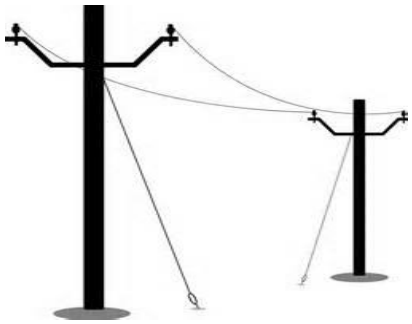
Teacher Answer Key

Chapter 7

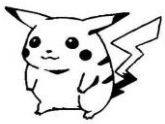





Electricity

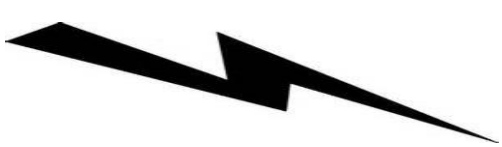
Broughton High School of Wake County

Physical Science Vocabulary



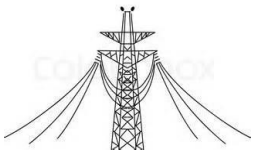
Vocabulary for Chapter 7 – Electricity

Vocabulary Word	Definition
1. Charging by Contact	Process of transferring charge between objects by touching or rubbing.
2. Charging by Induction	Process of rearranging electrons on a neutral object by bringing a charged object close to it.
3. Circuit	A closed conducting loop through which an electric current can flow. Any complete path along which charge can flow.
4. Conductor	A substance through which heat and electricity can flow easily. Common Conductors: Silver, Copper, Gold, Aluminum, Magnesium, Nickel, Mercury, Iron, Sea Water
5. Electric Current	The net movement of electric charges in a single direction measured in amperes. A continuous flow of electric charge.
6. Electric Power	The rate at which electrical energy is converted to another form of energy. Electric Power is measured in watts (W). P = IV (Electric Power = Current X Voltage Difference)
7. Insulator	A material that is a poor energy conductor and does not transfer charge easily. Common Insulators: glass, rubber, oil, asphalt, wood, plastic, fiberglass, asphalt
8. Law of Conservation of Charge	A law stating that the total electric charge in an isolated system is constant. Electric charge is never created or destroyed. States that charge can be transferred from one object to another but it cannot be created or destroyed.
9. Ohm's Law	states that the current in a circuit equals the voltage difference divided by the resistance. I = V/R (the relationship between volts and amperes in a circuit.)
10. Parallel Circuit	A circuit in which two or more conductors are connected across two common points in the circuit to provide separate conducting paths for the current.
11. Resistance	The ratio of the voltage across a conductor to the current it carries. The tendency for a material to oppose electron flow and change electrical energy into thermal energy and light.
12. Series Circuit	A circuit in which electric current has only one path to follow.
13. Static Electricity	Electricity produced by charged bodies. The study of the behavior of electric charges including how charge is transferred between objects.
14. Voltage Difference	Potential difference in electrical fields The change in the electrical potential energy per unit of charge.



Broughton High School of Wake County

Note-Taking "Electricity"



Section 1: - Electric Charge

A. Protons have positive electric charge; electrons have negative electric charge.

1. In most atoms, the charges of the protons and electrons cancel each other out and the atom has no net charge.
2. Atoms become charged by gaining or losing electrons.
3. **Static electricity** – the accumulation of excess electrical on an object.

B. Electrically charged objects obey the following rules:

1. **Law conservation of charge** – charge may be transferred from object to object, but it cannot be created or destroyed.
2. Opposite charges attract, and like charges repel.
3. Charges can act on each other even at a distance, because any charge that is placed an **electric field** will be pushed or pulled by the field.
4. Electrons move more easily through **conductors**, like Metals.
5. Electrons do not move easily through insulators, such as plastic, wood, rubber, and glass.

C. Transferring electric charge

1. Charging by contact.

a. The process of transferring charge by touching or rubbuing.

b. Example: static electricity from your feet charges the carpet.

2. Charging by induction.

a. The rearrangement of electrons on a neutral object caused by a nearby charged object.

b. Example: a negatively charged balloon near your sleeve causes an area of your sleeve to become positively charged.

3. Static discharge.

a. A transfer of charge through the air between two objects because of a buildup of static electricity.

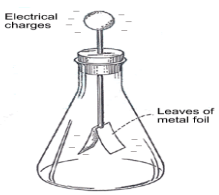
b. Example: lightning.

4. **Grounding –** using a conductor to direct an electric charge into the ground.

D. The presence of electric charges can be detected by an electroscope.

What is an Electroscope?

Instrument used for detecting positive and negative electrical charges.



Section 2: - Electric Current

A. The flow of charges through a wire or conductor is called **electric** current.

1. Current is usually the flow of electrons.
2. Electric current is measured in amperes (A).
3. Charges flow from high voltage to low voltage.

a. A **voltage difference** is the push that causes charges to move.

b. Voltage difference is measured in volts (V).

4. For charges to flow, the wire must always be connected in a closed path, or circuit.

B. Sources of electricity:

1. A Dry-Cell battery produces a voltage difference between its zinc container and its carbon suspension rod, causing current to flow between them.
2. A Wet-Cell battery contains two connected plates made of different metals in a conducting solution.
3. Wall sockets have voltage difference across the two holes of an electrical outlet, and a generator at a power plant provides the voltage difference.

C. Resistance – the tendency for a material to oppose the flow of electrons, changing electrical energy into Thermal energy and Light.

1. All materials have some electrical Resistance.
2. Resistance is measured in Ohms (Ω).
3. Making wires thinner, longer, or hotter increases the resistance.

D. Ohm's Law – the current in a circuit equals the voltage difference divided by the resistance.

Section 3: - Electric Circuits

A. Circuits rely on generators at power plants to produce a voltage difference across the outlet, causing the charge to move when the circuit is complete.

1. Series circuit – the current has only one loop to flow through.

a. The parts of a series circuit are wired one after another, so the amount of current is the same through every part.

b. Open - Circuit - if any part of a series circuit is disconnected, no current flows through the circuit.

c. Example: strings of Holiday Lights.

2. **Parallel circuit** – contains two or more branches for current to move through.

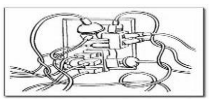
a. Individual parts can be turned off without affecting the entire circuit.

b. Example: the electrical system in a home or house.

What's wrong with this electrical outlet?

Fires relating to overloading and due to damaged and defective appliances.

Don't overload sockets – plugging too many electrical appliances



Section 3: - Electric Circuits

B. Household circuits use parallel circuits connected in a logical network.

1. Each branch receives the standard voltage difference from the electric company.
2. Electrical energy enters your home at the circuit breaker or Fuse box and branches out to wall sockets, major appliances, and lights.
3. Guards against overheating electric wires:

a. Electrical fuse - contains a small piece of metal that melts if the current becomes too high, opening the circuit and stopping the flow of current.

b. Circuit Breaker - contains a small piece of metal that bends when it gets hot, opening the circuit and stopping the flow of current.

C. Electrical energy is easily converted to mechanical, thermal, or light energy.

1. **Electrical power** – the rate at which electrical energy is converted to another form of energy.

   a. Electrical power is expressed in Watts (W).

   b. Power = current X voltage difference.

   c. P (watts) = I (amperes) X volts.

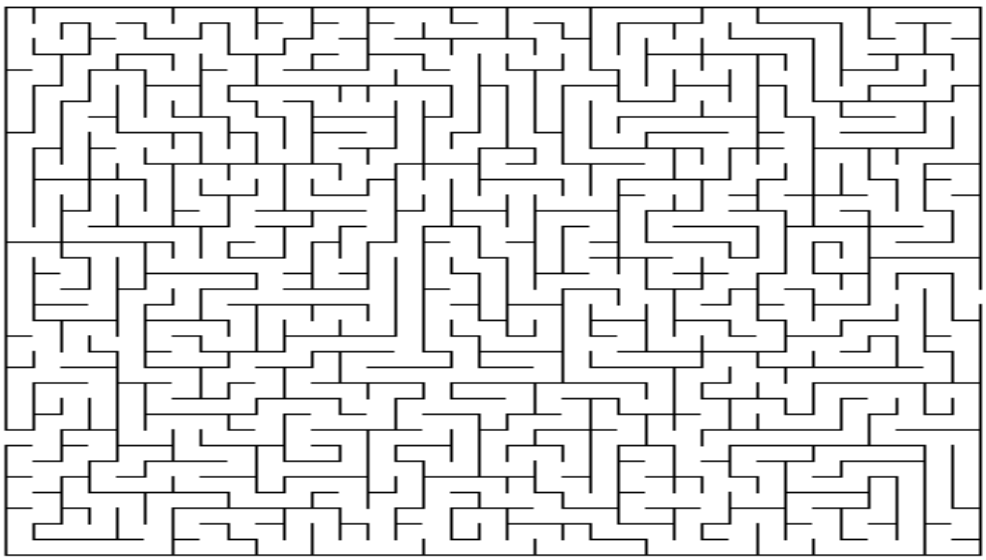
2. To calculate the amount of energy an appliance uses:

   a. The unit of electrical energy is the kilowatt - hour, which equals 1000 watts of power used for one hour.

   b. Energy = power X time.

   c. E (kWh) = P (kW) X time (t).

"Find your way to the water?"



Section 4 – Static Electricity

In the diagram below show the positive and negative particles in the balloon and the girl's hair after they are rubbed together.

1. The flow of electrons: _____.
2. When an object is positively charged it has more positive (p+) than negative (e-).
3. When an object is negatively charged it has more negative (e-) than positive (p+).
4. When two objects, each having more electrons than protons, are brought close to each other, they will attract (opposite) each other.

Write the word or phrase from column B in the space below before its description in column A.

	Column A	Column B
A	a. Electrical charges at rest	Static
C	b. Objects having more + than – charges	Neutron
E	c. Produces a form of electricity	Positively charged
B	d. No positive or negative electrical charge	Negatively charged
D	e. Objects having more – than + charges	Friction

5. Identify the following as: Positive (+), Negative (-), or Neutral (0)

+ Is attracted to an electron.

0 Most objects we encounter.

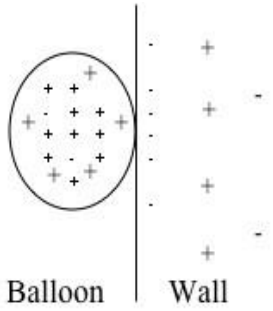
- An object that has 514 electrons and 275 protons.

+ Something that is repelled by an object that has gained electrons.

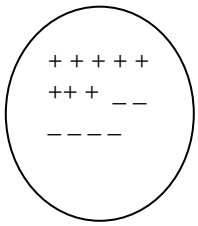
0 Will not attract or repel anything.

+ An object with 5 more protons than electrons.

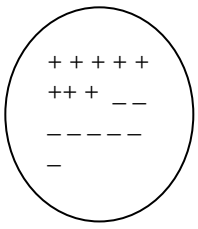
- An object that will take electrons from the earth when it is grounded.



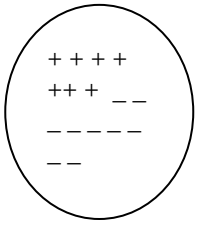
Calculate the total charge in each circle.



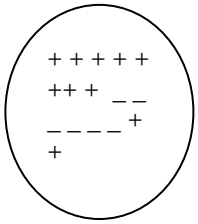
Positive Charges (+) = 8
Negative Charges (-) = 6
Net Charges = +2



Positive Charges (+) = 8
Negative Charges (-) = -8
Net Charges = 0



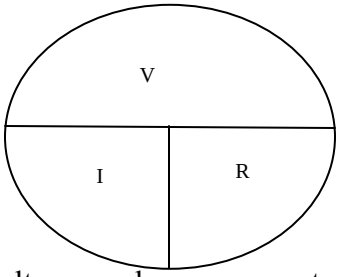
Positive Charges (+) = 7
Negative Charges (-) = -9
Net Charges = -2



Positive Charges (+) = 10
Negative Charges (-) = -5
Net Charges = 5

Section 5 – Ohm's Law

Complete the following memory circle **AND** the chart below.



	Letter stands for	Units
V	Voltage	Volts
I	Current	Amperes
R	Resistance	Ohms

1. What voltage produces a current of 50.0 amps with a resistance of 20 Ω?

Formula	Set Up & Solve	Answer
V = I X R	(50 A) (20 Ohms) =	1000 V

2. What is the current produced with a 9-V battery through a resistance of 100Ω?

Formula	Set Up & Solve	Answer
I = V/R	9V / 100 Ohms =	0.09 A

3. What resistance would produce a current of 200 A with a potential difference of 2000 Volts?

Formula	Set Up & Solve	Answer
R = V/I	2000V / 200 A =	10 Ohms

4. A 12-Volt battery produces a current of 25 A (amperes). What is the resistance?

Formula	Set Up & Solve	Answer
R = V/I	12 V / 25 A =	0.48 Ohms

5. Silver has a resistance of 0.00198 Ω. What voltage would produce a current 100 amps (amperes)?

Formula	Set Up & Solve	Answer
V = IR	(100 A) (0.00198 Ohms) =	0.198 V

Section 5 – Ohm's Law

6. What voltage produces a current of 150.0 amps with a resistance of 2.0 Ω?

Formula	Set Up & Solve	Answer
V = IR	(150 Amps) (2 Ohms) =	300 Volts

7. What is the current produced with a 9-V battery through a resistance of 1,000Ω?

Formula	Set Up & Solve	Answer
I = V/R	9V / 1000 Ohms =	0.009 Amps

8. What resistance would produce a current of 250 A with a potential difference of 24,000 Volts?

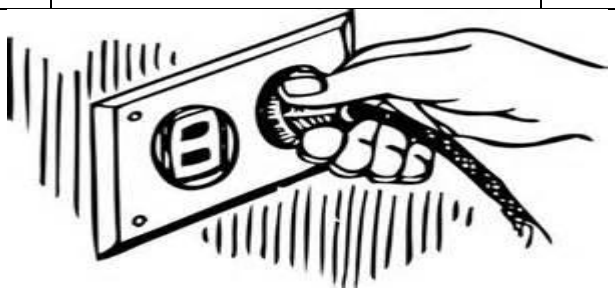
Formula	Set Up & Solve	Answer
R = V / I	24,000 V / 250 A =	96 Ohms

9. A 12-Volt battery produces a current of 35 A (amperes). What is the resistance?

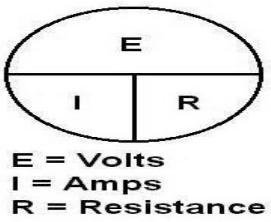
Formula	Set Up & Solve	Answer
R = V / I	12 V / 35 A =	0.342 Ohms

10. Silver has a resistance of 0.00198 Ω. What voltage would produce a current 150 amps (amperes)?

Formula	Set Up & Solve	Answer
V = IR	(150 Amps) (0.00198 Ohms) =	0.297 Volts



Section 6 - Electricity Problems



1. A circuit has a resistance of 4Ω. What voltage difference will cause a current of 1.4A to flow in the circuit?

Formula	Set Up & Solve	Answer
V = IR	(1.4 A) (4 Ohms) =	5.6 Volts

2. How many amperes of current will flow in a circuit if the voltage difference is 9V and the resistance in the circuit is 3Ω?

Formula	Set Up & Solve	Answer
I = V/R	9V / 3 Ohms =	3A

3. If the voltage difference of 3V causes a 1.5A current to flow in a circuit, what is the resistance in the circuit?

Formula	Set Up & Solve	Answer
R = V/I	3V / 1.5 A =	2 Ohms

4. The circuit in an appliance is 3A and the voltage difference is 120V. How much power is being supplied to the appliance?

Formula	Set Up & Solve	Answer
P = VI	(3A) (120 V) =	360 Watts

5. What is the current into a microwave oven that requires 700W of power if the voltage difference is 120V?

Formula	Set Up & Solve	Answer
I = V/P	120 V / 700 W =	0.171 A

6. What is the voltage difference in a circuit that uses 2420 W of power if 11A of current flows into the circuit?

Formula	Set Up & Solve	Answer
V = P/I	2420 W / 11 A =	220 V

Section 6 - Electricity Problems

7. How much energy is used when an 110kW appliance is used for 3 hours?

Formula	Set Up & Solve	Answer
E = Pt	(110 KW) (3 hr) =	330 KWhr

8. What is the resistance of a light bulb that draws 0.5 amps of current when plugged into a 120-V outlet?

Formula	Set Up & Solve	Answer
R = V/I	120 V / 0.5 AMPS =	240 Ohms

9. A circuit has a resistance of 6Ω. What voltage difference will cause a current of 2.1 A to flow in the circuit?

Formula	Set Up & Solve	Answer
V = IR	(2.1 A) / (6 Ohms) =	12.6 Volts

10. How many amperes of current will flow in a circuit if the voltage difference is 5V and the resistance in the circuit is 2Ω?

Formula	Set Up & Solve	Answer
I = V/R	(5V) / (2 Ohms) =	2.5 Amps

11. The circuit in an appliance is 7A and the voltage difference is 120V. How much power is being supplied to the appliance?

Formula	Set Up & Solve	Answer
P = IV	(7A) (120 V) =	840 Watts

12. What is the current into a microwave oven that requires 700W of power if the voltage difference is 120V?

Formula	Set Up & Solve	Answer
I = V / P	120 V / 700 Watts =	0.171 Amps

What type of aquatic organism genertates electicity?

Electric Eel generates 860 Volts

Elecrtic Eel uses the Hunter's Organ & Sach's Organ

to generate electricity

Section 6 - Electricity Problems

13. What is the voltage difference in a circuit that uses 2,420 W of power if 11A of current flows into the circuit?

Formula	Set Up & Solve	Answer
V = P / I	2,420 W / 11 A =	220 Volts

14. A microwave oven with a power rating of 1,200 Watts is used for 0.25 hours. How much electrical energy does the microwave use?

Formula	Set Up & Solve	Answer
E = Pt	(1,200 W) (0.25 hr X 1 Kw / 1000W) =	0.30 KWh

15. The current in an electric clothes dryer is 15A when it is plugged into a 240-volt outlet. How much power does the clothes dryer use?

Formula	Set Up & Solve	Answer
P =IV	(15 A) (240 V) =	3,600 Watts

16. A toaster oven is plugged into an outlet that provides a voltage difference of 120V. What power does the oven use if the current is 10A?

Formula	Set Up & Solve	Answer
P = IV	(10 A) (120 V) =	1,200 Watts

17. A flashlight bulb uses 2.4 W of power when the current in the bulb is 0.8A. What is the voltage difference?

Formula	Set Up & Solve	Answer
V = P/I	2.4 W / 0.8 A =	3 Volts

How much electrical energy does a vending Machine use?

E = Pt

E = (1,650 W) (8 hrs) (1 KW / 1000W) = 13.2 KWh

P = (15 A) (110 V) = 1,650 Watts

C

D

B

C

C

F

D

D

Section 10: Completion

Measurement	Unit	Symbol
35.	Ohm	
36.		kWh
37. Electrical power		
38. Voltage difference		
39.	Amperes	

40. Calculate the resistance between points **A** and **B** (R_{AB}) for the following resistor networks:

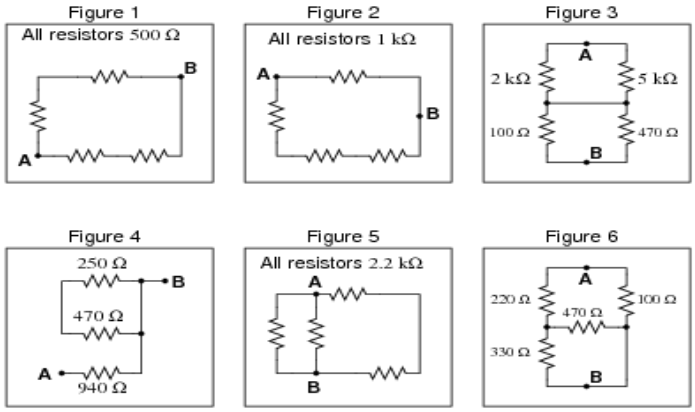
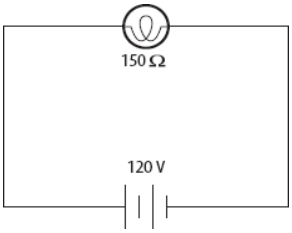


Figure 1: R_{AB} = 500 Ω **Figure 4:** R_{AB} = 940 Ω

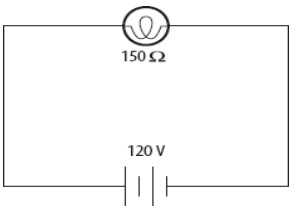
Figure 2: R_{AB} = 750 Ω **Figure 5:** R_{AB} = 880 Ω

Figure 3: R_{AB} = 1.511 kΩ **Figure 6:** R_{AB} = 80.54 Ω

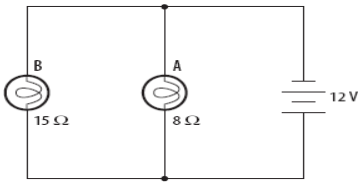
41. What is the current flowing through this circuit?



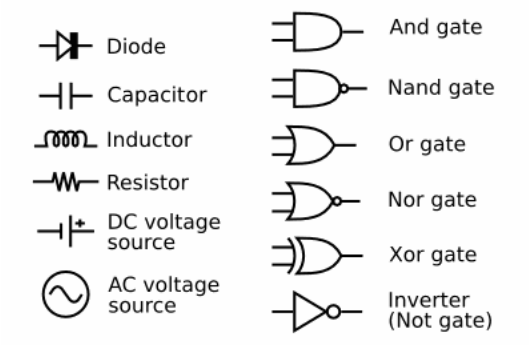
42. What is the power consumed by the light bulb in this circuit?



43. The illustration shows a _____.



a. broken circuit
b. open circuit
c. parallel circuit
d. series circuit

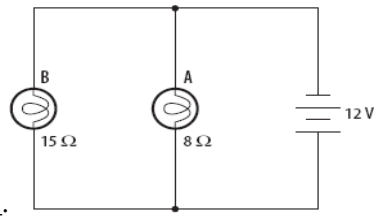


$$R_{total} = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}}$$

$$I_T = I_1 = I_2 = I_3 = \ldots$$

Quantity	Symbol	Unit of Measurement	Unit Abbreviation
Current	I	Ampere ("Amp")	A
Voltage	E *or* V	Volt	V
Resistance	R	Ohm	Ω

Section 10: Completion



44. The total current flow in this circuit is _____.

a. 0.52 A
b. 0.96 A
c. A
d. 1.9 A

ELECTRICITY AND ELECTRONICS

N	E	E	V	A	W	O	R	C	I	M	H	K	B	W
R	O	D	S	D	Q	K	T	F	K	C	M	A	A	A
B	E	S	O	M	Z	C	I	N	T	I	T	T	G	M
N	U	M	I	I	H	P	P	I	C	T	T	R	E	P
I	B	B	R	D	D	O	W	R	E	R	Z	H	N	L
L	M	G	K	O	E	S	O	R	A	P	M	E	E	I
K	F	O	W	O	F	P	Y	E	J	C	I	O	R	F
N	Y	A	E	R	H	S	L	R	F	O	B	S	A	I
A	Y	A	E	O	A	C	N	I	E	K	N	T	T	E
R	A	S	N	M	U	S	S	A	N	K	V	A	O	R
F	A	E	P	N	K	V	B	K	R	O	A	T	R	W
L	J	E	V	O	L	T	A	G	E	T	C	E	M	G
X	R	Y	Y	C	N	E	U	Q	E	R	F	R	P	H
E	V	A	C	U	U	M	T	U	B	E	P	Q	A	S
M	S	B	A	R	O	T	S	I	S	N	A	R	T	M

Find the Following Words

1. ampere - measure of current
2. amplifier - signal booster
3. battery - storage device
4. diode - lets current flow only in one direction
5. Edison - famed inventor
6. franklin - he used a kite to demonstrate that lightning is a form of electricity
7. frequency - measure of the rate of oscillation in alternating currents
8. generator - electrical power maker
9. laser - device that generates an extremely narrow light beam
10. Marconi - inventor who first demonstrated wireless communication
11. microphone - converts sound to electricity
12. microwave - form of energy used in a common kitchen appliance
13. nuclear - controversial way of producing electricity
14. ohms - measure of electrical resistance
15. rheostat - electrical control device
16. speaker - converts electricity to sound
17. switch - on-off device
18. transformer - device used to change current or voltage in ac circuits
19. transistor - miniature marvel of electronics
20. vacuum tube - old device used in radio, tv, etc., now obsolete
21. voltage - measure of electrical potential
22. watt - Scottish inventor whose name is used as a measure of power

Part I. Solve all of the following problems using Ohm's Law and your Power Equation

23. A circuit has a resistance of 35Ω. What voltage difference will cause a current of 2.5 A to flow in the circuit?

Formula	Set Up & Solve	Answer
V = IR	(2.5 A) (35 Ohms) =	87.5 Volts

24. How many amperes of current will flow in a circuit if the voltage difference is 6V and the resistance in the circuit is 12Ω?

Formula	Set Up & Solve	Answer
I = V / R	6V / 12 Ohms =	0.5 Amperes

25. The circuit in an appliance is 8A and the voltage difference is 120V. How much power is being supplied to the appliance?

Formula	Set Up & Solve	Answer
P = IV	(120 V) (8A) =	960 Watts

26. What is the current into a microwave oven that requires 5,100W of power if the voltage difference is 120V?

Formula	Set Up & Solve	Answer
I = V / P	120 V / 5,100 Watts =	0.023 Amperes

27. What is the voltage difference in a circuit that uses 2,420 W of power if 12A of current flows into the circuit?

Formula	Set Up & Solve	Answer
V = P/I	2,420 W / 12 A =	201.6 Volts

28. What is the voltage in a dryer if the dryer uses 4,250 W of power when plugged into a 22.0-A wall outlet?

Formula	Set Up & Solve	Answer
V = P/I	4,250 W / 22 A =	193.2 Volts

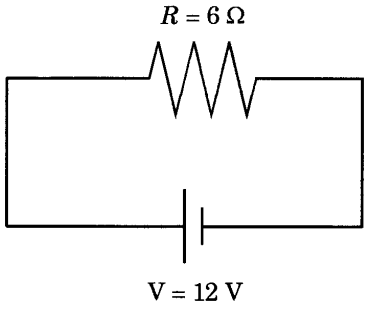
29. What is the current in a toaster if the toaster uses 7,500 W of power when plugged into a 110-V wall outlet?

Formula	Set Up & Solve	Answer
I = V/P	110 V / 7,500 W =	0.0146 Amperes

30. A series circuit has a current of 13A. The circuit contains a 150 Ω resister. What is the voltage of the circuit?

Formula	Set Up & Solve	Answer
V = IR	(13 A) (150 Ohms) =	1,960 Volts

31. This diagram represents a closed circuit. How much current flows through this circuit?



I = V/R

(12V) / (6 Ohms) = 2 Amperes

32. A flashlight bulb connected to a 6-V battery draws a 0.35 –A current. What is the power used by the flashlight bulb?

Formula	Set Up & Solve	Answer
P = IV	(0.35 A) (6V) =	2.1 Watts

33. A light bulb with a resistance of 50 ohms is plugged into a 120-volt outlet. . What is the current flowing through the bulb?

Formula	Set Up & Solve	Answer
I = V/P	(120 V) / (50 Ohms) =	2.4 Amperes

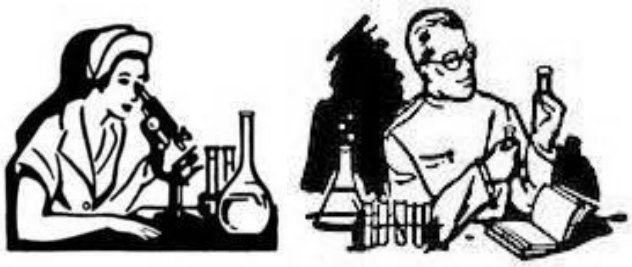
What field of science are these people possibly studying?

Microbiology, Tissue Cell Culture

Inorganic or Organic Chemistry

Agricultural Science

Pharmacology



34. A motor has a current of 4A flowing through it when it is powered with a 12-V battery. What is the power used by the motor?

Formula	Set Up & Solve	Answer
P = IV	(4A) (12 V) =	48 Watts

35. A series circuit has a 6-V battery and 2 ohms of resistance. How much current will flow through the circuit? ____.

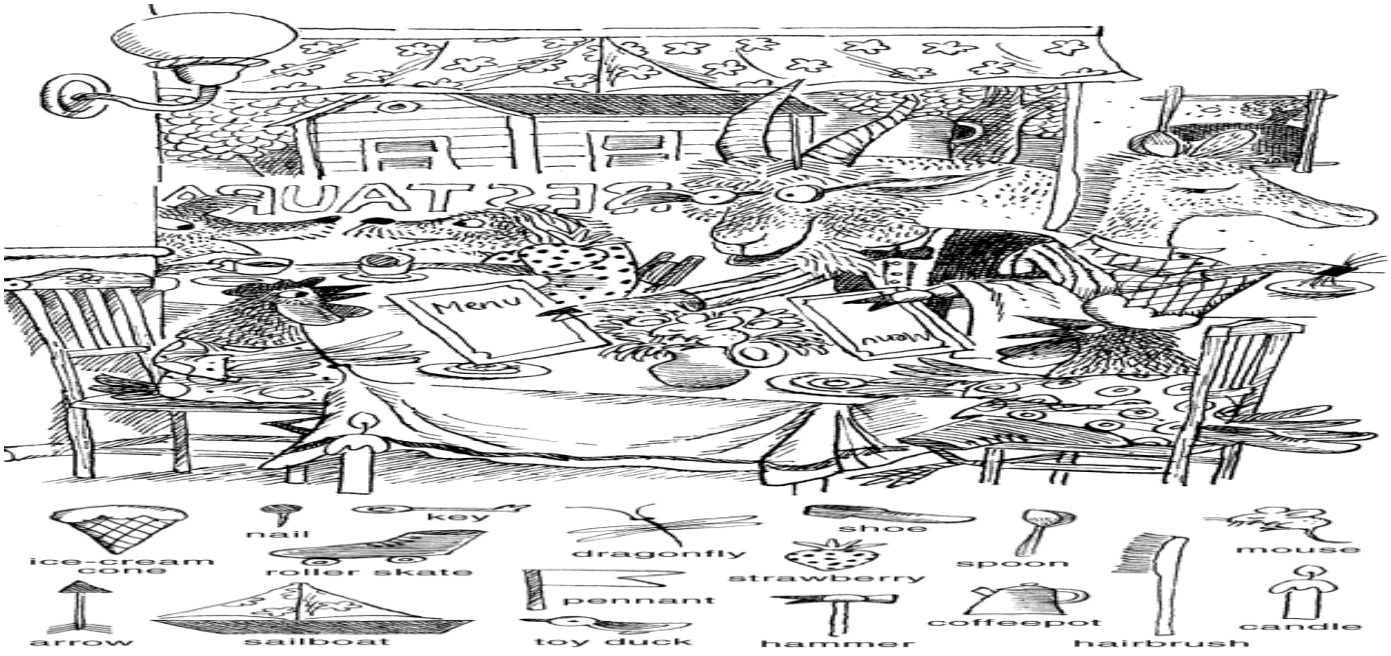
Formula	Set Up & Solve	Answer
I = V/P	6V / 2 Ohms =	3 Amperes

36. What voltage is required to run a 45-watt light bulb if the current is 0.9 ampere?

Formula	Set Up & Solve	Answer
V = P/I	(45 watts) / (0.9 A) =	50 Volts

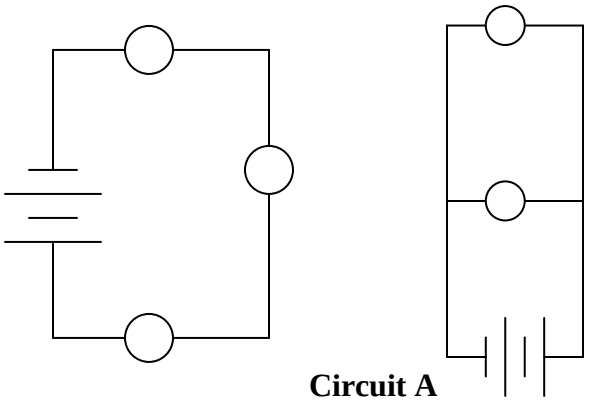
37. How much current is used by a 120-V refrigerator that uses 750 W of power?

Formula	Set Up & Solve	Answer
I = V / P	120 V / 750 W =	0.16 Amperes



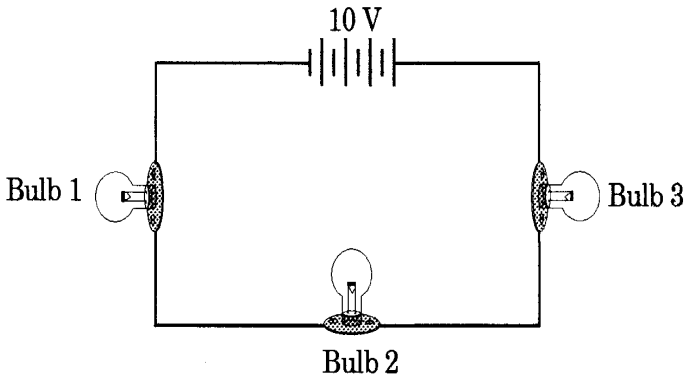
Part II. Answer the following questions about Circuits

38. A path that allows only one route for an electric current is called a Series.



Circuit A **Circuit B**

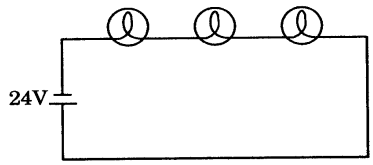
39. Circuit B is wired in series.
40. Circuit A is wired in parallel.
41. Circuit B represents the way homes are usually wired so that when one part of the circuit is interrupted the entire circuit is not broken.
42. Circuit A is the type of circuit that causes an entire string of decorative lights to go out when one of the bulbs burns out.
43. This diagram represents a closed circuit with three light bulbs and a 10 Volt battery. If bulb #3 burns out in the circuit, what will most likely happen?



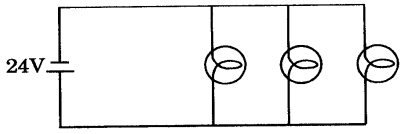
Bulb No. 1 & Bulb No. 2 will not glow.

44. Which is the correct diagram for a parallel circuit with three light bulbs powered by a 24-V battery?

A

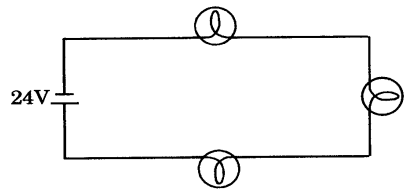


B

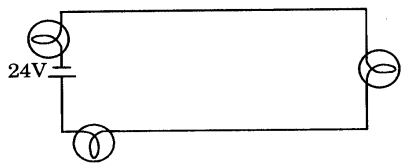


Parallel circiut

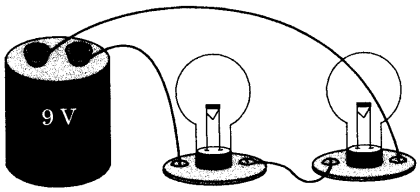
C



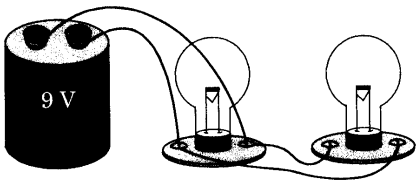
D



45. The diagrams represent two complete circuits. A 9-V battery is connected to two light bulbs as shown.



Circuit A



Circuit B

46. Which statement ***best*** describes what will happen?

a. the light from circuit B will be dimmer because each light bulb must share its current with the other light bulb
b. the light from circuit A will be brighter because each light bulb adds its current to the other light bulb
c. the light from circuit B will be brighter because each light bulb has a direct path to both poles of the battery
d. The light from Circuit A will be dimmer because each light bulb has a direct path to both poles of the battery.

47. Which ***best*** describes a circuit is series?

a. electrons have only one path at all times
b. current values are different at various points in the circuit.
c. electrons may take several paths.
d. different parts are on separate branches.

48. Which statement is true about parallel circuits?

a. they cease to function when one part of the circuit is disconnected.
b. they are usually called open circuits.
c. they provide one path through which current can flow.
d. they contain separate branches through which current can flow

49. Which of the following **DOES NOT** provide a voltage or potential difference in a circuit?

a. wet cell
b. electrical outlet
c. wires
d. dry cell or battery

50. Resistance in wires causes electrical energy to be converted into which form of energy?

a. chemical energy
b. nuclear energy
c. sound
d. thermal energy

51. One source of constant electric current is a _.

a. transformer
b. dry cell (battery)
c. switch
d. coulomb

52. Which of the following is a device designed to open an overloaded circuit and prevent overheating ____. a. circuit breaker
c. resistor
b. magnet
d. transformer

53. Current that does **not** reverse direction is called ____.

a. alternating current
b. a fused current
c. circuit current
d. direct current

54. Currents that reverse direction in a regular pattern is called ____.

a. alternating current
b. direct current
c. circuit current
d. magnetic current

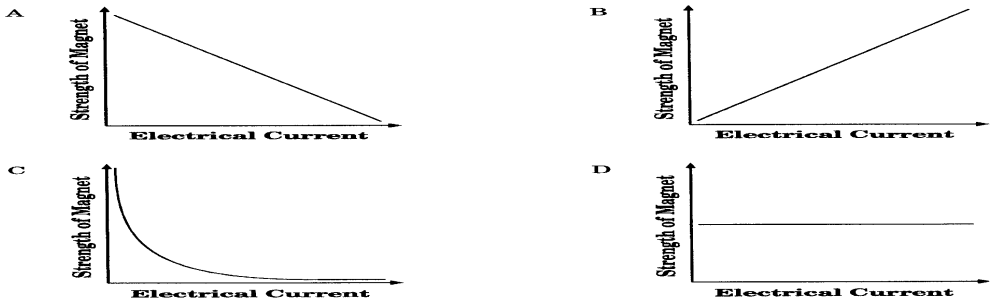
Part III Answer the following questions about Electromagnets

55. A student performed an experiment to determine the number of paper clips that are attracted to an electromagnet as the amount of current changes.

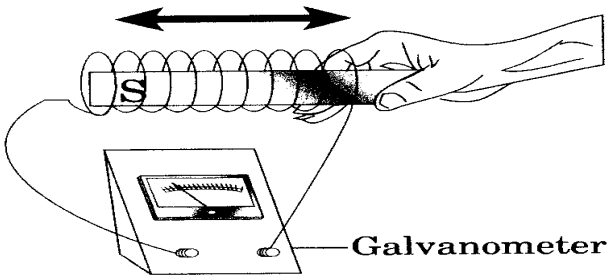
Data Table

Current	Number of Paper Clips
5 A	20
10 A	40
15 A	60
20 A	80

56. Which graph ***best*** describes the relationship between magnetism and electrical current?



57. A magnet is moved back and forth through a loop of wire as shown below. What will happen as the magnet is moved back and forth as shown?



a. the wire will attract the magnet
b. the magnet will attract the wire
c. the galvanometer needle will move back and forth
d. the galvanometer needle will be on 0.

58. A student coiled wire around a nail, attached both ends to a 2.5-V battery, and attempted to lift paper clips with the nail. What is a valid conclusion for this investigation?

Results

Number of Turns of Wire	Paper Clips Picked Up
10	2
20	4
30	10
40	20

a. increasing voltage increases electromagnetic strength
b. increasing the number of turns of wire decreases the electromagnetic strength
c. increasing the number of turns of wire has no effect on electromagnetic strength
d. increasing the number of turns of wire increases the electromagnetic strength

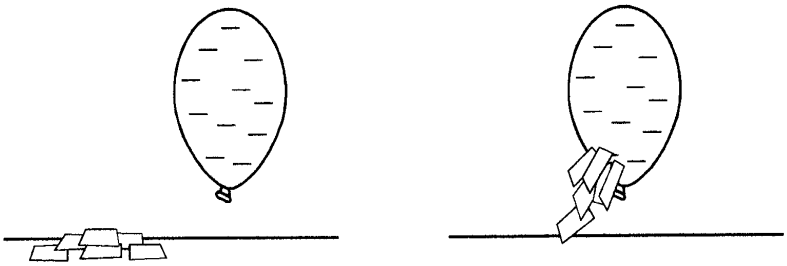
Part IV Answer the following questions about Static Electricity and Charges

59. If the leaves of an electroscope spread apart, it indicates that _____.

60. Electric charge that has accumulated on an object is referred to as _____.

61. A static discharge differs from an electric current in that a static discharge _____.

62. The diagram shows a negatively charged balloon. When the balloon is brought near some paper, the papers are attracted to the balloon by means of _____ and become _____.



63. When a plastic rod is rubbed with fur, the plastic rod becomes _____ charged. Electrons are transferred from the _____ to the _____.

64. How do electrically charged objects affect neutral objects when they come in contact?

a. Protons move from negatively charged objects to neutral objects
b. Protons move from neutral objects to negatively charged objects
c. Electrons move from positively charged objects to neutral objects
d. Electrons move from neutral objects to positively charged objects

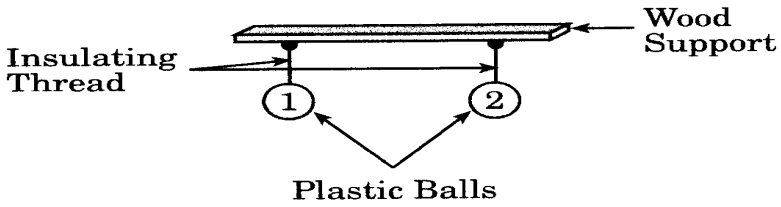
65. Lighting is a large _____ _____ _____ _____.

66. The electric force between two charged objects depends on which of the following?

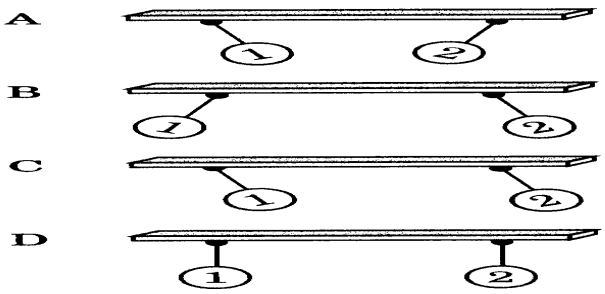
a. their masses and their distance of separation
b. their speeds
c. their charge and their distance of separation
d. their masses and their charge

67. An object becomes positively charged when it _____.

68. The drawing shows two uncharged lightweight plastic balls suspended by thin, insulating threads. Ball 1 is given a positive charge. Ball 2 is given an equivalent negative charge.



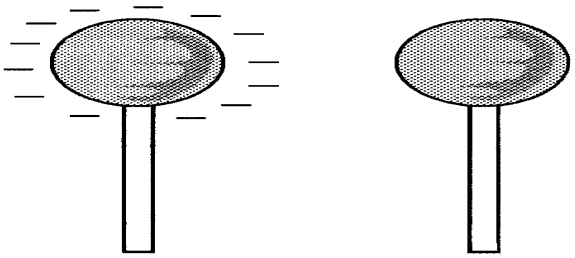
69. Which diagram ***best*** shows how the balls will react after becoming charged?



70. Which statement BEST explains why there could be a force of attraction between two electrically charged objects?

a. because they have like charges
b. because they have unlike charges
c. because they have the same number of electrons
d. because they have the same number of protons

71. The diagram shows two copper spheres. Sphere 1 is negatively charged, and Sphere 2 is neutral. What will be the result when the two spheres touch?



a. sphere 1 will become positively charged
b. sphere 2 will become positively charged
c. both spheres will become negatively charged equal to the initial charge of sphere 1
d. both spheres will become negatively charged less than the initial charge of sphere 1.

Part V Answer the following questions about Magnetism

72. The location of the strongest magnetic forces is the _____

73. Objects that keep their magnetic properties for a long time are called _____.

74. The atoms in a magnet are _____.

75. Which magnetic pole is located in Northern Canada? _____

76. A sheet of paper is positioned to completely cover a bar magnet. Iron fillings are then gently sprinkled on the paper.
_____

47. How could 3 magnets be arranged end-to-end so that there will be no attraction between them? Make a sketch.

Which Magnet is stronger?