubles · AQA June 2017 · A-level Paper 2 · Q19

With C fixed, doubling V doubles Q. Energy $= Q^2 / (2C)$, so it goes from $Q^2/2C$ to $(2Q)^2/2C = 4Q^2/2C$. The change is $3Q^2/2C$.

Watch out: $2Q^2/C$ (D) is the new total energy, not the change.

Medium

Question 5

5 **A**

Average current from repeated discharges · AQA June 2022 · A-level Paper 2 · Q17

Each charge stores $Q = CV = 0.40 \times 10^{-6} \times 4.0 = 1.6 \times 10^{-6}$ C. All of it passes through the ammeter on each discharge, 8000 times a second: $I = 1.6 \times 10^{-6} \times 8000 = 1.3 \times 10^{-2}$ A. Conventional current flows out of the positive plate, which takes it from X to Y through the ammeter: row A.

Watch out: 2.0×10^{-10} A divides by 8000 instead of multiplying.

How students did: Fewer than 40% of students got this right in June 2022.

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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