



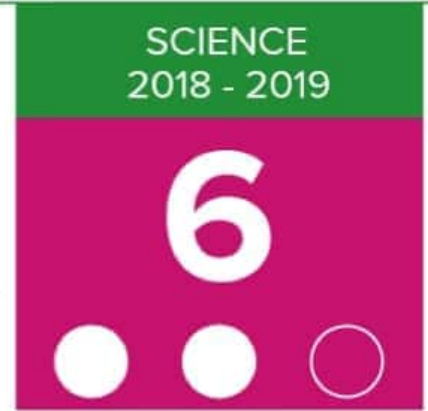
UNITED ARAB EMIRATES
MINISTRY OF EDUCATION



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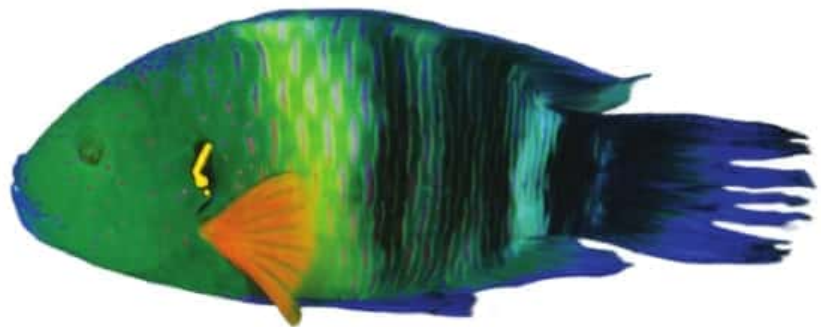
SCIENCE
2018 - 2019

McGraw-Hill Education
Integrated Science
United Arab Emirates Edition



Activity Lab
Manual

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Answer Key

McGraw-Hill Education

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United Arab Emirates Edition

GRADE 6 • VOLUME 2

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Activity Lab Manual



Brief Contents

Chapter 1: Methods of Science

Chapter 2: Activities are not available

Chapter 3: Energy, Work, and Simple Machines

Chapter 4: Matter and Atoms

Chapter 5: Matter: Properties and Changes

Chapter 6: Mixtures, Solubility, and Acid/Base Solutions

Chapter 7: Classifying and Exploring Life

Chapter 8: Cell Structure and Function

Chapter 9: Our Planet Earth

Chapter 10: Earth in Space

Chapter 11: Natural Resources

Chapter 12: Environmental Impact

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Lesson 1 Substances and Mixtures

Predict three facts that will be discussed in Lesson 1 after reading the headings. Record your predictions in your Science Journal.

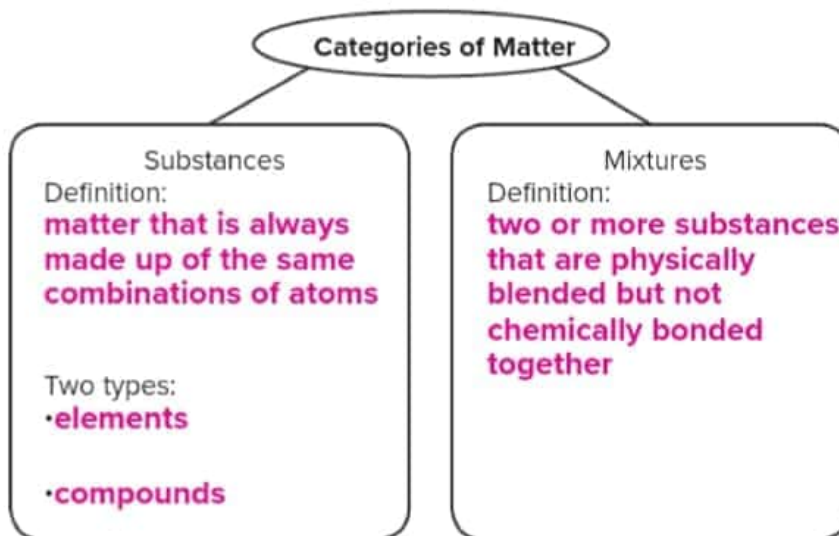
Main Idea

Matter: Substances and Mixtures



Details

Differentiate substances and mixtures.



Contrast heterogeneous mixtures with homogeneous mixtures.

Sample examples are shown.

Mixture	Description	Examples
Heterogeneous	Substances are not evenly mixed.	• granite • blood
Homogeneous	Substances are evenly mixed on the atomic level, but are not bonded together.	• soda • air

Compare the definitions of the terms solution and homogeneous mixture.

They mean the same thing. They both are mixtures in which two or more substances are evenly mixed on the atomic level, but are not bonded together.

Lesson 1 | Substances and Mixtures (continued)

Main Idea

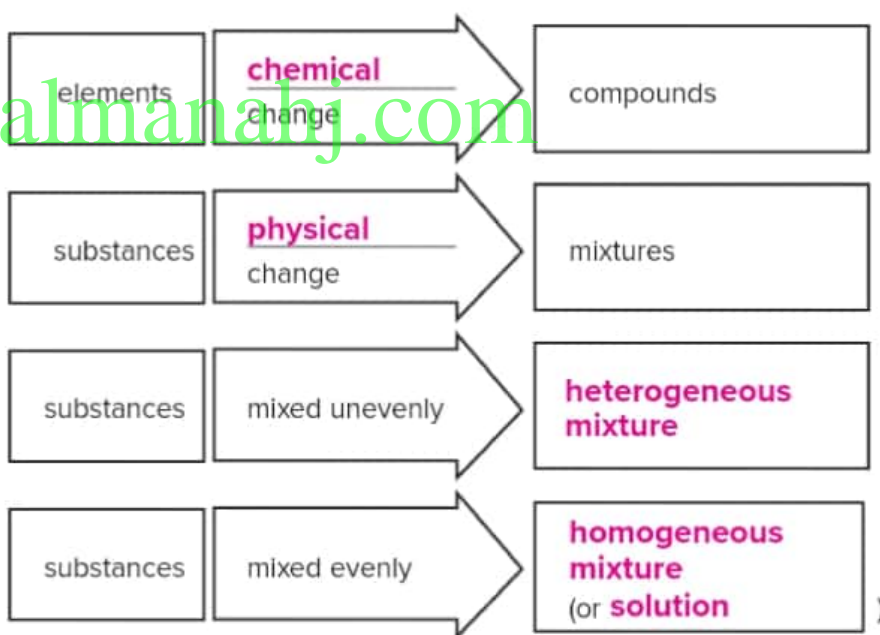
How do compounds and mixtures differ?

Details

Note three differences between compounds and mixtures.

Mixture	Compound
The substances that make it up are not chemically bonded.	Elements that make it up are chemically bonded together.
Substances keep their properties.	Properties can be different from the properties of the elements that make it up.
They can be separated using physical methods.	They can only be separated by a chemical change that breaks bonds.

Characterize combinations of matter.



Connect It Explain whether the following sentence is true: All substances are elements, but elements are not substances.

Accept all reasonable responses. Sample answer: No; it is the other way around. All elements are substances because they are always made up of the same combination of atoms. But many substances are compounds, made of atoms of two or more elements bonded together.

Lesson 2 Properties of Solutions

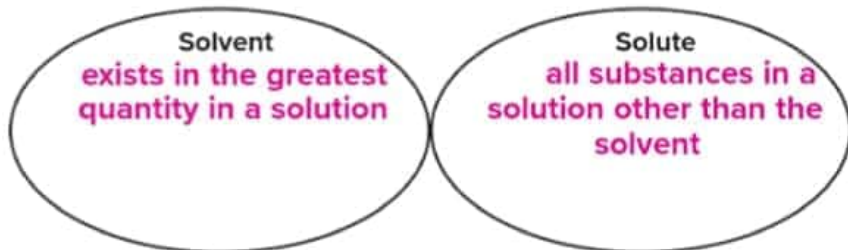
Scan Lesson 2. Read the lesson titles and bold words. Look at the pictures. Identify three facts you discovered about solutions. Record your facts in your Science Journal.

Main Idea

Details

Parts of Solutions

Differentiate solvent from solute in a solution.



Types of Solutions

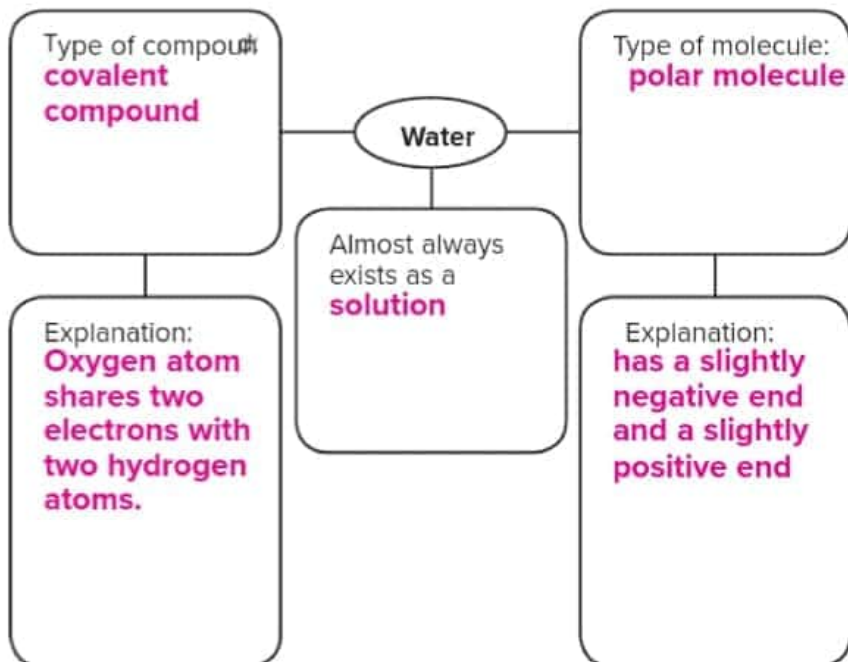
Categorize parts of different types of solutions.



Type of Solution	Solvent is a	Solute can be
Solid	solid	gas or solid
Liquid	liquid	solid, liquid, and/or gas
Gas	gas	gas

Water as a Solvent

Characterize water as it relates to solutions.



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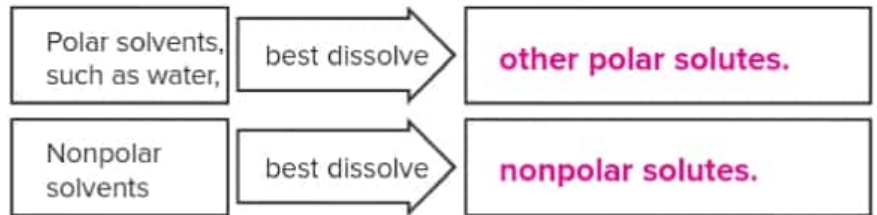
Lesson 2 | Properties of Solutions (continued)

Main Idea

Like Dissolves Like

Details

Diagram the concept of “like dissolves like.”



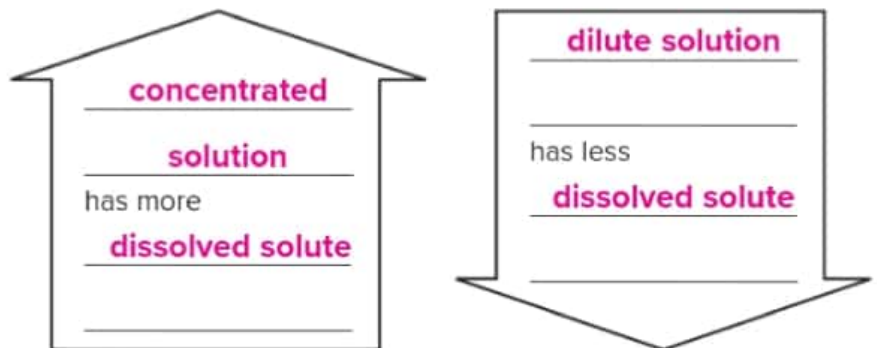
Model the attraction of an ionic compound, NaCl, to a polar solvent, water.

Student drawing should represent the bent shape of water molecules with a negative charge on the side of the larger oxygen atom and a positive charge on the side of the two smaller hydrogen atoms. The positive ends of the water molecules should present toward negative chloride ions; the negative ends of the water molecules should present toward positive sodium ions.

Concentration—How much is dissolved?

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Contrast concentrated and dilute solutions.



Represent concentration in an equation.

$$\text{Concentration (C)} = \frac{\text{mass of solute (m)}}{\text{volume of solution (V)}}$$

Describe the calculation of concentration by percent of volume. the volume of solute divided by the total volume of the solution multiplied by 100

Lesson 2 | Properties of Solutions (continued)

Main Idea

Solubility—How much can dissolve?

Details

Contrast concentration *and* solubility.

Concentration
the amount of solute dissolved in a solution

Solubility
the amount of solute an amount of solvent *can* dissolve

Differentiate saturated solutions *from* unsaturated solutions.

At given **temperature** and **pressure**

Saturated solutions
contain maximum solute the solvent can hold

Unsaturated solutions
can still dissolve more solute

Explain factors that can affect solubility.

Factor	Explanation
Temperature	can increase or decrease the solubility of many solids and gases in liquids
Pressure	can affect the solubility of gases in liquids

How Fast a Solute Dissolves

Point out three methods to make a solid solute dissolve faster in a liquid solvent.

- Stir the solution.**
- Crush the solute.**
- Increase the temperature.**

Analyze It Describe a solution that you encounter routinely. Use and circle at least five of the Lesson 2 vocabulary words in your description.

Accept all reasonable responses. Sample answer: I drink soda. It is a solution of water, a solvent with polar molecules, and many solutes that give it flavor. It has a high concentration of sugar, but probably is not a saturated solution, because I think I could dissolve more sugar in it.

Lesson 3 Acid and Base Solutions

Skim Lesson 3 in your book. Read the headings and look at the photos and illustrations. Identify three things you want to learn more about as you read the lesson. Record your ideas in your Science Journal.

Main Idea

What are acids and bases?



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What is pH?

Details

Differentiate acids and bases.

Acid

a substance that produces a hydronium ion when dissolved in water

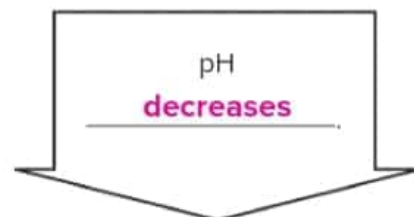
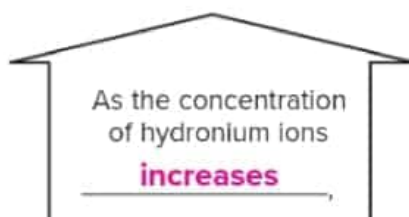
Base

a substance that produces a hydroxide ion when dissolved in water

Categorize properties and uses of acids and bases. Place an *A* before properties of acids, and a *B* before properties of bases. Note that some properties apply to both.

- A* provide sour taste in food
- A* found in saliva
- A and B* can damage skin and eyes
- B* OH^- ions can conduct electricity
- A* react with metals to produce hydrogen gas
- B* slippery
- A* H_3O^+ ions can conduct electricity
- B* provide bitter taste in food
- A* found in milk
- A* helps plants grow

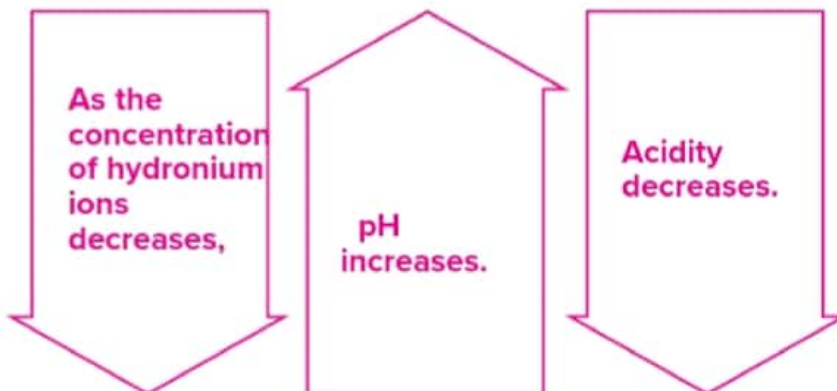
Model the measure of pH in a solution.



Main Idea

Details

Redraw the model from the bottom of the previous page to show decreasing concentration of hydronium ions. Add a third arrow to show what happens to acidity as this change occurs.



Relate concentrations of ions to the pH of solutions.

Solutions	Relationship Between Hydronium and Hydroxide Ions	Value on the pH Scale
Acids	$H_3O^+ > OH^-$	< 7
Neutral	$H_3O^+ = OH^-$	7
Bases	$H_3O^+ < OH^-$	> 7

Determine concentrations of hydronium ions.

pH value	Concentration of Hydronium Ions
3	10,000
4	1,000
5	100
6	10
	7
8	1/10
9	1/100
10	1/1,000
11	1/10,000

Lesson 3 | Acid and Base Solutions (continued)

Main Idea

Details

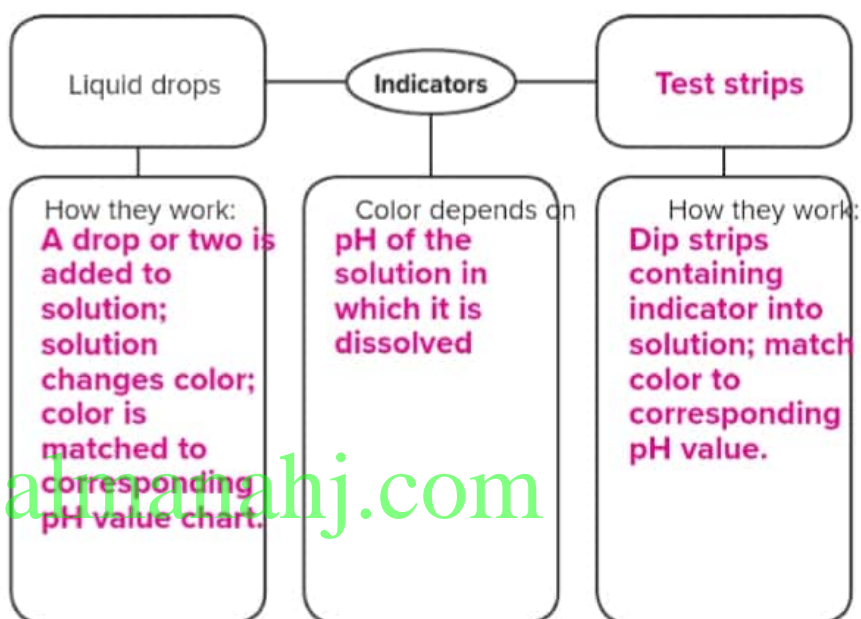
Represent the difference in acidity or basicity of two solutions, and explain what the variable means.

$$10^n$$

where n is the difference between the two pH values

How is pH measured?

Characterize indicators.



Compare and contrast indicators with pH meters.

Method	Indicators	pH Meter
Accuracy	approximate	more accurate
How it works	Molecules change color.	Electrode senses hydronium ion concentration.

Connect It If you have heartburn, a condition of excess stomach acid, what food and drink might you want to avoid and why?

Accept all reasonable responses. Sample answer: Milk, tomatoes, citrus fruits and foods containing vinegar are all acidic. They would add acid to the stomach and could increase heartburn.

Mixtures, Solubility, and Acid/Base Solutions

Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned.

Use this checklist to help you study.

- Study your *Activity Lab Manual* on this chapter.
- Study the definitions of vocabulary words.
- Reread the chapter, and review the charts, graphs, and illustrations.
- Review the Understanding Key Concepts at the end of each lesson.
- Look over the Chapter Review at the end of the chapter.



Summarize It Reread the chapter Big Idea and the lesson Key Concepts. Summarize the ways of categorizing and describing matter discussed in the chapter. Refer to each of the chapter's three lessons in your summary.

Accept all reasonable responses. Sample answer: Lesson 1 talks about the differences between pure substances and mixtures. Substances are made of the same combination of atoms; mixtures are physically blended but not bonded together. The lesson also differentiates heterogeneous and homogeneous mixtures. Heterogeneous mixtures are not evenly mixed; homogeneous mixtures are evenly mixed and are also called solutions. Lesson 2 discusses the parts of solutions and how solutions form. It differentiates the solvent, the substance with the greatest volume in a solution, from solutes, the substances dissolved in the solvent. The lesson also discusses how much solute is dissolved (concentration) and can be dissolved (solubility) in a solvent. Lesson 3 distinguishes solutions by their pH value. It differentiates between acid and base solutions and discusses their properties and measurement.

Challenge Keep a journal of matter that you encounter in a day. Make a chart that categorizes and describes the types of matter you encounter as elements, compounds, substances, mixtures, solutions, and so on. Present your chart of observations to your class.

Classifying and Exploring Life

Before You Read

Before you read, decide if you agree or disagree with each of these statements. On the line before each statement, place an A if you agree or a D if you disagree. As you read this chapter, see if you change your mind about any of these statements.

Before You Read	Statements	After You Read
	1. All living things move. Disagree; movement is not a characteristic of all living things.	
	2. The Sun provides energy for almost all organisms on Earth. Agree	
	3. A dichotomous key can be used to identify an unknown organism. Agree	
	4. Physical similarities are the only traits used to classify organisms. Disagree; physical similarities, molecular similarities, and ancestral relationships are used to classify organisms.	
	5. Most cells are too small to be seen with the unaided eye. Agree	
	6. Only scientists use microscopes. Disagree; microscopes are used by many different types of people, including forensic scientists, healthcare workers, and manufacturing technicians.	

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What have you learned?

After you read each lesson, return to this worksheet to see if you have changed your mind about any of the statements related to that lesson. Place a C after each statement that is correct or an I for those that are incorrect.



Lesson 1

Characteristics of Life

Key Concept What characteristics do all living things share?

Directions Living things have all the characteristics of life. Unscramble the letters to find a characteristic of living things. Write the characteristic in the blank.

1. THOWGRDAN VELDEMEOPN **growth and development**
Hint: You have changed since you were born.

2. MEOHOSTSISA **homeostasis**
Hint: You sweat when you are hot.

3. IOGANORATNIZ **organization**
Hint: You have different body parts that have different jobs.

4. PRORETIONDUC **reproduction**
Hint: Baby birds are in a nest with their mother.

5. NSEPORES OT MULISTI **response to stimuli**
Hint: You are hungry and go to the kitchen.

6. SUE FO ERGYEN **use of energy**
Hint: You have been playing soccer for an hour.

Directions Write your own hint for each of the six characteristics of living things on the lines provided.

7. Hint: **Students' hints should reflect the characteristics of life as taught in Lesson 1.**

8. Hint: **Students' hints should reflect the characteristics of life as taught in Lesson 1.**

9. Hint: **Students' hints should reflect the characteristics of life as taught in Lesson 1.**

10. Hint: **Students' hints should reflect the characteristics of life as taught in Lesson 1.**

11. Hint: **Students' hints should reflect the characteristics of life as taught in Lesson 1.**

12. Hint: **Students' hints should reflect the characteristics of life as taught in Lesson 1.**

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Lesson 1 | Characteristics of Life (continued)

Key Concept What characteristics do all living things share?

Directions On each line, write the term from the word bank that correctly completes each sentence. Some terms may be used more than once.

development energy growth homeostasis
organization reproduction stimulus

1. Specialized structures in cells are an example of organization.
2. When a plant's leaves and stems grow toward light, the plant is responding to an external stimulus.
3. A paramecium regulates homeostasis by pumping water out of the cell.
4. Multicellular organisms have a greater level of organization than unicellular organisms have.
5. Increasing cell size is growth.
6. Changing from one kind of cell to a specialized cell is development.
7. The process that makes more living things is reproduction.
8. All activities carried out by living things use energy.
9. Drinking water helps your body maintain homeostasis.

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Lesson 1 | Characteristics of Life (continued)

Key Concept What characteristics do all living things share?

The use of energy is an important characteristic that all living things share. Food webs describe how energy can pass from one organism to another.

Directions: Answer each question or respond to each statement on the lines provided.

1. List the characteristics of life that plants and animals in a food web share.

organization, growth and development, reproduction, response to stimuli, homeostasis, use of energy

2. Name three ways the organisms in a food web get energy.

Possible answer: Plants get energy from the Sun. Some animals get energy from eating plants. Some animals get energy from eating other animals.

3. What are some ways the organisms in a food web use energy?

Possible answer: Living things in a food web use energy for everything they do, such as grow and develop, reproduce, respond to stimuli, and maintain homeostasis. Individual cells use energy to transport substances, make new cells, and perform chemical reactions.

4. What are some ways individual cells in an organism use energy?

Possible answer: Individual cells use energy to transport substances, make new cells, and perform chemical reactions.

5. What do you have in common with other living things in a food web?

Possible answer: Like other living things, I have the characteristics of life and need to get and use energy.

Lesson 1 | Characteristics of Life (continued)

Key Concept What characteristics do all living things share?

All living things consist of cells. Some organisms are made of one cell. Other organisms are made of organized groups of cells.

Directions Read each sentence and decide which type of organism it describes. On the line before each item, write U for unicellular, M for multicellular, or B for both unicellular and multicellular.

- M** _____ 1. These organisms are made of two or more cells.
- M** _____ 2. Some of these organisms lay eggs.
- M** _____ 3. These organisms grow as the number of cells increases.
- B** _____ 4. These organisms use energy for everything they do.
- M** _____ 5. During development, the cells in these organisms become specialized.
- U** _____ 6. These organisms are made of only one cell.
- B** _____ 7. These organisms respond to internal and external stimuli.
- M** _____ 8. These organisms have specialized cells for reproduction.
- U** _____ 9. This organism grows only as the cell increases in size.
- B** _____ 10. Homeostasis is necessary for these organisms to survive.
- U** _____ 11. These organisms reproduce by dividing and becoming two cells.

Directions Answer the question on the line provided.

12. What process is considered to be growth when it occurs in a multicellular organism and reproduction when it occurs in a unicellular organism?

cell division

Lesson 2 Classifying Organisms

Key Concept What methods are used to classify living things into groups?

Directions Use the terms from the word bank to answer each question on the lines provided. Some terms may be used more than once.

Animalia Archaea Bacteria Eukarya
Fungi Plantae Protista

1. Which terms are the names of domains?

Bacteria, Archaea, Eukarya

2. Which terms are the names of kingdoms?

Bacteria, Archaea, Protista, Fungi, Plantae, Animalia

3. Which four terms represent organisms in the same domain?

Protista, Fungi, Plantae, Animalia

Directions Put a check mark on the line before each item in this list that is used to classify organisms.

4. cell types
5. number of organisms
6. habitats
7. how they obtain food and energy
8. amount of blood
9. common ancestry
10. molecular analysis
11. age of organisms



Lesson 2 | Classifying Organisms (continued)

Key Concept What methods are used to classify living things into groups?

Directions: The system used to classify organisms has changed over time. Put each system listed below in the order it was used, starting with the oldest system.

Aristotle's two groups, plants and animals

Linnaeus's two-kingdom system, plants and animals

Systematics

Whittaker's five-kingdom system

1. Aristotle's two groups, plants and animals

2. Linnaeus's two-kingdom system, plants and animals

3. Whittaker's five-kingdom system

4. Systematics

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Directions: Answer each question on the lines provided.

5. What does Whittaker's system have that Linnaeus's system does not?

5 kingdoms

6. What does systematics have that the other systems do not?

domains and the consideration of molecular evidence

7. Why is the system of classifying organisms still changing?

Possible answer: More is being learned about organisms and new species are still being discovered.

Lesson 2 | Classifying Organisms (continued)

Key Concept What methods are used to classify living things into groups?

Directions Answer each question or respond to each statement on the lines provided.

1. Imagine that you just observed an insect landing on your desk. How can a dichotomous key help you identify the kind of insect you saw?

Possible answer: A dichotomous key can help me by giving me a series of questions about an insect's characteristics. By observing my insect and answering the questions, I can identify my insect.

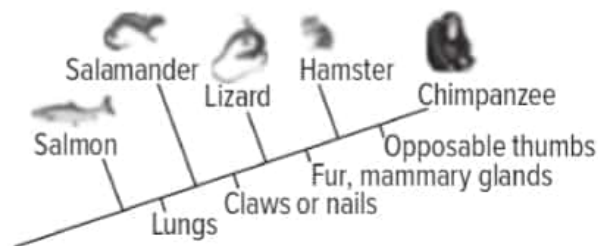
2. Write two questions you might see in a dichotomous key for insects.

Possible answer: The insect has wings. The insect does not have wings.

3. What is the diagram below called?

a cladogram

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4. Which organisms shown have claws or nails?

lizard, hamster, chimpanzee

5. Which organisms shown do not have opposable thumbs?

salmon, salamander, lizard, hamster

Lesson 2 | Classifying Organisms (continued)

Key Concept Why does every species have a scientific name?

Directions Work with a partner to answer each question on the lines provided.

1. What system is used to give an organism a scientific name?

binomial nomenclature

2. What are the two words in a scientific name?

the organism's genus name and species name

3. Are more kinds of organisms in a species or in a genus? Explain your answer.

Possible answer: A genus has more kinds of organisms because a species is one kind of organism and a genus contains different species.

4. Why are scientific names important for scientists to use?

Possible answer: Scientific names are important to use so scientists who want to communicate about organisms refer to the same species. The same common name can refer to a number of different species.

Directions List each taxonomic group from largest to smallest on the lines provided.

class domain family genus

kingdom order phylum species

5. **domain, kingdom, phylum, class, order, family, genus, species**

Lesson 3 Exploring Life

Key Concept How did microscopes change our ideas about living things?

Directions: Answer each question on the lines provided.

1. How is a magnifying lens similar to the first microscope invented?

Possible answer: Like the first microscope, a magnifying lens uses light and one lens to magnify images.

2. What did the invention of microscopes allow people to see?

Possible answer: The invention of microscopes allowed people to see images of objects that could not be seen with the unaided eye. It allowed them to observe the cells that make up all living things.

3. Leeuwenhoek's microscope could magnify an image about 270 times its original size. What kinds of objects did he observe with his microscope?

Possible answer: Leeuwenhoek observed objects such as blood cells, small insects, and pond water.

4. In the 1700s, what important discovery about living things did Hooke make using his microscope?

Hooke observed and named cells.

5. What can scientists today study about living things using microscopes?

Possible answer: Scientists can study the tiny structures inside cells.

Lesson 3 | Exploring Life (continued)

Key Concept What are the types of microscopes, and how do they compare?

Directions On each line, write the term from the word bank that correctly completes each sentence. Some terms may be used more than once.

compound microscope electron microscope light microscope
scanning electron microscope transmission electron microscope

1. A simple **light microscope** uses one lens to magnify an image.
2. The magnification of a(n) **compound microscope** is found by multiplying the magnification of the ocular lens by the magnification of the objective lens.
3. A(n) **compound microscope** is a type of light microscope.
4. A TEM is one type of **electron microscope**.
5. In a(n) **scanning electron microscope**, electrons bounce off an object.
6. In a(n) **transmission electron microscope**, electrons pass through an object.
7. A(n) **scanning electron microscope** produces a three-dimensional image of a cell's surface.
8. A(n) **transmission electron microscope** produces an image of the tiny structures inside a cell.
9. The two main types of microscopes are the **light microscope** and the **electron microscope**.



Lesson 3 | Exploring Life (continued)

Key Concept What are the types of microscopes, and how do they compare?

Directions: Answer each question or respond to each statement on the lines provided. Compare your responses with a partner's responses.

1. Suppose you want to observe the movements of a unicellular organism. **Explain** which type of microscope you would use and why.

Possible answers: I would use a compound microscope because I can observe a living organism with it. I can put the unicellular organism directly under the microscope and observe its movements.

2. What is the difference between magnification and resolution?

Possible answers: Magnification is how much larger an image looks, but it doesn't mean that the image can be seen clearly. Resolution is how clearly the magnified image can be seen, regardless of how much it is magnified.

3. **Compare** the magnification and resolution of a light microscope with those of an electron microscope. Include specific magnifications and resolutions.

A light microscope can magnify an image up to 1,500 × with a resolution of 0.2 micrometers. An electron microscope can magnify an image up to 100,000 × with a resolution as small as 0.2 nanometers.

4. What are a micrometer and a nanometer?

A micrometer is two-millionths of a meter. A nanometer is two-billionths of a meter.

5. Give three examples of how people use microscopes today.

Possible answers: Healthcare professionals use microscopes to analyze body fluids. Microscopes are also used during surgeries. Forensic scientists use microscopes to study evidence from crime scenes. Scientists use microscopes to study fossils.

Lesson 3 | Exploring Life (continued)

Key Concept What are the types of microscopes, and how do they compare?

Directions Complete the table by writing the correct terms on the lines provided.

Two Main Types of Microscopes	Specific Types
Light microscopes	1. _____ (in either order) simple light microscope, compound light microscope 2. _____
Electron microscopes	3. _____ (in either order) transmission electron microscope, scanning electron microscope 4. _____

Directions Write the types of microscopes you would use for the following on the lines provided. Be as specific as possible. Discuss your answers with a partner.

5. You want to view a white blood cell magnified 100,000 times.

I would use an electron microscope because it is the only kind that can magnify 100,000 ×

6. You want to view living yeast cells.

I would use a compound light microscope because I want to view a living organism.

7. You want to view the detail of a three-dimensional image of the outside of a cell.

I would use a scanning electron microscope because it is used to study the surface of an object and makes a three-dimensional image.

8. You want to view a white blood cell magnified 1,000 times.

I would use a compound light microscope because it can magnify 1,000 ×.

9. You want to view the detail of the tiny structures inside a cell.

I would use a transmission electron microscope because it passes electrons through an object and is used to study extremely small things.

Classifying and Exploring Life

Chapter Wrap-Up

Directions: Work with a group. As a group, choose an organism you are familiar with or make up a new organism. Then complete the following tasks.

1. Draw your organism and label it with a common name.

Drawings can be of a known organism or a new organism with a common name labeled.

2. Write a paragraph or create a table that lists the characteristics of life and evidence of each characteristic that your organism has.

Paragraphs or tables should include all the characteristics of life (organization, growth and development, reproduction, response to stimuli, homeostasis, use of energy) and evidence of the characteristic in the organism.

3. Explain how your organism is classified. Include its domain, kingdom, genus, and species. Label the drawing of your organism with a plausible scientific name.

The domain name should be one of the following: Bacteria, Archaea, Eukarya. The kingdom name should be from one of the following: Bacteria, Archaea, Protista, Fungi, Plantae, Animalia. The genus and species names will vary. The drawings should be labeled with a binomial nomenclature to indicate the genus name and the species name.

4. Create a dichotomous key that will help other people identify your organism.

Dichotomous keys should include a series of questions about the organism's characteristics in sets of two that lead to another set of questions or to the identification of the organism.

5. What could you learn about your organism by using a microscope? Which type of microscope would you use?

Possible answer: I could learn about the kinds of cells that the organism has. I would use a compound microscope.

6. Present your organism to the class.

Students' presentations should cover the classification and identification of their organisms.

Lesson 1 Cells and Life

Skim Lesson 1 in your book. Read the headings and look at the photos and illustrations. Identify three things you want to learn more about as you read the lesson. Write your ideas in your Science Journal.

Main Idea

Understanding Cells

Details

Explain why it took so long for scientists to learn about cells.

Cells are too small to see without special tools. No one knew that cells existed until the microscope was invented.

Key Summarize discoveries made by scientists that led to the cell theory.

Robert Hooke **built a microscope and used it to study cells for the first time; used the term "cells" to describe what he saw**

Matthias Schleiden **used one of the new microscopes to study plant cells and their features; noted similarities to animal cells**

Theodor Schwann **used one of the new microscopes to study animal cells and their features; saw similarities to plant cells**

Rudolf Virchow **proposed that all cells come from preexisting cells**

List the 3 main principles of the cell theory.

- All living things are made of one or more cells.**
- The cell is the smallest unit of life.**
- All new cells come from preexisting cells.**



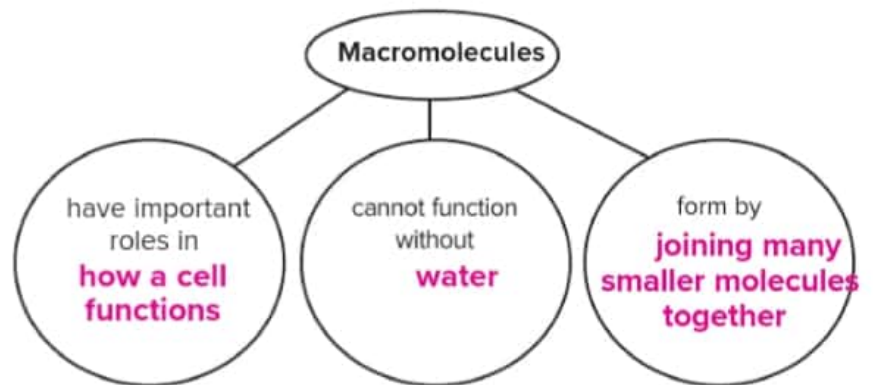
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Main Idea

Basic Cell Substances

Details

Organize information about macromolecules.



Complete the statement about basic cell substances.

The main material inside cells is water, which makes up more than 75 percent of the cell's volume.

Draw a water molecule in the space below. Color the oxygen red and the hydrogen blue, and label the positive and negative ends. In the space below your drawing, describe the structure of the water molecule, and explain:

1. how that structure helps dissolve materials;
2. why water's ability to dissolve materials is important to the function of a cell.

Drawings should show a large central red oxygen atom with two smaller blue hydrogen atoms attached to it. Students should indicate that the oxygen end is negative (–) and the hydrogen end is positive (+).

The water molecule has a positive end and a negative end.

This structure makes substances dissolve easily because the

positive ends of the water molecules can attract the negative

parts of other substances and the positive ends can attract

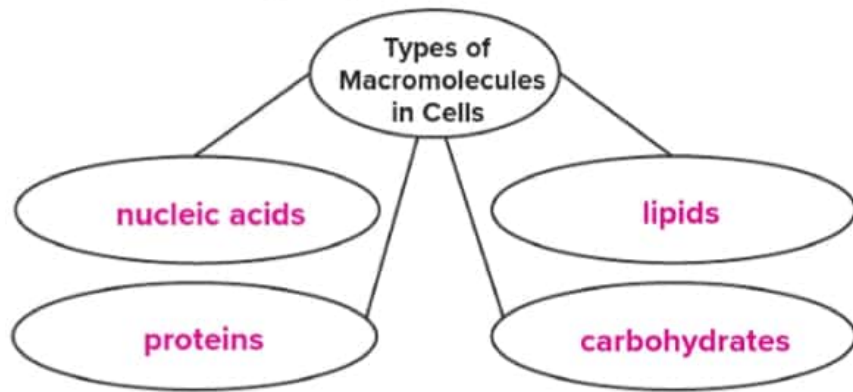
negative parts. Materials can only enter into and exit from cells

when dissolved in water.

Main Idea

Details

Identify the types of macromolecules inside cells.



Distinguish 2 types of nucleic acids and indicate what cells make with each type.

1. DNA is used to make RNA.
2. RNA is used to make proteins.

Identify 4 functions of proteins.

1. communication
2. transport
3. chemical breakdown of substances
4. structural support

Explain why lipids are able to function as protective barriers in cells.

They do not dissolve in water.

Summarize information about carbohydrates.

Carbohydrates	
that provide energy	that provide support
1. <u>sugars</u>	1. <u>cellulose</u>
2. <u>starches</u>	

Connect It Describe how the development of cell theory shows that scientific ideas can change over time. Use specific examples.

Sample answer: When Robert Hooke first saw cells, he did not know what they were and called them "little rooms." As scientists used better equipment, they began to see cells in greater detail and to realize that cells contained other things. They also learned that all living things are made of cells and that all cells come from other cells.

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Lesson 2 The Cell

Scan Lesson 2 in your book. Think of three questions you have about cells. Write those questions in your Science Journal. Then try to answer your questions as you read.

Main Idea

Cell Shape and Movement

Details

Compare cell parts by completing the chart. Put a check mark in the Plant or Animal column to indicate which types of cells contain the cell part listed. You might need to reference the cell diagrams to decide.

Cell Part		Plant	Animal
Cell membrane	Description: a flexible covering around the cell		
	Purpose: protects the inside of a cell from the environment outside a cell	✓	✓
Cell wall	Description: a stiff structure outside the cell membrane		
	Purpose: maintains cell's shape; protects cell from harmful organisms	✓	
Cytoplasm	Description: fluid inside a cell that contains salts and molecules		
	Purpose: provides water environment in which cell processes take place	✓	✓
Cytoskeleton	Description: threadlike proteins joined together		
	Purpose: gives a cell shape and helps it move	✓	✓



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Main Idea

Details

Identify and describe examples of cell appendages.

1.	Example: cilia	Description: short, hairlike structures	Purpose: can move a cell or move molecules away from a cell
2.	Example: flagella	Description: whiplike structures	Purpose: movement

Cell Types

Classify cells as prokaryotic or eukaryotic by writing "E" or "P" in the right-hand column.

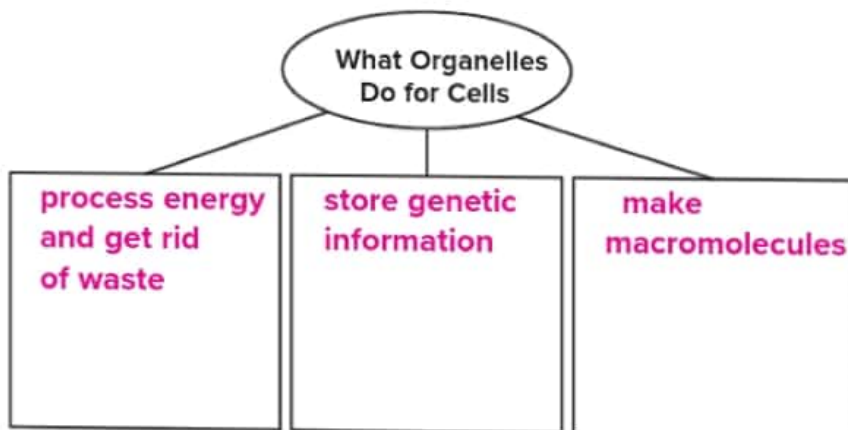
Characteristic	Cell Type
Cell's genetic material is surrounded by a membrane.	E
Cell is usually a unicellular organism.	P
It is usually the smaller of the two types of cell.	P
Cell contains organelles.	E

Cell Organelles

Identify four facts about organelles. **Sample answers shown.**

- surrounded by a membrane**
- have a specialized function**
- inside eukaryotic cells**
- enable a cell to carry out many functions at once**


Describe some functions of organelles.




Lesson 2 | The Cell (continued)

Main Idea

Details

 **Classify** information about organelles. In the right-hand column, indicate whether the organelle is in a plant cell, an animal cell, or both.

Organelle	Function Sample answers are shown.	Plant, Animal, or Both?
Nucleus	directs all cell activity and stores genetic information	both
Nucleolus	makes ribosomes	both
Ribosome	makes proteins	both
Rough endoplasmic reticulum	provides a site for making proteins	both
Smooth endoplasmic reticulum	makes lipids and helps remove harmful substances from cell	both
Mitochondria	releases energy from ATP molecules	both
Chloroplast	uses energy from sunlight and makes glucose	plant
Golgi apparatus	prepares proteins for their specific jobs and packages them into vesicles	both
Vesicle	transports substances to different areas within the cell	both
Central vacuole	stores food, water, and waste material	plant
Lysosome	helps break down and recycle cellular components	animal

 **Synthesize It** Some cells contain chloroplasts that use light energy and produce food. Do cells without chloroplasts also depend on sunlight for their food? Explain.

Sample answer: Yes; cells without chloroplasts also depend on sunlight for their food.

They use the sugars made by cells with chloroplasts for energy.

Lesson 3 Moving Cellular Material

Predict three things that will be discussed in Lesson 3. Read the headings, and look at the photos and illustrations. Write your predictions in your Science Journal.

Main Idea

Passive Transport

Diffusion

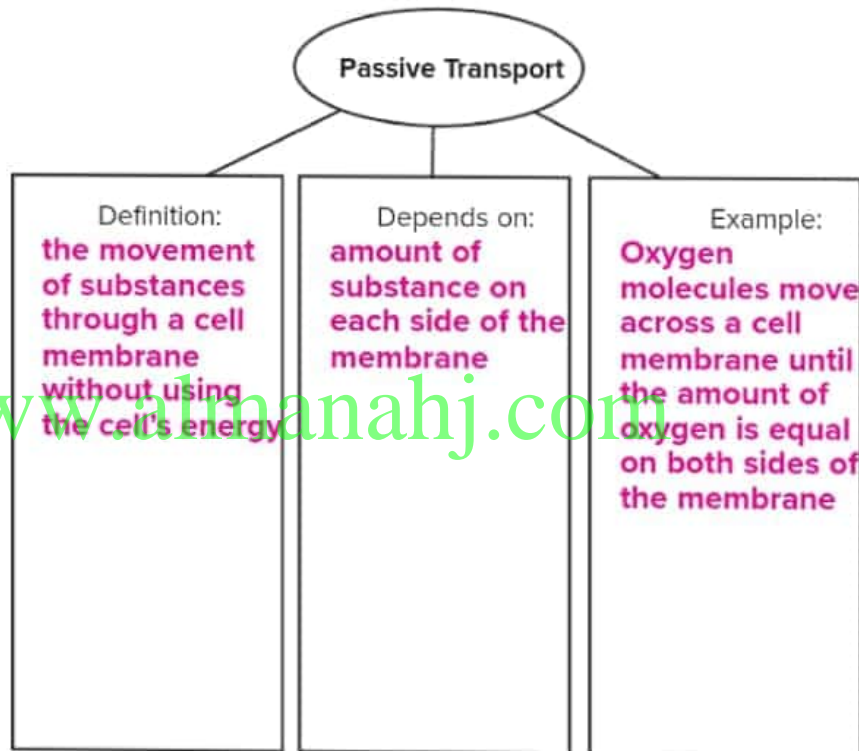


Details

List 2 functions of membranes.

1. boundaries between cells and between organelles
2. control movement of substances into and out of cells

Organize information about passive transport.



Assess information about diffusion. Read the statements below. If the statement is true, write true on the line. If it is false rewrite the underlined portion of the statement so that it is true.

Diffusion is the movement of substances from an area of lower concentration to an area of higher concentration.

False; higher concentration, lower concentration

Diffusion continues until the concentration of a substance is higher inside a cell than outside a cell.

False; the same on both sides of a cell's membrane



Lesson 3 | Moving Cellular Material (continued)

Main Idea

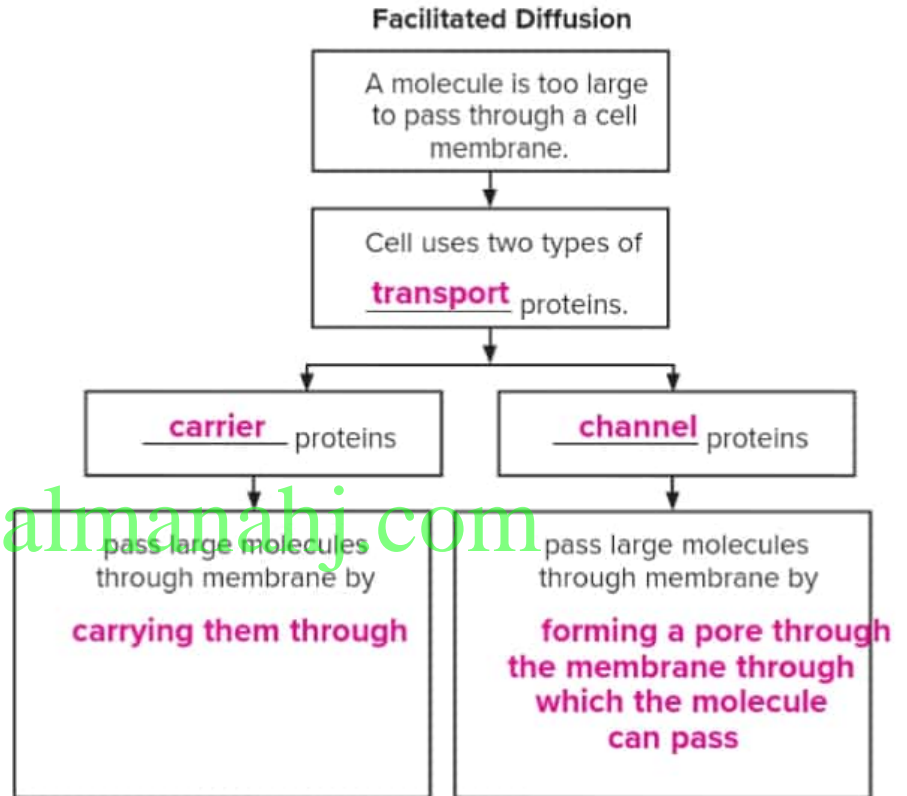
Osmosis—The Diffusion of Water

Details

Complete the sentence about osmosis.

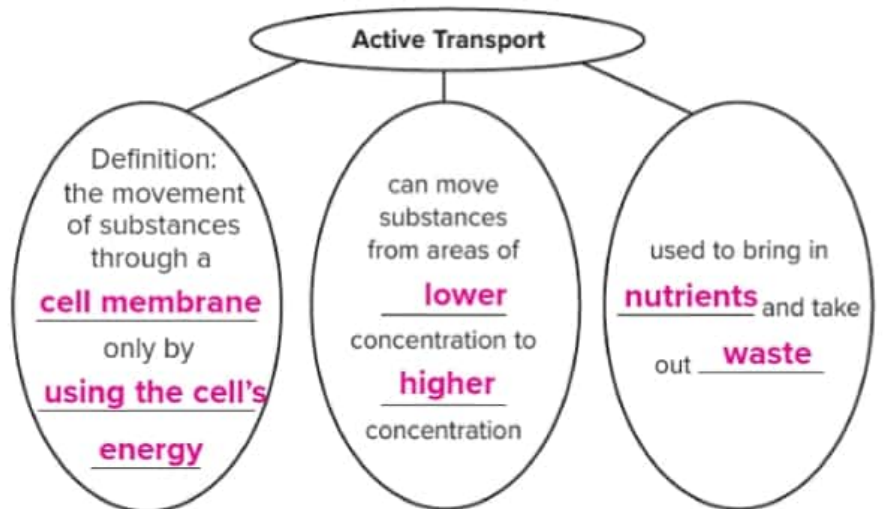
Osmosis is a type of passive transport that involves movement of water molecules only through the cell membrane.

Explain the process of facilitated diffusion.



Active Transport

Organize information about active transport.



Lesson 3 | Moving Cellular Material (continued)

Main Idea

Details

Compare and contrast facilitated diffusion *and* active transport by writing yes or no in each empty box of the chart.

Description	Facilitated Diffusion	Active Transport
Uses carrier proteins	yes	yes
Transports materials across cell membrane	yes	yes
Requires cellular energy	no	yes
Able to move materials from an area with lower concentration to an area with higher concentration	no	yes

Identify each process as either endocytosis or exocytosis.

Process	Description
endocytosis	Materials entering cell
exocytosis	Materials being expelled from cell

Cell Size and Transport

Explain how cell size and transport are related. Underline the term that correctly completes each sentence.

As a cell grows, both its volume and surface (increase/ decrease).
 Volume increases (faster/ slower) than surface area.
 Eventually, the cell's membrane would (be large/ too small) to move enough materials into and out of the cell.

Analyze It Cells are very small. Yet, as living things, they have the ability to grow. What keeps cells from growing to much larger sizes than they do?

Accept all reasonable responses. Sample answer: For transport of materials, a cell's surface area must be much larger than its volume. As a cell grows, its volume increases more quickly than its surface area. If a cell were to keep growing, its membrane would not be able to transport enough materials for the cell to survive.

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Lesson 4 Cells and Energy

Scan Lesson 4 in your book. Think of three questions you have about cells and energy. Write those questions in your Science Journal. Then try to answer your questions as you read.

Main Idea

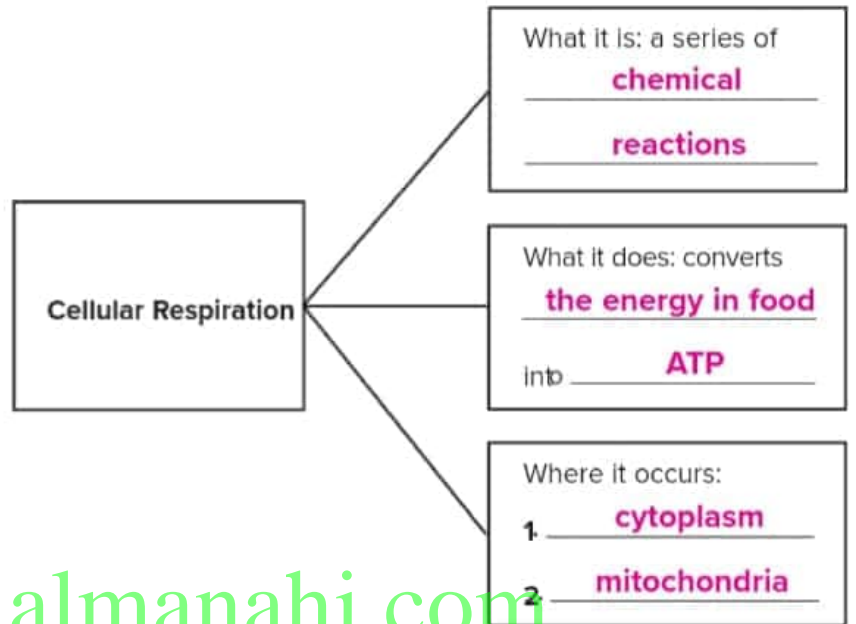
Cellular Respiration



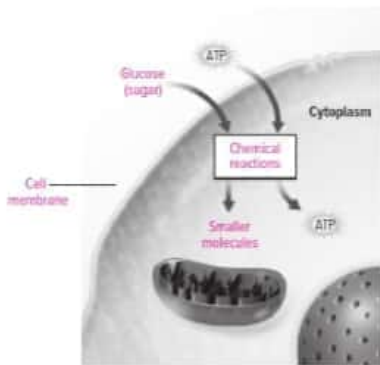
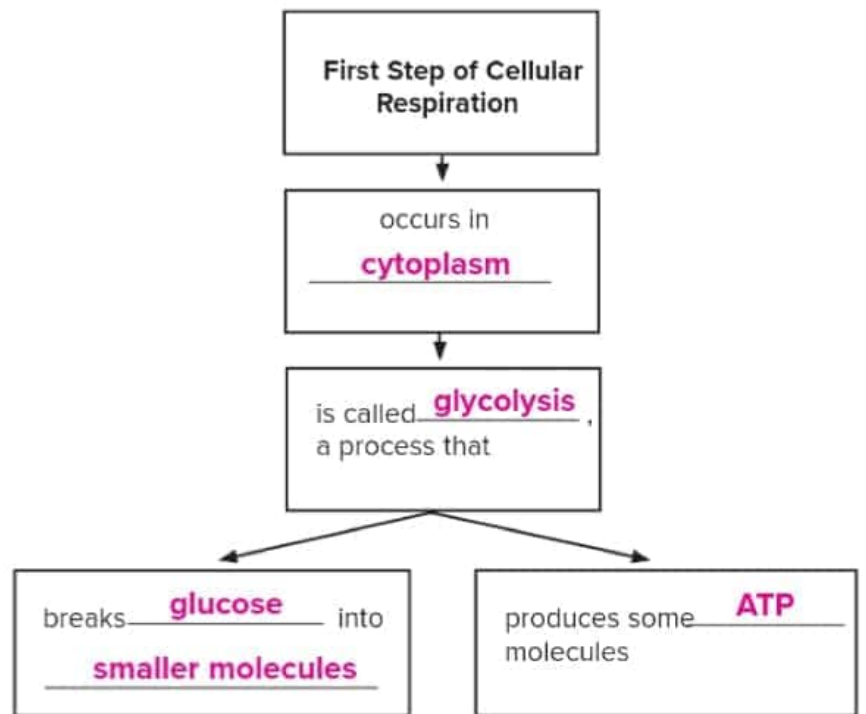
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Details

Organize information about cellular respiration.



Summarize the first step in the process of cellular respiration. Then label the steps in the diagram on the left.

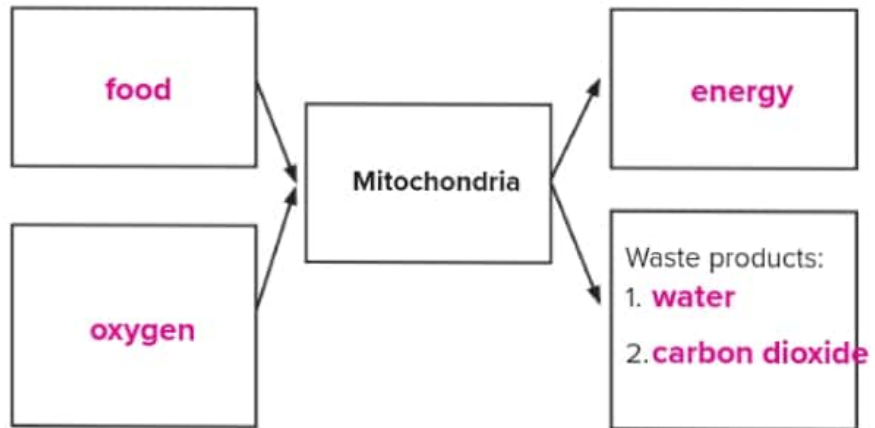


Lesson 4 | Cells and Energy (continued)

Main Idea

Details

Describe the second step of cellular respiration.



Fermentation

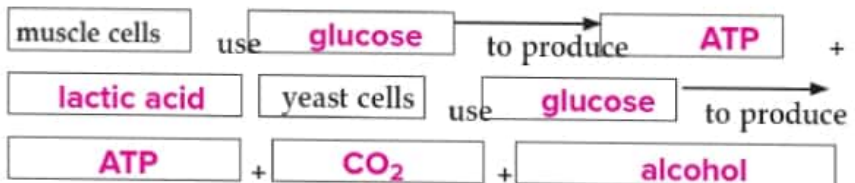
Define fermentation by completing the sentences.

When cells do not have enough oxygen to make ATP through cellular respiration, they use a process called fermentation. Because no oxygen is used, less ATP is produced than in cellular respiration.

Compare fermentation to cellular respiration.

	Fermentation	Cellular Respiration
What gets broken down?	glucose	glucose
Where does the breakdown occur?	cytoplasm only	cytoplasm and mitochondria
Is energy released?	yes	yes

Sequence the 2 types of fermentation.



Lesson 4 | Cells and Energy (continued)

Main Idea

Photosynthesis

Details



Diagram *Draw the reactions that occur in chloroplasts during photosynthesis in the space below. Show what goes into and comes out of this process. Use these terms:*

• sugar • oxygen • light energy • water • carbon dioxide

Accept any diagram that shows this relationship:
light energy + water + carbon dioxide → sugar + oxygen

Create *a cycle diagram that shows the relationship between photosynthesis and cellular respiration. Use the terms chloroplast, glucose, oxygen, water, carbon dioxide, light energy, and mitochondrion in your model.*

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Diagram should show sunlight energy entering the cycle before the chloroplast, chloroplast producing glucose and oxygen, those products going to a mitochondrion, which releases energy and produces carbon dioxide and water, which enters the chloroplast once again through sunlight energy to start the process over.



Analyze It Why is photosynthesis important to living things other than plants?

Sample answer: Students should conclude that without photosynthesis, plants and some other organisms cannot make food. If these organisms cannot make food, they cannot survive and act as food for other living things that cannot make their own food.

Cell Structure and Function

Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned.

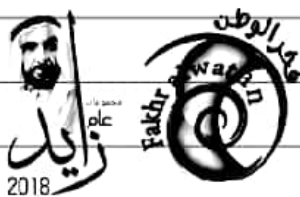
Use this checklist to help you study.

- Complete your Foldables[®] Chapter Project.
- Study your *Science Notebook* on this chapter.
- Study the definitions of vocabulary words.
- Reread the chapter, and review the charts, graphs, and illustrations.
- Review the Understanding Key Concepts at the end of each lesson.
- Look over the Chapter Review at the end of the chapter.



Summarize It Reread the chapter Big Idea and the lesson Key Concepts. When scientists first began to study cells, they found that plant and animal cells were similar to each other and yet different from each other. What are the similarities that you have noticed? What are the differences?

Accept all reasonable responses. Students should explain that both types of cells have the same kinds of organelles, except that plant cells have chloroplasts, central vacuoles, and cell walls. They should also explain that the processes inside the cells are similar, except that plant cells can photosynthesize their food.



Challenge Compare the cell to a factory. For example, a factory has a manager, and a cell has a nucleus. Use similar analogies to describe the functions of different parts of the cell.

Lesson 1 Earth Systems

Scan Lesson 1. Read the lesson titles and bold words. Look at the pictures. Identify three facts you discovered about Earth systems. Record your facts in your Science Journal.

Main Idea

What is Earth?

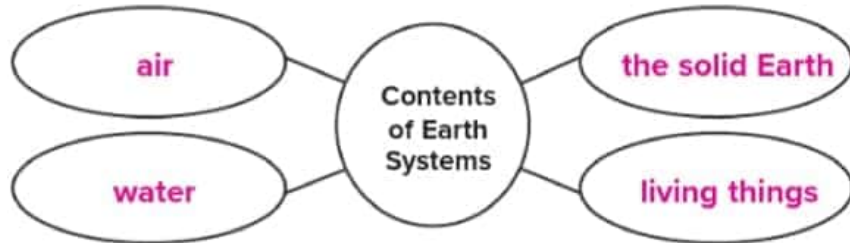
The Atmosphere



Sample details are shown.

Details

Differentiate materials that make up Earth's 4 systems.



Describe the composition of the biosphere.

the system that contains all the living things on Earth

Characterize the composition of the atmosphere.

Part of the Atmosphere	Details (in dry air)
78%	nitrogen
21%	oxygen
1%	other (trace) gases
Other contents	water vapor solid particles

Detail the layers of the atmosphere. Provide one detail for each bullet in the table below.

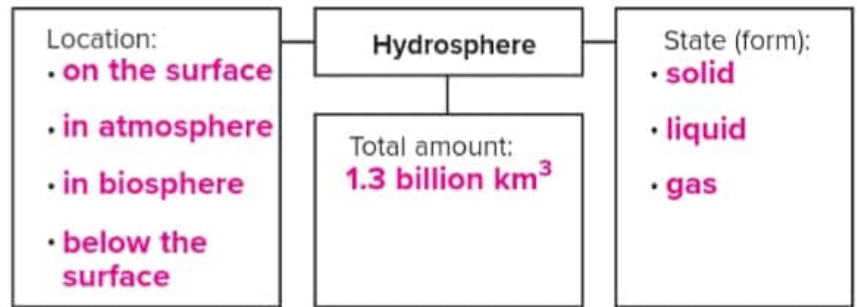
Layer	Description
Exosphere	<ul style="list-style-type: none"> lowest density of gas molecules next to outer space
Thermosphere	temperatures increase
Mesosphere	temperatures decrease
Stratosphere	<ul style="list-style-type: none"> flat layers of stable gases contains the ozone layer
Troposphere	<ul style="list-style-type: none"> bottom layer, at Earth's surface most of the atmosphere's mass where weather occurs

Main Idea

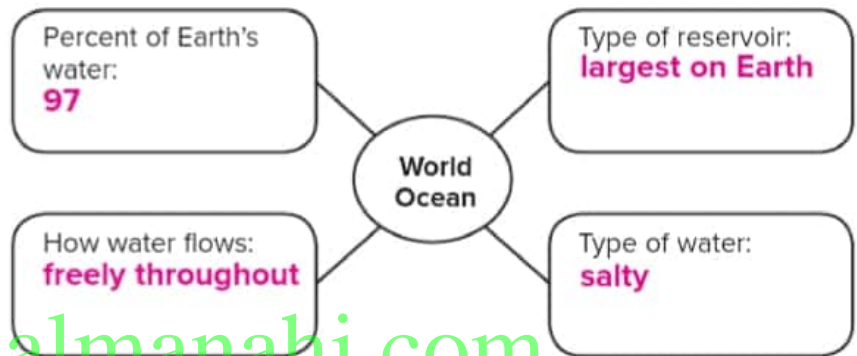
The Hydrosphere

Details

Organize information about the hydrosphere.

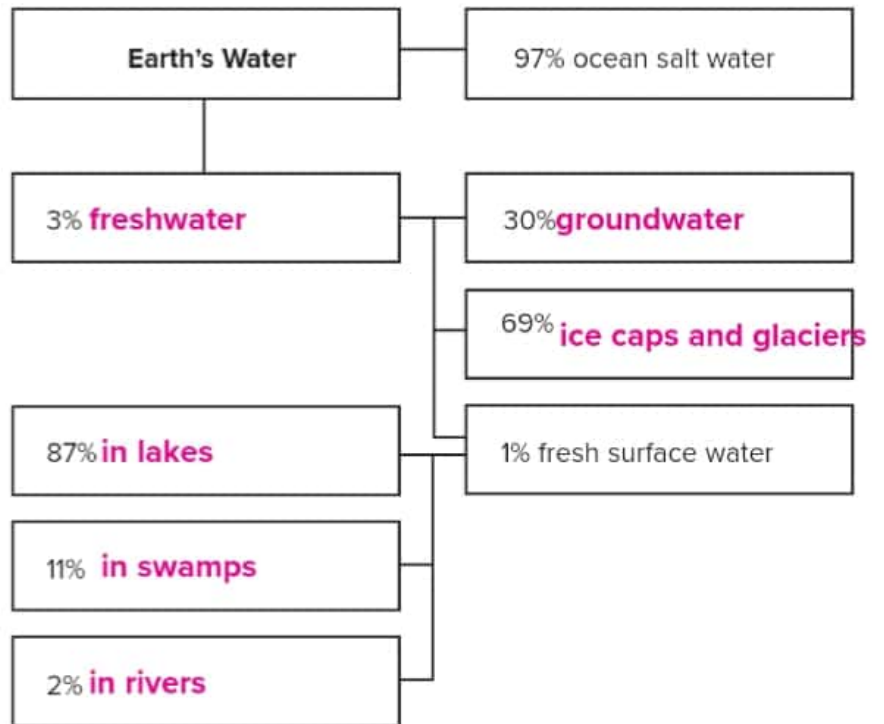


Characterize the world ocean.



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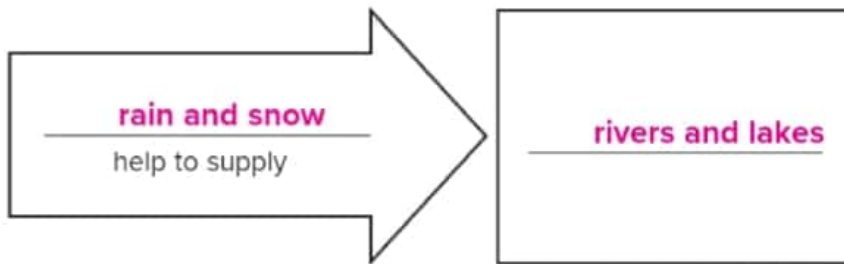
Diagram the distribution of Earth's water throughout the hydrosphere.



Main Idea

Details

Relate how Earth's surface reservoirs are supplied with water.

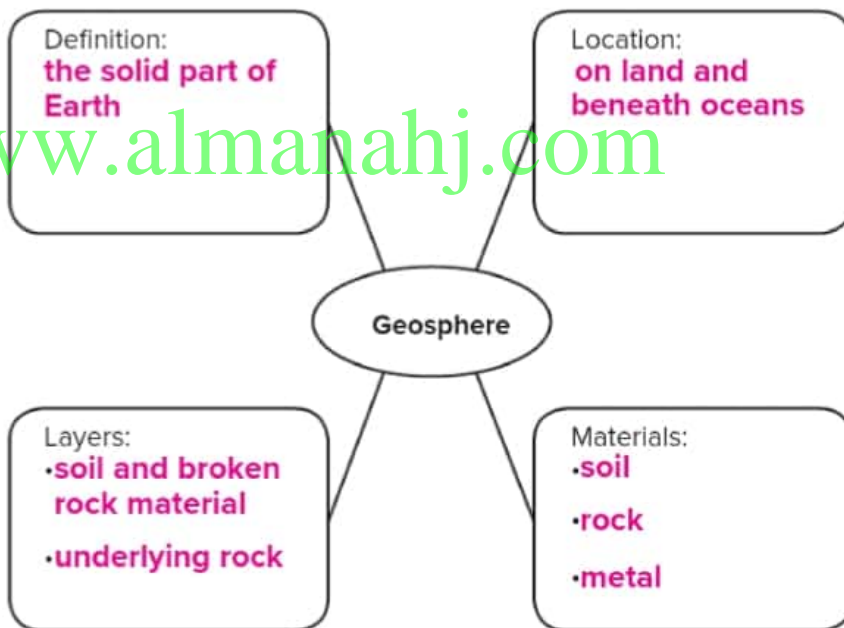


State how people can get freshwater where there is no accessible surface water.

They can drill wells down into layers of rock that contain groundwater.

The Geosphere

Characterize the geosphere.



Restate the 5 characteristics of minerals.

1. naturally occurring
2. inorganic
3. solid
4. crystal structure
5. definite chemical composition

Main Idea

Details

Record five physical properties used to identify minerals.

- 1. **color** _____
- 2. **hardness** _____
- 3. **crystal shape** _____
- 4. **streak** _____
- 5. **luster** _____

Describe the formation of 3 types of rocks.

Igneous Rocks	Sedimentary Rocks	Metamorphic Rocks
Formation: Molten material cools and hardens.	Formation: Layers of sediment are compressed and then cemented together.	Formation: Extreme temperatures and pressure change existing rock into new rock.

Elaborate on the structure of Earth's geosphere.

Layer	Description
Crust	brittle outer layer
• Oceanic	thinner, denser, only igneous rock
• Continental	under soil; made of all kinds of rock
Mantle	middle, largest layer; hotter and denser than crust; flows in some places
Core	center; iron with some nickel
• Inner	solid iron
• Outer	liquid

Synthesize It Explain one way that you interact with each of the four Earth systems discussed in Lesson 1.

Accept all reasonable responses. Sample answer: I am living, so I am part of the biosphere. I live on land and use materials from Earth's geosphere. I need freshwater to stay alive; I also carry part of Earth's hydrosphere in my body. The air I breathe comes from Earth's atmosphere.

Lesson 2 Interactions of Earth Systems

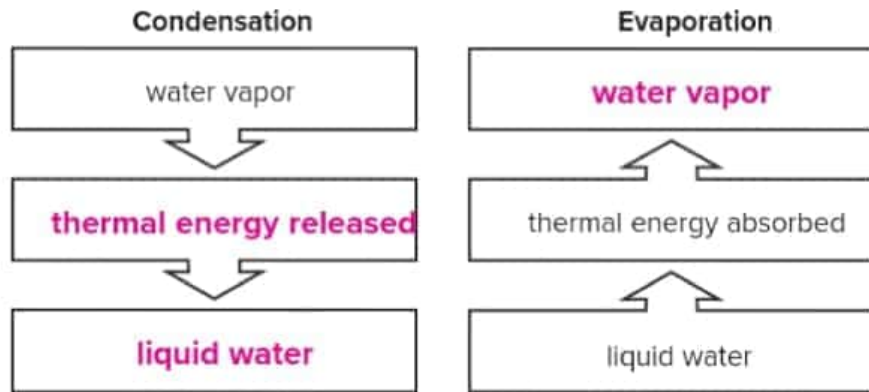
Predict three facts that will be discussed in Lesson 2 after reading the headings. Write your facts in your Science Journal.

Main Idea

The Water Cycle

Details

Order the relationship between thermal energy and the physical state of water.



Interpret the illustration of the water cycle. Use the terms to the right of the picture in your explanations.



- hydrosphere
- atmosphere
- geosphere
- biosphere

Description of Water Cycle Processes

1. **Liquid water in the hydrosphere evaporates into the atmosphere and condenses to form clouds.**
2. **Precipitation falls from the atmosphere to the surface of the geosphere.**
3. **Transpiration and respiration from organisms in the biosphere release water vapor into the atmosphere.**
4. **Water flows over the surface of the geosphere and flows into lakes and oceans; some soaks into the ground.**

Sample answers are shown.

Main Idea **Details**


Changes in the Atmosphere

Explain five processes that occur within the water cycle.

Process	Explanation
Evaporation	Liquid water changes into gas.
Transpiration	Plants release water vapor through their pores.
Respiration	Animals release water vapor from their lungs when they breathe.
Condensation	Water vapor changes to liquid water.
Precipitation	Moisture falls from clouds to Earth's surface.

Describe factors that influence weather.

Factor	Description
Air temperature	average amount of energy produced by the motion of air molecules
Air pressure	the force exerted by air molecules in all directions
Wind	the movement of air caused by differences in air pressure
Humidity	the amount of water vapor in a given volume of air

 **Relate** how weather is influenced by conditions in the geosphere and the hydrosphere.

Accept all reasonable responses. Sample answer: Air masses take on the characteristics of the areas over which they form. Therefore, weather is determined by an air mass's formation over land or water and the warmth or coolness of that land or water.

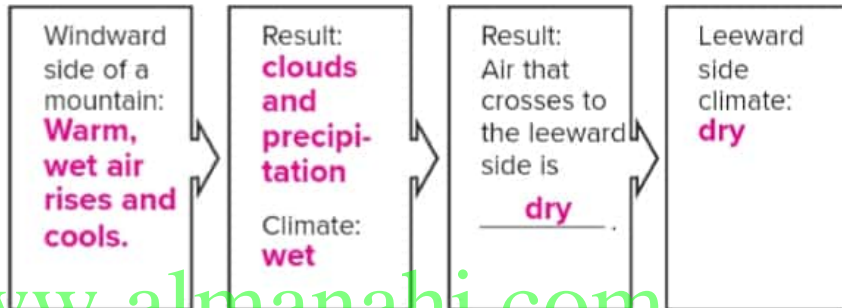
Main Idea

Details

Differentiate weather from climate.

Weather	Climate
the state of the atmosphere at a certain place and time	the average weather pattern for a region over a long period of time

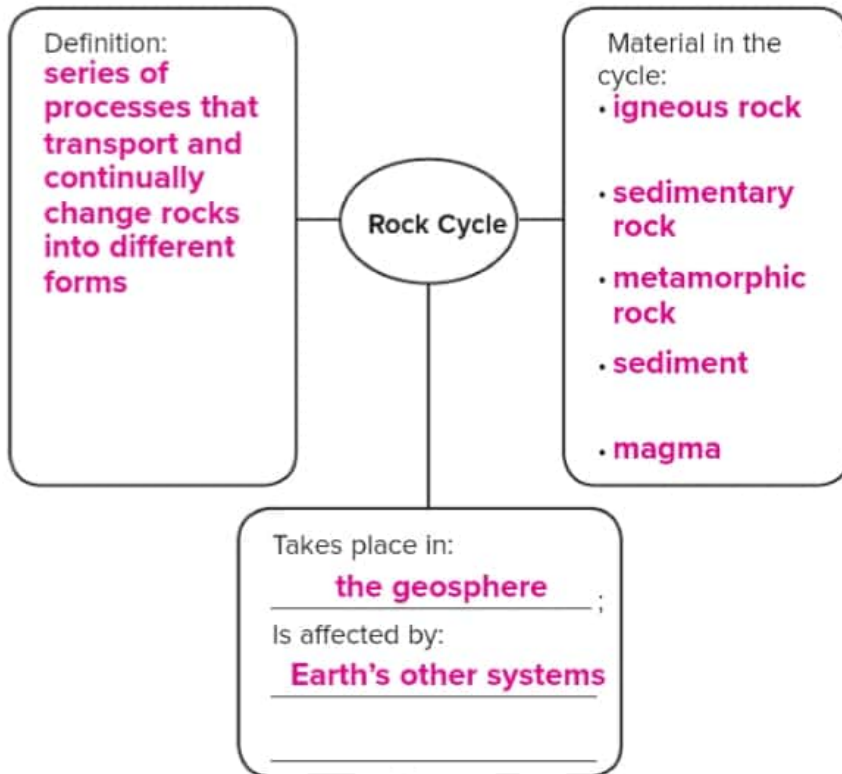
Sequence cause and effect in the formation of a rain shadow.



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The Rock Cycle


Organize information about the rock cycle.



Lesson 2 | Interactions of Earth Systems (continued)

Main Idea

Details


 **Explain** the processes in the rock cycle. Use these terms in your explanations.

• hydrosphere • atmosphere • geosphere • biosphere

Process	Explanation
Cooling	Magma inside the geosphere erupts as lava and cools at Earth's surface.
Crystallization	Mineral crystals form as liquid rock cools.
Uplift	Large bodies of Earth material are moved to higher elevations.
Weathering	Factors in the atmosphere, the hydrosphere and the biosphere break rock into sediment.
Erosion	Wind, water, and glaciers carry sediment to new locations.
Deposition	Eroded sediments are deposited in new places.
Compaction	The weight of layers of sediment presses down on layers below.
Cementation	Minerals from groundwater crystallize between grains of compressed sediment and cement them together.

Infer why the atmosphere, the biosphere, and the hydrosphere do not influence metamorphic rock formation.

Metamorphic rock forms deep beneath Earth's surface.

 **Analyze It** Suppose you are walking to school in the rain. You notice muddy water running down a hill into an animal's burrow. Explain the interactions in this example between each of the Earth systems.

Accept all reasonable responses. Sample answer: Weather, which occurs in the atmosphere, is causing rain to fall. The water, part of the hydrosphere, is carrying sediment down the hill; the sediment and hill are both part of the geosphere. The sediment and water in the animal's burrow will cause the animal, part of the biosphere, to have to repair its home. As it digs, the animal is changing geosphere.

Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned. Complete the final column in the chart on the first page of this chapter.

Use this checklist to help you study.

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- Study the definitions of vocabulary words.
- Reread the chapter, and review the charts, graphs, and illustrations.
- Review the Understanding Key Concepts at the end of each lesson.
- Look over the Chapter Review at the end of the chapter.



Summarize It Reread the chapter Big Idea and the lesson Key Concepts. Give one short example of how each of the four systems discussed in the chapter affects each other system. **Accept all reasonable responses. Sample answers are shown.**

- Atmosphere → Geosphere: weathering and erosion of rock
- Atmosphere → Biosphere: Plants and animals need gases for survival.
- Atmosphere → Hydrosphere: water vapor and precipitation
- Hydrosphere → Biosphere: Plants and animals need water for survival.
- Hydrosphere → Atmosphere: Humidity drives weather.
- Hydrosphere → Geosphere: cementation of sedimentary rock
- Geosphere → Biosphere: Minerals are necessary to support life.
- Geosphere → Atmosphere: Land masses affect weather formation.
- Geosphere → Hydrosphere: Land masses determine runoff patterns.
- Biosphere → Hydrosphere: respiration and transpiration of water vapor
- Biosphere → Atmosphere: exhalation of gases
- Biosphere → Geosphere: shaping of land and building of structures

Challenge Hypothesize what would happen if any of Earth's systems stopped working. What would be the effect on the other systems? Write a science fiction story about such a scenario. Share your story with your class.