

BIOLOGY Note-Taking Handout
Chapter 8 Photosynthesis

1. _____ is the ability to do work and it comes in many forms including _____. Nearly every activity depends on one kind of energy or another. _____ depend on energy too. This energy comes from _____.

2. Living things can obtain their energy in two basic ways: They can be **autotrophic** which means that _____

or they can be **heterotrophic** _____

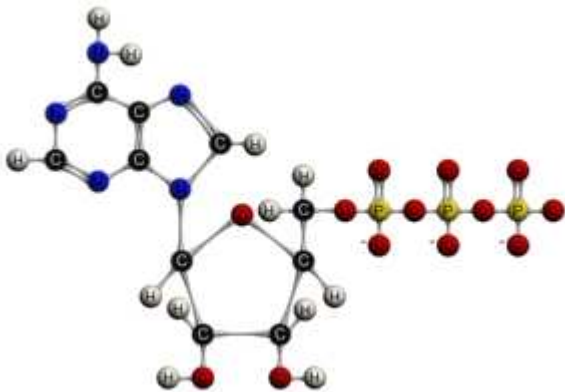
Examples of autotrophs

Examples of heterotrophs

3. The energy in food is _____ energy. By the time the food gets to your cells it has been broken down into _____. This glucose is still not in the correct form for the cell to use. The glucose must be converted to units of _____ or **ATP**.

Consider a gum-ball machine that only accepts quarters. You have a \$5 bill. The five-dollar bill represents 20 quarters but you won't get any gumballs with the paper money. The bill has to be converted to quarters. The glucose molecule must be "converted" into ATP molecules, which are the "quarters" that your cell can "spend" to perform work. This conversion process is called _____ and the organelles that do this converting are the _____.

4. A molecule of ATP consists of _____, a 5-carbon sugar called _____ and three _____ groups.



Circle and label the three parts of the ATP molecule shown here.

Draw a cartoon version of the ATP molecule below.

5. Draw a cartoon version of **ADP** (_____)

How do the two molecules differ? _____

_____ is _____ in the bond connecting the second and third phosphates.

When a cell wants to store energy _____

When a cell wants to release energy _____

List some cell activities that would use ATP. _____

6. It wouldn't be very convenient for you to carry around 50 to 100 quarters. Instead you carry paper money and convert to coin only when necessary. That's how the cell operates. Cells keep only _____ of ATP on hand. A single glucose molecule stores _____ than a single ATP.

Cells generate ATP from _____ as needed by using the energy in foods like _____.

7. The glucose being converted to ATP right now in your cells came from _____

All animals, fungi, and many microorganisms get their glucose by _____

Plants, algae and other microorganisms can _____

autotrophs

heterotrophs

8. During the process of **photosynthesis**, plants and algae use the energy of _____ to convert _____ and _____ into high-energy _____ (_____) and produce a very important waste product, _____.

9. Photosynthesis usually produces a 6-carbon _____ ($C_6H_{12}O_6$). The overall equation for photosynthesis is usually written out as

10. In addition to **water** and **carbon dioxide**, photosynthesis requires _____ and _____, a molecule in chloroplasts.

The sun's energy travels to the Earth in the form of _____. Our eyes perceive sunlight as _____ but it is actually a mixture of different _____ of light. These wavelengths make up the visible _____. List the colors of the visible spectrum from longest to shortest wavelength. (Roy G. Biv can help you remember these).

A **pigment** is a molecule that _____.
The main photosynthetic pigment is _____. Chlorophyll will absorb the _____ parts of the visible spectrum. Chlorophyll reflects the _____ portion and that's why chlorophyll is green. Plants also contain _____ and _____ pigments that can absorb the green portion of the spectrum. When do we notice these other pigments?

When chlorophyll absorbs light, the energy is transferred to _____

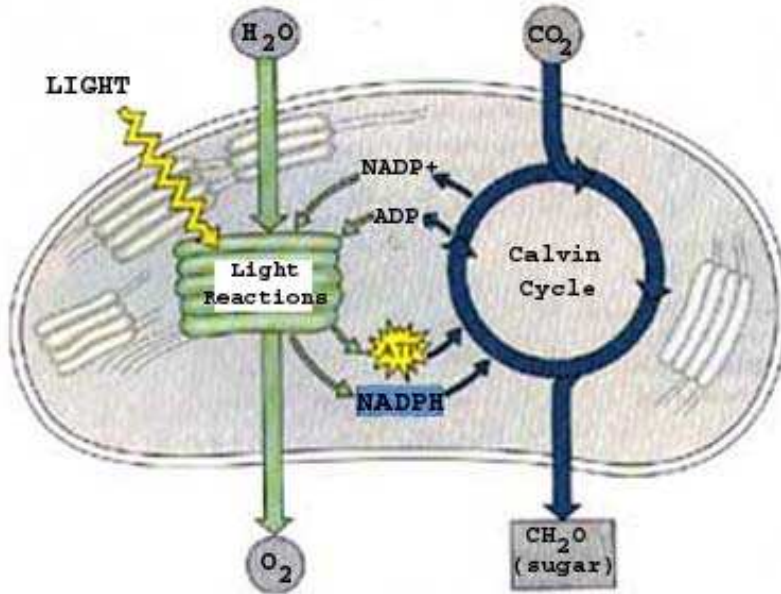
11. In plants and algae, photosynthesis takes place in cell organelles called _____



stroma

grana (granum)

thylakoid



12. Photosynthesis is not a single process, but two. The above diagram shows the two main parts of photosynthesis. These two parts are the _____ and the _____.

The **Light Reactions** and the **Calvin Cycle** cooperate in converting _____ energy to the _____ energy of food.

13. When sunlight strikes _____ in chlorophyll, the electrons gain a great deal of _____. These "high-energy" electrons require a _____. A *carrier molecule* is one that can _____

The carrier molecule in the light reactions is called _____. The **NADP⁺** accepts and holds two _____ along with a _____.

The hydrogen ion came from _____. As light strikes chlorophyll, water is split into _____ and _____. The oxygen will be _____.

_____ and
the hydrogen will be _____. This
converts **NADP+** into _____. The NADPH will carry the
_____ to _____

At the same time a phosphate group is added to _____ making _____

The products of the light (dependent) reactions of photosynthesis:

14. The ATP and NADPH formed during the light reactions contain _____
_____ but
they cannot store that energy for more than a few _____. During
the **Calvin cycle** the chemical energy from _____ and
_____ will be used to produce _____

The Calvin cycle does _____ require light, so these reactions are called
_____. The cycle begins by
incorporating _____ from the air into organic
molecules already present in the chloroplast. This process is known as

The Calvin cycle will convert the carbon compounds into carbohydrates by incorporating
the _____ from NADPH and
using the energy in the **ATP** that was made during the

The main product of the Calvin cycle: _____

How did the process of photosynthesis alter the atmosphere of the planet?

16. Three factors that can affect the rate (_____)
of photosynthesis include:

(1) _____

(2) _____

(3) _____

