Exploring Electricity and Energy

Teacher Pack

TeacherVision

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Materials Needed for the Projects in this Unit

Electric Spaghetti, Please Extension Activity (Optional)

String

Building an Electrical Circuit Extension Activity (Optional)

- Energizer® Power Bank (available at Amazon or Walmart)
- Spring-tension wood or plastic clothespin
- 22 AWG insulated copper bell wire (available at most hardware stores)
- Small block of wood
- Nail, thumbtacks, and paper clip
- 3-volt flashlight bulb

Design a Charger

Each group will need:

- Pipe cleaners
- Construction paper
- Cardboard
- Straws
- Art supplies, like markers, colored pencils, and crayons

Books About Energy and Electricity

Note for the Teacher: Gather as many books as you can about energy and electricity.

Suggested Books:

Charged Up: The Story of Electricity by Jacqui Bailey and Matthew Lilly

DK Eyewitness Books: Energy by Dan Green

DKfindout! Energy by Emily Dodd

Electricity by Hugh Westrup

Energy by Suzanne Barchers

Energy: Heat, Light, and Fuel by Darlene Ruth Stille and Sheree Boyd

Energy Makes Things Happen by Kimberly Bradley and Paul Meisel

Energy: Physical Science for Kids by Andy Diehn and Hui Li

Harvesting Solar, Wind, and Tidal Power by Baby Professor

How Does My Home Work? by Chris Butterworth and Lucia Gaggiotti

Shocking: Where Does Electricity Come From? by Bobo's Little Brainiacs Books

The Big Book of Invisible Technology: A Look at How Things Work for Kids by Chloe Taylor

The Magic School Bus and the Electric Field Trip by Joanna Cole and Bruce Degan

Powering the Planet *Answer Key*

Teacher Notes: Show your students the virtual field trip "Powering the Planet". Have them answer the questions as they watch. You might want to pause the video as the questions are answered to give them a chance to record their responses. Use the sample answers to discuss energy use.

1. What are two ways you use energy every day?

to power my television *to power flashlights*

2. What are two renewable energy resources?

wind *sun*

3. Answer the question from the video: How do we get energy?

Sample answers: We get energy from gas, coal, and oil. We get energy from our food.

4. How do they use renewable energy on the Palmyra Atoll?

They installed solar panels and used renewable energy from the sun. They use a wind turbine to make electricity. They had to make a special design to keep the birds safe.

5. How do they use renewable energy in the Mojave Desert?

They capture the energy from the sun with solar panels and they concentrate solar power by using mirrors that reflect sunlight onto a solar tower.

6. Answer the question from the video: What items in your home or school use energy?

Sample answers: Computers and microwaves use energy.

7. Why is it important to use more renewable resources to create energy?

Renewable resources will never run out. If we keep using nonrenewable resources, there won't be any left for future generations. It's also important because renewable sources of energy are better for the environment.

A Time Without Power Sample Story

Teacher Notes: Use this story or a story from your own personal experience to have your students imagine a time without power when they would need a cell phone.

I was sitting in the living room watching TV as I noticed the sky outside getting darker and darker. I could hear the rumble of thunder in the distance, and I saw streaks of lightning in the sky. My mom was in the kitchen making dinner. She had just put the chicken in the oven.

Suddenly, rain started pouring from the sky. I could hear it pounding on the roof, and the thunder sounded like it was going to break down the walls of the house. There was a bright streak of lightning, and then everything went dark. "Mom," I called in a panicked voice. "What happened?"

"We lost power," she said. "Let me find some candles to light so we can see."

I could hear her moving things around in a drawer until she found a candle and a pack of matches. She lit a match and used it to light the candle. It illuminated the kitchen. I was still a little bit scared, but I was starting to feel better.

"Well, I guess my chicken isn't going to cook," said Mom. "The oven doesn't work without power. I'm starving. Let's call for some pizza." Mom grabbed her cell phone and tried to turn it on. "Uh oh!" she exclaimed. The battery is dead, and I don't have a way to charge it. I guess we're eating cheese and crackers for now."

Mom grabbed a box of cheese from the pantry and some slices of cheese from the refrigerator. "I hope the power comes back on soon, so the food in the refrigerator doesn't go bad," she said.

Mom carried the snacks and the candle into the living room. "I guess I'm going to miss the end of my show," I said sadly. "Can we play a game while we wait for the power to come back on?"

"Sure," said Mom. She picked up the UNO cards and started shuffling them. As she dealt the cards, I noticed that the sky was starting to get brighter again. The sound of the thunder was quiet as the storm moved away from our house. Suddenly, I heard a click, and everything turned back on - the lights, the TV, and the oven. Mom and I cheered excitedly. The power had only been off for 30 minutes, but it felt like an eternity.

"Can you please charge your cell phone so we can order that pizza now? The chicken will take a long time to cook, and I'm still really hungry," I said. We finished our game of UNO while we waited for our pizza to be delivered.

Energy Video *Answer Key*

Teacher Notes: Show the students the "Energy" video. Go over the answers together when the video is over.

What is energy? *Energy is the ability to do work.*

What are two ways that your body gets energy? *Your body gets energy from the food you eat and from the sun.*

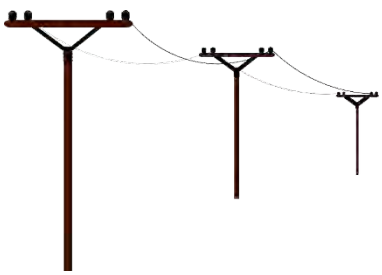
What is the difference between kinetic and potential energy? *Kinetic energy is energy in motion. Potential energy is the energy stored inside an object.*

Energy can neither be *destroyed* **nor** *created* **, but it can** *transform* **from one form of** *energy* **to another.**

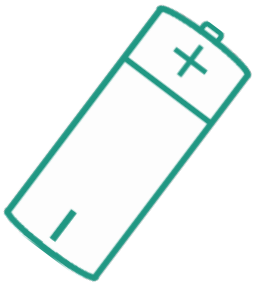
Directions: Work with your teacher to fill in the blanks.

Electric **energy is important to our everyday life and can be converted into many useful forms of energy, such as** *thermal* **energy, or heat.**

Electric energy can be stored in *batteries* **as chemical energy, and then used at a later time.**



Types of Energy *Answer Key*



Teacher Notes: Show the students the "Types of Energy for Kids" video. Discuss the answers together when the video is over.

1. What are three renewable sources of energy?

wind *the sun* *sea waves*

2. What are the advantages of using renewable energy?

Renewable energy sources are environmentally friendly. They are limitless because they come from natural resources that don't run out. They are safer for our health.

3. What are the disadvantages of renewable energy sources?

The sources of renewable energy vary by location and aren't found everywhere. They are randomly obtained because we can't predict the amount of rainfall or wind.

4. What are four nonrenewable sources of energy?

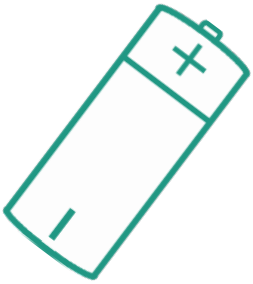
oil *coal*

natural gas *nuclear power*

5. What are the disadvantages of nonrenewable energy sources?

They are not good for the environment. They release contaminated gases into the air. Nuclear energy has radioactive residue. Accidents can cause environmental catastrophes.

Inside a Battery *Answer Key*



Directions: Read the information about batteries. Color the battery according to the color key. Then, fill in the blanks.

The batteries used in flashlights are called dry cells. Dry cells also run most battery-powered toys.

Dry cells work because of a chemical reaction. Zinc has more electrons than carbon. When you use a battery, electrons move from zinc to carbon. The electrons move through your lightbulb or toy and make it work. This is the flow of electricity.

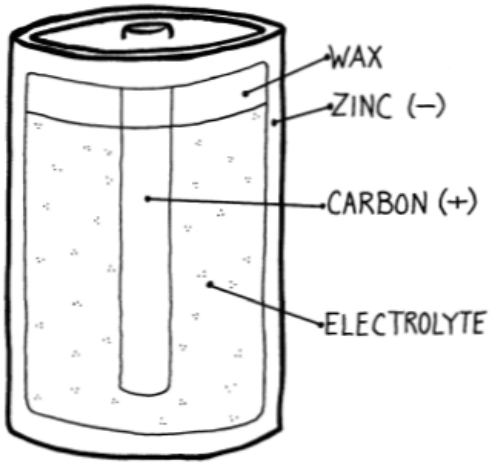
Color:

Carbon – black

Zinc – blue

Electrolyte – red

Wax – yellow



1. A dry cell works because of a *chemical* **reaction inside.**

2. Electrons move from *zinc* **to** *carbon* **.**

3. Name two things that use dry cell batteries.

flashlights *battery-powered toys*

Name ..... Date .....

Electricity and Energy Quick Quiz

Directions: Read each question. Circle the best answer. Use information from your phone charger project to complete the sentences.

1. How does a dry cell battery work?

A Wind moves through the battery from north to south and creates electricity.

B Electrons move from zinc to carbon creating electricity through a chemical reaction.

C There is water inside the battery, and the hydrogen and oxygen react to form electricity.

D Coal burns inside the battery to create electricity.

Two things that are run by batteries are ..... and

..... .

2. Which of these is a result of losing power?

A You won't have running water.

B Your flashlight won't work.

C You won't be able to play ball.

D Your refrigerator won't keep food cold.

The phone charger I designed will still work if the power goes out because .....

..... .

3. Which of these is a type of renewable energy?

A Oil

B Wind

C Batteries

D Coal

We should try to use more renewable energy sources because .....

..... .

Electricity and Energy Quick Quiz
Answer Key

Directions: Read each question. Circle the best answer. Use information from your phone charger project to complete the sentences.

1. **How does a dry cell battery work?**

   A Wind moves through the battery from north to south and creates electricity.

   B *Electrons move from zinc to carbon creating electricity through a chemical reaction.*

   C There is water inside the battery, and the hydrogen and oxygen react to form electricity.

   D Coal burns inside the battery to create electricity.

   Two things that are run by batteries are *Answers will vary.*

2. **Which of these is a result of losing power?**

   A You won't have running water.

   B Your flashlight won't work.

   C You won't be able to play ball.

   D *Your refrigerator won't keep food cold.*

   The phone charger I designed will still work if the power goes out because *Answers will vary.*

3. **Which of these is a type of renewable energy?**

   A Oil

   B *Wind*

   C Batteries

   D Coal

   We should try to use more renewable energy sources because *renewable energy sources are better for the environment, and they will never run out.*

Name ..... Date .....

Electricity and Energy Summative Assessment

PART A

Directions: There are two types of energy, renewable energy and nonrenewable energy. Read each word below and put "R" on the line if it is an example of renewable energy and "N" on the line if it is an example of nonrenewable energy.

.....	Water	.....	Solar	.....	Natural Gas
.....	Geothermal	.....	Coal	.....	Wind
.....	Oil	.....	Biomass	.....	Nuclear

PART B

Directions: Answer these questions using complete sentences.

Choose one of the types of energy from Part A. Explain how that type of energy is transferred to electrical energy. Name something it can be used to power.

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Which type of energy should we try to use more of: renewable or nonrenewable? Why?

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Electricity and Energy Summative Assessment

Answer Key

PART A

Directions: There are two types of energy, renewable energy and nonrenewable energy. Read each word below and put "R" on the line if it is an example of renewable energy and "N" on the line if it is an example of nonrenewable energy.

R	Water	R	Solar	N	Natural Gas
R	Geothermal	N	Coal	R	Wind
N	Oil	R	Biomass	N	Nuclear

PART B

Directions: Answer these questions using complete sentences.

Choose one of the types of energy from Part A. Explain how that type of energy is transferred to electrical energy. Name something it can be used to power.

Answers will vary.

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Which type of energy should we try to use more of: renewable or nonrenewable? Why?

We should try to use more renewable energy because we will never run out of renewable sources of energy, like the sun and wind. Renewable energy sources are also better for the environment and help us protect the planet.

Name ..... Date .....

Electricity and Energy Project Rubric

	4	3	2	1
Project Planning	The "Crazy Chargers" portion of the project lists five accurate ways cell phones can be charged without electricity. The "Invent a Charger" section includes well thought-out plans and materials for the phone charger.	The "Crazy Chargers" portion of the project has 4 accurate ways cell phones can be charged without electricity. The "Invent a Charger" section includes plans and materials for the phone charger.	The "Crazy Chargers" portion of the project has 2 or 3 accurate ways cell phones can be charged without electricity. The "Invent a Charger" section is missing the plans or materials.	The "Crazy Chargers" portion of the project has 0 or 1 accurate ways cell phones can be charged without electricity. The "Invent a Charger" section is missing the plans and materials.
Project Design	The students used the provided materials to create a detailed model of the phone charger. They used labels to name all of the materials that were used.	The students used the provided materials to create a model of the phone charger. One or two parts are missing labels.	The students used the provided materials to create a model of the phone charger, but there are no labels.	The students did not use the provided materials to create a model of the phone charger. There are no labels.
Project Presentation	The students clearly explained how the phone charger works in detail. They described the materials that are needed to make it.	The students explained how the phone charger works and named the materials that are needed to make it.	The students explained how the phone charger works, but it was confusing. They named the materials that are needed to make it.	The students didn't explain how the phone charger works or the materials that are needed to make it.
Reflection	All three answers in the "Invention Reflection" portion of the project are complete and accurate.	Two of the answers in the "Invention Reflection" portion of the project are complete and accurate.	One of the answers in the "Invention Reflection" portion of the project is complete and accurate.	None of the answers in the "Invention Reflection" portion of the project are complete and accurate.

Teacher's comments: .....

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