Electrostatics problems 11/14/06

1. Two identical, conducting spheres carry identical electric charges. If the spheres are set a distance d apart they repel one another with a force F. A third sphere, identical to the other two but initially uncharged is then touched to one sphere and then to the other before being removed. What would be the resulting force between the original two spheres?

2. Charge is uniformly distributed along a disk of radius a. Draw a graph that represents the magnitude of the electric field along the axis of the disk as a function of distance from the center of the disk.

3. A free electron and a free proton are placed between two oppositely charged parallel plates. Both are closer to the positive plate than to the negative plate. Which has more potential energy, the proton or the electron?

4. (Setup) A spherical shell with an inner surface of radius a and an outer surface of radius b is made of conducting material. A point charge $+Q$ is placed at the center of the spherical shell and a total charge $-q$ is placed on the shell.

a. How is the charge $-q$ distributed after it has reached equilibrium?

b. Assume that the electrostatic potential is zero at an infinite distance from the spherical shell. What is the electrostatic potential at a distance R from the center of the shell, where $b > R > a$?

5. Four point charges are held in place at the corners of a square of side length a. The point charges have the same magnitude q, but one of the charges is negatively charged– i.e., one charge is $-q$. How much work does it take to assemble that configuration of charges?