

Heat

Use your textbook to help you fill in the blanks.

What is heat?

1. Heat is energy that moves from an object with a(n) _____ temperature to an object with a(n) _____ temperature.
2. Heat continues to flow from one object to another object until both have the same _____.
3. Heat is the _____ amount of thermal energy that an object releases.

How does heat travel?

4. Conduction can occur between objects that are _____.
5. As hot and cool portions of a liquid or gas move, _____ currents form.
6. The heat that you can feel radiating away from hot objects as electromagnetic rays is called _____ rays.

What is thermal conductivity?

7. Convection currents move heat more slowly than do _____ but more quickly than conduction.
8. Heat traveling by conduction moves at the speed at which molecules can _____ one another and change how fast nearby molecules are vibrating.

9. A material that conducts heat poorly is a good _____
10. Thermal conductivity increases as _____ increases, so _____ are the best conductors of heat and _____ are the worst conductors.
11. Objects with a low heat capacity change temperature _____ when heated.

When is heat waste?

12. Heat energy caused by friction is usually a waste product that results when energy _____ or _____

Critical Thinking

13. Describe how heat is used in a kitchen. What appliances produce heat, and how do they produce it? What objects are used as insulators, and what objects are used as conductors?
- _____
- _____
- _____
- _____
- _____
- _____
- _____

Heat

Who am I? What am I?

Choose a word from the word box below that answers each question.

- | | |
|-----------------|----------------|
| a. conduction | d. heat |
| b. conductivity | e. radiation |
| c. convection | f. temperature |

1. _____ I can transfer heat through a vacuum because I am electromagnetic rays. Who am I?
2. _____ I flow from a warmer object to a cooler object until both objects are the same temperature. What am I?
3. _____ I move heat through a material from one atom or molecule to the next. Who am I?
4. _____ I move heat as a liquid or a gas rises and sinks. Who am I?
5. _____ I am a measurement of the average energy of molecules. What am I?
6. _____ I can tell you how easily heat moves through a material. What am I?

Heat

Fill in the blanks.

conduction	gases	temperature
convection	liquids	thermal conductors
faster	molecules	thermal insulators

Heat is energy that flows from an object at a higher temperature to an object at a lower temperature. The measure of the average kinetic energy of molecules is _____ . When a warmer object touches a cooler object, heat moves by _____ .

The molecules of the warmer object vibrate _____ . The two objects stay in place, but their _____ bump one another and energy passes from the warmer object to the cooler object.

Some materials, such as metals, are good _____ . Other materials, such as gases, are good _____ . Currents of matter spread heat through _____ and _____ , a process called _____ . The transfer of heat by electromagnetic rays is called radiation.

Sound

Use your textbook to help you fill in the blanks.

How is sound produced?

1. Regions of a material that have many molecules squeezed together are _____; regions that have fewer molecules spread apart are _____.
2. A series of compressions and rarefactions moving through a medium is a(n) _____.
3. Sound waves vibrate the medium in the _____ direction that the energy moves.

How does sound travel?

4. Sound cannot travel through a(n) _____, which is a region of space that contains no matter.
5. Sound travels faster through a(n) _____ than it travels through a liquid or a(n) _____.
6. When sound hits soft, thick, or uneven materials, much of the sound is _____; when sound hits flat, firm surfaces, much of it is _____.

What is pitch?

7. The higher the frequency or pitch of a sound wave, the more _____ pass in a period of time.
8. To increase the pitch of a musical instrument, you need to _____ the part that vibrates.

9. If you move in the direction from which a sound wave is coming, you hear a higher pitch as a result of the _____ effect.

What is volume?

10. Amplitude of sound depends on how _____ the air in compressions is compared to normal air.
11. Volume is measured in _____.
12. A 30 dB noise has _____ more energy than a 10 dB noise, but a 30 dB noise sounds about _____ as loud as a 10 dB noise.
13. To make a sound louder, you need to use more energy, which increases the _____ of the particles in the compressions.
14. The volume of a sound decreases with _____ because the same amount of sound energy is spread over a larger and larger area.

What is echolocation?

15. Bats make sound and listen to the _____ to locate prey.
16. Sound navigation and ranging, or _____, is used to find the depth of a body of water and locate objects beneath water.

Critical Thinking

17. Why is the pitch of a train's whistle higher as the train approaches and lower as it moves away?

Name _____ Date _____

LESSON
Vocabulary

Sound

Use the words in the word box to finish the sentences.

absorption	frequency	reflection
amplitude	medium	sound
echolocation	pitch	vacuum

1. _____ Material through which sound travels
2. _____ The bouncing of a sound wave off a surface
3. _____ Number of wave peaks that pass each second
4. _____ Height of a sound wave
5. _____ Finding objects by using echoes
6. _____ How high or low a sound is
7. _____ Space that contains few or no molecules
8. _____ Disappearance of a sound wave into a soft surface
9. _____ A series of rarefactions and compressions traveling through a medium

Sound

Fill in the blanks.

amplitude	frequency	pitch	reflected
compressions	louder	rarefactions	sound wave

As an object vibrates, it moves back and forth against the air around it. The air begins to vibrate, creating _____ where air molecules are pushed together and _____ where air molecules are farther apart. Compressions and rarefactions moving through a medium make a(n) _____. The number of compressions that pass each second is the sound wave's _____. A higher frequency sound has a higher _____.

When more energy is used to make sound, the sound has a higher _____. High-amplitude sounds are _____ than sounds having low amplitude. When sound waves hit a flat, firm surface, much of their energy is _____. When sound waves hit a soft or uneven surface, much of their energy is absorbed.

Light

Use your textbook to help you fill in the blanks.

What is light?

1. Light is vibrating _____ and _____ energy.
2. Light waves vibrate in directions _____ to the direction of their motion.
3. Light travels fastest in a _____.
4. The wavelength of a wave times its frequency is the _____ of the wave.
5. Light has properties of both _____ and _____.

How does light make shadows?

6. Light rays bouncing off a surface at random angles is called _____.
7. If most light goes through an object, the object is _____; if some light goes through, the object is _____; if no light goes through, the object is _____.
8. Objects that do not allow light to pass through cause _____.

How does light bounce and bend?

9. According to the law of reflection, the angle between an _____ light ray and a surface equals the angle between the _____ light ray and the surface.
10. When light enters a different medium, its _____ changes and it undergoes _____.

Why do we see colors?

11. White light is a mixture of many _____ that can be separated by a _____ to form a spectrum.
12. Opaque objects appear the color of the light they _____, but _____ objects appear the color of light they let pass through.
- Is all light visible?**
13. Many forms of _____ radiation cannot be seen with the human eye.

Critical Thinking

14. Why does mixing the primary colors of light produce white light, but mixing paints that have the primary colors produces black paint?

Name _____ Date _____

Light

Use the words in the word box to fill in the blanks.

electromagnetism	prism	translucent
image	refraction	wavelength
photon	spectrum	

1. _____ Band of colors in a rainbow
2. _____ Tiny bundle of light
3. _____ Picture of a light source that light rays make when they reflect from a mirror or refract through a lens
4. _____ The way in which electric and magnetic forces interact
5. _____ Cut piece of glass with two opposite sides in the shape of a triangle
6. _____ Distance between one peak and the next in a wave
7. _____ Material that allows only some light to pass through
8. _____ The bending of light waves as they pass from one substance to another

Light

Fill in the blanks.

colors	red	straight lines	wavelength
opaque	refracts	vacuum	
prism	spectrum	violet	

A light wave is energy in the form of electric and magnetic fields. Light travels fastest through a(n) _____ and travels slower in other mediums. The size of a light wave is measured as its _____, the distance from one peak to the next. We see different wavelengths as different _____. The shortest wavelength looks _____, and the longest wavelength looks _____.

Light travels in _____ until it strikes an object or another medium. When light enters another medium, it slows down and _____, or bends. When white light travels through a(n) _____, a triangular piece of glass, it refracts and separates into the different colors of the _____. If light strikes an _____ object, most of it is absorbed but some scatters off the object.

How We Use Lasers



Write About It

Find out more about one of the uses of lasers. Write an expository essay giving important information about this use. Support your main idea with facts and details. Reach a conclusion at the end.

Getting Ideas

Brainstorm a list of uses of lasers. Choose one to write about. Then do some research. Use the chart below to record information that you find.

↓	↓	↓

Planning and Organizing

Nick wanted to tell about the benefits of laser surgery. Here are four sentences he wrote. Write Yes if the sentence below belongs in his essay. Write No if it does not.

1. The laser seals the blood vessels when it cuts. _____
2. When lasers are used, there is less blood lost during surgery. _____
3. Scientists used lasers to measure the distance between earth and the moon. _____
4. Lasers cut down on the risk of getting an infection from surgery. _____

Drafting

Write a sentence to begin your essay. Tell your topic. This is the use of lasers you chose to write about. Tell your main idea about this topic. This sentence is your topic sentence.

Now write your essay. Use a separate piece of paper. Start with your topic sentence. Then include facts and details that back up your main idea. (Do not include facts and details that don't support your main idea.) Reach a conclusion about your topic at the end.

Revising and Proofreading

Now revise and proofread your writing. Ask yourself:

- ▶ Did I clearly state my main idea about a use of lasers?
- ▶ Did I back up my main idea with facts and details?
- ▶ Did I reach a sound conclusion at the end?
- ▶ Did I correct all mistakes?

Electricity

Use your textbook to help you fill in the blanks.

What is static electricity?

1. When two objects rub against each other, electrons can move from one object to the other and cause a buildup of _____ electricity.
2. Electrons jumping through the air to an area that has a positive charge form a(n) _____.
3. Charges move easily on a good _____.
4. Objects can be protected from the buildup of static electricity by _____ them to the Earth.

How can electricity flow?

5. Circuits must have an unbroken path of conductors and a(n) _____ that causes the electrons to move along the path.
6. A device that can open or close a circuit is called a(n) _____.
7. Resistance is measured in _____, and electric current is measured in _____.
8. The amount of _____ moving in a circuit is measured in units called _____ or amps (A).

9. A current of electrons moving through resistors loses energy that changes into _____.

What kinds of circuits are there?

10. A circuit with only one conductive path is a(n) _____ circuit; a circuit with more than one conductive path is a(n) _____ circuit.
11. In a series circuit, resistance increases with each _____ added.
12. In a parallel circuit, paths with greater _____ have less electric current flowing through them.

How can you use electricity safely?

13. To protect against large currents, homes have _____.
14. Outlets in kitchens and bathrooms have _____ that turn an outlet off if a short is detected.
15. Touching two _____ at the same time or touching one power line and _____ or some grounded object can be deadly.

Critical Thinking

16. When a home circuit breaker opens, the lights in some rooms go off but the lights in other rooms stay on. Explain why.

Electricity

Matching

Match the correct letter with the description.

- | | |
|---------------------|-----------------------|
| a. circuit | d. resistor |
| b. electric current | e. static electricity |
| c. grounding | f. switch |

- _____ device that opens or closes an electric circuit
- _____ a buildup of charged particles
- _____ an unbroken path of conductors through which electric current passes.
- _____ a conductor sharing its excess charge with a much larger conductor
- _____ an object in an electric circuit that resists the flow of electrons
- _____ a flow of electricity through a conductor

Electricity

Fill in the blanks.

amperes	resistor	voltage source
circuit	static electricity	
conductors	switch	

When objects rub against each other, electrons sometimes move from one object onto the other. The resulting buildup of charged particles is called

_____. A _____ is formed when an electric current passes through an unbroken path of _____ . A _____ is needed to move electrons along the circuit. The amount of electric charge moving in a circuit is measured in _____ or amps (A).

A device that opens or closes a circuit is called a(n) _____ . Any device, such as a light bulb, that resists the flow of electrons is a(n) _____ . Circuits that have only one path for electrons are series circuits, and circuits that have more than one path are parallel circuits.

Building a Better Battery

Read the Reading in Science feature in your textbook.
Try to draw conclusions from text clues.

Draw Conclusions

Fill in the Drawing Conclusions Chart using text clues you find in the article.

Text Clues	Conclusion
<p>1. Batteries are devices that store _____ and make it available in _____ form.</p>	<p>Batteries convert _____ energy to _____ energy.</p>
<p>2. All batteries have positive and negative _____ and an electrolyte through which a(n) _____ can flow.</p>	<p>_____ can be attached to electrodes; _____ is a solution through which electrons move.</p>
<p>3. A(n) _____ battery has two electrodes in a(n) _____ solution; cars today still use them.</p>	<p>This type of battery uses _____ electrodes, and _____ solution is the electrolyte; this type of battery can be recharged.</p>
<p>4. Laptop computers use _____ batteries; they are lightweight and powerful.</p>	<p>Lithium-ion batteries allow laptop computers to run _____ without needing to be recharged.</p>



Write About It

Draw Conclusions

1. What makes batteries useful?
2. What is the electrolyte in a lead acid battery?

Planning and Organizing

Answer these questions in more detail.

What things do you use that require batteries?

Explain what an electrolyte is.

Explain how a voltaic pile is constructed and what is used as the electrolyte.

What kinds of batteries do cars have and why do they have them?

What are the benefits of using rechargeable batteries?

Magnetism

Use your textbook to help you fill in the blanks.

What is magnetism?

1. When a magnet is cut in half, each of the two pieces has a(n) _____ pole and a(n) _____ pole.
2. Like poles of a magnet _____ each other, and unlike poles _____ each other.
3. The Earth is a giant permanent _____.
4. Whenever an electric charge moves, it creates _____ forces.
5. The _____ together the lines of a magnetic field, the stronger the magnetic force.

What are electromagnets?

6. An electric current that produces a magnetic field is called a(n) _____.
7. A magnetic field _____ around a straight wire when current is flowing through it.
8. Wrapping many loops of wire together _____ the magnetism of the coil.
9. You can increase the strength of an electromagnet in three ways: _____, place an iron rod inside the coils, or _____.

10. As the electric current rises and falls in the _____ of a speaker, its magnetic field changes, causing a cone of paper or metal to vibrate.

11. In an electric motor, a coil acting as an electromagnet rotates between the poles of a(n) _____.

How can magnets produce electricity?

12. A generator creates an electric current by spinning a coil of wire between the poles of a powerful _____.

13. The energy needed to spin the coils in an electric generator can come from _____ in a hydroelectric dam, _____ in a coal-fired power plant, or from wind or tides.

What is magnetic levitation?

14. Two electromagnets can push against each other to _____ an object.

15. Scientists have designed _____ trains that are held just above their tracks by electromagnets, greatly reducing the amount of energy lost to _____.

Critical Thinking

16. In what way is an electric generator the opposite of an electric motor?

Magnetism

Who am I? What am I?

Choose a word from the word box below that answers each question.

a. alternating current	d. magnetic field
b. electromagnet	e. magnetic levitation
c. generator	f. magnetism

1. _____ When my wire coils are spun between the poles of my powerful magnet, I produce electricity. Who am I?
2. _____ I move back and forth through a wire, changing directions many times per second. What am I?
3. _____ I use magnetic forces to lift objects. I can even lift an entire train! Who am I?
4. _____ I am magnetic when an electric current flows through me. Who am I?
5. _____ When you have me, you can push or pull on another object that also has me. What am I?
6. _____ I describe the strength and direction of a magnet's force. If you sprinkle iron filings near a magnet, you can see me. What am I?

Magnetism

Fill in the blanks.

electric current	magnetic field	poles
electric motor	north	south
electromagnet	permanent magnet	spin

Permanent magnets are made of metals such as iron.

They have two _____, north and south, and a(n) _____ around them. An iron core with a wire coil wrapped around it is called a(n) _____.

When a(n) _____ passes through the wire coil, a magnetic field with a(n) _____ and a(n) _____ pole is generated.

Electric motors and electric generators have an electromagnet between the poles of a very strong _____. In a(n) _____, current is sent through the wire coil. The poles of the electromagnet switch back and forth, causing it to _____ between poles of the permanent magnet. In an electric generator, energy from falling water or some other source is used to spin the wire coil past the poles of the permanent magnet, generating electricity in the wire coil.

Using Energy

Choose the letter of the best answer.

1. A measurement of the average kinetic energy of molecules is
 - a. heat.
 - b. temperature.
 - c. thermal capacity.
 - d. thermal conductivity.
2. The movement of heat through a material while the material stays in place is
 - a. radiation.
 - b. convection.
 - c. conduction.
 - d. conductivity.
3. The surface of the Earth is warmed mainly by
 - a. convection.
 - b. conduction.
 - c. geothermal heat.
 - d. radiation.
4. Which of the following is the best thermal insulator?
 - a. wood
 - b. air
 - c. water
 - d. metal
5. Through which of these does sound travel fastest?
 - a. water
 - b. air
 - c. metal
 - d. a vacuum
6. A loud sound has a higher _____ than a soft sound.
 - a. frequency
 - b. pitch
 - c. wavelength
 - d. amplitude
7. Which statement about light is true?
 - a. It has properties of both a particle and a wave.
 - b. It travels slowest through a vacuum.
 - c. It can travel only through matter.
 - d. It always has the same amount of energy.
8. When white light travels through a prism, it forms a(n)
 - a. image.
 - b. spectrum.
 - c. shadow.
 - d. reflection.

9. When light hits an opaque object, we see the color that the object
- a. absorbs.
 - b. transmits.
 - c. scatters.
 - d. refracts.
10. What happens as light moves from one transparent material into a different transparent material?
- a. It reflects.
 - b. It refracts.
 - c. It is absorbed.
 - d. It is scattered.
11. Which color of visible light has the shortest wavelength?
- a. red
 - b. violet
 - c. yellow
 - d. blue
12. Which of the following is a resistor?
- a. a light bulb
 - b. a switch
 - c. a battery
 - d. a wire
13. What happens when one bulb in a series circuit burns out?
- a. The other bulbs get dimmer.
 - b. The other bulbs go out.
 - c. The other bulbs get brighter.
 - d. The other bulbs stay the same.
14. Which statement about magnets is true?
- a. Like poles attract each other.
 - b. Unlike poles attract each other.
 - c. Unlike poles repel each other.
 - d. Poles have no affect on each other.
15. A device that changes electrical energy into a spinning motion is a(n)
- a. electric motor.
 - b. transformer.
 - c. electromagnet.
 - d. electric generator.