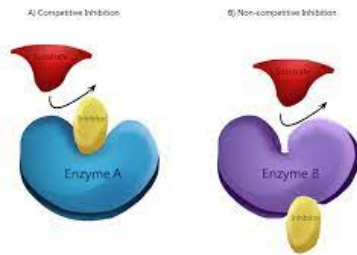


## AP Biology; Unit 3 Cellular Practice Exam

Question 1:



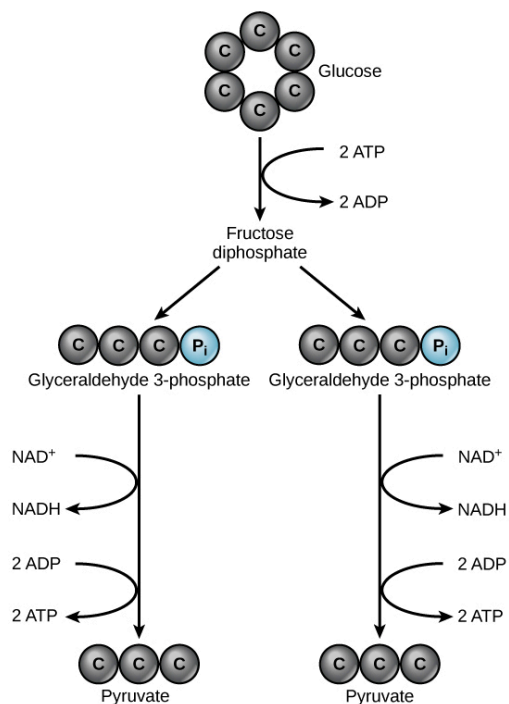
A.

B.

Which of the following statements most accurately describes the models above?

- a. A shows allosteric inhibition of an enzyme and B shows competitive inhibition.
- b. A shows competitive inhibition of an enzyme and B shows allosteric inhibition.**
- c. Both A and B show enzyme allosteric substrate interactions .
- d. None of the models shown show inhibition of an enzyme.

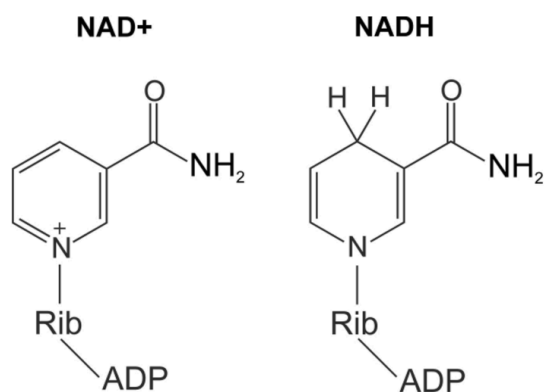
Question 2:



Where does the reaction depicted here occur?

- a. Stroma of the chloroplast
- b. Matrix of the mitochondria
- c. Cytoplasm of the cell**
- d. Inner membrane of the mitochondria

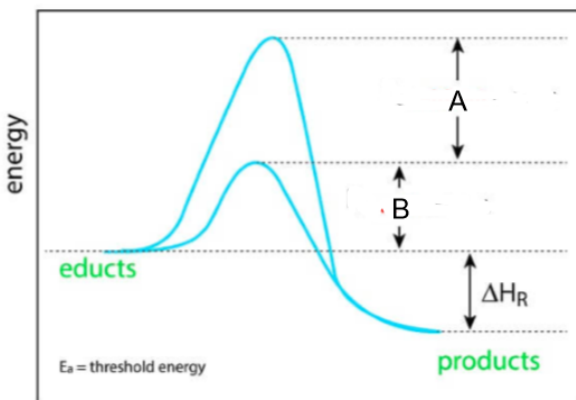
### Question 3



What is the role of NADH shown above?

- a. NADH is used to oxidize other molecules in metabolic reactions.
- b. NADH is used to inhibit enzymes
- c. NADH is a decoupling agent
- d. NADH is a high energy electron carrier used in metabolic reactions.

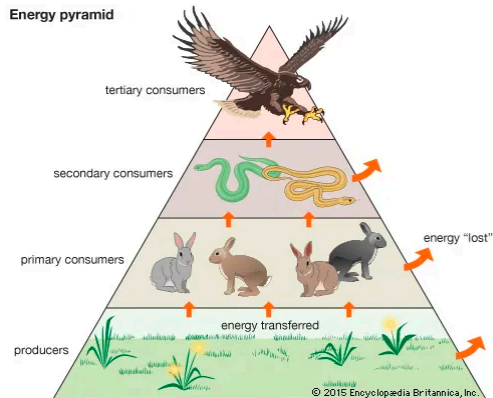
### Question 4:



The graph above represents a metabolic reaction both with and without an enzyme. Which of the following statements is likely true?

- a. A depicts the start-up energy required for the reaction to occur with the enzyme.
- b. B depicts the start-up energy required for the reaction to occur without the enzyme.
- c. B depicts the start-up up energy required for the reaction to occur with the enzyme.
- d. A represents the extra start up energy required without the substrate.

## Question 5



Which of the following statements is true?

- As energy moves up the pyramid it is lost as heat and can not be recaptured. This illustrates the first law of thermodynamics.
- As energy moves up the pyramid it increases. This illustrates the first law of thermodynamics.
- Only about 10 percent of the energy moves to the next trophic level. The rest is lost as unusable heat. This illustrates the second law of thermodynamics.
- As energy moves up the energy pyramid it increases each time it passes to the next trophic level. This illustrates the second law of thermodynamics..



## Question 6:

The chromatography of plant pigments demonstrates the variation in plastids. Why is this variation significant?

- Molecular variety allows an organism to more easily adapt to a changing environment.
- Molecular variety increases an organism's fitness.
- Molecular variety is a feature of evolution.
- All of the above.

Question 7:

Where does the product oxygen come from in photosynthesis?

- a. From the Krebs cycle.
- b. From the Calvin cycle.
- c. From the transition step.
- d. From the light dependent reactions.

Question 8:

Phycobiliproteins are a complex of accessory pigments and proteins found in cyanobacteria but not in green algae. A researcher claims that the phycobiliprotein pigments in cyanobacteria allow the cyanobacteria to survive in certain aquatic niches better than green algae can. Which of the following best justifies the researchers claim?

- a. The additional pigments absorb light at wavelengths that green algae cannot absorb; this may allow cyanobacteria to capture more light energy for photosynthesis than green algae can in certain areas.
- b. The additional pigments block light and prevent it from reaching photosynthetic organisms at greater depths, so no photosynthetic organisms can live below the surface waters containing cyanobacteria.
- c. The additional pigments allow the cyanobacteria to store light energy so that it can be used at night to continue photosynthesis.
- d. The additional pigments require energy and cellular resources to produce, so they can be used as an energy source during times of insufficient light.

Question 9:

Researchers investigating connections between mitochondria and chloroplasts discover that  $H^+$  concentrations increased under certain conditions causing a decrease in pH within specific compartments of the mitochondria and chloroplasts. Which of the following would you expect?

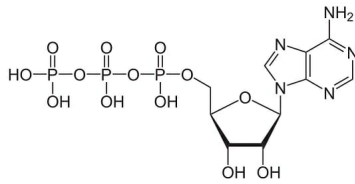
- a. pH lowers in the mitochondrial matrix in the presence of both sunlight and oxygen.
- b. pH lowers in stroma of the chloroplast only in the presence of oxygen.
- c. pH lowers in the mitochondrial intermembrane space in the presence of oxygen.
- d. pH lowers in mitochondrial intermembrane space in the absence of oxygen.

Question 10:

Which of the following statements is true regarding photosynthesis and cellular respiration?

- a. All organisms conduct photosynthesis, but some can conduct respiration too.
- b. Photosynthetic organisms rely on photosynthesis for energy instead of respiration.
- c. All organisms on earth conduct some form of respiration.
- d. Most organisms utilize anaerobic respiration to maximize ATP production.

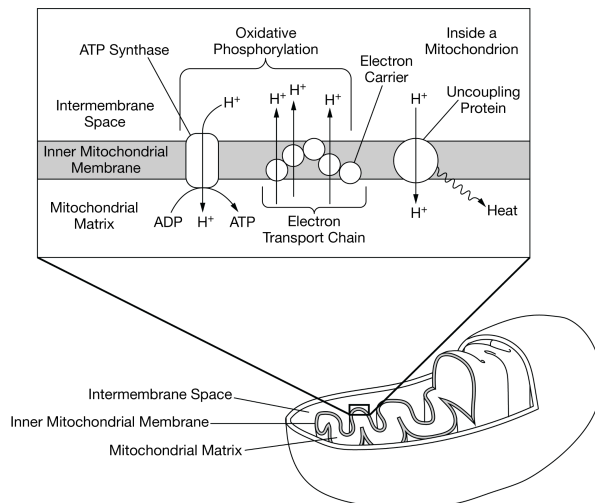
Question 11:



Which of the following is an INACCURATE statement regarding the molecule shown above?

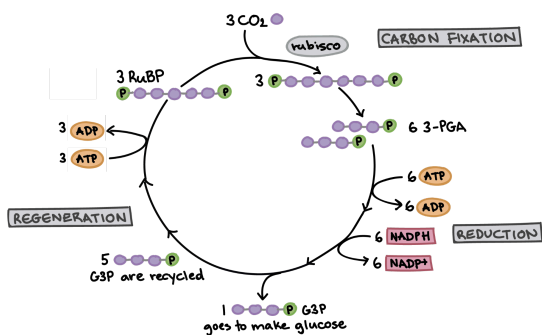
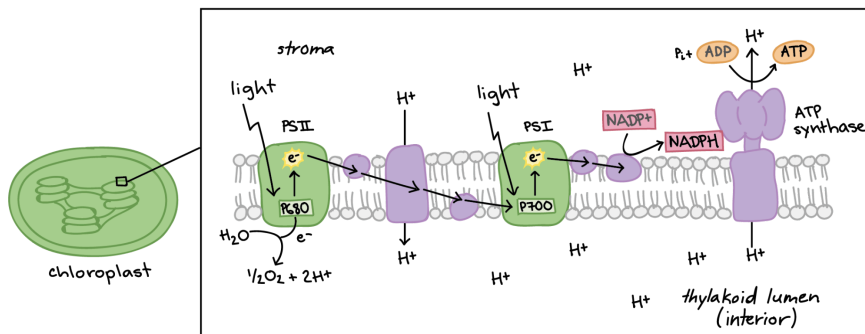
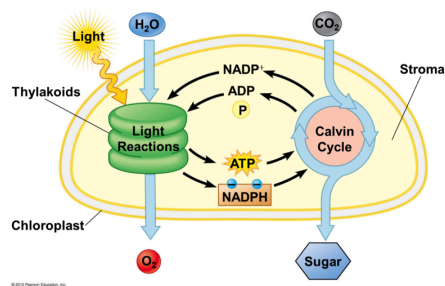
- a. It is produced in both photosynthesis and respiration.
- b. It is produced in both aerobic and anaerobic conditions.
- c. Under the right conditions, it is produced in abundance by ATP synthase.
- d. Under the right conditions, it is hydrolyzed by ATP synthase.

Question 12:



Brown fat is a type of fat tissue found in hibernating mammals. Inside the mitochondria of these fat tissue cells, these mammals have an uncoupling protein embedded in the inner mitochondrial membrane. This uncoupling protein allows hydrogen ions to leak from the intermembrane space back into the mitochondrial matrix. Figure 1 shows details of the processes in the inner mitochondrial membrane. Which of the following statements provides reasoning that supports the claim that brown fatty tissue keeps an animal warm?

- a. The uncoupling protein in this tissue increases the production of ATP and causes more body heat to be produced to warm the animal.
- b. The uncoupling protein in this tissue causes an increase in the proton gradient, which causes ATP to be produced that helps to warm the animal.
- c. The uncoupling protein in this tissue reduces the production of ATP and creates an increase in the proton gradient that allows more heat energy to be produced to warm the animal.
- d. The uncoupling protein in this tissue reduces the proton gradient across the membrane and thus produces heat to warm the animal without ATP production.



Use the diagrams above to answer the following:

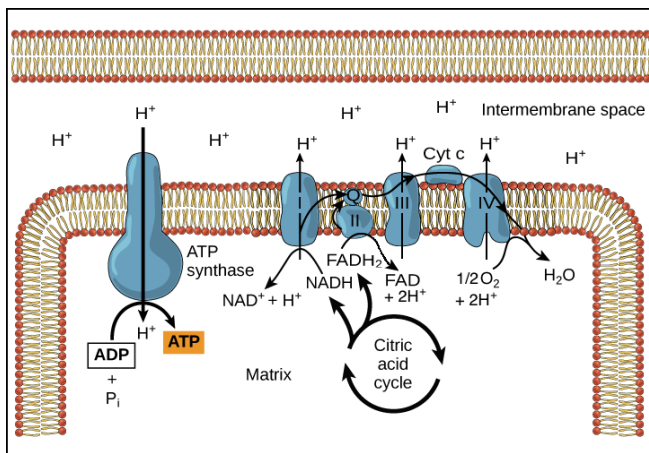
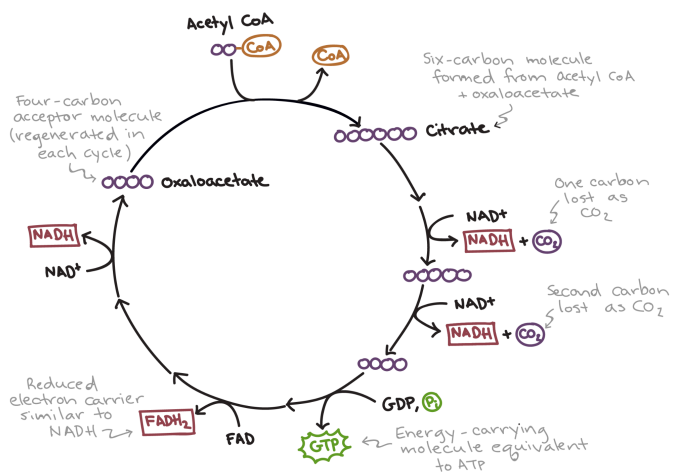
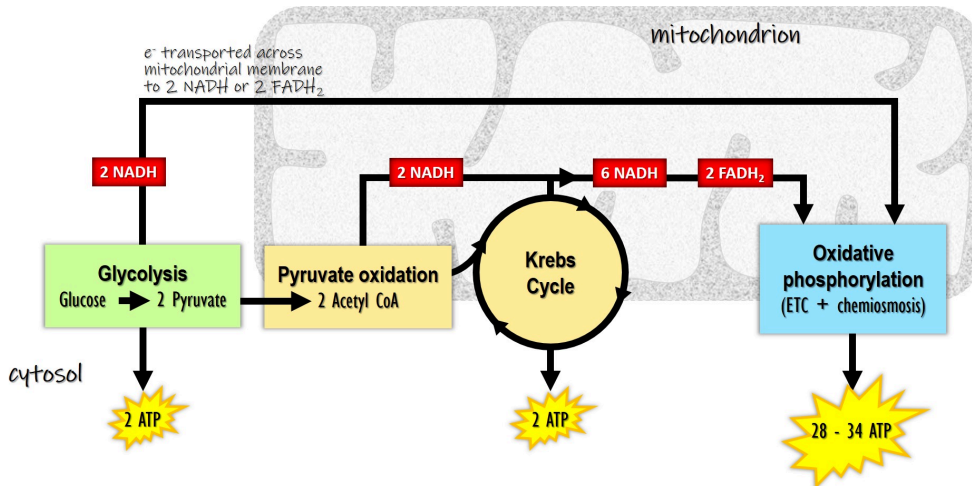
### FRQ #1

**Describe** the role of light in the light dependent reactions.

**Explain** How the products of the light dependent reactions are used in the Calvin cycle.

**Make a claim** regarding what would happen if there was a mutation in Photosystem II that would not allow it to properly carry out its current function.

Provide **reasoning with evidence** based on the role of Photosystem II to support the claim made above.



Use the visuals above are provided to help you answer the following questions:

FRQ #2

1. **Explain** why utilizing oxygen allows organisms to produce much more ATP than not utilizing oxygen.
2. **Describe** the important outputs of the Krebs cycle. What are the role(s) of these outputs?
3. Cyanide interferes with proteins in the electron transport chain that contain iron. **Make a claim** regarding the impact on ATP production from cyanide poisoning.
4. Provide **reasoning with evidence** based on the function of the electron transport chain to support your claim in #3.

The following diagrams are provided as a reference for you to complete the FRQs that follow.

Diagram 1.

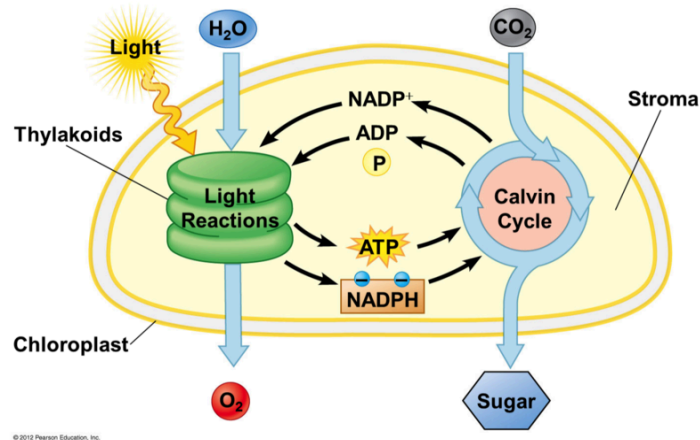


Diagram 2.

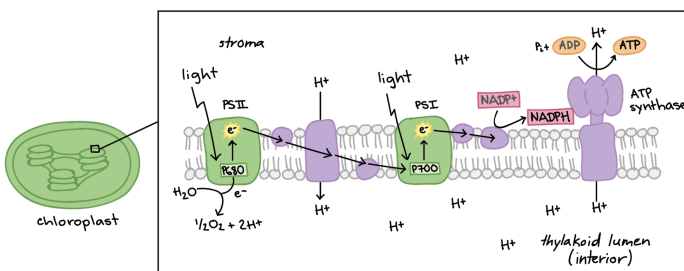


Diagram 3.

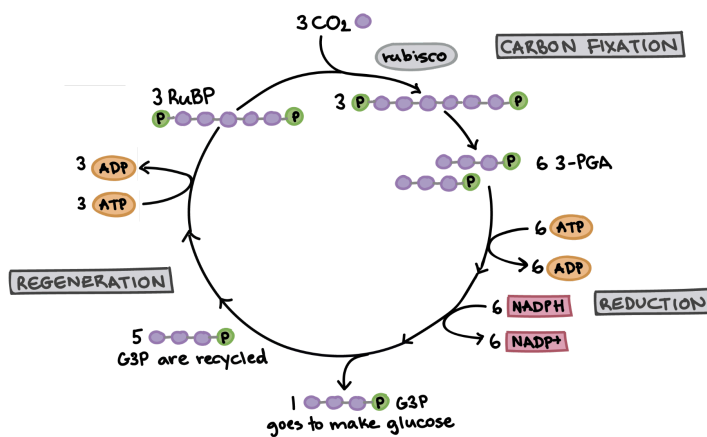


Diagram 4.

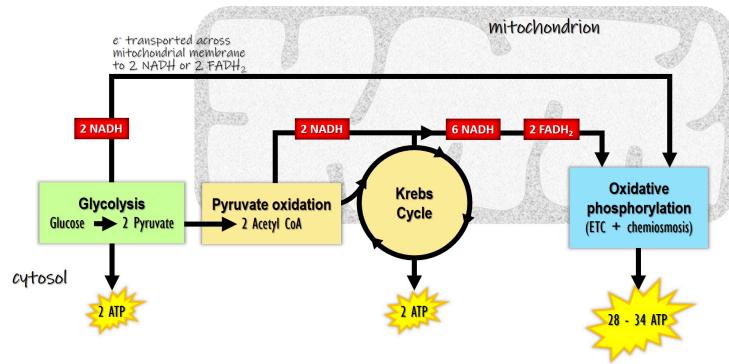


Diagram 5.

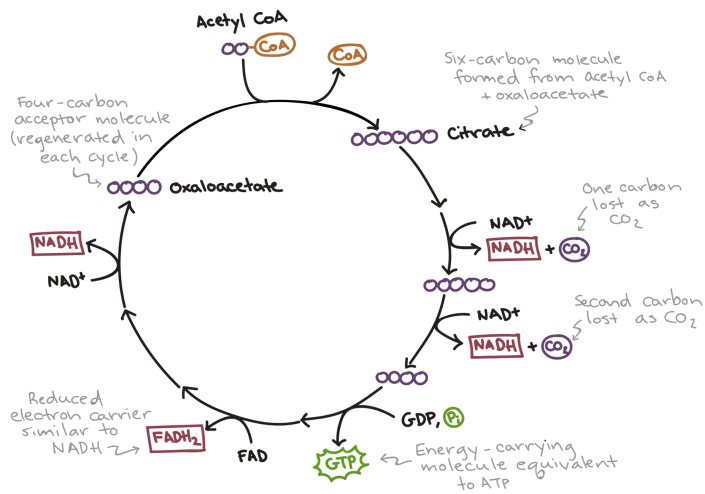
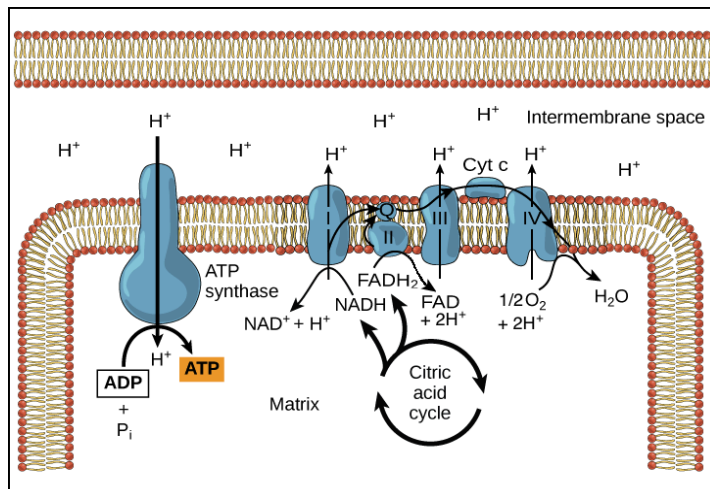


Diagram 6.



**FRQ #3:**

1. Photosynthetic organisms like plants and cyanobacteria use water, take in carbon dioxide, and give off oxygen. **Explain** the main purpose of photosynthesis. Include the chemical equation for photosynthesis in your explanation and **describe** which specific step(s) in photosynthesis utilize each molecule in the equation. For example, explain which stage of photosynthesis requires water and which stage uses carbon dioxide etc... Also, include the location(s) in the chloroplast in which each molecule is utilized or produced.
2. **Make a claim** regarding whether photosynthesis would still occur if the sun's light was temporarily blocked for a day.
3. Provide **reasoning with evidence** based on the process of photosynthesis.

**FRQ #4:**

1. **Explain** the significance of glucose in creating energy for the cell and why the presence of oxygen makes a difference in the amount of energy produced.
2. Fossil evidence shows photosynthetic bacteria appearing about 3.3 billion years ago. **Make a claim** regarding when cellular respiration (both aerobic and anaerobic) appeared in relation to photosynthesis. You don't need to give a specific number of years ago, but indicate whether each occurred before or after photosynthesis.
3. Provide **reasoning with evidence** based on the process of cellular respiration to support your claim.

**FRQ #5:**

1. Rotenone is an insecticide that binds to Protein Complex I of the electron transport chain in mitochondria. Why would this kill insects and be bad for you too?
2. **Support your claim with evidence** based on the process of oxidative phosphorylation,