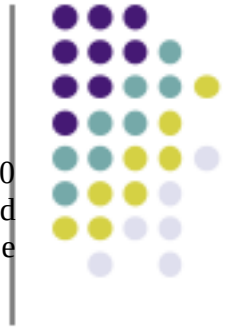
General Physics II (111 phys)

(HW3)

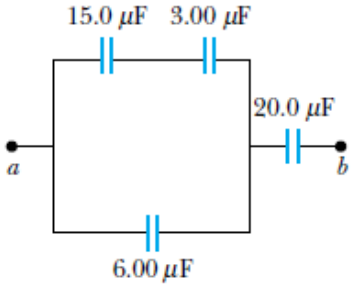
1- An isolated charged conducting sphere of radius 12.0 cm creates an electric field of 4.90×10^4 N/C at a distance 21.0 cm from its center. (a) What is its surface charge density? (b) What is its capacitance?



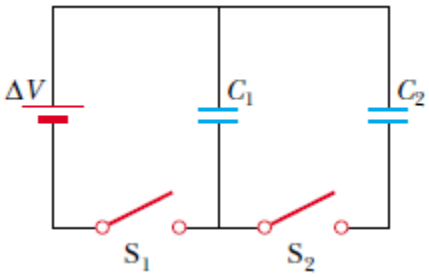
2- An air-filled capacitor consists of two parallel plates, each with an area of 7.60 cm^2, separated by a distance of 1.80 mm. A 20.0 V potential difference is applied to these plates. Calculate (a) the electric field between the plates, (b) the surface charge density, (c) the capacitance, and (d) the charge on each plate

3- When a potential difference of 150 V is applied to the plates of a parallel-plate capacitor, the plates carry a surface charge density of 30.0 nC/cm^2. What is the spacing between the plates?

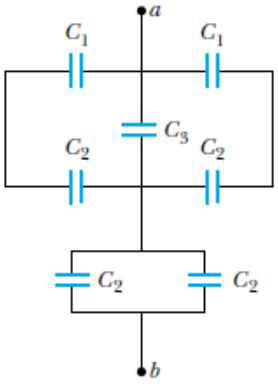
4- Four capacitors are connected as shown in the figure. (a) Find the equivalent capacitance between points *a* and *b*. (b) Calculate the charge on each capacitor if ΔVab = 15.0 V.



5- Consider the circuit shown in the figure where C_1 = 6.00 µF, C_2 = 3.00 µF, and ΔV = 20.0 V. Capacitor $C1$ is first charged by the closing of switch S_1. Switch S_1 is then opened, and the charged capacitor is connected to the uncharged capacitor by the closing of S_2. Calculate the initial charge acquired by C_1 and the final charge on each capacitor.



6- Find the equivalent capacitance between points *a* and *b* for the group of capacitors connected as shown in the figure. Take C_1 = 5.00 µF, C_2 = 10.0 µF, and C_3 = 2.00 µF.



7- Two capacitors, C_1 = 25.0 µF and C_2 = 5.00 µF, are connected in parallel and charged with a 100 V power supply. (a) Draw a circuit diagram and calculate the total energy stored in the two capacitors. (b) **What If?** What potential difference would be required across the same two capacitors connected in series in order that the combination stores the same amount of energy as in (a)? Draw a circuit diagram of this circuit.

8- A parallel-plate capacitor in air has a plate separation of 1.50 cm and a plate area of 25.0 cm^2. The plates are charged to a potential difference of 250 V and disconnected from the source. The capacitor is then immersed in distilled water. Determine (a) the charge on the plates before and after immersion, (b) the capacitance and potential difference after immersion, and (c) the change in energy of the capacitor. Assume the liquid is an insulator.

9- A parallel plate capacitor is fully charged by a 20 v battery acquiring a charge of 1.62 nC. The area of each plate is 3.5 cm 2 and the gap between them is 1.3 mm. What is the capacitance of the capacitor?

10- a) A dielectric capacitor with a capacitance C= 40µf is charged up to V 0 = 20 V. What is the energy U 0 stored in the capacitor
b) The capacitor then disconnected from everything else. The dielectric is removed, charging the capacitance to C 0 = 5µf. What was the dielectric constant k of the dielectric?

9- Each capacitor in the combination shown in the figure has a breakdown voltage of 15.0 V. What is the breakdown voltage of the combination?