



تجميع فيكل احياء-11 متقدم سناريو 2 - انساير

عمل : حمد العبدولي 11-متقدم

<https://t.me/Advvvv11>



اساله الهيكل الوحده الاوله وشرحها

1	BIO.3.4.01.028 Describe the complementary processes of cellular respiration and photosynthesis with respect to the flow of energy and the cycling of matter within ecosystems, and explain how human activities can disrupt the balance achieved by these processes	Information from text	30
2	BIO.3.1.02.025 Identify examples of the functions performed by the living organisms in which ATP is converted into ADP and inorganic phosphate.	Information from text	32
		"Demonstrate Understanding: Question 3"	33
3	BIO.3.1.02.025 Identify examples of the functions performed by the living organisms in which ATP is converted into ADP and inorganic phosphate.	Information from text	33
		Figure 4	33

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		Explain Your Thinking Question 5	33
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		Figure 2	32
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		Figure 3	32



ص 30

Transformation of Energy

Autotrophs and heterotrophs

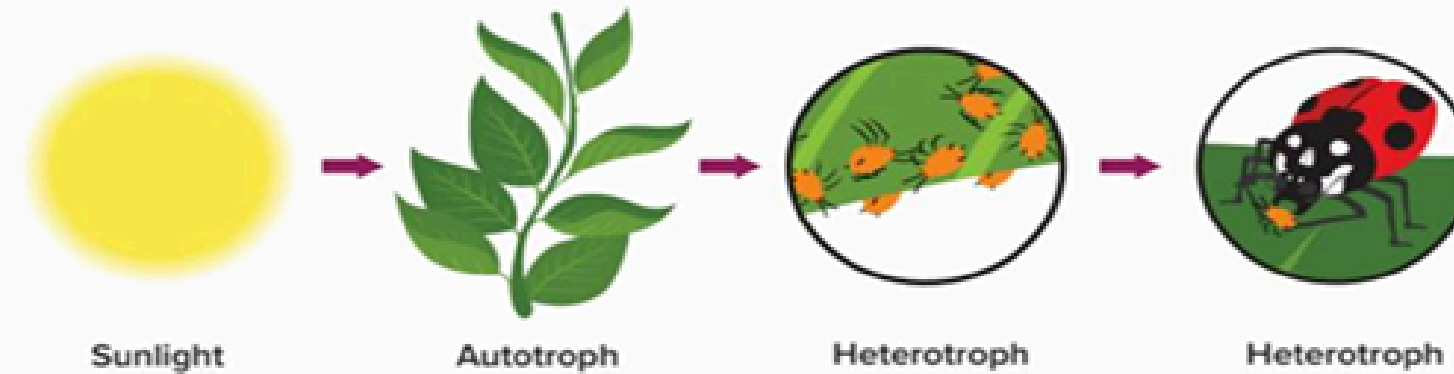
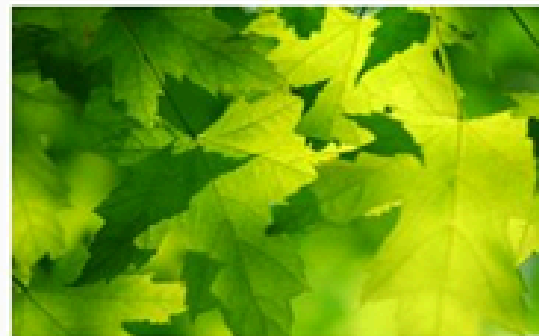


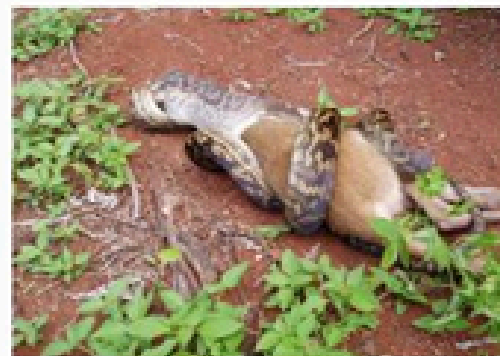
Figure 2 Almost all the energy in living organisms originates from the Sun, and energy flows from autotrophs to heterotrophs.

Autotrophs vs. Heterotrophs

Use light energy from sun to make own food



Obtain energy from other organisms



All Organisms Need Energy To Carry Out Life Functions And Must Release Energy From Sugars And Other Compounds!!

In a food chain, the amount of usable energy that is available to the next trophic level decreases.

Autotrophs and Heterotrophs

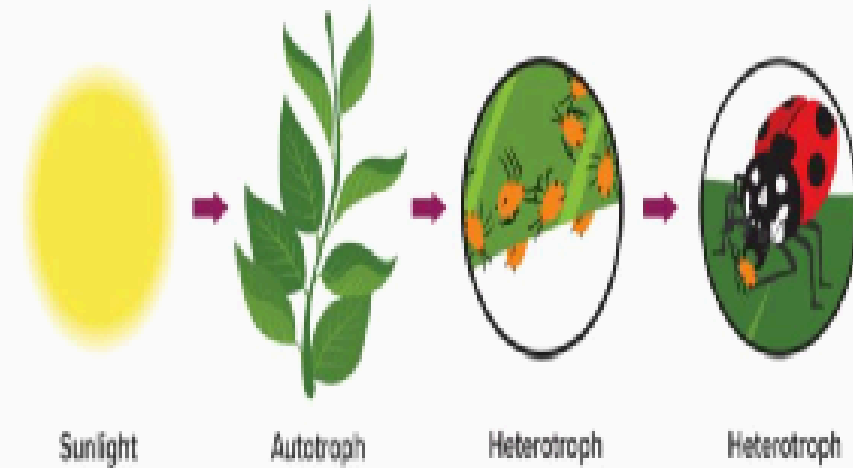
Heterotrophs are organisms that need to ingest food to obtain energy.

Autotrophs are organisms that make their own food.



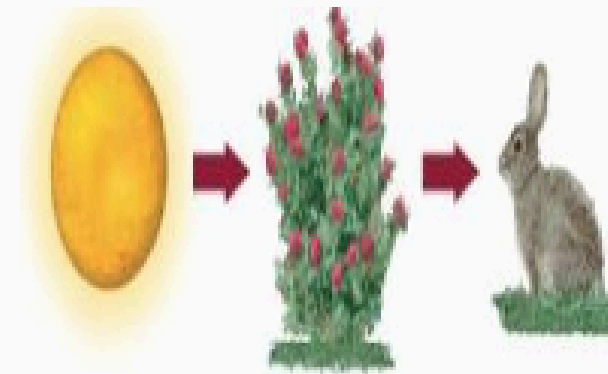
Which organism directly gets its energy by eating the Autotroph

- a) Sunlight
- ☒ b) The first consumer
- c) The second Heterotroph
- d) Another Autotroph



What is the initial source of energy for all living organisms shown in this food chain?

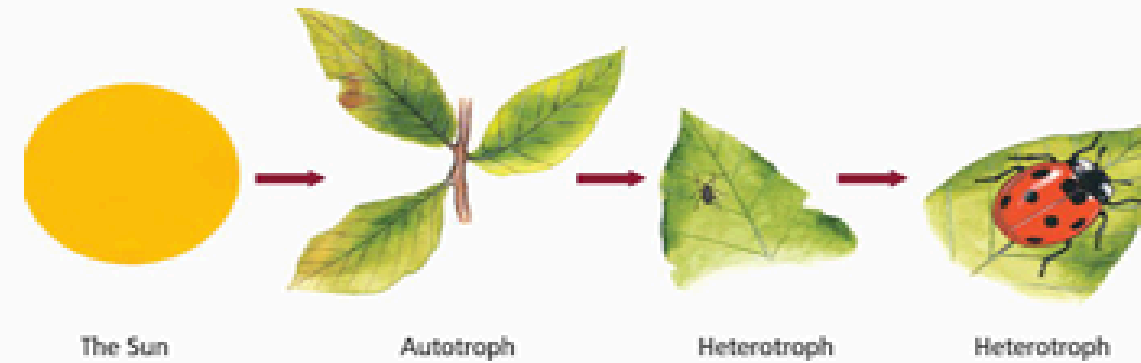
- a) the chemoautotroph
- b) the heterotroph
- ☒ c) the Sun
- d) the photoautotroph





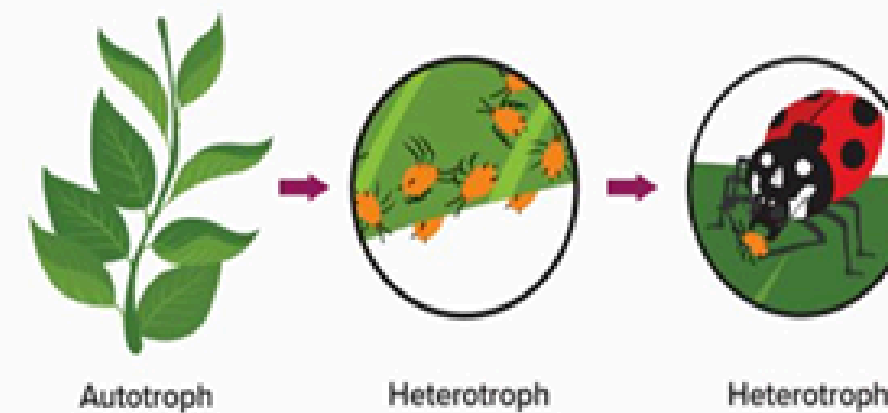
The Autotroph in this diagram is an organism that produces its own food using light energy.
Which term best describes such an organism?

- a) Primary Consumer
- ☒ b) Producer
- c) Secondary Consumer
- d) Decomposer



Which part of this food chain provides energy to just one other part?

- a) the chemoautotroph
- ☒ b) the 1st consumer
- c) the 2nd consumer
- d) the photoautotroph





ص 32

How Organisms Obtain Energy

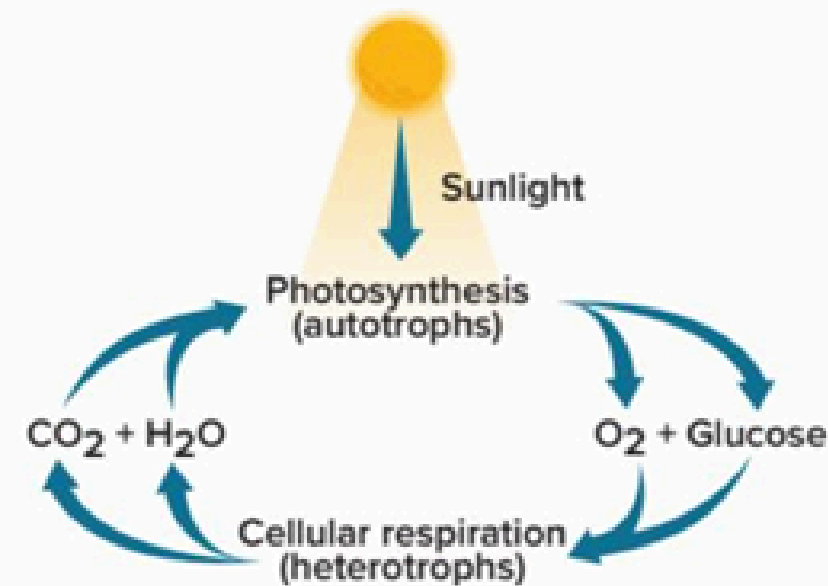


Figure 3 Photosynthesis and cellular respiration provide most of the energy for life processes.

- **Metabolism** - all of the chemical reactions in a cell

- Two types of metabolic pathways:

- 1. **Anabolic** – Take in energy to build large molecules
- 2. **Catabolic** – Releases energy when breaking down large molecules

- **Photosynthesis**—light energy from the Sun is converted to chemical energy for use by the cell
- **Cellular respiration**—organic molecules are broken down to release energy for use by the cell



ص 32

	Anabolic Reactions (Example: Photosynthesis)	Catabolic Reactions (Example: Cellular Respiration)
Definition	Buildup of complex organic molecules from simpler ones, like converting light energy to stored chemical energy in glucose.	Breakdown of complex organic molecules into simpler ones, like releasing energy from glucose.
Energy Input/Output	Requires energy (light energy from the sun).	Releases energy (stored in ATP).
Reactants	Simpler molecules: Carbon dioxide (CO₂), Water (H₂O), and light energy.	Complex molecule: Glucose (C₆H₁₂O₆) and Oxygen (O₂).
Products	Complex molecule: Glucose (C₆H₁₂O₆) (stored chemical energy) and Oxygen (O₂).	Simpler molecules: Carbon dioxide (CO₂), Water (H₂O), and Energy (ATP).
Location	Primarily in chloroplasts within plant cells and some other organisms.	Occurs in the cytoplasm and mitochondria of most <u>eukaryotic</u> cells.
Overall Goal/Function	To create complex organic molecules (glucose) from simpler inorganic molecules using energy.	To break down complex organic molecules (glucose) to release usable energy for the cell.





What does the first law of thermodynamics state?

- A. ☐ entropy increases
- B. ☒ energy is conserved
- C. ☐ metabolism decreases
- D. ☐ chemicals are produced

Autotrophs that convert light energy into chemical energy are called ____.

- A. ☒ photoautotrophs
- B. ☐ heterotrophs
- C. ☐ chemoautotrophs
- D. ☐ omnivores

All the chemical reactions in an organism's cells are called ____.

- A. ☐ chemotrophy
- B. ☐ autotrophy
- C. ☒ metabolism
- D. ☐ thermodynamics



Why is cellular respiration a catabolic pathway?

- A. Energy is used to form glucose and oxygen.
- B. Energy is converted from water to carbon dioxide.
- C. Energy that is lost is converted to thermal energy.
- D. Energy is released by the breakdown of molecules.**

In which metabolic process are molecules broken down to produce carbon dioxide and water?

- A. photosynthesis
- B. cellular respiration**
- C. homeostasis
- D. fermentation

In cellular respiration, which of the following are reactants? Select all that apply.

- ☒ O_2
- ☐ CO_2
- ☒ $C_6H_{12}O_6$
- ☐ H_2O
- ☐ energy



Which energy transformation can occur only in autotrophs ?

electrical energy into thermal energy .a

light energy into chemical energy **.b**

chemical energy into mechanical energy .c

mechanical energy into thermal energy .d



ص 33

ATP: The Unit of Cellular Energy

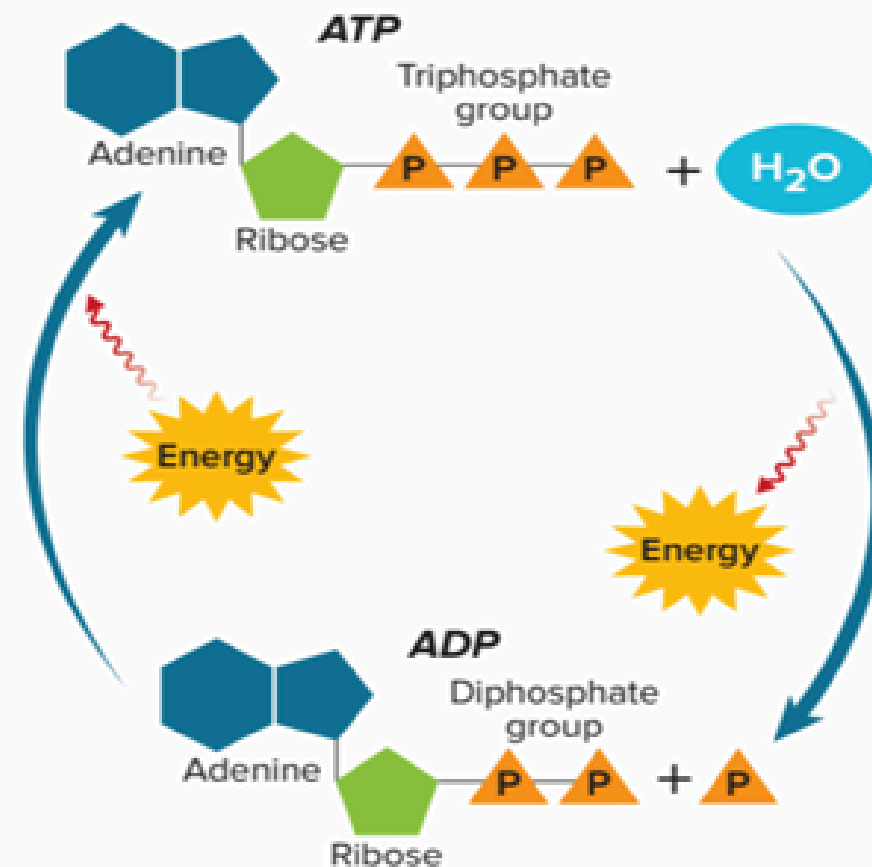
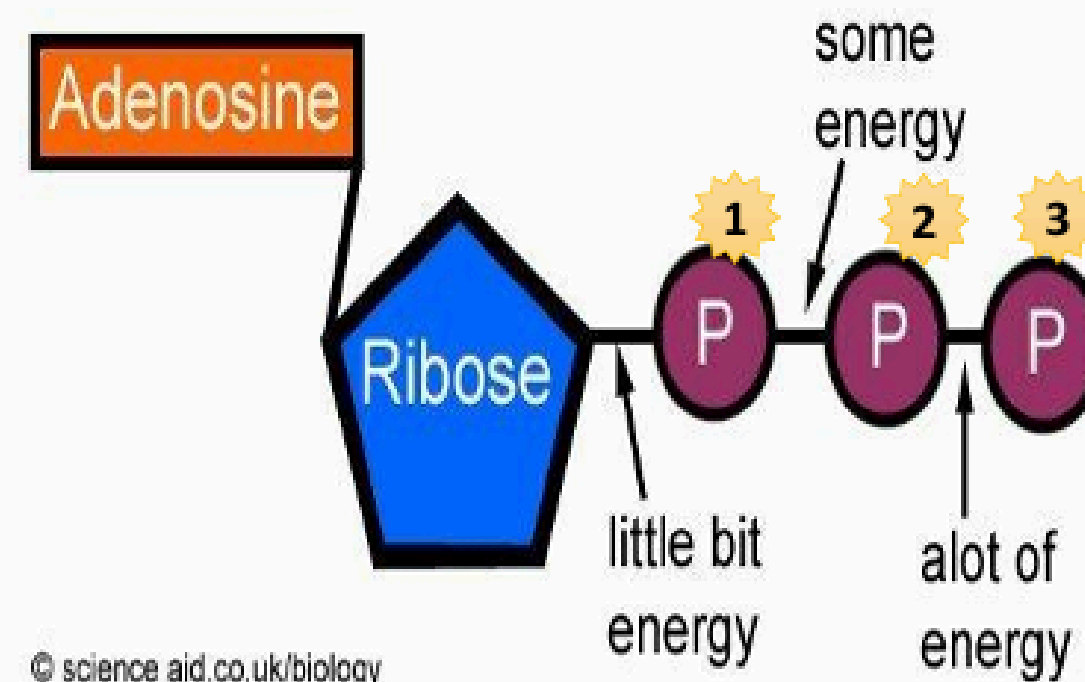


Figure 4 The breakdown of ATP releases energy for powering cellular activities in organisms.

- Adenosine triphosphate (ATP) is the most important biological molecule that provides chemical energy.





Which statement describes the law of conservation of energy?

- A. Energy cannot be converted or destroyed.
- B. Energy can be converted and destroyed.
- ☒ C. Energy can be converted but not destroyed.
- D. Energy can be destroyed but not converted.

In which metabolic process are molecules broken down to produce carbon dioxide and water?

- A. photosynthesis
- ☒ B. cellular respiration
- C. homeostasis
- D. fermentation

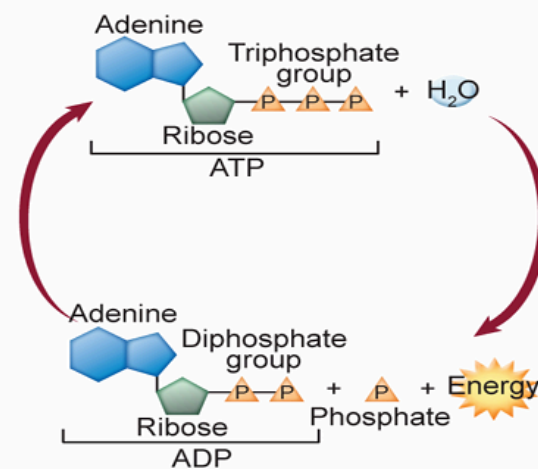


Why is adenosine triphosphate (ATP) such an important biological molecule?

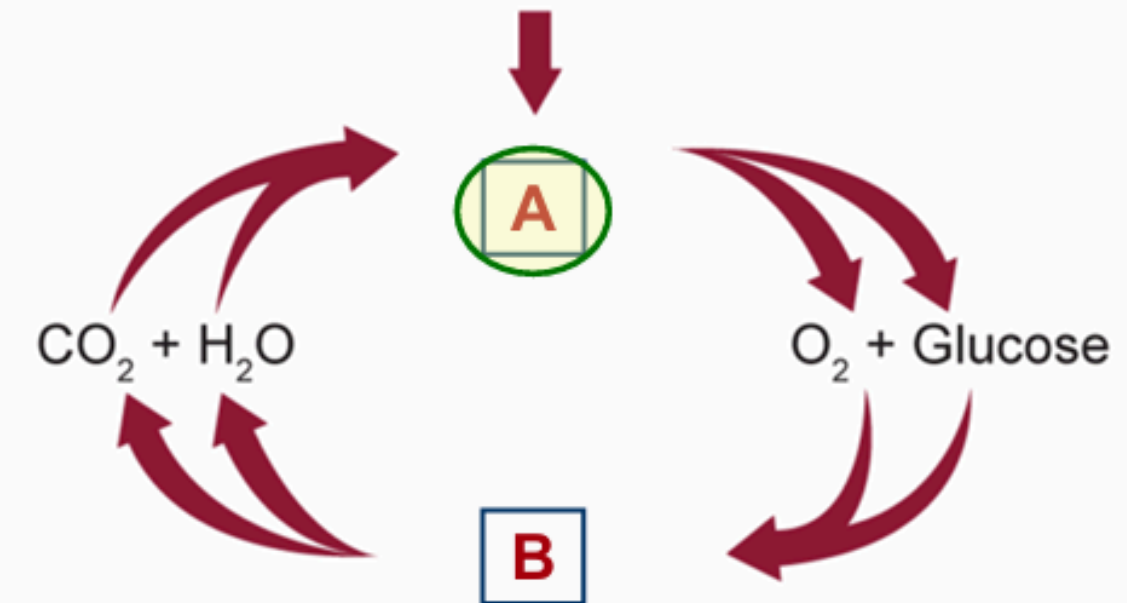
- A. It captures light energy from the sun.
- B. It is produced in anabolic pathways.
- C. It stores and releases chemical energy.**
- D. It converts mechanical energy to thermal energy.

Look at the following figure. Which molecule is released when ATP becomes ADP?

- A. phosphate group**
- B. water molecule
- C. ribose sugar
- D. energy cells



Which metabolic process is photosynthesis?





اساله من الف

Which process is described as the breakdown of organic molecules to release energy for use by the cell?

- Cellular respiration
- ATP synthesis
- Anabolism
- Photosynthesis

Which of the following best describes heterotrophs?

- Organisms that convert inorganic substances to energy
- Organisms that make their own food using sunlight
- Organisms that produce energy without external sources
- Organisms that ingest food to obtain energy

Which type of organism would a lettuce plant be classified as?

- Chemoautotroph
- Photoautotroph
- Heterotroph
- Carnivore

What is a metabolic pathway?

- The movement of ATP within a cell
- The process of breaking down ATP into ADP
- A series of chemical reactions where the product of one is the substrate for the next
- The flow of energy between organisms in an ecosystem

What concept explains why energy is lost as heat as we move up trophic levels in a food chain?

- First Law of Thermodynamics
- Second Law of Thermodynamics
- ATP synthesis
- Conservation of Energy

According to the Second Law of Thermodynamics, what happens when energy is converted?

- Energy is destroyed
- Energy is created
- Energy becomes more ordered
- There is a loss of usable energy

What happens to the amount of usable energy as w move up each trophic level in a food chain?

- It decreases
- It increases
- It remains constant
- It fluctuates randomly

What is the structure of ATP?

- A nucleotide made of an adenine base, a ribose sugar, and three phosphate groups
- A nucleotide made of a guanine base, a deoxyribose sugar, and two phosphate groups
- A protein made of amino acids linked by peptide bonds
- A carbohydrate made of glucose molecules

How does cellular respiration differ from photosynthesis in terms of metabolic pathways?

- Both are catabolic pathways
- Cellular respiration is anabolic while photosynthesis is catabolic
- Both are anabolic pathways
- Cellular respiration is catabolic while photosynthesis is anabolic

What is the primary source of energy for nearly all life on Earth?

- The Sun
- ATP
- Inorganic substances
- Glucose

What is the study of the flow and transformation of energy in the universe called?

- Thermodynamics
- Photosynthesis
- Metabolism
- Entropy

When does ATP release energy?

- When the bond between the second and third phosphate groups is broken
- When the adenine base is modified
- When the bond between the first and second phosphate groups is broken
- When the ribose sugar is broken down

Photosynthesis is an example of what type of metabolic pathway?

- Heterotrophic pathway
- Entropy pathway
- Anabolic pathway
- Catabolic pathway
- ADP
- ATP
- Ribose
- Glucose

What is the main unit of cellular energy?

What term describes all of the chemical reactions in a cell?

- Metabolism
- Cellular respiration
- Photosynthesis
- Thermodynamics

What is a metabolic pathway?

- The movement of ATP within a cell
- The process of breaking down ATP into ADP
- A series of chemical reactions where the product of one is the substrate for the next
- The flow of energy between organisms in an ecosystem



شروحات للدرس الاول من يوتيوب :

د. عمر

https://youtu.be/KOHulk1mB9w?si=tumJ4bAuYx_zqJ9I

Clear it up

https://youtu.be/jgqcOwevo30?si=iBlvIvbWCYKupln_

BioScope

<https://www.youtube.com/watch?v=bumHCEWPOMQ>



اساله الهيكل الوحده الثانيه وشرحها

4	BIO.3.1.02.030 Describe that photosynthesis converts carbon dioxide plus water into sugars plus oxygen, which is released.	Information from text	34
5	BIO.3.1.02.027 Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy	Information from text	35
		Figure 5 + Question below it	35
6	BIO.3.1.02.027 Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy	Information from text	36
		"Get it?" question	36
7	BIO.3.1.02.030 Describe that photosynthesis converts carbon dioxide plus water into sugars plus oxygen, which is released.	Information from text	39
		Figure 9	39
8	BIO.3.1.02.030 Describe that photosynthesis converts carbon dioxide plus water into sugars plus oxygen, which is released.	Information from text	39
		Figure 9	39

16	BIO.3.1.02.024 Explain that the hydrocarbon backbones of the sugars formed during photosynthesis are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules used, for example, to form new cells	Information from text	34
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19	BIO.3.1.02.030 Describe that photosynthesis converts carbon dioxide plus water into sugars plus oxygen, which is released.	Information from text	35
		Information from text	39
20	BIO.3.1.02.030 Describe that photosynthesis converts carbon dioxide plus water into sugars plus oxygen, which is released.	Information from text	40

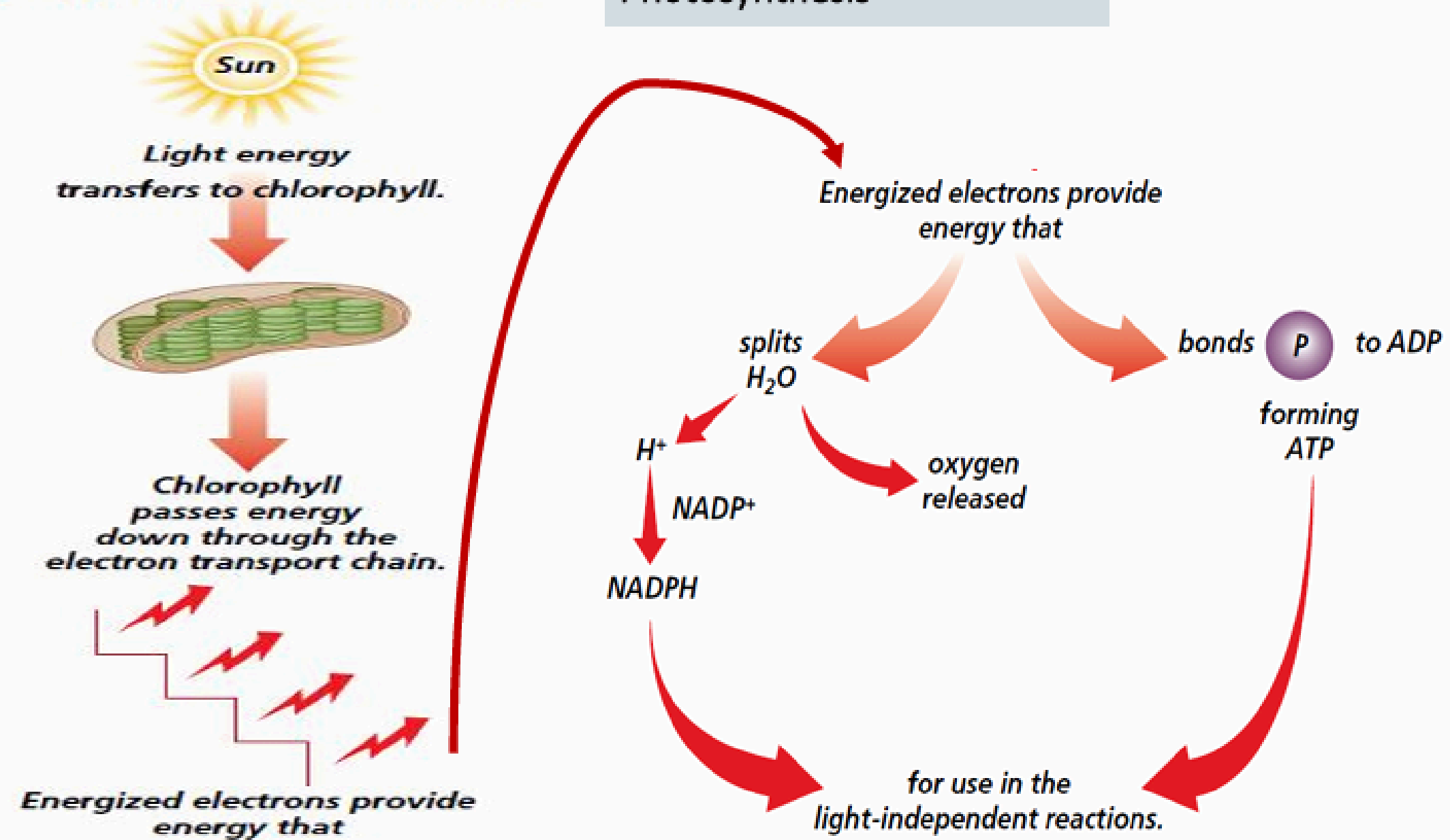
21	BIO.3.1.02.027 Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy	Information from text	37
		"Get it?" question	37



ص 34

Light-Dependent Reactions

Photosynthesis





Overview of Photosynthesis

Recall the first law of thermodynamics, which states that energy can be converted from one form to another, but it cannot be created nor destroyed. Photosynthesis is a complex chemical process that converts energy from one form to another. It is the main way that solar energy is captured and stored on Earth. Along with cellular respiration, it provides most of the energy for life processes.

Most autotrophs, including plants, make organic compounds, such as sugars, by a process called photosynthesis. Recall that a basic function of photosynthesis is the conversion of light energy into chemical energy. The products and reactants of photosynthesis are identified in the overall chemical reaction for photosynthesis, which is shown below.



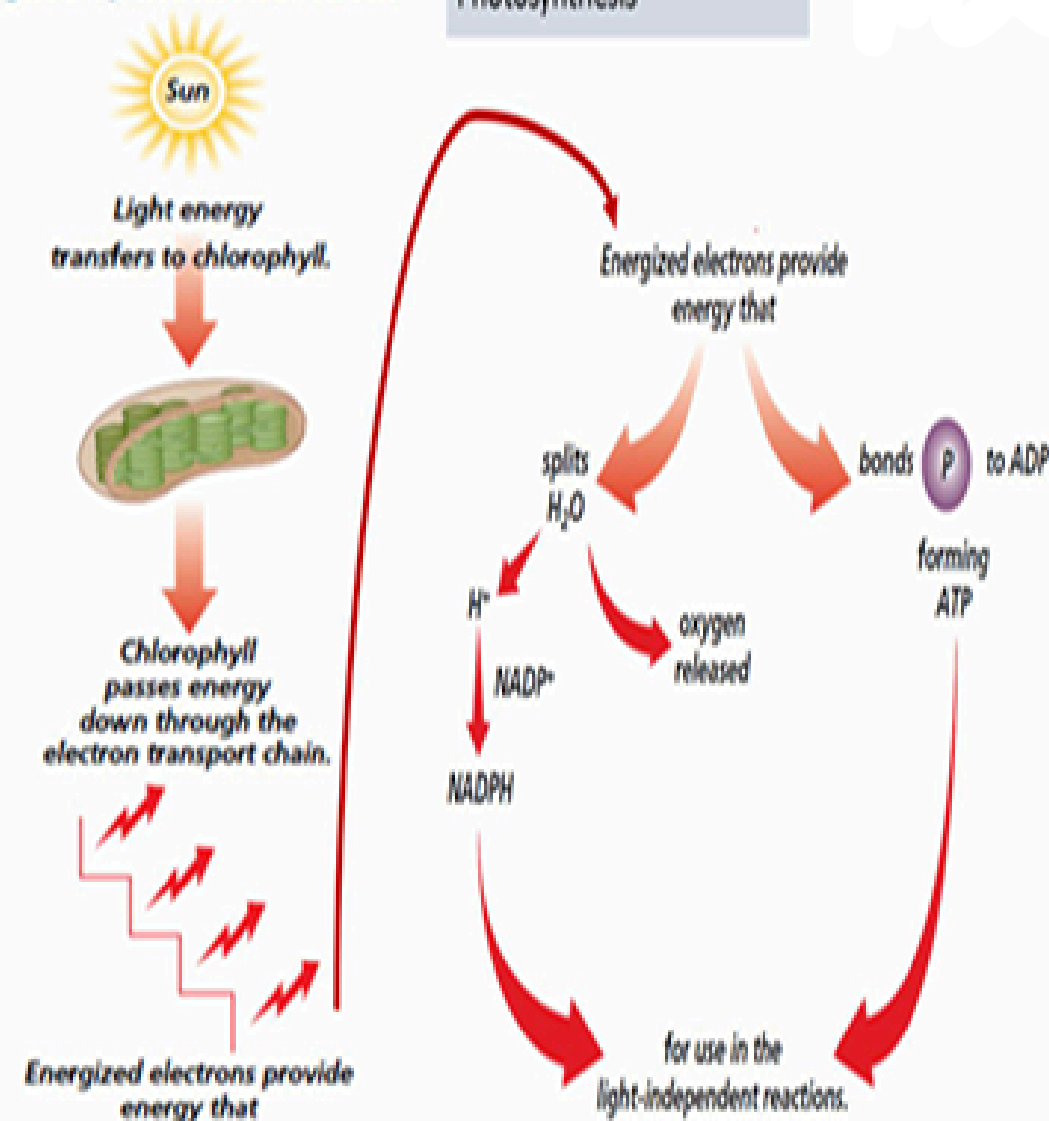
Photosynthesis occurs in two phases. Phase one of photosynthesis consists of reactions called the light-dependent reactions. First, light energy is captured, or absorbed, by organelles called chloroplasts. It is then converted into chemical energy, which is stored in ATP and NADPH molecules.

Phase two of photosynthesis consists of a series of reactions called the light-independent reactions. In phase two, molecules of ATP and NADPH that were formed in the phase one light-dependent reactions are used to make glucose, a form of sugar.

Once glucose is produced, it can be joined to other simple sugars to form complex carbohydrates, such as starch. The glucose molecules that are formed contain carbon, hydrogen, and oxygen; their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules such as proteins, lipids, or DNA used, for example, to form new cells.

Light-Dependent Reactions

Photosynthesis





ص 35

✓ **Photosynthesis** occurs inside pigmented organelles called **chloroplasts**.

✓ **Chloroplasts** are organelles that capture light energy.

They contain **two** main compartments:

Thylakoids: flattened saclike membranes
Stacks of thylakoids are called **grana**
(singular: granum).

Stroma: fluid-filled space outside the grana

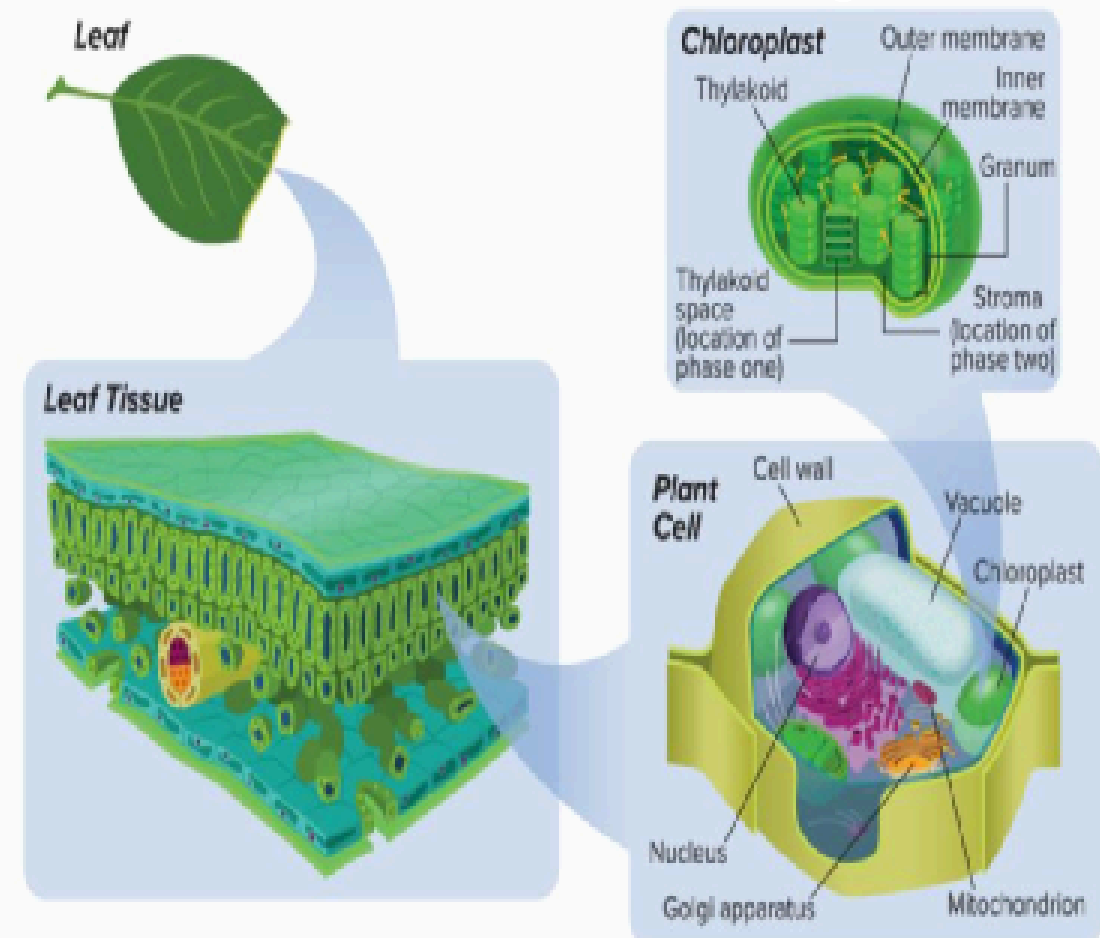


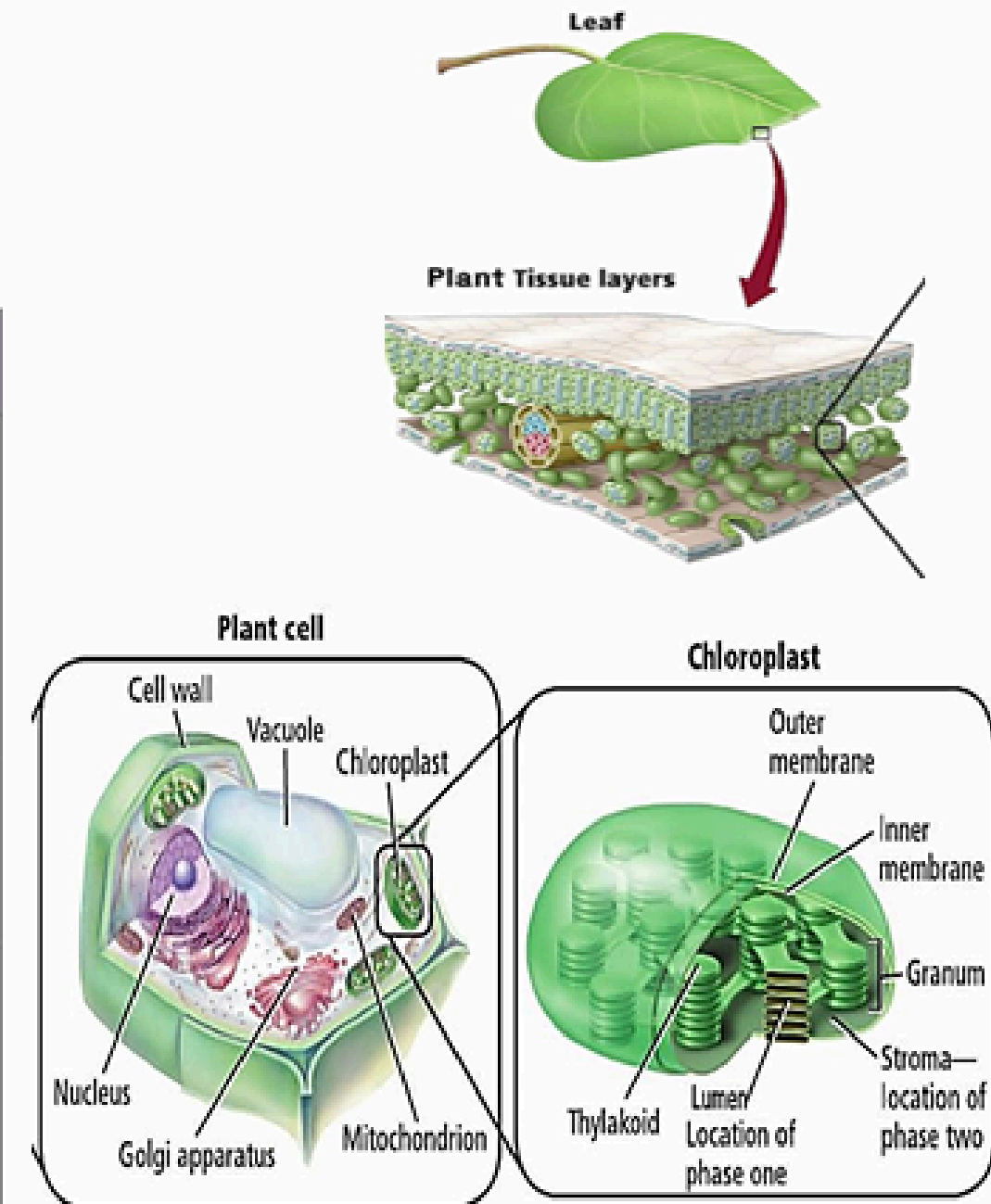
Figure 5 Photosynthesis occurs inside pigmented organelles called chloroplasts.
Identify the location of the stroma and thylakoids within a plant cell.



Phase One: Light Reactions

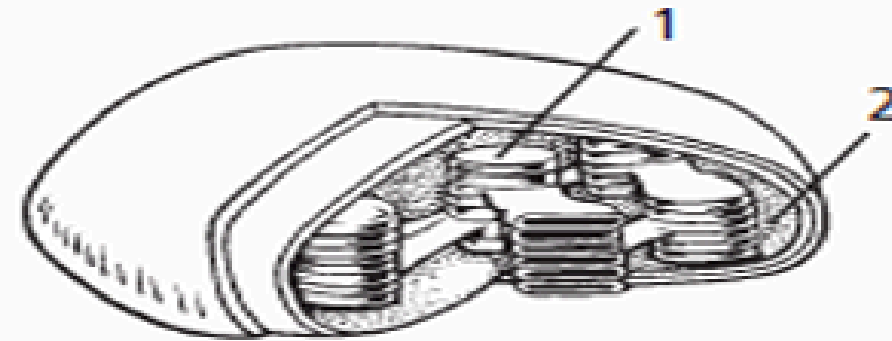
Compare: Thylakoids and Stroma

Compare between	Thylakoids	Stroma
The shape	Flattened, saclike membranes ,arranged in stacks (grana, singular granum)	Fluid-filled space outside the grana.
Type of Reaction	light-dependent reaction	light-independent reaction
Continents	Light-absorbing pigments	Molecules and enzyme need for phase2 reaction





Use the illustration below to answer questions 3 and 4.



- 3** Which reaction takes place in the thylakoid discs (1) of the chloroplast?
- A carbon fixation
 - B** light-dependent reaction
 - C light-independent reaction
 - D Calvin cycle
- 4** Which reaction takes place in the stroma (2) of the chloroplast?
- A carbon fixation
 - B light-dependent reaction
 - C** light-independent reaction
 - D photolysis



Where in the plant cell does photosynthesis take place?

- ☒ A. chloroplasts
- ☐ B. Golgi apparatus
- ☐ C. mitochondria
- ☐ D. vacuoles

Look at the following figure. Which part of the chloroplast is a sac-like membrane arranged in stacks?

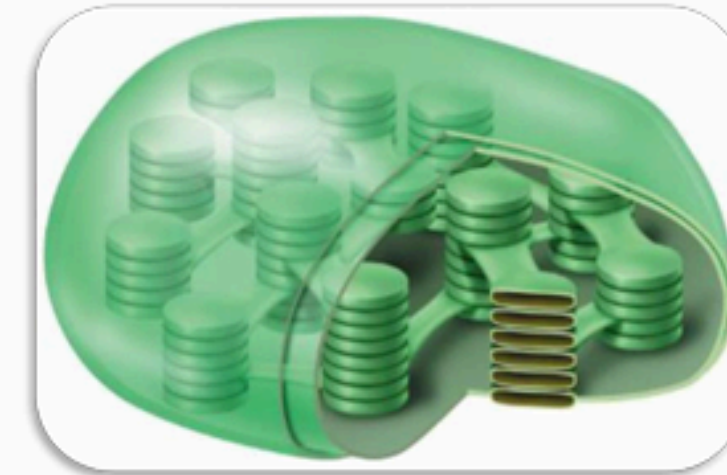
- ☐ A. grana
- ☐ B. stroma
- ☒ C. thylakoids
- ☐ D. Golgi apparatus

17) In photosynthesis, which of the following are reactants? Select all chemical formulas that apply.

- ☐ O_2
- ☒ H_2O
- ☒ energy
- ☒ CO_2
- ☐ $C_6H_{12}O_6$

18) In photosynthesis, which of the following are products? Select all that apply.

- ☐ energy
- ☐ CO_2
- ☒ O_2
- ☒ $C_6H_{12}O_6$
- ☐ H_2O





1) What three things do plants need for the process of photosynthesis?

- ☐ Sunlight, oxygen, and sugar
- ☐ Water, soil, and oxygen
- ☒ Sunlight, carbon dioxide, and water
- ☐ Carbon dioxide, oxygen, and soil
- ☐ Sunlight, soil, and water

2) If plants breathe in carbon dioxide, what do they breathe out?

- ☐ Nitrogen
- ☒ Oxygen
- ☐ Carbon monoxide
- ☐ Hydrogen
- ☐ Helium



3) What is the compound that plants use to absorb the energy from light?

- ☐ Carbon Dioxide
- ☐ H₂O
- ☐ Nitrogen
- ☐ DNA
- ☒ Chlorophyll

4) What color is chlorophyll?

- ☐ Red
- ☐ Blue
- ☐ Yellow
- ☒ Green
- ☐ Brown

Why do we perceive chlorophyll as being green?

- ☐ Because it is green.
- ☐ Because it absorbs green light.
- ☒ Because it reflects green light.
- ☐ Because it absorbs yellow light.

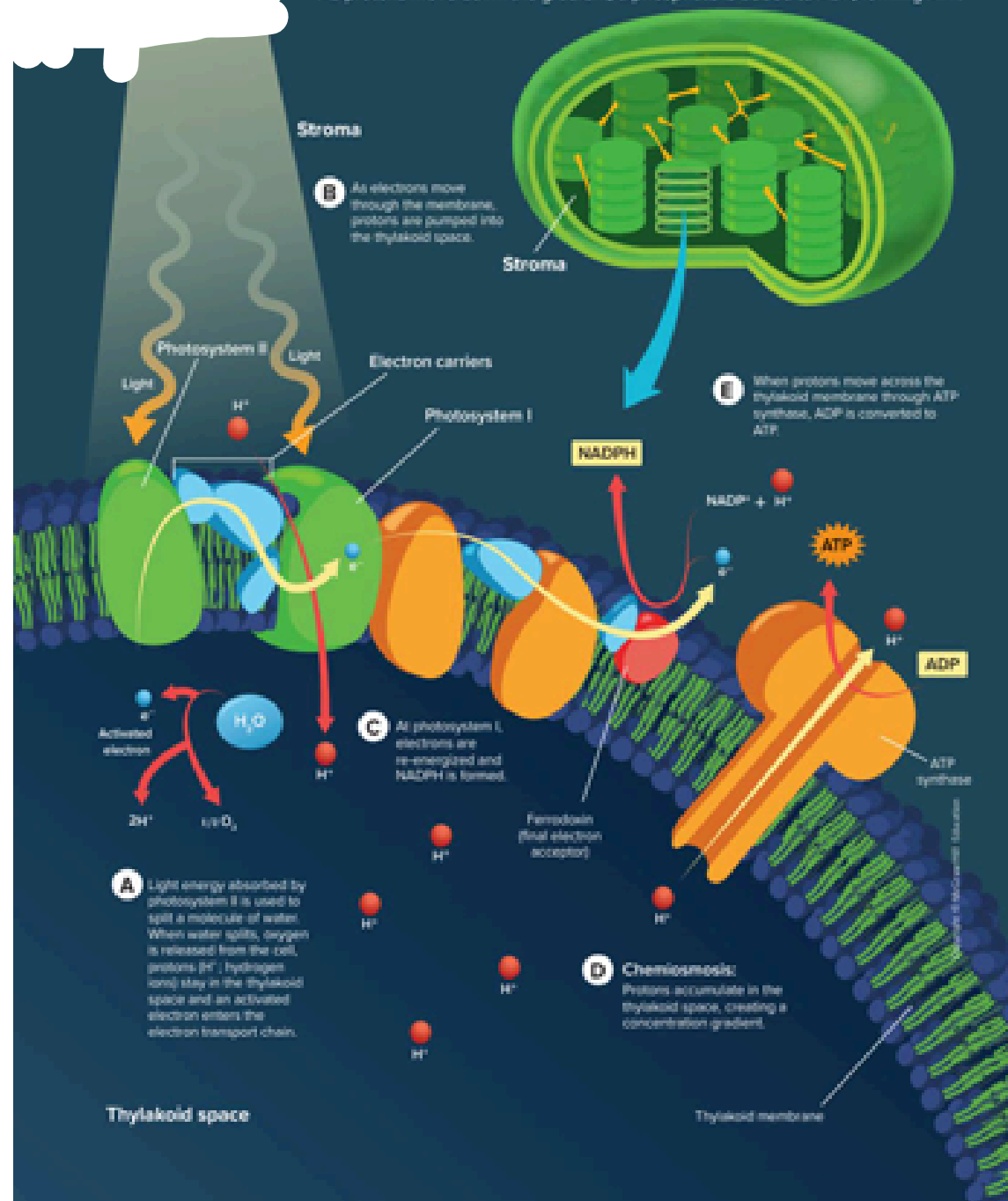


ص 38 + 39

Figure 8

Visualizing Electron Transport

Activated electrons are passed from one molecule to another along the thylakoid membrane. The energy from electrons is used to form a proton gradient. As protons move down the gradient, a phosphate is added to ADP, forming ATP.



Light-Dependent Reactions

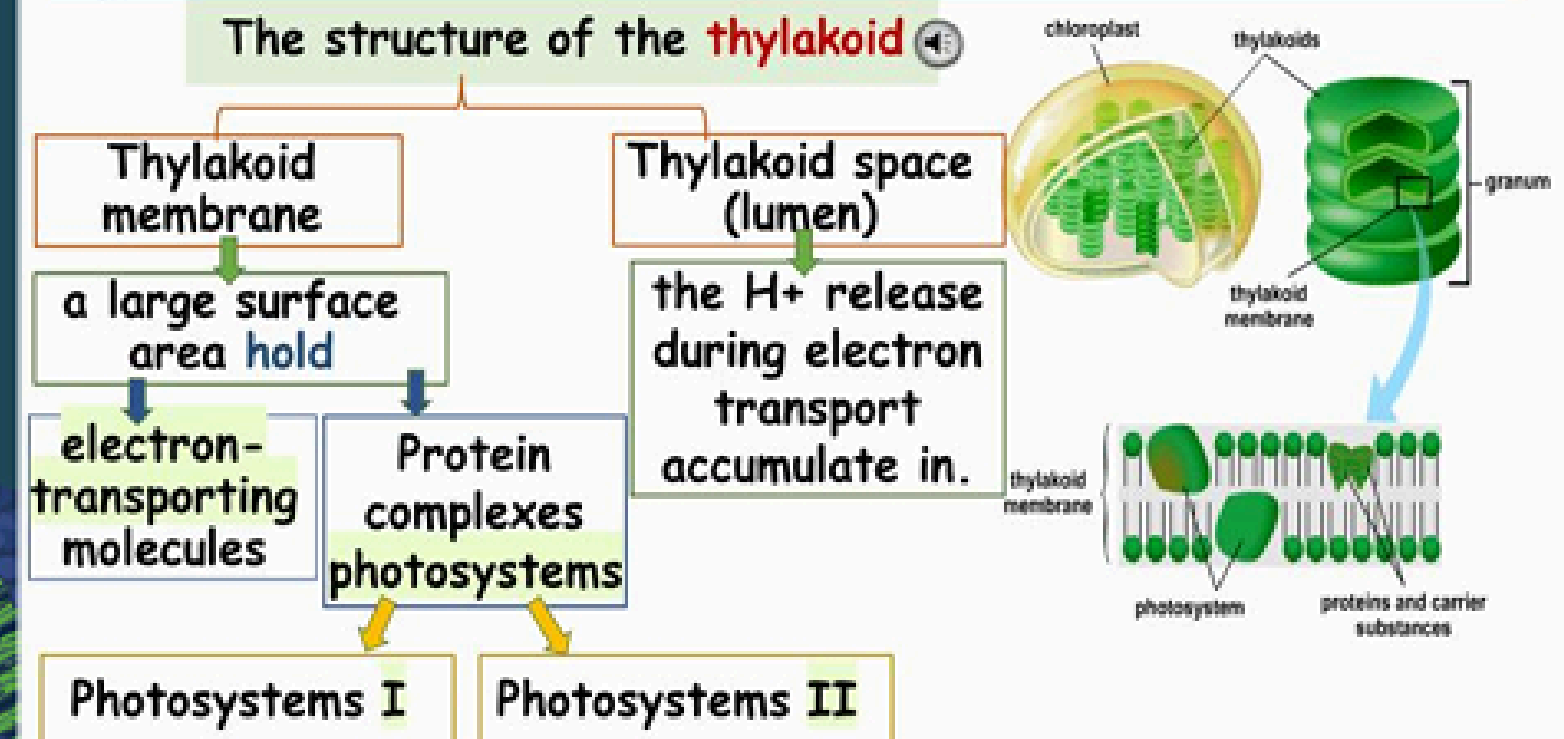
Chloroplasts capture light energy.

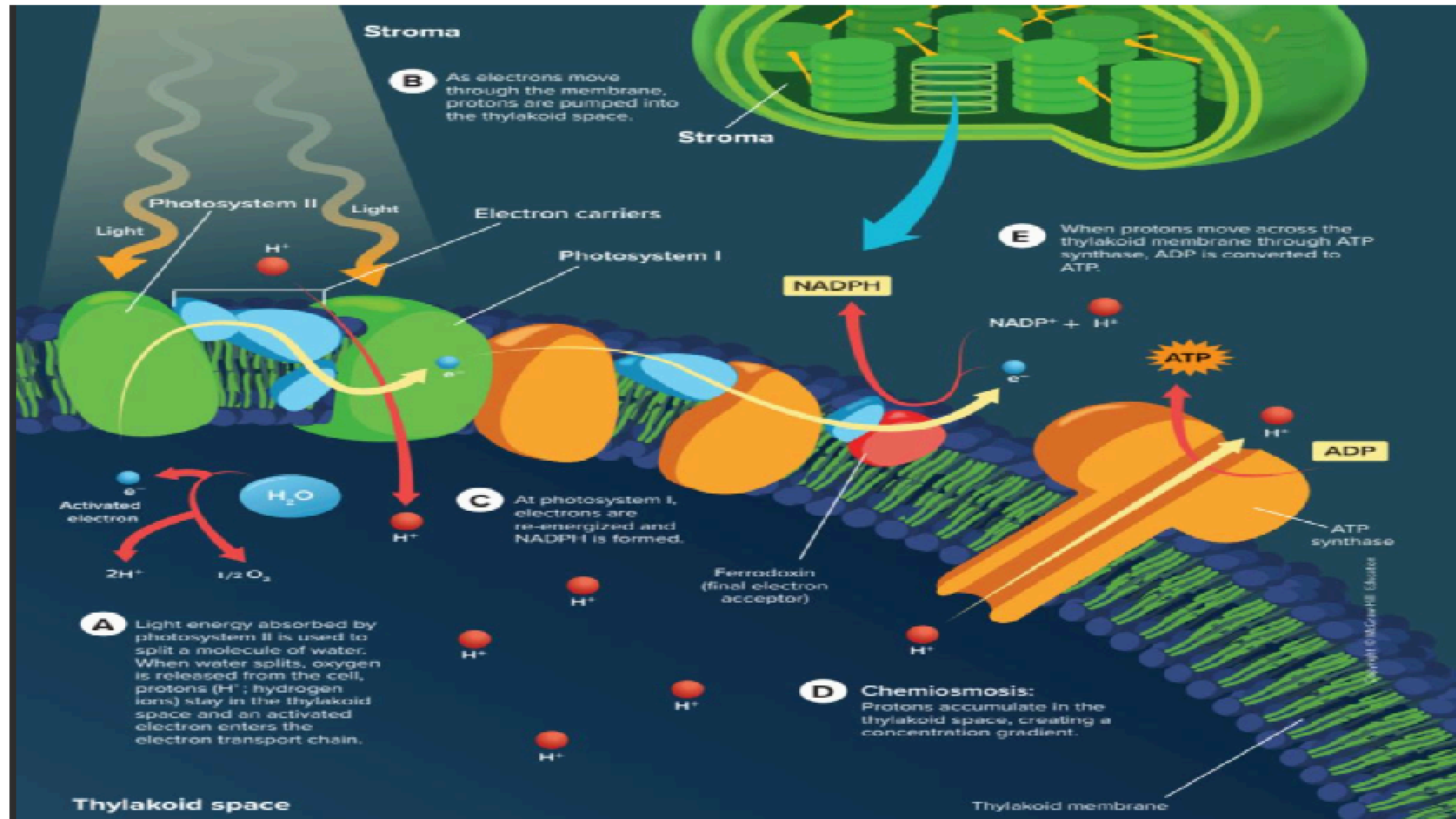
*Use energy from light to produce oxygen gas and convert ADP and NADP+ into the energy carriers ATP and NADPH

Phase One: Light Reactions

* Light reaction start when pigments absorb the light along the thylakoid membrane in a chloroplast.

The structure of the **thylakoid**

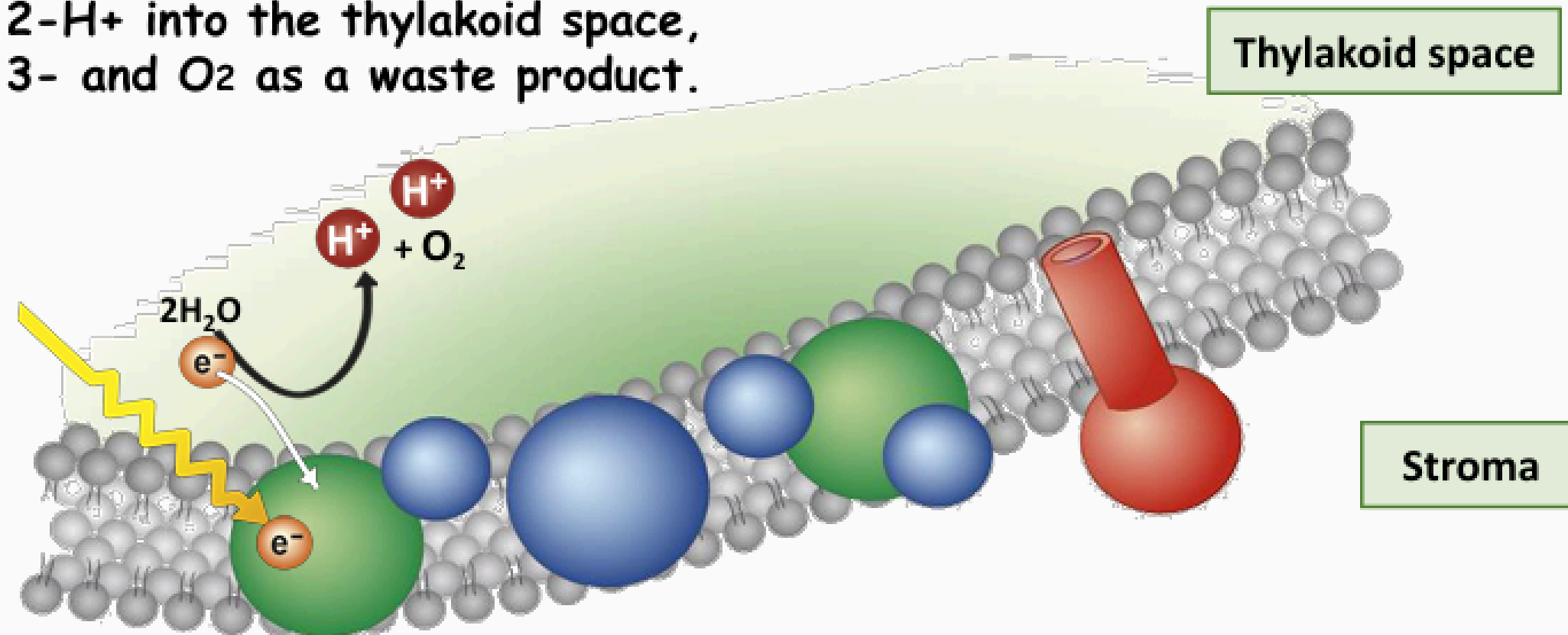






Electron Transport

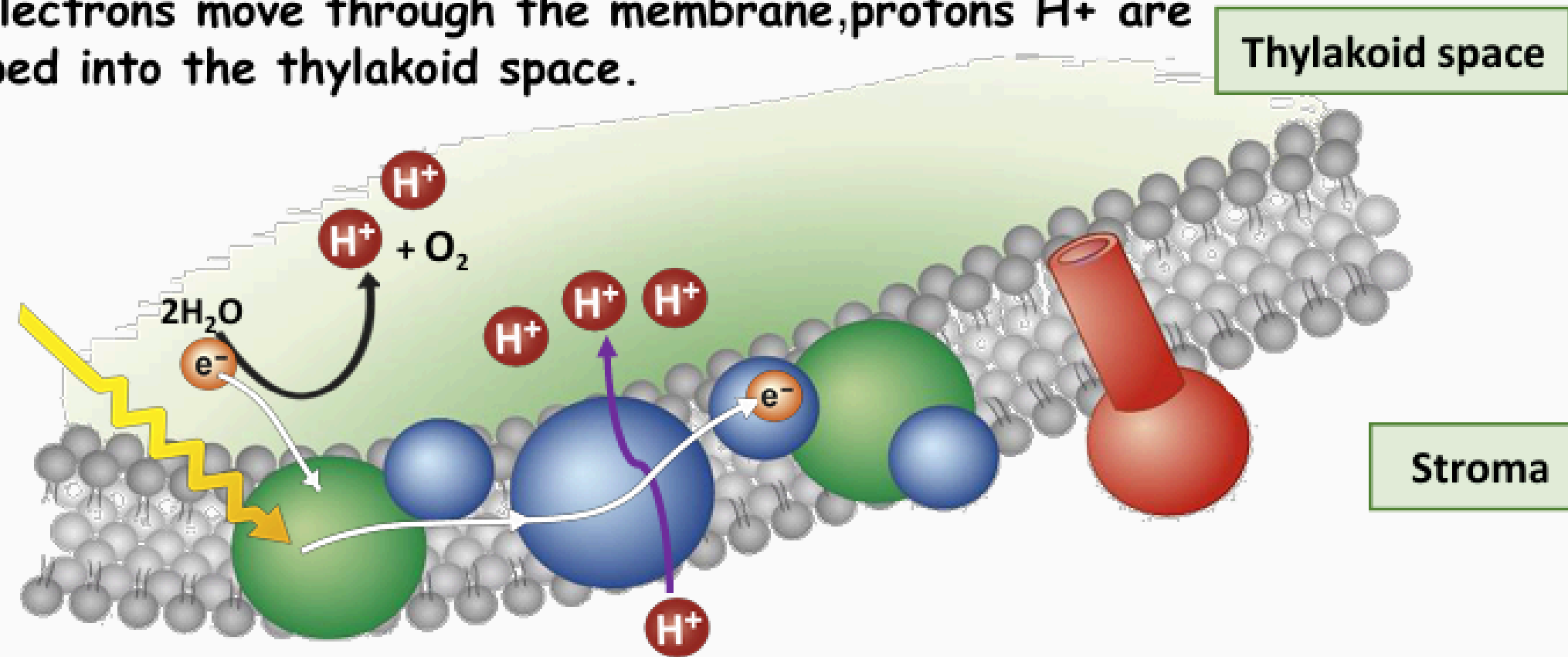
- First
- Light energy excites electrons in photosystem II
 - and also causes a water molecule to split, **releasing**:
 - 1-an electron into the electron transport system,
 - 2- H^+ into the thylakoid space,
 - 3- and O_2 as a waste product.





Electron Transport

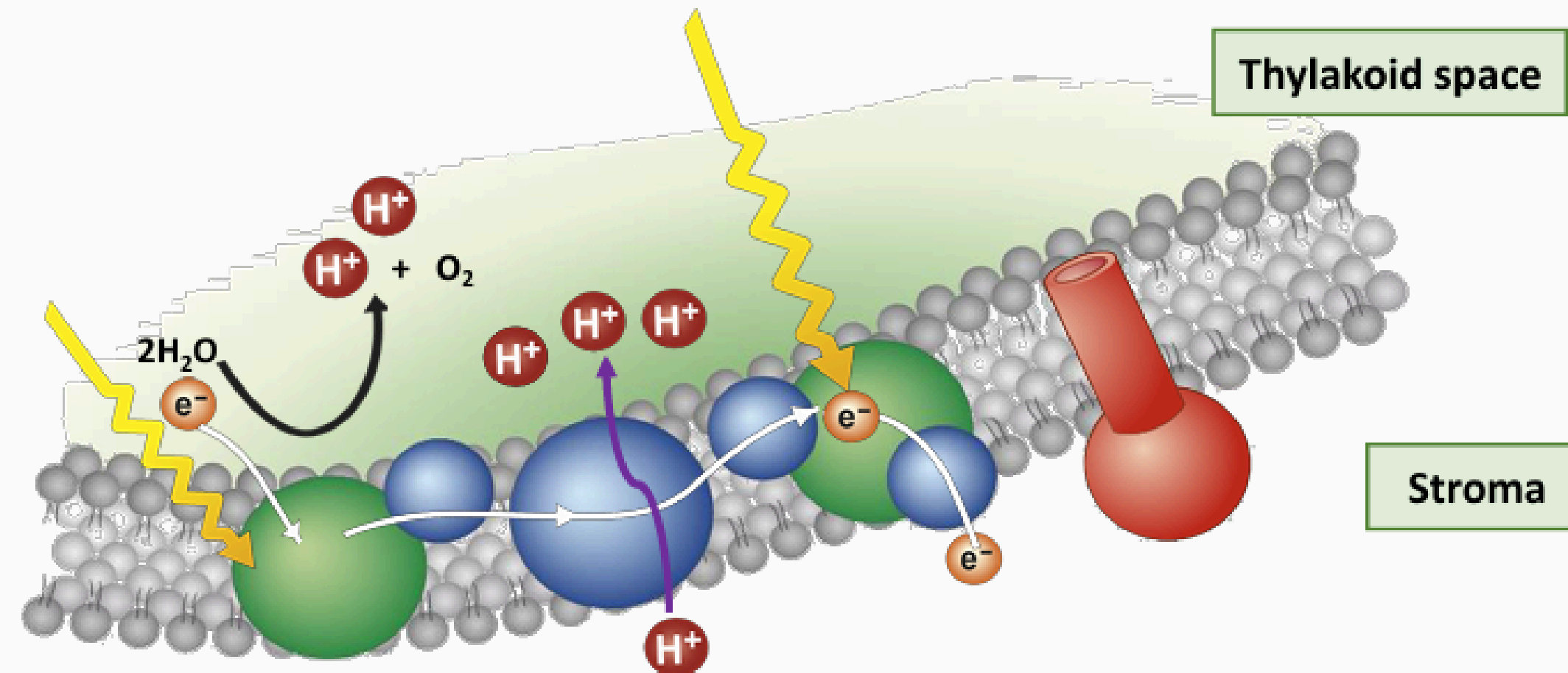
- Second ▪ The excited electrons move from photosystem II to an electron-acceptor molecule in the thylakoid membrane.
- As electrons move through the membrane, protons H^+ are pumped into the thylakoid space.





Electron Transport

Third ▪ The electron-acceptor molecule transfers the electrons along a series of electron-carriers to photosystem I.

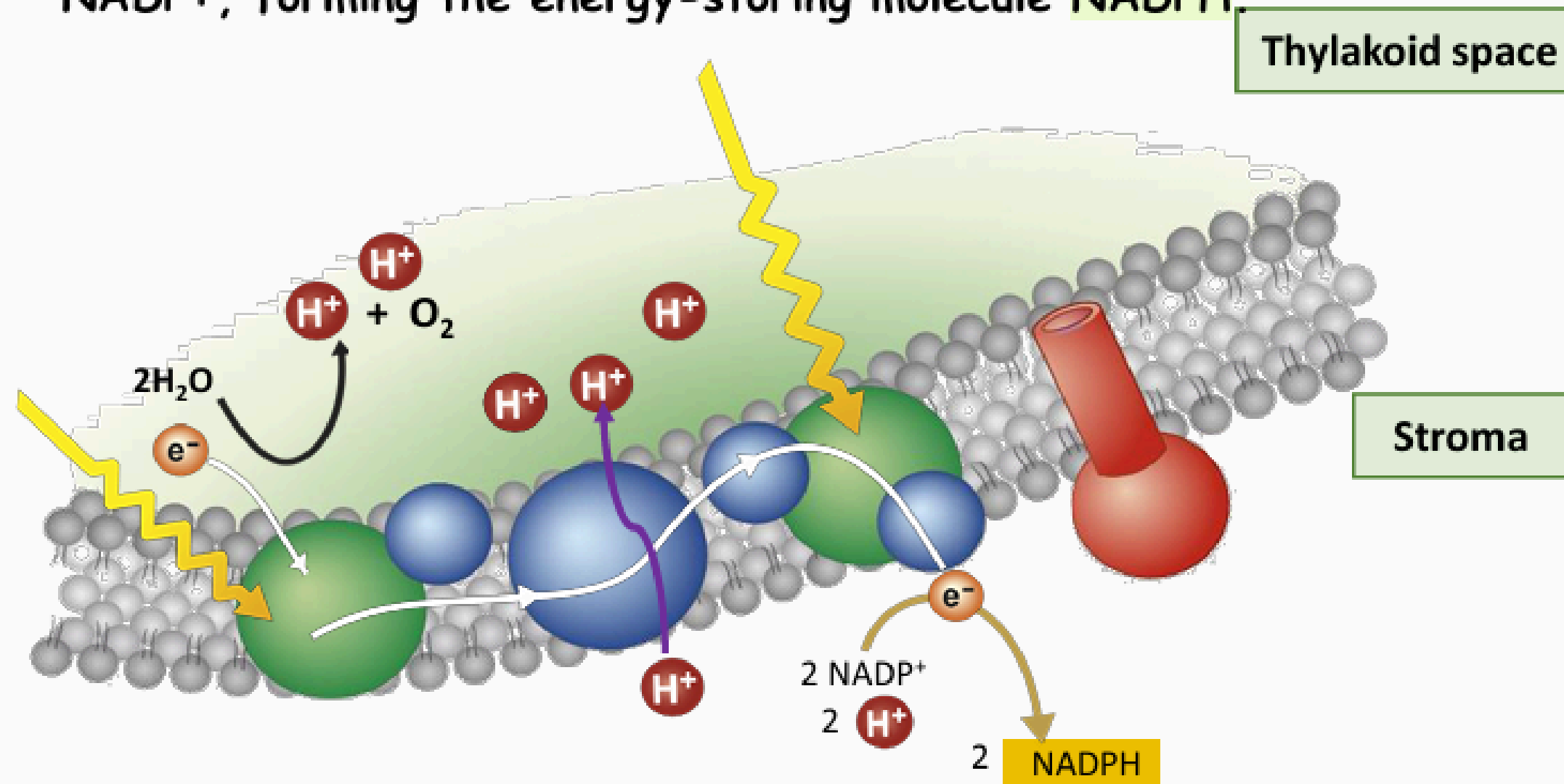


Fourth ▪ In the presence of light, Photosystem I transfers the electrons to a protein called ferredoxin.



Electron Transport

Finally ▪ Ferredoxin transfers the electrons to the electron carrier NADP^+ , forming the energy-storing molecule NADPH

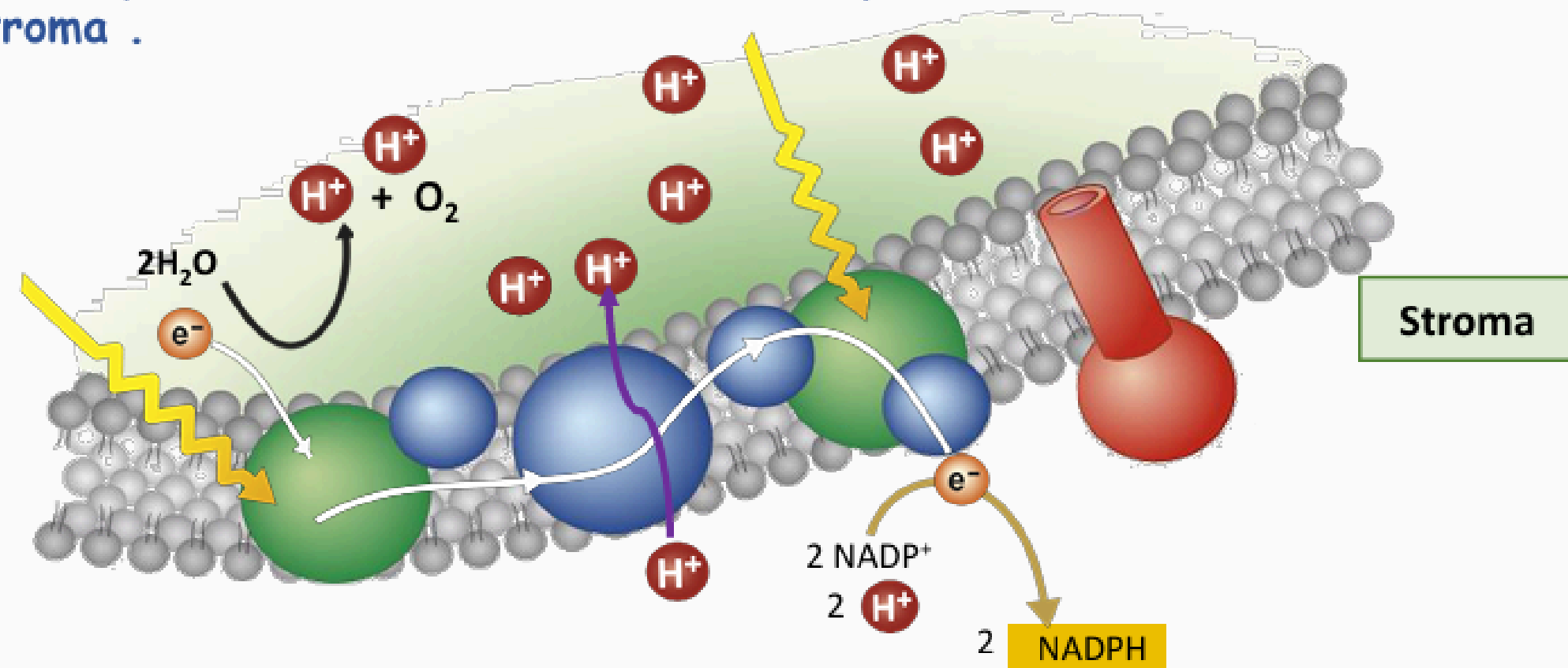




Chemiosmosis

- **Describe** the concentration of protons (H^+) on both sides of thylakoid membrane.

A high concentration of protons (H^+) in the thylakoid interior (thylakoid space) and a low concentration of protons (H^+) in the stroma .



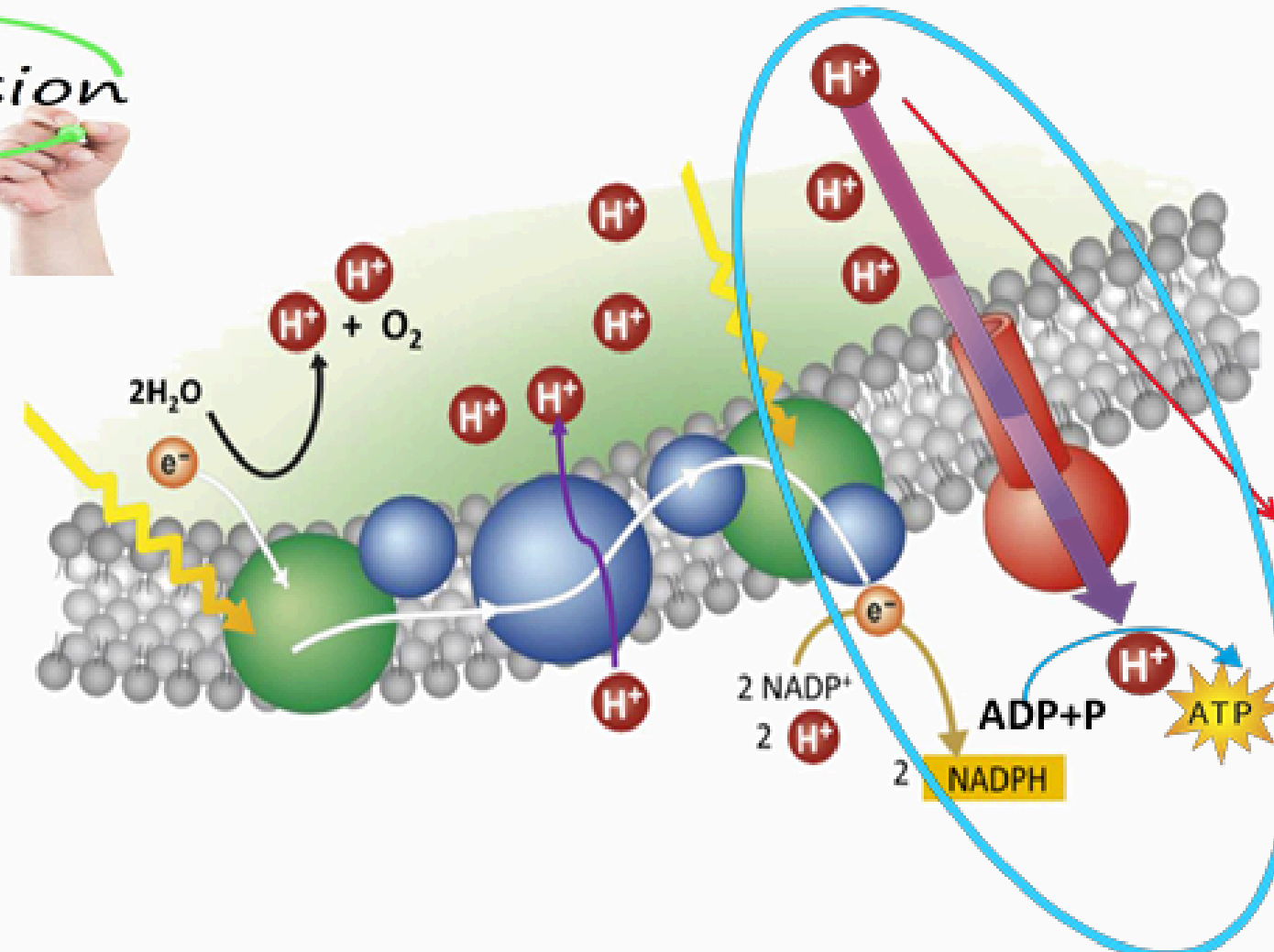


Chemiosmosis

- H^+ protons diffuse down their concentration gradient out of the thylakoid interior into the stroma through ATP synthases
- As H^+ moves through ATP synthases, ATP is formed in the stroma.

Conclusion

- Activated electrons are passed from one molecule to another along the thylakoid membrane in a chloroplast.
- The energy from electrons is used to form a proton gradient.
- As protons move down the gradient, a phosphate is added to ADP, forming ATP.





Phase One: Light reaction- Electron transport

- 1 Light energy absorbed by **Photosystem II** and excites the electrons in PSII. The excited electron moves from PSII to electron acceptor molecule in thylakoid membrane
- 2 Light energy causes water molecule to split releasing:
 - an electron to electron transport system in PSII
 - Hydrogen ion (H^+ –proton) into thylakoid space
 - Release Oxygen
- 3 - Electron acceptor molecules transfers electrons along a series electron carriers to **PS I**
- 4 **PS I** absorbs light and transfers electron to a protein called ferrodoxin. The electrons lost by PSI are replaced by electrons shuttled from PSII
- 5 Ferrodoxin transfers electrons to electron carrier $NADP^+$ forming energy storage **NADPH**



Chemiosmosis- production of ATP

- This happens when **light energy** cause **water** molecule to split into oxygen and two hydrogen ions H^+ (protons).
- This result in high concentration of H^+ (protons) in thylakoid and low concentration of H^+ in stroma .
- protons diffuse to stroma through ion channels that are enzymes called **ATP synthases** and produce ATP



At the beginning of photosynthesis, which molecule is split to produce oxygen (O_2) as a waste product?

- A. CO_2
- ☒ B. H_2O
- C. $C_6H_{12}O_6$
- D. 3-PGA

Which mechanism of photosynthesis uses the movement of hydrogen ions (H^+) across a concentration gradient to synthesize ATP?

- A. absorption
- ☒ B. chemiosmosis
- C. electron transport
- D. C_2 pathway

Q. What supplies the electron that is lost in PS II?

- ☐ oxygen
- ☒ water
- ☐ glucose
- ☐ rubisco

Light-absorbing-colored molecules called ____ are found in chloroplasts.

- ☒ A. pigments
- B. stroma
- C. rubisco
- D. ATPs



Where do light-independent reactions occur during photosynthesis?

- A. mitochondrion
- B. stroma in vacuoles
- C. nucleus
- ☒ D. stroma



Which photosystem does the light-dependent reaction begin with?



- A. Photosystem I
- ☒ B. Photosystem II

What are the products of the light-dependent reaction?

- A. Glucose
- B. Ferredoxin
- ☒ C. NADPH and ATP

What waste product of photosynthesis is released to the environment?

- a) carbon dioxide
- b) water
- ☒ c) oxygen
- d) ammonia

Which of these statements is true regarding chlorophyll?

- ☒ E. It is not the only photosynthetic pigment.
- F. There is only one kind of chlorophyll.
- G. It is the only type of pigment in leaves.
- H. It is the rarest type of pigment in leaves.

Which mechanism of photosynthesis uses the movement of hydrogen ions (H^+) across a concentration gradient to synthesize ATP?

- A. absorption
- ☒ B. chemiosmosis
- C. electron transport
- D. C_2 pathway



Phase Two: The Calvin Cycle

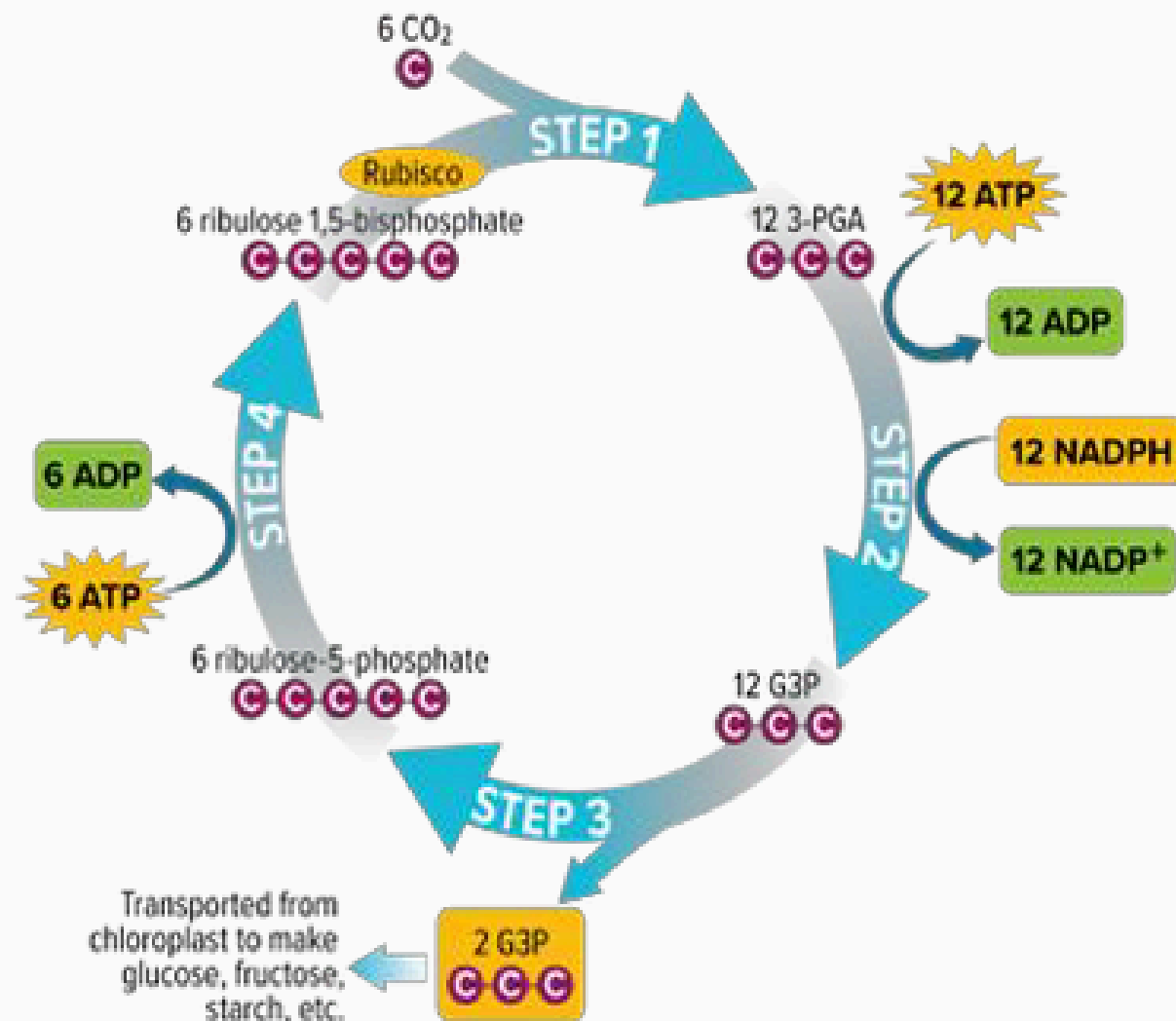


Figure 9 The Calvin cycle joins carbon dioxide with organic molecules inside the stroma of the chloroplast.

- In the second phase of photosynthesis, called the **Calvin cycle**, energy is stored in organic molecules such as glucose.
- The Calvin cycle builds sugars out of carbon dioxide and water using the energy stored in ATP and NADPH.
- The Calvin cycle's reactions do not require sunlight, which is why they are also referred to as **light-independent reactions**.
- It occurs in **stroma of chloroplast**.



1 The Calvin Cycle

In the first step of the Calvin cycle, called **carbon fixation**,

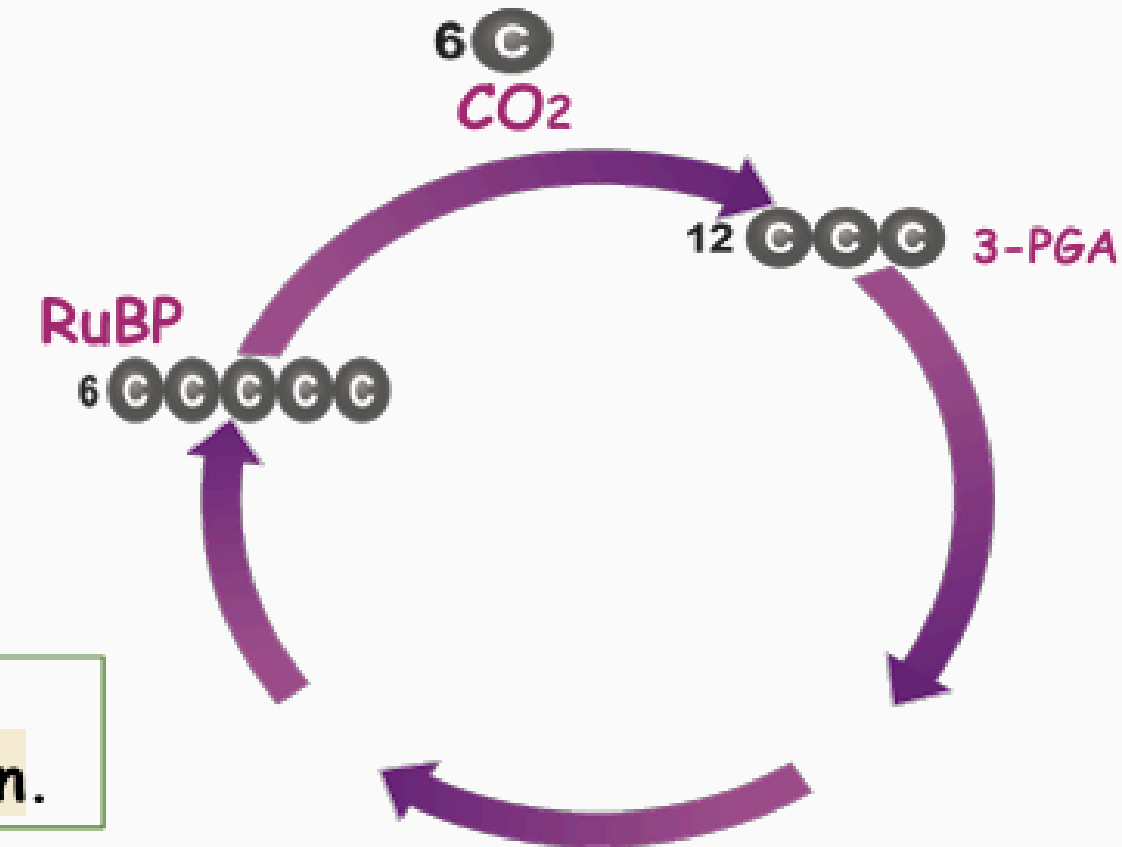
What does CO_2 fixation mean?

-Carbon fixation or carbon assimilation is the conversion process of inorganic carbon (carbon dioxide) to organic compounds by living organisms.

The joining of carbon dioxide with other organic molecules is called **carbon fixation**.

Carbon fixation,

* **six** carbon dioxide (CO_2) molecules combine with **six** 5 carbon compounds (**RuBP**) to form $\rightarrow\rightarrow\rightarrow\rightarrow$ **twelve** 3-carbon molecules called 3-phosphoglycerate (**3-PGA**).

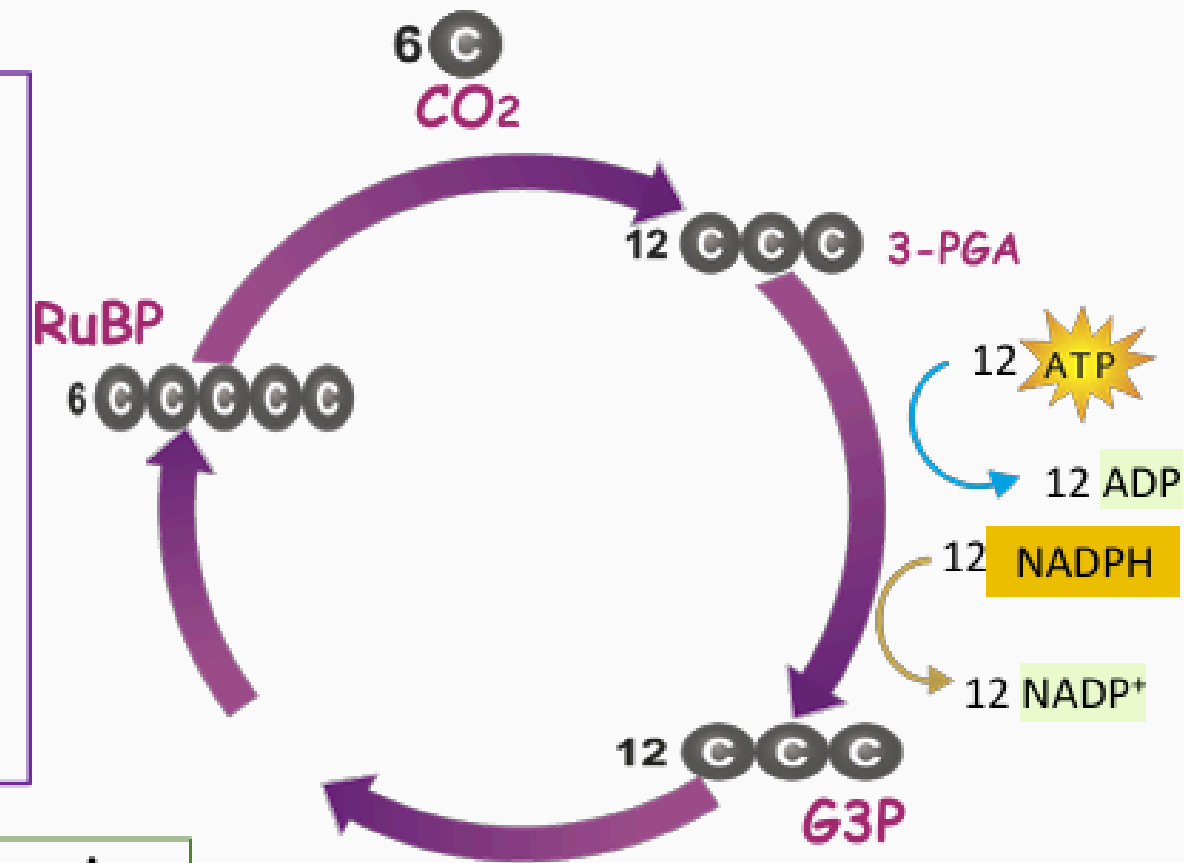




2 The Calvin Cycle

In the **Reduction** step, the chemical energy stored in **ATP** and **NADPH** is transferred to the 3-PGA molecules to form →→→ high-energy molecules called **glyceraldehyde 3-phosphates (G3P)**. **ATP** supplies the phosphate groups for forming **G3P** molecules, while **NADPH** supplies hydrogen ions and electrons.

The chemical energy stored in **ATP** and **NADPH** is transferred to make a **G3P** molecule.

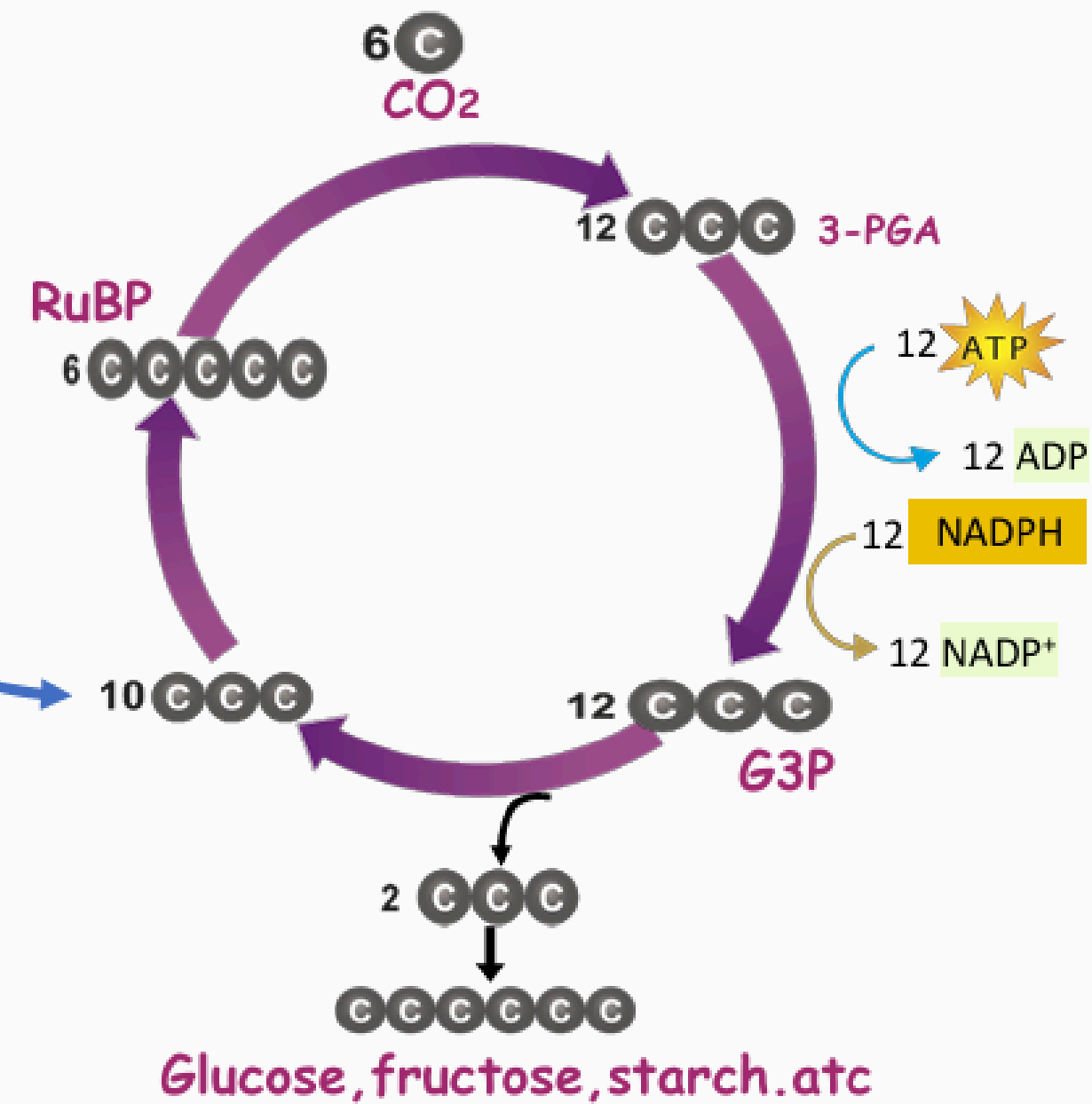




3 The Calvin Cycle

In the third step, two **G3P** molecules leave the cycle to be used for the production of $\rightarrow\rightarrow\rightarrow$ **glucose** and other organic compounds.

How many G3P left?.

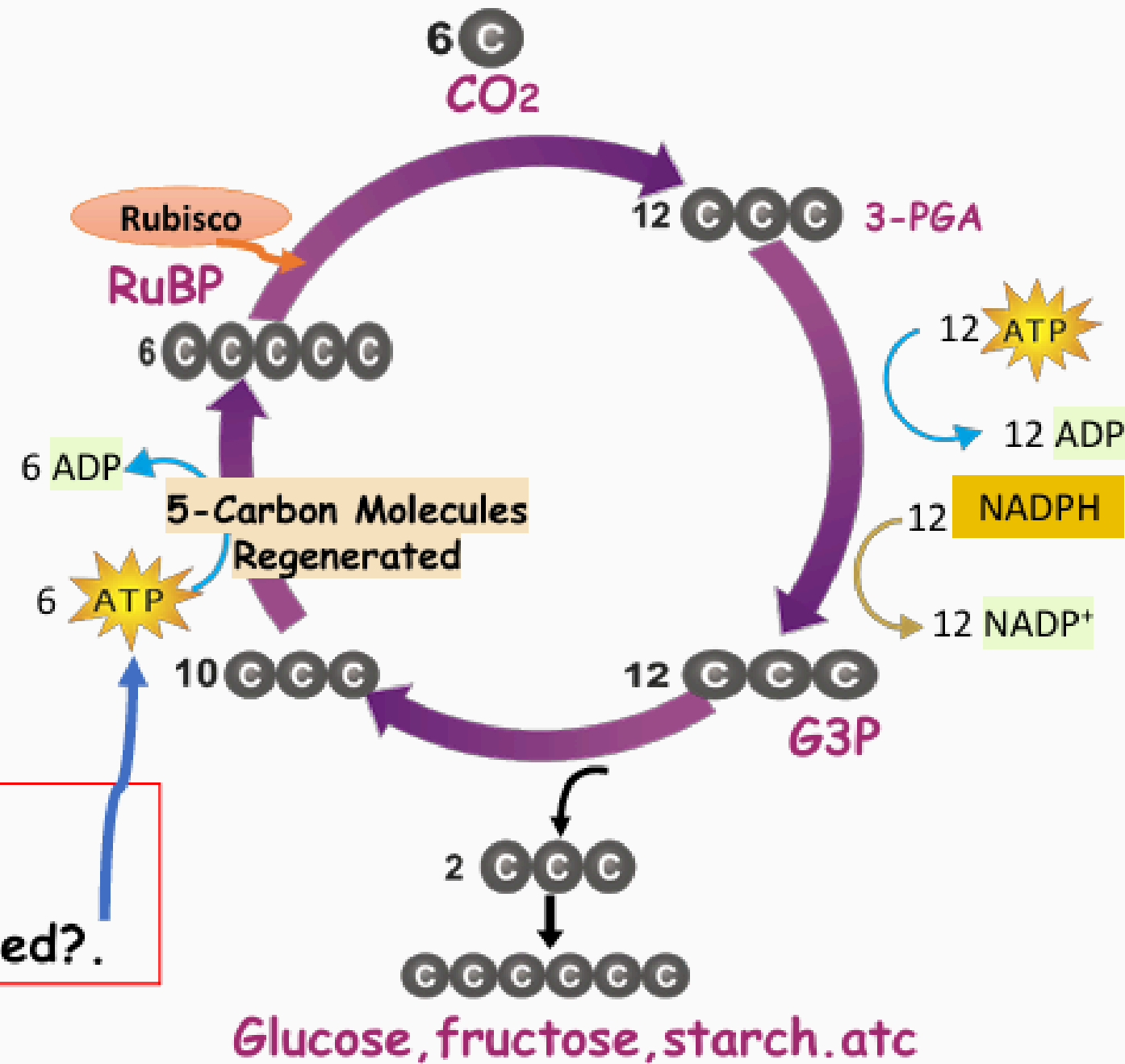




4 The Calvin Cycle

In the final step of the Calvin cycle, an enzyme called **rubisco** converts the remaining **ten** G3P molecules into 5-carbon molecules called ribulose 1, 5-bisphosphates (**RuBP**). These molecules combine with new carbon dioxide molecules to continue the cycle.

At converting G3P to RuBP, G3P molecules regenerated.
How many ATP would be consumed?





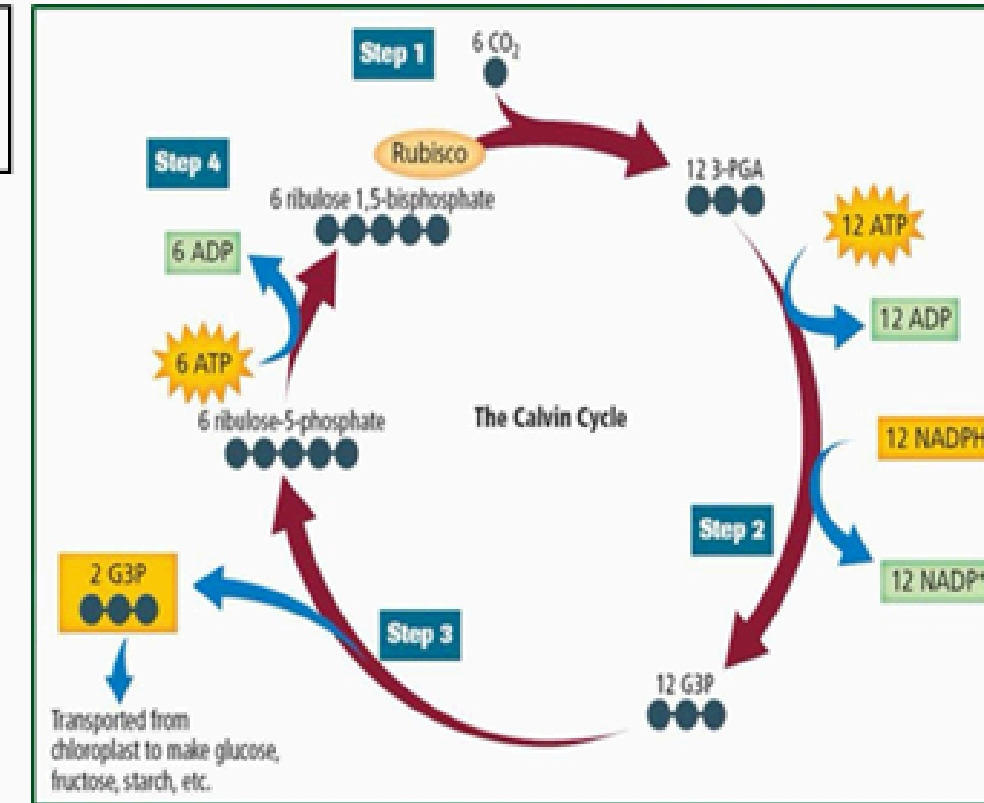
Which molecule helps provide the energy that drives this cycle?

- A. 3-PGA
- B. CO_2
- ☒ C. NADPH
- D. rubisco



Which product of the Calvin cycle is used for the production of glucose and other organic compounds?

- A. ADP
- B. CO_2
- ☒ C. G3P
- D. NADP^+



Q. How many carbons does G3P have?

- | | |
|------------------------------------|-------------------------|
| ☐ 1 | ☐ 2 |
| ☒ 3 | ☐ 6 |



Q. When carbon first enters the Calvin cycle, what molecule does it combine with?

- ☐ PGA ☐ G3P
- ☒ RuBP ☐ ATP

Q. What is the product of the Calvin Cycle?

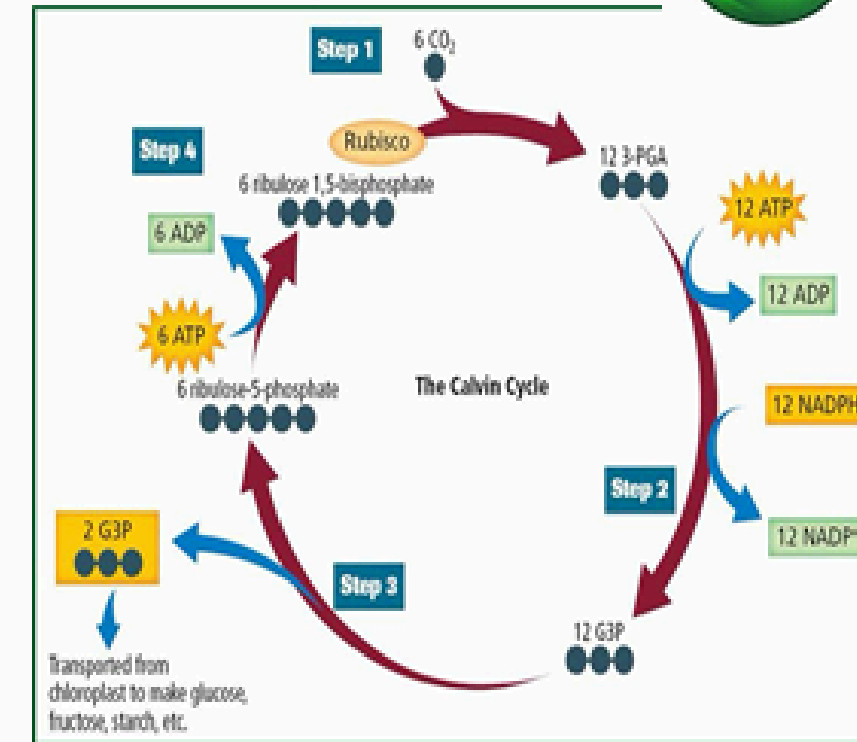
- ☐ Rubisco ☒ Glyceraldehyde 3-Phosphate (G3P)
- ☐ Oxygen ☐ Starch

Which step occurs during the Calvin cycle?

- a) formation of ATP
- ☒ **b) formation of six-carbon sugars**
- c) release of oxygen gas
- d) transport of electrons by NADP⁺

Where does the Calvin Cycle occur?

- ☐ thylakoid ☒ stroma
- ☐ lumen ☐ mitochondria





At the end of the Calvin cycle, where is energy stored?

- A. NADPH
- B. ATP
- C. chloroplast
- ☒ D. glucose

At the beginning of photosynthesis, which molecule is split to produce oxygen (O_2) as a waste product?

- A. 3-PGA
- B. CO_2
- ☒ C. H_2O
- D. $C_6H_{12}O_6$

_____ is a process in which energy is stored in organic molecules.

- ☒ a) Calvin cycle
- b) Carbon fixation
- c) glycolysis
- d) Krebs cycle

Which molecule is produced in the final step of the Calvin cycle?

- a. Acetyl COA
- b. Carbon dioxide (CO_2)
- ☒ c. Ribulose 1, 5-bisphosphate (RuBP)
- d. Glyceraldehyde 3 phosphate (G3P)



Which step occurs during the Calvin cycle ?

formation of ATP .a

transport of electrons by NADP^+ .b

release of oxygen gas .c

formation of six-carbon sugars .d

Which supplies energy used to synthesize carbohydrates during the Calvin cycle?

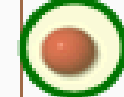
H_2O and O_2 .a

CO_2 and ATP .b

ATP and NADPH .c

NADPH and H_2O .d

6) What is the Calvin Cycle?



The second phase of photosynthesis



Where energy from sunlight is stored in ATP



Another name for the water cycle



All of the above



None of the Above

How can environmental factors such as light intensity and carbon dioxide levels affect rates of **photosynthesis**?



Increased light and CO_2 increase photosynthesis rates

b.

Increased light and CO_2 decrease photosynthesis rates

c.

Only increased light leads to increase photosynthesis rates

d.

Only increased CO_2 leads to increase photosynthesis rates



اساله من الف

Why are NADPH and ATP not suitable for long-term energy storage in plants?

- They are not stable enough to store chemical energy long-term ✓
- They contain too much energy for the plant to use efficiently
- They require too much water to maintain
- They cannot be transported throughout the plant

What is the main purpose of photosynthesis?

- To convert light energy from the sun into chemical energy ✓
- To fix nitrogen from the atmosphere
- To break down glucose for cellular respiration
- To produce oxygen as a primary product

What is the relationship between the light-dependent reactions and the Calvin cycle?

- They occur simultaneously in the same location of the chloroplast
- They are completely independent processes with no direct relationship
- The light-dependent reactions provide ATP and NADPH for the Calvin cycle ✓
- The Calvin cycle provides energy for the light-dependent reactions

What is chemiosmosis in the context of photosynthesis?

- The conversion of carbon dioxide to organic compounds
- The transfer of electrons from photosystem I to ferredoxin
- The mechanism by which ATP is produced as a result of the flow of electrons down a concentration gradient ✓
- The splitting of water molecules in photosystem II

Which adaptation allows C4 plants to thrive in hot, dry environments?

- They fix carbon dioxide into four-carbon compounds and keep stomata closed during hot days ✓
- They can perform photosynthesis without light
- They do not require water for photosynthesis
- They can convert oxygen directly into glucose

What is the role of rubisco in photosynthesis?

- It splits water molecules to release oxygen
- It transfers electrons between photosystems
- It converts G3P molecules into RuBP in the Calvin cycle ✓
- It pumps protons across the thylakoid membrane

What is carbon fixation in the Calvin cycle?

- The breakdown of glucose into carbon dioxide
- The transport of carbon compounds between cells
- The conversion of inorganic carbon dioxide to organic compounds ✓
- The release of carbon dioxide during cellular respiration

Which of the following is also known as the tricarboxylic acid (TCA) cycle?

- Krebs cycle ✓
- Fermentation
- Electron transport
- Glycolysis

What is the net yield of ATP from glycolysis?

- 6 ATP
- 4 ATP
- 8 ATP
- 2 ATP ✓

Where does glycolysis occur in the cell?

- In the Golgi apparatus
- In the nucleus
- In the mitochondria
- In the cytoplasm ✓

What is produced during alcohol fermentation that is not produced during lactic acid fermentation?

- Carbon dioxide ✓
- Pyruvate
- NAD+
- ATP



اساله من الف

What type of process is glycolysis?

Catabolic and anabolic process

Aerobic process

Anaerobic process



Photosynthetic process

What happens during the preparatory reaction before the Krebs cycle?

Glucose is broken down into pyruvate

Carbon dioxide is converted to oxygen

Pyruvate reacts with coenzyme A to form acetyl CoA



ATP is converted to ADP

What is the final electron acceptor in the electron transport chain during cellular respiration?

Water

Oxygen



Carbon dioxide

Hydrogen

What is the relationship between photosynthesis and cellular respiration?

They are interrelated and provide most energy for life processes



They are completely independent processes

They both produce glucose as an end product

They both occur only in plant cells

What are the two main parts of cellular respiration?

Krebs cycle and electron transport

Glycolysis and aerobic respiration



Photosynthesis and fermentation

Lactic acid fermentation and alcohol fermentation

Where do prokaryotes perform electron transport since they lack mitochondria?

In the cellular membrane



In the cytoplasm

In the nucleus

In specialized organelles



شروحات للدرس الثاني من يوتيوب :

Clear it up

https://youtu.be/R_74Oj9ojvs?si=h7gXGq7pljBpZa0o

BioScope

https://youtu.be/TPUYKSyGm8A?si=fvn2i_U5PV6LYbMS - PART 1

BioScope

https://youtu.be/V_1RqFPET1U?si=9lQDo4hUsZWc-_Av

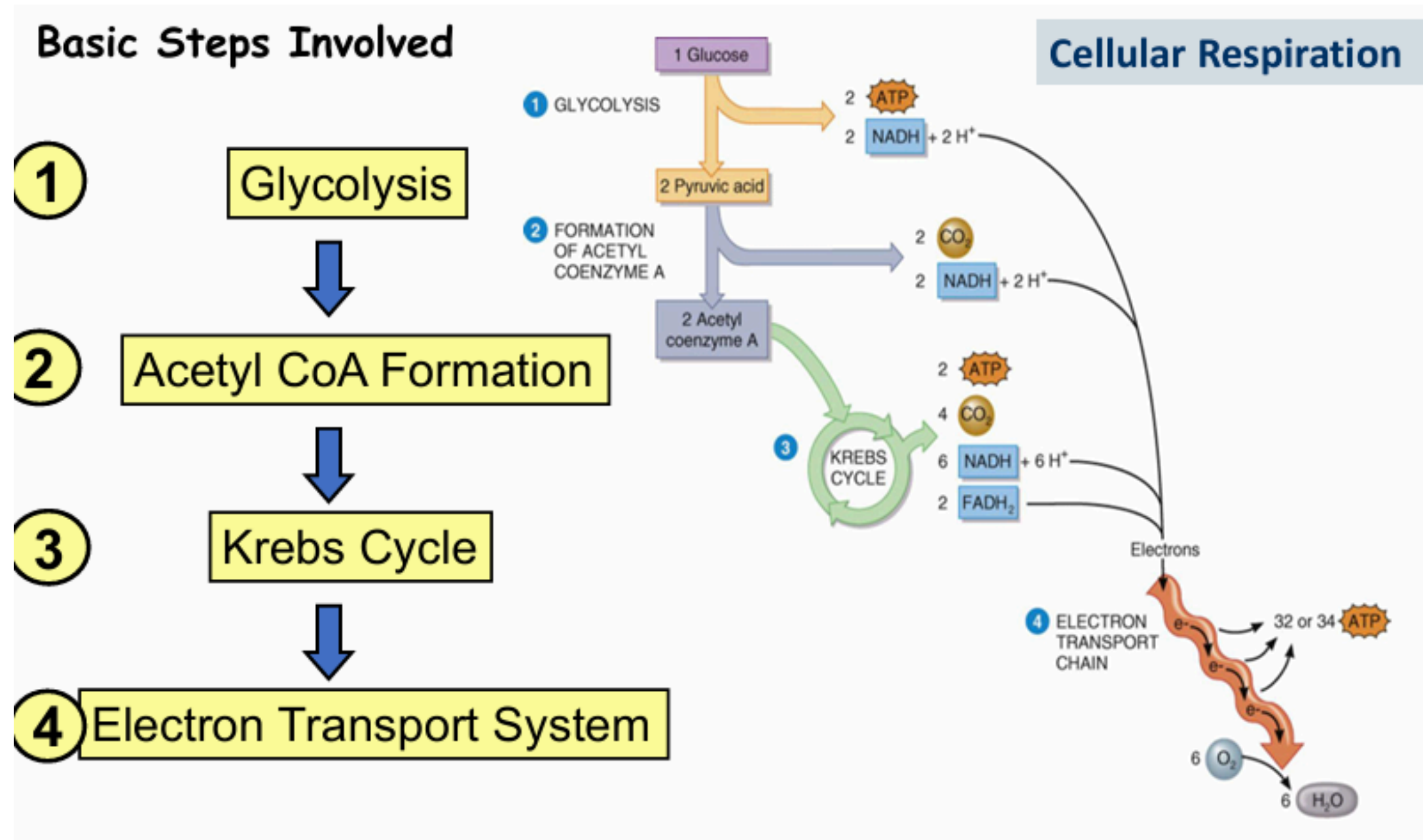


اساله الهيكل الوحده الثالثه وشرحها

9	BIO.3.1.02.028 Use a model to illustrate that aerobic cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.	Information from text	42
10	BIO.3.1.02.028 Use a model to illustrate that aerobic cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.	Information from text	43
		Figure 12	43
11	BIO.3.1.02.029 Investigate factors that affect the processes of fermentation or cellular respiration in living organisms.	Figure 14 + Question below it	45
12	BIO.3.1.02.029 Investigate factors that affect the processes of fermentation or cellular respiration in living organisms.	Information from text	45
22	BIO.3.4.01.028 Describe the complementary processes of cellular respiration and photosynthesis with respect to the flow of energy and the cycling of matter within ecosystems, and explain how human activities can disrupt the balance achieved by these processes	Information from text	46
		"Demonstrate Understanding: Question 4"	46
23	BIO.3.1.02.029 Investigate factors that affect the processes of fermentation or cellular respiration in living organisms.	Information from text	45
24	BIO.3.1.02.028 Use a model to illustrate that aerobic cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.	Information from text	44
		Figure 13	44
25	BIO.3.4.01.028 Describe the complementary processes of cellular respiration and photosynthesis with respect to the flow of energy and the cycling of matter within ecosystems, and explain how human activities can disrupt the balance achieved by these processes	Figure 15	46
26	BIO.3.1.02.028 Use a model to illustrate that aerobic cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.	Information from text	44
27	BIO.3.1.02.028 Use a model to illustrate that aerobic cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.	Information from text	42
30	BIO.3.1.02.029 Investigate factors that affect the processes of fermentation or cellular respiration in living organisms.	Information from text	44, 45
		Explain Your Thinking Question 5	46



ص 41





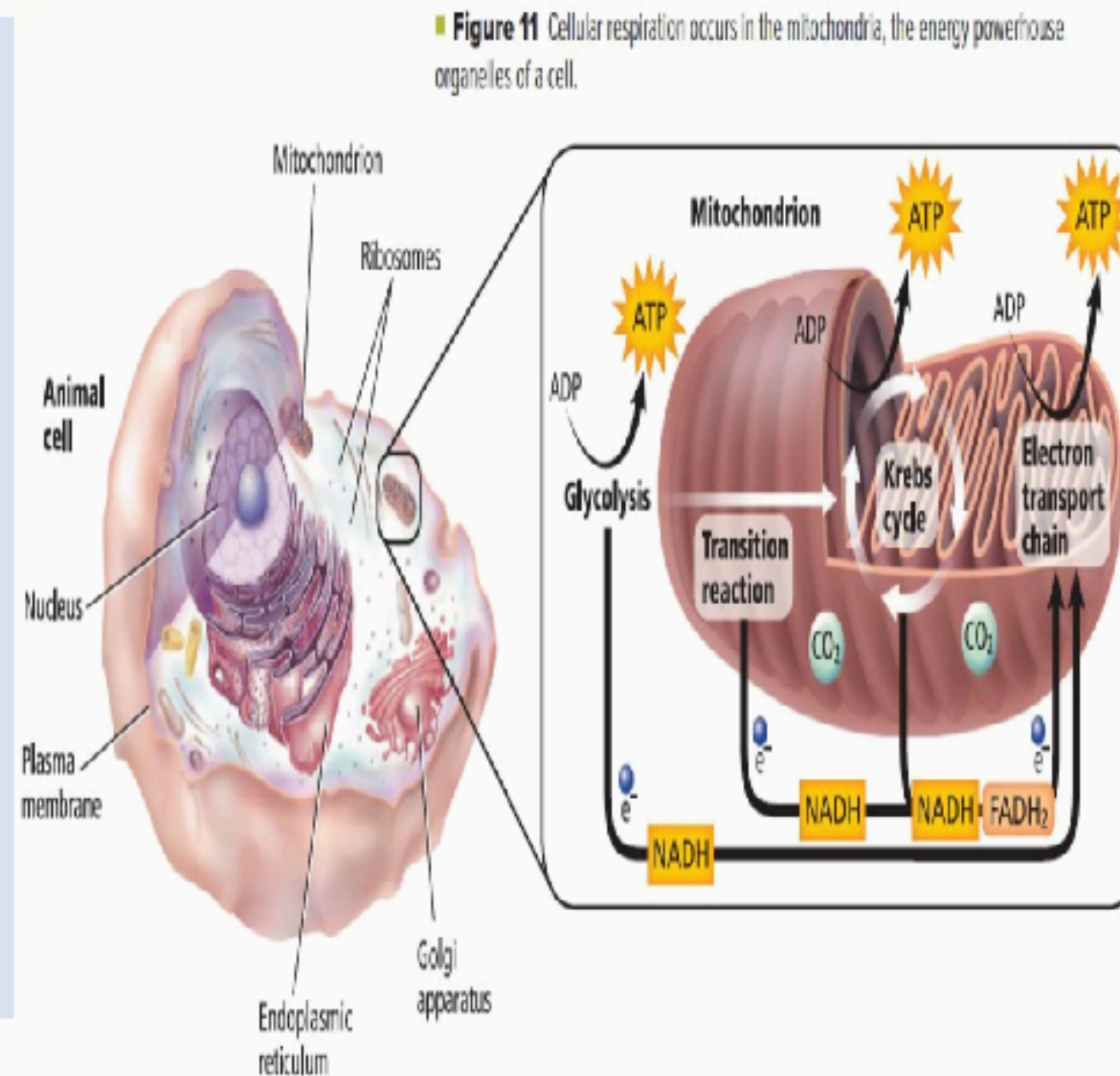
Cellular respiration It occurs in two main parts:

- 1- **Glycolysis**
- 2- **Aerobic Respiration.**

Glycolysis is an **anaerobic** process, meaning it does **not** **require** oxygen.

Aerobic respiration involves:
A. the Krebs cycle .
B. electron transport.

Aerobic processes **require** oxygen





ص 42

Krebs Cycle

- Also known as the **tricarboxylic acid (TCA)** cycle
- Also known as the **Citric acid cycle**
- Most of the energy from the glucose is still contained in the **pyruvate**.
- The series of reactions in which pyruvate is broken down into carbon dioxide is called the **Krebs cycle**.

When **oxygen** is present, pyruvate is transported into the **mitochondrial matrix**.

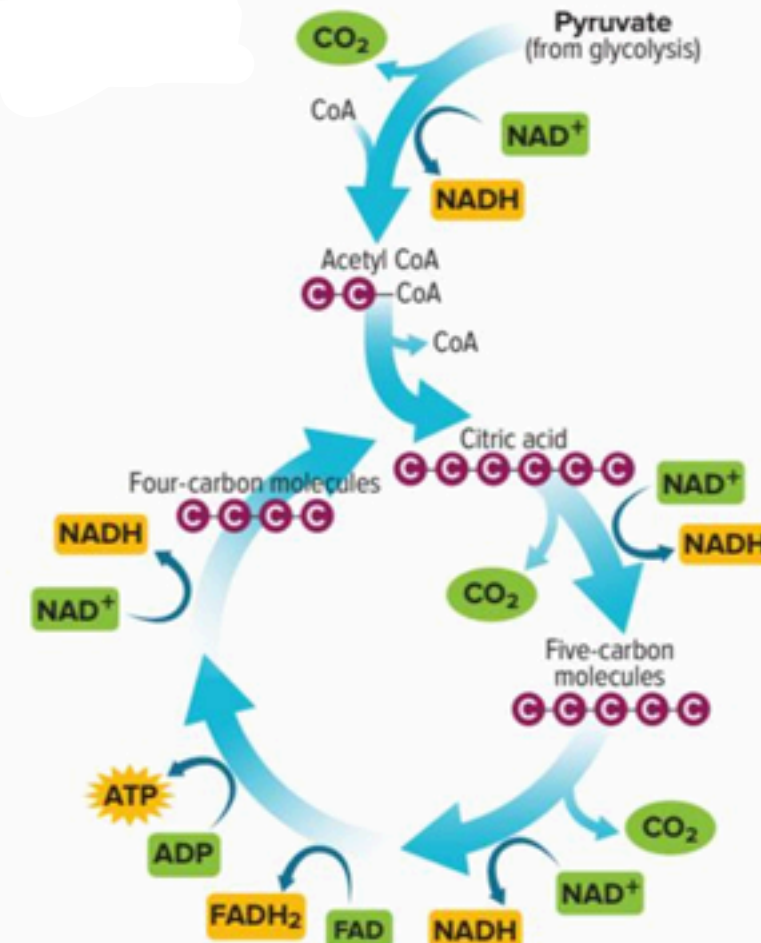


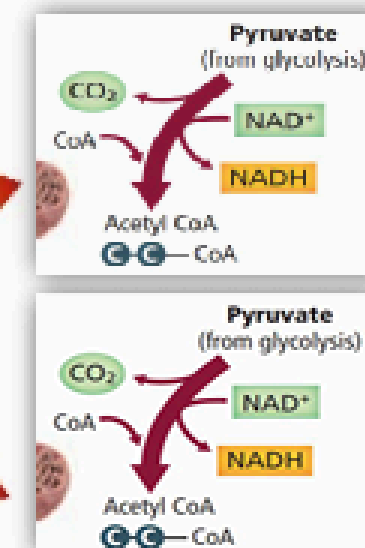
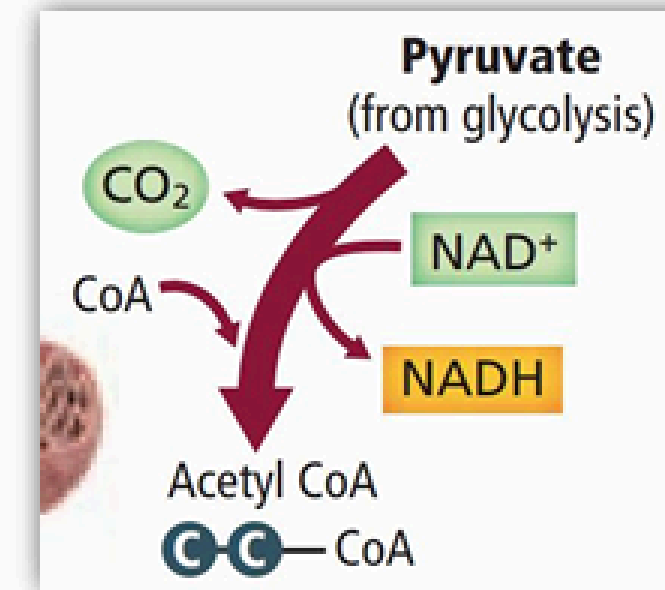
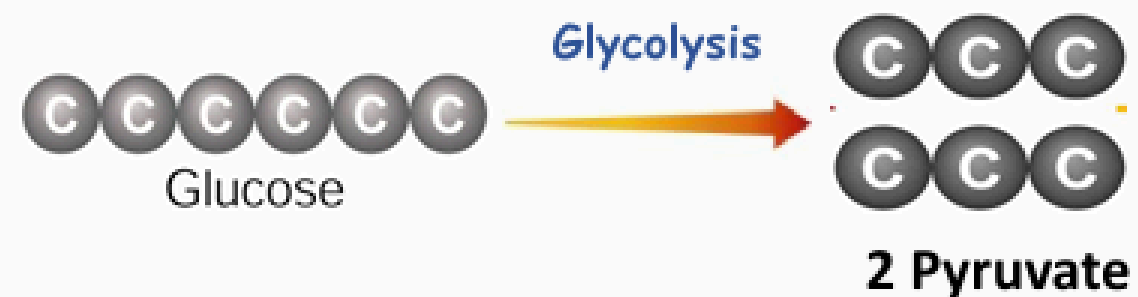
Figure 12 Pyruvate is broken down into carbon dioxide during the Krebs cycle inside the mitochondria of cells.

Trace Follow the path of carbon molecules that enter and leave the Krebs cycle.



Before the Krebs Cycle

- Pyruvate first reacts with coenzyme A (CoA) to form a 2-Carbon intermediate called **acetyl CoA**.
- At the same time NAD^+ is converted to **NADH** and **carbon dioxide** is released.
- Acetyl CoA then moves to the mitochondria matrix.
- Yield per glucose molecule = 2CO_2 and 2NADH are produced.





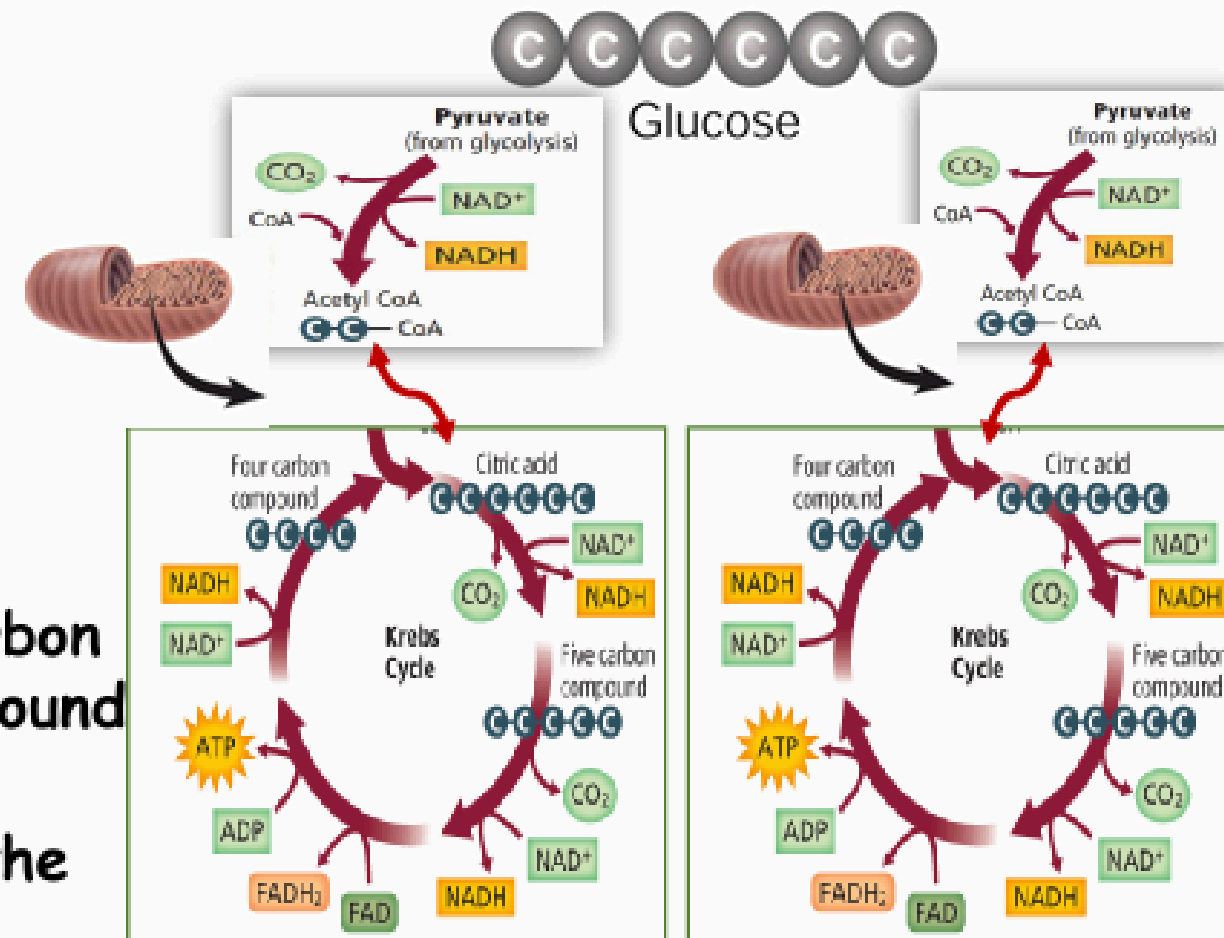
Krebs Cycle

- Two molecules of pyruvate are formed during glycolysis.
- This means** that there are **two "turns"** of the Krebs Cycle for each glucose molecule.

Steps of Krebs Cycle

- Acetyl CoA combining with a 4-Carbon compound to form a 6 - Carbon compound known as **citric acid**

- Citric acid is then broken down in the next series of steps, releasing 2 molecules of CO_2 and generating 1ATP, 3NADH, and 1FADH₂.
- FAD** is another electron carrier similar to **NAD⁺** and **NADP⁺**



The net yield from the Krebs cycle is=

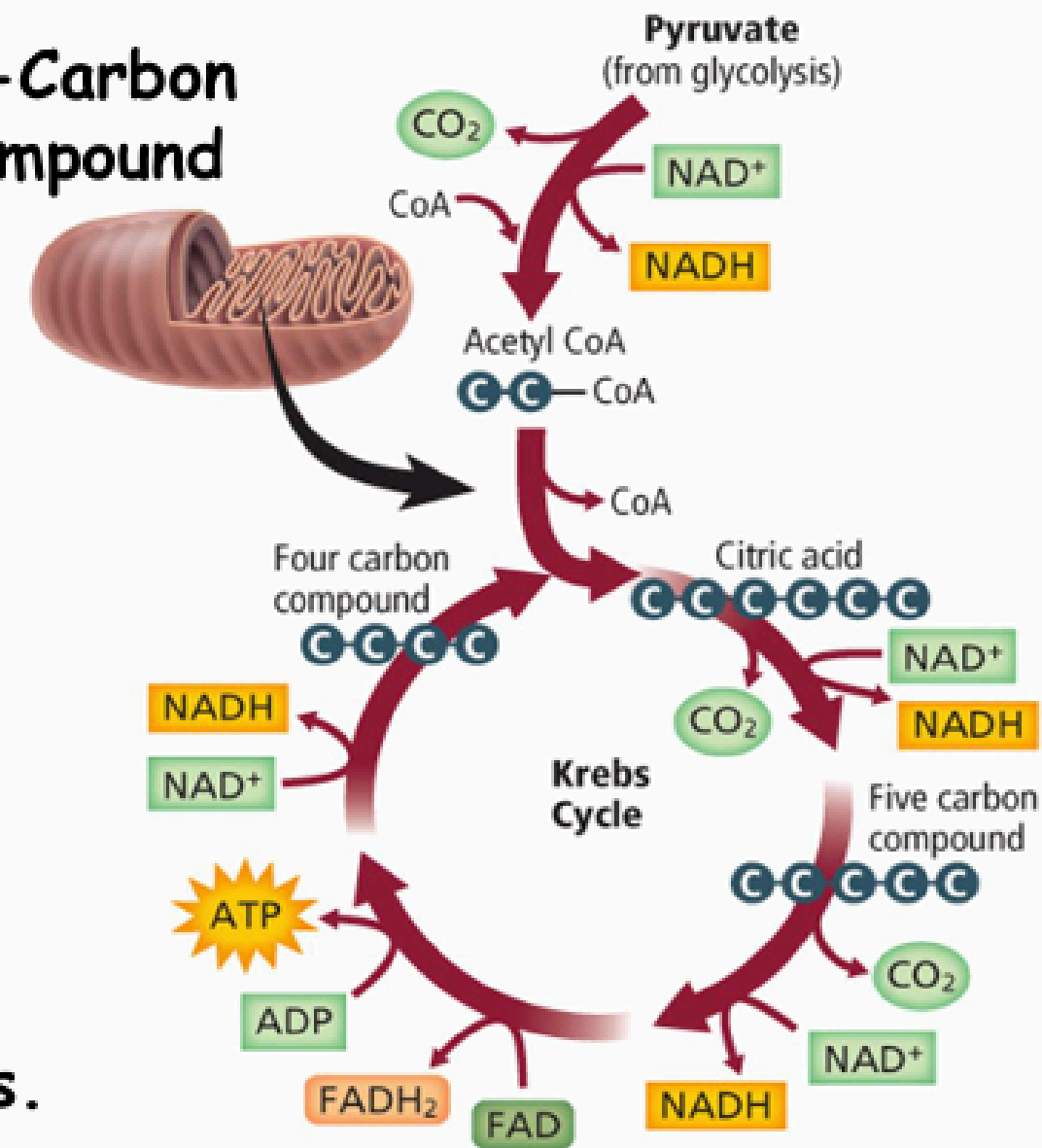
- 6 CO_2 molecules
- 2 ATP
- 8 NADH
- 2 FADH₂.



Steps of Krebs Cycle

1-Acetyl CoA combining with a 4-Carbon compound to form a 6 - Carbon compound known as citric acid

- **Citric acid** is then broken down in the next series of steps, releasing 2 molecules of CO_2 and generating 1ATP, 3NADH, and 1FADH₂.
- FAD is another electron carrier similar to NAD⁺ and NADP⁺
- Acetyl CoA and citric acid are generated and the cycle continues.

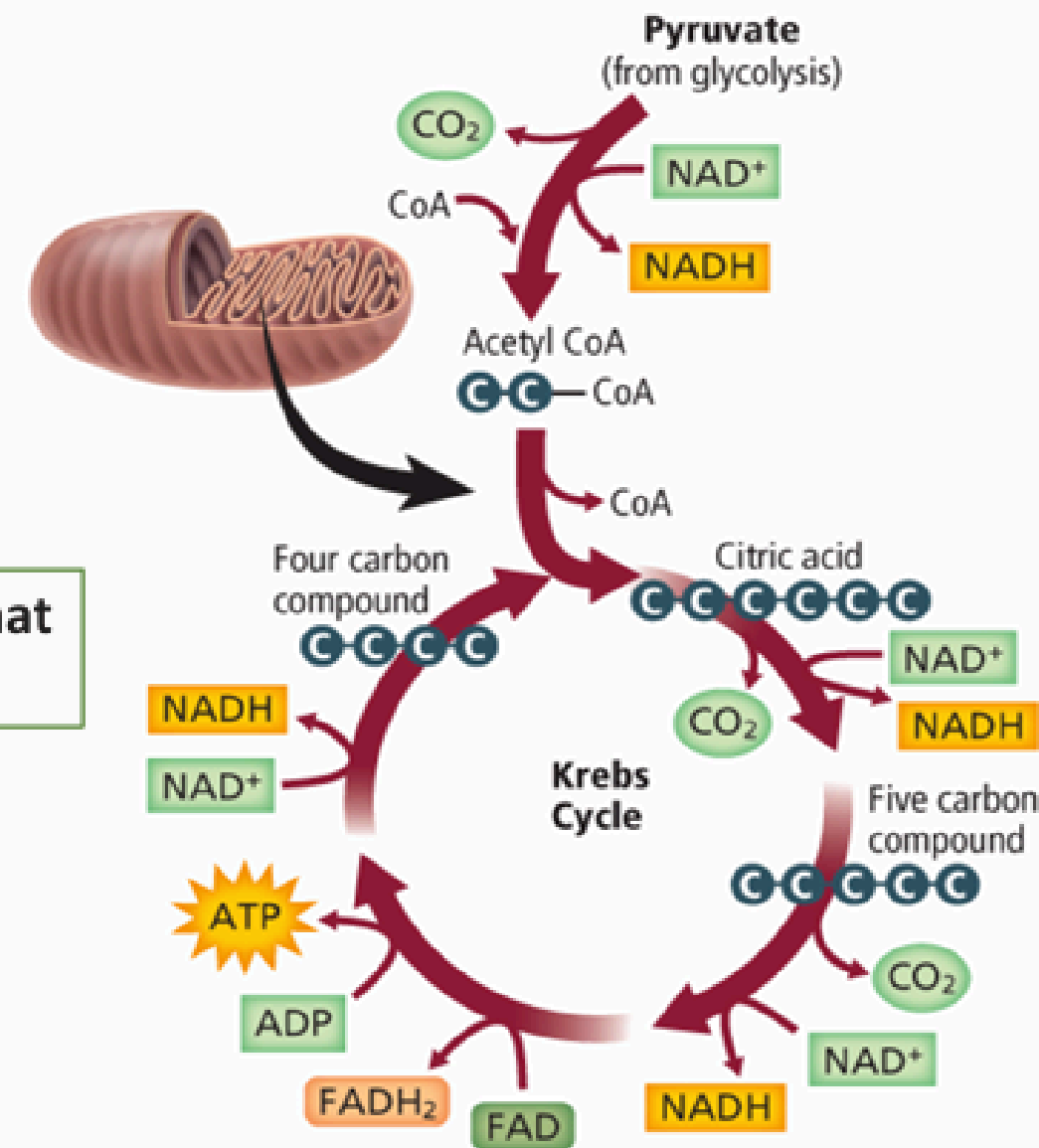




- The net yield from the Krebs cycle is=
 - 6 CO₂ molecules
 - 2 ATP
 - 8 NADH
 - 2 FADH₂.

Trace Follow the path of carbon molecules that enter and leave the Krebs cycle.

From pyruvate to citric acid to a five-carbon compound to a four-carbon compound.





What is the overall purpose of cellular respiration?

- ☒ A. to make ATP
- ☐ B. to process H_2O
- ☐ C. to store glucose
- ☐ D. to deliver oxygen



Which is not a stage of cellular respiration?

- ☐ a. Krebs cycle
- ☐ b. glycolysis
- ☐ c. electron transport chain
- ☒ d. lactic acid fermentation

Which represents the general sequence of cellular respiration?

- ☐ A. TCA cycle → chemiosmosis → glycolysis
- ☒ B. glycolysis → Krebs cycle → electron transport
- ☐ C. electron absorption → catalysis → phosphorylation
- ☐ D. aerobic pathway → anaerobic pathway → fermentation

When pyruvate acid is converted to a 2-carbon intermediate molecule called acetyl CoA it produces.....

$NADH + ATP$

☒ $NADH + CO_2$

$FADH_2 + CO_2$

$FADH_2 + ATP$



?Which occurs during the Krebs cycle

breaking down pyruvate

☒ .a

producing ethyl alcohol

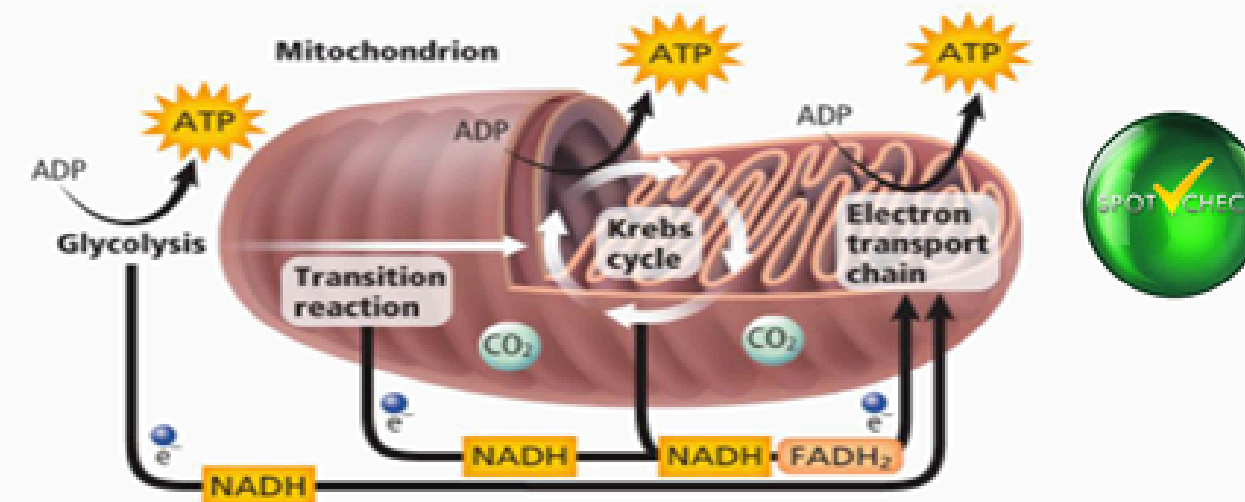
.b

capturing light energy

.c

creating glucose

.d



Which organelle is illustrated in the figure?

a) Golgi apparatus

☒ b) Mitochondrion

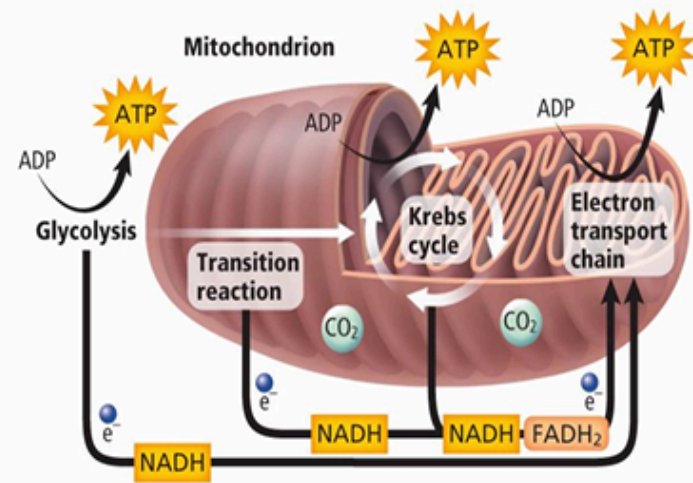
c) Nucleus

d) Endoplasmic reticulum



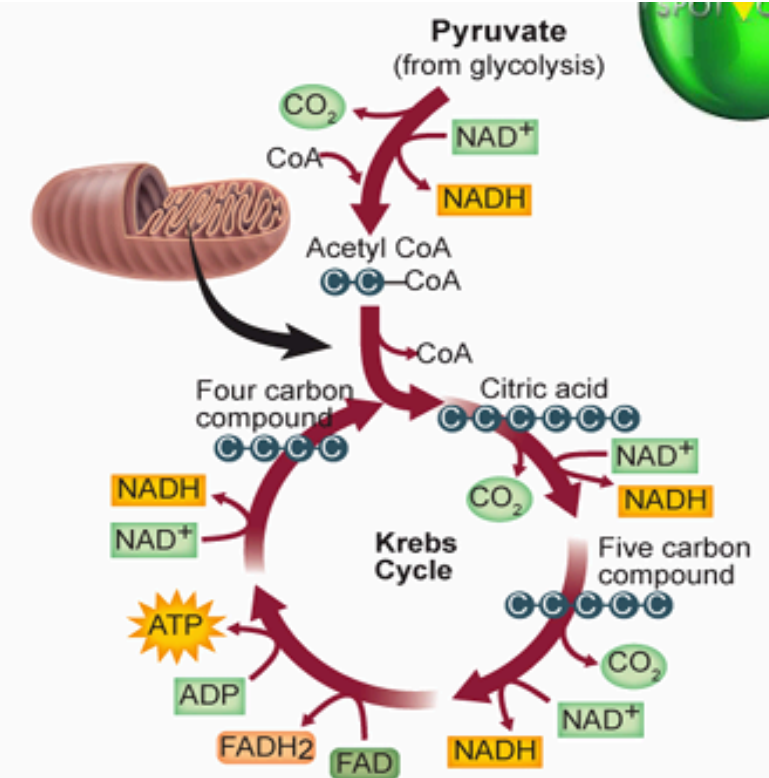
Which molecule generated by the Krebs cycle is a waste product?

- A. CoA
- B. CO_2**
- C. FADH_2
- D. NADH



During the Krebs cycle, pyruvate is broken down into what compound?

- A. H_2O
- B. O_2
- C. CO
- D. CO_2**





Electron Transport Chain

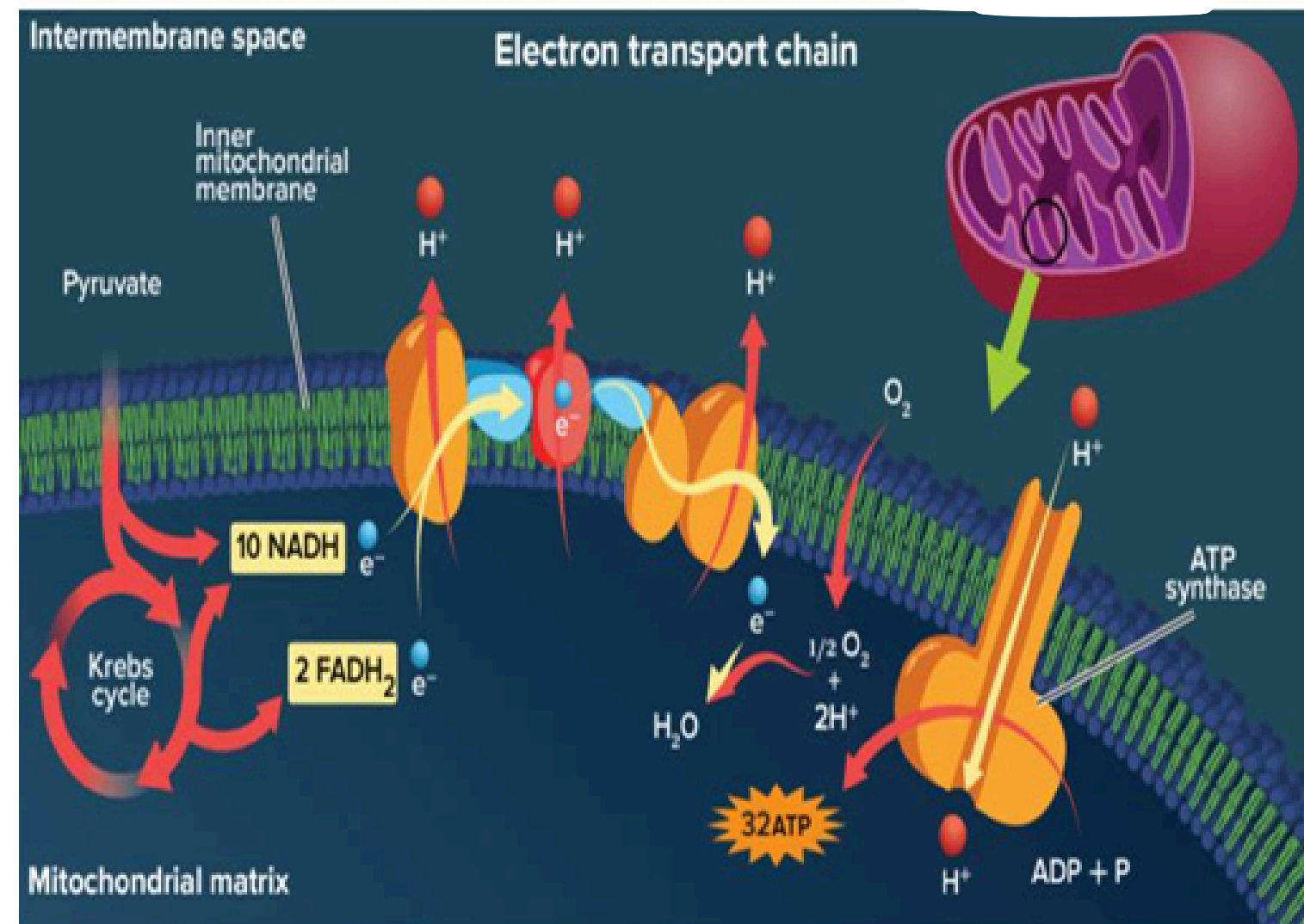


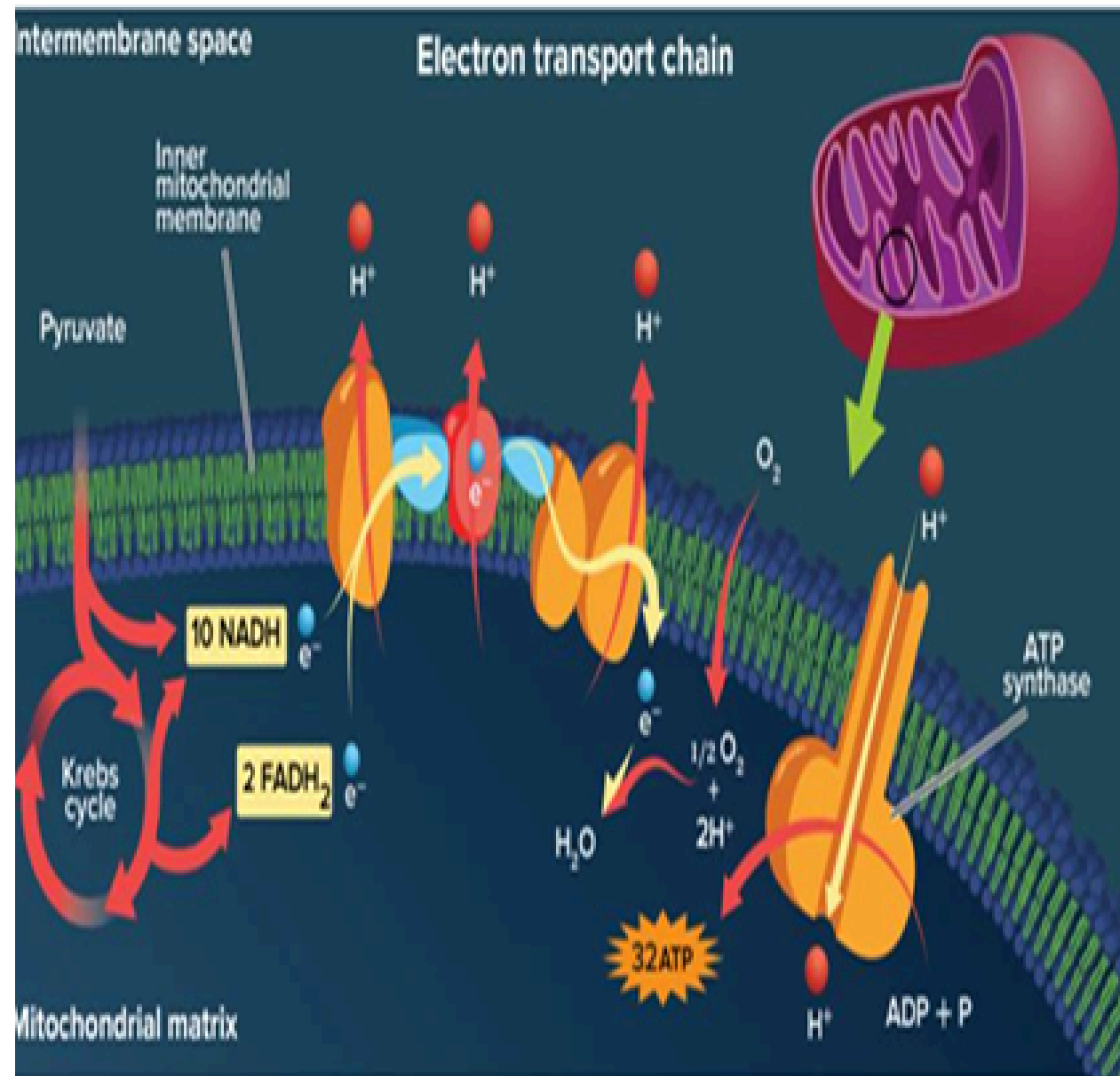
Figure 13 Electron transport occurs along the mitochondrial membrane.

Compare and contrast electron transport in cellular respiration and photosynthesis.

- The start of the electron transport chain begins with the 10 NADH molecules and the 2 FADH₂ molecules releasing electrons.
- The released electrons move along the inner mitochondrial membrane from one protein to another.
- The energy carriers are converted to NAD⁺ and FAD, and H⁺ ions are released into the mitochondrial matrix.
- The H⁺ ions are pumped into the intermembrane space through the proteins in the inner mitochondrial membrane.
- This creates an increase in the concentration of H⁺ ions in the intermembrane space.



Electron Transport Chain



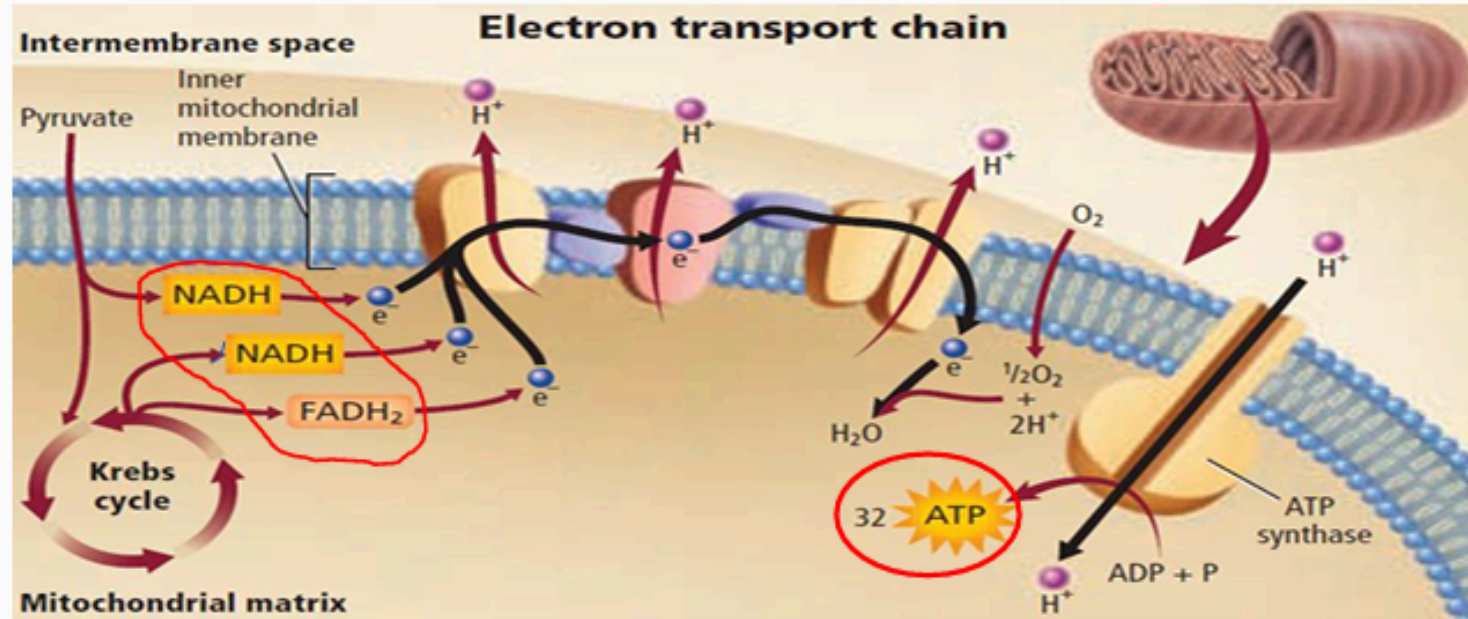
- As a result of high concentration in the intermembrane space and a low concentration in the mitochondrial matrix, the H⁺ ions **diffuse down their concentration gradient back across the inner mitochondrial membrane and into the mitochondrial matrix** through **ATP synthase proteins** in **chemiosmosis**.
- As the H⁺ ions move through the ATP synthase, **ADP** is converted into **ATP** in the mitochondrial matrix.
- **Oxygen** is the final electron acceptor in the electron transport system in cellular respiration. The H⁺ ions and electrons are transferred to **oxygen** to form **water**.

Overall, electron transport produces **32 ATP**. Each **NADH** molecule produces **three ATP** and each group of three **FADH₂** produces **two ATP**. In eukaryotes, **one molecule of glucose yields 36 ATP under ideal conditions**.



Electron Transport Chain

- The final step in the breakdown of glucose.
- Point where most **ATP** is produced.
- Electrons and hydrogen ions **from NADH and FADH₂** produced in Acetyl CoA Formation and Krebs Cycle **are used to convert ADP to ATP**.

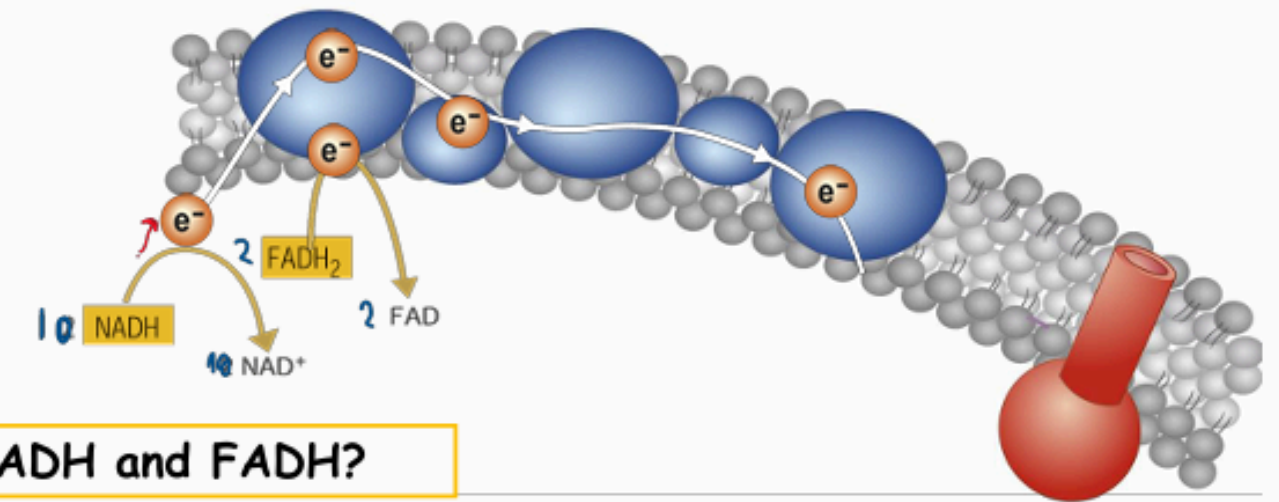


- Occurs along the mitochondrial membrane.

Electron Transport Chain

Uses high-energy electrons from the Krebs Cycle to convert ADP into ATP

- Electrons move along mitochondrial membrane from one protein to another.

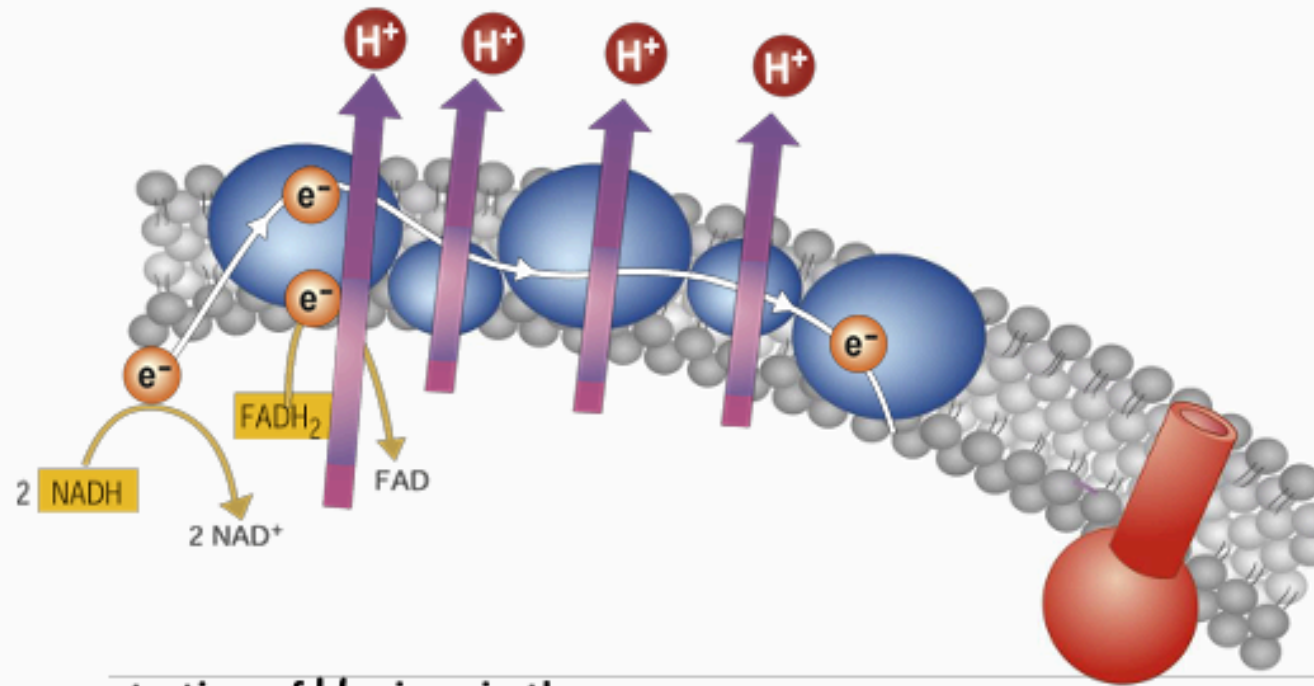


What happen to NADH and FADH?



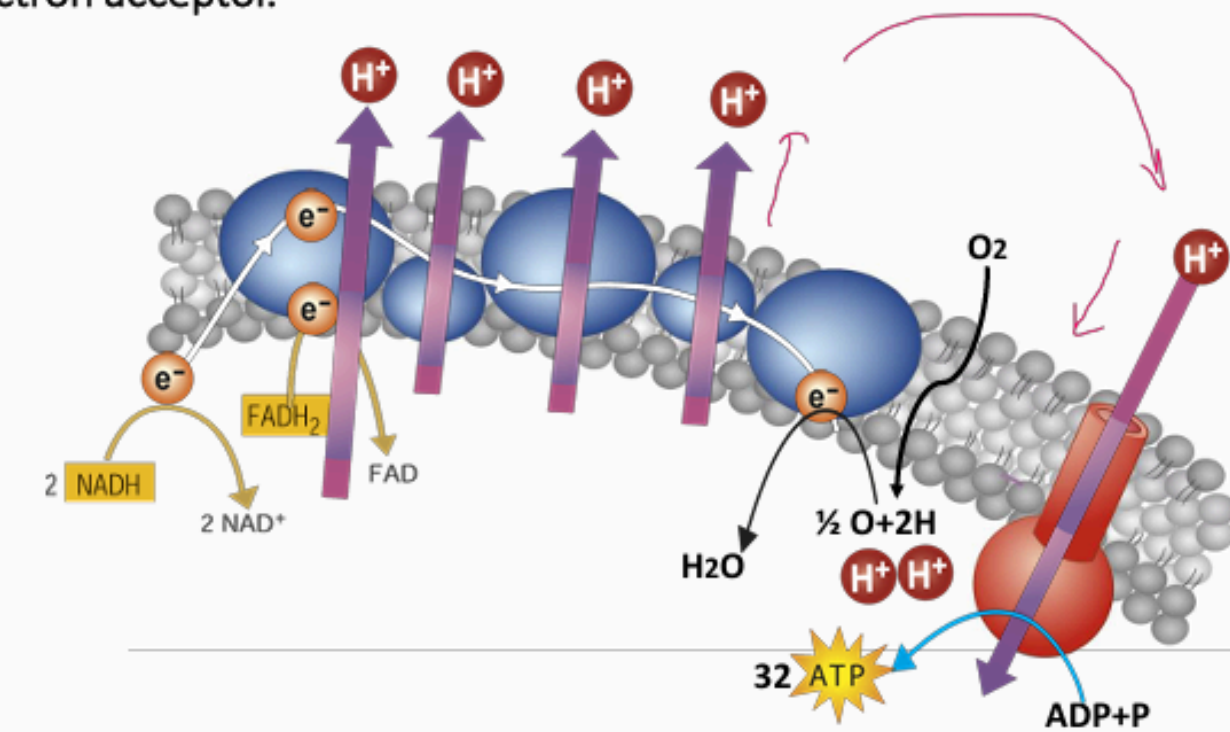
Electron Transport Chain

- The H^+ ions are pumped into the intermembrane space through the proteins in the inner mitochondrial membrane.



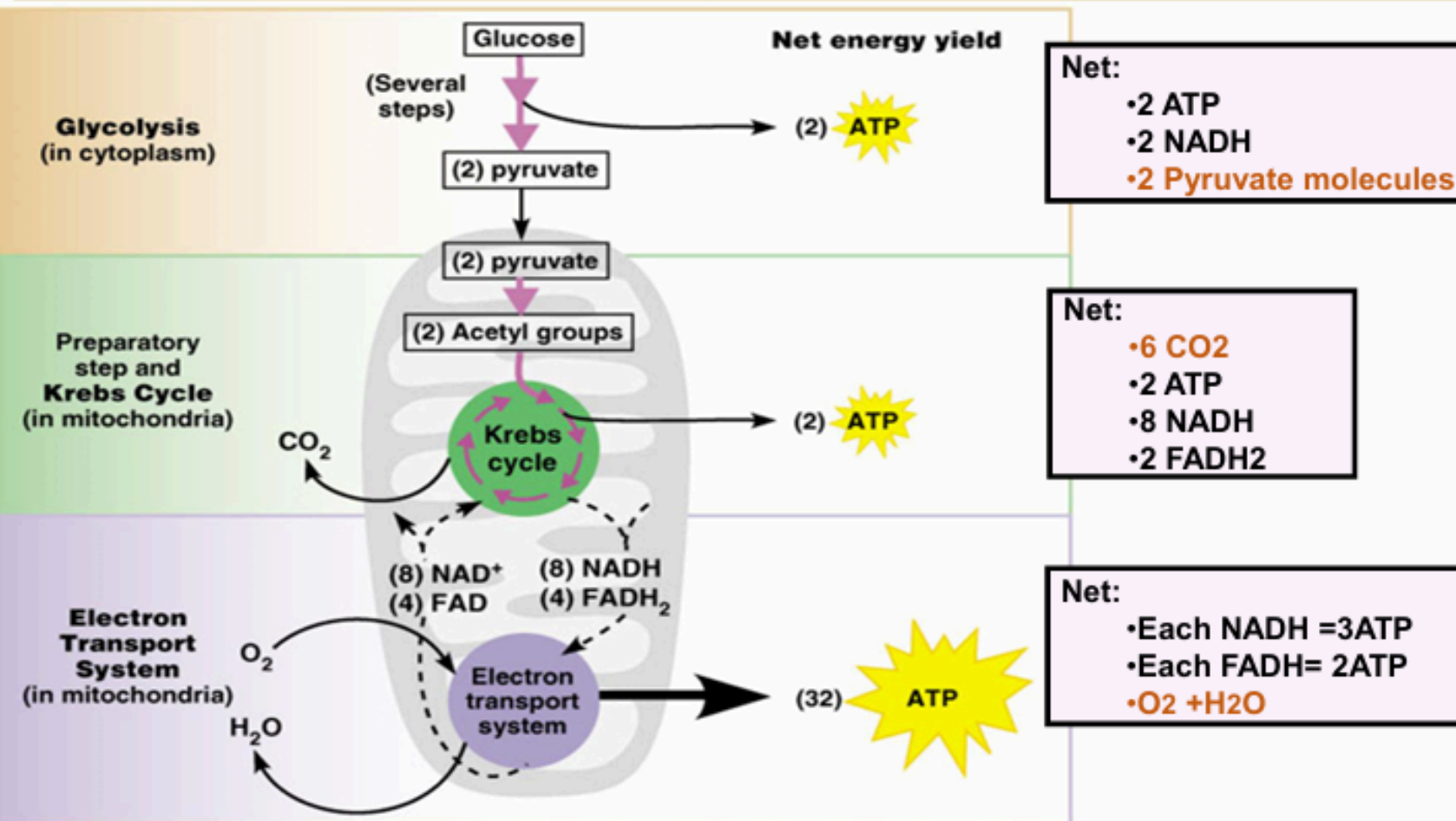
This creates an **increase** in the concentration of H^+ ions in the intermembrane space.

- Those H^+ ions then diffuse through ATP synthase into the mitochondrial matrix.
- This process converts ADP to ATP in a process called **chemiosmosis**
- Protons and electrons are transferred to O_2 to form H_2O .
- Oxygen is the final electron acceptor.





▪ **How many** ATP, NADPH, and FADH₂ are produced in each glucose molecules?.



Each Glucose Molecule

CO ₂	6	Electron Transport System used to make ATP
NADH	10	
FADH ₂	2	
ATP	4	



Overall ATP Production

Electron Transport System	34
Citric Acid Cycle	2
Glycolysis	2

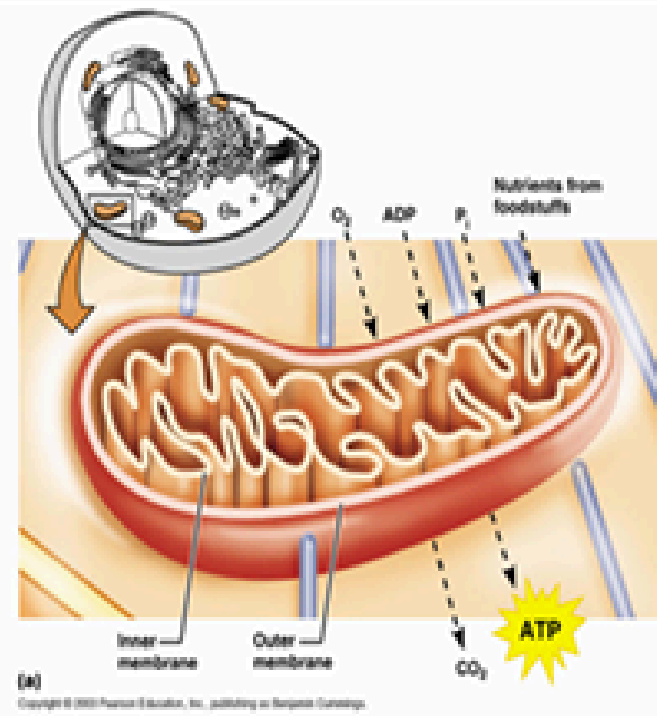
SUBTOTAL 38

When Pyruvate transport into Mitochondrion use NADH -2ATP

TOTAL 36



Compare between Cellular respiration in Eukaryotic and Prokaryotic



Eukaryotic		Prokaryotic	
1 Glucose molecule gives 36 ATP	ATP Net Total	1 Glucose molecule gives 38 ATP	
Inner Mitochondrion membrane	Electron transport location	Plasma membrane	
Enter Mitochondrion	Pyruvate movement	Stay in the Cytoplasm (no Mitochondrion)	This save 2 ATP



The electron transport chain begins with the release of electrons from which molecules?

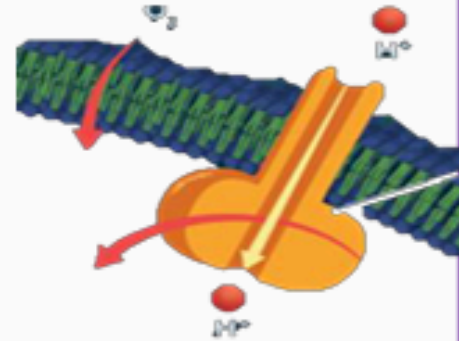
- a) a) ATP and ADP
- b) Glucose and Oxygen
- ☒ c) NADH and FADH₂
- d) Carbon dioxide and Water



What is the role of oxygen in the electron transport chain?

- a) a) It provides the initial electrons.
- b) It pumps ions into the intermembrane space.
- ☒ c) It is the final electron acceptor, forming water.
- d) It directly converts ADP to ATP.

What drives the movement of H⁺ ions back into the mitochondrial matrix through ATP synthase?



- a) a) The movement of electrons along the membrane.
- b) The conversion of NAD⁺ and FAD to NADH and FADH₂.
- c) The high concentration of H⁺ ions in the mitochondrial matrix.
- ☒ d) The high concentration of H⁺ ions in the intermembrane space.



Photosynthesis and Cellular Respiration

-**Photosynthesis** and **cellular respiration** are two important processes that cells use to obtain energy.

-They are **metabolic pathways** that produce and break down simple carbohydrates (glucose).

-**How these two processes are related?**

-The **products** of photosynthesis are oxygen and glucose, the **reactants** needed for cellular respiration.

-The **products** of cellular respiration, which are carbon dioxide and water, are the **reactants** for photosynthesis.

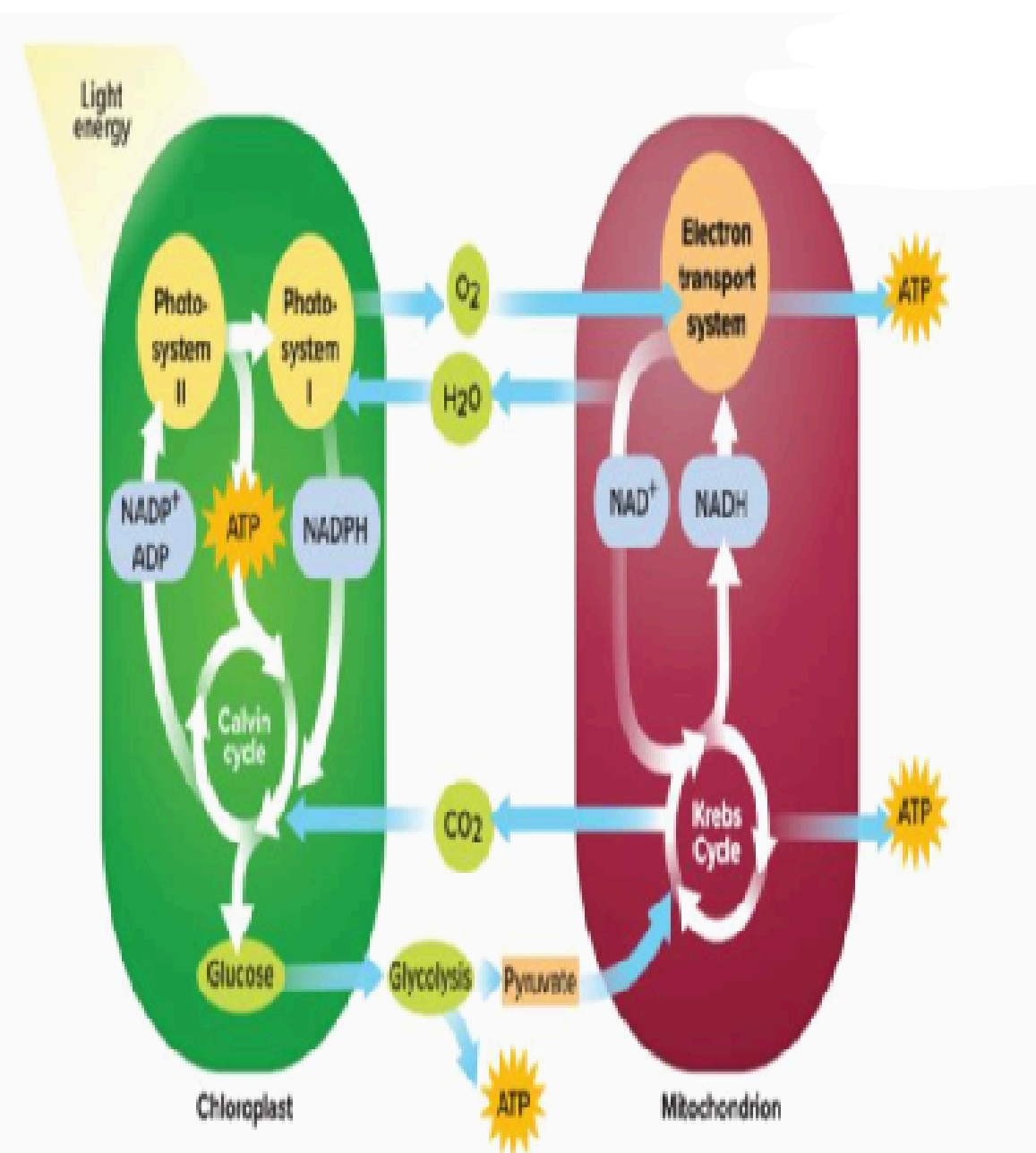


Figure 15 Photosynthesis and cellular respiration form a cycle.



summary

Comparison of Photosynthesis and Cellular Respiration

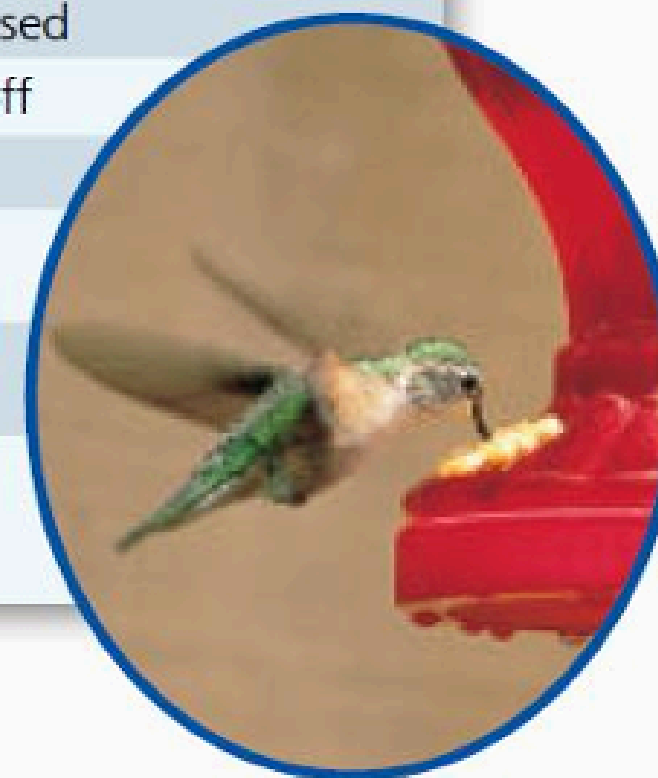
Photosynthesis

Food synthesized
Energy from sun stored in glucose
Carbon dioxide taken in
Oxygen given off
Produces sugars from PGAL
Requires light
Occurs only in presence of chlorophyll



Cellular Respiration

Food broken down
Energy of glucose released
Carbon dioxide given off
Oxygen taken in
Produces CO₂ and H₂O
Does not require light
Occurs in all living cells





What are the two main processes that cells use to obtain energy?

- a) The Calvin cycle and the Krebs cycle
- b) Digestion and Excretion
- ☒ c) Photosynthesis and Cellular Respiration
- d) Replication and Transcription

What are the products of photosynthesis?

- a) Carbon dioxide and water
- b) Oxygen and carbon dioxide
- c) Glucose and carbon dioxide
- ☒ d) Oxygen and glucose



the products of photosynthesis serve as the _____ for cellular respiration.

- a) Products
- b) Byproducts
- ☒ c) Reactants
- d) Enzymes

What are the products of cellular respiration that are also the reactants for photosynthesis?

- ☒ a) Carbon dioxide and water
- b) Oxygen and carbon dioxide
- c) Glucose and carbon dioxide
- d) Oxygen and glucose





اساله الف

How many carbon dioxide molecules are produced from one glucose molecule during the complete Krebs cycle?

Six ✓

Eight

Two

Four

What is regenerated during fermentation processes that allows glycolysis to continue?

ATP

Pyruvate

Oxygen

NAD+ ✓

Which process occurs in both prokaryotes and eukaryotes but in different cellular locations?

Glycolysis

Lactic acid fermentation

Electron transport ✓

Photosynthesis

What is the net yield from the Krebs cycle?

Eight carbon dioxide molecules, six ATP, two NADH, and two FADH2

Two carbon dioxide molecules, six ATP, two NADH, and eight FADH2

Six carbon dioxide molecules, two ATP, eight NADH, and two FADH2 ✓

Two carbon dioxide molecules, two ATP, eight NADH, and six FADH2

What is formed when acetyl CoA combines with a 4-carbon compound in the Krebs cycle?

Citric acid ✓

Lactic acid

Pyruvate

Ethyl alcohol

Which of the following processes is an anaerobic process?

Krebs cycle

Electron transport

Alcohol fermentation ✓

Aerobic respiration

What is produced during the conversion of pyruvate to acetyl CoA?

Lactic acid

Oxygen

Carbon dioxide ✓

Ethyl alcohol

What is the role of coenzyme A (CoA) in cellular respiration?

It is the final electron acceptor in the electron transport chain

It converts lactic acid back to pyruvate

It breaks down glucose during glycolysis

It reacts with pyruvate to form acetyl CoA ✓

What happens to citric acid during the Krebs cycle?

It is broken down, releasing two molecules of carbon dioxide ✓

It is converted to glucose

It is stored for later use

It is converted to pyruvate



اساله الف

In which part of the cell does the Krebs cycle occur?

Mitochondrial matrix

Endoplasmic reticulum

Cell membrane

Cytoplasm

What happens to NAD⁺ during glycolysis?

It is broken down into carbon dioxide

It is converted to NADH

It is the final electron acceptor

It combines with coenzyme A

What is the significance of oxygen in cellular respiration?

It is needed to form glucose

It is converted to carbon dioxide

It is required for glycolysis

It is the final electron acceptor in the electron transport chain

Which of the following is NOT produced during the Krebs cycle?

Glucose

ATP

NADH

Carbon dioxide

Which organisms perform alcohol fermentation?

Mitochondria

Skeletal muscles

Cyanobacteria

Yeast and some bacteria

What is the primary location of cellular respiration in eukaryotic cells?

Mitochondria

Nucleus

Golgi apparatus

Cytoplasm

What molecules carry electrons during cellular respiration?

Carbon dioxide and water

Glucose and oxygen

ATP and pyruvate

NADH and FADH₂

Which process provides most of the energy for life processes according to the text?

Glycolysis alone

Fermentation processes

The Krebs cycle alone

Photosynthesis and cellular respiration together



اساله الف

What is the relationship between photosynthesis and cellular respiration?

They are interrelated and provide most energy for life processes ✓

They are completely independent processes

They both produce glucose as an end product

They both occur only in plant cells

What are the two main parts of cellular respiration?

Krebs cycle and electron transport

Glycolysis and aerobic respiration ✓

Photosynthesis and fermentation

Lactic acid fermentation and alcohol fermentation

Where do prokaryotes perform electron transport since they lack mitochondria?

In the cellular membrane ✓

In the cytoplasm

In the nucleus

In specialized organelles

What is produced during alcohol fermentation that is not produced during lactic acid fermentation?

Carbon dioxide ✓

Pyruvate

NAD+

ATP

What happens during the preparatory reaction before the Krebs cycle?

Glucose is broken down into pyruvate

Carbon dioxide is converted to oxygen

Pyruvate reacts with coenzyme A to form acetyl CoA ✓

ATP is converted to ADP

What type of process is glycolysis?

Catabolic and anabolic process

Aerobic process

Anaerobic process ✓

Photosynthetic process

What is the final electron acceptor in the electron transport chain during cellular respiration?

Water

Oxygen ✓

Carbon dioxide

Hydrogen

Where does glycolysis occur in the cell?

In the Golgi apparatus

In the nucleus

In the mitochondria

In the cytoplasm ✓



شروحات للدرس الثالث من يوتيوب :

BioScope

<https://youtu.be/hkHr2DYCeCk?si=Vb3f44au2smh1znU> - PART1

BioScope

<https://youtu.be/6KYDwVrdebc?si=hMuTE6XJp2FsYGFR>



ادعولي بتوفيق
ولا تنسون استاذ احمد رضا من دعواتكم