

# SPH3U1: Grade 11 Physics

## A Virtual Learning Approach

# Introduction to Electrostatics

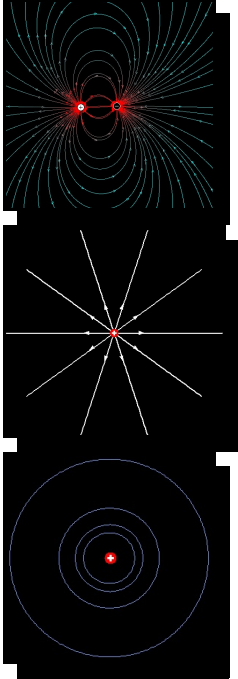
## Topics to Understand

Click Thumbnail to Activate Target URL

## Answer the following questions

on a separate handout provided by your teacher

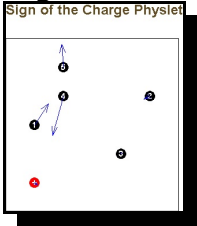
### Electrostatic Field (or flux) Lines Around Point Charges



- Sketch the **field lines** around
  - a positive charge
  - a negative charge
  - What does the distance between field lines represent? Explain.
  - a positive charge in close proximity to another positive charge
  - a positive charge in close proximity to a negative charge
  - Use your sketches to explain why **like charges repel each other and opposite charges attract each other**
- Sketch the **equipotential lines** around
  - a positive charge
  - a negative charge
  - a positive charge in close proximity to another positive charge
  - a positive charge in close proximity to a negative charge
  - Use your sketches to explain why **like charges repel each other and opposite charges attract each other**
- How does the electrostatic field around a point charge behave like a gravitational field?
  - How do electrostatic fields differ from gravitational fields?

<http://www.dgp.utoronto.ca/~mjmcguff/research/electrostatic/applet1/main.html>  
<http://www.mta.ca/faculty/science/physics/suren/FieldLines/FieldLines.html>

### Algebraic Sign of Charge (+ or -)

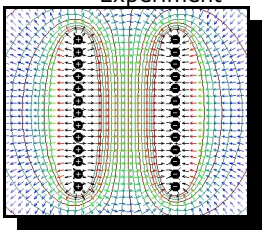


The force on a charged object is represented by a force vector. The length of the force vector represents the size of the force on the object and the direction of the force vector indicates the direction of the force on the object. Move the positive test charge to the bottom of the screen and move the other charges to the top of the screen. Place each charge, one at a time, about 1 cm from the positive test charge. Sketch each situation and summarize the charge on each of the 5 other charges.

[http://kingfish.coastal.edu/physics/physlets/Electrostatics/sign\\_of\\_charge.html](http://kingfish.coastal.edu/physics/physlets/Electrostatics/sign_of_charge.html)

### Electrostatic Field Lines Between Parallel Plates

- Introduction to concepts required to understand the Millikan Oil-Drop Experiment



Select Simulations G,H,I

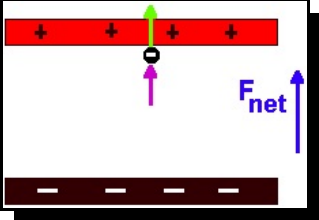
The Thumbnail shows lines of equipotential around two parallel plates of opposite charge.

- Draw two parallel and oppositely charged plates and the corresponding **electrostatic field lines** between them. Pay close attention to the spacing of the field lines.
- Draw a positive charge between your parallel plates and indicate the electrostatic force on it using an arrow to represent direction.
  - Draw a negative charge between your parallel plates and indicate the electrostatic force on it using an arrow to represent direction.
- Recall what the distance between field lines represents. State the nature of the electrostatic field between two parallel plates.

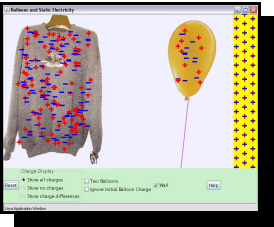
<http://physics.ius.edu/~kyle/physlets/electrostatics/electrostatics.html>

**SPH3U1: Grade 11 Physics**  
A Virtual Learning Approach

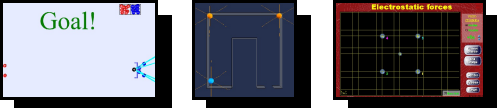
# Introduction to Electrostatics

<p><b>Topics to Understand</b> Click Thumbnail to Activate Target URL</p>	<p><b>Answer the following questions</b> on a separate handout provided by your teacher</p>
<p><b>Electrostatic Field Lines Between Parallel Plates</b></p> <p align="center"><b>Hints</b></p>	

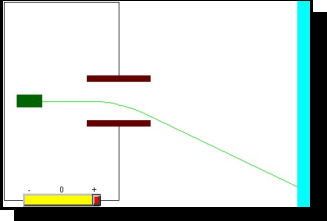
<http://www.regentsprep.org/Regents/physics/phys03/aparplate/>

<p><b>Balloons and Static Electricity</b></p> 	<p>Have some fun! Click the Thumbnail and find its corresponding icon</p> <ol style="list-style-type: none"> <li>1. Rub the balloon on the sweater</li> <li>2. Move the balloon close to the wall</li> </ol> <p align="center"><b>What do you observe?</b></p> <ol style="list-style-type: none"> <li>3. Now <i>let go</i> to see what happens</li> <li>4. Move the balloon further away from the wall and <i>let go</i></li> </ol>
---------------------------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

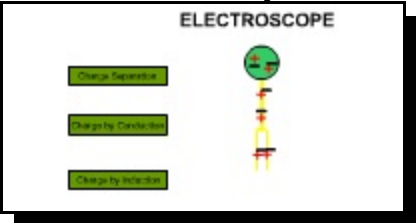
<http://phet.colorado.edu/web-pages/simulations-base.html>

<p><b>Electrostatic Games</b></p> 	<p>Have some more fun! Click one of the Thumbnails and find its corresponding icon</p> <p>For the game with 4 static charges, say the movable charge is at (0,0). Give it a charge of +4 ie (0,0)+4. Give the remaining objects the following locations and charges; (-1,0)+3, (-3,-1)+7, (-1,2)-9, (-3,2)-9</p>
----------------------------------------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

<http://phet.colorado.edu/web-pages/simulations-base.html>  
<http://ephysics.physics.ucla.edu/MIT/videogame/HTML/videogame.htm>  
<http://www.vjc.moe.edu.sg/fasttrack/physics/ElectroStaticForce.dcr>

<p><b>Electron Gun and Plates in an Oscilloscope or TV</b></p> 	<ol style="list-style-type: none"> <li>1. Sketch the apparatus</li> <li>2. Describe how this apparatus in combination with a computer chip would operate like a black and white TV</li> </ol>
----------------------------------------------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

<http://www.lon-capa.org/~mmp/kap18/RR4460app.htm>

<p><b>The Electroscope</b></p> 	<p><b>Hey! Now this one is important and, as such, it will take some effort to complete successfully.</b></p> <p>Run each of the following simulations:</p> <ul style="list-style-type: none"> <li>• Induced Charge Separation</li> <li>• Charging by Contact or Conduction</li> <li>• Charging by Induction</li> </ul> <ol style="list-style-type: none"> <li>1. Record a series of pictures to summarize each simulation. Don't forget to include a title for each series and make your sketches <b>big</b> enough!</li> </ol>
--------------------------------------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Virtual Labs <http://www.hazelwood.k12.mo.us/~grichert/sciweb/electric.htm>  
 OR <http://www.shep.net/resources/curricular/physics/P30/Unit2/electroscope.html>