



SCIENCE:

# GRADE 3—ENERGY



# Energy

## Exploring Energy

### TEKS

- 3 (6) Force, motion, and energy. The student knows that forces cause change and that energy exists in many forms.**

(A) The student is expected to explore different forms of energy, including mechanical, light, sound, and heat/thermal in everyday life.

#### Content Objective

*I can explore different forms of energy and how we use them.*

### Science

#### Science Process Skills

- 3 (2) Scientific investigation and reasoning. The student uses scientific inquiry methods during laboratory and outdoor investigations.**

(B) The student is expected to collect data by observing and measuring using the metric system and recognize differences between observed and measured data.

(F) The student is expected to communicate valid conclusions supported by data in writing, by drawing pictures, and through verbal discussion.

- 3 (4) Scientific investigation and reasoning. The student knows how to use a variety of tools and methods to conduct science inquiry.**

(A) The student is expected to collect, record, and analyze information using tools, including microscopes, cameras, computers, hand lenses, metric rulers, Celsius thermometers, wind vanes, rain gauges, pan balances, graduated cylinders, beakers, spring scales, hot plates, meter sticks, compasses, magnets, collecting nets, notebooks, sound recorders, and Sun, Earth, and Moon system models; timing devices, including clocks and stopwatches; and materials to support observation of habitats of organisms such as terrariums and aquariums.

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## Mathematics

- 3 (11) Measurement.** The student directly compares the attributes of length, area, weight/mass, and capacity, and uses comparative language to solve problems and answer questions. The student selects and uses standard units to describe length, area, capacity/volume, and weight/mass.

(A) The student is expected to use linear measurement tools to estimate and measure lengths using standard units.

- 3 (12) Measurement.** The student reads and writes time and measures temperature in degrees Fahrenheit to solve problems.

(A) The student is expected to use a thermometer to measure temperature.

## English Language Arts and Reading

- 3 (13) Reading/comprehension of informational text/expository text.** Students analyze, make inferences and draw conclusions about expository text and provide evidence from text to support their understanding.

(B) Students are expected to draw conclusions from the facts presented in text and support those assertions with textual evidence.

- 3 (22) Oral and written conventions/conventions.** Students understand the function of and use the conventions of academic language when speaking and writing. Students continue to apply earlier standards with greater complexity.

(B) Students are expected to use the complete subject and the complete predicate in a sentence.

(C) Students are expected to use complete simple and compound sentences with correct subject-verb agreement.

- 3 (29) Listening and speaking/listening.** Students use comprehension skills to listen attentively to others in formal and informal settings. Students continue to apply earlier standards with greater complexity.

(A) Students are expected to listen attentively to speakers, ask relevant questions, and make pertinent comments.

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- 3 (30) Listening and speaking/speaking.** Students speak clearly and to the point, using the conventions of language. Students continue to apply earlier standards with greater complexity. Students are expected to speak coherently about the topic under discussion, employing eye contact, speaking rate, volume, enunciation, and the conventions of language to communicate ideas effectively.
- 3 (31) Listening and speaking/teamwork.** Students work productively with others in teams. Students continue to apply earlier standards with greater complexity. Students are expected to participate in teacher- and student-led discussions by posing and answering questions with appropriate detail and by providing suggestions that build upon the ideas of others.

**Figure 19.**

**Reading/comprehension skills.** Students use a flexible range of metacognitive reading skills in both assigned and independent reading to understand an author's message. Students will continue to apply earlier standards with greater depth in increasingly more complex texts as they become self-directed, critical readers.

(C) The student is expected to monitor and adjust comprehension (e.g., using background knowledge, creating sensory images, re-reading a portion aloud, generating questions).

(D) The student is expected to make inferences about text and use textual evidence to support understanding.

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## English Language Proficiency Standards

3 (D) Cross-curricular second language acquisition/speaking. The student is expected to speak using grade-level content area vocabulary in context to internalize new English words and build academic language proficiency.

4 (G) Cross-curricular second language acquisition/reading. The student is expected to demonstrate comprehension of increasingly complex English by participating in shared reading, retelling or summarizing material, responding to questions, and taking notes commensurate with content area and grade level needs.

### Language Objective

*I can show that I understand English text about different forms of energy.*

## Response to Intervention/Tier 1 Differentiation

All science lessons support students in receiving quality Tier 1 instruction. Using the 5E model, knowledge is taught in a variety of contexts, integrating math, science, and ELA content, thus supporting the active engagement of students with the content. Lesson-specific differentiation strategies for addressing diverse student needs can be found throughout each lesson in sections titled “Differentiation Strategy.”

Differentiation should

- focus on skills students did not understand and extend the lesson for advanced students;
- be conducted in small groups or embedded in whole-group instruction; and
- provide students with a variety of strategies to process the information, such as
  - allowing for additional opportunities for verbal brainstorming of words associated with a topic (with teacher taking dictation);
  - making clear connections of new and more complex concepts to foundational aspects and prior knowledge;
  - participating in more tangible experiences, such as experiments, investigations, and active exploration;
  - sorting academic vocabulary words into categories by common attributes—process words or science content vocabulary;

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- organizing brainstorming into semantic maps or creating graphic organizers;
- discussing the meaning of a graphic organizer with a partner; and
- creating a visual representation to demonstrate understanding.

*See the handout in the Content Resources section that addresses instructional strategies.*

## College and Career Readiness Standards

I.C1 Collaborative and safe working practices. Collaborate on joint projects.

I.E2 Effective communication of scientific information. Use essential vocabulary of the discipline being studied.

II.F1 Scientific measurement. Select and use appropriate Standard International (SI) units and prefixes to express measurements for real world problems.

### Vocabulary Focus

Celsius  
energy  
Fahrenheit  
heat/thermal energy  
light energy  
mechanical energy  
sound energy  
temperature

## Prerequisite Science Knowledge

K (6)(A) The student is expected to use the five senses to explore different forms of energy such as light, heat, and sound.

1 (6)(A) The student is expected to identify and discuss how different forms of energy such as light, heat, and sound are important to everyday life.

2 (6)(A) The student is expected to investigate the effects on an object by increasing or decreasing amounts of light, heat, and sound energy such as how the color of an object appears different in dimmer light or how heat melts butter.



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## 5E Lesson Summary

### Engage

Students identify different forms of energy found in a toy.

### Explore

Students explore different forms of energy exhibited by everyday items using their senses.

### Explain

Students explain different forms of energy and how we use them.

### Elaborate

Students identify forms of energy found in everyday objects and explain why those forms of energy are important.

### Evaluate

Students write an explanation of how they use different forms of energy in their everyday lives.

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## Engage

### Materials

*For student groups*

- mini LED fan or toy

### Teacher Note

The mini LED fan or toy should exhibit light, sound, heat/thermal, and mechanical energy. Before the lesson, provide a brief reminder on how to safely use the fan or toy.

### Content Builder

While answering discussion questions throughout these lessons, instruct students to answer in complete sentences, encouraging students who are answering in short phrases to use increasingly complex sentences. Provide a sentence frame to model appropriate participation in the discussion. For example, when students are asked what they hear and the response is “air,” provide a sentence stem to encourage students to respond, “We hear the air.” To promote the use of complex sentences, provide an additional prompt that requires more information, e.g., “We hear the air moving around the . . .”

### Teacher Instruction

- Instruct students to turn on the mini LED fan or toy.
- Remind students to take turns holding the fan or toy.
- Ask students to describe the different forms of energy they observe.

### Facilitation Questions

- What do you see? *We see the fan blades moving and the lights changing shape or pattern.*
- What do you hear? *We hear the air moving around the fan. We hear the buzzing of the fan as it vibrates.*
- What do you feel? *We feel cooler air in front of the fan or feel the fan vibrating. We feel the fan become warmer the longer it runs.*
- What forms of energy are you observing? *We are observing light, sound, and heat energy.*
- Are there any other forms of energy that you may be observing? *Answers will vary based on students' prior knowledge but may include mechanical or electrical energy.*



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## Explore

### Teacher Note

The abbreviation RM stands for reproducible master. RMs include activity cards with instructions for students to follow or pages on which they can record observations and data.

Several types of hand warmers are available. Make sure to use hand warmers that are safe for children.

### Content Builder

The purpose of using the thermometer is for students to record the increasing temperature of the hand warmer in degrees Celsius ( $^{\circ}\text{C}$ ) and Fahrenheit ( $^{\circ}\text{F}$ ). In science, students will use the metric system because the metric system is a universal language for scientists around the world. However, before young students can function solely in metric, they need to build a frame of reference because they are most likely more familiar with the standard measuring system that we use in the United States. In this activity, students will directly compare temperature in  $^{\circ}\text{C}$  and  $^{\circ}\text{F}$ . For example, by comparing  $23^{\circ}\text{C}$  to  $74^{\circ}\text{F}$ , students will learn that the two temperatures feel the same.

### Advance Preparation

Place the items in a resealable plastic bag for each group.

### Teacher Instruction

- Pass a bag of items to each group.
- Instruct students to remove the items from their bags and to manipulate them to find the form(s) of energy they exhibit.
- Instruct students to use *RM 1: Exploring Energy* to record the different forms of energy shown by each item in their bags.
- Instruct students to activate the hand warmers according to manufacturer instructions. Once the hand warmer is activated, students may lay it flat on a table or desktop.

#### Materials

##### For student groups

- RM 1
- small toys that make sound, such as clappers or rattles
- small toys that light up, such as finger flashlights or glow sticks
- small toys that move, such as windup toys or toy cars
- small disposable hand warmer
- resealable plastic bag
- thermometer that measures both degrees Celsius and Fahrenheit
- metric ruler or meter stick
- timing device

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- Ask students to place a thermometer on top of a hand warmer so that the bulb is touching the hand warmer.
- Instruct students to observe and record on *RM 1* the starting temperature of the hand warmer in degrees Celsius and Fahrenheit.
- Ask students to wait 3–5 minutes before observing and recording on *RM 1* the ending temperature of the hand warmer in degrees Celsius and Fahrenheit.
- Remind students to use the meter stick to measure and record on *RM 1* the distance traveled in centimeters for the windup toy or toy car.
- Remind students to describe the form(s) of energy shown by each item on *RM 1*.

## Facilitation Questions

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- What form or forms of energy do the clappers and rattles produce? How do you know? *We could hear them make noise, so they produce sound energy.*
- How might we use clappers or rattles in our everyday lives? *Clappers or rattles might be used to make music or to cheer for a sports team.*
- What form or forms of energy do the flashlights or glow sticks have? How do you know? *We could see light coming from them, so they have light energy. Some flashlights may heat up if left lit long enough, which means they also give off heat/thermal energy.*
- How might we use flashlights or glow sticks in our everyday lives? *Flashlights or glow sticks might be used to see in a dark room or outside at night.*
- What form or forms of energy do the hand warmers produce? How do you know? *We felt the hand warmers become warmer the longer we held them, so they have heat/thermal energy. We also saw the temperature increase on the thermometer.*
- Why did you measure the temperature of the hand warmer in degrees Celsius and Fahrenheit? *We measured in degrees Celsius because scientists around the world use the metric system to communicate with each other. We measured in degrees Fahrenheit because we use the standard measuring system in the United States.*



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*States. Understanding degrees Fahrenheit helps us understand how hot or cold degrees Celsius feel.*

- What was the starting temperature of the hand warmer in degrees Celsius? Fahrenheit? *Answers will vary and may be around 22 °C and 72 °F.*
- What was the warmest temperature of the hand warmer in degrees Celsius? Fahrenheit? *Answers will vary and may be as high as 42 °C and 108 °F.*
- How might we use hand warmers in our everyday lives? *Hand warmers might be used to keep our hands or feet warm in cold weather.*
- What form or forms of energy do the windup toys or toy cars have? *We could hear them make noise, so they have sound energy. Some of these toys may light up, which means they have light energy. If left moving long enough, some of the toys may heat up, which means they also have heat/thermal energy.*
- What did you use to measure how far the windup toys or toy cars traveled? What was your measurement? *We used a meter stick to measure how far the windup toys or toy cars traveled. They traveled about \_\_\_\_ centimeters.*
- How might we use windup toys or toy cars in our everyday lives? *Windup toys or toy cars might be used to play games.*
- Are there any other forms of energy that the items in the bags may have? Why do you think so? *Answers will vary based on students' prior knowledge.*
- What other everyday objects have heat/thermal energy? Light energy? Sound Energy? *Answers will vary.*

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## Explain

### Materials

For teacher

- *Energy Made Easy by the Energetics book*

### Teacher Instruction

- Read and discuss *Energy Made Easy by the Energetics*.

### Facilitation Questions

- What forms of energy were defined? *Light, sound, heat/thermal, and mechanical energy were defined.*
- What is light energy? *Light energy is shown by anything that lights up. Light can travel through space.*
- What are some examples of things that have light energy? *The Sun, flashlights, and lamps have light energy.*
- What is sound energy? *Sound energy is made by vibrations. Sound needs to travel through matter and can move through solids, liquids, and gases. Sound cannot travel through outer space because matter does not exist there.*
- What are some examples of things that have sound energy? *Musical instruments, timing devices, basketballs bouncing on a court, or other things that make noise have sound energy.*
- What is heat/thermal energy? *Thermal energy is the result of the movement of tiny particles in solids, liquids, and gases. Heat energy is the energy transferred from a hotter object to a colder object.*
- How might you model the way particles move as they heat up or cool down? *When I get hot, I do not want to be close to other people. When I get cold, I want to bundle up in a blanket and sit close to other people.*
- How can you remember that thermal energy means heat energy? *The word thermal means "heat." Thermometers measure temperature. A Thermos® keeps things warm or heated, and thermal underwear helps keep people warm.*
- What are some examples of things that have heat/thermal energy? *The Sun and an oven that is baking cookies have heat/thermal energy. People have heat/thermal energy, too.*

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- What is mechanical energy? *Mechanical energy is the energy of motion. If an object is moving, it has mechanical energy.*
- What are some examples of things that have mechanical energy? *A bicycle, a windup toy, and a merry-go-round have mechanical energy.*
- Did the mini LED fan or toy used in Engage have mechanical energy? How do you know? *Yes, the mini LED fan or toy had mechanical energy because it had moving parts.*
- Did any of the items in the bag from Explore have mechanical energy? How do you know? *Yes, the clapper or rattle and windup toy or toy car had mechanical energy because they either moved or had moving parts.*

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## Elaborate

### Materials

#### For teacher

- RM 2

#### For student groups

- 1 card from RM 2
- RM 3



Use a video-enabled device for students to create a vodcast to share discoveries of forms of energy around the school.

### Teacher Note

It might be helpful to bring a toaster to class if you have students who are not familiar with a toaster or how it works.

### Advance Preparation

Print *RM 2: Forms of Energy* on cardstock, laminate, and cut apart cards.

### Teacher Instruction

- Pass one card to each student group.
- Instruct student groups to identify the object on their cards and to discuss the following:
  - How is the object used in everyday life?
  - What forms of energy does the object have?
  - What would happen if a form of energy were missing from the object?
- Debrief as a class once all the groups have completed the activity.
- Allow each group to share their object, its daily use, its forms of energy, and what would happen if a form of energy were missing.

### Differentiation Strategies

ELL: Use the Think-Pair-Share strategy. Give two students the same card. Instruct students to think of answers to the questions independently, share their answers with a partner, and then share with the class.


G/T: Instruct students to create their own cards and then trade the cards with a classmate.

### Facilitation Questions

- How is a toaster used in everyday life? *A toaster is used to toast bread, bagels, or frozen waffles.*

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- What forms of energy does a toaster have? How do you know?  
*A toaster shows light energy in the coils that turn red inside the toaster. Some toasters have lights that turn red if they are off and green if they are on.*  
  
*When you push the button down to drop the bread into the toaster and when the toasted bread pops up, you can hear the toaster, which means it has sound energy.*  
  
*The toast that comes out of the toaster is hot, which means the toaster has heat/thermal energy.*  
  
*The basket that holds the bread moves up and down, which means the toaster has parts that have mechanical energy.*
- What would happen if a toaster did not have heat/thermal energy? *If a toaster did not have heat/thermal energy, it would not toast bread, bagels, or frozen waffles. A person might not want to eat untoasted food.*
- What is a television used for in everyday life? *A television is used to watch the news or movies.*
- What forms of energy does a television have? How do you know?  
*When a television is on, the screen has light energy. When it is nighttime and the room is dark, you can turn on the television to have a little light.*  
  
*A television produces sound that can be turned up or down. This means it has sound energy.*  
  
*A television becomes warm after being on for a period of time, which means it has heat/thermal energy.*
- What would happen if a television did not have sound energy? *If a television did not have sound energy, a person would not be able to hear it.*
- What is a cell phone used for in everyday life? *A cell phone is used to communicate with other people, to play games, and to find information on the Internet.*
- What forms of energy does a cell phone have? How do you know?  
*A cell phone lights up when someone calls or when it is unlocked, which means it has light energy. Some cell phones can also act as flashlights.*



Visit [www.socrative.com](http://www.socrative.com) to use as a formative assessment tool.



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*A cell phone rings, beeps, vibrates, or plays music, which means it has sound energy.*

*A cell phone can become warm if it is used for a long period of time, which means it has heat/thermal energy.*

*A cell phone can vibrate, which means it has mechanical energy.*

- What would happen if a cell phone did not have light energy? *If a cell phone did not have light energy, it would be impossible to see what was on the screen, especially at night or in a dark room. If a person cannot see the numbers or keys clearly, he or she might incorrectly dial a phone number.*
- What is a ceiling fan used for in everyday life? *A ceiling fan is used to move air and to make the temperature in a room cooler.*
- What forms of energy does a ceiling fan have? How do you know? *Some ceiling fans have a light, which means some ceiling fans have light energy.*

*Some ceiling fans hum or make noise when they are on, which means they have sound energy.*

*Some ceiling fans may become warm if left running for a period of time, which means they have heat/thermal energy. A ceiling fan has moving parts, which means it has mechanical energy.*

- What would happen if a ceiling fan did not have mechanical energy? *If a ceiling fan did not have mechanical energy, the fan would not spin. If the fan did not spin, the fan could not make the temperature in a room feel cooler.*
- What is a lawn mower used for in everyday life? *A lawn mower is used to cut grass.*
- What forms of energy does a lawn mower have? How do you know? *Some lawn mowers may have a light or headlights that turn on when the mower is running, which means the lawn mower would have light energy.*

*A lawn mower engine hums when it is on, which means the mower has sound energy.*

*A lawn mower engine becomes warm after it has been running for a period of time, which means it has heat/thermal energy. A lawn mower has moving blades, which means it has mechanical energy.*





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- What would happen if a lawn mower did not have mechanical energy? *If a lawn mower did not have mechanical energy, it would be hard to push or pull, and the blades would not move. The grass would continue to grow taller.*
- What is a car used for in everyday life? *A car is used to move people or things from place to place.*
- What forms of energy does a car have? How do you know? *A car has headlights, taillights, and interior lights, which means it has light energy.*

*A car has an engine that hums and a horn that honks, which means it has sound energy.*

*A car engine becomes warm after running for a period of time, so it has heat/thermal energy.*

*A car moves, which means it has mechanical energy.*

- What would happen if a car did not have mechanical energy? *If a car did not have mechanical energy, it would not be able to move. If a car could not move, it would not be able to take people anywhere.*

## Science Notebook Entry

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- Post the following science notebook entry prompt for students to read.
  - Look around you. What forms of energy can you see, hear, and feel? How do you use those forms of energy? What would you do without energy?
- Instruct students to copy the prompt into their science notebooks and to answer the questions.

# Energy

## Evaluate

### Materials

For each student

- RM 4

### Differentiation Strategies

ELL: The sentence stems on *RM 4: Exploring Energy Assessment* provide guided support.

G/T: Turn the sentence stems on *RM 4* into open-ended questions for students to answer.

### Teacher Instruction

- Instruct students to complete the assessment using their knowledge of forms of energy in their everyday lives.

### RM 4 Answer Key

Answers will vary based on students' individual life experiences. For example, an answer may resemble the following:

- I experience heat energy every day when I take a hot shower.
- Sound energy is important to me because I use it every day to wake up.
- If I did not have light energy, I could not see if my clothes matched.





# Grade 3

## RM 1: Exploring Energy

### Instructions

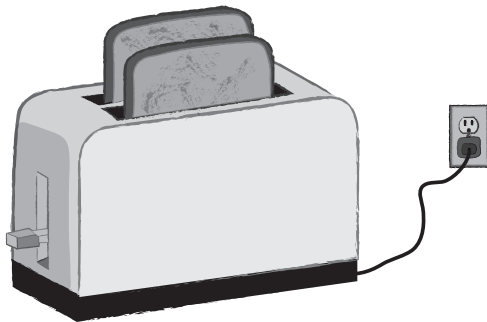
- Observe the objects in your bag.
- What form(s) of energy does each object show?
- Do any of the objects light up, make noise, produce heat, or move?
- Draw and label a picture of each object and record your observations.
- Use the thermometer to measure the starting and ending temperatures of the hand warmer in degrees Celsius and Fahrenheit.
- Use the meter stick to measure the distance traveled in centimeters for the windup toy or toy car.

Object	Form(s) of Energy	Observations									
hand warmer		<table><tr><td>Temperature</td><td>°C</td><td>°F</td></tr><tr><td>Starting</td><td></td><td></td></tr><tr><td>Ending</td><td></td><td></td></tr></table>	Temperature	°C	°F	Starting			Ending		
Temperature	°C	°F									
Starting											
Ending											
windup toy or toy car		Distance traveled: _____ cm									

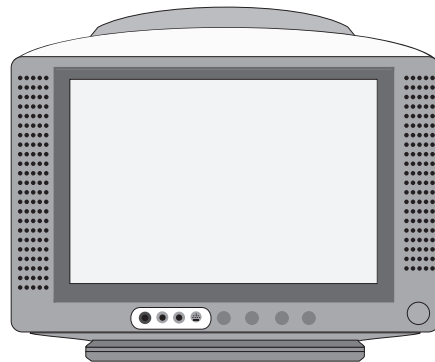


# Grade 3

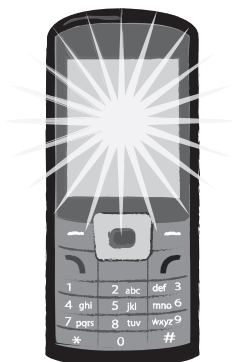
## RM 2: Forms of Energy



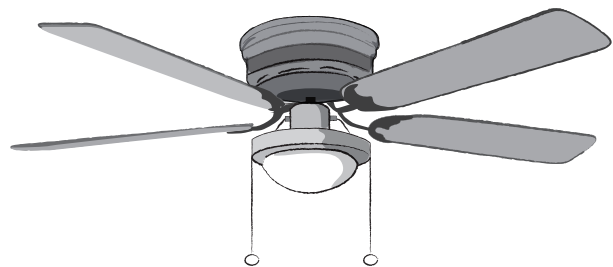
toaster



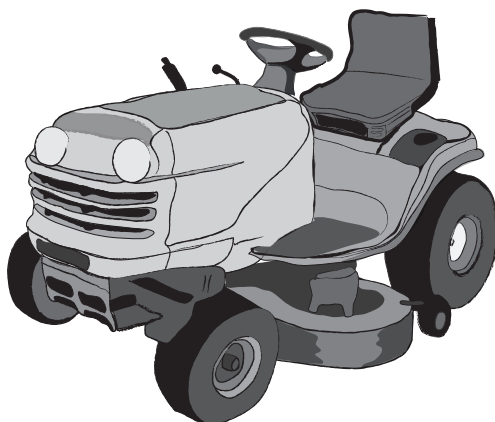
television



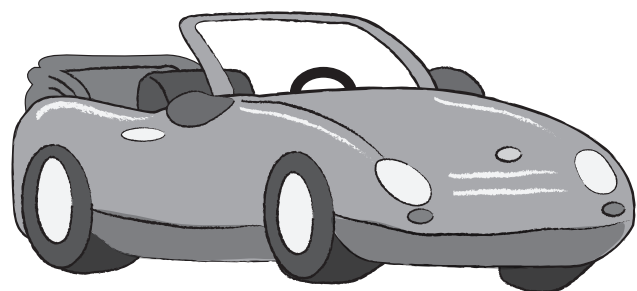
cell phone



ceiling fan



lawn mower



car





# Grade 3

## RM 3: Energy All-in-One

### Instructions

- Observe the object on the card.
- Record the name of the object in the table.
- Place an X in the box next to the form or forms of energy your object has.
- Discuss the questions below and record your responses.

Object:				
Forms of Energy	Light	Sound	Heat/Thermal	Mechanical
What forms of energy does the object have? How do you know?				
How is the object used in everyday life?				
What would happen if a form of energy were missing from the object?				



# Grade 3

## RM 4: Exploring Energy Assessment

Describe how you experience light, sound, heat/thermal, and mechanical energy every day.

1. I experience \_\_\_\_\_ energy every day when I \_\_\_\_\_

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2. \_\_\_\_\_ energy is important to me because I use it every day to

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3. If I did not have \_\_\_\_\_ energy, I could not \_\_\_\_\_

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# NOTES

[illegible]

