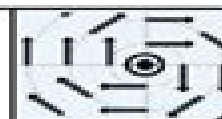


Activity A: Electromagnetic fields

Get the Gizmo ready:

- Turn on **Show electric field at sensor**.
- Click **Reverse** to move the magnet down and set the **Speed** to 10 cm/s.



STEFAN ROGGENDORF 4/8/24

Introduction: When electric current runs through a wire, it induces a **magnetic field** near the wire. Similarly, **electric fields** can be created in the process of **electromagnetic induction**.

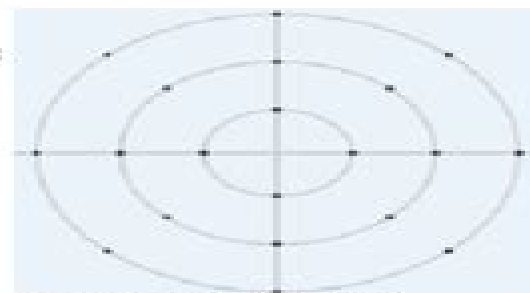
Question: How do magnets induce electric fields?

1. **Observe:** While the magnet is *not* moving, is there any electric field? **Yes**

2. **Sketch:** Click **Forward**, and observe the electric field display. (Note: This display shows a top view of the electric field picked up by the sensor at the top of the SIMULATION pane.) Sketch the electric field at right.

Notice the electric field consists of an array of arrows, or **vectors**. Each vector represents the force on a positive charge located at the base of the vector.

What do you notice? **Each arrow is evenly distanced**



3. **Experiment:** Click **Reverse** and observe the electric field as the magnet moves away.

A. How does changing the direction of the magnet affect the electric field?

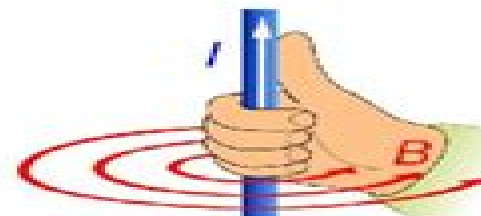
The electric field go farther away

B. Increase the **Speed** to 20 cm/s, and then click **Forward**. How does increasing the speed of the magnet affect the strength of the electric field?

The positive charge on the magnet gets stronger

4. **Make a rule:** If you have studied how currents induce magnetic fields, you may recall the **right-hand rule** illustrated at right. For electric currents, the thumb represents the direction of positive charge (I) and the fingers represent the induced magnetic field (B).

To describe the electric field induced by a moving magnet, you can use a "left-hand rule." What do the thumb and fingers of your left hand represent in this case?



Thumb: **The direction of the of the negative charge** Fingers: **The magnetic field**

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Michael Rajnik



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