**Magnets and Electrons**

**OBJECTIVES**

* *Describe the magnetic field around a magnet.*
* *Describe the movement of a magnetic field.*
* *Describe the movement of electrons in a wire.*
* *Explain how the magnetic field affects the electrons in the wire.*

Click this link: <http://phet.colorado.edu/en/simulation/generator>. When it loads, click “Run Now”.

1. Click on the **BAR MAGNET** tab. The little red and white compasses around the screen show the ***magnetic field – the influence of the magnet, the direction it applies force to other magnetic objects***. This is actually the same idea as when you did the compass part of the magnet investigations.
   1. Use drawings (with captions) to describe the magnetic field around the magnet.
   2. Click on the “Show Field Meter”. Drag the meter around the screen. The top number tells you the strength of the field. Where (outside the magnet) is the force strongest? Where is it weakest?
   3. Click and drag the magnet back and forth. What happens to the magnetic field?
2. Summarize what you now know about the magnetic field around a magnet (see first two objectives).



**CHECK WITH YOUR TEACHER BEFORE YOU MOVE ON!!!!**

1. Open**PICKUP COIL**tab*.*
2. What do the dots in the coiled wire represent? Don’t know? Try choosing different options on the right hand side. ☺
3. When the dots move, this is called **electrical current**. What happens to the direction of the current when you move the magnet back and forth?
4. **Why do you think this happens?**
5. Click on the voltage indicator. What happens as you move the magnet from the left of the coil to the right?
6. **Why do you think this happens?**
7. How does changing the number of loops affect the voltage when you move the magnet?
8. **Why do you think this happens?**
9. Summarize what is happening that causes the light bulb to light up. Include the magnet, the magnetic field, and the electrons in the wire.



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1. Openthe **GENERATOR**tab. Click “Show Field” (you can click off “Show Compass”). Click the voltage indicator next to the light bulb. Turn the water on very slow. Set the loop area at 100%.
   1. Watch **carefully**. Look at the little compasses near the wire. When does the direction of the current change?
   2. Revise your answer to 3b – why does the direction of the current change?



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1. **THE BIG IDEA! – INDIVIDUAL WORK** Write a conclusion to answer the following question. *What happens to make electrical current flow in a generator?* Include these ideas:
   * The magnetic field
   * The movement of the magnet
   * The description of electrons in the wire
   * How the magnetic field affects the electrons in the wire
2. Think back to your generator prototype redesign. **Why** did your design change affect the amount of electric current? Think about what you saw in the simulation and the energy story.