**5** Two capacitors A and B are connected into the circuit shown in Fig. 5.1.

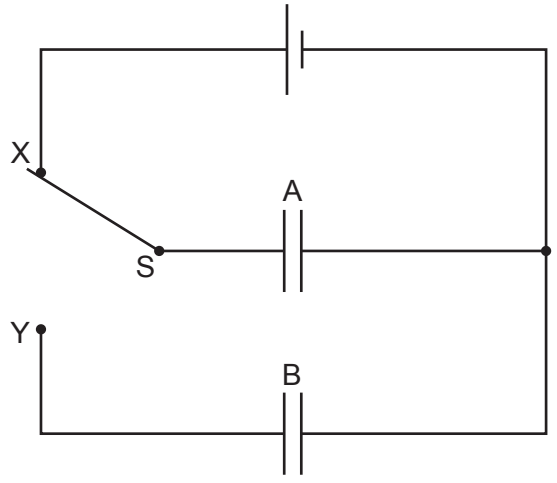


**Fig. 5.1**

Capacitor A has capacitance $C$ and capacitor B has capacitance $3C$.
The electromotive force (e.m.f.) of the cell is $V$.
The two-way switch S is initially at position X, and capacitor B is initially uncharged.

**(a)** State, in terms of $V$ and $C$, expressions for:

**(i)** the initial charge $Q_A$ on the plates of capacitor A

$Q_A$ = ..... [1]

**(ii)** the initial energy $E_A$ stored in capacitor A.

$E_A$ = ..... [1]

**(b)** The two-way switch S is now moved to position Y.

**(i)** State and explain what happens to the charge that was initially on the plates of capacitor A.

.....

.....

..... [2]

**(ii)** Show that the final potential difference (p.d.) $V_B$ across capacitor B is given by

$$V_B = \frac{V}{4}.$$

Explain your reasoning.

[3]

**(iii)** Determine an expression, in terms of $V$ and $C$, for the decrease $\Delta E$ in the total energy that is stored in the capacitors as a result of the change of the position of the switch.

$\Delta E$ = ..... [2]

[Total: 9]