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MINISTRY OF EDUCATION



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McGraw-Hill Education  
**Advanced Science**  
**Program**

United Arab Emirates Edition

6



# Activity Lab Manual



Answer Key

McGraw-Hill Education  
**Advanced Science  
Program**

United Arab Emirates Edition

GRADE 6 • VOLUME 2

**Activity Lab  
Manual**



# **Brief Contents**

- Chapter 1: Methods of Science**
- Chapter 3: Energy and Energy Transformations**
- Chapter 4: Waves, Light, and Sound**
- Chapter 5: Electricity and Magnetism**
- Chapter 6: Matter and Atoms**
- Chapter 7: Matter: Properties and Changes**
- Chapter 8: Life's Classification and Structure**
- Chapter 9: Inheritance and Adaptations**
- Chapter 10: Introduction to Plants**
- Chapter 11: Interactions of Life**
- Chapter 12: Mapping Earth**
- Chapter 13: Earth in Space**
- Chapter 14: Our Planet - Earth**
- Chapter 15: Natural Resources**

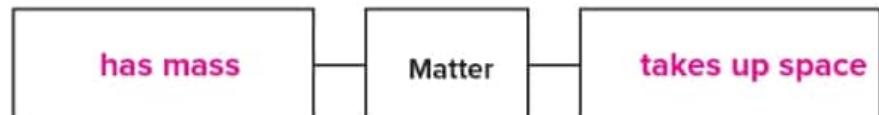
# Lesson 1 Substances and Mixtures

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

## Main Idea

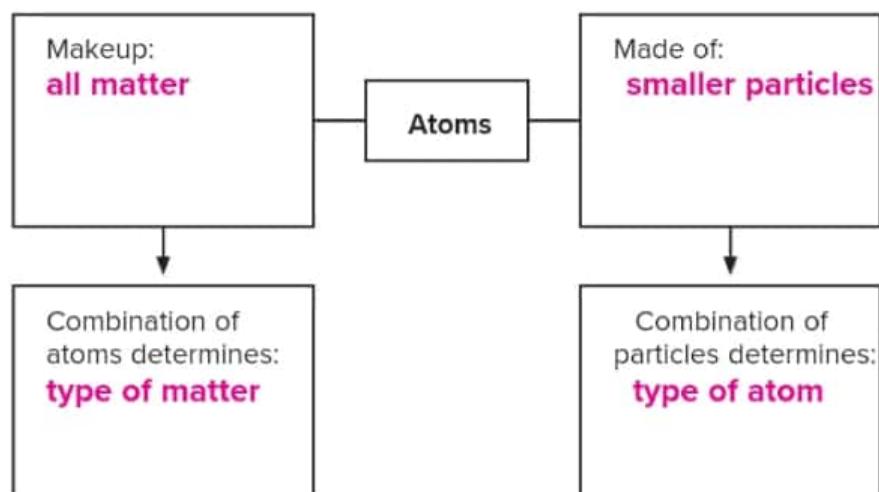
What is matter?

**Identify** the defining characteristics of matter.



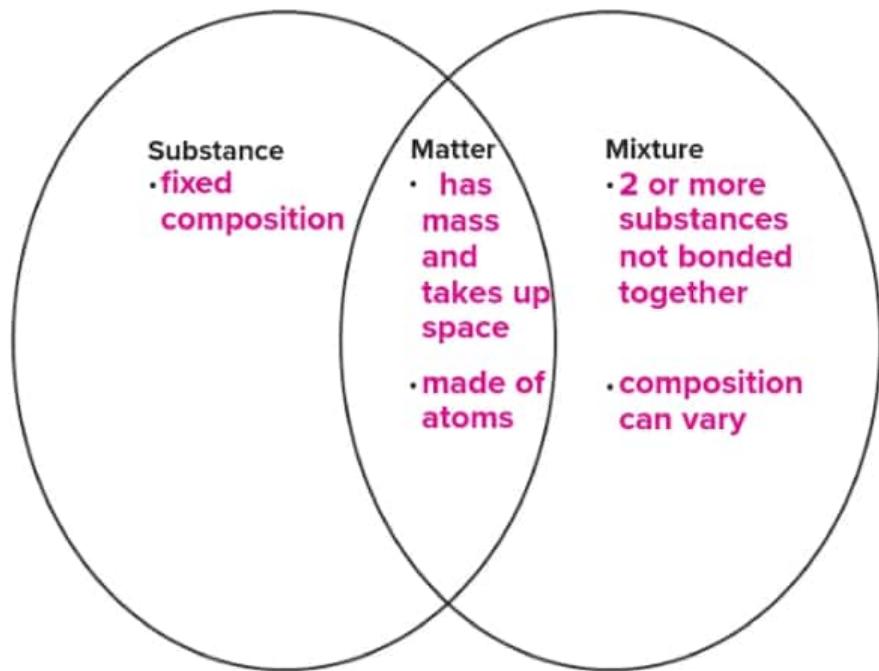
What is matter made of?

**Characterize** atoms.



Classifying Matter

**Differentiate** classifications of matter.



## Lesson 1 Substances and Mixtures (continued)

### Main Idea

What is a substance?

### Details

 **Differentiate** building blocks of matter.

Matter	Description
Atom	<b>building block of all matter</b>
Substance	<b>matter with a composition that is always the same</b>
Element	<b>a substance made of only one kind of atom</b>
Molecule	<b>two or more atoms held together by chemical bonds</b>
Compound	<b>a substance made of two or more elements chemically joined in a specific way</b>



**Determine** whether each statement is true or false. Write T for true statements. For false statements, write F and then rewrite the underlined word(s) to make the statement true.

Statement	T/F	Corrections
1. <u>Molecules</u> are made of atoms of one type.	F	<b>Elements</b>
2. All <u>substances</u> are elements.	F	<b>elements, substances</b>
3. All <u>compounds</u> are substances.	T	
4. All elements are compounds.	F	<b>No</b>
5. All matter is made up of <u>molecules</u> .	F	<b>atoms</b>

**Express** the relationship between properties of a compound and the properties of the elements which compose the compound.

**The properties are usually different.**

## Lesson 1 Substances and Mixtures (continued)

### Main Idea

### Details

What is a mixture?

**Differentiate** between substances and mixtures.

Substance  
**definite composition**

Mixture  
**can vary in composition**

Types of Mixtures

**Categorize** information about mixtures.

Mixtures  
**can be any state of matter**

Which state of matter?

**homogeneous**

Two  
types

**heterogeneous**

Prefix:**homo-**  
Means:**the same**

Prefix:**hetero-**  
Means:**different**

**Contrast** the ways homogeneous mixtures and heterogeneous mixtures are combined.

Mixture	Contrasting Characteristic
Heterogeneous	<b>Substances are not evenly mixed.</b>
Homogeneous	<b>Substances are evenly mixed but not bonded together.</b>

**Organize** information about solutions.

**Solution**  
Another name for **homogeneous mixture**

Part: **solvent**  
Definition: **the substance present in the largest amount**

Part: **solute**  
Definition: **dissolves and mixes evenly in the solvent**

## Lesson 1 Substances and Mixtures (continued)

### Main Idea

### Details

 **Assess** whether all mixtures are solutions.

**No, heterogeneous mixtures are not solutions.**

### Compounds v. Mixtures

 **Compare and contrast** solutions and compounds.

Detail	Solution	Compound
Appearance	evenly mixed	evenly mixed
Composition	can vary	fixed
Atoms bonded?	no	yes
Properties	keeps properties of its parts	different properties from its elements
Changing the composition	maintains similar properties	makes a new compound

**Identify** ways to separate mixtures.

Type of Mixture	Possible Techniques
Heterogeneous	remove physically, such as by hand or with a strainer
Homogeneous	boiling or evaporation

### Visualizing Classification of Matter

**Cite** two key factors in the classification of matter.

1. type of atoms

2. arrangement of atoms

 **Connect It** Identify an element, a substance, a compound, a heterogeneous mixture, and solution that you have encountered recently.

**Accept all reasonable responses.** Sample answer: My mom's gold earrings are an element and a substance; water is a compound (but the water that comes out of my tap is a solution of water and other substances); the raisin bran I ate for breakfast was a heterogeneous mixture.

## Lesson 2 The Structure of Atoms (continued)

### Main Idea

#### The Size of Atoms

**Express** the exponent in the relative comparison between the sizes of an atom and the earth.

16

Size of Earth = Size of atom  $\times 10^{16}$

#### Differences in Atoms



**Relate** the atomic number of an atom to the number of protons in the atom's nucleus.

**They are the same.**

**Differentiate** ions from isotopes of atoms.

Isotopes
Two atoms of the same element with
• the same number of <b>protons</b>
• but different numbers of <b>neutrons</b>

Ions
Atoms of an element that have a charge because they have
• <b>lost</b>

#### Atoms and Matter

**Assess** changes to an atom caused by changing its number of particles.

Change	Result
Add or lose a proton	<b>new element</b>
Add a neutron	<b>isotope</b>
Add or lose an electron	<b>ion</b>

**Connect It** The fairytale *Rumpelstiltskin* tells about a little man who can spin ordinary straw into gold. How would Rumpelstiltskin have to recombine the atomic particles in the straw to achieve his magical feat?

**Accept all reasonable responses.** Sample answer: Atoms in the straw would have to be broken apart and put back together with 79 protons in each new atom.

## Lesson 2 The Structure of Atoms (continued)

### Main Idea

#### The Size of Atoms

**Express** the exponent in the relative comparison between the sizes of an atom and the earth.

$$\text{Size of Earth} = \text{Size of atom} \times 10^{16}$$

#### Differences in Atoms

**Relate** the atomic number of an atom to the number of protons in the atom's nucleus.

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**Differentiate** ions from isotopes of atoms.

Isotopes
Two atoms of the same element with
• the same number of <b>protons</b>
• but different numbers of <b>neutrons</b>

Ions
Atoms of an element that have a charge because they have
• <b>lost</b>
• or <b>gained</b>
electrons

#### Atoms and Matter

**Assess** changes to an atom caused by changing its number of particles.

Change	Result
Add or lose a proton	<b>new element</b>
Add a neutron	<b>isotope</b>
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**Accept all reasonable responses.** Sample answer: Atoms in the straw would have to be broken apart and put back together with 79 protons in each new atom.

## 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 the chapter.

### 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 how the composition of the atoms of elements, as shown on the periodic table, relates to the many ways matter is categorized.

**Accept all reasonable responses.** Sample answer: The number of different particles in atoms determine the identity of elements. Each element exhibits its own properties. In mixtures of elements, the elements are only physically combined, so they maintain their properties. But in compounds, the chemical bonding of elements changes the matter into something with new properties. Matter is categorized by the atoms that make it up and by how those atoms are combined, chemically or physically.

**Challenge** Choose a pure form of matter, an element, to analyze. Research to learn out about the element's atoms, isotopes, and ions. Find out what kinds of compounds, solutions, or mixtures the element occurs in and how they are used. Make a poster about your element, and display it in your class.

# Chapter 7 - Matter: Properties and Changes



## What gives a substance its unique identity?

### Before You Read

Before you read the chapter, think about what you know about matter. Record your thoughts in the first column. Pair with a partner, and discuss his or her thoughts. Record those thoughts in the second column. Then record what you both would like to share with the class in the third column.

Think	Pair	Share

### Chapter Vocabulary

Lesson 1	Lesson 2
<b>NEW</b> volume solid liquid gas physical property mass density solubility chemical property	<b>NEW</b> physical change chemical change law of conservation of mass  <b>ACADEMIC</b> expose
<b>REVIEW</b> matter	

A Lesson Content Vocabulary page for each lesson is provided in the Chapter Resources File.

# Lesson 1 Matter and Its Properties

**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

What is matter?

Sample answers shown.

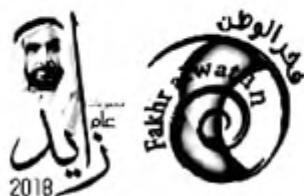
## Details

**Identify** three things that are matter and three things that are not matter. Then tell what all matter has in common.

Matter	Not Matter
chair, air, table, water	light, sound, shadows

All matter **has mass and takes up space.**

## States of Matter



**Summarize** information about the 3 familiar states of matter by completing the chart.

	Solid	Liquid	Gas
Shape	definite	not definite; takes the shape of its container	no definite shape; fills container
Volume	definite	definite	not definite; fills its container
Space between particles	close together	close together	very far apart
Strength of attraction between particles	very strong	weaker than between particles of solids; stronger than between particles of gases	very weak
How particles move	vibrate in all directions	freely move past one another	freely move in all directions

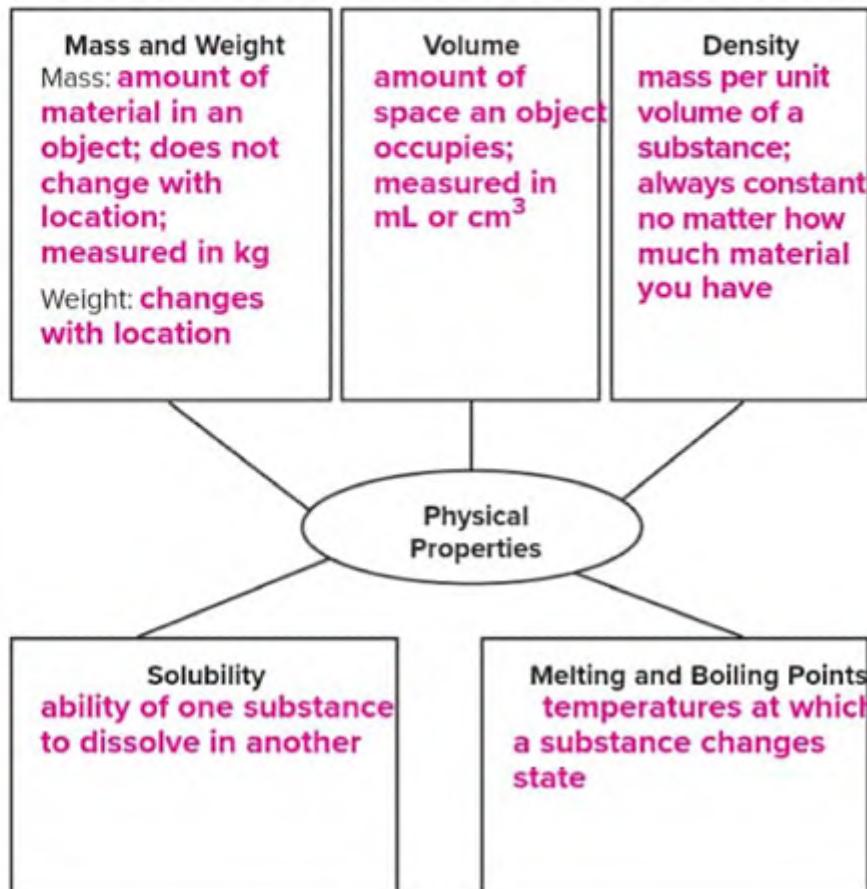
## Lesson 1 Matter and Its Properties (continued)

### Main Idea

What are physical properties?

### Details

**Create** a spider map to describe the physical properties of matter.



What are chemical properties?

**Distinguish** properties as chemical or physical. Circle the chemical properties. Underline the physical properties. Then tell how physical properties are different from chemical properties.

ability to be bent or rolled

ability to be attracted to a magnet

ability to rust

ability to burn

ability to conduct electricity

ability to react with oxygen

You can observe physical properties without changing the identity of the substances that make up a substance. You can observe chemical properties only as a substance reacts with or changes into a different substance.

## Lesson 1 Matter and Its Properties (continued)

### Main Idea

#### Identifying Matter Using Physical Properties



**Identify** properties that are useful for identifying unknown substances. You might need to refer to the section on physical properties for help.

1. **density**
2. **solubility**
3. **boiling point**
4. **melting point**

#### Sorting Materials Using Properties and Separating Mixtures Using Physical Properties

**Classify** methods for sorting materials and separating mixtures. For each material, choose the physical property below that would be most useful for separating the parts.

magnetism  
state of matter  
solubility

Pasta and water: **state of matter**

Sugar and salt in water: **solubility**

Metal and plastic beads: **magnetism**

**Connect It** Imagine that you can see the particles of ice, liquid water, and water vapor. Describe how these three states of water differ.

**Sample answer:** Water as a solid (ice) has a fixed shape and volume. The particles of ice are held closely together by strong, attractive forces. The particles vibrate in all directions. Liquid water has a fixed volume; however, it does not have a fixed shape—it takes the shape of its container. Its particles are still close together, but the attractive forces between these particles are weaker than in solid ice. For this reason, the particles move freely past one another. Water vapor has neither a fixed shape nor a fixed volume. The particles are far apart and have very weak attractive forces between them. For this reason, the particles move freely.

## Lesson 2 Matter and Its Changes

**Scan**Lesson 2 in your book. Write three questions you have about changes in matter in your Science Journal. Try to answer your questions as you read.

### Main Idea

#### Changes of Matter

#### What are physical changes?



### Details

**Give an example** of a change in matter you observe from the time you wake in the morning until you arrive at school.

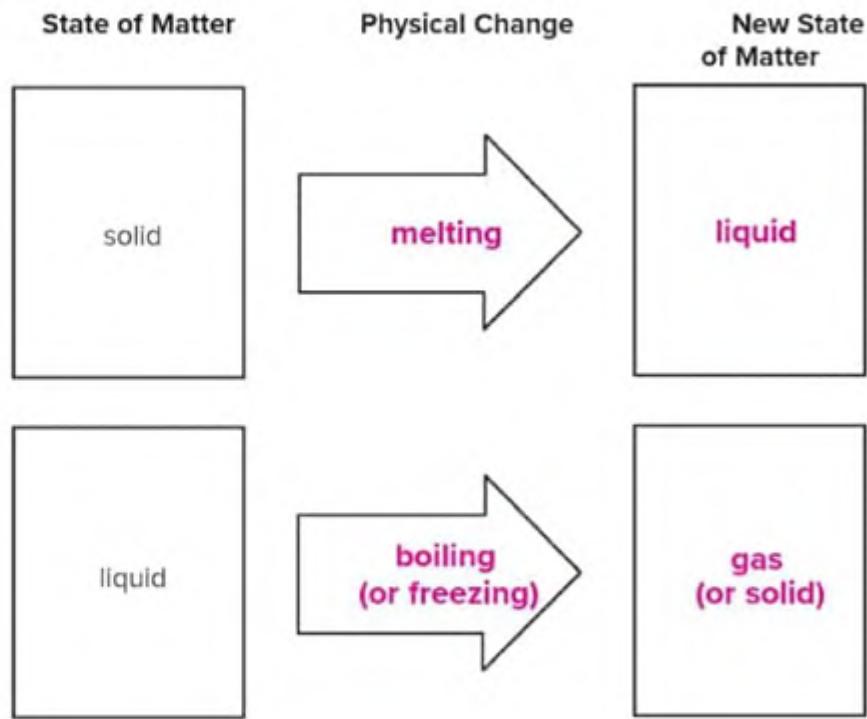
**Accept all reasonable responses.** Students might describe steam (water vapor) filling the room as they shower, changes to an egg as it cooks or cereal as it soaks in milk, changes in air temperature between the inside and the outside of the house, and so on.

**Classify** physical changes. List two physical changes in which the identity of a substance stays the same.

1. **dissolving**

2. **changing state**

**Organize** the examples of physical changes to states of matter by completing the chart.



## Lesson 2 Matter and Its Changes (continued)

### Main Idea

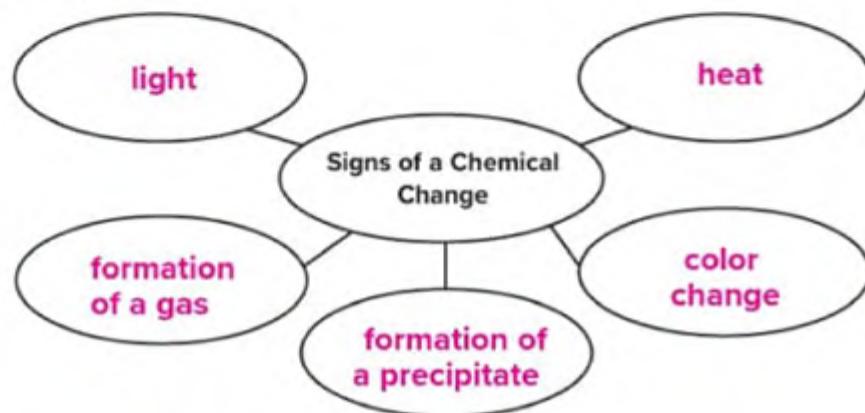
What are chemical changes?

### Details

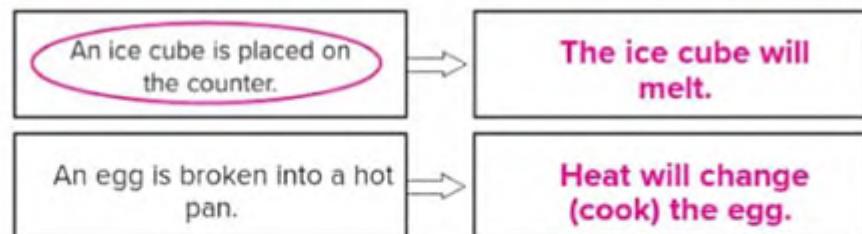
**Key** Explain how chemical changes are different from physical changes.

A chemical change produces new substances with different chemical and physical properties. A physical change results only in changes to physical properties—the substance itself does not change.

Complete the graphic organizer below with five signs of a chemical change.



Predict the effect of each event. Circle the effect that can be reversed.



State the law of conservation of mass.

The total mass before a chemical reaction is the same as the total mass after the chemical reaction.

**Key** Describe how physical and chemical changes affect mass.

Physical changes: do not affect mass

Chemical changes: do not affect mass

## Lesson 2 Matter and Its Changes (continued)

### Main Idea

#### Comparing Physical and Chemical Changes

Sample answers are shown.

### Details

**Classify** changes. Identify five types of physical changes and five types of chemical changes.

Physical Changes	Chemical Changes
melting	changing color
boiling	burning
changing shape	rusting
mixing	forming a gas
dissolving	forming a precipitate

 **Compare and contrast** information about physical changes and chemical changes.

Physical Changes	Chemical Changes
• substance <u>stays the same</u>	• <u>different</u> substance formed
• only <u>physical properties</u> change	• both <u>physical and chemical properties</u> change

 **Analyze It** A classmate shows you the remnants of a campfire. He tries to convince you that the ashes in the fire pit are all that remains of the wood that burned. What can you tell your friend about chemical changes that will help him understand what happened to the matter that made up the wood?

**Sample answer:** The burning wood released gases and other particulates in the form of smoke in addition to the ashes. If these materials could be captured, they, along with the ashes, would have the same mass as the wood before burning.

## 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.
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**Summarize It** Review the Big Idea and the lesson Key Concepts. Imagine that you have an unknown substance. Explain how you could use physical and chemical properties to identify the substance.

**Accept all reasonable responses. Students should explain that a substance has a unique set of physical and chemical properties. They should then identify physical and chemical properties that are useful in identification. Physical properties of this type include density, solubility, melting point, boiling point, ability to conduct electricity, and magnetism. Chemical properties that could be used include reactivity and flammability.**



**Challenge** Work with a partner to design a way to prove the law of conservation of mass when a physical change occurs. Share your design with the class.

# Lesson 1 Classifying Living Things

**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. Record your ideas in your Science Journal.

## Main Idea

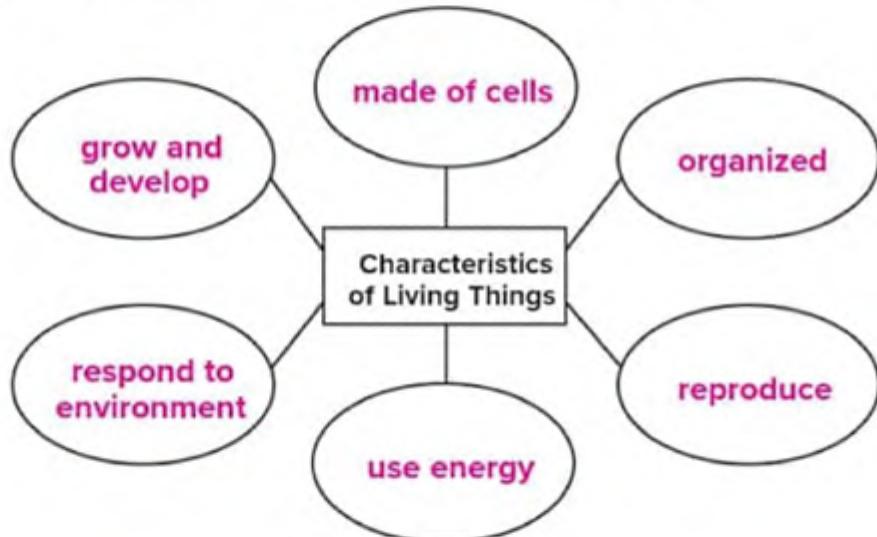
What are living things?



Students might list other characteristics.

## Details

 Identify the 6 characteristics of living things.



Recall the 4 macromolecules in cells.

1. nucleic acids	3. lipids
2. proteins	4. carbohydrates

Differentiate unicellular from multicellular organisms.

	Definition	Sample Characteristics
Unicellular	made up of only one cell	most abundant life forms; oldest forms of life; have everything they need to survive inside single cell
Multicellular	made of more than one cell	have different cells that carry out specialized functions; different levels of organization

## Lesson 1 | Classifying Living Things (continued)

### Main Idea

Sample examples are shown.

### Details



**Describe** ways in which living things perform functions.

Function	Description
Grow	Unicellular organism: <b>size of cell increases</b>  Multicellular organism: <b>number of cells increase</b>
Develop	Example: <b>Ladybug larvae grow into pupae and then adults.</b>
Reproduce	Asexual reproduction: <b>Unicellular organisms divide; some multicellular organisms also reproduce asexually.</b>  Sexual reproduction: <b>Reproductive cells of parent organisms join and form a new organism.</b>
Use energy	Autotrophs: <b>convert light or energy released by chemical reactions to usable energy</b>  Heterotrophs: <b>obtain energy from other organisms</b>
Respond to stimuli	Example: <b>An octopus responds to predators by releasing ink to protect itself.</b>

What do living things need?



**Identify** three things that organisms need to obtain from their habitats.

1. **energy (food)**
2. **water**
3. **a place to live (shelter or protection)**

## Lesson 1 | Classifying Living Things (continued)

### Main Idea

### Details

**Define** habitat.

Habitat: a specific environment where an organism lives

How are living things classified?

 **Order** *8 taxonomic groups from largest to smallest.*

Taxonomic Groups	
Largest	Order
Domain	Family
Kingdom	Genus
Phylum	Species
Class	Smallest

 **Relate** *a taxon to binomial nomenclature.*

	Definition	Relationship
Binomial Nomenclature	<i>a naming system that gives each living thing a two-word scientific name</i>	<i>Two of the taxa to which an organism belongs, its genus and species, determine the two words in its scientific name.</i>
Taxon	<i>a group of organisms</i>	

**Explain** *how a dichotomous key helps with the identification of an organism.*

Organized steps of questions about an organism's features

determine which taxa the organism belongs in.

 **Connect It** Explain whether the following statement is true or false, and why: "People are multicellular autotrophs."

Accept all reasonable responses. Sample answer: This is false. People are multicellular; however, people do not make their own usable energy from light. People are heterotrophs; they must obtain energy from other organisms.

## Lesson 2 Cells

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

### Main Idea

What are cells?



What are cells made of?

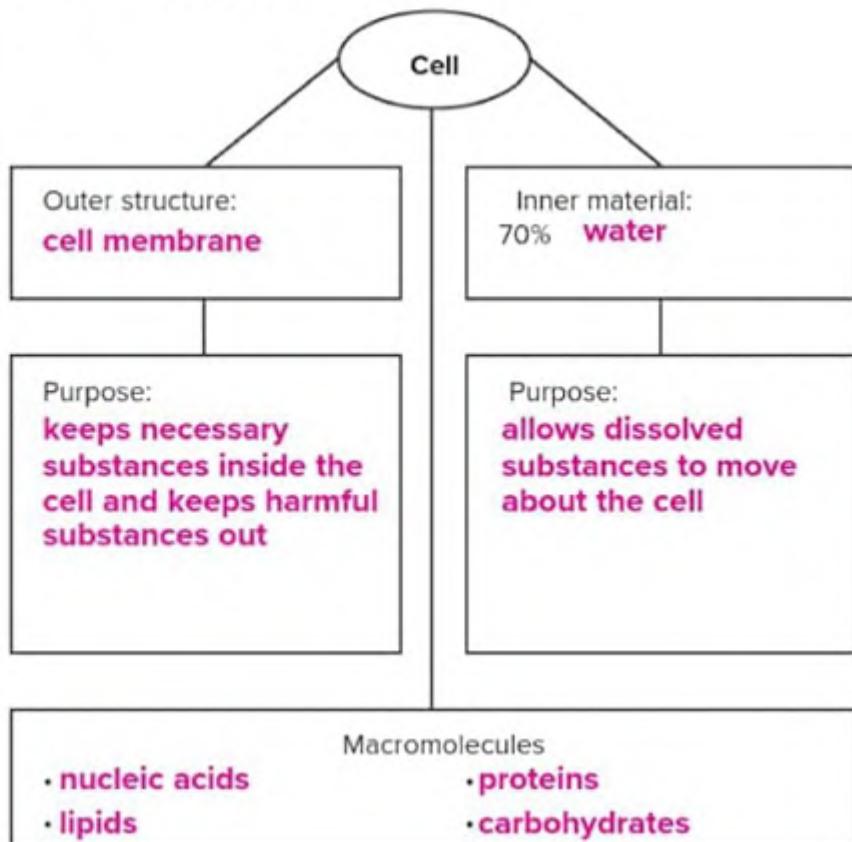
### Details

**Contrast**the numbers of cells that make up organisms.

Most Organisms: **only one cell**

Humans: **about 100 trillion cells**

**Characterize**the makeup of cells.



Types of Cells

**Describe**types of cells.

Prokaryotic cells	Eukaryotic cells
do not have a nucleus or other membrane-bound organelles	have a nucleus and other membrane-bound organelles

## Main Idea

## Details

**Model** a prokaryotic cell. Draw and label the cell, using different colors for different structures. Circle the names of at least two structures that are also present in eukaryotic cells.

Student drawings should show these structures: cell wall, cell membrane, capsule, flagellum, cytoplasm, ribosome, DNA. Students should circle **ribosome** and **cell membrane**; they might also circle **cytoplasm**.

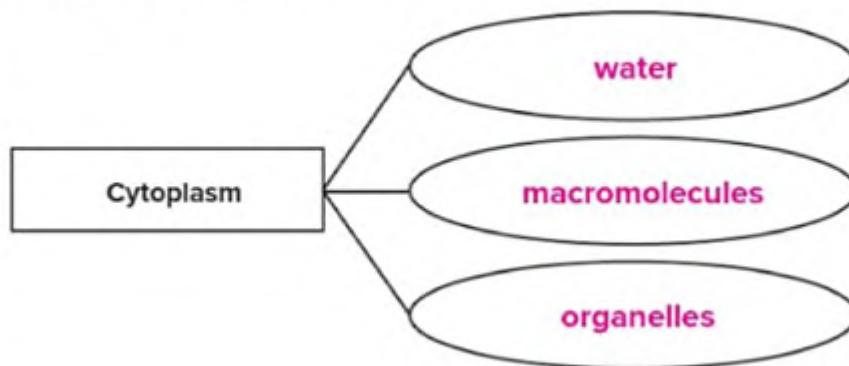
## The Outside of a Cell

**Contrast** a cell membrane with a cell wall.

Cell Membrane	Cell Wall
made of lipids and proteins; protects the cell; communicates with other cells and senses changes in the environment	made of different types of carbohydrates; a strong, rigid layer outside the cell membrane; found in plants, fungi, and many types of bacteria

## The Inside of a Cell

**Characterize** the contents of the cytoplasm in cells of eukaryotic organisms.



## Lesson 2 | Cells (continued)

### Main Idea

### Details

 **Distinguish** the nucleic acid DNA from RNA.

DNA	RNA
genetic material that controls all of a cell's activities	gives cells instructions about which proteins need to be made

 **Compare and contrast** the functions and locations of a mitochondrion and a chloroplast.

Mitochondrion	Both	Chloroplast
break down food and release energy; found in all eukaryotes	organelles in eukaryotes that process energy	capture light and convert it to energy; found in autotrophs only

 **Describe** the roles of different cell structures.

Structure	Role
Ribosomes	make proteins in the cytoplasm
Endoplasmic reticulum	holds the ribosomes in eukaryotic cells; processes and moves proteins inside the cell
Golgi apparatus	packages proteins into organelles called vesicles
Vesicles	transport proteins around a cell
Vacuoles	store water and other molecules; provide support in plant cells

 **Analyze It** Generalize how prokaryotic and eukaryotic cells relate to unicellular and multicellular organisms.

Accept all reasonable responses. Sample answer: Most prokaryotes are unicellular organisms, such as bacteria. Most multicellular organisms are made of eukaryotic cells.

## 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. Describe yourself as an organism, using all of the vocabulary terms from Lessons 1 and 2.

**Accept all reasonable responses. Sample answer:** I am not an autotroph because I cannot convert light energy into my own food. I am a heterotroph because I get my energy from other organisms. My habitat includes buildings like my home and school, which provide me with shelter and protection. In binomial nomenclature, my scientific name is *Homo sapiens*. One of the taxa I belong to is the kingdom *Animalia*. I am not made of prokaryotic cells; I am made of eukaryotic cells. All of my cells have cytoplasm and mitochondria.



**Challenge** Research organisms that are considered to be multicellular prokaryotes. Design a poster about one such unusual organism with captions that explain its characteristics. Display the poster in your classroom.

# Lesson 1 Inheritance and Traits

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

## Main Idea

What is inheritance?

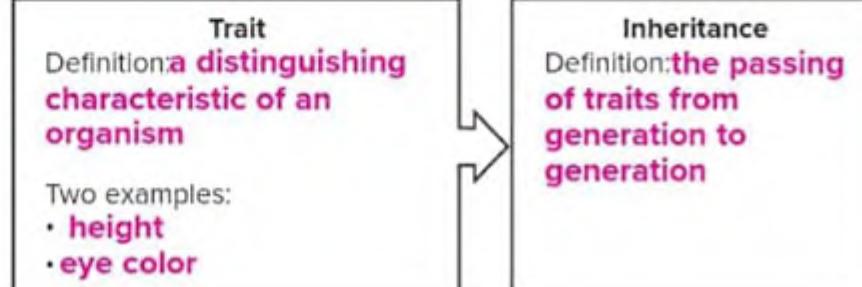
Sample examples are shown.

Inheritance and DNA



## Details

**Relate** traits to inheritance.



**Describe** terms associated with inheritance.

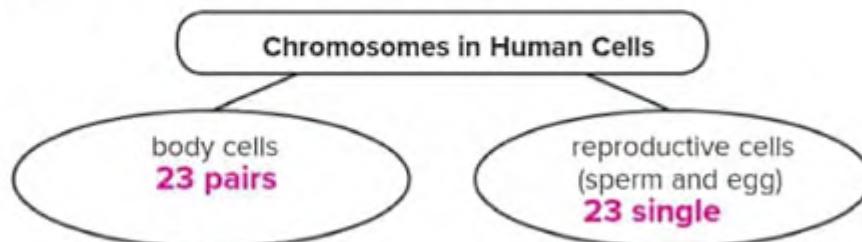
Term	Description
<b>DNA</b>	a long, tightly-coiled molecule that looks like a twisted zipper inside a cell's nucleus
<b>Gene</b>	<b>a section of DNA that has genetic information for one trait</b>
<b>Chromosome</b>	<b>a structure made of long chains of DNA and thus hundreds or thousands of genes</b>

**Restate** the role of genes in inheritance.

**Genes carry the information for traits. Traits are passed from parents to offspring in genes.**

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**Differentiate** numbers of chromosomes in human cells.



## Lesson 1 | Inheritance and Traits (continued)

### Main Idea

#### Combining Genes

### Details

**Sequence** the recombination of genes in sexual reproduction.

#### Meiosis

Chromosomes in existing reproductive cells **replicate and divide.**



They split into **four cells**, each with **half** the number of chromosomes.

#### Fertilization

A **sperm** and an **egg** unite.



The resulting offspring has **a full set of paired chromosomes**, half from **each parent.**

### Influencing Traits

**Contrast** genotype and phenotype. Describe each term, then circle yes or no in answer to each question.

#### Genotype

Description: **an organism's complete set of genes**

Can it change?

yes  no

Influenced by the environment?

yes  no

#### Phenotype

Description: **how a trait appears or is expressed**

Can it change?

yes  no

Influenced by the environment?

yes  no

## Lesson 1 | Inheritance and Traits (continued)

### Main Idea

Sample examples are shown.

### Details

**Classify** examples of environmental factors that affect phenotype.

#### Effects of Environmental Factors on Phenotype

Example of physical factor:  
**A nutrient-rich diet can transform an ordinary bee into a queen.**

Example of social factor:  
**Locusts change color and swarm when they are in a large group.**

**Contrast** changes to phenotype caused by the environment with mutations. (How do these changes affect offspring?)

Environmental changes to phenotype are not passed on to offspring; mutations are permanent changes to the sequence of DNA and are passed on in genes.

**Distinguish** possible causes and effects related to mutation in reproductive cells.

#### Possible causes

random or caused by exposure to chemicals or radiation

#### Mutation

a change in the sequence of DNA in reproductive cells

#### Effects on organism

- May help.
- May hurt.
- May neither help nor hurt.

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**Connect It** Describe a trait amongst members of your family or the family of a friend that others might observe and use to conclude that family members are related.

Accept all reasonable responses. Sample answer: My grandfather, my mom, my sister, several of my aunts, uncles, and cousins, and I all have similar bumps on our noses.

## Lesson 2 Adaptations in Species

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

### Main Idea

What is adaptation?



### How Adaptations Occur

### Details



**Relate** how mutations cause variation.

Mutations, which are **permanent changes** in the sequence of DNA in a gene

cause...

variations, which are **slight differences in inherited traits among individual members of a species.**

**Define** adaptation.

Adaptation: an inherited trait that helps a species survive in its environment



**Assess** how the variations in giraffe fur patterns can serve as an adaptation.

Giraffe spots help them blend in with their surroundings and avoid predators.

**Characterize** natural selection.

Variations help organisms

survive in their environment

which allows them to

live longer

compete better

which allows them to

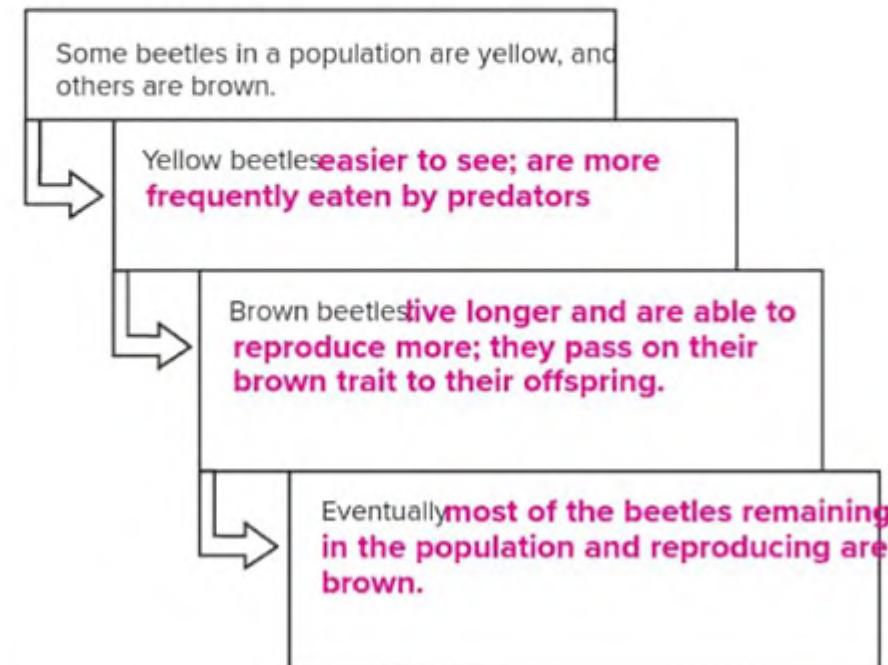
reproduce more

## Lesson 2 | Adaptations in Species (continued)

### Main Idea

### Details

**Sequence** the natural selection process that turns a color variation in beetles into an adaptation.



**Differentiate** natural selection from selective breeding.

Natural Selection	Selective Breeding
the process by which organisms with variations that help them survive in their environment live longer, compete better, and reproduce more than those that do not have the variation	the selection and breeding of organisms with desired traits

**Express** the primary difference between the two processes above.

In selective breeding, humans, instead of nature, select the desired traits to be passed on.

## Lesson 2 | Adaptations in Species (continued)

### Main Idea

#### Types of Adaptations

### Details

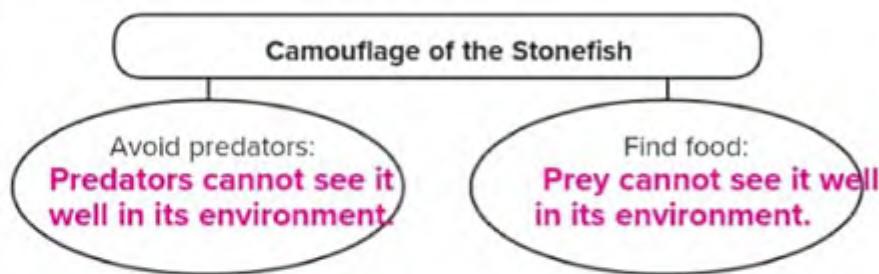
 **Distinguish** the 3 types of adaptations.

Type	Description	Example
Structural	a physical trait that increases survival	the color and shape of insect's eyes
Behavioral	a behavior or action that increases survival	playing dead to fool predators
Functional	a biochemical change that enables a species to increase survival or maintain homeostasis	hibernating or shedding

 **Describe** two types of structural adaptations.

Camouflage	Mimicry
an adaptation that helps a species blend in with its natural surroundings	an adaptation in which one species looks like another species

 **Assess** how a structural adaptation helps an animal both to avoid predators and to find food.



 **Analyze It** Consider a world without variations within species. Describe how this might affect the balance between predators and prey.

**Accept all reasonable responses.** Sample answer: Some species would likely disappear, because they could not develop adaptations over time that help them avoid predators. On the other hand, predators would not be developing adaptations to better enable them to catch their prey, either.

## Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned. Review the cause and effect chart on the first page of the chapter and compare your ideas to what you know now.

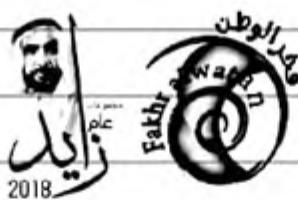
**Use this checklist to help you study.**

- 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. Summarize how the processes of inheritance and natural selection have shaped the diversity of life on Earth.

**Accept all reasonable responses. Sample answer:** Through the process of inheritance, endless combinations of traits are passed from parent organisms to their offspring. Over the course of many generations, this results in many genotypes and many variations expressed in organisms' phenotypes. Those variations that turn out to be beneficial to organisms continue to be passed on because of natural selection.



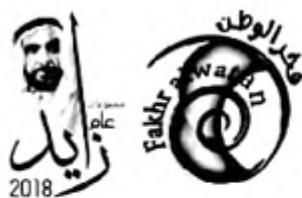
**Challenge** Choose an animal species to learn about. Study the animal's traits, variations, and adaptations. Make a poster with images and labels that display how the animal's adaptations help it to survive in its environment. Present your poster to your class.

# Lesson 1 Plant Diversity

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

## Main Idea

What is a plant?



## Details

**Restate** four uses for which humans depend on plants.

1. food
2. 4. building materials
3. oxygen
4. paper

**Classify** cell parts. Make a checkmark in the columns to indicate whether a part belongs to plant cells, animal cells, or both.

Plant	Animal	Part of Cell
✓	✓	nucleus
✓		chloroplast
✓		cell wall
✓	✓	mitochondria
✓		central vacuole
✓	✓	ribosomes

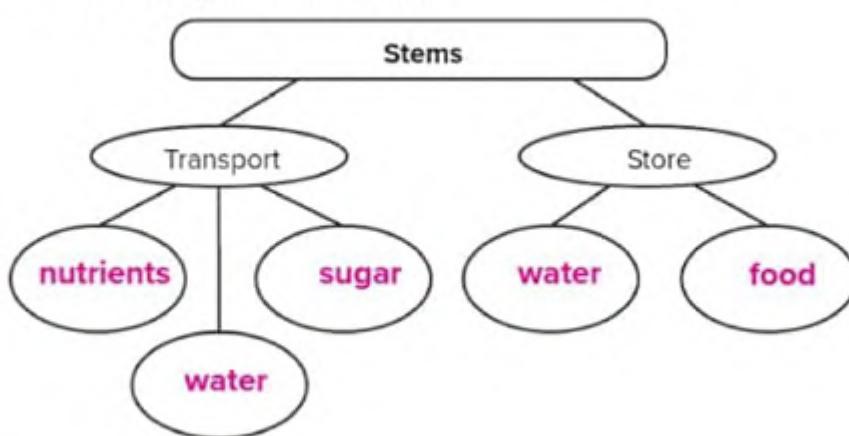
**Key** **Differentiate** roots from rhizoids.

**Root:** anchor and support plant; absorb water and minerals

**Rhizoid:** rootlike structure that anchors a plant without

transport tissue to a surface

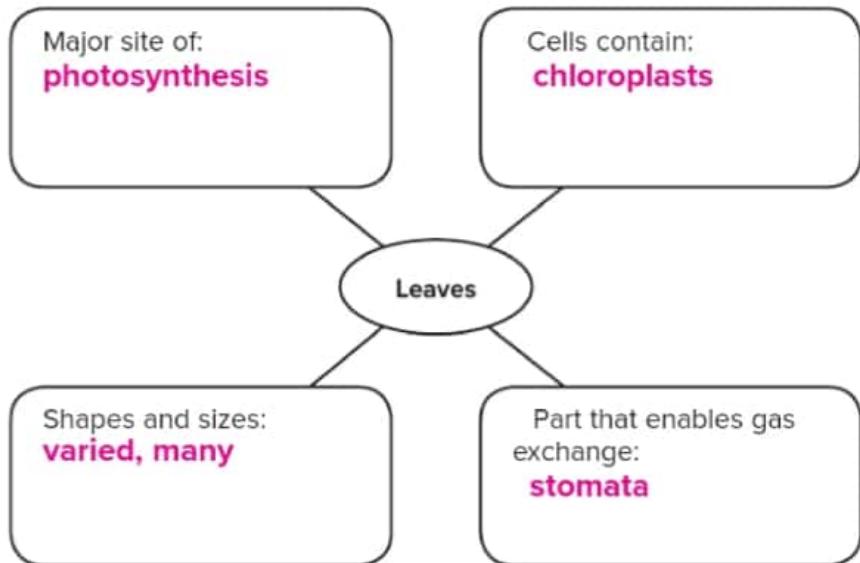
**Key** **Identify** functions of stems.



## Main Idea

## Details

Characterize leaves.



## Nonvascular Plants

Describe nonvascular plants.

	Definition	Three Divisions
Nonvascular Plants	plants that lack specialized tissues for transporting water and nutrients	<ul style="list-style-type: none"><li>mosses</li><li>liverworts</li><li>hornworts</li></ul>

## Vascular Seedless Plants

Define vascular plant.

Vascular plant: a plant that has specialized tissues, called vascular tissues, that transport water and nutrients throughout the plant

Identify the characteristic shared by ferns, horsetails, and club mosses.

Ferns, horsetails, and club mosses are three types of vascular plants that do not produce seeds.

## Lesson 1 | Plant Diversity (continued)

### Main Idea

#### Vascular Seed Plants

Sample examples are shown.

### Details

 **Classify** *vascular seed plants.*

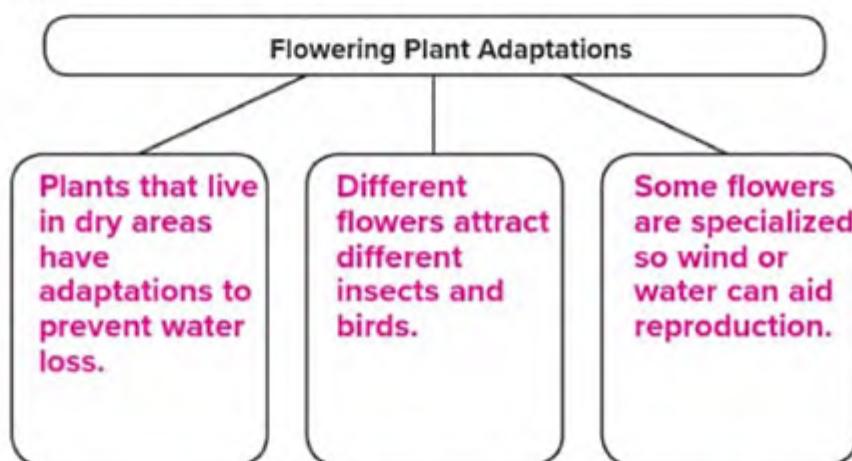
Vascular Seed Plants		
Two types	gymnosperm	angiosperm
Definitions	plants that produce seeds that are not part of a fruit	plants that produce flowers and develop fruits
Examples	<ul style="list-style-type: none"><li>cycad</li><li>gingko</li><li>conifer</li><li>gnetophyte</li></ul>	<ul style="list-style-type: none"><li>poppy</li><li>palm tree</li><li>cactus</li><li>grass</li></ul>

 **Paraphrase** *the primary difference between the two groups of vascular seed plants.*

One group produces flowers and fruits; the other does not.

Sample answers are shown.

 **Identify** *three ways flowering plants can be adapted to different environments.*



 **Connect It** Consider the plants you routinely see around your home or school. Describe four of them using concepts you have learned in Lesson 1.

Accept all reasonable responses. Sample answer: The plants in the garden are angiosperms. The tree in the yard has a woody stem, but the daisies by the mailbox have herbaceous stems. The fern on my teacher's desk is a vascular seedless plant.

## Lesson 2 Plant Reproduction

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

### Main Idea

#### Asexual Reproduction



#### Sexual Reproduction

### Details



#### Characterize



#### Sequence

#### sexual reproduction in plants.



#### Compare and contrast

#### asexual and sexual reproduction in plants.

Asexual	Both	Sexual
<b>one parent, genetically identical offspring</b>	produce offspring	<b>two parents, genetically different offspring</b>

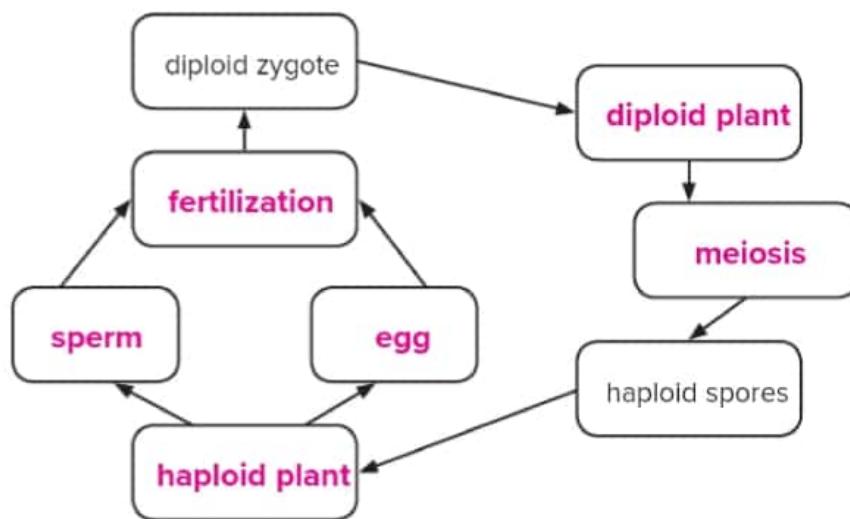
## Lesson 2 | Plant Reproduction (continued)

### Main Idea

#### Plant Life Cycles

### Details

**Diagram** the life cycle of plants.



**Contrast** the formation of reproductive cells in seedless and seed plants.

Seedless Plants	Seed Plants
<p><b>Mature plant produces spores; spore produces gametophyte; gametophyte produces sperm and egg.</b></p>	<p><b>Mature plant produces pollen, which contains sperm, and female structures that produce eggs.</b></p>

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**Identify** processes of seed plant reproduction.

#### **pollination**

Pollen is transferred to a female plant structure; a seed forms.

#### **dormancy**

The seed goes through a period of no growth.

#### **germination**

The seed begins to grow when conditions are favorable.

## Lesson 2 | Plant Reproduction (continued)

### Main Idea

### Details

**Key** **Contrast** female reproductive parts of a gymnosperm and an angiosperm. Use the following terms in your explanations.

eggs

seed

pistil

Gymnosperm	Angiosperm
Eggs (and after fertilization, the seeds) are contained within female cone.	The pistil, inside the flower, contains the ovary where the seed develops.

**Define** parts of a flower.

Pistil: the female reproductive organ

Stamen: the male reproductive organ

Anthers: structures on the stamen that produce pollen

**Describe** the gametophyte stage of a flowering plant.

Gametophyte stage:  
**production of eggs and sperm by the flower**

Beginning of sporophyte stage:  
**fertilization**

**Differentiate** growth cycles of seed plants.

**Annuals**  
grow from a seed and produce flowers in one season

**Biennials**  
take two seasons to produce flowers

**Perennials**  
grow and bud for many years

**Key** **Analyze It** Carrots and beets are biennial plants with large roots that store food between growing seasons. Hypothesize what these plants might look like if you planted them in a garden, but instead of harvesting them to eat, left them in the ground to grow in the next season.

Accept all reasonable responses. Sample answer: The plants would flower and seed.

# Lesson 3 Plant Processes

**Predict** three facts that will be discussed in Lesson 3 after reading the headings. Record your predictions in your Science Journal.

## Main Idea

Photosynthesis and Cellular Respiration

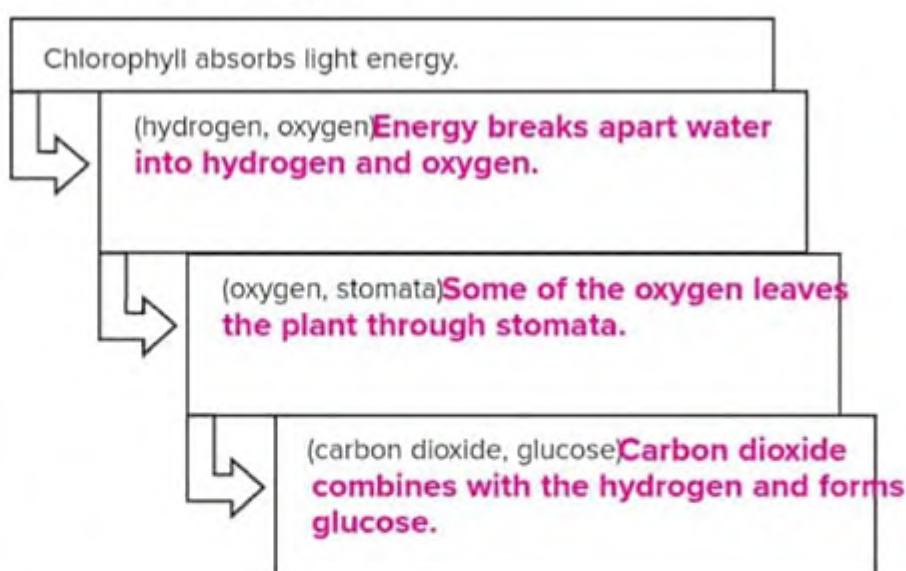


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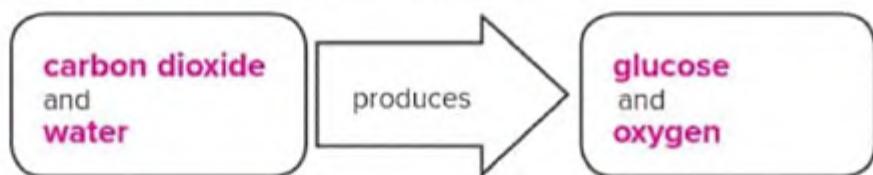
**Relate** the importance of plants to all animal life.

**All animals either eat plants themselves or depend on other organisms that eat plants.**

**Sequence** the processes of photosynthesis. Use the words in parentheses in your explanations.



**Express** the process of photosynthesis.



**Differentiate** photosynthesis from cellular respiration.

Photosynthesis	Cellular Respiration
Carbon dioxide and water yield glucose and oxygen.	Glucose and oxygen yield carbon dioxide, water, and ATP.

## Lesson 3 | Plant Processes (continued)

### Main Idea

### Details

**Compare** ways in which plants and animals both use oxygen.  
**Both plant and animal cells use oxygen during cellular respiration.**

### Movement of Nutrients and Water

**Contrast** absorption and transpiration.

Absorption	Transpiration
Roots absorb water and nutrients from the soil.	Stomata in leaves release water vapor.

### Plant Responses

**Categorize** plant responses.

Stimulus	Tropism	Description
light	Positive phototropism	Leaves grow toward the light.
gravity	Negative gravitropism	Stems grow away from the ground.
touch	Thigmotropism	Tendrils coil around an object.

**Synthesize It** Why is it beneficial to humans to know about the plant processes discussed in Lesson 3?

**Accept all reasonable responses.** Sample answer: People rely directly or indirectly on plants for all of our food. We can cultivate plants for our own food production, and the plants will be more productive if we ensure that they get proper light and water for photosynthesis.

# Guide the Investigation / Suggested Pacing

## Day 1

### It's alive! Or is it?

- Introduce the project by reading the section titled **It's alive! Or is it?**
- Review what students know about cells and identify misconceptions.
- Explain the activity's goal. Students should conduct an investigation designed to determine the nature of three unidentified samples.

### Get Started!

- Outline the activity by reading the **Get Started!** section.
- Provide students with materials and tools they will have available to them to conduct their investigation.
- Remind students that the questions to be answered are: Is the sample living or nonliving? Does the sample consist of one cell or many cells? Is the sample made of one type of cell or many types of cells?



## Day 2

### Get Started!

- Guidelines specified on **Day 1** should continue.
- Students should use their lists to conduct their investigations. Remind students to record their observations.
- Once all student investigations are complete, reveal the composition of the three samples.
- If there is time, have students briefly describe their investigation and evidence to the other groups.

### Finish Up!

- Explain to students that a memo is a brief written message or summary of information.
- Ask guiding questions to help students identify the strengths and weaknesses of their investigations.
- Generate a discussion about the last bullet point on the **Finish Up!** section. Ask the class to use the evidence from all groups to generate a list of general characteristics of living things. Have them make another list for cells. Is this easier than using just one group's evidence? Why or why not?
- In the last bullet point, students are asked to write lists of characteristics to determine whether an object:
  - is living or nonliving **Possible answer: A living organism is made up of one or more cells. A nonliving thing does not contain cells.**
  - is made of one or many cells **Possible answer: Many microscopic organisms, such as bacteria and protists, are made up of only one cell. Most organisms that can be observed without the aid of a microscope are made up of many cells.**
  - contains one type of cell or many types of cells **Possible answer: Most organisms that are made up of more than one cell have different types of cells.**