# **Guided Inquiry - Electric Fields**

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Go to the link <https://phet.colorado.edu/sims/html/charges-and-fields/latest/charges-and-fields_en.html>

Place a single positive charge into the center of the screen. Sketch the field lines and arrow direction around a single positive charge.

Hit reset and place a single negative charge into the center of the screen, sketch the field lines and arrow direction around a single negative charge.

Hit reset and put a single positive charge back on the screen.

Now take the blue voltmeter sensor and move it around. Ignore the units:

Where are the values the same around the positive charge? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Where are they different?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Take at least 5 measurements and come up with a relationship between the distance and the measured value on the sensor. Use the tape measure!

|  |  |  |
| --- | --- | --- |
| **Trial** | **Distance** | **Voltmeter Reading** |
| **1** |  |  |
| **2** |  |  |
| **3** |  |  |
| **4** |  |  |
| **5** |  |  |

Graph your results:

Based on your results, what do you think the relationship is between distance and field strength? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Hit reset: Now place two positive charges so they are stacked on top of one another. What does this do to the number?

Place the voltmeter at a set distance away from the particle and keep stacking positive charges and record how the number changes.

|  |  |  |
| --- | --- | --- |
| **Trial** | **Charge #** | **Voltmeter Reading** |
| **1** |  |  |
| **2** |  |  |
| **3** |  |  |
| **4** |  |  |
| **5** |  |  |

Graph your results:

Based on your results, what do you think the relationship is between charge and field strength? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**STOP and Hypothesize** what the field diagram would look like for two positive charges close to each other.

**Justify** your thoughts: Are there going to be areas where the value is 0? Where would they be if so?

Now prove/disprove your hypothesis by using the simulation.

 What will you do to test your hypothesis?

 What was the result of your experiment? Were you correct? Explain why or why not.

Draw two negative charges interacting (don’t forget field lines AND direction of arrows)

**STOP and Hypothesize** what the field diagram would look like for a positive charge and a negative charge.

**Justify** your thoughts:

Are there going to be areas where the value is 0? Where would they be if so?

Now prove/disprove your hypothesis by using the simulation.

 What will you do to test your hypothesis?

 What was the result of your experiment? Were you correct? Explain why or why not

Draw a positive and negative charge interacting (don’t forget field lines AND direction of arrows)