Edgenuity

Warm-Up | Electromagnetic Induction

Lesson Question

What is the relationship between electricity and magnetism?

Lesson Goals

Explore the relationship between electricity and magnetism.

Indicate how magnetism is produced by electric currents.

Identify the characteristics of solenoids and electromagnets.

Examine how an electric current is produced by a magnet.

Words to Know

Write the letter of the definition next to the matching word as you work through the lesson. You may use the glossary to help you.

B solenoid

D electromagnetism

A electromagnetic induction

C electromagnet

A. the generation of an electric current by a changing magnetic field

B. a coil of current-carrying wire

C. a strong magnet created by wrapping a metal core in a solenoid

D. the generation of a magnetic field by an electric current

© Edgenuity, Inc.

Warm-Up | Electromagnetic Induction

Circuits and Magnetic Fields

- Current flows from [positive] to negative.
- Magnetic fields [radiate] from the north pole to the south pole of a magnet.

© Edgenuity, Inc.

Instruction | Electromagnetic Induction

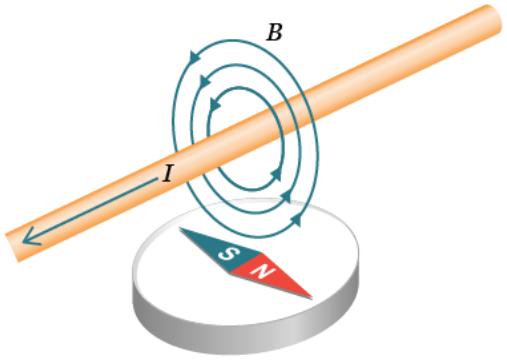
Slide 2

Induced Magnetic Field

- Flowing [current] generates a magnetic field.
- Iron filings will align to the magnetic field.

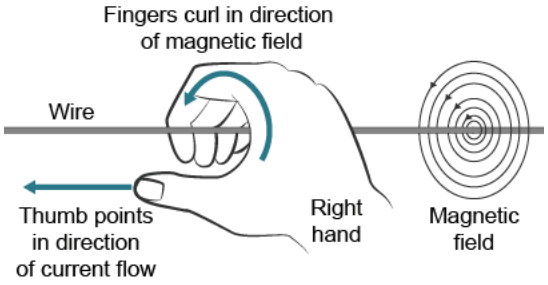
Oersted's Experiments

- Hans Oersted observed that flowing current deflected a compass needle [away] from Earth's north pole.
- Oersted is credited with the discovery of [electromagnetism], the generation of a magnetic field by an electric current.



Direction of Magnetic Field

- The right-hand rule is a way to determine the [direction] of a magnetic field.
  - The thumb points in the direction the current flows.
  - The fingers [curl] in the direction of the magnetic field.



© Edgenuity, Inc.

Instruction | Electromagnetic Induction

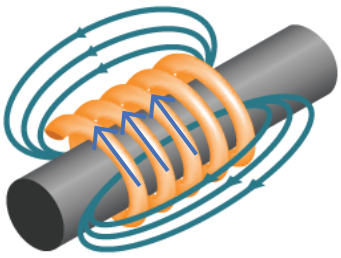
Slide 4

Solenoids

- A **solenoid** is made when a current-carrying wire is looped repeatedly.
- A solenoid generates a magnetic field similar to that of a bar magnet with a north and south pole.
- The strength of the magnetic field can be increased by increasing the:
  - closeness of the loops.
  - number of loops.
  - amount of current.

Electromagnets

- An **electromagnet** is created when a metal core is wrapped in a solenoid.
  - Iron or nickels are often used for the core because they are magnetized easily.
- An electromagnet only has magnetic properties while a current flows through the solenoid.



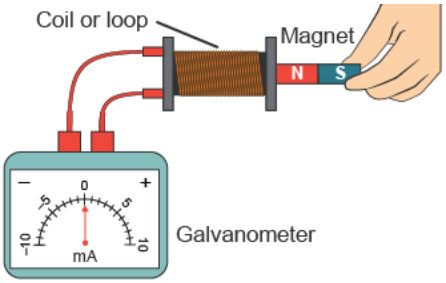
© Edgenuity, Inc.

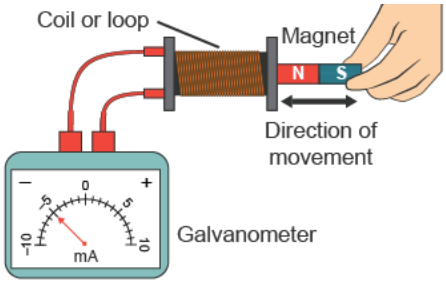
Instruction | Electromagnetic Induction

Slide 7

Faraday's Experiment

- Michael Faraday discovered **electromagnetic induction**, the generation of an electric current in a closed circuit by a [changing] magnetic field.

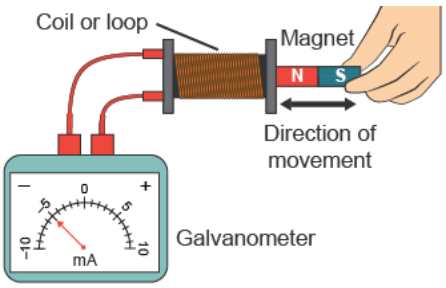


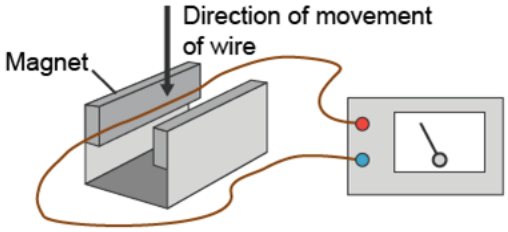


- No [moving] magnetic field = no current
- Moving magnetic field = current induced

Results from Faraday's Experiments

- A changing magnetic field is required for [current] to be induced.





- Magnet can move
- [Circuit] can move

© Edgenuity, Inc.

Instruction | Electromagnetic Induction

Slide 7

Factors That Affect Current

- To generate more current:
  - Move the magnet [faster].
  - Move the circuit faster.
  - Add [coils] to the solenoid.
  - Use a stronger magnet.
- To change the direction of current:
  - Move the magnet (or the wire) in the [opposite] direction.
  - Flip the magnet over so a different [pole] moves into the circuit.

© Edgenuity, Inc.

Summary | Electromagnetic Induction

Lesson Question

What is the relationship between electricity and magnetism?

Answer

(Sample answer) Electricity and magnetism occur together. Where electricity flows, a magnetic field will occur. Where a magnetic field exists, electricity can flow. The presence of one can cause induction of the other.

Slide 2

Review: Key Concepts

- Current flowing through a wire induces a magnetic field.
  - The direction of the magnetic field can be determined with the right-hand rule.
  - Changing the direction of the flow of current changes the direction of the magnetic field.
- A solenoid is a tightly coiled, current-carrying wire that produces a magnetic field.
- By placing a metal bar within a solenoid, it strengthens the magnetic field and creates an electromagnet.
- Moving a magnet into or out of a current loop induces more current.
  - Changing the direction of the magnetic field changes the direction of the current flow.

© Edgenuity, Inc.

Summary | Electromagnetic Induction

Use this space to write any questions or thoughts about this lesson.

© Edgenuity, Inc.