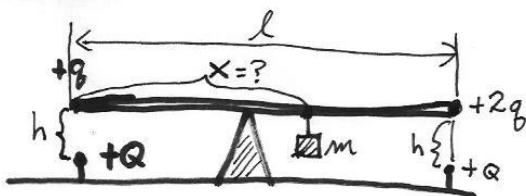


Physics 4B Homework assignment set 1 for electric charge and its properties.

1. Two free (not held fixed) point charges $+q$ and $+4q$ are a distance l apart. A third charge is placed such that all three charges have zero acceleration. Find the location, magnitude, and sign of the third charge. There is no gravity in this problem.
2. Two similar small conducting balls each of mass m are hung from silk threads each of length l and carry similar charges q and are in equilibrium. Assume that the angle of separation between the two threads is a small angle θ . Find the charge on one ball. There is gravity in this problem.
3. Roughly estimate the number of coulombs of positive charge in a glass of water. Let the volume be 250 cubic centimeters. (This problem will not be on a lecture quiz).
4. 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 the two coulomb forces that are diagonal.



5. Two equal positive charges are held fixed and separated by distance D . Find the electric field vector along their perpendicular bisector. Then find the position relative to their center where the field is a maximum.
6. Find the electric field vector anywhere in the plane of a dipole. Let the charge value on one charge be q . Let them be separated by d . Let the origin be in between them. And say they are each on the y axis.
7. Three positive charges, q_1 , q_2 , and q_3 are connected with 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.