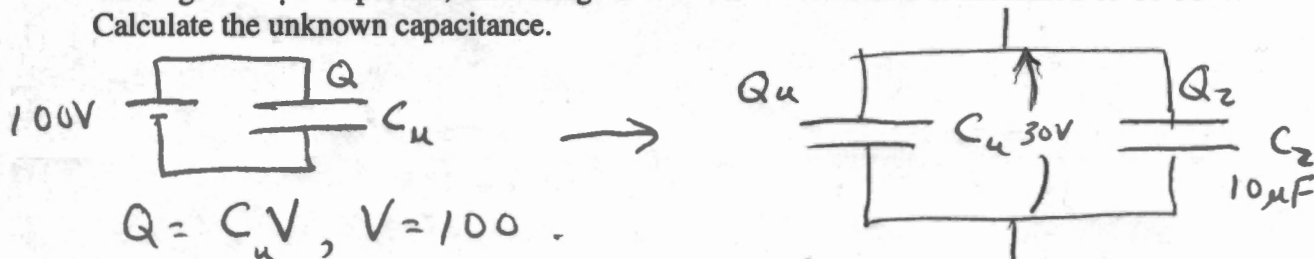5.   (10 pts.) An isolated capacitor of unknown capacitance has been charged to a potential difference of 100 V. When the charged capacitor is then connected in parallel to an uncharged 10 μF capacitor, the voltage across the combination is measured to be 30 V. Calculate the unknown capacitance.

5. (10 pts.) An isolated capacitor of unknown capacitance has been charged to a potential difference of 100 V. When the charged capacitor is then connected in parallel to an uncharged 10 μF capacitor, the voltage across the combination is measured to be 30 V. Calculate the unknown capacitance.

$Q = C_u V$, $V = 100$.

$C_u =$ unknown capacitance.

total charge Q splits into two: $Q = Q_u + Q_2$

$C_2 = 10 \mu F$

$V = 30V$.

Now use conservation of charge and $Q = CV$.

$$Q = Q_u + Q_2$$

$$(C_u)(100) = (C_u)(30V) + (10 \mu F)(30V)$$

$$70 \, C_u = 300 \mu C$$

$$\boxed{C_u = 4.29 \mu F}$$