7 **(a)** Define *capacitance*.

.....

.....[1]

(b) Three capacitors of capacitances C_1, C_2 and C_3 are initially uncharged. They are then connected in series to a battery, as shown in Fig. 7.1.

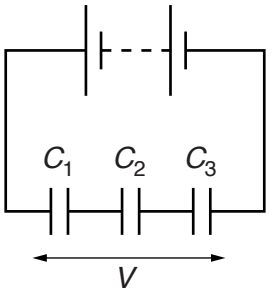

Fig. 7.1

The battery applies a potential difference V across the three capacitors.

Show that the combined capacitance C of the capacitors is given by

$$\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}.$$

[2]

(c) A battery of e.m.f. 12 V and negligible internal resistance is connected to a network of two capacitors and a resistor, as shown in Fig. 7.2.

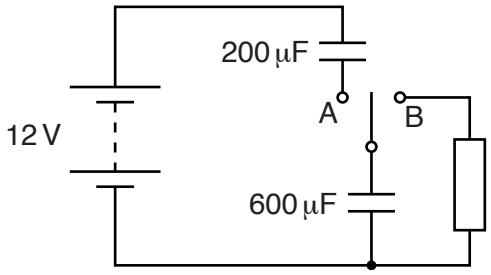

Fig. 7.2

The capacitors have capacitances of 200 μF and 600 μF. The switch has two positions, A and B.

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(i) The switch is moved to position A.

Calculate

1. the combined capacitance of the two capacitors,

combined capacitance = ... μF [1]

2. the charge on the 600 μF capacitor,

charge = ... C [1]

3. the potential difference across the 600 μF capacitor.

potential difference = ... V [1]

(ii) The switch is now moved from position A to position B.

Calculate the potential difference across the 600 μF capacitor when it has discharged 50% of its initial energy.

potential difference = ... V [3]

[Total: 9]

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