

7 (a) Define the capacitance of a parallel-plate capacitor.

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.....

..... [2]

(b) An initially uncharged capacitor X, of capacitance C , is gradually charged so that the final potential difference (p.d.) between its plates is V and the final charge is Q .

(i) On Fig. 7.1, sketch the variation of charge with p.d. for capacitor X as the p.d. increases from 0 to V .

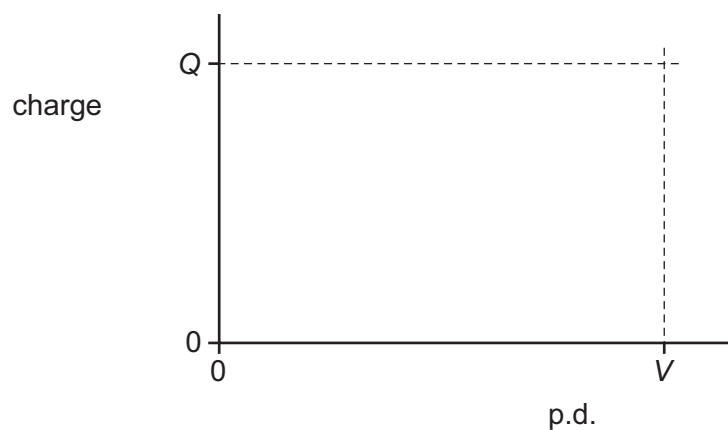


Fig. 7.1

[2]

(ii) Determine an expression, in terms of Q and V , for the work W done on capacitor X during the charging process. Explain your reasoning.

$W =$ [2]



- (c) Another capacitor Y is initially uncharged. The fully charged capacitor X in (b) is now connected to capacitor Y, as shown in Fig. 7.2.

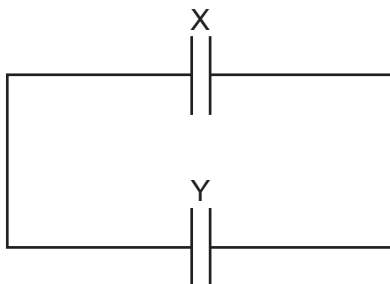


Fig. 7.2

The capacitance of capacitor Y is $3C$.

- (i) Complete Table 7.1 to show expressions, in terms of Q and V , for the final p.d.s across, and the final charges on, the two capacitors.
Use the space below for any working that you need.

Table 7.1

	X	Y
final p.d.		
final charge		

[3]

- (ii) State whether the total energy stored in the two capacitors is less than, the same as, or greater than the energy initially stored in capacitor X.

..... [1]