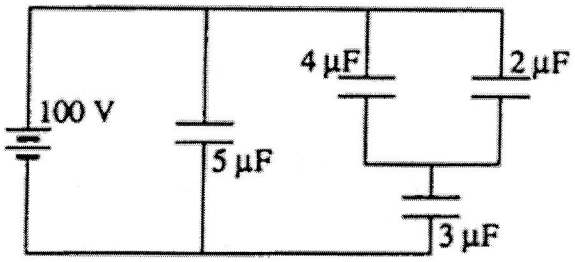
Electricity: Capacitors Quiz

Name: _____ Period: _____ Date: _____

I. Simplify the following electric circuits. Show your work to get full credit.

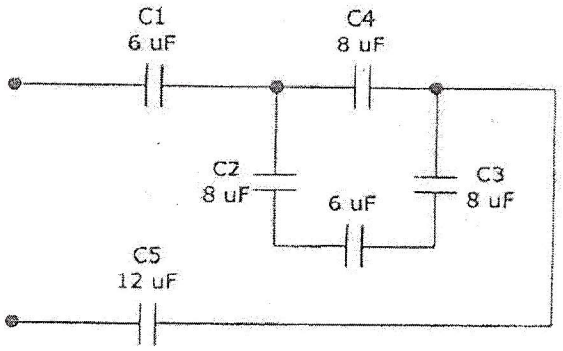
1.



a. Type of circuit: _____

b. Total Capacitance in the circuit: _____

2.

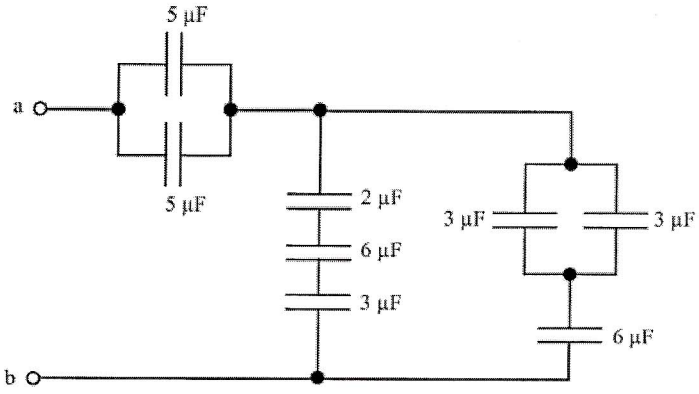


a. Type of circuit: _____

b. Total Capacitance in the circuit: _____

c. Total charge in the circuit if the voltage provided is 120V _____

3.



a. Type of circuit: _____

b. Total Capacitance in the circuit: _____

II. Answer the following. Show work and provide final answer in scientific notation.

1. A 6.5 nanofarad parallel plate capacitor holds a charge of magnitude 25μC on each plate.

   a. What is the potential difference (Voltage) between the plates? _____

   b. If the plates are separated by a distance of 0.45mm, what is the area of the plate?_____

   c. What the electric potential energy (U) stored in the capacitor? _____

2. A capacitor is fully charged by a 16V battery and has 50μJoules of energy stored in it..

   a. Find the charge on each conducting plate of the capacitor. _____

   b. Find the value of the capacitance. _____

   c. Find the separation of the plates is the surface area is 4.5mm^2 _____

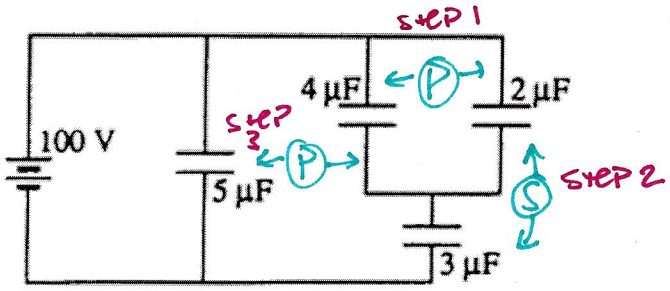
Electricity: Capacitors Quiz

Name: Key Period: _____ Date: _____

I. Simplify the following electric circuits. Show your work to get full credit.

(P) Parallel
(S) Series

1.



STEP 2

$\frac{1}{C} = \frac{1}{6} + \frac{1}{3}$

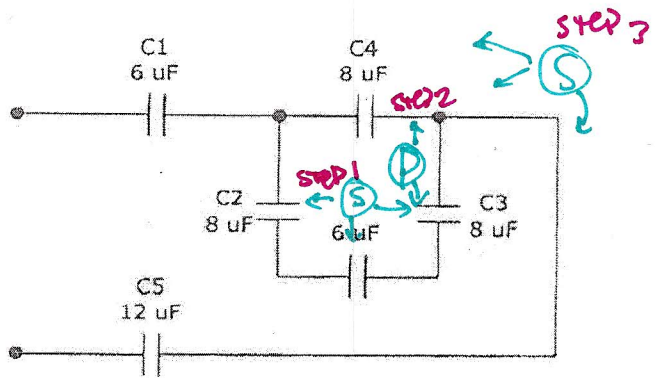
$\frac{1}{C} = \frac{1+2}{6} = \frac{3}{6}$

$C = \frac{6}{3} = 2\mu F$

a. Type of circuit: COMBINED

b. Total Capacitance in the circuit: 7 μF

2.



a. Type of circuit: COMBINED

b. Total Capacitance in the circuit: 2.89 μF

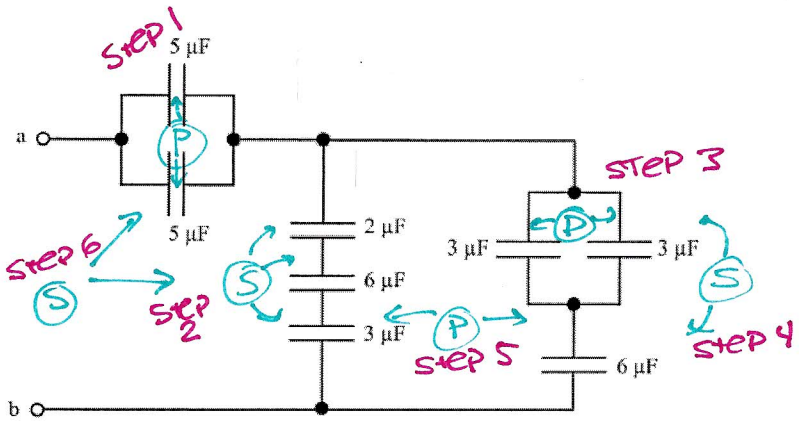
c. Total charge in the circuit if the voltage provided is 120V 3.47×10^{-4} C

c) $C = \frac{Q}{V}$

$Q = CV = (2.89 \times 10^{-6} F)(120)$

$Q = 3.47 \times 10^{-4}$ C

3.



a. Type of circuit: Combined

b. Total Capacitance in the circuit: 2.86 μF

STEP 4

$\frac{1}{C} = \frac{1}{6} + \frac{1}{6}$

$\frac{1}{C} = \frac{2}{6}$

$C = \frac{6}{2} = 3$

STEP 2

$\frac{1}{C} = \frac{1}{2} + \frac{1}{6} + \frac{1}{3}$

$\frac{1}{C} = \frac{3+1+2}{6}$

$\frac{1}{C} = \frac{6}{6}$

$C = 1$

STEP 6

$\frac{1}{C} = \frac{1}{10} + \frac{1}{4}$

$\frac{1}{C} = \frac{4+10}{40}$

$C = \frac{40}{14} = 2.86$

II. Answer the following. Show work and provide final answer in scientific notation.

1. A 6.5 nanofarad parallel plate capacitor holds a charge of magnitude 25μC on each plate.

a. What is the potential difference (Voltage) between the plates? $3.85\times10^{3}V$

b. If the plates are separated by a distance of 0.45mm, what is the area of the plate? $3.3\times10^{-1}F$

c. What the electric potential energy (U) stored in the capacitor? $4.8\times10^{-2}J$

$C=6.5\times10^{-9}F$

$Q=25\times10^{-6}C$

a) $V=?$

b) $A=?$

c) $U=?$

$d=0.45mm=4.5\times10^{-4}m$

a) $C=\frac{Q}{V}$

$V=\frac{Q}{C}=\frac{25\times10^{-6}}{6.5\times10^{-9}}=3846.15=3.85\times10^{3}V$

b) $C=\frac{\varepsilon_0 A}{d}$ $A=\frac{C\cdot d}{\varepsilon_0}=\frac{(6.5\times10^{-9})(4.5\times10^{-4})}{8.85\times10^{-12}}=0.33=3.3\times10^{-1}F$

c) $U=\frac{QV}{2}=\frac{(25\times10^{-6})(3.85\times10^{3})}{2}=4.8\times10^{-2}J$

2. A capacitor is fully charged by a 16V battery and has 50μJoules of energy stored in it..

a. Find the charge on each conducting plate of the capacitor. $6.25\times10^{-6}C$

b. Find the value of the capacitance. $3.9\times10^{-7}F$

c. Find the separation of the plates is the surface area is $4.5mm^2$ $1.02\times10^{-10}m$

$V=16V$

$U=50\times10^{-6}J$

a) $U=\frac{QV}{2}$

$Q=\frac{2U}{V}=\frac{2(50\times10^{-6})}{16}=6.25\times10^{-6}C$

b) $C=\frac{Q}{V}=\frac{6.25\times10^{-6}C}{16}=3.9\times10^{-7}F$

c) $A=4.5mm^2\left(\frac{1}{1000}\right)^2$

$A=4.5\times10^{-6}m^2$

$C=\frac{\varepsilon_0 A}{d}$

$d=\frac{\varepsilon_0 A}{C}=\frac{(8.85\times10^{-12})(4.5\times10^{-6})}{3.9\times10^{-7}}$

$d=1.02\times10^{-10}m$