

Name: _____

Unit 3

7th grade Science

Biochemical Processes

How do living things get Energy?

Mitochondria Structural Features

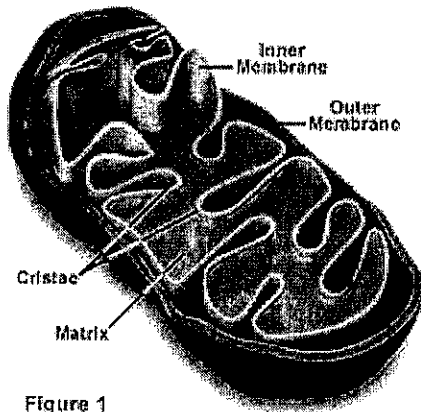
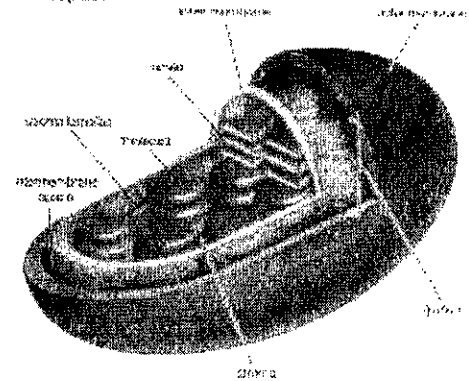


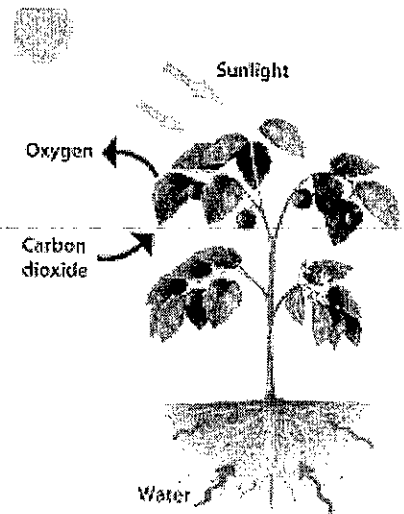
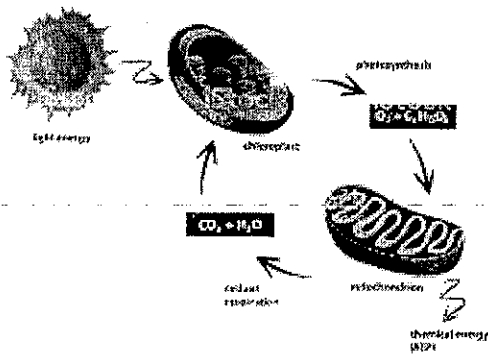
Figure 1

Chloroplast



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Cellular Respiration





Name: _____

Period: _____

Cellular Respiration	
Photosynthesis	
Enzymes	
ATP (Adenosine Triphosphate)	
Monomer	
Polymer	
Synthesis	
Hydrolysis	
Polysaccharide	

Autotrophic	
Chloroplasts	
Stomate	
Guard Cell	
Chlorophyll	
Palisades Layer	
Mitochondria	

Aim: How do Plants Accomplish Autotrophic Nutrition?

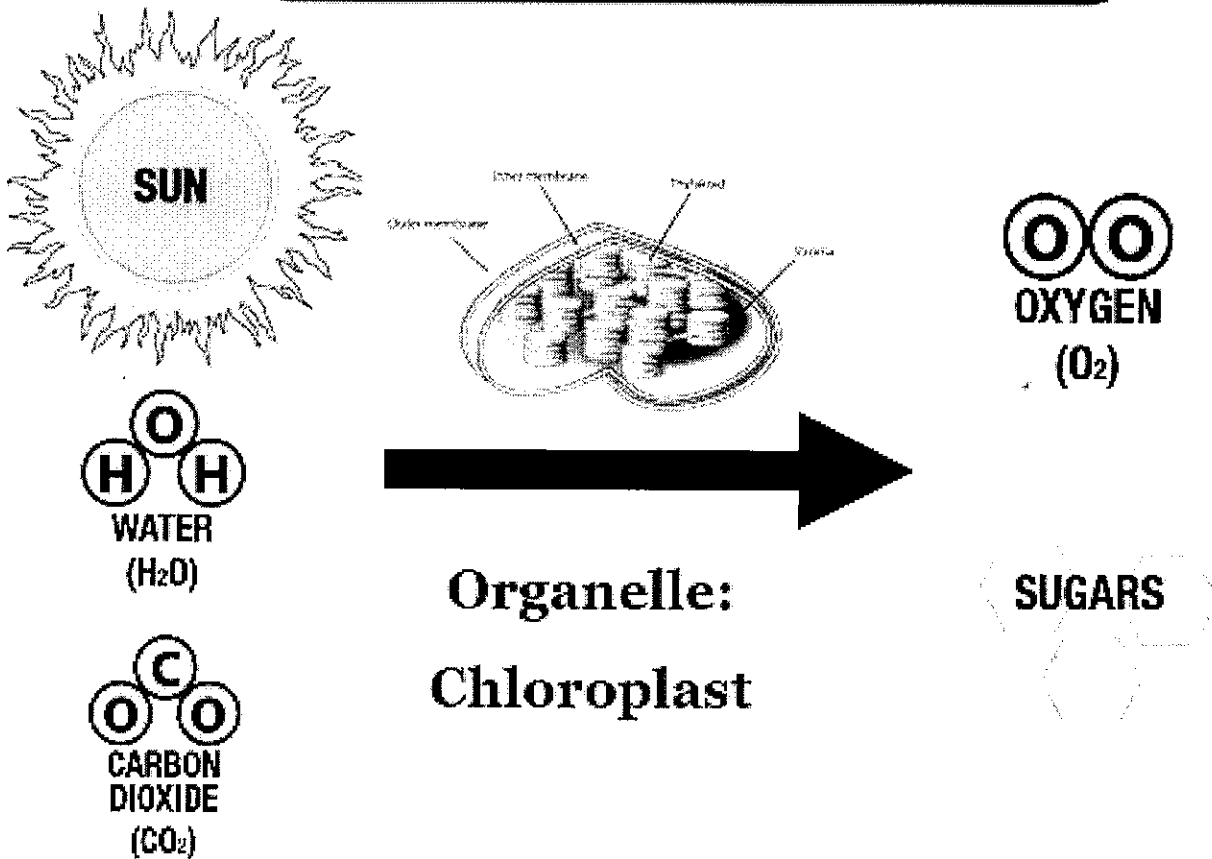
NOVA | Photosynthesis

<https://ny.pbslearningmedia.org/resource/tdco2.sci.life.stru.photosynth/photosynthesis/#.WgCyJmiPKUk>

As you watch the video, think about the following questions:

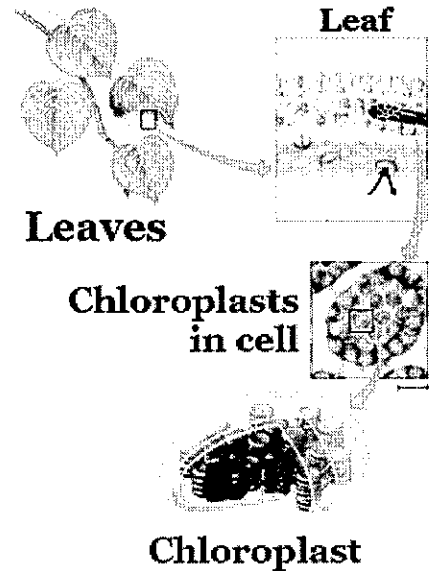
1. Do plants eat?
2. Where do plants get the energy they need to grow?
3. What REACTANTS do plants need for photosynthesis?
 - a. Where do plants get these materials?
4. In what part of the plant does photosynthesis take place?
5. Why are plants called producers?

The WORK of PLANT LIFE



Chloroplasts

- Saclike _____ that contains enzymes and chlorophyll, a green pigment that absorbs sunlight
- Site of _____ located in the leaves of plants



Photosynthesis Reaction

Word Equation:

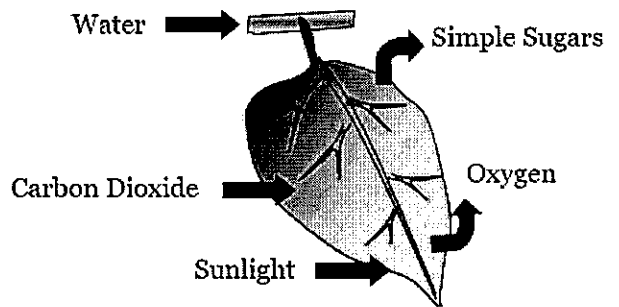
_____ → _____

Chemical Equation:



Photosynthesis

- ⊛ Process by which _____ convert _____ energy into _____ energy of _____ compounds

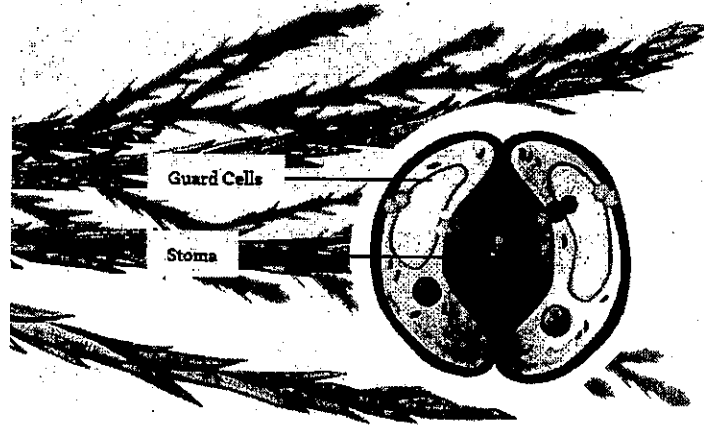


Autotrophic Nutrition AKA Photosynthesis

- _____ or _____
 - Make their own food (photosynthesis)
 - Examples: PLANTS and ALGAE

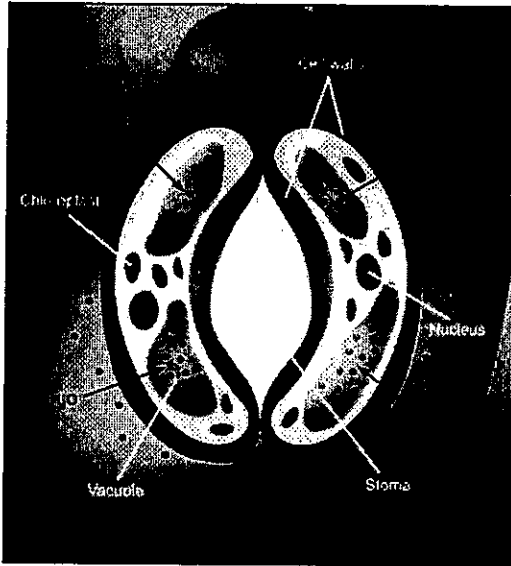
Maintaining Homeostasis in Plants

- _____ open & close **STOMATE** (leaf pore)
 - _____ - CO₂, O₂, and H₂O – Can Occur
- Maintains homeostasis



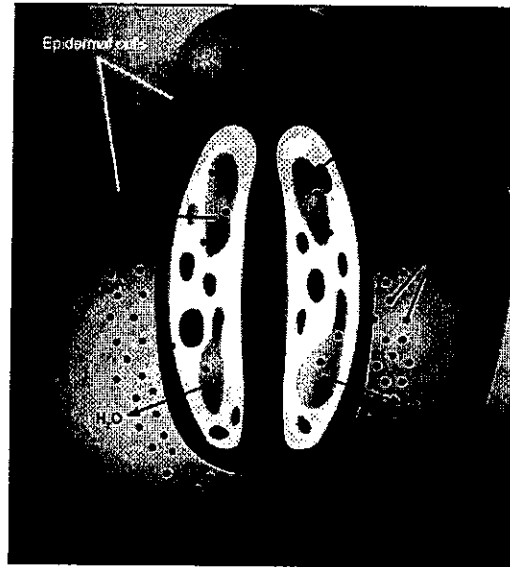
Below is an image of guard cells and a stoma opening.

Guard cells (swollen)



Stoma opening

Guard cells (shrunken)



Stoma closing

1. In what environmental conditions, do you think the guard cells would open? _____

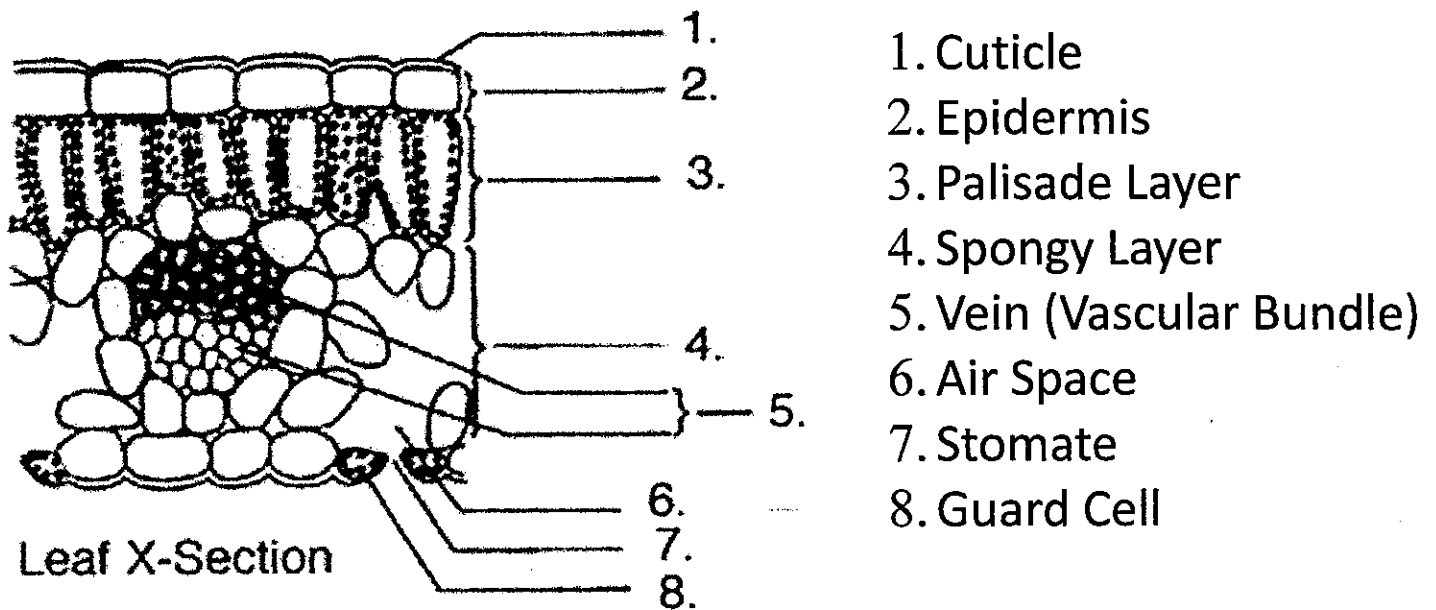
Explain your reasoning. _____

2. In what environmental conditions, do you think the guard cells would close? _____

Explain your reasoning. _____

Structure of a Leaf

Cuticle	Waxy Covering, protects from excess water loss
Epidermis	Protects the internal structures of the leaf
Palisade Layer	Most photosynthesis takes place here
Spongy Layer	Some photosynthesis occurs, exchange of gases within air spaces
Vein	Xylem - carries water and minerals to the leaf Phloem - distributes food to other parts of plant
Chloroplasts	Site of photosynthesis
Stomates	Opening in lower epidermis, allow O ₂ , CO ₂ and H ₂ O to move in and out
Guard Cells	Regulate the size of the stomate



Name: _____ Date: _____

HW: Chemistry of Photosynthesis

Directions: Using your **NOTES**, answer the following question. **REMEMBER** to use your strategies (underlining, crossing out, labeling, etc) to assist you.

1. Write out the equation for photosynthesis. You may use words or chemical symbols. **USE THIS TO HELP YOU ANSWER THE QUESTIONS!!**

_____ + _____ + _____ → _____ + _____

2. The mass of some corn plants at the end of their growth period was 6 tons per acre. Most of this mass was produced from

1. water and organic compounds absorbed from the soil
2. minerals from the soil and oxygen from the air
3. minerals and organic materials absorbed from the soil
4. water from the soil and carbon dioxide from the air

3. The diagram below represents a cell from the plant being used in the study.

a. Using the word bank below, **LABEL** the reactants and products on the diagram below:

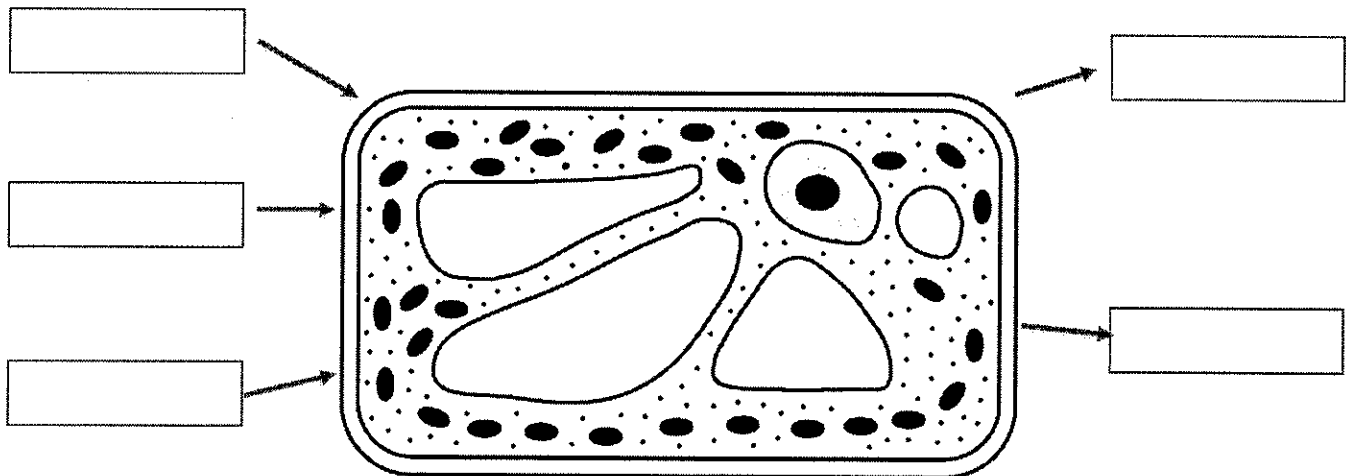
Carbon Dioxide

Glucose

Oxygen

Sunlight

Water



b. **DRAW** an arrow to a cell structure directly responsible for oxygen production in this cell. The tip of the arrow must touch the cell structure.

4. What types of organisms perform photosynthesis? _____

_____ 5. An **inorganic** molecule **required** by green plants for the process of photosynthesis is

- 1. oxygen
- 2. starch
- 3. carbon dioxide
- 4. glucose

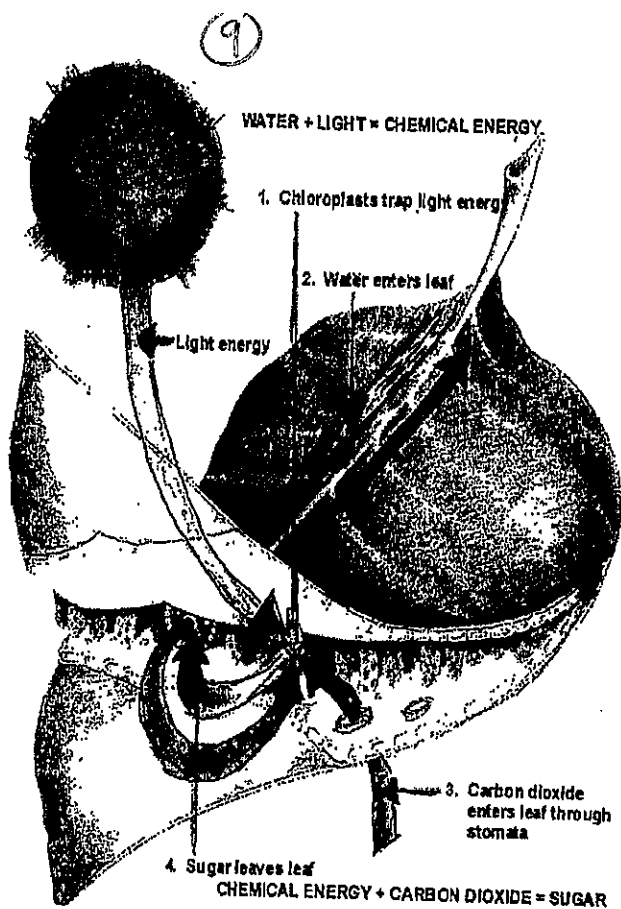
_____ 6. Which activity occurs in the process of **photosynthesis**?

- 1. Chemical energy from organic molecules is converted into light energy.
- 2. Organic molecules are obtained from the environment.
- 3. Organic molecules are converted into inorganic food molecules.
- 4. Light energy is converted into the chemical energy of organic molecules

_____ 7. During the process of photosynthesis, energy from the Sun is converted into

- 1. chemical energy in the bonds of inorganic molecules
- 2. chemical energy in the bonds of organic molecules
- 3. enzymes used to produce inorganic molecules
- 4. enzymes used to produce organic molecules

What is photosynthesis?



Leaf: Question on photosynthesis

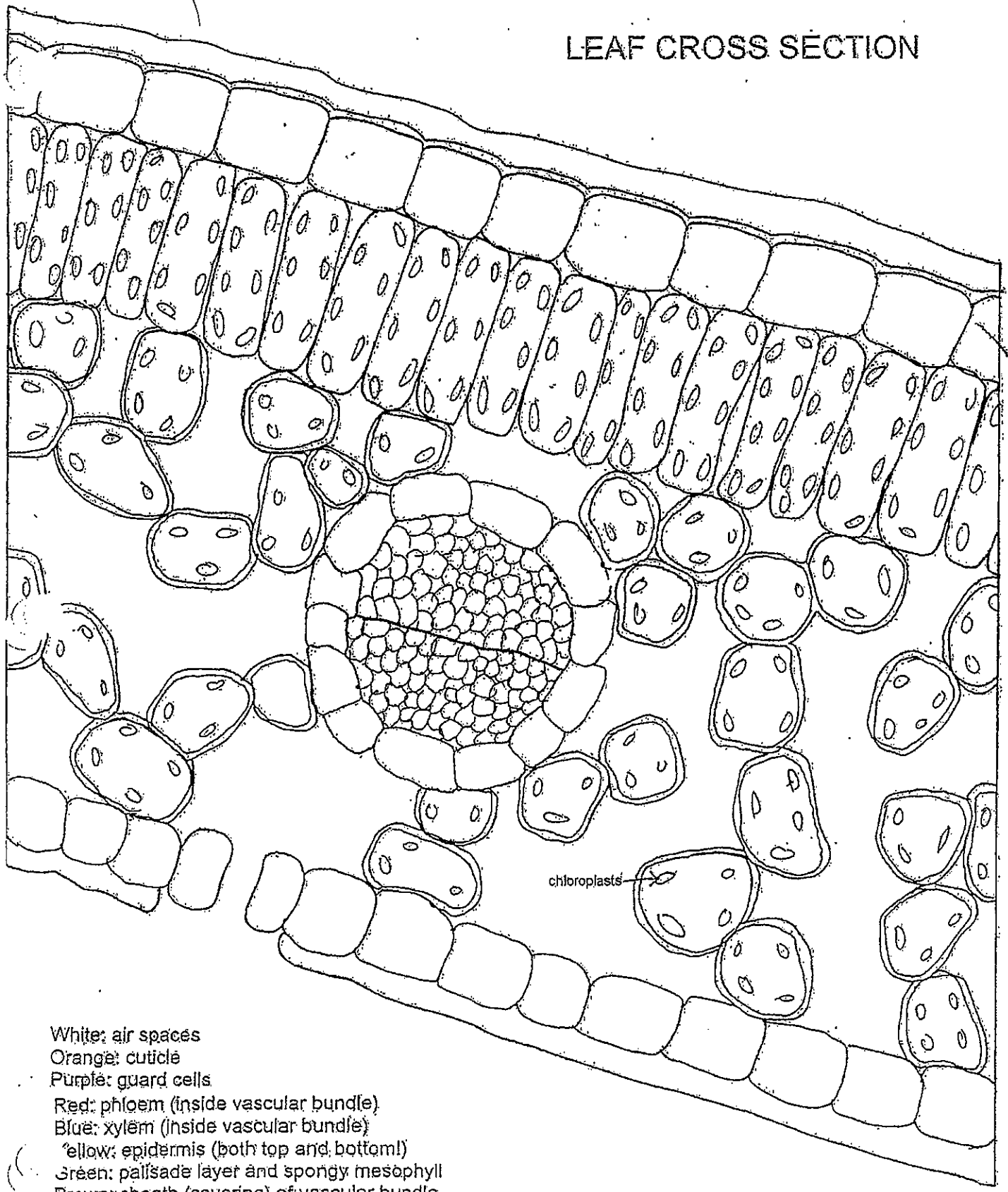
1. a) What substance enters the leaf from the roots that is needed for photosynthesis? _____
- b) What bundle of cells does it travel through to reach the leaf? _____
- c) What cell in the leaf does this substance go to for photosynthesis? _____
- d) Where does most photosynthesis take place in the leaf? _____
2. a) What organelle traps the sunlight for energy? _____
- b) What cells are these organelles located in the diagram? _____
- c) What enters the stomata that is needed for photosynthesis? _____
What cell does it go to? _____
- d) What food is made during photosynthesis? _____
3. Name four materials needed to make food during the process of photosynthesis:
_____ + _____ + _____ + _____
4. During photosynthesis, what gas is made and given off into our atmosphere? _____

Fill in the blanks for the photosynthesis equation below:



Name: _____ Date: _____ Period: _____

LEAF CROSS SECTION



- White: air spaces
- Orange: cuticle
- Purple: guard cells
- Red: phloem (inside vascular bundle)
- Blue: xylem (inside vascular bundle)
- Yellow: epidermis (both top and bottom)
- Green: palisade layer and spongy mesophyll
- Brown: sheath (covering) of vascular bundle

Name _____ Class _____ Date _____

8-3 What are leaves?

Lesson Review

Match each term in **Column B** with its description in **Column A**. Write the correct letter in the space provided.

Column A

Column B

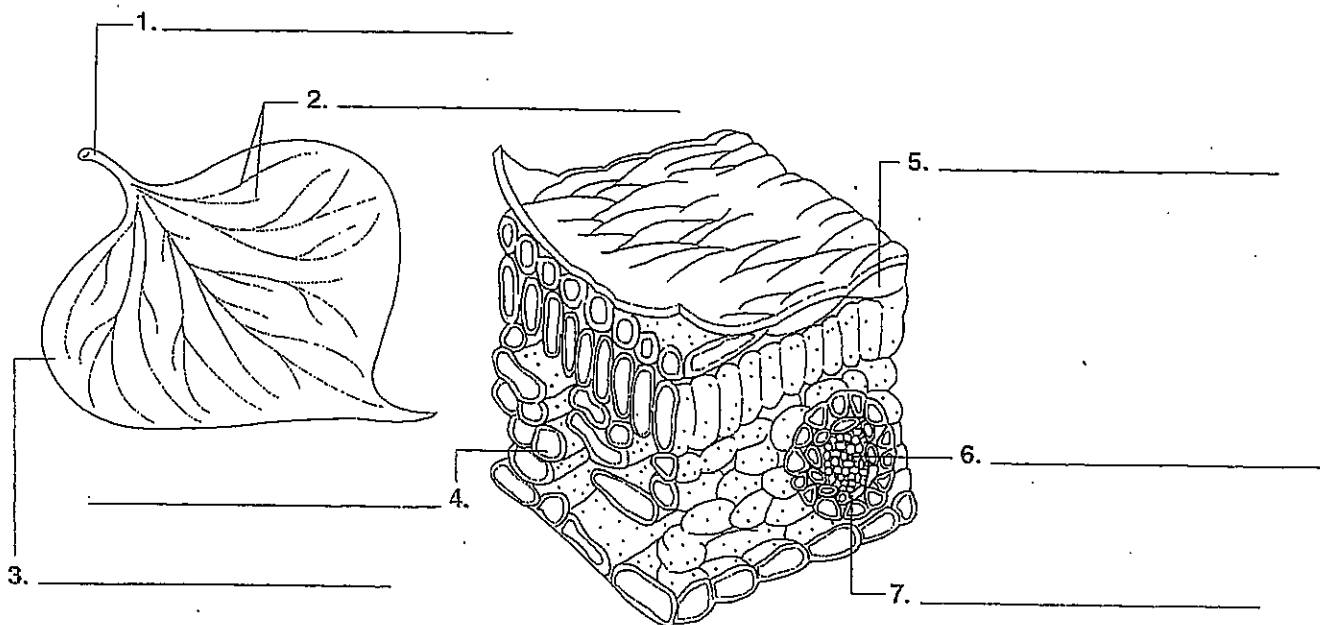
- _____ 1. protective layer that covers a leaf
- _____ 2. wide, flat part of a leaf
- _____ 3. leaf blades in one piece
- _____ 4. control the size of stomata
- _____ 5. bundle of tubes that contain xylem and phloem
- _____ 6. layer of a leaf where most food-making occurs
- _____ 7. supports the blade
- _____ 8. pieces that make up a compound leaf

- a. simple leaves
- b. epidermis
- c. guard cells
- d. mesophyll
- e. blade
- f. veins
- g. leaflets
- h. stalk

Skill Challenge

Skill: identifying

Label the parts of the leaf shown using the following labels: *blade*, *stalk*, *veins*, *mesophyll*, *phloem*, *epidermis*, and *xylem*.



Name _____ Class _____ Date _____

8-4 What is photosynthesis?

Lesson Review

Circle the term that makes each statement true.

1. Photosynthesis takes place in the (leaves / root) of a plant.
2. (Sunlight / Water) supplies the energy a plant needs to make sugar.
3. Carbon dioxide enters the plant through the (xylem / stomata).
4. The cell parts of green plants where photosynthesis takes place are (mesophyll / chloroplasts).
5. A plant gives off (oxygen / carbon dioxide) as a byproduct during photosynthesis.
6. Most photosynthesis takes place in the (mesophyll / phloem) layer of the plant leaf.
7. Water is taken into a plant through the (roots / veins).
8. An organism that gets food by eating other organisms is (an autotroph / a heterotroph).

Skill Challenge

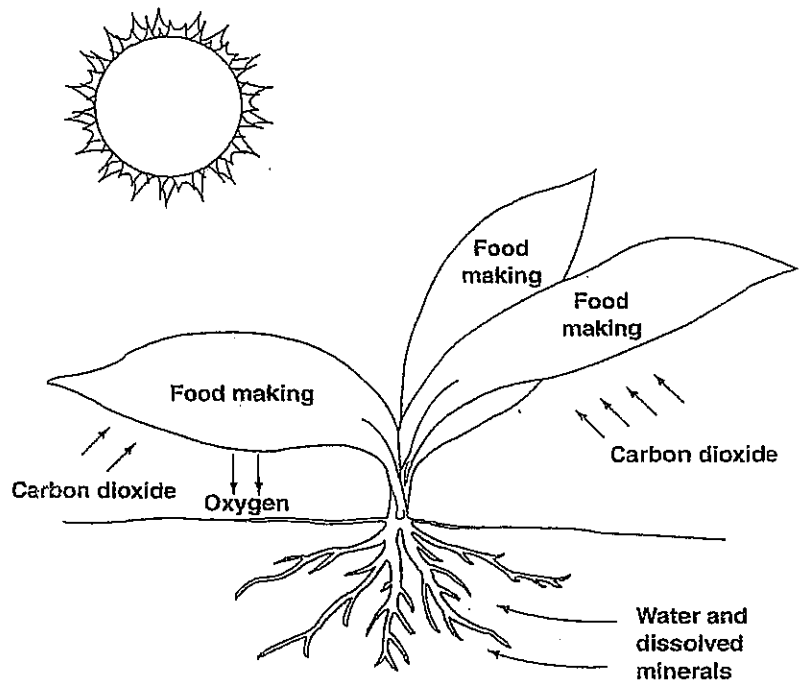
Skills: analyzing, interpreting

Use the diagram below to answer the questions about the process of photosynthesis.

1. What gas is being taken in by the plant? _____
2. What does the sunlight provide?

3. What gas is given off as a byproduct by the plant?

4. What do the roots take in?



Name: _____ Date: _____

CL HW: Photosynthesis and Plant Adaptations

Directions: Using your **NOTES**, answer the following question. **REMEMBER** to use your strategies (underlining, crossing out, labeling, etc) to assist you.

Write out the equation for photosynthesis.

_____ + _____ + _____ → _____ + _____

___ 1. The chart below lists substances involved in the process of photosynthesis.

Substance	
A	glucose
B	oxygen
C	carbon dioxide
D	water

Which statement best describes how these substances interact in photosynthesis?

1. A and B combine to produce C and D.
2. B and C combine to produce A and D.
3. C and D combine to produce A and B.
4. A and C combine to produce B and D.

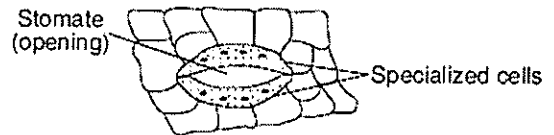
___ 2. Which process is most closely associated with the regulation of water loss from the leaves of trees?

1. digestion of water within the cytoplasm in the leaf cells of the trees
2. synthesis of protein by the chloroplasts in the leaf cells of the trees
3. movement of water through leaf openings controlled by the guard cells
4. absorption of nitrogen through leaf openings controlled by the guard cells

___ 3. Which process uses energy to combine inorganic molecules to synthesize organic molecules?

1. respiration 2. digestion 3. photosynthesis 4. decomposition

___ 4. The diagram to the right represents specialized cells in the surface of the leaf of a green plant.



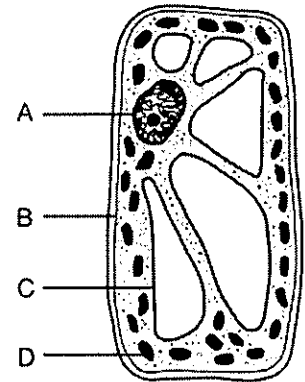
The main function of these cells is to

1. change the size of the stomate to regulate water loss
2. close the stomate to keep dust and dirt out of the leaf
3. directly provide leaf cells with the water involved in photosynthesis
4. allow newly formed glucose to be released from the leaf

5. During the process of photosynthesis, energy from the Sun is converted into

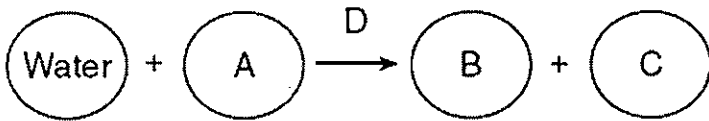
1. chemical energy in the bonds of inorganic molecules
2. chemical energy in the bonds of organic molecules
3. enzymes used to produce inorganic molecules
4. enzymes used to produce organic molecules

6. The diagram to the right represents a cell of a green plant. Solar energy is used to produce energy-rich compounds in structure



1. A
2. B
3. C
4. D

7. A biological process that occurs in plants is represented below.



Which row in the chart below identifies the lettered substances in this process?

Row	A	B	C	D
1.	enzymes	oxygen	carbon dioxide	glucose
2.	carbon dioxide	glucose	oxygen	enzymes
3.	glucose	enzymes	oxygen	carbon dioxide
4.	oxygen	glucose	carbon dioxide	enzymes

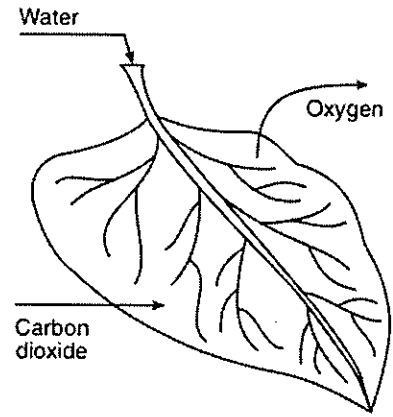
8. Organisms that have the ability to use an atmospheric gas to produce an organic nutrient are known as

1. herbivores
2. decomposers
3. carnivores
4. autotrophs

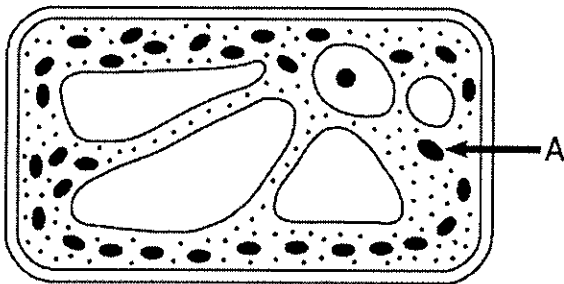
9. The arrows in the diagram to the right represent the movement of materials.

This movement of materials indicated by the arrows is most directly involved in the processes of

- 1. respiration and replication
- 2. photosynthesis and excretion
- 3. digestion and recycling
- 4. circulation and coordination



10. The diagram below represents an autotrophic cell.

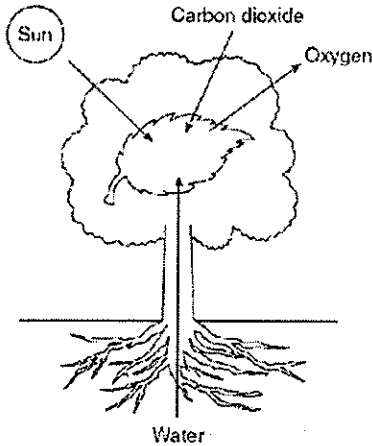


For the process of autotrophic nutrition, the arrow labeled A would most likely represent the direction of movement of

- 1. carbon dioxide, water, and solar energy
- 2. oxygen, glucose, and solar energy
- 3. carbon dioxide, oxygen, and heat energy
- 4. glucose, water, and heat energy

11. The diagram below represents events associated with a biochemical process that occurs in some organisms.

Which statement concerning this process is correct?

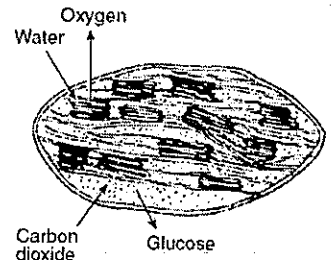


- 1. The process represented is respiration and the primary source of energy for the process is the Sun.
- 2. The process represented is photosynthesis and the primary source of energy for the process is the Sun.
- 3. This process converts energy in organic compounds into solar energy which is released into the atmosphere.
- 4. This process uses solar energy to convert oxygen into carbon dioxide.

12. The diagram to the right illustrates the movement of materials involved in a process that is vital for the energy needs of organisms.

The process illustrated occurs within

- 1. chloroplasts
- 2. ribosomes
- 3. mitochondria
- 4. vacuoles

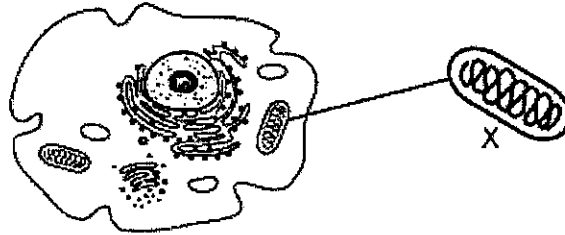


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Aim: How do ALL Living Things make USABLE ENERGY?

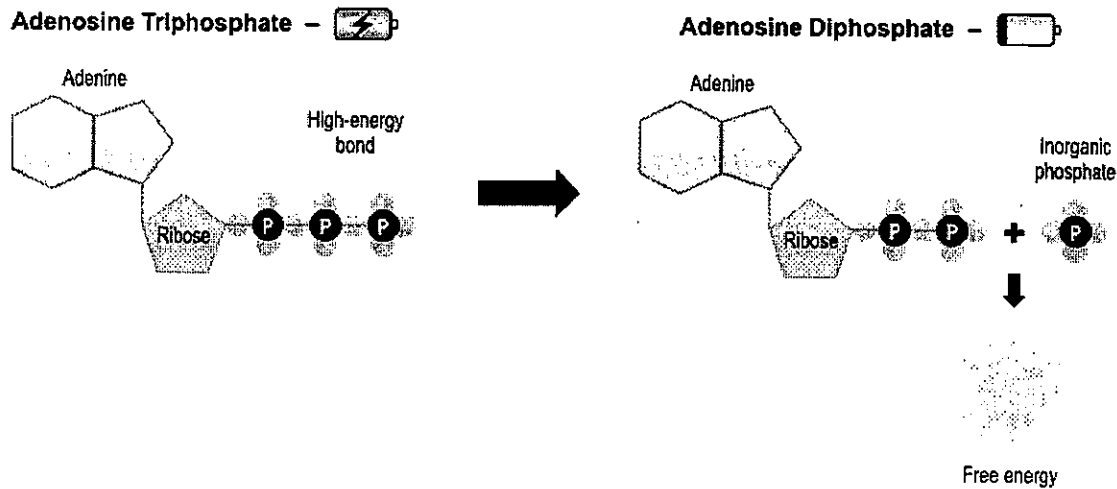
Cellular Respiration

- Transfer of stored _____ energy (*glucose*) into a _____ form (*ATP*)
- Occurs in the _____



Usable Energy

- _____ - Energy used to power metabolic processes in the cell
- Structure of ATP:



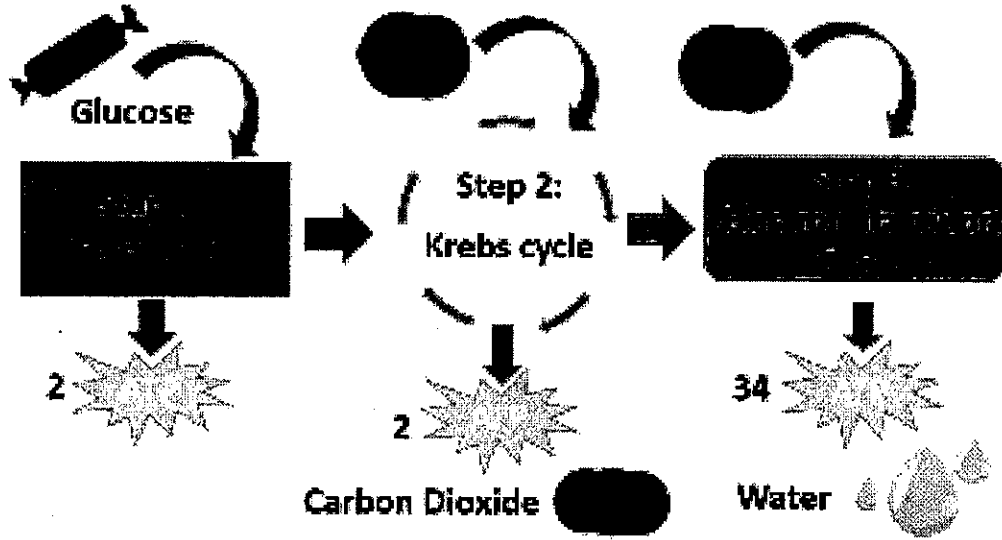
- Energy is released when CHEMICAL BONDS are broken.
 - _____!

Mitochondria

- Contains many folds, which increase the surface area for chemical reactions.
- Site of _____ in BOTH plants and animals!

Type of Cellular Respiration

Anaerobic Respiration	*Aerobic Respiration
Occurs in the	Occurs in the



Anaerobic Respiration (fermentation)

- Only makes _____ ATP molecules
- Does _____ require oxygen
 - Used to make alcohol, bread, yogurt
 - Causes _____ due to the build up of lactic acid
- Occurs in the cytoplasm of prokaryotes and eukaryotes

Aerobic Respiration



_____ + _____ → _____ + _____ + _____

Name _____ Date _____

HW: Chemistry of Cellular Respiration

Directions: Using your **NOTES**, answer the following question. **REMEMBER** to use your strategies (underlining, crossing out, labeling, etc) to assist you.

1. Write the (chemical or word) formula for cellular respiration

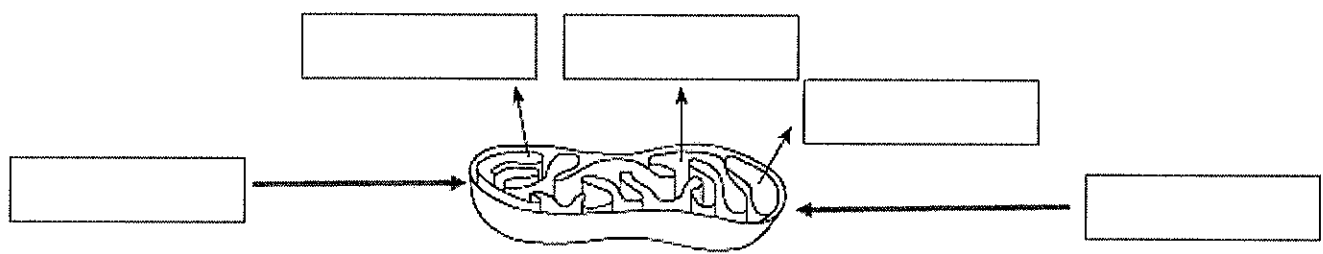
_____ + _____ → _____ + _____ + _____

2. The diagram below represents a cell structure involved in converting energy stored in organic molecules into a form used by animal and plant cells.

a. Identify the organelle (structure) in the diagram below. _____

c. Using the word bank below, **LABEL** the reactants and products on the diagram below:

carbon dioxide Water Glucose ATP Oxygen



___ c. The arrows in the diagram could represent the release of

- 1. ATP from a chloroplast carrying out photosynthesis
- 2. oxygen from a mitochondrion carrying out photosynthesis
- 3. glucose from a chloroplast carrying out respiration
- 4. carbon dioxide from a mitochondrion carrying out respiration

___ 3. During the process of cellular respiration, energy is released from

- 1. carbon dioxide
- 2. water molecules
- 3. oxygen atoms
- 4. chemical bonds

___ 4. The energy found in ATP molecules synthesized in animal cells comes directly from

- 1. sunlight
- 2. organic molecules
- 3. minerals
- 4. inorganic molecules

___ 5. The main result of cellular respiration is the

1. conversion of radiant energy into chemical energy
2. production of lactic acid as an end product
3. storage of energy in a polysaccharide
4. production of ATP from the breakdown of glucose

___ 6. Which substance is needed for aerobic cellular respiration to occur?

1. oxygen
2. carbon dioxide
3. nitrogen
4. methane

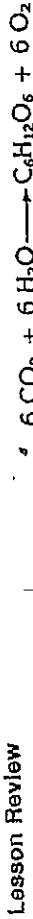
Name _____

Per. _____

Photosynthesis

Photosynthesis is the process by which green plants manufacture food.

General Formula for Photosynthesis
(in the presence of light energy)



Lesson Review

Circle the term that makes each statement true.

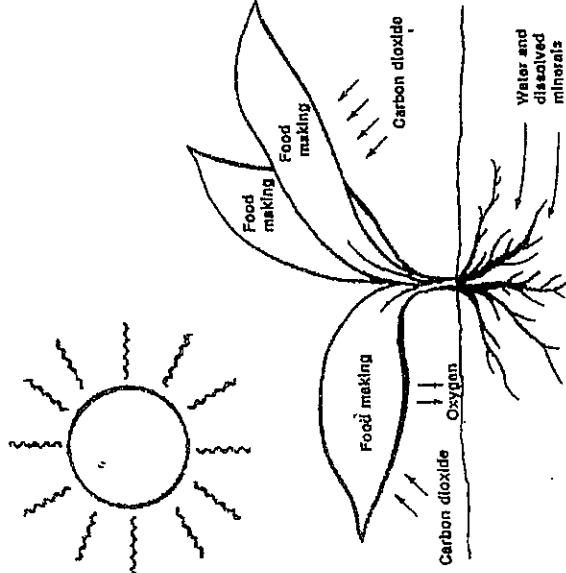
- Photosynthesis takes place in the (leaves, stem) of a plant.
- (Sunlight, Water) supplies the energy a plant needs to make sugar.
- Carbon dioxide enters the plant through the (xylem, stomata).
- The cell parts of green plants where photosynthesis takes place are (chlorophyll, chloroplasts).
- During photosynthesis, a plant gives off oxygen and water as (food, waste).
- Most photosynthesis takes place in the (mesophyll, phloem) layer of the plant leaf.
- Water is taken into a plant through the (roots, veins).

Skill Challenge

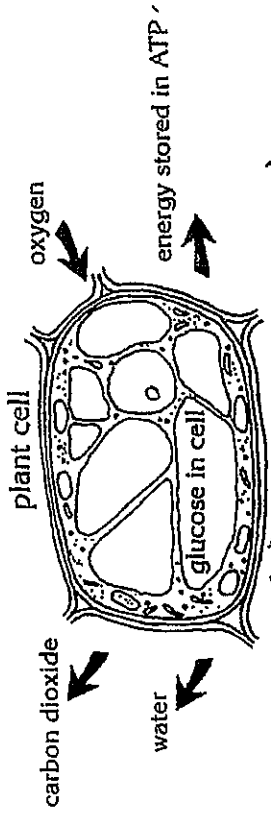
Skills: analyzing, interpreting

Answer the questions about the process of photosynthesis.

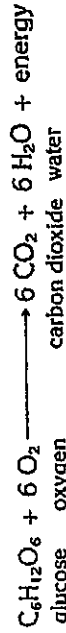
- What gas is being taken in by the plant? _____
- What does the sunlight provide? _____
- What gas is given off as a waste by the plant? _____
- What do the roots take in? _____



Respiration is the process by which energy is released from food.



General Formula for Respiration



PHOTOSYNTHESIS AND RESPIRATION

Write the words "used" or "produced" appropriately for boxes "energy to oxygen" only...

	Photosynthesis	Respiration
Energy		
Water		
Carbon dioxide		
Glucose		
Oxygen		
Location		

B. Write the letter of the term on the right next to the statement(s) with which it belongs on the left.

- Occurs only in cells containing chlorophyll. a. photosynthesis
- Carried on by all cells. b. respiration
- Is a kind of burning.
- Provides food for the plant.
- Carbon dioxide, water, and energy are the products. **Select** photosynthesis or respiration before each statement.
 - occurs day and night
 - occurs in all living plant cells
 - produces carbon dioxide gas
 - Glucose is formed.
 - Chlorophyll is energized.

22

LESSON

26

How do living things
get their energy?

You need energy to live, so do plants. All living things need energy to carry out their life processes.

How do plants and animals get energy? The same way our car gets its energy—by burning a fuel. Cars use gasoline as fuel. Energy is released when oxygen from the air combines with the gasoline in the engine.

Plants and animals use glucose as a fuel. Glucose is a simple sugar. Energy is produced when oxygen combines with glucose. This energy-producing process is called **respiration** [res-puh-RAY-shun]. You may remember that respiration is one of the life processes.

WHERE DOES GLUCOSE COME FROM?

Animals ingest food. They eat plants or other animals. During digestion, some of this food is changed to glucose. Animals use this glucose for energy.

Plants are different. They make their own food in a process called **photosynthesis** [foht-uh-SIN-thuh-sis].

Photosynthesis takes place in the leaves of green plants. The cells of green plants have structures called chloroplasts. Chloroplasts contain the green substance chlorophyll. Chlorophyll traps light energy from the sun. Light energy is needed for plants to make their own food.

Plants also need two other substances to make their own food — water and carbon dioxide.

- Water enters a plant through its roots.
- Most carbon dioxide enters a plant through tiny holes in its leaves called **stomata** [STOH-muh-tuh].

MORE ABOUT RESPIRATION AND PHOTOSYNTHESIS

The energy-producing process in living things is called respiration. Respiration is the release of energy by combining oxygen with digested food (glucose). Carbon dioxide and water are also produced. They are waste products of respiration.

A simple way to show respiration is this:



The food-making process of green plants is called photosynthesis. Photosynthesis is also responsible for the production of oxygen.

Photosynthesis can be shown in this way:



Using the above information, answer the following questions.

1. What do we call the release of energy by living things? _____
2. Respiration is _____ in plants and animals.
different, the same
3. Two waste products produced by respiration are _____ and _____
4. What fuel do living things use for energy? _____
5. What must link up with this fuel to produce energy? _____
6. Do plants take in food from the outside? _____
7. How do plants obtain food? _____
8. The food-making process of plants is called _____

9. Photosynthesis chemically combines two products. Name them.

10. Photosynthesis also requires energy and the green substance called _____

11. In which part of a plant does most photosynthesis take place?

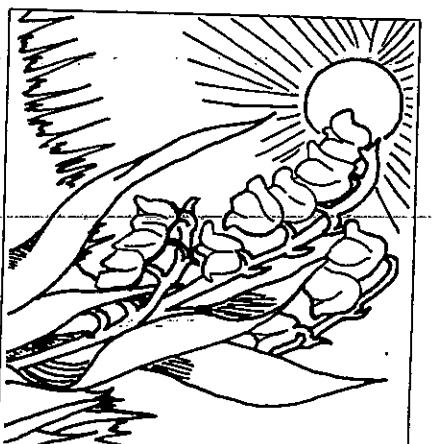


Figure A

Study Figure B carefully. Then answer these questions.

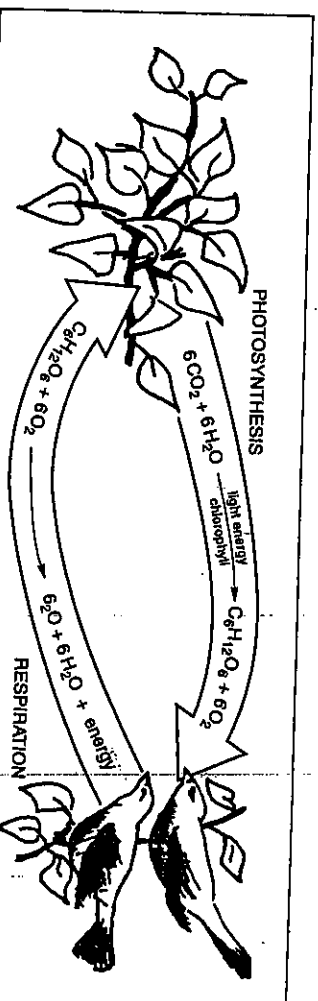


Figure B

12. In photosynthesis,

- a) what are the starting products? _____ and _____
- b) what are the end products? _____ and _____

13. In respiration,

- a) what are the starting products? _____ and _____
- b) what are the end products? _____ and _____

14. a) Is energy needed for photosynthesis to take place? _____

b) Is energy produced by respiration? _____

15. Photosynthesis and respiration are _____ reactions.
the same, opposite

This picture shows photosynthesis taking place. When green plants are in sunlight, this is what happens:

water plus carbon dioxide make glucose and oxygen.

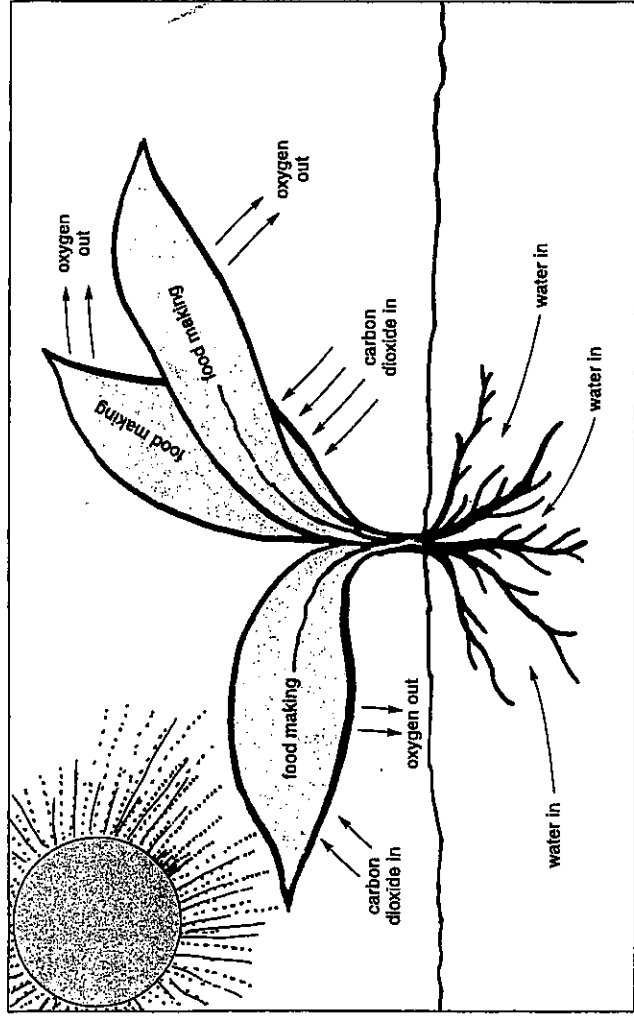


Figure C

Look at Figure C and then answer the following questions about photosynthesis.

1. Does photosynthesis take place in the leaves or in the roots? _____
2. What two materials must a plant take in for photosynthesis? _____
3. What else is needed for photosynthesis? _____
4. Where does the carbon dioxide gas come from? _____
5. What are the two things that photosynthesis makes? _____
6. What does a plant make as food? _____
7. Where does water enter a plant? _____
8. Where does carbon dioxide enter a plant? _____
9. Where does oxygen leave a plant? _____
10. What living things use the oxygen? _____

Complete each statement using a term or terms from the list below. Write your answers in the spaces provided. Some words may be used more than once.

chlorophyll
glucose
respiration

life processes
carbon dioxide
water

photosynthesis
oxygen

1. The release of energy in living things is called _____.
2. Respiration links up the simple sugar, _____, with the gas, _____.
3. The waste products of respiration are _____.
4. Most of the energy released during respiration is used for the _____.
5. The food-making process of plants is called _____.
6. The products that chemically link up during photosynthesis are _____ and _____.
7. The substance in the leaves of green plants that is needed for photosynthesis is _____.

REACHING OUT

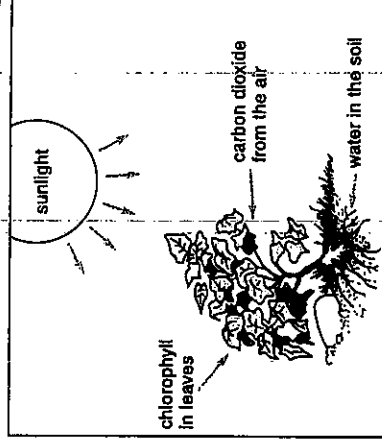


Figure D Photosynthesis

1. A plant makes its own food (glucose). Plants also make other nutrients. How do plants get these nutrients? _____
2. Algae have chlorophyll and carry out photosynthesis. How do algae get their nutrients? _____ (Hint: You can look back at Lesson 22 if you need help.) _____

Name _____ Date _____

HW #4.4 - Photosynthesis and Cellular Respiration

Directions: Using your **NOTES**, answer the following question. **REMEMBER** to use your strategies (underlining, crossing out, labeling, etc) to assist you.

Write the equation for photosynthesis.

_____ + _____ + _____ → _____ + _____

Write the equation for cellular respiration

_____ + _____ → _____ + _____ + _____

____ 1. Which organisms and set of characteristics are correctly paired?

- 1. fungi— carry out photosynthesis and heterotrophic nutrition
- 2. plants— carry out respiration and autotrophic nutrition
- 3. decomposers— carry out photosynthesis and autotrophic nutrition
- 4. animals— carry out autotrophic nutrition and heterotrophic nutrition

____ 2. Which two processes are responsible for keeping the percentage of atmospheric oxygen at relatively constant levels?

- 1. circulation and coordination
- 2. respiration and photosynthesis
- 3. respiration and coordination
- 4. photosynthesis and circulation

____ 3. Photosynthesis and respiration are alike in that they both

- 1. require the Sun as a direct source of energy
- 2. result in the production of glucose molecules
- 3. require specific catalysts
- 4. occur within mitochondria

____ 4. The energy used to obtain, transfer, and transport materials within an organism comes directly from

- 1. ATP
- 2. DNA
- 3. sunlight
- 4. starch

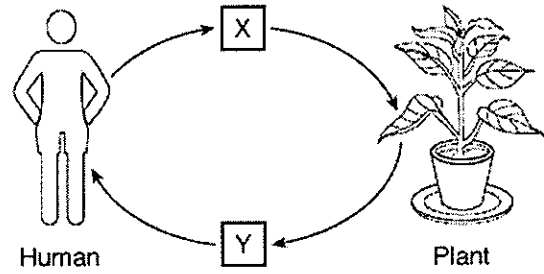
____ 5. Which substance is needed for aerobic cellular respiration to occur?

- 1. oxygen
- 2. carbon dioxide
- 3. nitrogen
- 4. Methane

6. The diagram below represents a cycling of materials.

Which row in the chart below shows the substances represented by X and Y?

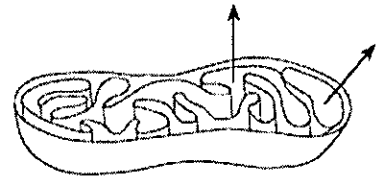
Row	X	Y
1.	oxygen	carbon dioxide
2.	glucose	oxygen
3.	carbon dioxide	oxygen
4.	amino acids	carbon dioxide



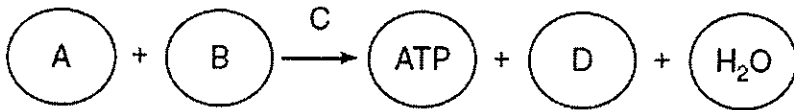
7. The diagram below represents a cell structure involved in converting energy stored in organic molecules into a form used by animal cells.

The arrows represent the movement of which substances?

- 1. carbon dioxide and sugar
- 2. ATP and carbon dioxide
- 3. oxygen and ATP
- 4. oxygen and sugar



____ 8. A biological process that occurs in both plants and animals is shown below.



Which row in the chart below identifies the lettered substances in this process?

Row	A	B	C	D
1.	O ₂	CO ₂	glucose	enzymes
1.	glucose	O ₂	enzymes	CO ₂
1.	enzymes	O ₂	CO ₂	glucose
1.	glucose	CO ₂	enzymes	O ₂

____ 9. Which statement best describes cellular respiration?

1. It occurs in animal cells but not in plant cells.
2. It converts energy in food into a more usable form.
3. It uses carbon dioxide and produces oxygen.
4. It stores energy in food molecules.

____ 10. The buildup of waste products in muscle cells that are active might cause

1. digestion
2. cellular respiration
3. increased fatigue
4. decreased heart rate

Energetics

INORGANIC

ORGANIC

Carbohydrates:

- Building Block
- Examples

Proteins:

- Building Block
- Examples
- Protein Shape = _____

Enzymes

- Also called _____
- (Speed up -or- Slow down) chemical reactions
-

PHOTOSYNTHESIS

1. Write the basic formula including reactants and end products.
2. Where does the energy come from in the reaction
3. Where is the energy at the end of photosynthesis?
4. In what cell organelle does it take place?
5. What part of the plant does photosynthesis take place?

6. How does this structure regulate photosynthesis and maintain homeostasis?

7. How is the excess glucose stored in the plant?

RESPIRATION

8. Write the basic formula including reactants and end products.

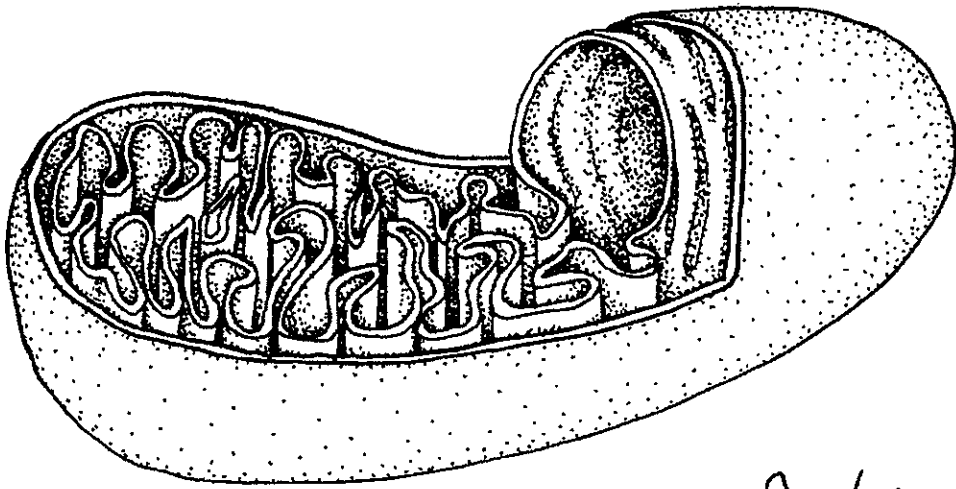
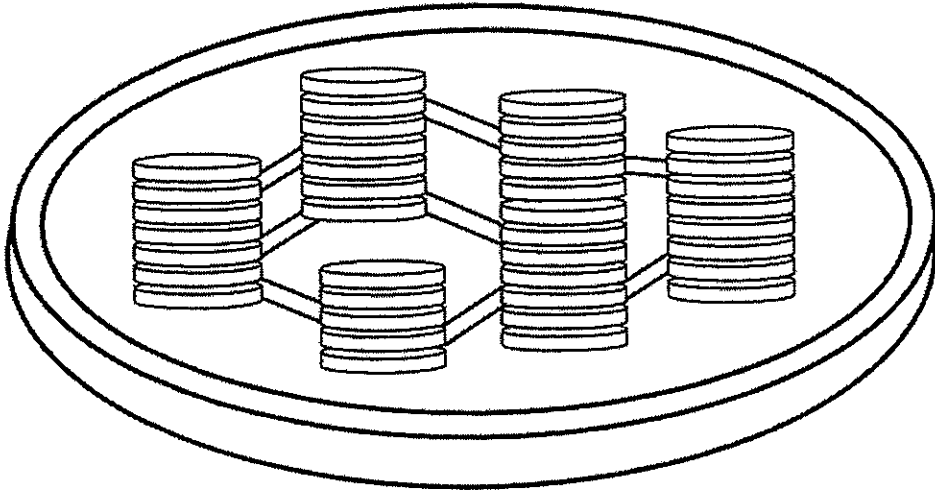
9. Where does the energy come from in the reaction

10. Where is the energy at the end of respiration?

11. In what cell organelle does it take place?

12. What must happen to the starch before it can be used for respiration?

13. Draw a diagram of photosynthesis and respiration, including the compounds needed and those produced to show a cycle between the two.



9/4/02

