Interactive Lecture Demonstrations

Prediction Sheet— **Electrostatic Field, Force and Potential**

**Directions:**   Write your name at the top to record your presence and participation in these demonstrations.  For each demonstration below, write your prediction on this sheet before making any observations. You may be asked to send this sheet to your instructor.

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| **Demonstration 1:** Two identical positive point charges are located as shown in the figure on the right. Draw an arrow to indicate your prediction of the direction of the electric field at each of the x’s.Only after you have made your predictions, open the simulation: <https://phet.colorado.edu/sims/html/charges-and-fields/latest/charges-and-fields_en.html>Place two equal positive charges as shown. Use the Sensor to view the vector representing the field at each of the three points in the diagram on the right. (You can see what this should look like be clicking [here](http://pages.uoregon.edu/sokoloff/Demo101.png) to see a picture.) Draw arrows in a different color on the right and compare your observations to your predictions. Explain any differences. |  |
| **Demonstration 2:** Imagine that you place a small positive test charge on one of the x’s in the figure on the right. Draw an arrow to indicate your prediction of the direction of the electrostatic *force* on the test charge. Repeat for each of the other two x’s.Only after you have made your predictions, view the directions of the forces [here.](http://pages.uoregon.edu/sokoloff/Demo102.png) Draw arrows in a different color on the right and compare your observations to your predictions. Explain any differences. |  |
| **Demonstration 3:** Assume the value of the electrostatic potential is zero infinitely far from any point charge. At each x in the figure on the right indicate with a symbol (+,- or 0) your prediction of whether the electrostatic *potential* is positive, zero, or negative.At which x would a test charge have the *highest* electrostatic potential energy? How do you know?Only after you have made your predictions, use the same simulation as in Demonstration 1, only this time use the Equipotential meter to examine the potential at the three points. To see an example of how the Equipotential meter is used, click [here](http://pages.uoregon.edu/sokoloff/Demo103.png).Examine the sign of the potential at the three points. Compare to your predictions and explain any differences.Measure which of the three points has the highest potential, compare to your prediction, and explain any differences. |  |
| **Demonstration 4:** A positive and a negative charge of equal strength are located as shown in the figure on the right. Draw an arrow to indicate the direction of the electric field at each of the x’s.Only after you have made your predictions, use the same simulation as in Demonstration 1 to find the directions of the field. Place equal positive and negative charges as shown. Use the Sensor to view the vector.Draw arrows in a different color on the right and compare your observations to your predictions. Explain any differences. |  |
| **Demonstration 5:** Imagine that you place a small positive test charge on one of the x’s in the figure on the right. Draw an arrow to indicate the direction of the electrostatic *force* on the test charge. Repeat for each of the other two x’s.Only after you have made your predictions, view the directions of the forces [here.](http://pages.uoregon.edu/sokoloff/Demo105.png) Draw arrows in a different color on the right and compare your observations to your predictions. Explain any differences. |  |
| **Demonstration 6:** Assume the value of the electrostatic potential is zero infinitely far from any point charge. At each x in the figure on the right indicate with a symbol (+,- or 0) whether the electrostatic potential is positive, zero, or negative.At which x’s would a test charge have the *highest* electrostatic potential energy?Only after you have made your predictions, use the same simulation as in Demonstration 1, only this time use the Equipotential meter to examine the potential at the three points. Examine the sign of the potential at the three points. Compare to your predictions and explain any differences.Measure which of the three points has the highest potential, compare to your prediction, and explain any differences. |  |
| **Demonstration 7:** In the figure on the right, a *positively* charged particle is initially moving to the right through a uniform electric field pointed towards the top of the page. At this instant, draw an arrow to indicate the direction of the force on the particle.Only after you have made your predictions, view the direction of the force [here.](http://pages.uoregon.edu/sokoloff/Demo107.png) Draw an arrow in a different color on the right and compare your observation to your prediction. Explain any differences. |  |
| **Demonstration 8:** In the figure on the right, a *negatively* charged particle is initially moving to the right through a uniform electric field pointed towards the top of the page. At this instant, draw an arrow to indicate the direction of the force on the particle.Only after you have made your predictions, view the direction of the force [here.](http://pages.uoregon.edu/sokoloff/Demo108.png) Draw an arrow in a different color on the right and compare your observation to your prediction. Explain any differences. |  |