Photosynthesis

THE BASICS OF PHOTOSYNTHESIS

* Almost all plants are photosynthetic \_\_\_\_\_\_\_\_\_\_\_\_\_\_, as are some bacteria and protists
* Autotrophs generate their own organic matter through \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is transformed to energy stored in the form of chemical bonds

Why Are Plants Green?

THE COLOR OF LIGHT SEEN IS THE COLOR NOT ABSORBED

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_absorb \_\_\_\_\_\_\_\_\_\_\_ energy and convert it to \_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy.

AN OVERVIEW OF PHOTOSYNTHESIS

Photosynthesis is the process by which \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ organisms use \_\_\_\_\_\_\_\_\_\_\_\_\_\_ to make \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_ gas from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_.

Write the chemical equation for Photosynthesis in the space below:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The light reactions convert \_\_\_\_\_\_\_\_\_\_ energy to \_\_\_\_\_\_\_\_\_\_\_ energy

Produce ATP & NADPH

The Calvin cycle makes \_\_\_\_\_\_\_\_\_\_\_\_\_from \_\_\_\_\_\_\_\_\_\_\_\_\_\_.

ATP generated by the light reactions provides the energy for sugar synthesis

The NADPH produced by the light reactions provides the electrons for the reduction of carbon dioxide to glucose

Photosynthesis occurs in chloroplasts

In most plants, photosynthesis occurs primarily in the \_\_\_\_\_\_\_\_\_\_, in the chloroplasts

A chloroplast contains:

* \_\_\_\_\_\_\_\_\_\_\_, a fluid
* grana, stacks of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* The thylakoids contain \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Chlorophyll is the \_\_\_\_\_\_\_\_\_\_\_pigment that captures \_\_\_\_\_\_\_\_\_ for photosynthesis

Steps of Photosynthesis

1. **“THE LIGHT REACTIONS”**

* \_\_\_\_\_\_\_\_\_\_\_ hits reaction centers of chlorophyll, found in chloroplasts
* Chlorophyll vibrates and causes \_\_\_\_\_\_\_\_\_\_\_\_\_ to break apart.
* \_\_\_\_\_\_\_\_\_\_\_\_\_ is released into air
* \_\_\_\_\_\_\_\_\_\_\_\_\_ remains in chloroplast attached to NADPH
* Two types of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cooperate in the light reactions
* In the light reactions, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ generate ATP, NADPH, & O2
* Two connected photosystems collect photons of light and transfer the energy to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_electrons
* The excited electrons are passed from the primary electron acceptor to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Their energy ends up in ATP and NADPH

**Summary—Light Dependent Reactions**

a. Overall input- \_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_.

b. Overall output- \_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_.

2. **The DARK Reactions= Calvin Cycle (Light Independent Reactions)**

* \_\_\_\_\_\_\_\_\_ from atmosphere is joined to \_\_\_\_\_\_from water molecules (NADPH) to form glucose
* \_\_\_\_\_\_\_\_\_\_\_\_ can be converted into other molecules with yummy flavors!
* \_\_\_\_\_\_\_\_\_ from CO2 is converted to \_\_\_\_\_\_\_\_\_\_

**Summary—Light Independent Reactions**

a. Overall input- \_\_\_\_\_\_, \_\_\_\_\_\_, \_\_\_\_\_\_\_\_.

b. Overall output- \_\_\_\_\_\_\_\_\_\_\_\_.

**Types of Photosynthesis**

1. Photorespiration - when the plant takes in \_\_\_\_ instead of \_\_\_\_\_

Occurs under the following conditions:

* + - * \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (high O2 concentrations)
      * \_\_\_\_\_\_\_\_\_\_\_\_\_

Photorespiration is estimated to reduce photosynthetic efficiency by \_\_\_\_\_\_\_\_

The plants are not producing enough \_\_\_\_\_\_\_\_\_ and not making as much \_\_\_\_\_\_\_\_

Why High Heat?

* + When it is hot, plants close their \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to conserve water
  + They continue to do photosynthesis
  + use up \_\_\_\_\_\_\_ and produce O2
  + creates high O2 concentrations \_\_\_\_\_\_\_\_\_\_ the plant \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ occurs

1. C4 Photosynthesis
   * Certain plants have developed ways to \_\_\_\_\_\_\_\_ the amount of photorespiration

* C4 Pathway\*
* CAM Pathway\*
  + \* Both convert CO2 into a \_\_\_\_\_\_\_\_\_\_\_\_\_ intermediate —› C4 Photosynthesis
  + Leaf Anatomy
* In C3 plants (those that do C3 photosynthesis), all processes occur in the \_\_\_\_\_\_\_\_\_\_\_ cells.
* In C4 plants photosynthesis occurs in both the mesophyll and the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cells.
* \_\_\_\_\_\_\_\_\_\_ is “smuggled” into the bundle sheath cell
* The bundle sheath cell is not very permeable to \_\_\_\_\_\_\_\_
* CO2 is released —› goes through the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**How Does the C4 Pathway limit Photorespiration?**

* + Bundle sheath cells are far from the surface– \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + An enzyme in the pathway doesn’t have an affinity for O2—› allows plant to collect a lot of \_\_\_\_\_\_\_\_ and concentrate it in the bundle sheath cells

1. CAM Pathway
   * Fix CO2 at \_\_\_\_\_\_\_\_\_ and store as a 4-carbon molecule
   * Keep stomates closed during \_\_\_\_\_\_\_ to prevent \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   * Same general process as C4 Pathway

**How does the CAM Pathway limit photorespiration?**

* Collects CO2 at \_\_\_\_\_\_\_\_ so that it can be more concentrated during the day
* Plant can still do the Calvin Cycle during the day without losing \_\_\_\_\_\_\_\_\_

**Summary of C4 Photosynthesis**

* C4 Pathway = Separates by \_\_\_\_\_\_\_\_\_\_ (different locations)
* CAM Pathway = Separates reactions by \_\_\_\_\_\_\_\_\_ (night versus day)