Ch. 8 Prob 46

$V = 9.00\,V$

$C_1 = 2.00\,\mu F$

$C_2 = 7.40\,\mu F$

a) Place the capacitors in series

$$\frac{1}{C_s} = \frac{1}{C_1} + \frac{1}{C_2}$$

$$\frac{1}{C_s} = \frac{1}{2.00\,\mu F} + \frac{1}{7.40\,\mu F}$$

$$\frac{1}{C_s} = 0.635\,\frac{1}{\mu F}$$

$$C_s = 1.57\,\mu F$$

Charge will be the same in each capacitor because they are connected in series

$$C = \frac{Q}{V} \rightarrow Q = C \cdot V$$

$$Q = (1.57\times10^{-6}\,F)(9.00\,V)$$

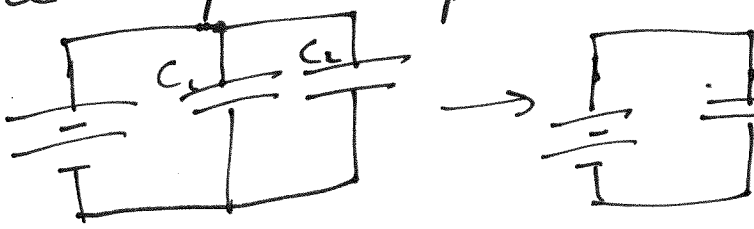
$$= 1.41\times10^{-5}\,C = \boxed{14.1\,\mu C}$$

Energy on the collection of capacitors is

$$U_c = \frac{1}{2}\frac{Q^2}{C} = \frac{1}{2}\frac{(1.41\times10^{-5}\,C)^2}{(1.57\times10^{-6}\,F)} = 6.33\times10^{-5}\,J$$

$$= \boxed{63.3\,\mu J}$$

b) Place the capacitors in parallel



$$C_p = C_1 + C_2$$

$$= 2.00\,\mu F + 7.40\,\mu F$$

$$= 9.40\,\mu F$$

Voltage is the same across both capacitors, the ~~charge~~ total charge on ~~each~~ the capacitors is

$$Q = C \cdot V = (9.40\times10^{-6}\,F)(9.00\,V)$$

$$Q = 8.46\times10^{-5}\,C = \boxed{84.6\,\mu C}$$

Energy stored is

$$U_c = \frac{1}{2}\frac{Q^2}{C} = \frac{1}{2}\frac{(8.46\times10^{-5}\,C)^2}{(9.40\times10^{-6}\,F)} = 3.81\times10^{-4}\,J = \boxed{381\,\mu J}$$