Newark Board of Education

School Closure Packet

Mathematics & Science

Grade 5

Roger León
Superintendent

2020 School Year

NAME:_____

TEACHER:_____

GRADE 5 SCHOOL CLOSURE PACKET

DIRECTIONS

Complete each activity in the School Closure Packet. Be sure to read all texts and complete activities thoughtfully and thoroughly.

Students are to return the completed packet to their teachers when school reopens.

Parents/Guardians, you are encouraged to assist in the following ways:

- Make a plan to complete the activities. For some activities, manipulatives are needed. If you do not have these at home, you can utilize the online manipulatives: https://www-k6.thinkcentral.com/content/hsp/math/hspmath/na/common/itools_int_9780547584997_/main.html
- Provide a time and quiet space for your child to work on these assignments.
- Help your child to complete the activities if he or she needs support.
- Review and discuss your child's responses. (Strongly urged at grades Kdg - 4)
- Provide positive feedback and praise for sincere effort and independence.
- Ensure your child understands the directions to each problem and listen to him/her read.
- Ensure that the completed packet is returned to school when school reopens

Thank you for helping your child to be successful!

Newark Board of Education	Grade 5	Mathematics

Day 1

Lesson 5-6 (pages 117 - 120) Use Ordered Pairs to Represent Problems

1) Review I Can Statement:
I can find the volume of a figure composed of right rectangular prisms.

2) Step It Out: #1 Page 117 Discuss with children that the figure can be broken apart in many different ways to form right rectangular prisms. What information do you need that is not given in order to find the volume of the frame? How can you use the given information to find the unknown dimensions of the top right rectangular prism?

3) Check Understanding: #1 - #2 Page 119 Children Should break the figure into different rectangular prisms.

4) On Your Own: #3 Page 120. Students find the volume of a composed figure by adding and by subtracting volumes of right rectangular prisms.

Day 2

Lesson Module 5 Review (pages 123 - 124)

1) Vocabulary: #1 Page 123 Students should review the vocabulary terms for this module.

3) Concepts and Skills: #2- #10 Page 123 - 124 Use tools and strategies from this module to complete the review.

Day 3

Lesson Module Opener Module 20 (pages 495 - 496)

1) How many right triangles?: Page 495 How can you tell if a triangle is a right triangle? How would you classify the other two angles in a right triangle? How do two line segments form a right triangle?

2) Are You Ready?: #1- #8 Page 496 Complete these problems to review prior components and skills you will need for this module.

Day 4

Lesson 20-1 (pages 497 - 500): Identify and Classify Polygons

1) Review I Can Statement:
I can identify and classify polygons.

2) Spark Your Learning: “Using a Diagram to Identify and Classify Polygons” Page 497. What do the blue marks on the figures represent? What are some characteristics of polygons that you could use to group polygons? Which figures appear in more than one category? Which tool could you use to solve the problems? Why is this tool more appropriate to use than the others?

3) Build Understanding: How can you describe the difference between an angle and a vertex? What do you notice about the attributes of each polygon? Describe the relationship between the numbers of sides, vertices and angles of each polygon and how you can use this relationship to name a polygon. Two other polygons to complete the table on Page 498. #2 Page 499

3) Check Understanding: #1 Page 499 Draw pictures

	to show each number. **4) On Your Own:** #2 - #3 Page 500
Day 5 **Lesson 20-2 (pages 501 - 504) Classify and Organize Triangles** **1) Review I Can Statement:** I can classify triangles. **2) Spark Your Learning:** "Classify and Organize Triangles" Page 501. How do the blue tick marks on certain sides of these triangles relate to their lengths? What categories can you use to classify angle measures? How do thow categories carry over into classifying triangles? Which tool could you use to solve the problems? Why is this tool more appropriate to use than the others? **3) Build Understanding:** What is true about the angles of equilateral triangles? How can you use as many terms to classify triangles? Children will name angles and triangles by attributes on page 501. **4) Step It Out:** #2 Page 503 Draw and name a triangle with exactly two congruent sides and all angles smaller than a right angle. How can you draw a triangle with exactly two congruent sides? How can you draw and triangle with all angles that measure less than a right triangle? **5) Check Understanding:** #1 Page 503 Identify and classify the given triangle on a floor plan. Use attributes to classify. **6) On Your Own:** #4 - #7 Page 504 Children should use the correct vocabulary to identify and classify triangles.	**Day 6** **Lesson 20-3 (pages 50 - 50) Classify and Organize Quadrilaterals** **1) Review I Can Statement:** I can classify and compare quadrilaterals. **2) Spark Your Learning:** "Classify and Organize Quadrilaterals" Page 505 How can you describe the parallel sides in a quadrilateral? What is an example of an object that has two pairs of parallel sides and is in the shape of a quadrilateral? What are some attributes of different kinds of quadrilaterals that can you see in the illustration on page 505? **3) Build Understanding:** Page 506 Why is a square a parallelogram? Why is a rectangle a parallelogram? How can a square be also a rectangle? Use the diagram to classify quadrilaterals. **4) Step It Out:** #2 Page 507 As children complete the figure and number each quadrilateral, have them explain why they are labeling each figure with each number. Are all quadrilaterals parallelograms? Explain. **5) Check Understanding:** #1 - #3 Page 507 Explain why statements are false. **6) On Your Own:** #6, #10 Page 508 Use attributes to classify and compare quadrilaterals.
Day 7 **Lesson 20-4 (pages 509 - 512) Use Venn Diagrams to Classify Two-Dimensional Figures** **1) Review I Can Statement:** I can compare and classify two-dimensional figures using Venn diagrams. **2) Spark Your Learning**: "Use Venn Diagrams to Classify Two-Dimensional Figures" Page 509. What are some attributes of the polygons shown? Is there more than one way to organize the polygons? Explain. How are polygons alike? How are they different? Where is a polygon placed if it matches the attributes that label one oval but none of the others?	**Day 8** **Lesson Module 20 Review (pages 513 - 514)** **1) Vocabulary:** #1 Page 513 Students should review the vocabulary terms for this module. **3) Concepts and Skills:** #2- #11 Page 513 - 514 Use tools and strategies from this module to complete the review.

3) Build Understanding: Page 510 Use the Venn diagrams to compare squares, rectangles, and rhombuses. How does the structure of the Venn diagram show the chosen definition of a trapezoid? **4) Step It Out:** #2 Pages 511 As children are placing shapes in Venn diagram, ask them to explain their reason for placement. How are the regions for regular polygons and parallel sides related to each other? According to the finished diagram, how many figures fit at least one of the given attributes? **5) Check Understanding:** #1 Page 511 **6) On Your Own:** #2 - #5 Page 512 Children apply their understanding of quadrilaterals to solve problems.	
Day 9 **Lesson Module Opener Module 19 (pages 471 - 472)** **1) Where is the treasure?:** Page 471 What pattern is shown on the hundred chart after the first step? In Parts B and C, the rules are Add 6 and Add 12. Why don't any of the same numbers get crossed out from these rules? What would have happened if the instruction in Part D had the pattern start at 95 instead of 83? **2) Are You Ready?:** #1- #3 Page 472 Complete these problems to review prior components and skills you will need for this module.	**Day 10** **Lesson 19-1 (pages 473 - 476) Describe a Coordinate System** **1) Review I Can Statement:** I can identify and describe a point in a coordinate system. **2) Spark Your Learning:** "Describe a Coordinate System" On page 473 Identify and label locations on a coordinate grid. On a map, which direction is east? Which direction is north? Which location should you plot first? Why? **3) Build Understanding:** Page 474 - 475 Have children describe and give examples of number lines. Then have them describe parts of the coordinate system. Which axis do you use to measure distances to the right and to the left? What does the first number in an ordered pair represent? What does the second number in an ordered pair represent? How can you find the ordered pair of the location of the library? **4) Check Understanding:** #1 - #2 Page 475 Use the coordinate grid to answer the questions. **5) On Your Own:** #3 - #7 Page 476
Day 11 **Lesson 19-2 (pages 477- 480) Understand Ordered Pairs** **1) Review I Can Statement:** I can graph a point on a coordinate grid and interpret the coordinate values.	**Day 12** **Lesson 19-3 (pages 481 - 484) Use Ordered Pairs to Represent Problems** **1) Review I Can Statement:** I can use coordinate graphing to represent and solve problems.

2) Spark Your Learning: “Understand Ordered Pairs” Page 477 What does each unit on the coordinate grid represent? What is the location of the art museum? What is the location of the history museum? How can you determine the location of the library? How can you determine the walking distances from the two museums to the library? **3) Build Understanding:** #1 Page 478 Use the coordinate Grid to plot the location of two buildings. Could you plot the location of the library by reversing the steps in Part A, first moving up the y-axis 5 units and then ovr from the y-axis 6 units? Explain why or why not. **4) Step It Out:** #2 Page 478 How would you use ordered pairs to describe the locations of the aquarium, the museum, and the park? How is the distance between the aquarium and the museum related to the difference between the x-coordinates of the two points? **5) Check Understanding:** #2 - #3 Page 479 **6) On Your Own:** #4, #7 - #12, #16 Page 480 Use a coordinate grid to locate ordered pairs.	**2) Step It Out:** #1 - #2 Page 481 Encourage children to share their reasoning. How is this coordinate grid different from the coordinate grids in the previous lessons? How can you find the answer to Part B? For #2 have children discuss the different ways they can find the area of the garden from the graph. Which lines are parallel to the x-axis? Which lines are parallel to the y-axis? **3) Check Understanding:** #1 - #4 Page 483 Children should interpret the graph to solve problems. **4) On Your Own:** #9 - #11 Page 484. Students interpret real world data presented on a coordinate grid. Students connect their understanding of points on a coordinate grid with reasoning about the perimeter of a rectangle.
Day 13 **Lesson 19-4 (pages 485 - 488) Generate and Identify Numerical Patterns** **1) Review I Can Statement:** I can use two rules to generate numerical patterns, write ordered pairs using corresponding terms, and identify a relationship between them. **2) Step It Out:** #1 - #2 Page 485 - 486 Discuss with children how establishing the relationship between the numbers in Antonia’s and Connor’s patterns make it possible to find the numbers in Connor’s pattern. How will you complete Antonia’s row in the table? How will you complete Connor’s row in the table? How does writing the numbers as ordered pairs help you analyze their relationship? For #2 What number is represented by Start? On what number is Nora after her first turn? **3) Check Understanding:** #2 Page 487 Children will use the rule provided to solve problems. **4) On Your Own:** #3 - #4 Page 488	**Day 14** **Lesson 19-5 (pages 489 - 492) Identify and Graph Relationships and Patterns** **1) Review I Can Statement:** I can write and graph ordered pairs on a coordinate grid using two numerical patterns. **2) Step It Out:** #1 Pages 489 Discuss with children whether they would prefer to generate each pattern by following each rule or use the relationship between corresponding numbers. What is the rule for the side length? What is the rule for the perimeter? **3) Check Understanding:** #2 - #4 Page 491 **4) On Your Own:** #5 - #10 Pages 491-492 Children Find ordered pairs to determine relationships.
Day 15 **Lesson Module 19 Review (pages 493- 494)**	

1) Vocabulary: #1 Page 493 Students should review the vocabulary terms for this module. **2) Concepts and Skills:** #2 - #10 Pages 493 - 494 Use tools and strategies from this module to complete the review.	

Newark Board of Education	Grade 5	Science

Day 1 **Types of Respiration** **Task: Read *Types of Respiration* on the two types of cellular respiration that can occur. Then answer the following questions after you have finished reading.**	**Day 2** **Plants and Animal Needs** **Task: Visual Kinesthetic Vocabulary** **Cut and Fold vocabulary task** **Complete each Memory Maker**
Day 3 **Elements Atoms, and Molecules** **Building blocks of life.** **Task: Read *Elements, Atoms, and Molecules* on the building blocks of matter. Discuss and answer questions in complete sentences.** **Scales, Proportion, and Quantity**	**Day 4** **Invasive Species** **Task: Read *Invasive Species* about organisms that disrupt the balance in ecosystems. Then answer the following questions after you have finished reading.**

Day 5	Day 6
Creating Chemistry Task:Read *Creating Chemistry* about Antoine Lavoisier, the father of modern chemistry. Then discuss and answer questions in complete sentences.	Metals, Nonmetals and Metalloids What are their properties? Task:Read *Metals, Nonmetals, and Metalloids* about different types of matter. Answer the following questions after you have finished reading. Why are metalloids important to use in modern technology?

Day 7 **Plant Tropism** **Part I** **Task:Research the four main types are phototropism, gravitropism, hydrotropism, and thigmotropism.** **Use your science handbook and other materials to research.** **Use your research to draw a diagram of the tropism you researched.** **Make sure you label the components of the diagram.**	**Day 8** **Plant Tropism** **Part II** **Task:Research the four main types are phototropism, gravitropism, hydrotropism, and thigmotropism.** **Use your science handbook and other material to research.** **You are going to plan an investigation about the plant tropism** **using the information from your research.** **Ask a Question: What question do you hope to answer about the plant tropism from the results of the investigation you are going** **to plan?**

Day 9 **Research Metals** **Most metals that conduct electricity well also conduct heat well, and those that do not conduct electricity well do not conduct heat well.** **Task: Use your Science Handbook and other research materials to determine which types of metals conduct electricity and heat better than others.**	**Day 10** **Volume, Density, and Buoyancy** **Task: Read page 253. Then answer the following questions in complete sentences after you have finished reading.**

Day 11 **Look at the photo of the artist blowing glass. How does this occur?** **Task: What questions do you have about this process?** **Read about a materials scientist and answer the questions** **on the next page.** **STEM Career Connection: Material Scientist**	**Day 12** **With or Without Soil?** **Task: Research hydroponic plants and find out whether or not plants can get what they need to grow without soil.**

Day 13 **Hydrosphere** **Task: Visual Kinesthetic Vocabulary** **Cut and Fold vocabulary task** **Complete each Memory Maker**	**Day 14** **Melting Point** **Task: Visual Kinesthetic Vocabulary** **Cut and Fold vocabulary task** **Complete each Memory Maker**

Day 15 **Earth's Core** **Task: Visual Kinesthetic Vocabulary** **Cut and Fold vocabulary task** **Complete each Memory Maker**	

Name _____ Date _____

Types of Respiration

Cellular respiration is a very important process to living things. Without it, we couldn't move or even digest our food. During this process, food is broken down to make energy. There are two main forms of respiration. Aerobic respiration happens when oxygen is present. Anaerobic respiration happens when there is no oxygen present.

Aerobic Respiration

In aerobic respiration, sugar and oxygen are broken down to make carbon dioxide, water and energy. Most of the energy goes to a special molecule called ATP, which stores it for use throughout the organism. This process is very efficient. It can produce 38 ATP molecules for every sugar molecule it uses.

Many living things including humans use aerobic respiration because it is so efficient. When people inhale, they bring a constant supply of oxygen for the cells to use.

Aerobic Cellular Respiration Formula

$$C_6H_{12}O_6 + 6O_2 \Longrightarrow 6CO_2 + 6H_2O + ATP$$

Glucose Oxygen Carbon Dioxide Water Energy

Anaerobic Respiration

Imagine a person running a marathon. They are tired and weak. Their body is using a great deal of energy. There is not enough oxygen coming in to meet the body's energy needs. In this case, the body may supplement the energy needs by using an anaerobic process called fermentation. In anaerobic respiration sugar is broken-down into lactic acid and energy. This process is less efficient. It only produces 2 molecules of ATP for every sugar molecule it uses.

Name _____ Date _____

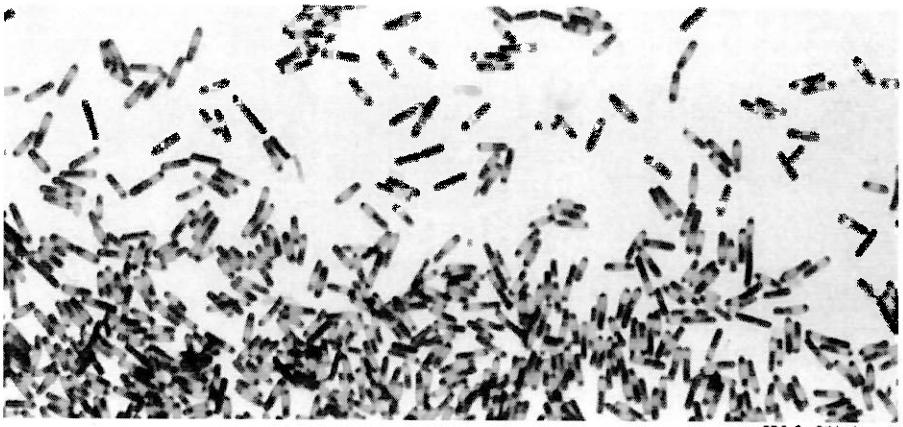
Anaerobic Cellular Respiration Formula

$$C_6H_{12}O_6 \text{ (glucose, stored energy)} \xrightarrow[\text{fewer steps}]{\text{anaerobic respiration}} 2 \text{ Lactic Acids} + 2ATP \text{ (usable energy)}$$

Neustockimages/Getty Images

What Living Things Use Anaerobic Respiration?

Most of the living things that use only anaerobic respiration are smaller and less complex. These include some bacteria. Animals with larger energy needs such as those with complex muscle movements and digestive systems tend to use aerobic respiration. Some animals cannot survive in environments with oxygen, so they use anaerobic respiration to make energy.



CDC/Dr. Gilda Jones

These species of bacteria are able to live for a long time in adverse conditions because they use anaerobic respiration. They can cause the diseases tetanus, botulism and gangrene.

Types of Respiration

Read *Types of Respiration* on the two types of cellular respiration that can occur. Answer the following questions after you have finished reading.

1. What is the difference between aerobic and anaerobic respiration?

2. What types of living things use anaerobic respiration?

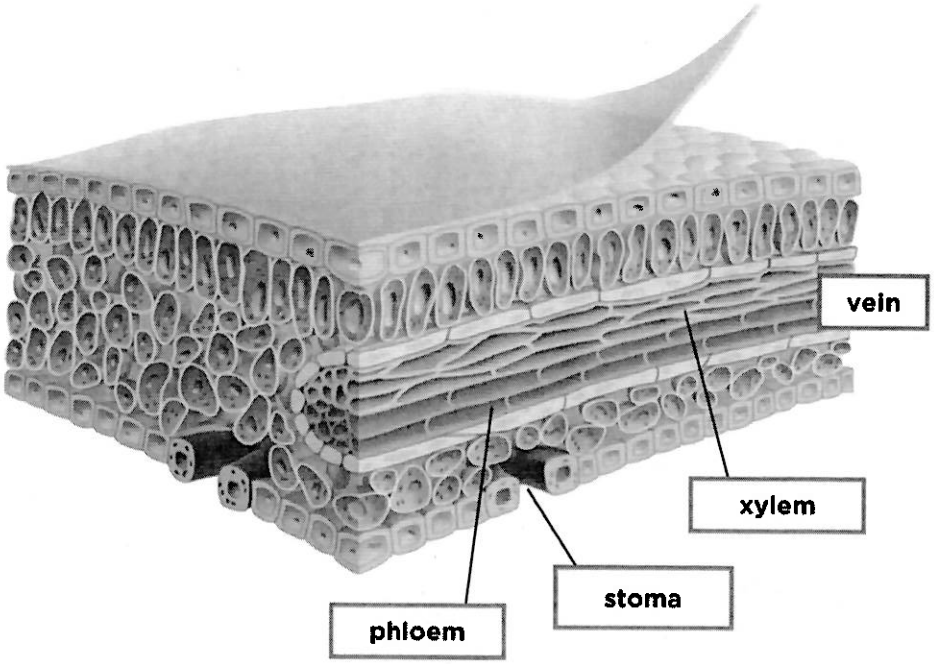
3. Describe the chemical formula of cellular respiration.

Name _____ Date _____

Plants Use Cellular Respiration

Before understanding how plants use food for cellular respiration, first we need to know how plants get food. Leaves do two important things for a plant. Leaves can regulate the balance of water in the plant. Water is taken up by the plants' roots and is transported through the xylem tissue up to the leaf veins. If the plant has plenty of water, transpiration, or evaporation through small pores called stoma in the leaves, takes place. If the plant needs all its water, the pores close and transpiration does not take place. Chloroplasts in the leaves of plants also perform photosynthesis. The chloroplasts found in the plant cells take in carbon dioxide and water, and use sunlight to produce sugars such as glucose. Some of this food is used right -away, and some is stored.

This food is transported to the rest of the plant through tissues called phloem. The plant cells will use this food to make energy during cellular respiration. This happens in the mitochondria of the plant cells. In the mitochondria, oxygen combines with sugars to release the energy plant cells need to do work.



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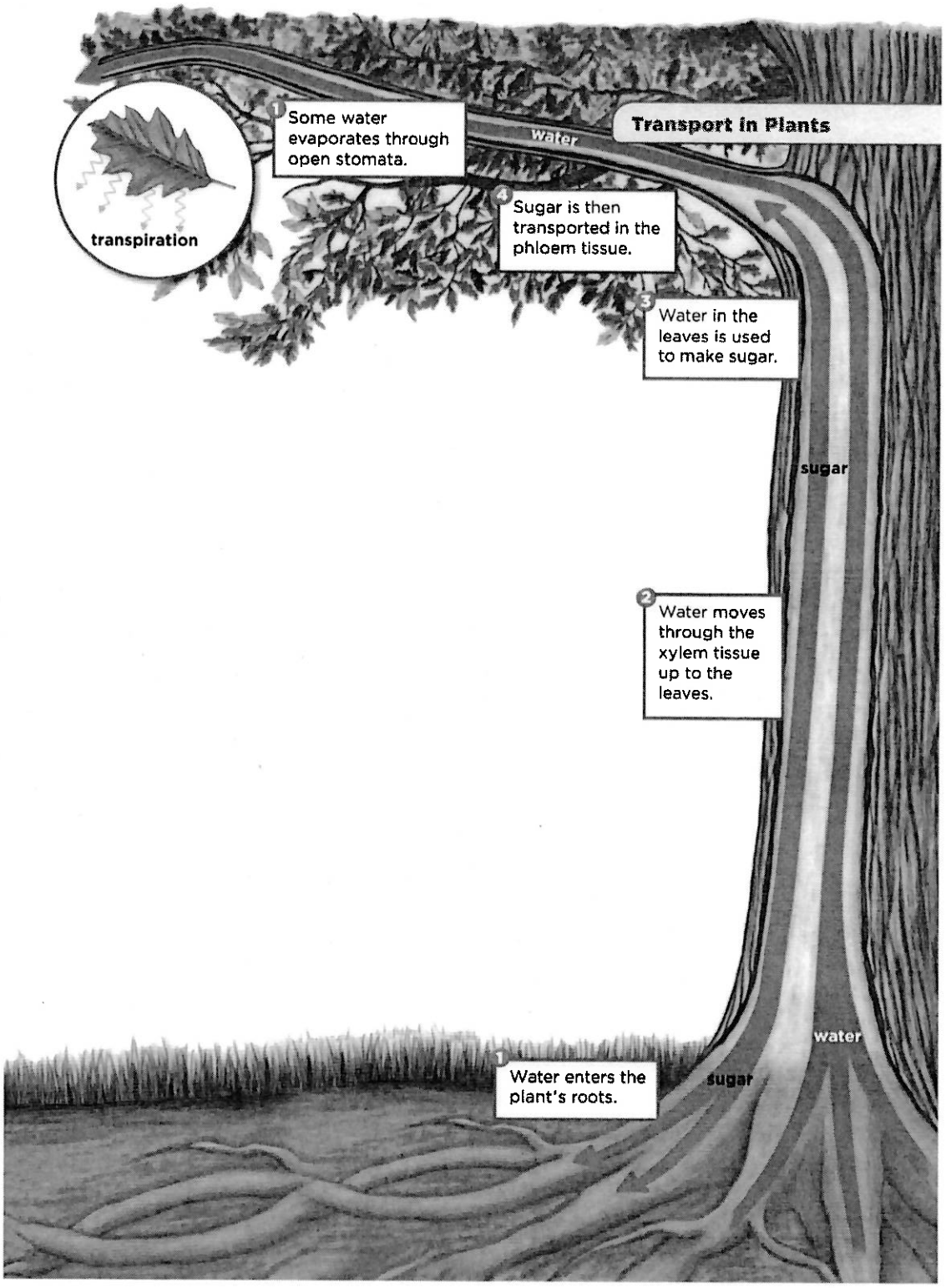
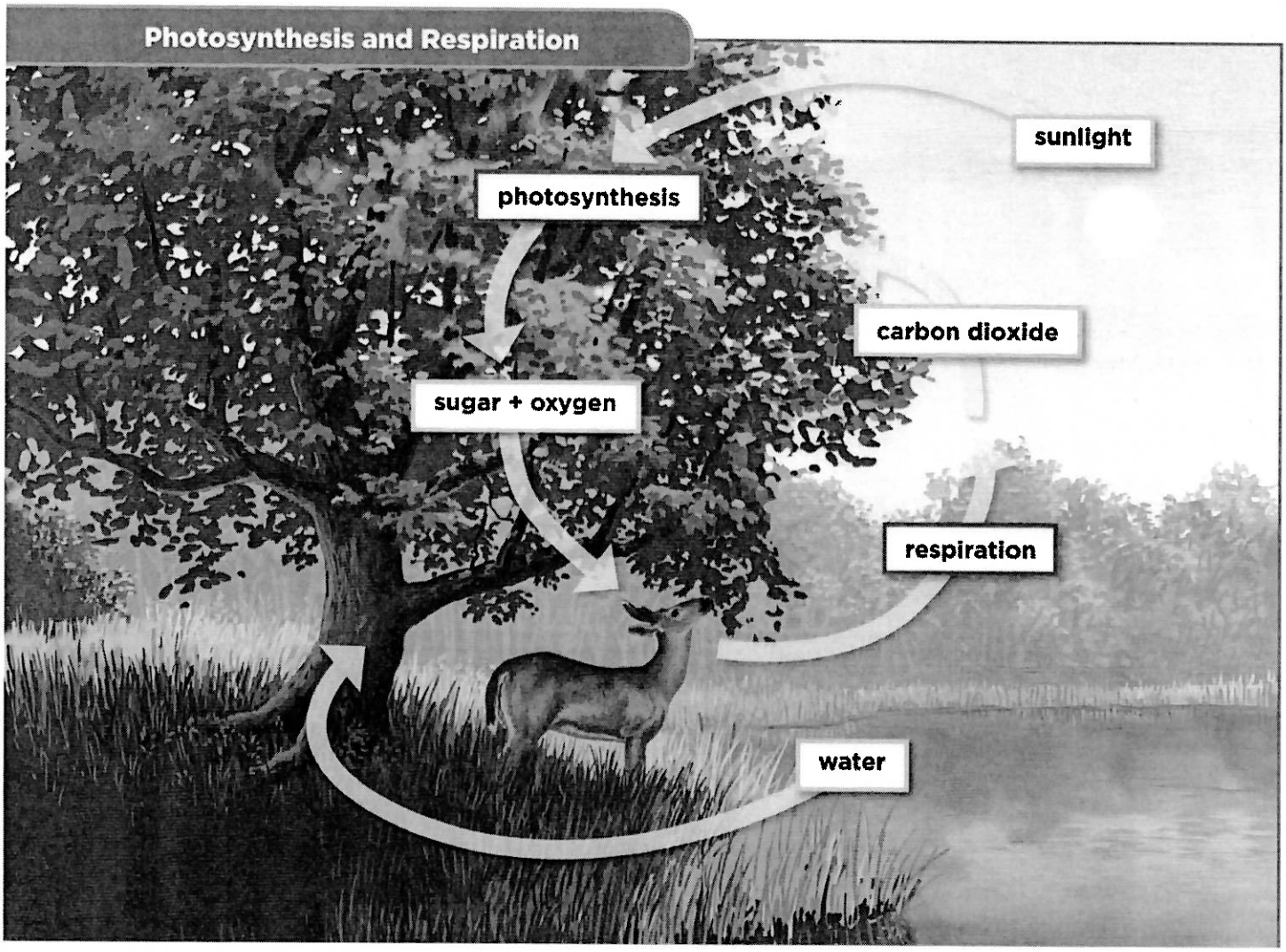


Name _____ Date _____

Plants use energy for many things, such as building new cells or making compounds using sugar. These compounds keep plant cell walls strong. It is important to remember that all the energy that the plant needs to survive, create other compounds, and produce new growth comes from cellular respiration.



cut on all dashed lines

fold on all solid lines

_____ is the process of using oxygen to break down food into energy.

_____ is the process of breaking down food into energy without using oxygen.

cellular respiration

_____ is the process of releasing energy from food molecules, such as glucose, which takes place in the mitochondria of a cell.

Memory Maker: In **cellular respiration**, cells release energy. How is **cellular respiration** different from **aerobic respiration** and **anaerobic respiration**? _____

_____

_____

_____

_____

anaerobic

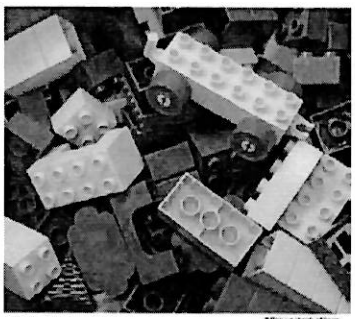
aerobic

Name _____ Date _____

Elements, Atoms, and Molecules

Building blocks of life

Imagine you made a model out of connecting blocks. If you took the model apart, you would get back the basic building blocks. You could then take those same blocks and build a completely different model. The variations would be almost endless!



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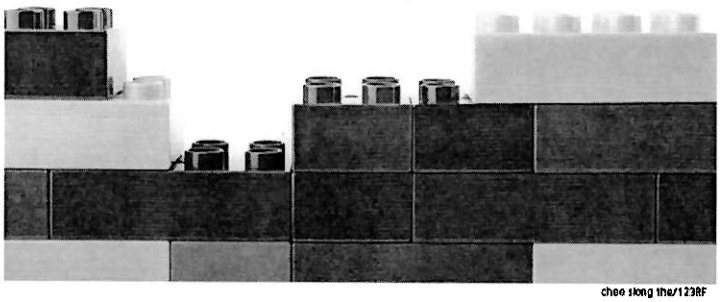

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In a similar way, all matter is made of a set of building blocks. An element is the most basic building block. It cannot be broken down into anything simpler by chemical reactions. Scientists have identified over 100 elements in the universe, each with its own set of different properties. These elements combine in different ways to provide the large variety of matter all around you.

One example of an element is the common metal aluminum. Suppose you have a piece of aluminum foil and cut it in half. Will it still be aluminum? Yes, the two halves have the same properties of aluminum. What if you kept cutting? Eventually you would have the smallest piece of aluminum possible. This is called an atom. An atom is the smallest unit of an element that retains the properties of that element.

ginasanders/123RF

Groups of atoms joined together are called molecules. Molecules are one of the ways that elements combine. Let's look at water molecules as an example. Water is made up of two elements, hydrogen and oxygen. In one molecule of water, two atoms of hydrogen are joined with one atom of oxygen. One molecule of water contains three atoms, but molecules of other materials could have hundreds of millions of atoms. A molecule may not exhibit the properties of each of the different types of elements that make it up.

This glass of water contains millions of water molecules!

Name _____ Date _____ EXPLAIN

Elements, Atoms, and Molecules

Read *Elements, Atoms, and Molecules* on the building blocks of matter. Answer the following questions after you have finished reading.

Crosscutting Concepts
Scale, Proportion, and Quantity

4. What is the smallest unit of an element that has the properties of that element?

_____

_____

5. What forms when two or more atoms join together?

_____

_____

6. Describe how elements, atoms, and molecules are related.

_____

_____

_____

_____

Name _____ Date _____

Invasive Species

Humans are able to easily travel the world. Sometimes, humans move an organism from its natural ecosystem to another. If the organism lives and reproduces in the new ecosystem, it can cause harm to that area. An organism that is introduced to a new ecosystem and causes harm is an **invasive species**. Invasive species can harm the environment, natural species, the economy, and even human health. Species that grow and reproduce quickly, and spread aggressively are likely to become invasive.

Sometimes, an invasive species is accidentally introduced to an environment. Other times, it is introduced on purpose. The cane toad was introduced to Australia in the 1930s. A beetle in Australia was eating farmer's sugar cane crops. Cane toads are known to eat large amounts of beetles. So, farmers moved the cane toad from their natural habitat in South America to the sugar cane fields in Australia. These toads have a toxic skin, and have no natural predators in Australia. Approximately 3,000 toads were introduced in the 1930s. The population is now in the millions! These toads are both poisoning and competing with native species.

Johan Larson/123RF

Name _____ Date _____

Zebra mussels first came to the U.S. from Eurasia in ship ballast water released into the Great Lakes. Since 1988, they have spread dramatically, and out-compete native species for food and habitat. Zebra mussels can attach to almost any hard surface. They clog water intake and discharge pipes, attach themselves to boat hulls and docks, and they even attach to native mussels and crayfish.

Dutch elm disease is caused by the fungus *Ophiostoma ulmi.* It is transmitted to trees by elm bark beetles. It was introduced to Ohio from Asia in the 1930s. Since then, the disease has spread from Ohio through most of the country, killing over half of the elm trees in the northern U.S.

Torbjorn Lagerwall/iStock/Getty Images Plus/Getty Images

Invasive species are primarily spread by human activities, often unintentionally. People, and the goods we use, travel around the world very quickly, and they often carry uninvited species with them.

Symbiosis and Invasive Species

Read page 119 in the ***Science Handbook***.

Then, read *Invasive Species* about organisms that disrupt the balance in ecosystems. Answer the following questions after you have finished reading.

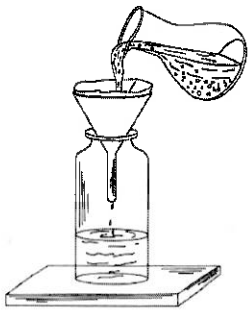
Crosscutting Concepts
Systems and System Models

8. How are mutualism, commensalism, and parasitism the same? How are they different?

9. What did all of the examples of invasive species have in common?

Name _____ Date _____

Creating Chemistry



Chemistry is the science of matter. It organizes how matter is classified based on its properties. Chemistry has been studied for thousands of years, but it was founded by the work of many curious scientists. One of these scientists is Antoine Lavoisier, who is considered the father of modern chemistry.

Lavoisier lived in France during the 1700s. He originally studied to become a lawyer, but found science so interesting that he never practiced law. Lavoisier is responsible for some of the biggest discoveries in the world of chemistry. From naming oxygen and other elements, showing how humans breathe oxygen and release carbon dioxide, realizing that water is a compound, and writing the first chemistry textbook, Lavoisier is an important figure in the history of science.

His biggest accomplishment came from documenting very detailed experiments that he completed. Lavoisier believed in exact measurements and facts. This led him to uncover that matter is maintained throughout an experiment, even during a chemical reaction. This is known as the law of conservation of mass.

Lavoisier set the stage for scientists to follow the practice of careful experiments and detailed records. With little room for error, scientists are able to be effective without wasting time and resources. This eventually evolved into the scientific process that scientists all over the world follow today.

The scientific process that Lavoisier helped to create has allowed scientists to study matter for the last 300 years. This process includes asking a question and then making a hypothesis, or an educated guess, about the question. Then, the process involves planning a way to test the hypothesis and measuring the results. Finally, scientists analyze their results and determine if their question was answered. They then can apply what they have learned or retest their hypothesis.

Read *Creating Chemistry* about Antoine Lavoisier, the father of modern chemistry. Answer the questions when you have finished reading.

5. What big discoveries in chemistry is Lavoisier responsible for?

6. What is considered Lavoisier's biggest accomplishment?

Name _____ Date _____

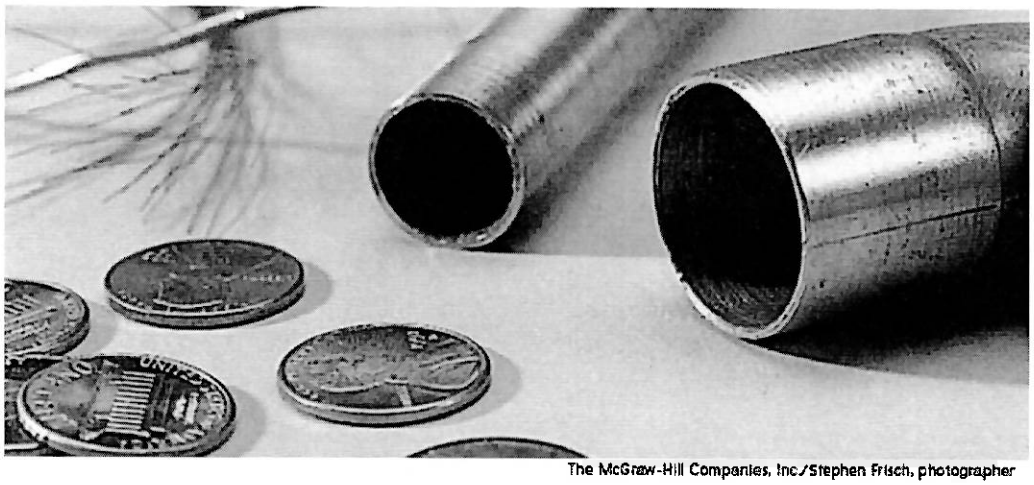
Metals, Nonmetals and Metalloids

What are their properties?

The Periodic Table is a handy device to quickly learn different properties of elements. Moving from left to right across the table, you find elements that fit into three categories: metals, metalloids, and nonmetals.

Metals

Metals are elements found on the left side of the Periodic Table. These elements share many properties. Metals are solid at room temperature, with the exception of mercury. They are very shiny, dense, and have a metallic appearance. They are malleable, which means they can easily be shaped or pounded into thin sheets. They are ductile, which means they can be drawn into wire. Metals corrode or oxidize in air. They also have very high melting points. Metals are good conductors of heat and electricity. You would never touch a pot sitting on a hot stove with your bare hand because the pot would be hot and you would be burned. Copper is used in cooking because it transmits heat evenly. It also is used to wire homes, because the metal can be drawn into a wire and transmits electricity effectively.



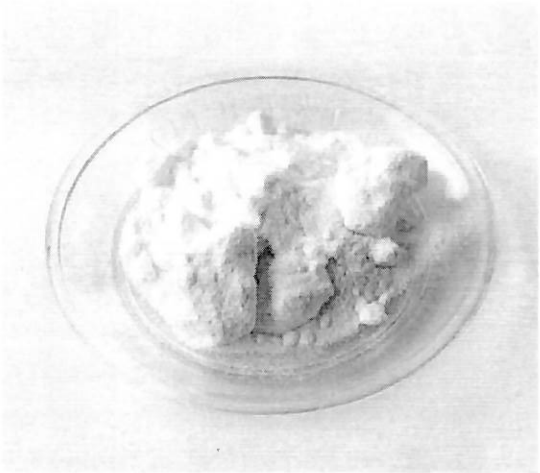
The McGraw-Hill Companies, Inc./Stephen Frisch, photographer

Copper is a metal that is ductile and can be drawn into wire. It is also malleable and can be pounded into sheets to make coins.

Name _____ Date _____

Nonmetal

Nonmetals are elements found on the right side of the Periodic Table. These elements share many properties. Nonmetals are dull in appearance. They are brittle and less dense than metals. They also have low melting points, compared to metals. Nonmetals are poor conductors of electricity or heat.

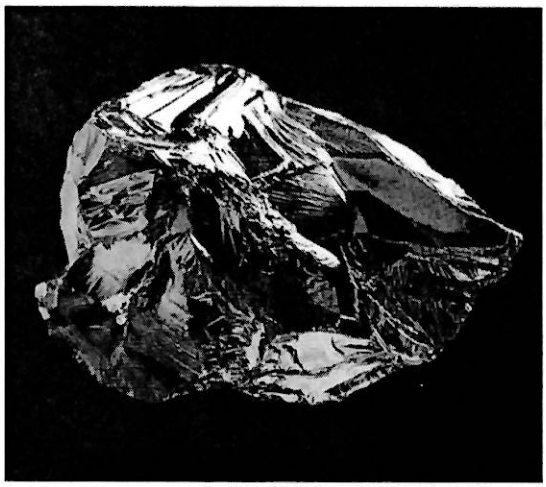


David J. Green/Alamy

Sulfur is a nonmetal element. It is brittle and dull in appearance.

Metalloids

Metalloids lie between metals and nonmetals on the Periodic Table. They share many of the properties of both metals and nonmetals. These elements can be dull or shiny. They are often ductile and malleable. Most important to their use in today's technology they can conduct heat and electricity, but not as well as metals. This last property makes them excellent semiconductors. A semiconductor is a material that conducts electricity better than nonmetals, but not as efficiently as metals. Metalloids, like silica or germanium, are used as semiconductors in engineering, such as the development of microprocessors to improve the speed, complexity, and memory of computers.



GYRO PHOTOGRAPHY/amanaimagesRF/Getty Images

Silica is a semiconductor that is used to make microprocessors to improve the speed of computers.

Research, Investigate, and Communicate

Researching Metals

Most metals that conduct electricity well also conduct heat well, and those that do not conduct electricity well do not conduct heat well.

Research Use your ***Science Handbook*** and other research materials to determine which types of metals conduct electricity and heat better than others.

Crosscutting Concepts

Scale, Proportion, and Quantity

1. Choose three metals from the periodic table and research their conductivity. List them in order based on how conductive they are, and describe common uses for each of the metals.

_____

_____

_____

_____

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_____

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_____

2. **Construct an Explanation** Choose one of the metals you researched. Based on its properties, what new uses you can think of for this metal? What uses of this metal should be avoided?

_____

_____

_____

_____

Volume, Density, and Buoyancy

The amount of space an object takes up is its **volume**. Volume describes how large or small an object is. Volume does not depend on the number of particles in an object. Compare an inflated balloon and small bag of marbles. The balloon has a greater volume, but the bag of marbles has more mass. The marbles are made up of more particles.

Density is a measure of how closely packed an object's particles are. It shows the relationship between mass and volume. If you add more marbles to the bag, the marbles become more closely packed. The density of the bag increases. Take marbles out, and the density of the bag decreases.

There are many ways you can change the density of a bag of marbles. You can change the volume of the bag. You can add or subtract marble "particles." Most matter is not like a bag of marbles. With most matter, adding more material also changes the volume. The relationship between mass and volume is fixed, which makes density a useful property for identifying matter.

Density also determines whether an object will sink or float. **Buoyancy** is an object's resistance to sinking. If the density of an object is less than the liquid it is placed in, it will float. If the object is more dense than the liquid, it will sink.

Did You Know?

Heavy ships are buoyant in water because of their shape. Air fills the interior of the ship, making the average density of the ship less dense than water, so the ship floats.

Name _____ Date _____ ELABORATE

Research, Investigate, and Communicate

Volume, Density, and Buoyancy

Read page 253 in the ***Science Handbook***. Answer the following questions after you have finished reading.

1. What is density?

_____

_____

_____

_____

2. How are buoyancy and density related?

_____

_____

_____

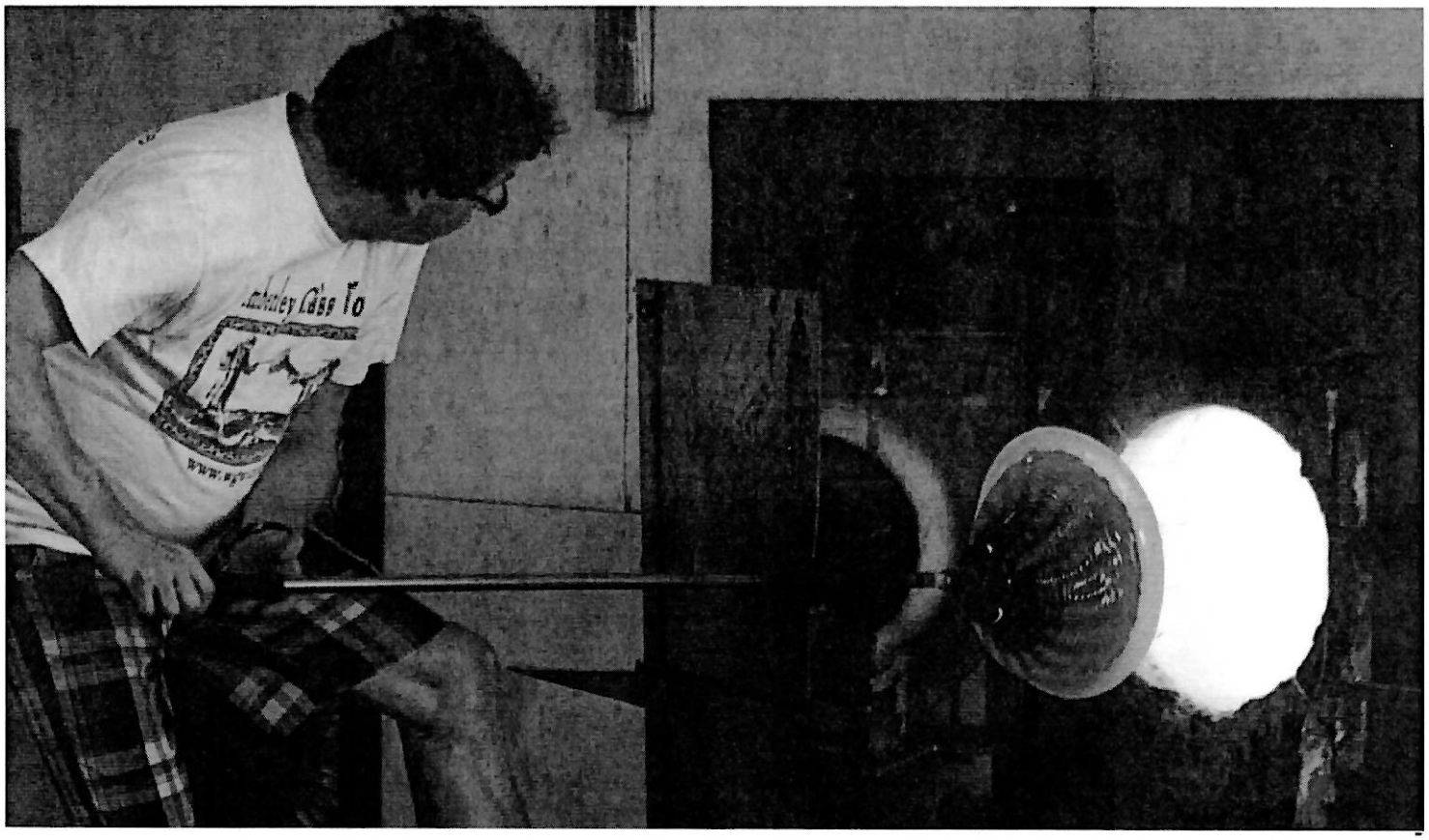
_____

_____

_____

3. How do you think you could test an object's buoyancy?

Media



Science in Our World

Look at the photo of the artist blowing glass. How does this occur? What questions do you have about this process?

_____

_____

_____

_____

_____

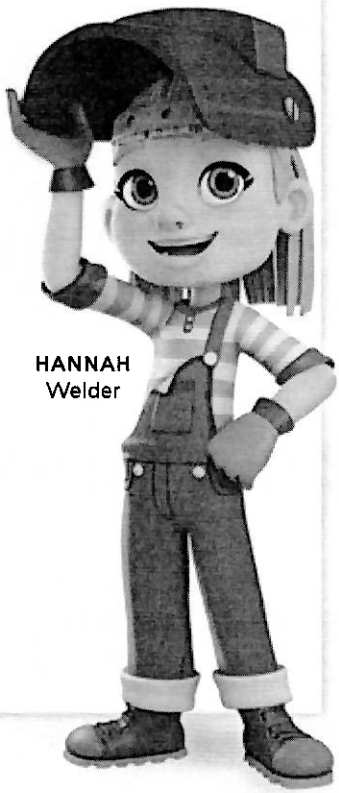
Read about a materials scientist and answer the questions on the next page.

STEM Career Connection

Materials Scientist

People have been working with metal for thousands of years. Even parts of human history have been named after the metals that were commonly used. Have you heard of the Iron Age or the Bronze Age? Today, materials scientists are using metals in ways that no one could have pictured before. Can you believe they can shape a copper wire thousands of times thinner than a strand of your hair?

Materials scientists try to combine elements and compounds into new materials with useful properties. In the past, people used and changed materials by trial and error. Modern materials scientists combine and change materials based on an understanding of their properties and how matter is put together. They often work with materials on a very small scale.



 Name _____ Date _____

1. How does a materials scientist investigate matter?

_____

_____

_____

_____

_____

2. How can materials scientists combine different materials more efficiently than they did in the past to make them more useful?

_____

_____

_____

_____

Essential Question

How do the particles in matter affect its properties?

_____

_____

_____

Science and Engineering Practices

I will plan and carry out an investigation.

Research, Investigate, and Communicate

Plant Tropisms

Although plants cannot move like animals, some plants react to their environment. This response is known as a *tropism*. The four main types are *phototropism*, *gravitropism*, *hydrotropism*, and *thigmotropism*.

Use your ***Science Handbook*** on page 46 and other research materials to find information about one of the main types of plant tropisms. Record your research below.

_____

_____

_____

_____

_____

_____

_____

_____

Use your research to draw a diagram of the tropism you researched. Make sure you label the components of the diagram.

Carry Out an Investigation

You are going to plan an investigation about the plant tropism using the information from your research.

Ask a Question What question do you hope to answer about the plant tropism from the results of the investigation you are going to plan?

_____

_____

_____

1 List the materials you will need to carry out the investigation.

_____

_____

_____

_____

_____

_____

_____

_____

2 How much time will you need in order to start seeing results? Explain.

_____

_____

_____

_____

_____

_____

_____

Carry Out an Investigation

Write the procedure that you will follow to carry out the investigation of the plant tropism you researched. Make sure your steps are clearly written so someone else could follow the procedure and replicate your results.

_____

_____

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Crosscutting Concepts

Energy and Matter

1. How do tropisms help plants?

_____

_____

_____

_____

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_____

Vocabulary

Use this word when explaining how plants use energy from food.

plant tropism

Plants Use Cellular Respiration

Read *Plants Use Cellular Respiration* on how plants use the food they make during photosynthesis. Answer the following questions when you have finished reading.

1. What processes does a plant use to produce its own food for energy and to store that energy?

2. Where does cellular respiration occur in plant cells?

3. What do plants use the energy from cellular respiration to do?

Plant Behavior

Plants cannot move around as animals can, yet plants also react to changes in their environments. Plants respond to stimuli such as sunlight, water, or gravity. A plant responds to a stimulus by changing its pattern of growth. This response is known as a *tropism*.

Word Study

The word *tropism* comes from the Greek word *tropos*, which means "a turning."

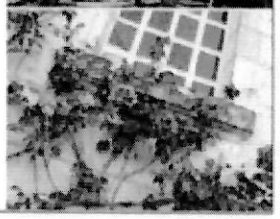
Plant Tropisms

Phototropism Plants respond to light by growing toward the light source. In this photo, sunlight is the stimulus. In response, the plant produces a chemical that causes cells on different sides of its trunk to grow at different rates. The plant bend toward the light. This response is known as phototropism. The word part *photo* means "light."

Gravitropism Most plant roots grow downward—the same direction as the pull of gravity. Like the water lilies shown here, the stems of most plants grow upward, away from the pull of gravity. This response is known as gravitropism. The word part *gravi* means "force that gives weight to objects," also known as gravity.

Hydrotropism Roots sense water in the soil and grow toward it. This response is known as hydrotropism. The word part *hydro* means "water." These roots are showing both hydrotropism by searching for water and gravitropism by searching for soil.

Thigmotropism Some plants respond to touch or contact with an object by curling around that object or clinging to it. This response is known as thigmotropism. The word part *thigmo* means "touch."



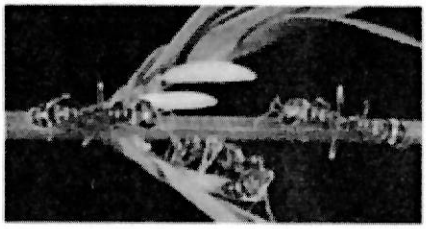
Symbiosis

Symbiosis is a relationship between two or more kinds of organisms that lasts over time. Symbiotic relationships are also behavioral adaptations.

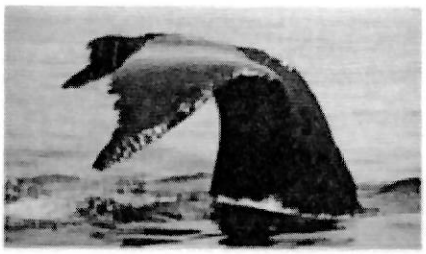
Mutualism A symbiotic relationship that benefits both organisms is called **mutualism**. The relationship between a pollinator and a flowering plant is an example of mutualism. The pollinator, usually an insect or a bird, gets nectar from the flower. The plant gets its pollen transported to the pistil of another flower. Both organisms rely on the relationship for survival.

Commensalism Remoras are fish that attach themselves to the bodies of rays and sharks. The remora gets food scraps, transportation, and protection from the ray. While the remora does not hurt the ray in any way, it does not help the ray either. A symbiotic relationship that benefits one organism without harming the other is called **commensalism**.

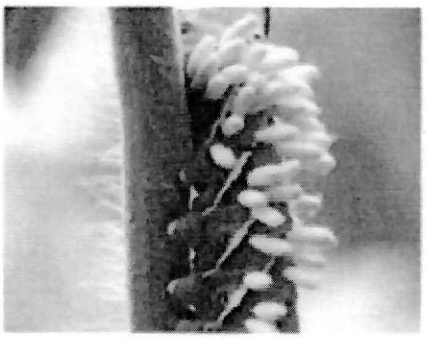
Parasitism Some partnerships are harmful to one of the individuals in the relationship. **Parasitism** is a symbiotic relationship in which one organism benefits and the other is harmed. The organism that benefits from the relationship is called a parasite. The organism that is harmed is called a host. Ticks are parasites on mammals. A tick uses its host's body for a home and a food source. The tick attaches itself to a host and then harms the host by taking its blood. The host gets no benefit from this relationship.



Ants and acacia trees have a mutualistic relationship. The tree provides food and shelter for the ants. The ants defend the tree from other insects.



Barnacles growing on the backs of whales are commensal. The barnacles gain a home. The whales are not hurt by the barnacles.



A wasp laid its eggs under this tomato hornworm's skin. The larvae of the wasps fed on the hornworm and then surfaced and made these pupas.

cut on all dashed lines

fold on all solid lines

_____ is Earth's solid, rocky surface.

_____ is the layer of Earth beneath the crust.

Earth's core

_____ is the central part of Earth.

Interactions of Earth's Major Systems

cut on all dashed lines

fold on all solid lines

Memory Maker: Draw a picture that defines the terms **Earth's crust**, **Earth's mantle**, and **Earth's core**.

mantle

crust

cut on all dashed lines

fold on all solid lines

_____ is the temperature at which a substance changes state from a liquid into a gas.

_____ is the temperature at which a substance changes state from a liquid to a solid.

melting point

_____ is the particular temperature at which a substance changes state from a solid into a liquid.

boiling

Memory Maker: In each of the boxes below, draw a picture to define the term.

Boiling point

Melting point

Freezing point

freezing

cut on all dashed lines

fold on all solid lines

cut on all dashed lines

fold on all solid lines

The _____ is the part of Earth in which living things exist and interact.

The _____ is the layers of rock, dirt, and soil on Earth, including the mantle, cores, and crust.

hydrosphere

The _____ is Earth's water, whether found on land or in oceans, including the freshwater in ice, lakes, rivers, and underground.

Interactions of Earth's Major Systems

cut on all dashed lines

fold on all solid lines

Memory Maker: The word part **sphere** is a Greek root that means "ball." What does a ball shape have to do with the meanings of **biosphere, geosphere,** and **hydrosphere?** _____

_____

_____

_____

bio

geo