6 **(a)** State **two** different functions of capacitors in electrical circuits.

1. .....

.....

2. .....

.....

[2]

(b) Three uncharged capacitors of capacitances C_1, C_2 and C_3 are connected in series with a battery of electromotive force (e.m.f.) E and a switch, as shown in Fig. 6.1.

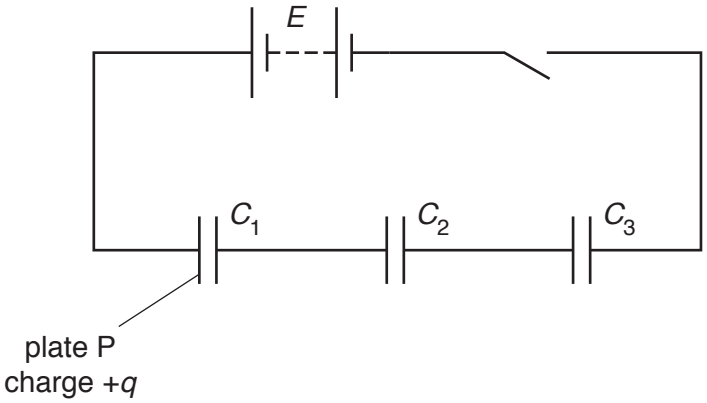

Fig. 6.1

When the switch is closed, there is a charge $+q$ on plate P of the capacitor of capacitance C_1.

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

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

[3]

(c) A student has available four capacitors, each of capacitance 20 μF.

Draw circuit diagrams, one in each case, to show how the student may connect some or all of the capacitors to produce a combined capacitance of:

(i) 60 μF

[1]

(ii) 15 μF.

[1]

[Total: 7]