End of term 2 Exam preparation

Science Grade 4

Al Sumow School

2023-2024

Created by Miss Zahra Salahuddien.
Contains images and questions from Inspire Platform

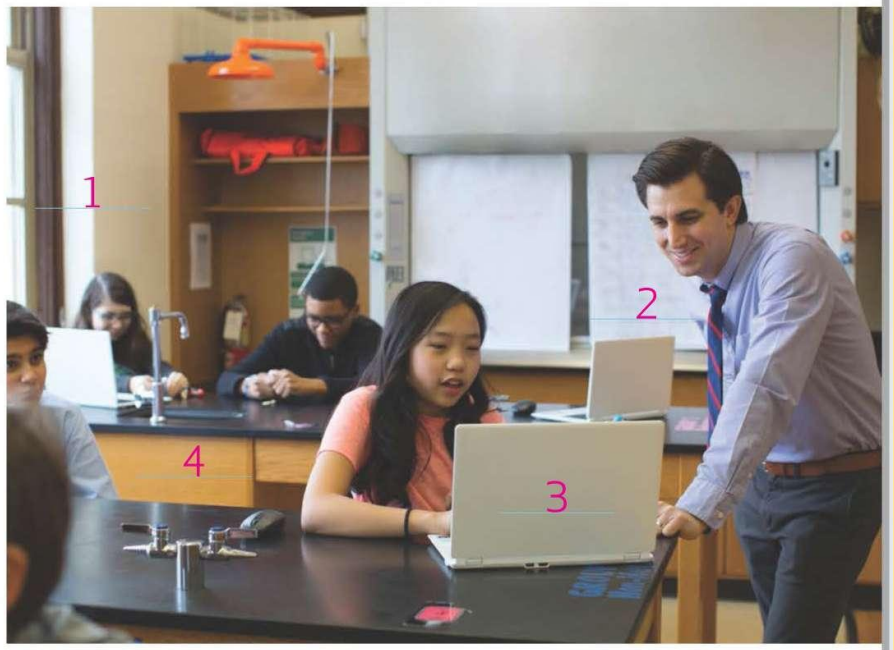
Structure of Exam

Number of MCQ عدد الأسئلة الموضوعية	15
Marks of MCQ درجة الأسئلة الموضوعية	60
Number of FRQ عدد الأسئلة المقالية	5
Marks per FRQ الدرجات للأسئلة المقالية	40

Multiple choice 4 marks each question

Written answer 8 marks each question

Label the Photo: Energy in the Classroom



Read the description below. Use the numbers to label the type of energy present in the photo above.

GO ONLINE Explore what happens when different types of energy are applied to different objects in the *Energy Causes Change* simulation.

1. Window with Sunlight: The radiation from the Sun is converted to heat and light in the classroom.

2. Teacher Talking: The teacher transforms chemical energy from food into kinetic energy and sound energy.

3. Computer: The computer transforms electrical energy into light, sound, and thermal energy.

4. Students Building a Model: The students transforms chemical energy from food into kinetic energy when they use their hands to build a model.

Q1: Page 15
U2M1L1

4-PS3-2: Students will make observations to explain how different types of energy can be transferred in various ways.

Key Concepts from page 15

Identify the energy change in the figure:

1 **Window with sunlight**: Radiation from the sun is converted into **heat and light**

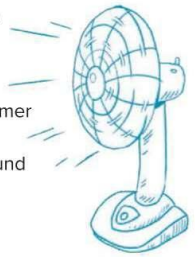
2 **Teacher talking**: transforms **chemical** energy from food to **sound** energy

3 **Computer**: The **electrical** energy from the laptop is transferred into **heat, sound and light**.

4 **Students building a model**: converts **chemical** energy from food to **kinetic** energy as they use their hands to build the model.

A stove, a heater, and a match can all produce thermal energy. **Thermal energy** is the internal energy of an object due to the energy of motion of its particles. The faster these particles move, the warmer a substance gets. Thermal energy increases as the substance gets warmer.

Sound energy is a type of energy produced by vibrations of material. A vibration is a fast back-and-forth movement. When a drummer beats a drum, the drum vibrates. The vibrations of the drum make the air vibrate. Sound waves travel away in all directions. Because sound depends on the movement of the particles that make up matter, it is a type of energy of motion.



thermal energy

sound energy

2. Classify each type of energy that you learned about as kinetic energy or potential energy. Remember that potential energy is stored and kinetic energy involves motion.

Stored Energy	Energy of Motion
chemical energy, nuclear energy	electrical energy, thermal energy, sound energy, light energy

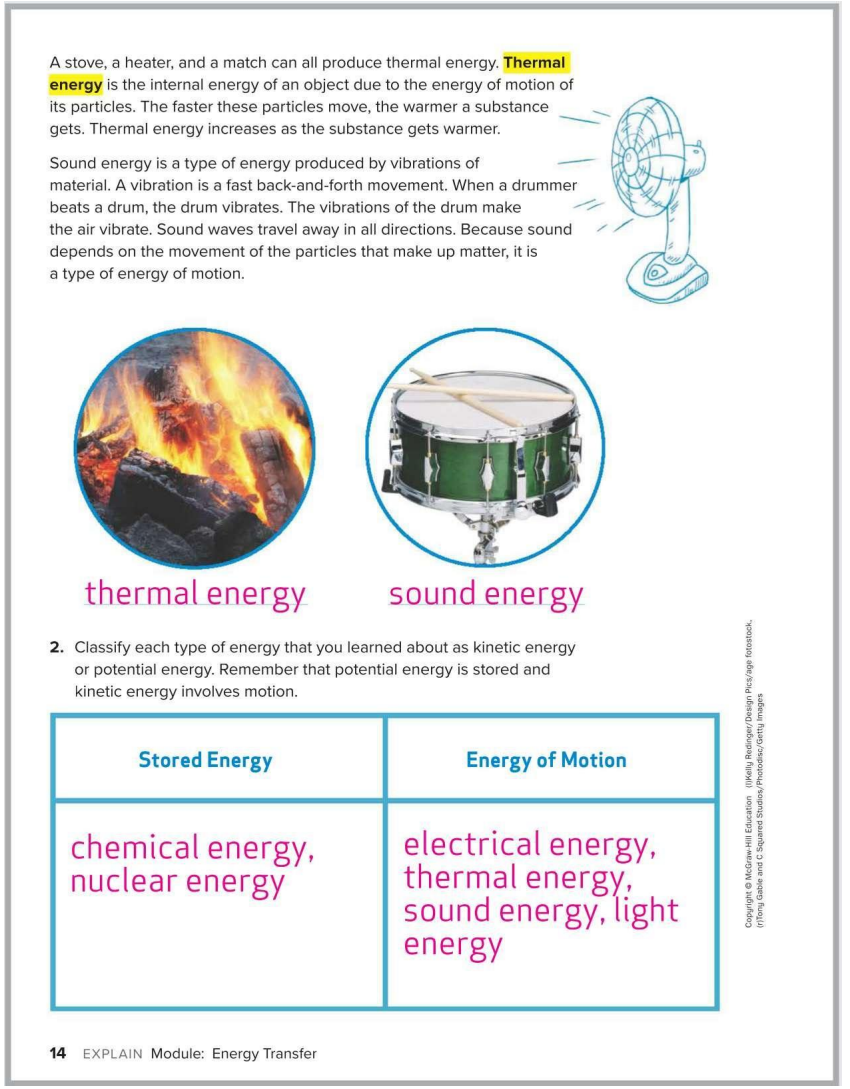
Q2: Page 14
U2M1L1

4-PS3-2: Students will make observations to explain how different types of energy can be transferred in various ways.

Types of energy: U2M1L1 page 14

Key concepts (look for and record these answers to summarize):

- What is thermal energy?
- What is sound energy?
- Which of the following energies is stored?
- Which of the following energies is energy of motion?



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Stored Energy	Energy of Motion
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4) How can people use thermal energy in their home?

- ○ turn on the fan
- ○ turn on the radio
- ○ turn on the stove
- ○ turn on the water faucet

6) Thermal energy is

- the internal energy of an object due to the kinetic energy of its particles
- the external energy of an object due to its potential energy
- the internal energy of an object due to the stored energy of its particles
- the external energy of an object due to its exposure to the Sun

10) Frank placed a metal spoon in a glass bowl of hot soup. He then went back to get crackers. When he touched the spoon he was surprised to find that it was hot. Frank knew that the spoon was not hot when he put it in the soup. Which sentence best explains how this happened?

- ○ The radiation from the microwave bounced onto the spoon.
- ○ Spoons begin heating up when they are placed into liquids.
- ○ Thermal energy is transferred from the soup to the spoon.
- ○ Heat is created when metals and glasses combine with one another.

2) Fill in the blanks using the available answer choices.

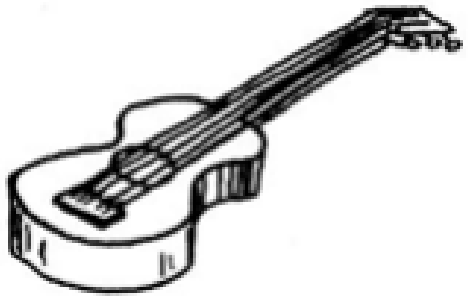
_____ travels in a wave of vibrations that spreads outward in all directions.

(Blank 1)

Blank 1 options

- sound
- light

8) When a student plays a guitar, how does the sound travel to reach your ears?



- using echos
- through potential energy
- through thermal energy
- through sound waves

Three-Dimensional Thinking

1. Which best describes how energy changes in a toaster?

   A. chemical to thermal

   B. electrical to light

   C. electrical to thermal

   D. electrical to chemical

2. Dan made the following observations in his science notebook:
   The radio sitting on the table made the water in my glass move.
   What can he conclude?

   A. Some types of energy cannot transfer through water.

   B. The sound energy of the radio transferred to the water.

   C. The electrical energy of the radio transferred through the water.

   D. Only light can move through water.

3.

Energy Transformation	Example
chemical to electrical	battery powered flashlight
light to thermal	sunlight heats the sidewalk
motion to sound	

Which example best fits in the last row of the table?

A. burning candle heats up

B. plucked guitar string makes noise

C. ball rolls down hill

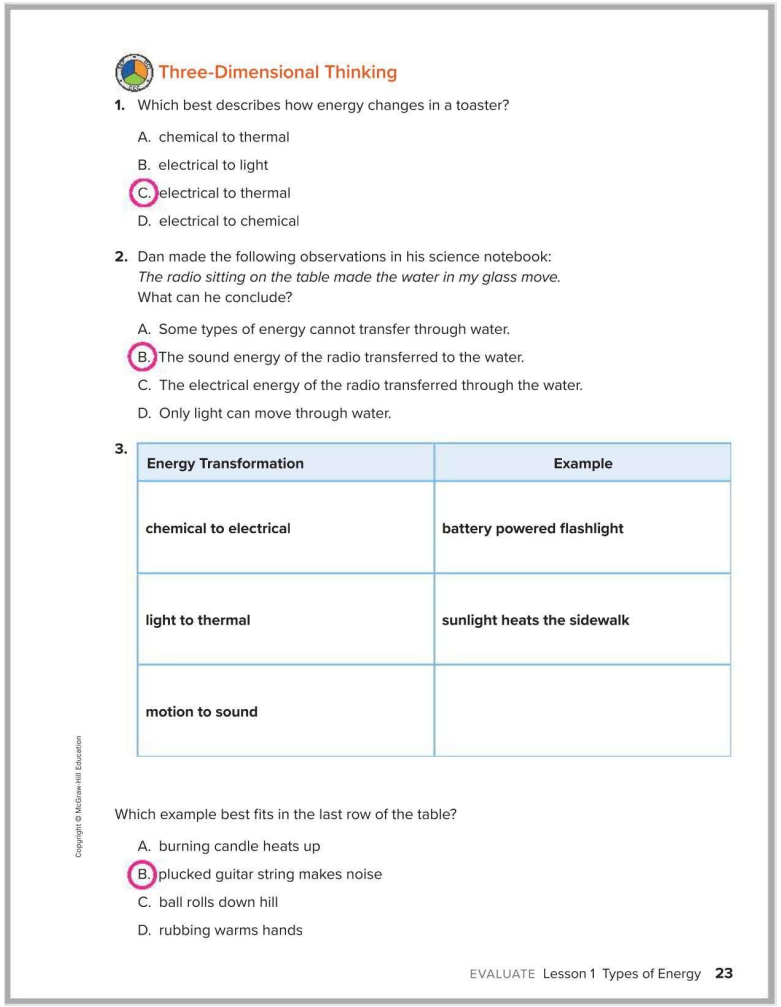
D. rubbing warms hands

Q3: Page 23
U2M1L1

4-PS3-2: Students will make observations to explain how different types of energy can be transferred in various ways.

Types of energy : U2M1L1 page 23

- Learn these 3 questions!!!!!!



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B. electrical to light
C. electrical to thermal
D. electrical to chemical

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VOCABULARY

Look for these words as you read:

longitudinal wave

medium

solar cell

sound wave

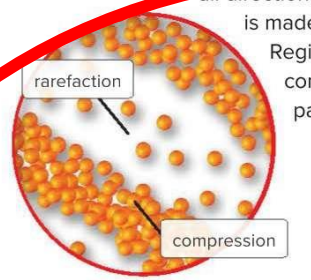
vibration

Sound Energy

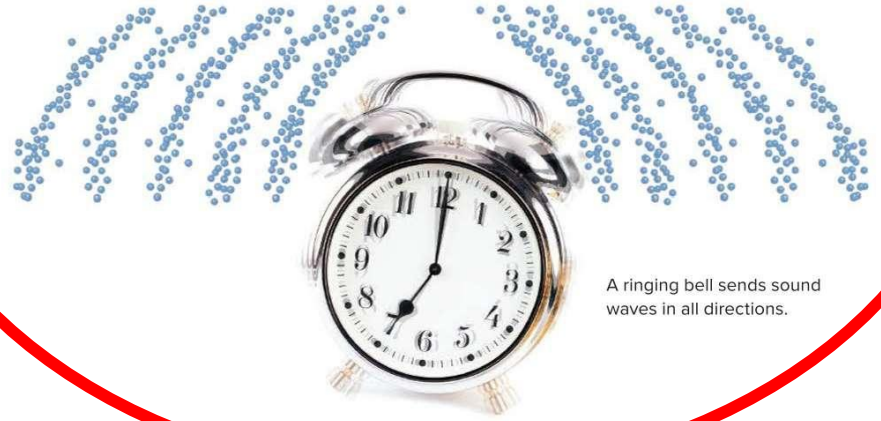
If you drop a book on the floor, you hear a sound. Some of the falling book's energy of motion has changed to sound. Sound is a type of kinetic energy. It is produced by moving particles of a material. Air is made of particles, or tiny parts, that transmit sound.

When you plucked the rubber band in the Inquiry Activity, *Make Sound*, it moved back-and-forth quickly. This back and forth motion is called a **vibration**. The vibration produced sound. All sounds begin with vibration.

The vibrating parts of the rubber band bumped into air particles. Those particles bumped into other air particles. The rubber band's vibrations pushed air particles closer together, and then those same particles were pushed out. A wave that transfers energy through a material and spreads outwards in all directions from a vibration is a **sound wave**. A sound wave is made of a series of compressions and rarefactions. Regions of air that have many particles are called compressions. Regions of air that have fewer particles are called rarefactions.



GO ONLINE Watch the video *Sound and Light Energy* to learn about how sound and light transfer energy.

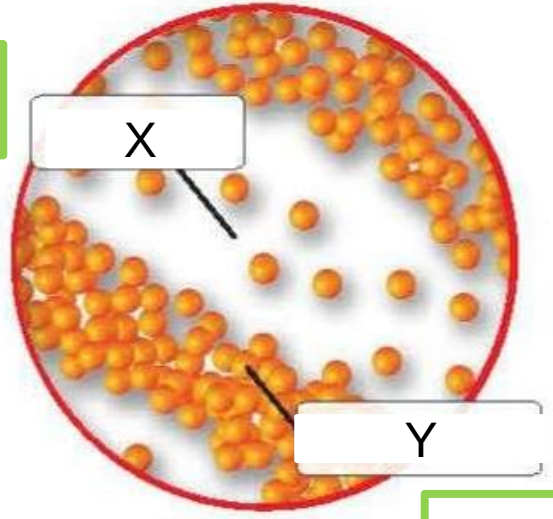


A ringing bell sends sound waves in all directions.

Q4: Figure Page 30 U2M1L2

- 4-PS3-2: Students will plan and carry out investigations to describe and model how energy transfers with sound and light.

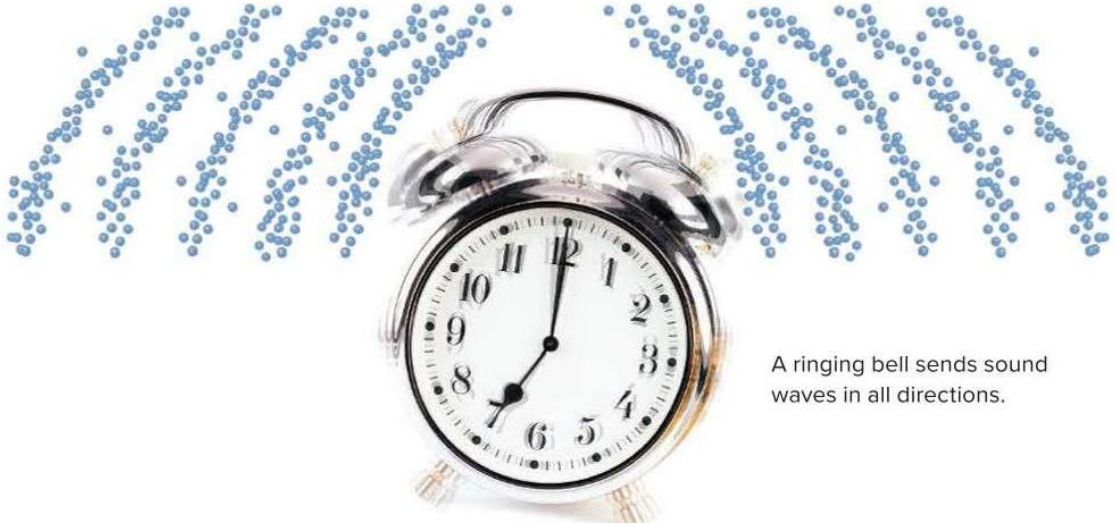
Possible questions from page 30



Label X and Y in the picture.

How do sound waves travel?

Outward in all directions from the source



Light Energy

If you stand outside on a sunny day, you can feel the warmth of sunlight on your face. This is evidence that light transfers energy.

GO ONLINE Explore the sound and light tabs in the simulation *Energy Transfer Through Matter* to see how sound and light move through air and cause change.

For thousands of years, people have used the Sun's rays for warmth, to heat water, to dry food like fruits and grains, and for many other purposes.

Today, people use many different devices to harvest the energy of the Sun, or solar energy. For example, **solar cells** are devices that use light from the Sun to produce electricity.

Solar cells are also called photovoltaic cells. The word part *photo* refers to "light," and *voltaic* refers to "electricity." These cells can be used to power something as small as a calculator or as large as an airplane.

Although light is a wave of energy, it also consists of particles. Light travels as tiny particles of energy. It can travel with or without a medium. Nothing travels faster than light in a vacuum. Light moves slowly in media like air and glass.

Solar radiation has powered life on Earth for billions of years.

Q5 and Q6: Page 32 U2M1L2

- 4-PS3-2: Students will plan and carry out investigations to describe and model how energy transfers with sound and light.

Sound and light: U2M1L2 page 32

Key concepts :

- Evidence that light transfers energy: Can feel warmth on your face
- What is Earth's main source of light energy? Sun
- What device changes light energy to electricity? Solar cell
- Light travels as particles so it can travel in space
- Light is fastest in space, slower in other mediums.

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Which of the following is the source of solar energy used to produce electricity?

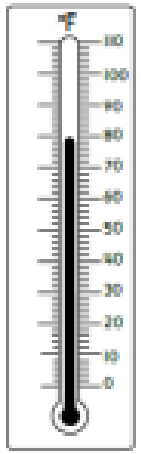
A. Sun
B. Air
C. Water
D. Wind

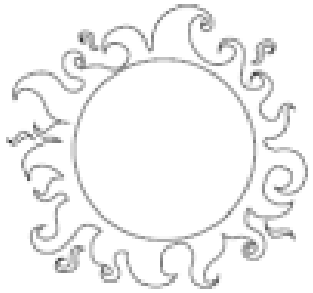
8) A form of energy that allows you to see objects is _____.

- ○ heat
- ○ light
- ○ solar energy
- ○ vision

9) Light travels as tiny _____ of energy.

1) What is Earth's primary source of light energy?





7) Solar cells produce electricity using _____ from the Sun.

VOCABULARY

Look for these words as you read:

circuit

conductor

electric current

insulator

resistor

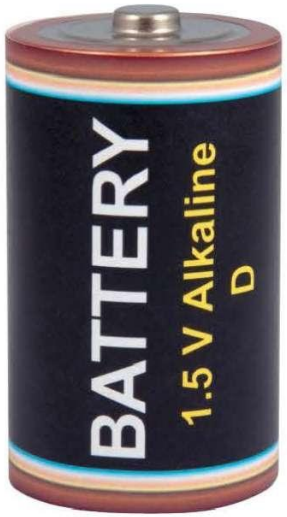
Electric Current

When you are in the dark, a flashlight is useful. A flow of electric charge lights the bulb. **Electric current** is the flow of electricity through a conductor.

A **conductor** is a material through which electricity flows easily. In contrast, an **insulator** is a material that slows or stops the flow of energy, such as electricity or sound.

As you saw in the Inquiry Activity, *Make it Work,* a **circuit** is a path through which electric current can flow. Often this path consists of wires. Circuits must also have a device to move electrically charged particles along. These devices, called voltage sources, increase the number of charged particles flowing in a circuit. Batteries are a voltage source.

A switch is a device that can open or close the path in a circuit. When the switch is closed, the electric current can flow around and around through the circuit. When the switch is open, the current cannot flow.



The chemicals inside a battery store energy.

GO ONLINE Watch the video *Uses of Electricity* to see different ways that electricity is used every day.

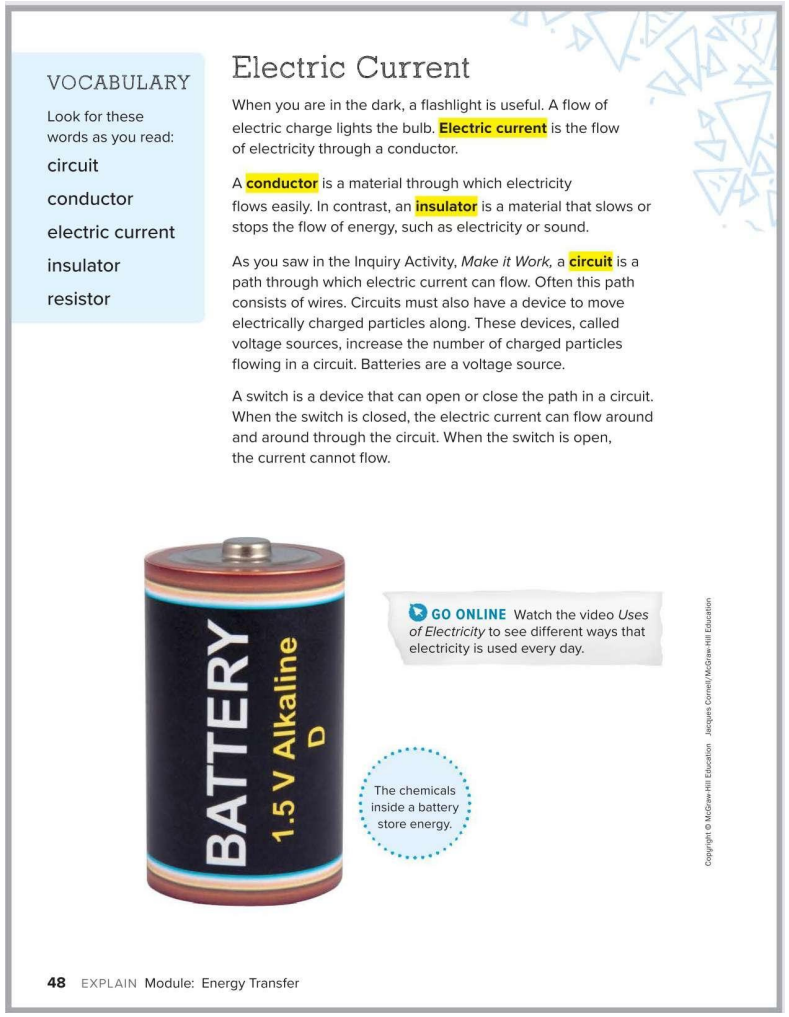
Q 7 and 8: Page 48 U2M1L3

- 4-PS3-2: Students will use their observations from their investigations to describe how energy is transferred by electric currents.

Electricity: U2M1L3 page 48

Key concepts (look for and record these answers to summarize):

- What is electric current?
- What is a conductor?
- What is an insulator?
- What is a circuit?
- What are the parts of a circuit and their function?
- What is an open and closed circuit?
- Which circuit can electricity not flow through?



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The chemicals inside a battery store energy.

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Which of the following slows down or stops the flow of electric current?

A. Copper
B. Silver
C. Gold
D. Wood

insulator

1) A fan is plugged into an extension cord. The extension cord is plugged into a wall outlet. How does the extension cord help the fan work?

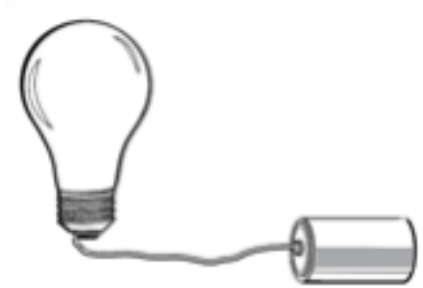
- ○ The extension cord makes the fan more powerful.
- ○ The extension cord makes the fan easier to operate.
- ○ The extension cord transfers sound energy to the fan.
- ○ The extension cord transfers electric currents from the outlet to the fan.

2) A flow of electrical charges is known as _____.

- resistance
- electrical current
- static electricity
- voltage

12) The path along which electrical current flows is called a(n) _____ .

17) A student made the circuit in the drawing below.



Which does the student need to add to the circuit to make it work?

- another bulb
- another battery
- a switch
- another wire

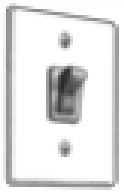
4) In an electric circuit, a battery can act as a ___.

- voltage source
- conductor
- insulator
- resistor

5) A conductor is a

- a material that increases the number of charged particles
- material that increases the amount of electricity
- material through which electricity flows easily
- material that stops the flow of energy

8) A switch in a circuit _____.

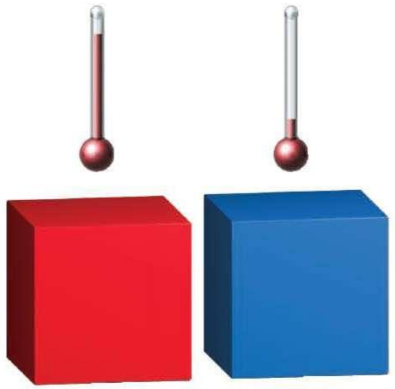


- acts as an insulator
- absorbs electricity
- allows or stops the flow of electricity
- keeps the flow of electricity at a safe level

9) An object in an electrical circuit that resists the flow of energy is called _____.

- a magnet
- a compass
- a voltage
- a resistor

Thermal energy moves from a substance with a higher temperature to a substance with a lower temperature. Temperature is a measure of the average energy of motion of the particles in an object. All of the particles in an object are vibrating with kinetic energy. Objects with a higher kinetic energy are vibrating faster. Objects with a lower temperature have particles that do not vibrate as much. When a hot object touches a cold object, their particles bump into each other. When this happens, the particles from the hot object pass on some of their energy to the particles in the cold object. The cold object becomes warmer and the hot object loses heat.



When the two blocks are pushed together, energy will flow from the hot block to the cooler block.

When the two blocks reach the same temperature, thermal energy will stop flowing between the two blocks.

1. What is the difference between thermal energy and heat?

Sample answer: Thermal energy is the energy of the moving particles of matter. Heat is the flow of thermal energy from a warmer object to a cooler object.

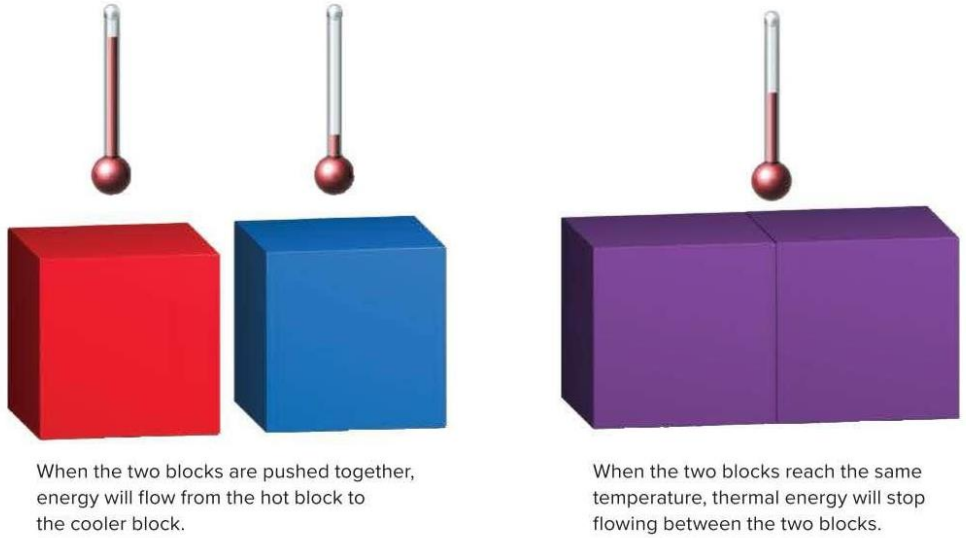
Q 9: Figure Page 69 U2M1L4

- 4-PS3-2: Students will plan and carry out investigations to explain how energy can be transferred by heat.

Heat: Figure Page 69 U2M1L4

Key concepts

- Where does the energy flow?
  From the warmer (hot) to the cooler (cold) object
- What happens to the thermal energy of the blocks when they reach the same temperature?
  Thermal energy will stop flowing



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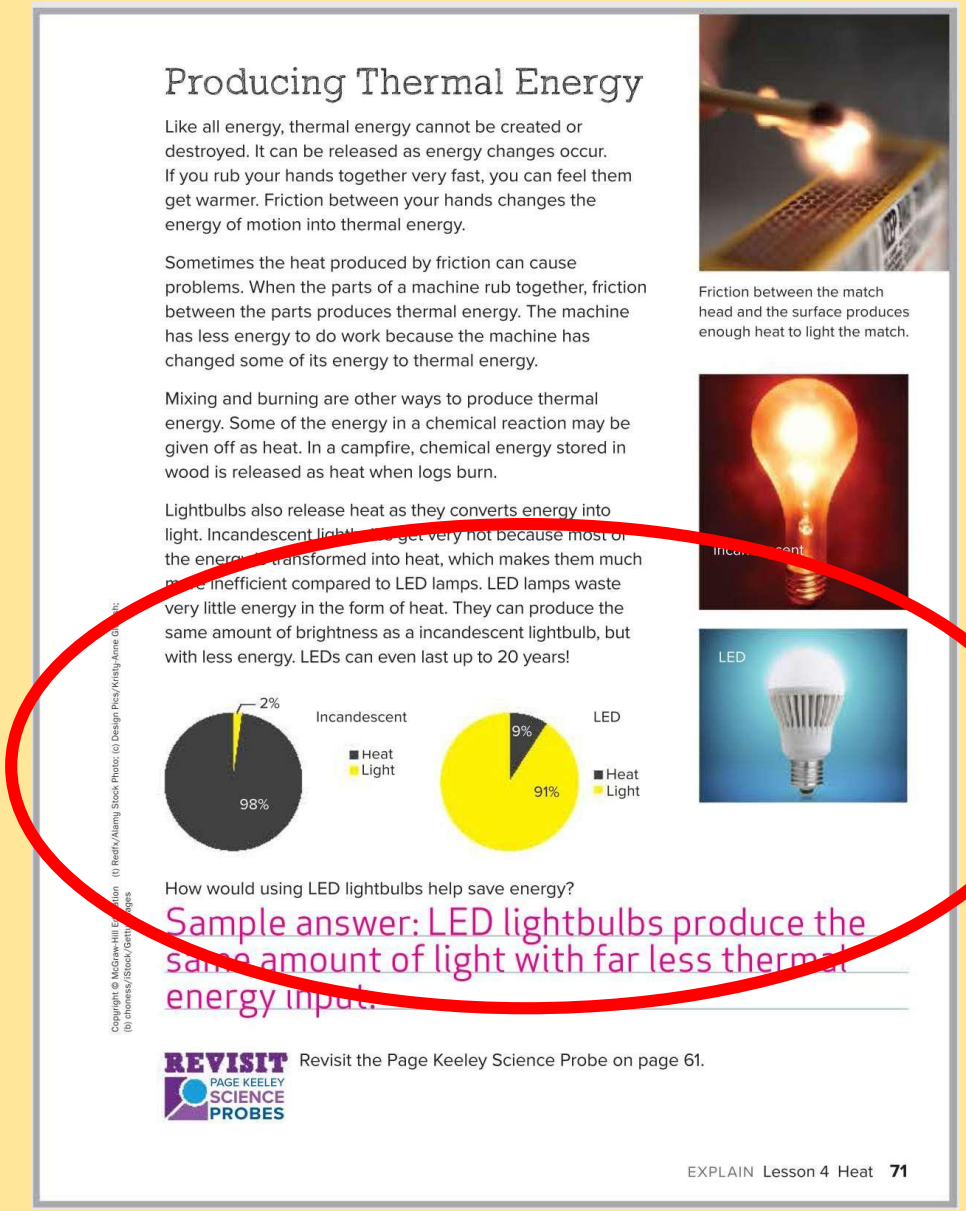


Producing Thermal Energy

Like all energy, thermal energy cannot be created or destroyed. It can be released as energy changes occur. If you rub your hands together very fast, you can feel them get warmer. Friction between your hands changes the energy of motion into thermal energy.

Sometimes the heat produced by friction can cause problems. When the parts of a machine rub together, friction between the parts produces thermal energy. The machine has less energy to do work because the machine has changed some of its energy to thermal energy.

Mixing and burning are other ways to produce thermal energy. Some of the energy in a chemical reaction may be given off as heat. In a campfire, chemical energy stored in wood is released as heat when logs burn.

Lightbulbs also release heat as they converts energy into light. Incandescent lightbulbs get very hot because most of the energy is transformed into heat, which makes them much more inefficient compared to LED lamps. LED lamps waste very little energy in the form of heat. They can produce the same amount of brightness as a incandescent lightbulb, but with less energy. LEDs can even last up to 20 years!

Friction between the match head and the surface produces enough heat to light the match.

How would using LED lightbulbs help save energy?

Sample answer: LED lightbulbs produce the same amount of light with far less thermal energy input.

REVISIT PAGE KEELEY SCIENCE PROBES Revisit the Page Keeley Science Probe on page 61.

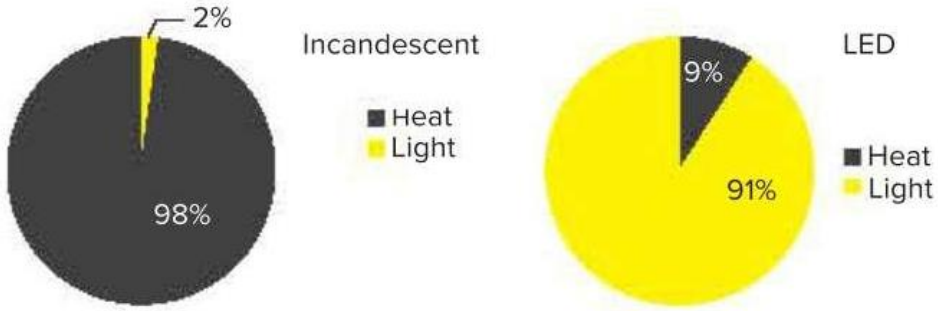
EXPLAIN Lesson 4 Heat 71

Q 10: Figure Page 71 U2M1L4

- 4-PS3-2: Students will plan and carry out investigations to explain how energy can be transferred by heat.

Heat: U2M1L4 page 71

- Figure page 71



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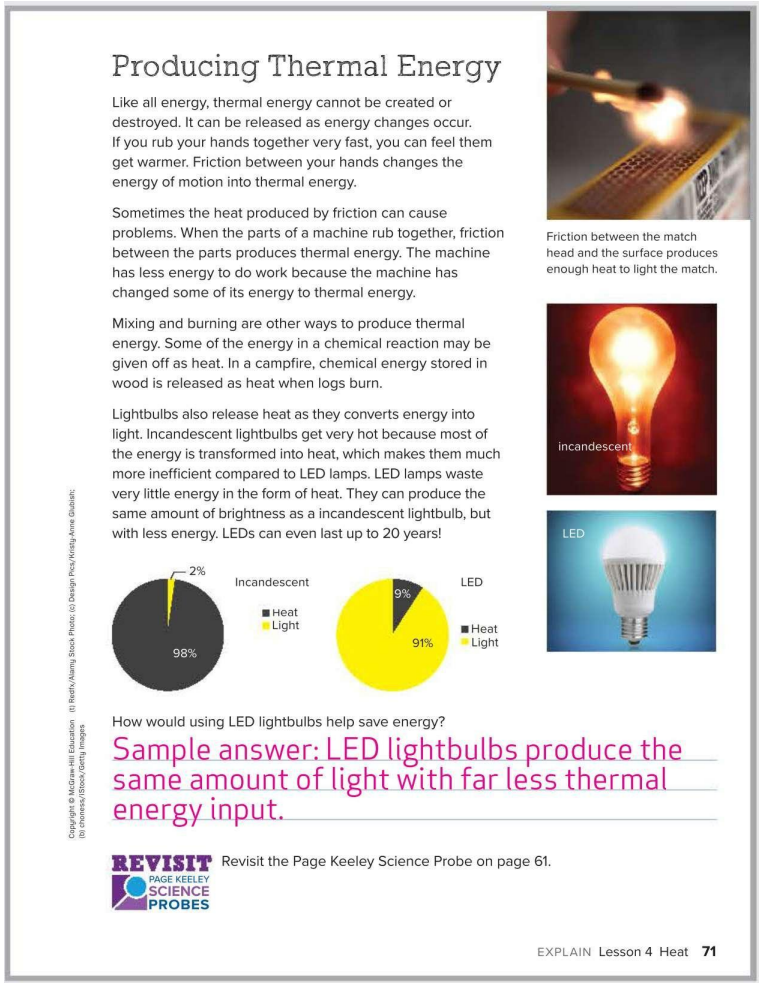

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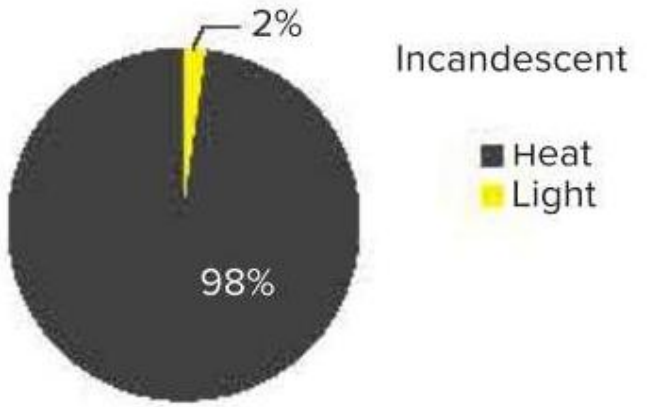
Possible Questions:

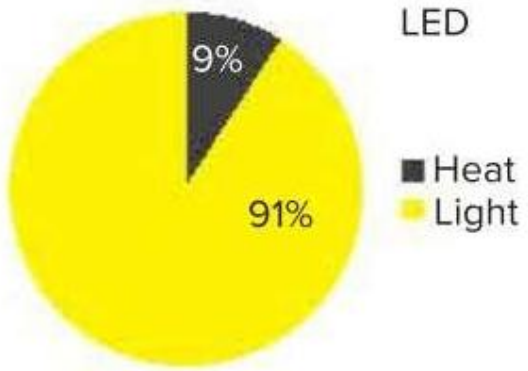
1.Which bulb produces more light? LED

2.Which bulb uses more electricity? Incandescent

3.How much light is produced by LED or Incandescent? LED 91% Incandescent 2%

4.How much Heat is produced by LED or Incandescent? LED 9% Incandescent 98%

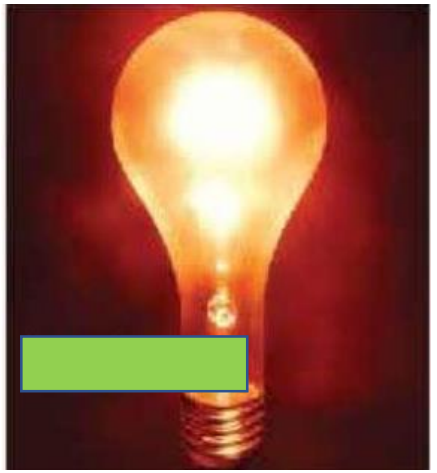




Possible Question:

1.How is thermal energy produced in the picture?

Friction between the match and box



Possible Questions:

1.Which bulb produces more light?

LED

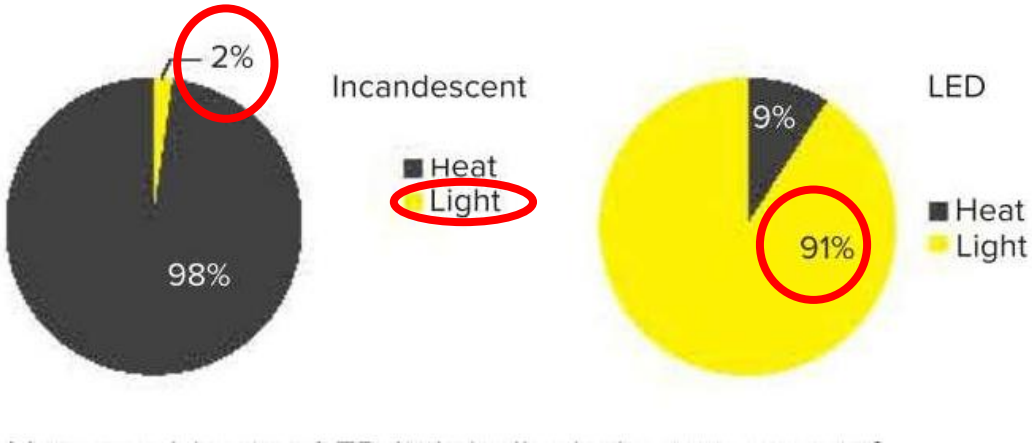
2.Which bulb uses more electricity?

Incandescent

3. Label the incandescent and led bulb

The figure below shows the percentages of heat and light energy produced from LED and incandescent light bulbs.

What is the percentage of light that is produced from each of them?



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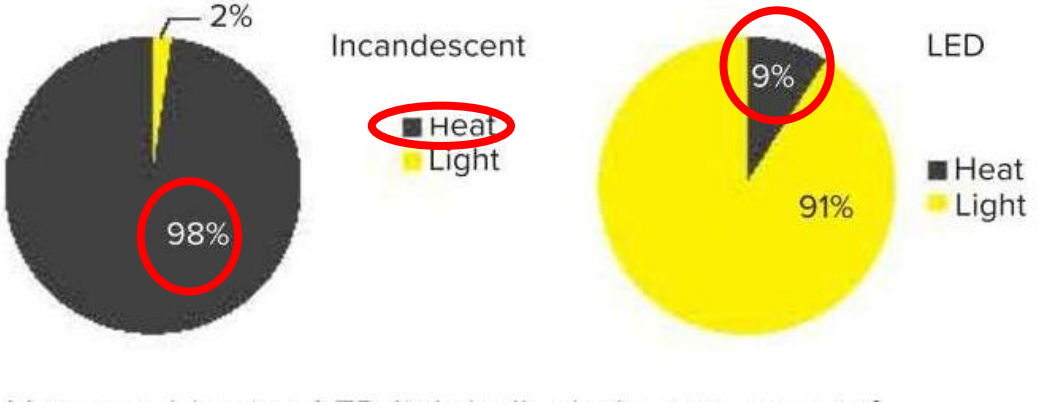
B. LED 9% and incandescent 2%
C. LED 98% and incandescent 91%
D. LED 9% and incandescent 2%

The figure below shows the percentages of heat and light energy produced from LED and incandescent light bulbs.

What is the percentage of heat that is produced from each of them?

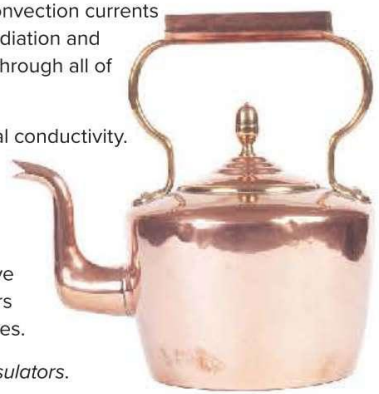


A. LED 91% and incandescent 2%
B. LED 9% and incandescent 2%
C. LED 98% and incandescent 9%
D. LED 9% and incandescent 2%

Thermal Conductivity

Thermal energy travels at different speeds. Thermal energy is carried by radiation through empty space at the speed of light. Convection currents travel slower. Conduction is usually slower than both radiation and convection. In conduction, thermal energy must travel through all of the particles of matter.

The ability of a material to transfer heat is called thermal conductivity. Materials that conduct heat easily are good thermal *conductors*. Most metals are thermal conductors. Thermal conductivity usually increases with density. Density is the amount of matter in an object. When particles in a material are closer together, heat can move more quickly through them. Solids are better conductors than liquids, and liquids are better conductors than gases.



This copper pot is a good thermal conductor.

Materials that conduct heat poorly are called thermal *insulators*. Air, for example, is a thermal insulator. Most winter coats are puffy because they contain pockets of air that prevent heat from moving away from your body.

Thermal Conductivity

Material	How Many Times Better Than Air It Conducts Heat
Oak wood	6
Water	23
Brick	25
Glass	42
Stainless steel	534
Aluminum	8,300
Copper	15,300
Silver	16,300

Use evidence to explain which material from the table above is the best thermal conductor.

Silver is a solid, a metal, and is 16,300 times better than air in transferring heat, which makes it the best thermal conductor.

Q 11: Page 74 U2M1L4

- 4-PS3-2: Students will plan and carry out investigations to explain how energy can be transferred by heat.

Heat: Q 11: Page 74 U2M1L4

Key concepts:

- Thermal energy travels at different speed: fastest by radiation through space, convection slower, slowest conduction.
- What is thermal conductivity? Ability of a material to transfer heat
- What materials are good thermal conductors? metals
- When does thermal conductivity increase? It increases with density. Solids faster then liquids and last gas.
- What are good thermal insulators? Air, wood, brick, water, plastic, silicon
- Practice reading information from the table. Focus on words like most / best and least / worst

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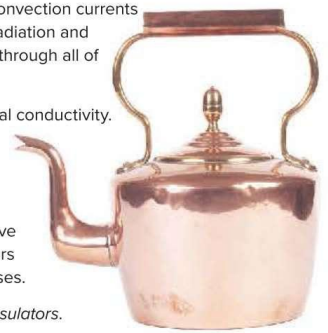

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Energy Changes

Energy is found in many forms. There is energy in light, heat, electricity, and in food. We cannot make energy, but we can change it from one form to another. When we eat, we change the energy that was stored in food into the energy of movement—like when you run. A car engine changes most of the chemical energy stored in gasoline into energy of motion. A microwave oven turns electrical energy into heat.

Sometimes energy is stored. Batteries store chemical energy. If we connect a battery to a circuit, electricity flows through the wires. Wind-up toys store energy in a spring when you turn the crank. The stored energy, or potential energy, in the spring changes into energy of motion when the toy is released.

1. Underline the sentence in the first paragraph that shows what happens to the chemical energy in a car.
2. How is the energy transformation in a lightbulb similar to starting a campfire?

Sample answer: Both processes turn another form of energy into heat and light.

Talk About It

Discuss with a partner. What other energy changes have you experienced today?

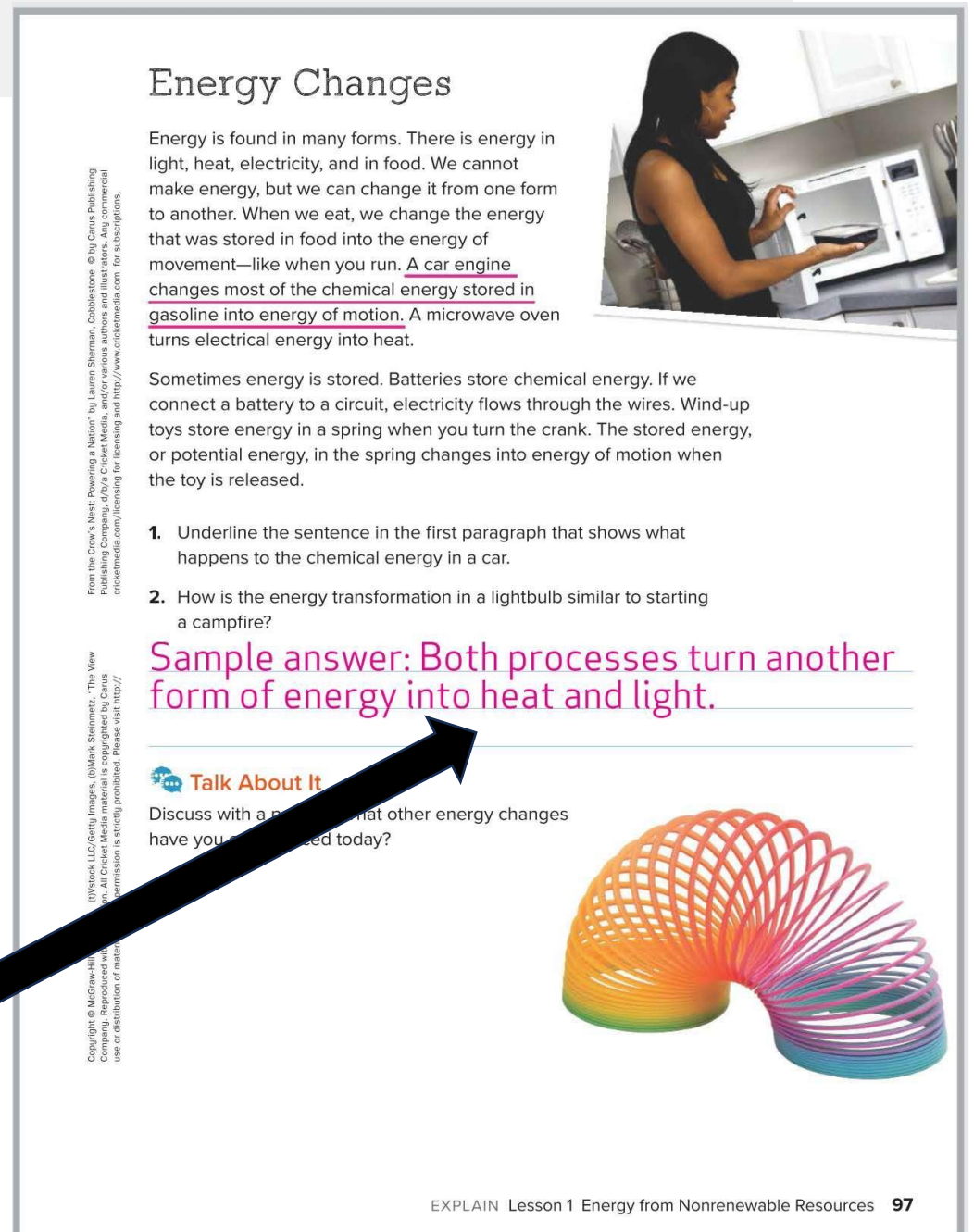
Q 12: Page 97 U2M2L1

- 4-ESS3-1: Students will obtain and combine information about the source of nonrenewable resources, and how their uses affect humans.

Q 12: Page 97 U2M2L1

Key concepts:

- We cannot make energy, but we can change it.
- How does energy change in our body from food? Chemical energy changes to movement when we run
- What happens to the chemical energy in a car? Chemical energy changes to energy of motion
- What energy change occurs in a microwave? Electrical energy changes to heat (thermal energy)
- How can we store energy and what form is it in? Use batteries to store as potential energy.
- How does energy change in a circuit with a battery? From potential to electric
- How does energy change in a wind-up toy? From potential to kinetic
- Practice answering the question on page 97



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Discuss with a p… hat other energy changes have you …ed today?

VOCABULARY

Look for these words as you read:

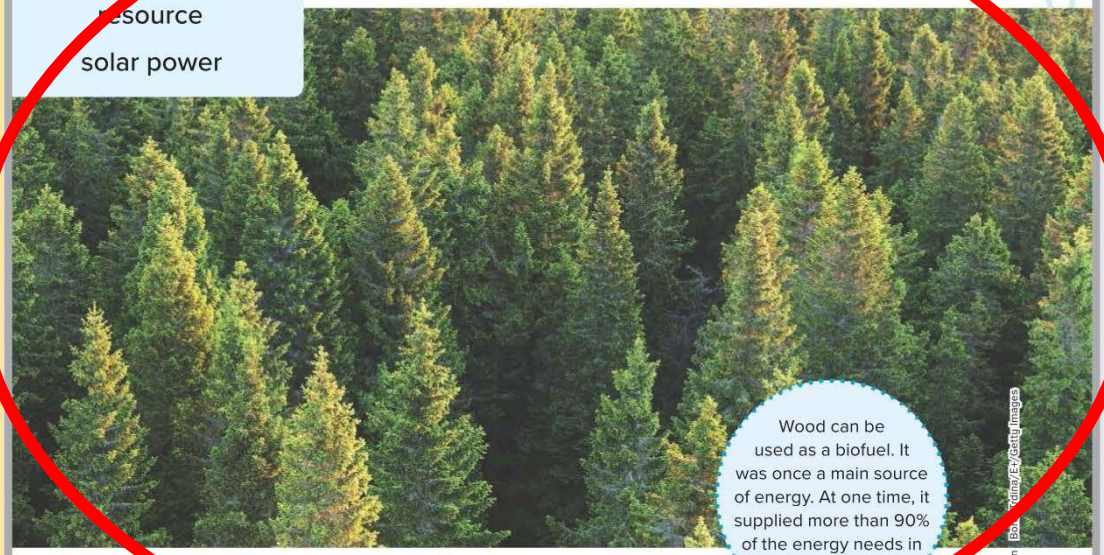
- alternative energy source
- biofuel
- geothermal energy
- hydroelectricity
- renewable resource
- solar power

Renewable Resources

Think about how you were able to replace renewable resources in the Inquiry Activity, *Renewable Resources.* Researchers are trying to find ways to use renewable resources. A **renewable resource** is a material that is replaced quickly in nature. Water, wind, sunlight, plants, and animals are examples of renewable resources.

An **alternative energy source** is a source of energy other than burning of a fossil fuel. Plants, animals, sunlight, geothermal energy, moving water, and wind are all examples of alternative energy sources.

GO ONLINE Watch the video *Using Renewable Resources* to see some examples and uses of renewable resources.



Wood can be used as a biofuel. It was once a main source of energy. At one time, it supplied more than 90% of the energy needs in the United States.

Biomass

Wood, crops, and animal waste are part of what we know as biomass. Burning biomass transforms the stored energy into thermal energy, gas or fuel. A type of fuel made from biomass, or living or formerly living material, is called **biofuel**. Iowa, Georgia, Mississippi, North Carolina, and North Dakota lead the United States in biomass production.

Underline the evidence in the text that shows stored energy can be transformed into thermal energy.

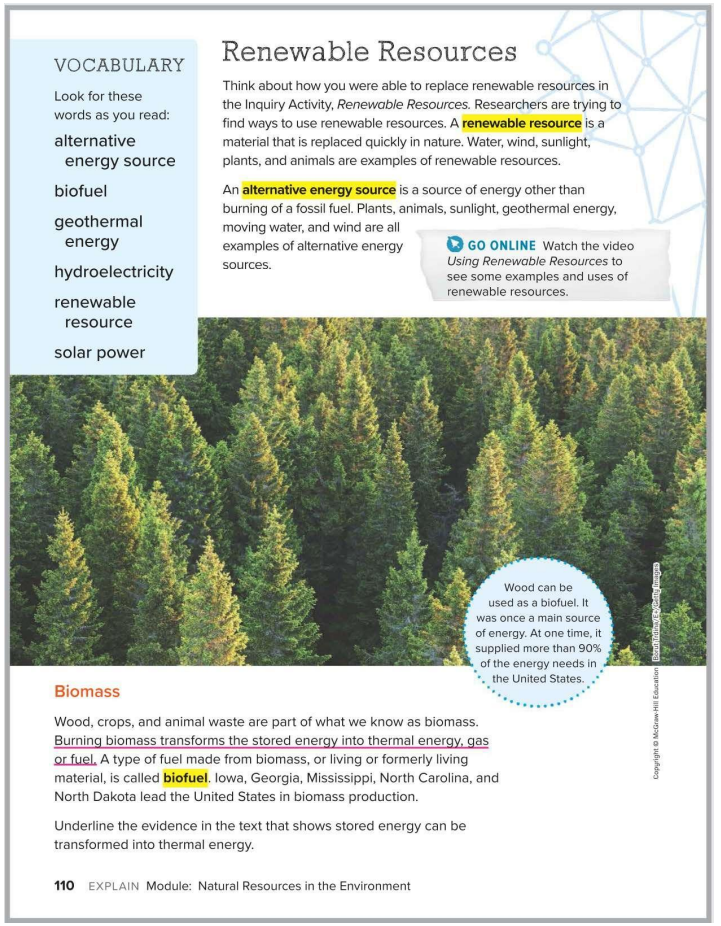
Q13: Figure Page 110 U2M2L2

- 4-PS3-4: Students will obtain and combine information about the source of renewable resources, and how their uses affect humans.

Energy from renewable resources: U2M2L2 page 110

Key concepts :

- What type of energy is shown in the picture? renewable
- What is a renewable resource? Can be replaced in a short amount of time
- Examples of renewable resources
- What are alternative energy resources and examples.
- What is biomass and biofuel? Energy we can get from plants or living things



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biofuel

geothermal energy

hydroelectricity

renewable resource

solar power

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Underline the evidence in the text that shows stored energy can be transformed into thermal energy.

1) Biomass conversion generates energy from _____.

- plant and animal wastes
- running water
- sunlight
- moving air

3) Wind, moving water, solar energy, nuclear energy, and geothermal energy are all _____.

- nonrenewable resources
- free energy sources
- fossil fuels
- renewable energy sources

4) Solar panels and windmills are _____ energy sources.

5) Which is <u>not</u> a resource that is burned to heat our homes and give us electricity?

- ○ natural gas
- ○ coal
- ○ plastic
- ○ oil

7) Which is not a source of renewable energy?

- thermal energy
- wind energy
- solar energy
- fossil fuels

10) Which method is used to change plant and animal materials into usable fuel?

- hydroelectricity
- recycling
- biomass conversion
- solar collection

Wind Energy

Wind is a renewable resource and an alternative energy source. Wind is formed as the Sun heats Earth unevenly. This causes some of the atmosphere to have areas with warm air and other areas with cooler air. Wind is formed as warm air rises and cooler air sinks.

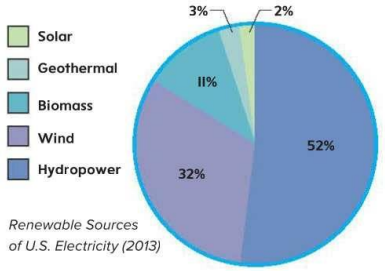
Windmills harness the motion of the wind to generate electricity. Windmills called wind turbines change wind's kinetic energy into electric energy. How? The blades are connected to a shaft that is connected to a generator. As the wind moves the blades, the generator converts the power of the wind to electricity.

Thirty-nine states currently have operating wind turbines. Mountaintops, shorelines, open plains, and valleys are good places for windmills. Wind towers are tall since winds are stronger at higher altitudes above the ground. Wind power generates 32 percent of the total electricity produced in the United States.

What does a wind turbine do?

A wind turbine transforms the energy of motion of the wind into electricity.

Wind turbines are made up of a tower, usually three blades, and a generator.



Renewable Sources of U.S. Electricity (2013)

Hydropower and wind power are the most widely used renewable sources of electricity in the United States.

Q14: Figure Page 114 U2M2L2

- 4-PS3-4: Students will obtain and combine information about the source of renewable resources, and how their uses affect humans.

Energy from renewable resources: U2M2L2 page 114

- Figure page 114

What does a wind turbine do?

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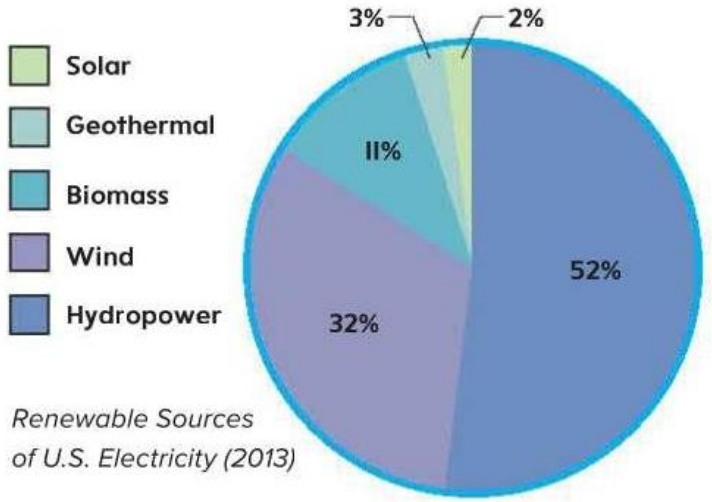


Renewable Sources of U.S. Electricity (2013)

Hydropower and wind power are the most widely used renewable sources of electricity in the United States.

The figure below shows wind turbines. What kind of energy transformation does a wind turbine do?

A. Motion into electrical energy
B. Chemical energy into thermal energy
C. Thermal energy into mechanical energy
D. Chemical energy into kinetic energy

Possible Questions:

1.What percentage of energy is produced by … (example: biomass)?

11%

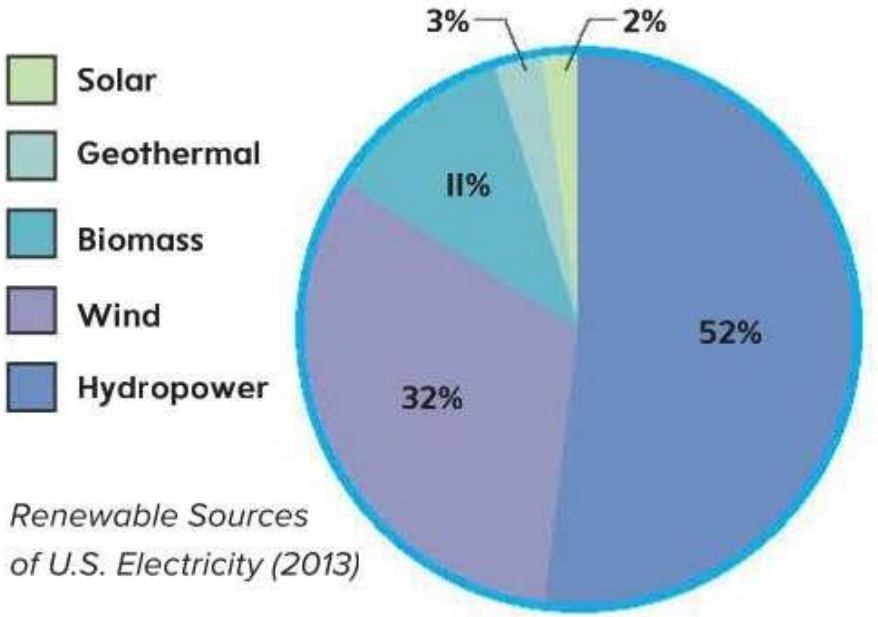
2.What is the most widely used renewable res

hydropower

3.What is the least use renewable resource?

solarpower

4.How much electricity is produced from… (example: wind and hydropower)?



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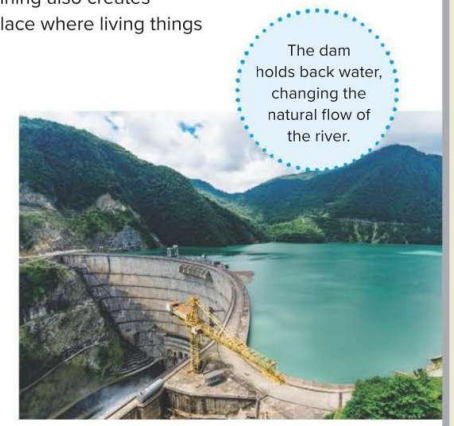
Habitat Loss

People work in coal mines or use giant shovels to dig away layers of rock and soil to obtain coal. People must drill into rocks to obtain oil and natural gas. These activities affect the land. Trees, plants, and topsoil are often removed to get to coal. Mining also creates pollution and destroys habitats. A habitat is a place where living things or organisms live.

The use of some renewable resources also can result in habitat loss or destruction. Dams are built on rivers to harness hydroelectric power. These dams can affect the animals that live in the water by changing their habitat. Some types of fish need to migrate up rivers to reproduce. Dams and other hydroelectric plant structures block the natural migration of certain fish.

Wind turbines can affect the habitat of birds. Birds can get hurt or killed when they fly into the blades of wind turbines.



The dam holds back water, changing the natural flow of the river.

Read a Photo: Strip Mining

1. What has been cleared away in this strip mining operation?

Sample answer: Trees, plants, and soil have been cleared.

2. **ENVIRONMENTAL Connection**
How does burning fossil fuels affect the environment?

Burning fossil fuels pollutes the air.

GO ONLINE Watch the video *Energy Use and the Environment* to see how energy use can affect habitats.

REVISIT PAGE KEELEY SCIENCE PROBES Revisit the Page Keeley Science Probe on page 121.

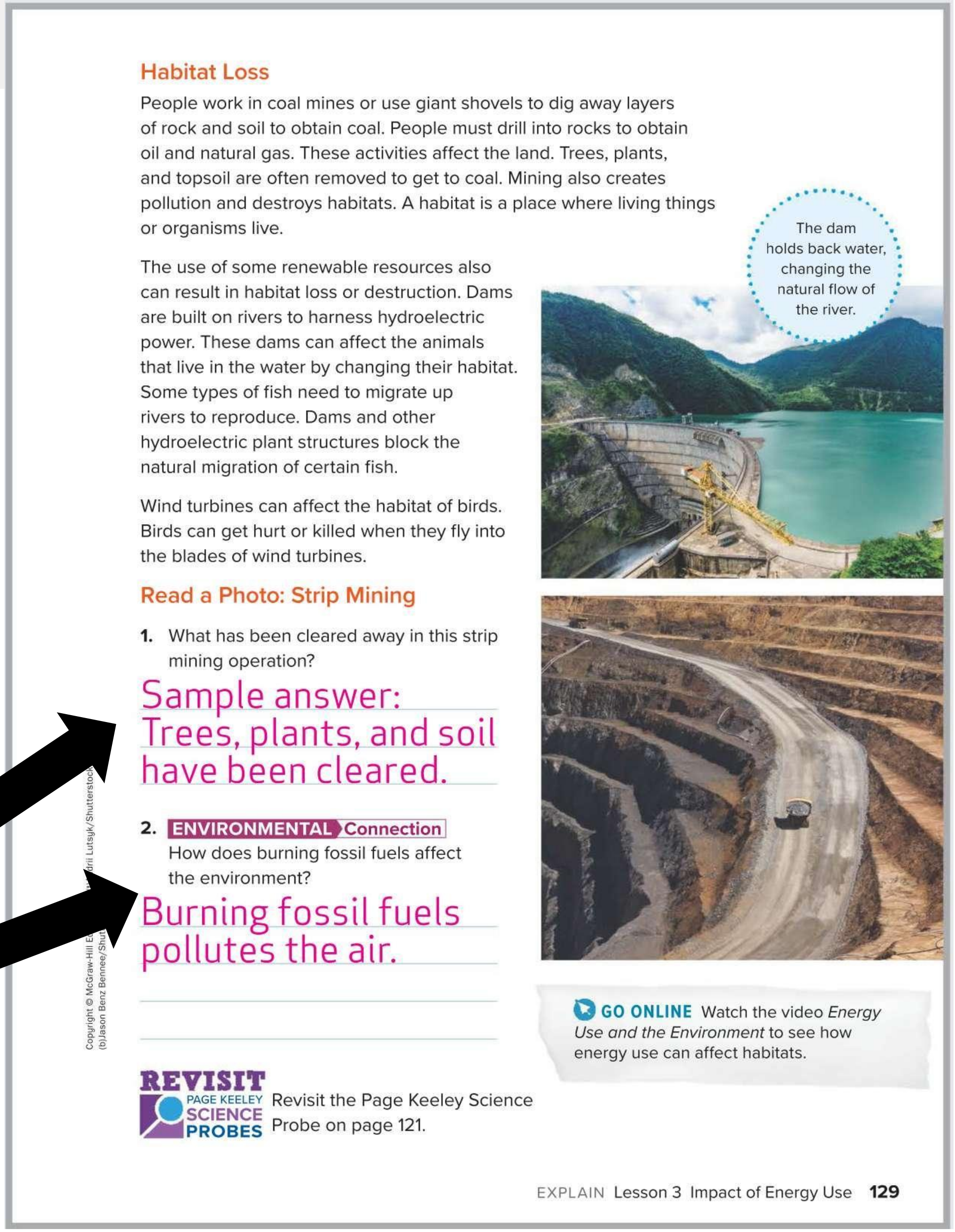
Q 15: Page 129 U2M2L3

- 4-PS3-4: Students will obtain and combine information about the effects of nonrenewable resources on the environment.

Q 15: Page 129 U2M2L3

Key concepts:

- Habitat loss is when animals lose their home
- Which activities lead to habitat loss? Mining for coil, oil, natural gas and by building dams
- Which activity causes disruption to fish? Hydropower builds dams, can disrupt fish migration
- Which activity causes disruption to birds? Wind turbines, can kill birds.
- Practice reading information from the pictures. Read and learn these questions. Make sure you understand the meaning of it.



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VOCABULARY

Look for these words as you read:

chemical energy

nuclear energy

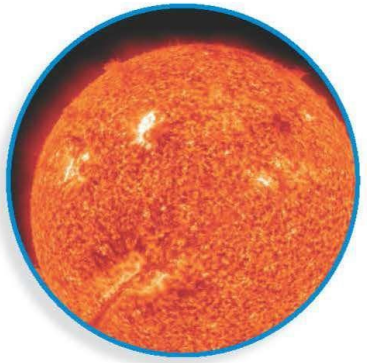
thermal energy

Forms of Energy

Stored energy and energy of motion can take many forms. You just investigated how the stored energy in a balloon transfers and transforms into the energy of motion of a pom-pom. Think about other ways different forms of energy affect your life as you learn about them.

Chemical energy is a type of stored energy or potential energy. **Chemical energy** is potential energy that is released when links between particles, which are tiny parts that make up a material, are broken or created. These links store energy that can be released by a chemical reaction. A chemical reaction is needed to change this stored energy into energy of motion. Burning wood and digesting food are examples of chemical reactions.

Nuclear energy is stored energy that is released when the links between the particles that make up matter are broken. It takes a nuclear reaction to split the particles and release this energy. For example, nuclear reactions in the Sun release nuclear energy.



chemical energy

nuclear energy

Talk About It

Discuss with a partner. Identify and label the type of energy represented by each photo on pages 12–14.

Q 16: Figure Page 12 U2M1L1

4-PS3-2: Students will make observations to explain how different types of energy can be transferred in various ways.

Important points to remember!

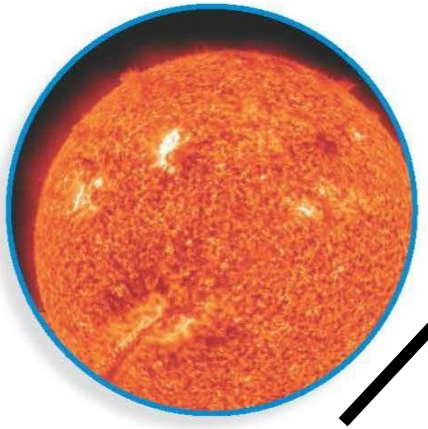
- Chemical and nuclear energy are <u>stored</u> --- <u>potential energy</u>
- Both are stored in links between particles

- released when links are broken or created during <u>chemical reactions</u>

Examples:

- burning wood
- digesting food

chemical energy



nuclear energy

- released when links are broken during <u>nuclear reactions</u>

Examples:

- in the sun
- nuclear power plants

Fossil Fuels

A larger portion of the energy humans use comes from burning fossil fuels. A **fossil fuel** is a source of energy made from the remains of ancient, once-living things. Coal, oil, and natural gas are examples of fossil fuels.

GO ONLINE Watch the video *Using Nonrenewable Resources* to see some examples of nonrenewable resources and how they are used.

Coal, the most plentiful fossil fuel, is found between rock layers. Coal is used mainly to generate electricity. Coal was once used to power the steam engines in locomotives and steamboats.

Crude oil is a thick, black substance that is also called petroleum. People drill into rocks to find oil and pump it to the surface. Oil can be used to produce electricity. It can be turned into gasoline and other types of fuel.

Natural gas can be found where oil is found. It is pumped out of the ground from wells and stored. Natural gas can provide energy for cooking and heating our homes.

2. Underline in the text how we use each type of fossil fuel.

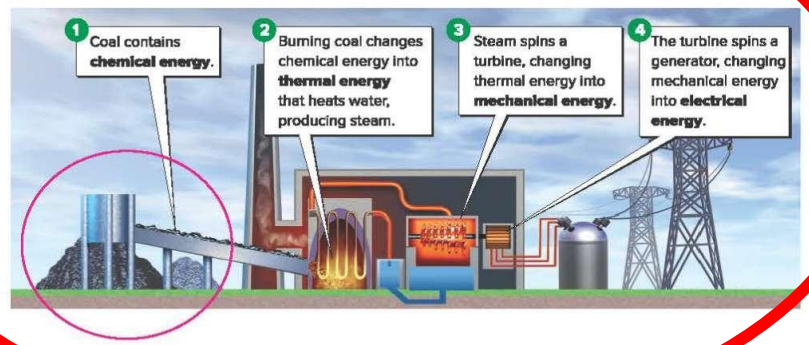
New technologies are being developed for finding and using more old energy sources. However, some believe that the use of fossil fuels and nuclear power may damage the environment. Researchers are also exploring new energy sources. They consider what it costs to obtain and use it, its effect on the environment, and if it is renewable or not.

3. Highlight in the text why there are concerns about using fossil fuels.

Read a Diagram: Power Plant

Circle the nonrenewable resource used to produce electrical energy in the diagram below.

GO ONLINE Explore *The Energy Sequence* to learn more about how coal is used to generate electricity.



Q17: Figure Page 95 U2M2L1

- 4-ESS3-1: Students will obtain and combine information about the source of nonrenewable resources, and how their uses affect humans.

Energy from nonrenewable resources: U2M2L1 page 95

- Figures page 95

Read a Diagram: Power Plant

Circle the nonrenewable resource used to produce electrical energy in the diagram below.

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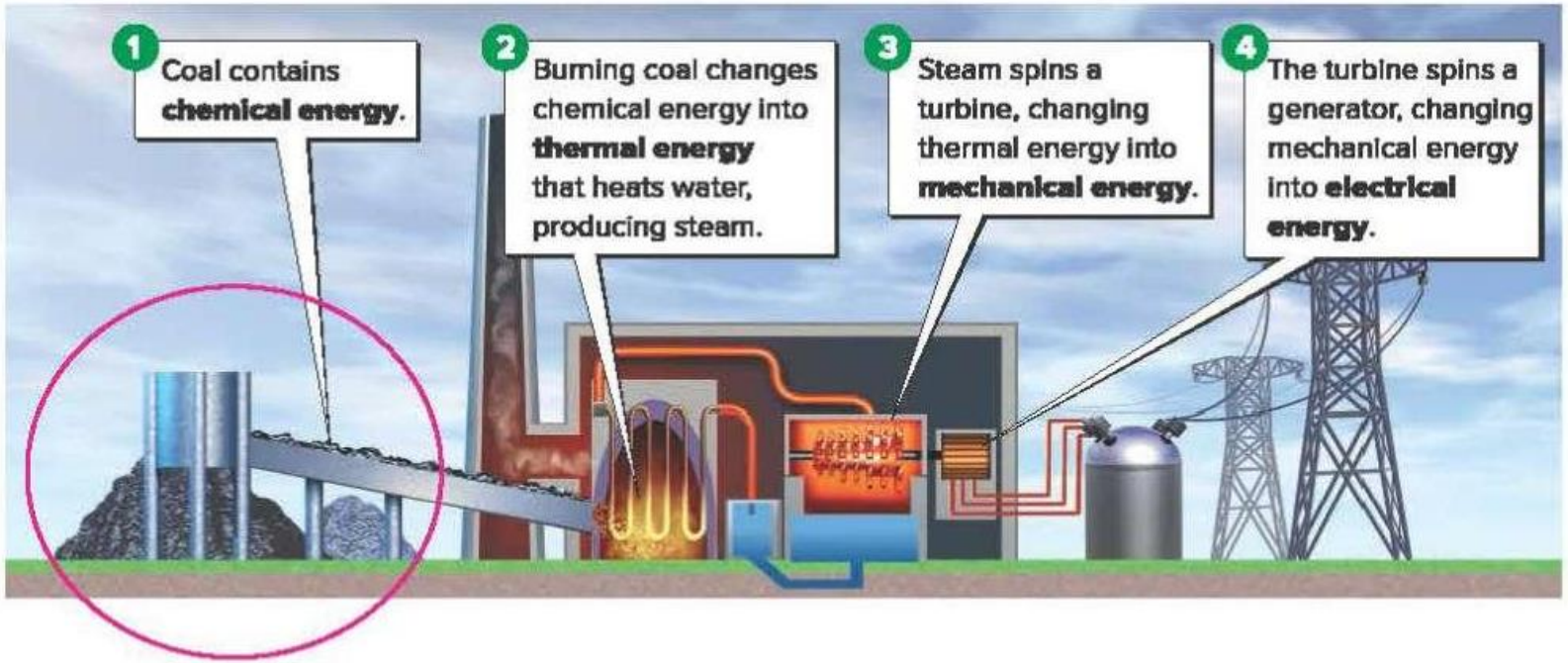

Possible questions page 95

What resource is being removed?

Crude oil

Is this resource renewable or nonrenewable?

nonrenewable

What other fossil fuels do you know of?

Coal and natural gas

What makes a resource nonrenewable?

It is used up faster than it can be replaced

Know how to read a diagram for information:

-Circle the nonrenewable energy resource

-What energy is heating the water? thermal

-What converts the energy to electrical energy?

generator

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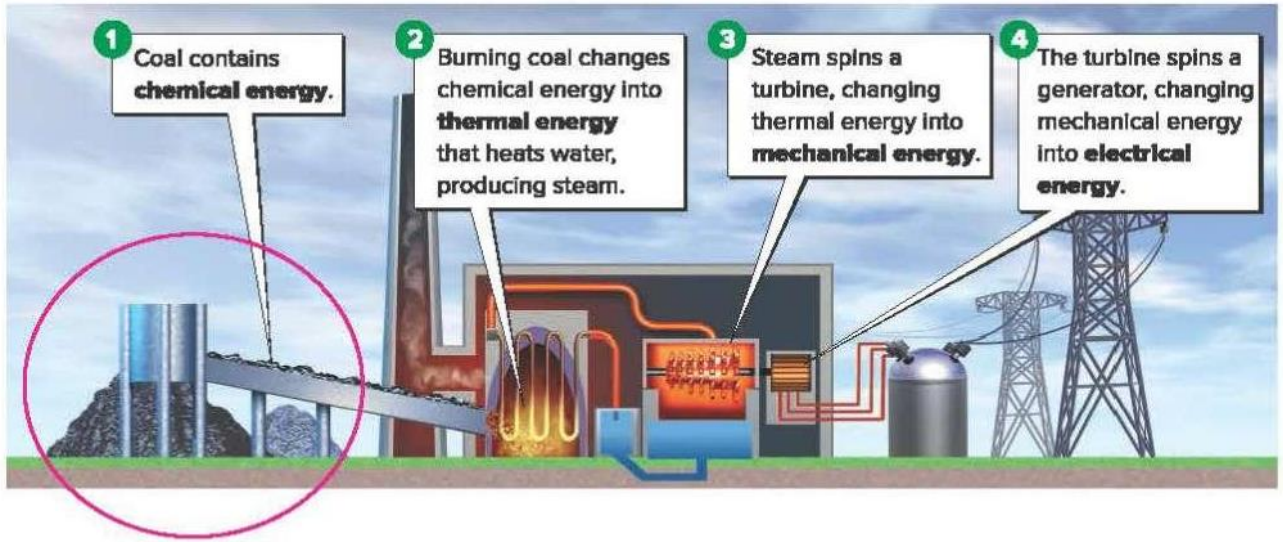
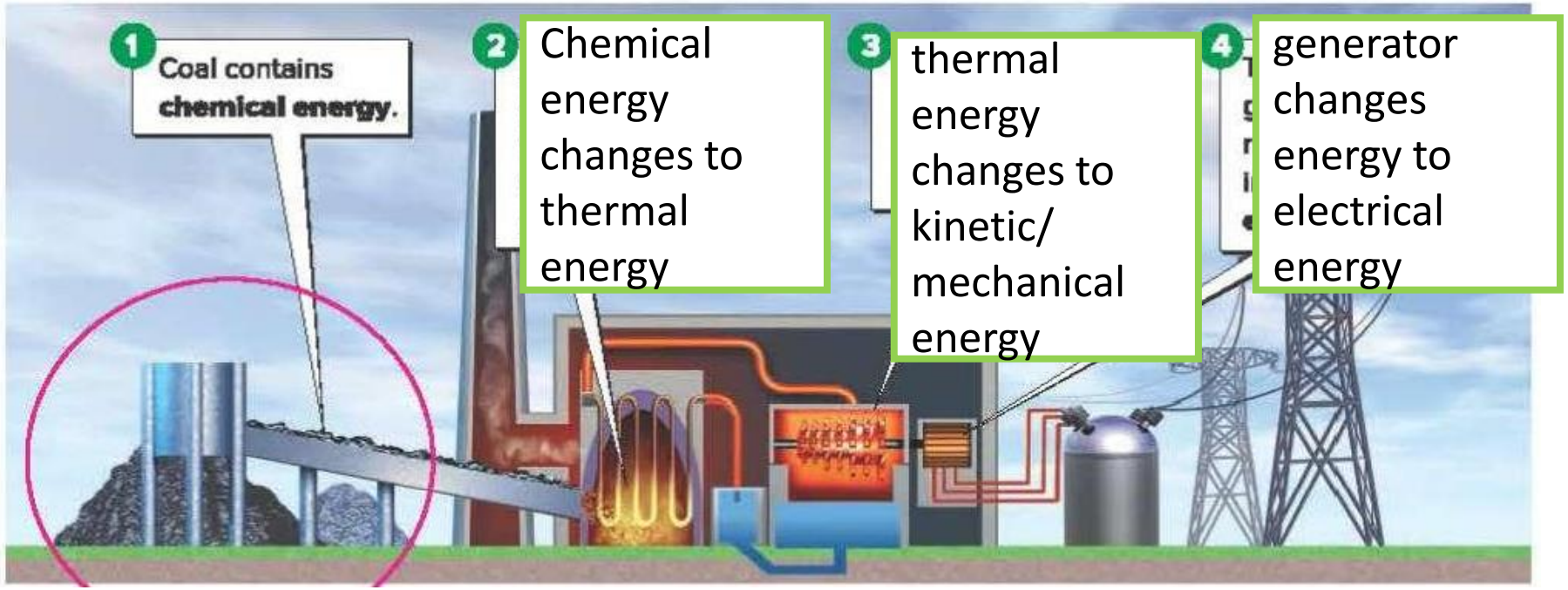
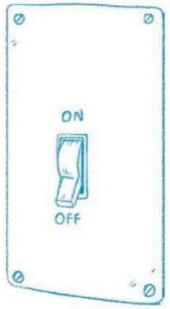


Possible questions page 95

Label the energy transformations that are happening in the picture?



Conservation



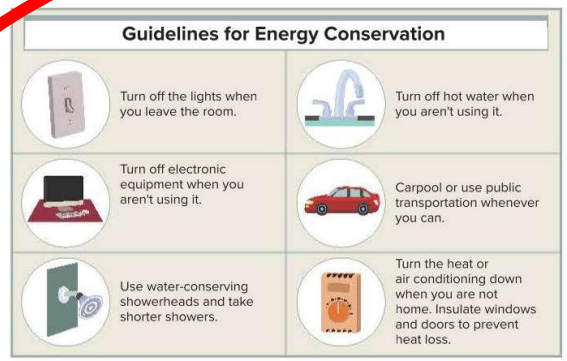
Many resources are being used more quickly than nature can replace them. Some cannot be replaced at all. **Conservation** is the act of saving, protecting, or using resources wisely.

People conserve resources in many ways. Planting trees helps conserve soil. Taking shorter showers helps conserve water. The "three Rs" also guide people in conserving resources. The three Rs are *reduce*, *reuse*, and *recycle*.

Reduce

To reduce means to lessen the amount something is used. Paper is made from material that comes from trees. People can conserve trees by writing or printing on both sides of each sheet of paper. Running many errands at once instead of taking multiple trips helps reduce the amount of fuel used. Installing low-energy lightbulbs instead of standard ones helps reduce electricity used.

1. Read a Diagram Look at the diagram below. What are some ways people can conserve resources?



Sample answer: Turning off lights, taking shorter showers, and turning the heat down are some ways that people can conserve energy.

Q 18: Figure Page 132 U2M2L3

- 4-PS3-4: Students will obtain and combine information about the effects of renewable resources on the environment.

Q 18: Figure Page 132 U2M2L3

1. Read a Diagram Look at the diagram below. What are some ways people can conserve resources?

*Learn the examples in the table

Sample answer: Turning off lights, taking shorter showers, and turning the heat down are some ways that people can conserve energy.

Q 18: Figure Page 132 U2M2L3

Possible questions

What does conservation mean?

The act of saving and using resources wisely.

What are the 3 R's ?

Reduce, Reuse, Recycle

Q 19: Figure Page 70 U2M1L4

- 4-PS3-2: Students will plan and carry out investigations to explain how energy can be transferred by heat.

Thermal Energy Transfers

Thermal energy transfer happens in three different ways:

GO ONLINE Watch the video *Heat Energy* to see conduction, convection, and radiation in action.

Conduction The particles that make up matter are always vibrating. **Conduction** is the transfer of energy between two solid objects that are touching.

Conduction can also occur within the same object. The material itself does not move. The vibrations spread from a warmer object or part of an object to a cooler object or part of an object. On a summer day, when your cool feet touch the hot sand, your feet become warmer through conduction.

Convection Inside a pot of heating water, thermal energy spreads as warm and cool parts of the water move around. **Convection** is the transfer of energy in moving gases or liquids, such as the warm air rising above a heater. Convection is caused by cool parts sinking and pushing warmer parts up into the liquid or gas. As the warm and cool parts move, they cause rotating currents. The currents spread thermal energy throughout the material.

Radiation Earth's surface is warmed by radiation from the Sun. **Radiation** is the energy that comes from a source in the form of waves or particles. As the waves travel from their source, they carry energy from one place to another. Unlike with conduction and convection, radiation does not need a material to transfer energy. Hot objects radiate heat.

Label a Diagram: How Thermal Energy Moves

Use what you learned about conduction, convection, and radiation to label each process on the diagram below.

conduction convection radiation

Possible questions image page 70

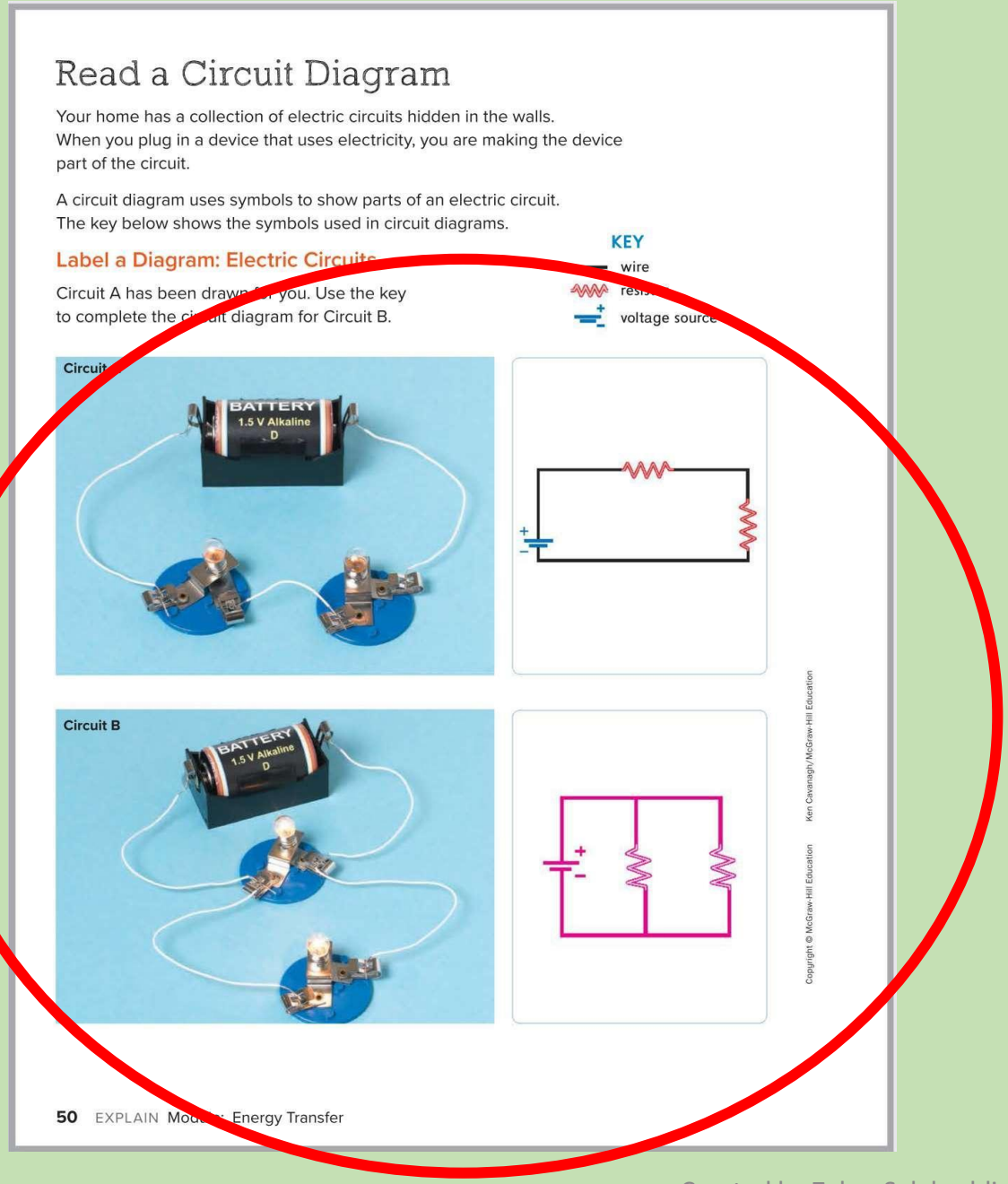
Use what you learned about conduction, convection, and radiation to label each process on the diagram below.

conduction convection radiation

What type of energy is transferred?

Thermal energy

*Learn the pictures and solutions. Remember to look for clues and make sure to spell correctly



Q 20: Figure Page 50
U2M1L3

- 4-PS3-2: Students will use their observations from their investigations to describe how energy is transferred by electric currents.

Electricity: U2M1L3 page 50

Learn this!!!

- Figure page 50

Possible Questions:

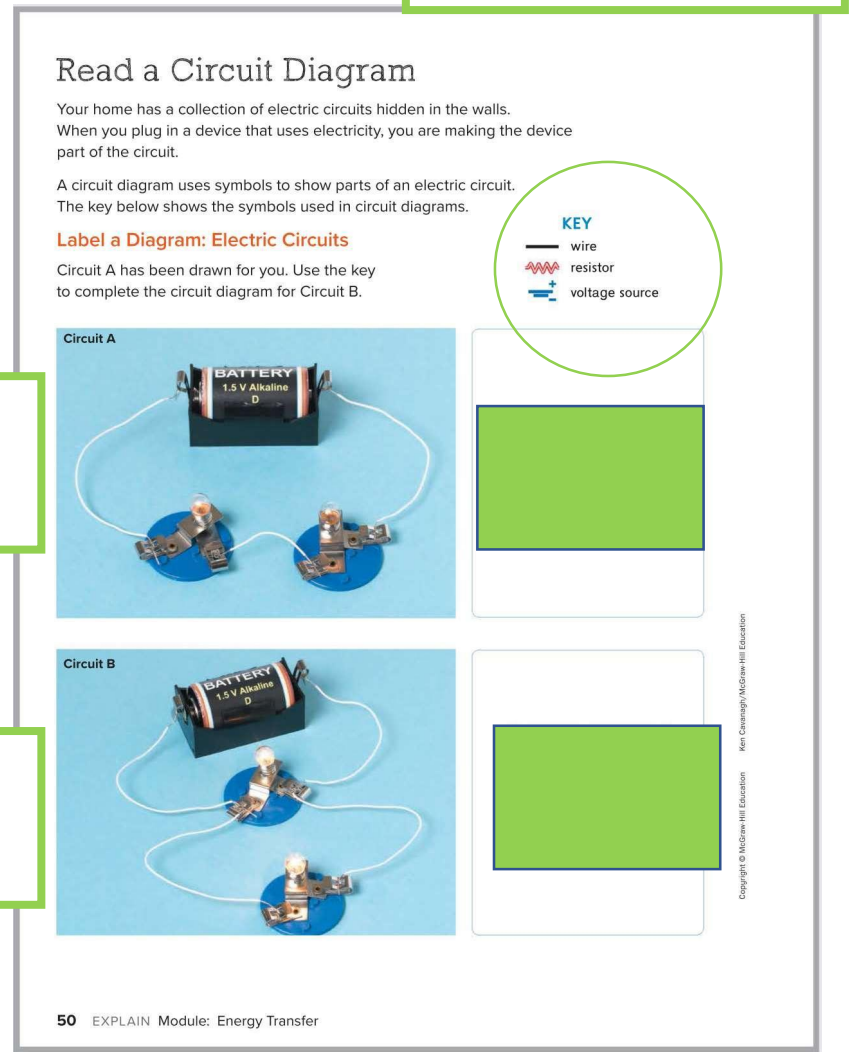
What type of circuit is diagram A and B showing?

What do the symbols represent?

Draw a circuit diagram of A or B

series circuit

parallel circuit



Read a Circuit Diagram

Your home has a collection of electric circuits hidden in the walls. When you plug in a device that uses electricity, you are making the device part of the circuit.

A circuit diagram uses symbols to show parts of an electric circuit. The key below shows the symbols used in circuit diagrams.

KEY
wire
resistor
voltage source

Label a Diagram: Electric Circuits

Circuit A has been drawn for you. Use the key to complete the circuit diagram for Circuit B.

Circuit A

Circuit B

*These are only suggested guides for possible questions. Please study all pages mentioned carefully.
*Questions might appear in a different order in the actual exam, or on the exam paper in the case of G4


GOOD LUCK


You Can Do It!