1. A 4 volt battery stores 24 Coulombs of charge. Calculate the capacitance of the capacitor.

$C = \frac{Q}{\Delta V} = \frac{24C}{4V} = 6 C/V$ or Farads

2. A capacitor has a rating of 3 Farads. How much voltage is necessary to push 18 Coulombs onto the plates?

$C = \frac{Q}{\Delta V}$ $\Delta V = \frac{Q}{C} = \frac{18C}{3F} = 6V$

3. What does it mean to discharge a capacitor? Let the electrons flow back to + plate (Back to Owlt)

4. How much charge is held on one plate of a 15 farad capacitor brought to 6V?

$15F = \frac{Q}{6V} = 90C$

5. A. Calculate the voltage across a 4μF capacitor that holds 12μC of charge on one plate.

$C = \frac{Q}{\Delta V} = \Delta V = \frac{Q}{C} = \frac{12\times10^{-6}C}{4\times10^{-6}F}$ $4F = \frac{12C}{V} = V\frac{12V}{4E} = 3$ Volts

B. How much energy is held by the capacitor?

$PE = \frac{1}{2}QV = \frac{1}{2}\ 12\times10^{-6}C \cdot 3V = 1.8\times10^{-5}J$

C. What is the total charge of the capacitor? 0C always = + 's + - 's

D. How much charge is there on one plate of the capacitor after it has been discharged?

0C, 0V both plate neutral

6. When does a capacitor stop charging?

$V_{cap} = V_{batt}$

7. A parallel plate capacitor has .0035 m^2 of area for each plate, which are separated by 6mm.

A. Calculate the capacitance.

$C = \varepsilon_0 \frac{A}{d} = (8.85\times10^{-12})\ \frac{.0035m^2}{6\times10^{-3}m} = 5.16\times10^{-12}F$

B. How much voltage is required to separate 2μC of charge?

$C = \frac{Q}{V}$ $V = \frac{Q}{C} = \frac{2\times10^{-6}C}{5.16\times10^{-12}F} = 3.88\times10^{5}V$

C. How much potential energy is held on the capacitor?

$PE = \frac{1}{2}Q\Delta V = \frac{1}{2}\ 2\times10^{-6}C \cdot 3.88\times10^{5}V = 0.388J$

D. Give three ways to increase its capacitance.

Bigger Area, Closer Distance, insert dielectric

8. When is the net charge of a capacitor not zero?

Never $+Q = -Q$ Always!!!

9. How does the capacitance change?

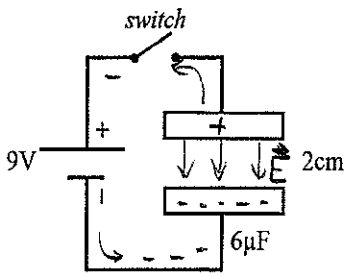
A. If the plate area is doubled. doubled

B. If the distance between the plates is halved. doubled

C. If a dielectric is placed between the plates. ↑

D. If the voltage across the capacitor is doubled. No Change

10. Use the diagram at the left to answer the following.



A. Draw what will happen to the capacitor when the switch is closed.

B. Which direction does the electric field point inside the charged capacitor? down ↓

C. Which plate has a higher potential (voltage)? + Plate

D. What is the voltage across the charged capacitor? 9V

E. What is the total charge of the capacitor? 0 coulombs (always)

F. How much charge does the 6μF capacitor hold on one plate, when fully charged?

$C = \frac{Q}{V}$ or $Q = CV = 6\mu F \cdot 9V = 5.4\times10^{-5}C$

G. How much energy is stored in the capacitor?

$PE = \frac{1}{2}QV = \frac{1}{2}\ 5.4\times10^{-5}C \cdot 9V = 2.43\times10^{-4}J$

H. Calculate the area of one plate.

$C = \varepsilon_0 \frac{A}{d}$ $6\mu F = \varepsilon_0 \frac{A}{.02m} = 1.36\times10^{11}m^2$

I. If the battery is replaced by a 12v battery, what will be the new capacitance?

no change. Battery doesn't Δ Cap = 6μF

J. With the 12v battery, how much charge is held on the capacitor?

$C = \frac{Q}{V}$ or $Q = CV = 6\mu F \cdot 12V = 7.2\times10^{-5}C$