

Eighth Grade “Electricity and Magnetism” Assessment

- 1a. Electricity is the flow of _____ through a substance.
a. electrons
b. water
- 1b. Electricity is the flow of _____ through a conductor.
- 1c. What is the basic definition of electricity?

- 2a. If you have two positively charged objects, they will _____ each other.
a. attract
b. repel
- 2b. With electrically charged objects, two objects of the same charge will _____ each other, while two objects of opposite charge will _____ each other.
- 2c. State the rule for electric charges:

- 3a. A substance that lets electric charges flow through easily is called a _____.
a. passer
b. conductor
- 3b. A(n) _____ is a substance (like a metal) that will allow electric charges to flow easily.
- 3c. What does it mean for a substance to be a conductor of electricity?

- 4a. An object or substance is called a(n) _____ if it doesn't let electric charges through easily.
a. insulator
b. restrictor
- 4b. A substance that will not allow electrons to pass through itself easily is called a(n) _____.

4c. Tell what it means to be an electrical insulator, and give an example.

5a. Which type of circuit will allow electrons to pass through it without stopping?

- a. open
- b. closed

5b. What type of circuit will you always need in order for electrons to keep moving through it? _____

5c. Tell which type of circuit will always allow an electric current to keep moving, and draw a very simplified version.

6a. If you want electricity to stop flowing through a circuit, you would _____ the circuit.

- a. open
- b. wrap

6b. A(n) _____ circuit will not allow electricity to pass through it. Draw a very simple diagram of one of these circuits:

6c. Draw a simple diagram of an open circuit, and tell what will happen to the electric current in it when it is opened.

7a. A short circuit happens when electricity takes a(n) _____ path instead of following the path it is supposed to take.

- a. easier
- b. harder

7b. A(n) _____ circuit occurs when the electric current in a circuit takes the opportunity to follow an easier path instead of the one it is designed to follow.

7c. What happens to cause a short circuit?

8a. Which of these devices can help protect from the effects of a short circuit?

- a. switch
- b. circuit breaker

8b. A short circuit in your house can cause a fire if the wires overheat. Name a device that can protect your home from overloaded circuits: _____

8c. Explain what fuses and circuit breakers do to protect buildings from short circuits.

9a. For safety reasons, you should never _____ electric power lines.

- a. touch
- b. walk under

9b. Give one principle of electrical safety:

9c. You are painting the outside of your house. Tell what precautions you would take for electrical safety.

10a. Electrons have a _____ charge.

- a. neutral
- b. negative

10b. Electrons carry what charge? _____

10c. Tell all three of the main subatomic particles and their charges.

- 1. _____
- 2. _____
- 3. _____

11a. Conductors not only carry electricity easily, they will also _____ their electrons easily.

- a. keep
- b. give up

11b. Metals are good conductors because they do what with their electrons?

11c. Why are metals good conductors of electricity?

12a. Materials like glass are good _____ because they don't give up their electrons very easily.

- a. insulators
- b. machines

12b. Glass is a good electrical _____ because it doesn't give up its electrons or let others pass through.

- 12c. Name two substances that act as electrical insulators:
1. _____
 2. _____
- 13a. A _____ charge happens when an object has many extra electrons or far too few electrons and so develops an electrical field.
- a. current
 - b. static
- 13b. A static charge exists when an object possesses too many or too few _____.
- 13c. Explain how an object might develop a positive or negative static charge.
- _____
- _____
- _____
- _____
- 14a. A capacitor stores _____ energy with two metal plates, one positively charged, and one negatively charged.
- a. electrical
 - b. chemical
- 14b. A _____ is a device that stores electrical energy with two metal plates of opposite charges with an insulator in between.
- a. transformer
 - b. capacitor
- 14c. Write and/or draw a diagram to show the parts of a capacitor, a device that stores electrical charges.
- _____
- _____
- _____
- 15a. Why should you never touch a capacitor?
- a. it can store dangerous amounts of electrical energy
 - b. it might be hot
- 15b. You should never touch a capacitor because it may store very large amounts of _____ energy.

15c. Why should you never touch a capacitor unless you know it is safe?

16a. We call it _____ when we connect electrical machinery and circuits through wiring to the Earth.

16b. Grounding allows excess electrons to safely pass into what? _____

16c. What is grounding of electrical devices effective in doing?

17a. If you touch something that has built up a static charge, you get a _____ because you have just grounded the electricity through your body.
a. shock
b. bruise

17b. When you touch an object with a static charge, you get a shock because you have done what for that object? _____

17c. Why are you shocked when you touch an object with a buildup of static electricity?

18a. _____ is a discharge (grounding) of static electricity from the clouds.
a. Rain
b. Lightning

18b. What happens when static charges built up in clouds are released?

18c. Outline the process leading up to, during, and after a lightning strike.

19a. Electrical potential is measured in _____.
a. joules
b. volts

19b. What is the unit for electrical potential?

- a. joules
- b. volts
- c. watts
- d. newtons

19c. What is a volt and what is it the unit of measurement for?

20a. Electric _____ or flow is measured in amperes.

- a. current
- b. static

20b. Which of these is measured in amperes?

- a. electric current
- b. static discharge
- c. volume
- d. sound energy

20c. What is an ampere and what does it measure? What is the unit for electrical current flow?

21a. 1 coulomb equals the charge of 6.25 _____ electrons.

21b. 1 coulomb is equal to the charge of how many electrons?

- a. 3000
- b. 320 million
- c. a googol
- d. 6.25 billion billion

21c. What is a coulomb and what is it equal to?

22a. Electrical power is measured in _____.

- a. watts
- b. grams

22b. The total power of a flow of electrons is measured in _____.

22c. What is a watt?

23a. Resistance in an electrical circuit makes electricity flow _____.

- a. faster
- b. slower

23b. Electrical resistance _____ current flow.

- a. resists
- b. encourages
- c. stimulates
- d. discourages

23c. What is electrical resistance?

24a. The unit for electrical resistance is the _____.

- a. ohm
- b. meter

24b. What is the unit for electrical resistance?

- a. ohm
- b. meter
- c. watt
- d. newton

24c. What is an ohm and what does it measure?

25a. The formula for Ohm's Law is Watts = amps x _____.

- a. time
- b. volts

25b. The formula for Ohm's Law is Watts =

- a. amps x time
- b. amps x watts
- c. amps x meters
- d. amps x volts

25c. Ohm's Law states that Watts = _____ x _____.

26a. The Earth is a giant _____.

- a. charged particle
- b. magnet

26b. The Earth itself acts like a giant _____, with opposite poles.

26c. Why is the Earth considered to be a giant magnet?

27a. The Earth's magnetism may be due to the movement of charged particles

- a. in the atmosphere
- b. in the mantle

27b. Where are the charged particles believed to be the basis of the Earth's magnetic field located? _____

27c. What is the leading theory that explains Earth's magnetism?

28a. A _____ allows us to tell directions because of the Earth's magnetic north pole.

- a. compass
- b. odometer

28b. A _____ is a device that allows us to navigate on earth using the Earth's magnetic north pole.

28c. How does a compass work?

29a. If you make a coil of wire and move a magnet back and forth near it, it makes a _____ in the wire.

- a. current
- b. hot spot

- 29b. A magnet moving back and forth near a coil of wire will make a _____ flow through the wire.
- 29c. How would you make an electric current if all you had was wire and a magnet?

- 30a. To make an electromagnet, all you have to do is wrap _____ around an iron bar and run electricity through it.
a. plastic wrap
b. wire
- 30b. List three items that a very basic electromagnet can be made with:
1. _____
2. _____
3. _____
- 30c. Explain how to make a basic electromagnet using household objects.

- 31a. Every atom is a tiny magnet because of the _____ spinning around the outside of it.
a. protons
b. electrons
- 31b. The electrons spinning around the outside of each atom causes them all to have their very own tiny _____ field.
a. magnetic
b. electric
- 31c. Why is every atom considered to have its own magnetic field?

- 32a. Just like electric charges, magnetic poles of opposite types will _____ each other.
a. attract
b. repel
- 32b. Two magnetic poles that are alike will _____ each other, while two opposites will _____ each other.

32c. How are magnetic poles very much like electrically charged particles in their interactions?

33a. An electric _____ produces electricity by turning a magnet within a coil of wire.
a. engine
b. generator

33b. An electric generator produces electricity by turning a(n) _____ within a coil of wire.
a. battery
b. magnet
c. engine
d. electron

33c. What are the two main parts of an electrical generator, and how do they interact with each other?

34a. An electric motor works because the current in a coil of wire causes a _____ to spin.
a. magnet
b. neutron

34b. An electric _____ works because a wire hooked to a battery will make a magnet spin around.

34c. How does a simple electric motor work? You may want to draw a diagram to help explain.

35a. In a step-up transformer, the voltage in a wire _____.

- a. increases
- b. doesn't change

35b. A step-up transformer moves from a _____ coil to a _____ coil to increase voltage.

- a. small; large
- b. large; small
- c. positive; negative
- d. negative; positive

35c. What is the arrangement of coil sizes in a step-up transformer?

36a. A _____ transformer will decrease voltage in a wire.

36b. What does a step-down transformer do?

36c. Draw a simple diagram of a step-down transformer and label the parts.

The following Colorado Model Content Standards are addressed in this assessment by the questions indicated:

Questions 2a, 2b, 2c, 3a, 3b, 3c, 4a, 4b, 4c, 6a, 6b, 6c, 12a, 12b, 12c, 29a, 29b, 29c, 30a, 30b, 30c, 32a, 32b, 32c, 33a, 33b, 33c, 34a, 34b, 34c: Standard 1. Students understand the processes of scientific investigation and design, conduct, communicate about, and evaluate such investigations.

All questions: Standard 2. Physical Science: Students know and understand common properties, forms, and changes in matter and energy.

Questions 18a, 18b, 18c, 26a, 26b, 26c, 27a, 27b, 27c, 28a, 28b, 28c: Standard 4. Earth and Space Science: Students know and understand the processes and interactions of Earth's systems and the structure and dynamics of Earth and other objects in space.

Questions 5a, 5b, 5c, 33a, 33b, 33c: Standard 5. Students know and understand interrelationships among science, technology, and human activity and how they can affect the world.

Questions 2a, 2b, 2c, 4a, 4b, 4c, 12a, 12b, 12c, 14a, 14b, 14c, 18a, 18b, 18c, 26a, 26b, 26c, 27a, 27b, 27c, 28a, 28b, 28c, 33a, 33b, 33c, 34a, 34b, 34c: Standard 6. Students understand that science involves a particular way of knowing and understand common connections among scientific disciplines.

Answer Key

- 1a. a. electrons
1b. electrons
1c. Acceptable answers could include:
-the flow of electrons through a conducting substance
- 2a. b. repel
2b. repel/attract
2c. opposite charges attract and like charges repel
- 3a. b. conductor
3b. conductor
3c. Acceptable answers could include:
-it will allow electricity to flow through it relatively easily
- 4a. a. insulator
4b. insulator
4c. Acceptable answers could include:
-Insulators do not allow electrons to flow easily through them.
-An example should probably be a non-metal, such as wood, glass, or plastic.
- 5a. b. closed
5b. closed
5c. Acceptable answers could include:
-closed circuit- picture must be a closed shape: no gaps
- 6a. a. open
6b. open
diagram: must be some gap in the circuit
6c. Acceptable answers could include:
-drawing must have a gap in the circuit
-Electrons stop flowing when there is an opening, because they have nowhere to go.
- 7a. a. easier
7b. short
7c. Acceptable answers could include:
-electricity always chooses the easiest path to the ground, so if it is easier to jump out of wiring and take an easier path through other parts of the machinery or through a person, it will go through that path
- 8a. b. circuit breaker
8b. circuit breaker or fuse
8c. Acceptable answers could include:
-Fuses and circuit breakers open circuits when they begin to carry too much current. The metal in a fuse melts to open the circuit, and the switch inside the circuit breaker trips.

- 9a. a. touch
- 9b. Acceptable answers could include:
-don't go outside during a lightning storm
-check overhead wires when using a ladder
- 9c. Acceptable answers could include:
-discussion of ladders and overhead power lines
- 10a. b. negative
- 10b. negative
- 10c. 1. protons: positive
2. neutrons: neutral
3. electrons: negative
- 11a. b. give up
- 11b. lose them easily
- 11c. Acceptable answers could include:
-Metals have "loose" electrons, which will come off easily and flow as an electrical charge.
- 12a. a. insulators
- 12b. insulator
- 12c. Answers will vary, but probably should be non-metals, such as wood, glass, or plastic.
- 13a. b. static
- 13b. electrons
- 13c. Acceptable answers could include:
-procedures such as friction transferring electrons to or from an object to build up a charge
- 14a. a. electrical
- 14b. b. capacitor
- 14c. Drawing or explanation needs to include two metal plates, one positive and one negative, with an insulating material in between them.
- 15a. a. it can store dangerous amounts of electrical energy
- 15b. electrical
- 15c. Acceptable answers could include:
-Capacitors can store a large amount of electricity, and may release it when touched.
- 16a. grounding
- 16b. the Earth
- 16c. Acceptable answers could include:
-Allowing extra electrical current or short circuits to pass safely into the Earth through a short path instead of through regular wiring or through a person.

- 17a. a. shock
- 17b. grounded it: you've become the short route to the ground
- 17c. Acceptable answers could include:
 -the buildup is always trying to equalize and go into the ground or another uncharged object, so when you touch it, the charge transfers to you, shocking you in the process
- 18a. b. Lightning
- 18b. lightning
- 18c. Acceptable answers could include:
 -friction between molecules in clouds or between clouds and the ground build up a static charge
 -When enough charge is built up, it will discharge to another cloud or to the ground as lightning. After the discharge, the static starts to build again.
- 19a. b. Volts
- 19b. b. Volts
- 19c. Acceptable answers could include:
 -the unit of electromotive force, the volt measures how much "pressure" there is in an electrical current
 -the volt is the unit of measurement for electric potential
- 20a. a. current
- 20b. a. electric current
- 20c. Acceptable answers could include:
 -an ampere is a unit of electrical current that measures electric flow or current
- 21a. billion billion
- 21b. d. 6.25 billion billion
- 21c. Acceptable answers could include:
 -a unit of electric charge equal to 6.25 billion billion electrons
- 22a. a. watts
- 22b. watts
- 22c. Acceptable answers could include:
 -the basic unit of power named after the 18th century Scottish inventor James Watts
 -the unit in which electrical power is measured
- 23a. b. slower
- 23b. a. resists
- 23c. Acceptable answers could include:
 -a property of electrical conductors that slows down or impedes the flow of electrons through it
- 24a. a. Ohm
- 24b. a. Ohm
- 24c. Acceptable answers could include:

-an ohm is a unit of electrical resistance

- 25a. b. volts
- 25b. c. amps x meters
- 25c. amps x volts

- 26a. b. magnet
- 26b. magnet
- 26c. Acceptable answers could include:
 - the Earth has a north and south magnetic pole, and a magnetic field

- 27a. b. in the mantle
- 27b. in the molten layers of the earth (the mantle, etc.)
- 27c. Acceptable answers could include:
 - the movement of charged particles in the mantle, like a current flowing through a wire, causes magnetism

- 28a. a. compass
- 28b. compass
- 28c. Acceptable answers could include:
 - that the compass must have a magnetic needle that is free to swing towards the north

- 29a. a. current
- 29b. current
- 29c. Acceptable answers could include:
 - making a coil out of the wire and moving the magnet back and forth near the coil

- 30a. b. wire
- 30b. battery, nail, and coil of wire
- 30c. Acceptable answers could include:
 - a soft iron core, a coil of wire around it, and a power source

- 31a. b. electrons
- 31b. a. magnetic
- 31c. Acceptable answers could include:
 - the electrons moving in circles around it are like a current, and an electrical current makes a magnetic field

- 32a. a. attract
- 32b. repel/attract
- 32c. Acceptable answers could include:
 - like magnetic poles repel just like like electrical charges, and opposites of both will attract each other

- 33a. b. generator
- 33b. b. magnet

- 33c. Acceptable answers could include:
-a magnet and a coil of wire, with one or both pieces moving near each other
- 34a. a. magnet
34b. motor
34c. Acceptable answers could include:
-A current is sent through a wire that is coiled around, but not touching, a magnet. The current makes a magnetic field around the wires, which attracts and repels the magnet, causing it to spin.
- 35a. a. increases
35b. a. small; large
35c. Acceptable answers could include:
-A small coil with few loops going in, a large coil with many loops going out.
- 36a. step-down
36b. decreases the voltage in a wire
36c. Acceptable answers could include:
-Diagram must include two coils of wire, one large with many loops, one small with few loops. It also must show that the current is going into the large coil and coming out of the small coil.