

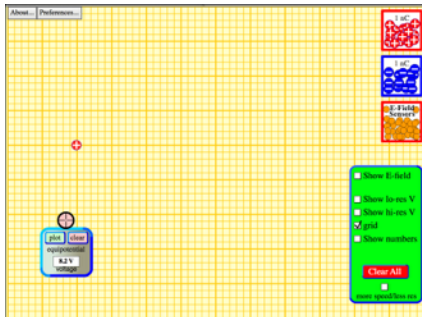
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## Part 1 - Charges and Fields

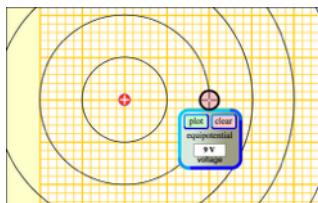
Follow this link to the activity provided by the PhET project at the University of Colorado - Boulder. <http://phet.colorado.edu/en/simulation/charges-and-fields>

There are two buttons to start the activity. The “run now” button could work within your browser, but the “download” button may have more success on the school computers.

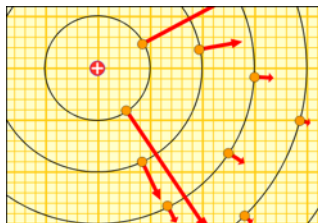


When you create a new file, you are given a pile of positive and negative charges, a bunch of E-Field sensors and controls on the display.

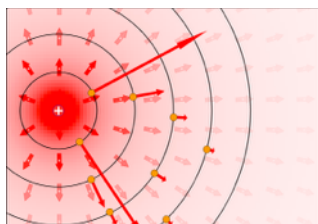
Turn on the grid lines, and place a positive charge on a major grid intersection about 2 blocks from the left of the screen. Consider this the origin from here.



Place the target of the voltage tool on each major grid intersection to the right of the positive charge. Click the green “plot” button. The lines that are created are called equipotential lines. This means that the voltage (potential) is the same at all points on the line.



Place at least two E-Field sensors on each equipotential line. These are positive test charges as we discussed in class. The vectors that are displayed show the magnitude and direction of the force that would exist on a charge at that location.



Turn off the grid lines.

Turn on “Show Hi-Res V”

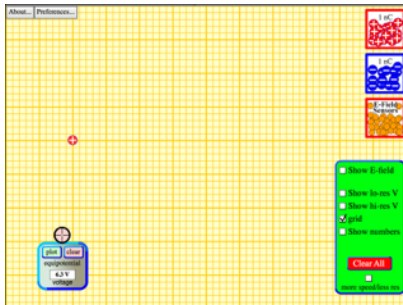
This will shade the background from Red as a positive electric field to Blue in a negative field.

Turn on “Show E-Field”

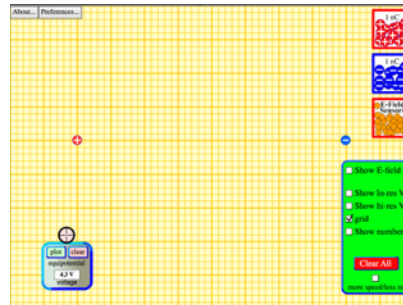
This will place force vectors throughout the electric field showing the direction from positive to negative.

Take a screen capture, include it in the handout, and answer the questions below.

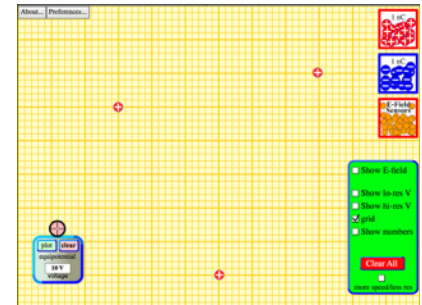
Show the completed E-Field for each of the following charge distributions. Be sure to plot enough equipotential lines to fill in the field.



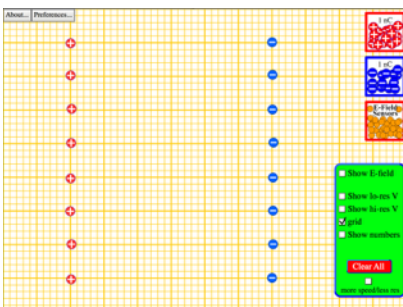
A Single Positive Charge



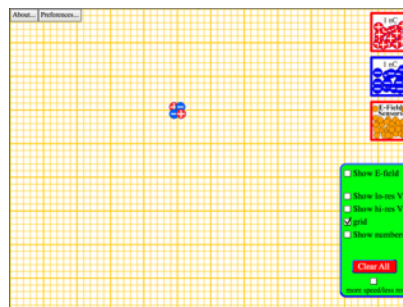
A Dipole: 1 + and 1 -



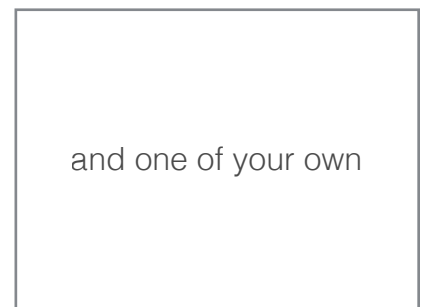
Three positives



2 Lines



2+ and 2-



and one of your own

After plotting the fields;

Describe two things you observed about the equipotential lines.

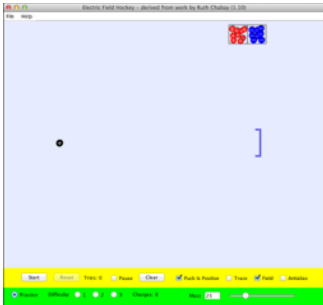
Describe two things you observed about the field lines (the arrows).

Describe one thing you could not explain.

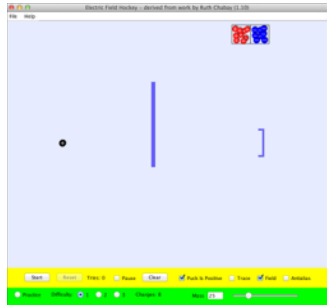
What would happen, in general, if you reversed all of the charges so that positives were negatives.

Follow this link to the activity provided by the PhET project at the University of Colorado - Boulder. <http://phet.colorado.edu/en/simulation/electric-hockey>

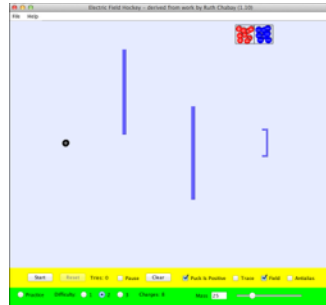
At each level, you will use positive and negative charges to push or pull the puck towards and into the goal. Take a screen shot of each difficulty level when you have scored a goal.



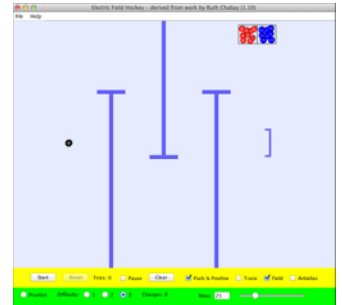
Practice - 5 points



Level 1 - 10 points



Level 1 - 5 bonus points



Level 1 - 10 bonus points