Observing the Electric Field Using Simulation Lab

PSI Physics Name_____

OBJECTIVE: As a class, observe and understand the factors that affect electric field

RESOURCES:

Simulation: http://phet.colorado.edu/simulations/sims.php?sim=Charges_and_Fields

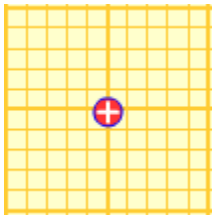
Dubson, M. PhET Charges and Fields - Electric Charges, Electric Field, Electric Potential. Retrieved 12/18, 2009, from http://phet.colorado.edu/simulations/sims.php?sim=Charges_and_Fields
Sokolowski, A. (2008). Using Gravitational Analogies to Introduce Electric Field Theory Concepts --- A response. Phys.Teach., 46(3), 132-133.

BACKGROUND:

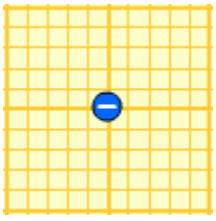
The electric field is a vector, having both magnitude and direction. The direction of the electric field is defined as the direction that a positive test charge would accelerate. The electric field, E is defined as: $E=kQ/r^2$. The electric field is measured in either N/C (Newtons per Coulomb) or V/m (Volts per meter).

PROCEDURE:

1. Your teacher will open the simulation.
2. Turn on the grid by clicking on the box next to “grid”.
3. Click on the box next to “show e-field” to show the electric field.
4. Pull a positive charge onto the grid.
5. Draw the direction of the electric field below.



6. Put the positive charge back on the pile where it came from and place a negative charge onto the grid.
7. Draw the direction fo the electric field below.



8. How does charge affect the direction of the electric field?

9. Explain how the electric field direction and the direction of electric force are related. Reminder: F=qE.

10. Press the “Clear All” button.

11. Turn off “show e-field” and keep the grid on

12. Pull out a positive charge and put it on a major axis (solid orange line).

13. Pull out an “e-field sensor”. The red arrow represents the electric field vector.

14. Move the sensor around the screen. Describe what happens to the magnitude of the electric field.

15. Click the box next to “show numbers”. This displays the strength of the electric field in V/m.

16. Place the “e-field sensor” on the same major axis as the positive charge. Note that the scale at the bottom left of the screen.

17. Move the “e-field sensor” to the distances shown in the table. Record the electric field strength at each distance.

18. Make a graph of Electric Field vs. Distance. Draw a line of best fit.

Distance (m)	Electric Field (V/m)
0.5	
1.0	
1.5	
2.0	
3.0	

19. Describe the relationship between distance and electric field.

20. Move the electric field sensor to a distance of 1 meter away from the positive charge on the same major axis.

21. Add another positive charge on top of the first positive charge. How did the field strength change?

22. Now, add two negative charges on top of the positive charges. What happened to the field strength?

23. Describe the relationship between charge electric field.