Electrostatics -- Conceptual Questions

1.) The mass of an electron is 9.1×10^{-31} kg and its charge is 1.6×10^{-19} coulombs. If two electrons are separated by 1 meter, each will exert an electrical force and a gravitational force on one another. How do those forces compare?

2.) A light, small, styrofoam ball (this is called a *pith ball*) is painted with a metallic paint and attached to a string that hangs freely in mid-air.
   a.) What will the pith ball do when a positively charged rod is brought close to it (the two don't touch)?
   b.) How would the results of *Part a* have changed if the rod had been negatively charged?
   c.) How would the results of *Part a* have changed if the pith ball had not been coated with a metallic paint but, instead, was simply styrofoam?
   d.) The rod and pithball in *Part a* touch. What are the consequences for the pith ball?
   e.) You have a pithball that is covered with metallic paint. *Without allowing the pith ball and rod to touch*, what clever thing could you do to make the pithball electrically negative?

3.) If you put gas in a spherical shell, the gas will distribute itself pretty much evenly throughout the volume. If you put charge on a solid metal sphere, what will the charge do?

4.) You have a charged, hollow, egg-shaped object made of copper.
You put charge on the structure. How will the charge distribute itself
over the surface? That is, will it distribute uniformly or what? If it
doesn't distribute itself uniformly, how generally will it concentrate?

egg-shaped conductor
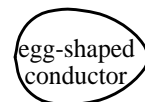
5.) Two point charges, one twice as large as the other, are placed a distance r units apart. How will the force on the smaller charge change if:
   a.) The distance is doubled?
   b.) The larger charge is doubled?
   c.) How would the answers to *Parts a* and *b* have changed if you had been examining the larger charge instead of the smaller charge?

6.)   Three equal point charges are positioned at the corners of an
equilateral triangle. The net force on the top charge is measured. The
distance between the top charge and the other two charges is doubled.
Decide which of the lettered responses below describes how the new net

d

2d
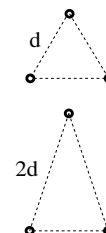
force on the top charge will change, then explain why that response is appropriate.

    a.) Double.
    b.) Halve.
    c.) Quadruple.
    d.) Quarter.
    e.) None of the above.