Chapter 19 Magnetism and Electromagnetism

Study Guide

1. The Nature of **Magnetism**
    a. Magnets
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        i. Interactions Between Magnetic Poles
        ii. Paired Poles
    c. **Magnetic Fields**
        i. **Magnetic Field Lines**
    d. Inside a Magnet
        i. Electron Spin
        ii. **Magnetic Domains**
        iii. Magnetic Materials
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    e. Making Magnets
        i. **Permanent Magnet**
    f. Destroying Magnets
    g. Breaking Magnets
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    b. Earth As a Magnet
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        iii. **Aurora**
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b. Moving Charge and Magnetism
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    d. Recording Information

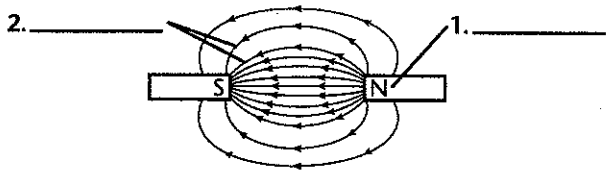
Name _____ Date _____ Class _____

SECTION 19-1 REVIEW AND REINFORCE

The Nature of Magnetism

◆ Understanding Main Ideas

Label the parts of the figure below, and then answer items 3 and 4 in the spaces provided.



3. Are these magnets attracting or repelling each other? How can you tell?

_____

_____

4. Infer the likely arrangement of the magnetic domains in these magnets.

_____

_____

◆ Building Vocabulary

Match each term with its definition by writing the letter of the correct definition on the line beside the term.

_____ **5.** magnetism

_____ **6.** nucleus

_____ **7.** permanent magnet

_____ **8.** atom

_____ **9.** proton

_____ **10.** magnetic field

_____ **11.** element

_____ **12.** ferromagnetic material

_____ **13.** electron

a. the core at the center of every atom

b. a magnet made of a material that keeps its magnetism

c. a material that shows strong magnetic effects

d. one of about 100 basic materials that make up all matter

e. the attraction of a magnet for another object

f. a tiny, negatively charged particle that orbits the nucleus

g. the smallest particle of an element that has all the properties of that element

h. the region around a magnet in which magnetic forces act

i. a positively charged particle found in the nucleus

Name _____ Date _____ Class _____

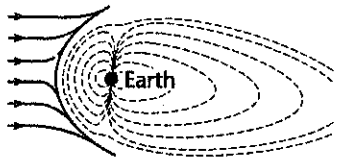
SECTION 19-2 REVIEW AND REINFORCE

Magnetic Earth

◆ Understanding Main Ideas

Label the parts on the following figure in the blanks provided, and then answer the following questions in the spaces provided.

1. _____



2. _____

3. How is Earth like a magnet?

_____

_____

4. If you follow a compass pointing north, will you reach the geographic north pole? Explain your answer.

_____

_____

◆ Building Vocabulary

Fill in the blank to complete each statement.

5. A(n) _____ is a device that has a magnetized needle that can spin freely.

6. _____ is the angle between geographic north and the north to which a compass needle points.

7. A(n) _____ is a glowing region caused by charged particles from the sun.

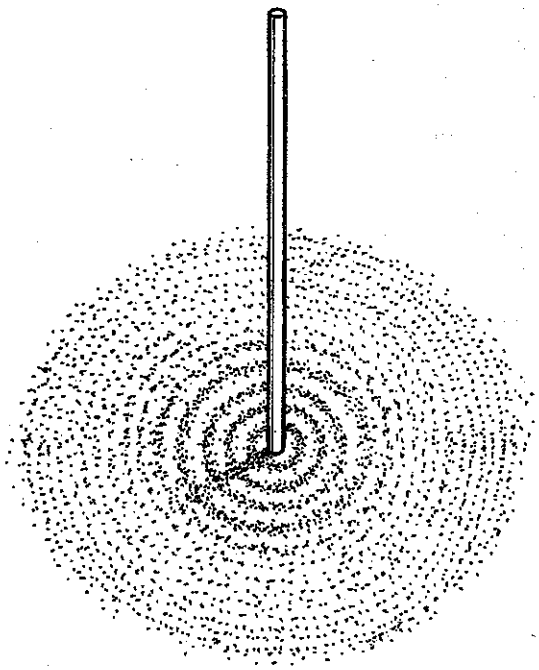
Name _____ Date _____ Class _____

SECTION 19-3 REVIEW AND REINFORCE

Electric Current and Magnetic Fields

◆ Understanding Main Ideas

Examine the figure and answer the following questions on a separate sheet of paper.



1. How can you tell that a current is passing through this wire?
2. Is this wire a conductor or an insulator? Explain.
3. What part of an electric circuit is shown in the figure?

◆ Building Vocabulary

From the list below, choose the term that best completes each sentence.

electric charge	electric current
electric circuit	conductor
insulator	resistor
resistance	superconductor

4. A(n) _____ is a material through which an electric current can move freely.
5. _____ is the flow of charge through a material.
6. A(n) _____ is a device that interferes with the flow of electric charge.
7. A material that has no electrical resistance is a(n) _____.
8. Electrons and protons have a property called _____.
9. Charges are not able to move freely through a(n) _____.
10. A(n) _____ is a complete path through which electric charges can flow.
11. The opposition to the movement of charges flowing through a material is called _____.

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SECTION 19-4 ENRICH

A Turn for the Better

There are many ways to increase or decrease the strength of an electromagnet. Two of these involve electric current and the coils of a solenoid. How are these factors related to each other, and what is the total effect produced by varying them? The unit used to determine the result of this relationship is the ampere-turn. The ampere-turn is a measure of the strength of an electromagnet. An ampere, or simply an amp, is a unit of electric current.

The table below shows the results of varying the number of turns of a wire around a solenoid and the current through that wire. All other factors stay the same.

Fill in the blanks to complete the table, and then answer the following questions on a separate sheet of paper.

Current (amp)	Turns	Electromagnet Strength (ampere-turn)
2	125	250
5	125	625
12	100	1,200
12	200	2,400
14	250	**1.**
2.	300	4,800

3. What is the relationship in the above table between current and turns as they relate to the strength of an electromagnet?

4. There are 200 turns of wire around an electromagnet. The current flowing through the wire is 6 amps. You want to increase the strength of the magnet to 1.5 times its present strength. What are the two changes you can make to achieve your goal? Show all your calculations.

5. The current leading to an electromagnet with a strength of 800 ampere-turn is reduced by the power company from 20 amp to 10 amp. What can you do to keep the strength of the electromagnet constant? Show all your calculations.

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Choose the letter of the correct answer.

1. If you are in the northern hemisphere and see the Northern Lights, you are seeing
   [A] the magnetosphere. [B] a magnetic field. [C] an aurora. [D] magnesia.

2. A complete path through which electric charges can flow is a(n)
   [A] electric circuit. [B] magnetic pole. [C] electrical resistance. [D] magnetic field line.

3. Since Earth produces a strong magnetic field,
   [A] Earth can attract other planets.
   [B] Earth can make magnets.
   [C] the ground will repel a magnet placed upside-down.
   [D] meteorites tend to move in Earth's direction.

4. How can you destroy a magnet's magnetism?
   [A] by cooling it [B] by heating it
   [C] by putting it in water [D] by breaking it into pieces

5. An electromagnet would most likely be used as a
   [A] refrigerator decoration.
   [B] ski lift.
   [C] pocket compass.
   [D] device on the end of a crane to lift junked cars.

6. Streams of electrically charged particles flowing at high speeds from the sun make up the
   [A] magnetosphere. [B] magnetic domain. [C] solar wind. [D] magnetic field.

7. An example of a common ferromagnetic material is
   [A] nickel. [B] copper. [C] plastic. [D] hydrogen.

8. The ampere is a unit of
   [A] electric charge. [B] temperature. [C] electric current. [D] magnetism.

9. The magnetic properties of a material depend on its
   [A] atomic structure. [B] position. [C] magnetic poles. [D] shape.

Choose the letter of the correct answer.

10. You can increase the strength of an electromagnet's field by
    [A] decreasing the current in the wire.
    [B] increasing the thickness of the insulation on the wire.
    [C] decreasing the number of loops in the wire.
    [D] using a stronger ferromagnetic material for the core.

11. Where is Earth's magnetic north pole?
    [A] at the geographic north pole
    [B] at the geographic south pole
    [C] in northern Canada
    [D] along the coast of Antarctica

12. An example of a conductor is
    [A] aluminum. [B] plastic. [C] glass. [D] wood.

13. A cluster of billions of atoms that all have magnetic fields lined up in the same way is known as a
    [A] magnetic field line.
    [B] magnetic pole.
    [C] magnetic domain.
    [D] permanent magnet.

Fill in the word or phrase that best completes the statement(s).

14. Molten rock that formed the ocean floor contained _____, which lined up in the direction of Earth's magnetic field.

15. A magnetic _____ is a cluster of billions of atoms that all have magnetic fields lined up in the same way.

16. Superconductors allow electric current to flow without resistance, but only at very low _____.

17. A current-carrying coil of wire with many loops is called a(n) _____.

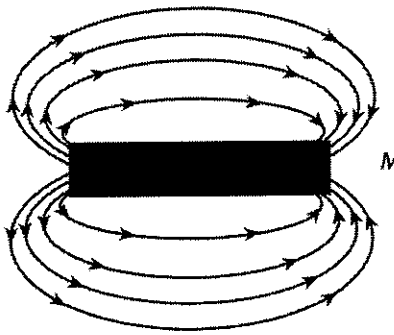
18. An atom can act as a tiny magnet because of the spinning and orbiting motion of negatively charged particles called _____.

19. The angle between true north and the north to which a compass needle points is known as _____.

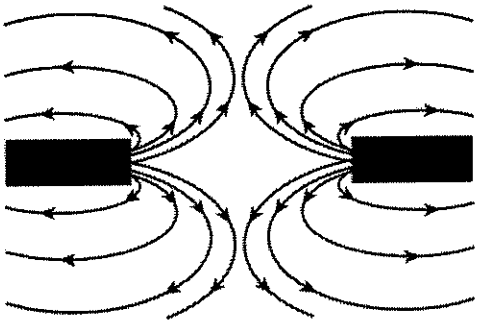
If the statement is true, write true. If it is false, change the underlined word or words to make the statement true.

20. Increasing the number of loops in an electromagnet will cause the strength of its magnetic field to <u>decrease</u>.

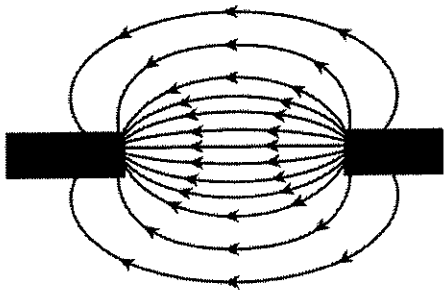
Use the diagram to answer the question(s).



Magnet A



Magnet Pair B

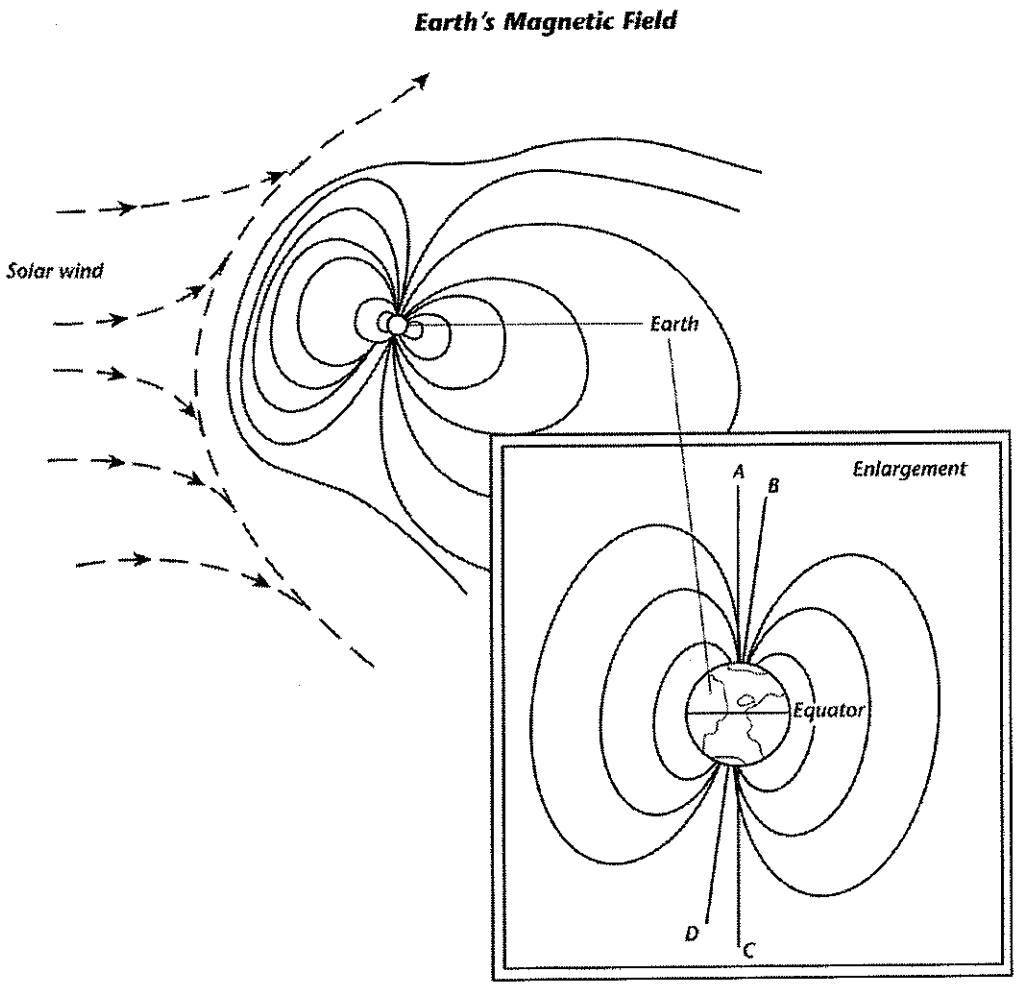


Magnet Pair C

21. Based on the direction of the lines around magnet A, where are the north and south magnetic poles? Explain.

22. Which pair of magnets is arranged so that like poles are placed near each other?

Use the diagram to answer the question(s).



23. In the enlargement in the diagram, what does point A represent?

24. Earth's magnetic field is similar to that of a huge bar magnet. If such a bar were buried within Earth, between what points in the enlargement in the diagram would this magnet be located?

25. Why are the field lines of the magnetosphere closer together on the side of Earth facing toward the sun?

Write an answer to the following question(s).

26. How can the strength of an electromagnet be increased?

27. Why might a permanent magnet become unmagnetized if it is dropped?

28. How can iron filings be used to map the magnetic field of a bar magnet?

29. Suppose that a bar magnet is suspended a few millimeters above another bar magnet. If the north pole of the bottom magnet is on the left, where is the north pole of the top magnet? Explain.

30. What are the basic features of an electric circuit?