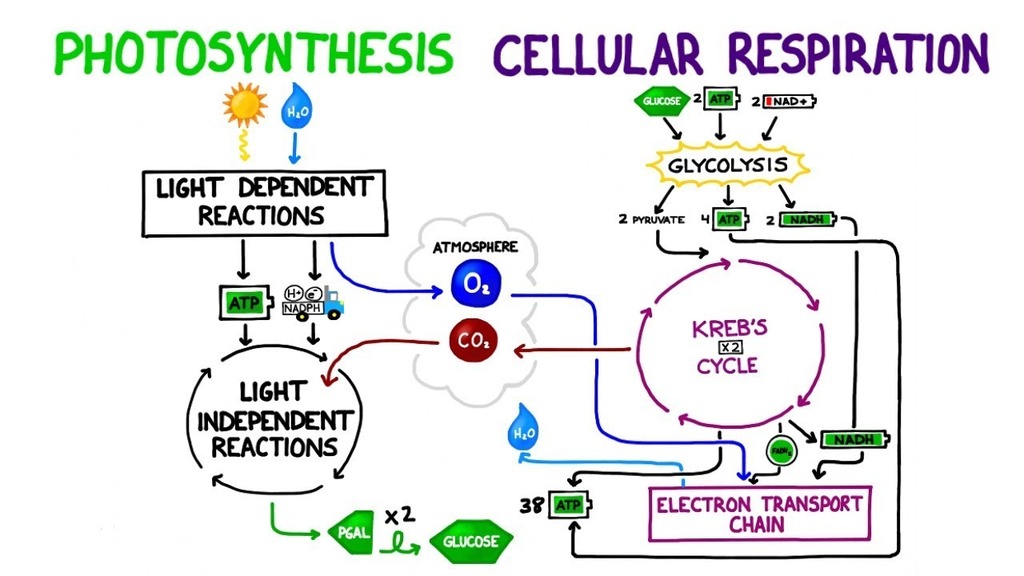
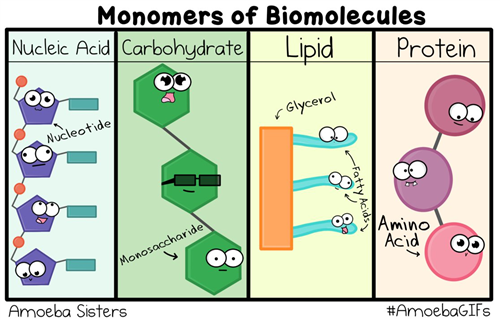
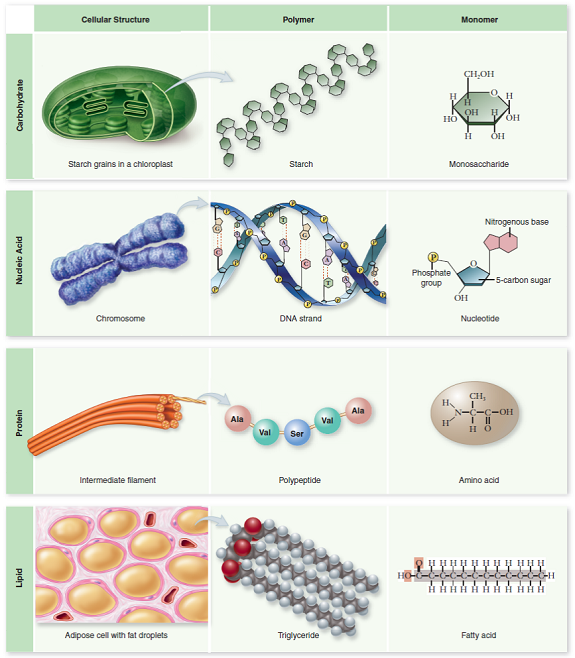
**SECTION 8**

**CELLS: ENERGY FOR CELLULAR PROCESSES**



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| **KEY CONCEPTS** **CELLS: ENERGY FOR PROCESSES** |
| MS-CCR Standard(s):  BIO. 1B. Students will analyze the structure and function of the macromolecules that make up cells.  BIO. 1B. 1. Develop and use models to compare and contrast the structure and function of carbohydrates, lipids, proteins, and nucleic acids (DNA and RNA) in organisms.  BIO. 1B. 2. Design and conduct an experiment to determine how enzymes react given various environmental conditions (i.e., pH, temperature, and concentration). Analyze, interpret, graph, and present data to explain how those changing conditions affect the enzyme activity and the rate of the reactions that take place in biological organisms.  BIO. 1D. Students will describe the structure of the cell membrane and analyze how the structure is related to its primary function of regulating transport in and out of the cells to maintain homeostasis.  BIO. 1D. 1. Plan and conduct investigations to prove that the cell membrane is a semi-permeable, allowing it to maintain homeostasis with its environment through active and passive transport processes.  BIO. 1D. 2. Develop and use models to explain how the cell deals with imbalances of solute concentration across the cell membrane (i.e., hypertonic, hypotonic, and isotonic conditions, sodium/potassium pump).  BIO. 2. Students will explain that cells transform energy through the processes of photosynthesis and cellular respiration to drive cellular function.  BIO. 2. 1. Use models to demonstrate that ATP and ADP are cycled within a cell as a means to transfer energy.  BIO. 2. 2. Develop models of the major reactants and products of photosynthesis to demonstrate the transformation of light energy into stored chemical energy in cells. Emphasize the chemical processes in which bonds are broken and energy is released, and new bonds are formed, and energy is stored.  BIO. 2. 3. Develop models of the major reactants and products of cellular respiration (aerobic and anaerobic) to demonstrate the transformation of the chemical energy stored in food to the available energy of ATP. Emphasize the chemical processes in which bonds are broken and energy is released, and new bonds are formed, and energy is stored.  BIO. 2. 4. Conduct scientific investigations or computer simulations to compare aerobic and anaerobic cellular respiration in plants and animals, using real world examples. |





**Monomer**=a molecule that can be bonded to other identical molecules to form a polymer.

**Polymer**=is a large molecule, or macromolecule, composed of many repeated subunits.

**Key Important** things to Remember about macromolecules:

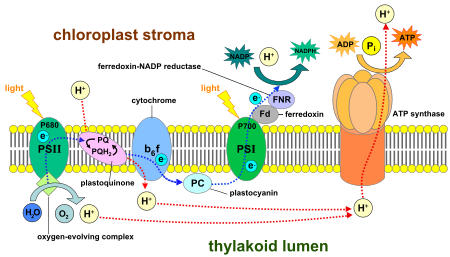
Important cellular components and perform a wide array of functions necessary for the survival and growth of living organisms.

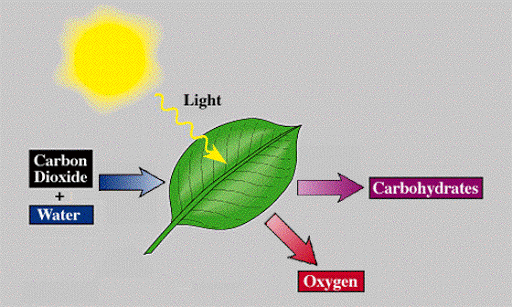
The four major classes of biological macromolecules are carbohydrates, lipids, proteins, and nucleic acids.

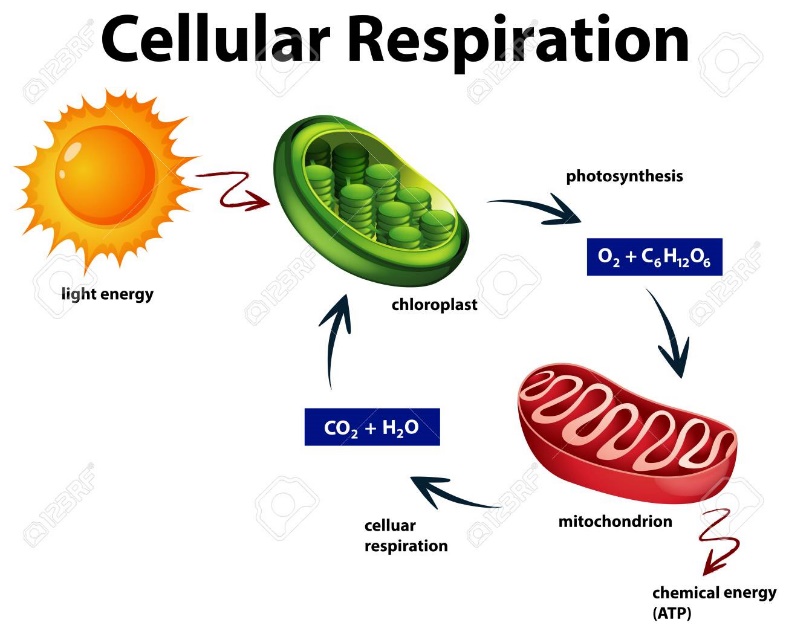
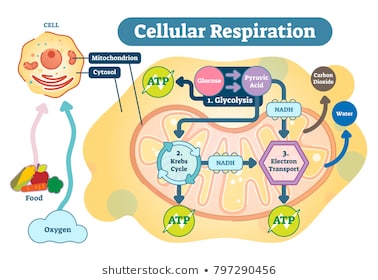
**Macromolecules**



**Photosynthesis**







**Photosynthesis**

**and Cellular Respiration**



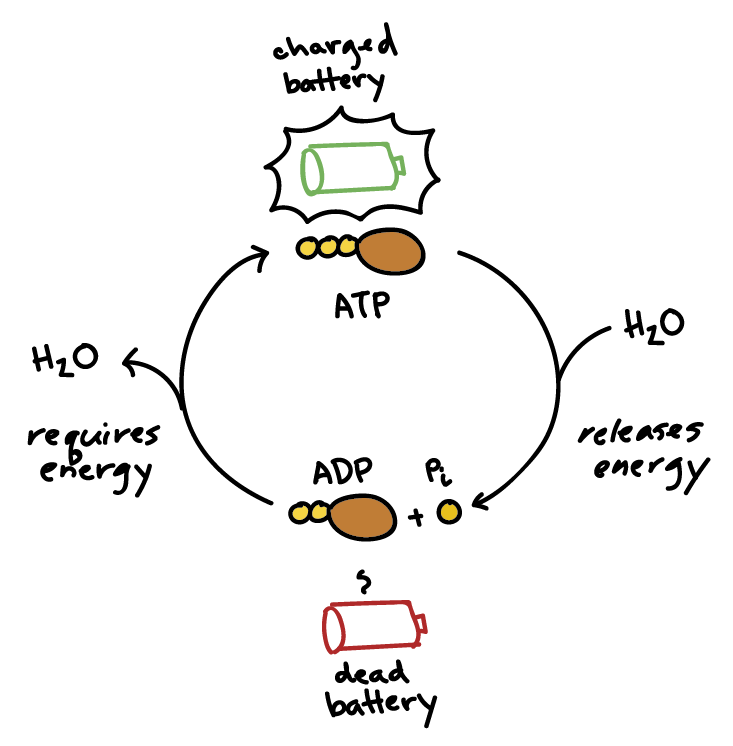
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| **KEY VOCABUALRY** **CELLS: ENERGY FOR PROCESSES** |
| MS-CCR Standard(s):  BIO. 1B. Students will analyze the structure and function of the macromolecules that make up cells.  BIO. 1B. 1. Develop and use models to compare and contrast the structure and function of carbohydrates, lipids, proteins, and nucleic acids (DNA and RNA) in organisms.  BIO. 1B. 2. Design and conduct an experiment to determine how enzymes react given various environmental conditions (i.e., pH, temperature, and concentration). Analyze, interpret, graph, and present data to explain how those changing conditions affect the enzyme activity and the rate of the reactions that take place in biological organisms.  BIO. 1D. Students will describe the structure of the cell membrane and analyze how the structure is related to its primary function of regulating transport in and out of the cells to maintain homeostasis.  BIO. 1D. 1. Plan and conduct investigations to prove that the cell membrane is a semi-permeable, allowing it to maintain homeostasis with its environment through active and passive transport processes.  BIO. 1D. 2. Develop and use models to explain how the cell deals with imbalances of solute concentration across the cell membrane (i.e., hypertonic, hypotonic, and isotonic conditions, sodium/potassium pump).  BIO. 2. Students will explain that cells transform energy through the processes of photosynthesis and cellular respiration to drive cellular function.  BIO. 2. 1. Use models to demonstrate that ATP and ADP are cycled within a cell as a means to transfer energy.  BIO. 2. 2. Develop models of the major reactants and products of photosynthesis to demonstrate the transformation of light energy into stored chemical energy in cells. Emphasize the chemical processes in which bonds are broken and energy is released, and new bonds are formed, and energy is stored.  BIO. 2. 3. Develop models of the major reactants and products of cellular respiration (aerobic and anaerobic) to demonstrate the transformation of the chemical energy stored in food to the available energy of ATP. Emphasize the chemical processes in which bonds are broken and energy is released, and new bonds are formed, and energy is stored.  BIO. 2. 4. Conduct scientific investigations or computer simulations to compare aerobic and anaerobic cellular respiration in plants and animals, using real world examples. |

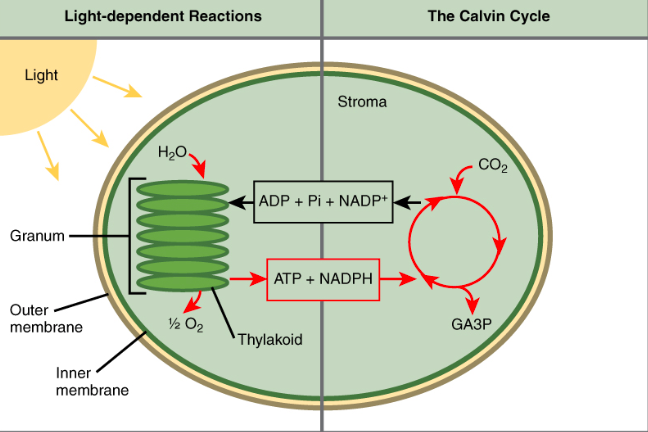
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| **KEY TERMS** | **KEY IMAGE** | **CLUES** |
| **ATP** |  | * is able to store and transport chemical energy within cells. ATP also plays an important role in the synthesis of nucleic acids. |
| **ADP** |  | * It can add and remove phosphate molecules to form different molecules. |
| **Photosynthesis** | Image result for photosynthesis | * is a process used by plants and other organisms to convert light energy into chemical energy that can later be released to fuel the organisms' activities. |
| **Chlorophyll** | Image result for chlorophyll | * is a green photosynthetic pigment found in plants, algae, and cyanobacteria. Chlorophyll absorbs mostly in the blue and to a lesser extent red portions of the electromagnetic spectrum, hence its intense green color. |
| **Thylakoid** | Image result for stroma | * are membrane-bound compartments inside chloroplasts and cyanobacteria. They are the site of the light-dependent reactions of photosynthesis. Thylakoids consist of a thylakoid membrane surrounding a thylakoid lumen. Chloroplast thylakoids frequently form stacks of disks referred to as grana. |
| **Stroma** | Image result for stroma | * refers to the colorless fluid surrounding the grana within the chloroplast. Within the stroma are grana, and the sub-organelles or daughter cells, where photosynthesis is commenced before the chemical changes are completed in the stroma. |
| **NADP+** | Image result for nadp | * is a cofactor used in anabolic reactions, such as the Calvin cycle and lipid and nucleic acid syntheses, which require NADPH as a reducing agent. It is used by all forms of cellular life. |
| **Light-dependent reaction** | Image result for light independent reactions | * use light energy to make two molecules needed for the next stage of photosynthesis: the energy storage molecule ATP and the reduced electron carrier NADPH. In plants, the light reactions take place in the thylakoid membranes of organelles called chloroplasts. |
| **Light-independent reaction** | Image result for light independent reactions | * take place in plant chloroplasts. In this process, sugars are made from carbon dioxide. The process, known as the Calvin cycle, uses products of the light-dependent reactions (ATP and NADPH) and various enzymes. |
| **Electron-transport chain** | Image result for electron transport chain | * is a series of complexes that transfer electrons from electron donors to electron acceptors via redox reactions, and couples this electron transfer with the transfer of protons across a membrane. |
| **ATP synthase** | Image result for atp synthesis | * is an enzyme that creates the energy storage molecule adenosine triphosphate. ATP is the most commonly used "energy currency" of cells for all organisms. It is formed from adenosine diphosphate and inorganic phosphate. |
| **Aerobic** | Image result for anaerobic respiration | * is the process of producing cellular energy involving oxygen, Cells break down food in the mitochondria in a long, multistep process that produces roughly 36 ATP. |
| **Anaerobic** | Image result for anaerobic respiration | * is respiration using electron acceptors other than molecular oxygen. |
| **Cellular Respiration** | Image result for cellular respiration | * is a set of metabolic reactions and processes that take place in the cells of organisms to convert biochemical energy from nutrients into adenosine triphosphate (ATP), and then release waste products. |
| **Glycolysis** | Image result for glycolysis | * is the metabolic pathway that converts glucose C₆H₁₂O₆, into pyruvate, CH₃COCOO⁻, and a hydrogen ion, H⁺. The free energy released in this process is used to form the high-energy molecules ATP and NADH. Glycolysis is a sequence of ten enzyme-catalyzed reactions. |
| **NAD+** | -Image result for NAD+ | * Nicotinamide adenine dinucleotide is a cofactor that is central to metabolism. Found in all living cells, NAD is called a dinucleotide because it consists of two nucleotides joined through their phosphate groups. One nucleotide contains an adenine nucleobase and the other nicotinamide. |
| **Krebs Cycle/Citric** | Image result for krebs cycle | * a series of chemical reactions used by all aerobic organisms to generate energy through the oxidation of acetate—derived from carbohydrates, fats, and proteins—into carbon dioxide. |
| **Alcoholic Fermentation** | Image result for alcoholic fermentation | * is a biological process which converts sugars such as glucose, fructose, and sucrose into cellular energy, producing ethanol and carbon dioxide as by-products. |
| **Lactic Acid Fermentation** |  | * is a metabolic process by which glucose and other six-carbon sugars are converted into cellular energy and the metabolite lactate, which is lactic acid in solution. It is an anaerobic fermentation reaction that occurs in some bacteria and animal cells, such as muscle cells. |

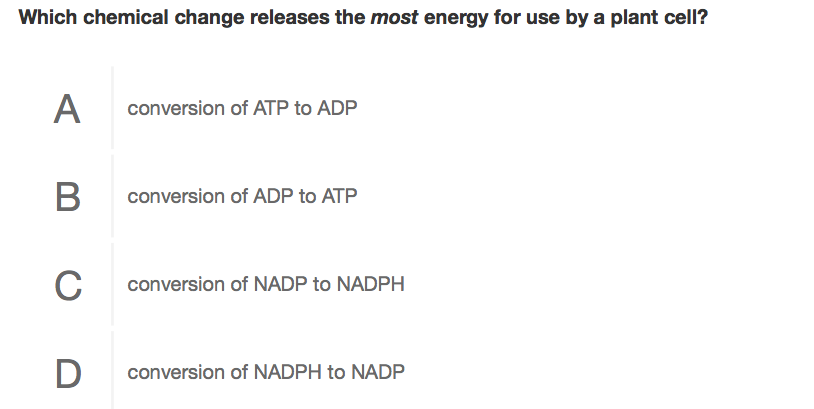
**CONTENT REVIEW**

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ processes break down larger molecules into smaller molecules.
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ processes build large molecules from smaller molecules.
3. Photosynthesis is an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ process
4. Cellular respiration is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ process
5. Write the equation for photosynthesis. Identify the reactants and the products.
6. The energy for photosynthesis comes from the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
7. Photosynthesis occurs in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
8. The 2 reactions for photosynthesis are : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
9. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is a waste product of the light reactions (Calvin cycle).
10. The light reactions occur in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
11. The dark reactions occur in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
12. The electron carriers are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
13. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_is the splitting of water to gain electrons and hydrogen ions.
14. Write the equation for cellular respiration. Identify the products and the reactants.
15. The first step of cellular respiration is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
16. Glycolysis occurs in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, is a(n) \_\_\_\_\_\_process, and nets ATP.
17. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ process require oxygen, while \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ processes do not.
18. The follow aerobic respiration, the next step in the cycle or the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cycle.
19. The Krebs cycle occurs in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and nets \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ATP, along with the electron carriers \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
20. After the Krebs cycle, the electrons enter the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
21. The electron transport chain occurs in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and nets \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ATP.
22. The final electron acceptor is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

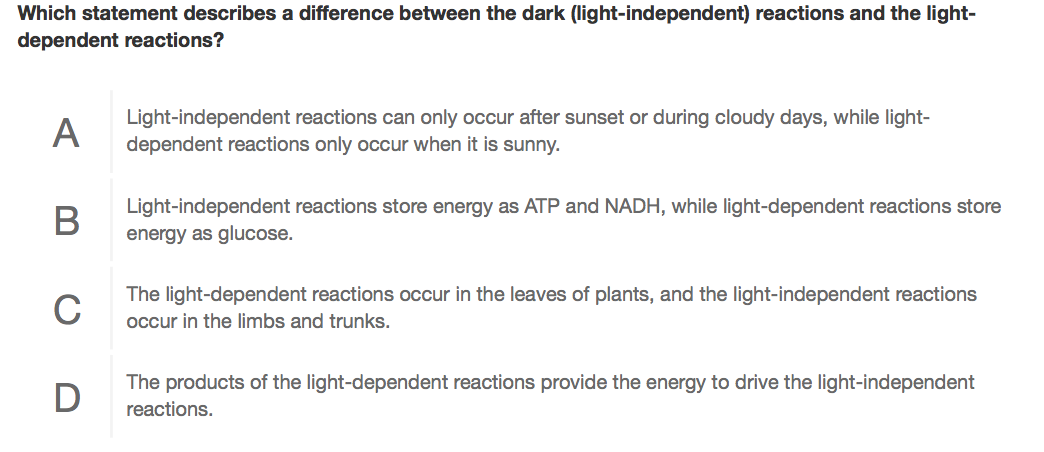




**MAAP TEST PREP**



1. Write the formula for the conversion of ADP to ATP?
2. Rewrite the question in your own words. What are they really asking?
3. What is the correct answer and WHY? (you will not get credit without an explanation)

2)

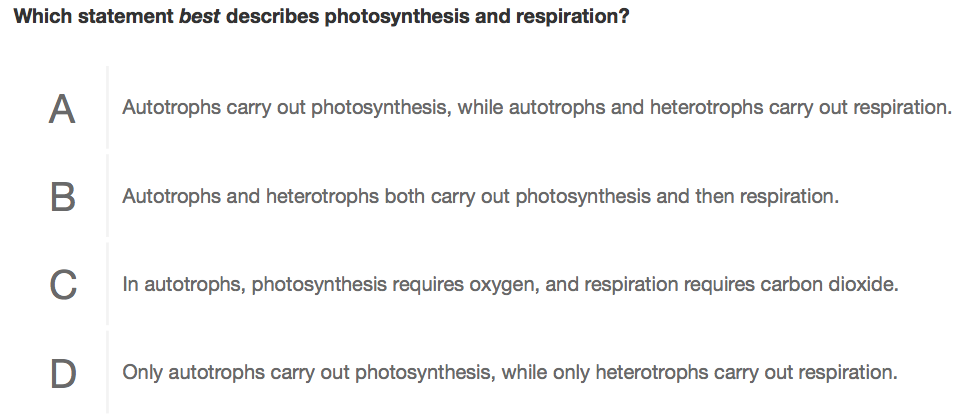
1. Define the following terms from the question above:

Light-dependent reactions

Light-independent reactions

1. Rewrite the question in your own words. What are they really asking?
2. What is the correct answer and WHY? (you will not get credit without an explanation)

3)



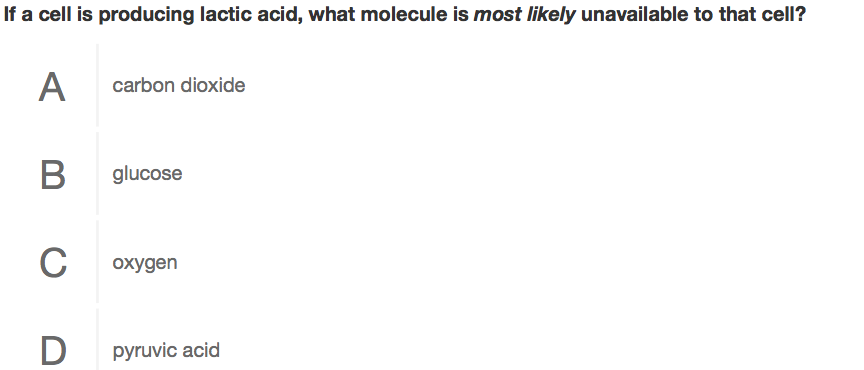
1. Define the following terms from the question above:

Autotrophs

heterotrophs

1. Rewrite the question in your own words. What are they really asking?
2. What is the correct answer and WHY? (you will not get credit without an explanation)

4)



1. What are the two types of fermentation?
2. Rewrite the question in your own words. What are they really asking?
3. What is the correct answer and WHY? (you will not get credit without an explanation)

