Electric Fields and Potentials pre-lab **Name: _____** **Date: _____**

For this lab we will study some general characteristics of the electric field and the electric potential produced by configurations of point charges. For the pre-lab, we will use the following PhET simulation:

https://phet.colorado.edu/en/simulation/charges-and-fields

Begin by putting a single **positive** point charge into the simulation area. There is a *potential plotting tool* (above the tape measure) that you can drag around the screen to sample the potential at various places. Hitting the ***Pencil*** button on this tool will plot an equipotential line (a line along which every point has the same electric potential). Plot several such lines (preferably, using the same potential difference between neighboring lines).

1. What shape are the equipotential lines from a point charge? _____

2. Turn on the *Electric field* function as well as *Values*. The brightness of the arrows indicates the magnitude of the electric field. What can you say about the direction of the electric field from a positive charge?

3. True or false? Electric field points in the direction of increasing potential. [ ] True [ ] False

4. True or false? Equipotential lines are perpendicular to electric field. [ ] True [ ] False

5. True or false? The stronger the field, the more rapidly the potential changes. [ ] True [ ] False

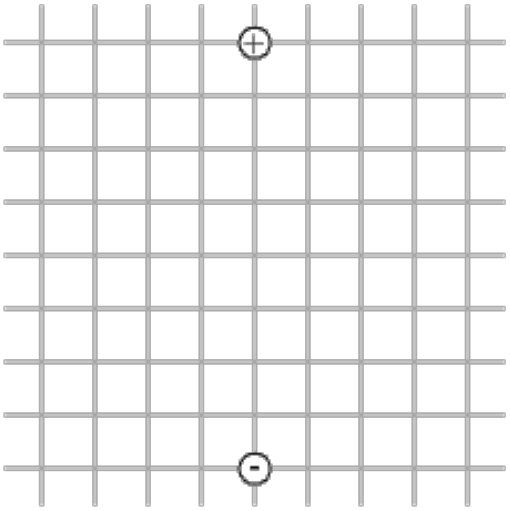
Put the positive charge away, and replace it with a single negative charge. Plot some equipotentials.

6. What can you say about the direction of the electric field from a negative charge?

7. Now that you have more information available, seeing what happens with a negative charge, should the answers to the true/false questions above be changed?

[ ] Yes, change at least one answer [ ] No, all the answers are still valid

Now, create an electric dipole, by adding a positive charge to the picture. You should have the positive charge above the negative charge, as shown at right.



8. On the picture, sketch the electric field pattern and a few equipotential lines, so you can really see what the field and the equipotentials look like.

9. One of the equipotential lines should have a potential of V = 0 volts. Is the electric field equal to 0 V/m along that line? (Feel free to use an *e-field sensor* to check.)

[ ] Yes [ ] No