

Electromagnetic Induction I

Lesson Recap

- Forces on a current-carrying conductor in a magnetic field
- Fleming's Left-hand Rule
- Applications:
 - Loudspeaker
 - D.C. Motor

Electricity

- Where does electricity come from?
- How do we get our electrical appliances in our homes and schools to work?
- How do we "create" energy?



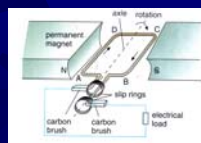
How do we produce electrical energy?

- The hydroelectric dam



The Generator

- Device in power plants that transforms mechanical energy into electrical energy
- This generator produces alternating current which is then transported to our homes.



Electricity in Singapore?

- Oil and Gas-powered plants (e.g. Senoko, Tuas)
- Why are other forms of electrical production not feasible in Singapore?

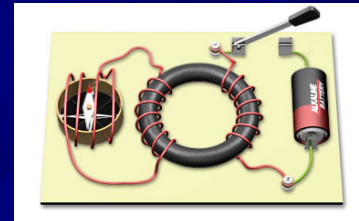


Today's lesson objectives

- ☀ Electromagnetic Induction
 - Induced e.m.f. due to changing magnetic field
 - Factors affecting this induced e.m.f.
 - The direction of the induced current
- ☀ The a.c. generator
 - How it works

Faraday's Iron Ring Experiment

- ☀ <http://micro.magnet.fsu.edu/electromag/java/faraday/>



Faraday's Iron Ring Experiment

- ☀ On closing or opening the switch, a magnetic field is created in right coil.
- ☀ Compass deflects when switch is turned on or off → a current is induced in the left coil
- ☀ Induced current arose only when there is change in the magnetic field cutting the left closed circuit
- ☀ Nothing happens when switch is left on or off

Faraday's Solenoid Experiment

- ☀ <http://micro.magnet.fsu.edu/electromag/java/faraday2/>



- ☀ Video demos on solenoid experiment
→ [Worksheet](#)

Electromagnetic Induction

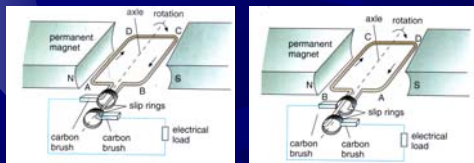
- ☀ Electromagnetic Induction is the phenomenon of inducing an e.m.f. in a circuit due to a changing magnetic field
- ☀ The magnitude of the induced e.m.f. is directly proportional to the rate of change of magnetic field lines cutting the conductor.
- ☀ Factors affecting the magnitude of the induced e.m.f.:
 - Number of turns in the coil
 - Strength of magnet
 - Speed at which magnet enters and exits

Direction of Induced Current

- ☀ Direction of Induced current
 - Opposes the change in magnetic field producing it
- ☀ A north pole will be induced when a north pole approaches the conductor
- ☀ A south pole will be induced when the north pole moves away from the conductor

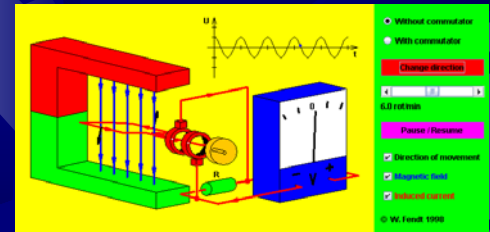
The A.C. Generator

- ☀ Electromagnetic induction in an a.c. generator



A.C. Generator Applet

- ☀ [Applet demo](#)



Summary of today's lesson

- ☀ What is electromagnetic induction
- ☀ What are the factors affecting the magnitude of this electromagnetic induction
- ☀ What determines the direction of the induced current
- ☀ How a simple a.c. generator works