

- 4 (a) State two functions of capacitors in electrical circuits.

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2.
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[2]

- (b) Three uncharged capacitors of capacitance C_1 , C_2 and C_3 are connected in series, as shown in Fig. 4.1.

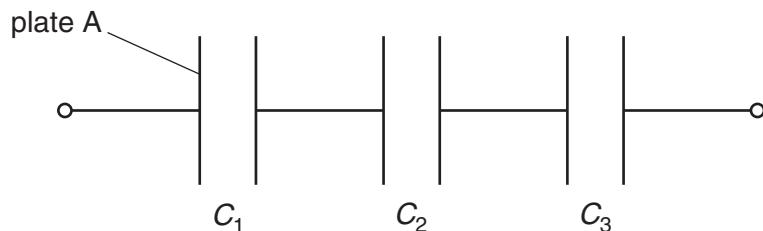


Fig. 4.1

A charge of $+Q$ is put on plate A of the capacitor of capacitance C_1 .

- (i) State and explain the charges that will be observed on the other plates of the capacitors.
You may draw on Fig. 4.1 if you wish.

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[2]

- (ii) Use your answer in (i) to derive an expression for the combined capacitance of the capacitors.

[2]

- (c) A capacitor of capacitance $12\mu\text{F}$ is charged using a battery of e.m.f. 9.0V, as shown in Fig. 4.2.

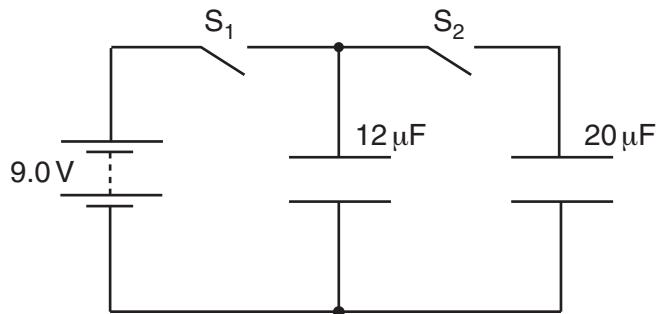


Fig. 4.2

Switch S_1 is closed and switch S_2 is open.

- (i) The capacitor is now disconnected from the battery by opening S_1 . Calculate the energy stored in the capacitor.

energy = J [2]

- (ii) The $12\mu\text{F}$ capacitor is now connected to an uncharged capacitor of capacitance $20\mu\text{F}$ by closing S_2 . Switch S_1 remains open. The total energy now stored in the two capacitors is $1.82 \times 10^{-4}\text{ J}$.

Suggest why this value is different from your answer in (i).

..... [1]