

Electromagnetic Induction

Related Objectives from the Georgia Performance Standards:

S(K-5)CS3: Students will use tools and instruments for observing, measuring, and manipulating objects in scientific activities.

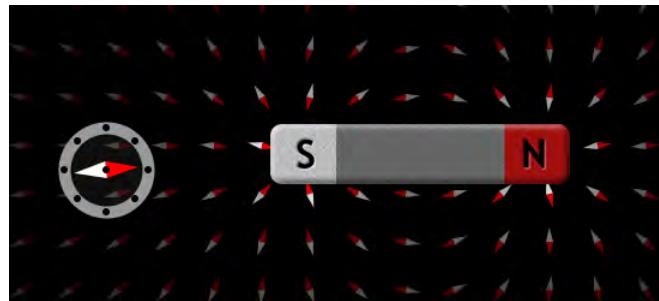
S(K-5)CS5: Students will communicate scientific ideas and activities clearly.

S3P2: Students will investigate magnets and how they affect other magnets and common objects.

S5P3: Students will investigate electricity, magnetism, and their relationship.

Magnetic Fields:

Bar Magnets:

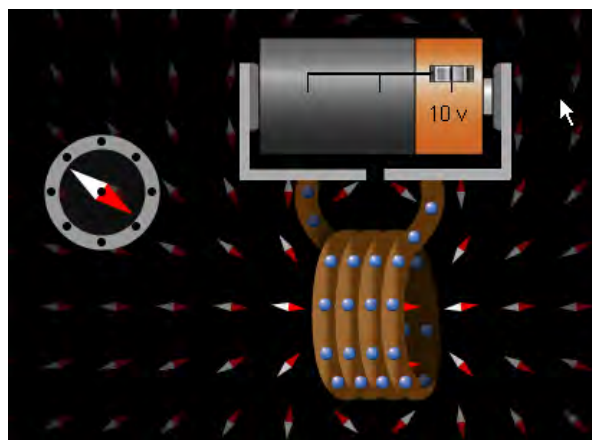


Go to the PhET link, <http://phet.colorado.edu/simulations/> click on physics, then click on “Electricity, Magnets & Circuits” and click on the “Faraday’s Electromagnetic Lab”. The first tab shows a magnet and a compass like shown in the Figure. The magnet results on a magnetic field. This is represented by the small compasses shown throughout. The stronger the magnetic field, the brighter are the small compasses. The larger compass can be used to visualize the effect of the magnetic field on a small magnet (the magnet of the compass). Describe what you observe.

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Electromagnets:



Click on the “Electromagnet” tab. You should observe something similar to what is in the Figure. Describe what you observe and compare it to what you have observed with a bar magnet?

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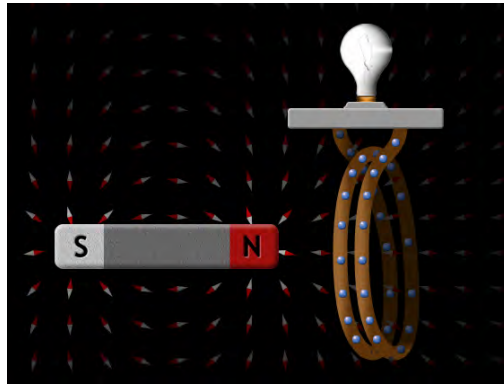
Use the slider on the battery to change the type of current flowing through the coil. (1) What happens when the current is reduced? (2) What happens when the current is zero? (3) What happens when the current is reversed?

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Inducing Electricity:



Click on the "Pickup Coil" tab. You should observe something similar to what is in the Figure. You can move the coil or the magnet; you can also change the strength of the magnet and flip its polarity. You can change the loop area and the number of loops. Make all of these changes, one at a time. What are the six changes that result in the light bulb giving off light?

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For how long does the bulb give off light?

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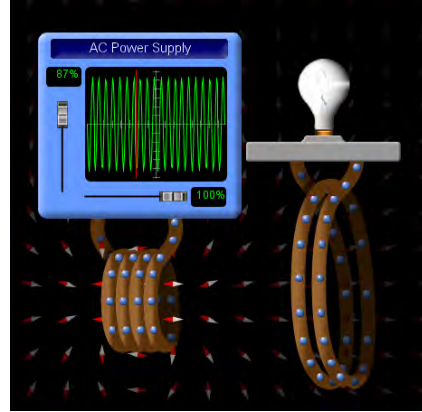
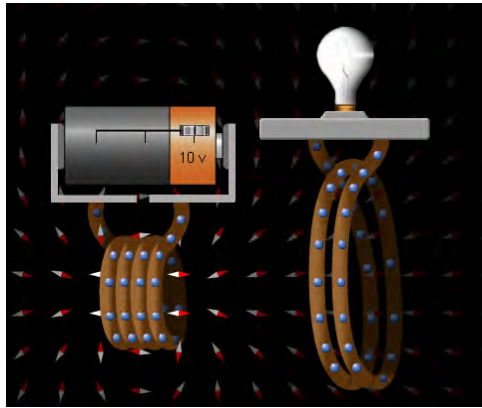
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What do you conclude (seek help from the instructor in discussing magnetic flux.)

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Transformer:



Now click on the “Transformer” tab. You should observe something similar to what is in the left Figure. This simulation illustrates the concept of a transformer. You can move either of the coils; you can also change the current through one of the coils and flip its polarity. You can change the loop area and the number of loops for each of the coils. Focus on changing the current through the first coil and describe what you observe? Does the light bulb give off light when you are not in the process of changing the current?

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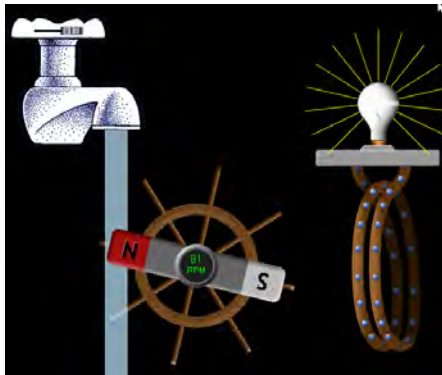
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Change the battery now into an AC Power supply. Use the slider in the bottom of the supply unit to change its frequency and the slider to the right, to change the voltage. Describe what you observe. What is the advantage of using an AC power supply for a transformer?

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Electrical Generator:



Now click on the “Generator” tab. This simulation illustrates the concept of an electric generator. You can change the strength of the magnet, the loop area and the number of loops for the coil. You can also regulate the amount of water flow. Manipulate, one at a time, each of the parameters, and describe in your own word the recipe for producing electricity. Can you think of another method for producing electricity not relying on the flow of water?

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