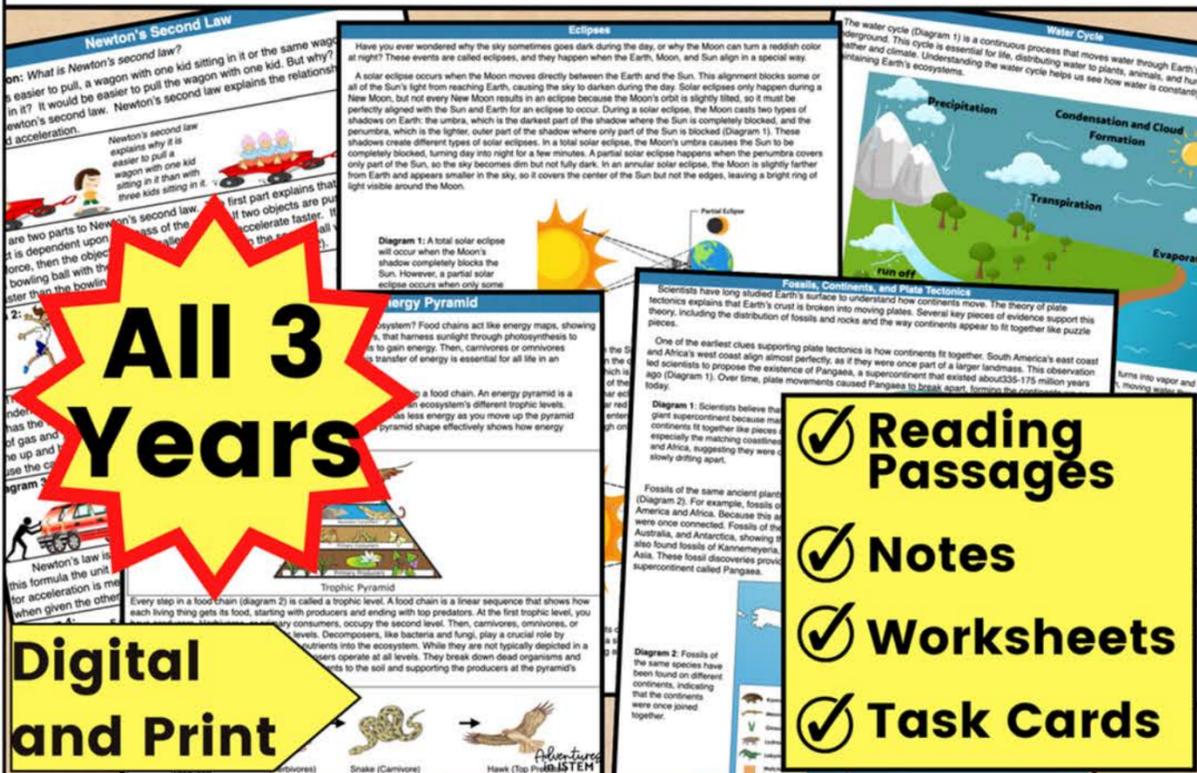


NGSS MIDDLE SCHOOL LIFE, PHYSICAL, EARTH Science Reading

Complete NGSS Middle School



All 3
Years

Digital
and Print

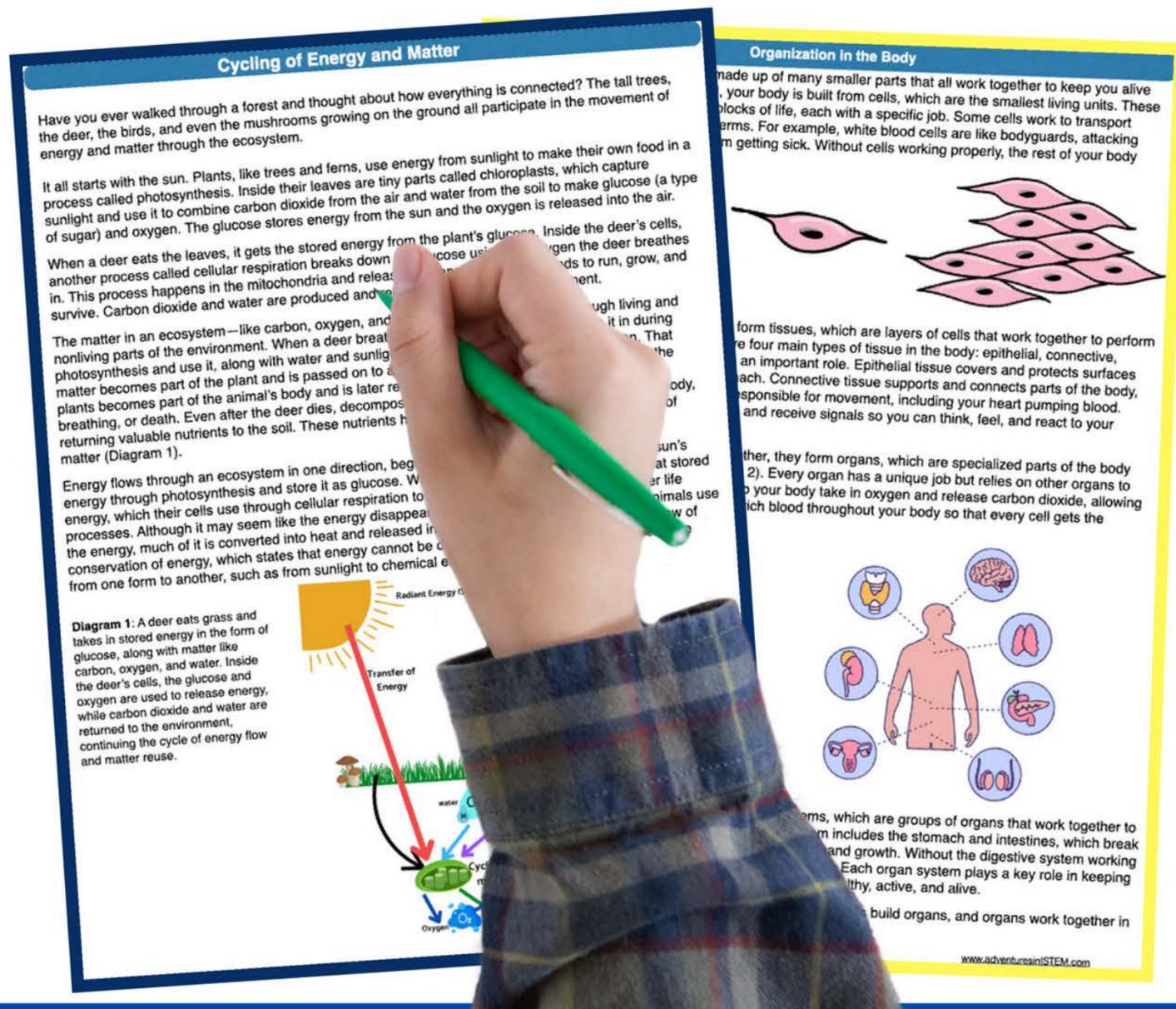
Readings with Questions

Scroll Through

To take a peek inside!

Help students learn about Life Science, Earth Science, and Physical Science and test their comprehension with these easy to read science reading passages.

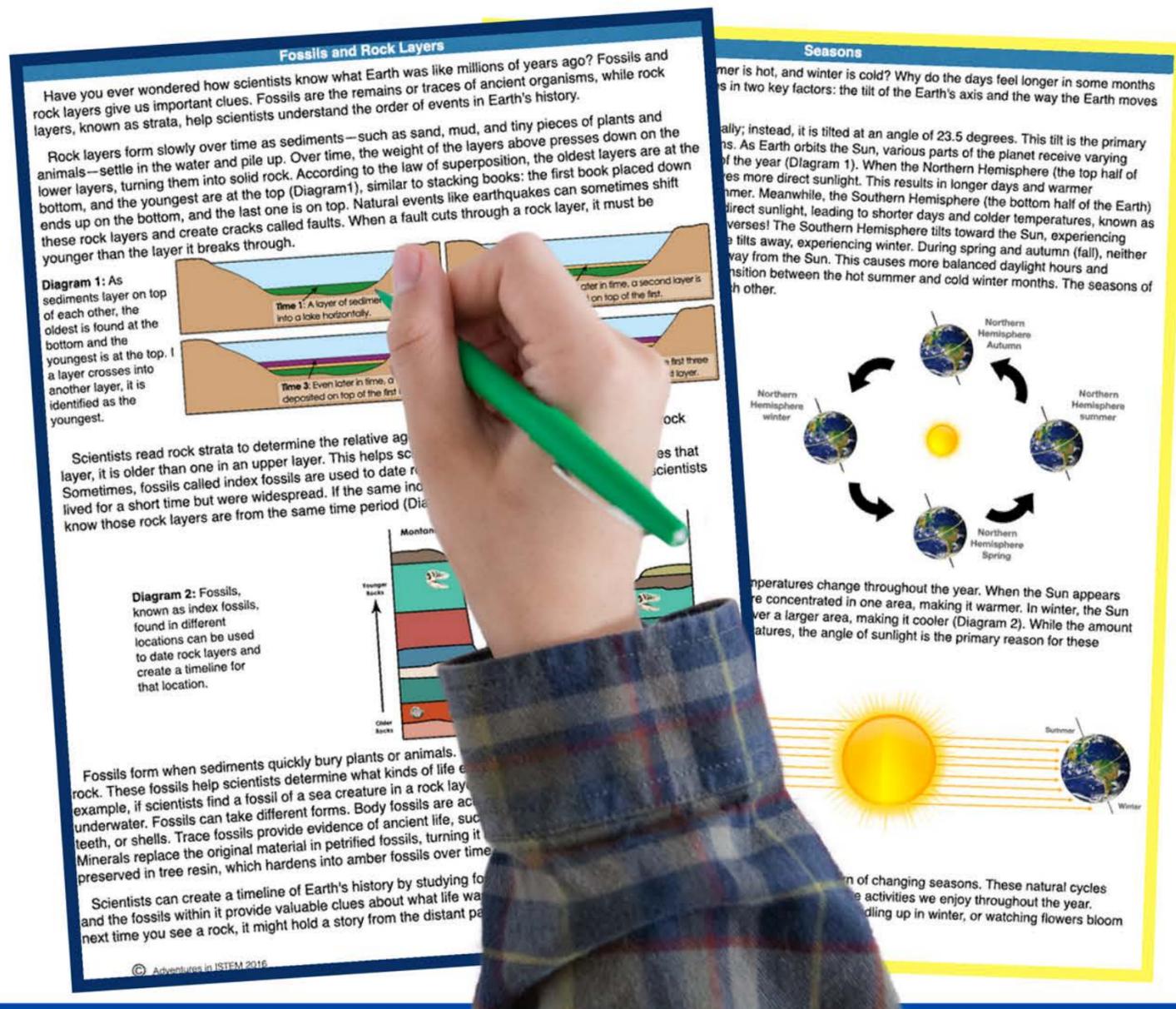
NGSS MIDDLE SCHOOL LIFE, PHYSICAL, EARTH Science Reading



Units Included: Life Science

- ✓ **Molecules to organisms: cells, human body, animal behavior, photosynthesis and cellular respiration**
- ✓ **Ecosystems: Biodiversity, types of ecosystems, competition in ecosystems, energy flow through ecosystems**
- ✓ **Genetics: asexual and sexual reproduction and mutations**
- ✓ **Evolution: evidence of evolution, natural selection, artificial selection**

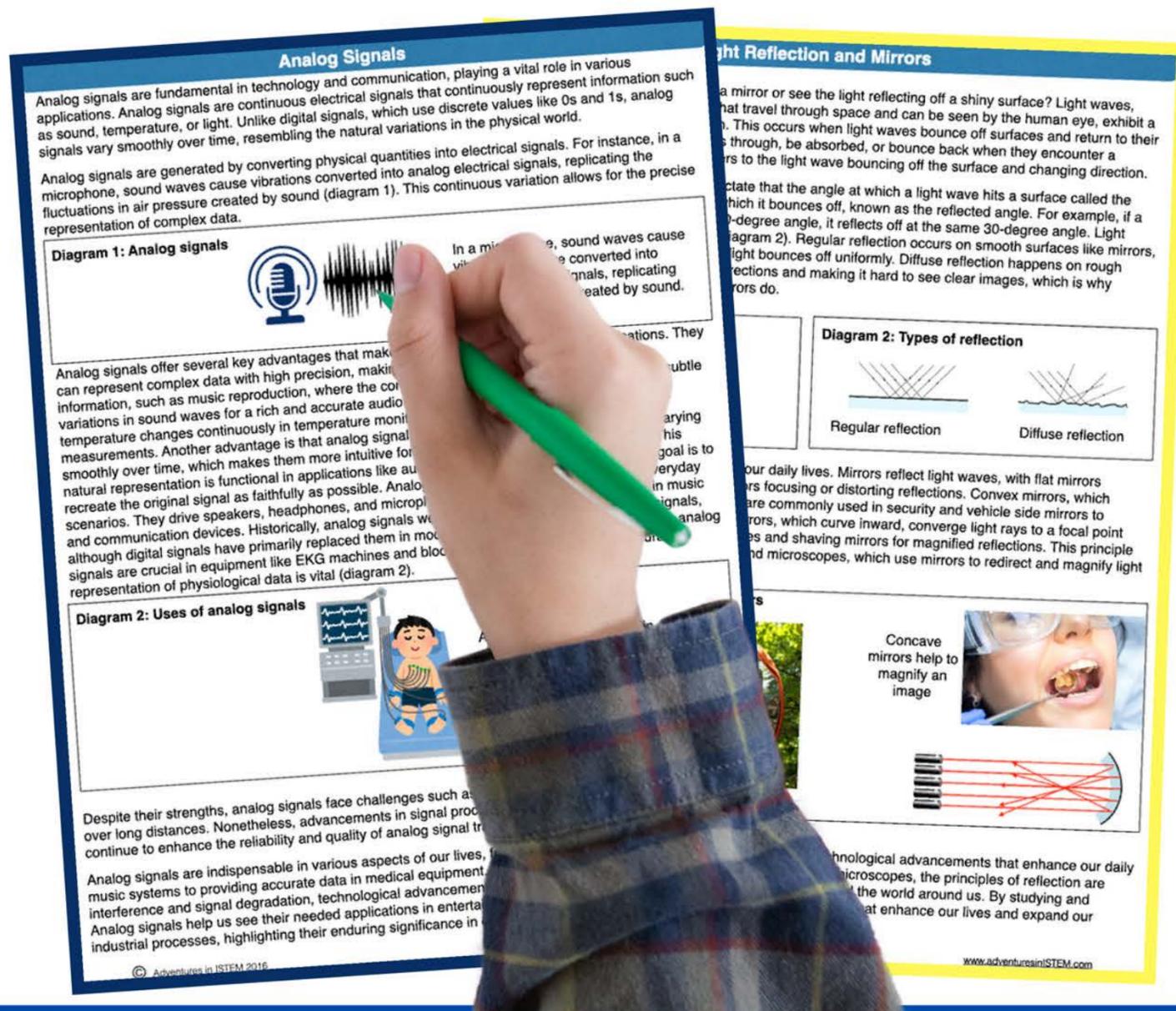
NGSS MIDDLE SCHOOL LIFE, PHYSICAL, EARTH Science Reading



Units Included: Earth Science

- ✓ Earth's place in the universe: role of gravity, Earth, Moon, Sun system, scale of objects in the Solar System, Geologic timescale
- ✓ Earth's systems: geoscience processes, global winds, ocean currents, plate tectonics, changes to Earth's surface, rock cycle, water cycle, weather
- ✓ Earth and human activity: natural hazards, impact of the human population, human impact on nonrenewable resources, human impact on climate change, global warming

NGSS MIDDLE SCHOOL LIFE, PHYSICAL, EARTH Science Reading



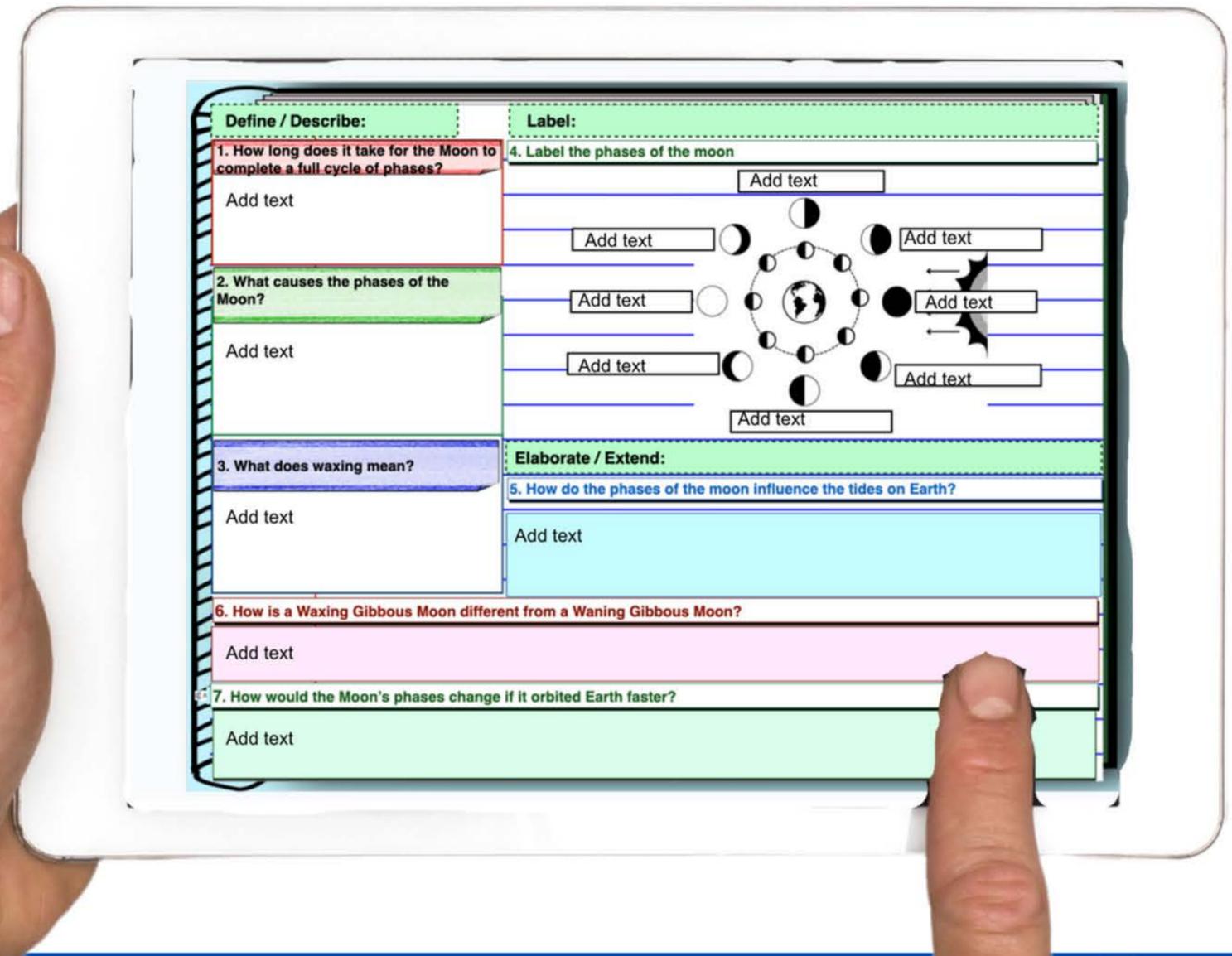
Units Included: Physical Science

- ✓ **Matter and its interactions: Atoms, Compounds, Chemical Reactions, Conservation of matter, States of matter, phase changes, gas laws, thermal energy transfer, synthetic materials**
- ✓ **Motion and Stability: Newton's 1st law, Newton's 2nd law, Newton's 3rd law, Types of forces including gravity, electric forces, magnetic forces, friction, electromagnetism**
- ✓ **Energy: Mechanical energy with potential and kinetic energy, conservation of energy, thermal energy**
- ✓ **Waves and Technology: Types of waves, properties of waves, light and sound waves, analog and digital signals**

Resource *includes*

- ✓ 131 Reading Passages
- ✓ 131 Note-taking guides
- ✓ 131 Comprehension Worksheets
- ✓ 164 Task cards
- ✓ Answer key
- ✓ Digital version

NGSS MIDDLE SCHOOL LIFE, PHYSICAL, EARTH *Science Reading*



Each topic *includes*

- ✓ One to two page science reading passage to teach the topic.
- ✓ Notes with questions to guide their reading
- ✓ Comprehension worksheets to review the information using multiple levels of questioning
- ✓ Task cards to extend their learning and for extra review
- ✓ Answer keys to easily check the student knowledge
- ✓ Digital version for more flexibility on how to use the lesson
- ✓ Lesson Design to help you differentiate the lesson in your classroom

The collage displays various educational resources for the water cycle. At the top left is a worksheet titled "Water Cycle" with a "Define / Describe:" section containing four questions: "1. What is the water cycle?", "2. What is the difference between evaporation and transpiration?", "3. What happens during condensation?", and "4. What forms of precipitation exist?". Below these is an "Identify:" section with question "5. Label the different parts of the water cycle" and a diagram of the water cycle. The diagram shows evaporation from the ocean, transpiration from trees, condensation forming clouds, precipitation as rain or snow, and runoff into a river. To the right is a blank "Notes" page with a header for "Class:" and "Date:". In the center is a larger diagram of the water cycle with labels: "Precipitation", "Condensation and Cloud Formation", "Transpiration", "Evaporation", and "run off". Below this diagram is a text passage explaining the water cycle process. At the bottom right is a digital tablet displaying a digital version of the worksheet, with text boxes for answers and a diagram with labels. The text on the tablet includes: "1. What is the water cycle? Add text", "2. What is the difference between evaporation and transpiration? Add text", "3. What happens during condensation? Add text", "4. What forms of precipitation exist? Add text", "5. Label the different parts of the water cycle", "Elaborate / Extend:", "6. How does the water cycle influence weather? Add text", "7. How does the water cycle help regulate Earth's climate? Add text", and "8. What role do glaciers play in the water cycle? Add text".

NGSS MIDDLE SCHOOL LIFE, PHYSICAL, EARTH Science Reading

Synthetic Materials

What makes up the materials we use every day? Some materials, called synthetic materials, are not found in nature but are created by scientists. These materials are made by combining different chemicals in a laboratory, similar to mixing ingredients for a cake. Scientists use chemicals instead of flour and sugar to create new and valuable materials. Synthetic materials are produced through chemical reactions, transforming natural materials into something new with unique properties. For example, plastics are synthetic materials made by chemically altering natural resources like petroleum. Scientists carefully mix specific chemicals to create materials with unique properties, such as being stronger, lighter, or more flexible than natural materials. This ability to customize materials makes synthetic materials crucial in today's world.

Synthetic materials have many properties that make them useful in various industries (diagram 1). Some synthetic materials can conduct electricity, making them essential for electronics like computers and smartphones. Others are waterproof, making them ideal for raincoats and tents. Some are heat-resistant, crucial for items like oven mitts and firefighter gear. These properties make synthetic materials versatile and valuable in everyday life. Materials scientists play a vital role in developing new synthetic materials. They study the structure of materials and how it relates to their properties, using this information to create improved materials. Ideas for synthetic materials often come from nature. For instance, scientists study sea cucumbers, which can change from soft to rigid, to develop materials that mimic this behavior.

Diagram 1: properties of synthetic materials

Ability to conduct electricity

Water-resistant

All synthetic materials start with natural resources, which are transformed into synthetic materials (diagram 2). In this process, the atoms and molecules of natural resources are broken down and recombined into different structures. For example, polymers are created by joining long chains of atoms together. These polymer chains can be altered to create materials with different properties. Scientists are making them versatile for various applications. Scientists are making them versatile for various applications. Scientists are making them versatile for various applications.

Diagram 2: Production of synthetic materials

Start with a natural resource like crude oil.

In a factory, natural resources are broken down into many chemicals.

These chemicals are then combined to create synthetic materials.

In conclusion, synthetic materials, made from natural resources, are essential for modern life. They offer unique properties that natural materials cannot provide. Scientists continue to develop new synthetic materials for various industries and everyday products. Scientists continue to develop new synthetic materials for various industries and everyday products. Scientists continue to develop new synthetic materials for various industries and everyday products.

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Newton's Second Law

Question: What is Newton's second law?

It is easier to pull a wagon with one kid sitting in it or the same wagon but with three kids sitting in it? It would be easier to pull the wagon with one kid. But why? The reason is Newton's second law. Newton's second law explains the relationship between force, mass, and acceleration.

Newton's second law explains why it is easier to pull a wagon with one kid sitting in it than with three kids sitting in it.

There are two parts to Newton's second law. The first part explains that the acceleration of an object is dependent upon the mass of the object. If two objects are pushed or pulled with the same force, the object with a smaller mass will accelerate faster. If you kick a soccer ball with the same amount of force, then the soccer ball will accelerate more than the bowling ball because it has less mass (diagram 2).

A soccer ball will move much faster and farther, when kicked, than a bowling ball because it has less mass.

The second part of Newton's second law explains that acceleration of an object is dependent upon the force acting on the object. If objects have the same mass, then the object with more force applied to it will accelerate faster. For example, imagine your car runs out of gas and you push it. It begins to move slowly. Then four big, strong people push it. Now it's moving much faster. The extra force of the four people makes the car accelerate more than it did with just your force pushing it (diagram 3).

The more people pushing, the greater the force, the faster the car will move.

Newton's second law is more easily explained using the formula; force = mass x acceleration. In this formula, force is the Newton (N), the unit for mass is kilogram (Kg), and the unit for acceleration is meters per second squared (m/s²). Diagram 4 shows how to calculate force.

Problem: If an object has a mass of 100 kg, how much force is needed to accelerate it 20 m/s²?

Force = mass X acceleration

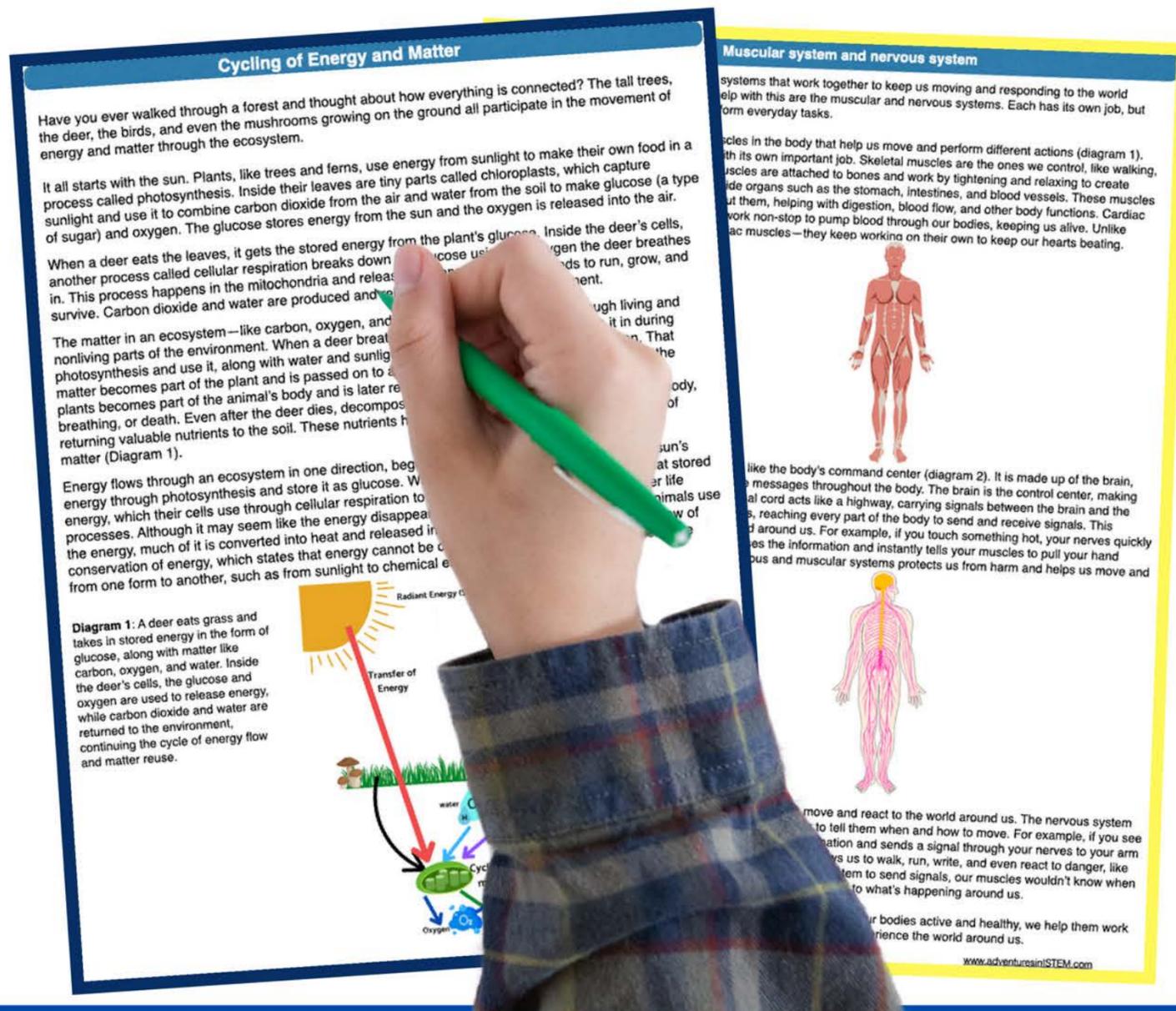
Force = 100 kg X 20 m/s² Force = 2,000 N

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What Are *students* Doing?

- ✓ **Marking the text**
- ✓ **Filling in the guided note-taking template**
- ✓ **Reviewing and applying their knowledge**
- ✓ **Reinforcing their understanding**

NGSS MIDDLE SCHOOL LIFE, PHYSICAL, EARTH Science Reading



Different ways to use the *science readings*

- Substitute plan on days you will be out
- Introduction of the material at the beginning of the unit
- During the explain phase of the 5E model
- As part of a science station
- For reteach to reinforcing their understanding
- During the review at the end of the unit

Why? SCIENCE READING PASSAGES?

- ✓ Increase science literacy in the classroom
- ✓ Simple passages to help students comprehend the information
- ✓ Note-taking template to help students interact with the reading
- ✓ Worksheets to review and apply their knowledge
- ✓ Reinforcement task cards to continue their understanding



“My students and I absolutely loved this resource!!! The way this was planned out with the reading, diagrams, and questions was perfect. I mainly used this with my students but they used it one day with a substitute and they wrote to tell me how great it was! (I think they thought I created it so I have to tell them otherwise!)” -

Nicole

HOW TO USE THE RESOURCE IN

3 simple steps

1

Print the PDF version, make copies, and hand out to students

2

Use the digital version by clicking the titles in the RED BOX to make your own copy (found at the end of the PDF)

3

Share the resource with your students using your favorite LMS (Google Classroom, Powerschool (schoolology), Canva...)

Interactive Digital Flip Book

Teachers Guide

What You Will Need To Get Started:

1. Download link for the Google Resource by clicking on the titles in the red box

Cell Energy Digital Flip Book Student

Cell Energy Digital Flip Book Teacher

2. Access to the Internet and a Google Account (Free)
3. Google accounts or Microsoft OneDrive accounts for your students to save their work
4. Open the file on your Google Drive. The link will prompt you to make a copy

5. This new copy is now yours to edit and share with your students

6. Printer access if you choose to print the finished product as an actual flip book

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NGSS MIDDLE SCHOOL LIFE, PHYSICAL, EARTH

Science Reading

Fossils
Fossils are like Earth's time capsules, preserving the remains or traces of ancient plants, animals, and other organisms. They give us valuable insights into life forms that existed long before humans, helping scientists reconstruct Earth's history. Fossil evidence supports evolution, the process by which different kinds of living organisms develop and diversify from earlier forms.

Fossils form through a process called fossilization. When an organism dies, its remains may be buried under layers of sediment. Over time, the sediment hardens into rock, and the remains are preserved as fossils.

Food Chain and Energy Pyramid
Have you ever wondered how energy moves through an ecosystem? Food chains act like energy maps, showing how life sustains itself. They start with plants, the producers, that harness sunlight through photosynthesis to create energy. Next in line are herbivores, which eat plants to gain energy. Then, carnivores or omnivores consume herbivores, passing energy along the chain. This transfer of energy is essential for all life in an ecosystem.

Energy pyramids (diagram 1) help organize these energy levels within a food chain. An energy pyramid is a graphical representation that shows the energy distribution among an ecosystem's different trophic levels. Producers sit at the base, holding the most energy. Each level has less energy as you move up the pyramid because some is lost as heat during bodily functions. This pyramid shape effectively shows how energy decreases as it travels through the food chain.

Diagram 1: Food Pyramid

Diagram 2: Food Chain trophic levels

Every step in a food chain (diagram 2) is called a trophic level. A food chain is a linear sequence that shows how each living thing gets its food, starting with producers and ending with top predators. At the first trophic level, you have producers. Herbivores, or primary consumers, occupy the second level. Then, carnivores, or secondary consumers, fill higher trophic levels. Decomposers, like bacteria and fungi, break down dead matter and recycling nutrients into the ecosystem. While the energy pyramid shows energy flow, decomposers operate at all levels. They break down waste from all trophic levels, returning vital nutrients to the soil and supporting the base.

Energy is lost at each trophic level due to activities like breathing and maintaining body weight. As a result, energy efficiency decreases as you move up the energy pyramid, which is why ecosystems can only sustain so many top predators as primary consumers. Maintaining a balanced food chain and energy pyramid is crucial for ecosystem health. However, overhunting and habitat loss can upset this balance, affecting energy flow and organisms' roles. Protecting biodiversity and adopting sustainable practices are essential for keeping ecosystems healthy and functioning correctly.

In summary, understanding food chains and energy pyramids reveals ecosystems' complex web of energy and relationships. From plants to decomposers, each organism has a role in sustaining life and maintaining ecological harmony. Grasping these concepts, we can contribute to conservation efforts and support the well-being of Earth's diverse ecosystems.

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Check out what teachers just like you have said about these readings:



My students really enjoyed this one. It broke down the concepts very easily in language that my students could understand. – Breanna



My students and I absolutely loved this resource!!! The way this was planned out with the reading, diagrams, and questions was perfect. I mainly used this with my students but they used it one day with a substitute and they wrote to tell me how great it was! (I think they thought I created it so I have to tell them otherwise!) – Nicole



Great resource that made this topic easier for my students. – Cynthia

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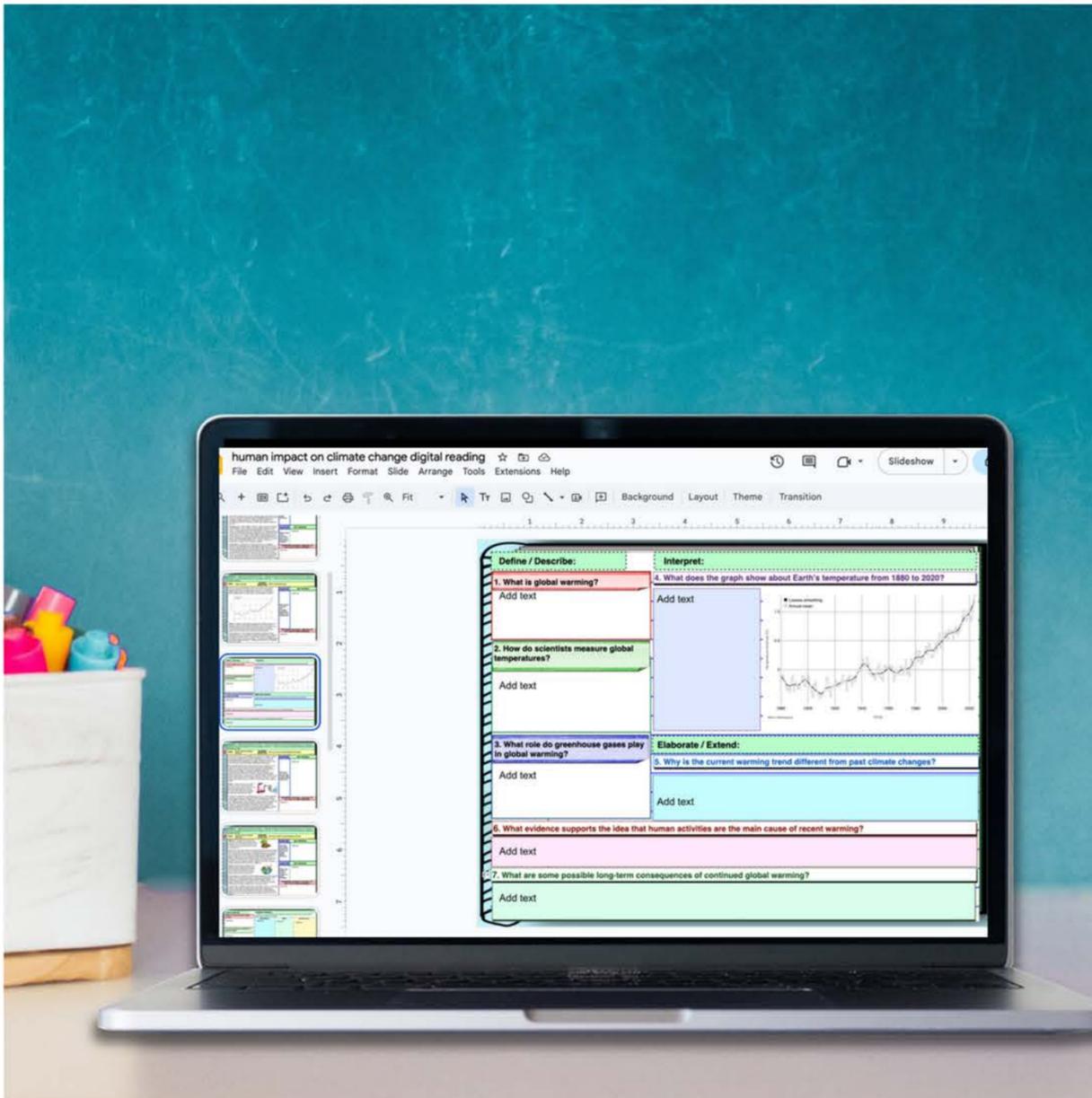
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4. Use with your class

5. Leave a review on your My Purchases page to get reward points to spend on new resources!

Leave a review



**Keep Scrolling For More details about
each science reading**

Included: Cells Science Reading

Covers

- ✓ Cell theory
- ✓ Prokaryote
- ✓ Eukaryote
- ✓ Plant Cells
- ✓ Animal Cells

“ My students and I absolutely loved this resource!!! The way this was planned out with the reading, diagrams, and questions was perfect. I mainly used this with my students but they used it one day with a substitute and they wrote to tell me how great it was! (I think they thought I created it so I have to tell them otherwise!)- Nicole ”

The collage features several educational components:

- Discovery of Cells Worksheet:** Includes a "Big Idea Question: What are cells and what is the cell theory?" and a diagram of a natural scene with labels for birds, clouds, mountains, trees, grass, water, and rocks. Below the diagram is a text passage about the history of cell discovery, mentioning Zacharias Jansen and Robert Hooke's discovery of cork cells.
- Eukaryotes Worksheet:** Includes a "Big Idea Question: What are the similarities and differences between the types of eukaryote cells?" and two diagrams. Diagram 1 shows a unicellular organism (paramecium). Diagram 2 shows a multicellular organism with labels for animal cell, nerve cell, and blood cell. Below these are detailed diagrams of a plant cell and an animal cell with various organelles labeled.
- Plant Cell Diagram:** A detailed diagram of a plant cell with labels for vacuole, ribosomes, cell membrane, cell wall, endoplasmic reticulum, nucleus, and chloroplast.
- Animal Cell Diagram:** A detailed diagram of an animal cell with labels for nucleus, mitochondria, cell membrane, vacuoles, cytoplasm, lysosomes, endoplasmic reticulum, and Golgi complex.
- Cell Theory Worksheet:** A worksheet with directions and questions. It includes a table for comparing prokaryotes and eukaryotes. The table has columns for "Prokaryote Only", "Both", and "Eukaryote Only", and rows for "Add text".
- Laptop:** A laptop displaying a digital version of the worksheets, showing the text and diagrams on a screen.

Included: Human Body Science Reading

Covers

- ✓ organization in the human body
- ✓ circulatory and respiratory systems
- ✓ excretory and digestive systems
- ✓ nervous and muscular systems
- ✓ skeletal and endocrine systems

The image displays a collection of educational resources. At the top, there are two worksheets titled "Discovery of Cells" and "Eukaryotes".

Discovery of Cells Worksheet:

- Big Idea Question:** What are cells and what is the cell theory?
- Diagram 1:** A landscape illustration with labels for birds, clouds, mountains, trees, grass, water, and rocks.
- Text:** "Take a look at the picture above (diagram 1). Some things are living, and some are not living. Can you tell which are which? All living things have certain characteristics: they use energy, they grow and develop, they reproduce, they respond to their environment, they adapt to their environment, and most importantly they are made of cells." "Cells are the smallest units of living things. They are so small that scientists did not always know about them. Most cells cannot be seen by the naked eye. In the 16th century, Zacharias Jansen put some lenses together to increase the magnitude of what he was seeing—and the first microscope was created. Then in the 17th century, Anton Van Leeuwenhoek invented a more powerful and recognizable microscope, which allowed him to see small microscopic organisms. In the 1660s, a scientist named Robert Hooke looked at a small section of bark on an oak tree called cork (diagram 2). This small section was made up of little rectangles which he called "cells" (diagram 3). He didn't know it at the time, but he was getting the first glimpse of plant cells. It is Robert Hooke that is credited with coining the term *cells*."
- Diagram 2:** A cross-section of a cork oak bark with labels: Cork, Cork cambium, Phloem, Secondary Phloem, and Bark.
- Diagram 3:** A microscopic view of cork cells, showing small rectangular structures.
- Text:** "The works of Hooke and Van Leeuwenhoek contained cells and where they came from and their cells. The three main points of the evidence." "The Cell Theory: 1. Every living organism is made of cells. 2. Cells are the basic units of living things. 3. Cells come only from other existing cells."

Eukaryotes Worksheet:

- Big Idea Question:** What are the similarities and differences between the types of eukaryote cells?
- Diagram 1:** A diagram of a unicellular organism (paramecium).
- Diagram 2:** A diagram of a multicellular organism showing an animal cell, a nerve cell, and a blood cell.
- Text:** "All living things are made up of cells. Some living things are small and are made up of only one cell. These are called unicellular organisms. An example of a unicellular organism is a paramecium (diagram 1). Other living things are made up of multiple cells that all have specific functions. These are called multicellular organisms. An example of a multicellular organism is you." "Eukaryotic organisms can be either unicellular or multicellular. Eukaryotic cells are larger and have many parts that work together to help them stay alive. The special parts, called organelles, are not found in all eukaryotic cells. The type of organelles that are found in each cell are dependent upon the main function of the cell. As we discuss the main organelles found in eukaryotic cells, we will focus on the two most common eukaryotic cells, plant cells and animal cells (diagram 3)."
- Diagram 3:** Two diagrams comparing a Plant Cell and an Animal Cell. The Plant Cell diagram labels include: cell wall, cell membrane, nucleus, endoplasmic reticulum, vacuole, chloroplast, and ribosomes. The Animal Cell diagram labels include: nucleus, mitochondria, cell membrane, vacuoles, cytoplasm, lysosomes, endoplasmic reticulum, and Golgi complex.
- Text:** "The nucleus is the brain of the cell, it holds the genetic information or blue prints. It is found in all eukaryotic cells. The cell wall is a structure that protects the cell and helps it keep its shape. It is only found in plant cells and some bacteria. The cell membrane is found in all cell types. It allows things to move through them. The Golgi complex is an office. These are organelles that use energy. They are used to convert it into food. Some cells have one large vacuole, though some plants, have many small ones."

At the bottom, a laptop screen shows a digital version of a worksheet with a table for comparing prokaryotes and eukaryotes.

Compare prokaryotes to eukaryotes.	Prokaryote Only	Both	Eukaryote Only
What is the definition of cells?	Add text	Add text	Add text
Identify the cells below with the labels on the left.	Eukaryote	Prokaryote	
Eukaryotic cells are at least ten times larger than prokaryotic cells. Why do you think they are so large? Explain your reasoning with evidence.	Add text		

Included: Animal Behavior and Plant Structures in Reproduction Science Reading

Covers

- ✓ animal behavior and reproduction
- ✓ plant reproduction and structures
- ✓ factors that influence the growth of organisms

The image displays a collection of educational resources. At the top, there are two worksheets titled "Discovery of Cells" and "Eukaryotes".

Discovery of Cells Worksheet:

- Big Idea Question:** What are cells and what is the cell theory?
- Diagram 1:** A landscape illustration with labels for birds, clouds, mountains, trees, grass, water, and rocks.
- Text:** "Take a look at the picture above (diagram 1). Some things are living, and some are not living. Can you tell which are which? All living things have certain characteristics: they use energy, they grow and develop, they reproduce, they respond to their environment, they adapt to their environment, and most importantly they are made of cells." "Cells are the smallest units of living things. They are so small that scientists did not always know about them. Most cells cannot be seen by the naked eye. In the 16th century, Zacharias Jansen put some lenses together to increase the magnitude of what he was seeing—and the first microscope was created. Then in the 17th century, Anton Van Leeuwenhoek invented a more powerful and recognizable microscope, which allowed him to see small microscopic organisms. In the 1660s, a scientist named Robert Hooke looked at a small section of bark on an oak tree called cork (diagram 2). This small section was made up of little rectangles which he called "cells" (diagram 3). He didn't know it at the time, but he was getting the first glimpse of plant cells. It is Robert Hooke that is credited with coining the term *cells*."
- Diagram 2:** A cross-section of a cork with labels: Cork, Cork cambium, Phelloderm, Secondary Phloem, and Pith.
- Diagram 3:** A diagram of a cork cell with labels: cell wall, nucleus, and cytoplasm.
- Text:** "The works of Hooke and Van Leeuwenhoek contained cells and where they came from and their cells. The three main points of the evidence."
The Cell Theory:
 1. Every living organism is made of cells.
 2. Cells are the basic units of living things.
 3. Cells come only from other existing cells.

Eukaryotes Worksheet:

- Big Idea Question:** What are the similarities and differences between the types of eukaryote cells?
- Diagram 1:** A diagram of a unicellular organism (paramecium).
- Diagram 2:** A diagram of a multicellular organism showing an animal cell, a nerve cell, and a blood cell.
- Text:** "All living things are made up of cells. Some living things are small and are made up of only one cell. These are called unicellular organisms. An example of a unicellular organism is a paramecium (diagram 1). Other living things are made up of multiple cells that all have specific functions. These are called multicellular organisms. An example of a multicellular organism is you." "Eukaryotic organisms can be either unicellular or multicellular. Eukaryotic cells are larger and have many parts that work together to help them stay alive. The special parts, called organelles, are not found in all eukaryotic cells. The type of organelles that are found in each cell are determined by the main function of the cell. As we discuss the main organelles found in eukaryotic cells, we will focus on the two most common eukaryotic cells, plant cells and animal cells (diagram 3)."
- Diagram 3:** A comparison of a plant cell and an animal cell. The plant cell has a cell wall, large central vacuole, chloroplasts, and a nucleus. The animal cell has a nucleus, mitochondria, lysosomes, and a cell membrane.
- Text:** "The nucleus is the brain of the cell, it holds the genetic information or blue prints. It is found in all eukaryotic cells. The cell wall is a structure that protects the cell and helps it keep its shape. It is found in plant cells and some bacteria. The cell membrane is found in all cell types. It allows things to move through them. The cytoplasm is the jelly-like substance that fills the cell. These are organelles. They are small structures that perform specific functions. They convert it into food. Some cells have one large central vacuole. Though some plants, they have many small vacuoles."

In the foreground, a digital tablet displays a reading comprehension interface with the following sections:

- Directions:** 1. Answer the questions on the left. 2. Label the diagrams with the labels on the right. 3. Compare and contrast prokaryotes and eukaryotes. 4. Answer the question at the bottom.
- Text Box:** "What is the definition of cells?"
- Diagram Labeling:** A diagram of a cell with labels for "Prokaryote Only", "Both", and "Eukaryote Only".
- Comparison Table:**

Prokaryote Only	Both	Eukaryote Only
Add text	Add text	Add text
- Text Box:** "Eukaryotic cells are at least ten times larger than prokaryotic cells. Why do you think they are so large? Explain your reasoning with evidence."

Included: Photosynthesis and Cellular Respiration

Covers

- ✓ Photosynthesis
- ✓ Cellular respiration
- ✓ Cycling of matter and energy

“ Our biology teacher and I share a lot of the same students this semester, so finding reading activities I can sprinkle into my English classes is a blessing! We discuss the passages together as a class and talk through any confusion students may have on the science concepts, as well as discussing the writing elements of the passage. Highly recommend!- Laura ”

Cellular Respiration

We all know the importance of oxygen—it's what we breathe to stay alive. But oxygen is needed for more than just our lungs. It plays a key role in helping our bodies release energy from food. Have you ever run a race and felt completely exhausted by the end? That's because your body is using a lot of energy. Marathon runners often eat a big meal the night before a race, full of carbohydrates like pasta and bread. Why do they do this? Because those foods contain sugars that provide fuel for the body's cells. The process that turns food into usable energy is called cellular respiration.

Cellular respiration is a chemical process that happens inside your body's cells to release energy from food, and it takes place in the mitochondria, often called the cell's "powerhouse." Before this can happen, your body must first break down the food you eat. Your digestive system breaks down carbohydrates—like bread, fruit, and pasta—into a sugar called glucose, which enters your bloodstream and travels to your cells. At the same time, oxygen from the air you breathe moves from your lungs into your blood and is carried to the cells as well (Diagram 1). When glucose and oxygen meet inside the mitochondria, they undergo a chemical reaction that releases energy, carbon dioxide, and water as waste. This energy powers everything your body does, like running, thinking, growing, and staying warm.

Diagram 1: This visual shows how the body prepares for cellular respiration. The digestive system breaks down food into glucose, and the respiratory system brings in oxygen—both are sent through the bloodstream to cells, where they are used to produce energy.

Inside your cells, glucose from the food you eat and oxygen from the air you breathe are combined in a series of chemical reactions called cellular respiration (Diagram 2). This process happens in the mitochondria, where the chemical bonds in glucose are broken, and the atoms are rearranged to form carbon dioxide and water. As these new molecules form, energy is released as ATP (adenosine triphosphate), which your cells use to power everything you do—like moving your muscles, growing new cells, thinking, and staying warm. The carbon dioxide is carried through your blood back to your lungs, where you exhale it, and the water may be used by your body or removed as waste. Even though food and oxygen seem simple, together, they fuel every part of your body through this amazing process that turns matter into usable energy.

$$\text{glucose} + \text{oxygen} \rightarrow \text{carbon dioxide} + \text{water} + \text{ATP (energy)}$$
$$\text{C}_6\text{H}_{12}\text{O}_6 + 6 \text{O}_2 \rightarrow 6 \text{CO}_2 + 6 \text{H}_2\text{O} + \text{ATP (energy)}$$

Diagram 2: Cellular respiration is the process where glucose and oxygen enter the mitochondria of a cell and are broken down through chemical reactions. This releases energy in the form of ATP, along with carbon dioxide and water as byproducts.

Photosynthesis

According to the World Wildlife Fund, we lose about 36 football fields of forest every minute through fires, clear-cutting for agriculture, ranching, development, logging, and climate change. This impact threatens both humans and other animal species. To better understand this impact, we need to know why plants are important and what they do for us. Plants are important because they undergo a process called photosynthesis.

Photosynthesis is how plants make their own food and how they bring energy into the entire ecosystem. This means that almost all the energy living things use starts with plants. Inside the cells of a plant's leaves are tiny structures called chloroplasts, which are like little solar panels (Diagram 1). These chloroplasts contain a green pigment called chlorophyll, which gives plants their green color. Chlorophyll's job is to capture energy from sunlight, much like a solar panel collects energy from the sun. That light energy is then used to start a chemical reaction chain that turns simple ingredients—carbon dioxide and water—into sugar that the plant can use for energy and growth. Without chloroplasts and chlorophyll, plants couldn't perform photosynthesis, and life on Earth would look very different.

Diagram 1: Chloroplasts are tiny green structures found inside the cells of plant leaves. They contain chlorophyll and are the part of the plant where photosynthesis happens, capturing sunlight to make food.

But sunlight isn't the only ingredient. Plants also need carbon dioxide for photosynthesis, a gas found in the air. They take in carbon dioxide through tiny openings on the underside of their leaves called stomata, which open and close like little mouths to exchange gases. Plants also need water, which they absorb from the soil through their roots. The water travels up the stem through narrow tubes called xylem, where it meets the carbon dioxide and sunlight. When all three ingredients—light, water, and carbon dioxide—are present, the plant uses the sun's energy to power a chemical reaction (Diagram 2). This reaction produces glucose, a sugar that stores energy, and oxygen, which is used into the air. Glucose becomes food for the plant and is stored for future energy use. Oxygen is a byproduct—about 20% of the Earth's oxygen comes from forests. Without any one of these ingredients, photosynthesis could not happen, and life on Earth would look very different.

Diagram 2: Photosynthesis is the process by which plants use sunlight, carbon dioxide from the air, and water from the soil to produce glucose and oxygen.

$$\text{carbon dioxide} + \text{water} \xrightarrow{\text{sunlight}} \text{glucose} + \text{oxygen}$$
$$6 \text{CO}_2 + 6 \text{H}_2\text{O} \xrightarrow{\text{sunlight}} \text{C}_6\text{H}_{12}\text{O}_6 + 6 \text{O}_2$$

Worksheet Questions:

- 1. What is photosynthesis? Add text
- 2. What is cellular respiration? Add text
- 3. What is the role of decomposers in the cycling of matter? Add text
- 4. Label the diagram to show how matter is cycled and energy is transferred in an ecosystem. Add text
- 5. What happens to energy as it moves through an ecosystem? Add text
- 6. How does matter cycle through an ecosystem? Add text

Included: Energy Flow (Food Web and Food Chain) Science Reading

Covers

- ✓ energy flow in ecosystems
- ✓ food chains and energy pyramids
- ✓ food webs

Food Chain and Energy Pyramid

Have you ever wondered how energy moves through an ecosystem? Food chains act like energy maps, showing how life sustains itself. They start with plants, the producers, that harness sunlight through photosynthesis to create energy. Next in line are herbivores, which eat plants to gain energy. Then, carnivores or omnivores consume herbivores, passing energy along the chain. This transfer of energy is essential for all life in an ecosystem.

Energy pyramids (diagram 1) help organize these energy levels within a food chain. An energy pyramid is a graphical representation that shows the energy distribution among an ecosystem's different trophic levels. Producers sit at the base, holding the most energy. Each level has less energy as you move up the pyramid because some are lost as heat during bodily functions. This pyramid shape effectively shows how energy decreases as it travels through the food chain.

Diagram 1: Food Pyramid

Trophic Pyramid

Every step in a food chain (diagram 2) is called a trophic level. A food chain is a linear sequence that shows how each living thing gets its food, starting with producers and ending with top predators. At the first trophic level, you have producers. Herbivores, or primary consumers, occupy the second level. Then, carnivores, omnivores, or secondary consumers fill higher trophic levels. Decomposers, like bacteria and fungi, play a crucial role by breaking down dead matter and recycling nutrients into the ecosystem. While they are not typically depicted in a specific level of the energy pyramid, decomposers operate at all levels. They break down dead organisms and waste from all trophic levels, returning vital nutrients to the soil and supporting the producers at the pyramid's base.

Diagram 2: Food Chain trophic levels

Energy is lost at each trophic level due to activities such as metabolism, growth, and movement. The number of organisms that can be supported at each level decreases as you move up the energy pyramid, which is why ecosystems need a balanced food chain and energy flow. Habitat loss can upset this balance, affecting energy flow. Adopting sustainable practices are essential for maintaining a balanced food chain and energy flow.

In a summary, understanding food chains and energy pyramids, from plants to decomposers, each organism has a role to play. Grasping these concepts, we can contribute to maintaining healthy ecosystems.

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Food Web

Have you ever thought about how all living things are connected in nature? A food web is like nature's intricate tapestry; every strand represents a vital connection. It's a complex network of interlinked food chains, showing how energy flows through an ecosystem.

The core of a food web (diagram 1) are the producers, like plants and algae, which harness sunlight through photosynthesis. Herbivores such as rabbits and deer rely on these plants for energy. Carnivores like lions and wolves hunt other animals for food. Omnivores, like humans and bears, eat both plants and animals. Decomposers, like fungi and bacteria, break down organic matter, returning nutrients to the soil. Energy flows through trophic levels, starting with producers that capture energy. As you move up the levels, the amount of energy decreases because some energy is lost during the process. This transfer of energy sustains life across the ecosystem.

Diagram 1: Food Web

Desert Ecosystem

Marine Ecosystem

A linear sequence showing how each living thing gets food, starting with a producer and ending with a predator. In contrast, a food web is a more complex network of interconnected food chains. A food web illustrates the many different ways energy flows through different parts of an ecosystem. A food web can cause changes in an ecosystem, impacting plant life and species' survival.

Maintaining a balanced food web is essential for biodiversity. Each organism can actively contribute to the stability of the ecosystem. Appreciating the complexity of life they support is a key to understanding ecosystems.

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Energy in Ecosystems

TOPIC Energy in Ecosystems

GUIDING QUESTION How do different living organisms obtain the energy they need to survive?

Diagram 2: Cellular Respiration

Energy drives all life-sustaining processes. It's the force behind organisms' growth, repair, reproduction, and movement. Without energy, cells wouldn't be able to perform metabolic activities, and life would cease to function. Maintaining energy balance is key for health and survival at all levels of biological organization. In ecosystems, energy flows in a structured manner. Producers like plants and algae capture sunlight and convert it into chemical energy through photosynthesis. This energy is transferred through the food chain as consumers—herbivores, carnivores, omnivores—feed on producers or other consumers. At each trophic level (diagram 3), some energy is lost as heat during metabolic processes, resulting in ecosystems' pyramid-shaped energy transfer structure.

Diagram 3: Trophic levels

Balancing energy intake and expenditure is crucial for organisms' health. Not getting enough energy can lead to malnutrition and impaired physiological functions, while too much energy intake without adequate expenditure can cause obesity and related health issues. Understanding energy balance helps promote well-being and ecological stability.

In conclusion, energy is a fundamental component of life, driving biological processes and sustaining ecosystems. By understanding the sources, conversion, importance, and dynamics of energy transfer, we gain insights into the intricate web of life on Earth and the interconnectedness of all living organisms.

QUESTION	KEY DETAILS
How does energy flow through ecosystems?	Add text
SYNTHESIS SENTENCE: 'BIG IDEA OF THE TEXT IN ONE SENTENCE'	Add text

Included: Ecosystem Relationships Science Reading

Covers

- ✓ symbiotic relationships in ecosystems
- ✓ competition in ecosystems
- ✓ predatory relationships in ecosystems

Predatory Relationships in Ecosystems

Have you ever wondered how predator-prey relationships shape ecosystems? These interactions play a crucial role in maintaining the balance of nature. Imagine a coyote silently stalking a rabbit in a meadow. The coyote is the predator, and the rabbit is the prey (diagram 1). A predator is an animal that hunts other animals for food. The animals that are hunted are called prey. When the coyote catches the rabbit, it not only gets a meal but also helps control the rabbit population. These interactions help keep prey populations from growing too large, ensuring a healthy balance within the ecosystem.

Diagram 1: Predator prey relationship

Predators, like coyotes, hunt prey like rabbits for food.

Predators are essential in preventing prey populations from reaching the ecosystem's carrying capacity, the maximum number of individuals an environment can support over time. Predators often catch the weaker or injured members of a prey population, leaving more resources for the healthier individuals. This keeps the population in check and ensures that the remaining members have access to adequate resources, keeping the population strong and resilient.

The balance between predator and prey populations is dynamic. As the prey population increases, more food is available for predators, causing the predator population to grow. However, as the number of predators increases, they capture more prey, which leads to a decrease in the prey population. Consequently, the predator population also starts declining due to food scarcity. This cycle continues, helping to regulate the sizes of both predator and prey populations over time. If the predator population decreases, for example, if there are fewer hawks to eat rabbits (diagram 2), the prey population (snakes) can grow unchecked. This can lead to an overpopulation of snakes, which may impact other species and resources within the ecosystem, creating an imbalance.

Diagram 2: Decrease in predator

When hawks decreased in population, they caused a chain reaction in the ecosystem. The number of snakes increased because they were no longer hunted by the hawks and had no competition from the hawks, allowing them to consume more rabbits and decreasing the rabbit population.

Some predators are known as keystone species. For example, certain sea stars on mussels and sea urchins with no other natural predators would grow explosively, changing the ecosystem.

Both predators and prey have adaptations. Keen senses, help them capture prey. Prey often avoid being caught. These evolutionary adaptations and prey thrive in their environment.

Understanding predatory relationships is crucial for ecosystems. By appreciating the roles of predators and prey, we can better understand how to maintain the ecological balance and biodiversity.

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Competitive Relationships in Ecosystems

Have you ever wondered how members of the same species compete with each other in nature? Intraspecific competition is a natural phenomenon where individuals of the same species vie for resources within their environment. This competition is crucial in shaping behaviors, adaptations, and population dynamics.

Intraspecific competition comes in several forms (diagram 1). One type is resource competition, where individuals within a species compete for limited resources such as food, water, and shelter. For example, in a forest, trees of the same species may vie for sunlight and nutrients to support their growth. Another form is territorial competition, where many animals establish territories to secure access to resources and mates. Territorial disputes often involve displays of aggression or marking boundaries to ward off competitors. Lastly, social competition occurs within social groups where individuals compete for leadership positions, mating rights, or social benefits like grooming or protection.

Diagram 1: Intraspecific competition

Resource Competition
Individuals compete for limited resources like nesting sites in trees.

Territory Competition
Individuals compete for territory of resources and mating rights.

Social Competition
Individuals compete for leadership positions and mating rights.

Individuals within a species have developed various strategies to navigate intraspecific competition. Dominance hierarchies are one such strategy, where dominant individuals have preferential access to resources, reducing conflict and ensuring that resources are distributed. Territorial marking is another strategy, where animals use scent markings or physical markers to claim and defend territories, deterring intruders and ensuring access to resources. Additionally, behavioral adaptations like aggression, cooperation, or strategic alliances can help individuals gain competitive advantages, ensuring survival and reproductive success.

Intraspecific competition influences population densities, growth rates, and distribution patterns within species. However, human activities such as habitat destruction, pollution, and overexploitation of resources can intensify intraspecific competition among wildlife (diagram 2). Conservation efforts aim to mitigate these impacts and promote sustainable practices to maintain ecological balance.

Diagram 2: Human impact through introduction of Red Lionfish

The introduction of Red Lionfish to the Western North Atlantic region has had a significant impact on the local ecosystem. Red Lionfish, an invasive species, has outcompeted native species for resources, leading to a decline in their populations. This has disrupted the ecological balance and biodiversity of the region.

Prague Ecosystem

Population of organisms in population

Grasshopper
Squirrel
Snake
Hawk

TOPIC Symbiotic relationships in Ecosystems

GUIDING QUESTION What are the key differences between mutualism, commensalism, and parasitism, and how do these relationships benefit or harm the species involved?

Have you ever wondered how different species live together in nature? Symbiosis, the intimate relationships between different species, is a cornerstone of ecosystem dynamics. These interactions range from mutually beneficial partnerships to exploitative dependencies, shaping how organisms interact and thrive within their environments.

Mutualism, commensalism, and parasitism (diagram 1) are fascinating symbiotic relationships that illustrate the intricate connections between different species. In mutualism, both species involved benefit from the interaction. A prime example is the relationship between flowering plants and pollinators like bees. As bees gather nectar for food, they inadvertently transfer pollen between flowers, aiding in plant reproduction and ensuring the survival of both species. In commensalism, one species benefits while the other is neither helped nor harmed. Birds nesting in trees shelter themselves without affecting the trees. The birds gain a safe place to live while the trees remain largely unaffected. Parasitism, on the other hand, involves one organism benefiting at the expense of another. Parasites such as ticks or fleas feed on their hosts, often causing harm or discomfort. Despite the negative impact on the host, parasites control population sizes and shape evolutionary adaptations.

Diagram 1: Symbiotic Relationships

Mutualism **Commensalism** **parasitism**

QUESTION What is symbiosis?

KEY DETAILS Add text

QUESTION What is the difference between mutualism, commensalism, and parasitism?

KEY DETAILS Add text

SYNTHESIS SENTENCE: (BIG IDEA OF THE TEXT IN ONE SENTENCE)

Add text

population dynamics
preserve biodiversity
for appreciation of
the world.

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Included: Biodiversity Science Reading

Covers

- ✓ importance of biodiversity
- ✓ threats to biodiversity
- ✓ biodiversity in ecosystems

The collage features several educational components:

- Importance of biodiversity:** Text explaining that biodiversity refers to the incredible variety of life on Earth, including all living organisms, from tiny bacteria to giant trees and animals. It's like a vast library of species that make our planet unique and beautiful. Biodiversity encompasses the diversity of species, genetic variation within species, and the ecosystems they form.
- biodiversity in Ecosystems:** Text defining biodiversity as the incredible variety of life on Earth, including plants, animals, and microorganisms. It encompasses the diversity of species, genetic variation within species, and the ecosystems they form. Different biomes vary significantly in their biodiversity.
- Diagram 1: healthy ecosystem:** Illustrates the role of bees in pollinating flowers, which helps regulate the Earth's climate. Biodiversity also ensures ecosystem resilience, allowing ecosystems to recover faster from disturbances.
- Diagram 2: Importance of biodiversity:** Shows a coral reef ecosystem with various marine life, including a turtle and a shark, highlighting the importance of biodiversity in maintaining the balance and stability of the ecosystem.
- Land ecosystems:** Illustrates a land ecosystem with a bear, a bird, and a tree, explaining that land ecosystems provide a variety of habitats for different species.
- Water ecosystems:** Illustrates a water ecosystem with a fish and a turtle, explaining that water ecosystems are equally diverse and support a variety of life forms.
- Presentation Slide:** A slide titled "1. What is biodiversity?" with a "Grassland ecosystem" image and a "Desert ecosystem" image. It includes questions like "2. What types of ecosystems have high biodiversity?", "3. How do grasslands differ in biodiversity compared to deserts?", "4. Explain why aquatic ecosystems are important for maintaining biodiversity.", and "5. Explain why land ecosystems are important for maintaining biodiversity.".

Included: Types of Ecosystems Science Reading

Covers

- ✓ **terrestrial ecosystems**
- ✓ **freshwater ecosystems**
- ✓ **aquatic ecosystems**

The image displays a collection of science reading materials. On the left, there are two pages from a book or workbook. The top page is titled 'Terrestrial Ecosystems' and discusses various biomes like deserts, grasslands, and rainforests. It includes a diagram of a grassland ecosystem with giraffes and lions, and a diagram of a deciduous forest with deer and squirrels. The bottom page continues the text about rainforests and taiga. On the right, there are two pages titled 'Freshwater Ecosystems'. The top page discusses the biodiversity of lakes and rivers, including a diagram of a lake ecosystem with fish and amphibians. The bottom page discusses the importance of wetlands and the impact of human activities on freshwater ecosystems. In the foreground, a tablet displays a worksheet with the following questions: 1. Describe freshwater ecosystems. 2. Identify which freshwater ecosystem is illustrated in the picture. 3. List the different types of freshwater ecosystems. 4. How are wetlands and ponds similar and different? 5. How are humans impacting freshwater ecosystems? The worksheet also includes several 'Add text' boxes for student responses.

Included: Genetics Science Reading

Covers

- ✓ Mendel
- ✓ heredity
- ✓ Inheritance of traits
- ✓ Punnett squares
- ✓ Dominant and recessive traits
- ✓ Phenotypes and genotypes
- ✓ Meiosis

“ It took my students a few days to complete, but it was exactly what we needed to break the topic down.- Learning with a cup of coffee ”

Inheritance
Big Idea Question: How do traits get passed on from parent to offspring?
In 1853, Gregor Mendel, a priest, began teaching high school near his monastery. He also cared for the monastery's garden. He became interested about the pea plants in the garden. He noticed that some of them displayed different traits, or characteristics, than the others. Most of the plants were tall, but he also saw a few short ones. Most of the flowers were purple, but every once in a while a different trait emerged that was not like the parent. He experimented with pea plants for more than ten years and formed the foundation of **genetics**, the study of heredity.

Diagram 1:

Seed	Flower	Pod	Stem		
Form	Cotyledons	Color	Place	Size	
ROUND	YELLOW	FULL	YELLOW	AXIL FLOWERS	TALL
WRINKLED	GREEN	CONTRACTED	GREEN	TERMINAL FLOWERS	SHORT

Gregor Mendel studied pea plants because they had many traits with only two forms.

Mendel chose to work with pea plants because they had many traits that had only two characteristics. It was also easy for him to prevent the pea plants from self-pollinating and control the pollination himself. When Mendel started his experiments, he made sure he had purebred plants and not hybrid. A **purebred** means the parents always produced offspring that had the same form of trait as themselves. You have probably heard this term in relation to dogs. A purebred Labrador's parents and its grandparents are all Labradors, whereas a **hybrid** dog's parents and grandparents are a mix of breeds. In Mendel's case, this meant that tall plants always produced tall plants and short plants always produced short plants. He crossed two purebred plants with opposite forms and noticed something interesting.

Diagram 2:

P generation: purebred tall with a purebred short.

F₁ generation:

When Mendel mixed a purebred tall plant with a purebred short plant the result in the first generation was all tall plants. The short form of the trait seemed to disappear.

In his first cross, he crossed purebred tall parents P generation, or parent generation. The short form of the trait seemed to disappear.

Punnett Squares
Big Idea Question: How can Punnett squares be used to predict the probable outcomes of offspring?
When mice reproduce, there is a 50% chance of having a boy and a 50% chance of having a girl.
Mice are known to have six to eight babies per litter and can have multiple litters in a year. Each time a mouse has a baby, there is a 50% chance of having a boy and a 50% chance of having a girl. This does not mean that if they have six babies half will be boys and half will be girls. They could have all boys or all girls. The actual results will be to the predicted outcome. You can predict the possible results of two parents using a tool called a Punnett Square.
A Punnett square is a tool that can show possible allele combinations of a genetic trait between two parents genotypes. A Punnett square shows the allele combination for a trait. The genotype combination is written in the top and left of the square. It determines an organism's **phenotype** or appearance. Diagram 2 shows a Punnett square for a brown bunny and a white bunny. The allele for brown fur is represented by a capital letter B. All offspring have the same result Bb. Since B is dominant and b is recessive, all offspring are brown.

Diagram 2:
A cross of a brown (BB) with a white (bb) will result in:
Bb - 100% brown - 100%

geneticists use two types of an organism. One is a purebred and the other is a hybrid. A purebred has two of the same alleles, either two dominant or two recessive alleles. When the alleles are different, they are heterozygous. Two of the same alleles are homozygous. If they are both capital letters, they are homozygous dominant. If they are both lowercase letters, they are homozygous recessive.

Meiosis
Directions: 1. Read the information on the left. 2. Use the red circles on the left to identify key words. 3. Answer the questions by putting answers and key details onto the right. 4. Write a one sentence synthesis statement that explains the big idea of the text.
Meiosis is a type of cell division that occurs in two main steps (diagram 2). In the first step, the chromosomes in the two cells separate into two cells. In the second step, the chromosomes in the two cells separate again. The end result is four cells, each with half the number of chromosomes. For example, if the organism starts with 24 chromosomes in its body cells, then after meiosis its sex cells will each have 12 chromosomes. The sex cells of the parent combine to produce an organism with a full number of chromosomes, half from one parent and half from the other.

TOPIC	Meiosis	GUIDING QUESTION	Why does each parent only give one allele for each trait?
QUESTION	What is meiosis?	KEY DETAILS	Add text
QUESTION	Why do sex cells have half the number of chromosomes?	KEY DETAILS	Add text
SYNTHESIS SENTENCE: (BIG IDEA OF THE TEXT IN ONE SENTENCE)			
Add text			

Included: Reproduction and mutations Science Reading

Covers

- ✓ asexual reproduction
- ✓ sexual reproduction
- ✓ mutations

Sexual Reproduction

Sexual reproduction is a process where organisms create new individuals by combining genetic material from two parents, resulting in offspring with unique traits. This type of reproduction involves the fusion of specialized sex cells, or gametes, from each parent. These gametes contain half the parent's genetic material, which combines to form a zygote with a complete set of chromosomes, ensuring genetic diversity.

In sexual reproduction, each parent produces gametes through meiosis, which reduces the chromosome number by half. During fertilization, a sperm cell from the male and an egg cell from the female merge to create a zygote (diagram 1). This zygote then undergoes mitosis and cell division, developing into a new individual with a mix of genetic traits from both parents. This genetic variation is crucial for the survival and adaptability of species.

Diagram 1: sexual reproduction

Bees help fertilization occur in plants by transferring the male sperm cells from one plant to the female egg cells of another plant.

One of the primary advantages of sexual reproduction is genetic diversity. This diversity increases the chances of survival in changing environments because it produces offspring with varied traits. For example, in a population of plants, some individuals might be better equipped to survive droughts or resist diseases, thanks to the genetic variation introduced through sexual reproduction. This adaptability is a significant evolutionary advantage, allowing species to thrive in diverse and fluctuating conditions. Additionally, genetic diversity helps populations avoid the negative effects of inbreeding, such as the accumulation of harmful mutations. It also promotes the potential for beneficial traits to emerge, enhancing the overall fitness and resilience of the population. This variability within a population is crucial for long-term survival and evolution.

Diagram 1: Advantages of sexual reproduction

Siblings look similar to parents and each other but have slight variations. These variations can make some better at survival than others.

However, sexual reproduction also has its downsides. It is often more time-consuming and energy-intensive. Additionally, supporting the growth of offspring demands more resources. In animals like certain mammals, experience learning and socializing can also be demanding. The need to find mates, avoid predators, and cope with diseases, or harsh environmental conditions, adds to the complexity. These factors can limit reproduction frequency. The need to find mates, avoid predators, and cope with diseases, or harsh environmental conditions, adds to the complexity. These factors can limit reproduction frequency. The need to find mates, avoid predators, and cope with diseases, or harsh environmental conditions, adds to the complexity. These factors can limit reproduction frequency.

By combining genetic material from two parents, sexual reproduction is a more resource-intensive and risky strategy. However, it is also a more effective way to promote biodiversity and genetic stability. This combination of genetic material is fundamental to the evolution of species and their ability to adapt to changing environments.

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Mutations

Genetics, mutations play a crucial role in creating diversity among living organisms. These changes in DNA lead to new traits and adaptations and sometimes even contribute to diseases. Mutations are alterations in the genetic material and DNA that occur spontaneously or due to external factors like radiation or chemicals. They can affect a single nucleotide, known as a point mutation, or involve more significant segments of DNA, such as insertions, deletions, or duplications. While some mutations are harmless, others can significantly affect an organism's phenotype or observable characteristics.

Mutations can occur in various forms. Point mutations involve changes in a single nucleotide, such as when one nucleotide is substituted for another, potentially altering the amino acid sequence in proteins (diagram 1). For example, changing a Cytosine (C) to a Thymine (T) can lead to different protein structures. Insertions and deletions, which add or remove nucleotides from the DNA sequence, can cause a shift in the reading frame of the genetic code, resulting in non-functional or truncated proteins. Duplications result in extra copies of a gene, which can lead to gene amplification or altered gene regulation. Translocations involve the exchange of genetic material between non-homologous chromosomes, potentially disrupting normal gene function.

Diagram 1: Point mutations

Mutations on a species can vary widely. Beneficial mutations can confer advantages, such as resistance to diseases or environmental stresses, enhancing an organism's ability to survive and reproduce. For example, the peppered moths that caused dark coloration provided camouflage against soot-covered trees during the Industrial Revolution, enhancing their survival (diagram 2). Neutral mutations have no effect on an organism's fitness or phenotype, often occurring in non-coding regions of DNA or in regions that do not affect their survival or reproduction. For example, in wild mice populations, mutations in the Mc1r gene can lead to different coat colors without impacting their survival. Harmful mutations can accumulate over time, leading to genetic disorders or diseases. For example, a mutation in the CFTR gene can lead to cystic fibrosis in humans, a chronic lung disease that causes difficulty breathing and frequent infections. Other mutations can affect an organism's ability to find food, avoid predators, and reproduce, leading to a decrease in their fitness and survival. Some mutations can also lead to the development of new species over time, a process known as speciation.

Directions: 1. Read the information on the left. 2. Use the red circles on the left to identify keywords. 3. Answer the questions by putting answers into the key details on the right. 4. Write a one sentence synthesis statement explaining the text's big idea.

TOPIC	GUIDING QUESTION	QUESTION	KEY DETAILS
Asexual reproduction	What are the advantages and disadvantages of asexual reproduction?	What is asexual reproduction?	Add text
Bacteria undergoing binary fission	What are some ways asexual reproduction can occur?	What are some ways asexual reproduction can occur?	Add text

SYNTHESIS SENTENCE: (BIG IDEA OF THE TEXT IN ONE SENTENCE)

Add text

After when the trees

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Included: Artificial Selection Science Reading

Covers

- ✓ selective breeding
- ✓ genetic engineering
- ✓ genetically modified organisms

Genetic Engineering

What if you could change the instructions that make plants grow or produce life-saving medicines? Artificial selection, the human-directed process of selecting specific traits in organisms, has been used for centuries to shape the characteristics of various plants and animals. Genetic engineering is a modern extension of this process, directly modifying an organism's DNA. DNA, which functions like a set of instructions for living things, can be altered by scientists to create organisms with new traits and abilities. By precisely editing these instructions, genetic engineering helps enhance the effectiveness and efficiency of artificial selection, enabling the development of crops resistant to pests and diseases or bacteria that can produce essential medicines.

Special tools that allow scientists to cut and paste pieces of DNA are at the heart of genetic engineering. Imagine DNA as a long string of letters representing a different trait. Scientists can snip out certain letters and insert new ones, changing the instructions and creating organisms with desired characteristics. For example, they can make crops resistant to pests or develop bacteria that produce medicines.

Genetic engineering offers a wide range of benefits across various fields. Agriculture helps create crops that can withstand harsh conditions like drought or pests, increasing food production and reducing the need for harmful pesticides. This is particularly important for feeding growing populations around the world. Genetic engineering has revolutionized the development of treatments and therapies for numerous diseases in medicine. For example, it enables the creation of gene therapies that target and correct genetic disorders at their source, offering hope for conditions previously deemed untreatable. Cancer treatments have also advanced, with genetically engineered immune cells designed to recognize and attack cancer cells more effectively. Beyond therapies, genetic engineering plays a crucial role in producing vital substances such as insulin, which is essential for diabetes management. By inserting the human insulin gene into bacteria, scientists can produce large quantities of insulin more efficiently and at a lower cost. This advancement has transformed the lives of millions of diabetics worldwide, ensuring a reliable and accessible supply of this life-saving hormone.

Diagram 2: Insulin

The gene for making insulin is removed from the cell. A portion of DNA is removed from the bacterium. The insulin gene is put into the bacterium's DNA. The bacteria rapidly multiply with each one producing insulin. Insulin is removed and given to a human who needs it.

Selective Breeding

What if you could choose the traits of your pet or the vegetables in your garden? Artificial selection, a process where humans intentionally breed organisms with specific traits, encompasses methods like selective breeding. Selective breeding involves actively choosing particular traits in plants or animals to be bred together, aiming to create offspring with desired characteristics. This method has been used for centuries and plays a crucial role in shaping the characteristics of various organisms around us.

Selective breeding begins with breeders carefully selecting organisms that exhibit the traits they desire. For example, farmers might choose cows that produce a high quantity of milk or plants that resist pests. These selected organisms are bred together over multiple generations, ensuring the desired traits become more pronounced and consistent in the offspring.

Selective breeding offers numerous benefits across different fields. Agriculture helps improve food production by developing crops more resistant to diseases, pests, and environmental stresses (diagram 1). Additionally, selective breeding is used in animal breeding programs to enhance traits such as size, intelligence, or loyalty, catering to various preferences and needs.

Diagram 1: Selective Breeding in Agriculture

Farmers will cross-breed different plants to produce more plants with a desired trait.

Advantages, selective breeding also presents challenges and considerations. One primary concern is the reduction of genetic diversity within populations. As breeders focus on specific traits, they naturally decrease the gene pool, making organisms more susceptible to new diseases or environmental changes (diagram 2). Ethical considerations are also paramount in selective breeding, including the well-being and welfare of the organisms involved are prioritized throughout the process.

Disadvantages of selective breeding

While genetic engineering holds great promise, it also comes with significant challenges and considerations. One primary concern is its potential environmental impact. The release of genetically modified organisms could unpredictably affect biodiversity and ecological balance. The ethical questions surrounding manipulating human DNA raises issues about genetic engineering, and social inequality, as access to these technologies could have profound societal implications. The concept of "designer babies" adds another layer of complexity, as access to these technologies could have profound societal implications. High these considerations to ensure that the benefits of genetic engineering are shared equitably and responsibly.

As technology advances, so does genetic engineering. New techniques to edit DNA more precisely and efficiently, and innovations in agriculture, medicine, and environmental science. New genetic engineering can help create sustainable solutions to some of the world's most pressing challenges.

Genetic engineering is a captivating field that continues to evolve. As our understanding of DNA, scientists are paving the way for groundbreaking discoveries and innovations that hold immense potential for the future.

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Directions: 1. Read the information on the left. 2. Use the red circles on the left to identify keywords. 3. Answer the questions by putting answers into the key details on the left. 4. Write a one sentence synthesis statement explaining the text's big idea.

TOPIC	GUIDING QUESTION	QUESTION	KEY DETAILS
Genetically modified organisms	What are the pros and cons of genetically modified organisms?	What are the benefits of genetically modified organisms?	Add text
Genetically modified organisms	What are the pros and cons of genetically modified organisms?	What are the benefits of genetically modified organisms?	Add text

SYNTHESIS SENTENCE: (BIG IDEA OF THE TEXT IN ONE SENTENCE)

Add text

Diagram 1: GMO Corn

Core Yield (GMO vs No modification)

Amount of Corn Yield	Amount of Pesticide
High	Low
Medium	Medium
Low	High

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revolutionizing the way we introduce specific traits into plants and animals and the way we breed them. This process opens up a deeper understanding of sustainable breeding and food security and the role of genetically modified organisms. Selective breeding is a key tool in this process. www.venturesinSTEM.com

Included: Natural Selection Science Reading

Covers

- ✓ Darwin
- ✓ natural selection
- ✓ Evolution
- ✓ Speciation
- ✓ Extinction
- ✓ Taxonomy
- ✓ Cladograms

“ Good resource to differentiate reading passages for students. A great time saver as well.- Julie ”

Darwin and Natural Selection
Big Idea Question: What is natural selection?
It was the 1830s and the HMS *Beagle*, a British ship, was on a 5 year journey to sail around the world. On the ship was a naturalist named Charles Darwin. A naturalist is someone who studies nature. Among their many stops, they visited a group of islands off the coast of Ecuador, named the Galapagos Islands. Although Darwin had observed many plants and animals around the world, he was intrigued by what he found on this tiny group of islands. He found many interesting and unusual organisms. For instance, he saw large tortoises that were the size of a small child, iguanas that could swim under water, and a large number of different birds. Although all of these organisms were unusual, he did notice that they were all similar to the same type of organisms found on the mainland.

Finches and The Theory of Evolution
Charles Darwin was most interested in the various finches he found. He noticed that although they were alike, they all had slight differences, most noticeable in their beaks. These differences allowed the finches to live next to each other without competing for the same food source. Some of the beaks were large and wide making it easier to crack open hard seeds. Other beaks were small and narrow allowing them to catch small insects. His study of the organisms on the Galapagos Islands led him to write his most famous book, called *On the Origin of Species by Means of Natural Selection*. In his book he explains his theory that evolution, the process of organisms developing from earlier organisms, happens by natural selection.

Natural Selection
Charles Darwin proposed that natural selection is the process that allows for evolution. Natural selection happens when organisms that are better adapted to their environment survive and pass on their traits, while those that are less adapted do not. Eventually, more members of the population have the desirable traits until a new species is formed, different from the original one. The process of natural selection occurs in four steps: overproduction, inherited variation, struggle to survive, and successful reproduction (diagram 1).

Diagram 1
The diagram illustrates the four steps of natural selection: 1. Overproduction (many offspring), 2. Struggle to Survive (competition for resources), 3. Inherited Variation (differences in traits), and 4. Successful Reproduction (survivors pass on traits).

Natural Selection in Action
Big Idea Question: How do populations change?
Charles Darwin theorized that evolution was caused by natural selection. He explained that environmental factors can determine which traits are favorable and which are unfavorable. A change in the environment produces a change in the population. This change in the environment plays a role in new species being formed and other species going extinct.

Forming of new species
Speciation is the formation of a new species as the result of evolution. It occurs in three ways: separation, adaptation, and reproductive isolation. Earthquakes can cause new mountains, mountain ranges, or canyons to form. These new geologic features can divide a population. Once the population is divided, natural selection acts on the groups. Some organisms have traits that are better adapted to the new environment than others. These traits are passed down to future generations. By being isolated from each other, they are able to reproduce and pass down the traits that are better adapted to the new environment. Eventually, the organisms become so different from each other that even if they are reunited they will no longer be able to interbreed. Diagram 1 shows how the finches of the Galapagos Islands may have evolved.

The diagram shows three stages of finch evolution: 1. A single finch on a mainland. 2. Finches adapt to a new island. 3. Finches adapt to a second island and become reproductively isolated.

Overproduction: The species produces many offspring knowing that not all will survive to maturity.

Struggle to Survive: Individuals within a population compete with each other for food and shelter and avoid predators.

Cladogram
A cladogram is a diagram that is used to show the relationships among organisms (diagram 1). The bottom of the cladogram shows the most ancient common ancestor of the organisms. The traits are drawn on the cladogram to show how organisms are different from each other. Each trait listed on the cladogram is only shared by the organisms listed above it. The more traits organisms have in common, the more closely related they are. In diagram 1, the mouse and the human have four traits in common, so they are more closely related than the human and the frog which only have two traits in common.

TOPIC	Taxonomy / Cladogram	GUIDING QUESTION	What is a cladogram?
QUESTION	What is a cladogram?	KEY DETAILS	Add text
QUESTION	How do you read a cladogram?	KEY DETAILS	Add text
SYNTHESIS SENTENCE: (BIG IDEA OF THE TEXT IN ONE SENTENCE)			Add text

Included: Evidence of Evolution Science Reading

Covers

- ✓ Fossils
- ✓ comparative anatomy
- ✓ embryology

Fossils

Fossils are like Earth's time capsules, preserving the remains or traces of ancient plants, animals, and other organisms. They give us valuable insights into life forms that existed long before humans, helping scientists reconstruct Earth's history. Fossil evidence supports evolution, the process by which different kinds of living organisms develop and diversity from earlier forms.

Fossils form through a process called fossilization (diagram 1). When an organism dies, its remains may be buried in mud, sand, or volcanic ash. Over time, more sediment layers pile on top, pressing down on the remains. Minerals from the sediment seep into the organic material, gradually turning it into rock, a process that can take thousands or even millions of years.

Diagram 1: How fossils are formed

There are different types of fossils (diagram 2). Body fossils are the preserved physical parts of an organism, such as bones, teeth, shells, or even impressions of skin or feathers. These give us direct evidence of what ancient creatures looked like. Trace fossils are signs left behind by ancient life, such as footprints, tracks, burrows, nests, and even droppings. These provide clues about the behavior and activities of organisms. Petrified fossils occur when organic material in the remains gets replaced by minerals, turning the remains into stone-like structures and preserving intricate details of plants and animals. Mold and cast fossils are formed when the complex parts of an organism leave an impression in sediment that hardens over time. The mold is the impression, while the cast is created if the mold gets filled with other hardened materials. Amber fossils occur when organisms, usually insects, become trapped in tree resin that hardens into amber. These fossils can preserve incredibly detailed and delicate features.

Diagram 2: Types of fossils

Fossils are crucial for understanding Earth's changes in life forms over time, reconstructing, for instance, fossils show how whales evolved from land mammals. They also provide climate clues, such as pollen, indicating a warmer climate in the past. Fossils are like Earth's history books, helping scientists reconstruct the past. By studying fossils, scientists can see how life diversified after mass extinctions and how new species have emerged. This gives us a clear picture of the history of life on Earth.

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Comparative Anatomy

What can the structure of different organisms tell us about their evolutionary past? Comparative anatomy is the study of similarities and differences in the structures of living organisms. Through comparative anatomy, scientists can study how anatomical features have evolved to suit specific ecological niches. For instance, the skeletal structures of vertebrates often exhibit similarities, such as the presence of spine and limb bones, indicating shared ancestry.

Homologous structures are features that share a common evolutionary origin but may serve different functions in different species. The pentadactyl limb's typical skeletal pattern in mammals, reptiles, and birds is a classic example of homology. Humans and birds look different and move in various ways. Humans use their arms for grasping and their hands to grasp objects. The forelimbs of birds are wings and are used for flying. However, the bones of humans and birds show similar patterns. Homologous structures, such as the forelimbs of mammals, cats, frogs, bats, and birds, suggest that these species are related. The more alike the two structures are, the more likely the species have evolved from a recent common ancestor. This makes homologous structures strong evidence of evolution, demonstrating how species can diverge from a common ancestor while retaining similar anatomical features.

Diagram 1: Homologous structures

The different colors indicate similar bones.

Analogous structures are features that serve similar functions but have different evolutionary origins. The wings of insects are adapted for flight but evolved independently. Bird wings are covered with feathers, while insect wings are covered with tiny hairs. Though both are used for flight, their structural differences indicate they do not share a common ancestry. Because analogous structures do not indicate a common ancestry, they are not evidence of evolution.

Vestigial structures are body parts that have lost their original function through evolution. The pelvic bones of whales are an example of vestigial structures. The function for vestigial structures is that the species with a vestigial structure is related to an ancestor that used the structure for a specific purpose. Whales, for example, evolved from land mammals. Pelvic bones (c) are vestigial because they were once necessary for walking.

Evolutionary processes, including speciation, are supported by evidence from comparative anatomy. Vestigial structures, such as the pelvic bones of whales, provide evidence of common ancestry. The presence of vestigial structures, such as wings and beaks in flightless birds, supports the theory of evolution. Studying these structures helps scientists understand the relationships between different species and how they have changed over time. For more information, visit www.venturesinSTEM.com.

Embryology

What is the study of embryology, and how is it used as evidence of evolution?

Directions: 1. Read the information on the left. 2. Use the red circles on the left to identify keywords. 3. Answer the questions by putting answers into the key details on the left. 4. Write a one sentence synthesis statement explaining the text's big idea.

Diagram 1: Embryo Similarities

	Cat	Chicken	Fish	Human	Pig	Salmon
Stage 1						
Stage 2						
Stage 3						

Embryology has several important applications in science. It informs medical research, aiding in understanding human development and potential birth defects. By studying embryos of endangered species, scientists can devise conservation and habitat preservation strategies. Additionally, embryology contributes to understanding evolutionary mechanisms, including speciation and adaptation.

Embryology is a field that unveils the interconnectedness of life and provides a window into evolutionary processes. It bridges the past with the present, offering valuable insights for medical, conservation, and evolutionary studies. By exploring how organisms develop and change from embryos to adults, we can better understand the story of life on Earth and how it continues to evolve.

QUESTION

How do scientists use embryology to support the theory of evolution?

KEY DETAILS

Add text

SYNTHESIS SENTENCE (BIG IDEA OF THE TEXT IN ONE SENTENCE)

Add text

SOLAR SYSTEM

Science Reading

Formation of the Solar System

Define / Describe:

1. What is a nebula? _____
2. What force pulled particles together to form the solar system? _____
3. What are planetesimals? _____
4. What keeps the planets in orbit around the Sun? _____

Sequence:

5. Use details from the reading to fill in all four squares with a sequence of events in the formation of our solar system and planetesimals.

Elaborate / Extend:

6. Describe how planetesimals grew into planets. _____
7. Why is gravity called the "key force" in the formation of the solar system? _____
8. Do you think Earth would still support life if it weren't held in orbit by the Sun? Why or why not? _____

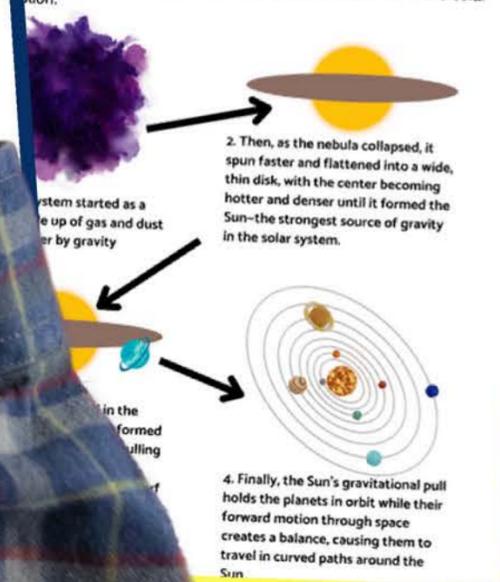
Formation of the Solar System

The solar system began as a large, cold cloud of gas and dust floating in space. This cloud, called a nebula, was filled with tiny particles and gases that spread over a huge area. At some point, something caused part of the nebula to become unstable. A nearby dying star, could have triggered this. The blast sent shockwaves through the nebula, causing it to clump together. As more particles gathered in one spot, they began to pull each other together. The key force: gravity.

Gravity works between anything with mass, no matter how big or small. It pulls things toward each other. As the cloud collapsed, it spun faster and faster, like a spinning pizza dough. The disk's center got hotter and denser, becoming the strongest source of gravity in the solar system.

As the Sun formed, it used up most of the gas and dust. The rest of the material in the disk formed small rocky bodies called planetesimals. As planetesimals grew, they pulled in more dust and gas. Some of these planetesimals crashed into each other and became round and formed the planets and dwarf planets we know today. The rocky planets like Mercury, Venus, Earth, and Mars because they were closer to the Sun, it was cooler, so those planets kept their thick gas layers and atmospheres. The leftover gas and dust that didn't become planets became comets and meteors.

The Sun's gravity didn't stop working—it became why they stayed in place. The Sun's gravity pulled the planets toward it, preventing them from flying off into space. At the same time, the planets' forward motion through space creates a balance, causing them to travel in curved paths around the Sun. Without gravity, the planets would float away. And without the Sun's gravity, they would pull them straight into the Sun. Gravity holds the entire solar system together.



1. The solar system started as a nebula of gas and dust held together by gravity.

2. Then, as the nebula collapsed, it spun faster and flattened into a wide, thin disk, with the center becoming hotter and denser until it formed the Sun—the strongest source of gravity in the solar system.

3. As the Sun formed, it used up most of the gas and dust. The rest of the material in the disk formed small rocky bodies called planetesimals.

4. Finally, the Sun's gravitational pull holds the planets in orbit while their forward motion through space creates a balance, causing them to travel in curved paths around the Sun.

Topics Included

Formation of the solar system

Inner planets

Outer Planets

Other Objects

STARS AND GALAXIES

(LIFE CYCLE OF STARS, CLASSIFICATION OF STARS, H-R DIAGRAM, AND GALAXIES)

Science Reading

Galaxies

Big Idea Question: Do galaxies have a lifecycle like stars?

As you look into the night sky away from city lights, you can see hundreds of stars. Most of these stars belong to our own Milky Way galaxy. A galaxy is a large group of gas, dust, and stars held together through gravity. Galaxies can come in different shapes and sizes. Scientists classify them by their shape and the three most common shapes are irregular, spiral, and elliptical. Although galaxies are not born or die like stars, they do change in age. Their shape is dependent upon the stars inside them. As the stars age, so does the galaxy and its shape changes, too.

Irregular:
Galaxies that have no definitive shape are irregular galaxies. They might have small areas where more stars gather together into clumps but not enough to make a spiral or elliptical galaxy. Irregular galaxies are the least common of the three shapes and are made up of old, middle-aged, and young stars. These galaxies can have as few as 10 million stars.



Spiral:
Spiral galaxies are some of the most common galaxies in the universe. They have a central bulge, but they all have a huge bulge in the center and arms coming out. In spiral galaxies, the younger stars are in the arms and the older stars are in the center. As they become more massive, they gain more gravity and make the arms more prominent. The bulge at the center is made up of old stars and so it is located in the middle of one of the arms on the galaxy.



Elliptical:
An elliptical galaxy looks like a giant star that is out of shape. The shape is due to the lack of dust and gas surrounding the stars. The stars were used up billions of years ago in the creation of stars. These galaxies are the largest of the galaxies.



Galaxies

Type of Galaxy	Ages of Stars (Circle all that apply)	Circle the correct age of the galaxy
	young stars	young galaxy
	middle-aged stars	middle-aged galaxy
	old stars	old galaxy
	young stars	young galaxy
	middle-aged stars	middle-aged galaxy
	old stars	old galaxy
	young stars	young galaxy
	middle-aged stars	middle-aged galaxy
	old stars	old galaxy

Spiral

Destined for Head-On Collision." Explain, using your knowledge of galaxies, what you think would happen inside them when two galaxies run into each other.

Topics Included

- Life cycle of stars
- Classification of stars with H-R diagram (three different versions)
- Galaxies

GEOSCIENCE PROCESSES

Science Reading

Slow geoscience processes

Earth's surface constantly changes, but some changes happen so gradually that they are barely noticeable in a human lifetime. These slow processes have shaped mountains, valleys, and continents over millions of years and continue to reshape our planet today.

Plate tectonics is the slow but powerful movement of large pieces of Earth's outer shell, known as tectonic plates. These rigid plates fit together like a giant puzzle and float on the semi-molten, the flexible layer beneath them called the mantle. Deep inside the Earth, heat causes convection currents—swirling movements of molten rock—that push and pull the plates a few centimeters each year, about the same speed that fingernails grow. Although this motion is slow, it dramatically shapes Earth's surface over millions of years. When plates push against each other, they can crumple and lift to form massive mountain ranges like the Himalayas. When plates move apart, molten rock rises to fill the gap, creating new ocean floors at places like the Mid-Atlantic Ridge. These movements also cause earthquakes and volcanic eruptions at plate boundaries. In Earth's past, the shifting of plates broke apart huge supercontinents, such as Pangaea, into the continents we know today. The shifting of plate locations, continuing to reshape the planet today (Diagram 1).

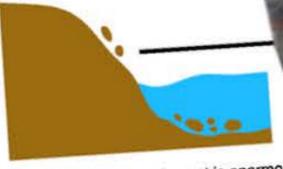
Diagram 1: Plate tectonics is responsible for the shifting of the continents from one giant continent to the seven separate continents we have today.



Weathering is the slow process that breaks down rocks in place. Physical weathering involves the breaking of rocks into smaller pieces by forces such as temperature changes, freezing and thawing, and the expansion and contraction of rocks. Chemical weathering involves reactions between rock minerals and water, often from rain or plant decay—that slowly dissolve or alter the minerals. Wind can lift and carry away small particles of rock, and erosion carries these pieces away. Wind can lift and carry away small particles of rock, and erosion carries these pieces away. Wind can lift and carry away small particles of rock, and erosion carries these pieces away.

Deposition is the process that happens when eroded materials like sand, silt, and clay are carried by wind, water, or ice and eventually settle in a new location, slowly building up new landforms. After wind, water, or ice carries eroded materials, they eventually lose energy and drop the materials they are carrying. When a river slows down and spreads out, forming a fan-shaped delta, it deposits sand and silt into dunes, shaping vast desert landscapes such as those in the American Southwest. Layers of these sediments can press together and harden into sedimentary rocks. These rocks can preserve fossils, giving scientists clues about what life and environments were like in the past. Deposition is one of the key processes that constantly reshapes Earth's surface, recording Earth's history layer by layer.

Diagram 2: Water can carry sand, silt, and clay, forming sedimentary rocks where they are deposited. These rocks can preserve fossils to help us understand past environments.



Even though these changes happen slowly, their impact is enormous. Weathering, erosion, and deposition have shaped Earth's landscape over millions of years. By studying these processes, scientists can better understand Earth's past and predict its future.

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Topics Included

- ✓ **Slow geoscience processes: plate tectonics, weathering, deposition, erosion**
- ✓ **Fast geoscience processes: earthquakes, volcanoes, landslides, tsunamis**
- ✓ **Cyclical geoscience processes: rivers, coastal erosions, seasonal changes**

PLATE TECTONICS

Science Reading

Fossils, Continents, and Plate Tectonics

Scientists have long studied Earth's surface to understand how continents move. The theory of plate tectonics explains that Earth's crust is broken into moving plates. Several key pieces of evidence support this theory, including the distribution of fossils and rocks and the way continents appear to fit together like puzzle pieces.

One of the earliest clues supporting plate tectonics is how continents fit together. South America's east coast and Africa's west coast align almost perfectly, as if they were once part of a larger landmass. This observation led scientists to propose the existence of Pangaea, a supercontinent that existed about 335-175 million years ago (Diagram 1). Over time, plate movements caused Pangaea to break apart, forming the continents we see today.

Diagram 1: Scientists believe that Pangaea was a giant supercontinent because many of today's continents fit together like pieces of a puzzle, especially the matching coastlines of South America and Africa, suggesting they were once joined before slowly drifting apart.



Fossils of the same ancient plants and animals have been found on different continents, such as South America, Africa, India, Australia, and Antarctica, suggesting that these landmasses were once connected. Fossils of the extinct plant *Glossopteris* were found in South America, Africa, India, Australia, and Antarctica. Fossils of the dinosaur *Mesosaurus* were found in South America and Africa. Fossils of the large plant-eating reptile *Lystrosaurus* were found in Africa, India, and Antarctica. Fossils of the plant-eating reptile *Lobosaur* were found in Africa, India, and Antarctica. Fossils of the plant-eating reptile *Kannemeyeria* were found in Africa, India, and Antarctica. These fossil discoveries provide strong evidence that the supercontinent called Pangaea once existed.

Diagram 2: Fossils of the same species have been found on different continents, indicating that the continents were once joined together.



Not only do fossils provide evidence, but rock formations also provide evidence. Mountain ranges and rock layers on different continents match in age and composition. For example, the Appalachian Mountains in North America are geologically similar to mountain ranges in Scotland. The rock layers in the Appalachian Mountains are the same as the rock layers in West Africa, indicating that these regions were once part of the same landmass before the Atlantic Ocean formed.

The distribution of fossils, matching rock formations, and the fit of the continents together provide strong evidence that the supercontinent called Pangaea once existed. By studying these clues, scientists can predict how continents may continue to shift in the future.

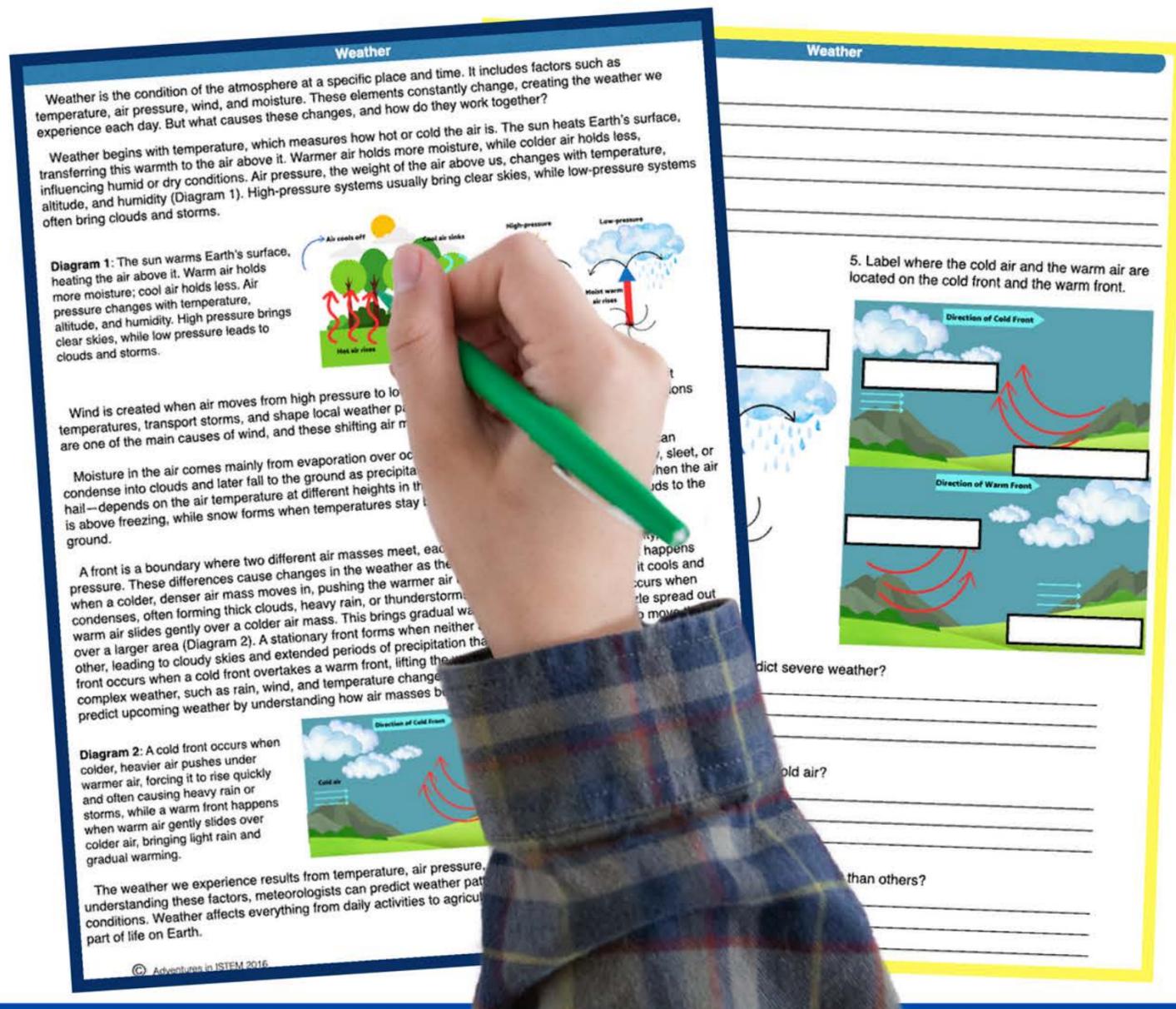
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Topics Included

- ✓ **Plate Tectonics: Types of Boundaries**
- ✓ **Seafloor spreading, subduction, and Plate Tectonics**
- ✓ **Fossils, Continents, and Plate Tectonics**

WATER CYCLE AND WEATHERING

Science Reading



Topics Included

Water Cycle

Weather including air masses and fronts

Local Weather Patterns

GLOBAL WINDS AND OCEAN CURRENTS

Science Reading

Ocean Currents

Have you ever wondered how the water in the ocean moves and why it's so important for our planet? Ocean currents are like giant rivers flowing through the oceans, shaping climate and supporting marine life. They can be divided into two main types: surface currents and deep currents.

The wind mainly drives surface currents. When the wind blows across the ocean's surface, it pushes the water, creating currents. However, these currents don't move in straight lines. Due to the Coriolis effect, caused by Earth's rotation, surface currents curve. In the Northern Hemisphere, they curve to the right, while in the Southern Hemisphere, they curve to the left (Diagram 1). These curved currents form large circular patterns in the oceans called gyres. Surface currents play a major role in moving warm water from the equator toward the poles and bringing cooler water back toward the equator, helping to balance temperatures across the planet. For example, the Gulf Stream carries warm water from the Caribbean up the east coast of North America, keeping coastal cities like New York and Boston warmer in winter than inland areas at the same latitude.

Diagram 1: Surface currents, driven by wind, carry warm water away from the equator toward the poles and curve due to the Coriolis effect—turning right in the Northern Hemisphere and left in the Southern Hemisphere. These curved paths form large ocean gyres that help distribute heat around the planet.



Deep currents form due to differences in water density, which is created by differences in temperature and salinity (salt content). Colder, saltier water is denser and sinks, while warmer, less salty water rises. This creates a continuous global circulation pattern known as thermohaline circulation, shown in Diagram 2. These deep currents move slowly but carry vast amounts of water, helping to transport heat, carbon, and nutrients around the planet. They help regulate Earth's climate and stabilize it. One example is the North Atlantic Deep Water, which keeps Europe's climate mild by bringing warmer waters northward.

Diagram 2: The global conveyor belt, or thermohaline circulation, mixes warm water from the equator with cold water from the poles by moving warm surface currents poleward and returning cold, dense water toward the equator through deep currents. This continuous loop helps regulate Earth's climate and distributes heat, nutrients, and gases throughout the oceans.

Ocean currents have a major impact on weather patterns worldwide. Warm currents lead to higher humidity and more rainfall. In contrast, cold currents lead to lower humidity and less rainfall. For example, the California Current brings cold water along the west coast of North America, leading to a dry climate. Meanwhile, the El Niño phenomenon occurs when warm water moves away from the equator, altering weather patterns and causing heavy rainfall in some areas.

Ocean currents are essential to Earth's climate system and marine life. They influence weather patterns, and support life in the ocean by bringing nutrients and oxygen. Studying these currents helps scientists predict climate changes and understand how they affect life on Earth.

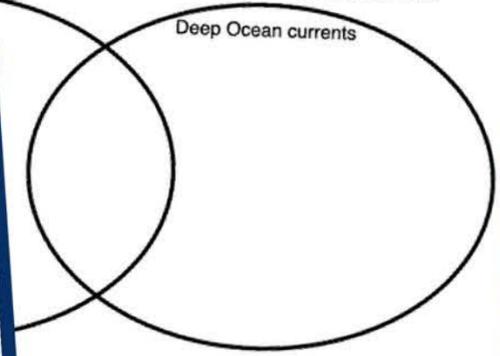
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Ocean Currents

_____ of ocean currents? _____

_____ of ocean currents? _____

_____ differences between surface currents and deep ocean currents?



_____ influence coastal weather in North America?

_____ help predict extreme weather events?

_____ influence North America's climate?

Topics Included

- Global winds**
- Ocean currents**
- Climate**

TYPE OF ROCKS AND THE ROCK CYCLE

Science Reading

metamorphic Rocks

Big Idea Question: *What are metamorphic rocks?*

Metamorphic rocks are different from sedimentary rocks and igneous rocks. Sedimentary and igneous rocks used to be something else before they became rocks. Metamorphic rocks, however, started as rocks that changed into different kinds of rocks because of certain conditions. Metamorphic rocks require exposure to really high heat, high pressure, or a hot, mineral-rich liquid. These conditions are usually found deep in the Earth's crust or where tectonic plates meet. While experiencing these conditions, the rock needs to stay solid for the metamorphosis to happen. If it melts, it will become an igneous rock instead. There are two main types of metamorphic rock (diagram 1): foliated and non-foliated.

Foliated metamorphic rocks have visible layers or bands caused by the rock's minerals aligning themselves under pressure. Some examples of foliated metamorphic rocks are:

- Slate: A fine-grained rock that is derived from shale and has a distinct cleavage, which means it can easily be split into thin, flat sheets.
- Schist: A medium to coarse-grained rock with a layered appearance.
- Gneiss: A coarse-grained rock with distinct banding.

Non-foliated metamorphic rocks do not have a layered appearance. Some examples of non-foliated metamorphic rocks are:

- Marble: A rock that is formed from limestone or dolomite.
- Quartzite: A rock that is formed from sandstone that has been subjected to high heat and pressure. It is very hard and durable and is often used in building.
- Hornfels: A fine-grained rock that is composed of a variety of minerals, including quartz, mica, and mica, that have been recrystallized and fused together, resulting in a smooth texture.

Diagram 1: Types of Metamorphic Rocks

Foliated		Non-foliated
Visible layers or bands that are caused by the minerals aligning themselves under pressure.		A uniform texture with no visible layers or bands.
Gneiss 	Schist 	Marble 

Topics Included

Sedimentary Rocks

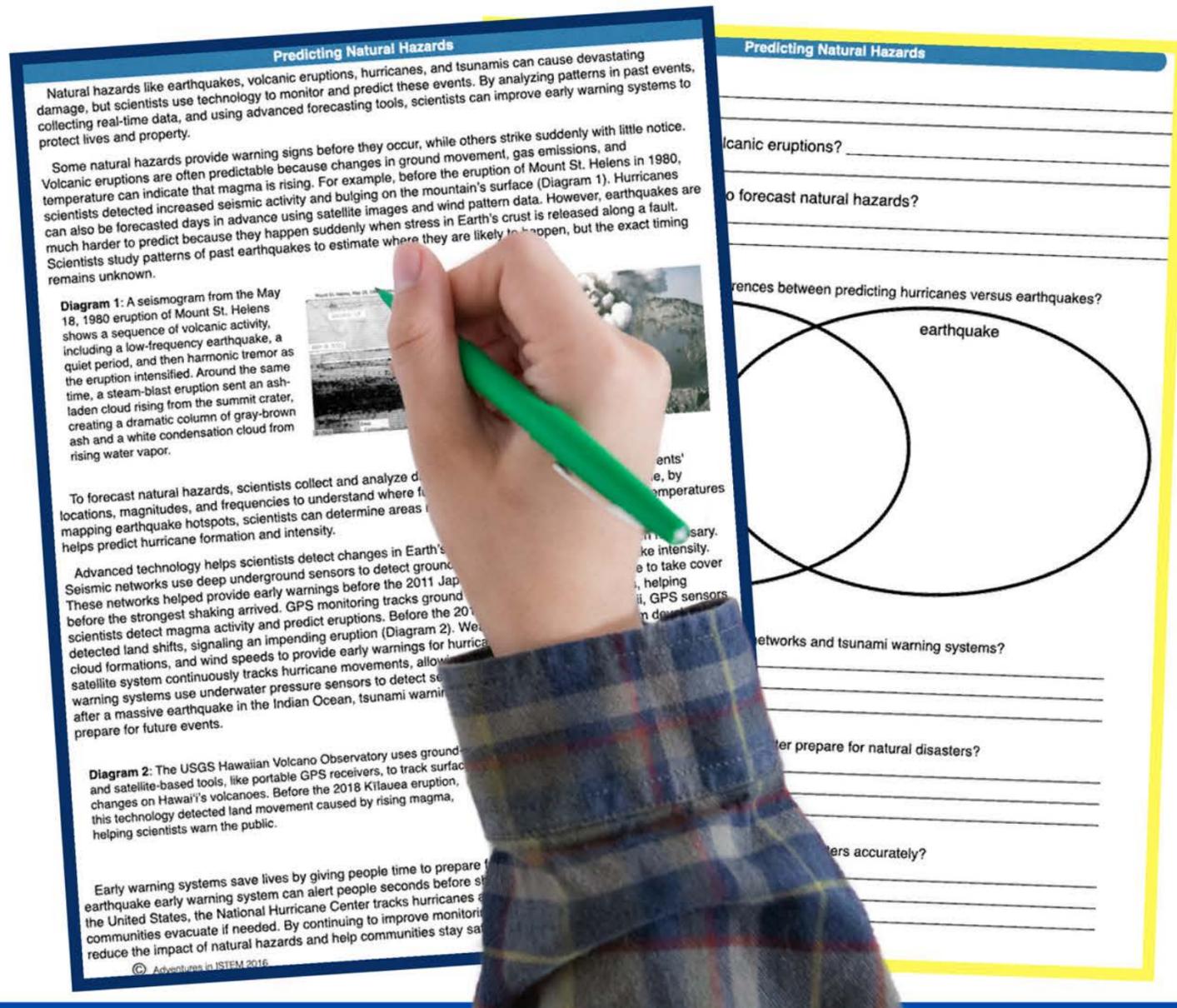
Metamorphic Rocks

Igneous Rocks

Rock Cycle

NATURAL HAZARDS

Science Reading

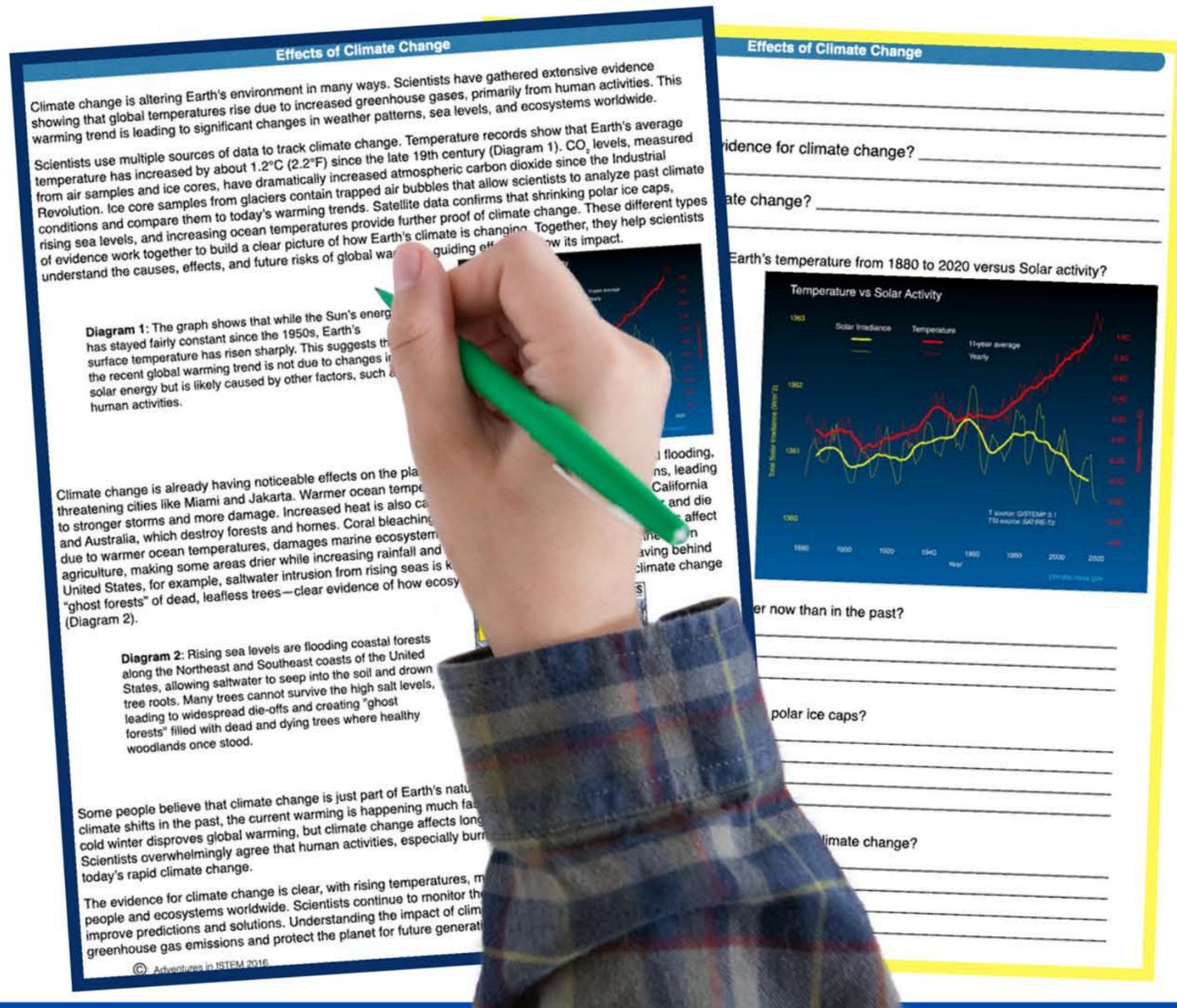


Topics Included

- Predicting Natural Hazards
- Volcanoes and Earthquakes
- Hurricanes and Tornadoes
- Typhoons and Floods

HUMAN IMPACT ON CLIMATE CHANGE / GLOBAL WARMING

Science Reading



Topics Included

- Global warming
- Human impact on global warming
- Effects of climate change

HUMAN GROWTH POPULATION IMPACT ON EARTH'S RESOURCES

Science Reading

Human Population Growth

The number of people living on Earth keeps getting bigger. This increase is called population growth. A population is the total number of people in a certain area, like a town, country, or the whole planet. Scientists measure population growth by comparing the number of people born to those who die each year. If more people are born than die, the population grows. Over time, Earth's population has grown very quickly. In the year 1900, about 2 billion people were on the planet. Today, there are more than 8 billion. That means the population has more than tripled in just over 100 years. This fast growth greatly affects how we use the land, water, and other resources around us.

As more people are added to the planet, they all need natural resources to live. People need land for homes and farms, water for drinking and growing food, energy to power lights and cars, and food to stay healthy. More people using these things means we take more from the Earth, sometimes faster than nature can keep up. When demand for resources grows too quickly, it can lead to shortages, like water running low in dry regions or farmland becoming overused. It also means more mining, drilling, and logging—activities that can damage the environment if not managed carefully.

One major change we see from population growth is urbanization. People are moving from rural areas to cities and towns. Forests, grasslands, and farms are cleared to make space for cities, roads, and farms. Office buildings (Diagram 1). As cities grow, they often spread out, leading to crowded living spaces, more traffic, and higher energy use.

Diagram 1: Forests are often cleared to make space for cities, roads, and farms. In the Amazon rainforest, large areas of trees have been cut down for development, which destroys animal habitats and reduces the forest's ability to clean the air.

Another big change is deforestation. People often cut down trees for construction and fuel. Deforestation removes important plant life and animals. Without trees, the land can become dry and more likely to erode. Forests also help absorb carbon dioxide. Without them, there is more pollution and hotter temperatures in nearby areas.

Pollution is also a growing problem. More people using cars, electricity, and power plants releases gases like carbon dioxide into the air (Diagram 2). Trash and the noise and lights from busy cities can affect animals and people.

Diagram 2: Large cities often produce pollution from cars, factories, and power plants. This pollution releases gases like carbon dioxide into the air, which can lead to smog and contribute to global warming.

Population growth brings many challenges. As more people share the Earth, we need to think about how we use its resources and how to reduce the harm caused by urbanization.

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Topics Included

- ✓ Human population growth
- ✓ Per-capita consumption
- ✓ Impact of human consumption on Earth

Acids and Bases Science Reading

Covers

✓ Acids

✓ Bases

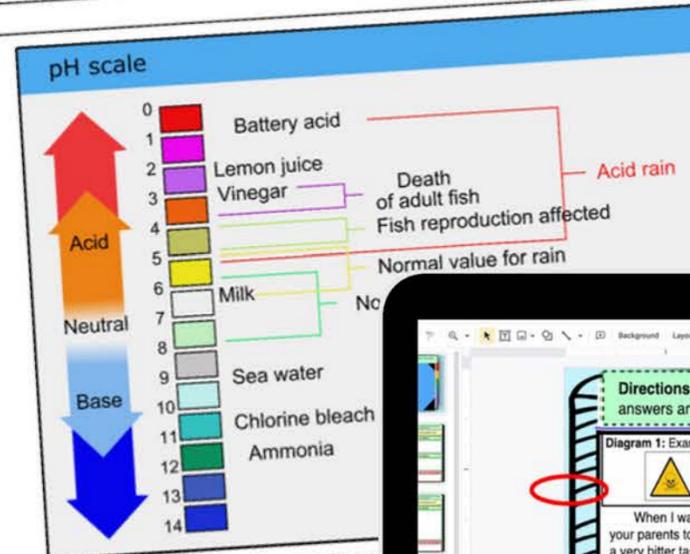
✓ pH

Strength of Acids and Bases

Define and Describe:

1. What is the pH scale? _____

2. What happens when you mix an acid and a base? _____



Bases

Big Idea Question: What are the properties of bases?

Diagram 1: Examples of bases

When I was younger, if you said a bad word, it was normal for your parents to put soap in your mouth as a punishment. Soap is a very bitter tasting substance. This is because soap is a base. You can find bases in a lot of cleaning products like bleach and oven cleaners. A base is a compound that breaks down and releases hydroxide ions (OH-) when placed in water. The releasing of these hydroxide ions causes the substances to have certain properties.

Diagram 2: Properties of Bases

“Great resource, love that it comes with note pages and annotated articles. Exactly what I needed for AVID close reading assignments and the level was perfect to help my students understand the material.- Mellisa C.”

Directions: 1. Read the information on the left. 2. Use the red circles on the left to identify key words. 3. Answer the questions by putting answers and key details onto the right. 4. Write a one sentence synthesis statement that explains the big idea of the text.

QUESTION	KEY DETAILS
What is a base?	Add text
What are the properties of bases?	Add text
SYNTHESIS SENTENCE: (BIG IDEA OF THE TEXT IN ONE SENTENCE)	
Add text	

... substance is a ... of a base is that it ... washing your ... acids, bases can ... on. Lastly, bases ... For example, ... soda is used ... toothpaste to ... ed to make ... help neutralize ... cleaners.

Atoms and Isotopes Science Reading

Covers

✓ Atoms

✓ Isotopes

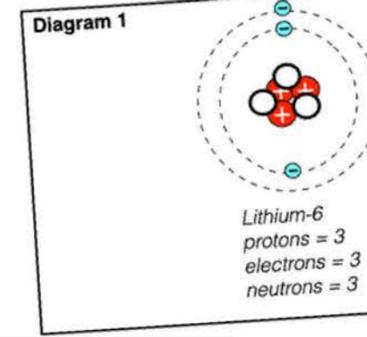
“ This supplement helped in all types of students I have in the classroom. They all agree that it is an effective resource- Alexandra A. ”

Isotopes

Big Idea Question: What is an isotope and what are they used for?

Look at the periodic table. Focus on the atomic numbers and the atomic masses of the different elements. What do you notice? One detail you might have noticed is that the atomic number is always a whole number while the atomic mass has decimals. Why? The atomic number is made up of the number of protons. The atomic mass is made up of the number of protons and neutrons. Although the number of protons in an element stays the same, the number of neutrons varies. The atomic mass is an average of the different number of neutrons an atom of an element has.

The atoms in an element that have the same number of protons but different numbers of neutrons are called *isotopes*. Isotopes of an element are given isotope names that include the elements name and the mass number of that element. For example, Lithium has two main isotopes, Lithium-6 and Lithium-7. Lithium-6 is contains 3 protons and 3 neutrons while Lithium-7 contains 3 protons and 4 neutrons. The number of protons is the same, they both have 3. The number of neutrons for each is different, Lithium-6 has 3 and Lithium-7 has 4 (diagram 1).

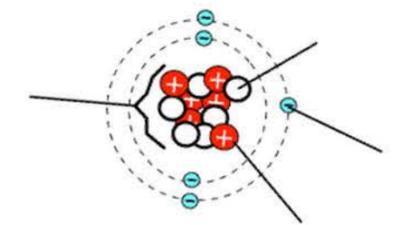


is so important? d in many of our is used in radiol y isotopes you r the alpha particl: ons. These ions rent, the smoke icine used for th ount of activity i d hypothyroidis obalt-60, which 3. These are onl an find through r

Atoms

Identify and Define:
1. What is an atom?

2. Label the parts of the atom.



3. Fill in the table.

Directions: 1. Answer the questions on the left. 2. Use the labels on the left to identify the parts of the atom. 3. Fill in the table below. 4. Use the information to identify the number of protons, electrons, and neutrons for each atom.

What is an atom?
Add text

Use the labels on the left to identify the different parts of the atom.

Fill in the table

	Charge	Location	
Protons	Add text	Add text	Add text
Neutrons	Add text	Add text	Add text
Electrons	Add text	Add text	Add text

Identify the number of protons, electrons, and neutrons.

Element	# of protons	# of electrons	# of neutrons
4 Be Beryllium 9	#	#	#
9 F Fluorine 19	#	#	#
11 Na Sodium 23	#	#	#

Location	Mass

in the elements below?

11 Na Sodium 23
protons = _____
electrons = _____
neutrons = _____

10 Ne Neon 20
protons = _____
electrons = _____
neutrons = _____

Chemical reactions and balancing equations Science Reading

Covers

- ✓ chemical Change
- ✓ Exothermic
- ✓ Endothermic
- ✓ Chemical Equations

“ My students loved working with a partner for this activity. It was a great way for me to introduce chemical reactions to them.- The Classy Teacher ”

Physical vs. Chemical Change

Big Idea: What is a chemical change, and how do you know one has occurred?
 Have you ever popped popcorn in a microwave and left it on for too long? When this happens, you get a distinct smell, and the popcorn at the bottom looks black. This is because a chemical reaction has occurred.

Diagram 1
 Corn kernels being heated for 2 minutes to create popcorn is a physical change; the substance is still corn.
 Corn kernels being heated for 5 minutes to create popcorn will burn some of the kernels. These burnt pieces represent a chemical change. The burnt pieces are no longer corn.

Physical Change vs. Chemical Change

There is one main difference between a physical change and a chemical change. In a physical change, the substance changes its form, but it is still the same substance. An example of a physical change is when you place water in the freezer and it turns to ice. The ice is still made up of water molecules; they are just in a different form. In a chemical change, the substance actually changes and turns into a different substance. An example of a chemical change is when iron and oxygen combine with a lot of heat to form rust. The iron and oxygen combine to form a new substance. Odor and a color change are also signs of a chemical change.

Evidence of a Chemical Change
 Diagram 1
 Evidence of a chemical change includes: energy change, gas production, color change, and precipitate formation.

Directions: 1. Read the information on the left. 2. Use the red circles on the left to identify key words. 3. Answer the questions by writing answers and key details onto the right. 4. Write a one sentence synthesis statement that explains the big idea of the text.

TOPIC: Exothermic and Endothermic

GUIDING QUESTION: What happens to the energy during a chemical reaction?

QUESTION	KEY DETAILS
What happens to the energy during a chemical reaction?	Add text
What is an exothermic reaction?	Add text

SYNTHESIS SENTENCE: (BIG IDEA OF THE TEXT IN ONE SENTENCE)
 Add text

Exothermic and Endothermic

Define: What is the law of conservation of energy? _____

Describe:

	Exothermic	Endothermic
What happens to the temperature?		
What happens to the energy?		

photosynthesis

exothermic / endothermic

exothermic / endothermic

When the container gets this and how do you

Ionic and Covalent compounds and Chemical Bonding

Covers

- ✓ Ionic compounds
- ✓ Covalent compounds
- ✓ Chemical Bonding

Covalent Compounds

Big Idea Question: What are covalent compounds and how are they formed?

If you put sugar in a pot and put it on the stove the sugar will melt and turn into caramel. This is because sugar is a covalent compound and is held together by weak bonds. The way these bonds are formed give it certain properties.

Diagram 1 lithium Fluorine

Fluorine Fluorine

Covalent bonds

The type of compound an atom will form is dependent upon the number of valence electrons it has. Metals generally have fewer than four valence electrons so they will lose their electrons and become ions. When they lose electrons they become positive ions. Nonmetals have more than four valence electrons so they gain electrons from metals they become negative ions. Nonmetals can also share their electrons they form covalent bonds and become covalent compounds.

Diagram 2 Hydrogen only needs one more electron to fill its shell. It will share one electron with oxygen which will share one back in return.

Sharing Electrons

When atoms share electrons the number of electrons one atom share. For example, if an atom of hydrogen share one electron back as shown in diagram 2. Many electrons that you need to complete their shells.

Covalent Compounds

Definition: What is a covalent bond? _____

The Periodic Table of Elements

13 14 15 16 17 18

Directions: 1. Read the information on the left. 2. Use the red circles on the left to identify key words. 3. Answer the questions by putting answers and key details onto the left. 4. Write a one sentence synthesis statement that explains the big idea of the text.

need one atom of each. However, if you were to combine lithium with oxygen you would need two lithium atoms to accomplish this. This is because each lithium atom will give up one valence electron out oxygen needs two valence electrons to fill its shell. When the transferring of electrons occurs it creates positive ions for the metals and negative ions for the nonmetals. The positive and negative ions become attracted to each other and an ionic bond is formed.

Properties of Ionic Compounds

These ionic bonds give ionic compounds certain properties. Due to the strong attraction of the ions, ionic compounds have very strong bonds. This gives them high melting and boiling points. It also gives them a crystal lattice structure since only opposite ions are attracted to each other so they alternate between positive and negative as seen in diagram 3. They are also brittle and can dissolve easily in water. A fun fact is that when they are in a solution they can conduct electric current as shown in diagram 4.

Diagram 4

TOPIC	GUIDING QUESTION
Ionic Compounds	What are ionic compounds and how are they created?

QUESTION	KEY DETAILS
How are ionic bonds formed and what properties to they create?	Add text

SYNTHESIS SENTENCE: (BIG IDEA OF THE TEXT IN ONE SENTENCE)

Add text

“ This resource really helped my 7th graders understand chemical reactions better than when we started. I really appreciated the extra space for answer questions. I always get my students to write more but most paper do not have room. The reading was great, I will be buying more from you. ALL my students need to read more & this does. Thanks!- Shelly ”

Measuring Matter with Mass, Volume, and Density

Covers

- ✓ Measuring mass and volume
- ✓ Density
- ✓ Why objects float or sink

Floating and Sinking

Big Idea Question: What causes substances to float or sink?

Diagram 1

A rock sinks in water. It is more dense than water.

A feather floats on water. It is less dense than water.

A parent walking with their child throws a rock into the lake and they watch it sink. The parent asks them why that happened and the child replies, "because it's heavy." The parent then throws a feather into the lake and it floats. Again the parent asks why this happened and the child replies, "because it's light." These are very often the responses children give for why objects float or sink but they are incorrect. A paper clip is light and yet if placed in water it will sink. On the other hand, a cruise ship is heavy and yet it floats on water. How is that possible? It all has to do with density.

To determine if a substance will float or sink, you need to know two things. First, you need to know the density of the substance and the density of the liquid it is in. Substances that are more dense than the liquid they are in will sink. Substances that are less dense than the liquid they are in will float.

Directions: 1. Read the information on the left. 2. Use the red circles on the left to identify key words. 3. Answer the questions and key details onto the right. 4. Write a one sentence synthesis statement that explains the big idea of the text.

Diagram 1: Pound of feathers, Pound of bricks

Density of a feather, Density of a brick

What would you rather carry, a pound of feathers or a pound of bricks? Both of them are a pound, however it would take a lot more feathers than bricks to make a pound. This is because a brick is more dense than a feather. Let me explain. Density is the amount of matter in a given space. A brick has a lot more matter in a given space than a feather (diagram 1).

To determine how much density an object has, you divide its mass by its volume using the formula, Density = mass / volume or $D = m/v$ (diagram 2). The unit for density is the mass unit over the volume unit. For example, to find the density of 100 ml of water that weighs 100 g, you divide its mass by its volume, 100 g/100ml. The density of water is 1 g/ml.

Diagram 2:

Example 1: What is density when the mass is 10 g and volume is 5 cm³?
 $D = m/v$ $D = 10g/5cm^3$ $D = 2g/cm^3$

Example 2: What is the mass when the density is 4g/cm³ and volume is 3 cm³?
 $m = D \times v$ $m = 4g/cm^3 \times 3cm^3$ $m = 12g$

Example 3: What is the volume when the density is 8g/cm³ and mass is 4 g?
 $v = m/d$ $v = 4g/8g/cm^3$ $v = 0.5cm^3$

Describe: Write the sentences. Objects that are _____ dense than the liquid will float. Objects that are _____ dense than the liquid will sink.

Calculate: Find the density of each object and then determine if it will float or sink in water (density of water = 1g/ml).

1. mass = 7 g, volume = 10 cm³

4. mass = 12 g, volume = 2 cm³

5. mass = 22 g, volume = 11 cm³

6. mass = 40 g, volume = 200 cm³

7. mass = 12 g, volume = 15 ml

10. mass = 44 g, volume = 8 ml

TOPIC: Density **GUIDING QUESTION:** What is Density and How is it Calculated?

QUESTION	KEY DETAILS
What is density?	Add text
How do you calculate density?	Add text

SYNTHESIS SENTENCE: (BIG IDEA OF THE TEXT IN ONE SENTENCE)

Add text

© Adventures in ISTEM

“ Great for distance learning, used the reading articles and questions with my students. Very helpful for our density unit - Melissa ”

Periodic Table

Covers

✓ Reading the periodic table

✓ Metals, nonmetals, metalloids (semimetals)

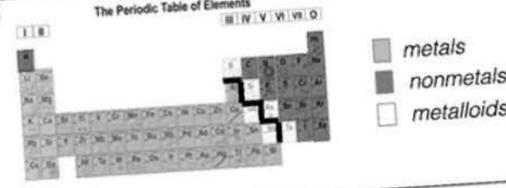
✓ Families of the periodic table

“ I use the article every day for my gen chem students. The articles are great and there is no prep. Just print and use- Melissa ”

Categories of the Periodic Table

Big Idea Question: How are the elements categorized on the periodic table?

Diagram 1 The Periodic Table of Elements



metals
nonmetals
metalloids

Look at the periodic table above. What are some things you notice? You might see that most of the elements on the periodic table are considered metals, and they are mainly located on the left side. The next largest category of elements are nonmetals—mainly located on the right side. The exception is *hydrogen* which is found on the far left. The smallest group of elements are the metalloids, which are found between the metals and nonmetals.

Categories of the Periodic Table

The largest category of the metals. Metals are located to Elements that are metals hav Metals are good conductors c are usually solids at room ter They are ductile and malleat pulled thin and pounded into also hard. An example of a n we use copper for cooking a

Neon is an example of a no

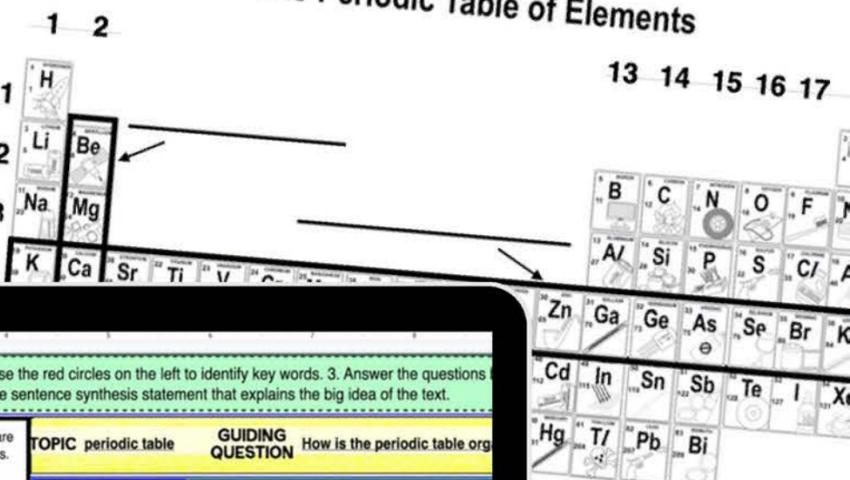


Periodic table

Identify and Define:

1. What is the periodic table?
2. Label the parts of the periodic table.

The Periodic Table of Elements

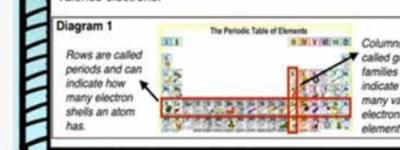


Directions: 1. Read the information on the left. 2. Use the red circles on the left to identify key words. 3. Answer the questions answers and key details onto the right. 4. Write a one sentence synthesis statement that explains the big idea of the text.

There are over 100 elements on Earth. Even though they are very unique, some have similar physical and chemical properties. Almost 150 years ago, scientists tried to organize the elements into a tool that would make it easy to understand the properties and characteristics of the elements. At that time, there were only 56 known elements. Dmitri Mendeleev organized the elements in such a way that it left holes where he thought the missing elements would go. With his organization, he was able to correctly predict the properties of the missing elements. His organization tool is called the periodic table.

Dmitri Mendeleev organized the elements in order by atomic mass, while today's modern periodic table is organized by atomic number. With this organization, we can see some patterns develop that help us predict some properties of the elements. The elements are organized into rows and columns (diagram 1). Rows are called periods and can indicate the number of electron shells an atom has. For example, row 1 has one electron shell and row 5 has 5 electron shells. Columns are called groups or families and, with the exception of columns 3-12, can indicate how many valence electrons the element has. For example, column 1 has one valence electron, column 13 has three valence electrons, column 16 has six valence electrons, and column 17 has seven valence electrons.

Diagram 1 The Periodic Table of Elements



Rows are called periods and can indicate how many electron shells an atom has.

Columns are called groups or families and can indicate how many valence electrons an element has.

TOPIC	periodic table	GUIDING QUESTION	How is the periodic table org
QUESTION		KEY DETAILS	
What is the periodic table?		Add text	
QUESTION		KEY DETAILS	
How is the periodic table organized?		Add text	
SYNTHESIS SENTENCE: (BIG IDEA OF THE TEXT IN ONE S			
Add text			

States of Matter and Phase Changes

Covers

- ✓ States of Matter
- ✓ Phase Changes

Physical Changes

Big Idea Question: What happens to the particles in a substance when energy is added or taken away?

Removing Heat (decreasing energy):
 When heat is removed from a substance, the particles in a substance slow down. As they become less energized, the substance starts to change from one state to another. For example, water in a gas state can be called steam. The particles in steam are moving super fast and collide into each other. The particles have very little attraction to each other. As heat is removed and the substance cools down, the particles slow down. This increases their attraction. Eventually, they get close together and start sliding past each other. When this happens, the steam becomes liquid water. This process is called condensation. If the particles continue to slow down, their energy decreases even more. The attraction between them becomes greater. At some point, they become so attracted to each other that they huddle together and become packed in. The liquid water turns into ice. This process is called freezing. Diagram 3 explains what is happening.

Diagram 3:
 Condensation
 When condensation occurs, the particles become more attracted and get closer together. They slow down and start sliding past each other. The exact temperature at which this happens is called the condensation point. The condensation point for water is 100° C.

Diagram 1:
 Friction causes the ball to slow down and eventually stop.

Diagram 2:
 The man is pushing, but the cabinet does not move because static friction is acting against his push.
 The man is pushing, and the cabinet finally starts moving at a slow velocity due to kinetic friction.

Physical Changes

Define:
 What is a physical change? _____
 What is the definition of boiling point? _____
 What is the definition of freezing point? _____

Apply: Fill in the diagram.

Gas
 Liquid

the substance?
 to a liquid state.

Directions: 1. Read the information on the left. 2. Use the red circles on the left to identify key words. 3. Answer the questions by answers and key details onto the right. 4. Write a one sentence synthesis statement that explains the big idea of the text.

You are playing soccer and kick a ball at the goal, but the ball just misses it. The ball rolls past and eventually comes to a stop. Why did it stop? What slowed it down? There must be some type of force acting on it that is changing its velocity, slowing it down, and eventually making it stop. This force is called friction.

Diagram 1
 Friction causes the ball to slow down and eventually stop.

Friction is a force that opposes the motion of objects. There are two types of friction: kinetic friction and static friction. If you have ever tried to push heavy furniture and it didn't move, then you have come in contact with static friction. Static friction happens when you try to apply a force to an object to move it and it does not move. Kinetic means moving, so kinetic friction occurs when you apply a force to an object and it moves. When you push the heavy furniture, the second it starts moving is when it experiences kinetic friction (diagram 2).

Diagram 2
 The man is pushing, but the cabinet does not move because static friction is acting against his push.
 The man is pushing, and the cabinet finally starts moving at a slow velocity due to kinetic friction.

QUESTION	KEY DETAILS
What is friction?	Add text
What are the two types of friction?	Add text

TOPIC Friction **GUIDING QUESTION** What effect does friction have on motion of objects?

SYNTHESIS SENTENCE: (BIG IDEA OF THE TEXT IN ONE SENTENCE)
 Add text

“ After completing the first part of the assignment, the students completed the illustration page as the activity page in their interactive notebook. They copied the illustration and filled in the blanks and then answered the questions.- Linda ”

Thermal energy with conduction, convection, and radiation

Covers

- ✓ Conduction
- ✓ Convection
- ✓ Radiation

Radiation

Big Idea Question: How is thermal energy transferred through radiation?

Radiation is the only way of transferring thermal energy that does not require matter. Radiation transfers through electromagnetic waves. When the wave hits the object, it transfers its energy to the object causing the particles to increase their kinetic energy.

The sun heats the Earth through radiation. The light waves from the sun come in contact with the particles in the atmosphere and the particles on land. This increases their kinetic energy. There is a reason summer temperatures are hotter than winter temperatures, due to the angle of the Earth. More light rays can reach the Earth in summer and stay for a longer time. This increases the amount of thermal energy being transferred from the sun to the Earth through radiation.



Conduction

Define:

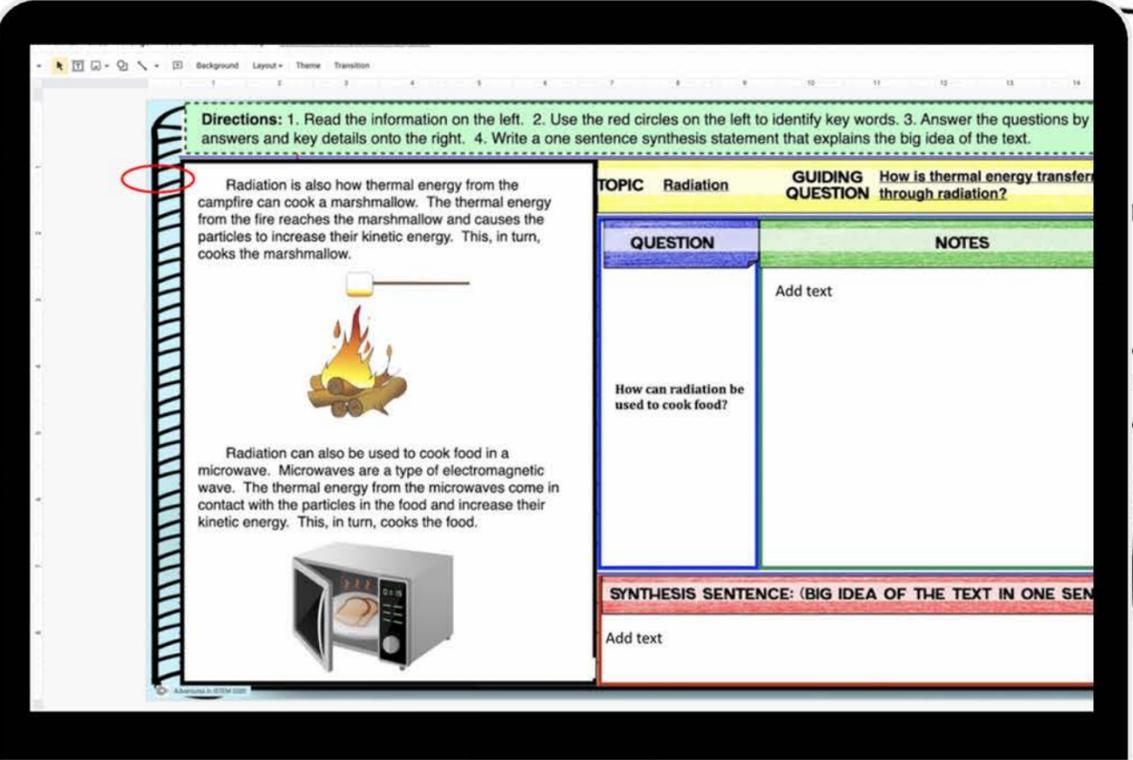
1. Conduction? _____

2. Thermal Conductors? _____

Insulators? _____

Label: Use arrows to show the direction of the thermal energy transfer between the two instances

Radiation is also how thermal energy from the fire reaches the marshmallow. This increases their kinetic energy. This, in turn, cooks the marshmallow.



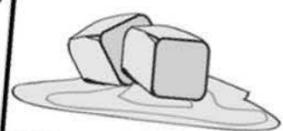
Directions: 1. Read the information on the left. 2. Use the red circles on the left to identify key words. 3. Answer the questions by answers and key details onto the right. 4. Write a one sentence synthesis statement that explains the big idea of the text.

QUESTION	NOTES
How can radiation be used to cook food?	Add text

SYNTHESIS SENTENCE: (BIG IDEA OF THE TEXT IN ONE SENTENCE)

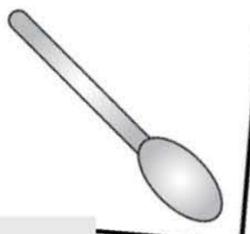
Add text

Ice cube on floor



good thermal conductor or a

Metal spoon



Radiation can also be used to cook food in a microwave. Microwaves are a type of electromagnetic wave. The thermal energy from the microwaves come in contact with the particles in the food and increase their kinetic energy. This, in turn, cooks the food.

“ My students used this while waiting for the science experiment to be set up. They were very engaged. They are just the right amount of reading and comprehension questions.- Mary ”

Included: Synthetic Materials vs Natural Resources

Covers

- ✓ Synthetic materials
- ✓ Natural Resources
- ✓ Impact of Synthetic vs Natural

Natural Resources

What makes up the materials we use every day? Natural resources are substances or processes that are essential for our daily lives without human intervention. They include materials like wood, cotton, and leather, derived from plants and animals and used to make various products we rely on.

Natural resources can be classified in several ways, providing insight into their origin and sustainability. One primary classification is based on their origin, distinguishing between biotic and abiotic resources. Biotic resources are derived from living organisms, such as timber from trees, wool from sheep, and fish from oceans, making them renewable as long as their ecosystems remain healthy. Abiotic resources from non-living sources include water, air, and minerals like copper, iron, and gold. These resources can be either renewable or nonrenewable (diagram 1). Renewable resources, such as sunlight, wind, and air, are naturally replenished over short periods and are continuously available. Biological resources, like crops and forests, are renewable if managed sustainably. Nonrenewable resources, including fossil fuels like coal, oil, and natural gas, cannot be replenished once used or take millions of years to form. These fossil fuels are derived from ancient organic matter subjected to heat and pressure over millions of years. Similarly, many minerals are nonrenewable; although abundant in Earth's crust, economically viable concentrations are finite and can be exhausted through mining.

Diagram 1: Classification of natural resources

Renewable	Nonrenewable
Sun (solar energy)	Fossil fuel (oil)
wind (wind energy)	Coal
water (hydro energy)	

We use natural resources in various ways essential for human survival and comfort. Wood, which is solid and sturdy, is used for building houses and furniture. Cotton, which is soft and breathable, is ideal for making clothing and bedding (diagram 2). Leather, which is rigid yet flexible, is used for crafting durable shoes and bags. Other materials like sand and rocks, mined from the earth, are used in construction and manufacturing. Freshwater, which makes up only a tiny percentage of all the water on Earth, is essential for drinking, irrigation, and industry. Soil, which takes hundreds of years to form, is necessary for growing food and sustaining plant life. Both fresh water and arable soil are crucial for the survival of human populations, as they are needed to grow food and support life.

Diagram 2: Use of cotton

In conclusion, natural goods and services and minerals, these applications. Under the need to manage

Synthetic Materials

Define and Describe:
Define synthetic material. _____

What are polymers made from? _____

List three examples of synthetic materials. _____

Circle the pictures that show synthetic materials.

wood, plastic bag, crude oil, paper bag, nylon parachute

What synthetic materials created?

TOPIC Synthetic Materials

GUIDING QUESTION What are synthetic materials, and how are they made?

What makes up the materials we use every day? Some materials, called synthetic materials, are not found in nature but are created by scientists. These materials are made by combining different chemicals in a laboratory, similar to mixing ingredients for a cake. Scientists use chemicals instead of flour and sugar to create new and valuable materials. Synthetic materials are produced through chemical reactions, transforming natural materials into something new with unique properties. For example, plastics are synthetic materials made by chemically altering natural resources like petroleum. Scientists carefully mix specific chemicals to create materials with unique properties, such as being stronger, lighter, or more flexible than natural materials. This ability to customize materials makes synthetic materials crucial in today's world.

Synthetic materials have many properties that make them useful in various industries (diagram 1). Some synthetic materials can conduct electricity, making them essential for electronics like computers and smartphones. Others are waterproof, making them ideal for raincoats and tents. Some are heat-resistant, crucial for items like oven mitts and firefighter gear. These properties make synthetic materials versatile and valuable in everyday life. Materials scientists play a vital role in developing new synthetic materials. They study the structure of materials and how it relates to their properties, using this information to create improved materials. Ideas for synthetic materials often come from nature. For instance, scientists study sea cucumbers, which can change from soft to rigid, to develop materials that mimic this behavior.

Diagram 1: properties of synthetic materials

Ability to conduct electricity	Waterproof	heat-resistant
--------------------------------	------------	----------------

QUESTION	KEY DETAILS
What are synthetic materials?	Add text
What are some properties of synthetic materials?	Add text
SYNTHESIS SENTENCE: (BIG IDEA OF THE TEXT IN ONE SENTENCE)	
Add text	

Motion, Speed, and acceleration Science Reading

Covers

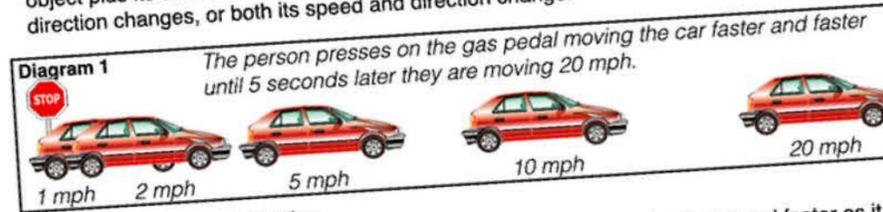
- ✓ Speed
- ✓ Acceleration
- ✓ Velocity
- ✓ Motion Graphs

“My students did well with the ready-made lesson and it makes it easy for me classroom the educator and my homebound students. It allowed me to provide meaningful instruction to students.- Dorothea M.”

Acceleration

Big Idea Question: What is acceleration?

You are at a red light. The light turns green and you accelerate forward. We think of acceleration as the increase in speed, but that is not the real definition of acceleration. The definition of acceleration is the rate at which velocity changes. Velocity is the speed of an object plus its direction. This means that an object can accelerate if its speed changes, its direction changes, or both its speed and direction change.



Change in Speed or Direction

Looking at diagram 1, you can see the speed of the car moving faster and faster as it moves away from the stop sign. This increase in speed is referred to as positive acceleration. When the car brakes, the car will move slower and this is negative acceleration. An object moving in a circle at a constant speed is also accelerating because its direction is changing as it orbits.

Diagram 2

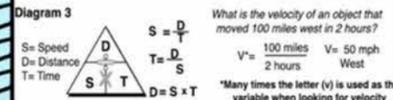
Calculating Acc

Directions: 1. Read the information on the left. 2. Use the red circles on the left to identify key words. 3. Answer the questions by putting answers and key details onto the right. 4. Write a one sentence synthesis statement that explains the big idea of the text.

TOPIC Speed and Velocity **GUIDING QUESTION** What is the difference between speed and velocity and how are they calculated?

QUESTION How do you find the average speed of an object? **KEY DETAILS** Add text

SYNTHESIS SENTENCE: (BIG IDEA OF THE TEXT IN ONE SENTENCE) Add text



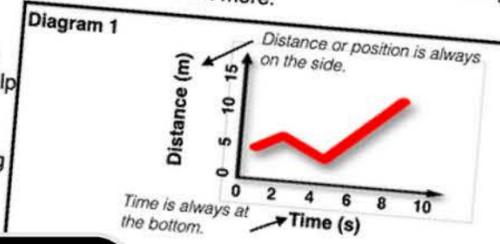
To find out how fast Michael Phelps was moving in the 2008 Summer Olympics men's 100 meter butterfly, take his total distance traveled and divide it by the total time it took. Michael Phelps swam the 100 meters in 50.58 seconds, giving him an average speed of 1.9770 m/s when rounded to the nearest millionth place. Milorad Cavic swam the 100 meters in 50.59 seconds giving him an average of 1.9767 m/s when rounded to the nearest millionth place. That is how close the race was and how close their average speed was.

Motion Graphs (Position/Time)

Big Idea Question: How can you describe the motion of an object using a graph? Scientists use diagrams to visually explain and describe what they are observing. Motion graphs are a great way to visually describe the motion of an object. They show the speed, distance, time, and can even show if the object was moving away from the start or heading back to start. Let's look at the various graphs below to learn more.

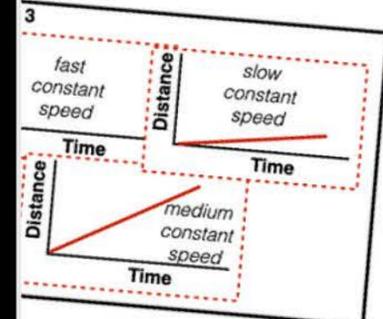
Reading a Graph

A graph can give you a lot of information if you know what you are looking at. Scientists use labels to help you read a graph. In a position/time graph, the time goes along the horizontal (x) axis. It represents how long the object is moving. For position/time graphs, the position or distance is on the vertical (y) axis. It shows how far the object is from the start.



Time is always at the bottom.

in a car at a red light, time is passing but the distance is not changing. This is represented by a straight horizontal line as seen in the graph below.



When the light turns green, the car starts to move faster and faster. This is represented by a graph that curves upward. As you move toward the end of the race, the car slows down. This is represented by a graph that curves downward. A change in speed is called acceleration.

Newton's laws of motion Science Reading

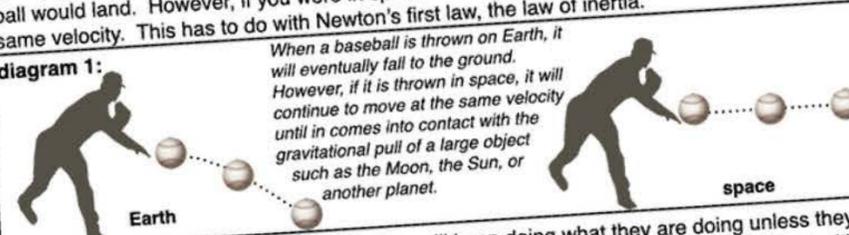
Covers

- ✓ Newton's 1st law
- ✓ Newton's 2nd law
- ✓ Newton's 3rd law

Newton's First Law

Big Idea Question: *What is Newton's first law?*
Have you ever wondered what would happen to an object if you threw it in space? Would it keep going forever, or would it eventually stop. If you threw a ball on Earth, eventually that ball would land. However, if you were in space and threw a ball, it would keep moving at the same velocity. This has to do with Newton's first law, the law of inertia.

Diagram 1: When a baseball is thrown on Earth, it will eventually fall to the ground. However, if it is thrown in space, it will continue to move at the same velocity until it comes into contact with the gravitational pull of a large object such as the Moon, the Sun, or another planet.



According to Newton's first law, objects will keep doing what they are doing unless they are acted upon by another force. In the case of the ball being thrown, once you throw it with the initial force it will keep moving at the same velocity until another force acts on it. On Earth, the forces acting on the ball are air resistance and the gravity of the Earth pulling it down. In space there is no air resistance and the ball will keep moving until it comes into contact with another object's gravitational field. The point is that it would keep moving until it is referred to as the law of inertia. It wants to keep moving at the same velocity.

Newton's first law has to do with objects that are at rest or moving at a constant velocity. If the net force is zero, acting on them. They will continue to do so. Forces that act in opposite directions are balanced and the object will continue to not move, but if the net force is not zero, the object will accelerate.

Newton's Second Law

Define and describe:
What is Newton's second law? _____
What are the two parts of Newton's second law? _____

Activity: Circle the object that would require more force to accelerate it 30 m/s².



one box two boxes

Newton's Third Law

Directions: 1. Read the information on the left. 2. Use the red circles on the left to identify key words. 3. Answer the questions by putting answers and key details onto the right. 4. Write a one sentence synthesis statement that explains the big idea of the text.

Diagram 1: How does the rocket move up when the force of its thrusters is pushing down?

Diagram 2: Action: The person pushes down on the chair and the chair pushes up on the person with an equal force. Reaction: The thrusters of the rocket push down on the ground and the ground pushes back up on the rocket with an equal force. Once in the air the thrusters push on the air, which will push back on the rocket.

QUESTION	KEY DETAILS
What is Newton's third law?	Add text
How do rockets go up in space?	Add text

SYNTHESIS SENTENCE: (BIG IDEA OF THE TEXT IN ONE SENTENCE)
Add text

8 N



11
What is the mass of an object that is pushed with a force of 10 N and accelerates 20 m/s²?

“ I really like this resource because of the differentiation. I like that there are practice problems for students to complete and questions based on the text as well. - Byranna T. ”

Conservation of Energy KE and PE

Science Reading

Covers

- ✓ Kinetic Energy
- ✓ Potential Energy
- ✓ Conservation of Energy

“AMAZING resource! It was VERY easy to use and not overwhelming!- Morgana R.”

Potential Energy

Define and Describe:

1. What is the definition of potential energy? _____
2. How is potential energy different from kinetic energy? _____

Identify:

3. Which type of potential energy is in the picture (elastic, chemical, gravitational)?



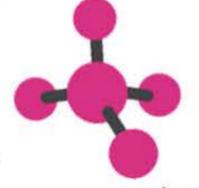
elastic / chemical / gravitational



elastic / chemical / gravitational



elastic / chemical / gravitational



elastic / chemical / gravitational

4. Circle the picture that

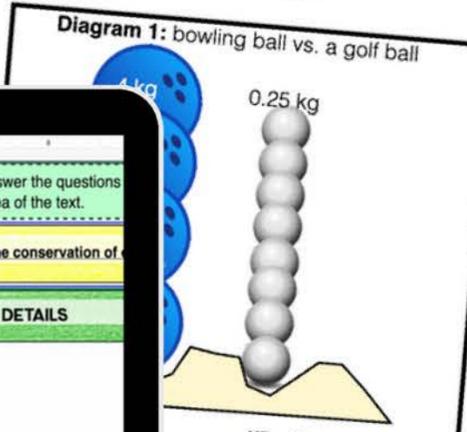
Kinetic Energy

Big Idea Question: What is kinetic energy and how is it calculated?

What is kinetic energy?
Let's say you have a bowling ball and a golf ball. You drop them from the same height onto sand. Which one will create a larger hole? If you said the bowling ball you are correct. It does a lot of work to move the sand aside and create the hole. As the balls are dropped, they have the ability to do this work because of their motion. The work is transferred into energy of motion, or kinetic energy. Kinetic energy is the energy an object has because of its motion. Objects that have more mass or are moving faster have more kinetic energy.

How do we calculate kinetic energy?
How much kinetic energy an object has is dependent upon its mass and its velocity. To find the kinetic energy...

Diagram 1: bowling ball vs. a golf ball



$KE = 1/2 (m \times v^2)$
 $KE = 1/2 (0.25 \text{ kg} \times 25 \text{ m/s}^2)$
 $KE = 78 \text{ J}$

Directions: 1. Read the information on the left. 2. Use the red circles on the left to identify key words. 3. Answer the questions on the left and key details on the right. 4. Write a one sentence synthesis statement that explains the big idea of the text.

Have you ever been in a bumper car? As you hit another car head-on, your car moves a little backward. This is because some of the energy from the other car gets transferred to your car causing you to move in the opposite direction. This transfer of energy is called conservation of energy. Conservation of energy states that energy cannot be created or destroyed it is just transferred from one thing to another.

Diagram 1



After the two cars collide, the energy is transferred between the two cars causing them to move backward in opposite directions.

In a closed system, or a system in isolation, the total amount of energy between two objects before they interact and after they interact is the same or equal to each other. To simplify this, we will make each car a system. The first car, system one, has an energy of 5 Joules, and the second car, system two, has an energy of 1 Joule. Joule is the unit for energy. Combined, the two systems have a total of 6 Joules of energy. When they interact, some of the energy between the systems is transferred. After the interaction, system one now has 3 Joules and system two now has 3 Joules. Combined, the two systems have a total of 6 Joules after the interaction. This transfer of energy can be transferred into heat energy, mechanical energy, electrical energy, light energy, or chemical energy. Look at diagram 2 for a visual understanding of this concept.

TOPIC	GUIDING QUESTION
Conservation of energy	What is the conservation of energy?
QUESTION	KEY DETAILS
What is the conservation of energy?	Add text
QUESTION	KEY DETAILS
How is energy transferred from one object to another?	Add text
SYNTHESIS SENTENCE: (BIG IDEA OF THE TEXT IN ONE SENTENCE)	
Add text	

speeds up or slows down. Same kinetic energy no matter what. This means that a car in a crash has more kinetic energy than a car going slower. The speed of the object becomes...

Types of Forces Science Reading

Covers

- ✓ Friction
- ✓ Fluid Friction
- ✓ Air Resistance
- ✓ Gravity
- ✓ Elastic Force: Tension
- ✓ Elastic Force: Compression
- ✓ Buoyant Force

“ This was a great help for some of my lower level students who needed additional reinforcement on the concepts.- Trisha H. ”

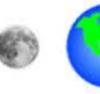
Gravity

Big Idea Question: Why do objects fall to the ground?

Diagram 1  As the story goes, Isaac Newton came up with the law of universal gravitation when an apple fell and hit him on the head.

You have probably heard the story of an apple falling on top of Newton's head causing him to come up with the law of universal gravitation. While that story is probably not true, he did come up with the law. What is the law of universal gravitation?

The law of universal gravitation states that anything with matter in the Universe attracts other objects of matter in the Universe to its center. Stated simply, everything with matter has gravity, and gravity is a force of attraction. This means that not only does the Earth have gravity, but Jupiter has gravity, you have gravity, your pencil has gravity, an ant has gravity, even a single hydrogen atom has gravity. The amount of gravity is dependent on three factors: the mass of the first object, the mass of the second object, and the distance between them.

Diagram 2 

When it comes to Earth (diagram 2). This is why, when you drop a pencil, your pencil will fall toward Earth. Jupiter's atmosphere is thick enough to not only pull in objects, but also to pull in gas.

Diagram 3 

two astronauts walking on the surface of the Earth. One astronaut is holding a ball. The ball is falling toward the Earth.

Directions: 1. Read the information on the left. 2. Use the red circles on the left to identify key words. 3. Answer the questions by writing answers and key details onto the right. 4. Write a one sentence synthesis statement that explains the big idea of the text.

You are playing soccer and kick a ball at the goal, but the ball just misses it. The ball rolls past and eventually comes to a stop. Why did it stop? What slowed it down? There must be some type of force acting on it that is changing its velocity, slowing it down, and eventually making it stop. This force is called friction.

Diagram 1  Friction causes the ball to slow down and eventually stop.

Friction is a force that opposes the motion of objects. There are two types of friction: kinetic friction and static friction. If you have ever tried to push heavy furniture and it didn't move, then you have come in contact with static friction. Static friction happens when you try to apply a force to an object to move it and it does not move. Kinetic means moving, so kinetic friction occurs when you apply a force to an object and it moves. When you push the heavy furniture, the second it starts moving is when it experiences kinetic friction (diagram 2).

Diagram 2  The man is pushing, but the cabinet does not move because static friction is acting against his push. The man is pushing, and the cabinet finally starts moving at a slow velocity due to kinetic friction.

TOPIC	Friction	GUIDING QUESTION	What effect does friction have on the motion of objects?
QUESTION	What is friction?	KEY DETAILS	Add text
QUESTION	What are the two types of friction?	KEY DETAILS	Add text
SYNTHESIS SENTENCE: (BIG IDEA OF THE TEXT IN ONE SENTENCE)			
Add text			

Elastic Force

Define and Describe:
What is tension? _____
What is compression? _____

Compare / Contrast:
How are tension and compression similar and different? _____

Directions: Does the object represent a tension force or a compression force.

5 

6  tension / compression

9  tension / compression



Included: Electromagnetism Science Reading

Covers

- ✓ Electric Forces
- ✓ Magnetic Forces
- ✓ Electromagnetism

Magnetic Forces

What makes your headphones produce sound when connected to your device? It's all about magnetic forces, which, though invisible, are vital in our daily lives. Magnetic forces are the push or pull between objects due to their electrical signals that generate energy that converts into sound waves. This process allows you to enjoy your favorite music. Magnets also attract certain metals like iron. Suppose you've ever played with a magnet and seen it pull small metal objects toward it. In that case, you've witnessed magnetic attraction, a fundamental aspect of magnetic forces in various applications, from picking up paper clips to powering electric motors.

Every magnet has two poles: North (N) and South (S). These poles either attract or repel each other. Try pushing two magnets together with the same poles facing each other—they go away due to the repulsive force between like poles (diagram 1). Magnets also create invisible fields around them called magnetic fields, which affect nearby objects. Sprinkling iron filings around a magnet can help visualize these fields, showing their shape and direction. The Earth is a giant magnet with a magnetic field that influences compass needles, aiding global navigation.

Diagram 1: Magnetic fields

Opposites attract

Likes repel

The magnetic compass is a classic example of magnetic forces in action. The needle inside a compass is a small magnet that aligns with the Earth's magnetic field, helping sailors, explorers, and hikers determine direction relative to the Earth's magnetic poles (diagram 2). This alignment aids navigation by providing a reliable reference point for direction. Additionally, magnetic forces are harnessed in navigation systems used in aircraft and ships, where advanced magnetic sensors offer precise location data, enhancing safety and accuracy. In modern technology, magnetic forces are integral to the functioning of computer hard drives, where tiny magnetic fields store vast amounts of data, enabling us to save and retrieve digital information efficiently.

Diagram 2: Magnetic compass

Earth's magnetic field

A magnetic compass aligns with earth's magnetic field

Magnets vary in strength, from those in everyday items to powerful magnets in MRI machines used for medical imaging. In MRI machines, strong magnets create detailed images of the inside of the human body, aiding in diagnosis and treatment. When magnets attract or repel each other, they store potential energy, like a compressed spring released when they separate. This principle is used in magnetic levitation (maglev) trains, where magnetic forces lift and propel the train, reducing friction and allowing high-speed travel. Not all materials respond to magnetic forces the same way. Iron and steel are strongly attracted to magnets, while wood and plastic are not. There are also temporary magnets that only exhibit magnetism in a magnetic field and permanent magnets that retain their magnetism. Magnets are used in electromagnets for cranes that move scrap metal, while permanent magnets are used in headphones and speakers to create vibrations that we hear.

Magnetic forces are also used in many other ways, such as in the flow of electrons and the resulting electric fields can power...

Electric Forces

Define and Describe:
Define electric force. _____

How do electric fields work? _____

What two factors determine the charge of an electric field? _____

Using the image, identify which one has the greater electric field on the objects.

Choice A

Choice B

5.

Choice A

Choice B

copper wires covered with a form of plastic? _____

the flow of electrons and the resulting electric fields can power _____

TOPIC Electromagnetism

GUIDING QUESTION How does the interaction between electric currents and magnetic fields, known as electromagnetism, play a role in everyday devices?

QUESTION What happens when you switch on a fan or use a hand-cranked flashlight? These everyday actions rely on electromagnets, where electricity and magnetism work together to power our daily lives. Electromagnetism is the interaction between electric currents and magnetic fields. It begins with the movement of tiny particles called electrons inside atoms. When these electrons move, they generate magnetic fields, a principle that underlies many everyday objects.

KEY DETAILS

What is electromagnetism?

Add text

QUESTION How do electromagnets work?

KEY DETAILS

Add text

SYNTHESIS SENTENCE (BIG IDEA OF THE TEXT IN ONE SENTENCE)

Add text

Diagram 1: Electromagnet

Closed system: the electromagnet attracts metal objects

Open system: the electromagnet does not attract metal objects

Included: Light Waves Science Reading

Covers

- ✓ Light Absorption
- ✓ Light Reflection with Mirrors
- ✓ Light Transmission with Lenses and angle of refraction

The collage features three main educational components:

- Light Transmission and Lenses Reading Passage:** Explains how light waves interact with different materials (transparent, translucent, opaque) and how lenses (convex and concave) manipulate light rays. It includes diagrams showing light passing through materials and being focused or diverged by lenses.
- Light Reflection and Mirrors Worksheet:** Contains questions about reflection, a diagram of a protractor measuring an angle of reflection, and diagrams of concave and convex mirrors with associated questions.
- Digital Presentation:** A tablet displaying a digital version of the worksheet, showing interactive text boxes and diagrams.

Included: Digital and Analog Signals Science Reading

Covers

-  Digital Signals
-  Analog Signals

Digital Signals

How do digital signals power our fast-paced world? In today's digital age, communication happens at lightning speed, thanks to digital signals. Digital signals are electrical impulses representing data in binary form, using combinations of 0s and 1s. These signals are the backbone of modern communication systems, including the Internet, smartphones, and digital devices.

Digital signals are created by encoding information into binary code (diagram 1), which uses only two digits: 0 and 1. Each digit in this binary system is known as a bit, the smallest data unit in computing and digital communications. When combining multiple bits, they form bytes, each consisting of eight bits. These combinations of bits can represent different pieces of information, such as characters, numbers, or commands. For example, the letter "A" is defined by the binary code 01000001, a specific arrangement of eight bits. In digital communication, this encoding process involves converting data into electrical impulses that can be transmitted over various media, such as wires, optical fibers, or radio waves. The binary system's simplicity makes it highly compatible with electronic components' on/off states, like transistors in a computer's processor. These components easily switch between two states corresponding to the binary digits 0 and 1, facilitating rapid and reliable data transmission and processing.

Diagram 1: Binary code



The binary sequence "11010110 11010110 11010110" most commonly represents the characters "000" in the extended ASCII character set.

Digital signals revolutionized communication by offering several key advantages. They can be amplified and regenerated, reducing signal degradation and ensuring clear communication over long distances. They can carry various data types, from text and images to videos and audio. Additionally, digital signals transmit data much faster than analog signals, enabling real-time communication and high-speed internet access.

Digital signals are used in countless everyday applications. They power the internet, allowing us to browse websites, stream videos, and communicate through email and social media. Telecommunications enable phone calls (diagram 2), text messages, and video calls on mobile devices and landlines. Digital signals also deliver television and radio broadcasts, offering high-definition quality and interactive features. In computing, digital signals are essential for processing and transmitting data, enabling tasks like software applications, gaming, and data storage.

Diagram 2: Binary code



You can communicate with your friends on your phones due to digital signals.

While digital signals offer many benefits, they also face challenges like signal interference and security risks. Interference from other devices or environmental factors can disrupt signal quality. Security threats such as hacking and encryption and error-transmission. Encrypt while error-correcting.

In conclusion, digital exchange across va navigating the digita

© Adventures

Digital Signals

Define and Describe:
Define digital signals. _____

What is binary code? _____

Identify:
Use the table below to decipher what five-letter word is represented by the following binary code: 1101000 1100001 1110000 1110000 1111001

Binary Code	Letter	Binary Code	Letter	Binary Code
1100001	j	1101010	s	1110011
1100010	k	1101011	t	1110100
1100011	l	1101100	u	1110101
1100100	m	1101101	v	1110110
1100101	n	1101110	w	1110111
1100110	o	1101111	x	1111000
1001111	p	1110000	y	1111001
1010000	q	1110001	z	1111010
01001	r	1110010		

the benefits and challenges of using digital signals?

TOPIC Analog Signals

GUIDING QUESTION What are the advantages and challenges of using analog signals?

QUESTION What are some advantages and disadvantages of using analog signals?

KEY DETAILS Add text

SYNTHESIS SENTENCE: (BIG IDEA OF THE TEXT IN ONE SENTENCE) Add text

Diagram 2: Uses of analog signals



Analog signals are crucial in equipment like EKG machines and blood pressure monitors, where accurate representation of physiological data is vital.

Despite their strengths, analog signals face challenges such as noise interference and signal degradation over long distances. Nonetheless, advancements in signal processing and amplification technologies continue to enhance the reliability and quality of analog signal transmission.

Analog signals are indispensable in various aspects of our lives, from delivering high-quality sound in music systems to providing accurate data in medical equipment. While they face challenges like noise interference and signal degradation, technological advancements continue to improve their reliability. Analog signals help us see their needed applications in entertainment, communication, healthcare, and industrial processes, highlighting their enduring significance in our modern world.

Properties of Waves Science Reading

Covers

- ✓ Longitudinal vs Transverse
- ✓ types of waves
- ✓ how to measure waves

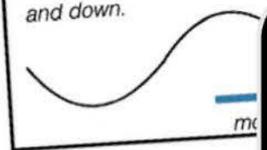
“ The reading is chunked well with clear diagrams and questions. Great resource for Waves Properties.-
Sheila H. ”

Longitudinal and Transverse Waves

Big Idea Question: What is the difference between longitudinal and transverse waves?

Have you ever sat in a bounce house or on a trampoline while someone else was bouncing? You were moving in an up and down motion. This type of motion is typical of transverse waves. Transverse waves are waves that travel at right angles to the direction of their motion. They look like little rollercoaster hills as they go up and down. The particles in them travel perpendicular to the direction of the wave. These type of waves can spread through solids but not through the bulk of fluids like liquids and gases. You can demonstrate a transverse wave using some rope. To start, tie one end of the rope to an object. Then, hold the other end of the rope. Last, move your hand up and down. The motion the rope makes represents the motion of transverse waves. You can see a picture of transverse waves in diagram 1. Some examples of transverse waves are light waves, earthquake S waves, and magnetic waves.

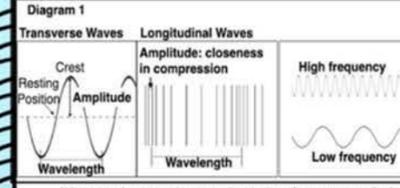
Diagram 1: Transverse waves move at right angles to the motion. The particles move up and down.



Longitudinal waves move in the same direction as the direction of their motion. The particles move back and forth through the medium. The medium moves back and forth trying to go back to its resting position.

Directions: 1. Read the information on the left. 2. Use the red circles on the left to identify key words. 3. Answer the questions on the right. 4. Write a one sentence synthesis statement that explains the big idea of the text.

Quicksilver's In Memory of Eddie Aikau, otherwise known as The Eddie, is only held when open ocean swells reach a minimum of 20 feet high. It is one of the most prestigious big wave surfing competitions in the world. It has only been held nine times since it started in 1984 due to the wave height requirement. Surfers head to Oahu's North Shore every winter hoping that the conditions will be perfect for the call to be made letting them know that today is the day. But how do they know that the conditions are right and the wave height has reached at least 20 feet?



When people measure waves, they look at the waves amplitude, wavelength, and frequency (diagram 1). A wave's amplitude is the distance the particles move when a wave passes through them. In a transverse wave, the amplitude, or wave height, is known as the difference between the height of the crest and the resting position. The higher the crest is, the greater the amplitude. So when the amplitude is 20 feet or higher, The Eddie is held. In a longitudinal wave, the amplitude measures the compression of the particles. The closer they are, the greater the amplitude. A wave's wavelength is the distance between two points on adjacent waves. The closer the points are, the shorter the wavelengths are. A wave's frequency is measured by counting the number of crests or compressions that go through a point in 1 second and is measured in hertz (Hz). One hertz equals one wave passing in one second. The greater the number of waves, the greater the frequency, the higher the hertz.

Measuring Waves

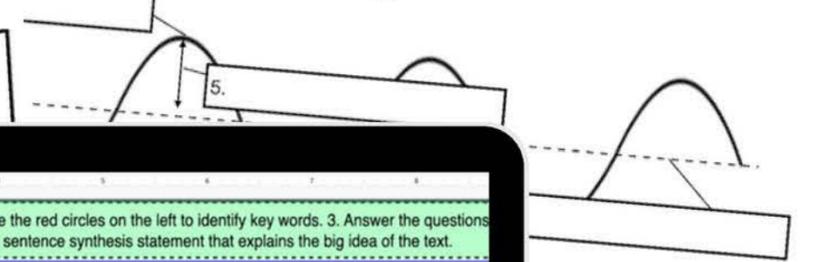
Define:

Amplitude: _____

Wavelength: _____

Frequency: _____

Identify: Label the different parts of a wave.



ing the wave with the highest

TOPIC: measuring waves	GUIDING QUESTION: How are waves measured?
QUESTION: How can you find the amplitude and wavelength of a wave?	KEY DETAILS: Add text
QUESTION: How do you measure the frequency of a wave?	KEY DETAILS: Add text
SYNTHESIS SENTENCE: (BIG IDEA OF THE TEXT IN ONE SENTENCE)	
Add text	

wavelength is 2.5 m?

gth is 3 m?

y is 4 Hz?



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