Suggested Problems

1. You are given three samples. If you observe that any two samples (chosen out of the three in any possible combination) electrically attract each other,
   (a) What conclusion(s) that you know 100% right can you derive?
   (b) Illustrate each case for all possible interactions between any two samples.

2. A rod sample made of glass is rubbed against a fabric sample made of silk, and a rod sample of plastic is rubbed against a fabric sample of fur. If you observe that the glass rod and the fur repel each other,
   (a) Which combination of the samples do you think should attract each other? Why?
   (b) Which samples have to be charged by the same amount? Why?

3. If you connect a charged sphere (with excess electrons or missing electrons) to earth (to the ground), for example, via a piece of wire, the sphere will be completely discharged by either repelling or attracting electrons from the earth, respectively. This is called grounding.

   If you have two electrically isolated spheres and a piece of wire, how can you make the sphere A charged with Q/2 and the sphere B neutral when you start with the sphere A neutral and the sphere B charged with Q?

4. A friend of yours is trapped into a very large, metal sphere cage. S/he is sitting right in the center of the sphere without having any electrical connection to the sphere. In the case that the sphere is heavily charged, is s/he in danger? Why/Why not?

   (Hint: What you learnt so far in the class should be sufficient for you to derive an answer. Think about the symmetry. [Note: Whatever you find as an answer for the center of the sphere is actually the same for any point inside the sphere. But that part is for later in the course...])

5. Find the electrostatic force exerted on a point charge of q_o by a line charge of Q with a length of L if the point charge is separated away from the middle point of the line charge by a distance d in normal configuration by making 90° with the line charge as shown below.