Problems Due Week Beginning Oct 11, 1999.

Prob2617: A coaxial cable with an inner wire of diameter 3 mm and an outer sheath wire of diameter 8 mm has a potential of 1 kV between the wires. (a) What is the capacitance of 10 m of the cable? (b) How much energy is stored in the 10 m piece of cable and in a 1-km piece?

Hint: Use known formulas

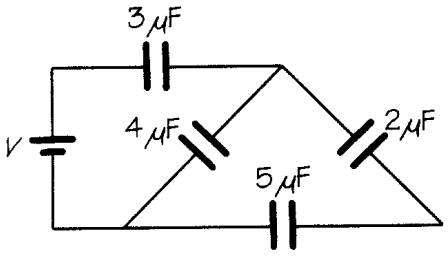
Prob2626: A metal sphere of radius 0.10 m carries a charge of 8.5×10^{-6} C. How much energy is contained in a spherical region of radius 25 cm that is concentric with the sphere?

Hint: The field exists only outside.

Prob2630: Assume that an electron consists of a sphere of radius R with its charge distributed uniformly on the surface. (a) What is the electric field outside of the radius R? (b) What is the total electrostatic energy stored in the electric field? (c) Assume that all the energy of part (b) is solely responsible for the rest energy of the electron. (Rest energy is the energy associated with an object's mass, according to the theory of special relativity, even if the object is at rest. It takes the form mc^2, where in this case m is the electrons mass, 0.9×10^{-30} kg, and c is the speed of light, 3×10^8 m/s. What must the radius R of the electron be?

Hint: Use your answer for (b) and equate that to mc^2 in part (c).

Prob2633: Find the equivalent capacitance of the circuit shown in the figure below.



Hint: Redraw the circuit thrice everytime reducing the number of capacitors.

Prob2649: A parallel-plate capacitor carrying charge qo is modified by the insertion of a dielectric with $\kappa = 1.8$ between the plates. As a consequence, the energy stored in the capacitor triples. What will the charge be after the dielectric is inserted?

Hint: Use known equations

Prob2660: A charge e is placed on a parallel-plate capacitor of area L x L and plate separation d. The capacitor is then filled with a dielectric of dielectric constant κ. If L = 0.15 m, d = 3 mm, Q = 0.3 μC, and κ = 2.5, what is the surface charge induced on the dielectric? What is the magnitude of the electric field in the dielectric? How much energy is stored in this capacitor?

Hint: Use equation for induced charge density in text.

Prob2908: A cork ball carrying charge q has a mass of 0.6 g and is set in straight-line motion perpendicular to a uniform magnetic field of 0.03 T. What is the value of q if its direction of motion changes by 0.01degree in 1.0 s?

Hint: magnetic field produces acceleration perpendicular to original direction of motion on a moving charge.