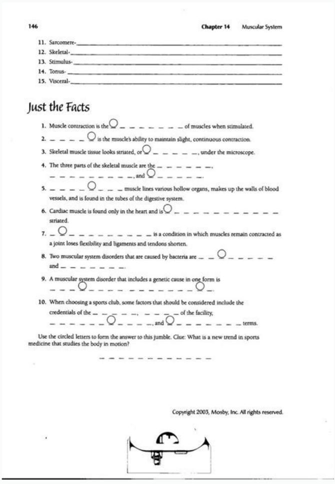
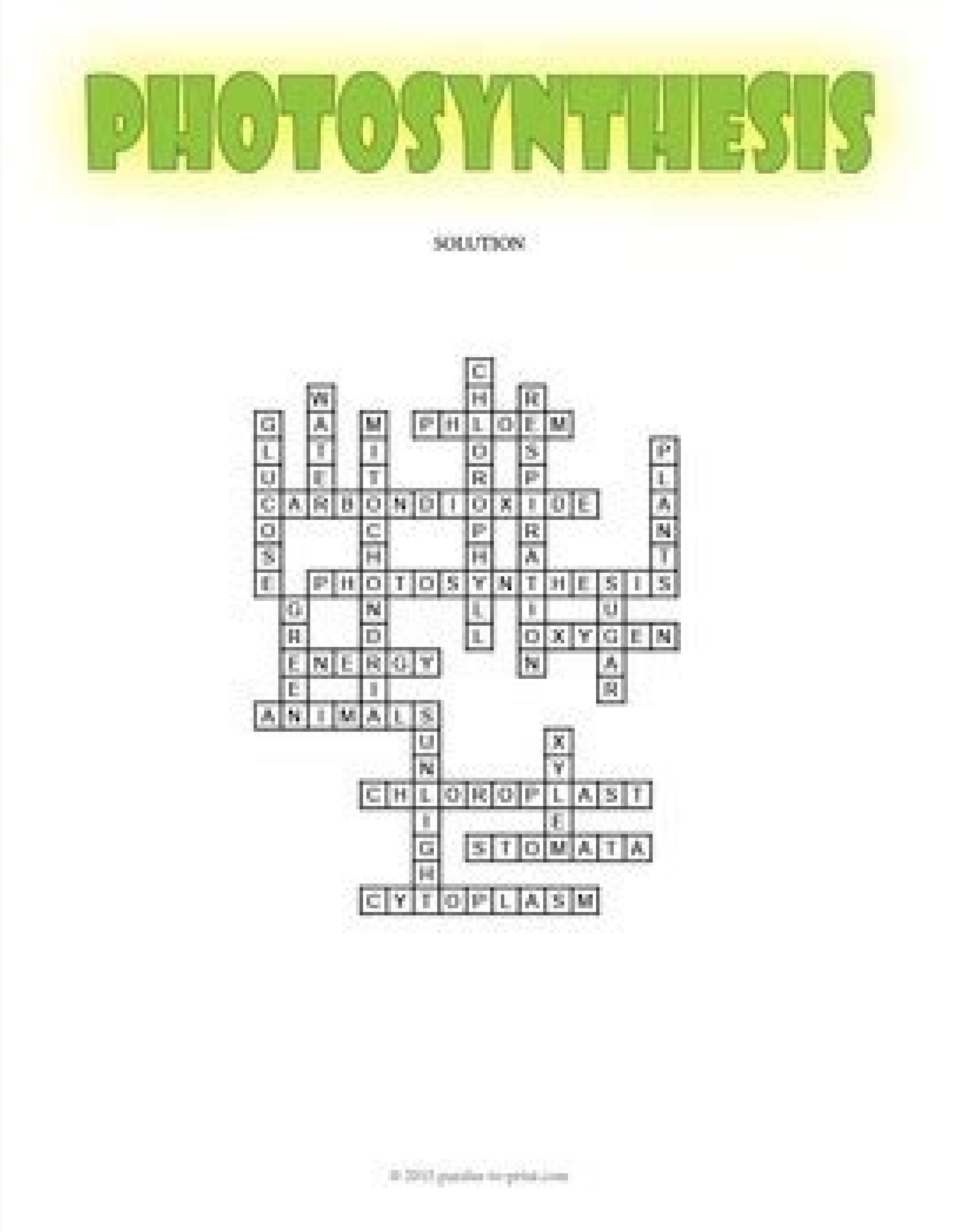
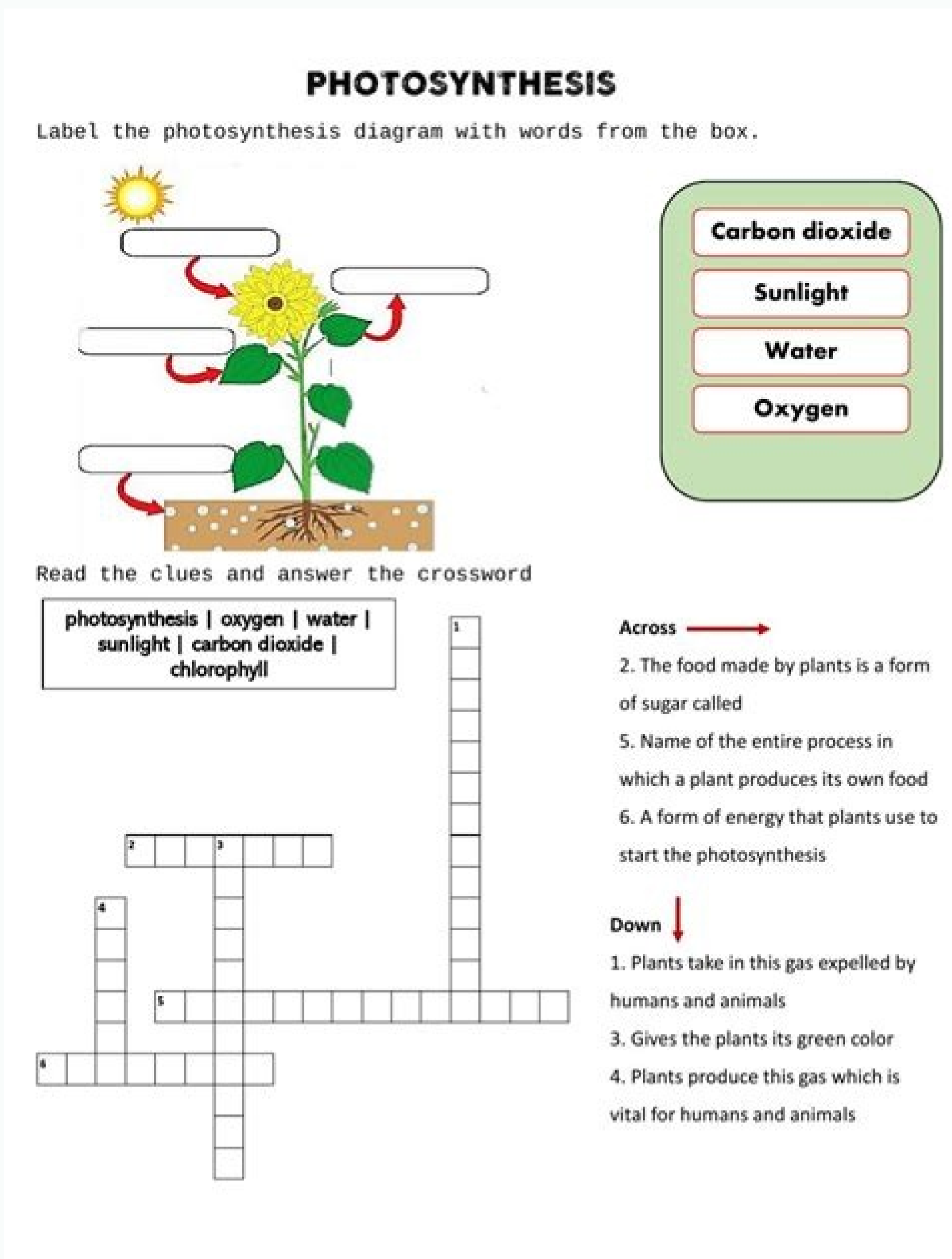
Photosynthesis and chemiosmosis worksheet answers







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Quiz & Worksheet - Plant-Like Protists

1. Why is this 'Ulva spp' (also known as sea lettuce) NOT considered a plant?

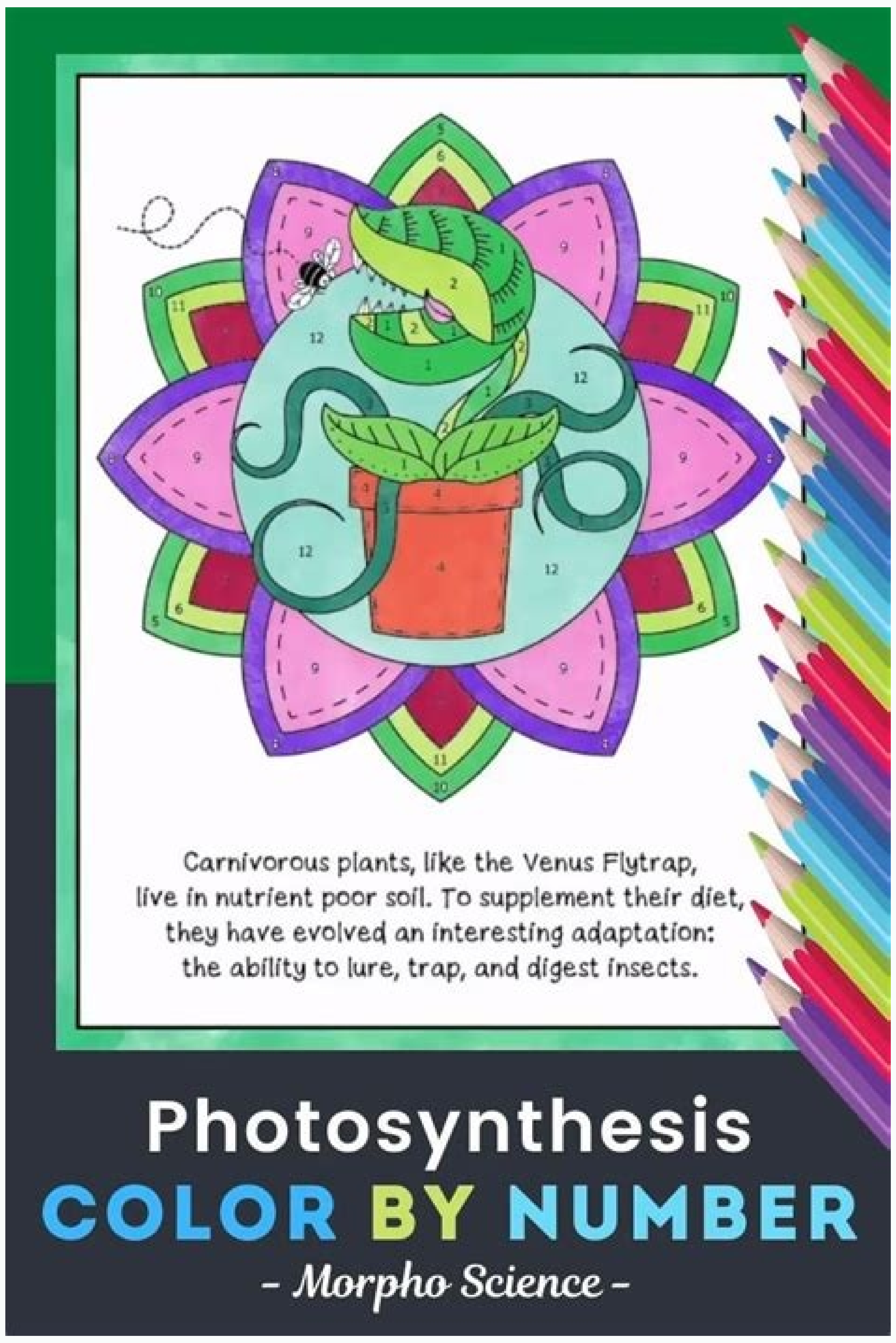
- It does not have any specialized cells. It is a colony of photosynthetic protists.
- It does not have any specialized cells. It is a unicellular photosynthetic protists.
- It is a seaweed and weeds are not plants.
- It does not have chloroplasts because it does not have specialized tissues or organelles for photosynthesis.

2. Which best explains why this plant-like protist has a red appearance?

- It has more red chloroplasts than green chloroplasts, thus it appears red instead of green.
- It has red pigments that mask the color of the green pigment found in its chloroplasts.
- It does not have chlorophyll so it is not photosynthetic like plants.
- It has red chloroplasts instead of green chloroplasts like plants.

3. Which of these cells fuse during sexual reproduction?

- Diploid gametes
- Haploid gametes
- Diploid zygote
- Haploid zygote



At the end of this section, you will be able to: Explain how plants absorb solar light energy Describe how the wavelength of light affects your energy and color Describe how and where photosynthesis takes place within a plant How can light be used to produce food? It is easy to think of light as something that exists and allows living organisms, like humans, to see, but light is a form of energy. Like all energy, light can travel, change shape and be used to do work. In the case of photosynthesis, the energy of light is transformed into chemical energy, which autotrophics use to build carbohydrate molecules. However, autotrophs only use a specific component of solar light (Figure 5.8). Figure 5.8 Autotrophs can capture light energy from the sun, making it chemical energy used to build food molecules. (Credit: modification of Gerry Atwell's work, U.S. Fish and Wildlife Service) Visit this site and click through animation to see the photoynthesis process within a sheet. The sun emits a huge amount of electromagnetic radiation (solar energy). Humans can only see a fraction of this energy, which is known as "visible light". The way solar energy travels can be described and measured as waves. Scientists can determine the amount of energy of a wave by measuring its wavelength, the distance between two similar consecutive points in a series of waves, such as from cresta to cresta or from valley to valley (Figure 5.9). Figure 5.9 The wavelength of a single wave is the distance between two consecutive points along the wave. Visible light is only one of the many types of electromagnetic radiation emitted by the sun. The electromagnetic spectrum is the range of all possible wavelengths of radiation (Figure 5.10). Each wavelength corresponds to a quantityof transported energy. Figure 5.10 The sun emits energy in the form of electromagnetic radiation. This radiation exists in different wavelengths, each of which has its own energy. Visible light is a type of energy emitted by the sun. Each type of electromagnetic radiation has a characteristic range of wavelengths. The longer the wavelength (or the more extended it appears), the less energy is charged. The short, narrow waves carry the most energy. This may seem illogical, but think of it in terms of a piece of moving rope. It takes little effort for a person to move a string in long, wide waves. To make a string move in short, tight waves, a person needs to apply significantly more energy. The sun emits a wide range of electromagnetic radiation, including X-rays and ultraviolet (UV) rays. High-energy waves are dangerous to living things; for example, X-rays and UV rays can be harmful to humans. The energy of light enters the process of photosynthesis when the pigments absorb the light. In plants, pigment molecules absorb only visible light for photosynthesis. The visible light seen by humans as white light actually exists in a rainbow of colors. Certain objects, such as a prism or a drop of water, disperse white light to reveal these colors to the human eye. The visible light portion of the electromagnetic spectrum is perceived by the human eye as a rainbow of colors, with violet and blue having shorter wavelengths and, therefore, greater energy. At the other end of the spectrum towards red, the wavelengths are longer and have less energy. There are different types of pigments, and each absorbs only certain wavelengths (colors) of visible light. Pigments reflect the color of wavelengths they cannot absorb. All photosynthetic organisms contain a pigment called chlorophyll a, which humans see as the common green color associated with plants. Chlorophyll absorbs wavelengths from any of the visible spectrum (blue and red), but not from the green. Because the green is reflected, chlorophyll appears green. Other types of pigments include chlorophyll B (which absorbs blue and red-orange light) and carotenoids. Each type of pigment can identified by the specific pattern of wavelengths it absorbs from visible light, which is its absorption spectrum. Many photosynthetic organisms have a mixture of pigments; among them, the body can absorb energy from a wider range of visible light wavelengths. Not all photosynthetic organisms have full access to sunlight. Some organisms grow underwater where the intensity of light decreases with depth, and some wavelengths are absorbed by the water. Other organisms grow in competition for light. Plants on the forest floor should be able to absorb any little light that comes in, as the tallest trees block most of the sunlight (Figure 5.11). Figure 5.11 Plants that normally grow in the shade benefit from having a variety of light-absorbing pigments. Each pigment can absorb different wavelengths of light, allowing the plant to absorb any light that passes through the tallest trees. (Credit: Jason Hollinger) The general purpose of light-dependent reactions is to convert the energy of light into chemical energy. This chemical energy will be used by the Calvin cycle to fuel the assembly of sugar molecules. Light-dependent reactions start in a group of pigment molecules and proteins called a photosystem. There are photosystems in the membranes of the thylacoid. A pigment molecule in the photosystem absorbs a photon, a quantity or “package” of light energy, at a time. A photon of light energy travels to reach a chlorophyll molecule. The photon causes an electron in the chlorophyll to be “excited”.The energy given to the electron allows it to free itself from an atom in the chlorophyll molecule. Therefore, chlorophyll is said to “donate” an electron (Figure 5.12). To replace the electron in the chlorophyll, a water molecule is divided. This division an electron and leads to the formation of oxygen ions (O2) and hydrogen (H+) in the tilacoid space. Technically, every breakage of a water molecule releases a couple ofAnd therefore you can replace two donated electrons. Graph 5.12 The energy of light is absorbed by a chlorophyll miller and passes through a path to other chlorophyll millets. Energy culminates in a chlorophyll molecule that is located in the reaction center. The energy â € œExcitaâ € to one of its electrons enough to leave the molecule and be transferred to a primary electron receiver nearby. A watermolk is divided to release an electron, which is necessary to replace the donor. The oxygen and hydrogen ions are also formed from the division of water. The substitution of the electron allows the chlorophyll to respond to another photonus. The oxygen molecules produced as by-products find their way to the surrounding environment. The hydrogen ions play critical roles in the rest of the reactions dependent on light. Keep in mind that the proposition of the reactions dependent on light is to convert solar energy into chemical carriers that will be used in the Calvin cycle. In eukaryotes and some prokaryotes there are two photosystems. The first is called System II, which was named for the order of its discovery instead of for the order of the function. After photon strokes, System II transfers the free electron to the first one in a series of proteins within the Tilakoide membrane called electron transport chain. As the electron passes along these proteins, energy from electron membrane pumps that actively move hydrogen ions against their stromal concentration gradient in the tilakoid space. This is quite analogous to the process that occurs in the mitochondrion in which an electron transport chain pumps hydrogen ions from the mitochondrial stroma through the internal membrane and in the intermembrano space, creating an electrochemical gradient. After the energy is used, the electron accepted by a pigment molecule in the following photo system, which is called photosystem I (figure 5.13). Figure 5.13 Photosystem II, the electron travels along a series ofThis electron transport system uses the energy of the electron to pump hydrogen ions into the thylacoid. A pigment molecule in photosystem I accepts the electron. In light-dependent reactions, the energy absorbed by sunlight is stored by two types of energy-carrying molecules: ATP and NADPH. The energy these molecules carry is stored in a bond that holds an atom to the molecule. For ATP, it’s a phosphate atom, and for NADPH, it’s a hydrogen atom. Recall that NADH was a similar molecule that transported energy in the mitochondria from the cyclic acid cycle to the electron transport chain. When these molecules release energy in the Calvin cycle, each loses atoms to become the lower energy molecules ADP and NADP+. The accumulation of hydrogen ions in the thylachoid space forms an electrochemical gradient due to the difference in the concentration of protons (H+) and the difference in charge across the membrane they create. This potential energy is harvested and stored as chemical energy in ATP by chemosis, the movement of hydrogen ions along their electrochemical gradient via the transmembrane enzyme ATP synthase, as in the mitochondria. Hydrogen ions are allowed to pass through the thylacoid membrane through an embedded protein complex called ATP synthase. This same protein generated ATP from ADP in the mitochondria. The energy generated by the flow of hydrogen ions allows ATP synthase to bind a third phosphate to ADP, which forms an ATP molecule in a process called photophosphorylation. The flow of hydrogen ions through ATP synthase is called chemosis, because the ions move from an area of high to low concentration through a semi-permeable structure. The remaining function of the light-dependent reaction is to generate the other molecule of Energy, NADPH. As electron transport chain electron reaches photos system, it is re-energized with another photon captured by chlorophyll. chlorophyll. The energy of this electron drives the NADPH formation from NADP + and a hydrogen ion (H +). Now that the solar energy is stored in energy carriers, it can be used to make a sugar molecule. In the first part of the photosselves, the reaction dependent on the light, the pigment molt absorbs energy from sunlight. The most common and abundant pigment is chlorophyll a. A foton hits photosystem II to start photosintesis. The energy travels through the electron transport chain, which pumps hydrogen ions to the Tilacoid space. This forms an electrochemical gradient. The ions flow through the ATP synthase from the tilacoid space until the stroma in a process called chemiosis to form ATP molt, which are used for the formation of azúcar molecules in the second stage of the photosselves . The photos System and absorbs a second photon, which results in the formation of a NADPH miller, another energy carrier for the reactions of the Calvin cycle. Absorption spectrum: The specific pattern of absorbing a substance that absorbs electromagnetic radiation chlorophyll A: the form of chlorophyll that absorbs violet-blue and red chlorophyll: the chlorophyll form and red-orange light electromagnetic spectrum: The range of all possible frequencies of the radiing photon: an amount or «package» of luminous energy photos: a group of protein, chlorophyll and other pigments that are used in light-dependent photosive reactions to absorb luminous energy and convert it into chemical energy wavelength: the distance between consecutive points of a wave wave

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