



QUESTION WORKBOOK

Capacitors and energy stored

Capacitance · Year 13

AQA 3.7.4.1, 3.7.4.2, 3.7.4.3 · CIE 19.1, 19.2 · OCR A 6.1.1, 6.1.2, 6.2.3

10 questions · 30 marks

PRINT EDITION

SECTION A · Warm-up

A1 Define capacitance and state its unit. [2]

A2 A capacitor stores $6.0 \times 10^{-3} \text{ C}$ when the potential difference across it is 12 V. Calculate its capacitance. [2]

A3 State the three equivalent equations for the energy stored in a capacitor. [2]

SECTION B · Standard

B1 A $100 \mu\text{F}$ capacitor is charged to 20 V. Calculate (a) the charge stored and (b) the energy stored. [3]

- B2** A capacitor holds a charge of $5.0 \times 10^{-3} \text{ C}$ at a potential difference of 8.0 V . Calculate the energy stored using $E = \frac{1}{2}QV$. [3]

- B3** A parallel-plate capacitor has plates of area 0.020 m^2 separated by 1.0 mm of vacuum. Calculate its capacitance ($\epsilon_0 = 8.85 \times 10^{-12} \text{ F m}^{-1}$). [4]

- B4** A $470 \mu\text{F}$ capacitor is charged to 9.0 V . Calculate the charge and the energy stored. [3]

SECTION C · Stretch

- C1** The parallel-plate capacitor above (177 pF in vacuum) is filled with a dielectric of relative permittivity 4.0 . Calculate its new capacitance, and state the effect on the energy stored at a fixed voltage. [4]

- C2** A $220 \text{ }\mu\text{F}$ capacitor stores a charge of $3.3 \times 10^{-3} \text{ C}$. Calculate (a) the energy stored using $E = \frac{1}{2}Q^2/C$ and (b) the potential difference across it. [4]

- C3** Explain how a polar dielectric between the plates increases the capacitance. [3]