

86. (Fifth problem of **Cluster**)

- (a) To begin with, the charge on capacitor 1 is $Q_1 = C_1 V_{\text{bat}} = 400 \mu\text{C}$, and the charge on capacitor 2 is $Q_2 = C_2 V_{\text{bat}} = 150 \mu\text{C}$. After the rearrangement and closing of the switch, the total charge in the upper portion of the circuit is $Q_1 - Q_2 = Q = 250 \mu\text{C}$. With notation similar to that in the previous problems,

$$\begin{aligned} Q &= q_1 + q_2 \\ &= C_1 V + C_2 V \end{aligned}$$

which yields $V = 4.55 \text{ V}$, which, in turn implies $q_1 = C_1 V = 182 \mu\text{C}$ and $q_2 = C_2 V = 68 \mu\text{C}$. To achieve this distribution (with $+182 \mu\text{C}$ on one upper plate and $+68 \mu\text{C}$ on the other upper plate) from the arrangement right before closing the switch (with $+400 \mu\text{C}$ on one upper plate and $-150 \mu\text{C}$ on the other upper plate), it is necessary for $218 \mu\text{C}$ to flow through the switch.

- (b) As shown above, $V = 4.55 \text{ V} = V_1 = V_2$.