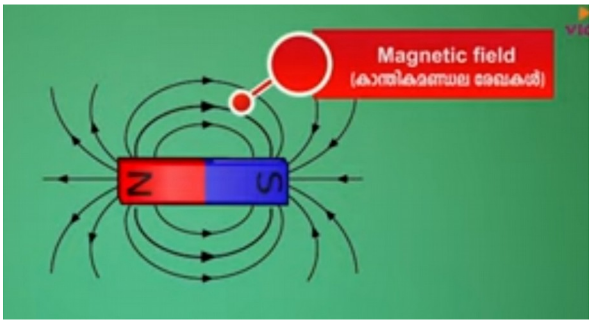
UNIT 3

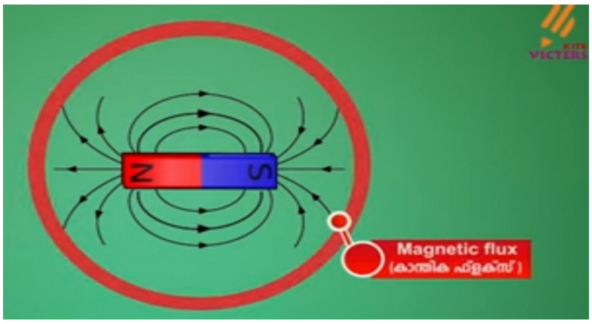
Electromagnetic Induction

20/08/2020 – Class 17

Activity 1

In the previous class, we discuss the factors affecting the induced emf produced in a coil due to electromagnetic induction. Observe the pictures.



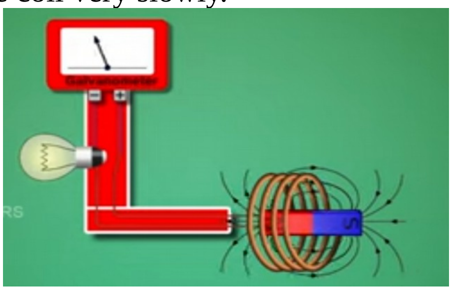
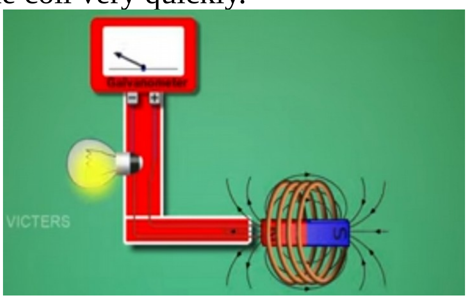


Discussion

- What is magnetic field? **The region around a magnet where the influence is felt.**
- What is the direction of magnetic field lines? **North to south.**
- Total number of magnetic field lines in a magnetic field is known as........? **Magnetic flux.**

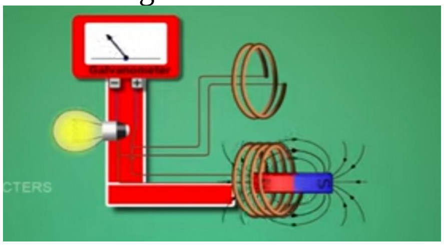
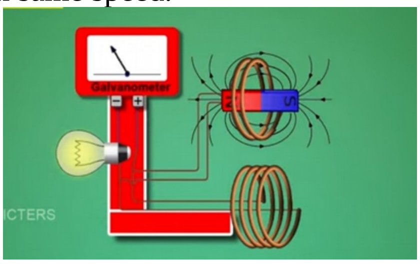
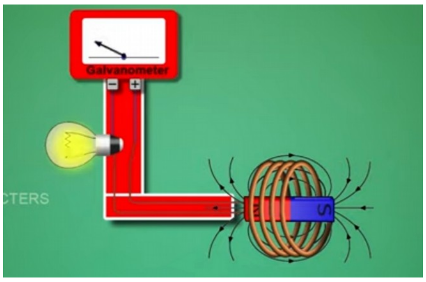
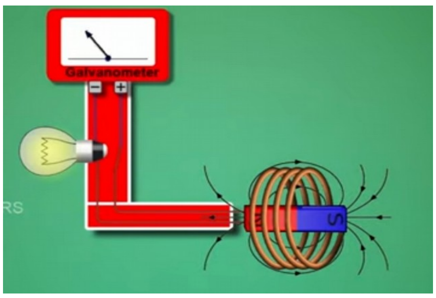
Activity 2.

Watch the animation.

Activity	Observation	Inference
Insert the north pole of the magnet into the coil very slowly. 	• A feeble deflection in the galvanometer needle. • Bulb is glowing with less intensity.	Current / emf produced in the coil is less.
Insert the north pole of the magnet into the coil very quickly. 	• Galvanometer needle is deflected more. • Bulb is glowing with more intensity.	More current / emf is produced in the coil.

Inference

When the speed of motion of the magnet / solenoid is increased the induced emf produced in the solenoid is also increased.

Insert the north pole of the magnet into the coil having more turns. 	• Galvanometer needle is deflected more. • Bulb is glowing with more intensity.	More current / emf is produced in the coil.
Insert the north pole of the magnet into the coil having lesser number of turns with same speed. 	• A feeble deflection in the galvanometer needle. • Bulb is glowing with less intensity.	Current / emf produced in the coil is less.
<u>Inference</u> **When the number of turns in the solenoid is increased the induced emf produced in the solenoid is also increased.**		
Insert the north pole of a strong magnet into the solenoid. 	• Galvanometer needle is deflected more. • Bulb is glowing with more intensity.	More current / emf is produced in the coil.
Insert the north pole of a weak magnet into the solenoid. 	• A feeble deflection in the galvanometer needle. • Bulb is glowing with less intensity.	Current / emf produced in the coil is less.
<u>Inference</u> **When the strength of the magnet is increased the induced emf produced in the solenoid is also increased.**		

Conclusion

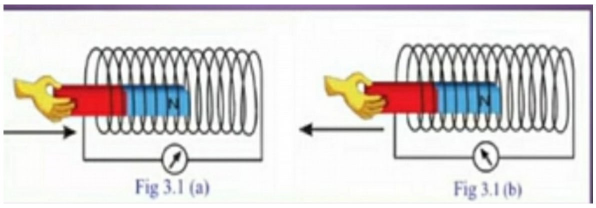
Factors affecting the induced emf produced in a solenoid are,

- Number of turns of the coiled conductor.
- Strength of the magnet.
- Speed of motion of the magnet or coil.

Activity 3

Assignment Answer.

a) Draw the complete circuit of the experiment done in class room, to produce electric current using the components shown. 1) bar magnet, 2) Solenoid, 3) Galvanometer



b) Which phenomenon causes the production of electricity through the circuit?
Electromagnetic Induction

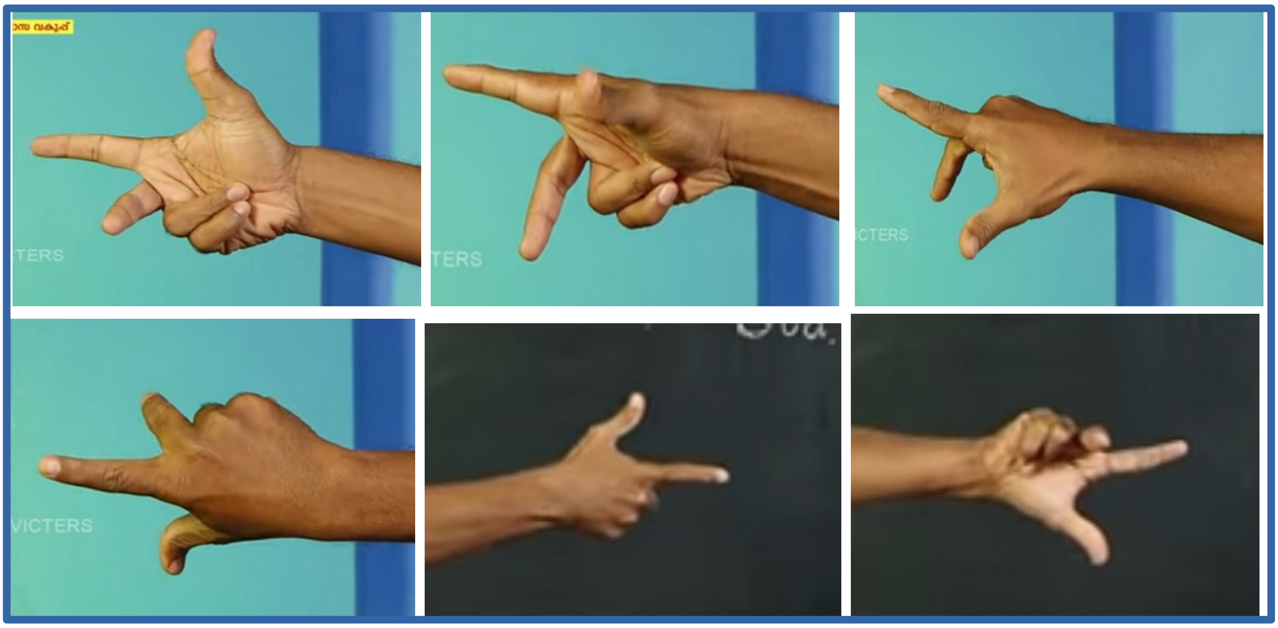
c) Define this phenomenon? **Whenever there is a change in magnetic flux linked with a coil an emf is induced in the coil. This phenomenon is called electromagnetic induction.**

d) Write three factors that are helpful to increase the amount of electric current in this experiment?

- **1. Use a stronger magnet.**
- **2. Increase the number of turns of the coil.**
- **3. Increase the speed of either the coil or magnet**.

Activity 4.a

Stretch the forefinger, middle finger and the thumb of the right hand in mutually perpendicular directions. Without changing the direction of the forefinger move the other two fingers in different directions as shown in the figure.



Activity 4.b

Stretch the forefinger, middle finger and the thumb of the right hand in mutually perpendicular directions. Without changing the direction of the middle finger move the other two fingers in different directions as shown in the figure.

Activity 5

When a conductor moves in a magnetic field an emf is induced on it. When the conductor moves different ways, how the magnitude and direction of current changes?

An imaginary magnetic field and conductor is shown in the figure.

Discussion

- What is the direction of the magnetic field lines? **North to south**
- If the conductor moves parallel to the magnetic filed lines, does the conductor cut the magnetic field lines? **No**
- Is there a change in the magnetic flux linked with the conductor? **No**
- When the conductor moves parallel to the magnetic filed lines, does an emf is induced on the conductor? **No**
- If the conductor moves perpendicular to the magnetic field lines, does the conductor cut the magnetic field lines? **Yes**
- Is there a change in the magnetic flux linked with the conductor? **Yes**
- When the conductor moves parallel to the magnetic filed lines, does an emf is induced on the conductor? **Yes**

Inference

- When the conductor moves parallel to the magnetic filed lines, there is no change in the magnetic flux linked with the conductor. Hence current is not induced on the conductor.
- When the conductor moves perpendicular to the magnetic filed lines, magnetic flux change linked with the conductor is maximum. Hence maximum emf is induced on the conductor.

Activity 6

The British Scientist John Ambrose Fleming, explained the relation between the direction of the magnetic field, the direction of the movement of the conductor and the direction of the induced current.

Discussion

- In the Fleming's Right Hand Rule, forefinger indicates the direction of......? **magnetic field.**
- Thumb indicates the direction of.......? **Motion**
- Middle finger indicates the direction of.......? **Current.**

Fleming's right hand rule

Imagine a conductor moving perpendicular to a magnetic field. Stretch the forefinger, middle finger and the thumb of the right hand in mutually perpendicular directions. If the forefinger represents the direction of the magnetic field, and the thumb represents the direction of motion of the conductor, then, the middle finger represents the direction of the induced current.