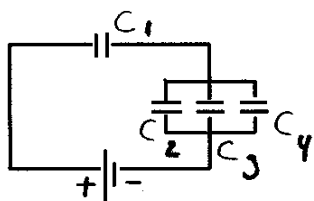


Physics 1112 - Quiz 3

Name SOLUTION

1. Consider the network of capacitors shown below. All the capacitors are identical and have the capacitance $C = 5.00 \mu\text{F}$.



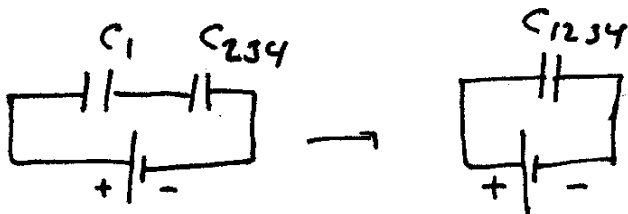
$$C_{234} = C_2 + C_3 + C_4 = 15.0 \mu\text{F}$$

$$\frac{1}{C_{1234}} = \frac{1}{C_1} + \frac{1}{C_{234}}$$

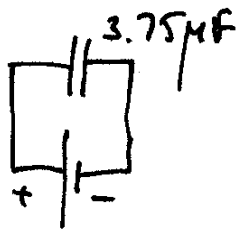
$$= \frac{1}{5.00 \mu\text{F}} + \frac{1}{15.0 \mu\text{F}} = \frac{4}{15.0 \mu\text{F}}$$

$$C_{1234} = \frac{15}{4} \mu\text{F} = 3.75 \mu\text{F}$$

- a. Calculate the equivalent capacitance of the network.



- b. If a potential difference of 12.0 V is placed across the network, what is the total energy stored in the electric fields of the capacitors of the network?



$$ES = \frac{1}{2} C (\Delta V)^2$$

$$ES = \frac{1}{2} C_{1234} (\Delta V)^2$$

$$= \frac{1}{2} (3.75 \times 10^{-6} \text{ F})(12.0 \text{ V})^2$$

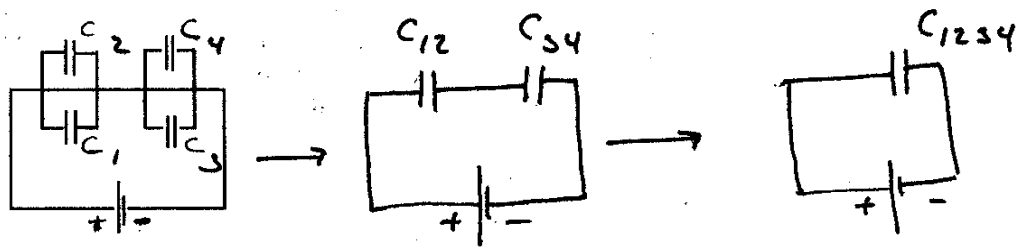
$$= 270 \times 10^{-6} \text{ J} = \underline{\underline{0.270 \times 10^{-3}}}$$

January 29, 2002

Physics 1112 - Quiz 3

Name SOLUTION

1. Consider the network of capacitors shown below. All the capacitors are identical and have the capacitance $C = 5.00 \mu\text{F}$.



- a. Calculate the equivalent capacitance of the network.

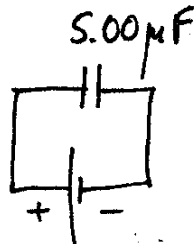
$$C_{12} = C_1 + C_2 = 10.0 \mu\text{F}$$

$$C_{34} = C_3 + C_4 = 10.0 \mu\text{F}$$

$$C_{1234} = 5.00 \mu\text{F}$$

$$\frac{1}{C_{1234}} = \frac{1}{C_{12}} + \frac{1}{C_{34}} = \frac{1}{10.0 \mu\text{F}} + \frac{1}{10.0 \mu\text{F}} = \frac{2}{10.0 \mu\text{F}} = \frac{1}{5.00 \mu\text{F}}$$

- b. If a potential difference of 12.0 V is placed across the network, what is the total energy stored in the electric fields of the capacitors of the network?



$$ES = \frac{1}{2} C (\Delta V)^2$$

$$ES = \frac{1}{2} (5.00 \times 10^{-6} \text{F}) (12.0 \text{V})^2$$

$$= 360 \times 10^{-6} \text{J} = \underline{\underline{0.360 \times 10^{-3} \text{J}}}$$