

Day 1 ~ Biology EOC Panther Run

Energy & Life

The chart below shows key terms from the lesson with their definitions. Complete the chart by writing a strategy to help you remember the meaning of each term. One has been done for you.

Term	Definition	How I'm Going to Remember the Meaning
Adenosine triphosphate (ATP)	Compound that cells use to store and release energy	<u>A</u>TP makes a cell <u>a</u>ble to do work.
Autotroph	A living thing that makes its own food	
Heterotroph	A living thing that gets its food by consuming other living things	
Photosynthesis	Process by which autotrophs use sunlight, water, and carbon dioxide to produce carbohydrates and oxygen	

ATP as a Charged Battery An analogy takes two things that seem to be different and shows how they can be similar.



1. How is a partially charged battery like ADP? _____

2. Why do cells contain only a small amount of ATP?

- A. ATP cannot store large amounts of energy for a long time.
- B. ATP releases energy too quickly.
- C. ATP cannot carry out active transport.
- D. ATP has only two phosphate groups.

Compare/Contrast Table Use a compare/contrast table when you want to see the similarities and differences between two or more objects or processes. As you read, place an “X” in the box next to characteristics that are true of an autotroph or a heterotroph. One has been done for you.

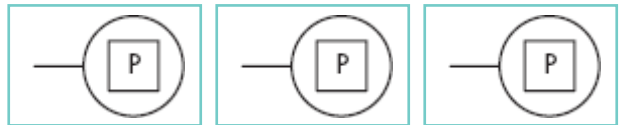
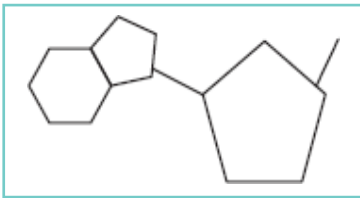
	Autotroph	Heterotroph
Directly uses sunlight for energy	X	
An oak tree is an example.		
A mushroom is an example.		
Makes its own food		
Consumes other living things to get energy		
Is capable of photosynthesis		

Chemical Energy and ATP

Chemical Energy Living things use chemical fuels. One of the most important compounds that cells use to store and release energy is ATP.

Follow the directions. Then answer the questions.

- Trace the outlines of the adenosine molecule and the three phosphate groups.
- Cut out each phosphate group.
- Arrange the phosphate groups on the adenosine molecule to form a molecule of ATP.



4. When ATP is changed to ADP, it releases energy. Change your ATP molecule so that it forms ADP. What change did you make? _____

5. ADP can be converted into ATP. Change your ADP molecule into ATP. What change did you make?

6. Fill in the blanks with *two* or *three*. The primary difference in the structures of ATP and ADP is that ATP has _____ phosphate groups and ADP has _____ phosphate groups.

Photosynthesis

How do plants make food ?

Plants make their own food in their leaves. They do not get food from the soil or from water. The leaves can make food for the plant because they are green. The green chemical in a leaf is called CHLOROPHYLL. Plants make food in a process called PHOTOSYNTHESIS. Photosynthesis can take place slowly or quickly. It depends on the temperature of the air. Photosynthesis takes place more quickly when it is warm.

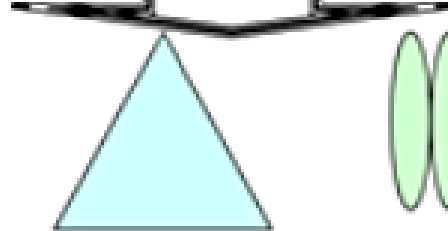
Here are the 4 things needed for photosynthesis to take place:



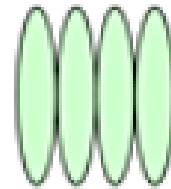
sunlight



water



carbon dioxide



chlorophyll

Now see if you can answer these questions with TRUE or FALSE.

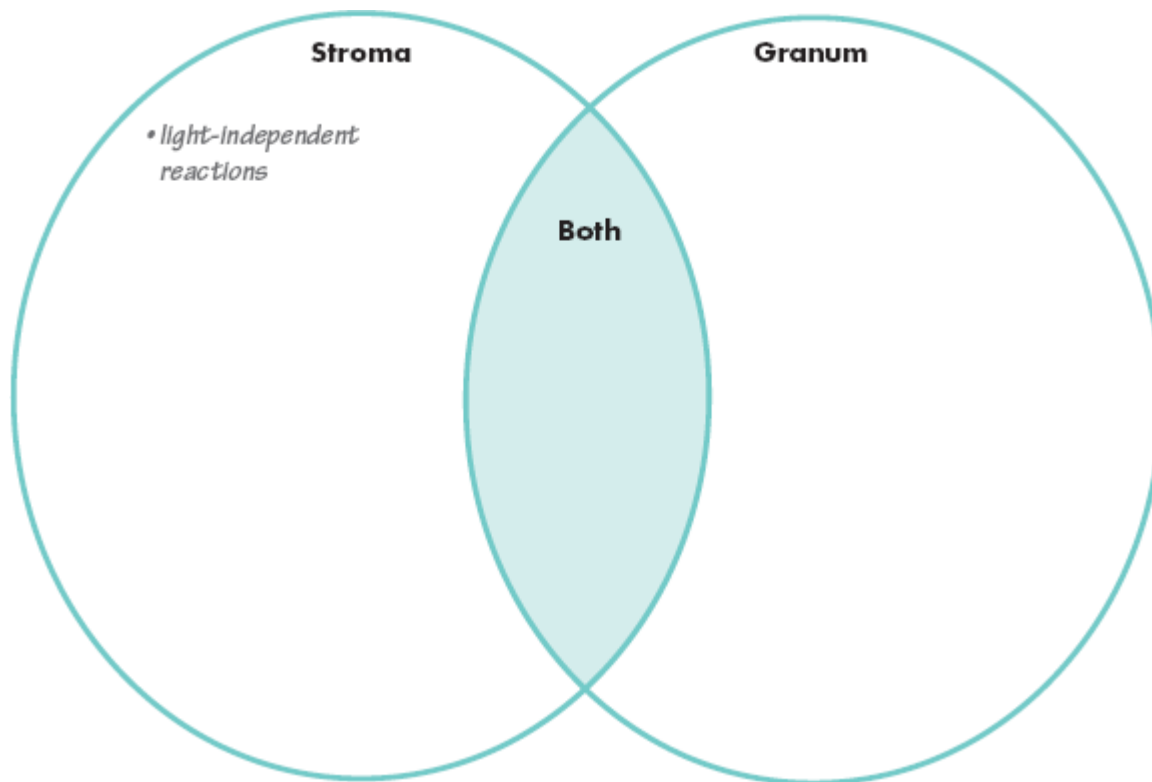
1. Plants get food from the soil. _____
2. Plants make food in their green leaves. _____
3. Water gives the plant the food it needs. _____
4. It is the green chemical in leaves that helps make the food. _____
5. To make food a plant needs oxygen. _____
6. Chlorophyll is green. _____
7. Photosynthesis makes chlorophyll. _____
8. Photosynthesis is when the plants makes food in its leaves. _____
9. A plant needs water to make food. _____
- 10 The plant gets food from the sun. _____
- 11 Sunlight is needed for photosynthesis. _____
- 12 The speed of photosynthesis is always the same in a leaf. _____
- 13 The speed of photosynthesis depends on the temperature. _____
- 14 It needs to be warm for photosynthesis to take place quickly. _____

Chlorophyll and Chloroplasts

Photosynthesis in plants takes place in organelles called chloroplasts. Within each chloroplast is a fluid-filled area called the stroma. Also inside each chloroplast are many saclike membranes called thylakoids. Thylakoids are connected to each other in stacks. Each stack is a granum.

Complete the Venn diagram to compare the stroma and a granum in a chloroplast. Use the phrases below. One has been done for you.

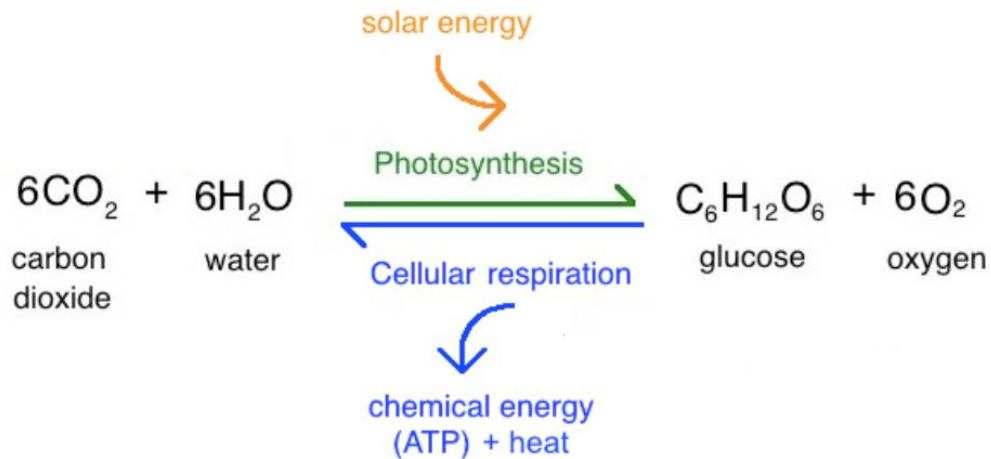
- contains pigments
- light-dependent reactions
- fluid portion of chloroplast
- located within a chloroplast



Answer the questions. Circle the correct answer(s).

1. Which reactions change the energy of sunlight to energy-rich carriers?
 light-dependent reactions light-independent reactions
2. Which two reactants are needed for light-dependent reactions?
 carbon dioxide light oxygen water
3. Which two reactants are needed for light-independent reactions?
 carbon dioxide energy-rich compounds oxygen stroma

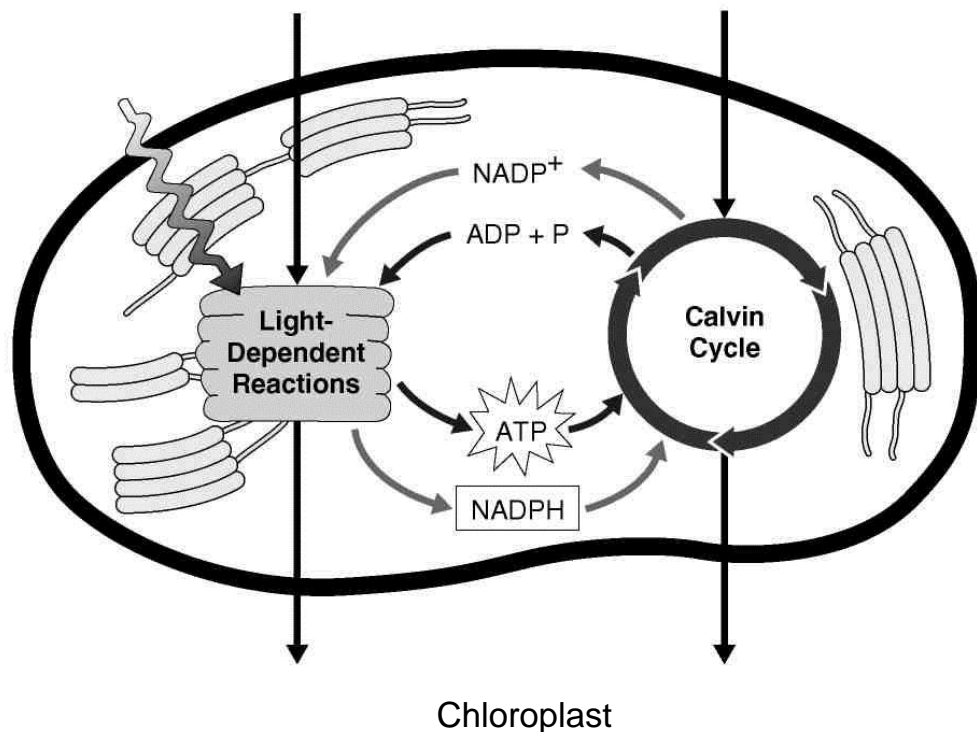
Photosynthesis Reaction



Inside Chloroplasts

1. Chloroplasts contain saclike photosynthetic membranes called _____.
2. What is a granum? _____
3. The region outside the thylakoid membranes in the chloroplasts is called the _____.
4. What are the two stages of photosynthesis called?
 - a. _____
 - b. _____

5. Complete the illustration of the overview of photosynthesis by writing the products and the reactants of the process, as well as the energy source that excites the electrons.



Comparing Photosynthesis and Cellular Respiration

Cellular respiration and photosynthesis can be thought of as opposite processes. Energy flows in opposite directions in the two processes.

Complete the table using the words below. Some words may be used more than once. You will use more than one term in some of the spaces.

carbon dioxide energy release mitochondria water

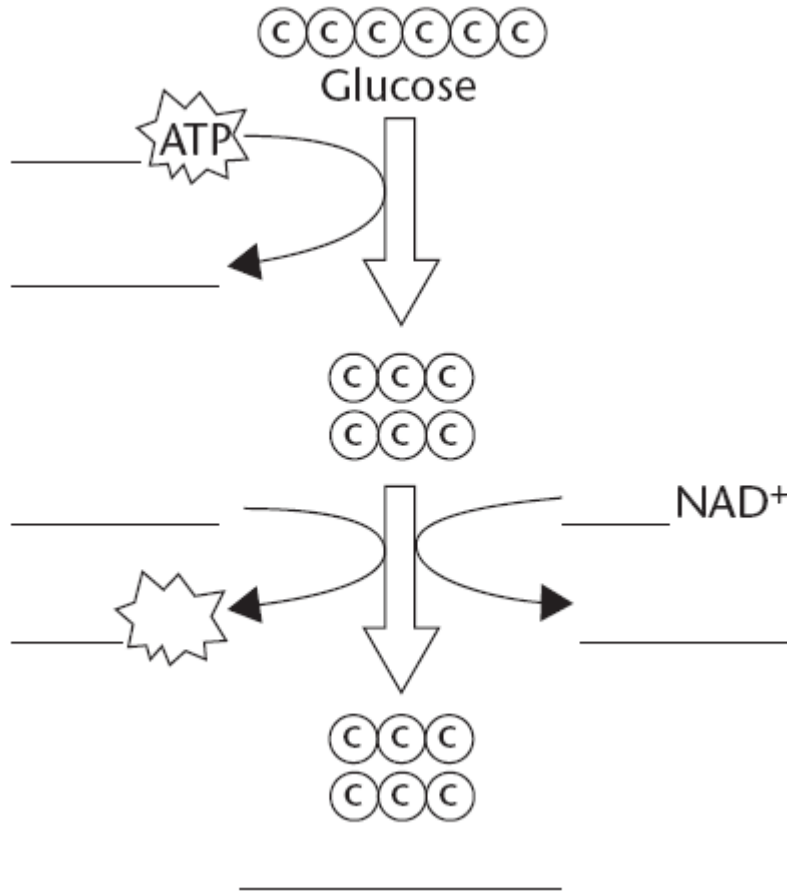
	Photosynthesis	Cellular Respiration
Function	energy capture	
Location	chloroplasts	
Reactants		glucose and oxygen
Products	oxygen and glucose	

Answer the questions

- Circle the correct answer. Which process releases energy for the cell?
cellular respiration photosynthesis
- Circle the correct answer. For which reaction is $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$ the correct equation?
cellular respiration photosynthesis
- Which statement about cellular respiration is true?
 - Cellular respiration does not use energy.
 - The total amount of energy is constant.
 - Energy is destroyed during the reaction.
 - Energy is created during the reaction.
- How are the processes of photosynthesis and cellular respiration connected?
 - The products of both processes are the same.
 - The reactants for one process are the same as the reactants for the other process.
 - Each process provides the materials needed in the other process.
 - There is no direct relationship.

Cellular Respiration ~ Glycolysis

Complete the diagram by writing on the lines provided the names and numbers of molecules used and produced during glycolysis.



2. Why is it an investment for the cell to use two ATP at the beginning of glycolysis?

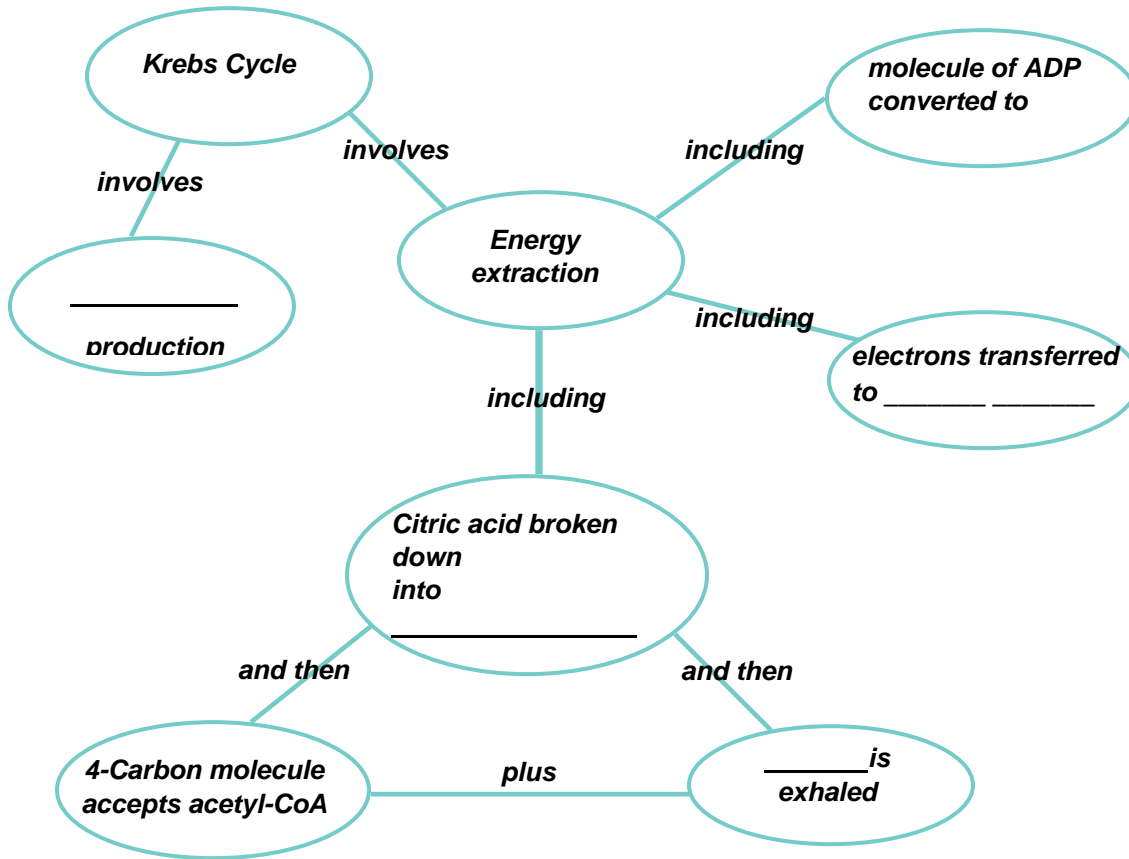
3. What are two advantages of glycolysis?

Cellular Respiration ~ Krebs Cycle

The Krebs Cycle

Pyruvic acid is formed during glycolysis. If oxygen is present, the pyruvic acid moves into the Krebs cycle. In the Krebs cycle, pyruvic acid is changed into carbon dioxide. High-energy electrons are accepted by NAD^+ and FAD . This results in the formation of NADH and FADH_2 . NADH and FADH_2 are used in another process to make ATP. A model of the Krebs cycle is shown below.

1. Fill in the details missing from the concept map below.



2. Why is it incorrect to say that a 4-carbon molecule is produced at the end of the Krebs cycle?

3. What happens to the carbon dioxide that results from the Krebs cycle?

STAND BACK. I'M TOSSING IN MY ACETYL-CoA.



THE ACETYL GROUP IS MOVED FROM COENZYME A TO A FOUR CARBON MOLECULE CALLED OXALOACETATE. THIS CREATES A SIX-CARBON MOLECULE THIS CALLED CITRATE.

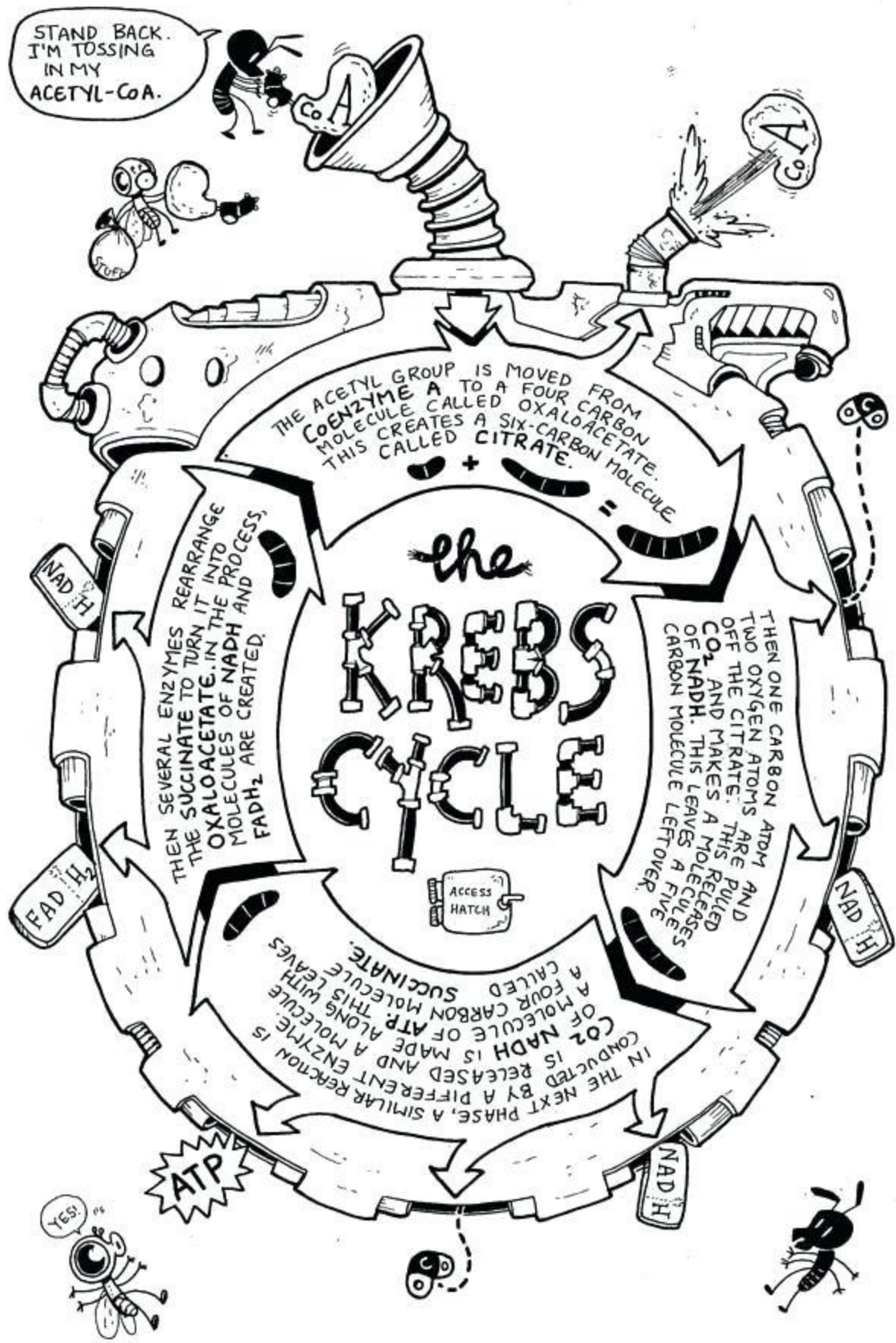
the KREBS CYCLE



THEN SEVERAL ENZYMES REARRANGE THE SUCCINATE TO TURN IT INTO OXALOACETATE. IN THE PROCESS, MOLECULES OF NADH AND FADH₂ ARE CREATED.

THEN ONE CARBON ATOM AND TWO OXYGEN ATOMS ARE PULLED OFF THE CITRATE. THIS RELEASES CO₂ AND MAKES A MOLECULE OF NADH. THIS LEAVES A FIVE CARBON MOLECULE LEFT OVER.

IN THE NEXT PHASE, A SIMILAR REACTION IS CONDUCTED BY A DIFFERENT ENZYME. CO₂ NADH IS MADE AND A MOLECULE OF ATP IS RELEASED ALONG WITH A FOUR CARBON MOLECULE CALLED SUCCINATE.



Cellular Respiration ~ Electron Transport

Electron Transport and ATP Synthesis

The electron transport chain uses the high-energy electrons produced by the Krebs cycle to move hydrogen ions from one side of the inner membrane to the other.

Complete the flowchart about electron transport. Use the terms in the box.

intermembrane	electron transport chain	ATP synthase
positively	inner membrane	ATP

High-energy electrons from NADH and FADH₂ are passed into and along the _____.

The energy from the electrons moving down the chain is used to move H⁺ ions across the _____.

H⁺ ions build up in the _____ space, making it _____ charged and making the matrix negatively charged.

H⁺ ions move through channels of _____ in the inner membrane.

The ATP synthase uses the energy from the moving ions to combine ADP and a phosphate, forming high-energy _____.

The Totals

15. How many ATP molecules per glucose molecule does a cell gain from each of the three stages of cellular respiration?

16. Besides glucose, what other kinds of molecules can be used to produce ATP in cellular respiration?

17. Why is cellular respiration considered an efficient process?

Compare/Contrast Table Use a compare/contrast table when you want to see the similarities and differences between two or more objects or processes. Look at the table below. The three stages of cellular respiration are shown across the top. The topics being compared are listed in the first column.

As you read about the process of cellular respiration, complete the table. The first one has been done for you. Use the completed chart as a study aid.

Steps of Cellular Respiration			
	Glycolysis	Krebs cycle	Electron transport chain
Where in cell it occurs	<i>cytoplasm</i>	<i>matrix of mitochondria</i>	<i>inner membrane of mitochondria</i>
Starting reactants			
Ending products			
Number of ATP molecules either produced or gained			
Is oxygen required?			

Answer the questions.

1. Where do the reactants for the Krebs cycle come from? _____

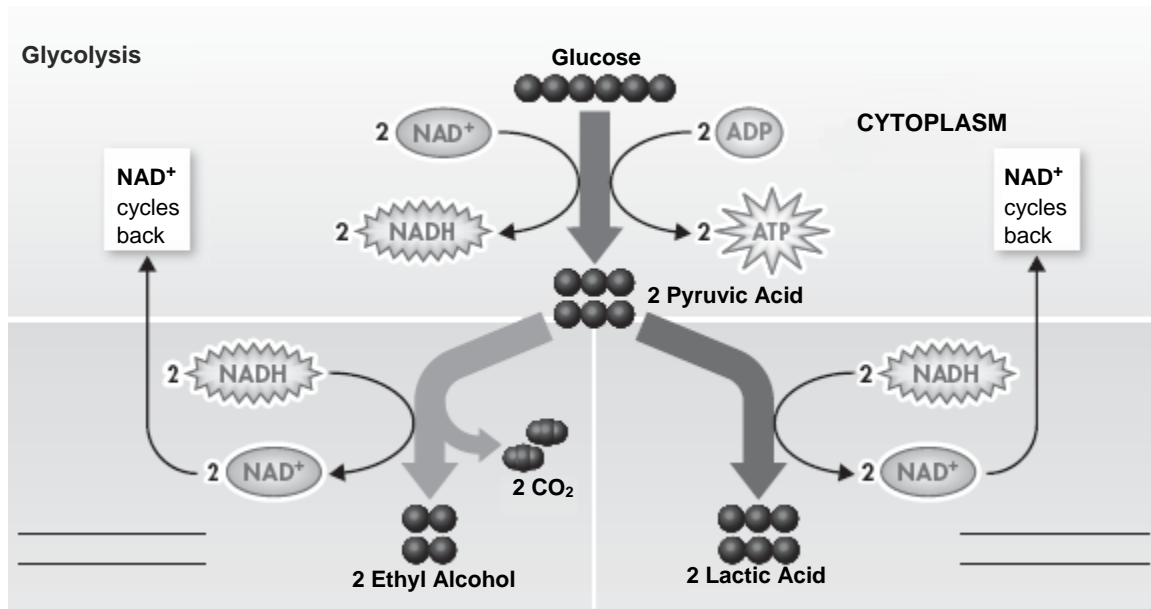
2. What is the name of the protein spheres that spin as hydrogen ions pass through them?

Fermentation

Fermentation is respiration without oxygen. In fermentation, energy is released from food molecules by producing ATP. There are two forms of fermentation: alcoholic fermentation and lactic acid fermentation. Alcoholic fermentation is what makes bread rise. It is also used in alcoholic beverages. Lactic acid fermentation is used to produce foods such as cheese, yogurt, pickles, and kimchi. The diagram below shows the two types of fermentation.

Follow the directions.

1. Label the process that shows alcoholic fermentation.
2. Label the process that shows lactic acid fermentation.



Circle the correct answer. Questions may have more than one correct answer.

3. Alcoholic fermentation is used to make which product?

- bread cheese yogurt pickles

4. What kind of taste do lactic acid bacteria give foods?

- sweet salty sour spicy

5. What are some milk products made from lactic acid fermentation?

- milk sour cream yogurt cheese

6. What is one main difference between fermentation and aerobic respiration?

PUNNETT SQUARES— CROSSES INVOLVING ONE TRAIT

In a certain species of animal, black fur (B) is dominant over brown fur (b). Using the following Punnett square, predict the genotypes and phenotypes of the offspring whose parents are both Bb or have heterozygous black fur.

	B	b
B		
b		

Genotypes: _____% homozygous black fur (BB)
 _____% heterozygous black fur (Bb)
 _____% homozygous brown fur (bb)

Phenotypes: _____% black fur
 _____% brown fur

Now do the same when one parent is homozygous black and the other is homozygous brown.

Genotypes: _____% homozygous black fur (BB)
 _____% heterozygous black fur (Bb)
 _____% homozygous brown fur (bb)

Phenotypes: _____% black fur
 _____% brown fur

Repeat this process again when one parent is heterozygous black and the other is homozygous brown.

Genotypes: _____% homozygous black fur (BB)
 _____% heterozygous black fur (Bb)
 _____% homozygous brown fur (bb)

Phenotypes: _____% black fur
 _____% brown fur

BLOOD TYPE AND INHERITANCE

Name _____

In blood typing, the gene for type A and the gene for type B are codominant. The gene for type O is recessive. Using Punnett squares, determine the possible blood types of the offspring when:

1. Father is type O, Mother is type O

_____ % O
_____ % A
_____ % B
_____ % AB

2. Father is type A, homozygous; Mother is type B, homozygous

_____ % O
_____ % A
_____ % B
_____ % AB

3. Father is type A, heterozygous; Mother is type B, heterozygous

_____ % O
_____ % A
_____ % B
_____ % AB

4. Father is type O, Mother is type AB

_____ % O
_____ % A
_____ % B
_____ % AB

5. Father and Mother are both type AB

_____ % O
_____ % A
_____ % B
_____ % AB

PUNNETT SQUARES— CROSSES INVOLVING TWO TRAITS

Name _____

In a dihybrid cross, when two traits are considered, the number of possible combinations in the offspring increases. Suppose that black hair (B) is dominant over blonde hair (b) and brown eyes (E) are dominant over blue eyes (e).

What percent of offspring could be expected to have blonde hair and blue eyes if:

1. The father has black hair (heterozygous) and brown eyes (heterozygous) and the mother has blonde hair and blue eyes.

Genotype of father—**BbEe**

Genotype of mother—**bbee**

In the Punnett square below, complete the remaining gametes of the father. Then, fill in the boxes below.

	BE	Be		
be				

_____ %

2. Both parents have black hair (heterozygous) and brown eyes (heterozygous).

Genotype of father— _____

Genotype of Mother— _____

Complete the Punnett square below.

_____ %

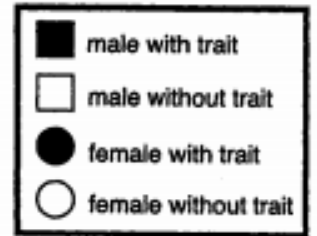
In each dihybrid cross, the phenotype ratio of individuals with brown hair and brown eyes, brown hair and blue eyes, blonde hair and brown eyes and blonde hair and blue eyes is

_____ : _____ : _____ : _____

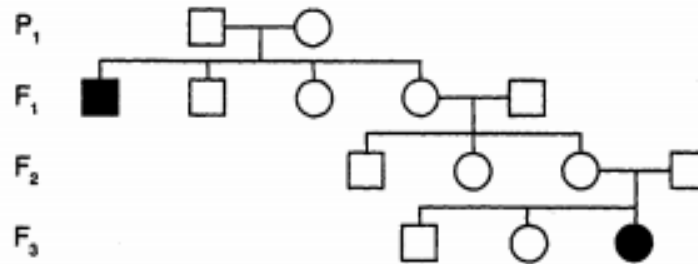
HUMAN PEDIGREES

Name _____

By studying a human pedigree, you can determine whether a trait is dominant or recessive. To interpret the three pedigrees below, use the same key shown at the right. Of course, the individual with the trait could be homozygous dominant or heterozygous dominant.



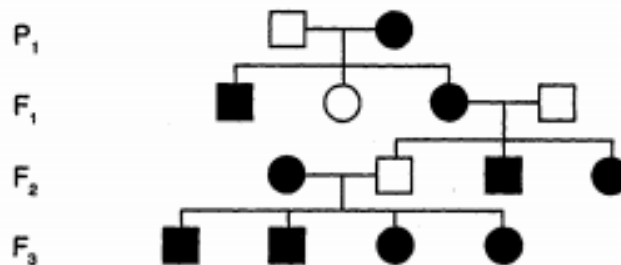
A. The pedigree shows the inheritance of attached earlobes for four generations.



Is the trait for attached earlobes, versus free earlobes, dominant or recessive?

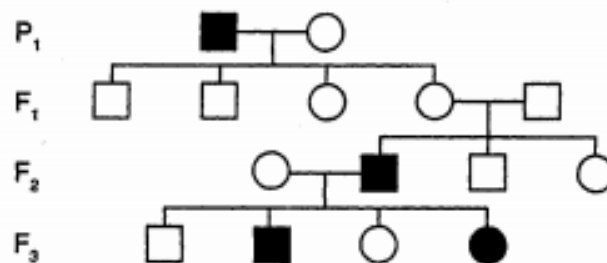
_____ How do you know? _____

B. The pedigree shows the inheritance of tongue rolling.



Is this trait dominant or recessive? _____ Explain. _____

C. This pedigree shows the inheritance of colorblindness, a sex-linked trait.



Is this trait dominant or recessive? _____ Is the mother of the colorblind girl in the F_3 generation colorblind, a carrier, or a person with normal color vision?

_____ Explain. _____
