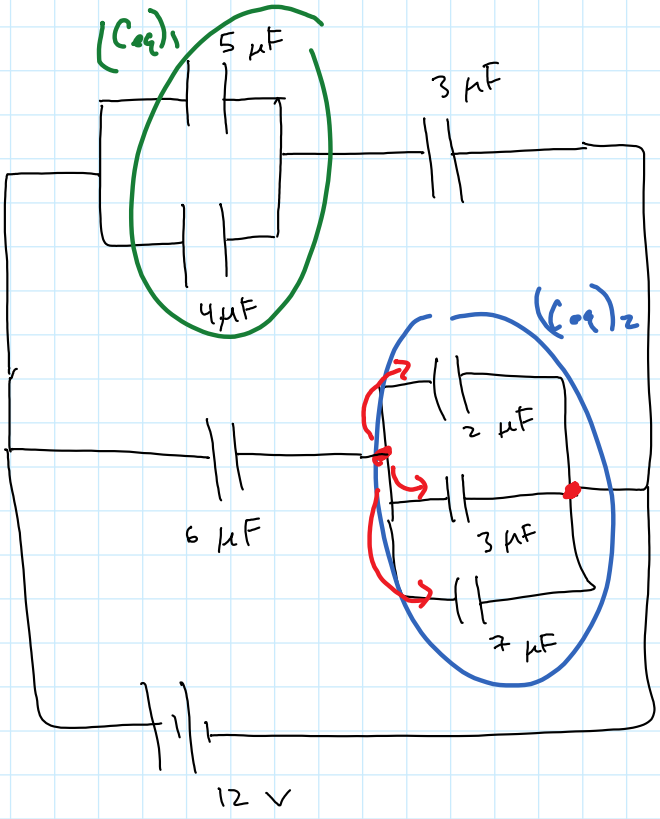
Phy 4B Review 5/12

Friday, May 12, 2017 11:24 AM

Book Problem 26-54 with a modification:

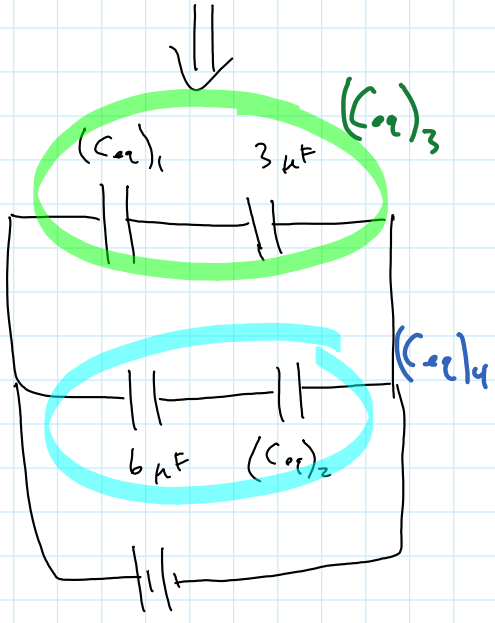
if $\Delta V_{battery} = 12$ V

find the Q and ΔV for every capacitor



$(C_{eq})_1 = 5 + 4 = 9$ μF

$(C_{eq})_2 = 2 + 3 + 7 = 12$ μF

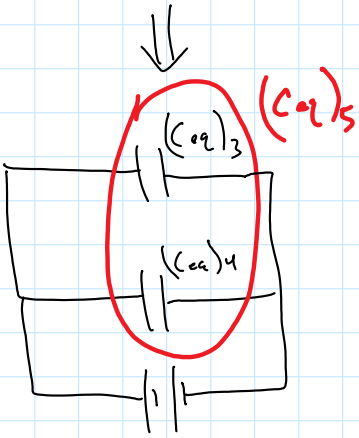


$$\frac{1}{(C_{eq})_3} = \frac{1}{9} + \frac{1}{3} = \frac{4}{9}$$

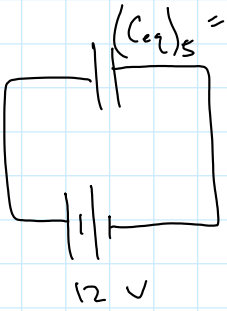
$$(C_{eq})_3 = \frac{9}{4}\ \mu F$$

$$\frac{1}{(C_{eq})_4} = \frac{1}{6} + \frac{1}{12} = \frac{3}{12}$$

$$(C_{eq})_4 = 4\ \mu F$$



$$(C_{eq})_5 = \frac{9}{4} + 4 = \frac{25}{4}$$

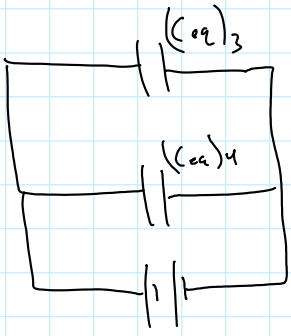


$$Q = C\ V$$

$$(Q_{eq})_5 = (C_{eq})_5\ (12)$$

$$= \left(\frac{25}{4}\right) 12$$

$$= 75\ \mu C$$



$$(Q_{eq})_3 = (C_{eq})_3\ (12\ V)$$

$$= \frac{9}{4}(12) = 27\ \mu C$$

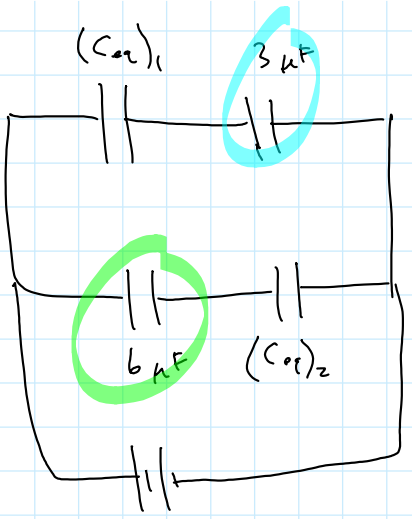
$$(Q_{eq})_4 = (C_{eq})_4\ (12\ V)$$

$$= 4\ (12) = 48\ \mu C$$

check: $(Q_{eq})_3 + (Q_{eq})_4 = (Q_{eq})_5$

$27 + 48 = 75$

$75 = 75$ ✓



$Q_3 = 27\ \mu C$
$\Delta V_3 = 9\ V$

$Q_6 = 48\ \mu C$
$\Delta V_6 = 8\ V$

$(Q_{eq})_1 = Q_3 = (Q_{eq})_3 = 27\ \mu C$

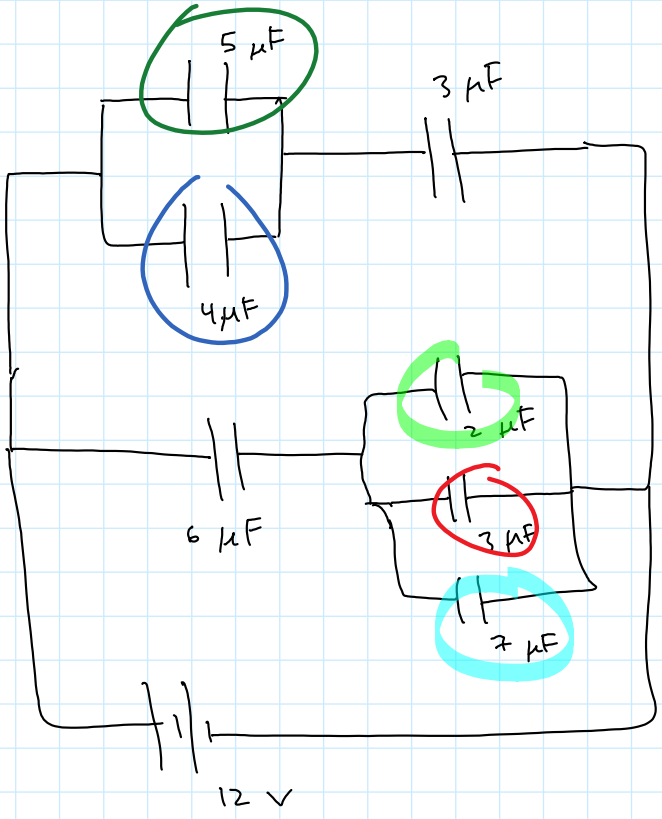
$V_3 = \frac{Q_3}{C_3} = \frac{27}{3} = 9\ V$

$(V_{eq})_1 = \frac{27}{9} = 3\ V$

$(Q_{eq})_2 = Q_6 = (Q_{eq})_4 = 48\ \mu C$

$V_6 = \frac{48}{6} = 8$

$(V_{eq})_2 = \frac{48}{12} = 4$



$Q_5 = 15\ \mu C$
$\Delta V_5 = 3\ V$

$Q_4 = 12\ \mu C$
$\Delta V_4 = 3\ V$

$\Delta V_5 = \Delta V_4 = \Delta V_{(C_{eq})_1} = 3\ V$

$Q_4 = C_4(3) = 12\ \mu C$

$Q_5 = C_5(3) = 15\ \mu C$

check: $Q_4 + Q_5 = Q_{(C_{eq})_1}$

$27 = 27$ ✓

$Q_2 = 8\ \mu C$
$\Delta V_2 = 4\ V$

$Q_3 = 12\ \mu C$
$\Delta V_3 = 4\ V$

$Q_7 = 28\ \mu C$
$\Delta V_7 = 4\ V$

$\Delta V_2 = \Delta V_3 = \Delta V_7 = \Delta V_{(C_{eq})_2} = 4\ V$

$Q_2 = C_2(4) = 8\ \mu C$

$Q_3 = C_3(4) = 12\ \mu C$

$Q_7 = C_7(4) = 28\ \mu C$

check: $Q_2 + Q_3 + Q_7 = Q_{(C_{eq})_2}$

$8 + 12 + 28 = 48$

$48 = 48$ ✓