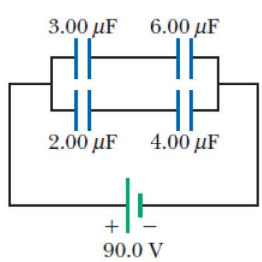
PHYS143
Physics for Engineers
Tutorial - Chapter 26

Question 1
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?

Question 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.

Question 3
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?

Question 4
For the system of four capacitors shown in Figure, find (a) the equivalent capacitance of the system, (b) the charge on each capacitor, and (c) the potential difference across each capacitor.



Question 5
Two capacitors, C_1 = 18.0 μF and C_2 = 36.0 μF, are connected in series, and a 12.0-V battery is connected across the two capacitors. Find (a) the equivalent capacitance and (b) the energy stored in this equivalent capacitance. (c) Find the energy stored in each individual capacitor.

Question 6
(a) How much charge can be placed on a capacitor with air between the plates before it breaks down if the area of each plate is 5.00 cm^2? (for air: κ = 1.00, with $E_{max} = 3.00 \times 10^6$ V/m.)

Question 7
A small, rigid object carries positive and negative 3.50-nC charges. It is oriented so that the positive charge has coordinates (-1.20 mm, 1.10 mm) and the negative charge is at the point (1.40 mm, -1.30 mm). (a) Find the electric dipole moment of the object. The object is placed in an electric field $\vec{\mathbf{E}} = (7.80 \times 10^3\ \hat{\mathbf{i}} - 4.90 \times 10^3\ \hat{\mathbf{j}})$ N/C. (b) Find the torque acting on the object. (c) Find the potential energy of the object–field system when the object is in this orientation. (d) Assuming the orientation of the object can change, find the difference between the maximum and minimum potential energies of the system.