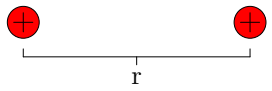
Recitation 1

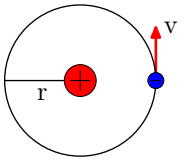
Chapter 19

Problem 3. Nobel laureate Richard Feynman once said that if two persons stood at arm's length from each other and each person had $p = 1\%$ more electrons than protons, the force of repulsion between them would be enough to lift a "weight" equal to that of the entire Earth. Carry out an order of magnitude calculation to substantiate this assertion.

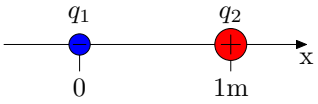
Problem 4. Two protons in an atomic nucleus are typically seperated by a distance of $r = 2.00 \cdot 10^{-15}$ m. The electric repulsion force F between the protons is huge, but the attractive nuclear force is even stronger and keeps the nucleus from bursting apart. What is the magnitude of F?



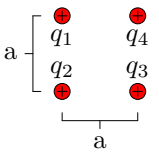
Problem 9. In the Bohr theory of the hydrogen atom, an electron moves in a circular orbit about a proton, where the radius of the orbit is $r = 0.529 \cdot 10^{-10}$ m. (a) Find the magnitude of the electric force each exerts on the other. (b) If this force causes the centripetal acceleration of the electron, what is the speed of the electron?



Problem 11. In Figure P19.11, determine the point (other than infinity) at which the electric field is zero. $q_1 = -2.50\ \mu$C and $q_2 = 6.00\ \mu$C.



Problem 15. Four point charges are at the corners of a square of side a as shown in Figure P19.15, with $q_1 = 2q$, $q_2 = 3q$, $q_3 = 4q$, and $q_4 = q$. (a) Determine the magnitude and direction of the electric field at the location of charge q_4. (b) What is the resultant force on q_4?



Problem 19. A uniformly charged ring of radius $r = 10.0$ cm has a total charge of $q = 75.0\ \mu$C. Find the electric field on the axis of the ring at (a) $x_a = 1.00$ cm, (b) $x_b = 5.00$ cm, (c) $x_c = 30.0$ cm, and (d) $x_d = 100$ cm from the center of the ring.