

Physics 4B

PLC Activity #3: The Electric Field

*To get credit for this activity, you must show your answers to a PLC tutor and have them initial the sign-out sheet **before 4:00 pm on Wednesday.***

Show all of your work for each question.

Part 1: Electric Field Physlets

Go to **Chapter 23: Electric Fields**. Do the following Physlet Physics exercises and answer the questions listed.

1) Exploration 23.2

The animation shows two fixed charges and a test charge (position is given in meters and time is given in seconds). The electric field lines due to the fixed charges and the force vector on the test charge are shown. The test charge will move under the action of the electric field when the animation is played.

a) Using Configuration A, drag the test charge to the approximate position of $(-0.8 \text{ m}, 0 \text{ m})$. Write down a prediction for the path the charge will follow after being released at this point. **After** you have made your prediction, play the animation. Was your prediction correct? If not, what caused your error?

b) Reset the applet and then drag the test charge to the approximate position of $(1 \text{ m}, 0.35 \text{ m})$. As before, write down a prediction for the path the charge will follow after being released. If your prediction was incorrect, explain the flaw in your reasoning.

c) Repeat using Configuration B with the charge being released from the point $(-0.5 \text{ m}, 0.5 \text{ m})$.

d) Repeat using Configuration B with the charge being released from the point $(0 \text{ m}, 1.3 \text{ m})$.

2) Physlet Problem 23.3

Five animations show the electric field produced by a configuration of hidden charges. The arrows represent the direction of the electric field, and the color represents the intensity of the field. Which electric field would be produced by the charge configuration shown below? Red represents a charge of $+Q$ and blue represents a charge of $-Q$.

3) Physlet Problem 23.5

An electron is shot through four regions of constant electric field (position is given in centimeters and time is given in seconds).

a) What is the direction of the electric field in each region?

b) Rank the magnitude of the electric fields of the four regions, smallest to greatest.

Part 2: Ranking Task Exercises and Conceptual Questions

4) An electron e travels through a small hole in plate A and then toward plate B. A uniform electric field in the region between the plates then slows the electron without deflecting it. (a) What is the direction of the field? (b) Four other particles similarly travel through small holes in either plate A or plate B and then into the region between the plates. Three have charges $+q_1$, $+q_2$, and $-q_3$. The fourth (labeled n) is a neutron, which is electrically neutral. Does the speed of each of those four other particles increase, decrease, or remain the same in the region between the plates?

