

Biology

UNIT 2 Energy

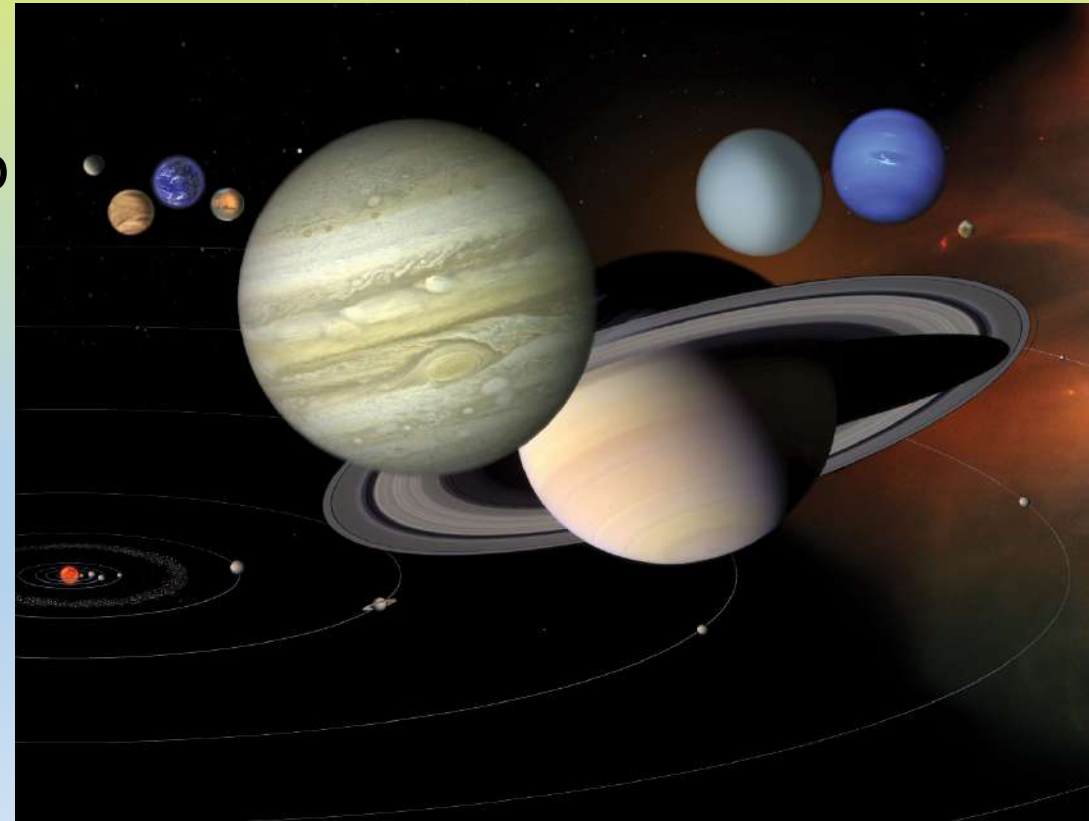
9/11 How does Carbon cycle through Planet Earth? P. 40 NB

1. Carbon is the main element of life in organic organisms. Look the Carbon Cycle on page 55 in the biology book. How does carbon cycle through the Atmosphere? Where is it released from?
2. Carbon not only cycles through the Atmosphere, but also the Biosphere – zone of life. How does carbon get absorbed and released in and from living things?
3. The Geosphere (Earth) and the Hydrosphere (Water) are two more spheres that CO₂ can cycle through. What are each of them? How does carbon get into and out of each?

9/12 Where do planets come from?

Obj. TSW learn about the formation of our solar system, our planet and specifically Earth. P. 42 NB

1. Where does most of the energy come from in our solar system?
2. What planets make up our solar system?
3. How old is our Solar System? Earth? How do we know?



Research Activity P. 41 NB

- <https://solarsystem.nasa.gov/planets/solarsystem>
- If you had to be one of our planets in our solar system, which one would you be and why?
- List 5 facts about it

9/13 Building Molecules CH 6.3

Obj. TSW identify the macromolecules living things are made of and describe their properties. P. 44NB

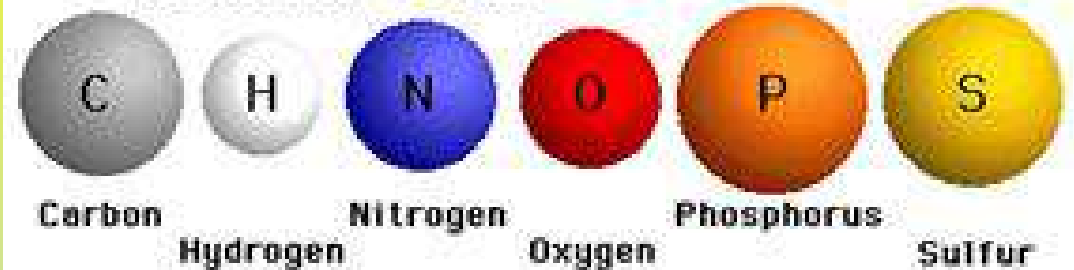
Organic Compounds

Carbon, Hydrogen, Oxygen, Nitrogen, Phosphorus and Sulfur are found in all living things

"CHONPS"



CHNOPS: The Six Most Abundant Elements of Life



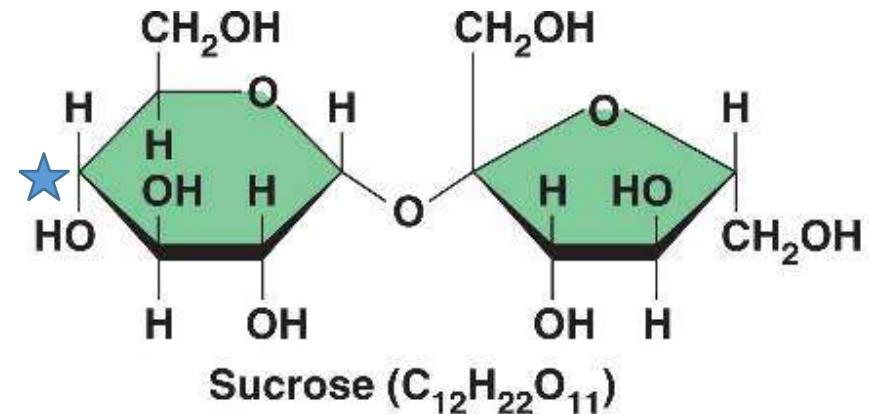
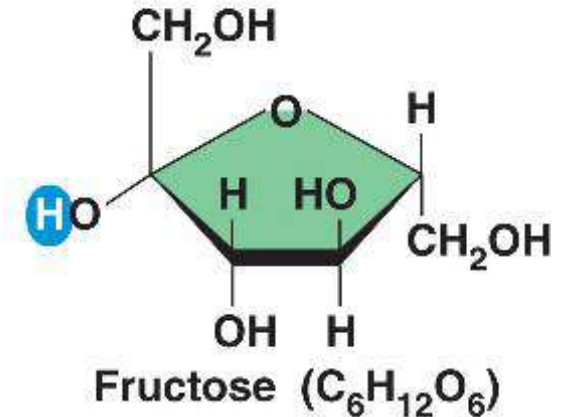
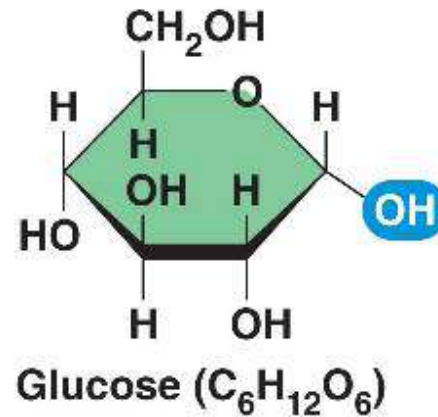
1. What are the 6 main elements that make up the 4 macromolecules?
2. What is an Enzyme?
3. What three environmental factors determine the enzymes function?

Build a Monosaccharide!

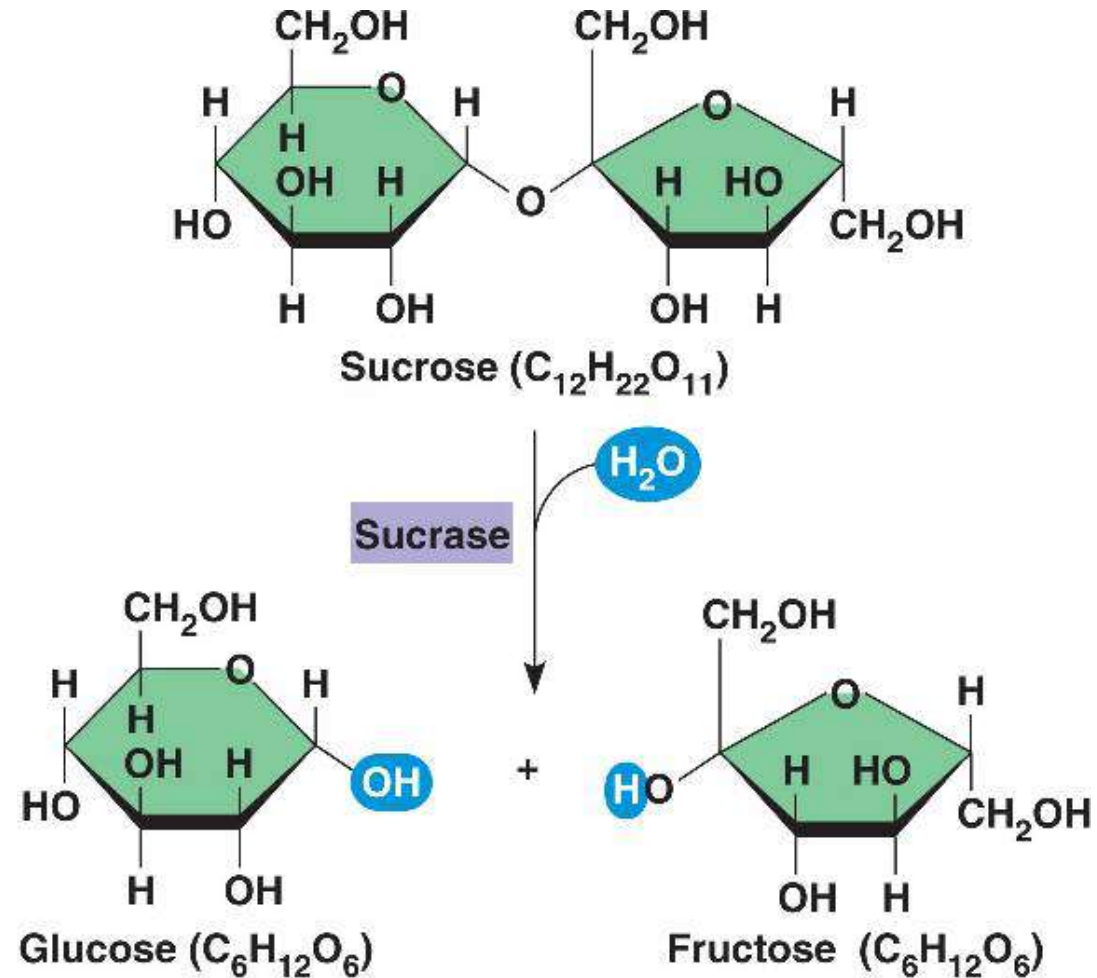
Show me a correct monosaccharide for extra credit!

Some Helpful Hints:

- **Black** atoms are **Carbon (C)**.
 - Carbon always needs to be bonded to 4 other atoms.
- **White** atoms are **Hydrogen (H)**.
 - Hydrogen only bonds to 1 atom.
- **Red** atoms are **Oxygen (O)**
 - Oxygen bonds to 2 atoms.
- Every unidentified **corner** is a **Carbon** atom.
 - For example, look at the ★ which identifies the corner on Sucrose. That is a carbon atom.



Enzymatic Reaction of Sucrase on Sucrose



Catalase Lab

ml H ₂ O ₂	Person 1	Person 2	Person 3	Person 4	Person 5
5	100				
6					
7		120			
8			120		
9				170	
10					140

Catalase Lab P. 27

- 1 flask / 2 people
- GLX
- Pressure Probe
- Yeast – 1 tsp.
- Hydrogen Peroxide 5ml
- Swirl
- Make observations.
- Write a summary paragraph about the function of enzymes with a picture of a substrate & enzyme & active site. What factors allow for the enzyme to function? What volume of H₂O₂ did Catalase work the best? Why does the enzyme speed up chemical reactions? Enzymes can be used again & again (Catalytic), how is this important in chemical reactions? At what volumes (ml) did the Catalase work the best? Write the chemical equation.

AXES Paragraph – Catalase Lab

- Assertion What is Exothermic Reactions? Use vocabulary.
- eXample Discuss an example of an enzyme. Include details from the lab.
- Explanation Describe the function of the enzyme, and factors that influence it.
- Significance Why are enzymes important for us?

Macromolecules

Protein	Lipids	Carbohydrates	Nucleic Acids

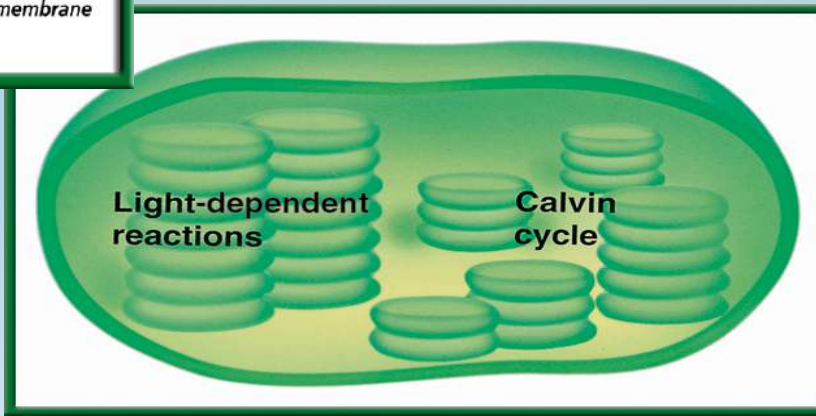
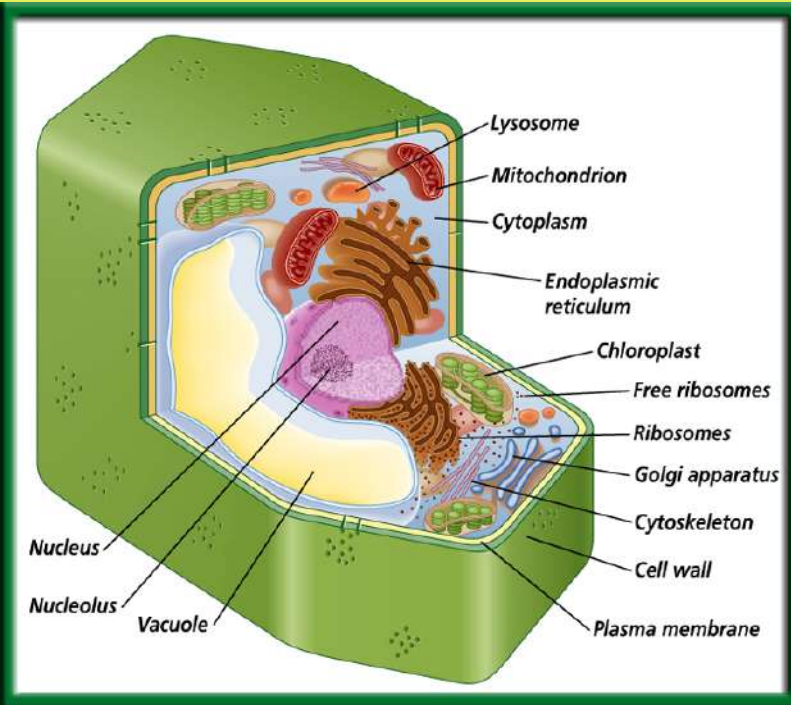
9/14 Photosynthesis: Trapping the Sun's Energy 9.2

Obj. TSW demonstrate how usable energy is captured from sunlight by chloroplasts and is stored through the synthesis of sugar by completing the warm up and participating in a photosynthesis class activity. P.46 NB

Cellsalive.com

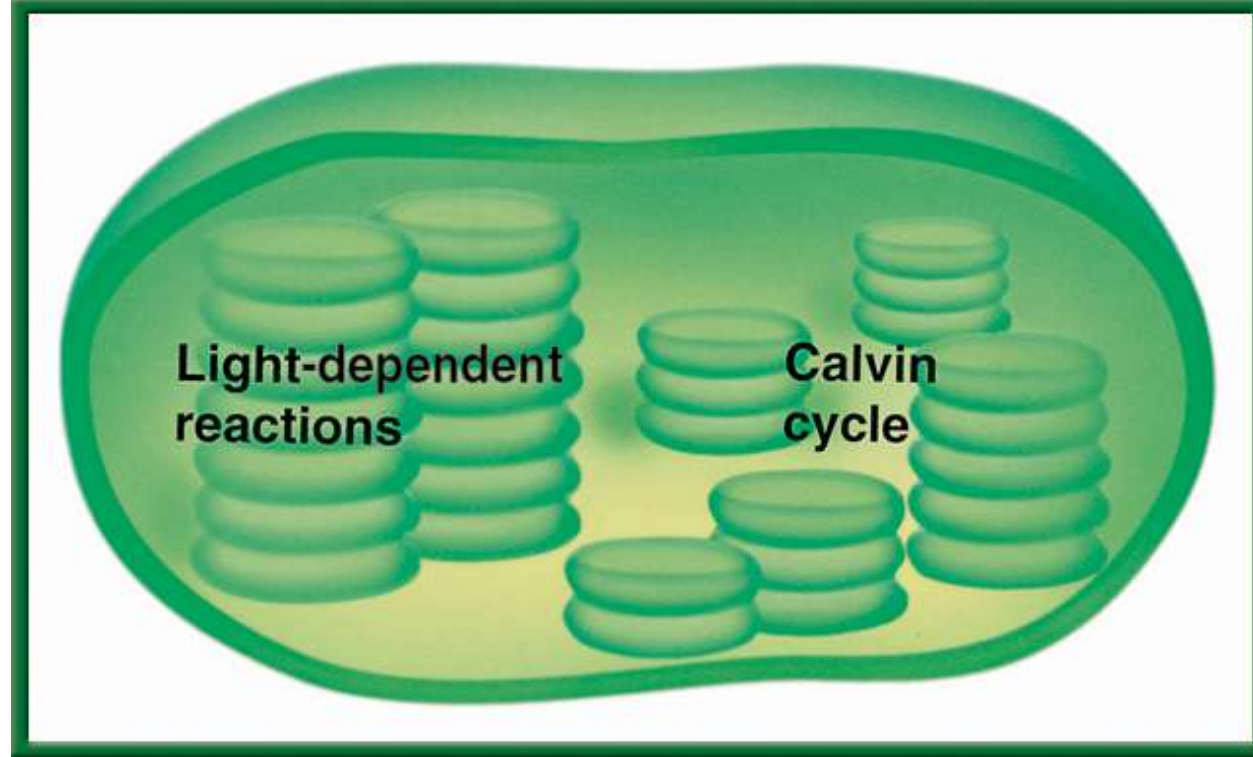
HW – Study Guide

1. What organelle in the plant cell traps the sun's energy, what is that process called?
2. Write and memorize the equation for photosynthesis.
3. What are the Reactants and the Products for Photosynthesis, what is the catalyst for this process?



Show Photosynthesis video
Osmosis AXES

#1 Chloroplast - Photosynthesis

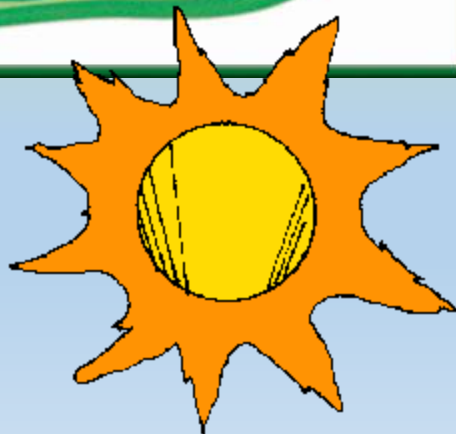
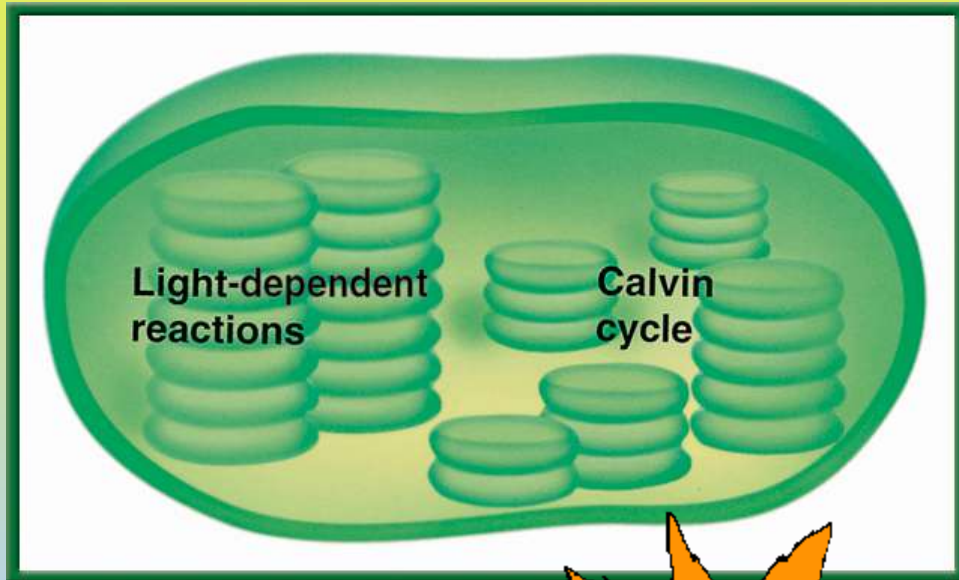


#3. Reactants

Products

9/15 Light-Dependent & Light-Independent Reactions CH 9.2
Obj. TSW demonstrate how light energy is captured by chloroplasts and converted to chemical energy (glucose) from CO_2 and H_2O by doing a flow chart. 48 NB

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1. Why is **Photolysis** important?
2. Compare and Contrast **Light Dependent** reactions and **Light Independent** reactions.
3. Where does the **Calvin Cycle** happen in the cell and what does it produce?

Study guide is due tomorrow! P. 59NB

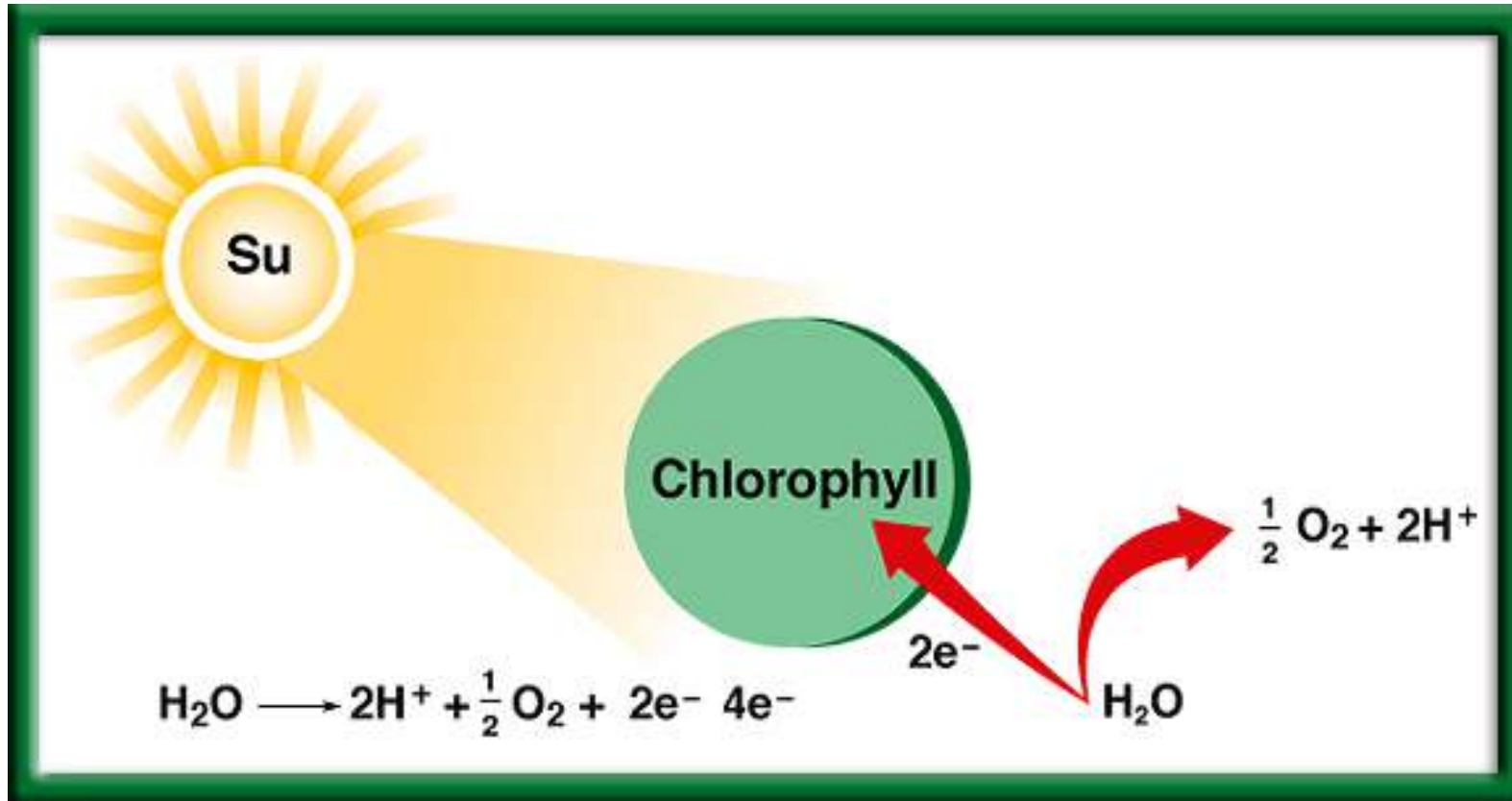
Read CH 6.3, 7, 8.1 & 9

Show Videos

Chapter 9

Image Bank

#1. Photolysis – Breaks up H₂O (Water) to release O, that makes O₂.



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SLIDE

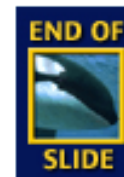
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RESOURCES

Restoring electrons

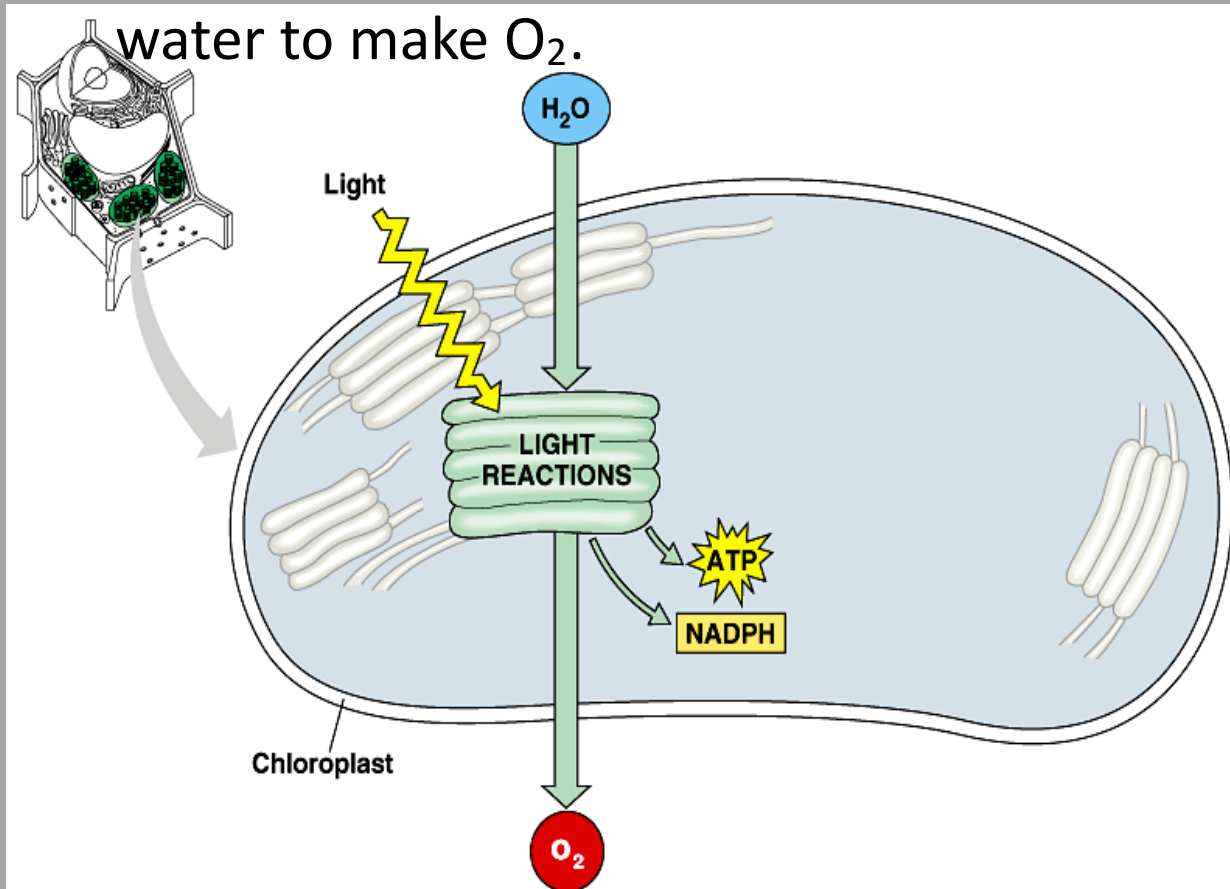
- The oxygen produced by photolysis is released into the air and supplies the oxygen we breathe.
- The electrons are returned to chlorophyll.
- The hydrogen ions are pumped into the thylakoid, where they accumulate in high concentration.



#2. How does light energy become chemical energy?

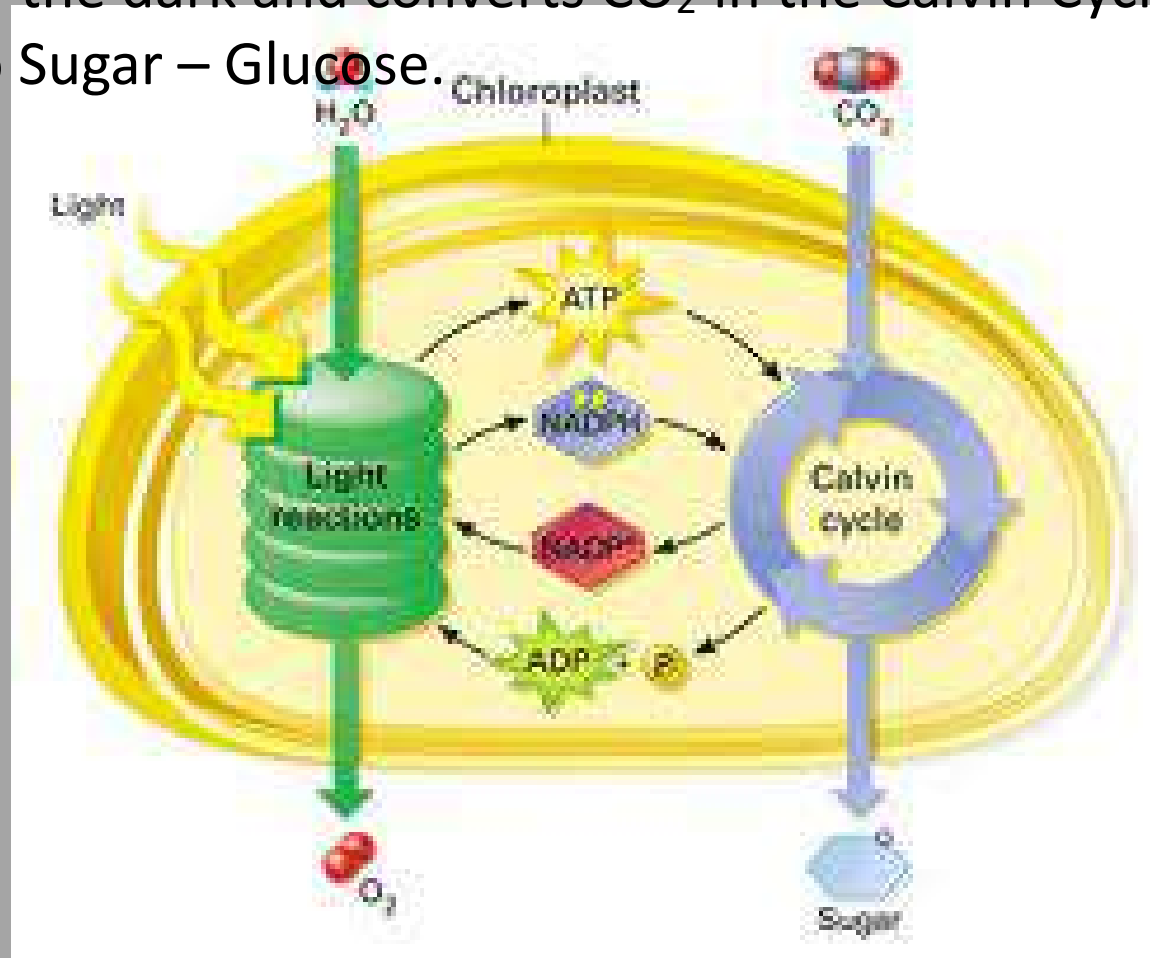
Light Dependent Reaction happens in the light when the light hits the Grana and splits

water to make O_2 .





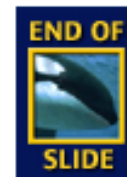
#2. How does light energy become chemical energy?

Light Independent Reaction happens in the light or the dark and converts CO_2 in the Calvin Cycle to Sugar – Glucose.



Trapping Energy from Sunlight

- Photosynthesis happens in two phases.
 1. The **light-dependent reactions** convert light energy into chemical energy. 
 2. The molecules of ATP produced in the light-dependent reactions are then used to fuel the **light-independent reactions** that produce simple sugars. 
- The general equation for photosynthesis is written as $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$

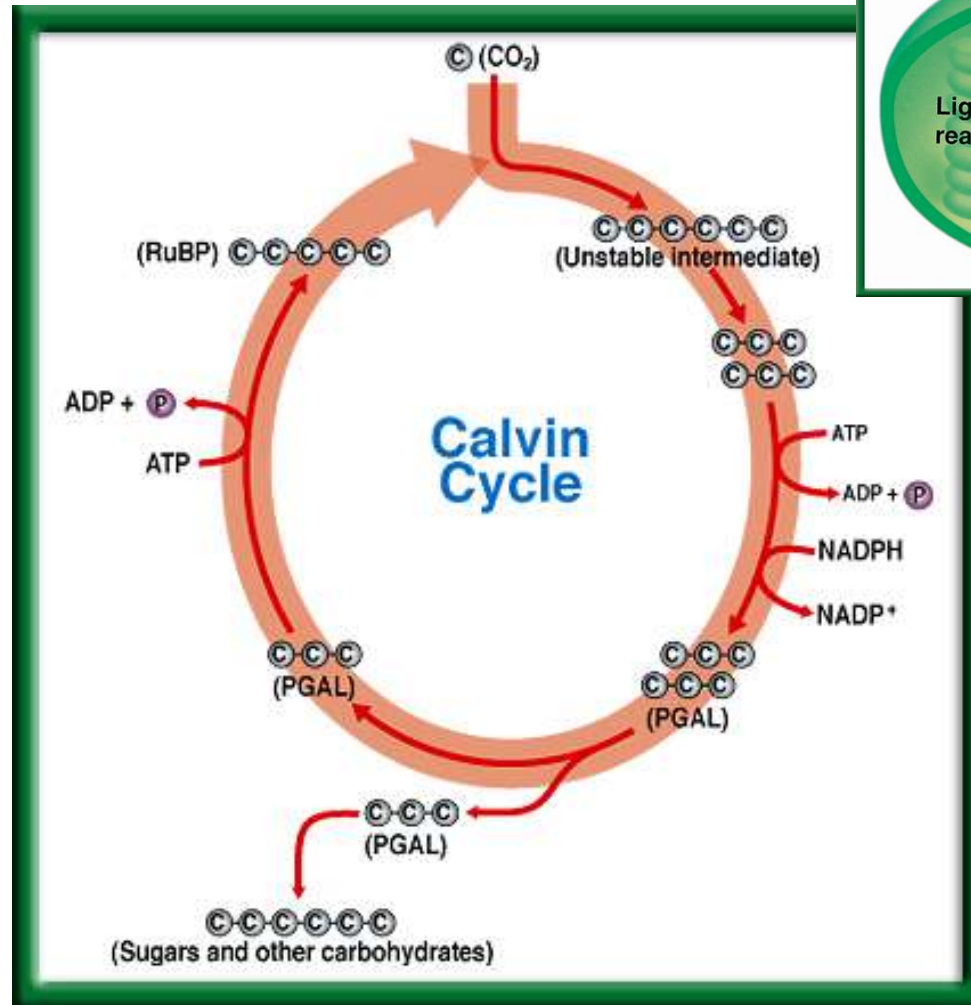
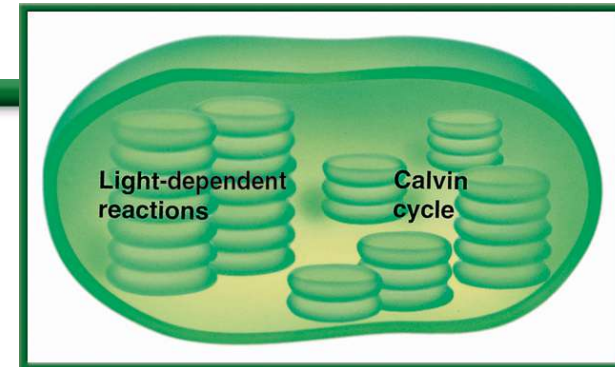


Chapter 9

Image Bank

Calvin Cycle

#3. The **Calvin Cycle** happens in the **Stroma** of the **Chloroplast**, and produces the glucose for the plant.



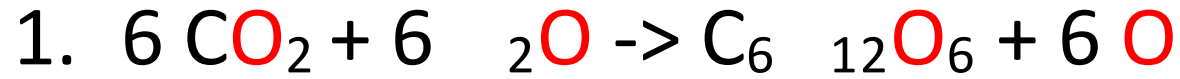
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RESOURCES

How to Make Carbohydrates Activity p. 55NB



Carbon Dioxide + Water = Glucose + Oxygen

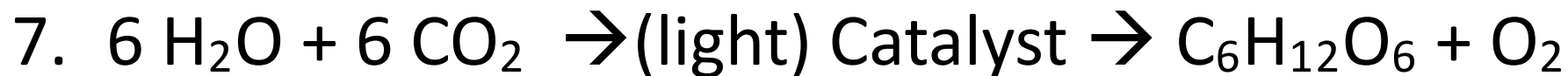
2. Sunlight – Catalyst

3. The chlorophyll inside the chloroplast

4. There were 6 molecules of O₂ left over.

5. The extra oxygen atoms give air to other organisms.

6. The O₂ diffuse into the atmosphere through the stomata.



Glucose Synthesis Activity

Photosynthesis: $6 \text{CO}_2 + 6 \text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6 \text{O}$

- Black = Carbon

- Red = Oxygen

- Person 1 – Root = O

- Person 2 – Stomata = CO_2

- Person 3 – Chloroplast = Light Energy (Sun)

- Person 4 – Glucose Synthesis/ O_2

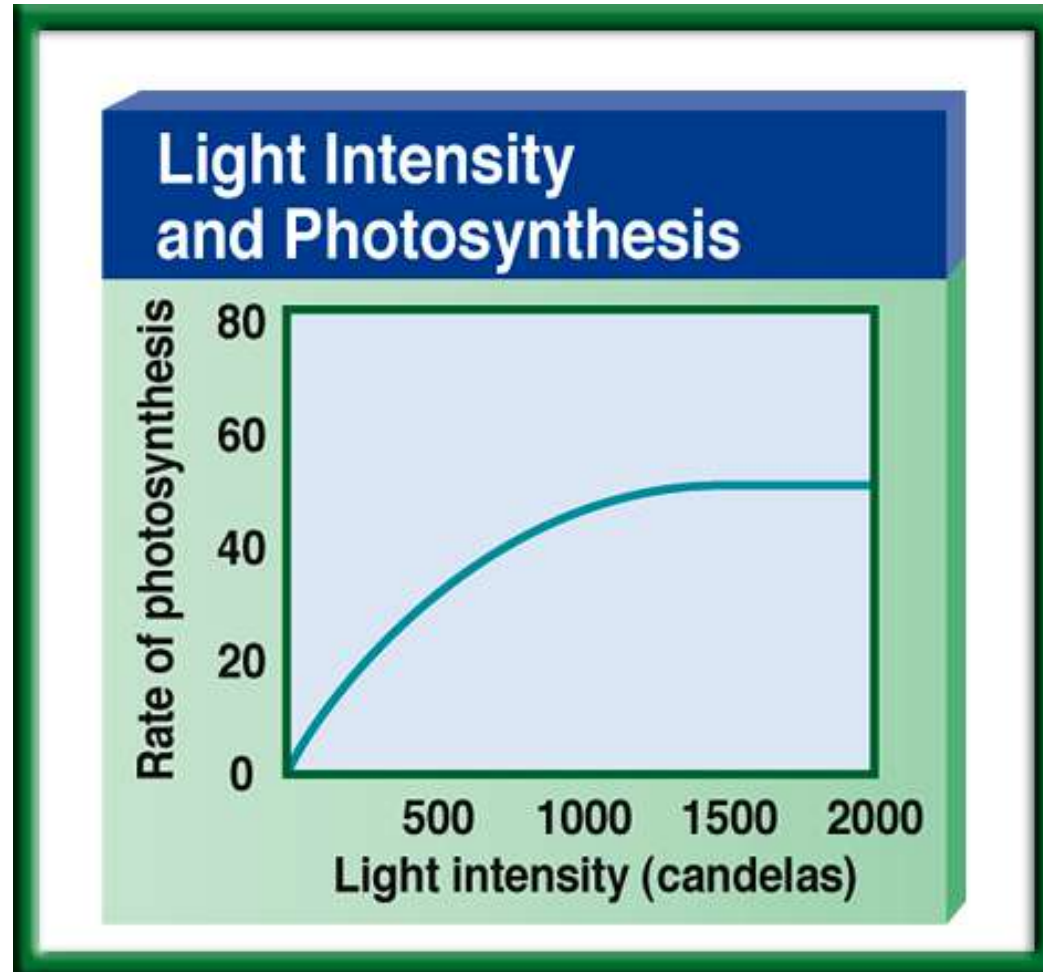
- Person 5 – Get ATP for Cellular Respiration

- Glucose

- $\text{C}_6\text{H}_{12}\text{O}_6$

Cellular Respiration: $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O} + 36 \text{ATP} + \text{Heat}$

- Copy this graph and explain what it means in a short paragraph.
 - Use your knowledge of Independent and Dependent Variables to explain what happens.
- Explain the relationship between the two variables
- Come up with a better title



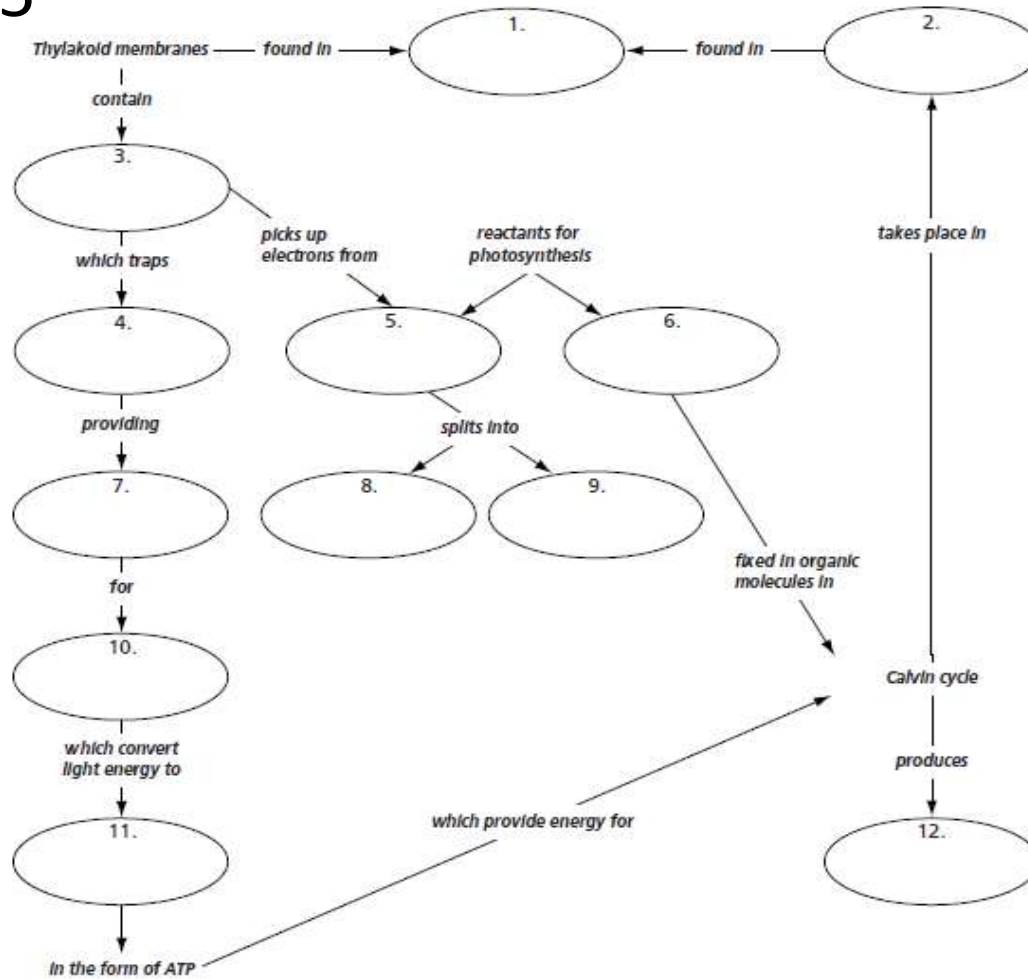
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p. 35 NB
Write a 3 – 5
sentence
summary

Photosynthesis: Trapping the Sun's Energy

Complete the concept map describing photosynthesis. Use these words or phrases once: *chemical energy, oxygen, light-dependent reactions, chlorophyll, stroma, glucose, water, sunlight, oxygen, carbon dioxide, hydrogen ions, chloroplasts.*



- Chemical energy
- Oxygen
- Light Dependent Reactions
- Chlorophyll
- Stroma
- Glucose
- Water
- Sunlight
- Carbon Dioxide
- Hydrogen ions
- Chloroplasts
- Energy

Taboo

- Chloroplast
- Cell Wall
- Plasma Membrane
- Passive transport
- Active Transport

Taboo

- Cellular Respiration
- Photosynthesis
- Mitochondria
- Theory
- Scientific Method
- Nucleic Acid

Honors Biology

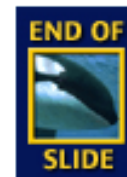
Do the Math

- What is the Percent change in temperature of your Catalase Reaction?
- $\frac{V1 - V2}{V1} \times 100\%$
- $\frac{21 - 36}{21} \times 100\% = ?$
- 76%
- Include this in your Data Analysis.

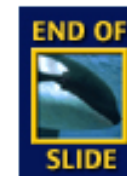
Question 1

The process that uses the sun's energy to make simple sugars is _____.

- A. cellular respiration
- B. glycolysis
- C. photosynthesis
- D. photolysis



The answer is C. Photosynthesis happens in two phases to make simple sugars and convert the sugars into complex carbohydrates for energy storage.

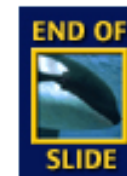


Question 1

Why do you add baking soda solution to the water containing the Elodea plants?

Answer

The baking soda supplies carbon dioxide, a necessary component of photosynthesis.



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Chapter 9

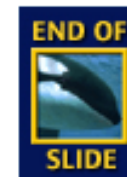
INVESTIGATE BioLab

Question 2

Why does the experiment use aquatic plants?

Answer

The oxygen given off by an aquatic plant will form visible bubbles in the water that can be easily observed.



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Chapter 9

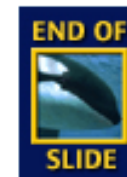
INVESTIGATE BioLab

Question 3

What is the independent variable in this experiment?

Answer

The independent variable in this experiment is the color of light that is directed on the Elodea.



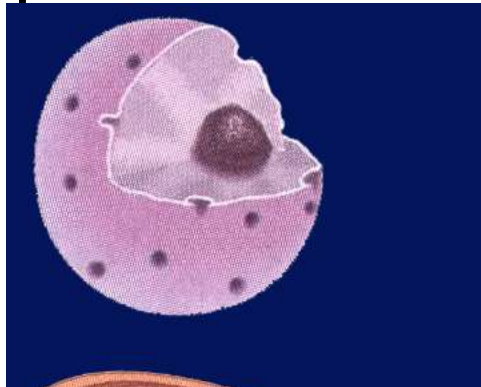
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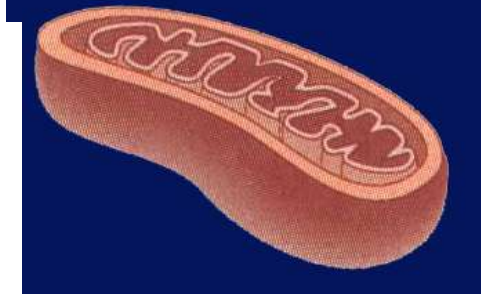
Question 4

In which of the following structures do the light-dependent reactions of photosynthesis take place?

A.



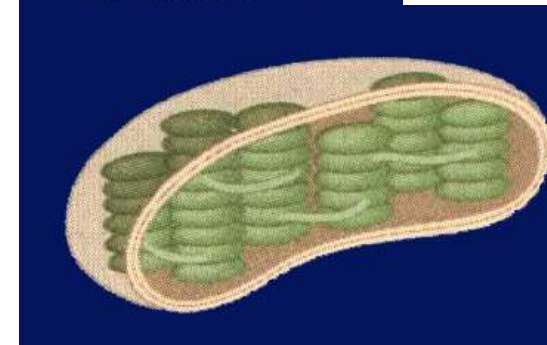
B.



C.



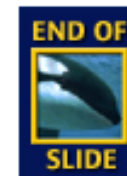
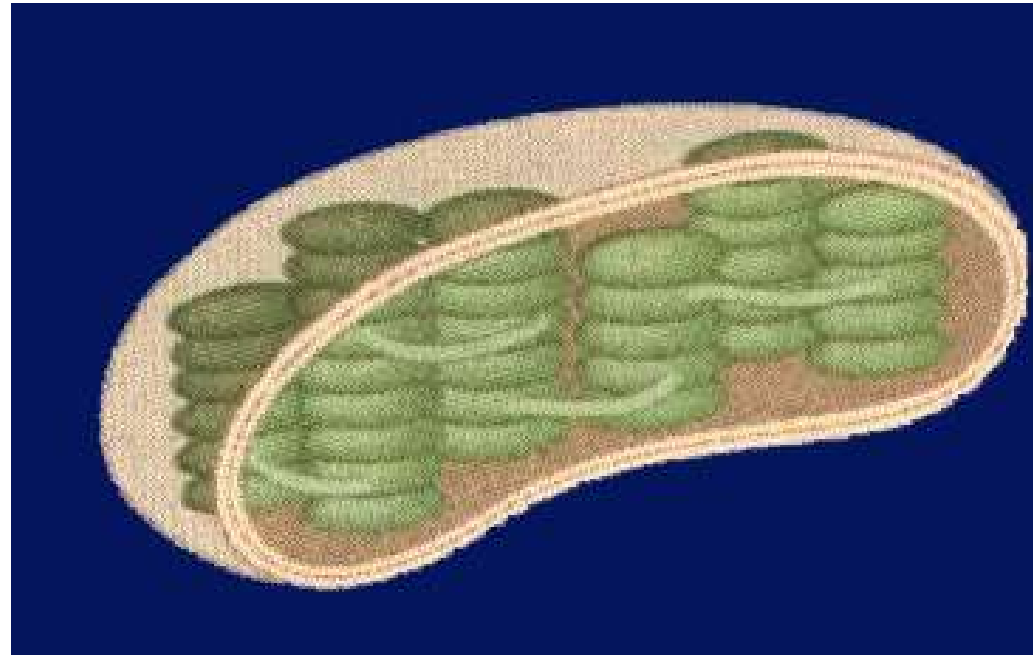
D.



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The answer is D. The light-dependent reactions of photosynthesis take place in the thylakoid membranes of chloroplasts.



Quote of the Day

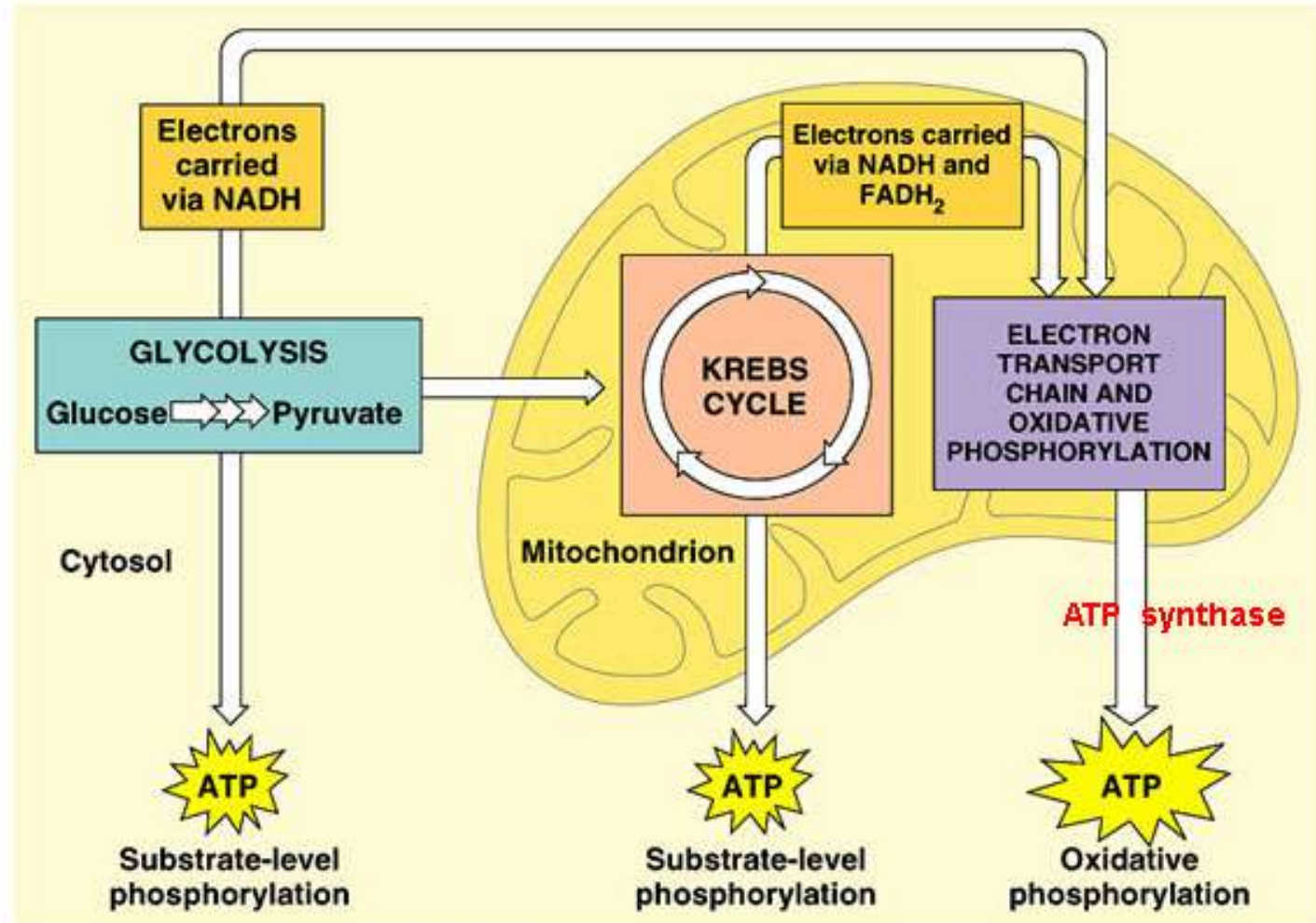
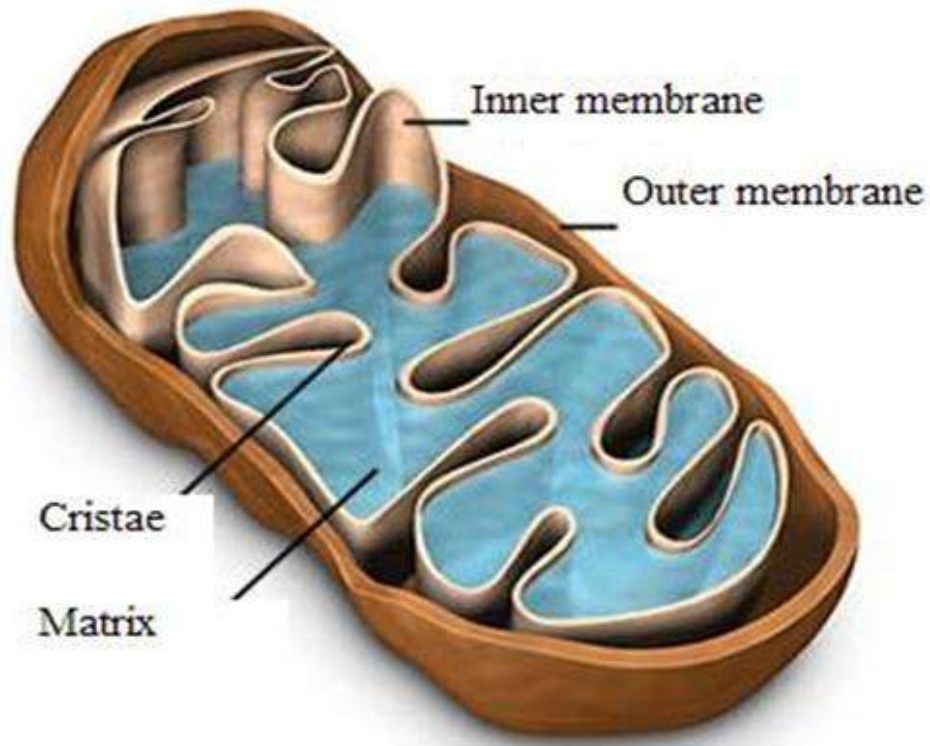
Everything you can imagine is real.

- Pablo Picasso

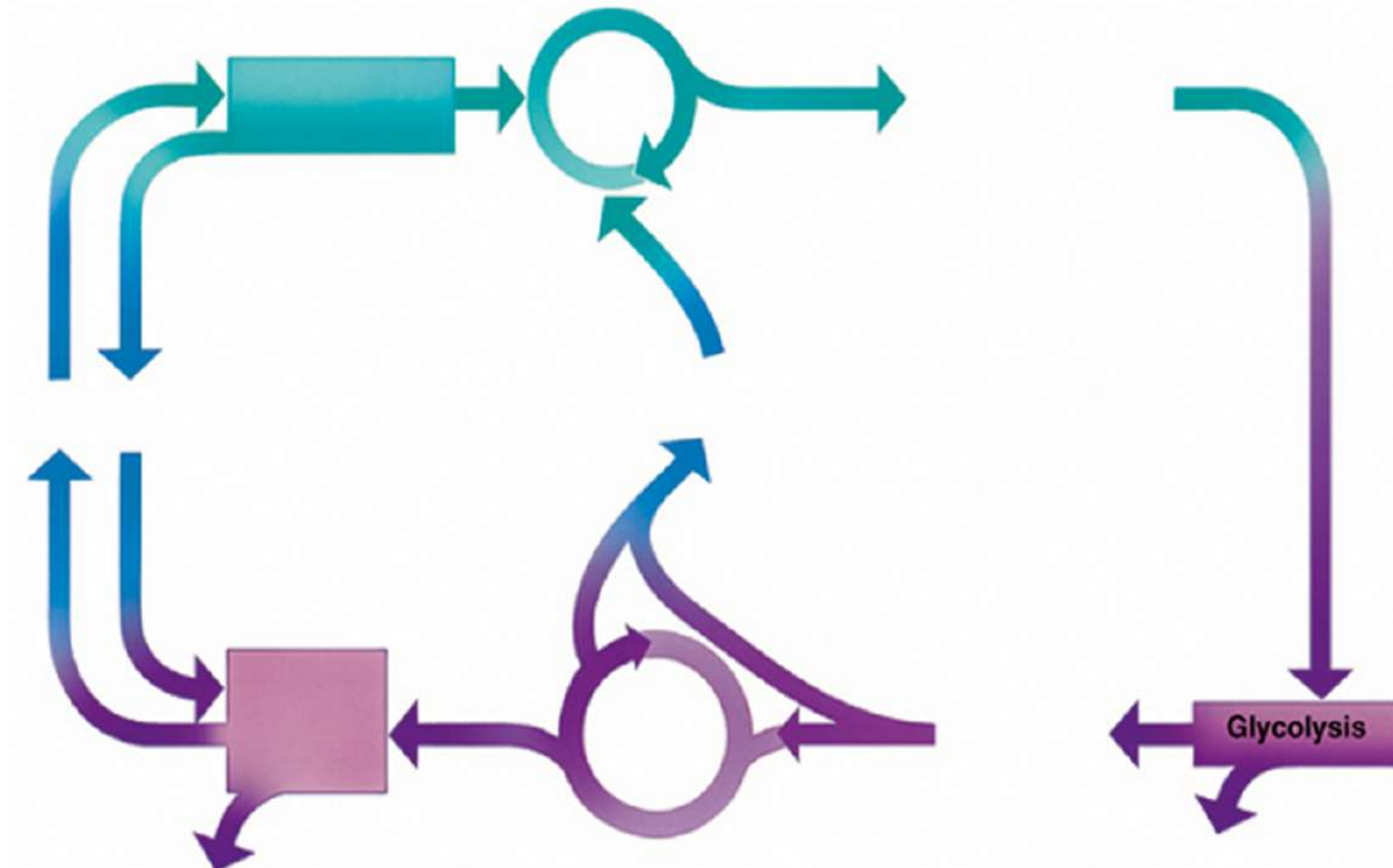
Kahoots Energy Quiz

1. Cellular Respiration – converts glucose in to ATP and Heat in the mitochondria.

All living organisms perform Cellular Respiration, including plants.



#2. The reactants for Photosynthesis (CO_2 & H_2O) are the Products for Cellular Respiration.

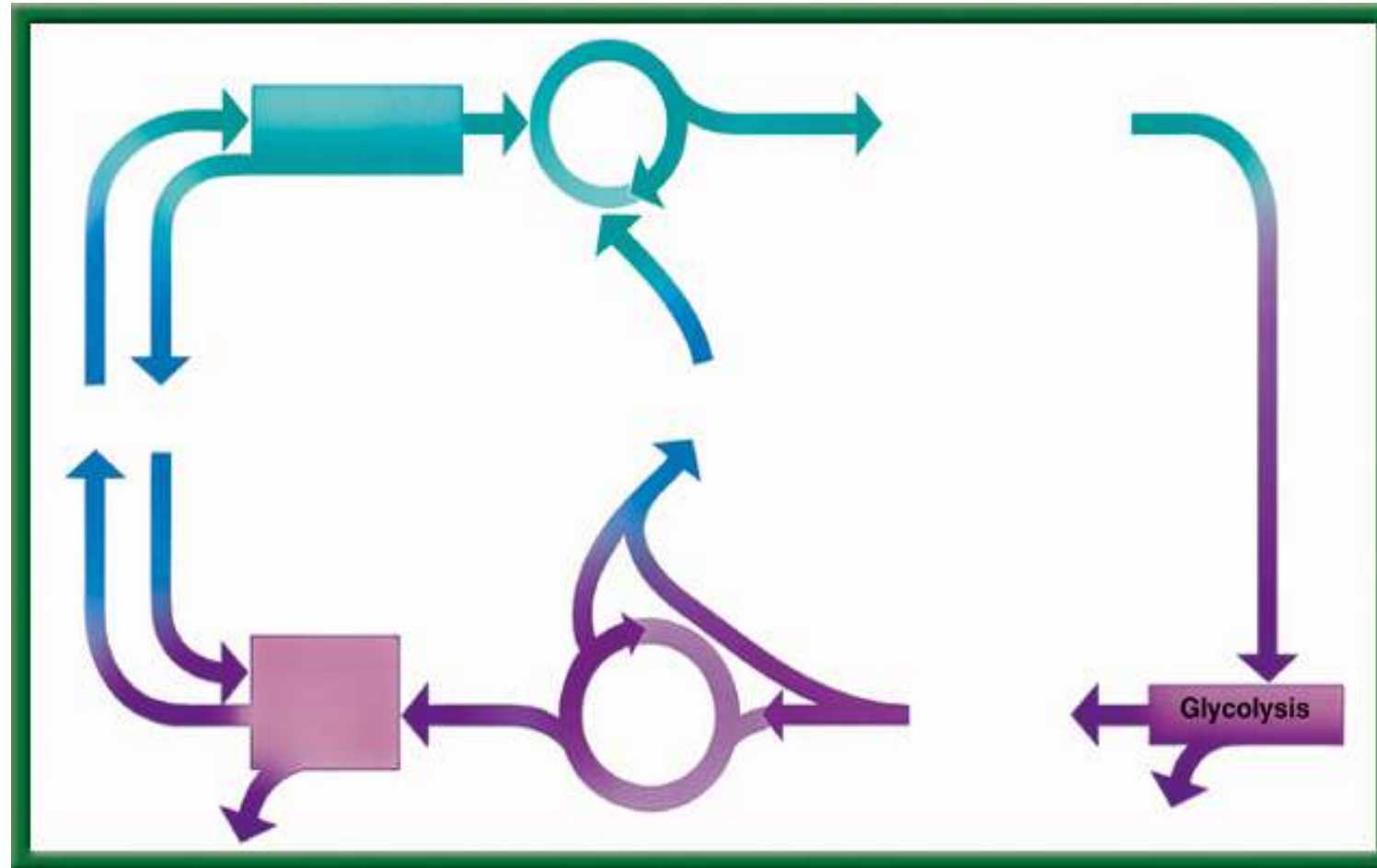


9.3

2.

P.55 NB Compare and contrast **cellular respiration** and **photosynthesis**.

3. Fermentation happens during glycolysis when not enough oxygen is present.



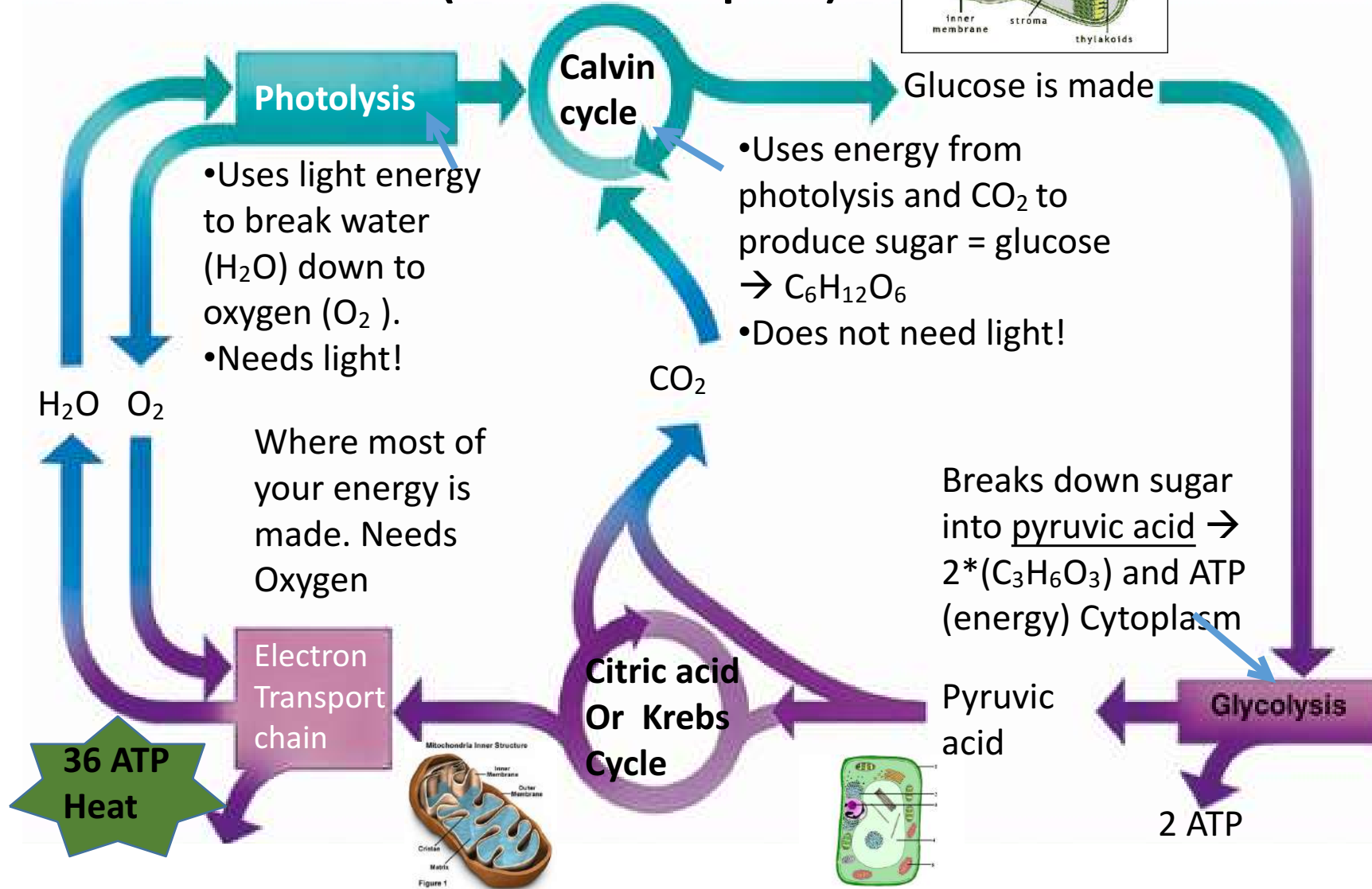
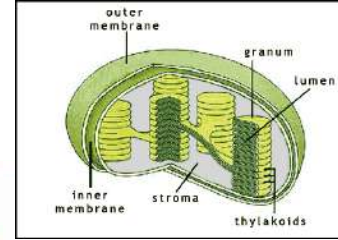
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RESOURCES

PHOTOSYNTHESIS (in the chloroplast)



CELLULAR RESPIRATION (in cytoplasm and mitochondria)

Taboo

Cellular Respiration

Vacuole

Prokaryotic

Osmosis

Passive Transport

Macromolecule

Taboo

- Photosynthesis
- Nucleus
- Eukaryotic Cell
- Active Transport
- DNA
- Protein

Taboo

- Scientific Method
- Independent Variable
- Plasma Membrane
- Bacteria
- Prokaryotic
- Chloroplast

- Dependent Variable
- Control
- Selective Permeability
- Endoplasmic Reticulum
- Cell Wall
- Vacuole

Comparing Photosynthesis and Cellular Respiration Notes p. 57 NB

Table 9.1 Comparison of Photosynthesis and Cellular Respiration

Photosynthesis	Cellular Respiration
Food synthesized = Endergonic	Food broken down = Exergonic
Energy from sun stored in glucose	Energy of glucose released
Carbon dioxide taken in	Carbon dioxide given off
Oxygen given off	Oxygen taken in
Produces sugars = $C_6H_{12}O_6$	Produces CO_2 , H_2O , ATP & Heat
Requires light	Does not require light
Occurs only in presence of chlorophyll	Occurs in all living cells, including plants



RESOURCES

Photosynthesis & Cellular Respiration AXES

Paragraph Bottom of page 57NB

- The mechanisms for P & CR are related because they are essentially opposite reactions. Photosynthesis transforms energy from the sun and Cellular Respiration makes use of chemical bond energy.
- Photosynthesis = Chloroplast
- Cellular Respiration = Cytoplasm, Mitochondria
- $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$ Photosynthesis
- $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O} + 36 \text{ ATP} + \text{Heat}$ Cellular Respiration

Gallery Walk – Cell UNIT Review

Describe, Draw, and Explain the importance of each of the following concepts/processes on a poster paper, for a Gallery Walk review. Page 51NB

- Osmosis
- Plasma Membrane
- Eukaryotic Cell
- Prokaryotic Cell
- Photosynthesis
- Cellular Respiration
- Folded Membranes
- Active & Passive Transport
- Macromolecules
- Scientific Method

Warm Up Answers

- 1) **Cellular Respiration**: process by which mitochondria break down food molecules (glucose) to produce **ATP**. The stages are: **glycolysis, citric acid cycle, electron transport chain**.
- 2) **Glycolysis**: series of chemical reactions in the cytoplasm of the cell that breaks down **glucose** into (2) **pyruvic acids- $C_3H_6O_3$** .
- 3). **Fermentation** – in the absence of Oxygen during glycolysis, Lactic acid (animals) or alcohol (plants) are produced.

Table 9.1 in text

[Cellular Respiration](#): Food broken down, energy of glucose released, CO_2 given off, O_2 taken in, does not require light, occurs in all living cells

They both produce Energy.

Photosynthesis: Food synthesized, energy from sun stored in glucose, CO_2 taken in, O_2 released, requires light, occurs only cells that contain chlorophyll

Both: use electron carriers, have cycles of chemical reactions, and form ATP

Cellular Respiration & Yeast

- Get into groups of 3 people. Get 1 flask, 1 balloon, 1 sugar cube, and ½ tsp. of Yeast, combine with 50 ml warm water.
- Place Balloon on the end of the Flask
- Record results
- What happens to the balloon?
- Why? What is the process called? What are the Products?

Cellular Respiration P. 31

- Question: How much Carbon Dioxide will be produced?
- Independent Variable: Changed the number of sugar ($C_6H_{12}O_6$) cubes.
- Dependent Variable: More Carbon Dioxide was produced.
- Control: 1 sugar cube was the control.

- Constant: Same Sugar, Yeast, balloons, Flasks
- Materials & Equipment: Yeast – ½ tsp., water – 100 ml, sugar, balloons, Hot plate, Flask
- Experimental Set up: Draw only
- Safety Concerns: Don't eat the sugar cubes.
- Procedure : Write the steps.... Step 1, Step 2, Step 3,

Enzymes, Catalase & Potatoes Page 47 NB

- Get into groups of 3 people. Get 1 flask, 1 balloon, H₂O₂, and 1 piece of Potato – raw, 1 piece of potato cooked.
- Place Balloon on the end of the Flask
- Record results
- What happens to the balloon?
- What do you know about enzyme function?
- Under what conditions do they function best?
- Why? What is the process called? What are the Products?

Enzyme Lab P. 47NB

- Question: How much Carbon Dioxide will be produced?
- Independent Variable: Changed the number of pieces of potato, or more H₂O₂.
- Dependent Variable: More Carbon Dioxide was produced.
- Control: 10 mL of H₂O₂ & 1 piece of potato.

Enzyme – Catalyse Lab Page 47 NB

- Constant: Same potato, H₂O₂, balloons, Flasks
- Materials & Equipment: H₂O₂ ½ tsp., balloons, Hot plate, Flask
- Experimental Set up: Draw only
- Safety Concerns: Don't eat the potatoes.
- Procedure : Write the steps.... Step 1, Step 2, Step 3,
- Answer Analysis questions on the lab.

Leaf Disk Assay Lab

Honor Biology Due Friday

- Enter data into **Excel**
- Make a **scatter plot graph** to show the **50% floating point**.
- **Data Analysis:** What does the graph mean? Error analysis
- **Conclusion:** Discuss why measuring the photosynthesis can be a problem. What competing process is occurring at the same time? Include in your discussion the relationship between Photosynthesis and Cellular Respiration by comparing and contrasting the equations.

STAGE 1: GLYCOLYSIS

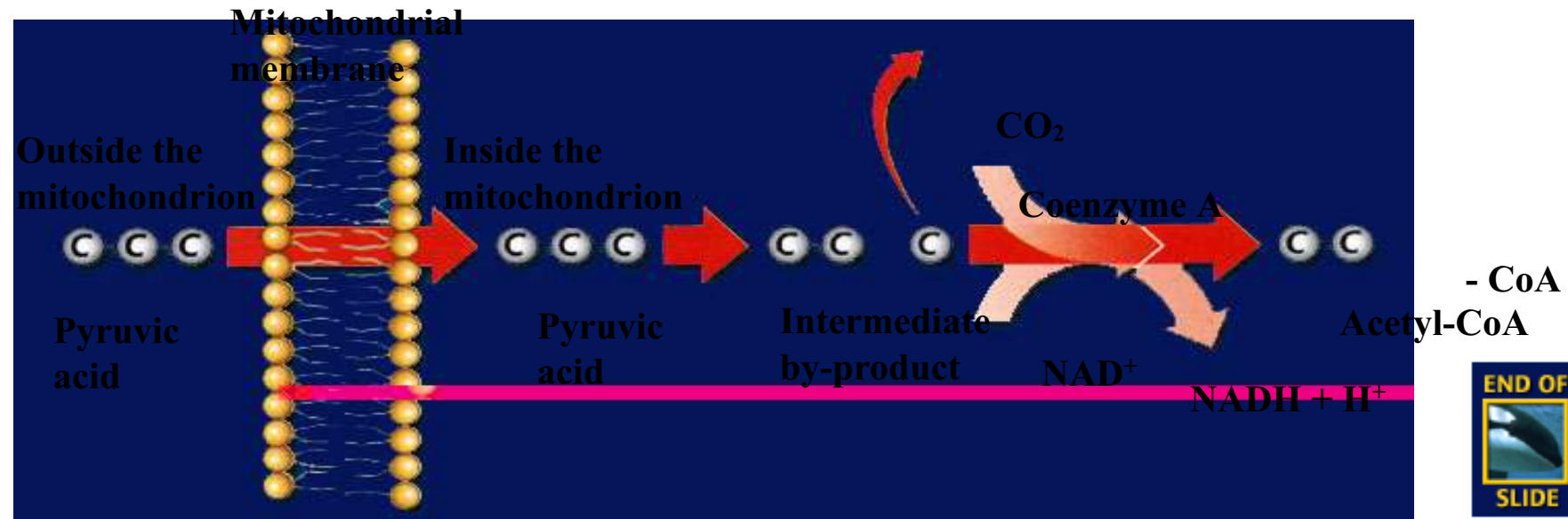
- Takes place in the cytoplasm of the cell
- Process where glucose is broken down and some energy is released
- In the absence of Oxygen, fermentation happens.

9.3

Getting Energy to Make ATP

Glycolysis

- Before citric acid cycle and electron transport chain can begin, pyruvic acid undergoes a series of reactions in which it gives off a molecule of CO_2 and combines with a molecule called coenzyme A to form acetyl-CoA.

[RESOURCES](#)

STAGE 2: CITRIC ACID CYCLE

- AKA Krebb's cycle
- Happens in the mitochondria
- Produces: carbon dioxide and some ATP

STAGE 3: ELECTRON TRANSPORT CHAIN

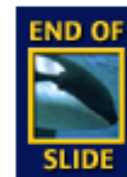
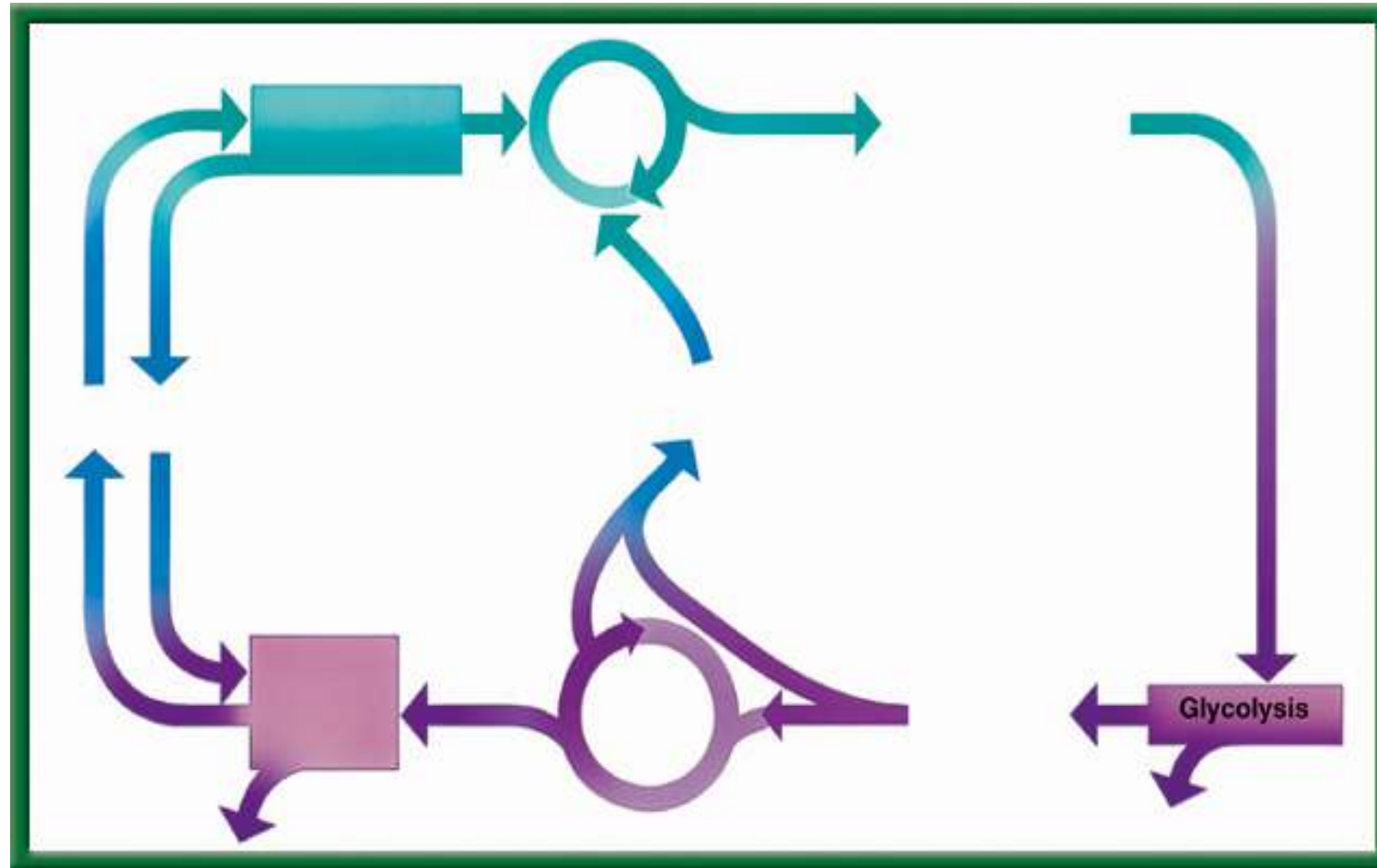
- Happens in the mitochondria
- Series of proteins that transfers energy
- Net creation of whole process: 36 ATP

PROBLEM

- What happens when our cells run out of oxygen? Can cell respiration occur?

FERMENTATION

- Without oxygen cell respiration can not occur.
- However, instead of giving up and dying, our cells have another way to create energy without using oxygen → FERMENTATION
- Occurs after glycolysis
- Lactic acid fermentation: animal cells (us!)
- Alcoholic Fermentation: plant cells



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