CHAPTER 20 Highlights

KEY TERMS

electromagnetic induction (p. 708)

generator (p. 716)

alternating current (p. 718)

back emf (p. 720)

mutual inductance (p. 721)

rms current (p. 724)

transformer (p. 727)

electromagnetic radiation (p. 733)

photon (p. 734)

PROBLEM SOLVING

See **Appendix D: Equations** for a summary of the equations introduced in this chapter. If you need more problem-solving practice, see **Appendix I: Additional Problems.**

KEY IDEAS

Section 1 Electricity from Magnetism

- A change in the magnetic flux through a conducting coil induces an electric current in the coil. This concept is called *electromagnetic induction.*
- Lenz's law states that the magnetic field of an induced current opposes the change that caused it.
- The magnitude of the induced emf can be calculated using Faraday's law of induction.

Section 2 Generators, Motors, and Mutual Inductance

- Generators use induction to convert mechanical energy into electrical energy.
- Motors use an arrangement similar to that of generators to convert electrical energy into mechanical energy.
- *Mutual inductance* is the process by which an emf is induced in one circuit as a result of a changing current in another nearby circuit.

Section 3 AC Circuits and Transformers

- The root-mean-square (rms) current and rms emf in an ac circuit are important measures of the characteristics of an ac circuit.
- Transformers change the emf of an alternating current in an ac circuit.

Section 4 Electromagnetic Waves

- Electromagnetic waves are transverse waves that are traveling at the speed of light and are associated with oscillating electric and magnetic fields.
- Electromagnetic waves transfer energy. The energy of electromagnetic waves is stored in the waves' electric and magnetic fields.
- The electromagnetic spectrum has a wide variety of applications and characteristics that cover a broad range of wavelengths and frequencies.

Variable Symbols

Quantities		Units	
N	number of turns	(unitless)	
ΔV_{max}	maximum emf	V	volt
ΔV_{rms}	rms emf	V	volt
I_{max}	maximum current	A	ampere
I_{rms}	rms current	A	ampere
M	mutual inductance	H	henry = V•s/A