85. (Fourth problem of **Cluster**)

(a) With the parallel pair $C_2$ and $C_3$ reduced to a single $C' = 45\,\mu$F capacitor, this becomes very similar to problem 82. Using notation similar to that used in the solution to 82, we have

$$Q = q_1 + q'$$

where $Q = C_1 V_{\text{bat}} = 400\,\mu$C. Also, after switch S is closed,

$$\begin{aligned} V_1 &= V' \\ \frac{q_1}{C_1} &= \frac{q'}{C'} \end{aligned}$$

which yields $\frac{9}{8} q_1 = q'$. Therefore,

$$Q = q_1 + \left(\frac{9}{8}\, q_1\right)$$

which gives the result $q_1 = 188\,\mu$C.

(b) We find the voltage across capacitor 1 from $q_1/C_1$ (see below) and (since the capacitors are in parallel) use the fact that $V_1 = V_2 = V_3$ with $q = CV$ to obtain the charges: $q_2 = 71\,\mu$C and $q_3 = 141\,\mu$C.

(c) See part (b).

(d) (e) and (f) The capacitors all have the same voltage. $V = q_1/C_1 = 4.7$ V.