

# CBL BIOLOGY: LIFE SCIENCE OPTION

BSCS Green Version 10th edition

*Biology An Ecological Approach*

Lesson Plan Quarter 1, Week 9, Day 1



## Outcomes for Today

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Standards Focus: 2f 4ae 5ab 6df

### PREPARE

#### 1. Background knowledge necessary for today's reading.

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Chemical reactions are going on everywhere. They do not occur in isolation. They are happening in your brain right now as you read this!

#### 2. Vocabulary Word Wall.

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Introduce 5 important, useful words from today's reading.

**synthesis      decomposition      acidic      alkaline      pH scale**

- show, say, explain, expand, explode or buzz about the word briefly
- show, say and define the word quickly and add to the word wall

### READ

#### 3. Review the vocabulary and concepts previously covered in this chapter.

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Start at the beginning and review the concepts and vocabulary covered so far

- mention the setting and main ideas
  - point to concept chart as you quickly review it
- Small particles called atoms and molecules make up all matter including all living things.  
 Chemical bonds hold atoms and molecules together.  
 Different atoms react with each other to form new substances.

#### 4. Read directions for investigation/activity.

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### 5. Read text. Section 4.3 pp. 89-91

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- Shared Reading RRP: Read, React, Predict every 2-3 pages  
 Tape  Partner  Choral  Silent  Round Robin Reading

setting	Characters	pages
Inside all matter	Atoms, molecules, ions compounds	90-91

## RESPOND

### 6. Fix the facts. Clarify what's important.

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Discuss the reading and add 3-5 events to the billboard

- discuss the text; clarify the most important facts, concepts, ideas and vocabulary
- decide on the 3-5 most important **concepts** and post these on the **billboard**

Students might mention:

When substances react to form new substances, the process is called synthesis.

Compounds can take on electrical charges. These are called ions.

An acid contains extra positive (+) ions.

A base contains extra negative (-) ions.

A chemical reaction can be speeded up or slowed (controlled) down by a catalyst.

### 7. Post information on the billboard. Add new information to ongoing class projects on the wall.

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- new **concept** information can be added to the billboard
- an answer can be added to a question from the KWL Chart
- new information can be added to ongoing charts and investigations

## EXPLORE

### 8. Explore today's investigation with inquiry activities.

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### 9. Explore today's simulation with inquiry activities.

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## 10. Collect data and post.

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### One possible activity:

#### Good website on simple pH:

<http://www.purchon.com/chemistry/ph.htm>

### Review this with students and then begin the supplemental investigation (attached to this lesson plan: pg 4)

Other possible activities for a  class  group or  individual

Bookmark  Open Mind Portrait  g6 Graphic Organizer

g7 Main Idea Graphic Organizer  c1-12 Cubing  Postcard  Prop

Poster  Ad  Map  Retelling  Reader's Theatre  Cartoon  Rap

### Key Questions

A chemical reaction in which a new substance is created is called \_\_\_\_\_.

Why do you suppose it is called this?

When compounds are broken down during chemical reactions, it is known as \_\_\_\_\_.

Give several examples of each of these.

An enzyme is a catalyst. What do enzymes do in living things?

Remember to ask  literal  structural  idea  craft  author  literature  life  evaluate and  inference questions every day.

### Key Paragraph

For chemical reactions to take place, the reacting substances must come in contact with each other. This happens most easily when the substances are in solution, that is, dissolved in water. When table salt dissolves in water, the sodium and chloride ions separate from each other, but they remain ions in solution.

## EXTEND

### 11. Prompt every student to write a short product tied to today's reading

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A catalyst is a substance which can speed up a chemical reaction. Sometimes individual people are referred to as "catalysts" in that they can and do "stir it up" between individuals or groups. Likewise different "human catalysts" can have a calming effect on groups. Do you know any human "catalysts"? How do they "play their game"? Explain this in a paragraph entitled, "Meet the catalyst"!

### 12. Close with a short summary.

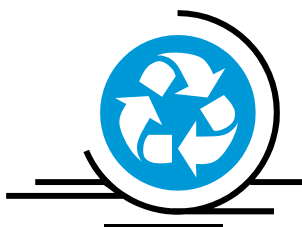
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Extend the reading to the students' lives or to the world.

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## Ch. 4 Supplemental Student Investigation # 4.1 *Acids & Bases*

### What is pH?

Introduction Understanding acids and bases can sometimes be a little confusing. Beginning with household chemicals is a good start.

Objectives: Students will be able to...

- Identify that pH is a term used by scientists.
- Respond that some tastes of food are related to pH.
- Indicate that a scale is used to indicate pH intensity.
- Indicate that there are acids and bases on this scale.
- Identify the pH of a liquid by using pH test strips.

Materials: Overhead projector to write rules on, overhead showing pH scale, student's notebooks, pH paper strips (4 per group), four well test plate to hold household chemicals (1 per group), masking tape to mark test wells with chemical names, marker/pen, household chemicals (mixture of acids and bases, and must be age appropriate {no drain cleaners or strong bleaches}), pH strip color chart, prize

Procedure:

1. Ask students "what is it like to eat a lemon" and get several responses.
2. Ask students "what do we call the taste of a lemon" student may respond with sour.
3. Explain to students that scientist realized that the sour taste of a lemon is related to certain type of chemical when it is present (acid) –Citric acid, ascorbic acid,...
4. However, scientists in this classroom don't use taste as a method for finding out if acids are present. Why? What has acids in it at home?
5. Scientist also recognized that another chemical type caused particular tastes and they called them bases. Bases taste bitter.
6. When scientist explored these acids and bases, they discovered a scale of numbers could be used to show how strong these chemicals are. The scale goes from 1-14 with 1-6 representing acids (1 is the strongest) and 8-14 representing bases (14 being strongest) What does 7 represent? Neutral What is a substance that is neutral? Pure water. What is pure water? Explain that most water, even bottled water has nutrients dissolved in it and therefore isn't pure.
7. Anyone heard of acid rain...what is it? Since acid rain is important to scientists, if we get rain in our rain gauge, we will want to test it's pH. How?
8. pH test strips. Explain how a pH test strip works, show example.
9. To practice with them, we are going to play a game called the pH game, explain rules of game
  - Work in groups of four
  - Come up and get a tray with four household chemicals in it

- In each of your note papers make a table like this
- Write down the chemicals name and observations you make
- Test one of the chemicals for pH using the strips as instructed

Chemical Name	Observation	pH	Acid or Base

- Dab your strip on a paper towel and your group comes up to see what the pH the color matches with (always walk in a science laboratory)
- Tell what pH you found it to be.
- Go back and write the pH in and decide if that is an acid or base
- Test the other three-one at a time.
- The team that finishes first and identifies their four chemicals correctly as acids and bases wins. ..wins what?
- Distribute first prizes (such as lemon head candy or some other sour candy) "They taste sour, so an \_\_\_\_\_ must be present"

10. Set out chemicals for each group and let them begin

11. Summarize activity: What are acids and bases? How do we measure them as scientists? What is the pH scale? What numbers on the scale mean acids? What numbers mean bases? If water has a pH of 7, does that mean that nothing is dissolved in it? (2 minutes)

Collect samples for second group and clean up as necessary.

# CBL BIOLOGY: LIFE SCIENCE OPTION

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*Biology An Ecological Approach*

Lesson Plan Quarter 1, Week 9, Day 2



## Outcomes for Today

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Standards Focus: 2f 4ae 5ab 6df

### PREPARE

#### 1. Background knowledge necessary for today's reading.

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An introductory understanding of the concept of energy is important here. Explain that energy drives the universe. If there is no energy transfer things are said to be static. Place a rock on the counter. It is pretty much static. Place a plant on the counter. There is energy exchange. The rock sitting on the counter is potential energy. Push it off the counter and you now have kinetic energy.

#### 2. Vocabulary Word Wall.

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Introduce 4 important, useful words from today's reading.

**energy**

**energy transfer**

**life processes**

**organized system**

- show, say, explain, expand, explode or buzz about the word briefly
- show, say and define the word quickly and add to the word wall

### READ

#### 3. Review the vocabulary and concepts previously covered in this chapter.

---

Start at the beginning and review the concepts and vocabulary covered so far

- mention the setting and main ideas
  - point to concept chart as you quickly review it
- Energy makes the world go around (literally and figuratively).  
 Review the types of energy (chemical, light, electrical, etc.).  
 Review potential (stored) and kinetic (energy in motion). Demonstrate these.

#### 4. Read directions for investigation/activity.

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## 5. Read text. Section 4.4 pp. 91-92

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- Shared Reading RRP: Read, React, Predict every 2-3 pages  
 Tape  Partner  Choral  Silent  Round Robin Reading

setting	Characters	pages
pond forest	frog and fly leaf	92

## RESPOND

### 6. Fix the facts. Clarify what's important.

---

Discuss the reading and add 3-5 events to the billboard

- discuss the text; clarify the most important facts, concepts, ideas and vocabulary
- decide on the 3-5 most important **concepts** and post these on the **billboard**

Students might mention:

Chemical reactions either give off or take in energy.

Examples of energy include moving our bodies, heating a home, building a bridge, or growing plants.

Energy is required to maintain order in all living things.

### 7. Post information on the billboard. Add new information to ongoing class projects on the wall.

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- new **concept** information can be added to the billboard
- an answer can be added to a question from the KWL Chart
- new information can be added to ongoing charts and investigations

## EXPLORE

### 8. Explore today's investigation with inquiry activities.

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### 9. Explore today's simulation with inquiry activities.

---

### 10. Collect data and post.

---

#### One possible activity:

In order to understand energy transfer and concepts, sometimes we need to explore some common misconceptions. Since so much of what is thought to be common knowledge comes from the media, perhaps we can take a look at a recent movie on energy and then “debunk it.”

## The Day After Tomorrow

Here is the synopsis:

What if we are on the brink of a new Ice Age?

This is the question that haunts climatologist Jack Hall (Dennis Quaid). Hall's research indicates that global warming could trigger an abrupt and catastrophic shift in the planet's climate. (*Hmmm...sound familiar to what we are hearing now?*) The ice cores that he's drilled in Antarctica show that it happened before, ten thousand years ago. And now he's warning officials that it could happen again if they don't act soon. But his warning comes too late.

It all begins when Hall witnesses a piece of ice the size of Rhode Island break off the Antarctic Ice Shelf. Then a series of increasingly severe weather events start to unfold around the globe: hail the size of grapefruit batters Tokyo, record-breaking hurricane winds pound Hawaii; (*again sound familiar...remember, this movie came out BEFORE Katrina!*) snow falls in New Delhi, and then a devastating series of tornadoes whips through Los Angeles.

A phone call from a colleague in Scotland, Professor Rapson (Ian Holm), confirms Jack's worst fears: these intense weather events are symptoms of a massive global change. Melting polar caps has poured too much fresh water into the oceans and disrupted the currents that stabilize our climate system. Global warming has pushed the planet over the edge and into a new Ice Age. And it all will happen during one global super storm.

While Jack warns the White House of the impending climate shift, his 17 year-old son Sam (Jake Gyllenhaal) finds himself trapped in New York City where he and some friends have been competing in a high school academic competition. He must now cope with the severe flooding and plummeting temperatures in Manhattan. Having taken refuge inside the Manhattan Public Library, Sam manages to reach his father by phone. Jack only has time for one warning: stay inside at all costs.

As full-scale, massive evacuations to the south begin, Jack heads north to New York City to save Sam. But not even Jack is prepared for what is about to happen -- to him, to his son, and to his planet.

### Movie Clip:

[http://www.climateprediction.net/schools/images/dayaftertomorrow\\_trailer.mov](http://www.climateprediction.net/schools/images/dayaftertomorrow_trailer.mov)

Here is a good website to discuss the movie with good questions and discussion on facts and fallacies of the movie:

[http://www.climateprediction.net/schools/DayAfterTomorrow\\_main.php](http://www.climateprediction.net/schools/DayAfterTomorrow_main.php)



**Note:**

The connection here helps drive home the concept of energy transfer and exchange while at the same time pointing out that our earth is in danger of severe alteration through human activity. Generating discussion is important, but it is also important to discern the facts as respected scientists have pointed out.

Other possible activities for a  class  group or  individual

- Bookmark  Open Mind Portrait  g6 Graphic Organizer  
 g7 Main Idea Graphic Organizer  c1-12 Cubing  Postcard  Prop  
 Poster  Ad  Map  Retelling  Reader's Theatre  Cartoon  Rap

**Key Questions**

Why do all chemical reactions require energy?

Give at least five examples of work.

Give at least four examples of highly organized systems in the natural world.

What are some sources of energy (other than the sun)?

Remember to ask  literal  structural  idea  craft  author  literature  life  
 evaluate and  inference questions every day.

**Bridge to a language building activity**

Teach a Mini Lesson using *Write AHEAD* pages # 629 and 630.

[The Write Ahead Activities are on individual work-pages in a separate file]

This would be a good time to look ahead to the chapter on biomes and a little understanding of the Arctic Biome.

**Key Paragraph**

Chemical reactions involve energy transfer. In general, synthesis reactions require an input of energy, and decomposition reactions release energy.

**EXTEND****11.** Prompt every student to write a short product tied to today's reading

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Sometimes the concept of energy transfer is best understood in graphic format. Write a little story about "Carl the Carbon Atom" and how he travels through several energy exchanges in moving from gasoline, through a car's engine, and out the tailpipe!

**12.** Close with a short summary.

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Extend the reading to the students' lives or to the world.

# CBL BIOLOGY: LIFE SCIENCE OPTION

BSCS Green Version 10th edition

*Biology An Ecological Approach*

Lesson Plan Quarter 1, Week 9, Day 3



## Outcomes for Today

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Standards Focus: 2f 4ae 5ab 6df

### PREPARE

#### 1. Background knowledge necessary for today's reading.

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This is a time to talk a little about the sun. What is it anyway? Remind them that:

- It is a star
- It is nuclear energy
- It is slowly getting larger (but we need to worry about global warming first)
- And, of course, it is the source of energy

#### 2. Vocabulary Word Wall.

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Introduce 5 important, useful words from today's reading.

**photosynthesis**      **absorption**      **chlorophyll**      **sugar**  
**biological activities**

- show, say, explain, expand, explode or buzz about the word briefly
- show, say and define the word quickly and add to the word wall

### READ

#### 3. Review the vocabulary and concepts previously covered in this chapter.

---

Start at the beginning and review the concepts and vocabulary covered so far

- mention the setting and main ideas
  - point to concept chart as you quickly review it
- Matter is changes (formed) and reformed by energy.  
 Energy necessary for all of life's activities comes from the sun.  
 Energy from the sun is primarily light energy (one of many energy forms).  
 Chemical reactions convert energy. It is absorbed in some and given off in others.

#### 4. Read directions for investigation/activity.

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See additional information in the attached activity guide.

#### 5. Read text. Section 4.5 pp. 92-93

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- Shared Reading RRP: Read, React, Predict every 2-3 pages  
 Tape  Partner  Choral  Silent  Round Robin Reading

setting	Characters	pages
The earth	Green plants	93
Our solar system	The earth and sun	Supplemental attached
Trees	leaves	investigation

### RESPOND

#### 6. Fix the facts. Clarify what's important.

---

Discuss the reading and add 3-5 events to the billboard

- discuss the text; clarify the most important facts, concepts, ideas and vocabulary
- decide on the 3-5 most important **concepts** and post these on the **billboard**

Students might mention:

All of life's activities require energy.

Light energy from the sun must be converted into chemical energy first before it can be used by plants and animals.

Photosynthesis is the process (chemical reaction) that is utilized by green plants to convert light energy into raw materials.

Chlorophyll is the green material in plants that absorbs the light energy.

Sugars are the end product of photosynthesis.

#### 7. Post information on the billboard. Add new information to ongoing class projects on the wall.

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- new **concept** information can be added to the billboard
- an answer can be added to a question from the KWL Chart
- new information can be added to ongoing charts and investigations

### EXPLORE

#### 8. Explore today's investigation with inquiry activities.

---

#### 9. Explore today's simulation with inquiry activities.

---

## 10. Collect data and post.

---

### One possible activity:

#### Why do leaves change colors in the fall? (See attached investigation and additional information: pg 14)

For more detailed information on photosynthesis go to :

<http://biology.clc.uc.edu/courses/bio104/photosyn.htm>

This site helps students understand the chemistry of photosynthesis.

Other possible activities for a  class  group or  individual

- Bookmark  Open Mind Portrait  g6 Graphic Organizer  
 g7 Main Idea Graphic Organizer  c1-12 Cubing  Postcard  Prop  
 Poster  Ad  Map  Retelling  Reader's Theatre  Cartoon  Rap

### Key Questions

Name at least four life activities that need energy to be carried out.

Why are green plants necessary for the survival of all living things on earth?

What is the function of chlorophyll in plants?

What kinds of foods do green plants produce?

What happens when this food is broken down?

Remember to ask  literal  structural  idea  craft  author  literature  life  
 evaluate and  inference questions every day.

### Bridge to a language building activity

Teach a Mini Lesson using *Write AHEAD* pages # 129 and 121

[The Write Ahead Activities are on individual work-pages in a separate file]

Have students look at the picture on page 120 and without any explanation, have them write what they think it is.

### Key Paragraph

Living things grow, move, and reproduce. These and other types of biological activity require energy. Consumer organisms get their energy from the food they eat, but where do the producers get their energy? Usually, their energy comes from the sun. Because no organism can use light energy directly from the sun as a source of food energy, the energy must be converted to chemical energy.

**EXTEND****11.** Prompt every student to write a short product tied to today's reading

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You have studied plants for awhile. Some people believe plants have feelings and emotions. Is there a plant in your life that “sees” you every day? Write a story about yourself from the plant's point of view. One paragraph will do. Begin with this sentence. “Hello, my name is (name the plant), and I would like to tell you a little about what I see (your name) doing each day.

**12.** Close with a short summary.

---

Extend the reading to the students' lives or to the world.



## Ch. 4 Additional Information and Student Investigation

### Leaf Colors

**Objective:** To learn more about leaf colors and the changing of colors.

**Materials:** Available nearby trees, coffee filter paper, rubbing alcohol.

#### Introduction

Question:  
“Why do leaves change color in the fall?”

#### Discussion

Leaves of all trees contain chlorophyll, a green pigment that has the unusual capability to capture light energy and (with the help of other components in the leaf) to convert that energy into a chemical form, such as sugar. Many leaves contain other pigments as well, and while these pigments can't photosynthesize as chlorophyll can, some of them are able to transfer the light energy they capture to the chlorophyll. Some of these "accessory" pigments are yellow, orange, or red and are called carotenoids because they belong to the same group of compounds as beta-carotene, the pigment that gives carrots their orange color (and margarine its yellow).

In the autumn, when deciduous leaves begin to get old, the leaf is able to break down some of the expensive pigments it has produced (such as chlorophyll) and absorb parts of them back into the stems for other uses. When the green color of chlorophyll is gone, the other colors are unmasked.

You can see these colors when the leaves are still green if you separate the pigments by a process called chromatography. If you have ever watched water-soluble ink smear on paper when it gets wet, you have seen chromatography in action.

#### Activity I

Separating the pigments from leaves is a little harder, because they are often enclosed in membranes within the cells of a leaf. But if you have some filter paper (try using a white coffee filter) you could try to express some of the pigments onto it by placing the leaf on the filter and then rolling a quarter across the leaf several times to make a line of pigments on the paper. Then dip one end of the paper in rubbing alcohol, and you might be able to see some of the other colors in the leaf separate from the green chlorophyll.

#### More Information

Some pigments in leaves--such as the reddish-purple in rhubarb or red cabbage--are not involved in photosynthesis at all. Perhaps they help protect the plant against too much sunlight? These compounds are held in other places in the cells of the leaf, and many of them are water-

soluble, so if you cook the leaf or grind it in a blender, you will release this reddish pigment in the water.

So what is it that causes the leaves to take on their fall colors as summer ends? What has changed in the last few weeks? It has been cooler and wetter here than usual, but last year at this time it was hot and dry and that same tree still changed colors. The thing that seems to happen at the same time every year is the shortening of the day (or, more accurately, the amount that the daylight diminishes as the summer wanes). In fact, it is the length of the day, called the photoperiod that triggers a mechanism in the tree to begin the process of dropping the leaves before winter. This process of shedding leaves is necessary for the tree, but it has the additional benefit to us of an explosion of color which we get to enjoy for a few short weeks in the fall.

To fully answer the question, "Why do leaves change color and why those colors?" it would be best to break it down into a couple of other questions. We already know *when* leaves change color: in the fall, to get the tree ready for winter. We can then ask, what do leaves do for the tree in the summer that the tree doesn't need to do during the winter? The leaves are the manufacturing plant of the tree. They capture the sun's light energy and use it to transform carbon dioxide from the air and rainwater into sugars. These sugars sustain the tree; any extra that is made allows the tree to grow larger. This process, called photosynthesis (which means "light put-together"), also pulls water up the tree, where it then evaporates from the surface of the leaves. If the leaves stayed on all winter, the tree would continue to lose water without much chance to re-supply it once the ground had frozen. So the leaves drop off to conserve water.

Now we can ask the next question. "Why do the leaves change color before they drop?" Remember that the tree is able to make sugar by capturing energy from sunlight. There are pigments in leaves which absorb that solar energy and send it off to sugar production. The most abundant pigment is chlorophyll, which we see as the green color of summer leaves. But the light from the sun is basically what is called white light. That means that sunlight is actually a combination of all colors. (Remember ROY G BIV, the rainbow colors?: red, orange, yellow, green, blue, indigo, and violet.) This combination of all colors is striking the leaves, but only certain colors are actually absorbed by the leaves; the others are reflected. We see reflected light as the color of an object. So we know that green light is reflected off the leaves. That means that the leaves use colors other than green to work in the production of sugars. In fact, chlorophyll absorbs mostly blue and some orange light.

One thing we have learned about nature is that it does not waste anything. Although chlorophyll only absorbs blue and orange light, other pigments in the leaves absorb the other colors. Some of those other pigments are called carotenoids. They absorb green light and reflect orange. Carrots have a lot of carotenoids. During the summer, there is so much chlorophyll in the leaves we simply cannot see the other pigments. But as the daylight shortens, the tree does not make as much chlorophyll. As the chlorophyll starts to fade away, we are able to see the other colors (pigments) in the leaf, mostly yellow ones. Aspens and poplars that turn bright yellow. The red and oranges are mostly seen in the sugar maples. Maples turn red because when the leaf-dropping process begins in these trees, some of the sugar that the leaves made remains trapped in the leaves. In this case, the color is dominated by a third type of light-absorbing pigment, one that reacts with the sugars and makes the red and orange color we see. The brighter the days are during fall, the more sugar gets trapped in the leaves and the more brilliant are the colors of the sugar maples.

### **Activity II (ongoing)**

Cover a green leaf, still on a tree, with black paper. When the leaves around it have changed, uncover the leaf and see what color it is. Black paper absorbs all the light and turns it into heat...though I wonder what would happen if you covered the green leaf with aluminum foil

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instead. I wonder what an aspen leaf would do compared to a maple, or an oak. I wonder what would happen if you took the leaf off the tree.

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**Lesson Plan Quarter 1, Week 9, Day 4**



## Outcomes for Today

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Standards Focus: 2f 4ae 5ab 6df

### PREPARE

#### 1. Background knowledge necessary for today's reading.

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Cellular respiration is a **controlled** chemical reaction. Talk about uncontrolled (fire, explosions, etc.) and controlled reactions.

Strike a match or flick a lighter and explain the uncontrolled aspect of the reaction.

Have students sense their own body heat. This is a controlled reaction.

#### 2. Vocabulary Word Wall.

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Introduce 5 important, useful words from today's reading.

**cellular respiration**      **fossil fuel**      **enzymes**      **respiration**  
**interrelatedness**

- show, say, explain, expand, explode or buzz about the word briefly
- show, say and define the word quickly and add to the word wall

### READ

#### 3. Review the vocabulary and concepts previously covered in this chapter.

---

Start at the beginning and review the concepts and vocabulary covered so far

- mention the setting and main ideas
- point to concept chart as you quickly review it

So far in this chapter, we have learned that all living things are composed of matter. Energy from the sun is converted into chemical energy by green plants during photosynthesis. This stored energy, in the form of sugars, is now ready for use. It must be converted to be available for life's functions.

**4. Read directions for investigation/activity.**

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**5. Read text. pp. 94-95**

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- Shared Reading RRP: Read, React, Predict every 2-3 pages  
 Tape  Partner  Choral  Silent  Round Robin Reading

setting	Characters	pages
Human digestive system anywhere	Hamburgers match	94

### RESPOND

**6. Fix the facts. Clarify what's important.**

---

Discuss the reading and add 3-5 events to the billboard

- discuss the text; clarify the most important facts, concepts, ideas and vocabulary
- decide on the 3-5 most important **concepts** and post these on the **billboard**

Students might mention:

Breathing (the taking in of air into the body through a process) is not the same as cellular respiration.

The burning of fossil fuels releases a great deal of energy in mostly uncontrolled reactions.

Respiration in living cells is a generally controlled reaction that produces energy. This energy is used but some is lost as heat. This process is called metabolism. Enzymes help control chemical reactions in the body.

**7. Post information on the billboard. Add new information to ongoing class projects on the wall.**

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- new **concept** information can be added to the billboard
- an answer can be added to a question from the KWL Chart
- new information can be added to ongoing charts and investigations

### EXPLORE

**8. Explore today's investigation with inquiry activities.**

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**9. Explore today's simulation with inquiry activities.**

---

## 10. Collect data and post.

---

### One possible activity:

**I challenge you to detect CO<sub>2</sub>.** (See attached student activity and data recording form: pg 19)

Other possible activities for a class group or individual

- Bookmark Open Mind Portrait g6 Graphic Organizer  
g7 Main Idea Graphic Organizer c1-12 Cubing Postcard Prop  
Poster Ad Map Retelling Reader's Theatre Cartoon Rap

### Key Questions

How is energy stored in cells made available for use in life's processes?

What is the function of sugar stored in animal cells?

How is respiration in living organisms different from a burning flame from a match?

What substances help control the energy release through chemical reactions in living things? How do they work?

Remember to ask literal structural idea craft author literature life  
evaluate and inference questions every day.

### Key Paragraph

The cell uses energy in food that is released in respiration to carry out the work of the cell. Carbon dioxide and water molecules are the by products that are formed as the food molecules are broken down.

## EXTEND

### 11. Prompt every student to write a short product tied to today's reading

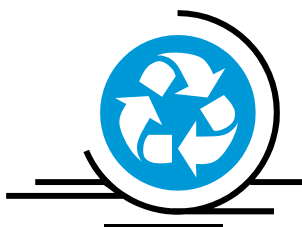
---

After the experiment and reading you know how humans take in oxygen and give off carbon dioxide. Suppose you were trapped in a mine after a tunnel collapse. As you continue to breathe in the remaining oxygen and breathe out carbon dioxide, do you think you would be better off knowing about the chemical reactions taking place or would you be better off not knowing? Explain your reasoning in a short paragraph.

### 12. Close with a short summary.

---

Extend the reading to the students' lives or to the world.



## Ch. 1 Student Investigation # 1.3

### Can You Detect CO<sub>2</sub>?

**Note:** This is a simple exercise designed to demonstrate the exchange of gasses in the human body.

**Objectives:** Students will understand the roles that carbon dioxide (CO<sub>2</sub>) and oxygen (O<sub>2</sub>) play in the respiratory system.

**Description:** How do carbon dioxide and oxygen trade places within the respiratory system? Oxygen is taken into the lungs when we inhale. Once oxygen is in the lungs, it moves through the watery membranes of the lung tissue and into the blood stream. Red blood cells then distribute oxygen to organs in need. At the same time carbon dioxide is being transported from the organs and back into the lungs. Carbon dioxide is then exhaled back out of the body. Students will conduct an experiment with cabbage water to gain insight into this process.

**Goals:** *Science as Inquiry, Life Science: Characteristics of respiratory system.* Students will need to have an understanding of what oxygen (O<sub>2</sub>) and carbon dioxide (CO<sub>2</sub>) are. They will also need to know the components of blood and have an understanding of what it means to inhale and exhale.

#### Materials:

- 21 containers (test tubes, beakers, glasses, etc.)
- 26 drinking straws
- 400ml distilled water
- 7 eyedroppers
- 1 head of cabbage
- clock
- 7 test tube racks (if necessary)
- masking tape
- Lab worksheet (attached)

## Making Cabbage Water

Red cabbage water is can be used as an indicator for carbon dioxide. Here is how to make it:

1. CHOP one large red cabbage into small pieces. **Note:** Blackberries, red onions, or even hibiscus flowers can be used as a substitute.
2. SIMMER the cabbage pieces until the water turns a deep shade of purple.
3. ALLOW the water to cool.
4. REFRIGERATE when not in use.

### Activity Level

#### Procedure:

##### *Focus Phase:*

Begin by asking the following questions: "What is the job of the respiratory system? What are the different parts of the respiratory system?" Inform students that they will be conducting an experiment with cabbage water to help them learn about carbon dioxide and oxygen. Review the difference between cellular respiration and physical respiration.

##### *Challenge Phase:* Add to the KWL Chart

Ask students to record predictions for the following questions: "Why do we exhale carbon dioxide and not oxygen? What do you think will happen to the cabbage water when you blow into it? What if you exercise for 1 minute and blow into the water? Will there be any difference when you exercise instead of just standing still?"

##### *Concept Introduction:*

[Note: Before beginning the experiment, have students practice blowing into the straw to avoid getting blue lips from the cabbage water.] Students may work in pairs or in small groups. Pass out materials and the lab worksheets. Each group will have three test tubes, labeled A, B, and C. Each test tube contains cabbage water. Using the eyedropper, students add four drops of clean, distilled water to test tube A. After 20 seconds, students check to see if the distilled water has caused the cabbage water to change color. On the worksheet, students record their observations. Next, they use a straw to blow into the cabbage water in test tube B, for 20 seconds. Again, students check to see if the water has changed color. Students record their observations on the worksheet. Students should rinse the straw in a beaker filled with distilled water. Have students exercise for 1 minute. Then students use a straw to blow into test tube C. Students check to see if the water has changed color and record their observations. Students should compare their results from test tube B and test tube C.

[Experiment Results: When drops of distilled water are placed in test tube A, nothing happens. This is the **control** for the remainder of the experiment. When students blow into the cabbage water (test tube B), the color changes from purple or green to red or pink, depending on the color of the cabbage water when they started. As long as the color changes, the experiment won't be wrong. When students exercise for 1 minute and then blow into the cabbage water (test tube C), the color changes faster and sometimes to a brighter color. This is due to the extra carbon dioxide being expelled from the body.]

*Concept Application:*

Have students complete the lab worksheet and questions. Conclude the activity with questions such as: "What did you observe in your experiment? Did you notice any differences between the experiments with test tube B and test tube C?"

**Assessment:** Observe students' participation in the experiments. Collect students' worksheets to check for accuracy. Students should answer questions 5-7 in complete sentences.

**Special Comments:** Make sure you remind students to practice blowing into the straw. If this is not done, the teacher runs the risk of having students suck in the cabbage water -- which will turn their lips blue. Also note that it takes time for the experiment to work. It may take between 30 seconds and 1 minute for the cabbage water to change color.



## CBL Recording Form / Challenge You -- Detect CO<sub>2</sub>!

Name \_\_\_\_\_ Date \_\_\_\_\_

**Directions: Complete observations and recordings as outlined by your teacher as well as the investigation directions.**

Instructions:

1. Read the lab.
2. Complete the investigation. (Remember, you need to blow into the straw. Don't suck from it!)
3. Use the text and your observations to help you answer the questions.

Predictions:

Do you think the experiment will be different if you exercise rather than standing still?

Why or why not?

LAB WORKSHEET

Test Tube

(Write down what is in each test tube.)

Observations

(What do you see? Why do you think this is happening?)

A

B

C

**Procedure:**

1. using the eyedropper, add four drops of clean, distilled water to test tube A. After 20 seconds (your teacher will time you if you don't have a watch), check to see if the distilled water has caused the cabbage water to change color. On the data table, record what you observe.
2. Using the straw, blow gently for 20 seconds into the cabbage water in test tube B. Check to see if the water has changed color. On the data table, record what you observe.
3. Exercise for 1 minute and repeat step 2, but this time use test tube C. Check to see if the water has changed color. Compare test tube C to test tube B and record your observations.

**Level One Questions:**

1. The term exhalation means.
2. As you breathe out, is expelled from your body. Use your data chart and your observation to help you to answer the remaining questions.
3. Did the four drops of distilled water cause the cabbage water in test tube A to change color?
4. Did the cabbage water change color in test tube B?

**Level Two Questions:**

5. What was different about the experiment on test tube C from test tube B? Did test tube C change color faster? Did it change a different color? Explain your observations.
6. Do your observations show that carbon dioxide is removed from your lungs when you exhale? Explain.
7. Was your previous prediction the same as the outcome of the experiment? Why or why not?



**CBL BIOLOGY: LIFE SCIENCE OPTION**  
**BSCS Green Version 10th edition**  
*Biology An Ecological Approach*  
**Lesson Plan Quarter 1, Week 9, Day 5**



## Outcomes for Today

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Standards Focus: 2f 4ae 5ab 6df

### PREPARE

#### 1. Background knowledge necessary for today's reading.

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Concepts of energy capture, storage, and release in living systems are not always easy to completely understand. This is why biologists create artificial models to help explain the process. The ATP – ADP cycle is one such model.

#### 2. Vocabulary Word Wall.

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Introduce 3 important, useful words from today's reading.

#### ATP

#### ADP

#### ATP-ADP Cycle

- show, say, explain, expand, explode or buzz about the word briefly
- show, say and define the word quickly and add to the word wall

### READ

#### 3. Review the vocabulary and concepts previously covered in this chapter.

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Start at the beginning and review the concepts and vocabulary covered so far

- mention the setting and main ideas
  - point to concept chart as you quickly review it
- Energy is stored in plants and animals for later use.  
 This stored energy needs to be made available for later use.  
 Remember, energy cannot be created or destroyed. It just changes form.  
 (Examples light-> , chemical -> heat, etc.)  
 Enzymes are the catalysts that control the chemical reactions necessary for life functions in plants and animals.

#### 4. Read directions for investigation/activity.

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## 5. Read text. pp. 95-96

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- Shared Reading RRP: Read, React, Predict every 2-3 pages  
 Tape  Partner  Choral  Silent  Round Robin Reading

setting	Characters	pages
All living things	ATP & ADP molecules	95-96

## RESPOND

### 6. Fix the facts. Clarify what's important.

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Discuss the reading and add 3-5 events to the billboard

- discuss the text; clarify the most important facts, concepts, ideas and vocabulary
- decide on the 3-5 most important **concepts** and post these on the **billboard**

Students might mention:

An ATP molecule carries energy.

When the energy is released, it becomes an ADP molecule.

The ADP molecule “returns” to pick up more energy and the process begins anew.

ATP is known as “energy currency” since it carries energy to areas of living things that need the energy.

This process is a cycle.

### 7. Post information on the billboard. Add new information to ongoing class projects on the wall.

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- new **concept** information can be added to the billboard
- an answer can be added to a question from the KWL Chart
- new information can be added to ongoing charts and investigations

## EXPLORE

### 8. Explore today's investigation with inquiry activities.

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### 9. Explore today's simulation with inquiry activities.

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## 10. Collect data and post.

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### Two possible activities:

**Do It Yourself: Energy Flow Lesson Plan** Investigation 4.3 attached to this lesson plan. (pg 28)

### ATP and Body Building

There is always interest among the mostly male segment of students in bodybuilding. This may be a good time to explore this a bit. There is a great deal of hype and misinformation, but rest assured, it is out there. One source that is accurate (although written by a builder) is here:

<http://www.bodybuilding.com/fun/drobson24.htm>

It does give a good summary of the ATP – ADP process from a somewhat different perspective.

This could be a good time to **invite a local body builder** to speak (and flex) to the class. There seem to be quite a few these days. This person could (in graphic format) talk about energy flow in the body. As always, when there is a personal interest, the information becomes valid!

Other possible activities for a class group or individual

- Bookmark Open Mind Portrait g6 Graphic Organizer  
g7 Main Idea Graphic Organizer c1-12 Cubing Postcard Prop  
Poster Ad Map Retelling Reader's Theatre Cartoon Rap

### Key Questions

ATP is an energy transfer compound. What does this mean?

What does the prefix “tri” mean?

What does the prefix “di” mean?

What kind of energy is needed for the ATP-ADP cycle?

Remember to ask literal structural idea craft author literature life  
evaluate and inference questions every day.

### Bridge to a language building activity

#### Key Paragraph

To see why ATP has been compared to money, imagine foreign tourists who arrive in New York City with only foreign currency. The tourists must pay a fee to change their foreign currency into dollars, to use for their purchases. In a similar manner, a cell carries out chemical reactions that exchange the chemical energy of food molecules for

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the chemical energy of ATP. Then ATP pays most of the energy “debts” inside a cell. The “fee” is the energy lost as heat during the conversion.

### **EXTEND**

#### **11. Prompt every student to write a short product tied to today’s reading**

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Here is a true story. Among some Native American groups, there was a simple test to see if a person was guilty or at least not truthful. Here is how it worked. All of the “suspects” were lined up in front of a fire. A stick was placed into the fire and allowed to burn for a while until the tip was glowing. The “suspects” were then asked to stick their tongues out while the shaman deftly tapped the hot stick to each of the suspect’s tongues. If the suspect cried out and jumped, he was determined to be guilty.

Based upon what you know about energy and body systems, write a short paragraph supporting or condemning this practice. Base your decision on scientific principles, not your “gut” reaction.

#### **12. Close with a short summary.**

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Extend the reading to the students' lives or to the world.



## Ch. 4 Student Investigation # 4.3

### Simple Do it Yourself Energy Flow Demonstrations

#### Introduction

- This lesson builds upon the energy transfer concept and helps the students understand matter and energy interactions.
- Explain to students that they are going to be observing and constructing examples of simple energy reactions.

#### Objective:

To illustrate potential and kinetic energy, tools to measure the gain or loss of energy, conductors, convection, radiation, and conduction heat transfer, and limited supply of energy sources

#### Materials:

Dominoes, A bowling ball, a thermometer

For each student: 1 lemon, 3-inch piece of 8 gauge copper wire, paper clip

For each group: AAA Battery, AA Battery, C Battery, D Battery, and 2 light bulb holders and light bulbs

#### Getting Started

Before activity distribute dominoes. Allow students time to play with the dominos. You know they will want to. Have them just experiment lining them up and arranging them. See which group can arrange the most unique “domino journey” by lining them up in various arrangements. After they do this for a while, you determine when it is time to move to the next step.

#### Procedures:

Now time to play “Energy Dominoes!”

Give students butcher paper. Review the ATP – ADP cycle with them. Based upon what they now know, have them diagram the cycle and use dominos to show the flow of energy. Let students arrange their demonstrations and then present to the class. This is an open ended activity and the idea is to physically represent the energy flow concept.

Let’s now move on to heat energy.

Hold up a thermometer.

*Does anyone know what this is? What does it do?*

Explain that a thermometer measures heat... a type of energy.

*How does it work? What type of energy does it measure?*

Using the bowling ball demonstrate kinetic and potential energy.

*When does the bowling ball have kinetic and potential energy?*

Using light bulbs and batteries have students experiment with the setup of a simple circuit.

*How are we demonstrating the flow of electricity in a system?*

*Is there more than one way to hook up a circuit?*

Discuss series and parallel circuits.

Allow students to create examples of each and discuss which is brighter.

What are we using to light up the bulbs?

*How do those batteries work?*

*Now it is time for students to create their own chemical battery.*

Distribute lemons wire and paperclip to each student.

*We are now going to see if we can make our own batteries.*

Have students stick the ends of both the paperclip and the wire halfway into the lemon, close enough to each other to touch their tongue to.

*Touch the lemon battery to your tongue, making sure you touch both wires.*

*Is anyone feeling a funny sensation?*

*What is happening?*

Explain to students that the acid is transferring electrons between the two wires, and the saliva on their tongue is completing the circuit. Also, note that the same thing happens in a battery.

### **Evaluation:**

Have students create a journal diagramming circuits, both series and parallel, and the flow of electrons in a battery.

Students should define terms used in the Game and give examples of each.

Students can draw a picture of the different experiments and label the parts to each.

### **Summary**

Explain that these demonstrations are all simple examples of energy exchanges. Review again the types of energy exchange processes in the human body.