Biology
UNIT 2 Energy

Week 6

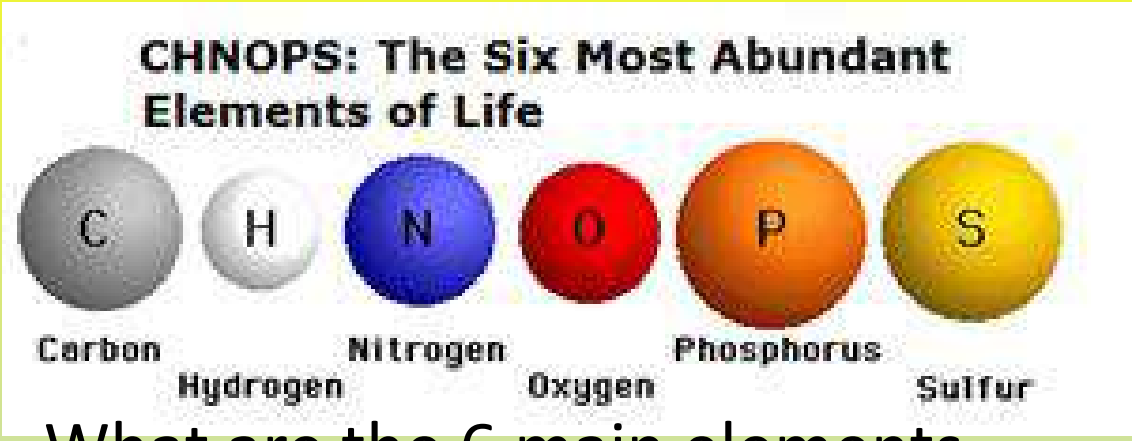
Fall Sept. 18th – 22nd

Research Activity P. 41 NB

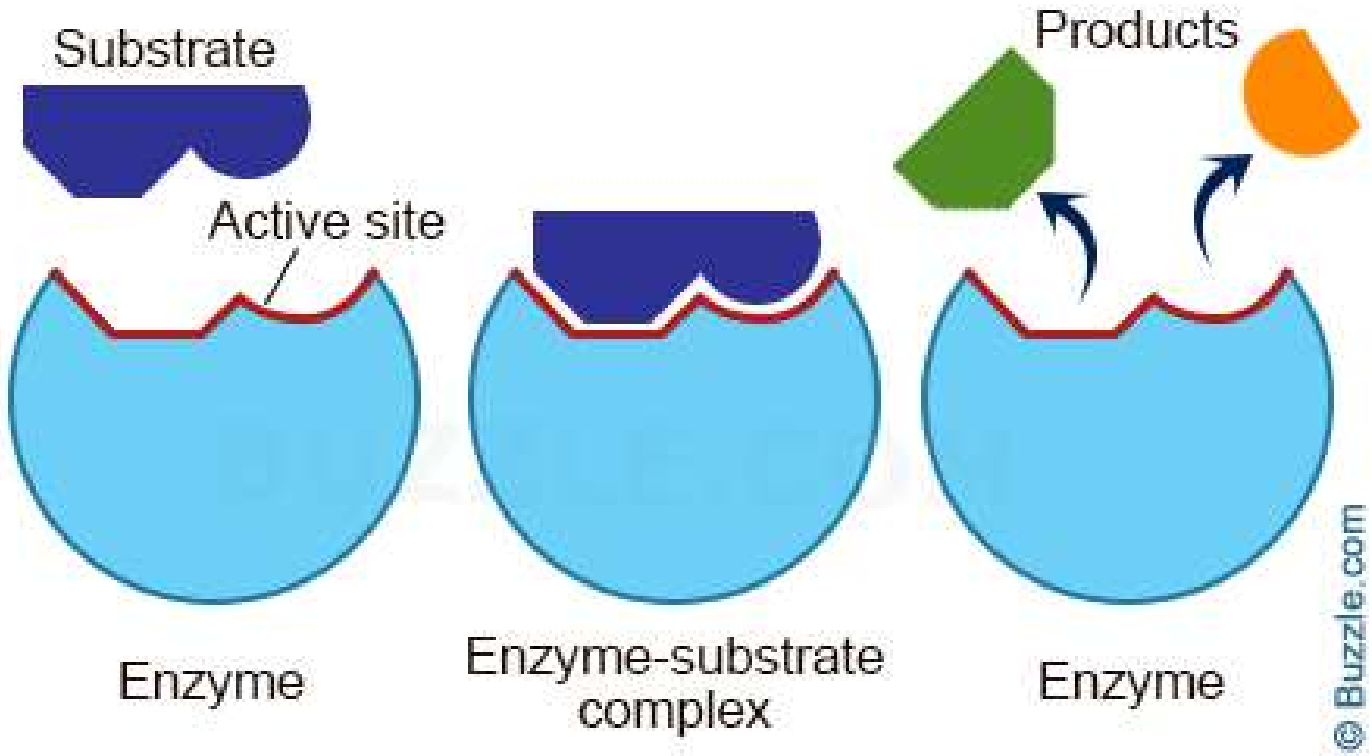
- https://solarsystem.nasa.gov/planets/solarsystem
- If you had to be one of our planets in our solar system, which one would you be and why?
- List 5 facts about it

9/13 Building Molecules CH 6.3

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



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?

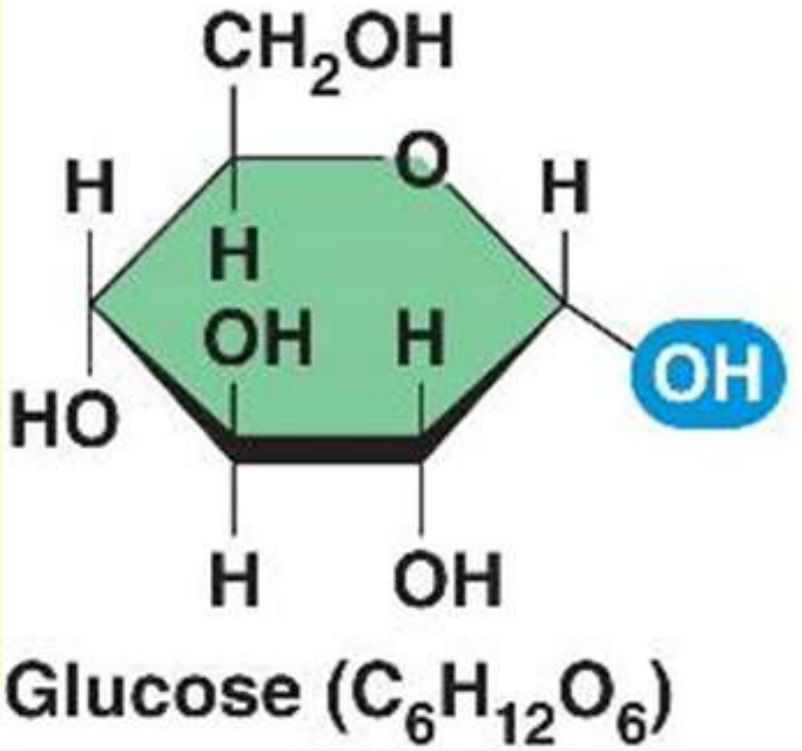


2. Enzymes are Proteins and they speed up chemical reactions. Temperature, pH, Amount of substrate or enzyme, Ionic Conditions (Salt).

Using your Cycles in Nature, build the molecule that is most evident for your cycle: P. 45 NB

H_2O, CO_2, NH_3, NO, NO_2, NO_3, O_2, CH_4, $C_6H_{12}O_6$

- Carbon = Black
- Oxygen = Red
- Hydrogen = White
- Nitrogen = Blue



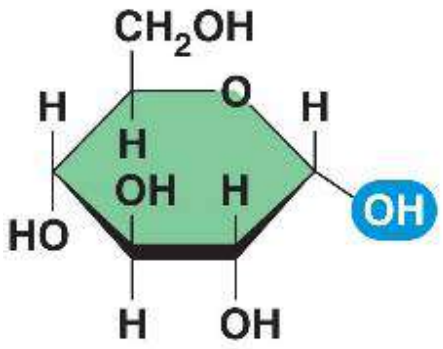
Glucose ($C_6H_{12}O_6$)

Build a Monosaccharide!

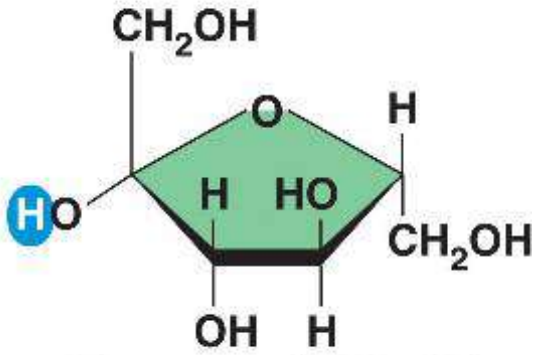
Show me a correct monosaccharide for extra credit!

Some Helpful Hints:

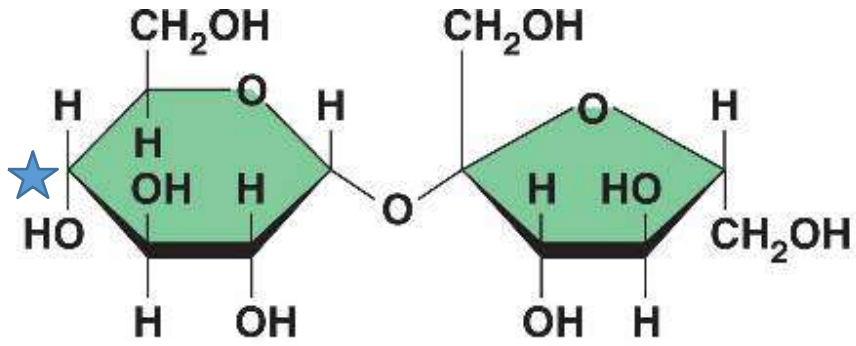
- **Black** atoms are **Carbon** (**C**).
  - Carbon always needs to be bonded to 4 other atoms.
- White atoms are Hydrogen (H).
  - Hydrogen only bonds to 1 atom.
- Red atoms are Oxygen (O)
  - Oxygen bonds to 2 atoms.
- Every unidentified **corner** is a **Carbon** atom.
  - For example, look at the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



Glucose ($C_6H_{12}O_6$)

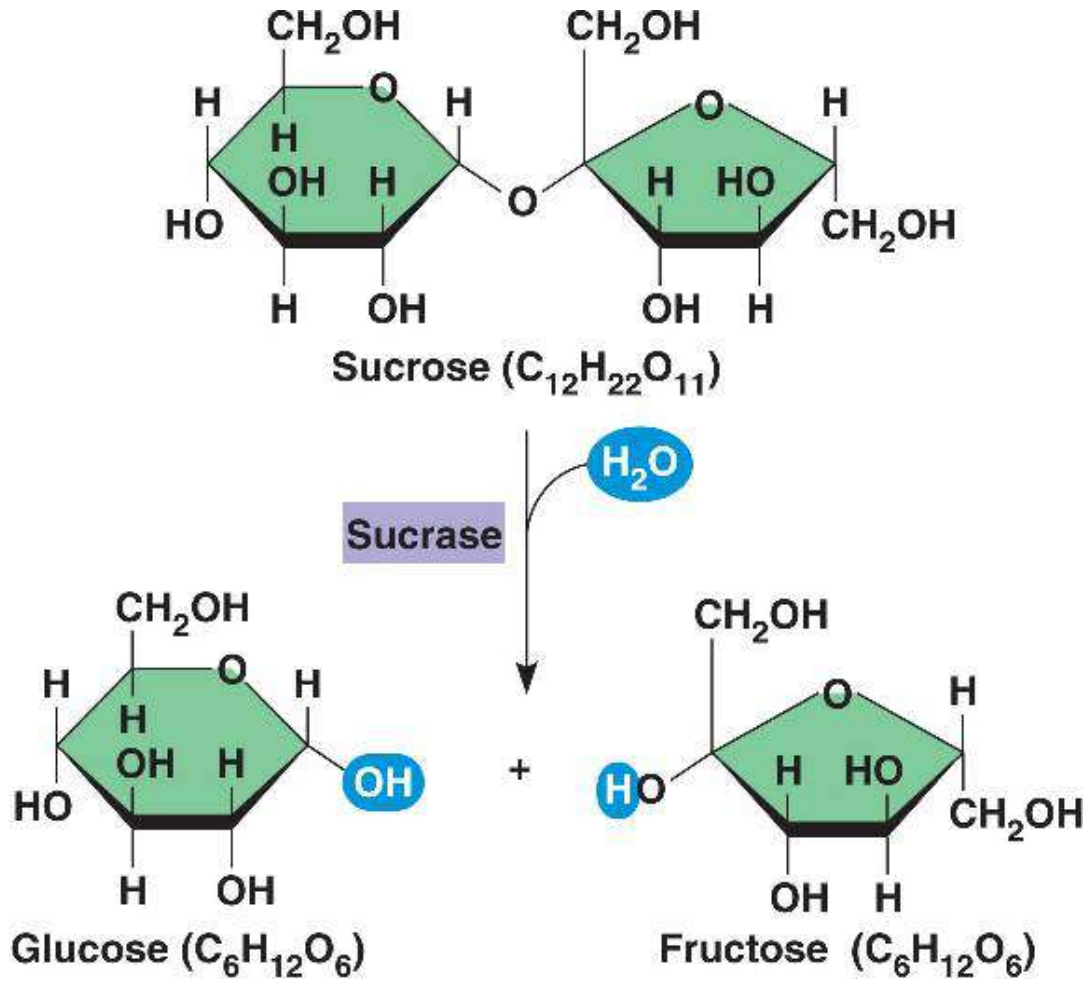


Fructose ($C_6H_{12}O_6$)



Sucrose ($C_{12}H_{22}O_{11}$)

Enzymatic Reaction of Sucrase on Sucrose



Catalase Lab

ml H2O2	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?

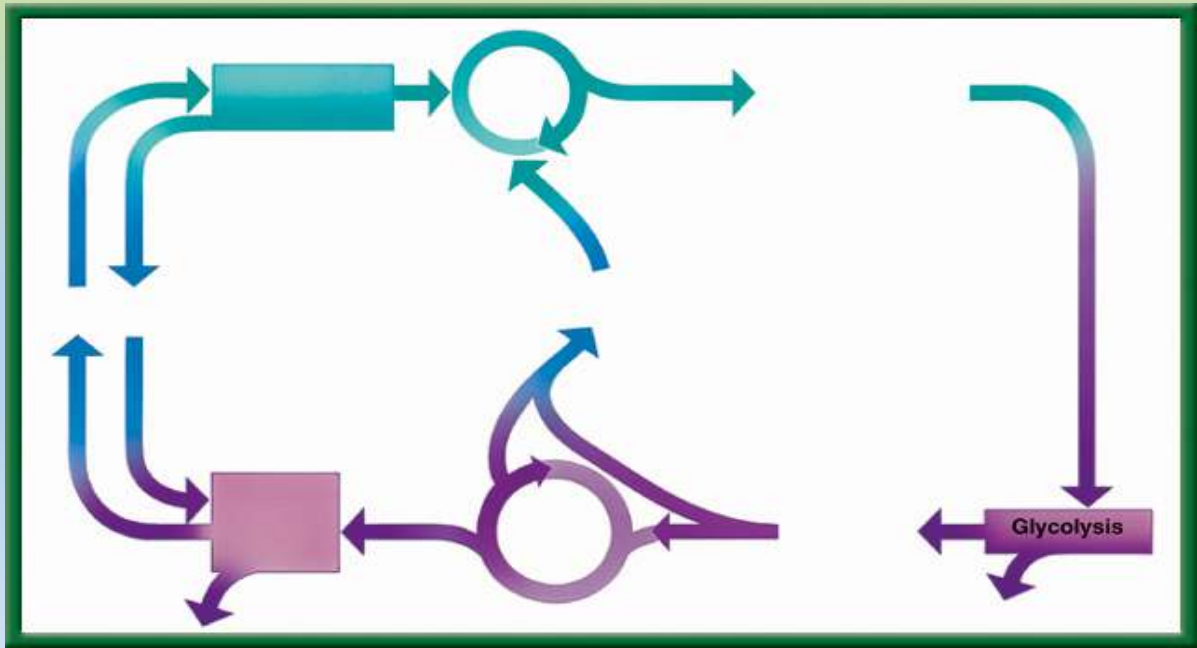
9/18 Cellular Respiration & Fermentation 9.3

Obj: TSW be able to compare and contrast photosynthesis and cellular respiration by completing the flow chart activity. pg. 50 NB

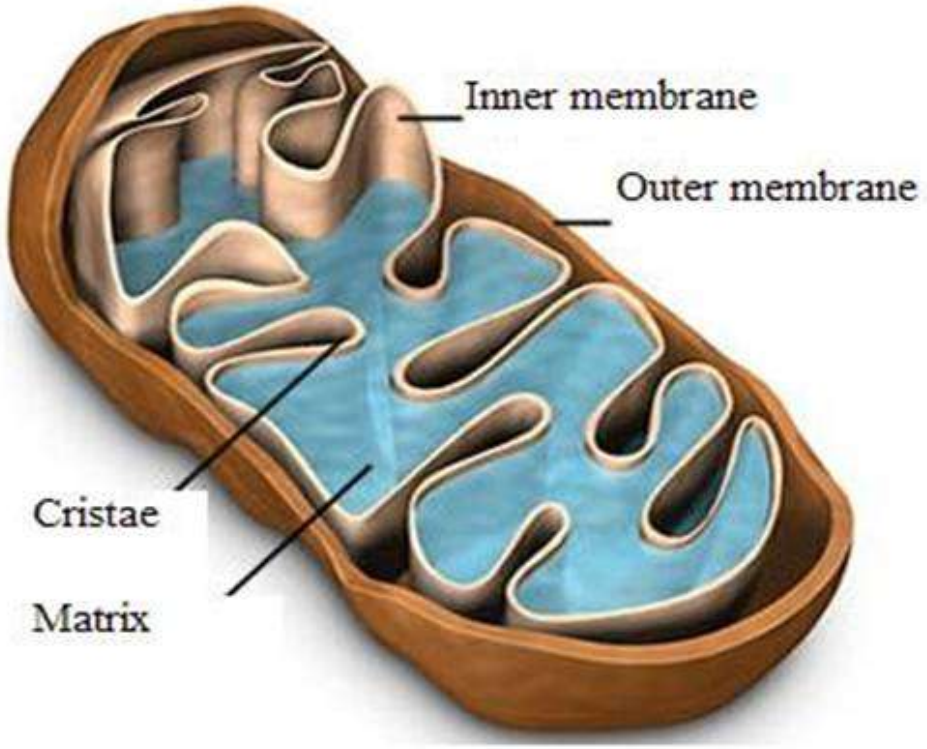
1) What is **Cellular Respiration**? Identify the three stages.

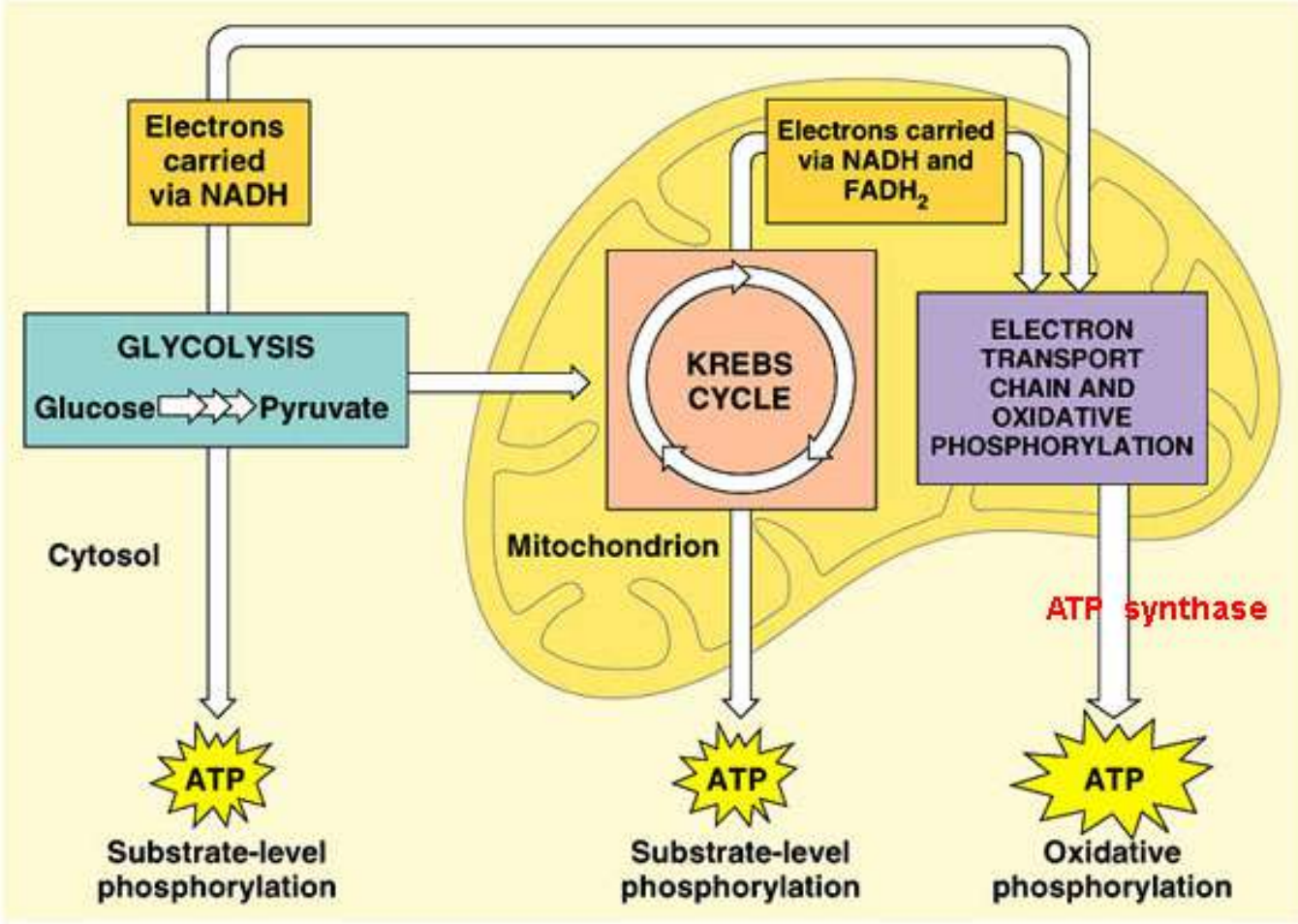
2) How is it related to Photosynthesis?

3) What is fermentation, where does it happen in the cycle?

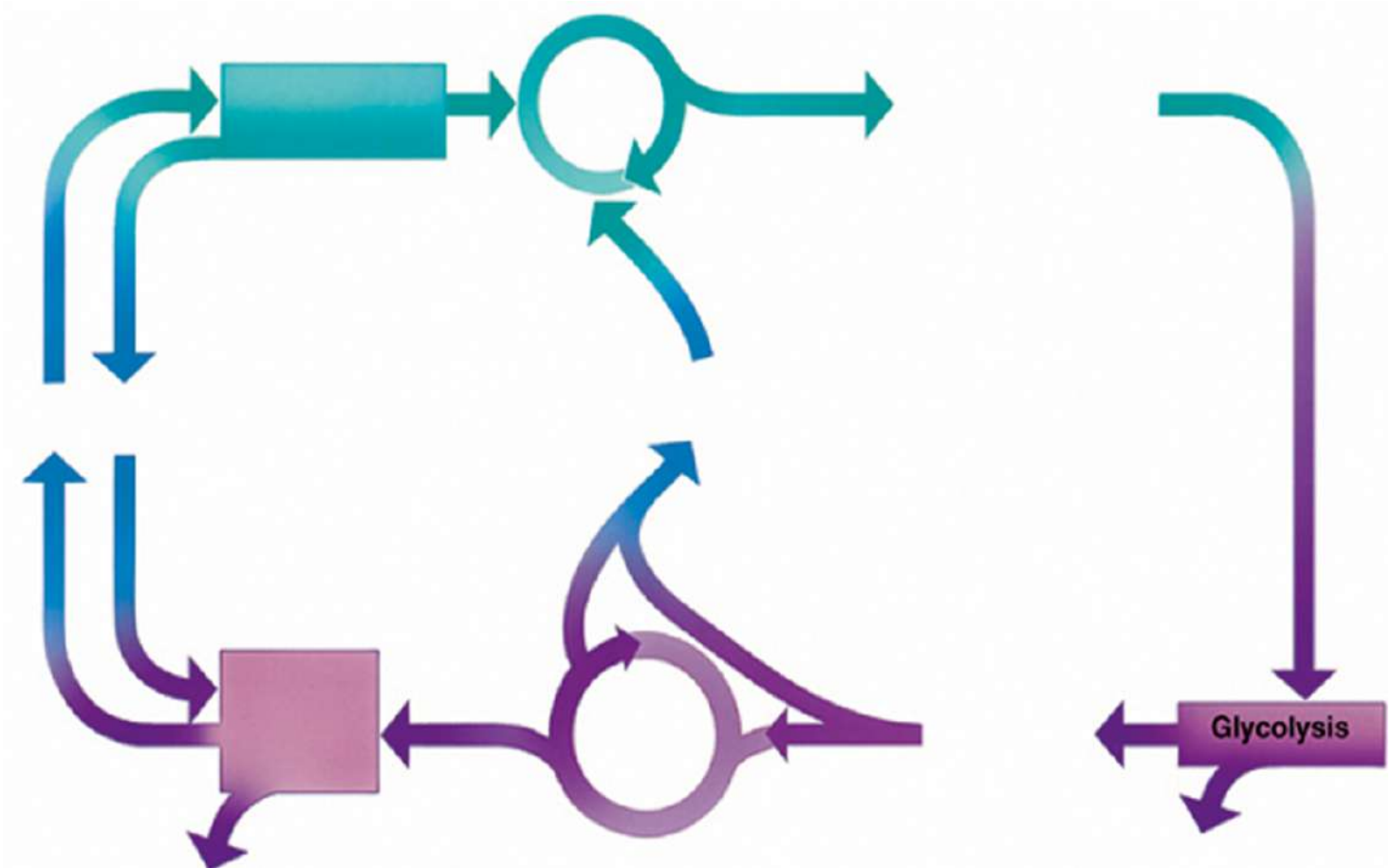


1. Cellular Respiration – converts glucose in to ATP and Heat in the mitochondria. The three stages are Glycolysis, Krebs Cycle, and the Electron Transport Chain.
All living organisms perform Cellular Respiration, including plants.





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



9.3

2. P.50 NB Compare and contrast **cellular respiration** and **photosynthesis**.

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

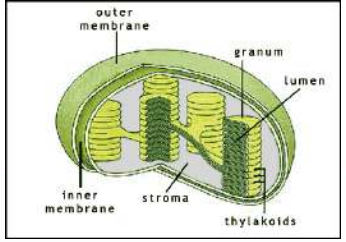
To return to th

Photosynthesis vs. Cellular Respiration

	Photosynthesis	Cellular Respiration
Stores Energy as glucose	✓	
Releases Energy in glucose		✓
Occurs in Living Cells	✓	✓
Uses an Electron Transport Chain	✓	✓
Occurs in Plant Cells	✓	✓
Occurs in Animal Cells		✓
Releases Oxygen	✓	
Releases Carbon Dioxide		✓
Creates Energy	Neither!	

P. 51 NB Write a summary paragraph

PHOTOSYNTHESIS (in the chloroplast)



Photolysis

- Uses light energy to break water (H_2O) down to oxygen (O_2).
- Needs light!

H_2O O_2

Calvin cycle

Glucose is made

- Uses energy from photolysis and CO_2 to produce sugar = glucose → $C_6H_{12}O_6$
- Does not need light!

CO_2

Where most of your energy is made. Needs Oxygen

Breaks down sugar into pyruvic acid → $2*(C_3H_6O_3)$ and ATP (energy) Cytoplasm

Glycolysis

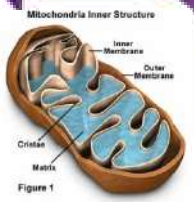
2 ATP

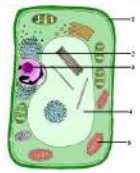
Pyruvic acid

Citric acid Or Krebs Cycle

Electron Transport chain

36 ATP Heat





CELLULAR RESPIRATION (in cytoplasm and mitochondria)

Macromolecules

Protein	Lipids	Carbohydrates	Nucleic Acids

How to Make Carbohydrates Activity p. 51NB

1. 6 CO_2 + 6 H_2O -> $C_6H_{12}O_6$ + 6 O

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.
7. 6 H_2O + 6 CO_2 →(light) Catalyst → $C_6H_{12}O_6$ + O_2

Glucose Synthesis Activity

Photosynthesis: $6\ CO_2 + 6\ H_2O \rightarrow C_6H_{12}O_6 + 6\ O$

- 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
- $C_6H_{12}O_6$

Cellular Respiration: $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_20 + 36\ ATP + Heat$

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.

END OF SLIDE

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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.

END OF SLIDE

To return to the chapter summary click escape or close this document.

PREVIOUS SLIDE TABLE OF CONTENTS NEXT SLIDE RESOURCES

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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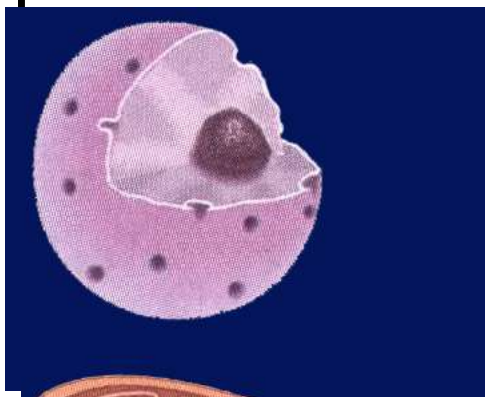
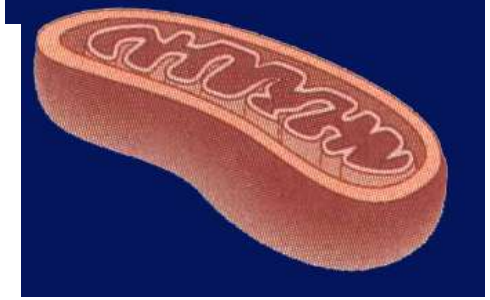
RESOURCES

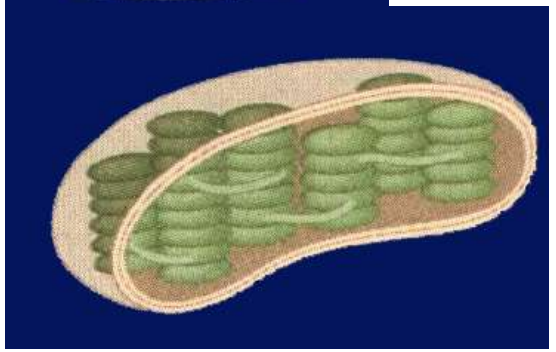
Question 4

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

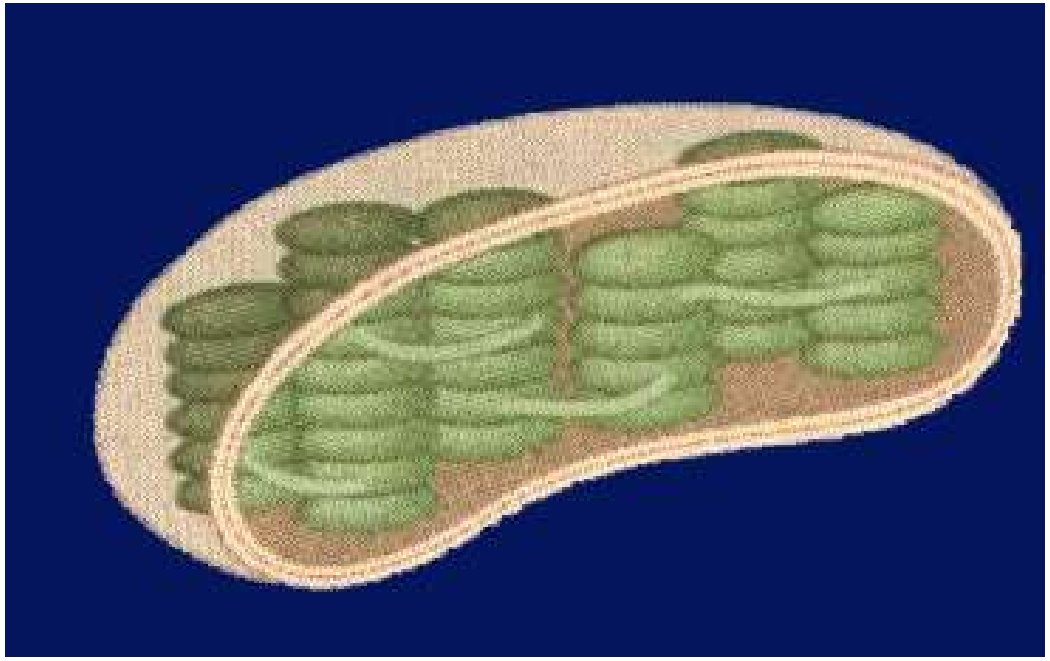
A. 

B. 

C. 

D. 

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.

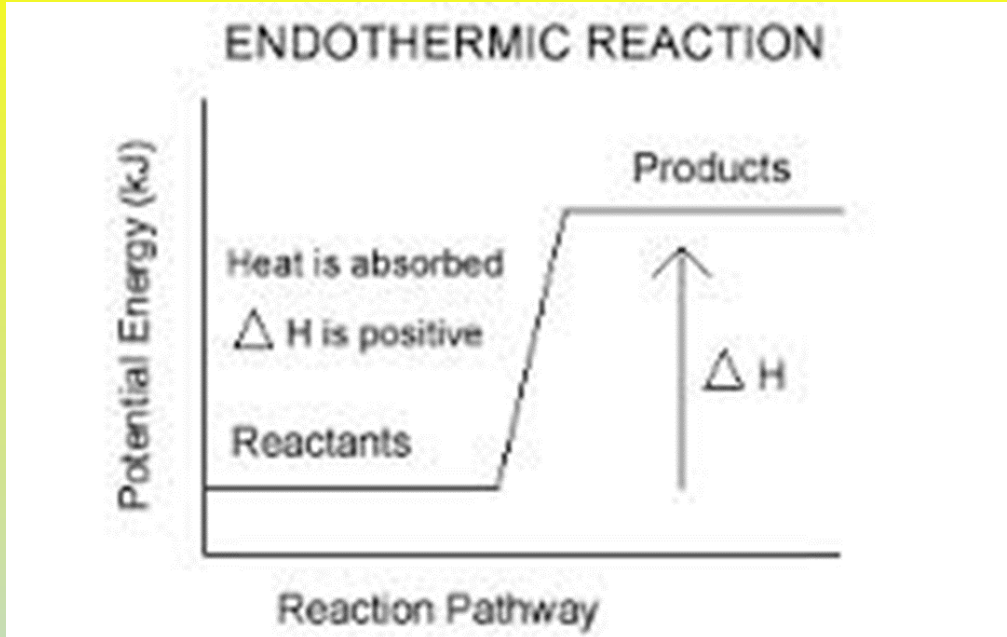
- Pablo Picasso

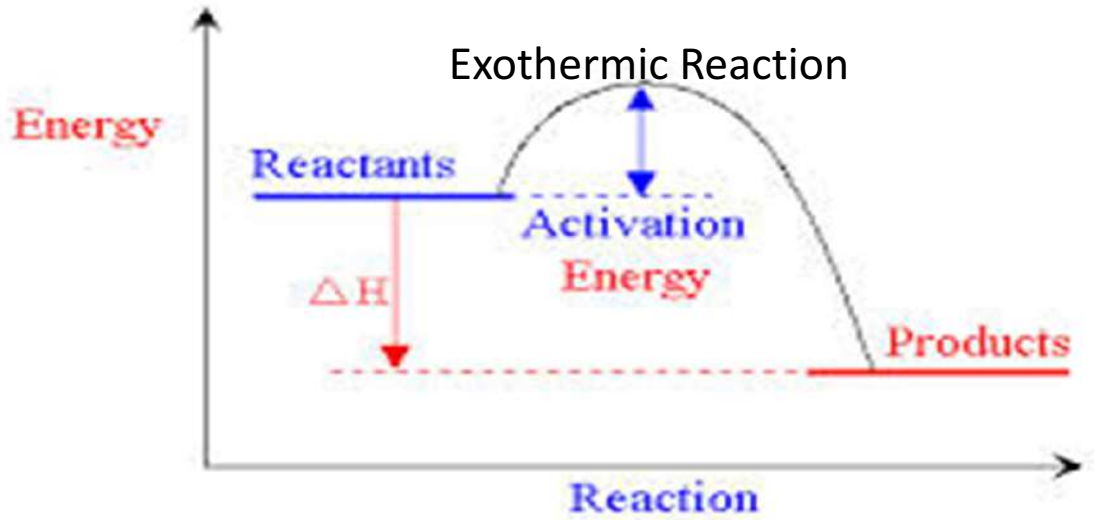
Kahoots Energy Quiz

9/19 Energy in Cells

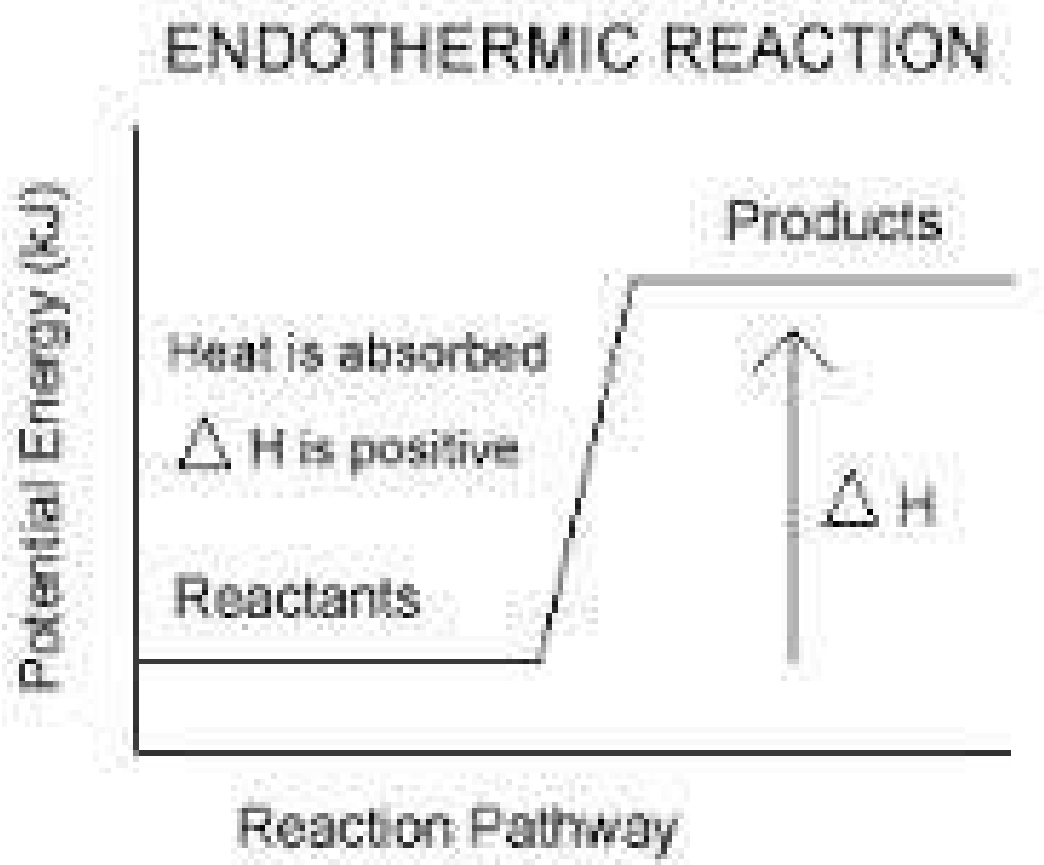
Obj. TSW learn how energy is stored in the bonds of molecules and released when bonds are broken. P. 52 NB

1. Copy this graph of an **endothermic** reaction. Describe in complete sentences how energy is stored using the Independent and dependent variables.
2. Copy this graph of an **exothermic** reaction. Describe in complete sentences how energy is released using the Independent and dependent variables in our explanation.
3. What molecule in plants stores energy, what is the product we feel in an exothermic reaction?

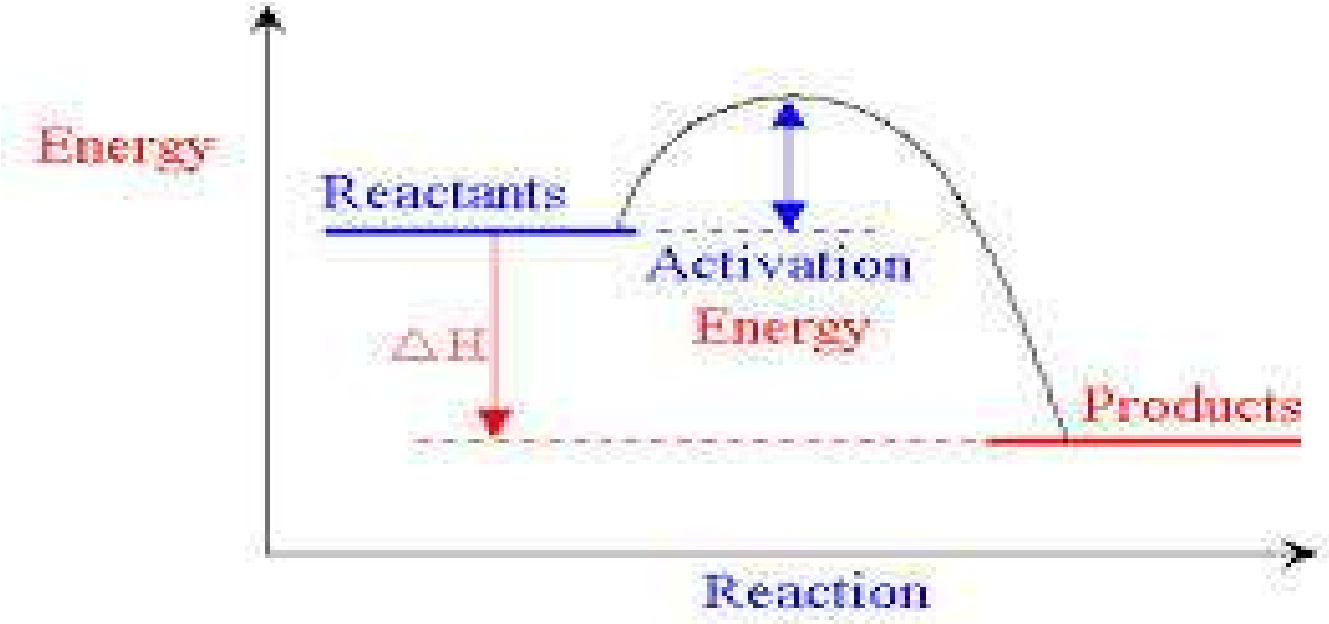




Endothermic Reaction – Photosynthesis p. 45 NB
Stores energy in Chemical Bonds - Glucose



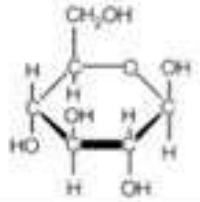
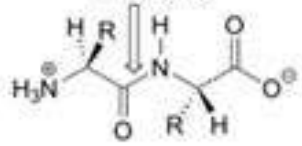
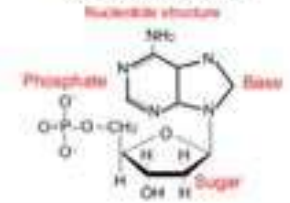
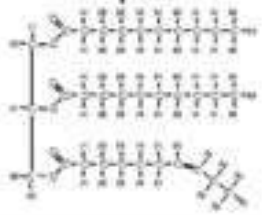
Exothermic Reaction – Yeast + Hydrogen Peroxide
Cellular Respiration P. 45NB
Releases Heat



9/20 Monomers & Polymers CH 6.3

Obj. TSW learn the 4 macromolecules and the subunits that make them. P. 54 NB

1. Review your notebook or CH 6.3 and write the 4 Macromolecules/ Biomolecules or Life Molecules.
2. Read carefully through the book and write the subunits for each of the Biomolecules. What are each of the Biomolecules made of?
3. What elements make up each Polymer? (CHONPS)

Biomolecules	Monomer(s)	Function	Food Source	Example(s)
Carbohydrates 	Monosaccharides	Provide material to build cell membrane Quick energy for cells	Pastas Breads Fruits Vegetables	Glucose Fructose Lactose Cellulose
Proteins 	Amino Acids	Provide structure Aid in muscle movement Provide immunity	Seafood Milk Eggs Cheese	Insulin Hemoglobin Antibodies Enzymes
Nucleic Acids 	Nucleotides	Contains genetic information Directs growth and development	XXX	DNA RNA
Lipids 	Glycerol (backbone) Fatty Acids	Store energy Cushion and insulate organs Material used for cell membrane	Butter Nuts Oil	Fats Oils Waxes

Taboo

Cellular Respiration

Vacuole

Prokayotic

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**

Photosynthesis & Cellular Respiration AXES Paragraph

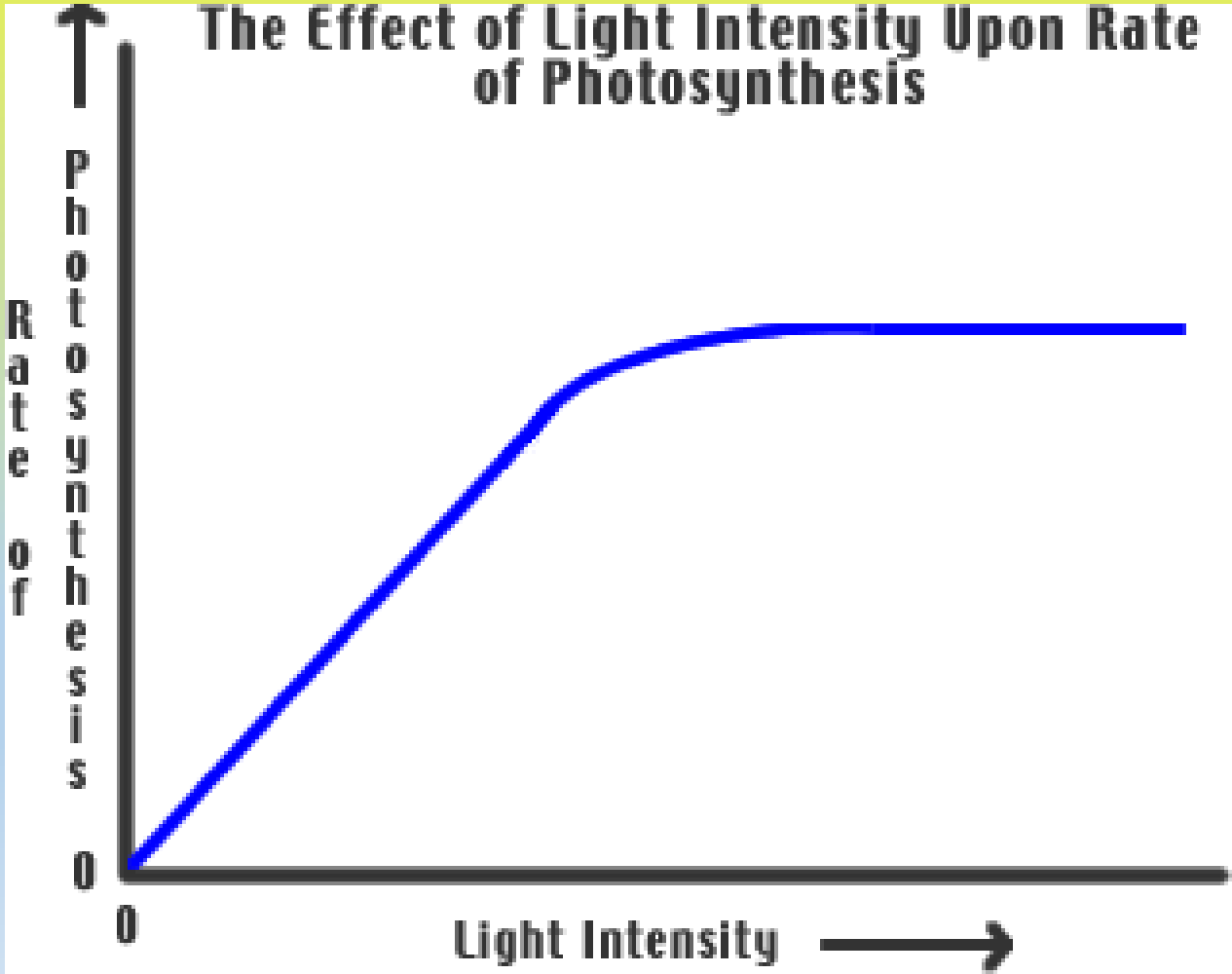
READ your highlighted parts of your article, Write an AXES paragraph on page 57NB

Assertion
e**X**ample
Explanation
Significance

- 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 and converts it to ATP & Heat
- Photosynthesis = Chloroplast
- Cellular Respiration = Cytoplasm, Mitochondria
- $6CO_2 + 6H_20 \rightarrow C_6H_{12}O_6 + 6O_2$ Photosynthesis
- $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_20 + 36$ ATP + Heat Cellular Respiration

9/21 Reading a graph for information
Obj. TSW review variables and the control in a lab and analyze the graph. P. 56 NB

1. Compare & Contrast Independent and Dependent Variables.
2. Why is the Control important?
3. Using the graph, what is the trend? How do you know?



Leaf Disk Assay Lab

- 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.

	Sodiun Bicarbonate	Water
0 Minute		
1 Minute		
2 minute		
3 minute		
4 minute		
5 minute		

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, CO2 given off, O2 taken in, does not require light, occurs in all living cells**

They both produce Energy.

Photosynthesis: **Food synthesized, energy from sun stored in glucose, CO2 taken in, O2 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 (C6 H12 O6) 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, Cataylase & 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 H_2O_2.
- Dependent Variable: More Carbon Dioxide was produced.
- Control: 10 mL of H_2O_2 & 1 piece of potato.

Enzyme – Catalyse Lab Page 47 NB

- Constant: Same potato, H2O2, balloons, Flasks
- Materials & Equipment: H2O2½ tsp., balloons, Hot plate, Flask
- Experimental Set up: Draw only
- Safety Concerns: Don’t eat the potatos.
- Procedure : Write the steps…. Step 1, Step 2, Step 3,
- Answer Analysis questions on the lab.

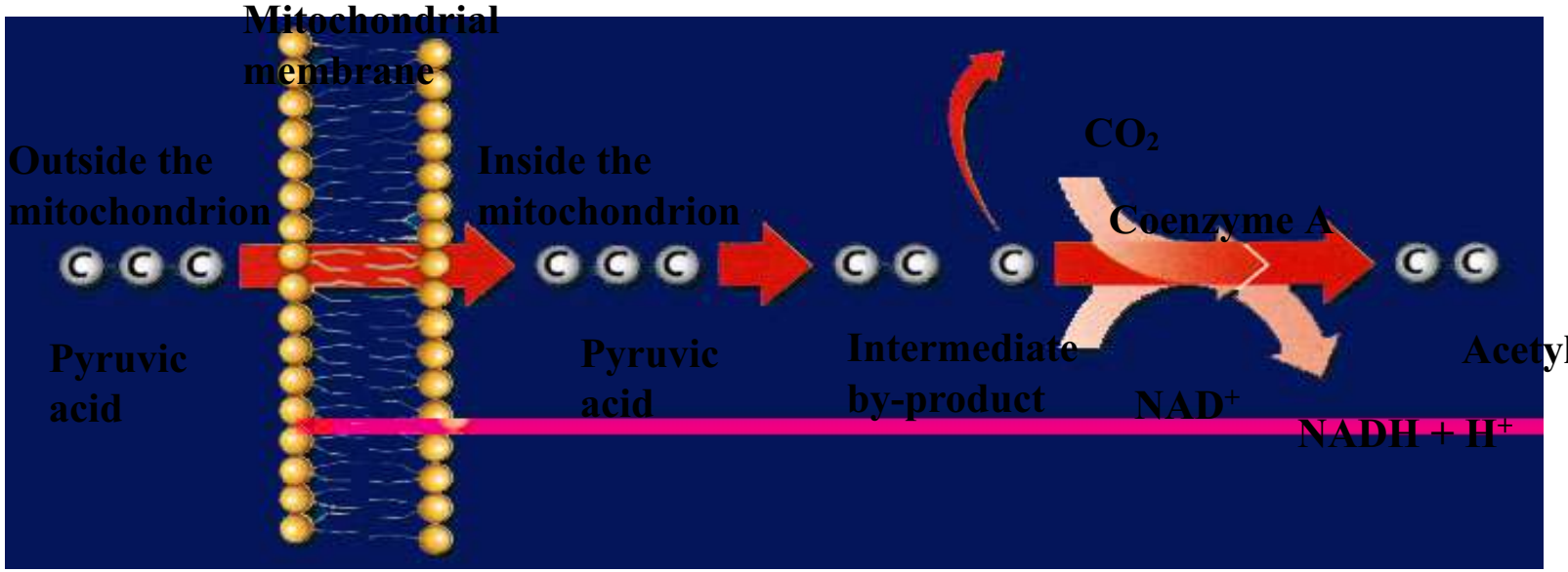
STAGE 1: GLYCOLYSIS

- 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.

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.



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

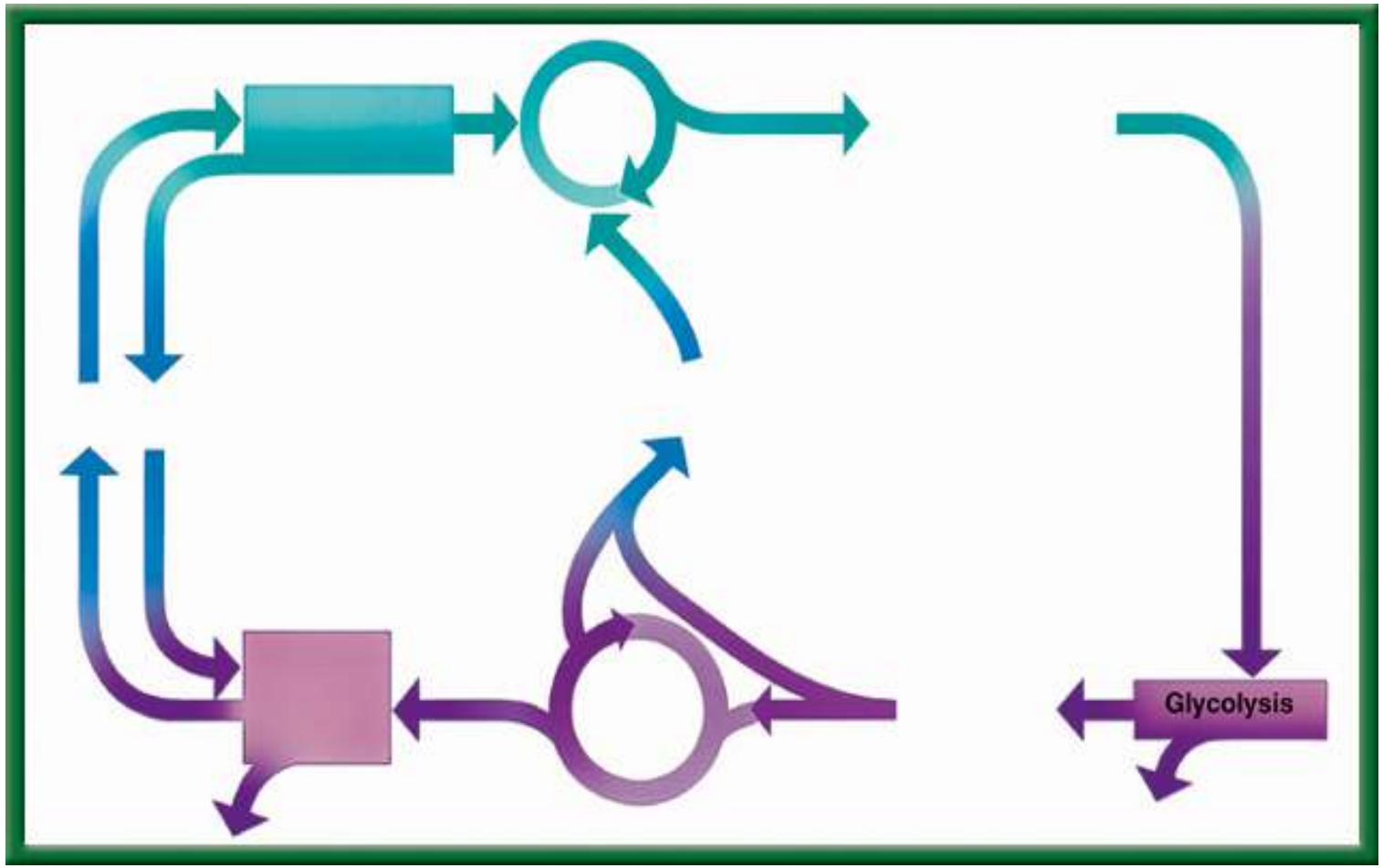
PROBLEM

- 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

Transparencies



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