

Chapter 17 MAGNETISM

Chapter 17 Assessment

Vocabulary

Select the correct term to complete the sentences.

biomass	generator	nonrenewable resource
commutator	geothermal	permanent magnets
electric motor	heat pump system	renewable resource
electrical power	hydroelectric	rotor
electromagnet	kilowatt-hour	solar energy
electromagnetic induction	magnetic	wind farm
fossil fuel	magnetic declination	
	magnetic field	

Section 17.1

1. A(n) ____ material can create or respond to forces from magnets.
2. A magnet fills the space around itself with a kind of potential energy called a(n) ____.
3. The difference between the direction a compass needle points and the direction of true north is called ____.
4. Bar magnets, refrigerator magnets, and horseshoe magnets are all good examples of ____.

Section 17.2

5. A simple ____ uses a coil of wire, often wrapped around an iron or steel object.

Section 17.3

6. The process by which a moving magnet creates voltage and current in a loop of wire is called ____.
7. A device that uses electromagnetic induction to make electricity is called a ____.

8. A(n) ____ is a device that converts electrical energy into mechanical energy.
9. A(n) ____ is the rotating disk of an electric motor.
10. A(n) ____ can switch the direction of electrical current in the electromagnet of an electric motor.

Section 17.4

11. A(n) ____ such as coal, petroleum, or natural gas is a ____ used to generate electricity.
12. A waste-to-energy plant uses ____ to generate electricity.
13. ____ power plants use Earth's internal heat energy to generate electricity.
14. A collection of wind turbines, called a(n) ____, is an example of using a(n) ____ to generate electricity.
15. A photovoltaic cell can convert ____ to electricity.
16. A(n) ____ takes advantage of Earth's constant shallow ground temperature for seasonal heating and cooling of buildings.
17. ____ plants will contribute over 50 percent of the renewable resource electricity generation in 2010.
18. ____ is the rate at which electrical energy is changed into other forms of energy.
19. A ____ is a relatively large amount of energy, equal to 3.6 million joules.

Concepts

Section 17.1

1. Name a metal that has strong magnetic properties.
2. Describe the types of forces that magnetic poles exert on each other.
3. Earth's magnetic north pole is:
 - a. aligned with the North Star.
 - b. near Earth's geographic North Pole.
 - c. near Earth's geographic South Pole.
 - d. at the equator.

Section 17.2

4. If you reverse the direction of electrical current in an electromagnet, what happens to the electromagnet?
5. What are three ways you can increase the strength of an electromagnet?
6. Explain why an electromagnet usually has a core of iron or steel.
7. Relatively few materials show magnetic properties because:
 - a. their atomic magnets must line up with Earth's geographic South and North Poles, and this is rare.
 - b. they contain a rare substance.
 - c. their atomic magnets are much stronger than the atomic magnets of other materials.
 - d. we see magnetic properties only if atomic magnets line up in the same direction throughout a material.
8. Name two examples of machines that use electromagnets. Explain the purpose of the electromagnet in each machine.
9. Plastic and wood are not magnetic materials. Explain, in terms of their atoms, why they are not magnetic.

Section 17.3

10. What are the key parts of an electric motor?

11. You can say that the battery used to power a DC motor is not directly responsible for making the rotor spin. What, then, is the battery directly responsible for? What actually causes the rotor to spin?

12. What is the purpose of a commutator in an electric motor?

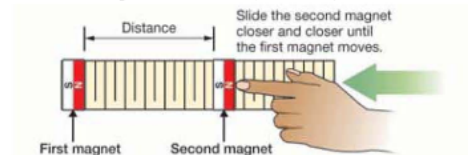
Section 17.4

13. Why is nuclear energy considered a nonrenewable resource?
14. Less than 10 percent of the United States' electric power generation in 2006 came from renewable resources. What is the main reason for this low percentage?
15. Why is hydroelectric the most widely used renewable resource for electricity generation in the United States?

Problems

Section 17.1

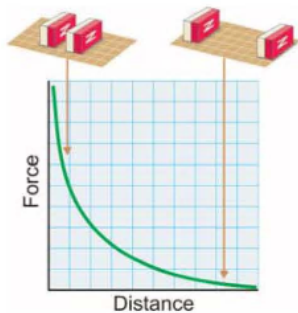
1. A student places two magnets with their north poles facing each other, 50.0 cm apart. When she moves one magnet toward the other, the first magnet repels the second at a distance of 26.0 cm. She repeats the procedure, but, now she places the magnets so the south pole of one faces the north pole of the other (see below).



- a. What is she likely to observe?
- b. Next, she put one of the magnets on her wooden desk with the north pole down. If the desk top is 2.5 cm thick, do you think she could move the magnet by placing another magnet under the desk? Explain.

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2. The graph below shows the force between two magnets when they are at various distances from each other.



- What does this graph show about the force between magnets that are very close together?
- What can you do to two magnets to decrease the force between them?

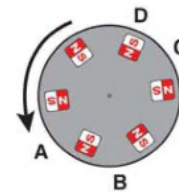
Section 17.2

- The atoms of a permanent magnet can't move, and the electrons in the atoms are lined up so that a magnetic field is created around the magnet. The atoms in iron or steel can move. Describe what you think happens to the atoms of a steel paperclip when the paperclip is near a permanent magnet.
- Draw an electromagnet. Label all parts including the magnetic poles.

Section 17.3

- A working electric motor needs to have three things. Which of the following are the three?
 - A device to switch the polarity of the electromagnets at the right time.
 - A moving element with magnets.

- An even number of magnets, never an odd number.
 - A stationary element with magnets.
- The diagram represents the rotor of an electric motor. In order for the rotor to turn in a counterclockwise direction, the north pole of a magnet should be placed at which position (A, B, C, or D)?



Section 17.4

- Alex uses a 1,000-watt heater to heat his room.
 - What is the heater's power in kilowatts?
 - How many kilowatt-hours of electricity does Alex use if he runs the heater for eight hours?
 - If the utility company charges \$0.15 per kilowatt-hour, how much does it cost to run the heater for 8 hours?

Applying Your Knowledge

Section 17.1

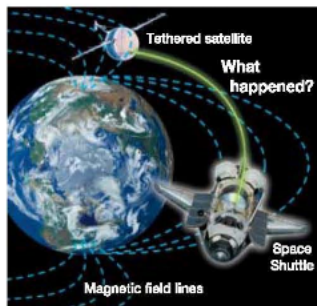
- Would a magnetic screwdriver be useful? Why or why not?
- Neodymium magnets are very strong. Do an Internet search to find the answers to the following questions.
 - What materials does this type of magnet contain?
 - Describe two uses for neodymium magnets.
 - Why should someone use extreme caution when using these magnets?

Section 17.2

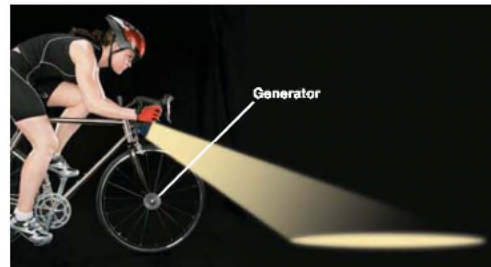
3. Suppose you are walking in a wooded park and you want to use a hand-held compass to walk directly west from your current position. Describe, using numbered steps, exactly how you would use the compass to direct you.

Section 17.3

4. In 1996, NASA scientists worked with Italian scientists to carry out an interesting experiment. They made a special satellite and connected it to the space shuttle with over 20 km of insulated copper cable. As the shuttle orbited Earth, scientists released the tethered satellite and conducted 12 different experiments while dragging the cable through Earth's magnetic field at speeds of over 15,000 mph! The satellite was equipped with many instruments to study the effects on the special copper cable. Based on your understanding of electromagnetic induction, what do you think happened to the copper cable?



5. A bicycle light generator is a device that you place on the wheel of your bike. When the wheel turns, the generator powers a light. When you stop, the light goes out. Explain how the bike generator makes electricity.

**Section 17.4**

6. Wind energy is a renewable resource used to produce electricity in the United States.
- Is wind energy being used at all in your state to generate electricity? Explain your answer and remember to cite your sources of information.
 - Do you think wind energy will be used more than any other resource to generate electricity 50 years from now? Why or why not?