ELECTRIC FIELDS AND POTENTIAL – QUIZ 21a

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

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

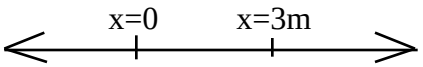
$m_e = 9.11x10^{-31}kg$ *and* $m_p \approx m_n \approx 1.67x10^{-27}kg$

$\vec{E} = \frac{\vec{F}_{\to q_0}}{q_0}$ *and* $\vec{F}_{\to q_0} = q_0\vec{E}$ $\quad [E] = N/C = V/m$ (When in doubt, try letting $q_0 = 1C$.)

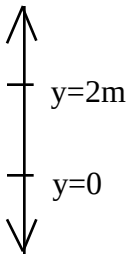
V = electrical potential energy per unit charge $\quad [V] = J/C = V\,(volt)$

$W = qV$ (Recall that $W = F \cdot d$ and $W = \Delta K$ where K.E. $= \frac{1}{2}mv^2$)

1. If Q = –4C at x = 0, what is the intensity or magnitude of the electric field at x = 3m?



2. If Q = 5C at y = 2m, find the electric field, $\vec{E}$, due to Q at y = 0.



3. Suppose there is only one charge, Q, in the universe, and it is located at x = 0. As you walk along the x-axis, you pass the signpost shown at x = x_o.

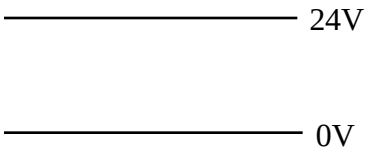
(a) When you get to $x = \frac{1}{2}x_0$, what does this $\vec{E}$ – field signpost read?

(b) What is the sign (positive/negative) of the charge, Q?

4. Shown here are two equipotential lines.

(a) If a charge of q = 2C is released from the top plate, how much work will be done by the electric field as the charge moves to the bottom plate?

(b) If an electron is released from the bottom plate, how much kinetic energy will it gain when it arrives at the top plate? (Gravitational effects are negligible here.)



5. Draw a negative and a positive charge of equal magnitude on your paper. Draw the electric field lines.