

## Chapter 23

Magnetic fields arise from moving electric charges, as shown in Chapter 22. Chapter 23 looks at the reverse relationship: electric fields are induced by changing magnetic fields. Faraday's law, which quantifies the electromotive force induced by a changing magnetic flux, and Lenz's law, which gives the direction of the induced current, are both described in detail. Electrical and mechanical energy are also discussed. Generators and motors transform between the two types of energy. Inductors store energy in a magnetic field, and transformers convert power at one voltage and current to power at another voltage and current.

### Objectives

By the end of the chapter, students should understand each of the following and be able to demonstrate their understanding in problem applications as well as in conceptual situations.

- Magnetic flux
- Induced emf
  - Faraday's law
  - Lenz's law
  - Motional emf
- Mechanical work and electrical energy
  - Generators
  - Motors (Calculate the back EMF in an electric motor.)
- Inductance
  - Mutual inductance
  - Calculate the inductance of a coil.
  - Inductors and  $RL$  circuits
  - Energy stored in a magnetic field
  - Transformers (use the transformer equation)
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### Assignment:

Look at all of the questions.

Make sure you can do the following problems from Ch. 23:

1, 9, 18, 19, 23, 29, 35, 39, 45, 49, & 61

Read Problems 56-60

Please Note: Not all of the material is in the text.