Name _____

19 Study Guide

In your textbook, read about determining wavelength with diffraction gratings.
Circle the letter of the choice that best completes the statement or answers the question.

16. For a diffraction grating, the wavelength equals _____.

a. $\sin d$ **b.** $\sin d\theta$ **c.** $d/\sin\theta$ **(d.)** $d \sin\theta$

17. When monochromatic light is used with a diffraction grating, what is produced?

a. no diffraction pattern

b. no central band, but bright bands to the left and right

(c.) a bright central band with bright bands to the left and right

d. a dark central band with white bands to the left and right

18. How do the screen locations of the red lines produced by red light shone on a diffraction grating compare with the locations of the red lines produced by white light?

a. Those produced by the red light are above.

b. Those produced by the red light are to the left.

c. Those produced by the white light are closer together.

(d.) They are in the same places.

19. The sine of the angle between bright bands is approximately equal to _____.

a. d/L **b.** L/x **(c.)** x/L **d.** d/x

20. Which quantity is read directly from the calibrated base of a grating spectrometer?

(a.) θ **b.** λ **c.** f **d.** c

In your textbook, read about telescope and microscope resolution.
For each of the statements below, write true *or rewrite the italicized part to make the statement true.*

21. wider — Decreasing the width of a lens used in a telescope causes the diffraction pattern to become *narrower.*

22. true — Two stars will be just resolved if the central bright band of one star falls on the *first dark band* of the second star.

23. narrower — The diffraction pattern formed by blue light in a microscope is *wider* than that formed by red light.

24. telescopes only — Using a larger lens is practical in reducing effects of diffraction on the resolving power of *both microscopes and telescopes.*

25. true — *White* light would be more useful than green light in reducing diffraction patterns formed in a microscope.

26. more spread out — Telescope diffraction causes light from a star to appear *brighter.*

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20 Study Guide

Use with Chapter 20.

Static Electricity

Vocabulary Review

Write the term that correctly completes each statement. Use each term once.

charged	coulomb	elementary charge
charging by conduction	Coulomb's law	insulators
charging by induction	electroscope	neutral
conductors	electrostatics	plasma

1. insulators — Materials through which charges will not move easily are electrical _____.

2. electrostatics — The study of electrical charges that can be collected and held in one place is _____.

3. electroscope — A(n) _____ is a device used to determine charge.

4. elementary charge — The magnitude of the charge of an electron is the _____.

5. charging by induction — Separating the charges in an object without touching the object is _____.

6. conductors — Materials such as metals are electrical _____. They allow charges to move about easily.

7. neutral — The positive charge in _____ objects exactly balances the negative charge.

8. charging by conduction — Giving a neutral body a charge by touching it with a charged body is _____.

9. Coulomb's law — The magnitude of the force between charge q_A and charge q_B, separated by a distance d, is proportional to the magnitude of the charges and inversely proportional to the square of the distance; this is a statement of _____.

10. coulomb — The _____ is the SI standard unit of charge.

11. plasma — A(n) _____ is a gaslike state of negatively charged electrons and positively or negatively charged ions.

12. charged — An object that exhibits electrical interaction after rubbing is said to be _____.

Name _____

20 Study Guide

Section 20.1: Electrical Charge

In your textbook, read about charged objects.
Circle the letter of the choice that best completes each statement.

1. Electricity caused by rubbing is _____.
   (a.) static electricity
   b. lightning
   c. current electricity
   d. charge
2. An object that exhibits electrical interaction after rubbing is said to be _____.
   a. positive
   b. electrical
   (c.) charged
   d. negative
3. Two objects with the same type of charge _____.
   a. have no affect on each other
   (b.) repel each other
   c. attract each other
   d. have to be positive
4. Two objects with opposite charges _____.
   a. have no affect on each other
   b. repel each other
   (c.) attract each other
   d. have to be negative
5. Two types of charges are _____.
   a. yellow and green
   b. top and bottom
   c. attractive and repulsive
   (d.) positive and negative

In your textbook, read about charged objects.
Complete the chart below by marking the appropriate column for the charge on each material after it is rubbed.

Table 1

Material	Positively charged	Negatively charged
6. plastic		x
7. wool	x	
8. hard rubber		x
9. fur	x	
10. glass	x	

In your textbook, read about the microscopic reasons for charge.
Answer the following questions.

11. What are the negative and positive parts of an atom?
    The electrons are negative and the nucleus is positive.

Name _____

20 Study Guide

12. How can an atom become charged?
    An atom becomes charged by losing or gaining electrons.
13. What happens when two neutral objects, such as rubber and fur, are rubbed together?
    Electrons from atoms in the fur are transferred to the rubber.

In your textbook, read about conductors and insulators.
Decide whether the examples below are insulators or conductors. Mark the correct column.

Table 2

Example	Insulator	Conductor
14. a material through which a charge will not move easily	x	
15. glass	x	
16. air as a plasma		x
17. aluminum		x
18. an object, held at the midpoint and rubbed only one end, becomes charged only at the rubbed end	x	
19. copper		x
20. dry wood	x	
21. a material through which charges move about easily		x
22. graphite		x
23. charges removed from one area are not replaced by charges from another area	x	
24. most plastics	x	
25. dry air	x	
26. charges applied to one area spread quickly over the entire object		x

Section 20.2: Electrical Force

In your textbook, read about forces on charged bodies and lightning.
For each of the statements below, write true *or rewrite the italicized part to make the statement true.*

1. There are *two* kinds of electrical charges, positive and negative.
   true
2. Charges *cannot* exert force on other charges over a distance.
   can

Name _____

20 Study Guide

3. The force between two charged objects is *weaker* when the objects are closer together.
stronger

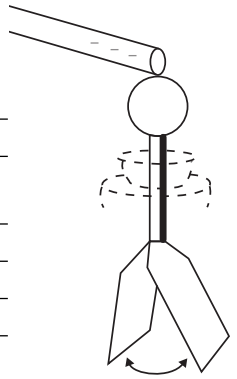
4. *Opposite* charges repel.
Like

5. If an electroscope is given a *positive* charge, the leaves will spread.
true

6. Neutral objects can attract charged objects because of separation of charge in the *charged* object.
neutral

7. Lightning bolts *discharge* clouds.
true

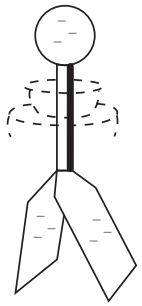
In your textbook, read about electroscopes.
Refer to the drawings to answer the following questions.



8. What is the net charge on the electroscope?
The net charge is negative.

9. By what method is the electroscope being charged?
The electroscope is being touched by a charged object, so it is being charged by conduction.

10. The electroscope has a net negative charge. What will happen if the electroscope is touched with an object that has a negative charge?
The leaves will spread farther apart.



11. What will happen if the electroscope is touched with an object that has a positive charge?
The leaves will fall.

Name _____

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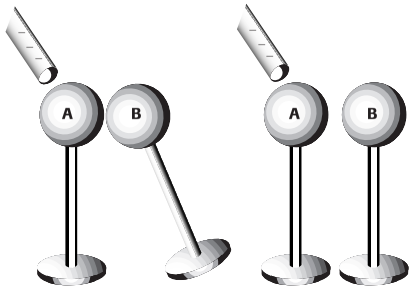

12. What is the charge on the metal sphere A?
It has a positive charge.

13. By what method are these metal spheres being charged?
They are being charged by induction.

In your textbook, read about Coulomb's law.
Circle the letter of the choice that best completes each statement.

According to Coulomb's law, the magnitude of the force on a charge q_A caused by charge q_B a distance d away can be written $F = K(q_A q_B/d^2)$.

14. The force, F, _____ with the square of the distance between the centers of two charged objects.
   a. varies directly
   b. varies inversely
   c. varies negatively
   d. doesn't vary

15. The force, F, _____ with the charge of two charged objects.
   a. varies directly
   b. varies inversely
   c. varies negatively
   d. doesn't vary

16. When the charges are measured in coulombs, the distance is measured in meters, and the force is measured in newtons, the constant, K, is _____
   a. 1
   b. 1.60×10^{-19} C
   c. 9.0×10^{9} N·m^2/C^2
   d. unknown

Name _____

20 Study Guide

17. Coulomb's law can be used to determine _____ of an electrical force.
    - **a.** the direction
    - **b.** the magnitude
    - **c.** the charge
    - **d.** both the magnitude and the direction

In your textbook, read about the application of electrical forces on neutral bodies.
Answer the following questions.

18. According to Newton's third law of motion, how is a neutral object affected by a charged object?
A neutral object is attracted toward the charged object.

19. Give two examples of applications of electrical forces on neutral particles.
Answers will vary. Sample answer: These forces can be used to collect soot in smokestacks to reduce air pollution. Static electricity is also used in photocopy machines.

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21 Study Guide

Use with Chapter 21.

Electric Fields

Vocabulary Review

Circle the letter of the choice that best completes each statement.

1. The unit used to measure the electric potential difference is the _____.
   - **a.** volt
   - **b.** voltmeter
   - **c.** coulomb
   - **d.** joule
2. The _____ of a charged object exerts force on other charged objects.
   - **a.** charge
   - **b.** capacitance
   - **c.** electric field
   - **d.** voltage
3. The ratio of charge to potential difference of an object is its _____.
   - **a.** capacitance
   - **b.** capacity
   - **c.** voltage
   - **d.** electric potential difference
4. The instrument that measures potential difference is the _____.
   - **a.** voltmeter
   - **b.** ammeter
   - **c.** potential difference meter
   - **d.** capacitor
5. The direction and strength of an electric field are depicted by _____ .
   - **a.** tangents
   - **b.** electric field lines
   - **c.** spokes
   - **d.** magnetic field lines
6. The change in potential energy per unit charge is _____.
   - **a.** volt
   - **b.** work
   - **c.** electric potential difference
   - **d.** capacitance
7. Touching an object to Earth to eliminate excess charge is _____.
   - **a.** connecting
   - **b.** equalizing
   - **c.** recharging
   - **d.** grounding
8. A device that stores charge by having a specific capacitance is a(n) _____.
   - **a.** charge holder
   - **b.** battery
   - **c.** capacitor
   - **d.** electric field
9. Capacitance is measured in _____.
   - **a.** coulombs
   - **b.** volts
   - **c.** ohms
   - **d.** farads
10. Electric charge may be visible as a(n) _____ on a power line.
    - **a.** corona
    - **b.** electric field line
    - **c.** electric vector
    - **d.** plasma

Name _____

21 Study Guide

Section 21.1: Creating and Measuring Electric Fields

In your textbook, read about electric fields.
Answer the following questions, using complete sentences.

11. What produces an electric field?
An electric charge produces an electric field.

12. Why must you use a test charge to observe an electric field?
An electric field can be observed only when it produces forces on other charges.

13. How does Coulomb's law relate to test charges?
The force exerted on a test charge in an electric field is proportional to the size of the test charge.

14. If arrows represent electric field vectors in a picture of an electric field, how are the magnitude and direction of the field shown?
The length of the arrow is used to show the magnitude of the field. The direction of the arrow shows the field direction.

15. How do you find the electric field from two charges?
Add the fields from the individual charges vectorially.

16. Why should an electric field be measured only by a small test charge?
The test charge exerts a force on *q*. It is important that the force exerted by the test charge doesn't move *q* to a new location, and thus change the force on *q*' and the electric field being measured.

In your textbook, read about models for electric fields.
Answer the following questions.

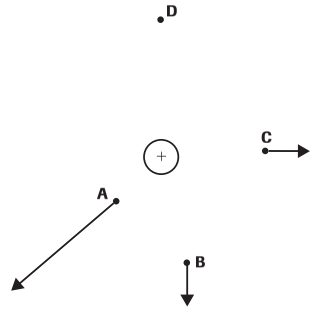
17. Explain what a Van de Graaff machine is and one way it can be used to show field lines.
A Van de Graaff machine transfers large amounts of charge from one part of the machine to the top metal terminal. A person touching the terminal is charged electrically. The charges on the person's hairs repel each other, causing the hairs to follow the field lines.

18. Do field lines and electric fields really exist? How are field lines and electric fields useful?
Field lines do not really exist, but electric fields do. Field lines provide a model of an electric field. Electric fields provide a method of calculating the force on a charged body.

Name _____

21 Study Guide

In your textbook, read about electric field vectors.
Refer to the illustration to answer the following questions.

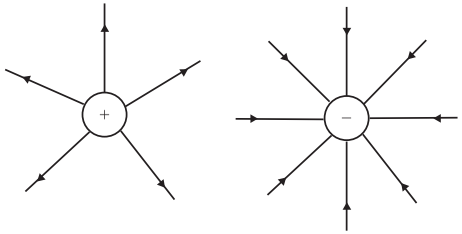


19. At what point is the magnitude of the electric field the greatest? Explain how you can tell from the drawing that this is true.
The magnitude of the electric field is greatest at point A. The arrow representing the field at this point is the longest.

20. Points B and C are the same distance from the field charge. What could cause the force measured on a test charge at point B to be twice as large as the force measured on a test charge at point C?
If the test charge used at point B is twice as large as the test charge used at point C, the force measured at point B would be twice as large.

21. If an arrow representing the electric field were drawn at point D, how long would it be relative to the other arrows in the drawing? Why?
It would be shorter than all the other arrows because it is farthest from the field charge.

In your textbook, read about electric field lines.
Answer the following questions.



22. Draw two electric charges, one positive and one negative. Assume they are so far apart that there is no interaction between the charges.

23. Draw electric field lines around each charge. Show that the field around the negative charge is twice as strong as the field around the positive charge.

Name _____

21 Study Guide

Section 21.2: Applications of Electric Fields

In your textbook, read about electric potential.
Circle the letter of the choice that best completes the statement or answers the question.

1. Which equation defines the electric potential difference?
   - **a.** $E = F/q'$
   - **b.** $\Delta V = \Delta V_e/q'$
   - **c.** $V = J/C$
   - **d.** $q = mg/E$
2. When you do positive work on a two-charge system, the electric potential energy _____.
   - **a.** increases
   - **b.** decreases
   - **c.** does not change
   - **d.** always disappears
3. Only _____ electric potential can be measured.
   - **a.** points of
   - **b.** absolute values of
   - **c.** differences in
   - **d.** attractions between
4. The electric potential _____ when a positive charge is moved toward a negative charge.
   - **a.** increases
   - **b.** stays the same
   - **c.** decreases
   - **d.** becomes positive
5. A positive test charge is located at point A. If the test charge is moved to some point B and then back to point A, what is the change in the electric potential?
   - **a.** The electric potential increases.
   - **b.** The electric potential decreases.
   - **c.** The electric potential becomes zero.
   - **d.** The electric potential does not change.

In your textbook, read about electric potential and uniform fields.
For each of the statements below, write true *or rewrite the italicized part to make the statement true.*

6. Two large, flat conducting plates parallel to each other can create a constant electric force and field. *Both are charged negatively.*
   One is charged negatively and one is charged positively.
7. The direction of an electric field between two parallel conducting plates is *from the positive plate to the negative plate.*
   true
8. The *electrical* difference between two points a distance d apart in a uniform field is represented by the equation $\Delta V = Ed$.
   potential
9. The potential increases in the direction *opposite* the electric field direction.
   true
10. The potential is *lower* near the positively charged plate.
    higher

Name _____

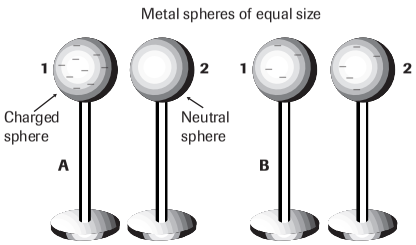
21 Study Guide

In your textbook, read about Millikan's oil-drop experiment.
Write the term that correctly completes each statement. Use each term once.

charged	gravitational field	multiple	suspended
electric field	ionized	potential difference	uniform
electron	magnitude		

Millikan used a(n) **(11)** **uniform** electric field between two parallel plates to measure the charge on an electron. **(12)** **Charged** oil drops between the plates fell from the air unless the **(13)** **potential difference** between the two plates was adjusted. When the top plate was positive enough, an oil drop was **(14)** **suspended** between the plates. At this adjustment, the force of Earth's **(15)** **gravitational field** and the force of the **(16)** **electric field** were the same magnitude. From the **(17)** **magnitude** of the electric field, the charge on the drop was calculated. When Millikan **(18)** **ionized** the air to add or remove electrons from the drops, the change in the charge of a drop was always a **(19)** **multiple** of 1.6×10^{-19} C. Therefore, Millikan proposed that each **(20)** **electron** always carried that charge.

In your textbook, read about objects sharing a charge.
Refer to the illustration. For each of the statements below, write true *or rewrite the italicized part to make the statement true.*



21. In drawing A, the electric potential of *sphere 1* is high.
    true
22. When the spheres touch, negative charges flow from *sphere 2 to sphere 1*.
    sphere 1 to sphere 2
23. When the spheres touch, the potential of sphere *2 decreases* and the potential of sphere 1 decreases.
    increases
24. In drawing B, the potential of sphere 1 now *equals* the potential of sphere 2.
    true
25. If sphere 2 were smaller than sphere 1, the two spheres *would not* have reached the same potential by touching.
    would

Name _____

21 Study Guide

In your textbook, read about grounding and conductors.
Answer the following questions.

26. Why can an object be touched to Earth to eliminate excess charge on a body?
Earth is such a large sphere that almost any amount of charge can flow into Earth without changing Earth's potential. So, all the excess charge on a body can flow into Earth.

27. Give one example of an object that requires grounding to prevent damage or injury.
Answers will vary. Sample answer: Gasoline trucks can acquire charge through friction. If they were not grounded, the charge could jump to Earth through gasoline vapor and cause an explosion.

28. Explain why people inside a car are protected from electric fields generated by lightning.
A car is a closed, hollow metal container, so excess charges move to the outer surface.

29. Explain how a lightning rod works.
Because lightning rods are pointed, the electric field is strong near the end of the rod. Air molecules are pulled apart and start a conducting path from the rods to the clouds. Charges in the clouds spark to the rod rather than to high points on the house. A conductor from the rod grounds the charges.

In your textbook, read about capacitance and capacitors.
Circle the letter of the answer that best completes each statement.

30. A small device invented by Pieter Van Musschenbroek that can store a large electric charge is the _____.
a. capacitor **c.** resistor
(b.) Leyden jar **d.** electric field

31. For a given shape and size of an object, the ratio of charge stored to _____ is a constant.
a. resistance **c.** current
(b.) potential difference **d.** size

32. All capacitors are made up of two _____, separated by an insulator.
a. insulators **b.** plates **(c.)** conductors **d.** wires

33. Capacitors are used in electric circuits to store _____.
(a.) charge **b.** current **c.** resistance **d.** capacitance

34. The capacitance of a capacitor is _____ the charge on it.
a. dependent on **b.** linked to **c.** changed by **(d.)** independent from

Date _____ Period _____ Name _____

22 Study Guide

Use with Chapter 22.

Current Electricity

Vocabulary Review

For each description on the left, write the letter of the matching item.

e	**1.** a closed loop though which charges can flow	**a.** ammeter
d	**2.** the flow of positive charge	**b.** ampere
j	**3.** a variable resistor or rheostat	**c.** battery
f	**4.** a flow of charged particles	**d.** conventional current
k	**5.** the property that determines how much current is present	**e.** electric circuit
		f. electric current
b	**6.** a flow of 1 C/s	**g.** kilowatt-hour
m	**7.** a circuit diagram	**h.** parallel connection
a	**8.** a device that measures current	**i.** photovoltaic cell
c	**9.** several voltaic cells connected together	**j.** potentiometer
l	**10.** device designed to have a specific resistance	**k.** resistance
		l. resistor
n	**11.** a connection that provides only one path for a current	**m.** schematic
		n. series connection
o	**12.** a device that measures the potential difference of a circuit	**o.** voltmeter
h	**13.** a connection of two or more electric devices that provides more than one current path	
i	**14.** a device that converts light energy to electric energy	
g	**15.** 100 watts of electric energy delivered continuously and used for 1 h	

Name _____

22 Study Guide

Section 22.1: Current and Circuits

In your textbook, read about electric circuits.
Circle the letter of the choice that best completes the statement or answers the question.

1. If two conductors at different potential differences are connected by another conductor, charges flow from the conductor with the _____ potential difference to the conductor with the _____ potential difference.
   (a.) higher, lower **b.** lower, higher **c.** negative, positive. **d.** medium, higher
2. If two conductors, A and B, are connected by another conductor, when does the flow of charge stop?
   a. when the potential difference of A is lower than the potential difference of B
   b. when the potential difference of A is higher than the potential difference of B
   (c.) when the potential difference of all conductors is equal
   d. never
3. Batteries and generators are both sources of _____.
   a. light **c.** photovoltaic cells
   (b.) electric energy **d.** kinetic energy
4. A(n) _____ is a closed loop that consists of a charge pump connected to a device that reduces the potential energy of the flowing charges.
   (a.) electric circuit **c.** resistor
   b. generator **d.** potentiometer
5. The potential energy lost by the charges moving through a device in a circuit is represented by _____.
   a. ΔV **c.** PE
   b. E (d.) qV
6. A general term that could refer to a battery, photovoltaic cell, or generator in a circuit is _____.
   a. ammeter (c.) charge pump
   b. resistor **d.** current
7. No generator is 100 percent efficient, and the kinetic energy that is not converted to electric energy usually _____.
   a. stays electric energy **c.** becomes light energy
   (b.) becomes thermal energy **d.** disappears
8. Because q is conserved, the net change in potential energy of the charges going completely around the circuit _____.
   (a.) must be zero
   b. is higher at the beginning than at the end
   c. is lower at the beginning than at the end
   d. is a negative number

Name _____

22 Study Guide

In your textbook, read about electric power.
Write the term that correctly completes each statement. Use each term once.

ammeter	coulomb	energy	power
ampere	electric current	potential difference	watts
charge			

Power measures the rate at which **(9)** energy is transferred. The energy carried by an electric current depends on the **(10)** charge transferred and the potential difference across which it moves. The unit used for quantity of electric charge is the **(11)** coulomb. Thus, the rate of flow of electric charge, or **(12)** electric current, is measured in coulombs per second. One coulomb per second is a(n) **(13)** ampere. A(n) **(14)** ammeter is used to measure current. The **(15)** power of an electric device is found by multiplying the **(16)** potential difference by the current. The power, or energy delivered to the electric device per second, is measured in joules per second, or **(17)** watts.

In your textbook, read about resistance.
For each of the statements below, write true *or rewrite the italicized part to make the statement true.*

18. almost no current — If you put a glass rod between two conductors that have a potential difference between them, you will have *a very large current.*
19. true — *Resistance* is measured by placing a potential difference across two points on a conductor and measuring the current.
20. current — Resistance is the ratio of the potential difference to the *charge.*
21. true — The resistance of a conductor is measured in *ohms.*
22. true — One ohm, 1Ω, is the resistance that permits a current of 1 A when a *potential difference of 1 V* is applied across the resistance.
23. constant resistance — A device that has a *changing resistance* and appears to be independent of the potential difference is said to obey Ohm's law.
24. small volume — To reduce current, you need a large resistance in a *large volume.*
25. zero — Superconductors are materials that have *high* resistance.

Name _____

22 Study Guide

In your textbook, read about control of current.
Answer the following questions.

26. How does voltage affect the current that passes through a resistor?

The larger the voltage that passes through a resistor, the larger is the current that passes through it.

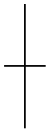
27. How can the current be reduced if the voltage is kept constant?

The current is reduced when the resistance is increased.

28. Explain how a variable resistor, or potentiometer, works.

A variable resistor consists of a coil of resistance wire and a sliding contact point. By moving the contact point to various positions along the coil, the amount of wire in the circuit varies. As more wire is included in the circuit, the resistance of the circuit increases.

In your textbook, read about symbols used in schematic diagrams.
Complete the table below by writing the correct symbols or the names of components.

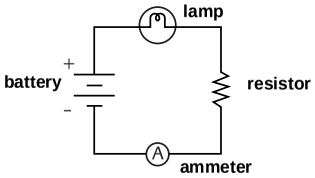
Component	Symbol	Component	Symbol
capacitor		**electric connection**	
conductor	_____	no electric connection	
fuse		**switch**	
lamp			

Name _____

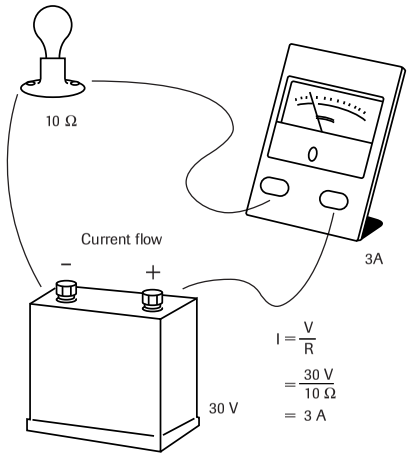
22 Study Guide

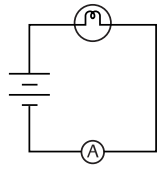
In your textbook, read about schematic diagrams of circuits.
Complete the schematic diagrams below.

29. Label the components of the schematic diagram below.

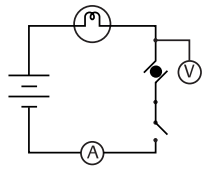


30. Draw a schematic diagram for the circuit in the drawing below.





31. Draw a schematic diagram for a circuit that has a battery, a lamp, a motor, a switch, and an ammeter, with a voltmeter across the motor.



Name _____

22 Study Guide

Section 22.2: Using Electrical Energy

In your textbook, read about resistors used to turn electric energy into thermal energy.
Circle the letter of the choice that best completes each statement.

1. A space heater, a hot plate, and the heating element in a hair dryer are designed to convert almost all the electric energy into _____.
   a. kinetic energy **c.** thermal energy
   b. potential energy **d.** solar energy
2. Household appliances that convert electric energy into thermal energy act as _____ when they are in a circuit.
   a. resistors **b.** motors **c.** ammeters **d.** voltage dividers
3. When a charge moves through a resistor, its _____ is reduced.
   a. current **c.** resistance
   b. potential difference **d.** charge
4. The _____ dissipated in a resistor is proportional to the square of the current that passes through it and to the resistance.
   a. voltage **b.** power **c.** current **d.** kinetic energy
5. A resistor gets hot because the power that cannot pass through it is changed _____.
   a. from thermal energy to electric energy
   b. from kinetic energy to thermal energy
   c. from electric energy to kinetic energy
   d. from electric energy to thermal energy

In your textbook, read about transmission of electric energy and power companies.
For each of the statements below, write true *or rewrite the italicized part to make the statement true.*

6. true — When power is transmitted over long distances, energy is lost as *thermal* energy.
7. resistance — To reduce the loss of energy during transmittal of power over long distances, either the current or the *voltage* must be reduced.
8. true — All *wires* have some resistance, even though the resistance is small.
9. large — Cables of high conductivity and *small* diameter are used to transmit power long distances to reduce the resistance and reduce loss of energy as thermal energy.
10. true — Current can be reduced without reducing power, by increasing the *voltage*.
11. kilowatt-hours — Electric companies measure their energy sales in *joules per second times seconds*.

Date _____ Period _____ Name _____

23 Study Guide

Use with Chapter 23.

Series and Parallel Circuits

Vocabulary Review

For each description on the left, write the letter of the matching item.

h 1. circuit in which all current travels though each device
e 2. short piece of metal that melts if too large a current passes through it
i 3. occurs when a circuit forms that has a very low resistance
g 4. circuit in which there are several different paths for a current
b 5. automatic switch that opens a circuit when the current reaches some set value
c 6. circuit that has some resistors in parallel and some in series
d 7. value of a single resistor that could replace all resistors in a circuit without changing the current
a 8. device used to measure the current in part of a circuit
k 9. device used to measure the potential drop across some part of a circuit
f 10. detects small differences in current caused by an extra current path and opens the circuit
j 11. series circuit used to produce a voltage source from a higher-voltage battery

a. ammeter
b. circuit breaker
c. combination series-parallel circuit
d. equivalent resistance
e. fuse
f. ground-fault interrupter
g. parallel circuit
h. series circuit
i. short circuit
j. voltage divider
k. voltmeter

Name _____

23 Study Guide

Section 23.1: Simple Circuits

In your textbook, read about current in series circuits.
Circle the letter of the choice that best completes the statement or answers the question.

1. The current is _____ a series circuit.

a. higher at the beginning of
c. lower at the beginning of
(b.) the same everywhere in
d. variable in

2. In an electric circuit, the increase in voltage provided by the generator or other energy source, ΔV_{source}, is equal to the _____ of voltage drops across the resistors.

a. subtraction **b.** multiplication **(c.)** sum **d.** average

3. Which of the following equations is not correct?

a. $I = \frac{\Delta V_{source}}{(R_1 + R_2)}$
c. $I = \frac{\Delta V_{source}}{(R_1 + R_2 + R_3)}$
b. $I = \frac{\Delta V_{source}}{R}$
(d.) $I = R_3 + \frac{\Delta V_{source}}{(R_1 + R_2)}$

4. Which of the following equations correctly computes the equivalent resistance for a series circuit with four resistors?

(a.) $R = R_1 + R_2 + R_3 + R_4$
c. $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4}$
b. $R = R_1 \times R_2 \times R_3 \times R_4$
d. $R = \frac{(R_1 \times R_2)}{(R_3 \times R_4)}$

5. In a series circuit, the equivalent resistance is _____ any single resistance.

(a.) larger than
c. equal to
b. determined by
d. smaller than

6. If the battery voltage does not change, adding more devices in series _____ the current.

a. sometimes decreases
c. sometimes increases
(b.) always decreases
d. always increases

7. Given the voltage of a series circuit, you first calculate _____ to find the current through the circuit.

a. the voltage
c. the power
(b.) the equivalent resistance
d. the equivalent voltage

Name _____

23 Study Guide

In your textbook, read about voltage drops in series circuits.
Answer the following questions, using complete sentences.

8. Why must the net change in potential be zero as current moves through a circuit?
As current passes through the resistors of a circuit, the energy source (the battery or generator) raises the potential an amount equal to the total voltage drops across the resistors.

9. How do you find the potential drop across an individual resistor?
Multiply the current in the circuit by the resistance of that resistor.

10. What type of circuit is used in a voltage divider?
A series circuit is used in a voltage divider.

11. What is the purpose of a voltage divider?
A voltage divider produces a voltage source from a higher-voltage battery.

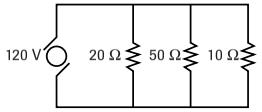
12. What determines the resistance of a photoresistor?
The resistance of a photoresistor depends on the amount of light that strikes it.

13. Why are photoresistors often used in voltage dividers? In what special devices can they be used?
The output voltage of a voltage divider that uses a photoresistor depends on the amount of light striking the photoresistor sensor. It can be used as a light meter.

Name _____

23 Study Guide

In your textbook, read about parallel circuits.
Refer to the circuit diagram below. Circle the letter of the best answer for each question.



14. What type of circuit does this diagram represent?

a. series circuit

(b.) parallel circuit

c. combination series-parallel circuit

d. tandem circuit

15. How many current paths are in this circuit?

a. one

b. four

(c.) three

d. five

16. How would you calculate the total current of this circuit?

a. Total current is found by computing the average of the currents through each path.

(b.) Total current is found by adding the currents through each path.

c. Total current is found by subtracting the currents through each path.

d. Total current cannot be calculated for this circuit.

17. If the 10-Ω resistor were removed from the circuit, which of the following would *not* be true?

a. The current through the 20-Ω resistor would be unchanged.

b. The sum of the current in the branches of the circuit would change.

c. The total current through the generator would change.

(d.) The current through the 50-Ω resistor would change.

18. Which of the following is true for this circuit?

(a.) The equivalent resistance of this circuit is smaller than 10 Ω.

b. $R = R_1 + R_2 + R_3$

c. $R = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

d. $R = R_1 \times R_2 \times R_3$

Name _____

23 Study Guide

Section 23.2: Applications of Circuits

In your textbook, read about safety devices.
For each of the statements below, write true *or rewrite the italicized part to make it true.*

1. When appliances are connected in *parallel,* each additional appliance placed in operation reduces the equivalent resistance in the circuit and causes more current to flow through the wires.
true

2. The *length* of the metal in a fuse determines the amount of current that will melt the fuse and break the circuit.
thickness

3. When a circuit breaker *opens,* it allows current to flow.
closes

4. Ground-fault interrupters can be used as safety devices on circuits in which the current flows along *a single path* from the power source into the electric outlet and back to the source.
true

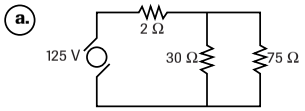
5. Electric wiring in homes uses only *series* circuits.
parallel

6. Low resistance causes the current to be very *small* and may result in a short circuit.
large

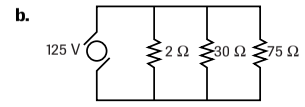
In your textbook, read about combined series-parallel circuits.
Circle the letter of the choice that best answers the question.

7. Which diagram represents a combined series-parallel circuit in which a 30-Ω resistor and a 75-Ω resistor are connected in parallel to a 125-V source through a 2-Ω resistor in series?

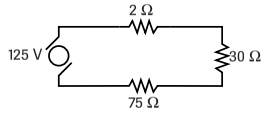
(a.)



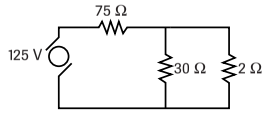
b.



c.



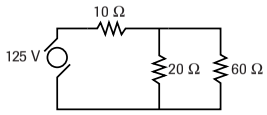
d.

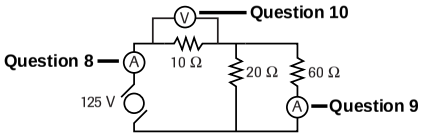


Name _____

23 Study Guide

In your textbook, read about ammeters and voltmeters.
Redraw the circuit diagram below according to the following directions.





8. Insert an ammeter in the circuit that would measure the current of the entire circuit.
See answer to problem 10.

9. Insert an ammeter in the circuit that would measure the current that flows through the 60-Ω resistor.
See answer to problem 10.

10. Insert a voltmeter that would measure the voltage drop across the 10-Ω resistor.

Write the term that correctly completes each statement. Use each term once.

ammeter	**low**	**series**
high	**parallel**	**voltmeter**

A(n) **(11)** ammeter measures current. It is placed in **(12)** series with the resistor if you want to measure the current through a resistor. So that it will change the current as little as possible, its resistance should be as **(13)** low as possible. A(n) **(14)** voltmeter measures the voltage drop across a resistor. It should be connected in **(15)** parallel with a resistor to measure the potential drop across that resistor. So that it will change the current as little as possible, its resistance should be as **(16)** high as possible.

Date _____ Period _____ Name _____

24 Study Guide

Use with Chapter 24.

Magnetic Fields

Vocabulary Review

For each description on the left, write the letter of the matching item.

d	**1.** a current-carrying coil of wire that has a north pole and a south pole	**a.** armature
j	**2.** the strength of a magnetic field	**b.** domain
e	**3.** used to find the direction of the magnetic field around a current-carrying wire	**c.** electric motor
b	**4.** the combined magnetic fields of electrons in a group of atoms	**d.** electromagnet
l	**5.** used to find the direction of the magnetic field around an electromagnet	**e.** first right-hand rule
n	**6.** used to find the direction of the force on a current-carrying wire in a magnetic field	**f.** galvanometer
f	**7.** a device used to measure very small currents	**g.** magnetic field
i	**8.** the number of magnetic field lines passing through a surface	**h.** magnetic field lines
k	**9.** having a north pole and a south pole	**i.** magnetic flux
g	**10.** the magnetic forces that exist around magnets	**j.** magnetic induction
h	**11.** imaginary lines used to help visualize a magnetic field	**k.** polarized
m	**12.** a long coil of wire consisting of many loops	**l.** second right-hand rule
c	**13.** a device that converts electrical energy to kinetic energy	**m.** solenoid
a	**14.** several rotating loops of wire in an electric motor	**n.** third right-hand rule