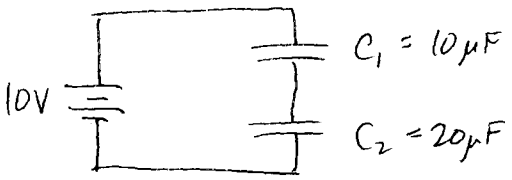
NAME:

Solution

Quiz #4:
Phys142

Two capacitors, C1=10 μF and C2=20 μF, are connected in series to a 10V battery [Note that μ stands for 10^{-6}].

(a)[1 pts] Draw the circuit diagram.



(b)[3 pts] Find the equivalent capacitance of the combination.

series:

$$\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2} \Rightarrow C_{eq} = \frac{C_1 C_2}{C_1 + C_2}$$

$$C_{eq} = \frac{(10\mu F)(20\mu F)}{30\mu F} = 6.67\mu F$$

(c)[3 pts] Find the potential difference across each individual capacitor.

do part (d) first:

$$V_1 = \frac{Q_{eq}}{C_1} = \frac{6.67\times10^{-5} C}{10\times10^{-6} F} = 6.67\ V$$

$$V_2 = \frac{Q_{eq}}{C_2} = \frac{6.67\times10^{-5} C}{20\times10^{-6} F} = 3.33\ V$$

(d) [3 pts] Find the charge stored on each individual capacitor.

$$C = \frac{Q}{V} \Rightarrow Q_{eq} = C_{eq} V_{battery} = (6.67\times10^{-6} F)(10\ V)$$

$$Q_{eq} = 6.67\times10^{-5} C = 66.7\mu C$$

Q is the same for all capacitors in series

$$Q_{eq} = Q_1 = Q_2$$

$$\Rightarrow Q_2 = Q_1 = 66.7\mu C$$