# Physics 2B Quiz Set 1 (The electric force meets Newton's 2nd law)

(there is no gravity unless the problem say so)

1. Two free point charges $+q$ and $+4q$ are a distance l apart. A third charge is placed so that all three are in equilibrium when released. **Find the location, magnitude, and sign of the third charge.**

2. Two similar small conducting balls (but treat them as point objects) each of mass m are hung from silk threads (non-conducting) each of length l. They carry equal charges, q, and are in equilibrium (a=0). **Find the charge on one ball.** There is gravity in this problem.

3. Consider the diagram. **Find the position x of the mass m such that the system is horizontal and balanced. Also for what value of h would there exist no force of the pivot on the rod?** The fulcrum is at the midpoint of the rod. There is only a force of gravity on the hanging mass, not on the rod or the charges. Ignore any diagonal coulomb forces.
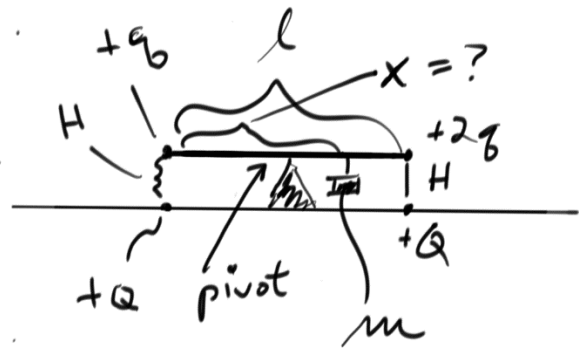
4. Three positive charges, q_1, q_2, and q_3 are connected by two strings of equal length L. Due to mutual Coulomb repulsion, the charges spread out and form a straight line such that the distance between 1 and 3 is 2L and, with 2 in the middle, the distance between 1 and 2 or 2 and 3 is just L. **Find the tension force in each string.**

5. Two identical spherical conductors initially are charged with *unlike* charges. When they are separated by a distance r, the force on each conductor is **F**. Then the two conductors are brought in contact and separated again to r. The force on each is again found to have the magnitude **F**. **What is the ratio of the two initial charges of the two spheres before contact?**

6. With the radius of a hydrogen atom given as r = 10^{-10}m, **find the speed of the electron in "orbit" about the proton.**