Project QuEST
Model Life Science Lessons
Cycles Set

These materials were produced by CREATE with funding from the U.S Department of Education (ED), Institute of Education Sciences, under Contract No. ED-R305A05056. The opinions expressed herein do not necessarily reflect the positions or policies of ED.

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Project QuEST
Model Life Science Lesson
Teacher Guide: The Carbon Cycle

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Middle School Science: Life Science

Cycles Set: The Carbon Cycle

Framework for K-12 Science Education: Dimension 3—Life Science

- **Disciplinary Core Idea (LS2.B)—Cycles of Matter and Energy Transfer in Ecosystems***:* Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact-primarily for food-within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. For example, when molecules from food react with oxygen captured from the environment, the carbon dioxide and water thus produces are transferred back to the environment, and ultimately so are waste products, such as fecal material. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem.
- **Science and Engineering Practices**: Developing and Using Models
- **Crosscutting Concepts**: Energy and Matter

Connections to the Common Core State Standards (ELA)

- **WHST.2**: Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
- **L6**: Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Connection to the Common Core State Standards (Math)

- **5.0A** : Analyze patterns and relationships.

Connections to English Language Development Standards[1]

- **ELD Standard 4**: Language of Science
    - **Reading**: Explain the carbon cycle or the carbon-dioxide oxygen cycle by sketching and labeling it with information from a reading passage.

[1] Because the WIDA English language development standards are currently used in 29 states, we reference these standards.

- **Writing**: Explain the ways nature recycles by writing a paragraph based on a video and diagram.
- **Listening**: Record the places in the environment where carbon occurs while watching a video.
- **Speaking**: Describe the carbon cycle to a partner using a word bank of key terms.

Overview of Activities

Focus Activity

- **Student Activity I: Rating and Discussion of Science, Language, and Vocabulary Objectives.** Teacher posts lesson objective poster; students rate their prior knowledge of each objective; brief discussion.

Engagement

- **Student Activity II: Food Webs and Food Chains Lesson Review.** Students answer review questions from previous lesson; teacher displays the answers; students correct responses as necessary.

- **Student Activity III: Pre-teaching of Science Content Words.** Teacher displays PowerPoint slides of science content words one at a time; teacher reads script aloud and elicits responses to teach the following: *organic*, *organic compound*, *matter*, *molecule*, *element*, *carbon cycle*.

- **Student Activity IV: Introduction to Matter.** Teacher reads the sentences about matter; students take notes in Student Chart 1.4.

- **Student Activity V: Elements and Compounds.** Teacher explains the periodic table of elements; teacher introduces elements found in organic compounds; students take notes to fill in questions #1 and #2 in Student Chart 1.5; teacher identifies some organic compounds; students take notes to fill in question #3 in Student Chart 1.5.

- **Student Activity VI: Carbon Cycle Video.** Teacher explains directions in Student Chart 1.6; teacher plays Carbon Cycle video; students complete question #2 in Student Chart 1.6; whole group discussion; students complete questions #3 and #4 in Student Chart 1.6; whole group discussion; teacher explains directions in Student Chart 1.7; students work in pairs to answer questions #1 and #2; teacher displays responses; whole group discussion.

Explanation and Exploration

- **Student Activity VII: Carbon Cycle Game**. Teacher reviews directions and displays the Carbon Cycle game to class; teacher quizzes students on facts and negotiates

game; students answer questions #1 and #2 in Student Chart 1.8; teacher displays responses; whole group discussion.

- **Student Activity VIII: How Does Nature Recycle?** Teacher reviews directions; oral discussion of the question; students complete Student Chart 1.9; several students share out.

Elaboration

- **Student Activity IX: General Academic Word Cards.** Teacher displays PowerPoint slides of general academic words one at a time; teacher reads script aloud and elicits responses to teach the following: *analyze.*

- **Student Activity X: Interactive Reading.** Teacher discusses text illustrations; one student reads guiding questions; teacher and students participate in shared interactive reading; teacher and students discuss guiding questions; students respond to guiding question by creating and presenting posters.

Evaluation

- **Student Activity XI: Glossary and Key Facts.** Students complete glossary for science content words, answer questions related to key content, and indicate if there is anything else they would like to learn about; whole class review.

Extension/Differentiation

- **Student Activity XII: Nitrogen Cycle Video.** Teacher asks students about nitrogen; teacher reads the guiding question; teacher plays the video; students orally discuss the answer to the guiding question; teacher displays the response; whole group discussion.

- **Student Activity XIII: Nitrogen Cycle.** Teacher displays the diagram and reads the question about the nitrogen cycle; whole group discussion

- **Student Activity XIV Nitrogen Cycle Game.**

- **Student Activity XV: Interactive Activity on the Nitrogen Cycle**.

QuEST Middle School Life Science

The Carbon Cycle

Objectives

- Science:
  - Students will be able to identify organic compounds and explain how they are recycled in the carbon cycle.
- Language:
  - Students will be able to watch and listen to a video on the carbon cycle and answer questions in writing with a partner.
  - Students will be able to read a passage on the carbon cycle and demonstrate comprehension by drawing and labeling a cycle.

Vocabulary

- Science content: *organic*, *organic compound*, *matter*, *molecule*, *element*, *carbon cycle*
- General academic: *analyze*

Teacher Management

Estimated time for completion, in minutes: 90

Materials

- For each student pair: access to a computer with internet connection

Teacher Prep

1. Review detailed lesson plan in the Teacher Guide.
2. Pull out the Activity Overview page(s), PowerPoint lesson guides, and student charts and add any necessary notes to them from the detailed lesson plan to help guide the lesson.
3. If necessary, organize activities to fit school schedule.
4. Download PowerPoint slides.
5. Display vocabulary cards on the Word Wall.
6. Group students for partner/small group work.

Safety Considerations:

None.

Vocabulary-Building Strategies

- Explicit interactive presentation of vocabulary cards
- Word Wall
- Glossary work

Background Information for Teacher

- ACCESS, pages 118–119

Lesson Content

Focus Activity/Warm-Up

Student Activity I (slides 3–8, Lesson Objective poster, Student Charts 1.2 and 1.3)
5 minutes
Activity Overview: Rating and Discussion of Science, Language, and Vocabulary Objectives. Teacher posts lesson objective cards; students rate their prior knowledge of each objective; brief discussion.

- Before students enter the room, display the science objectives.
- Make sure the ratings of the previous class have been erased.
- As they enter the classroom, have students rate their prior knowledge of each objective on a continuum of 1 to 4 (1=none, 4=a lot).
- Have students begin the review questions in Student Chart 1.1 until all students have rated their knowledge of the objectives.
- Review correct responses to review activity (see Activity II below).
- Have students turn to Student Chart 1.2.
- Read the science objectives aloud, one at a time, reporting students' level of prior knowledge.
- Read the language objectives.
- Have students turn to Student Chart 1.3.
- Read vocabulary words aloud.
- As appropriate, have students use thumbs up/thumbs down to indicate prior knowledge.

Engagement

Student Activity II (slides 5–8, Student Chart 1.1)
5 minutes
Activity Overview: Lesson Review. Students answer review questions from previous lesson; teacher displays the answers; students correct responses as necessary.

- After students have rated their knowledge of the objectives and as they wait for their peers to enter the room, students should begin working on Student Chart 1.1.
- Once all students have displayed their knowledge of the objectives poster and have had 2 minutes to answer the review questions, have students read the review questions and answer them aloud.
- Display responses.

- Have students correct their responses as necessary.

Student Activity III (slides 9–14, Science Content Word Cards)
10 minutes
Activity Overview: Pre-teaching of Science Content Words. Teacher displays PowerPoint slides of science content words one at a time; teacher reads script aloud and elicits responses to teach the following: *organic*, *organic compound*, *matter*, *molecule*, *element*, *carbon cycle.*

- Have students turn to Lesson 1 glossary words.
- Read the target words aloud, one at a time.
- Have students rewrite the target words in English and in Spanish (as appropriate) in their glossaries.
- Display the slides of the science content words one at a time, reading the text on the right side of each PowerPoint slide aloud and eliciting responses from student pairs.
- Point to the appropriate parts of the pictures as you read through the notes.
- Depending on your class, you may want to read (or have a student read) the definitions in Spanish.
- Tell students they may continue to use the science content word cards on the word wall for reference.
- **Teacher note: To save time you may want to eliminate partner talk and just ask one student to answer the question.**

Student Activity IV (slides 15, Student Chart 1.4)
4 minutes
Activity Overview: Introduction to Matter. Teacher reads the sentences about matter; students take notes in Student Chart 1.4.

- Have students turn to Student Chart 1.4.
- Read the sentences including the target terms. This is a note-taking activity.
- Display the key terms about matter and have students fill in question #1 in Student Chart 1.4.

Student Activity V (slides 16 and 17, Student Chart 1.5)
7 minutes
Activity Overview: Elements and Compounds. Teacher explains the periodic table of elements; teacher introduces elements found in organic compounds; students take notes to fill in questions #1 and #2 in Student Chart 1.5; teacher identifies some organic compounds; students take notes to fill in question #3 in Student Chart 1.5.

- Have students turn to Student Chart 1.5.
- Explain the periodic table of elements.
- Use the animated cues to introduce the elements that are often (but not always) found in organic compounds: hydrogen, carbon, oxygen, nitrogen, and phosphorus.

- This is a note-taking activity. Have students complete questions #1and #2 in Student Chart 1.5 by circling the element and writing its name.
- Have students generate organic compounds with your help.
- Have students complete question #3 in Student Chart 1.5 [glucose, carbohydrates, methane, proteins, etc.].

Student Activity VI (slides 18–20, Student Chart 1.6)
8 minutes
Activity Overview: Carbon Cycle Video. Teacher explains directions in Student Chart 1.6; teacher plays Carbon Cycle video; students complete question #2 in Student Chart 1.6; whole group discussion; students complete questions #3 and #4 in Student Chart 1.6; whole group discussion; teacher explains directions in Student Chart 1.7; students work in pairs to answer questions #1 and #2; teacher displays responses; whole group discussion.

- Have students turn to Student Chart 1.6.
- Read directions on Student Chart 1.6.
- Play the Brainpop video, "Carbon Cycle" [2:32].
- Have students complete question #2 in Student Chart 1.6.
- Discuss responses.
- Replay the video as necessary.
- Have students complete questions #3 and #4 in Student Chart 1.6.
- Discuss responses.
- Have students turn to Student Chart 1.7.
- Read directions to questions #1 and #2.
- Have students work in pairs to answer questions #1 and #2.
- Display responses and discuss.
- Have students correct responses as necessary.

Explanation and Exploration

Student Activity VII (slide 21, Student Chart 1.8, access to a computer)
8 minutes
Activity Overview: Carbon Cycle Game. Teacher reviews directions and displays the Carbon Cycle game to class; teacher quizzes students on facts and negotiates game; students answer questions #1 and #2 in Student Chart 1.8; teacher displays responses; whole group discussion.

- Have students turn to Student Chart 1.8.
- Click on the Carbon Cycle Game: http://www.windows2universe.org/earth/climate/carbon_cycle.html
- Negotiate the game as a class, reading each bulletin and quizzing the students on the facts that appear.
- Have students answer questions #1 and #2 in Student Chart 1.8.

- Display responses to question #1 and discuss.
- Have students correct responses as necessary.
- Have students share their answers to #2 aloud.
- **Teacher note: If students have access to computers, they can play in small groups.**

Student Activity VIII (slide 22, Student Chart 1.9)
8 minutes
Activity Overview: How Does Nature Recycle? Teacher reviews directions; oral discussion of the question; students complete Student Chart 1.9; several students share out.

- Have students turn to Student Chart 1.9.
- Read directions.
- Ask students to orally describe how nature recycles in the carbon cycle and in this food chain.
- Whole group discussion.
- Have students write their paragraph in Student Chart 1.9.
- Call on several students to share out.

Elaboration

Student Activity IX (slides 23 and 24 , General Academic Word Cards)
2 minutes
Activity Overview: General Academic Word Cards. Teacher displays PowerPoint slides of science content words one at a time; teacher reads script aloud and elicits responses to teach the following: *analyze*.

- Read each general academic vocabulary word to students.
- If you like, have students use thumbs up/thumbs down to indicate prior knowledge.
- Have students turn to the Lesson 1 glossary words.
- Read the target word aloud.
- Have students rewrite the target word in English and in Spanish (as appropriate) in their glossaries.
- Point to the appropriate part of the picture as you read through the notes.
- Depending on your class, you may want to read (or have a student read) the definition in Spanish.
- Ask one student pair to answer the question. [Anticipated responses: To find out how well I understand the subjects, how my behavior in class is, if I need extra help, etc.].
- Tell students they may continue to use the general academic word cards on the word wall for reference.
- **Teacher note: To save time you may want to eliminate partner talk and just ask one student to answer the question.**

Student Activity X (slides 25–29, Student Charts 1.10–1.12)
12 minutes

- ACCESS, pgs 117–119

Activity Overview: Interactive Reading. Teacher discusses text illustrations; one student reads guiding questions; teacher and students participate in shared interactive reading; teacher and students discuss guiding questions; students respond to guiding question; teacher posts correct response; students revise responses as necessary.

- **Preview**
  - Have students turn to Student Chart 1.10.
  - Read the guiding question aloud.
  - Review all illustrations in the text with students using the document camera.
- **Text**
  - Have students turn to Student Chart 1.11.
  - Read text aloud to students as they follow in their Student Chart.
  - Stop and clarify text if necessary.
  - Ask students embedded questions. Elaborate on their responses as necessary.
  - When you get to a figure, stop reading and have students look at the figure as you discuss it.
- **Guiding questions**
  - Have students turn to Student Chart 1.12.
  - Have students complete the chart.
  - Have students display their answers under the document camera.
  - Whole class discussion.

Evaluation

Student Activity XI (slides 30–32, Student Charts 1.13–1.15, Glossary)
8 minutes

Activity Overview: Glossary and Key Facts and Questions for Further Study. Students complete glossary for science content words, answer questions related to key content, and indicate if there is anything else they would like to learn about; whole class review.

- **Glossary work**
  - Have students locate Student Chart 1.13.
  - For each science content word, have students work in pairs to indicate whether the word is a cognate and to fill in the rest of the information required by the glossary.
  - Review glossary entries with class.
- **Key information**

- Have students turn to Student Chart 1.14.
- Give students several minutes to complete the questions.
- Display responses and discuss.
- Have students correct responses as necessary.

- **Questions for further study**
  - Have students turn to Student Chart 1.15.
  - Have students complete Student Chart.
  - As time permits, have students share their questions with a partner, with the whole class, or have them write them on a sticky note and put them on a "questions wall" on their way out of class. Students who finish an assessment or who have free time might be assigned to go online to find answers to class questions.

Extension

Student Activity XII (slide 35, Student Chart 1.16)
7 minutes
Activity Overview: Nitrogen Cycle Video.

- Have students turn to Student Chart 1.16.
- Explain to students that there is another well known cycle, called the "nitrogen cycle."
- Ask students: Is air mostly oxygen or nitrogen? Take class vote.
- Display response.
- Read the guiding question.
- Play the Brainpop video, "Nitrogen Cycle" [1:19].
- Discuss the answer to the guiding question.
- Then display the information that answers the guiding question and review it once more.
- **Teacher note: There is more nitrogen cycle information available in the Extension section.**

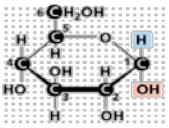
Student Activity XIII (slide 36, Student Chart 1.17)
4 minutes
Activity Overview: Nitrogen Cycle Discussion.

- Have students turn to Student Chart 1.17.
- Use this diagram to further explain the nitrogen cycle.
- Ask students the discussion question.
- Whole group discussion (answers will vary widely).
-

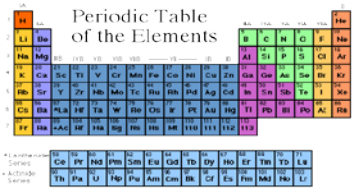
Student Activity XIV: Nitrogen Cycle Game.

Student Activity XV: Interactive Activity on the Nitrogen Cycle.

Slide 1



Cycles Set



Lesson 1:
The Carbon Cycle

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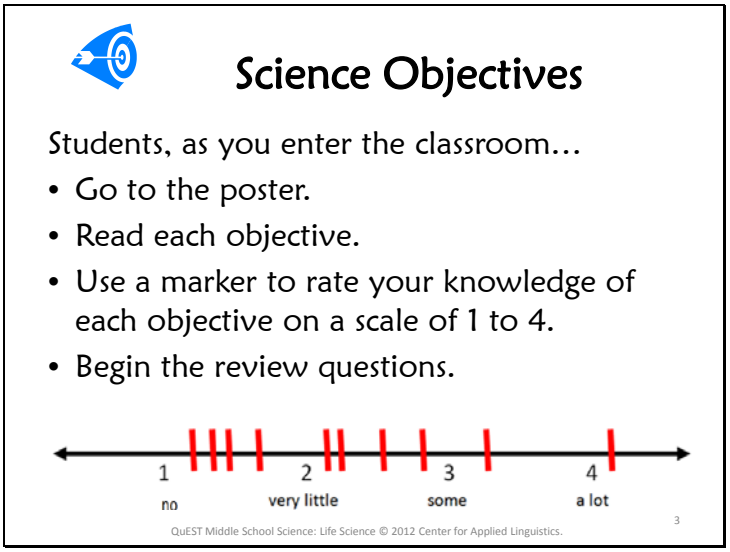
Slide 2

Cycles Lesson 1: Teacher Preparation

- Erase the ratings from the previous class on the objectives poster.
- Decide how students will access the online Carbon Cycle Game: individually, in pairs, or as a whole class.

Slide 3



Pacing: 3 minutes.

[There is no Student Chart for this slide].

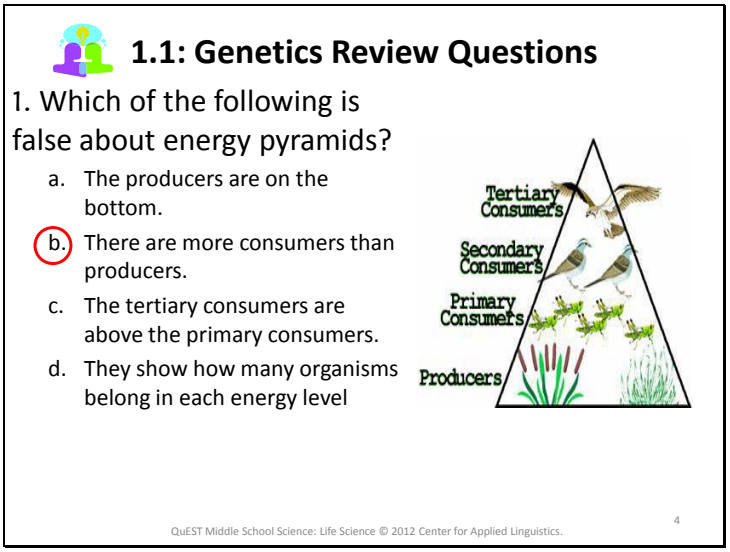
•Before students enter the room, display the science objectives.

•Make sure the ratings of the previous class have been erased.

•As they enter the classroom, have students rate their prior knowledge of each objective on a continuum of 1-4 (1=no to 4=a lot).

•Have students complete the review questions in Student Chart 2.1.

Slide 4



Pacing: 1 minute.

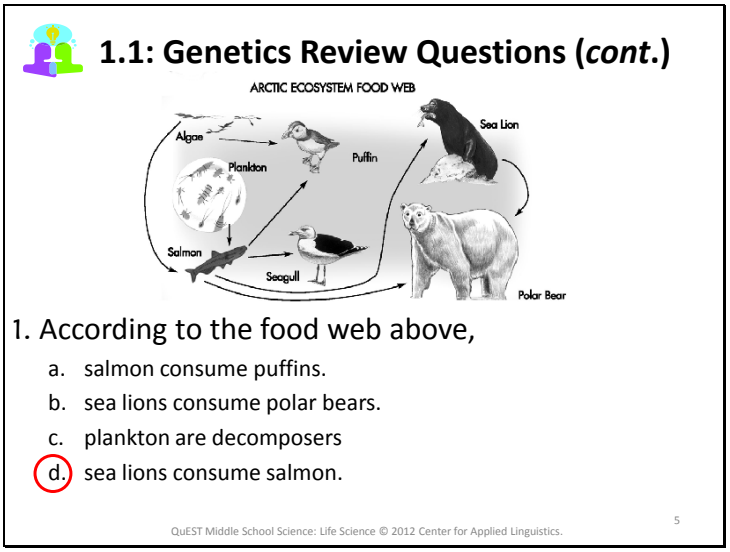
•[Students need to complete Student Chart 4.1 on their own or in pairs before questions are reviewed].

•Have one student read #1 from Student Chart 4.1 and answer it aloud.

•Display response.

•Have students correct student response as necessary.

Slide 5



Pacing: 2 minutes.

•Have one student read #1 from Student Chart 4.1 and answer it aloud.

•Display response.

•Have students correct student response as necessary.

Slide 6

1.1: Review Question (*cont.*)

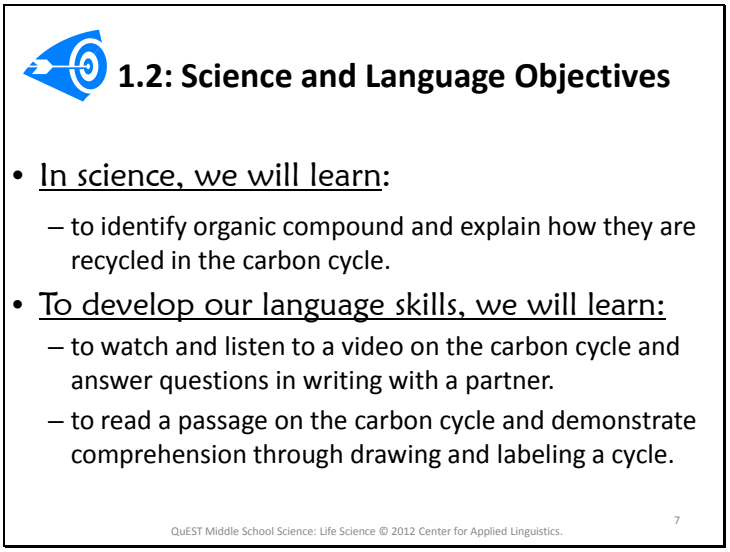
Choose from the following words to complete the sentences:

consumers, decomposer, heredity, petal, predator-prey relationship, producers, source

3. A __petal__ is the colorful leaf-like part of the flower.
4. Mushrooms and bacteria are examples of a type of __decomposer__.
5. Most __producers__ use photosynthesis to produce energy.
6. Humans are __consumers__.
7. __Heredity__ is the passing of genetic traits from parent to offspring.
8. Frogs eating insects is an example of a __predator-prey relationship__.
9. Factories can be a __source__ of pollution.

- **Pacing: 2 minutes.**
- Follow the same routine as you did with questions #1-2.

Slide 7



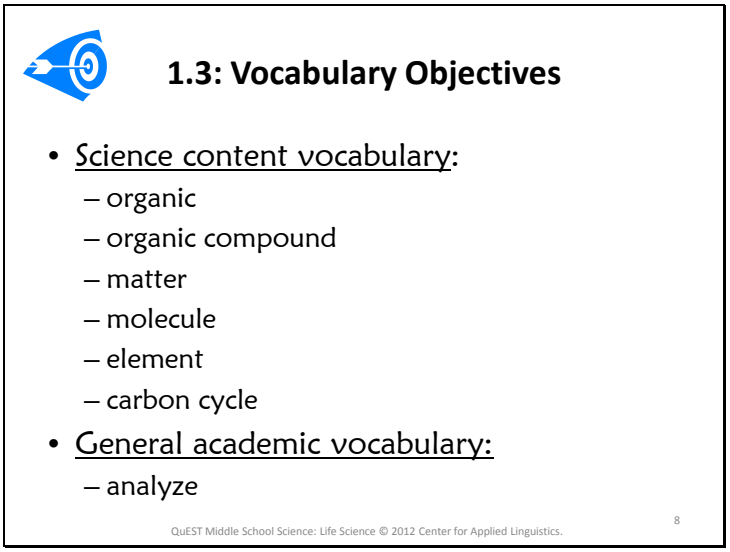
Pacing: 1 minute.

•Have students turn to Student Chart 1.2.

•Read the science objectives aloud, one at a time, reporting students' level of prior knowledge.

•Read the language objectives.

Slide 8



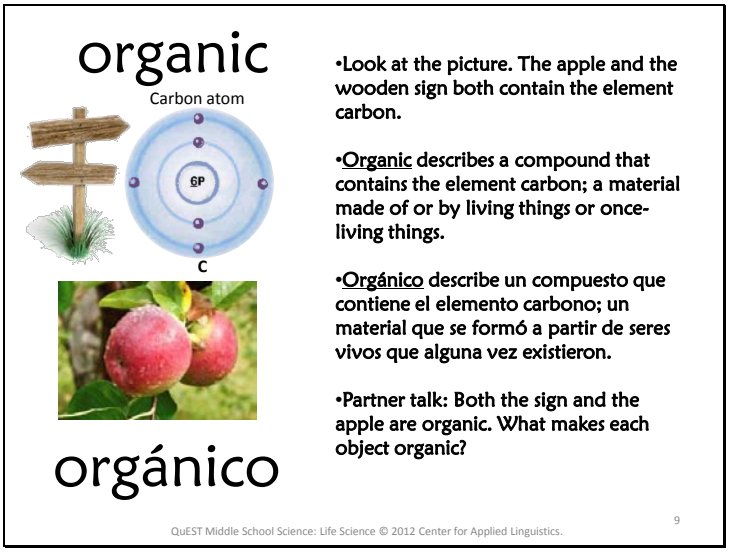
Pacing: 1 minute.

•Have students turn to Student Chart 1.3.

•Read vocabulary words aloud.

•If you like, have students use thumbs up/thumbs down to indicate prior knowledge.

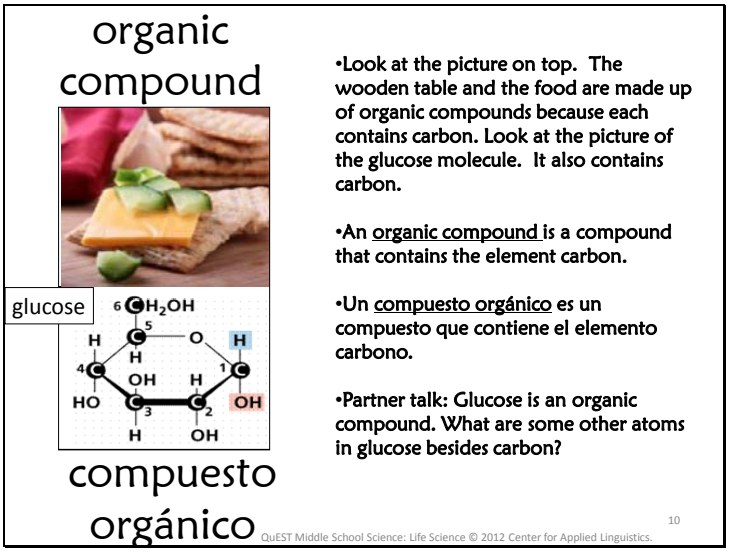
Slide 9



- **Pacing: <2 minutes.**
- Have students turn to lesson 1 glossary words.
- Read the target word aloud.
- Have students rewrite the target word in English and in Spanish (as appropriate) in their glossaries.
- Read through the notes on the right side of the slide.
- Point to the appropriate part of the picture as you read through the notes.
- Depending on your class, you may want to read (or have a student read) the definition in Spanish.
- Ask one student pair to answer the question. [Anticipated response: the wooden sign comes from a once-living tree; the apple is still living].

- Teacher note: To save time you may want to eliminate partner talk and just ask one student to answer the question.

Slide 10

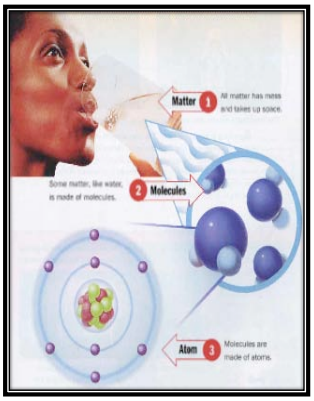


- **Pacing: <2 minutes.**
- Follow the same routine.
- Ask one student to answer the question.

[Anticipated responses: hydrogen and oxygen].

Slide 11

matter



•Look at the picture. The water, the ice cube, and the glass all have mass and take up space; they are forms of matter.

•Matter is anything that has mass and takes up space. It includes heat, sound, and light.

•El materia es cualquier cosa que tiene masa y ocupa espacio y que está compuesta de diferentes tipos de átomos; incluye el calor, el sonido o la luz.

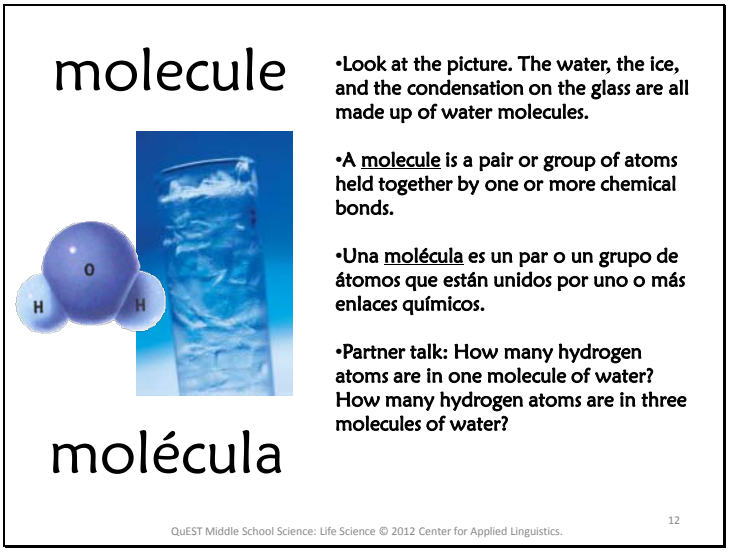
•Partner talk: Give your partner some clues about one form of matter in your classroom. Let them guess what it is.

materia

11

- **Pacing: <2 minutes.**
- Follow the same routine.
- Ask one student to answer the question. [Responses will vary].

Slide 12

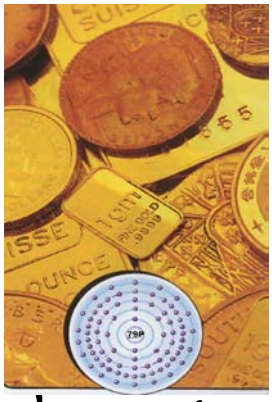


- **Pacing: <2 minutes.**
- Follow the same routine.
- Ask one student to answer the question.

[Anticipated response: two; six].

Slide 13

element



elemento

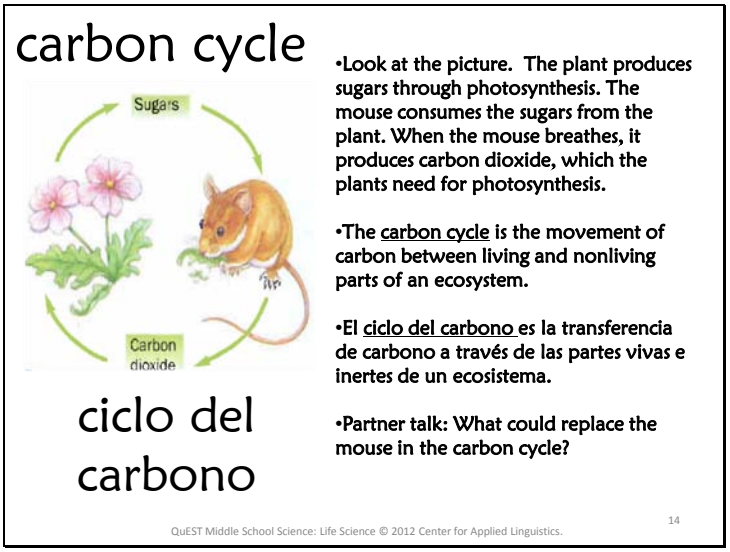
- Look at the picture. It shows the element gold.
- An element is a substance that cannot be split into simpler substances. Each element is made of just one kind of atom.
- Un elemento es material natural o sintético que no puede romperse en materiales más simples. Cada elemento está compuesto de solo un tipo de átomo.
- Partner talk: What is the difference between the element oxygen and the element gold?

13

- **Pacing: <2 minutes.**
- Follow the same routine.
- Ask one student to answer the question.

[Anticipated response: oxygen is a gas; gold is solid; gold is worth more; there is more oxygen than gold in the world; they have different numbers of protons, neutrons, and electrons].

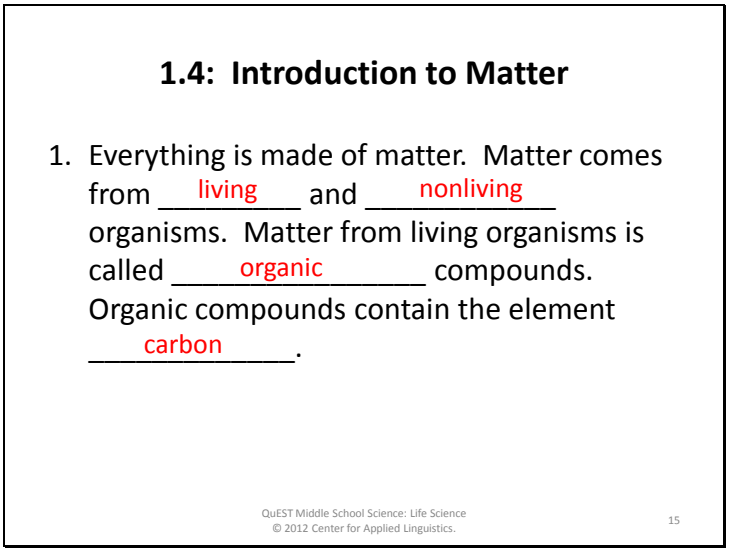
Slide 14



- **Pacing: <2 minutes.**
- Follow the same routine.
- Ask one student to answer the question.

[Anticipated responses: another herbivore].

Slide 15

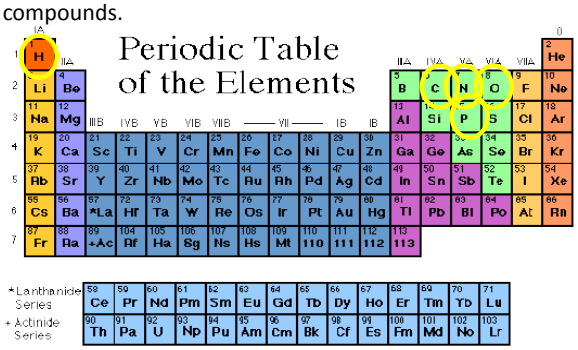


•**Pacing: 4 minutes.**
•Have students turn to Student Chart 1.4.
•Read the sentences including the target terms. **This is a note-taking activity.**
•Display the key terms about matter and have students fill in #1 in Student Chart 1.4.

Slide 16

1.5: Elements and Compounds

1. Circle the elements that are often (but not always) found in organic compounds.



2. The elements in organic compounds are carbon, hydrogen, nitrogen, phosphorus, and oxygen.

16

•Pacing: 5 minutes.

•Have students turn to Student Chart 1.5.

•Explain the periodic table of elements.

•Use the animated cues to introduce the elements that are often (but not always) found in organic compounds: Hydrogen, Carbon, Oxygen, Nitrogen, and Phosphorus.

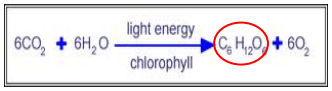
•This is a note-taking activity. Have students complete #1-2 in Student Chart 1.5—by circling the element and writing its name.

•Teacher's note: Each element is introduced one by one: the circles enter first in #1, followed by the name of the element in #2.

Slide 17

1.5: Elements and Compounds (*cont.*)

3. Can you name any organic compounds?
   – Hint: Think of the equation for photosynthesis:

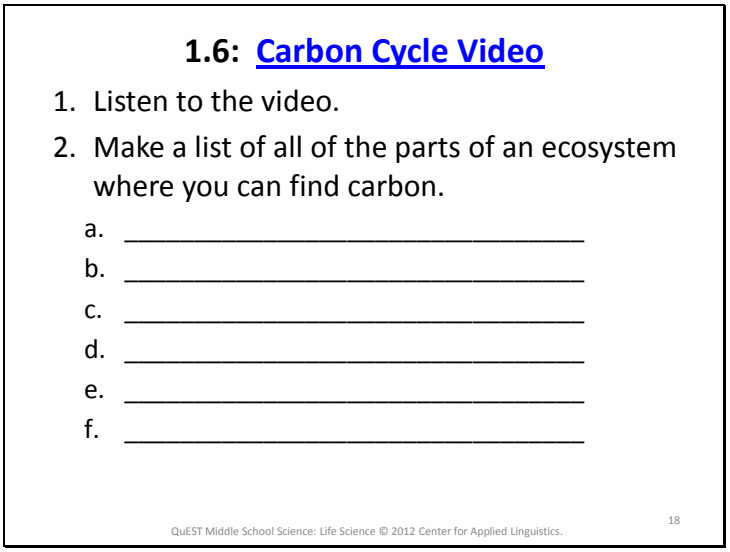


- _glucose_, _carbohydrates_, and _methane_.

Compound (molecular formula)	Structural formula
Methane CH_4	

•Pacing: 3 minutes.
•Have students generate organic compounds with your help.
•This is a note-taking activity. Students may not have familiarity with compounds. Display the compounds. Have students complete #3 in Student Chart 1.5 [glucose, carbohydrates, methane, proteins, etc.].

Slide 18

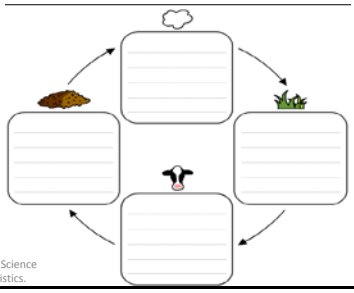


•Pacing: 4 minutes.
•Have students turn to Student Chart 1.6.
•Read directions on Student Chart 1.6.
•Play the Brainpop video, "Carbon Cycle" [2:32].
•Have students complete #2 in Student Chart 1.6.
•Discuss responses.

Slide 19

1.6 : Carbon Cycle Video (*cont.*)

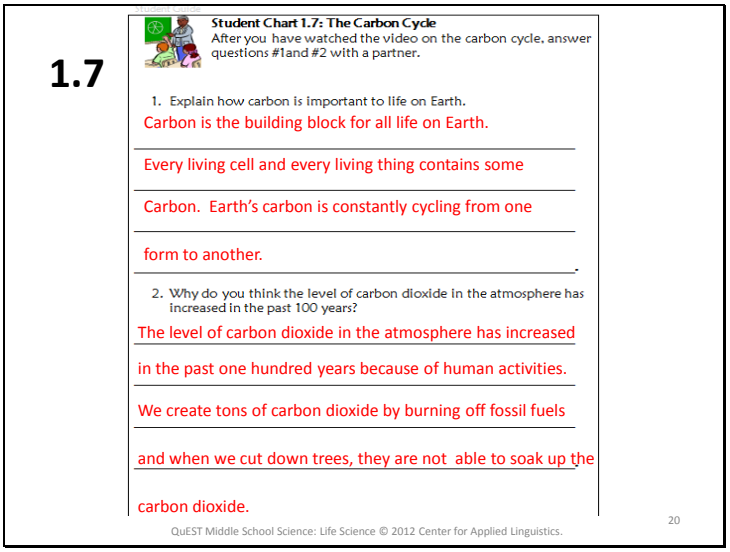
3. Use the key terms you need to explain the carbon cycle to your partner: *add, soak up, animals, breathe, plants, carbon dioxide, photosynthesis, ocean, atmosphere, die, earth's crust, volcano*
4. Write your explanation of the carbon cycle in the boxes below.



19

- **Pacing: 4 minutes.**
- Replay the video as necessary.
- Have students complete #3-4 in Student Chart 1.6.
- Discuss responses.

Slide 20

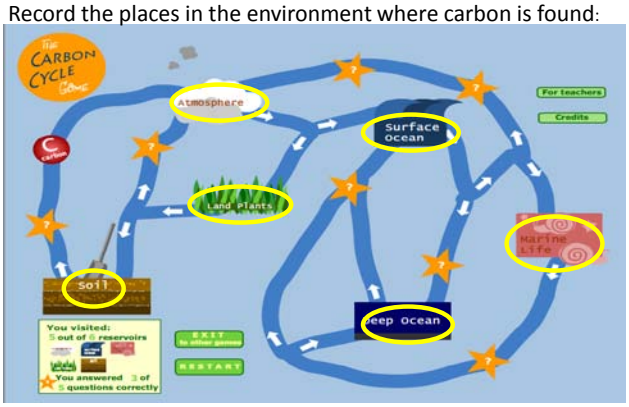


- **Pacing: 4 minutes.**
- Have students turn to Student Chart 1.7.
- Read directions to #1-2.
- Have students work in pairs to answer #1-2.
- Display responses and discuss.
- Have students correct responses as necessary.

Slide 21

1.8: Carbon Cycle Game

1. Record the places in the environment where carbon is found:

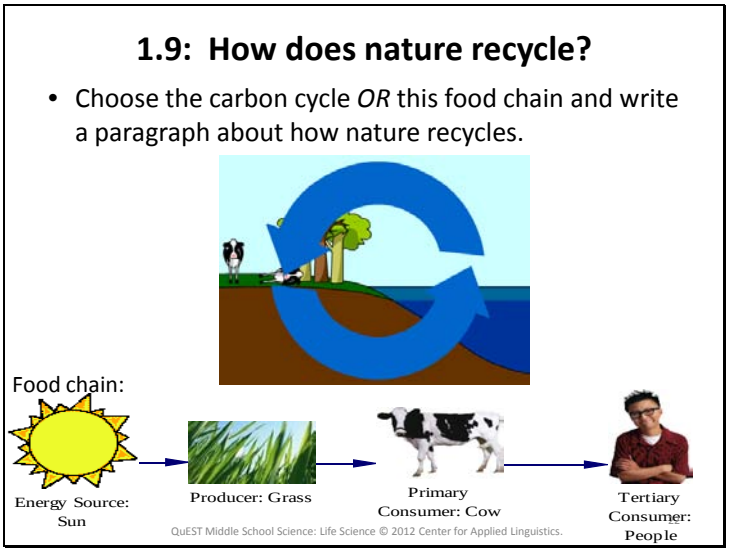


2. Write a fact about carbon that surprised you.

21

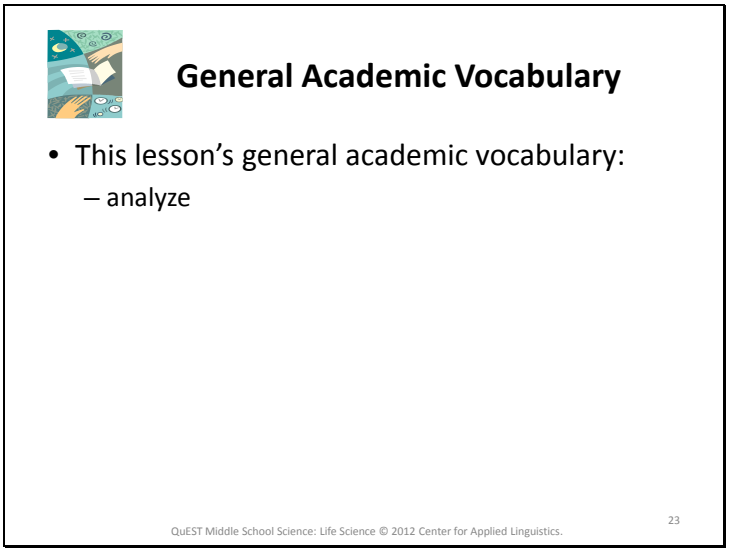
•Pacing: 8 minutes.
•Have students turn to Student Chart 1.8.
•Click on the Carbon Cycle Game:
http://www.windows2universe.org/earth/climate/carbon_cycle.html
•Negotiate the game as a class, reading each bulletin and quizzing the students on the facts that appear.
•Have students answer #1-2.
•Display responses to #1 and discuss.
•Have students correct responses as necessary.
•Have students share their answers to #2 aloud.
•Teacher's note: If you have student access to computers, they can play in small groups.

Slide 22



•Pacing: 8 minutes.
•Have students turn to Student Chart 1.11.
•Read directions.
•Ask students to orally describe how nature recycles in the carbon cycle and in this food chain.
•Whole group discussion.
•Have students write their paragraph in Student Chart 1.11.
•Call on several students to share out.

Slide 23



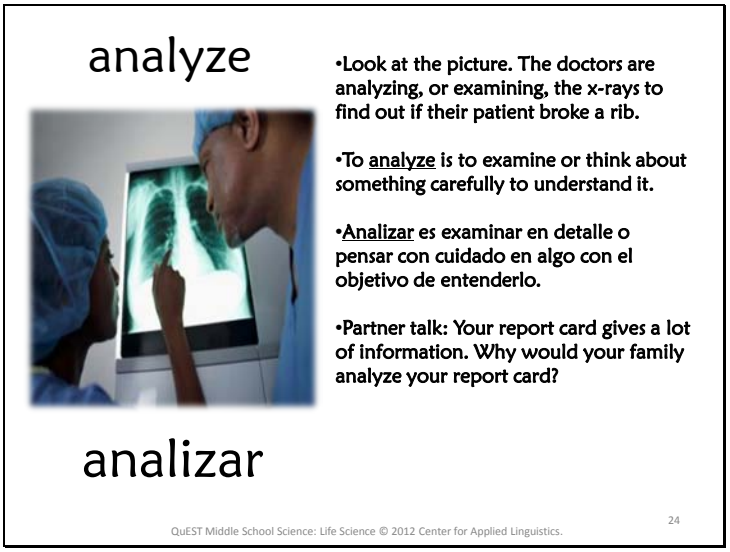
•Pacing: <1 minute.

[There is no Student Chart for this slide].

•Read each general academic vocabulary word to students.

•If you like, have student use thumbs up/thumbs down to indicate prior knowledge.

Slide 24



- **Pacing: 2 minutes.**
- Have students turn to lesson 1 glossary words.
- Read the target word aloud.
- Have students rewrite the target word in English and in Spanish (as appropriate) in their glossaries.
- Read through the notes on the right side of this PowerPoint slide.
- Point to the appropriate part of the picture as you read through the notes.
- Depending on your class, you may want to read (or have a student read) the definition in Spanish.
- Ask one student pair to answer the question. [Anticipated response: E.g., to find out how well I

understand the subjects, how my behavior in class is, if I need extra help, etc.].

- Teacher note: To save time you may want to eliminate partner talk and just ask one student to answer the question.

Slide 25

1.10: Interactive Reading—Preview

- Turn to Student Chart 1.10.
- Listen to the guiding question:
  - What are the nutrient cycles?
- As the text is read aloud, read along silently in your Student Chart and be prepared to answer the questions.

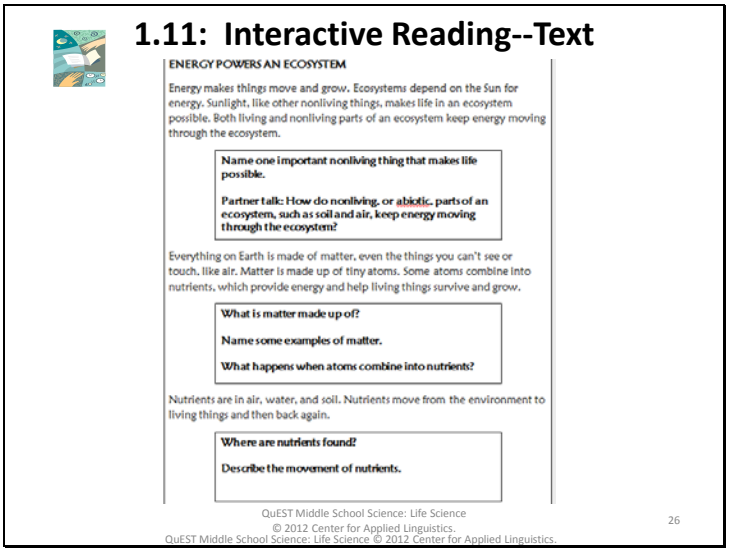
•Pacing: <1 minute.

•Have students turn to Student Chart 1.10.

•Read the guiding question aloud.

•Teacher's note: You may choose to display the ACCESS textbook under the ELMO.

Slide 26



•Pacing: 12 minutes for entire Interactive Reading.

•Have students turn to Student Chart 1.11.

•Read text aloud to students as they follow in their Student Chart.

•Stop and clarify text if necessary.

•Ask students embedded questions. Elaborate on their responses as necessary.

•When you get to a figure, stop reading and have students look at the figure as you discuss it.

Embedded Questions:

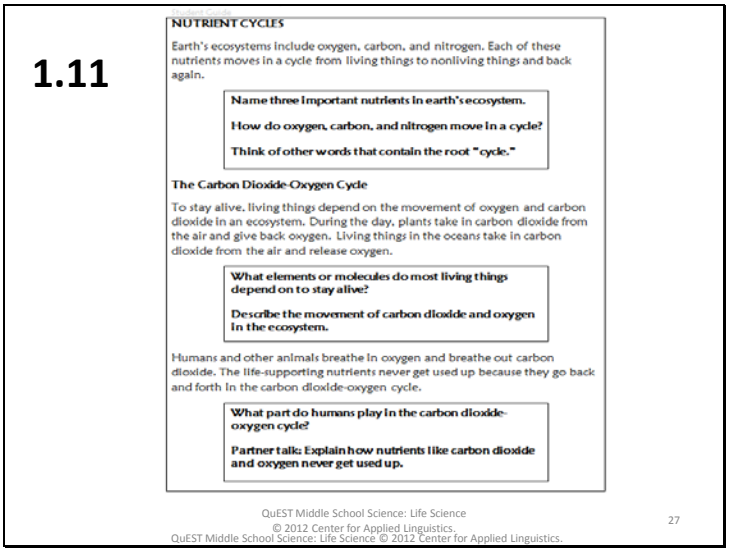
•**Name one important nonliving thing that makes life possible.** [the sun]

•**Partner talk: How do nonliving or abiotic parts of an ecosystem, such as soil and air, keep energy moving through the ecosystem?** [rocks can act as habitats; dead leaves can be used as food for decomposers; air provides oxygen for organisms; water sustains life; soil is used to grow new plants, etc.]

•**What is matter made up of?** [tiny atoms]

•**Name some examples of matter.** [it is made up of tiny atoms and includes everything on Earth—humans, desks, pencils, air, etc.]
•**What happens when atoms combine into nutrients?** [they provide energy and help living things survive].
•**Where are nutrients found?** [in air, water, and soil]
•**Describe the movement of nutrients.** [they move from the environment to living things and then back again]

Slide 27

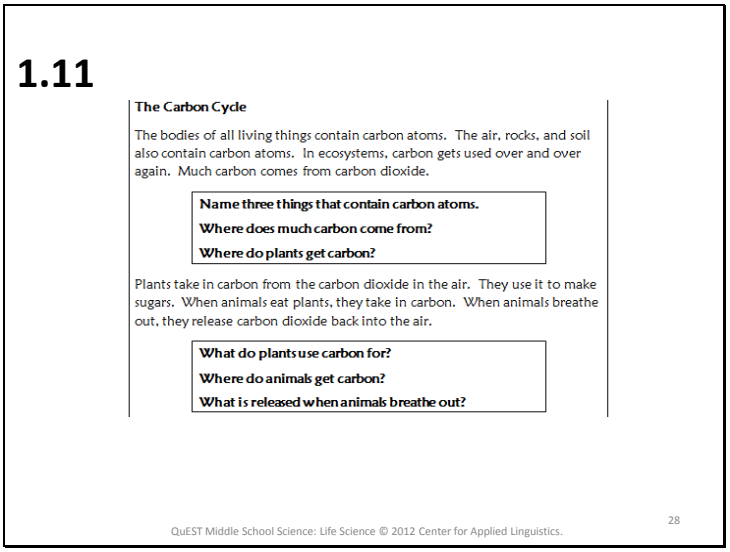


•Follow the same routine.

Embedded Questions:

•**Name three important nutrients in earth's ecosystem** [oxygen, carbon, and nitrogen]
•**How do oxygen, carbon, and nitrogen move in a cycle?** [they move from living things to nonliving things and back again]
•**Partner talk: Think of other words that contain the root "cycle."** [bicycle, recycle, cyclical, vicious cycle, etc.]
•**What elements or molecules do most living things depend on to stay alive?** [oxygen and carbon dioxide]
•**Describe the movement of carbon dioxide and oxygen in the ecosystem**. [plants take in CO2 and give back oxygen; living things in the oceans take in CO2 from the air and release oxygen].
•**What part do humans play in the carbon dioxide-oxygen cycle?** [humans take in oxygen and breathe out carbon dioxide].
•**Partner talk: Explain how nutrients like carbon dioxide and oxygen never get used up.**

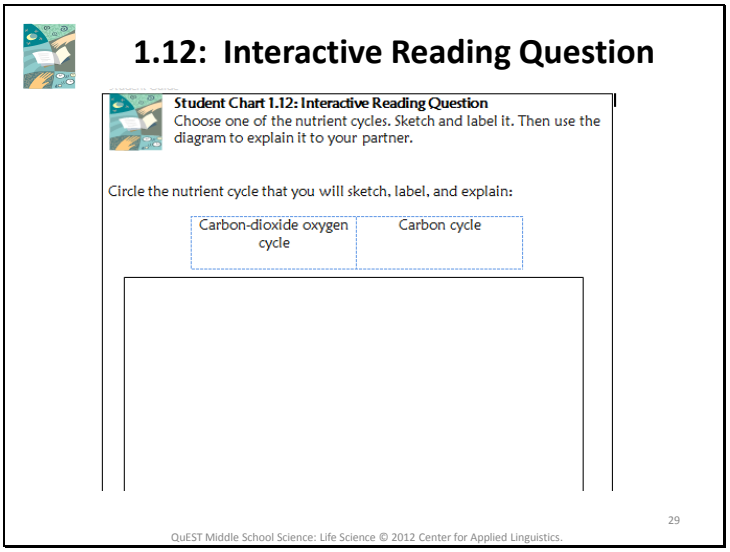
Slide 28



- Follow the same routine.
- Embedded questions:

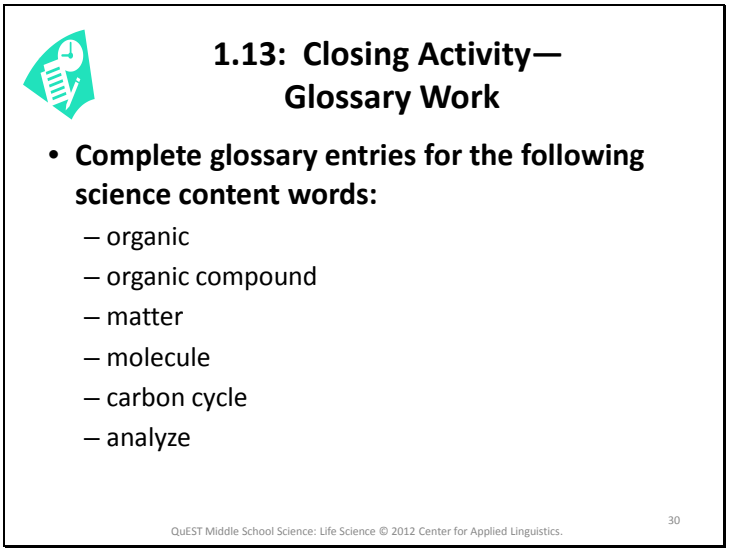
- **Name three things that contain carbon atoms.** [in living things; air, rocks, soil, carbon dioxide].
- **Where does much carbon come from?** [from carbon dioxide in the air]
- **Where do plants get carbon?** [from carbon dioxide].
- **What do plants use carbon for?** [to make glucose].
- **Where do animals get carbon?** [when they eat plants].
- **What is released when animals breathe out?** [carbon dioxide]

Slide 29



- Have students turn to Student Chart 1.12.
- Read the directions.
- Do the first example together.
- Display the answer.
- Have students complete the rest of the chart.
- Display responses and discuss.
- **Teacher's note: You may tell students to use Student Chart 1.6 for a diagram of the carbon cycle.**

Slide 30



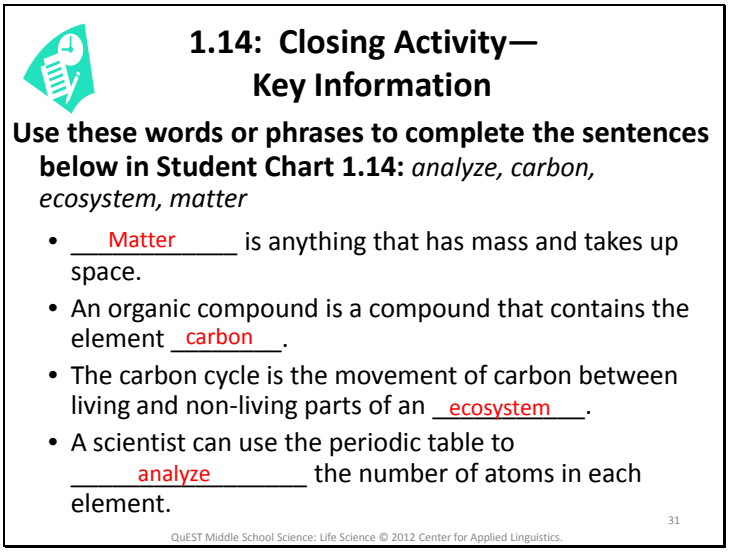
•Pacing: 5 minutes.

•Have students locate Student Chart 1.13.

•For each science content word, have students work in pairs to indicate whether the word is a cognate and to fill in the rest of the information required by the glossary.

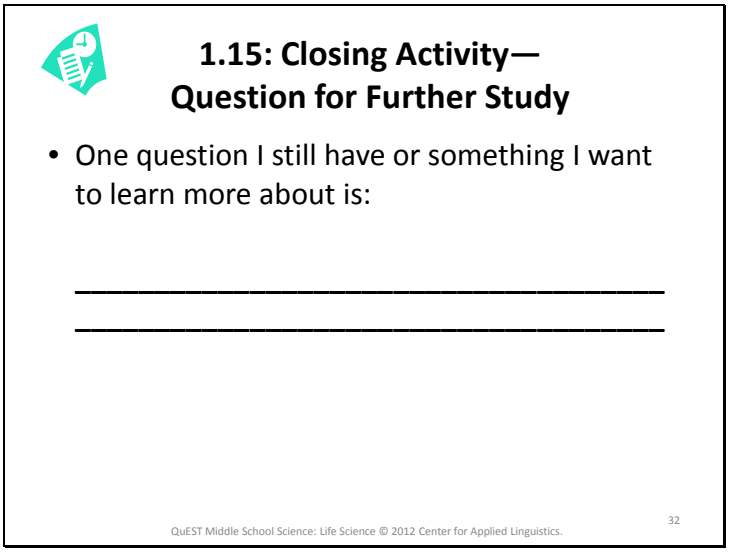
•Review glossary entries with class.

Slide 31



- **Pacing: 2 minutes.**
- Have students turn to Student Chart 1.14.
- Give students several minutes to complete the questions.
- Display responses and discuss.
- Have students correct responses as necessary.

Slide 32



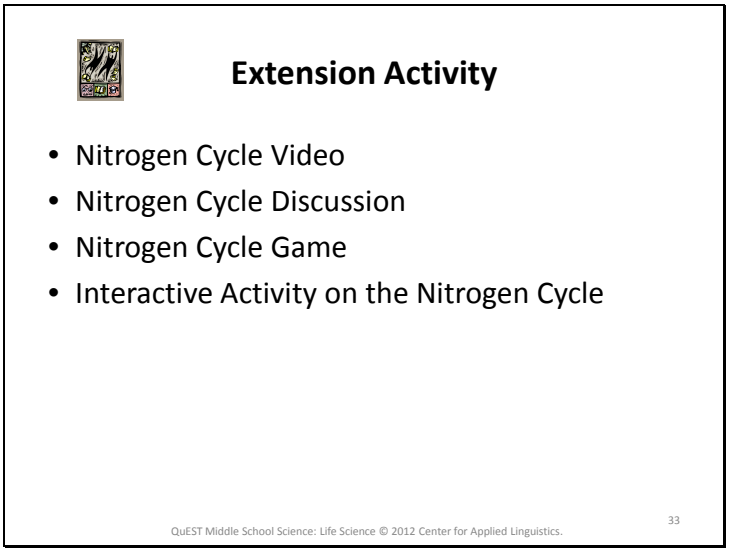
•Pacing: 1 minute.

•Have students turn to Student Chart 1.15.

•Have students complete Student Chart 1.15.

•As time permits, have students share their questions with a partner, with the whole class, or have them write them on a sticky note and put them on a "questions wall" on their way out of class. Students who finish an assessment early or who have free time might be assigned to go online to find answers to class questions.

Slide 33



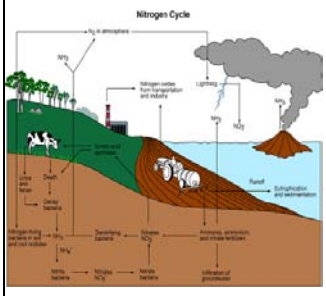
Optional

•Visit: http://www.windows2universe.org/teacher_resources/teach_nitrogen.html . Read the instructions for the Nitrogen cycle game, set it up and have students play the game. Summary: Students play the role of nitrogen atoms traveling through the nitrogen cycle to gain understanding of the varied pathways through the cycle and the relevance of nitrogen to living things.

•Visit http://www.teachersdomain.org/resource/lsps07.sci.life.eco.nitrogen/ for this interactive activity adapted from the University of Alberta illustrates how, through a process called fixation, nitrogen flows from the atmosphere, into the soil, through various organisms, and back to the atmosphere in a continuous cycle

Slide 34

nitrogen cycle



ciclo del nitrógeno

•Look at the picture. It demonstrates many ways that nitrogen is recycled. For example, the nitrogen moves from the grass to the cow (living parts of the ecosystem) to the soil (nonliving part the ecosystem).

•The nitrogen cycle is the movement of nitrogen between the living and nonliving parts of an ecosystem.

•El ciclo del nitrógeno es la transferencia de nitrógeno entre las partes vivas e inertes de un ecosistema.

•Partner talk: The cow in the field is part of the nitrogen cycle. How does the nitrogen move from the cow into the soil?

- **Pacing: <2 minutes.**
- Follow the same routine.
- Ask one student to answer the question.

[Anticipated response: urine and feces; death and decay].

Slide 35

1.16: Nitrogen Cycle

- Nitrogen is another important element for life on Earth.
  - Is air mostly oxygen or nitrogen?

Air is mostly Nitrogen (more than three quarters)

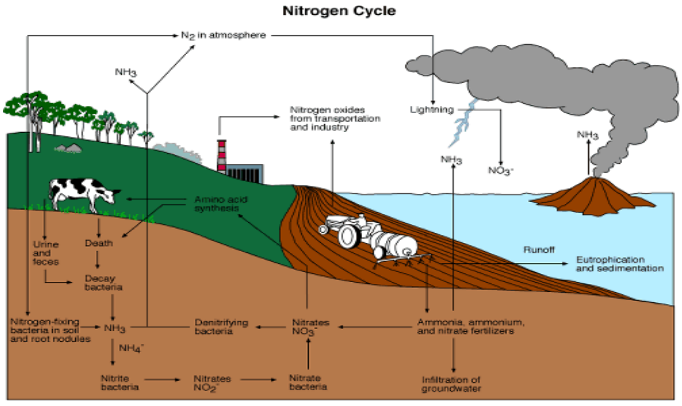
- Guiding question: How is bacteria important in the nitrogen cycle?

Nitrogen interacts with bacteria in soil. The bacteria combine the nitrogen with hydrogen to form ammonia, a compound that cells can use. Another type of bacteria combines ammonia with oxygen to form a compound that can be absorbed by the roots of plants to make proteins. Another type of bacteria takes the oxygen out of the protein compound, releasing the nitrogen into the atmosphere.

•**Pacing: 7 minutes.**
•Have students turn to Student Chart 1.16.
•Explain to students that there is another well known cycle, called the Nitrogen cycle.
•Ask students: Is air mostly oxygen or nitrogen? Take class vote.
•Display response.
•Read the guiding question.
•Play the Brainpop video "Nitrogen Cycle" [4:19].
•Discuss the answer to the guiding question.
•Then display the information that answers the guiding question and review it once more.
•**Teacher's Note: There is more nitrogen cycle information available in the Extension section.**

Slide 36

1.17: Nitrogen Cycle Discussion



Whole group discussion: What impact do humans have on the nitrogen cycle?

36

- **Pacing: 4 minutes.**
- Have students turn to Student Chart 1.17.
- Use this diagram to further explain the nitrogen cycle.
- Ask students the discussion question.
- Whole group discussion [Answers will vary widely].

Project QuEST
Model Life Science Lesson
Student Guide: The Carbon Cycle

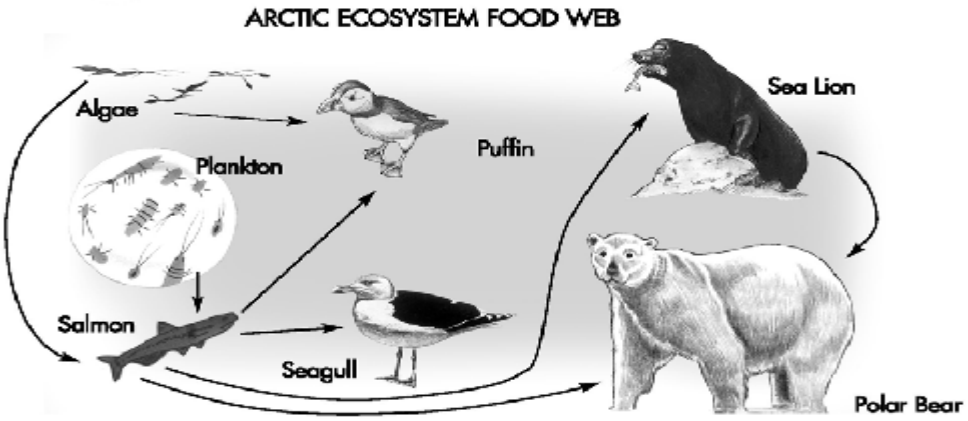
These materials were produced by CREATE with funding from the U.S Department of Education (ED), Institute of Education Sciences, under Contract No. ED-R305A05056. The opinions expressed herein do not necessarily reflect the positions or policies of ED.

Cycles Set: The Carbon Cycle

Student Chart 1.1: Food Webs and Food Chains Review

Complete the following questions.

1. Which of the following is false about energy pyramids?
   a. The producers are on the bottom.
   b. There are more consumers than producers.
   c. The tertiary consumers are above the primary consumers.
   d. They show how many organisms belong in each energy level



2. According to the food web above,
   a. salmon consume puffins.
   b. sea lions consume polar bears.
   c. plankton are decomposers.
   d. sea lions consume salmon.

Choose from the following words to complete the sentences:

consumers, decomposer, heredity, petal, predator-prey relationship, producers, source

3. A _____ is the colorful leaf-like part of the flower.
4. Mushrooms and bacteria are examples of a type of _____.
5. Most _____ use photosynthesis to produce energy.
6. Humans are _____.
7. _____ is the passing of genetic traits from parent to offspring.
8. Frogs eating insects is an example of a _____
9. Factories can be a _____ of pollution.

Student Chart 1.2: Science and Language Objectives

Listen and follow along as your teacher reads this lesson's objectives.

In Science we will learn:

- to identify organic compounds and explain how they are recycled in the carbon cycle.

To develop our language skills, we will learn:

- to watch and listen to a video on the carbon cycle and answer questions in writing with a partner.
- to read a passage on the carbon cycle and demonstrate comprehension by drawing and labeling a cycle.

Student Chart 1.3: Vocabulary Objectives

Listen and follow along as your teacher reads this lesson's vocabulary.

Science content vocabulary:

- organic
- organic compound
- matter
- molecule
- element
- carbon cycle

General academic vocabulary:

- analyze

Student Chart 1.4: Matter

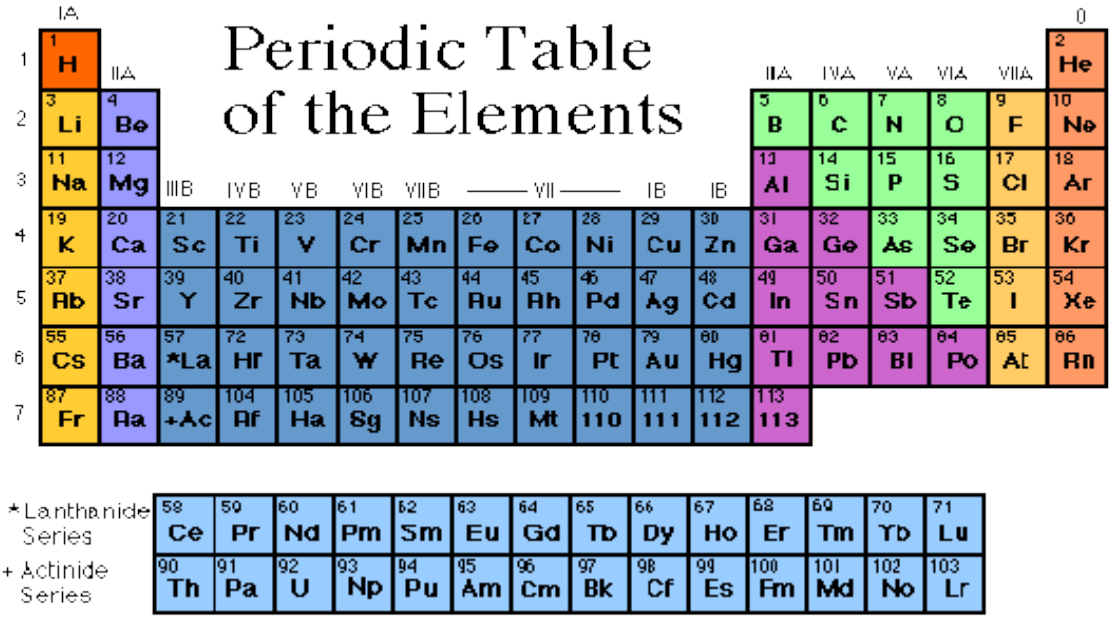
Take notes about organic compounds in item #1.

1. Everything is made of _____. Matter comes from _____ and _____ things. Matter from living organisms is called _____ compounds. Organic compounds contain the element _____.

Student Chart 1.5: Elements and Compounds

Identify the elements in organic compounds and list some organic compounds.

1. Circle the elements that are often (but not always) found in organic compounds.



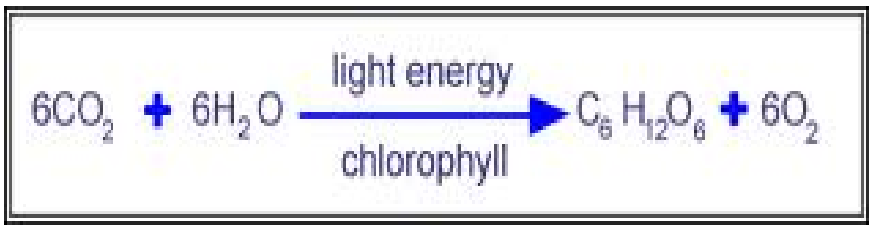
2. The elements in organic compounds are _____,

   _____, _____,

   _____, and _____.

3. Name some organic compounds: _____,

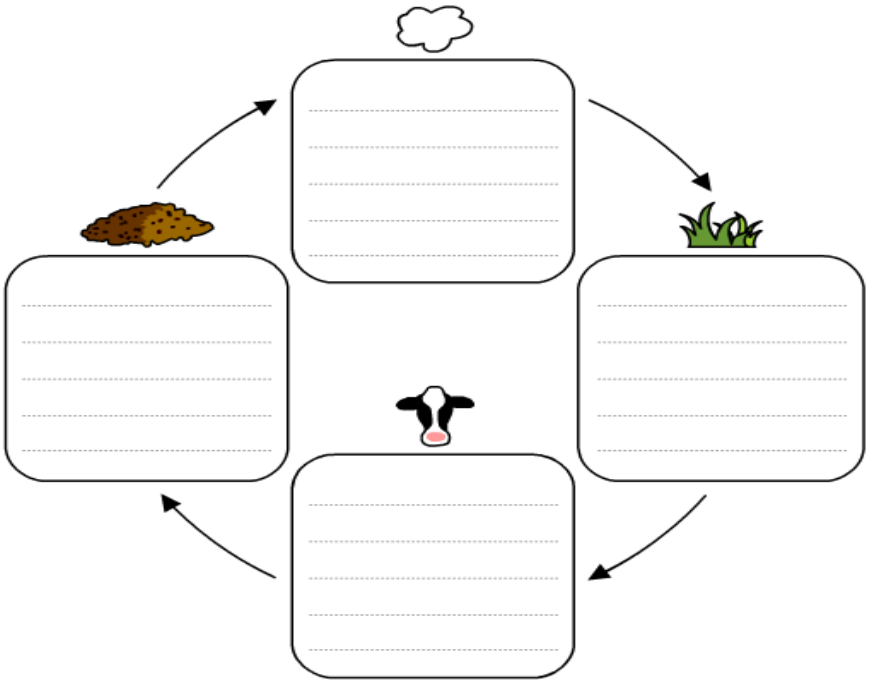
   _____, and _____.



Student Chart 1.6: Carbon Cycle Video

Watch the video on the carbon cycle. Then answer questions #2–#4 with a partner.

1. Listen to the video.
2. Make a list of all of the parts of an ecosystem where you could find carbon.
   a. _____
   b. _____
   c. _____
   d. _____
   e. _____
   f. _____
3. Use the key terms you need to explain the carbon cycle to your partner: *add*, *soak up*, *animals*, *breathe*, *plants*, *carbon dioxide*, *photosynthesis*, *ocean*, *atmosphere*, *die*, *Earth's crust*, *volcano.*
4. Write your explanation of the carbon cycle in the boxes below.



Student Chart 1.7: The Carbon Cycle

After you have watched the video on the carbon cycle, answer questions #1and #2 with a partner.

1. Explain how carbon is important to life on Earth.

_____

_____

_____

_____.

2. Why do you think the level of carbon dioxide in the atmosphere has increased in the past 100 years?

_____

_____

_____

_____.

Student Chart 1.8: The Carbon Cycle Game

Play the game as a class. Record the information in items #1 and #2.

1. Record the places in the environment where carbon is found:

   a. _____

   b. _____

   c. _____

   d. _____

   e. _____

   f. _____

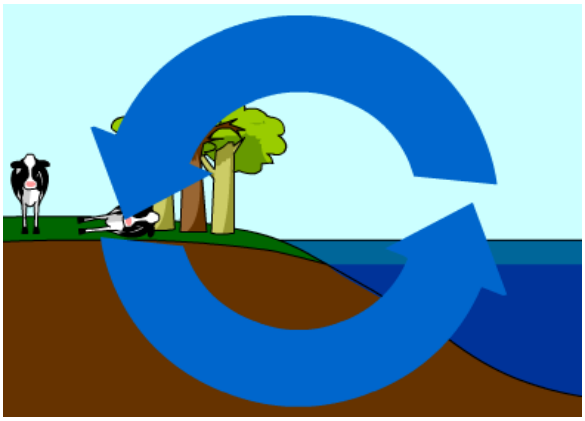
2. Write a fact about carbon that surprised you:

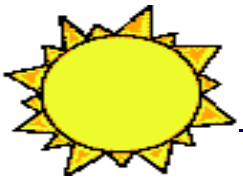
_____

_____

Student Chart 1.9: How Does Nature Recycle?

Choose the carbon cycle or a food chain and write a paragraph about how nature recycles.





Energy Source: Sun

Producer: Grass

Primary Consumer: Cow

Tertiary Consumer: People

Student Chart 1.10: Interactive Reading—Preview

Read the guiding question.

- What are the nutrient cycles?

Student Chart 1.11: Interactive Reading Text
(ACCESS, pages 117–119)
Listen and follow along as the text is read aloud. Be prepared to answer the questions.

ENERGY POWERS AN ECOSYSTEM

Energy makes things move and grow. Ecosystems depend on the Sun for energy. Sunlight, like other nonliving things, makes life in an ecosystem possible. Both living and nonliving parts of an ecosystem keep energy moving through the ecosystem.

Name one important nonliving thing that makes life possible.

Partner talk: How do nonliving, or abiotic, parts of an ecosystem, such as soil and air, keep energy moving through the ecosystem?

Everything on Earth is made of matter, even the things you can't see or touch, like air. Matter is made up of tiny atoms. Some atoms combine into nutrients, which provide energy and help living things survive and grow.

What is matter made up of?

Name some examples of matter.

What happens when atoms combine into nutrients?

Nutrients are in air, water, and soil. Nutrients move from the environment to living things and then back again.

Where are nutrients found?

Describe the movement of nutrients.

NUTRIENT CYCLES

Earth's ecosystems include oxygen, carbon, and nitrogen. Each of these nutrients moves in a cycle from living things to nonliving things and back again.

> Name three important nutrients in earth's ecosystem.
>
> How do oxygen, carbon, and nitrogen move in a cycle?
>
> Think of other words that contain the root "cycle."

The Carbon Dioxide-Oxygen Cycle

To stay alive, living things depend on the movement of oxygen and carbon dioxide in an ecosystem. During the day, plants take in carbon dioxide from the air and give back oxygen. Living things in the oceans take in carbon dioxide from the air and release oxygen.

> What elements or molecules do most living things depend on to stay alive?
>
> Describe the movement of carbon dioxide and oxygen in the ecosystem.

Humans and other animals breathe in oxygen and breathe out carbon dioxide. The life-supporting nutrients never get used up because they go back and forth in the carbon dioxide-oxygen cycle.

> What part do humans play in the carbon dioxide-oxygen cycle?
>
> Partner talk: Explain how nutrients like carbon dioxide and oxygen never get used up.

The Carbon Cycle

The bodies of all living things contain carbon atoms. The air, rocks, and soil also contain carbon atoms. In ecosystems, carbon gets used over and over again. Much carbon comes from carbon dioxide.

Name three things that contain carbon atoms.

Where does much carbon come from?

Where do plants get carbon?

Plants take in carbon from the carbon dioxide in the air. They use it to make sugars. When animals eat plants, they take in carbon. When animals breathe out, they release carbon dioxide back into the air.

What do plants use carbon for?

Where do animals get carbon?

What is released when animals breathe out?

Student Chart 1.12: Interactive Reading Question

Choose one of the nutrient cycles. Sketch and label it. Then use the diagram to explain it to your partner.

Circle the nutrient cycle that you will sketch, label, and explain:

Carbon-dioxide oxygen cycle

Carbon cycle

Student Chart 1.13: Glossary

Complete glossary entries for these science content words:

- organic
- organic compound
- matter
- molecule
- element
- carbon cycle
- analyze

Student Chart 1.14: Key Information

Use these words or phrases to complete the sentences below: *affect*, *analyze*, *carbon*, *ecosystem*, *matter.*

- _____ is anything that has mass and takes up space.
- An organic compound is a compound that contains the element _____.
- The carbon cycle is the movement of carbon between living and nonliving parts of an _____.
- Decomposers release _____ compounds from dead plants and animals.
- A scientist can use the periodic table to _____ the number of atoms in each element.

Student Chart 1.15: Question for Further Study

Write a sentence about what you still want to learn.

One question I still have or something I want to learn more about is:

_____

_____

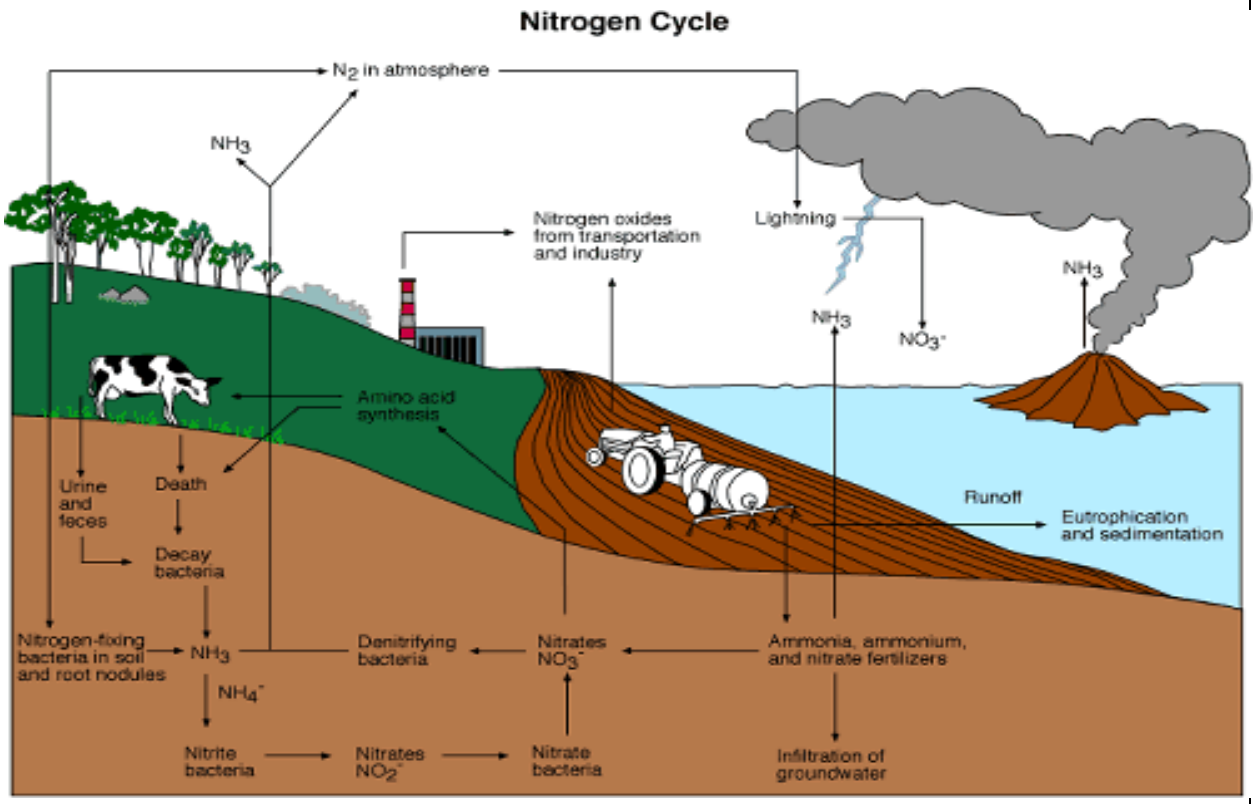
Student Chart 1.16: The Nitrogen Cycle

Watch the video. Be ready to discuss the guiding question.

- Guiding question: How is bacteria important in the nitrogen cycle?

Student Chart 1.17: The Nitrogen Cycle

Look at the diagram below. Then discuss the question below as a group.



- **Whole group discussion:** What impact do humans have on the nitrogen cycle?

Project QuEST
Model Life Science Lesson
Teacher Guide: Decomposition

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Middle School Life Science: Cycles

Cycles Lesson Set: Decomposition

Framework for K-12 Science Education: Dimension 3—Life Science

- **Disciplinary Core Idea (LS2.B)—Cycles of Matter and Energy Transfer in Ecosystems**: Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact-primarily for food-within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. For example, when molecules from food react with oxygen captured from the environment, the carbon dioxide and water this produces are transferred back to the environment, and ultimately so are waste products, such as fecal material. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem.
- **Science and Engineering Practices**: Developing and Using Models, Planning and Carrying Out Investigations, Constructing Explanations and Designing Solutions
- **Crosscutting Concepts**: Energy and Matter

Connections to the Common Core State Standards (ELA)

- **W6.8**: Gather relevant information from multiple print and digital sources, assess the credibility of each source, and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources.
- **WHST.7**: Conduct short research projects to answer a question (including a self generated question), drawing on several sources and generating additional, related focused questions that allow for multiple avenues of exploration.
- **L6:** Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Connection to the Common Core State Standards (Math)

- **MP.4:** Model with mathematics.
- **5.0A**: Analyze patterns and relationships.

Connections to English Language Development Standards[1]

- **ELD Standard 4**: Language of Science
  - **Reading**: Read from a variety of resources about composting to select an independent variable for an investigation on decomposition.
  - **Writing**: Measure the rate of decomposition and record observations in a data table.
  - **Listening**: Decide on an independent variable for investigation by talking to a group.
  - **Speaking**: Discuss your group's independent variable and hypothesis prior to beginning the investigation.

Overview of Activities

Focus Activity

- **Student Activity I: Rating and Discussion of Science, Language, and Vocabulary Objectives.** Teacher posts lesson objective poster; students rate their prior knowledge of each objective; brief discussion.

Engagement

- **Student Activity II: Lesson 4 Review.** Students answer review questions from previous lesson; teacher displays the answers; students correct responses as necessary.

- **Student Activity III: Pre-teaching of Science Content Words.** Teacher displays PowerPoint slides of science content words one at a time; teacher reads script aloud and elicits responses to teach the following: *decay*, *biomass*, *compost*, *independent variable*, *dependent variable.*

Explanation and Exploration

- **Student Activity IV: General Academic Word Cards.** Teacher displays PowerPoint slides of general academic words one at a time; teacher reads script aloud and elicits responses to teach the following: *activate*, *implement.*

- **Student Activity V: Interactive Reading.** Teacher discusses text illustrations; one student reads guiding questions; teacher and students participate in shared interactive reading; teacher and students discuss guiding questions; students respond to guiding question by creating and presenting posters.

- **Student Activity VI: Decomposition Investigation Preview and Planning.** Students plan their investigations based on the interactive reading in Student Chart 2.6; teachers preview the overview and steps of the investigation in Student Chart 2.7;

[1] Because the WIDA English language development standards are currently used in 29 states, we reference these standards.

teacher reviews possible resources for the investigation in Student Chart 2.8 or by distributing the readings; student groups discuss and choose their independent variable and record it in Student Chart 2.8; students record their procedures in Student Chart 2.9; teacher reviews procedures.

- **Student Activity VII: Decomposition Investigation Set-Up.** Students identify the materials they will need in Student Chart 2.10 and collect them; students set up the experiment and record their variables and hypotheses in Student Chart 2.11; students record data in the first column in Student Chart 2.12.

Elaboration

- **Student Activity VIII: Decomposition Investigation Data Observation.** Students continue to observe and measure the newspaper every 2 weeks; full class debriefing is in Lesson 11.

Evaluation

- **Student Activity IX: Glossary and Key Facts.** Students complete glossary for science content words, answer questions related to key content, and indicate if there is anything else they would like to learn about; whole class review.

Extension/Differentiation

- **Student Activity X: Nominalization Worksheet.**

QuEST Middle School Life Science

Decomposition

Objectives

- Science:
  - Students will be able to analyze the process of decomposition.
  - Students will be able to plan an experiment involving decomposition.
- Language:
  - Students will be able to orally share information they learn about composting with their groups.
  - Students will be able to draw conclusions from a reading about composting for planning their investigations.

Vocabulary

- Science content: *decay*, *biomass*, *compost*, *independent variable*, *dependent variable*
- General academic: *activate*, *implement*

Teacher Management

Estimated time for completion, in minutes: 90 (follow up on the decomposition lab occurs in Lesson 11)

Materials

For each student pair:

- 2 clear plastic cups (at least 12 oz)
- Soil (enough to fill each cup to top)
- Newspaper
- Scissors
- Overhead transparency with grid printed on it
- Water

Teacher Prep

1. Review detailed lesson plan in the Teacher Guide.
2. Pull out the Activity Overview page(s), PowerPoint lesson guides, and student charts and add any necessary notes to them from the detailed lesson plan to help guide the lesson.
3. If necessary, organize activities to fit school schedule.
4. Download PowerPoint slides.
5. Display vocabulary cards on the word wall.
6. Group students for partner/small group work.
7. Prepare the newspaper circles and prep stations for students to retrieve supplies.

8. Decide what additional materials you want to make available for students during the lab. **Teacher note: If students decide to use worms or other live material, follow all safety rules and provide an enclosed space so they do not escape (e.g., Ziploc bag).**
9. Decide which resources you want the students to have available for research and prepare the centers.

Safety Considerations:
None.

Vocabulary-Building Strategies

- Explicit interactive presentation of vocabulary cards
- Word wall
- Glossary work

Background Information for Teacher

- See the background research in Student Chart 2.8.

Lesson Content

Focus Activity/Warm-Up

Student Activity I (slides 3–8, Lesson Objective poster, Student Charts 2.1–2.3)
5 minutes
Activity Overview: Rating and Discussion of Science, Language, and Vocabulary Objectives. Teacher posts lesson objective cards; students rate their prior knowledge of each objective; brief discussion.

- Before students enter the room, display the science objectives.
- Make sure the ratings of the previous class have been erased.
- As they enter the classroom, have students rate their prior knowledge of each objective on a continuum of 1 to 4 (1=none, 4=a lot).
- Have students begin the review questions in Student Chart 2.1 until all students have rated their knowledge of the objectives.
- Review correct responses to review activity (see Activity II below).
- Have students turn to Student Chart 2.2.
- Read the science objectives aloud, one at a time, reporting students' level of prior knowledge.
- Read the language objectives.
- Have students turn to Student Chart 2.3.
- Read vocabulary words aloud.
- As appropriate, have students use thumbs up/thumbs down to indicate prior knowledge.

Engagement

Student Activity II (slides 4–6, Student Chart 2.1)
6 minutes
Activity Overview: Carbon Cycle Lesson Review. Students answer review questions from previous lesson; teacher displays the answers; students correct responses as necessary.

- After students have rated their knowledge of the objectives and as they wait for their peers to enter the room, students should begin working on Student Chart 2.1.
- Once all students have displayed their knowledge of the objectives poster and have had 2 minutes to answer the review questions, have students read the review questions and answer them aloud.
- Display responses.
- Have students correct their responses as necessary.

Student Activity III (slides 9–13, Science Content Word Cards)
10 minutes
Activity Overview: Pre-teaching of Science Content Words. Teacher displays PowerPoint slides of science content words one at a time; teacher reads script aloud and elicits responses to teach the following: *decay*, *biomass*, *compost*, *independent variable*, *dependent variable.*

- Have students turn to Lesson 2 glossary words.
- Read the target words aloud, one at a time.
- Have students rewrite the target words in English and in Spanish (as appropriate) in their glossaries.
- Display the slides of the science content words one at a time, reading the text on the right side of each PowerPoint slide aloud and eliciting responses from student pairs.
- Point to the appropriate parts of the pictures as you read through the notes.
- Depending on your class, you may want to read (or have a student read) the definitions in Spanish.
- Tell students they may continue to use the science content word cards on the word wall for reference.
- **Teacher note: To save time you may want to eliminate partner talk and just ask one student to answer the question.**

Explanation and Exploration

Student Activity IV (slides 14 and 15, General Academic Word Cards)

4 minutes

Activity Overview: General Academic Word Cards. Teacher displays PowerPoint slides of science content words one at a time; teacher reads script aloud and elicits responses to teach the following: *activate, implement.*

- Read each general academic vocabulary word to students.
- If you like, have student use thumbs up/thumbs down to indicate prior knowledge.
- Have students turn to Lesson 2 glossary words.
- Read the target words aloud.
- Have students rewrite the target words in English and in Spanish (as appropriate) in their glossaries.
- Read through the notes on the right side of each slide.
- Point to the appropriate part of the picture as you read through the notes.
- Depending on your class, you may want to read (or have a student read) the definition in Spanish.
- Display the slides of the general academic words one at a time, reading the script aloud and eliciting responses.
- Tell students they may continue to use the general academic word cards on the word wall for reference.
- **Teacher note: To save time you may want to eliminate partner talk and just ask one student to answer the question.**

Student Activity V (slides 16–20, Student Charts 2.4–2.6)

12 minutes

Activity Overview: Interactive Reading. Teacher discusses text illustrations; one student reads guiding question; teacher and students participate in shared interactive reading; teacher and students discuss guiding questions; students respond to guiding question; teacher posts correct response; students revise responses as necessary.

- **Preview**
  - Have students turn to Student Chart 2.4.
  - Read the guiding question aloud.
  - Introduce the term “landfill” using slide #16.
- **Text**
  - Have students turn to Student Chart 2.5.
  - Read text aloud to students as they follow in their Student Chart.
  - Stop and clarify text if necessary.
  - Ask students embedded questions. Elaborate on their responses as necessary.

- When you get to a figure, stop reading and have students look at the figure as you discuss it.

- **Guiding questions**
  - Have students turn to Student Chart 2.6.
  - Have students complete the chart.
  - Have students display their answers under the document reader.
  - Whole class discussion.

Student Activity VI (slides 21–23, Student Charts 2.7–2.9)
25 minutes
Activity Overview: Decomposition Investigation Preview and Planning.

- **Preview**
  - Have students turn to Student Chart 2.7.
  - Read the Investigation Overview and the Steps of Investigation.
- **Background research**
  - Have students turn to Student Chart 2.8.
  - Review the resources in Student Chart 2.8. Discuss the origin of the resources and why you chose to include them. Tell students they will be using the resources on this page to research decomposition and select their independent variable.
  - Be sure to highlight the proper way to cite their bibliographic sources and model note-taking to avoid plagiarism (see Appendix, page 12).
  - **Teacher note: You may wish to give students the printed readings, to watch the video clips as a class, or to have students do this as independent work. You may distribute highlighters for students to highlight from the printed readings.**
- **Procedure**
  - Have students turn to Student Chart 2.9.
  - Have students write down their procedure they will use.
  - Remind students to use the procedure in Student Chart 2.7.
  - Ask one student pair to read their procedure aloud.
  - With all of the supplies laid out, follow their directions verbatim, without any inference on your part.
  - Point out the importance of having a clear procedure that can be followed by any other scientist.
  - Give students time to edit their work.
  - If time allows, have students read their procedure to a partner as part of the editing process.
  - Circulate around the class to review each group's procedure.
  - When students have a procedure that is acceptable, allow the groups to begin setting up their experiment.

Student Activity VII (slides 24–26, Student Charts 2.10–2.12)
20 minutes

Activity Overview: Decomposition Investigation.

- Materials
  - Have students turn to Student Chart 2.10.
  - Once students have done their background research, have students fill in their independent variable in Student Chart 2.10.
  - Have students check off the materials they will need.
  - Distribute materials or have students collect them.
- Experiment
  - Have students turn to Student Chart 2.11.
  - Have student complete the experiment in pairs and record their hypothesis and variables in Student Chart 2.11.
  - Have students begin the investigation, recording the amounts of soil, newspaper and water in Student Chart 2.11.
- Data table
  - Have students turn to Student Chart 2.12.
  - Show students where they will fill in the data they observe.
  - Plan to collect data once every 2 weeks over the duration of the experiment.

Elaboration

Student Activity VIII (Student Chart 2.12)
Ongoing; every 2 weeks
Activity Overview: Decomposition Investigation Data Observation.

- Plan to collect data once every 2 weeks over the duration of the experiment.
- Every 2 weeks give students time to measure the newspaper with the transparency grid and record their measurements in Student Chart 2.12.
- Teacher note: If students have access to digital cameras, you may consider having them take a picture at specific intervals as a form of observation.
- Teacher note: The data analysis and conclusion for this activity continue in a later lesson (Lesson 11 is not included here, but see student charts corresponding to this activity in the Appendix, page 11).

Evaluation

Student Activity IX (slides 27–29, Student Charts 2.13–2.15, Glossary)
8 minutes
Activity Overview: Glossary and Key Facts and Questions for Further Study. Students complete glossary for science content words, answer questions related to key content, and indicate if there is anything else they would like to learn about; whole class review.

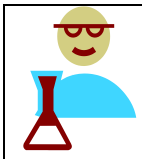
- Glossary work
  - Have students locate Student Chart 2.13.
  - For each science content word, have students work in pairs to indicate whether the word is a cognate and to fill in the rest of the information required by the glossary.
  - Review glossary entries with class.
- Key information
  - Have students turn to Student Chart 2.14.
  - Give students several minutes to complete the questions.
  - Display responses and discuss.
  - Have students correct responses as necessary.
- Questions for further study
  - Have students turn to Student Chart 2.15.
  - Have students complete Student Chart.
  - As time permits, have students share their questions with a partner, with the whole class, or have them write them on a sticky note and put them on a "questions wall" on their way out of class. Students who finish an assessment or who have free time might be assigned to go online to find answers to class questions.

Extension/Differentiation

- Student Activity X: Nominalization Worksheet.
- Student Activity XI: Decomposition Revisited (see Appendix)

Appendix: Decomposition Revisited

The following charts are the follow-up activity for the decomposition investigation in Cycles Lesson 2. This lesson is not included here in its entirety, but the charts for this activity are below.



Student Chart 11.4: Analysis

Discuss your results from Student Chart 2.12. Then answer questions #1–#4.

1. Which mixture made the paper decompose the fastest, cup #1 or cup #2?

_____

_____

2. Why do you think that mixture worked so well?

_____

_____

3. What would you add next time?

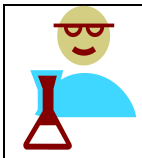
_____

_____

4. What did you learn from this experiment?

_____

_____ _____



Student Chart 11.5: Comparing Class Results

Use this chart to determine which pair(s) got the most significant results.

Pair #	What was added to the soil?	Squares at the end of the experiment/Squares at the beginning of the experiment= % of paper that decomposed

1. Which pair(s) had the most decomposition of the newspaper?

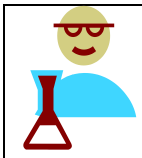
_____

_____ _____

2. What might that tell us about the conditions necessary for decomposition?

_____

_____ _____



Student Chart 11.6: Conclusion

Use your notes from Lesson 2 to fill in the information to complete the lab report.

The purpose of a conclusion is to tell the reader what happened in the experiment, explain why you think that it happened, and to give suggestions for what to do in future experiments.

Step 1: Explain what happened.

1. In this experiment I was trying to

_____

_____

_____.

2. My hypothesis was that

_____

_____.

(Circle one)

3. My hypothesis was [supported] or [not supported] by this experiment.

4. Here are the results of my experiment:
   - In cup one, the number of squares missing on the grid was _____.
   - In cup two, the number of squares missing on the grid was _____.

5. The soil mixture with the independent variable of _____ added made the paper decompose the most.

Student Chart 11.7: Conclusion (*cont.*)

Use your notes from lesson 5 to fill in the information to complete the lab report.

Step 2: Explain why it happened.

_____

_____

_____

Step 3: Explain what went wrong or what could have been done better in your experiment.

1. Some mistakes that were made in this experiment were

   _____

   _____

   _____

2. Other problems that happened in the experiment were

   _____

   _____

   _____

   _____

3. Next time I do the experiment I will

   _____

   _____

   _____

Step 4: Explain why your experiment is important.

The results of this experiment will be helpful to our town or city because

_____

_____

_____

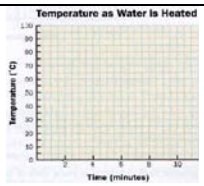
_____

Student Chart 11.8: References

Return to Student Chart 2.8 for a list of recommended resources for this investigation.

List the references that your group used.

Slide 1



Cycles Set

Lesson 2:
Decomposition

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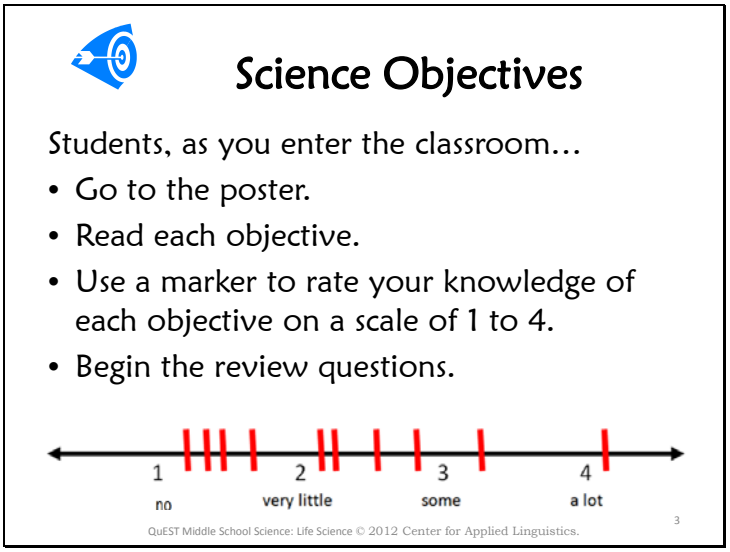
CREATE

Slide 2

Ecology Lesson 2: Teacher Preparation

- Erase the ratings from the previous class on the objectives poster.
- Composting lab:
  - Decide what additional materials you want to make available for students during the lab.
  - Note: If students decide to use worms or other live materials, follow all safety rules and provide an enclosed space (Ziploc bag, etc.)
  - Decide if students will do independent research or if you will distribute readings/resources.

Slide 3



Pacing: 3 minutes.

[There is no Student Chart for this slide].

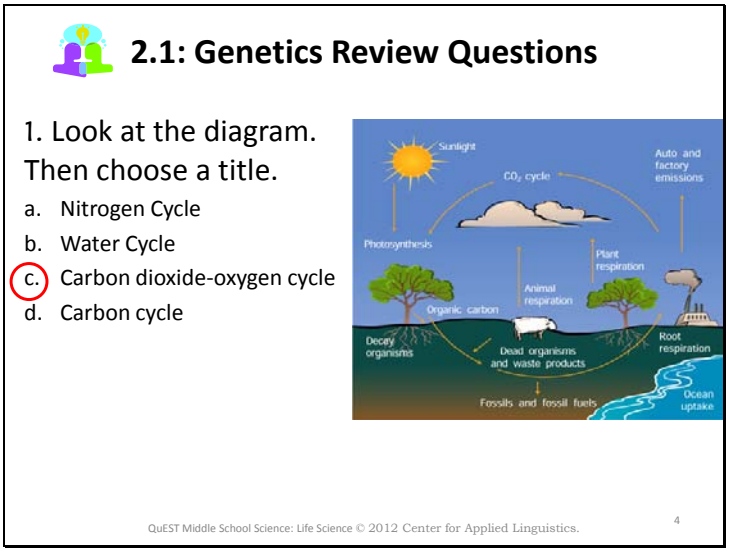
•Before students enter the room, display the science objectives.

•Make sure the ratings of the previous class have been erased.

•As they enter the classroom, have students rate their prior knowledge of each objective on a continuum of 1-4 (1=no to 4=a lot).

•Have students complete the review questions in Student Chart 2.1.

Slide 4

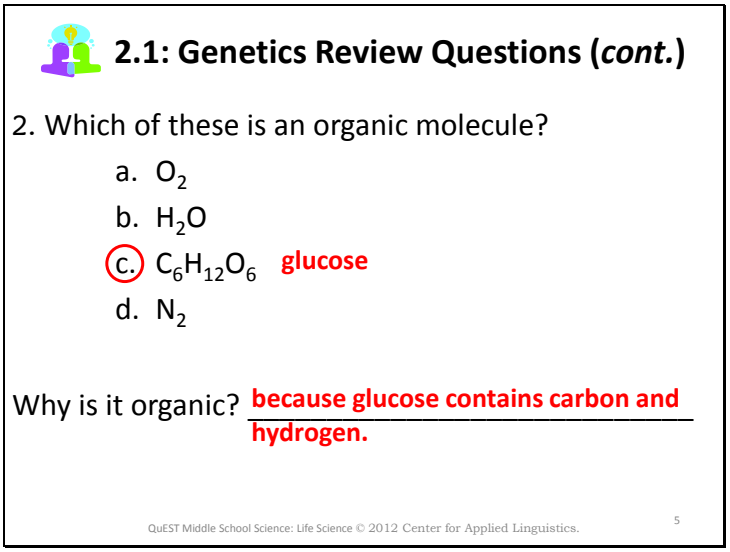


Pacing: 2 minutes.

[Students need to complete Student Chart 2.1 on their own or in pairs before questions are reviewed].

- Have one student read #1 from Student Chart 2.1 and answer it aloud.
- Display response.
- Have students correct student response as necessary.

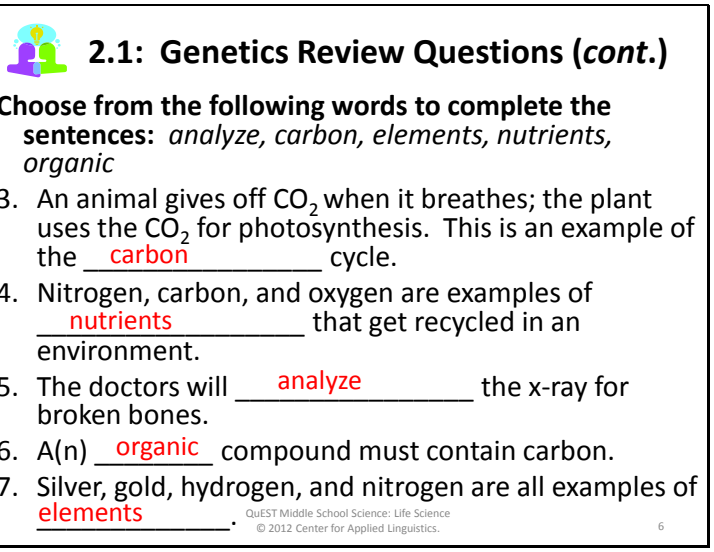
Slide 5



Pacing: 2 minutes.

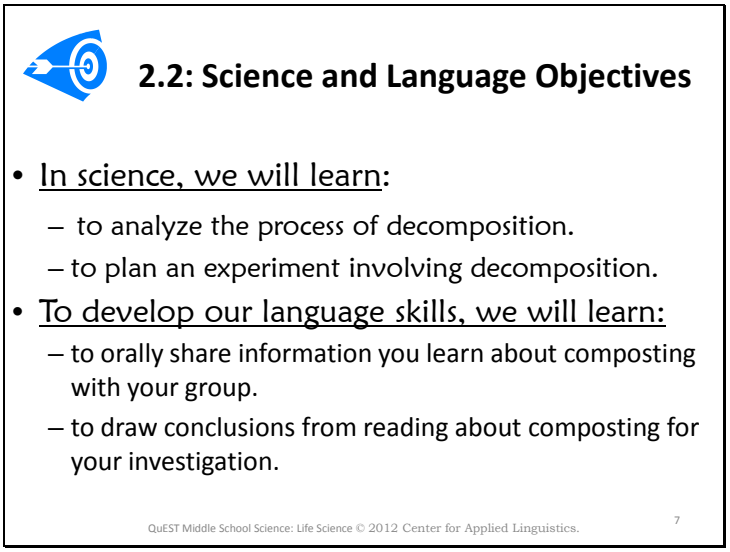
- Have one student read #2 from Student Chart 2.1 and answer it aloud.
- Display response.
- Have students correct student response as necessary.

Slide 6



- **Pacing: 2 minutes.**
- Follow the same routine as you did with questions #1-2.

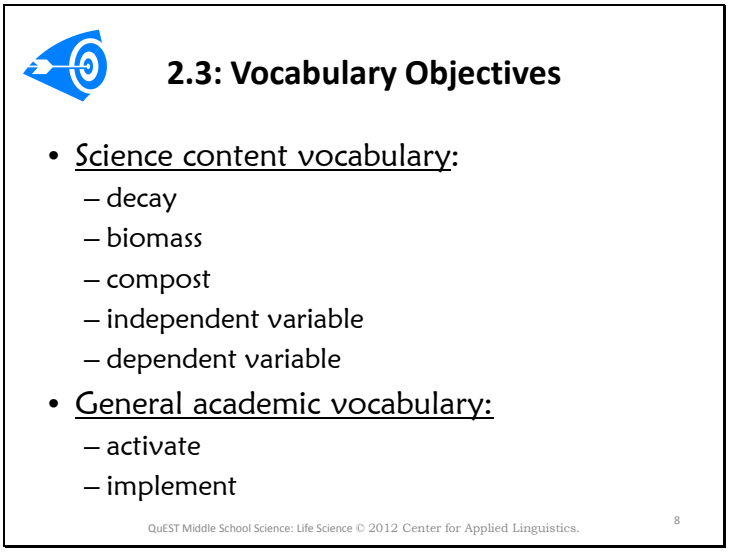
Slide 7



Pacing: 1 minute.

- Have students turn to Student Chart 2.2.
- Read the science objectives aloud, one at a time, reporting students' level of prior knowledge.
- Read the language objectives.

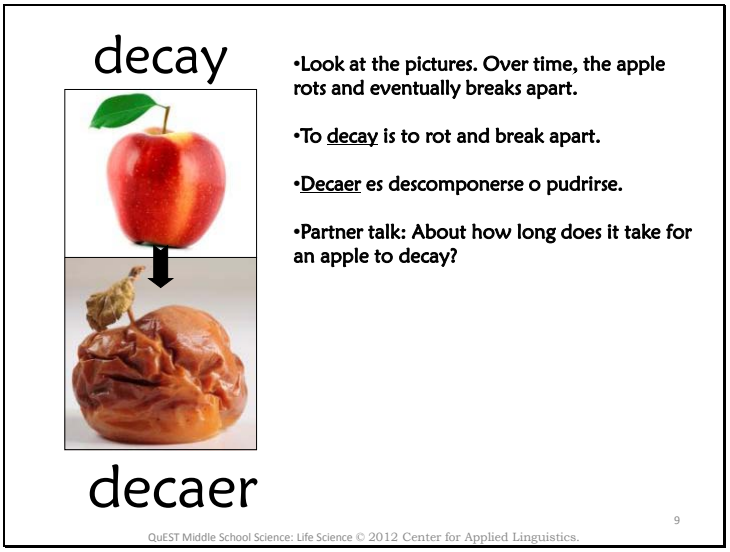
Slide 8



Pacing: 1 minute.

- Have students turn to Student Chart 2.3.
- Read vocabulary words aloud.
- If you like, have students use thumbs up/thumbs down to indicate prior knowledge.

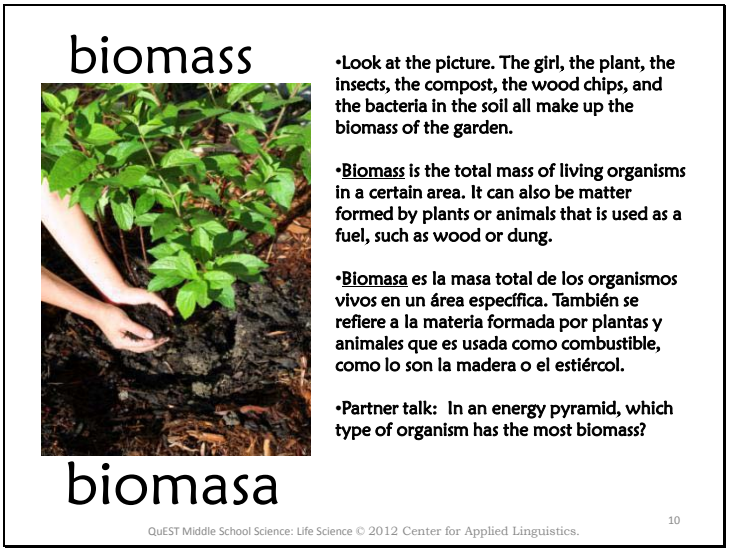
Slide 9



- **Pacing: 2 minutes.**
- Have students turn to lesson 5 glossary words.
- Read the target word aloud.
- Have students rewrite the target word in English and in Spanish (as appropriate) in their glossaries.
- Read through the notes on the right side of this Powerpoint slide.
- Point to the appropriate part of the picture as you read through the notes.
- Depending on your class, you may want to read (or have a student read) the definition in Spanish.
- Ask one student to answer the question. [Responses will vary].

- Teacher note: To save time you may want to eliminate partner talk and just ask one student to answer the question.

Slide 10



- **Pacing: 2 minutes.**
- Follow the same routine.
- Ask one student to answer the question. [Anticipated response: producers].

Slide 11

compost

abono

•Look at the picture. The person is churning the mixture of dead leaves, grass, and food scraps that make up his compost pile.

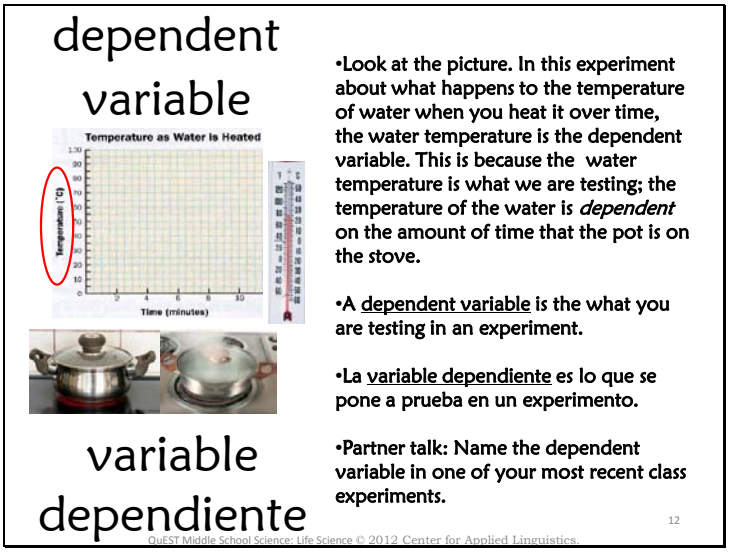
•Compost is a mixture of decaying leaves, vegetables, or manure that is used to improve garden soil.

•El abono es una mezcla de hojas, vegetales o estiércol que se encuentran en proceso de descomposición. Se usa para mejorar la calidad del suelo del jardín.

•Partner talk: Name some foods that you could put into a compost pile.

- **Pacing: 2 minutes.**
- Follow the same routine.
- Ask one student to answer the question. [Responses will vary].

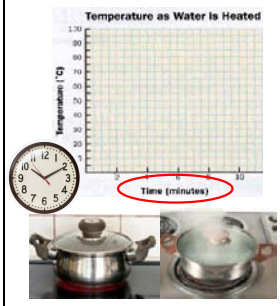
Slide 12



- **Pacing: 2 minutes.**
- Follow the same routine.
- Ask one student to answer the question. [Responses will vary].

Slide 13

independent variable



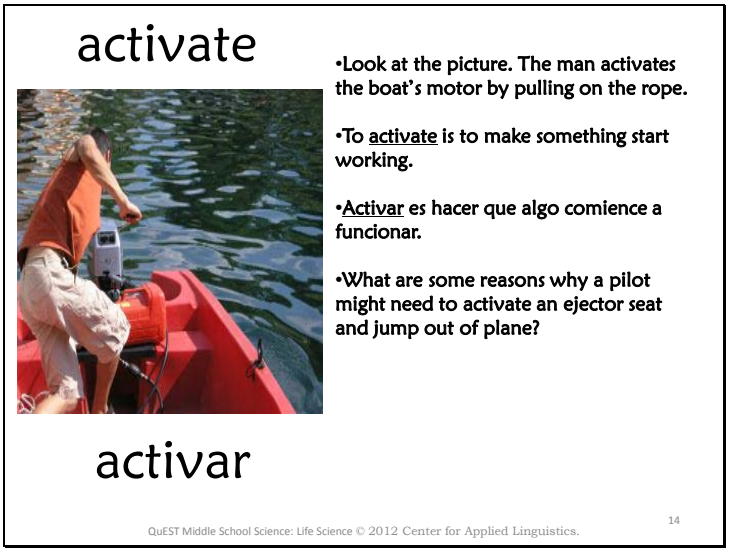
variable independiente

- Look at the picture. This is a science experiment about what happens to the temperature of water when you heat it over time. The independent variable is time because you control how much time the water is heating.
- An independent variable affects the value of the dependent variable; in an experiment, you control the value of the independent variable.
- La variable independiente afecta el valor de la variable dependiente; en un experimento, tú controlas el valor de la variable independiente.
- Partner talk: Name the independent variable in one of your most recent classroom experiments.

13

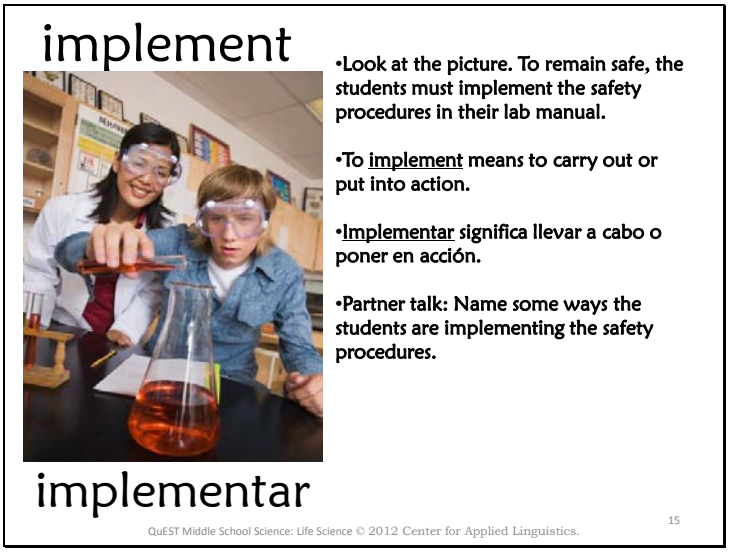
- **Pacing: 2 minutes.**
- Follow the same routine
- Ask one student to answer the question. [Responses will vary].

Slide 14



- **Pacing: 2 minutes.**
- Have students turn to lesson 2 glossary words.
- Read the target word aloud.
- Have students rewrite the target word in English and in Spanish (as appropriate) in their glossaries.
- Read through the notes on the right side of the slide.
- Point to the appropriate part of the picture as you read through the notes.
- Depending on your class, you may want to read (or have a student read) the definition in Spanish.
- Ask one student to answer the question. [Responses will vary].

Slide 15



- **Pacing: 2 minutes.**
- Have students turn to lesson 2 glossary words.
- Read the target word aloud.
- Have students rewrite the target word in English and in Spanish (as appropriate) in their glossaries.
- Read through the notes on the right side of the slide.
- Point to the appropriate part of the picture as you read through the notes.
- Depending on your class, you may want to read (or have a student read) the definition in Spanish.
- Ask one student to answer the question.

[Anticipated response: goggles, lab coat, standing far away, etc.]

Slide 16

Pacing: 2 minutes.

[There is no Student Chart for this slide].

•Ask students what a landfill is. Tell students that they will be involved in an investigation to reduce the amount of landfill in Trash County. This slide introduces the Interactive Shared Reading.

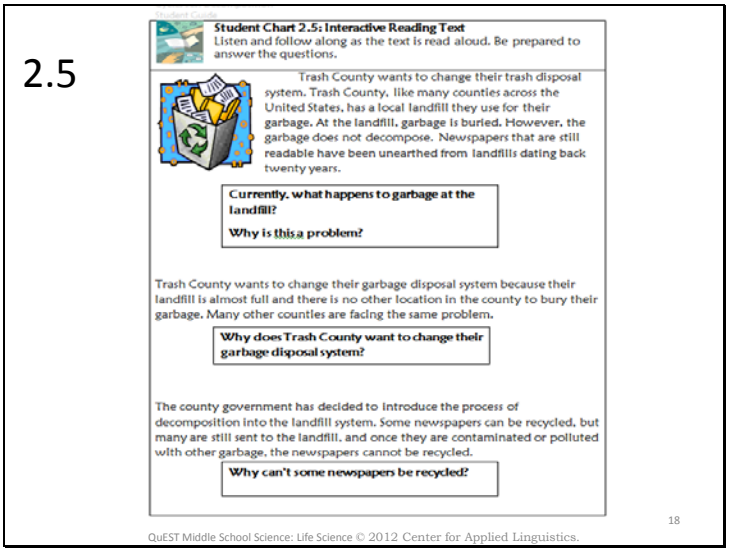
Slide 17

2.4: Interactive Reading—Preview

- Turn to Student Chart 2.4.
- Listen to the guiding question:
  - Can we use decomposition to make fertilizer and to reduce the amount of landfill?
- As the text is read aloud, read along silently in your Student Chart and be prepared to answer the questions.

- **Pacing: <1 minute.**
- Have students turn to Student Chart 2.4.
- Read the guiding question aloud.

Slide 18



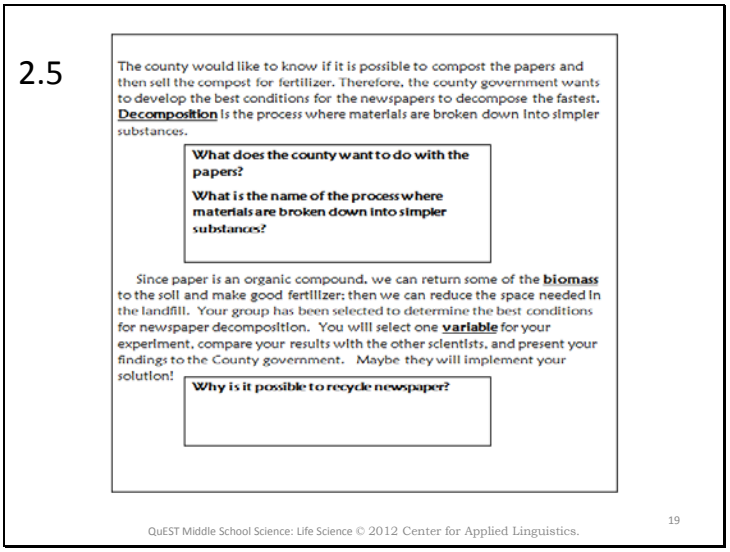
•Pacing for Interactive Reading: 12 minutes.
•Have students turn to Student Chart 2.5.
•Read text aloud to students as they follow in their Student Chart.
•Stop and clarify text if necessary.
•Ask students embedded questions. Elaborate on their responses as necessary.

Embedded Questions:

- **Currently, what happens to garbage at the landfill?** [garbage is buried]
- **Why is this a problem?** [the garbage does not decompose]
- **Why does Trash County want to change their garbage disposal system?** [because they are running out of room for their garbage]

- **Why can't some newspapers be recycled?** [because they are put in the garbage and contaminated by other garbage]

Slide 19



•Read text aloud to students as they follow in their Student Chart.
•Stop and clarify text if necessary.

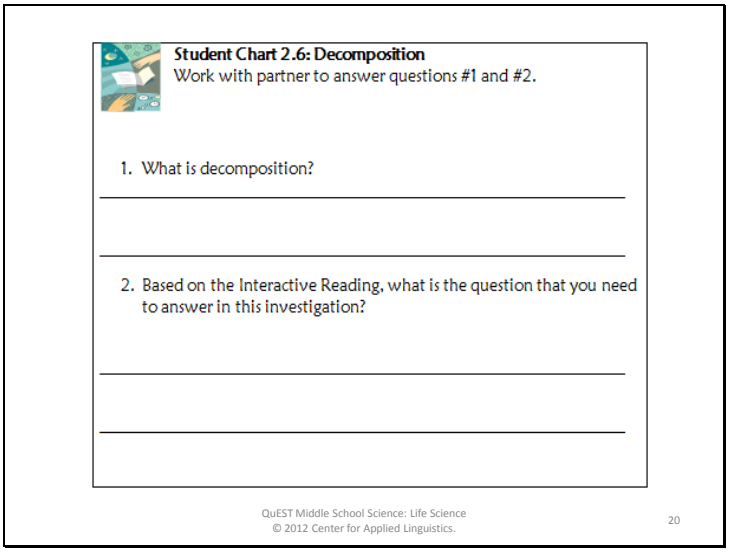
•Ask students embedded questions. Elaborate on their responses as necessary.

Embedded Questions:

- **What does the county want to do with the papers?** [compost the papers and sell the compost for fertilizer]
- **What is the name of the process where materials are broken down into simpler substances?** [decomposition]
- **Why is it possible to recycle newspaper?** [because it is an organic compound and so some of the

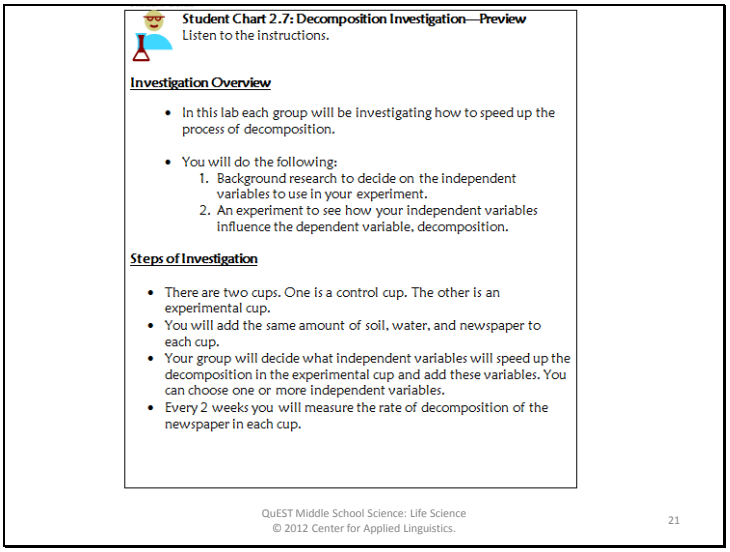
biomass can return to the soil and become good fertilizer]

Slide 20



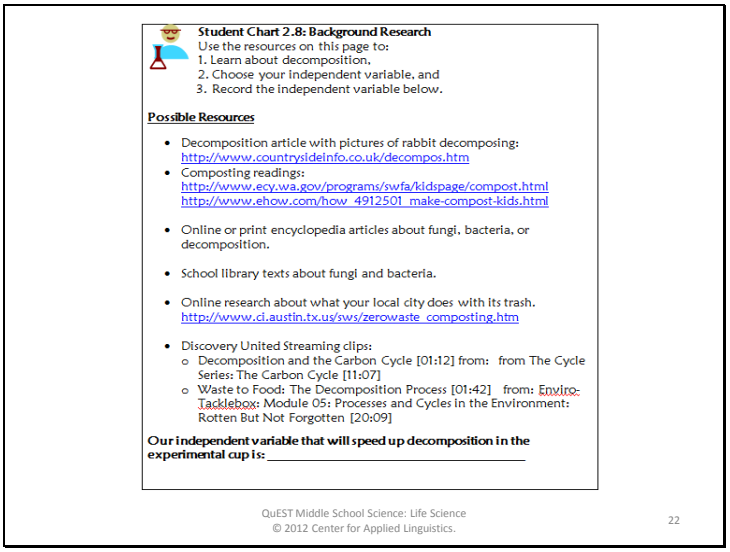
- Pair students.
- Have students turn to Student Chart 2.6.
- Have student answer #1-2.
- Whole class discussion.

Slide 21



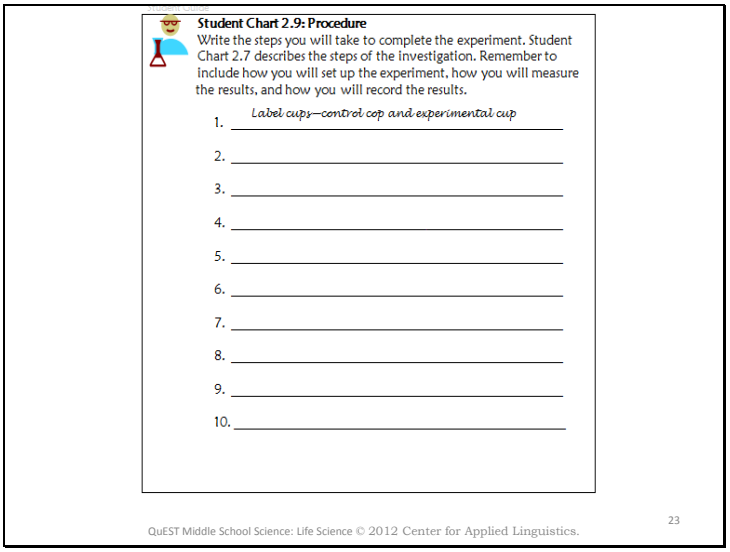
- **Pacing: 3 minutes.**
- Have students turn to Student Chart 2.7.
- Read the Investigation Overview and the Steps of Investigation.

Slide 22



- **Pacing: 15 minutes**
- Have students turn to Student Chart 2.8.
- Review the resources in Student Chart 2.8. Tell students they will be using the resources on this page to research decomposition and select their independent variable.
- **Teacher's note: You may wish to give students the printed readings or to watch the video clips as a class or to have students do this as independent work. You may distribute highlighters for students to highlight from the printed readings.**

Slide 23

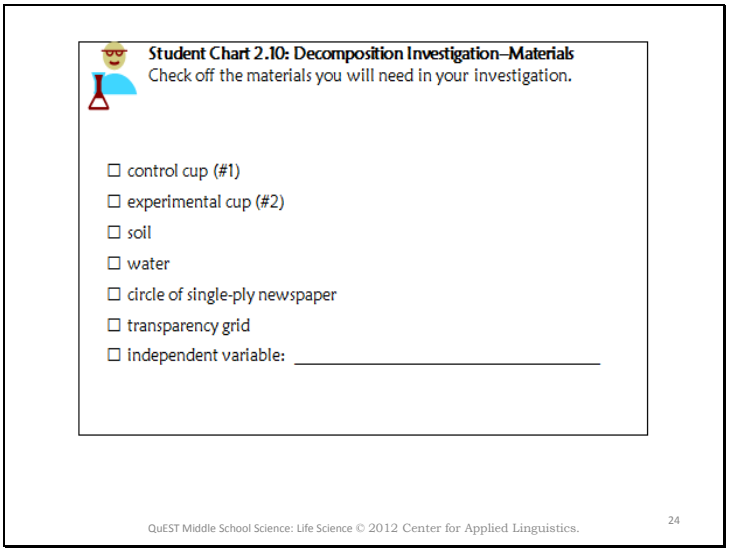


•**Pacing: 7 minutes.**
•Have students turn to Student Chart 2.9.
•Have students write down their procedure they will use.
•Remind students to use the Steps of the Investigation in Student Chart 2.7.
•Circulate around the class to review each group's procedure.
•When students have a procedure that is acceptable, allow the groups to begin setting up their experiment.

Optional:

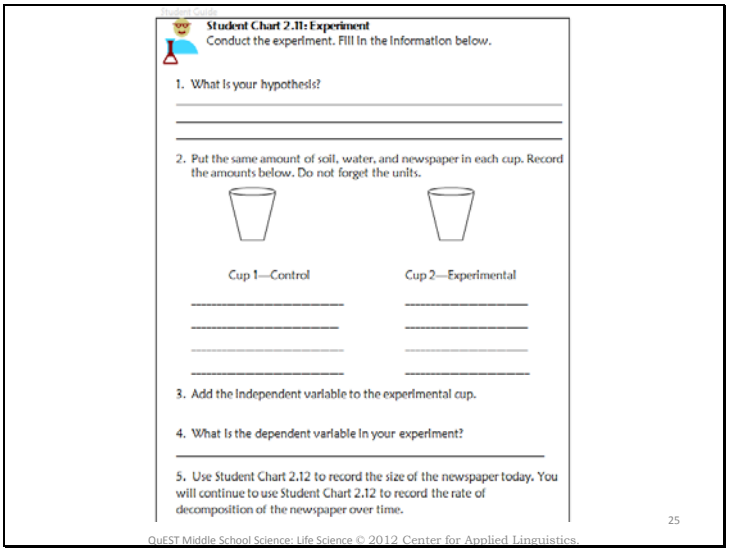
•Ask one student pair to read their procedure aloud.
•With all of the supplies laid out, follow their directions verbatim, without any inference on your part.
•Point out the importance of having a clear procedure that can be followed by any other scientist.
•Give students time to edit their work.
•If time allows, have students read their procedure to a partner as part of the editing process.

Slide 24



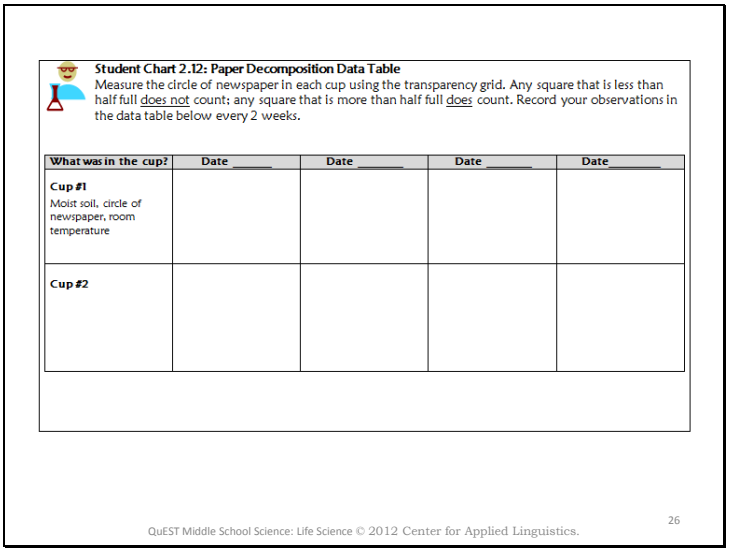
- **Pacing: 3 minutes.**
- Have students turn to Student Chart 2.10.
- Once students have done their background research, have students fill in their independent variable in Student Chart 2.10.
- Have students check off the materials they will need.
- Distribute materials or have students collect them.

Slide 25



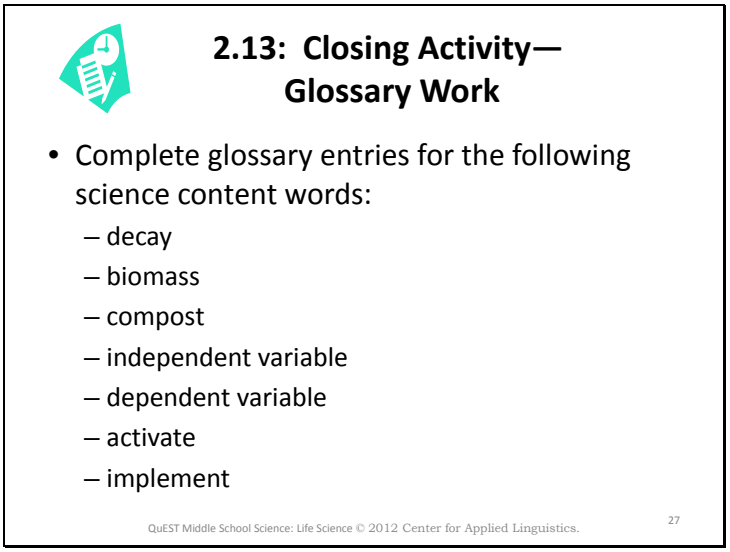
- **Pacing: 15 minutes.**
- Have students turn to Student Chart 2.11.
- Have student complete the experiment in pairs and record their hypothesis and variables in Student Chart 2.11.
- Have students begin the investigation, recording the amounts of soil, newspaper and water in Student Chart 2.11.

Slide 26



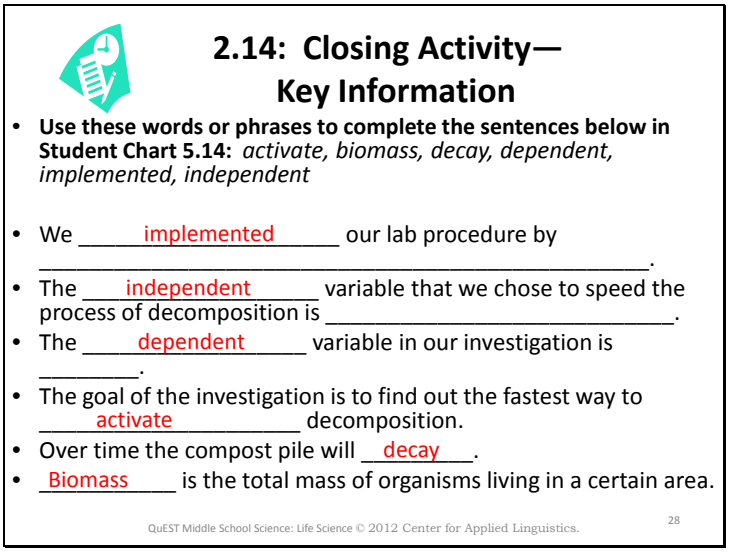
- **Pacing: 2 minutes**
- Have students turn to Student Chart 2.12.
- Show students where they will fill in the data they observe.
- Plan to collect data once every 2 weeks over the duration of the experiment.
- Every 2 weeks give students time to measure the newspaper with the transparency grid and record their measurements in Student Chart 2.12.
- **Teacher's note: If students have access to digital cameras, you may consider having them take a picture at specific intervals as any form of observation.**
- **Teacher's note: The data analysis and conclusion for this activity continue in a later lesson (Lesson 11-see Appendix of the Teacher Guide).**

Slide 27



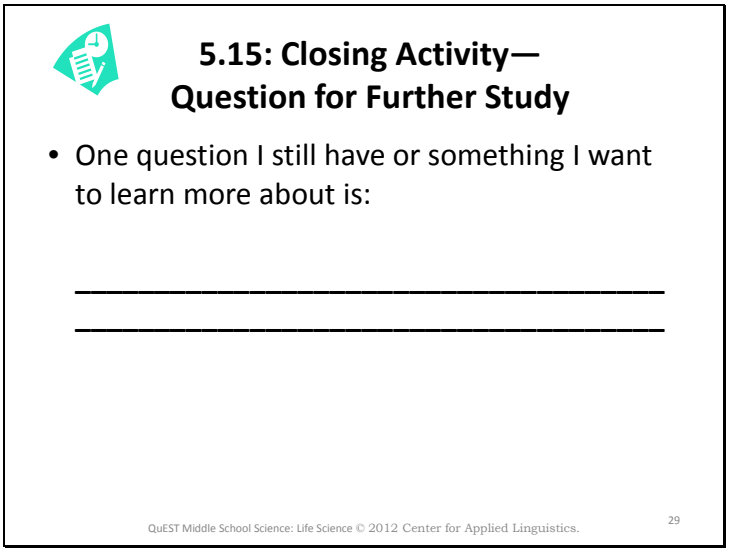
- **Pacing: 5 minutes.**
- Have students locate Student Chart 2.13.
- For each science content word, have students work in pairs to indicate whether the word is a cognate and to fill in the rest of the information required by the glossary.
- Review glossary entries with class.

Slide 28



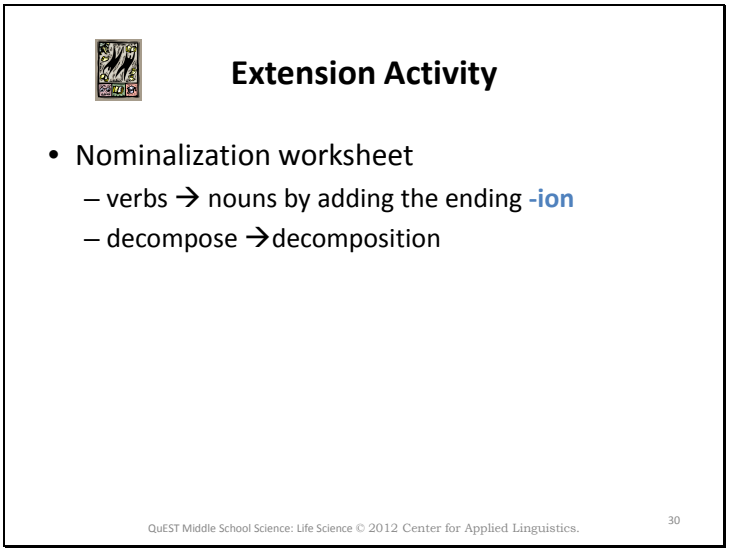
- **Pacing: 2 minutes.**
- Have students turn to Student Chart 2.14.
- Give students several minutes to complete the questions.
- Display responses and discuss.
- Have students correct responses as necessary.
- **Teacher note: The end of the first sentence is intentionally left blank for students to fill in the steps of their own procedures.**

Slide 29



- **Pacing: 1 minute.**
- Have students turn to Student Chart 2.15.
- Have students complete Student Chart 2.15.
- As time permits, have students share their questions with a partner, with the whole class, or have them write their questions on a sticky note and put them on a "questions wall" on their way out of class. Students who finish an assessment early or who have free time might be assigned to go online to find answers to class questions.

Slide 30



Optional

•Access the Sharepoint for a worksheet on nominalization.

Project QuEST
Model Life Science Lesson
Student Guide: Decomposition

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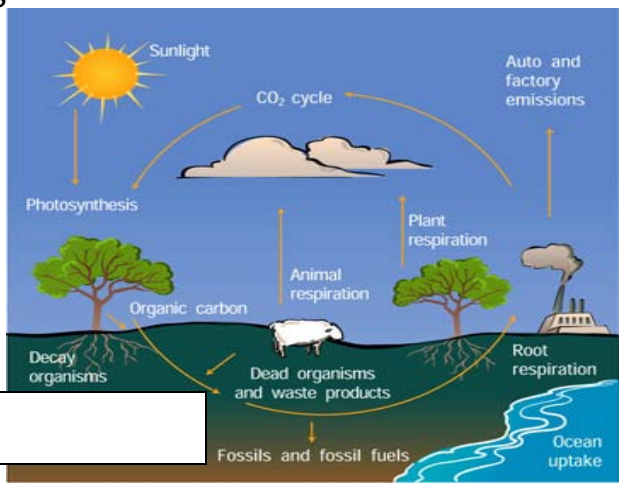
Cycles Set: Decomposition

Student Chart 2.1: Nitrogen Cycle Review

Complete the following questions.

1. Look at the diagram below. Then choose a title.



Title: _____

a. Nitrogen Cycle
b. Water Cycle`
c. Carbon Dioxide-Oxygen Cycle
d. Carbon Cycle

2. Which of these is an organic molecule?
   a. O_2
   b. H_2O
   c. $C_6H_{12}O_6$
   d. N_2

   Why is it organic? _____

Choose from the following words to complete the sentences:

analyze, *carbon*, *elements*, *nutrients*, *organic*

3. An animal gives off CO_2 when it breathes; the plant uses the CO_2 for photosynthesis. This is an example of the _____ cycle.
4. Nitrogen, carbon, and oxygen are examples of _____ that get recycled in an environment.
5. The doctors will _____ the x-ray for broken bones.
6. A(n) _____ compound must contain carbon.
7. Silver, gold, hydrogen, and nitrogen are all examples of _____.

Student Chart 2.2: Science and Language Objectives

Listen and follow along as your teacher reads this lesson's objectives.

In Science we will learn:

- to analyze the process of decomposition.
- to plan an experiment involving decomposition.

To develop our language skills, we will learn:

- to orally share information you learn about composting with your group.
- to draw conclusions from a reading about composting for planning your investigation.

Student Chart 2.3: Vocabulary Objectives

Listen and follow along as your teacher reads this lesson's vocabulary.

Science content vocabulary:

- decay
- biomass
- compost
- independent variable
- dependent variable

General academic vocabulary:

- activate
- implement

Student Chart 2.4: Interactive Reading—Preview

Read the guiding question.

- **Can we use decomposition to make fertilizer and to end the use of a landfill?**

Student Chart 2.5: Interactive Reading Text

Listen and follow along as the text is read aloud. Be prepared to answer the questions.

Trash County wants to change their trash disposal system. Trash County, like many counties across the United States, has a local landfill they use for their garbage. At the landfill, garbage is buried. However, the garbage does not decompose. Newspapers that are still readable have been unearthed from landfills dating back twenty years.

Currently, what happens to garbage at the landfill?

Why is this a problem?

Trash County wants to change their garbage disposal system because their landfill is almost full and there is no other location in the county to bury their garbage. Many other counties are facing the same problem.

Why does Trash County want to change their garbage disposal system?

The county government has decided to introduce the process of decomposition into the landfill system. Some newspapers can be recycled, but many are still sent to the landfill, and once they are contaminated or polluted with other garbage, the newspapers cannot be recycled.

Why can't some newspapers be recycled?

The county would like to know if it is possible to compost the papers and then sell the compost for fertilizer. Therefore, the county government wants to develop the best conditions for the newspapers to decompose the fastest. **Decomposition** is the process where materials are broken down into simpler substances.

What does the county want to do with the papers?

What is the name of the process where materials are broken down into simpler substances?

Since paper is an organic compound, we can return some of the **biomass** to the soil and make good fertilizer; then we can reduce the space needed in the landfill. Your group has been selected to determine the best conditions for newspaper decomposition. You will select one **variable** for your experiment, compare your results with the other scientists, and present your findings to the county government. Maybe they will implement your solution!

Why is it possible to recycle newspaper?

Student Chart 2.6: Decomposition

Work with partner to answer questions #1 and #2.

1. What is decomposition?

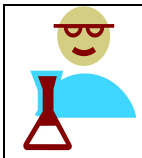
_____

_____

2. Based on the Interactive Reading, what is the question that you need to answer in this investigation?

_____

_____



Student Chart 2.7: Decomposition Investigation—Preview

Listen to the instructions.

Investigation Overview

- In this lab each group will be investigating how to speed up the process of decomposition.

- You will do the following:
  1. Background research to decide on the independent variables to use in your experiment.
  2. An experiment to see how your independent variables influence the dependent variable, decomposition.

Steps of Investigation

- There are two cups. One is a control cup. The other is an experimental cup.
- You will add the same amount of soil, water, and newspaper to each cup.
- Your group will decide what independent variables will speed up the decomposition in the experimental cup and add these variables. You can choose one or more independent variables.
- Every 2 weeks you will measure the rate of decomposition of the newspaper in each cup.

Student Chart 2.8: Background Research

Use the resources on this page to:
1. Learn about decomposition,
2. Choose your independent variable, and
3. Record the independent variable below.

Possible Resources

- Decomposition article with pictures of rabbit decomposing: http://www.countrysideinfo.co.uk/decompos.htm
- Composting readings:
  http://www.ecy.wa.gov/programs/swfa/kidspage/compost.html
  http://www.ehow.com/how_4912501_make-compost-kids.html

- Online or print encyclopedia articles about fungi, bacteria, or decomposition.

- School library texts about fungi and bacteria.

- Online research about what your local city does with its trash.
  http://www.ci.austin.tx.us/sws/zerowaste_composting.htm

- Discovery United Streaming clips:
  - Decomposition and the Carbon Cycle [01:12] from: from The Cycle Series: The Carbon Cycle [11:07]
  - Waste to Food: The Decomposition Process [01:42] from: Enviro-Tacklebox: Module 05: Processes and Cycles in the Environment: Rotten But Not Forgotten [20:09]

Our independent variable that will speed up decomposition in the experimental cup is: _____

Student Chart 2.9: Procedure

Write the steps you will take to complete the experiment. Student Chart 2.7 describes the steps of the investigation. Remember to include how you will set up the experiment, how you will measure the results, and how you will record the results.

1. *Label cups—control cop and experimental cup*
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

Student Chart 2.10: Decomposition Investigation--Materials

Check off the materials you will need in your investigation.

- ☐ control cup (#1)
- ☐ experimental cup (#2)
- ☐ soil
- ☐ water
- ☐ circle of single-ply newspaper
- ☐ transparency grid
- ☐ independent variable: _____

Student Chart 2.11: Experiment

Conduct the experiment. Fill in the information below.

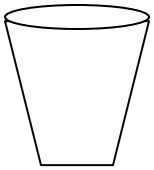
1. What is your hypothesis?

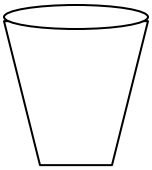
_____

_____

_____

2. Put the same amount of soil, water, and newspaper in each cup. Record the amounts below. Do not forget the units.





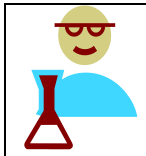
Cup 1—Control	Cup 2—Experimental
_____	_____
_____	_____
_____	_____
_____	_____

3. Add the independent variable to the experimental cup.

4. What is the dependent variable in your experiment?

_____

5. Use Student Chart 2.12 to record the size of the newspaper today. You will continue to use Student Chart 2.12 to record the rate of decomposition of the newspaper over time.



Student Chart 2.12: Paper Decomposition Data Table

Measure the circle of newspaper in each cup using the transparency grid. Any square that is less than half full does not count; any square that is more than half full does count. Record your observations in the data table below every 2 weeks.

What was in the cup?	Date _____	Date _____	Date _____	Date _____
Cup #1 Moist soil, circle of newspaper, room temperature				
Cup #2				

Student Chart 2.13: Glossary

Complete glossary entries for these science content words:

- decay
- biomass
- compost
- independent variable
- dependent variable
- activate
- implement

Student Chart 2.14: Key Information

Use these words or phrases to complete the sentences below:
activate, *biomass*, *decay*, *dependent*, *implemented*, *independent*

- We _____ our lab procedure by _____.
- The _____ variable that we chose to speed the process of decomposition is _____.
- The _____ variable in our investigation is _____.
- The goal of the investigation is to find out the fastest way to _____ decomposition.
- Over time, the compost pile will _____.
- _____ is the total mass of organisms living in a certain area.

Student Chart 2.15: Question for Further Study

Write a sentence about what you still want to learn.

One question I still have or something I want to learn more about is:

_____

_____

Project QuEST
Model Life Science Lesson
Teacher Guide: Cycles Set Review

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Middle School Science: Life Science

Cycles Set Review

Framework for K-12 Science Education: Dimension 3—Life Science

- **Disciplinary Core Idea (LS2.B) Cycles of Matter and Energy Transfer in Ecosystems***:* Food webs are models that demonstrate how matter and energy is transferred between producers, consumers and decomposers as the three groups interact-primarily for food-within an ecosystem. Transfers of matter into and out of the physical environment occur at every level- for example; when molecules from food react with oxygen captured from the environment, the carbon dioxide and water thus produces are transferred back to the environment, and ultimately so are waste products, such as fecal material. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem.
- **Science and Engineering Practices**: Developing and Using Models, Planning and Carrying out Investigations, Constructing Explanations and Designing Solutions
- **Crosscutting Concepts**: Energy and Matter

Connections to the Common Core State Standards (ELA)

- **L6:** Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Materials

- **Engagement Activity I**
  - Ziparound cards

Teacher Preparation

- Review instructions for review activity.
- Review Teacher and Student Charts.

Objectives

- **Science**:
  - Students will review science content.
- **Language**:
  - Students will write vocabulary.

- **Vocabulary:**
  - Students will review vocabulary from Lessons 1 and 2:
    - General academic: *activate*, *analyze*, *implement*
    - Science content: *biomass*, *carbon cycle*, *compost*, *decay*, *dependent variable*, *element*, *heterotroph*, *independent variable*, *matter*, *molecule*, *nitrogen cycle*, *organic*, *organic compound*

Overview of Activities

Engagement

- **Activity I: Ziparound.** Teacher distributes cards; students read their cards; one student reads his/her question aloud; all students listen; student with the response reads their answer and this his/her question on the reverse side of the question; students take turns reading their questions and answers in a loop until each student has had a turn.

Evaluation

- **Activity II: Vocabulary and Science Assessments.** Teacher hands out Student Charts for Lesson 3; teacher reviews instructions for each assessment; students complete assessment in alloted time—20 minutes.

- **Activity III: Review of Vocabulary and Science Assessment.** Teacher reviews assessment questions one by one; students correct incorrect responses; teacher asks students if they have any questions; teacher reviews crossword puzzle from previous week.

Extension Activity

- **Activity IV: Crossword Puzzle.** Students complete crossword puzzle when they finish their assessments or as homework.

Lesson Content

Engagement

Student Activity I (slide 2, Ziparound cards)
10 minutes
Activity Overview: Ziparound.

- Review instructions with students.
- Distribute Ziparound cards in a random order.
- Have students read their cards to a partner.

- Choose a student to start the game and continue the game until this same student reads his/her answer.
- **Teacher note: You may choose to play the game a second time and try to beat the time of the first game. Or play the game again and have students switch cards.**

Evaluation

Student Activity II (slide 3, Student Charts 3.1 and 3.2)
20 minutes
Activity Overview: Vocabulary and Science Assessment. Teacher hands out Student Charts 3.1 and 3.2; teacher reviews instructions for each assessment; students complete assessment in alloted time—20 minutes.
Teacher note: For students who have not finished in 20 minutes, the answers will be reviewed in Student Activity III.

- Hand out Student Charts 3.1 and 3.2.
- Tell students to turn to the Vocabulary Assessment in Student Charts 3.1 and the Science Assessment in Student Chart 3.2.
- Review instructions with students.
- Give students 20 minutes to complete the Charts.
- Students who finish early can work on crossword puzzle. Those who don't finish early can complete crossword for homework or the following week if they complete activities early.

Student Activity III (slides 4–12)
20 minutes
Activity Overview: Review of Vocabulary and Science Assessment. Teacher reviews assessment questions, one by one; students correct incorrect responses; teacher asks students if they have any questions; teacher reviews crossword puzzle from previous week.
Teacher note: Please devote up to 20 minutes to this activity. It is very important that you review assessment results with students and they correct their mistakes.

- Review assessment items by displaying responses one by one.
- Ask students to hightlight number of each incorrect response and correct it.
- Explain any misunderstandings.

Extension

- Student Activity IV: Crossword Puzzle.

Zip Around
Answer Key

1. I have **dependent variable**. 2. Who has the word that means to make something start working?		9. I have **analyze**. 10. Who has the word that means to carry out or put into action?
2. I have **activate**. 3. Who has the word that means a pair or group of atoms held together by one or more chemical bonds?		10. I have **implement**. 11. Who has the word that means the total mass of living organisms in a certain area, or matter formed by plants or animals that is used as a fuel?
3. I have **molecule**. 4. Who has the word that means something that affects the value of the dependent variable, that you control the value of in an experiment?		11. I have **biomass**. 12. Who has the word that means to rot and break apart?
4. I have **independent variable**. 5. Who has the word that means a mixture of decaying leaves, vegetables, or manure that is used to improve garden soil?		12. I have **decay**. 13. Who has the word that means an organism that obtains the energy it needs by feeding on other organisms?
5. I have **compost**. 6. Who has the word that means anything that has mass and takes up space?		13. I have **heterotroph**. 14. Who has the word that means the movement of carbon between living and nonliving parts of an ecosystem?
6. I have **matter**. 7. Who has the word that means a compound that contains the element carbon?		14. I have **carbon cycle**. 15. Who has the word that describes a compound that contains the element carbon; a material made of or by living things or once-living things?
7. I have **organic compound**. 8. Who has the word that means a substance that cannot be split into simpler substances, where each one is made of just one kind of atom?		15. I have **organic**. 1. Who has the word that means what you are testing in an experiment?
8. I have **element**. 9. Who has the word that means to examine or think about something carefully to understand it?		

Lesson 3 Student Assessments

Teacher Chart 3.1: Answers to Vocabulary Assessment

Write the letter that matches each definition in the space provided.

_D_ 1. The _____ is the movement of carbon between living and nonliving parts of an ecosystem.

_H_ 2. A(n) _____ is a substance that cannot be split into simpler substances. Each _____ is made of just one kind of atom.

_L_ 3. _____ is anything that has mass and takes up space.

_A_ 4. To _____ is to make something start working.

_K_ 5. A(n) _____ affects the value of the dependent variable; in an experiment, you control the value of the _____.

_M_ 6. A(n) _____ is a pair or group of atoms held together by one or more chemical bonds.

_F_ 7. To _____ is to rot and break apart.

_O_ 8. A(n) _____is a compound that contains the element carbon.

_N_ 9. _____ describes a compound that contains the element carbon; a material made of or by living things or once-living things.

_B_ 10. To _____ is to examine or think about something carefully to understand it.

_E _ 11. _____ is a mixture of decaying leaves, vegetables, or manure that is used to improve garden soil.

_G_ 12. A(n) _____is what you are testing in an experiment.

_I_ 14. A(n) _____ is an organism that obtains the energy it needs by feeding on other organisms.

_C_ 15. _____ is the total mass of living organisms in a certain area; it can also be matter formed by plants or animals that is used as a fuel, such as wood or dung.

_J_ 16. To _____ means to carry out or put into action.

A. activate
B. analyze
C. biomass
D. carbon cycle
E. compost
F. decay
G. dependent variable
H. element
I. heterotroph
J. implement
K. independent variable
L. matter
M. molecule
N. organic
O. organic compound

Student Chart 3.2: Science Assessment
Read each question and choose the best answer.

1. In a compost bin, bacteria help break down matter into simler sibustances. In this process, energy is released back in to the environment as…

   A. matter
   B. heat
   C. light
   D. electricity

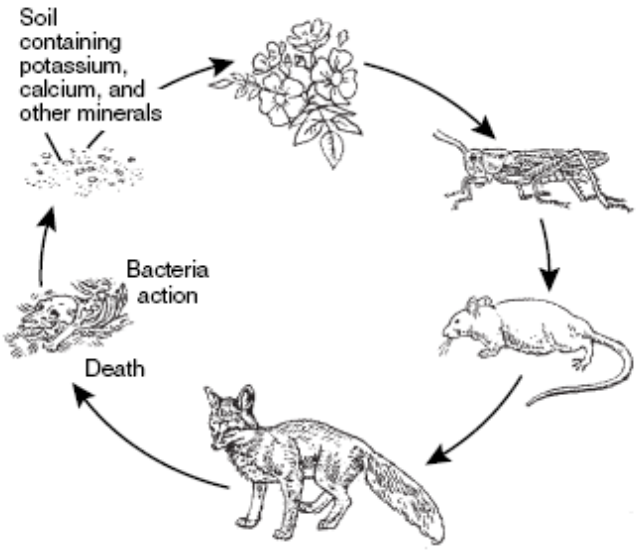
2. What factors affect the process of decomposition?

   A. amount of bacteria
   B. temperature
   C. size of what is decomposing
   D. all are correct

3. Which of these is an organic molecule?

   A. O_{2cl}
   B. H_2O
   C. $C_6H_{12}O_6$
   D. N_2

4. Which concept is best illustrated by the diagram below?



A. The exchange of CO_2 and O_2 in an ecosystem.
B. The effect of limiting factors in a biome.
C. Cycling of nutrients in an ecosystem.
D. Environmental pressures on a population.

5. After grass is cut, fungi and bacteria break down some of the cut grass on the lawn. This process returns nutrients stored in the cut grass to the soil. In this process, the fungi and bacteria act as…

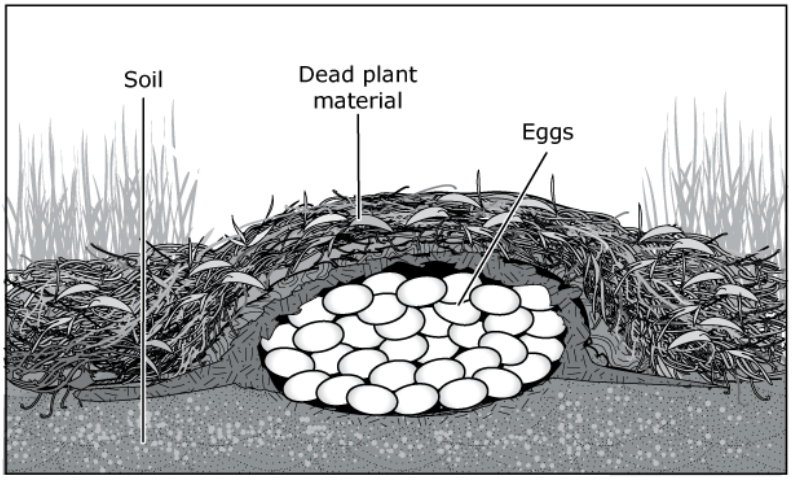
A. producers.
B. decomposers.
C. parasites.
D. prey.

6. Animal cells give off CO_2 (carbon dioxide) as a waste product during respiration. Plants use the carbon dioxide in the process of photosynthesis. This is an example of …

A. the carbon cycle.
B. decomposition.
C. the Nitrogen cycle.
D. predator-prey interactions.

7. Look at the picture below. It shows a cross section of an alligator nest.

Cross Section of an Alligator Nest



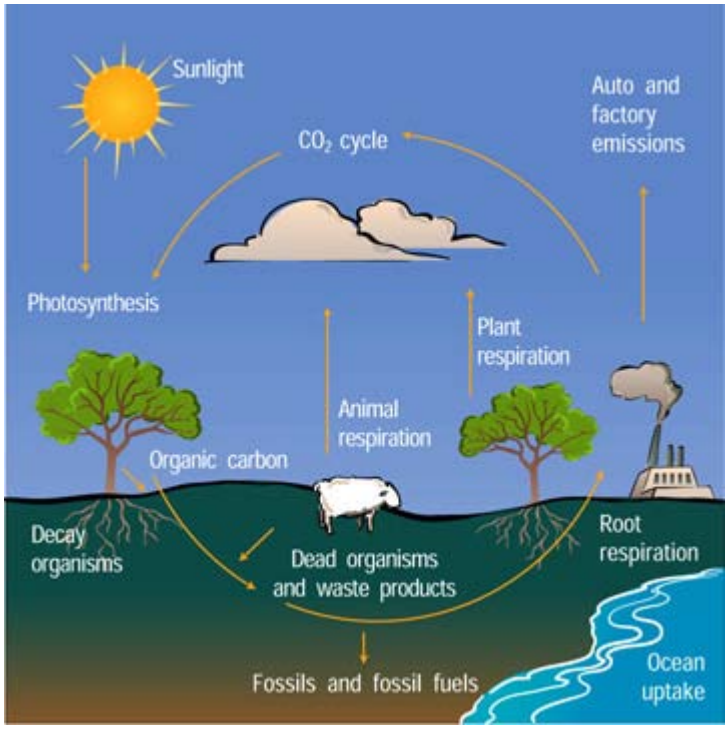
Alligators lay their eggs in nests made of soil and plant material. Just like a compost pile, the temperature of the nest is higher than the temperature of the soil and air around the nest. What creates the heat energy that allows the eggs to hatch?

A. The decay of dead plant material.
B. The size of the eggs.
C. The daily wind currents.
D. The temperature of the nearby river.

8. In the carbon cycle, …

A. carbon moves from living things into the atmosphere.
B. carbon moves from plants to animals.
C. carbon moves from the atmosphere to plants.
D. All are true.

9. Give this diagram an appropriate title:



A. Nitrogen Cycle
B. Water Cycle
C. Carbon Dioxide-Oxygen Cycle
D. Carbon Cycle

10. Explain the ways that nature recycles:

_____

_____

_____

_____

_____

_____

Student Chart 3.3: Student Crossword Puzzle

Use your glossary to complete the crossword puzzle.

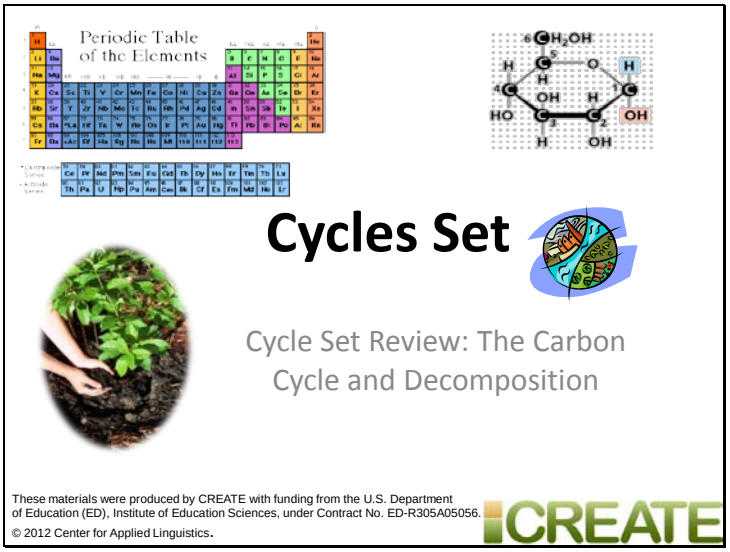
Across

3. A [**dependent**] variable is what you are testing in an experiment.
5. A [**heterotroph**] is an organism that obtains the energy it needs by feeding on other organisms.
6. [**Organic**] describes a compound that contains the element carbon; a material made of or by living things or once-living things.
8. [**Biomass**] is the total mass of living organisms in a certain area; it can also be matter formed by plants or animals that is used as a fuel, such as wood or dung.
10. A [**molecule**] is a pair or group of atoms held together by one or more chemical bonds.
11. To [**decay**] is to rot and break apart.
12. [**Matter**] is anything that has mass and takes up space.
14. An [**element**] is a substance that cannot be split into simpler substances. Each [**element**] is made of just one kind of atom.
15. The [**Carbon**] cycle is the movement of [**carbon**] between living and nonliving parts of an ecosystem.

Down

1. [**Compost**] is a mixture of decaying leaves, vegetables, or manure that is used to improve garden soil.
2. An organic [**compound**] is a compound that contains the element carbon.
7. The [**Independent**] variable affects the value of the dependent variable; in an experiment, you control the value of the _____ variable.
9. To [**implement**] means to carry out or put into action.
13. To [**activate**] is to make something start working.
16. To [**analyze**] is to examine or think about something carefully to understand it.

Slide 1


Periodic Table
of the Elements
Cycles Set
Cycle Set Review: The Carbon Cycle and Decomposition
These materials were produced by CREATE with funding from the U.S. Department of Education (ED), Institute of Education Sciences, under Contract No. ED-R305A05056.
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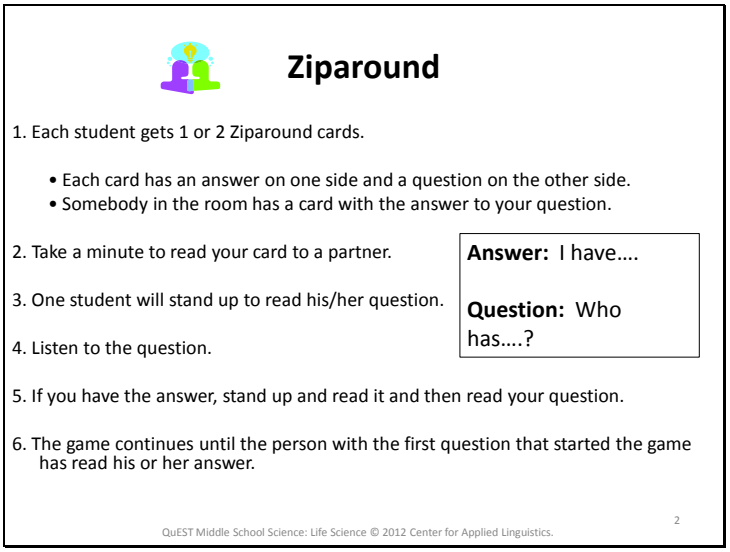
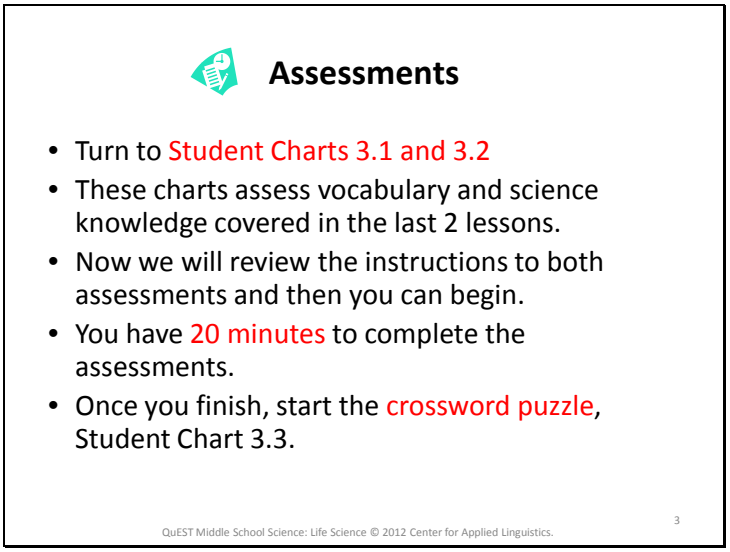
CREATE

Slide 2



•[There is no Student Chart for this activity].
•**Pacing for Ziparound: 10 minutes.**
•Review instructions with students.
•Distribute Ziparound cards in a random order.
•Have students read their cards to a partner.
•Choose a student to start the game and continue the game until this same student reads his/her answer.
•**Teacher's note: You may choose to play the game a second time and try to beat the time of the first game. Or play the game again and have students switch cards.**

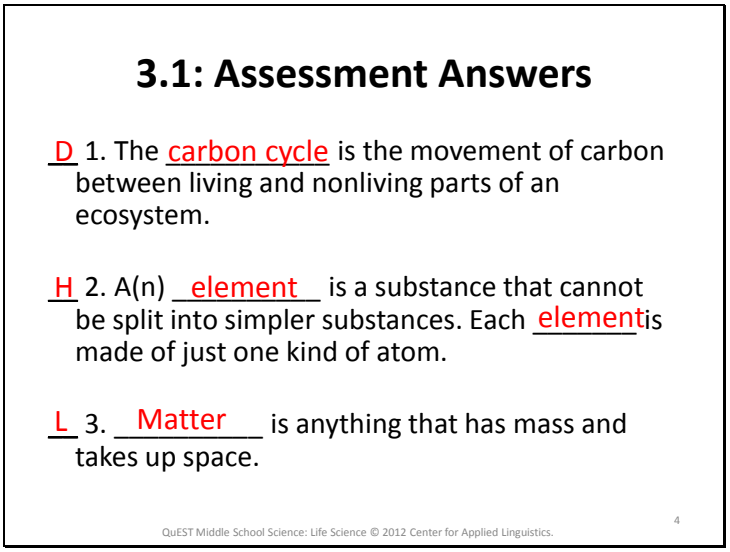
Slide 3



Pacing for Students to Complete Assessments: 20 minutes

- Hand out Student Charts for lesson 3.
- Review instructions with students.
- Give students 20 minutes to complete the Charts.

Slide 4



Pacing for Review of Assessments: 20 minutes

- Have students turn to Student Chart 3.1.
- Display responses.
- Have students correct responses as necessary.
- Explain any misunderstandings.

Slide 5

3.1: Assessment Answers, cont.

A 4. To activate is to make something start working.

independent

K 5. A(n) variable affects the value of the dependent variable; in an experiment, you control the value of the independent variable.

M 6. A(n) molecule is a pair or group of atoms held together by one or more chemical bonds.

- Follow the same routine.

Slide 6

3.1: Assessment Answers, cont.

F 7. To decay is to rot and break apart.

O 8. A(n) organic compound is a compound that contains the element carbon.

N 9. organic describes a compound that contains the element carbon; a material made of or by living things or once-living things.

B 10. To analyze is to examine or think about something carefully to understand it.

- Follow the same routine.

Slide 7

3.1: Assessment Answers, cont.

E 11. Compost is a mixture of decaying leaves, vegetables, or manure that is used to improve garden soil.

G 12. A(n) dependent variable is what you are testing in an experiment.

I 14. A(n) heterotroph is an organism that obtains the energy it needs by feeding on other organisms.

7

•Follow the same routine.

Slide 8

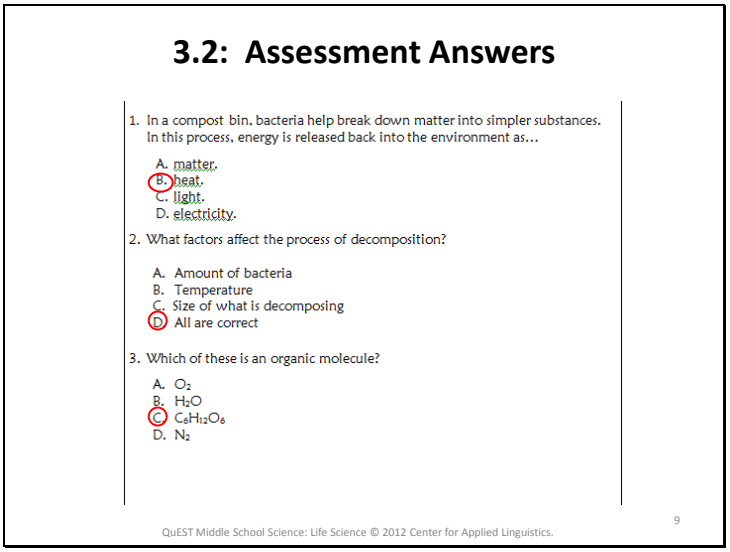
3.1: Assessment Answers (*cont.*)

C 15. biomass is the total mass of living organisms in a certain area; it can also be matter formed by plants or animals that is used as a fuel, such as wood or dung.

J 16. To implement means to carry out or put into action.

- Follow the same routine.

Slide 9

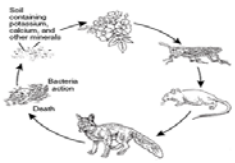


- Have students turn to Student Chart 3.2.
- Have students read each question and their answer.
- Display responses.
- Have students correct responses as necessary.
- Explain any misunderstandings.

Slide 10

3.2: Assessment Answers (*cont.*)

4. Which concept is best illustrated by the diagram below?



A. the exchange of CO_2 and O_2 in an ecosystem.
B. the effect of limiting factors in a biome.
C. cycling of nutrients in an ecosystem.
D. environmental pressures on a population.

5. After grass is cut, fungi and bacteria break down some of the cut grass on the lawn. This process returns nutrients stored in the cut grass to the soil. In this process, the fungi and bacteria act as–

A. producers
B. decomposers
C. parasites
D. prey.

6. Animal cells give off CO_2 (carbon dioxide) as a waste product during respiration. Plants use the carbon dioxide in the process of photosynthesis. This is an example of:

A. the carbon cycle
B. decomposition
C. the Nitrogen cycle
D. predator-prey interactions

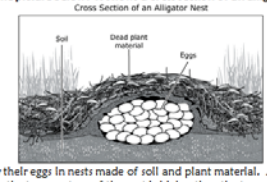
•Follow the same routine.

Slide 11

3.2: Assessment Answers (*cont.*)

7. Look at the picture below. It shows a cross section of an alligator nest.

Cross Section of an Alligator Nest



Alligators lay their eggs in nests made of soil and plant material. Just like a compost pile, the temperature of the nest is higher than the temperature of the soil and air around the nest. What creates the heat energy that allows the eggs to hatch?

A. the decay of dead plant material
B. the size of the eggs
C. the daily wind currents
D. the temperature of the nearby river

8. In the carbon cycle,

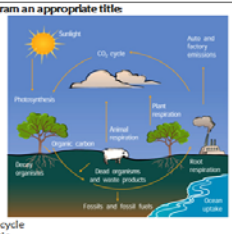
A. carbon moves from living things into the atmosphere
B. carbon moves from plants to animals
C. carbon moves from the atmosphere to plants
D. all are true

•Follow the same routine.

Slide 12

3.2: Assessment Answers (*cont.*)

9. Give this diagram an appropriate title:



A. Nitrogen cycle
B. Water cycle
C. Carbon dioxide-oxygen cycle
D. Carbon cycle

10. Explain the ways that nature recycles:

•Follow the same routine.

Project QuEST
Model Life Science Lesson
Student Guide: Cycles Set Review

These materials were produced by CREATE with funding from the U.S Department of Education (ED), Institute of Education Sciences, under Contract No. ED-R305A05056. The opinions expressed herein do not necessarily reflect the positions or policies of ED.

Lesson 3 Cycles Set Student Assessment

Student Chart 3.1: Vocabulary Assessment

Write the letter that matches each definition in the space provided.

___ 1. The _____ is the movement of carbon between living and nonliving parts of an ecosystem.

___ 2. A(n) _____ is a substance that cannot be split into simpler substances. Each _____ is made of just one kind of atom.

___ 3. _____ is anything that has mass and takes up space.

___ 4. To _____ is to make something start working.

___ 5. A(n) _____ affects the value of the dependent variable; in an experiment, you control the value of the _____.

___ 6. A(n) _____ is a pair or group of atoms held together by one or more chemical bonds.

___ 7. To _____ is to rot and break apart.

___ 8. A(n) _____is a compound that contains the element carbon.

___ 9. _____ describes a compound that contains the element carbon; a material made of or by living things or once-living things.

___ 10. To _____ is to examine or think about something carefully to understand it.

___ 11. _____ is a mixture of decaying leaves, vegetables, or manure that is used to improve garden soil.

___ 12. A(n) _____is what you are testing in an experiment.

___ 13. The _____is the movement of nitrogen between the living and nonliving parts of an ecosystem.

___ 14. A(n) _____ is an organism that obtains the energy it needs by feeding on other organisms.

___ 15. _____ is the total mass of living organisms in a certain area; it can also be matter formed by plants or animals that is used as a fuel, such as wood or dung.

___ 16. To _____ means to carry out or put into action.

A. activate
B. analyze
C. biomass
D. carbon cycle
E. compost
F. decay
G. dependent variable
H. element
I. heterotroph
J. implement
K. independent variable
L. matter
M. molecule
N. organic
O. organic compound

Student Chart 3.2: Science Assessment
Read each question and choose the best answer.

1. In a compost bin, bacteria help break down matter into simpler substances. In this process, energy is released back into the environment as…

   A. matter.
   B. heat.
   C. light.
   D. electricity.

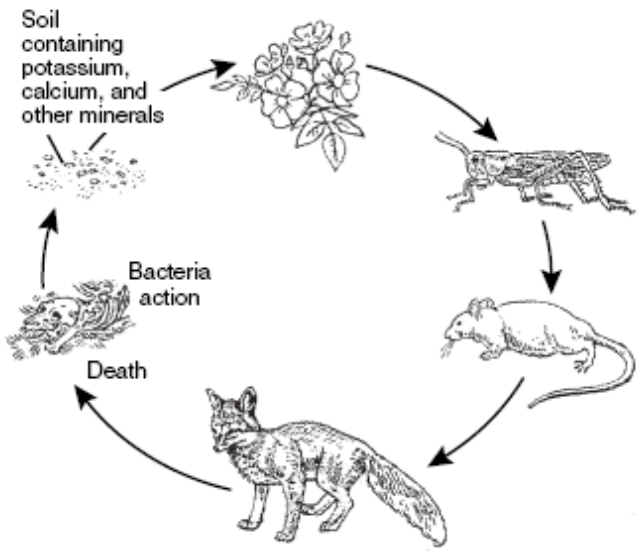
2. What factors affect the process of decomposition?

   A. Amount of bacteria
   B. Temperature
   C. Size of what is decomposing
   D. All are correct

3. Which of these is an organic molecule?

   A. O_2
   B. H_2O
   C. $C_6H_{12}O_6$
   D. N_2

4. Which concept is best illustrated by the diagram below?



A. The exchange of CO_2 and O_2 in an ecosystem.
B. The effect of limiting factors in a biome.
C. Cycling of nutrients in an ecosystem.
D. Environmental pressures on a population.

5. After grass is cut, fungi and bacteria break down some of the cut grass on the lawn. This process returns nutrients stored in the cut grass to the soil. In this process, the fungi and bacteria act as…

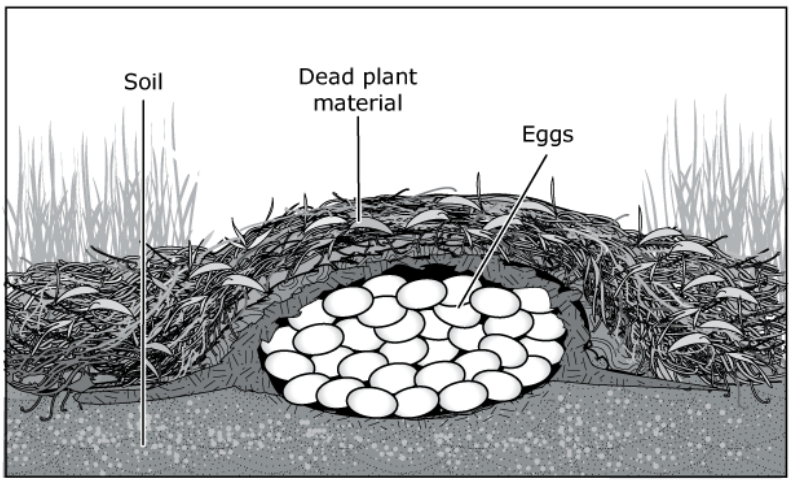
A. producers.
B. decomposers.
C. parasites.
D. prey.

6. Animal cells give off CO_2 (carbon dioxide) as a waste product during respiration. Plants use the carbon dioxide in the process of photosynthesis. This is an example of…

A. the carbon cycle.
B. decomposition.
C. the nitrogen cycle.
D. predator-prey interactions.

7. Look at the picture below. It shows a cross section of an alligator nest.

Cross Section of an Alligator Nest



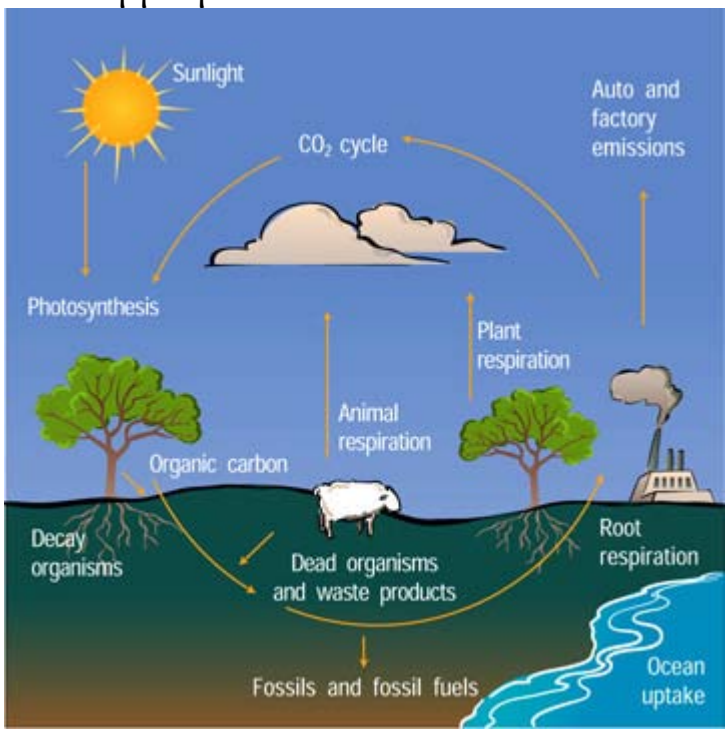
Alligators lay their eggs in nests made of soil and plant material. Just like a compost pile, the temperature of the nest is higher than the temperature of the soil and air around the nest. What creates the heat energy that allows the eggs to hatch?

A. The decay of dead plant material.
B. The size of the eggs.
C. The daily wind currents.
D. The temperature of the nearby river.

8. In the carbon cycle, …

A. carbon moves from living things into the atmosphere.
B. carbon moves from plants to animals.
C. carbon moves from the atmosphere to plants.
D. All are true.

9. Give this diagram an appropriate title:



A. Nitrogen Cycle
B. Water Cycle
C. Carbon Dioxide-Oxygen Cycle
D. Carbon Cycle

10. Explain the ways that nature recycles:

_____

_____

_____

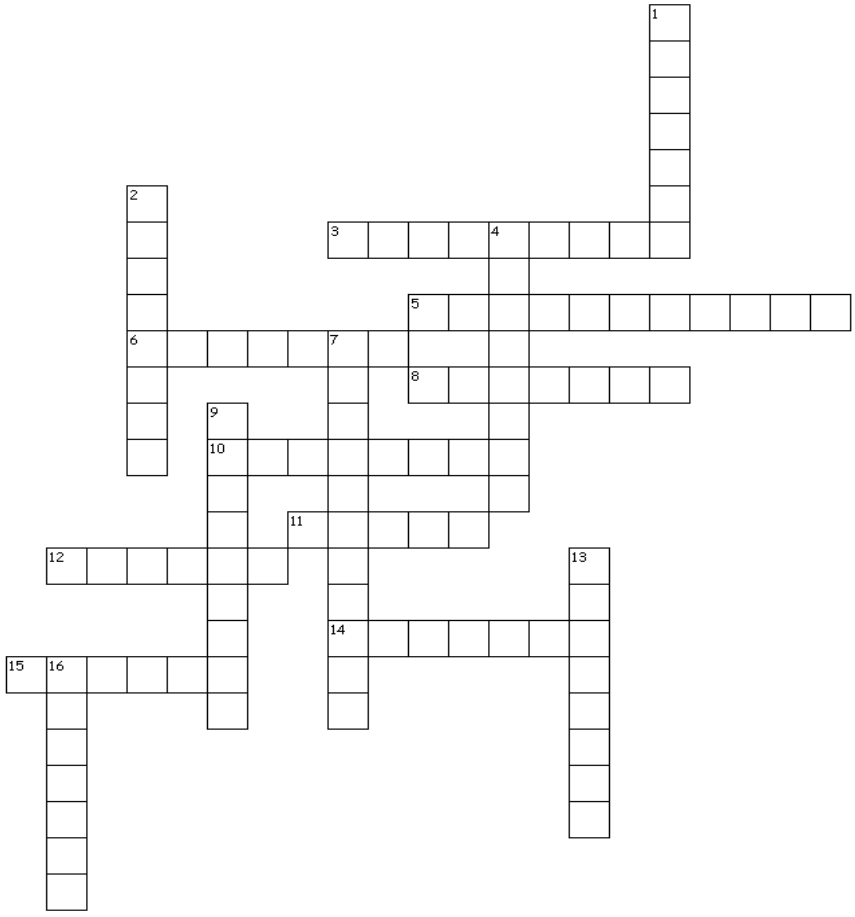
_____

_____

_____

Student Chart 3.3: Student Crossword Puzzle

Use your glossary to complete the crossword puzzle.



Word Bank

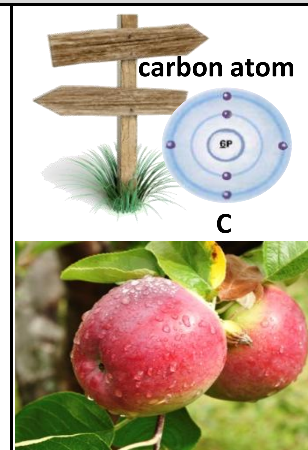
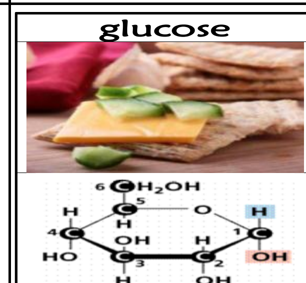
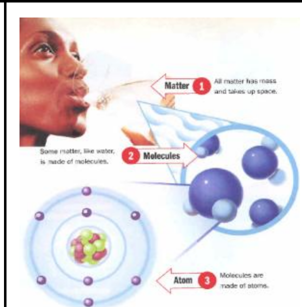
analyze
activate
implement
organic
organic
matter
molecule
element
carbon
decay
biomass
compost
independent
dependent
heterotroph

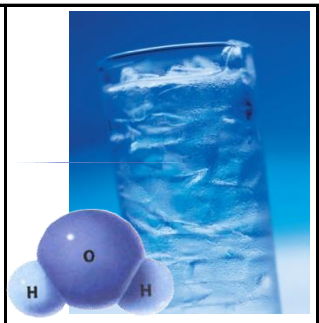
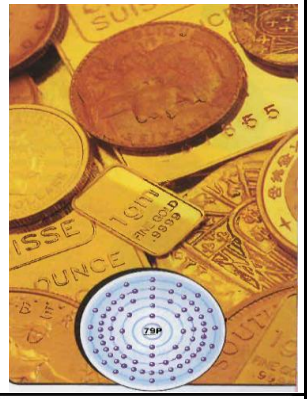
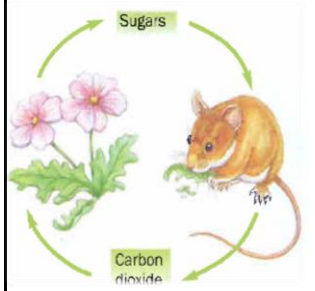
Across

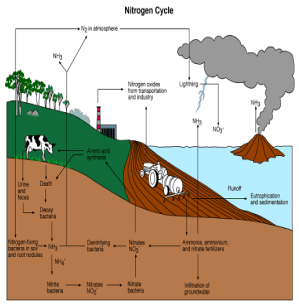
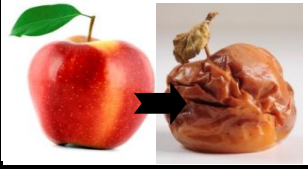
3. A _____ variable is what you are testing in an experiment.
5. A _____ is an organism that obtains the energy it needs by feeding on other organisms.
6. _____ describes a compound that contains the element carbon; a material made of or by living things or once-living things.
8. _____ is the total mass of living organisms in a certain area; it can also be matter formed by plants or animals that is used as a fuel, such as wood or dung.
10. A _____ is a pair or group of atoms held together by one or more chemical bonds.
11. To _____ is to rot and break apart.
12. _____ is anything that has mass and takes up space.
14. An _____ is a substance that cannot be split into simpler substances. Each _____ is made of just one kind of atom.
15. The _____ cycle is the movement of carbon between living and nonliving parts of an ecosystem.

Down

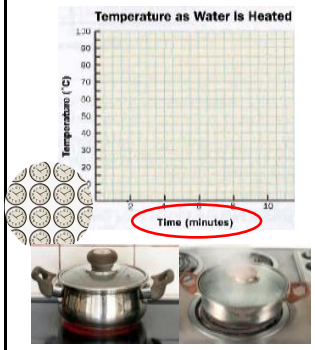
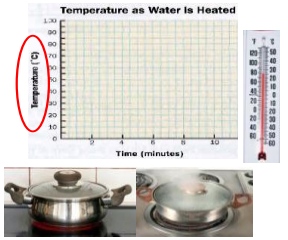
1. _____ is a mixture of decaying leaves, vegetables, or manure that is used to improve garden soil.
2. An organic _____ is a compound that contains the element carbon.
7. The _____ variable affects the value of the dependent variable; in an experiment, you control the value of the _____ variable.
9. To _____ means to carry out or put into action.
13. To _____ is to make something start working.
16. To _____ is to examine or think about something carefully to understand it.

Cycles Unit Glossary					
Vocabulary Word	Cognate?	Definition	Question	Picture	My Understanding: drawing, examples, or notes
Lesson 1					
English: __________________ Español: __________________		Organic describes a compound that contains the element carbon; a material made of or by living things or once-living things. Orgánico describe un compuesto que contiene el elemento carbono; un material que se formó a partir de seres vivos que alguna vez existieron.	An example of an organic compound from a tree is _____________________ _____________________ _____________________ _____________________ _____________________ _____________________		
English: __________________ Español: __________________		An organic compound is a compound that contains the element carbon. Un compuesto orgánico es un compuesto que contiene el elemento carbono.	Name an organic compound: _____________________ _____________________ _____________________		
English: __________________ Español: __________________		Matter is anything that has mass and takes up space. El materia es cualquier cosa que tiene masa y ocupa espacio y que está compuesta de diferentes tipos de átomos; incluye el calor, el sonido o la luz.	Name something that has mass and takes up space on your desk: _____________________ _____________________ _____________________ _____________________ _____________________		

English: _____ Español: _____		A molecule is a pair or group of atoms held together by one or more chemical bonds. Una molécula es un par o un grupo de átomos que están unidos por uno o más enlaces químicos.	The CO_2 molecule contains two elements: _____ and _____.		
English: _____ Español: _____		An element is a substance that cannot be split into simpler substances. Each element is made of just one kind of atom. Un elemento es material natural o sintético que no puede romperse en materialies más simples. Cada elemento está compuesto de solo un tipo de átomo.	How many atoms are there in the element carbon? _____ _____ _____		
English: _____ Español: _____		The carbon cycle is the movement of carbon between living and nonliving parts of an ecosystem. El ciclo del carbono es la transferencia de carbono a través de las partes vivas e inertes de un ecosistema.	The process of photosynthesis produces _____, which contains carbon.		

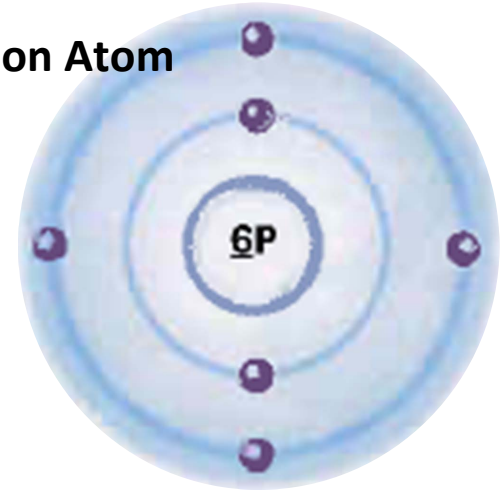
English: _____ Español: _____		The nitrogen cycle is the movement of nitrogen between the living and non-living parts of an ecosystem. El ciclo del nitrógeno es la transferencia de nitrógeno entre las partes vivas e inertes de un ecosistema.	The nitrogen enters the soil when _____ _____ _____.		
English: _____ Español: _____		To analyze is to examine or think about something carefully to understand it. Analizar es examinar en detalle o pensar con cuidado en algo con el objetivo de entenderlo.	How would you analyze how many cell phone minutes your family used this month? _____ _____ _____		
Lesson 2					
English: _____ Español:		To decay is to rot and break apart. Decaer es descomponerse o pudrirse.	How can you tell when you have left an apple in your lunchbox long enough for it to start decaying? _____ _____		

English: _____ Español: _____		Biomass is the total mass of living organisms in a certain area; it can also be matter formed by plants or animals that is used as a fuel, such as wood or dung. Biomasa es la masa total de los organismos vivos en un área específica. También se refiere a la materia formada por plantas y animales que es usada como combustible, como lo son la madera o el estiércol.	Estimate the biomass of your home, including the outside of the property. _____ _____ _____		
English: _____ Español: _____		Compost is a mixture of decaying leaves, vegetables, or manure that is used to improve garden soil. El abono es una mezcla de hojas, vegetales o estiércol que se encuentran en proceso de descomposición. Se usa para mejorar la calidad del suelo del jardín.	The ingredients needed for composting include: _____ _____ _____		

English: _____ Español: _____		An independent variable affects the value of the dependent variable; in an experiment, you control the value of the independent variable. La variable independiente afecta el valor de la variable dependiente; en un experimento, tú controlas el valor de la variable independiente.	The independent variable in our composting investigation is _____ _____ _____		
English: _____ Español:		A dependent variable is the what you are testing in an experiment. La variable dependiente es lo que se pone a prueba en un experimento.	The dependent variable in our composting investigation is _____ _____ _____		
English: _____ Español:		To activate is to make something start working. Activar es hacer que algo comience a funcionar.	Name some things that are activated with a password. _____ _____ _____		
English: _____ Español:		To implement means to carry out or put into action. Implementar significa llevar a cabo o poner en acción.	Describe some laws that you think should be implemented in the future. _____ _____ _____		

organic

Carbon Atom



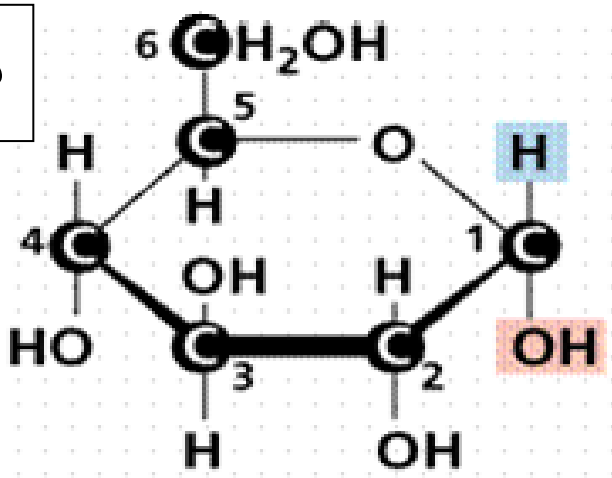
orgánico

- Organic describes a compound that contains the element carbon; a material made of or by living things or once-living things.

- Orgánico describe un compuesto que contiene el elemento carbono; un material que se formó a partir de seres vivos que alguna vez existieron.

organic compound

glucose

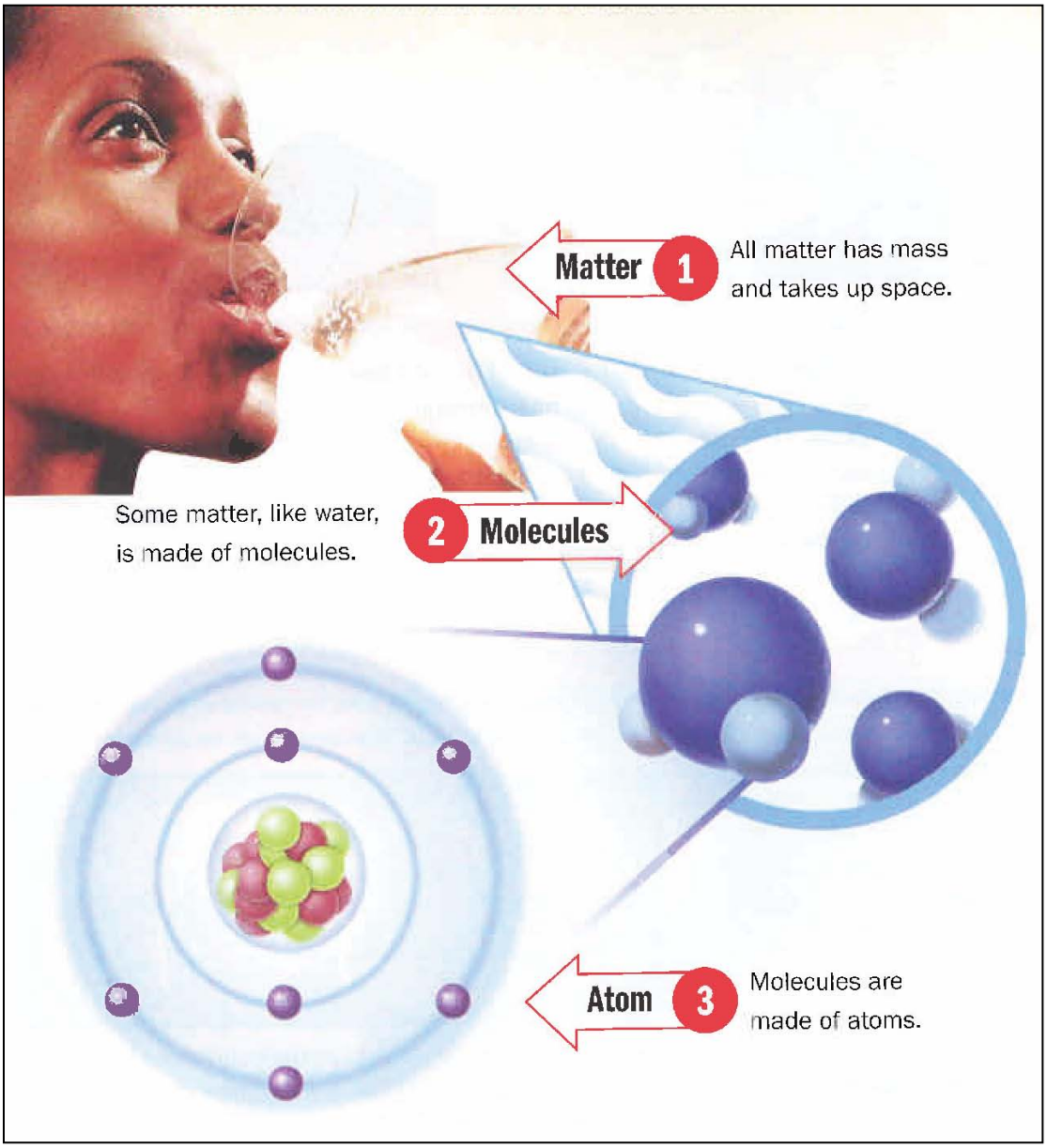


compuesto orgánico

- An organic compound is a compound that contains the element carbon.

- Un compuesto orgánico es un compuesto que contiene el elemento carbon.

matter

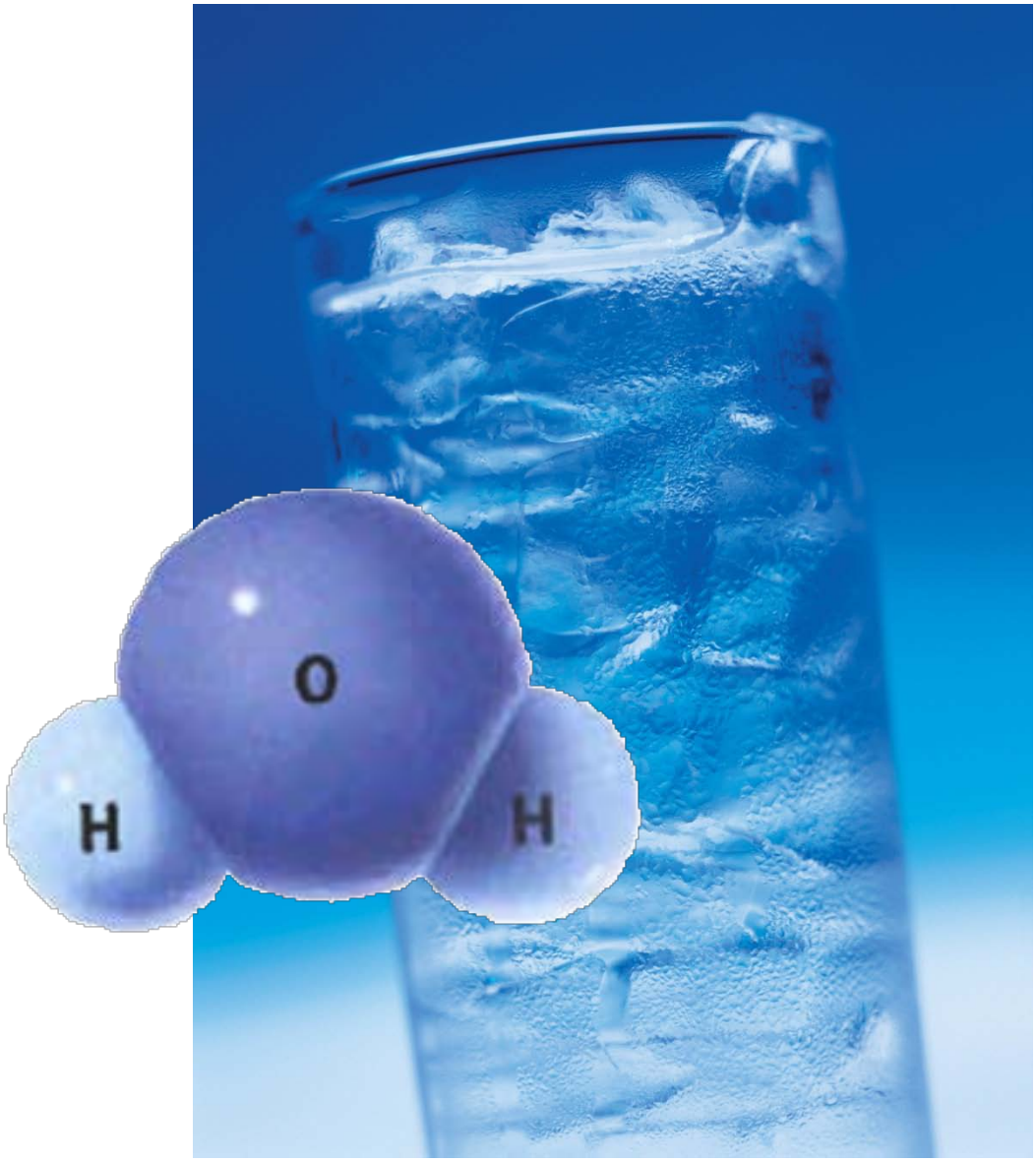


materia

- Matter is anything that has mass and takes up space.

- El materia es cualquier cosa que tiene masa y ocupa espacio y que está compuesta de diferentes tipos de átomos; incluye el calor, el sonido o la luz.

molecule



molécula

- A molecule is a pair or group of atoms held together by one or more chemical bonds.

- Una molécula es un par o un grupo de átomos que están unidos por uno o más enlaces químicos.

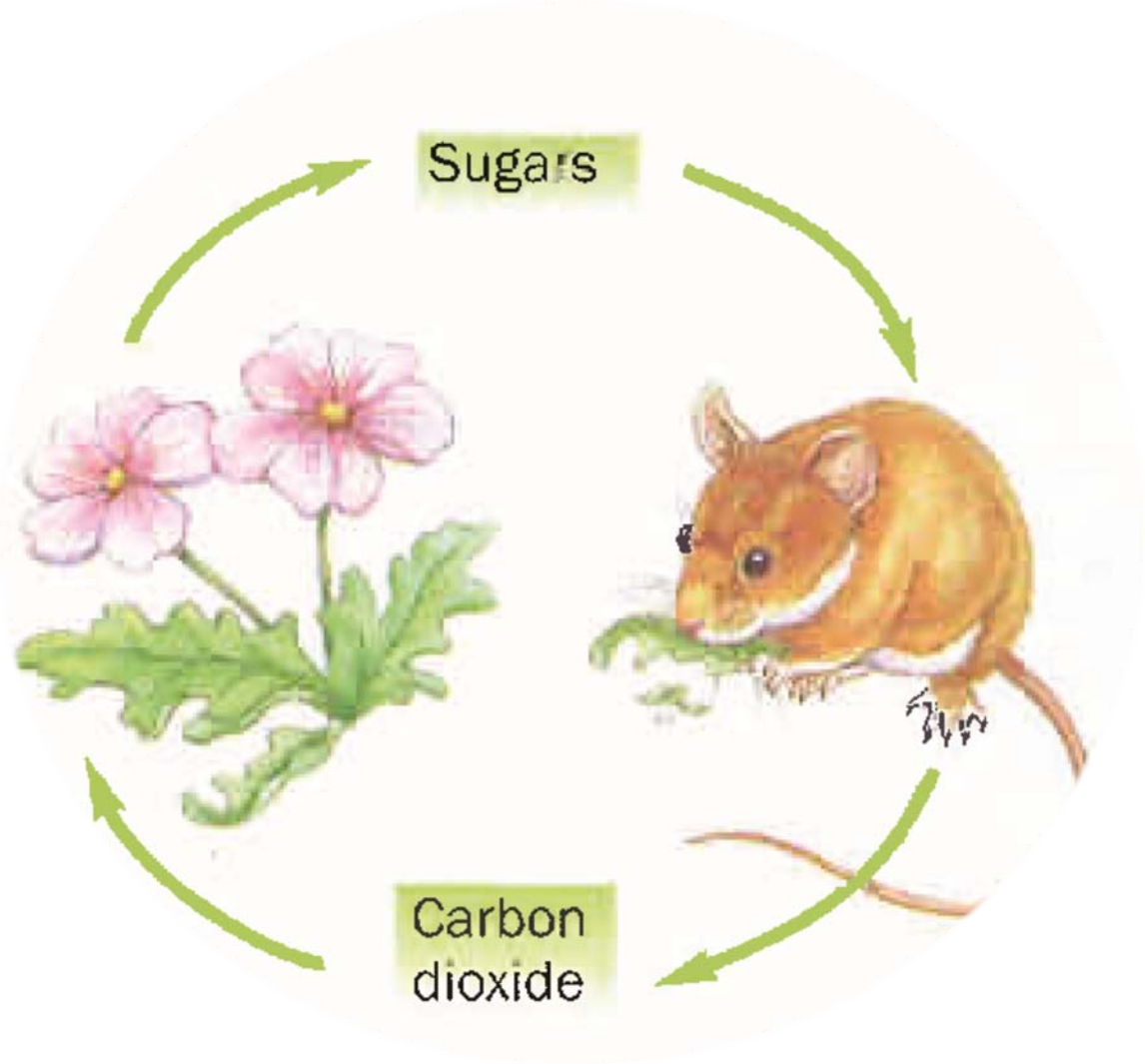
element

elemento

- An element is a substance that cannot be split into simpler substances. Each element is made of just one kind of atom.

- Un elemento es material natural o sintético que no puede romperse en materiales más simples. Cada elemento está compuesto de solo un tipo de átomo.

carbon cycle

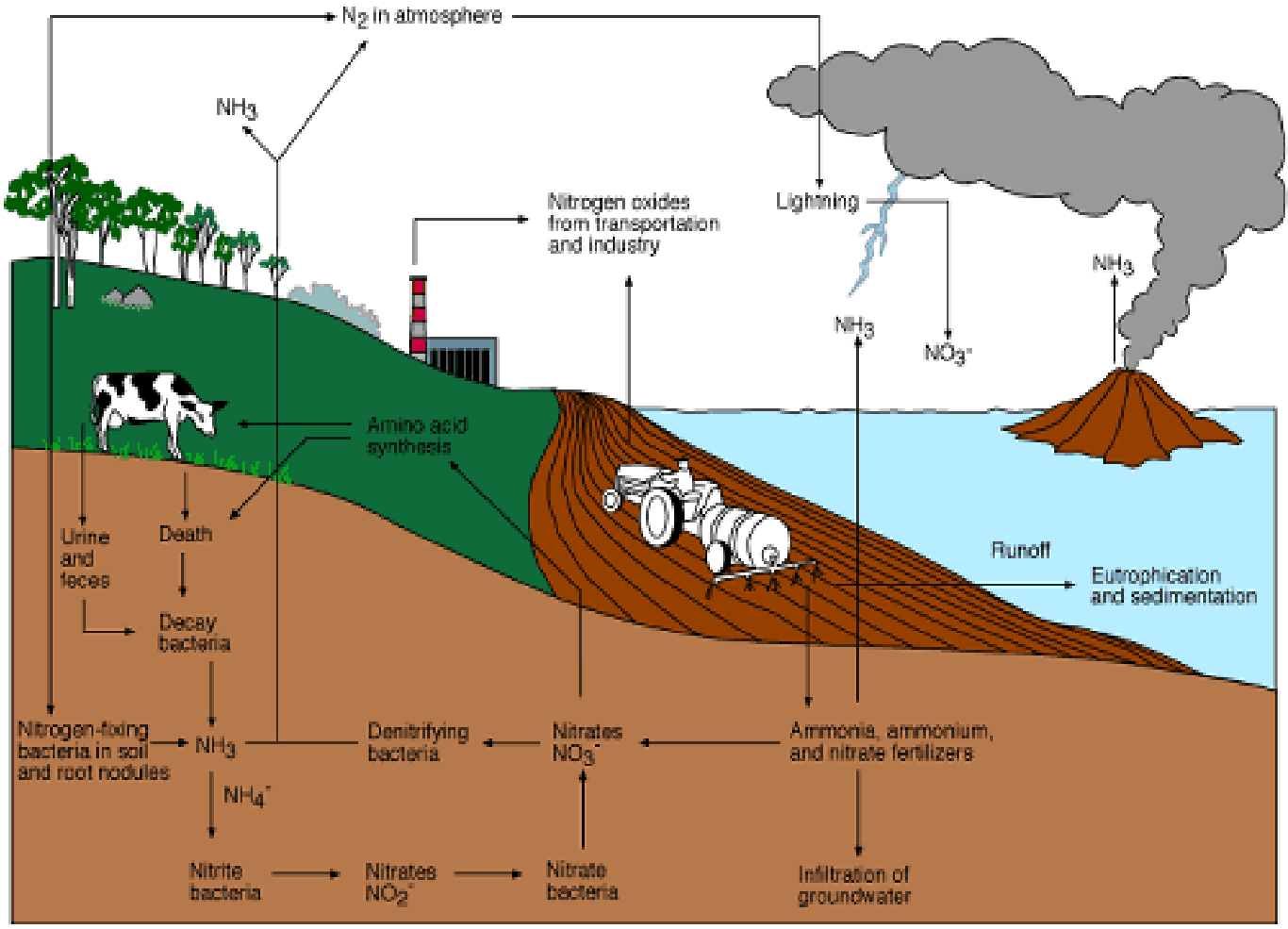


ciclo del carbono

- The carbon cycle is the movement of carbon between living and nonliving parts of an ecosystem.

- El ciclo del carbono es la transferencia de carbono a través de las partes vivas e inertes de un ecosistema.

nitrogen cycle



ciclo del nitrógeno

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analyze

analizar

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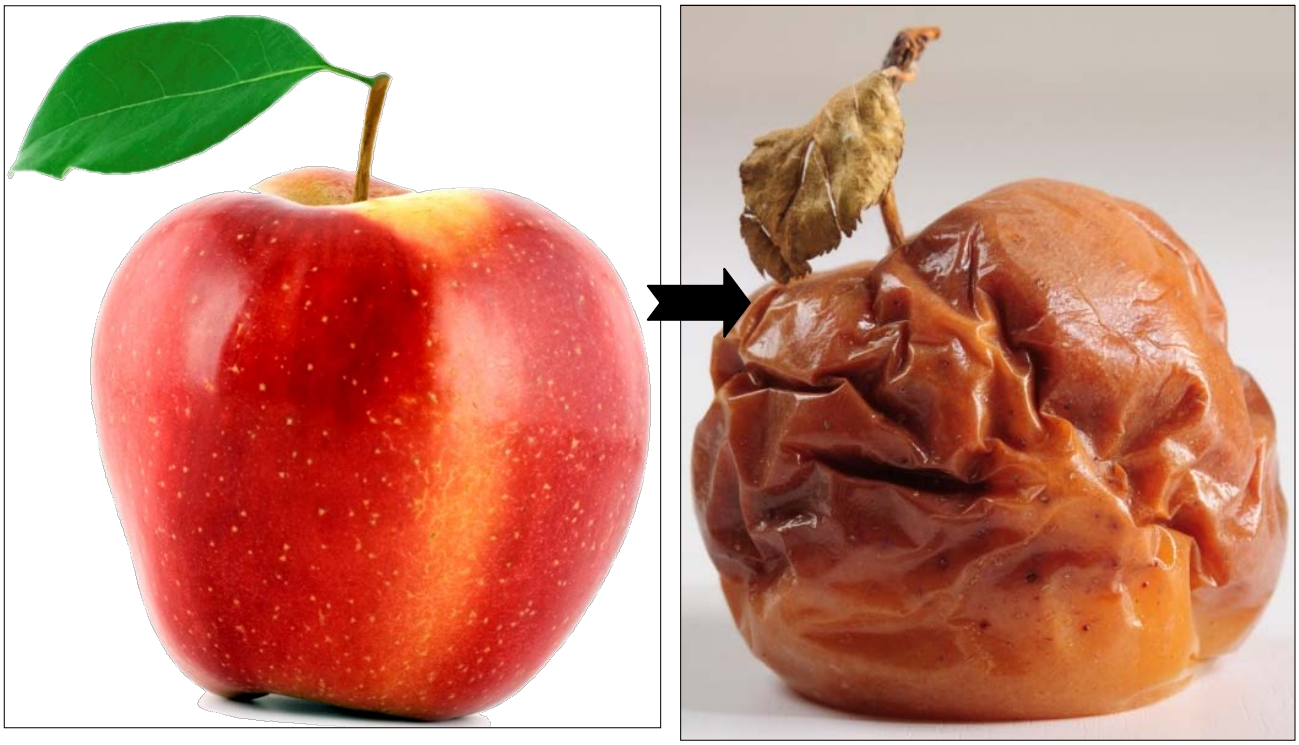
decay



decaer

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biomass

biomasa

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compost

abono

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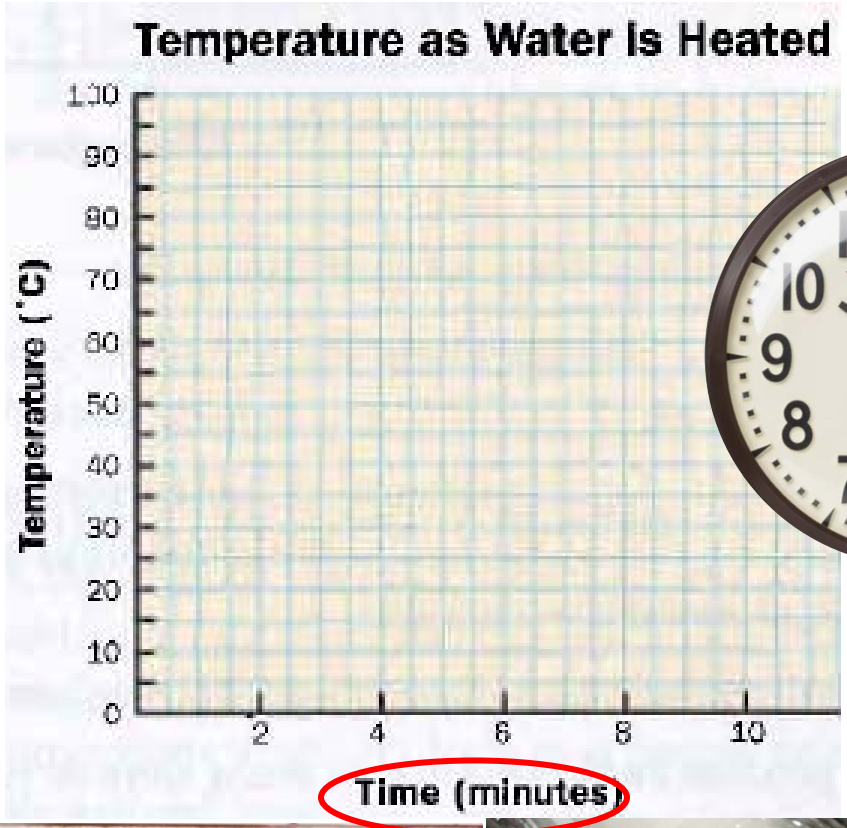
independent variable



variable independiente

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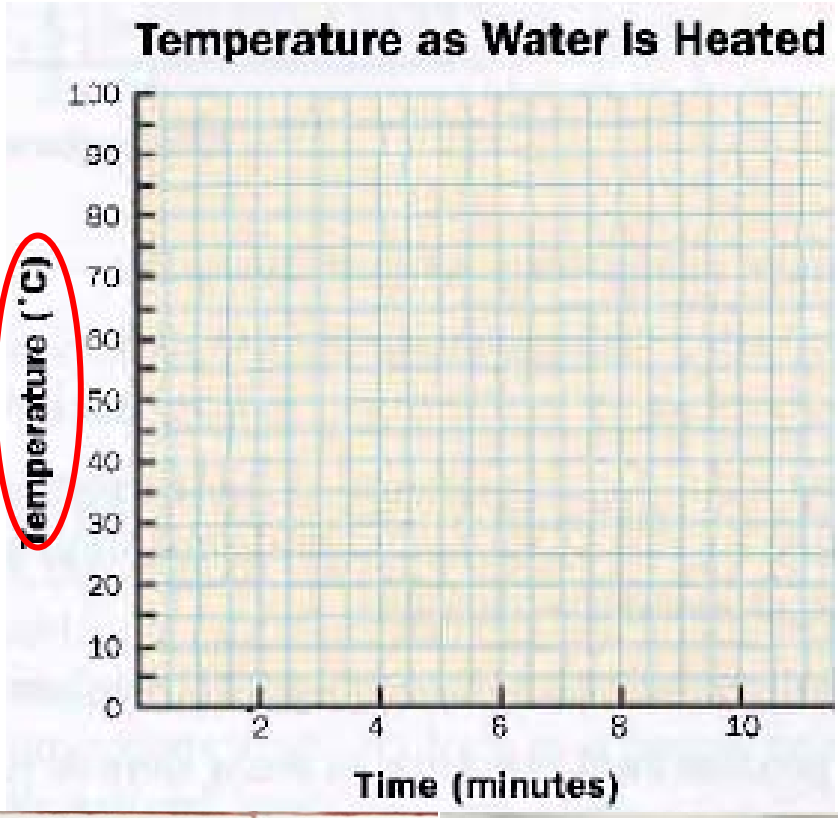
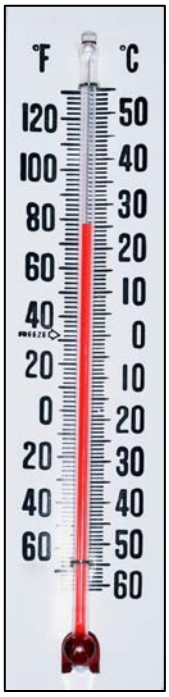
dependent variable





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activar

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