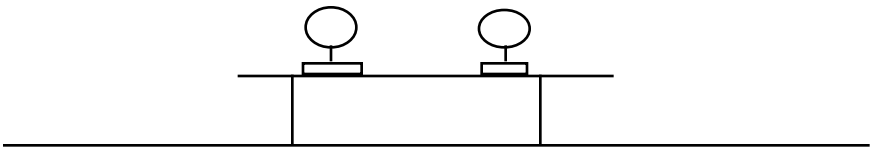
Coulomb's Law – Quiz 16aH

$\vec{F}_{12} = k\frac{q_1 q_2}{r^2}\hat{r}_{12}$ (*in a vacuum*) *where* $k = 9x10^9$ using SI or MKS units.

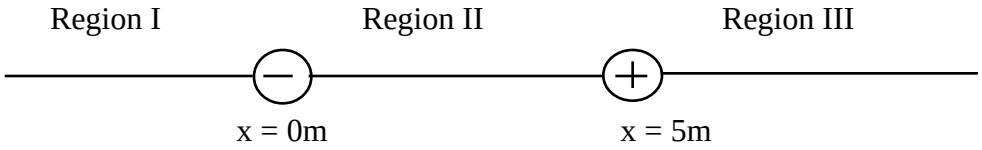
$e = 1.6x10^{-19}C(coulombs)$ *and* $1C = 6.25x10^{18}e$ (where "e" is the elementary unit of charge).

$m_e = 9.11x10^{-31}kg$ *and* $m_p \approx m_n \approx 1.67x10^{-27}kg$

1. Two identical metal spheres contain excess charges of –10C and 6C. The spheres are on insulated stands. They are touched together and then separated to a distance of 70cm. What now is the electric force of the sphere on the left acting on the sphere on the right?



2. If the negative charge at the origin of the x-axis is $q_1 = -4C$, and the positive charge is $q_2 = 6C$,
   (a) in what region could a third charge, q_3, be placed and have a zero net force on it?
   (b) Find this position on the x-axis where the electric field is zero.



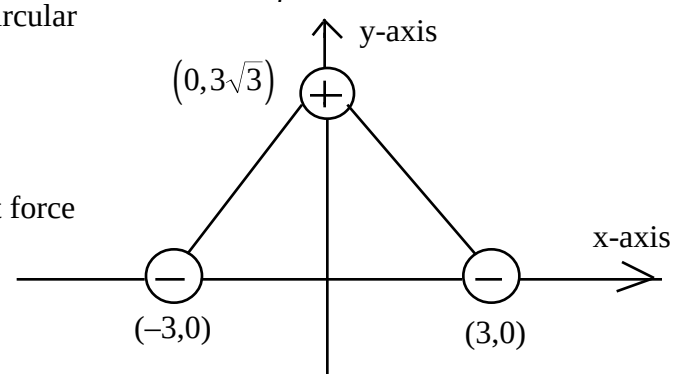
3. (a)What is the centripetal force which keeps the electron in orbit about the proton? Recall that:

The force of gravity of m_1 on m_2 is given by: $\vec{F}_{12} = -G\frac{m_1 m_2}{r^2}\hat{r}_{12}$

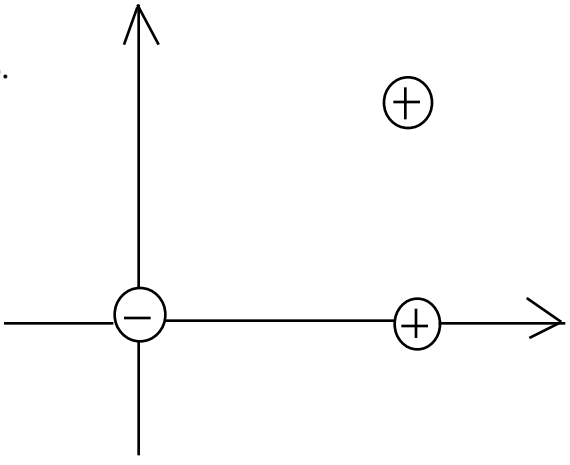
Assume that the radius of the supposed circular orbit is about $5.2x10^{-11}$ m.

(b)What is the electron's orbital speed?

4. If $q_1 = q_2 = -5nC$ are located on the x-axis as shown and $q_3 = 8nC$ on the y-axis, find the net force on q_3.



5.



If a negative charge of $q_A = -20\mu C$ is located at the origin and a positive charge of $q_B = 10\mu C$ is located at (4,0) m on the x-axis, find the net force on a third charge of $q_C = 5\mu C$ located at (4,3) m.

(P.S. You didn't really use Newton's Law of Gravitation on problem #3, did you?)