Energy Transfer

Differentiated Passages

LEXILE

Lightning Questions

1. Fill in the chart to show the steps lightning takes from the sky to the ground.

Negative charges build up in clouds.	→	A positively	

2. Read the claim below. Ther
claim.

Lightning is dangerc

3. The article says scientists hav
the time of Benjamin Franklin.

790L

Name: _____ Date: _____

Lightning

Lightning is electrical energy released from the Earth's atmosphere. Dr
and ice inside clouds have positive and negative charges. Sometimes negative
in a cloud. The ground beneath the cloud becomes positively charged to bala
charges. Opposite charges attract one another. The negative charges in the
connect with the positive charges on the ground.

Lightning

A negatively-char
current is released once the cloud's negative charge overpowers the air. A positively-charged current from the ground jumps up to meet the negative one. A bright flash happens when the two currents touch. This creates lightning. The process continues until all the negative charges in the cloud have been used. Thunder follows lightning because the lightning heats the gases in the air. This causes the gases to expand. The result is a loud boom.

Lightning striking the ground can create a glassy rock made of fused dirt and clay called **fulgurite**. The grass along the path of the strike is also damaged. Lightning can also travel down a tree trunk. This turns the water in the tree into steam. The steam expands. Pieces of bark and branches break off the tree. The wood in the path of the bolt is killed. The energy carried by the lightning then flows into Earth's surface. It spreads out until it loses its charge. Lightning can travel farther through some materials such as water and metal. It can reach houses through wiring or plumbing if it strikes a nearby pole or tree.

4th Grade
NGSS 4-PS3-2

MagiCORE

ABOUT LEXILE LEVELS

MagiCore Learning, LLC is a certified Lexile® Partner. These texts are officially measured and approved by Lexile and MetaMetrics® to ensure appropriate rigor and differentiation for students.

The Lexile Framework® for Reading measures are scientific, quantitative text levels. When the Lexile of a text is measured, specific, measurable attributes of the text are considered, including, but not limited to, word frequency, sentence length, and text cohesion. These are difficult attributes for humans to evaluate, so a computer measures them.

Common Core State Standards uses Lexile level bands as one measure of text complexity. Text complexity ranges ensure students are college and career ready by the end of 12th grade. Lexile measures help educators scaffold and differentiate instruction as well as monitor reading growth.

Grade Band	Lexile® Bands Aligned to Common Core Expectations
K-1	N/A
2-3	420L-820L
4-5	740L-1010L
6-8	1185L-1385L

Keep in mind when using any leveled text that many students will need scaffolding and support to reach text at the high end of their grade band. According to Appendix A of the Common Core Standards, "It is important to recognize that scaffolding often is entirely appropriate. The expectation that scaffolding will occur with particularly challenging texts is built into the Standards' grade-by-grade text complexity expectations, for example. The general movement, however, should be toward decreasing scaffolding and increasing independence both within and across the text complexity bands defined in the Standards."

Energy Transfer

4th grade

Table of Contents

Each passage set includes two differentiated passages on a fourth-grade level (one at the beginning of the band, one towards the end) and a question set geared towards comprehension and science mastery. The first question is differentiated to include a fill-in-the-blank diagram (lower complexity) or an open-ended diagram (higher complexity).

How to Use This Resource

This resource was created with the NGSS Science Standards in mind. It includes six differentiated passages aligned to the following standard:

4-PS3-3 Energy in Collisions

Ask questions and predict outcomes about the changes in energy that occur when objects collide. (Energy and Matter)

Clarification Statement: Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact.

Assessment Boundary: None

Here are some suggestions for using these passages:

- Use as independent work after you have taught an overview of this standard. Assign the different levels based on the passage students can read and comprehend independently.
- Use as a reading center to reinforce key comprehension and science concepts at the same time!
- Use as a homework or review packet.
- Use as an intervention for students who need to revisit science concepts.

790L

Name: _____ Date: _____

Types of Energy

Energy is the ability to do work. We need energy to make things happen. Energy comes in many different forms. Light, heat, sound, and motion are all types of energy. We use energy to ride a bike, drive a car, cook food, and keep our homes warm and lit. Energy is involved when you use electronics, watch a lightning storm, hear an engine roar, and grow a garden. Energy is **conserved**. This means it cannot be created or destroyed. It can, however, change forms and **transfer** from one place to another.

Light is a type of **radiant energy** which humans can see. It is made of electromagnetic radiation. The light from the sun supplies energy. This energy is necessary for living things to exist on planet Earth. A burning candle is another example of light energy.

Thermal and light energy from a candle.

Thermal energy, or heat, involves the moving of **molecules** in a substance. Changes in temperature are also part of thermal energy. A clothes dryer uses thermal energy to dry clothes after washing. Heat also allows us to cook as energy is transferred to the foods.

When an object is made to vibrate, it makes a sound. This energy is heard because of sound waves traveling to our ears. Sound waves can travel through air, water, and solid objects. Sound moves more slowly than light. If a sound is loud enough, like at a rock concert or from a jet engine, the energy can be felt as vibrations in our bodies.

Electrical energy is energy from moving electrons. All matter on Earth is made of **atoms**. Atoms are made of tiny particles called **protons**, which have positive charges, **neutrons**, which have no charge, and **electrons**, which have negative charges. Protons and neutrons are found in the center, or **nucleus**, of the atom. Electrons spin around the nucleus. Some substances, such as some metals, have electrons that can easily be made to move from one atom to another. Electrical energy is the result when this happens. A lightning bolt and the electricity in our homes are examples of electrical energy.

Baseball player swinging at a baseball

Energy coming from anything that is moving is called **mechanical energy**. This type of energy involves both motion and position. Hitting a baseball with a bat is an example of mechanical energy. When the bat is pulled back and held still before hitting the ball, it is full of **potential energy**. This is stored energy that is ready to go when needed. When the bat is swung forward, the potential energy becomes **kinetic energy**. Kinetic energy is energy something has because it is in motion. When the bat hits the ball, energy is transferred from the bat to the ball. This energy sends the ball forward.

Without energy, we wouldn't be able to do all the things we do. Energy affects us in so many ways. From digesting food to power our bodies to manipulating atoms to light up our world, energy is everywhere.

Types of Energy Questions

1. Fill in the chart to define the types of energy.

Type of Energy	Definition
Radiant energy	
	Heat, or the moving of molecules in a substance
Electrical energy	
	Energy from motion and position

2. Which is the best explanation for the following statement:

Energy is conserved.

a. Energy does not like to travel from place to place, it is hard to move.
b. Energy cannot be transformed into other types of energy
c. Energy is constantly being transferred and converted, but it cannot be created or destroyed
d. We need energy to do everything in life, it allows us to digest food, move objects, light up the world, and many other things.

3. Label the type of energy in each of the pictures below.

_____ _____ _____

970L

Name: _____ Date: _____

Types of Energy

Energy is the ability to do work, and we need energy to make things happen. Energy comes in many different forms such as light, heat, sound, and motion. We use energy to ride a bike, drive a car, cook food, and keep our homes warm and lit. Energy is involved when you use electronics, watch a lightning storm, hear an engine roar, and grow a garden. Energy is **conserved**, meaning it cannot be created or destroyed. It can, however, change forms and **transfer** from one place to another.

Light is a type of **radiant energy** that human sight can detect. It is made of electromagnetic radiation. The light from the sun supplies energy that is necessary for living things to exist on planet Earth. A burning candle is another example of light energy.

Thermal and light energy from a **candle.**

Thermal energy, or heat, involves the moving of **molecules** in a substance and changes in temperature. A clothes dryer uses thermal energy to dry clothes after washing. Heat also allows us to cook as energy is transferred to the foods we prepare.

When an object is made to vibrate, it produces a sound. This energy is heard because of sound waves traveling to our ears. Sound waves can travel through air, water, and solid objects, but it moves more slowly than light. If a sound is loud enough, like at a rock concert or from a jet engine, the energy can be felt as vibrations in our bodies.

Electrical energy is energy from moving electrons. All matter on Earth is made of **atoms**, and atoms are made of tiny particles called **protons**, which have positive charges, **neutrons**, which have no charge, and **electrons**, which have negative charges. Protons and neutrons are found in the center, or **nucleus**, of the atom, while the electrons spin around the nucleus. Some substances, such as some metals, have electrons that can easily be made to move from one atom to another. When this happens, electrical energy is the result. A lightning bolt and the electricity in our homes are examples of electrical energy.

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Types of Energy Questions

1. Fill in the chart to define the types of energy.

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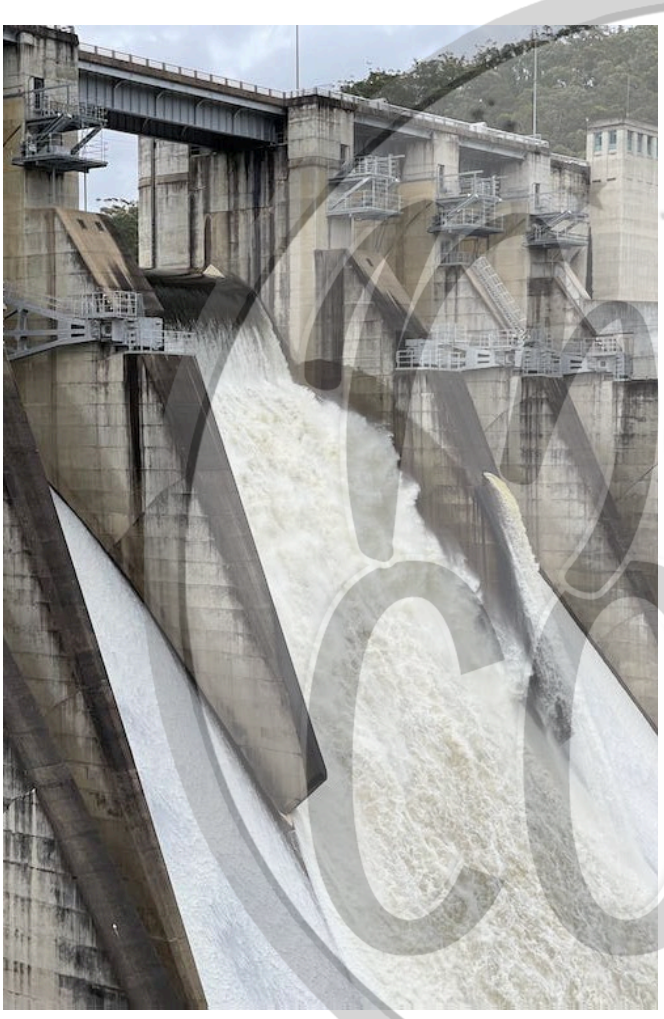
780L

Name: _____ Date: _____

Hydropower

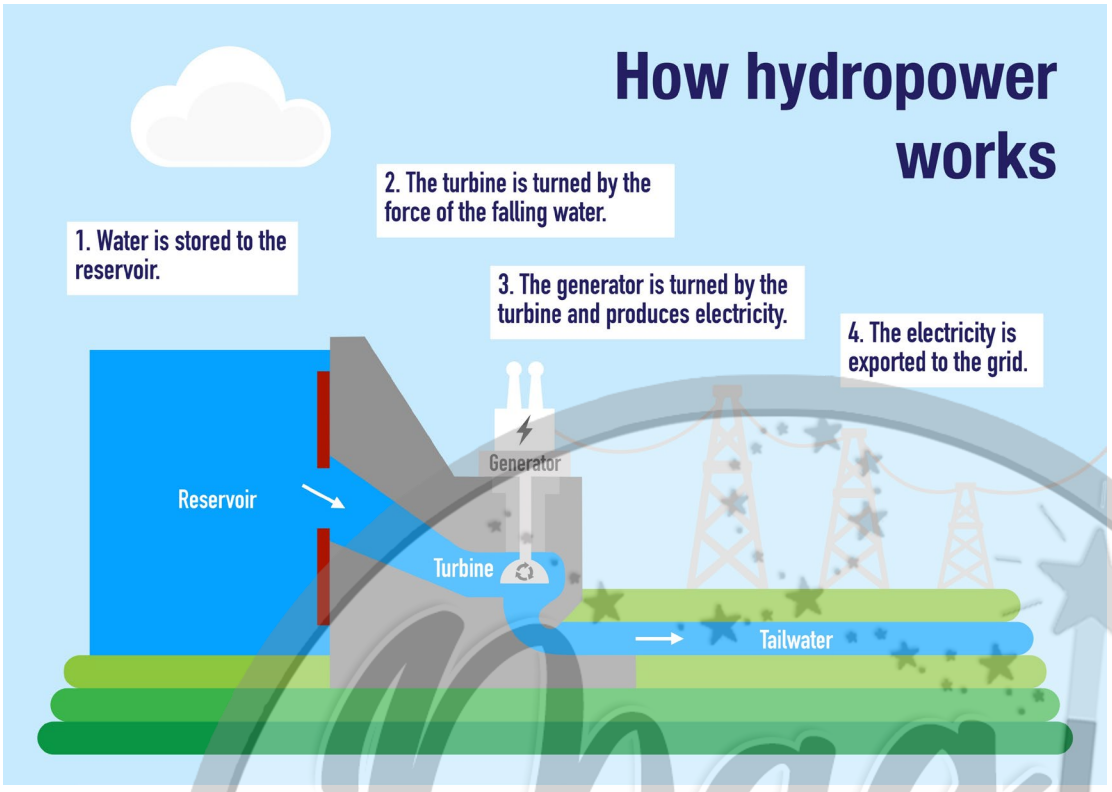
Hydropower uses the energy of falling water to make electricity. Hydropower plants can be small and only power a few homes. They can also be huge like the Hoover Dam and provide electricity for millions of people.



Hydropower dam at a hydropower plant.

Most modern hydropower plants have four main parts. The first part is the **dam**. A dam is built across a river to raise the water level and control the fall of water. Dams allow water to be stored in a **reservoir**. Water falls when they are opened. That falling water is what powers the next part of the hydropower plant – the **turbine**. Water turbines are like windmills. They have blades that get turned by falling water instead of wind. A **generator** is connected to the turbine. When the turbine blades spin, the generator spins as well. The energy from the turbine is turned into electric energy by the generator. This electric energy is then sent from the hydropower plant to users through **transmission lines**.

How far the water falls affects the amount of electricity that can be produced by the hydropower plant. Water has more energy when it has farther to fall. This means a higher dam can make more energy than a lower one because the water has a longer distance to travel. The amount of water falling through the dam also affects how much electricity can be made. The more water that passes through the turbine, the more the turbine spins. This makes more power. Bigger rivers have more flowing water. They produce more energy.



Hydropower is a **renewable** energy source. This is because water is not likely to run out due to the water cycle. The water cycle uses solar energy from the sun to heat water in rivers, lakes, and oceans. This heating causes the water to **evaporate**. Water vapor in the atmosphere forms clouds. The clouds eventually release water as precipitation. The precipitation collects in rivers. The rivers empty into oceans and lakes. The sun's energy heats the water. It evaporates to start the water cycle all over again. This process happens continuously so water is available to collect with dams for conversion to electricity. Geographic areas, seasonal changes, and situations like drought can affect making hydropower.

As far as energy production goes, hydropower is reliable. It can supply electricity or store it to meet the energy demands of consumers. Hydropower also works well with other forms of energy production such as wind and solar to make sure power supplies are constantly available.

Hydropower Questions

1. Use the chart below to describe the main parts of a Hydroplant and their function.

Part	Function
Dam	
	A holding area for water stopped by the dam.
Turbine	
	Turns the energy from the turbine blades into electricity.

2. Which of the following describes a river and dam that would make the most electricity?
   a. A low dam on a wide river with swiftly flowing water.
   b. A high dam on a narrow river with swiftly flowing water.
   c. A low dam on a narrow river with slowly flowing water.
   d. A high dam on a wide river with swiftly flowing water.

3. Explain why hydropower is considered a renewable resource.

980L

Name: _____ Date: _____

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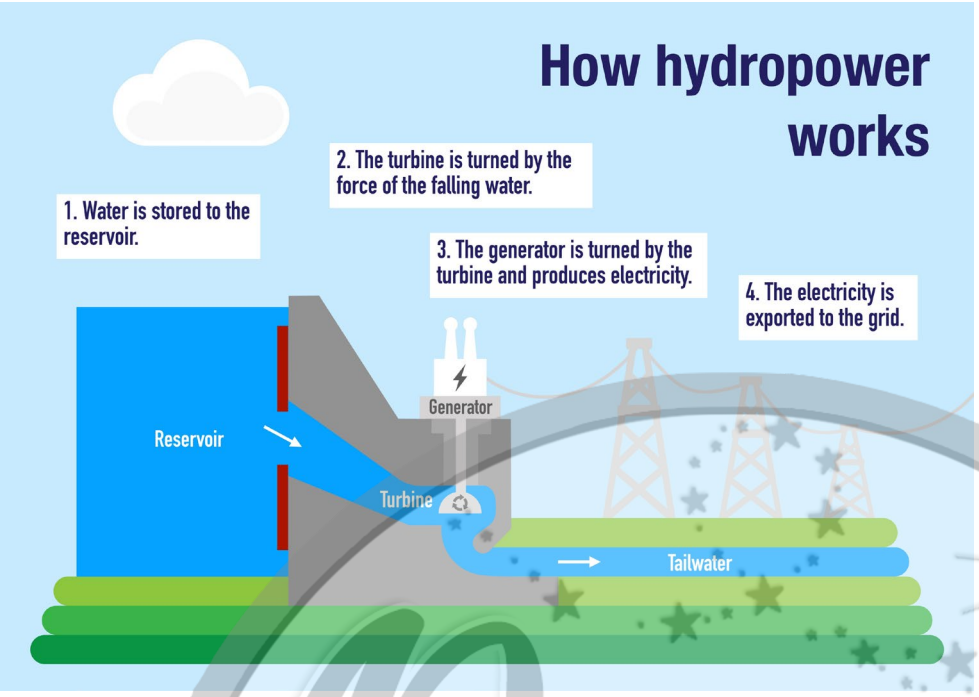

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