Name _____ Date _____

AP Physics Lab Activity #24 (20 pts)

Period _____ Mrs. Nadworny

Partners: Due Date _____

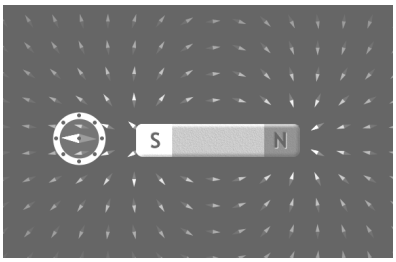
Electromagnetic Induction

NO Lab Write-Up Required

Purpose

To explore factors that affect electromagnetic induction.

Procedure

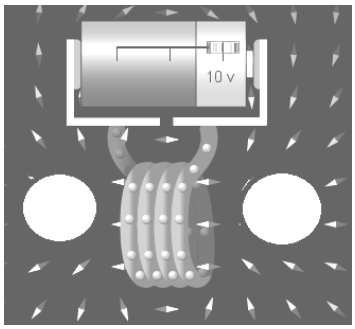


1. Go to https://phet.colorado.edu/en/simulations/faraday . Click on the Play button. Choose "Run Cheerpj Browser Compatible Version"
2. You should be on the Bar Magnet tab and see a screen as pictured.
3. Which end of the compass (red or white) is the North end?

4. Try moving the compass around the bar magnet. Notice how the compass needle compares to all the small needles (shown in the dark background) which represent the magnetic field. Write a general rule for the direction of the field lines surrounding the bar magnet.

5. Try changing the strength of the bar magnet and observe the small needles. How is the strength of the magnetic field related to the appearance of the small needles?

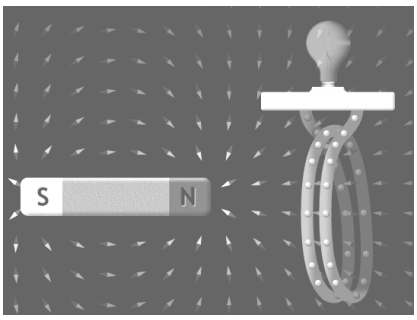
6. Now click on the **Electromagnet** tab. Are electrons flowing up or down in the front of the coil (solenoid)?



7. Inspect the compass needles to determine which end of the coil is the North end. Indicate the polarity of the solenoid by writing N and S in the appropriate white circles at right.

8. Use an appropriate hand rule (right or left?) to check your answer. Which hand did you use?

9. Now click on the **Pickup Coil** tab to see a screen as pictured. Move the magnet and/or coil and observe the current.



10. Is current induced when both the magnet and coil are stationary?

11. Is current induced when the magnet is moving?

12. Does the direction of the current change when the direction you move the magnet (or the coil) changes?

13. Does the amount of current depend on the speed at which you move either object? If so, in what way?

14. Explore the options in the control panel at the right of the screen to determine what factors affect the amount of current that is induced in the coil. You may want to switch the Pickup Coil Indicator to a voltmeter instead of a light bulb to see the magnitude of the current more clearly.

15. How does the number of loops affect the amount of induced emf (potential difference, voltage)?

16. Put the magnet very close to the coil and then increase the bar magnet strength to a maximum. Is emf induced in the coil when the strength of the bar magnet is at a maximum but constant?

17. Is emf induced in the coil when the strength of the bar magnet is constant or when the strength of the bar magnet is changing?

18. Center the pickup coil in the middle of the screen and move the bar magnet all the way into and through the coil so that it comes out the other side. Compare the induced emf when the magnet is on its way in to when the magnet is on its way out of the coil.

Conclusion

1. Is an emf induced in a pickup coil when the magnetic field through it is constant or when it is changing?

2. How does the rate at which the magnetic field in the coil changes affect the strength of the induced emf?

3. Write about two things you learned or were reinforced through this simulation.