BAL BHARATI PUBLIC SCHOOL, PITAMPURA, DELHI – 110034

SUBJECT:-PHYSICS- CLASS X

TOPIC: **Magnetic Effects of Electric Current**
Week: 2nd November to 6th November, 2020

No of blocks: 1 or 2

GUIDELINES FOR STUDENTS:

Dear students,

- There is only one assignment
  - Assignment 4: Electromagnetic induction
- Solve the assignment in a separate notebook you have made for Physics
- Suitable Video links have been provided for better understanding of the concept.
- Do read NCERT too for better understanding of these concepts.

SUBTOPICS: (a) Electromagnetic Induction

(b) Fleming's Right Hand Rule

Instructional Aids /Resources:

NCERT LINK FOR THE CHAPTER:
https://ncert.nic.in/ncerts/l/jesc113.pdf (Page no. 233-235)

Learning Outcomes:

Each learner will be able to:

1. state the Fleming's right hand rule and apply it to find the direction of induced current in a conductor placed in the varying magnetic field
2. define the phenomenon of electromagnetic induction
3. illustrate the phenomenon of electromagnetic induction with the help of certain activities

Lesson Development:

ELECTROMAGNETIC INDUCTION:

https://www.khanacademy.org/science/in-in-class10th-physics/in-in-magnetic-effects-of-electric-current/electromagnetic-induction/v/electromagnetic-induction-faradays-experiments

When a current-carrying conductor is placed in a magnetic field such that the direction of current is perpendicular to the magnetic field, it experiences a force. This force causes the conductor to move.

Is the converse possible?

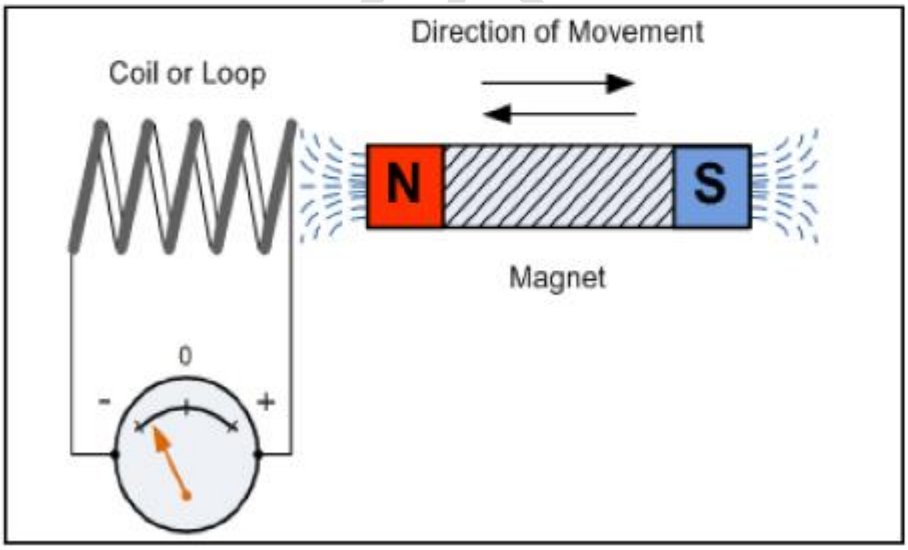
Can the magnetic field be used to produce current?

This was first studied by English physicist Michael Faraday.

In 1831, Faraday made an important breakthrough by discovering how a moving magnet can be used to generate electric currents.

Activity 1:

Perform the following activity with the set up as shown:



Observe:

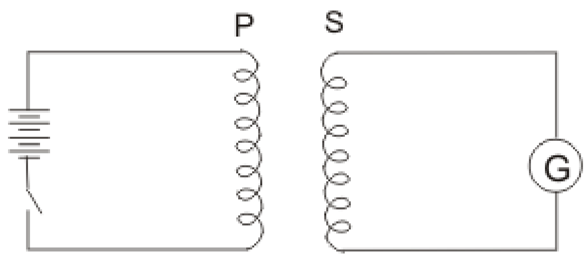
If North Pole of the magnet is moved towards the coil, there is deflection observed in the needle of the coil.

The deflections in the galvanometer would just be opposite to the previous case, if South Pole of the magnet is moved towards the coil.

When the coil and the magnet are both stationary, there is no deflection in the galvanometer.

It means that **motion of a magnet with respect to the coil produces an induced potential difference, which sets up an induced electric current in the circuit**.

Activity 2:



Plug in the key.

It is observed that the needle of the galvanometer instantly jumps to one side and just as quickly returns to zero, indicating a momentary current in coil S.

Disconnect coil P from the battery. Now the needle momentarily moves, but to the opposite side. It means that now the current flows in the opposite direction in coil S.

Note: Current is induced in coil S when current in coil P is changed. In this activity, we observe that as soon as the current in coil P reaches either a steady value or zero, the galvanometer in coil S shows no deflection.

From these observations, we conclude that a potential difference is induced in the coil S whenever the electric current through the coil P is changing (starting or stopping).

P is called the primary coil and S is called the secondary coil.

As the current in the first coil changes, the magnetic field associated with it also changes. Thus the magnetic field lines around the

secondary coil also change. Hence the change in magnetic field lines associated with the secondary coil is the cause of induced electric current in it.

This process, by which a changing magnetic field in a conductor induces a current in another conductor, is called **electromagnetic induction**.

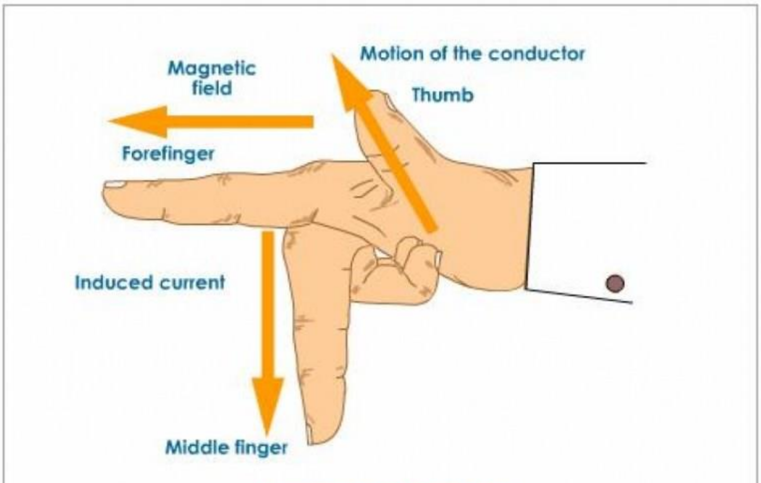
So, current can be induced in a coil either by moving it in a magnetic field or by changing the magnetic field around it.

The induced current is found to be the highest when the direction of motion of the coil is at right angles to the magnetic field.

Rule to know the direction of the induced current:

https://www.khanacademy.org/science/in-in-class10th-physics/in-in-magnetic-effects-of-electric-current/electromagnetic-induction/v/right-hand-generator-rule

Stretch the thumb, forefinger and middle finger of right hand so that they are perpendicular to each other. If the forefinger indicates the direction of the magnetic field and the thumb shows the direction of motion of conductor, then the middle finger will show the direction of induced current. This simple rule is called Fleming's right-hand rule.



Fleming's Right Hand Rule

Assignment 4:

Solve NCERT back questions: 1,2,4,5,6,10,13,14,15