Photosynthesis Part 2 Notes

Light-Dependent Reactions and the Calvin Cycle

Name: _____ Date: _____ Block: _____

Inside the Chloroplast

1. In plants and other photosynthetic eukaryotes, **photosynthesis** takes place where? _____

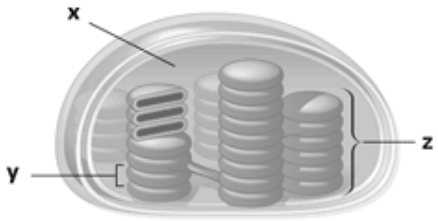
2. Chloroplast contain **saclike photosynthetic membranes** called? _____

   - **Thylakoids** are arranged in **stacks** known as? _____

3. **Proteins in the thylakoid membrane** organize chlorophyll and other pigments into **clusters** known as what?

- These **Photostems**, are light-collecting units of chloroplast.

  - **Photostem I:** are **chlorophyll clusters** and **pigments** that use energy from light to reenergize the electrons.
  - **Photstem II:** the energy from the light is absorbed by chlorophyll and transferred to electrons, and then these high-energy electrons are passed on to the electron transport chain.

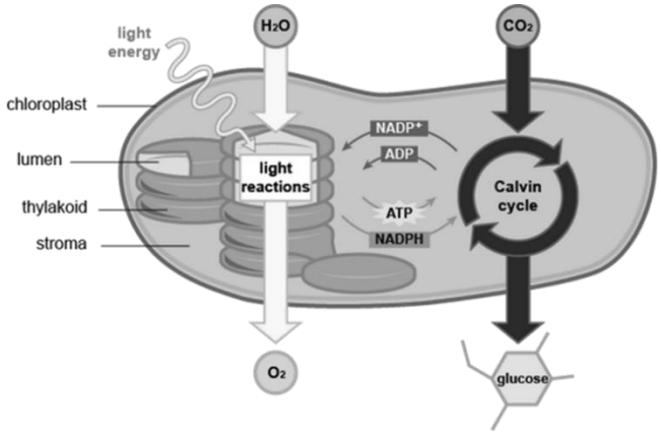


4. What do the letters in the **CHLOROPLAST** below identify?

X is the: _____

Y is the: _____

Z is the: _____



5. Scientist describe the reactions of the **Photostem** in two parts:

- _____
- _____

  - The _____ _____ takes place in the region **outside** of the **thylakoid membrane**. (*What letter X is in the Chloroplast diagrams!)*

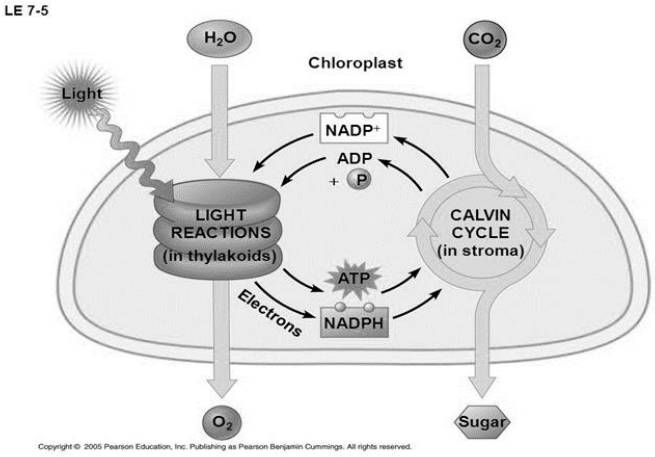
Electron Carriers

6. When sunlight excites _____ in _____, the electrons gain a **great deal of energy!**

- These excited, high-energy electrons require a **special carrier**.
    - Think of it as talking something hot out of the oven, would you want to use an oven mitt or do it with your bare hands? **HOT HOT HOT!**
- Cells do the same thing, they use **electron carriers** to **transport high-energy electrons from chlorophyll molecules.**

7. A _____ is a compound that can **accept** a pair of **high-energy electrons** and **transfer** them along with most of their energy to another molecule.
8. What are the electron carriers themselves known as in the process of **electron transport**?

   _____ _____ _____
9. One of these carrier molecules is a compound known as _____ _____ _____ _____ + (**nicotinamide adenine dinucleotide phosphate**).



- **NADP+ accepts** and **holds** _____ **high-energy electrons** along with a _____ion.
- This converts the **NADP+** to _____, this is one way the **energy of sunlight can be trapped in chemical forms.**
- **NADPH** can then carry high-energy electrons produced by light absorption in chlorophyll to chemical reactions elsewhere in the cell.
    - These high-energy electrons are used to help build molecules such as **carbohydrates** like _____ for the cell.

TURN IN YOUR TEXTBOOKS TO PAGE 211!

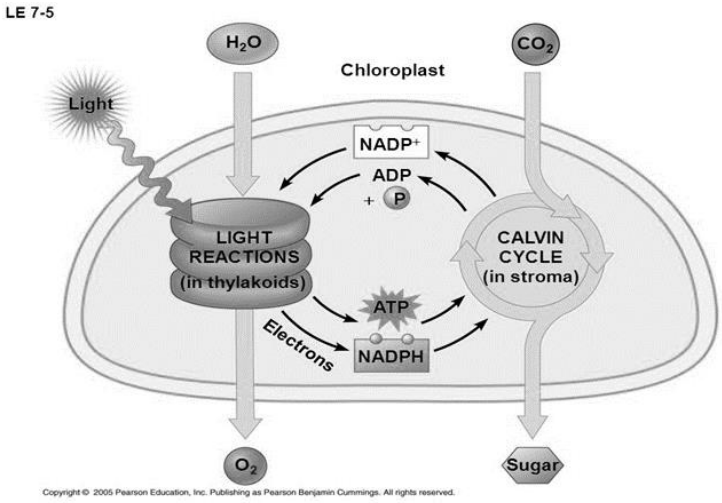
Light-Dependent Reactions

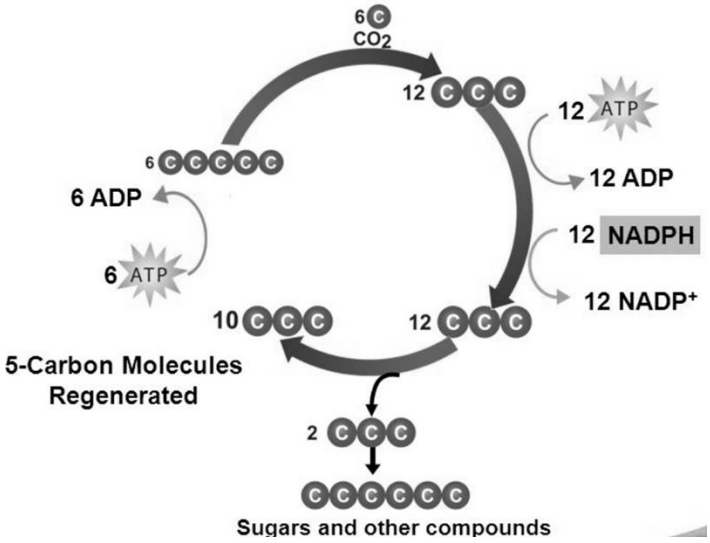
10. _____ **require light**. That is why plants need light to grow. The light-dependent reactions use energy from light to produce _____ and _____
    - The **light-dependent reactions** produce **oxygen gas** and convert _____ and _____ into the energy carriers **ATP** and **NADPH**.

The Calvin Cycle

- The **ATP** and **NADPH** formed by the **light-dependent reactions (LDR)** contain an abundance of chemical energy, **but are not stable enough to store that energy for more than a few minutes**.

11. During the _____ plants use energy that **ATP** and **NADPH** contain to build **high-energy compounds** that can be stored for a long time.
    - The Calvin Cycle uses _____ and _____ from the LDR to produce _____.
    - The Calvin Cycle **<u>does not require light</u>**. ***[Remember: this happens in the <u>stroma</u> of the chloroplast]***





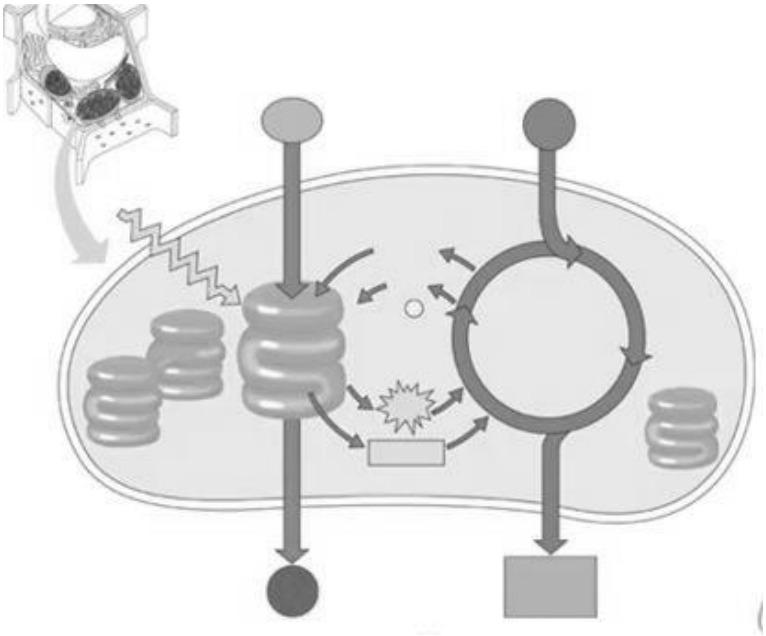
Factors Affecting Photosynthesis

12. How does **water** and **Carbon Dioxide** affect photosynthesis? _____
    _____

13. **Temperature** is another factor that affects photosynthesis. The enzymes of photosynthesis function best between _____ and _____. Which is _____ and _____ F
    - Temperature **above or below** that range may damage the _____, slowing down the rate of photosynthesis.

14. _____: also affects photosynthesis as it can increase the rate of photosynthesis. At some point many plants have a _____ _____ in which they photosynthesize regardless of the level of light intensity.

Take a moment and Label the photosynthetic process (in order) from 1-9 below!



_____ The high energy electrons and H^+ are combined with CO_2 (carbon dioxide) in 6 rotations to make $C_6H_{12}O_6$ (glucose)

_____ High energy electrons and the H^+ (hydrogen) from water are carried to the stroma to be used for the light-independent reaction (Calvin Cycle)

_____ Chlorophyll inside of the chloroplast captures the light energy.

_____ Sunlight hits the leaf

_____ Water is split, giving off O_2 (oxygen)

_____ Glucose is the high energy carbohydrate produced at the end of photosynthesis

_____ Low energy electrons are returned to the thylakoid to start all over again

_____ The second stage the light independent reaction or Calvin Cycle occurs in the stroma

_____ The first stage the light dependent reaction occurs in the thylakoids