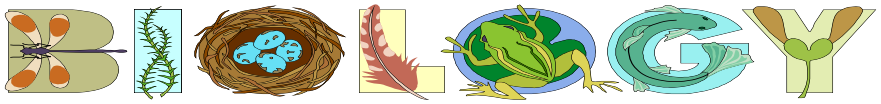


@ NEW SMYRNA BEACH HIGH SCHOOL

Accept our connectedness to events. It is not unknown forces that cause our problems. We are the cause and the cure. We create our own reality and we can change it.

STANDARD 6:

The Energy of Life

1. Photosynthesis
2. Cellular Respiration

2011-2012

New Smyrna Beach High School

Working together with parents, school personnel and community members, New Smyrna Beach High School students will graduate with the knowledge, skills and values to be positive contributors to society.

Standard 6: The Energy of Life

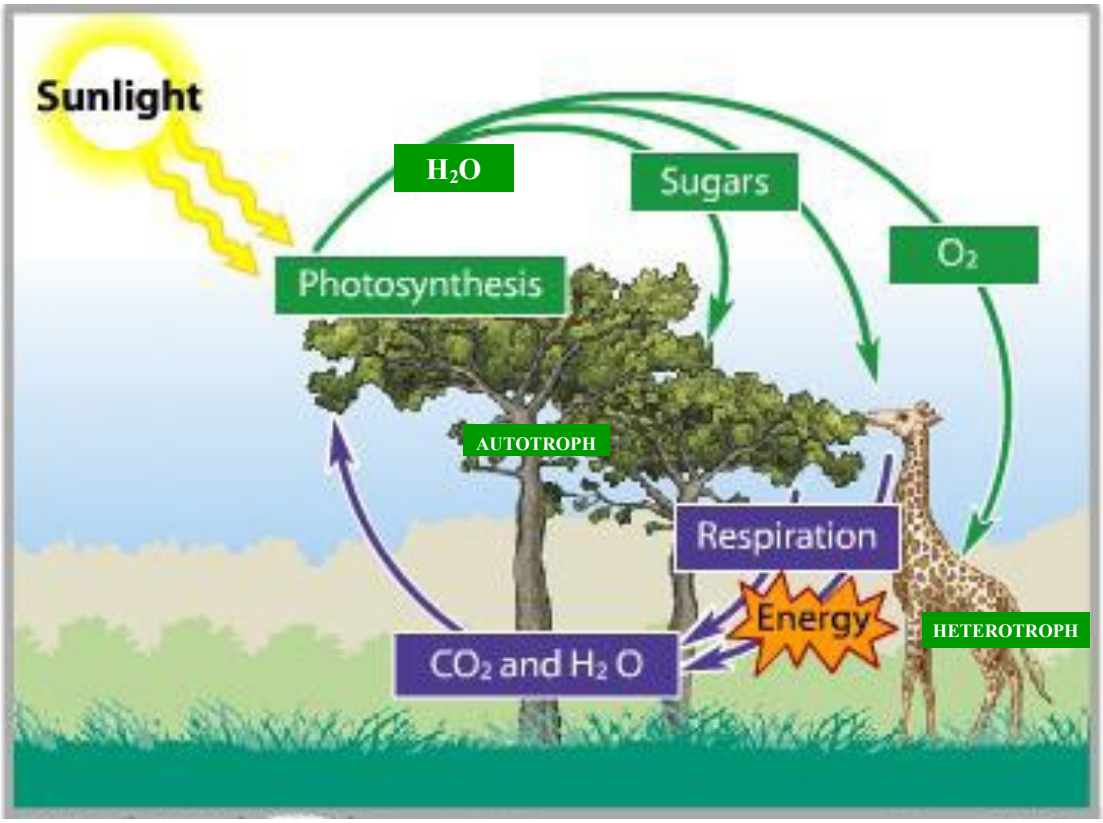
Key Terms

KNOWLEDGE	INFORMATION
Photosynthesis	
1. Definition	
2. Write the Equation	
3. Reactants in the equation?	
4. Products in the equation?	
5. Autotroph	
Cellular Respiration	
6. Definition	
7. Write the Equation	
8. Reactants in the equation?	
9. Products in the equation?	
10. Heterotroph	
11. Law of Conservation of Energy	*-Energy cannot be created or destroyed, only rearranged*

Graphic Summary of
Photosynthesis & Cellular Respiration in the Ecosystem

Summary of the Unit in One Picture!

- The purpose of this section is to look at how **ENERG**Y is made available to cells to power **METABOLISM** . You will learn how energy is captured & stored during **PHOTOSYNTHESIS** in **AUTOTROPHS** & how that energy becomes usable to both autotrophs and **HETEROTROPHS** through **CELLULAR RESPIRATION.**
- **Everything that organisms do in ecosystems— running, breathing, growing, reproducing— requires energy. The flow of energy is the most important factor that controls what kinds of organisms live in an ecosystem and how many organisms the ecosystem can support.**



1. Energy is basically the ability to _____
2. The energy in any ecosystem begins with light energy from the _____
3. The plants , also called _____ or producers, then convert that energy into usable energy during the process of _____
4. During photosynthesis, the plants make _____or glucose, for themselves and release a gas called _____They also release _____ through transpiration.
5. The giraffes, also called _____ or consumers, then get energy, also referred to as ATP. from the process called _____
6. During cellular respiration, the giraffes get ATP or _____ for themselves and release two gases called _____ and _____
7. As energy cycles through the ecosystem and is transferred from one organisms to the next, it is lost mostly as _____ with only _____% moving on.

NOTES

TOPIC: Photosynthesis

Possible Test Questions	***Notes:***
1. Photosynthesis	$6CO_2 + 6H_2O \longrightarrow C_6H_{12}O_6 + 6O_2$
A) Write equation in WORDS!	**Carbon Dioxide &**
B) Where does the energy	
for photosynthesis come	
from?	
C) What is chlorophyll?	
D) Look at Figure 4.5 of a	
chloroplast—what is its	
function?	
> What do you think is the	Draw your version of
advantage of so many	a chloroplast.
membranes in the	
chloroplasts?	
E) What are stomata	Draw & label a stoma
(stoma) Explain what	with its guard cells
they do?	
Book, page 652-653 :	
F) What is the importance	
of photosynthesis to us?	
to other animals? to the	
ecosystem?	

Rate of Photosynthesis

BACKGROUND:

Photosynthesis is the process by which plants take carbon dioxide from the atmosphere, add water, and use the energy of sunlight to produce sugar. Write the equation for photosynthesis:
Photosynthesis occurs in the chloroplast, an organelle in plant cells that contains the molecule chlorophyll. Chlorophyll absorbs the energy of sunlight. That light energy is converted to chemical energy through the steps of photosynthesis.

The reactions of photosynthesis can be divided into two major types: light-dependent reactions and light-independent reactions. The light-dependent reactions convert energy from the sun into a form that the chloroplast can then use to make sugar from carbon dioxide, in the process producing oxygen as a waste product. The light-independent reactions use that energy to make glucose from carbon dioxide and water.

MATERIALS: test tube, Elodea cuttings, sodium bicarbonate (baking soda), beaker with water, lamp

PROCEDURE:

1. Obtain a sprig of **Elodea**. Remove several leaves from around the cut end of the stem. Slice off a portion of the stem at an angle and lightly crush the cut end of the stem.
2. Place the sprig in a test tube, cut side up. Add water to test tube and a pinch of baking soda.
3. Place the test tube into a beaker filled with tap water.
4. Place a lamp next to the beaker. - The water in the beaker will help to absorb the heat from the light, thus reducing the variables in the experiment
5. Turn on the lamp. As soon as see small bubbles coming from the cut end of the stem, time the reaction for 10 minutes. If you do not see bubbles, cut the stem again and recrush.
6. Calculate the net photosynthesis in bubbles/min. (Divide the number of bubbles by 10 minutes.)
7. Remove your test tube from the bright light. Observe and record the rate of bubbles without direct light.

DATA:

BRIGHT LIGHT **Bubbles/min** _____	DIM LIGHT **Bubbles/min** _____

CONCLUSION:

1. What are the bubbles? Explain why bubbles happen._____
   _____
   _____
2. Did the number of bubbles change when the light intensity was reduced? Explain why this would occur.
   _____
   _____
   _____
3. Why was the test tube placed in a beaker of water? What is a variable and why is it important to eliminate them?
   _____
   _____
   _____
4. What was the purpose of adding sodium bicarbonate (baking soda) to the plant? Hint: look at the formula for photosynthesis _____
   _____

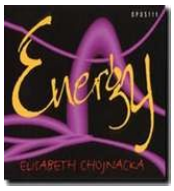
NOTES

TOPIC: Cellular Respiration

Possible Test Questions	***Notes:***
2. Cellular Respiration	$6O_2 + C_6H_{12}O_6 \longrightarrow 6H_2O + 6CO_2 + ATP$
A) Write equation in WORDS!	**Oxygen &**
B) Where does the energy	
for respiration come	
from?	
C) What does it mean that	
cell respiration is	
aerobic?	
> what do you think	
Anaerobic means?	
D) Look at Figure 4.11 of a	
mitochondrion—what is	
Its function?	Draw your version of
> What do you think is the	a mitochondrion.
advantage of so many	
membranes in the	
mitochondria?	
E) What is the importance	
of respiration to us?	
to other animals?	
**Comparing Photosynthesis to*	*These 2 processes from a CYCLE of ENERGY STORAGE and USE because…..*
Cell Respiration, complete the	*Photosynthesis stores energy in the form of _____ and Cell Respiration releases*
following:	*energy as __ __ __ and heat from the breakdown of _____*

The Power of a Pixie Stix

Cellular Respiration and You



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

SUGAR OXYGEN CARBON DIOXIDE WATER ENERGY!

Background

The carbohydrates are the compounds which provide energy to living cells. They are compounds of carbon, hydrogen and oxygen. The carbohydrates we use as foods have their origin in the photosynthesis of plants. They take the form of **sugars**, starches, and cellulose. When you eat carbohydrates (sugars & starches) the body breaks them down into simpler sugars. These sugars are absorbed into the **bloodstream**. As the sugar level rises in your body, the pancreas releases a hormone called insulin. **Insulin is needed to move sugar from the blood into the cells**, where the sugar can be used as a source of **energy**. When this process goes fast - as with simple sugars - you're more likely to feel hungry again soon. When it occurs more slowly, as with a whole-grain food (a complex carbohydrate), you'll be satisfied longer. The carbohydrates in some foods (mostly those that contain a lot of simple sugars) cause the blood sugar level to rise more quickly than others. Scientists have been studying whether eating foods that cause big jumps in blood sugar may be related to health problems like diabetes and heart disease. Limit simple sugars (such as candy) in your diet and eat more complex carbohydrates (like vegetables, oatmeal, and whole-grain wheat bread).

Objectives

- Students will be able to describe how carbohydrates are used for energy.
- To see what happens as cellular respiration converts food to energy.

Materials

- 1 Pixie Stix, Timer, You!

Procedures & Observations

1. EVERYONE is to take a base line measurement of the number of breaths you take per minute. _____
2. Take one Pixie Stix —> eat it —> Wait 20 minutes!
3. Depending on the color you took, you will have a specific job:
   A) Purple = runner B) Orange = walker C) Blue = timer

5. **RUNNERS:** All the 'runners' will run up & down the entire flight of stairs 3 times, (up and down only counts once!) —> then find a 'sitter' to time them as they count their breaths for 1 minute —> Record in Data Table below.
6. **WALKERS:** The 'walkers' will walk up & down both flights of stairs & then have a classmate ('sitter' or 'runner') time them as they count their breaths/minute —> record in Data Table below.
7. **SITTERS:** The 'sitters' will have another classmate time them as they count their breaths/minute—> Record

Student Name	"Job"	Baseline: # Breaths/min before exercise	# Breaths/min after exercise
	RUNNER		
	WALKER		
	SITTER		

Analysis Questions

1. Why did you eat the Pixie Stix first? _____
2. What happened to the number of breaths your or your classmates breathed in after a minute of exercise if you were a Sitter? A Walker? A Runner? _____
   _____
   _____
3. Why did the number of breaths change after the exercise? _____
   _____
   _____
4. What does the change tell you about the relationship between cell respiration and energy? _____
   _____
   _____
5. What other substances did your body need to undergo cell respiration during this activity? How do you know—based on what happened to you or your classmates during this activity? (Look at the equation!) _____
   _____
6. What did you release after the activity? How is that similar to cell respiration? (Look at the equation!) _____
   _____

Comparison
of
Photosynthesis & Cellular Respiration

SUMMARY OF PHOTSYNTHESIS			SUMMARY OF CELLULAR RESPIRATION		
$6CO_2 + 6H_2O$ + light energy —> $C_6H_{12}O_6 + 6O_2$		Picture	$C_6H_{12}O_6 + 6O_2$ —> $6H_2O + 6CO_2$ + ATP/Energy		Picture
1. Where does <u>Energy come from</u>…?			1. Where does <u>Energy come from</u>…?		
2. What materials are <u>used</u>?			2. What Materials are <u>used</u>?		
3. What materials are <u>produced</u>?			3. What materials are <u>produced</u>?		
4. <u>Time Frame</u> – when does it take place?			4. <u>Time Frame</u> – when does it take place?		
5. <u>Location</u> – where does it take place?			5. <u>Location</u> - where does it take place?		
6. <u>Importance</u> of Photosynthesis?			6. <u>Importance</u> of Respiration?		
7. In what organism does it take place?			7. In what organ-isms does it take place?		
8. Relationship to Respiration?	*Answer: Notice that the starting materi-als of photosynthesis are the end products of respiration!*		8. Relationship to Photosynthesis?		

ENERGY

Review Questions

Directions: Circle the lettered choice that best completes each statement or answers each questions.

1. Which compound provides energy to the cell? A) DNA B) RNA C) ATP D) the sun

2. The release of energy from the breakdown of food molecules in the presence of oxygen is called A) glycolysis B) respiration C) fermentation D) photosynthesis

3. ----- is the process by which autotrophs trap energy from sunlight to build carbohydates. A) respiration B) fermentation C) photosynthesis D) glycolysis

4. Autotrophs include A) ferns B) camels C) birds D) people

5. Heterotrophs are organisms that A) must make their own food by the process of respiration B) must go out and gather their own food C) make their food by way of photosynthesis D) include all plants

6. The source of energy for plants to make food is A) soil B) water C) minerals from fertilizer D) the sun

7. What raw materials are needed by the plant cell to make glucose? A) water and oxygen B) carbon dioxide and oxygen C) water and carbon dioxide

8. Complete the equation: $C_6H_{12}O_6 + 6O_2$ à A) C6H12O6 + 6H2O B) 6O2 + 6H2O C) 6O2 + 6H2O D) 6CO2 + 6H2

9. The two products of photosynthesis are glucose and A) water B) ATP C) oxygen D) carbon dioxide

10. The reactants of photosynthesis are A) O2 and H20 B) CO2 and H2 C) CO2 and H2O D) C + H2

11. In both plants and animals, food molecules are broken and CO2 is released by A) the carbon cycle B) breathing C) photosynthesis D) respiration

12. The primary function of the circulatory system is to A) digest and absorb food so the nutrients can be sent around the body in vessels B) to rid the body of waste products C) to carry oxygen from your lungs and nutrients from your digestive system to the cells of your body, and at the same time haul away wastes D) to take in oxygen and release carbon dioxide in order to maintain homeostasis

13. What is the primary function of the small intestine? A) food digestion B) nutrient absorption C) vitamin synthesis D) water absorption

14. It is important to know that in a chemical reaction A) matter is destroyed and created B) matter is rearranged only C) matter is rearranged, destroyed, and created D) none of the above

15. During all energy conversions, some of the energy is converted to A) carbon dioxide B) water C) heat D) sunlight

16. Applying Concepts: What might happen to the earth's atmosphere if photosynthesis suddenly stopped?

17. Applying Concepts: Why would muscle cells contain more mitochondria than skin cells?

18. Making Inferences: Some scientists think that the dinosaurs may have become extinct because an asteroid struck the Earth and sent large amounts of dust into the upper atmosphere. The dust remained in the atmosphere a long time. Explain how this would have resulted in the dinosaurs dying off.

Standard 6: The Energy of Life

Writing Supporting Detail

Compare/Contrast the two processes below. For every statement of fact, you must write 1 "detail" and then 1 "commentary" to support your statement. Please refer to your INS page 3 for detailed instructions.

PHOTOSYNTHESIS vs. CELLULAR RESPIRATION
1.
A.
B.
2.
A.
B.
3.
A.
B.
4.
A.
B.
5.
A.
B.
6.
A.
B.
7.
A.
B.
8.
A.
B.