Part 4 Organelles

Name:

Part 4 Lesson 1 Lysosomes

Cellular Organelles: A membrane-bound compartment or structure in a cell that performs a _____.

The Big / Roles / Jobs of Cellular Organelles. They…

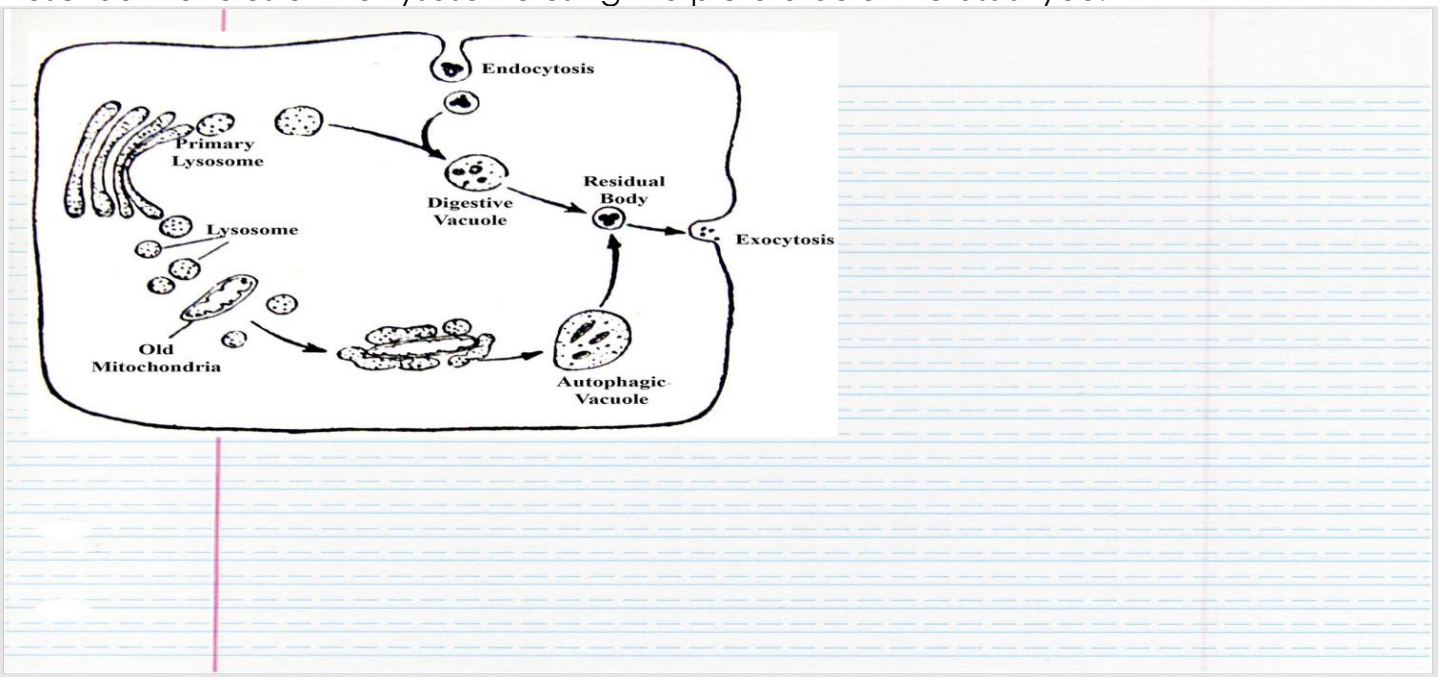
Examples / Organelles or process where this happens.	Examples / Organelles or process where this happens	Examples / Organelles or process where this happens	Examples / Organelles or process where this happens	Examples / Organelles or process where this happens

Lysosomes

-Has _____acids / _____ in a sac
-Digestive organelle, _____ old cell parts.
-Breaks down _____, lipids, and carbohydrates, and bacteria.
-_____ undigested material to cell membrane for removal.
-Cell breaks down if lysosome _____
-If cell id damaged the lysosome can help it to self-_____ in a process called apoptosis.

Peroxisomes: a small organelle present in the cytoplasm of many cells, which contains the reducing _____catalase and usually some oxidases.

Describe the roles of the Lysosome using the picture below to assist you.



Cytoskeleton, microtubules, microfilaments

--_____ cell and provides shape

-Aids in _____of materials in and out of cells

-Aids in _____

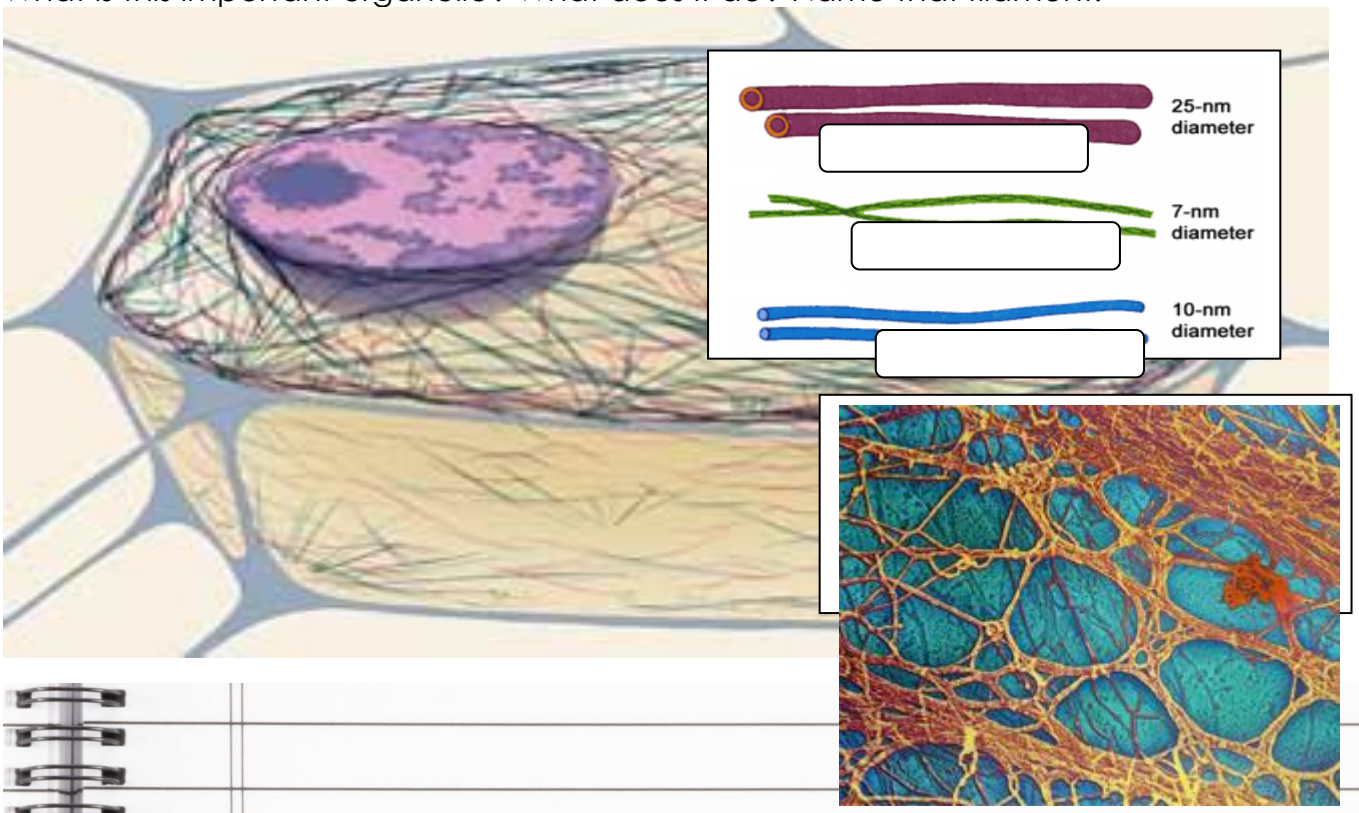
-Composed of…. Microfilaments (thin fibers), Intermediate filaments (medium sized), Microtubules (Large hollow cylinders)

Flagellum: A _____ structure that acts primarily as an organelle of locomotion.

Made of a bundle of nine pairs of microtubules surrounding two central pairs of microtubules

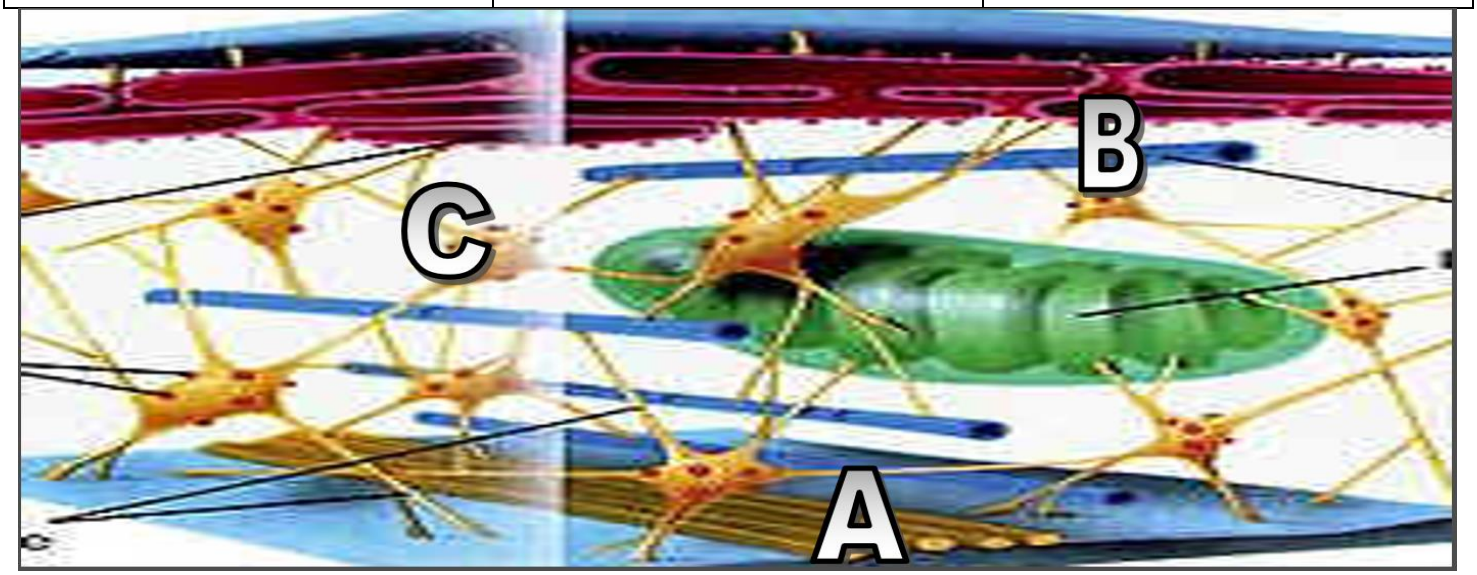
Cilium (Cilia): A small structure that extends out from the surface of cell and is used for _____.

What is this important organelle? What does it do? Name that filament.



Name A, B, C?

A=	B=	C=



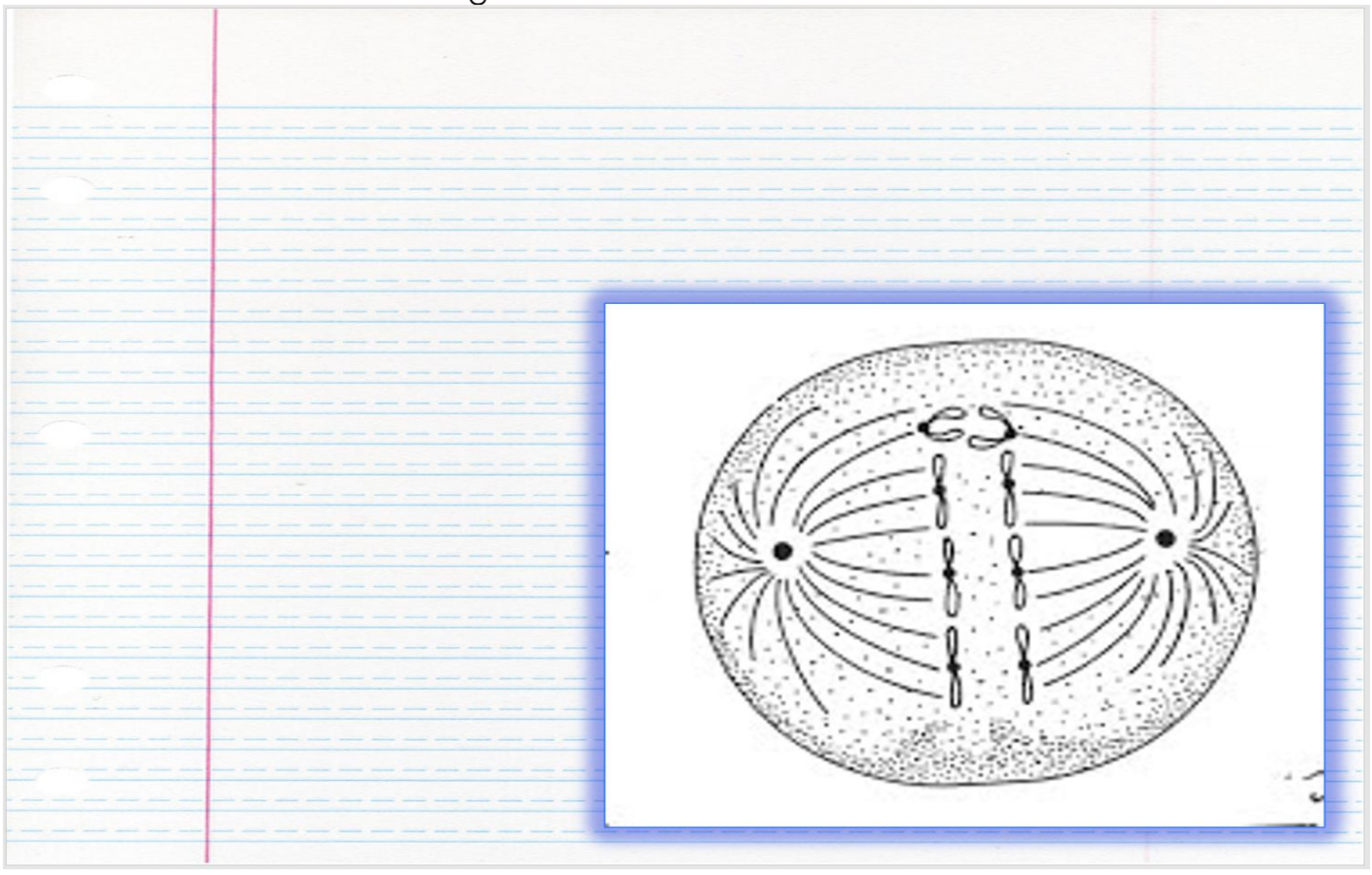
Centrioles / Centrosomes

-Look like golden nuggets (_____)

-Made of _____ tubes

-Aid in cell _____ (Mitosis)

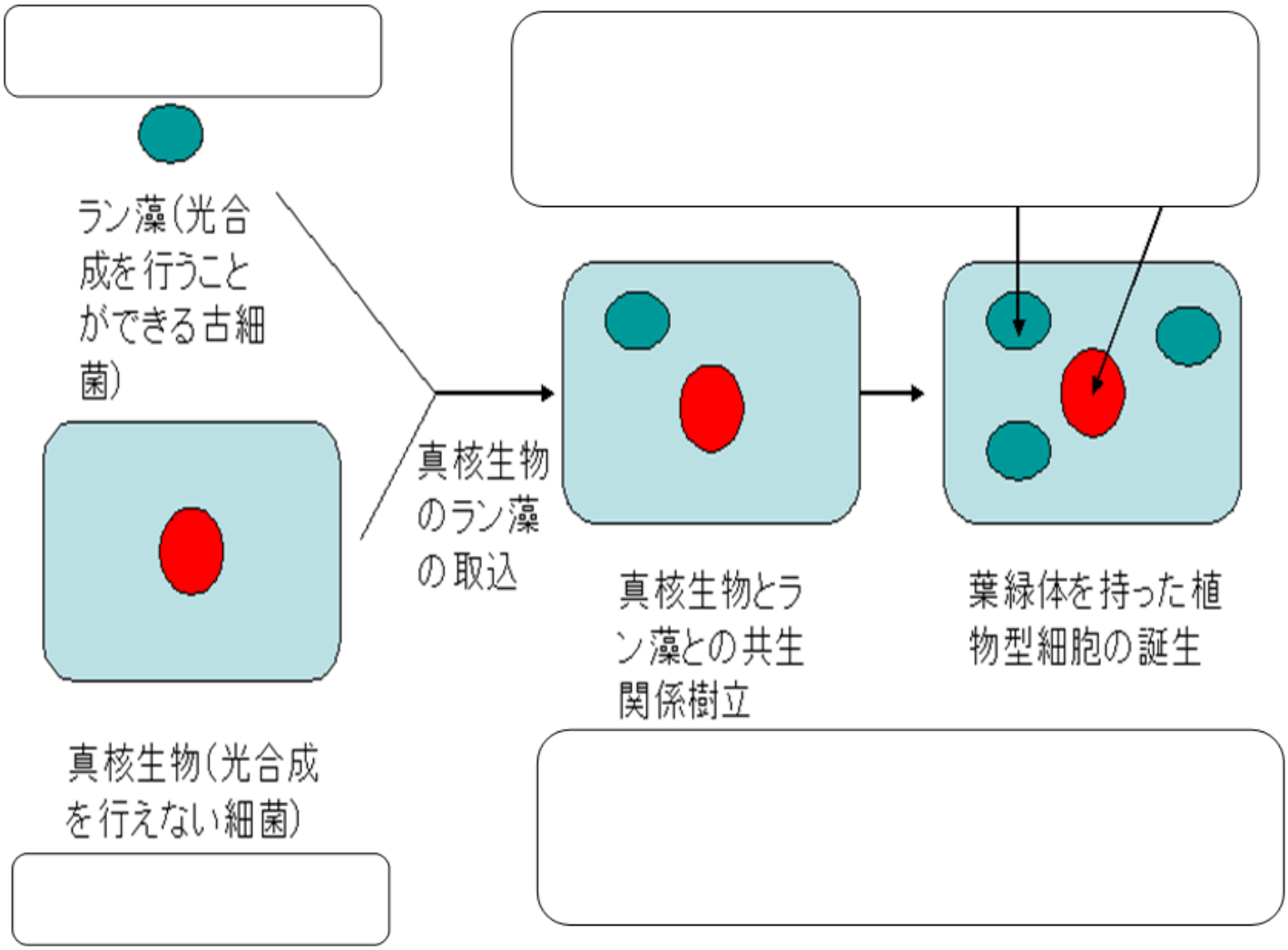
What are the centrosomes doing below?



The Endosymbiotic Theory: Mitochondria and chloroplasts were once primitive bacterial cells.

-A large eukaryotic cell ingested bacteria and the two became dependent on one another for survival, resulting in a permanent relationship.

Please translate the Mandrian Chinese below. Think Endosymbiotic Theory if you're confused.



Why do leaves turn color in the fall?

Part 4 Lesson 3 Chloroplast

Plastids (AKA Chloroplast)

-Organelle in _____

-Contain the green pigment _____

-Has stacks called _____

-Do _____ (Make the sugar)

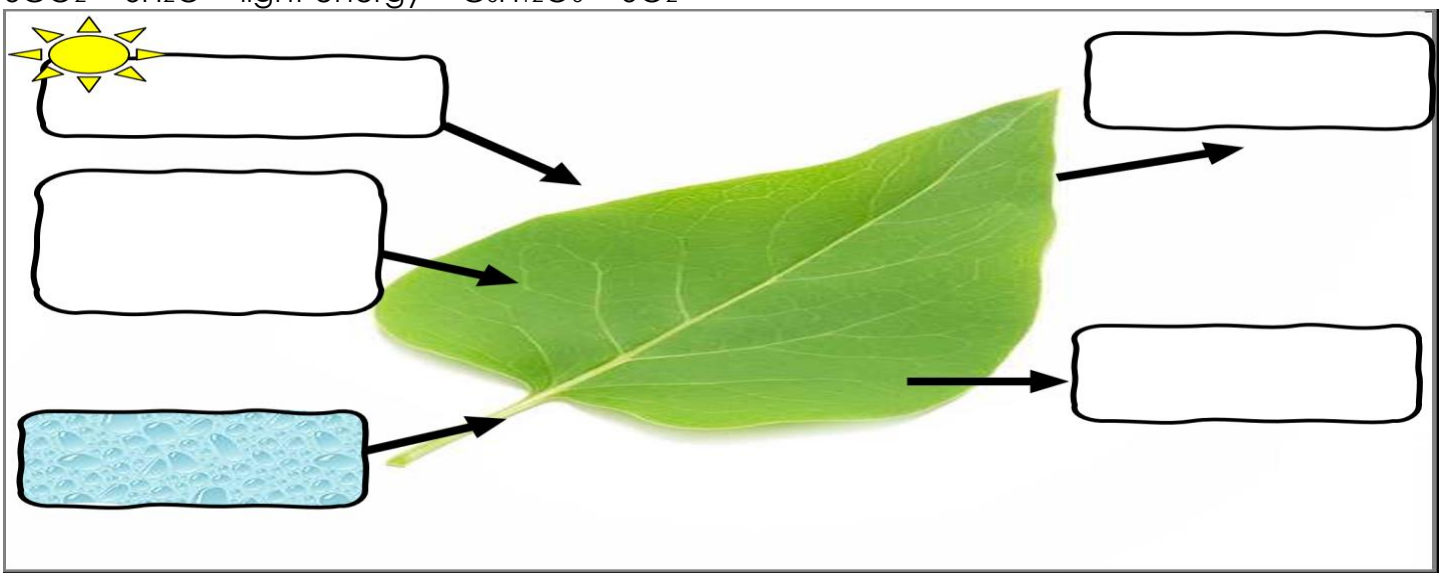
-Has its own unique _____.

Photosynthesis – Plants make sugar from _____. Light energy is turned into _____ energy (sugars – carbon based).

Which of the following statements is false of photosynthesis? and the answer is… A.) Photosynthesis requires sunlight, carbon dioxide, and water. B.) Oxygen and glucose are produced in photosynthesis. C.) Carbon Dioxide and water are produced. D.) In photosynthesis, plants use radiant energy from the sun to create chemical energy in the form of sugars. E.) None of the above.	Which of the following equations is true of photosynthesis? $6O_2 + C_6H12O_6$ Energy → $6CO_2 + 6H_2O$ $C_6H_{12}O_6 + 6O_2$ → Energy + Chloroplasts. $6O_2 + 6CO_2 + 6O_2$ → Energy + $C_6H_{12}O_6$ $6CO_2 + 6H_2O$ + Energy → $C_6H_{12}O_6 + 6O_2$ $6O_2 + 6CO_2$ + → Energy + $C_6H_{12}O_6 + 6O_2$ Energy + $6H_2O$ → Energy + $6O_2 + 6CO_2$ $CO_2 + 3H_2O$ + Energy → $C_6H_{12}O_6 + O_2$ $6CO_2 + 6H_2O$ → Energy + $6CO_2 + 6O_2$ Energy → $6O_2 + C_6H_{12}O_6 + 6CO_2$

Part 4 Lesson 4 Photosynthesis

$6CO_2 + 6H_2O$ + light energy = $C_6H_{12}O_6 + 6O_2$



Photosynthesis is the process by which light energy is utilized to convert _____and _____ into food to be used by plants.

_____ is released into the air during the process. (O_2) Waste

Light or solar energy is captured by _____ (CHLOR-oh-phil), the green pigment in leaves.

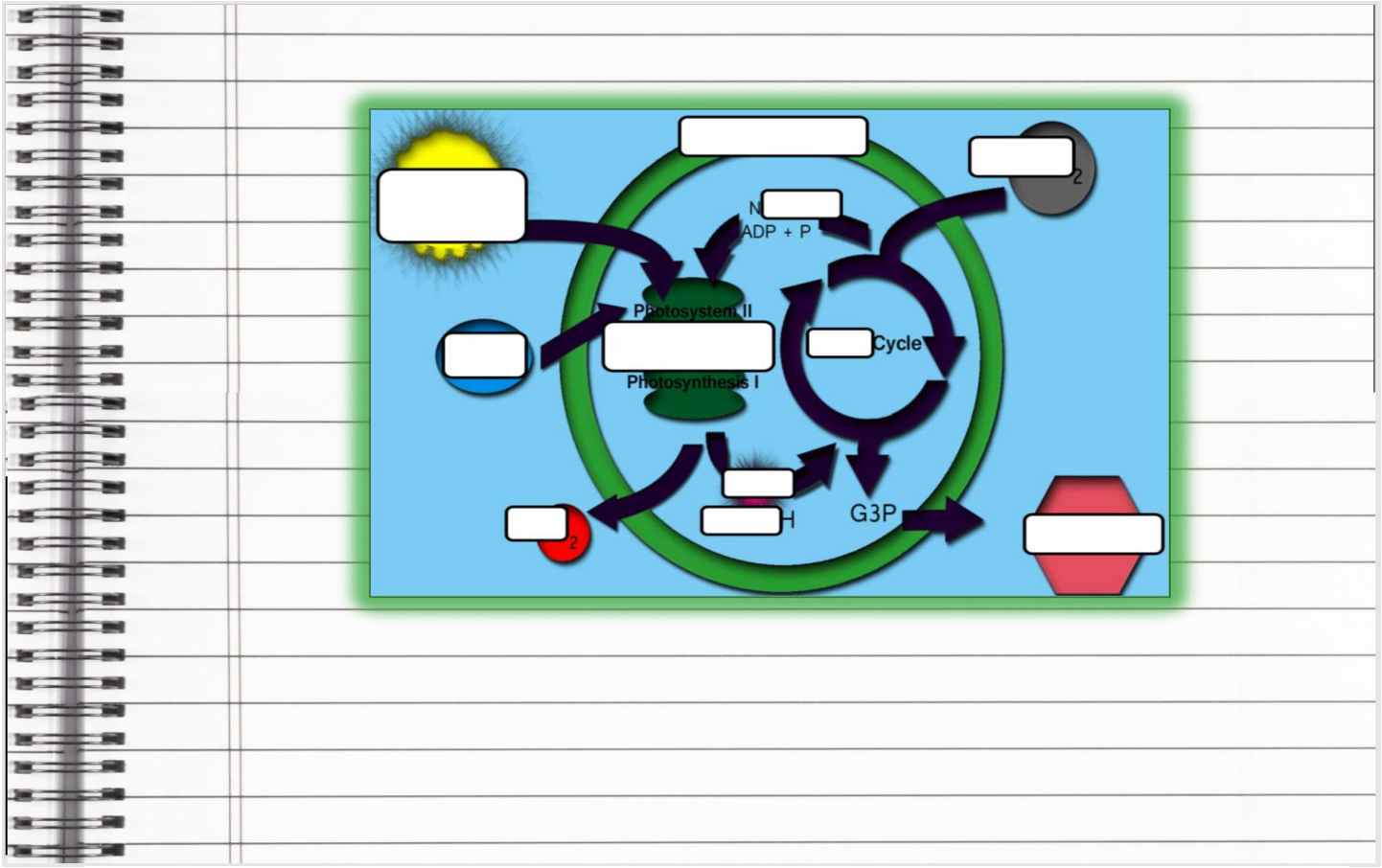
It is then converted into _____ energy which is stored as starch or sugar.

These starches and sugars are stored in roots, stems and fruits. They are available to the plant as food or fuel.

Photosynthesis

-Produces _____ from energy.
-Occurs only in cells with _____.
-_____is produced. Waste Product
-_____ is used.
-Carbon _____ is used.
-Occurs in _____.

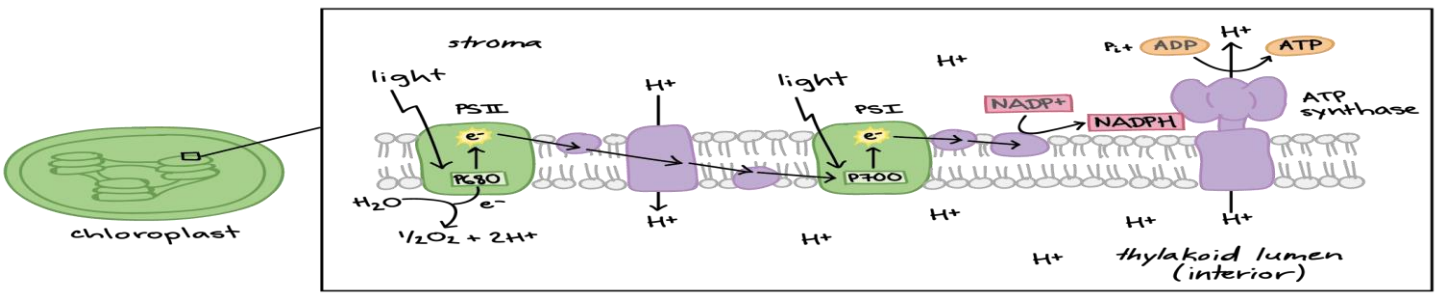
Record some notes and diagrams from one of the advanced photosynthesis videos from the slideshow below. Photosynthesis / Calvin Cycle



Note: The Calvin cycle reactions can be divided into three main stages: carbon fixation, reduction, and regeneration of the starting molecule.

It's complicated but there are generally four steps of the photosynthesis process.

- Absorption of _____
- Transfer of _____
- Production Of _____
- Carbon _____



Part 4 Lesson 5 Mitochondria

Cellular Respiration: Processes whereby certain organisms obtain _____ from organic molecules.

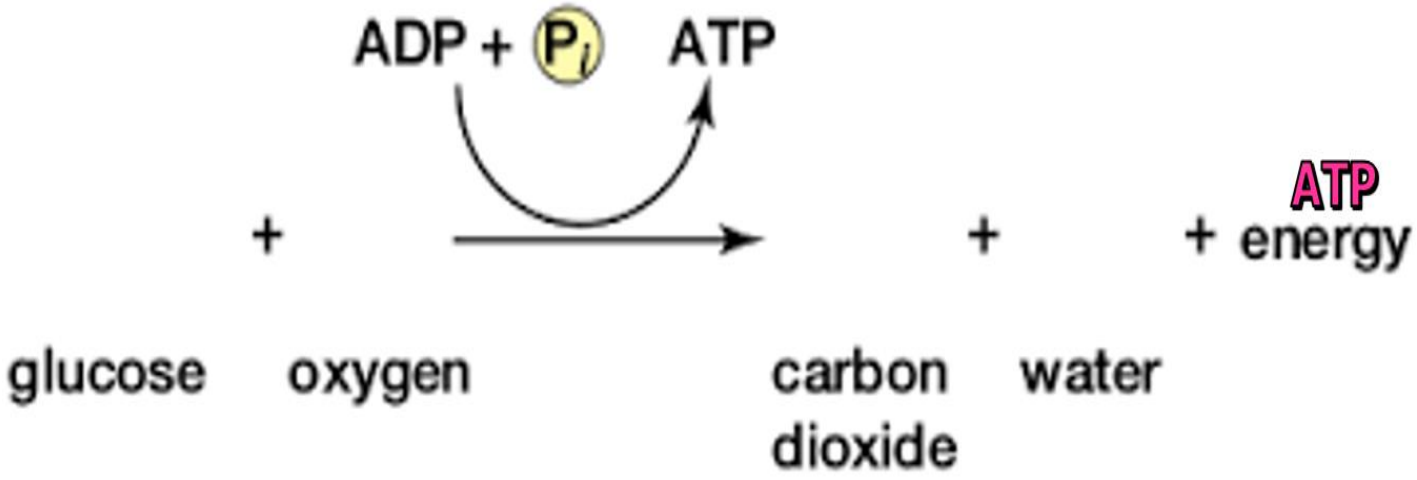
Side Note About Food: Food's macronutrients undergo chemical breakdown as they move through the digestive system.

Mitochondria

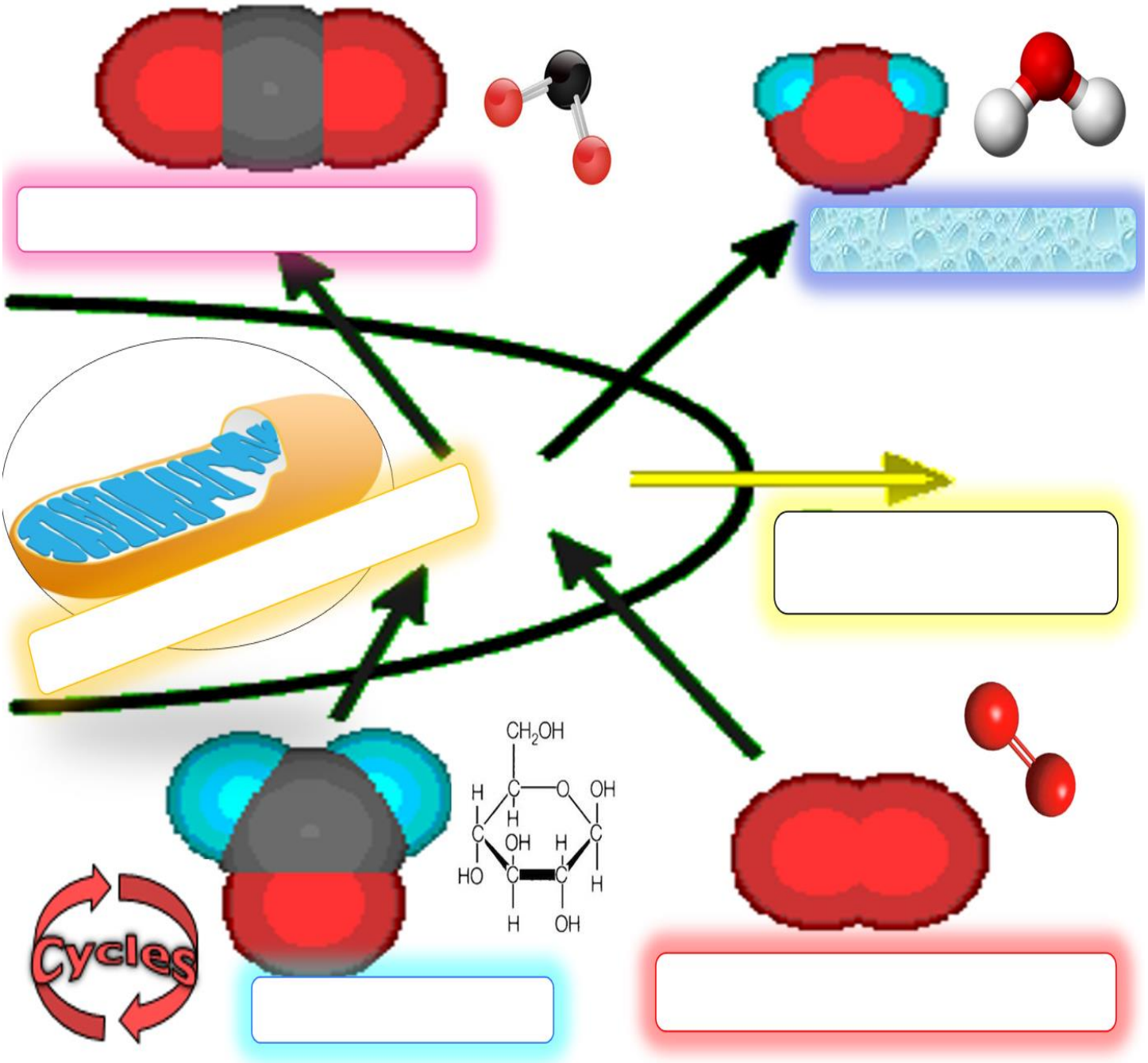
-Large organelle that makes _____ for the cell. (_____)
-Has _____ (surface area) called cristae
-_____ membranes
-Recycles wastes, produces _____
-Has its own _____. Reproduce independently from cell.

Which of the following is correct for the respiration equation.	Which of the following is correct for the respiration equation.
$6\ CO_2 \rightarrow 6H_2O + energy \rightarrow 6\ CO_2 \rightarrow 6H_2O$ $6\ CO_2 + C_6H_{12}O_6 + 6O_2 \rightarrow 6H_2O + energy$ $C_6H_{12}O_6 + 6O_2 \rightarrow 6\ CO_2 + 6H_2O + energy$ $6\ CO_2 + 6H_2O\ \ C_6H_{12}O_6 + 6O_2 \rightarrow 6O_2 + 6H_2O$ $C_6H_{12}O_6 + 6CO_2 \rightarrow 6O_2 + 6H_2O + energy$ $6CO_2 + 6O_2 \rightarrow 6H_2O + energy$ $6\ CO_2 \rightarrow 6H_2O + energy \rightarrow 6CO_2 \rightarrow 6H_2O + C_6H_{12}O_6$ $6CO_2 + 6O_2 \rightarrow 6H_2O + energy \rightarrow$ More energy	$6\ O_2 \rightarrow 6H_2O + energy \rightarrow 6\ CO_2 \rightarrow 6H_2O$ $6\ O_2 + C_6H_{12}O_6 + 6O_2 \rightarrow 6H_2O + energy$ $6\ CO_2 + 6H_2O + C_6H_{12}O_6 + 6O_2 \rightarrow 6O_2 + 6H_2O$ $C_6H_{12}O_6 + 6CO_2 \rightarrow 6O_2 + 6H_2O + energy$ $6CO_2 + 6O_2 \rightarrow 6H_2O + energy$ $6\ CO_2 \rightarrow 6H_2O + energy \rightarrow 6CO_2 \rightarrow 6H_2O + C_6H_{12}O_6$ $6CO_2 + 6O_2 \rightarrow 6H_2O + energy \rightarrow$ More energy $6O_2 + C_6H_{12}O_6 \rightarrow 6\ CO_2 + 6H_2O + energy$ (ATP)

Cellular Respiration



Please fill-in the missing terms as described in the slideshow. Word Bank: Mitochondria, Energy (ADP+P to ATP), Carbon Dioxide (CO_2), Water (H_2O), Oxygen (O_2), Glucose/Sugar $C_6H_{12}O_6$



Part 4 Lesson 6 Respiration Continued

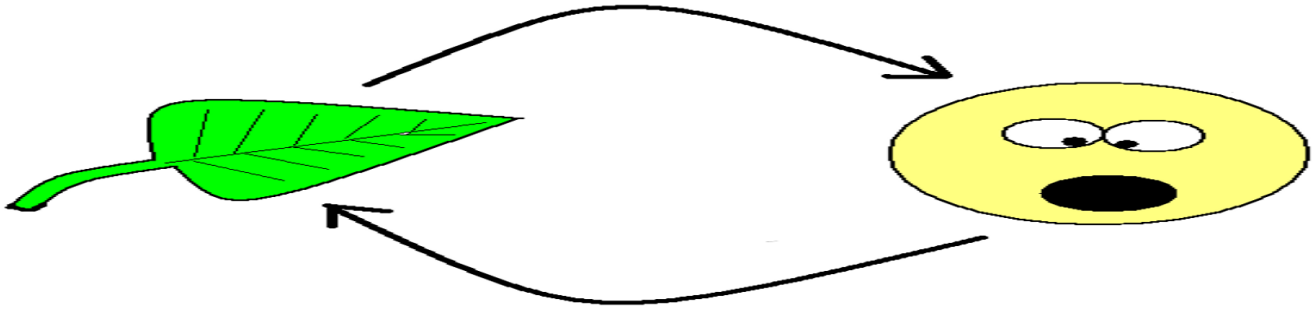
Cellular Respiration

-Burns _____ for energy.
-Energy is _____. ADP+P to ATP
-Occurs in most _____.
-_____ is used.
-_____ is produced.
-_____ dioxide produced. "Waste Product"
-Occurs in _____ and _____.

The carbon dioxide oxygen _____.

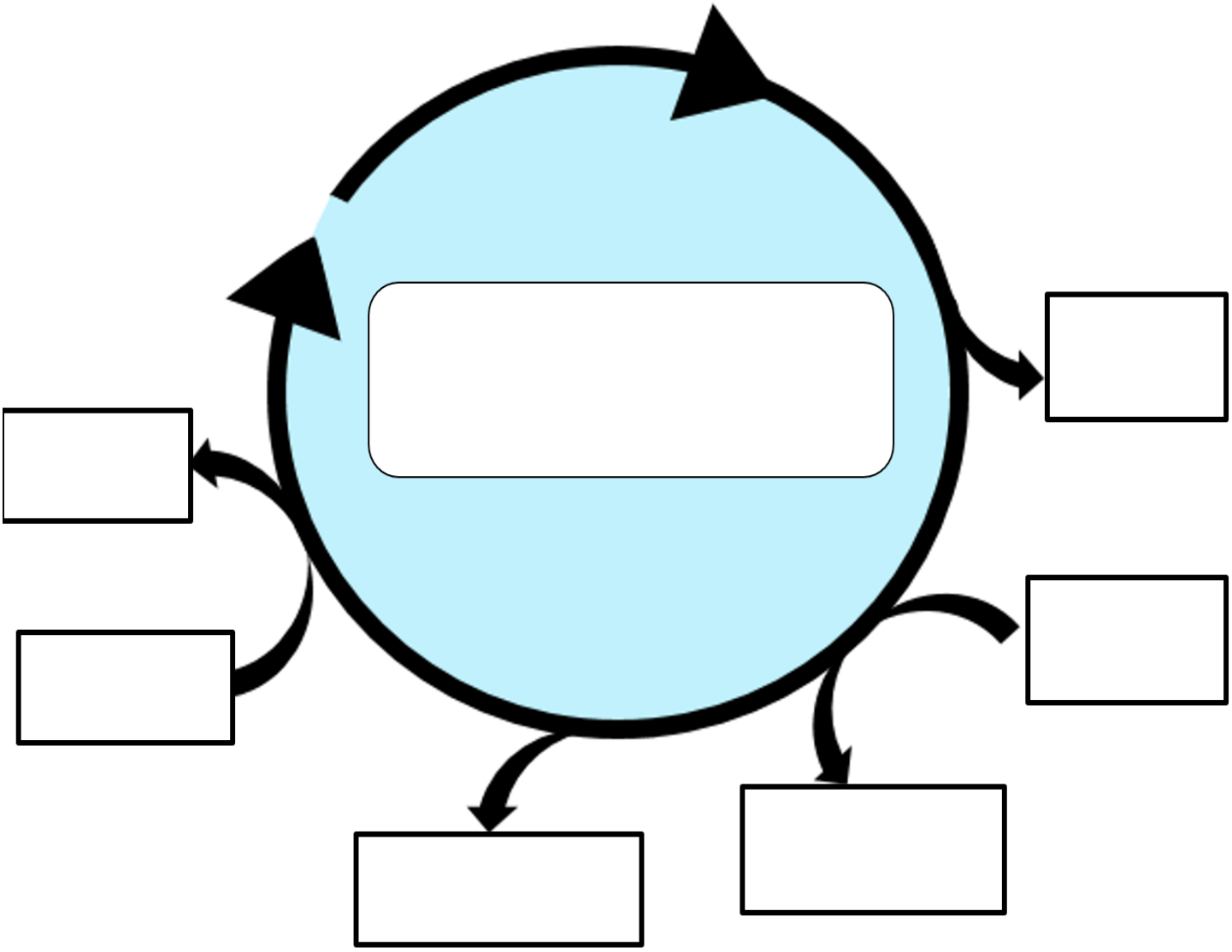
-The plant uses _____ and produces _____ during photosynthesis.

-Animals use _____ and produce _____ during cellular respiration.



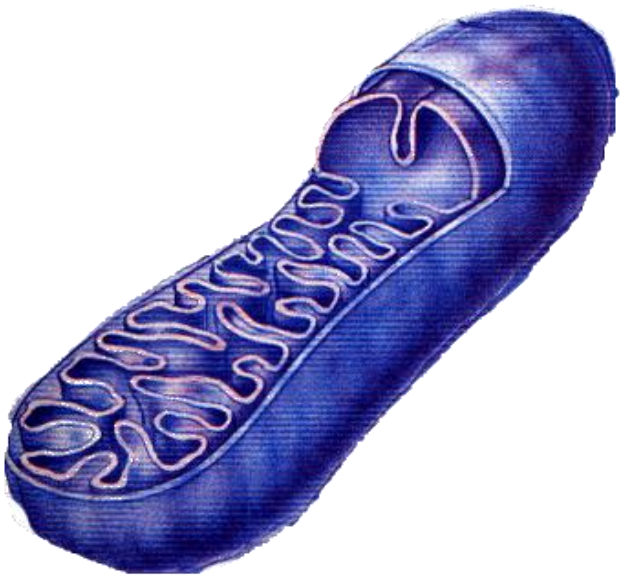
The _____ acid cycle is a series of chemical reactions used by all aerobic organisms to generate energy.

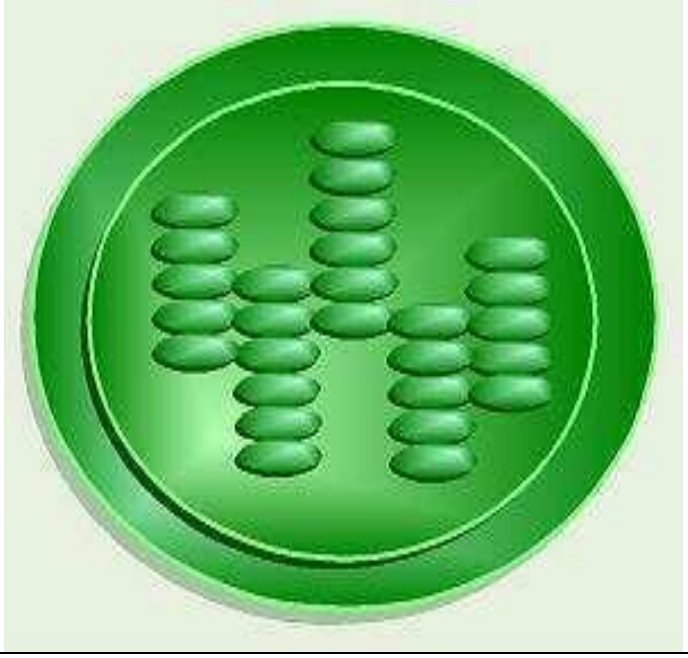
Requires the oxidation of _____—derived from carbohydrates, fats, and proteins—into carbon dioxide.



Please describe the following two organelles below and answer the questions?

1) Name each organelle? Can you name more…
2) Which organelle is only in plants?
3) Which organelle is found more in animal cells?
4) How is number 1 connected to number 2 in plant cells?
5) Why do both 1 and 2 have folds and membranes?

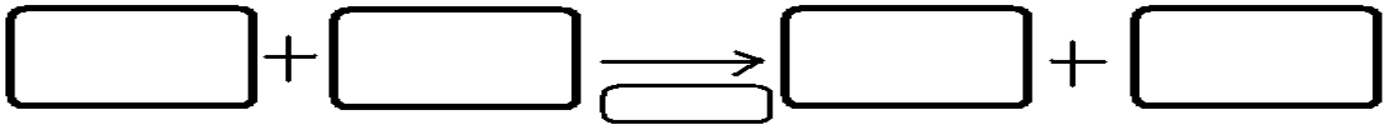




1

2

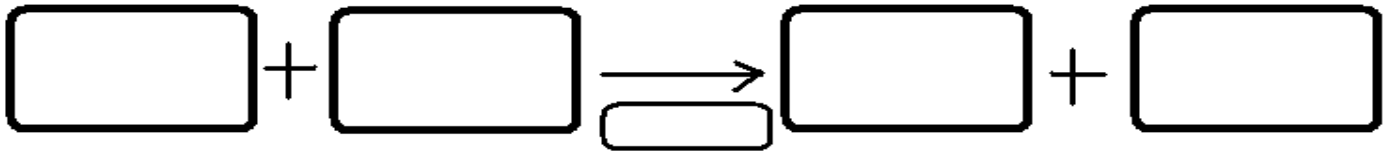
Write out the equation for **photosynthesis** in the boxes below.



Which of the following is the correct equation for photosynthesis?

1 A) $6O_2 + 6H_2O$ + light energy = $C_{12}H_6O_6 + 6O_2$
2 B) $6CO_2 + 6H_2O$ + sugar = $C_6H_{12}O_6 + 6O_2$
3 C) $6CO_2 + 6O_2$ + light energy = $C_6H_{12}O_6 + 6H_2O$
4 D) $6CO_2 + 6H_2O$ + light energy = $C_6H_{12}O_6 + 6H_2O$
5 E) $6CO_2 + 6H_2O$ + light energy = $C_6H_{12}O_6 + 6O_2$

Write out the equation for **cellular respiration** in the boxes below.



Which of the following is the correct equation for cellular respiration?

1 A) $C_6H_{12}O_6 + 6H_2O$ = Released energy + $6CO_2 + 6H_2O$.
2 B) $C_6H_{12}O6 + 6O_2$ = Released energy + $6CO_2 + 6H_2O$.
3 C) $C_6H_{12}O_6 + 6O_2$ = Released energy + $6O_2 + 6H_2O$.
4 D) $C_{12}H_6O_6 + 6O_2$ = Released energy + $6CO_2 + 6H_2O$.
5 E) $C_6H_{12}O_6 + 6CO_2$ = Released energy + $6O_2 + 6H_2O$.

Part 4 Lesson 7 Anerobic Respiration

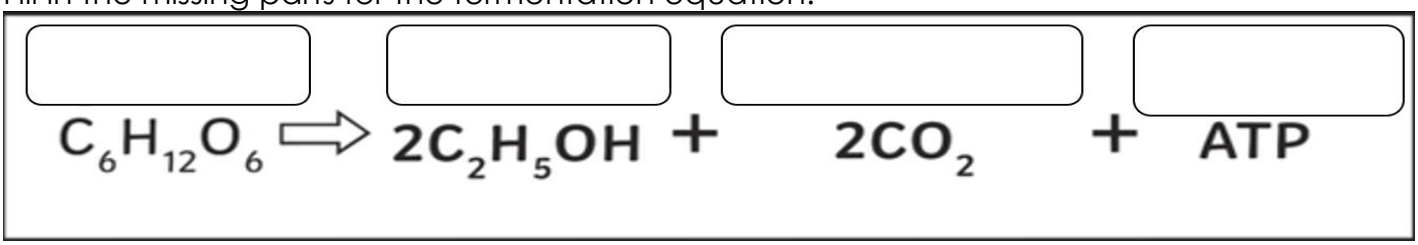
Aerobic Respiration: A form of cellular respiration that requires _____ in order to generate energy.
Anaerobic Respiration: A form of cellular respiration that occurs when oxygen is _____ or scarce.

-In anaerobic respiration: _____ isn't completely broken down. The waste product is _____ acid (muscle pain!) rather than carbon dioxide and water.

-_____is a rare but serious paralytic illness caused by a nerve toxin that is produced by the bacterium *Clostridium botulinum*. Never feed babies…

Fermentation - The _____ (no oxygen) conversion of _____ into _____dioxide and _____ by yeast.

Fill in the missing parts for the fermentation equation.



Which is aerobic respiration and which is anaerobic respiration?

This is a form of cellular respiration that occurs when oxygen is absent or scarce. Microscopic organisms use such as yeast. Humans carry out anaerobic respiration, especially when muscles perform strenuous exercise resulting in oxygen debt (example - sprint).	This is a form of cellular respiration that requires oxygen in order to generate energy. We use this form of respiration.

Activity! (Optional) Making Alcohol This alcohol is poisonous and will not be consumed.
Learn more at http://www.umsl.edu/~microbes/pdf/fungus1.pdf

A.) Add 2 tablespoons (9.85 ml) of bakers yeast to one cup (236.5 ml) of warm water.
B.) Add 2 tablespoons of sugar into the container. Sucrose or Fructose
C.) Pour mixture into a sports water bottle and seal tightly.
D.) Attach tubing tightly to the end of the plastic water bottle.
E.) Attach tube to container filled with cabbage water.
F.) Chop the cabbage into small pieces until you have about 2 cups of chopped cabbage. Place the cabbage in a large beaker or other glass container and add boiling water to cover the cabbage. Allow at least ten minutes for the color to leach out of the cabbage. (Alternatively, you can place about 2 cups of cabbage in a blender, cover it with boiling water, and blend it.)
G.) Filter out the plant material to obtain a red-purple-bluish colored liquid. This liquid is at about pH 7. (The exact color you get depends on the pH of the water.)
H.) Place other end of tube into the cabbage water.
I.) Make Observations about the colors of the cabbage solution, bubbles, and anything else.

What occurred in the cabbage solution? Can you test the pH?

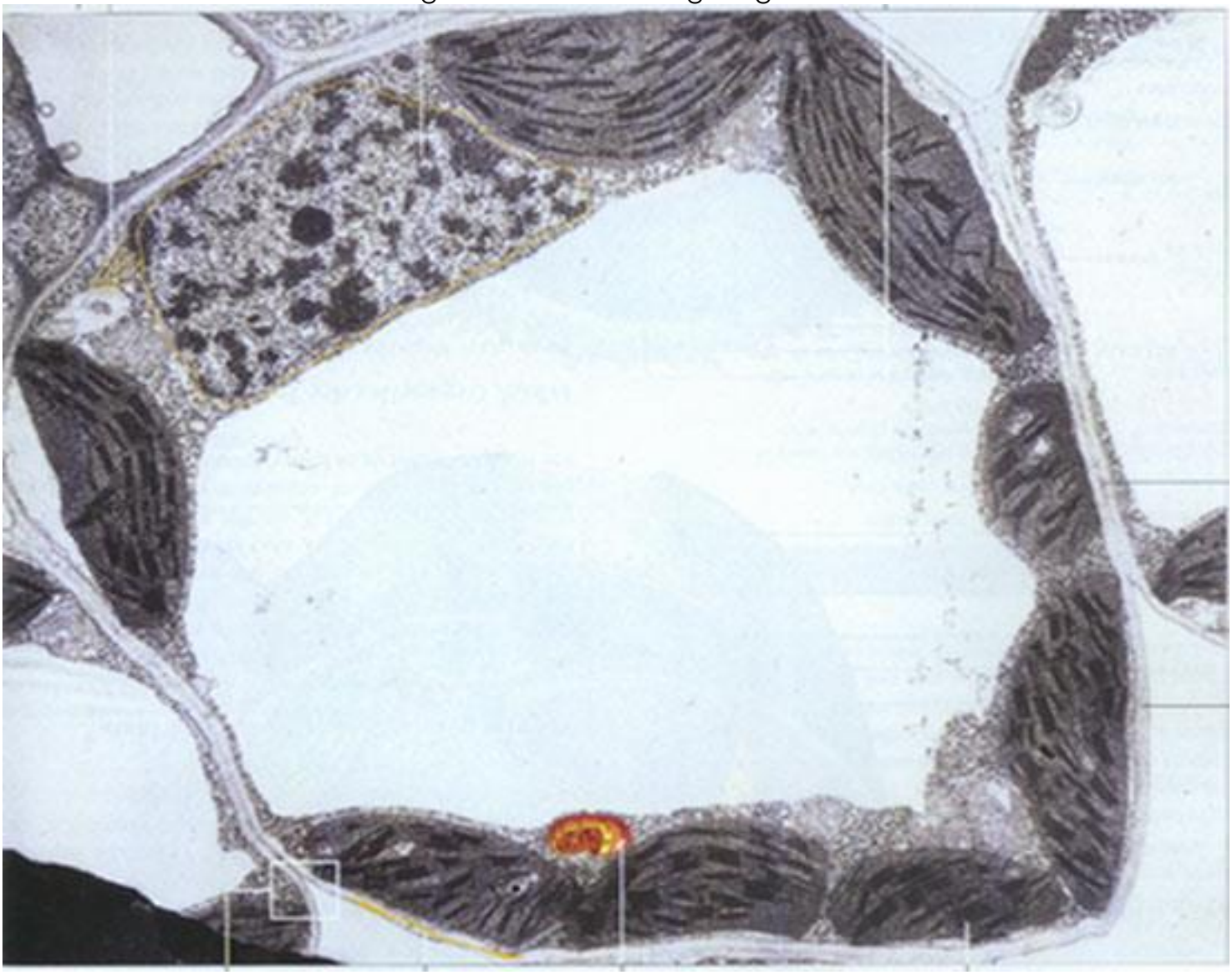
What was produced in the container with the yeast?

Part 4 Lesson 8 Vacuoles and Visual Quiz Next Page

Vacuole

-Membrane-bound sacs for _____, _____, and _____ removal
-_____ in plant cell. Keeps good…_____
-Create turgid _____ in plants
-Contains food and _____ solution
-_____ vacuoles for water removal (in unicellular organisms) + locomotion.

Record information about this organelle inside this large organelle.



Please fill in the blank with the correct organelle.

This organelle is the powerhouse of the cell _____

Packages proteins and sends them throughout the cell_____

This organelle would be the clean-up crew of a town_____

Recycles waste _____

This organelle stores food and waste_____

Protein making factories for the cell_____

Serves as cells transport system and allows ribosomes to attach_____

Composed of microtubules that support the cell_____

Photosynthesis occurs here_____

Composed of DNA and found in the chromatin_____

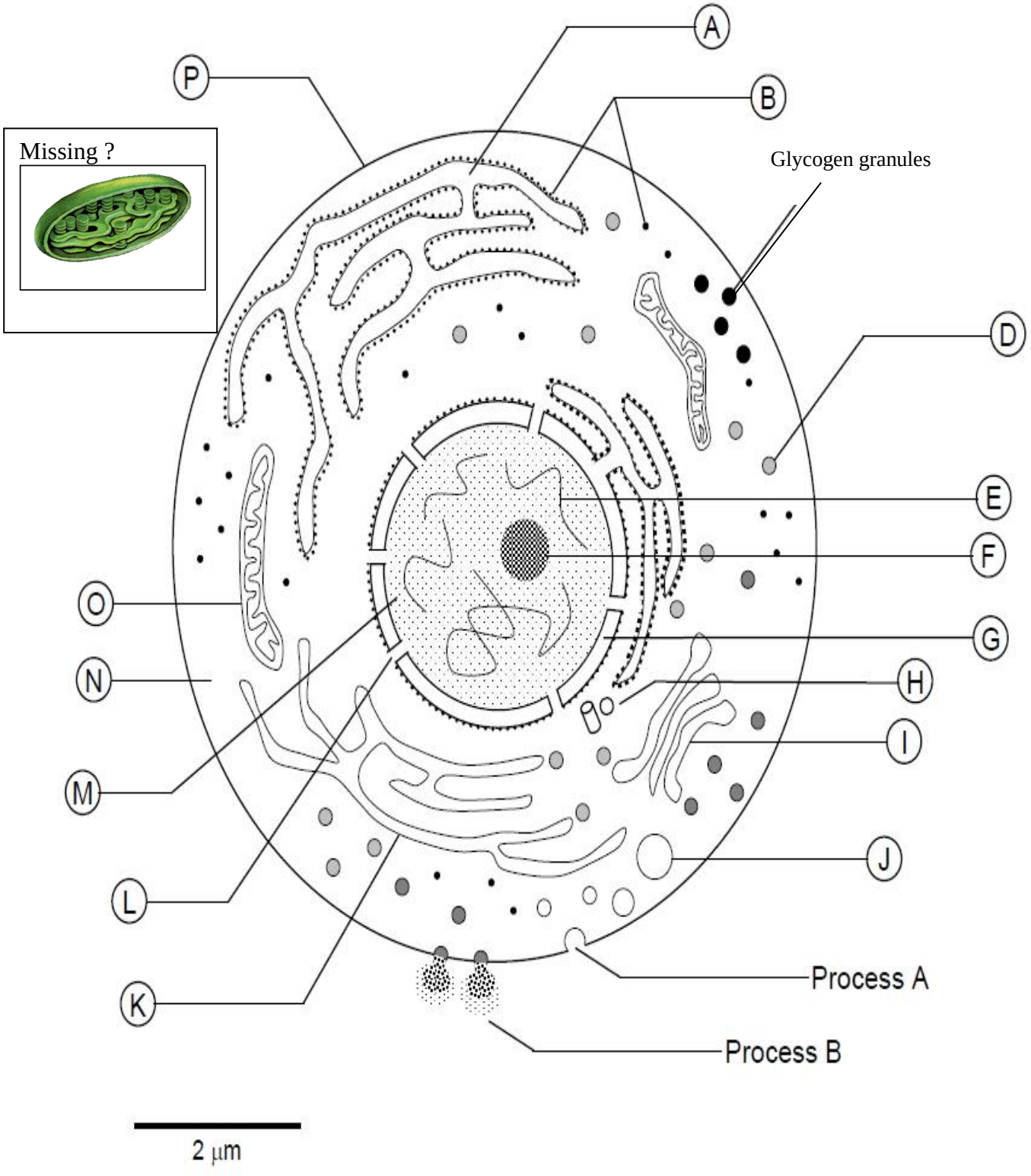
Inside nucleus and makes RNA to make proteins_____

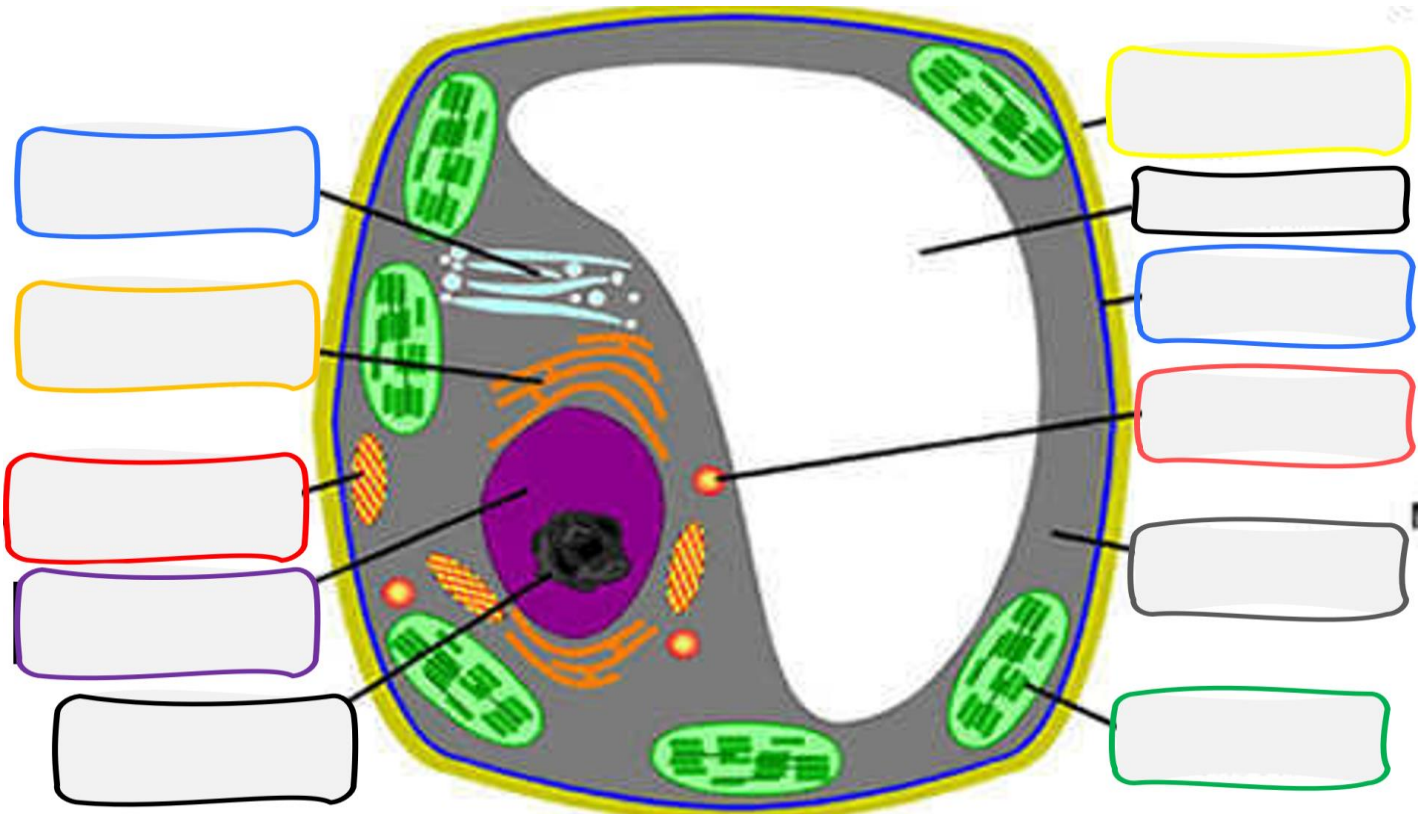
Allows certain materials into and out of the nucleus_____

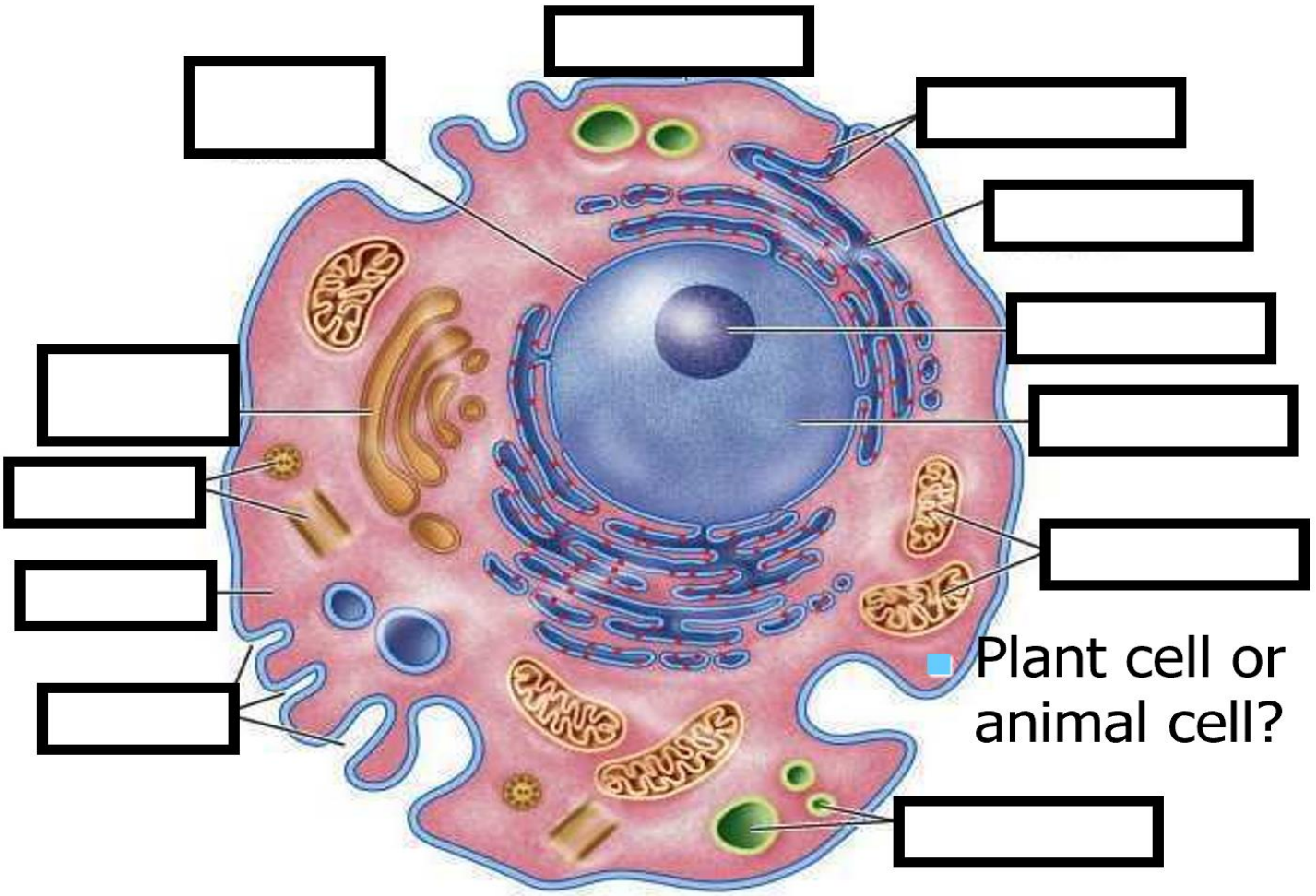
This houses the DNA and helps to control cell functions_____.

This is the fluid inside the cell that contains a chemical soup_____

Please label the organelles of the following cell. Is it a plant cell or an animal cell, explain after you title it?





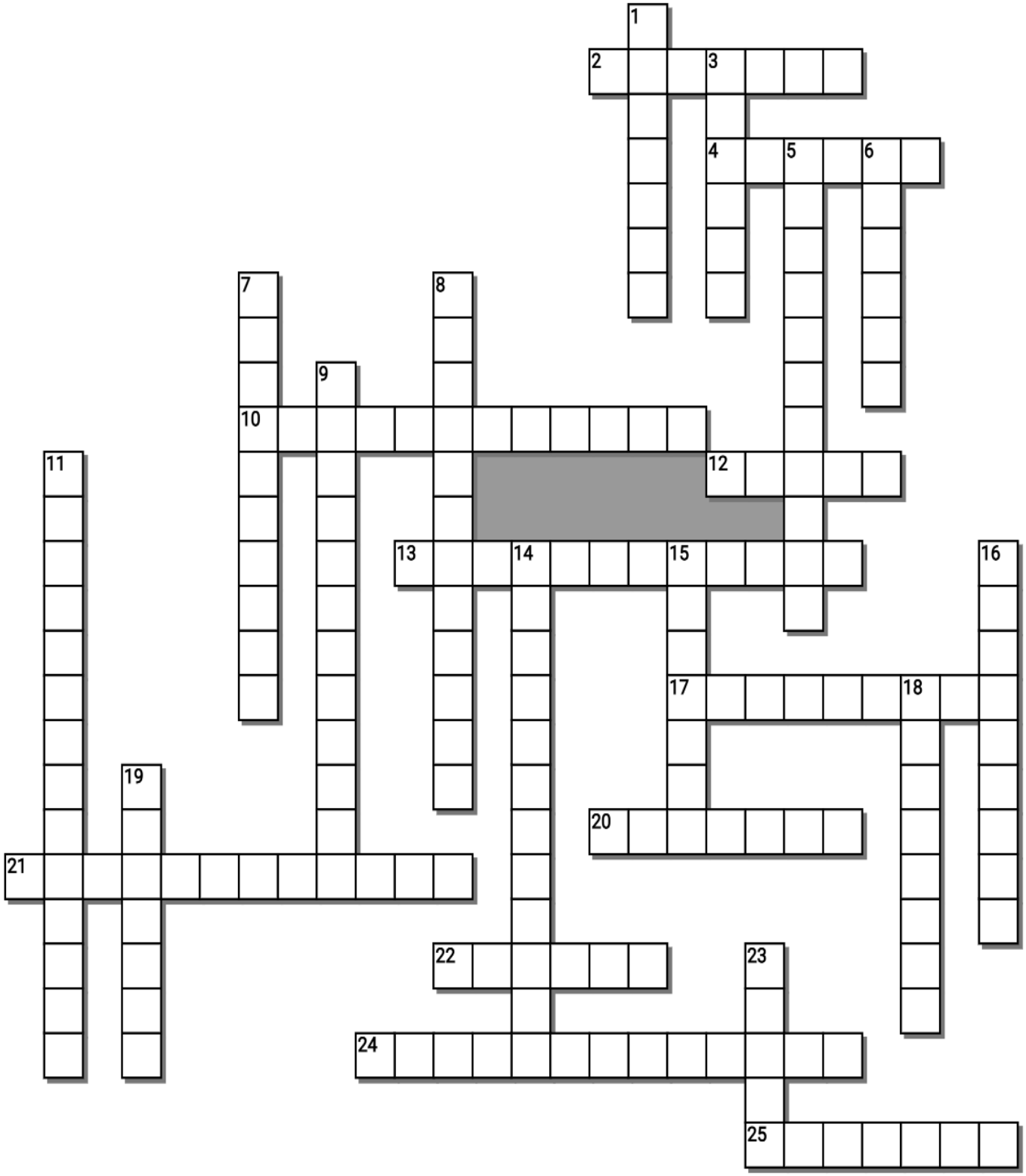


Plant cell or animal cell?

Cell Organelle Visual Quiz

(Secretly write owl in correct space +1 pt) Bonus 1 point Score ____ /100

1)	6)	11)	16)	*21)
2)	7)	12)	17)	*22)
3)	8)	13)	18)	*23)
4)	9)	14)	19)	*24)
5)	10)	15)	20)	*25)



Possible Answers

AEROBIC, ANAEROBIC, CALVIN, CENTROSOME, CHLOROPLASTS , CITRIC, CRISTAE, CYTOSKELETON, DIOXIDE, FERMENTATION, LATIC, LYSOSOME, MICROTUBULES, MITOCHONDRIA, ORGANELLE, OXYGEN, PHOTOSYNTHESIS, PLASTID, RESPIRATION, TURGOR, VACUOLE, WATER, ENDOSYMBIOTIC, GLUCOSE, TRIPHOSPHATE

Note: 6 Down should be oxygen – It is used in respiration, CO_2 is the waste.

Across

2. Cellular respiration releases stored energy in _____ molecules and converts it into a form of energy that can be used by cells.
4. Aside from storage, the main role of the central vacuole is to maintain _____ pressure against the cell wall.
10. ATP (adenosine _____) is the energy-carrying molecule used in cells because it can release energy very quickly.
12. During aerobic cellular respiration, glucose reacts with oxygen, forming ATP that can be used by the cell. Carbon dioxide and _____ are created as byproducts.
13. _____ is a metabolic process that produces chemical changes in organic substrates through the action of enzymes. In biochemistry, it is narrowly defined as the extraction of energy from carbohydrates in the absence of oxygen.
17. Cellular _____: A membrane-bound compartment or structure in a cell that performs a function.
20. A space or vesicle within the cytoplasm of a cell, enclosed by a membrane and typically containing fluid.
21. _____ are organelles that conduct photosynthesis, where the photosynthetic pigment chlorophyll captures the energy from sunlight, converts it, and stores it in the energy-storage molecules ATP and NADPH while freeing oxygen from water in plant and algal cells
22. The _____ cycle is a process that plants and algae use to turn carbon dioxide from the air into sugar, the food autotrophs need to grow.
24. The _____ theory states that some of the organelles in today's eukaryotic cells were once prokaryotic microbes
25. each of the partial partitions in a mitochondrion formed by infolding of the inner membrane.

Down

1. A membrane-bound organelle found in the cells of plants, algae, and some other eukaryotic organisms. They are considered to be intracelluar endosymbiotic Cyanobacteria.
3. The _____ acid cycle is a series of reactions that produces two carbon dioxide molecules, one GTP/ATP, and reduced forms of NADH and FADH2
5. Cellular _____ is a set of metabolic reactions and processes that take place in the cells of organisms to convert chemical energy from oxygen molecules or nutrients into adenosine triphosphate, and then release waste products
6. Waste Product of Cellular Respiration
7. An organelle that serves as the main microtubule organizing center (MTOC) of the animal cell, as well as a regulator of cell-cycle progression
8. A microscopic network of protein filaments and tubules in the cytoplasm of many living cells, giving them shape and coherence.
9. Are membrane-bound cell organelles that generate most of the chemical energy needed to power the cell's biochemical reactions
11. Plants make sugar from sunlight. Light energy is turned into chemical energy (sugars – carbon based).
14. _____ are polymers of tubulin that form part of the cytoskeleton and provide structure and shape to eukaryotic cells.
15. This is a form of cellular respiration that requires oxygen in order to generate energy.
16. _____ respiration. This is a form of cellular respiration that occurs when oxygen is absent or scarce.
18. n organelle in the cytoplasm of eukaryotic cells containing degradative enzymes enclosed in a membrane.
19. Waste Product of Photosynthesis. Carbon_____
23. _____ acid, or lactate, is a chemical byproduct of anaerobic respiration

Part 4 Review Game

Name:

1-10 = 10 pts * = Bonus + 1 pt, Part 4 Lesson 10

(Secretly write owl in correct space +1 pt)

Score ____ / 100

Final Question = 5 pt wager

IT BURNS	PHOTOSHOP	BREATH IN	BIG GULP	GREEN SUPER HEROES Bonus round 1 pt each
1)	6)	11)	16)	*21)
2)	7)	12)	17)	*22)
3)	8)	13)	18)	*23)
4)	9)	14)	19)	*24)
5)	10)	15)	20)	*25)

Final Question Wager ___ /5 Answer: _____

Part 4 Organelles

Name:

Part 4 Lesson 1 Lysosomes

Cellular Organelles: A membrane-bound compartment or structure in a cell that performs a function.

The Big / Roles / Jobs of Cellular Organelles. They…

Support	Make Manufacture	Breakdown Materials	Transport Materials	Communicate
Examples / Organelles or process where this happens. Cell Wall Cytoskeleton	Examples / Organelles or process where this happens Ribosomes Chloroplast Golgi-Vesicles	Examples / Organelles or process where this happens Lysosome Peroxisome	Examples / Organelles or process where this happens Endoplasmic Reticulum Golgi Apparatus Cell Membrane	Examples / Organelles or process where this happens Nucleus Ribosomes Endoplasmic Reticulum Lysosome

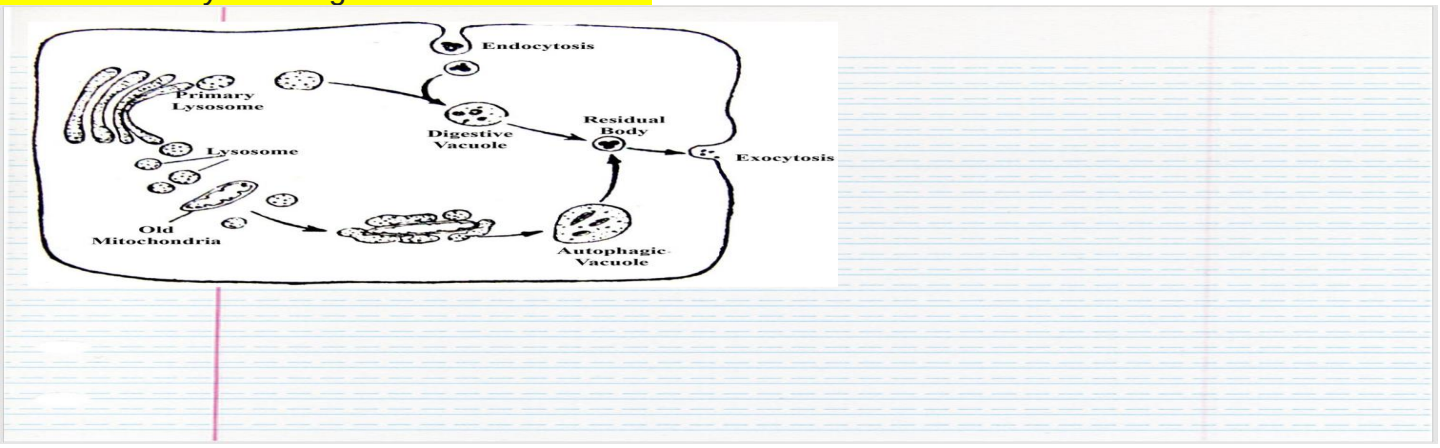
Lysosomes

-Has digestive acids / enzymes in a sac
-Digestive organelle, recycles old cell parts.
-Breaks down proteins, lipids, and carbohydrates, and bacteria.
-Transports undigested material to cell membrane for removal.
-Cell breaks down if lysosome breaks open
-If cell id damaged the lysosome can help it to self-destruct in a process called apoptosis.

Peroxisomes: a small organelle present in the cytoplasm of many cells, which contains the reducing enzyme catalase and usually some oxidases.

Describe the roles of the Lysosome using the picture below to assist you.

A lysosome is a membrane-bound cell organelle that contains digestive enzymes. Lysosomes are involved with various cell processes. They break down excess or worn-out cell parts. They may be used to destroy invading viruses and bacteria.



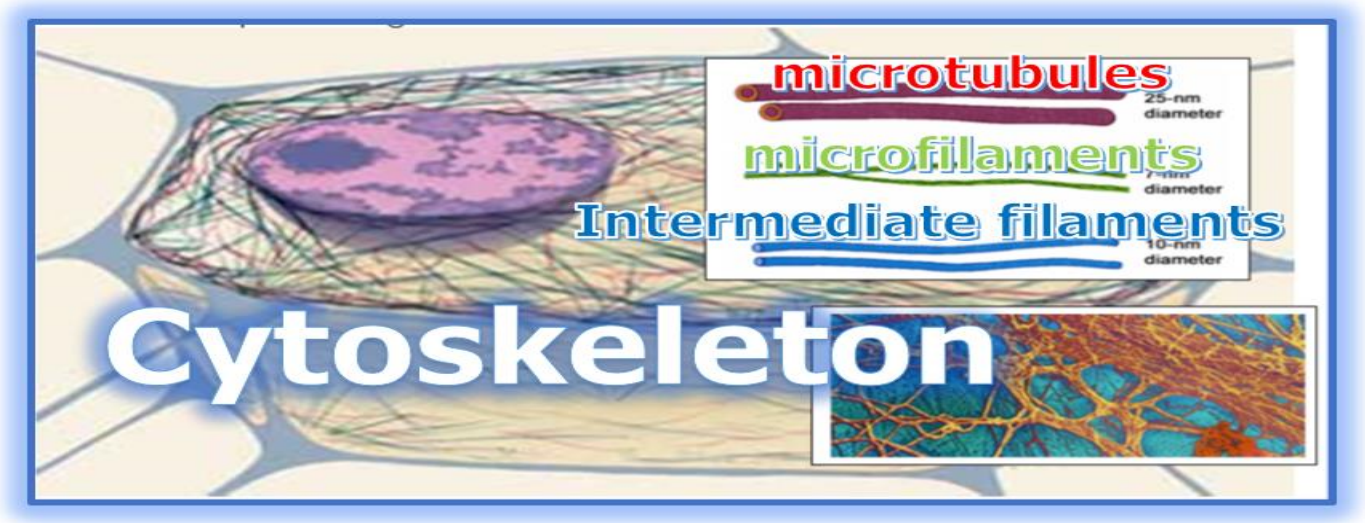
Cytoskeleton, microtubules, microfilaments

-Supports cell and provides shape
-Aids in movement of materials in and out of cells
-Aids in locomotion
-Composed of microtubule, Microfilaments (thin fibers), Intermediate filaments (medium sized), Microtubules (Large hollow cylinders)

Flagellum: A hair-like structure that acts primarily as an organelle of locomotion.
Made of a bundle of nine pairs of microtubules surrounding two central pairs of microtubules

Cilium (Cilia): A small structure that extends out from the surface of cell and is used for locomotion.

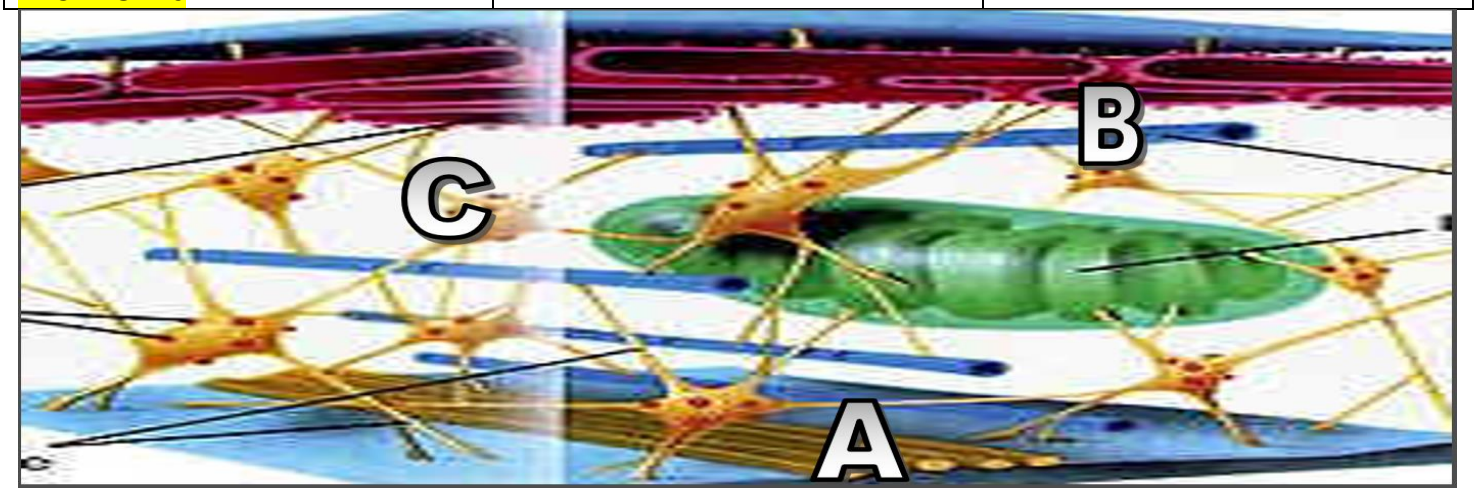
What is this important organelle? What does it do? Name that filament.



The cytoskeleton is a structure that helps cells maintain their shape and internal organization, and it also provides mechanical support that enables cells to carry out essential functions like division and movement.

Name A, B, C?

A= Intermediate Filaments	B=Microtubules	C=Microtubules



Centrioles / Centrosomes

-Look like golden nuggets (paired)
-Made of nine tubes
-Aid in cell division (Mitosis)

What are the centrosomes doing below?

The centrosome is an important part of how the cell organizes the cell division. Centrioles are cylindrical cell structures that are composed of groupings of microtubules, which are tube-shaped molecules or strands of protein. Without centrioles, chromosomes would not be able to move during the formation of new cells. Centrioles help to organize the assembly of microtubules during cell division. To put it simply, chromosomes use the centriole's microtubules as a highway during the cell division process.

Part 4 Lesson 2 Endosymbiotic Theory

The Endosymbiotic Theory: Mitochondria and chloroplasts were once primitive bacterial cells.

-A large eukaryotic cell ingested bacteria and the two became dependent on one another for survival, resulting in a permanent relationship.

Please translate the Mandrian Chinese below. Think Endosymbiotic Theory if you're confused.

The endosymbiotic theory states that some of the organelles in eukaryotic cells were once prokaryotic microbes. Mitochondria and chloroplasts are the same size as prokaryotic cells and divide by binary fission. Mitochondria and chloroplasts have their own DNA which is circular, not linear.

Why do leaves turn color in the fall?

Leaves are colored by molecules called pigments. The pigment that causes leaves to be green is chlorophyll. Chlorophyll is important for plants to make food using sunlight. During summer when there is plenty of sunlight, plants make a lot of chlorophyll.

In the fall plants stop making chlorophyll. Instead, those plants break down chlorophyll into smaller molecules. As chlorophyll goes away, other pigments start to show their colors. This is why leaves turn yellow or red in fall.

Part 4 Lesson 2 Endosymbiotic Theory
Part 4 Lesson 3 Chloroplast

Plastids (AKA Chloroplast)

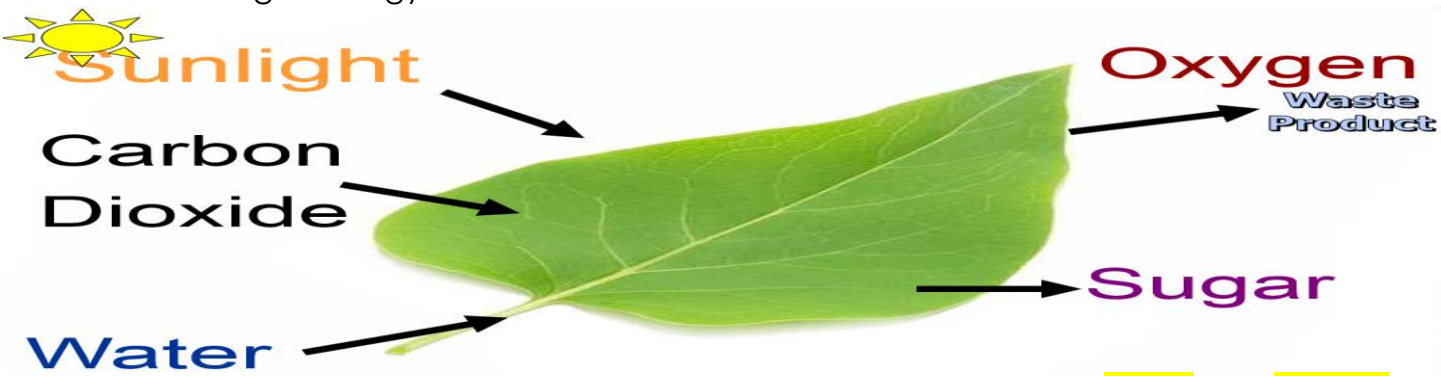
-Organelle in plants
-Contain the green pigment chlorophyll
-Has stacks called granum
-Does photosynthesis (Make the sugar)
-Has its own unique DNA.

Photosynthesis – Plants make sugar from light. Light energy is turned into chemical energy (sugars – carbon based).

Which of the following statements is false of photosynthesis? and the answer is…	Which of the following equations is true of photosynthesis?
A.) Photosynthesis requires sunlight, carbon dioxide, and water. B.) Oxygen and glucose are produced in photosynthesis. C.) Carbon Dioxide and water are produced. D.) In photosynthesis, plants use radiant energy from the sun to create chemical energy in the form of sugars. E.) None of the above.	$6O_2 + C_6H12O_6$ Energy → $6CO_2 + 6H_2O$ $C_6H_{12}O_6 + 6O_2$ → Energy + Chloroplasts. $6O_2 + 6CO_2 + 6O_2$ → Energy + $C_6H_{12}O_6$ $6CO_2 + 6H_2O$ + Energy → $C_6H_{12}O_6 + 6O_2$ $6O_2 + 6CO_2$ + → Energy + $C_6H_{12}O_6 + 6O_2$ Energy + $6H_2O$ → Energy + $6O_2 + 6CO_2$ $CO_2 + 3H_2O$ + Energy → $C_6H_{12}O_6 + O_2$ $6CO_2 + 6H_2O$ → Energy + $6CO_2 + 6O_2$ Energy → $6O_2 + C_6H_{12}O_6 + 6CO_2$

Part 4 Lesson 4 Photosynthesis

$6CO_2 + 6H_2O$ + light energy = $C_6H_{12}O_6 + 6O_2$



Photosynthesis is the process by which light energy is utilized to convert water and carbon dioxide into food to be used by plants.

Oxygen is released into the air during the process. (O_2) Waste

Light or solar energy is captured by chlorophyll (CHLOR-oh-phil), the green pigment in leaves.

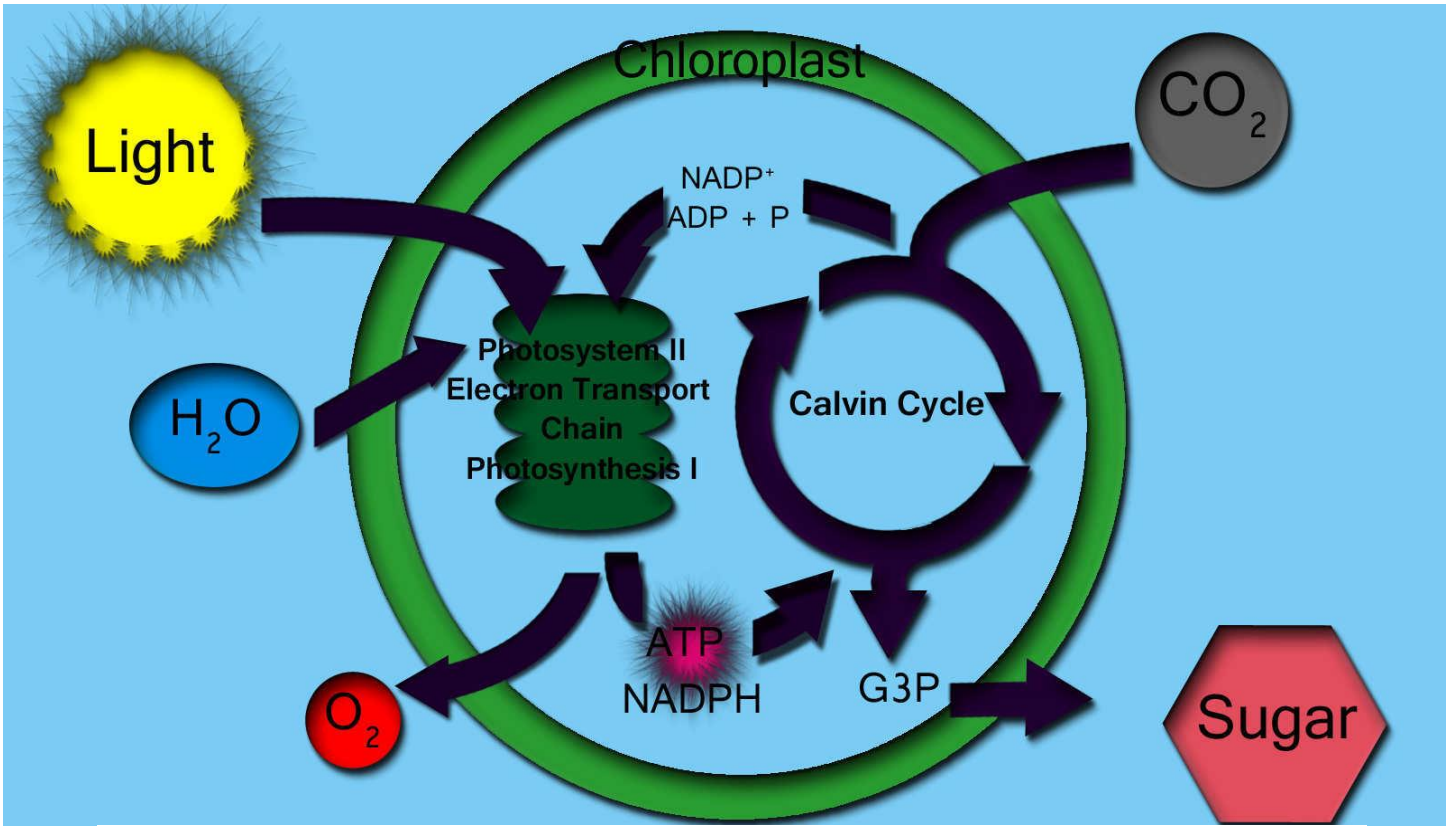
It is then converted into chemical energy which is stored as starch or sugar.

These starches and sugars are stored in roots, stems and fruits. They are available to the plant as food or fuel.

Photosynthesis

-Produces sugar from energy.
-Occurs only in cells with chloroplasts
-Oxygen is produced. Waste Product
-Water is used.
-Carbon dioxide is used.
-Occurs in light.

Record some notes and diagrams from one of the advanced photosynthesis videos from the slideshow below. Photosynthesis / Calvin Cycle

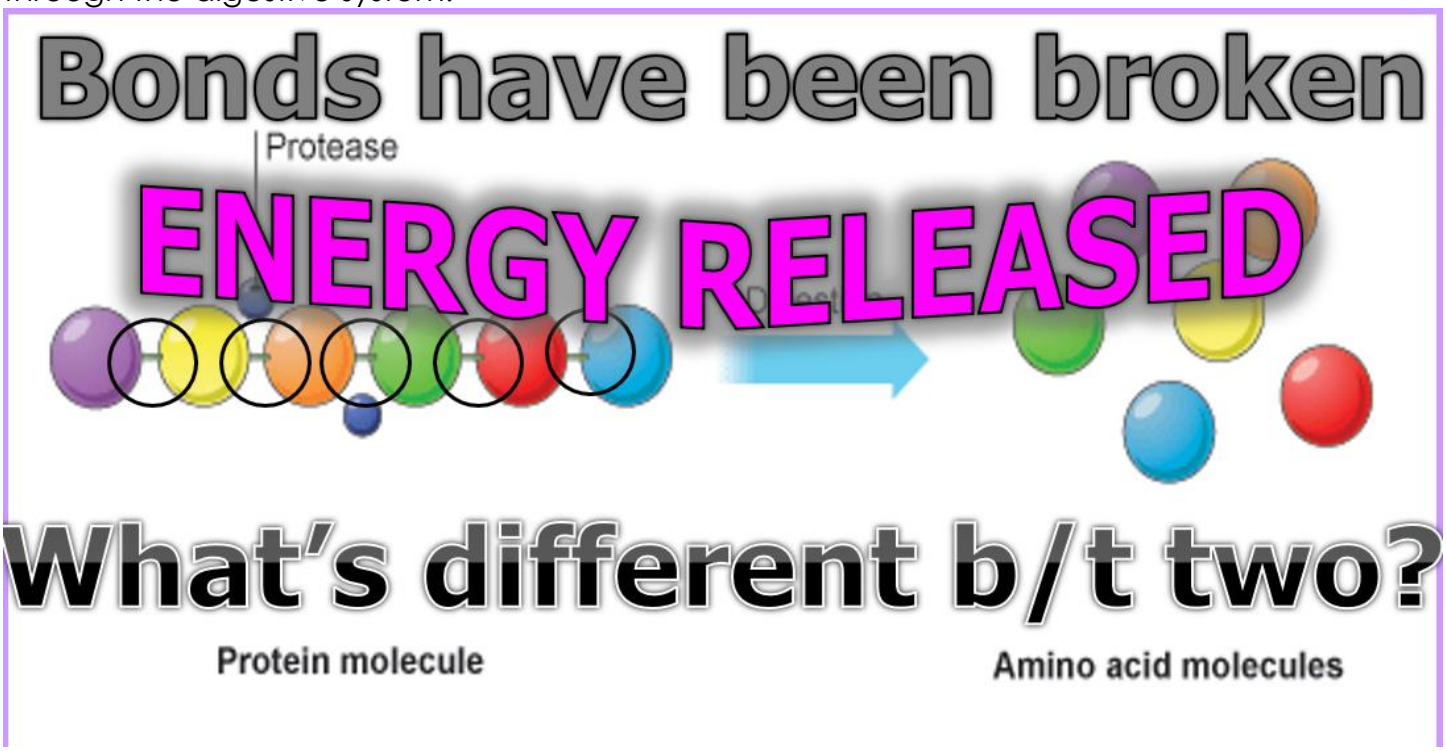


Note: The Calvin cycle reactions can be divided into three main stages: carbon fixation, reduction, and regeneration of the starting molecule.

Part 4 Lesson 5 Mitochondria

Cellular Respiration: Processes whereby certain organisms obtain energy from organic molecules.

Side Note About Food: Food's macronutrients undergo chemical breakdown as they move through the digestive system.

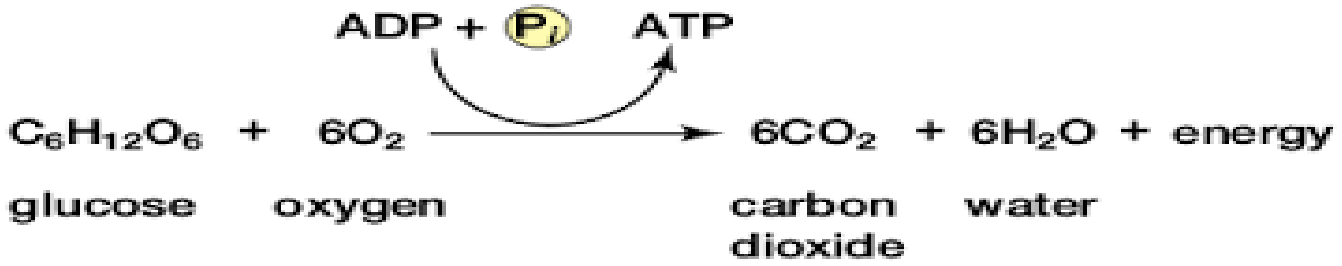


Mitochondria

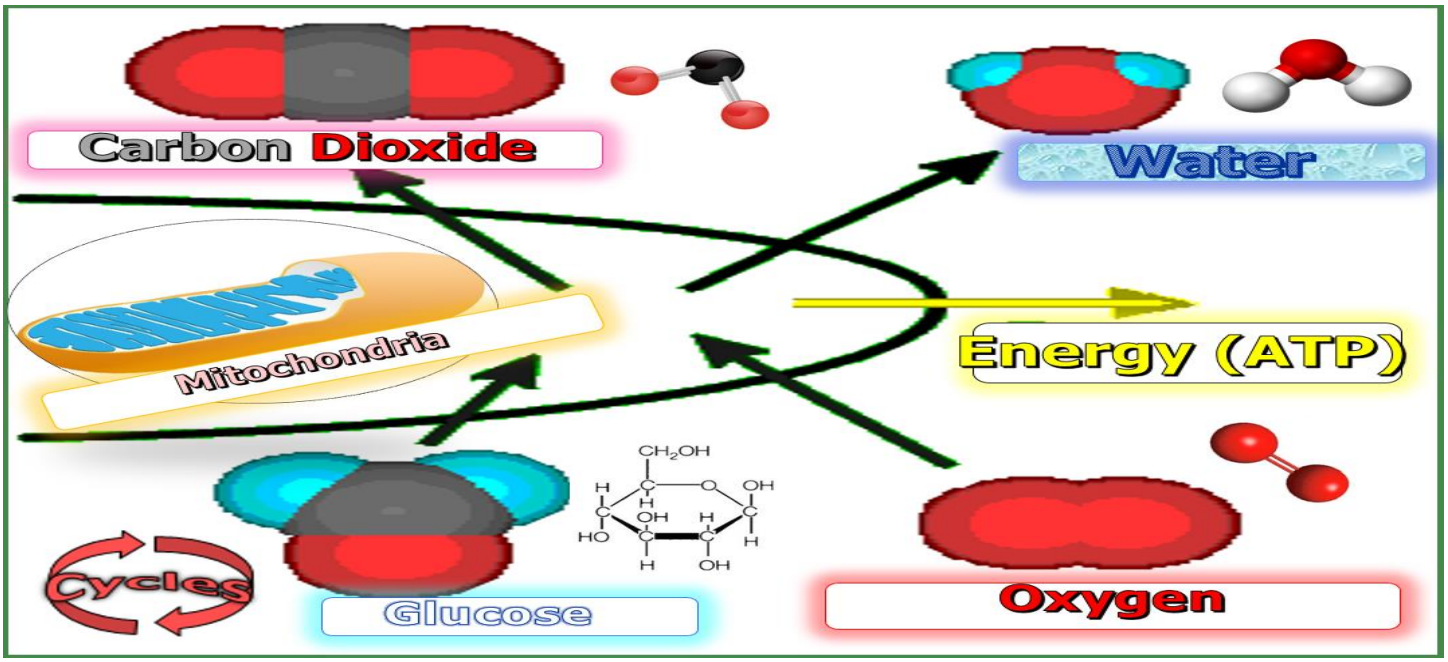
-Large organelle that makes energy for the cell. (respiration)
-Has folds (surface area) called cristae
-Two membranes
-Recycles wastes, produces urea
-Has its own DNA. Reproduce independently from cell.

Which of the following is correct for the respiration equation.	Which of the following is correct for the respiration equation.
$6\ CO_2 \rightarrow 6H_2O + energy \rightarrow 6\ CO_2 \rightarrow 6H_2O$ $6\ CO_2 + C_6H_{12}O_6 + 6O_2 \rightarrow 6H_2O + energy$ $C_6H_{12}O_6 + 6O_2 \rightarrow 6\ CO_2 + 6H_2O + energy$ $6\ CO_2 + 6H_2O\ \ C_6H_{12}O_6 + 6O_2 \rightarrow 6O_2 + 6H_2O$ $C_6H_{12}O_6 + 6CO_2 \rightarrow 6O_2 + 6H_2O + energy$ $6CO_2 + 6O_2 \rightarrow 6H_2O + energy$ $6\ CO_2 \rightarrow 6H_2O + energy \rightarrow 6CO_2 \rightarrow 6H_2O + C_6H_{12}O_6$ $6CO_2 + 6O_2 \rightarrow 6H_2O + energy \rightarrow$ More energy	$6\ O_2 \rightarrow 6H_2O + energy \rightarrow 6\ CO_2 \rightarrow 6H_2O$ $6\ O_2 + C_6H_{12}O_6 + 6O_2 \rightarrow 6H_2O + energy$ $6\ CO_2 + 6H_2O + C_6H_{12}O_6 + 6O_2 \rightarrow 6O_2 + 6H_2O$ $C_6H_{12}O_6 + 6CO_2 \rightarrow 6O_2 + 6H_2O + energy$ $6CO_2 + 6O_2 \rightarrow 6H_2O + energy$ $6\ CO_2 \rightarrow 6H_2O + energy \rightarrow 6CO_2 \rightarrow 6H_2O + C_6H_{12}O_6$ $6CO_2 + 6O_2 \rightarrow 6H_2O + energy \rightarrow$ More energy $6O_2 + C_6H_{12}O_6 \rightarrow 6\ CO_2 + 6H_2O + energy\ (ATP)$

Cellular Respiration



Please fill-in the missing terms as described in the slideshow. Word Bank: Mitochondria, Energy (ADP+P to ATP), Carbon Dioxide (CO_2), Water (H_2O), Oxygen (O_2), Glucose/Sugar $C_6H_{12}O_6$



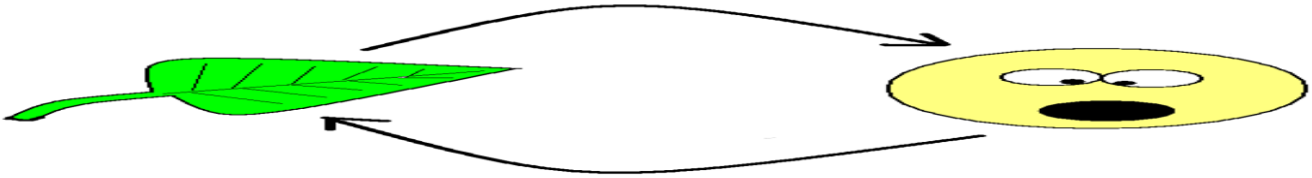
Part 4 Lesson 6 Respiration Continued

Cellular Respiration

-Burns sugar for energy.
-Energy is created. ADP+P to ATP
-Occurs in most cells.
-oxygen is used.
-water is produced.
-carbon dioxide produced. "Waste Product"
-Occurs in light and dark.

The carbon dioxide oxygen balance.

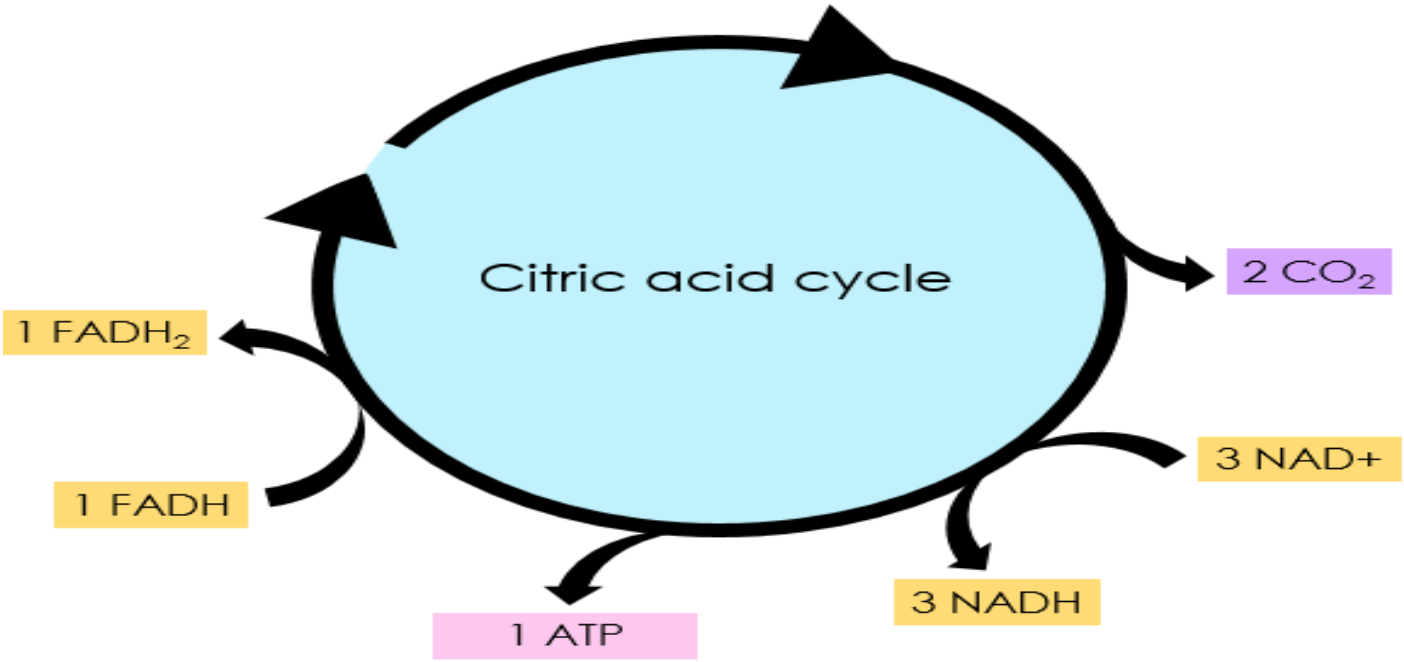
-The plant uses carbon dioxide and produces oxygen during photosynthesis.
-Animals use oxygen and produce carbon dioxide during cellular respiration.



The balance of oxygen and carbon dioxide is maintained in the atmosphere by the oxygen released by the plant during photosynthesis and carbon dioxide released by human , animals etc. in the atmosphere. The balance of oxygen and carbon dioxide is made due to respiration and photosynthesis.

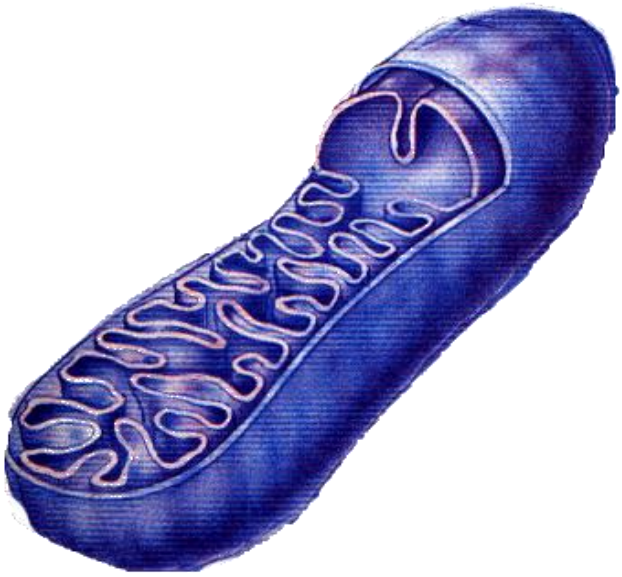
The citric acid cycle is a series of chemical reactions used by all aerobic organisms to generate energy.

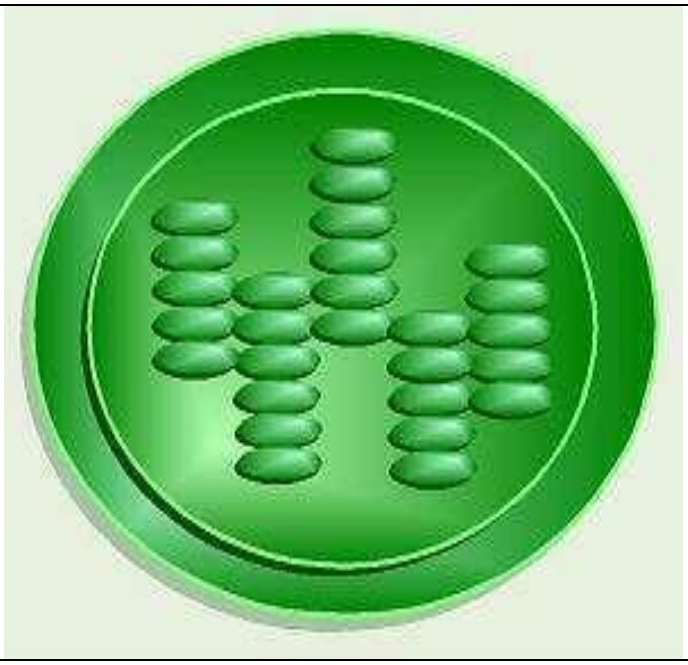
Requires the oxidation of acetate derived from carbohydrates, fats, and proteins—into carbon dioxide.



Please describe the following two organelles below and answer the questions

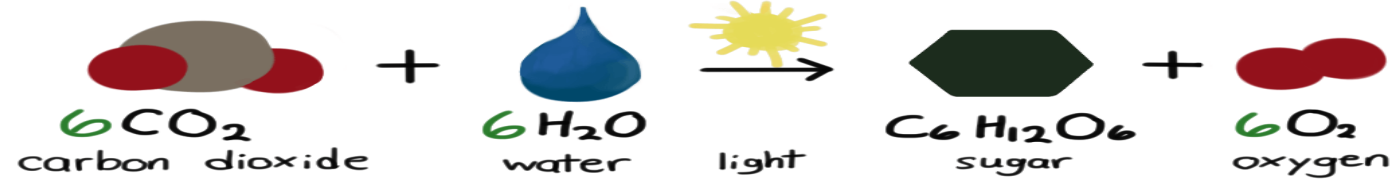
1) Name each organelle? Can you name more…
2) Which organelle is only in plants?
3) Which organelle is found more in animal cells?
4) How is number 1 connected to number 2 in plant cells?
5) Why do both 1 and 2 have folds and membranes?





Mitochondria Large organelle that makes energy for the cell. (ATP) Has folds (surface area) called cristae Two membranes Recycles wastes, produces urea Has its own DNA. Reproduce independently from cell. $6O_2 + C_6H_{12}O_6 \rightarrow 6CO_2 + 6H_2O$ + energy (ATP)	Plastids (AKA Chloroplast) Organelle in plants Contain the green pigment chlorophyll Has stacks called Thylakoids Do photosynthesis (Make the sugar) Has it's own unique DNA. $6CO_2 + 6H_2O$ + Energy → $C_6H_{12}O_6 + 6O_2$

Write out the equation for **photosynthesis** in the boxes below.



Which of the following is the correct equation for photosynthesis?

5 A) $6O_2 + 6H_2O$ + light energy = $C_{12}H_6O_6 + 6O_2$
6 B) $6CO_2 + 6H_2O$ + sugar = $C_6H_{12}O_6 + 6O_2$
7 C) $6CO_2 + 6O_2$ + light energy = $C_6H_{12}O_6 + 6H_2O$
8 D) $6CO_2 + 6H_2O$ + light energy = $C_6H_{12}O_6 + 6H_2O$
6 E) $6CO_2 + 6H_2O$ + light energy = $C_6H_{12}O_6 + 6O_2$

Write out the equation for **cellular respiration** in the boxes below.

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

glucose | oxygen gas | carbon dioxide gas | water | energy

Which of the following is the correct equation for cellular respiration?

6 A) $C_6H_{12}O_6 + 6H_2O$ = Released energy + $6CO_2 + 6H_2O$.
7 B) $C_6H_{12}O6 + 6O_2$ = Released energy + $6CO_2 + 6H_2O$.
8 C) $C_6H_{12}O_6 + 6O_2$ = Released energy + $6O_2 + 6H_2O$.
9 D) $C_{12}H_6O_6 + 6O_2$ = Released energy + $6CO_2 + 6H_2O$.
10 E) $C_6H_{12}O_6 + 6CO_2$ = Released energy + $6O_2 + 6H_2O$.

Part 4 Lesson 7 Anerobic Respiration

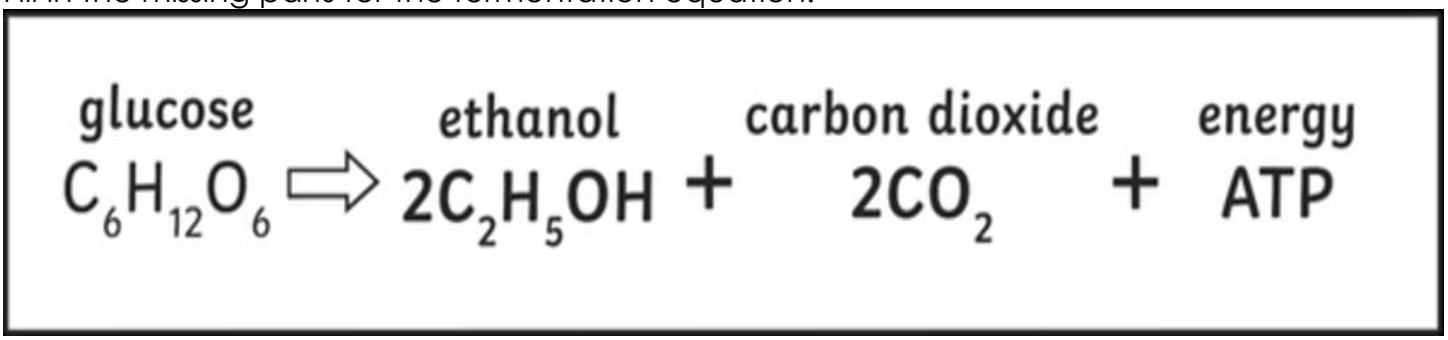
Aerobic Respiration: A form of cellular respiration that requires oxygen in order to generate energy.
Anaerobic Respiration: A form of cellular respiration that occurs when oxygen is absent or scarce.

-In anaerobic respiration: glucose isn't completely broken down. The waste product is lactic acid (muscle pain!) rather than carbon dioxide and water.

-Botulism is a rare but serious paralytic illness caused by a nerve toxin that is produced by the bacterium *Clostridium botulinum*. Never feed babies…

Fermentation - The anaerobic (no oxygen) conversion of sugar into carbon dioxide and alcohol by yeast.

Fill in the missing parts for the fermentation equation.



Which is aerobic respiration and which is anaerobic respiration?

Anaerobic Respiration	Aerobic Respiration
This is a form of cellular respiration that occurs when oxygen is absent or scarce. Microscopic organisms use such as yeast. Humans carry out anaerobic respiration, especially when muscles perform strenuous exercise resulting in oxygen debt (example - sprint).	This is a form of cellular respiration that requires oxygen in order to generate energy. We use this form of respiration.

Activity! (Optional) Making Alcohol This alcohol is poisonous and will not be consumed.
Learn more at http://www.umsl.edu/~microbes/pdf/fungus1.pdf
A.) Add 2 tablespoons (9.85 ml) of bakers yeast to one cup (236.5 ml) of warm water.
B.) Add 2 tablespoons of sugar into the container. Sucrose or Fructose
C.) Pour mixture into a sports water bottle and seal tightly.
D.) Attach tubing tightly to the end of the plastic water bottle.
E.) Attach tube to container filled with cabbage water.
F.) Chop the cabbage into small pieces until you have about 2 cups of chopped cabbage. Place the cabbage in a large beaker or other glass container and add boiling water to cover the cabbage. Allow at least ten minutes for the color to leach out of the cabbage. (Alternatively, you can place about 2 cups of cabbage in a blender, cover it with boiling water, and blend it.)
G.) Filter out the plant material to obtain a red-purple-bluish colored liquid. This liquid is at about pH 7. (The exact color you get depends on the pH of the water.)
H.) Place other end of tube into the cabbage water.
I.) Make Observations about the colors of the cabbage solution, bubbles, and anything else.

What occurred in the cabbage solution? Can you test the pH?
The cabbage solution should change colors. The carbon dioxide gas coming through the tube changed the pH of the water.
(made more acidic)

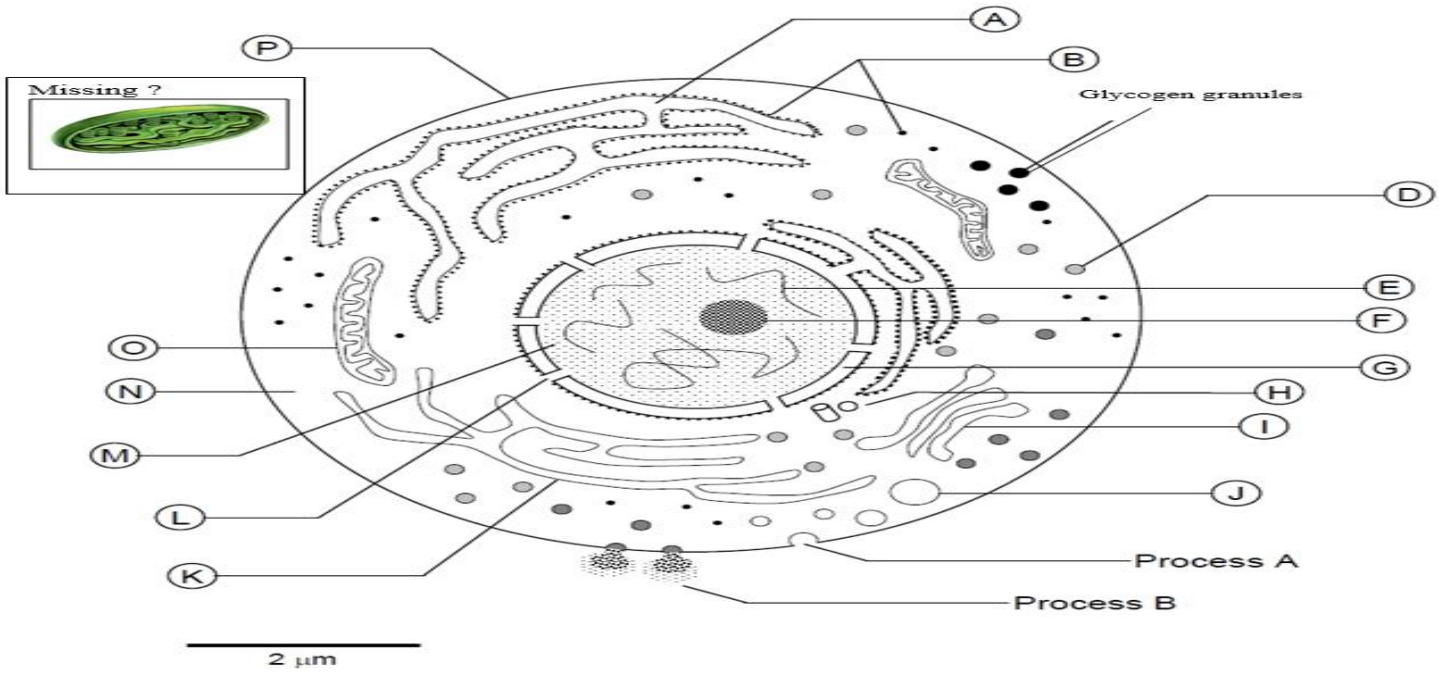
What was produced in the container with the yeast?
The yeast used the sugar and through fermentation created alcohol and carbon dioxide gas. The CO_2 gas traveled through the tube into the cabbage solution as noted by the bubbles and pH change.

Part 4 Lesson 8 Vacuoles and Visual Quiz Next Page
Vacuole
-Membrane-bound sacs for storage, digestion, and waste removal
-Large/Central in plant cell. Keeps good SA:V ratio
-Create turgor pressure in plants
-Contains food and waste solution
-Contractile vacuoles for water removal (in unicellular organisms) + locomotion.

Plant vacuoles are large compartments that occupy a significant volume (up to 90%) of plant cells. Under normal growth conditions water can flow into the vacuole, building up the turgor pressure that drives cell wall expansion
Roles…
Isolating materials that might be harmful or a threat to the cell.
Containing waste products.
Containing water in plant cells.
Maintaining internal hydrostatic pressure or turgor within the cell.
Maintaining an acidic internal pH.
Containing small molecules.

Record information about this organelle inside this large organelle.
Please fill in the blank with the correct organelle.
This organelle is the powerhouse of the cell Mitochondria
Packages proteins and sends them throughout the cell Golgi Apparatus
This organelle would be the clean-up crew of a town Lysosome
Recycles waste Lysosome

This organelle stores food and waste vacuole
Protein making factories for the cell Ribosome
Serves as cells transport system and allows ribosomes to attach Rough Endoplasmic Reticulum
Composed of microtubules that support the cell Cytoskeleton
Photosynthesis occurs here Chloroplasts
Composed of DNA and found in the nucleus Chromosoms/Chromatin
Inside nucleus and makes RNA to make proteins Nucleolus
Allows certain materials into and out of the nucleus Plasma / Cell Membrane
This the control center of the cell nucleus
This is the fluid inside the cell that contains a chemical soup cytoplasm

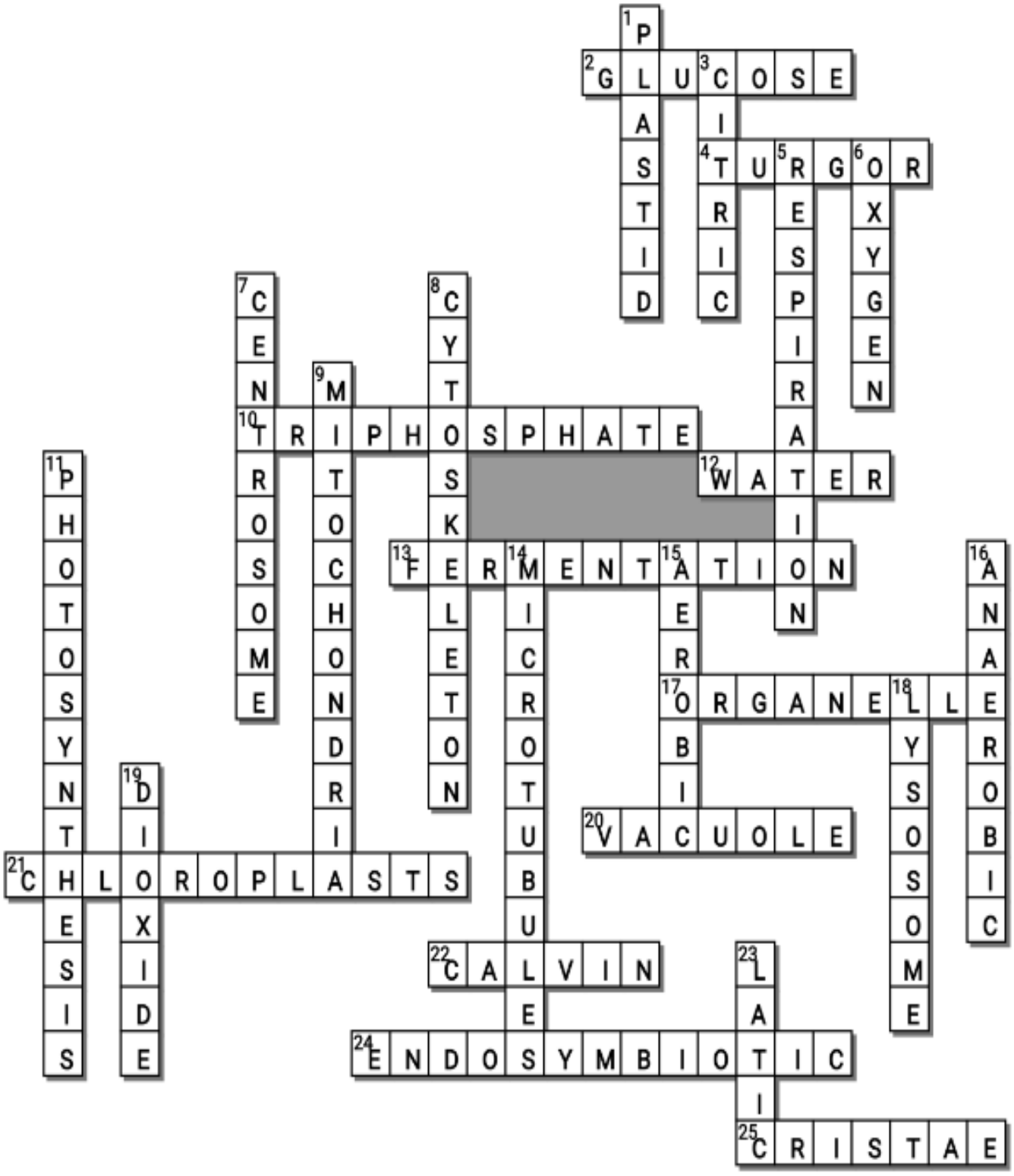


A= Endoplasmic reticulum
B= Ribosomes
C= Glycogen Granules
D= Vacuole
E=Chromatin
F=Nucleolus
G=Nuclear Membrane
H=Centriole
I=Golgi Apparatus
J=Lysosome
K=Smooth ER
L=Nuclear Pore
M=Nucleus
N=Cytoplasm
O=Mitochondria
Missing=Chloroplast

Cell Organelle Visual Quiz

(Secretly write owl in correct space +1 pt) Bonus 1 point Score ____ /100

1) Mitochondria	2) Smooth Endoplasmic Reticulum	3) Vacuole	4) Ribosomes	5) Chromosomes
6) Golgi Bodies	7) Cell Wall	8) Cytoplasm	9) Centrioles	10) Cytoskeleton
11) Nucleous	12) Nucleous	13) R.E.R Rough Endoplasmic Reticulum	14) Cell Wall	15) Plasma Membrane
16) Nuclear Membrane	17) Lysosomes	18) Plastids Chloroplasts	19) Rough Endo plasmic - reticulum	20) Cytoplasm
*21) DNA Deoxyribo Nucleic Acid	*22) Sid the Science Kid	*23) Emily Elizabeth	Total:	



Possible Answers

AEROBIC, ANAEROBIC, CALVIN, CENTROSOME, CHLOROPLASTS , CITRIC, CRISTAE, CYTOSKELETON, DIOXIDE, FERMENTATION, LATIC, LYSOSOME, MICROTUBULES, MITOCHONDRIA, ORGANELLE, OXYGEN, PHOTOSYNTHESIS, PLASTID, RESPIRATION, TURGOR, VACUOLE, WATER, ENDOSYMBIOTIC, GLUCOSE, TRIPHOSPHATE

Across

2. Cellular respiration releases stored energy in _____ molecules and converts it into a form of energy that can be used by cells.
4. Aside from storage, the main role of the central vacuole is to maintain _____ pressure against the cell wall.
10. ATP (adenosine _____) is the energy-carrying molecule used in cells because it can release energy very quickly.
12. During aerobic cellular respiration, glucose reacts with oxygen, forming ATP that can be used by the cell. Carbon dioxide and _____ are created as byproducts.
13. _____ is a metabolic process that produces chemical changes in organic substrates through the action of enzymes. In biochemistry, it is narrowly defined as the extraction of energy from carbohydrates in the absence of oxygen.
17. Cellular _____: A membrane-bound compartment or structure in a cell that performs a function.
20. A space or vesicle within the cytoplasm of a cell, enclosed by a membrane and typically containing fluid.
21. _____ are organelles that conduct photosynthesis, where the photosynthetic pigment chlorophyll captures the energy from sunlight, converts it, and stores it in the energy-storage molecules ATP and NADPH while freeing oxygen from water in plant and algal cells
22. The _____ cycle is a process that plants and algae use to turn carbon dioxide from the air into sugar, the food autotrophs need to grow.
24. The _____ theory states that some of the organelles in today's eukaryotic cells were once prokaryotic microbes
25. each of the partial partitions in a mitochondrion formed by infolding of the inner membrane.

Down

1. A membrane-bound organelle found in the cells of plants, algae, and some other eukaryotic organisms. They are considered to be intracelluar endosymbiotic Cyanobacteria.
3. The _____ acid cycle is a series of reactions that produces two carbon dioxide molecules, one GTP/ATP, and reduced forms of NADH and FADH2
5. Cellular _____ is a set of metabolic reactions and processes that take place in the cells of organisms to convert chemical energy from oxygen molecules or nutrients into adenosine triphosphate, and then release waste products
6. Waste Product of Cellular Respiration
7. An organelle that serves as the main microtubule organizing center (MTOC) of the animal cell, as well as a regulator of cell-cycle progression
8. A microscopic network of protein filaments and tubules in the cytoplasm of many living cells, giving them shape and coherence.
9. Are membrane-bound cell organelles that generate most of the chemical energy needed to power the cell's biochemical reactions
11. Plants make sugar from sunlight. Light energy is turned into chemical energy (sugars – carbon based).
14. _____ are polymers of tubulin that form part of the cytoskeleton and provide structure and shape to eukaryotic cells.
15. This is a form of cellular respiration that requires oxygen in order to generate energy.
16. _____ respiration. This is a form of cellular respiration that occurs when oxygen is absent or scarce.
18. n organelle in the cytoplasm of eukaryotic cells containing degradative enzymes enclosed in a membrane.
19. Waste Product of Photosynthesis. Carbon_____
23. _____ acid, or lactate, is a chemical byproduct of anaerobic respiration

Part 4 Review Game

Name:

1-10 = 10 pts * = Bonus + 1 pt, Part 4 Lesson 10

(Secretly write owl in correct space +1 pt)

Score ____ / 100

Final Question = 5 pt wager

IT BURNS	PHOTOSHOP	BREATH IN	BIG GULP	GREEN SUPER HEROES Bonus round 1 pt each
1) LYSOSOMES	6) FLAGELLUM	11) PHOTO SYNTHESIS	16) LETTER B	*21) GREEN ARROW
2) LETTER C	7) CILIA	12) LETTER D	17) CITRIC ACID CYCLE	*22) Dr. DOOM
3) PEROXISOME	8) CENTROSOMES /CENTRIOLES	13) LETTER C	18) LETTER F	*23) BEAST BOY
4) CYTOSKELETON	9) CHLOROPLAST /PLASTID	14) CELLULAR RESPIRATION Owl+1pt	19) VACUOLE	*24) AQUAMAN
5) A=INTERMEDIATE FILAMENTS B=MICROTUBULES C=Microfilaments	10) THYLAKOIDS	15) MITO CHONDRIA	20) ANAEROBIC RESPIRATION	*25) TEENAGE MUTANT NINJA TURTLES

Final Question Wager ___ /5 Answer: ENDOSYMBIOTIC THEORY