PHYS 202L Electric Field & Potential Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
**A. Electric field lines and Equipotentials:**

1. Open: <https://phet.colorado.edu/sims/html/charges-and-fields/latest/charges-and-fields_en.html>
2. Move up the positive charge to the middle, the electric field will be displayed, sketch the electric field pattern for a Positive charge below inside the box.
3. Move back the positive charge to its initial position. Move up the negative charge to the middle, the electric field will be displayed, sketch the electric field pattern for a Negative charge below inside the box.

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| --- | --- |
| Electric field for a Positive charge | Electric field for a Negative charge |
|  |  |

1. Reset the simulation, uncheck the Electric field box, check the Values and Grid boxes, move the positive charge up to an intersection of two major grid lines, move the negative charge to 1 m to the right of the positive charge, and check the Electric field box. Sketch this electric field pattern below.
2. Reset the simulation, uncheck the Electric field box, check the Values and Grid boxes, move the positive charge up to an intersection of two major grid lines, put another positive charge to 1 m to the right of the earlier positive charge, and check the Electric field box. Sketch this electric field pattern below.

|  |  |
| --- | --- |
| Electric field for a Positive and Negative charge nearby | Electric field for two positive charges nearby |
|  |  |

1. Reset the simulation, move up the positive charge, uncheck the Electric field box, move the Equipotential sensor (blue shield on the right) close to the charge, and click the pencil to display the equipotential, as shown below. Move the sensor away and click the pencil again to display another equipotential. Do this for few more equipotentials and sketch the equipotentials for a positive charge below, inside the box on the right.

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| --- | --- |
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1. Reset the simulation, uncheck the Electric field box, check the Grid box, move the positive charge up to an intersection of two major grid lines, move the negative charge to a location of 6 grid boxes away from the positive charge, move the Equipotential sensor (blue shield on the right) to a location of 1 grid box away (as shown below), and click the pencil to display the equipotential. Move the sensor to every major grid line between the charges and click the pencil to display the equipotentials, and sketch the equipotentials for a positive and negative charges nearby, below in the box to the right.

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**B. Electric field and potential:**

Purpose: Determine the electric field and electric potential dependence on radial distance for a point charge.

To measure the electric field and potential as a function of radial distance:

1. Open: <https://phet.colorado.edu/sims/html/charges-and-fields/latest/charges-and-fields_en.html>
2. Uncheck the Electric field box, check the Values and Grid boxes, move the positive charge (1 nC = 1 nano coulomb = 1 x 10-9C) up to an intersection of two major grid lines, move the sensor (yellow dot) at 0.5 m (next major grid line intersection) from the charge (as shown below), and record the electric field (unit V/m). Repeat this for other distances and record them in the data table.



1. Move down the electric field sensor, move the electric potential sensor (blue shield on the right) at 0.5 m (next major grid line intersection) from the charge (as shown below), and record the electric potential (unit V). Repeat this for other distances and record them in the data table.



Electric field and potential data as a function of radial distance:

*q* = 1 nC = 1 nano coulomb = 1 x 10-9C

|  |  |  |
| --- | --- | --- |
| Radial Distance, *r* (m) | Electric Field, *E* (V/m) | Electric Potential, *V* (V) |
| 0.5 |  |  |
| 1.0 |  |  |
| 1.5 |  |  |
| 2.0 |  |  |
| 2.5 |  |  |
| 3.0 |  |  |
| 3.5 |  |  |
| 4.0 |  |  |

1. Plot the graphs, *E* *versus* *r* and *V* *versus* *r*, add power fit, and display equation on chart. Determine the electric field and potential dependence on radial distance. Insert your graphs below.

1. For a point charge (*q*), Electric field *E* and Electric potential *V* at a distance *r* from the point charge is given by the following equations, where *k* is the Coulomb’s constant. Use the coefficient of power fit above and determine the Coulomb’s constant.

1. Write a conclusion for part B.