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Reactants and products of light reactions

The structure of the chloroplast and photosynthetic membrane | Phases of photosynthesis | The reactions of the dark reaction light | Pathway C-4 | The carbon cycle | Learning objectives | Terms | Review questions | Links What is photosynthesis? | Back to the top Photosynthesis is the process with which plants, some bacteria and some protists use energy from sunlight to produce sugar, that cellular breathing converts to ATP, the "fuel" used by all living things . The conversion of unusable solar light in which can be used, is associated with the actions of the chlorophyll of the green pigment. Most of the time, the photosynthetic process uses water and releases oxygen that we must absolutely have to remain alive. Oh yes, we also need food! We can write the overall reaction of this process as: $6\text{H}_2\text{O} + 6\text{CO}_2 \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$ Many of us do not speak chemical, so the aforementioned chemical equation translates as: six more than six water molecules Carbonic anhydride molecules produce a sugar molecule more six oxygen diagram molecules of a typical plant, showing the inputs and outputs of the photosynthetic process. Image from Pureve et al., Life: The science of biology, the 4th edition, of Sinauer Associates (www.sinauer.com) and Wh Freeman (www.whfreeman.com), used with permission. Leaves structure and leaves | Back to top Plants are the only photosynthetic organisms to have leaves (and not all plants have leaves). A leaf can be seen as a solar collector full of photosynthetic cells. The raw materials of photosynthesis, water and carbon dioxide, enter the cells of the leaf and the products of photosynthesis, sugar and oxygen, leave the leaf. Cross section of a leaf, which shows the important anatomical characteristics for the studio of photosynthesis: stoma, guard cell, mesophyll cells and vein. Image from Pureve et al., Life: The science of biology, the 4th edition, of Sinauer Associates (www.sinauer.com) and Wh Freeman (www.whfreeman.com), used with permission. The water enters the root and is transported to the leaves through specialized vegetable cells known as Xilem (pronounced Zigh-Lem). Terrestrial plants must protect against drying (drying) and therefore have evolved specialized structures known as stomics to allow gas to enter and leave the leaf. The carbon dioxide cannot pass through the protective waxed layer that covers the leaf (cuticle), but can enter the leaf through an opening (the stoma, plural = stomes, Greek per hole) flanked by two guard cells. Similarly, oxygen produced during photosynthesis can only pass off the leaf through open stomas. Unfortunately for the plant, while these gases are moving between the inside and outside the leaf, even a large water is lost. Cottonwood trees, for example, will lose 100 liters of water per hour during the desert days. Carbon dioxide enters autotropro-cellular and aquatic through specialized structures. Pea leaf stoma, VICEA SP. (SEM X3,520). Image represents Copyright Dennis Kunkel on www.denniskkel.com, used with permission. The nature of light | Back to top The white light is separate in the different colors (= wavelenghts) of the light passing it through a prism. The wavelength is defined as the distance from the peak to peak (or through depressed). The energy of it is inversely portional to the wavelength: longer wavelengths have less energy than the shortest ones. Wave length and other soaps of the nature wave nature. Image from Pureve et al., Life: The science of biology, the 4th edition, by Sinauer Associates (www.sinauer.com) and Wh Freeman Used with permission. The order order is determined by the wavelength of light. The visible light is a small part of the electromagnetic spectrum. The wavelength of visible light wavelength longer the color. Similarly, the shortest wavelengths are towards the purple side of the spectrum. The longer red wavelengths are indicated as infrared, while the brief ones of the violet are ultraviolet. The spectrum. Image from Pureve et al., Life: The science of biology, the 4th edition, of Sinauer Associates (www.sinauer.com) and Wh Freeman (www.whfreeman.com), used with permission. The light behaves both as a wave and a particle. The properties of the light wave include the flexion of the wave path when they pass from a material (half) in another (ie the prism, the rainbows, the pencil in a glass of water, etc.). Particle properties are demonstrated by the photoelectric effect. Zinc exposed to ultraviolet light is positively accused because energy light forces zinc electrons. These electrons can create an electric current. Sodium, potassium and selenium have critical wavelengths in the visible light range. The critical wavelength is the maximum wavelength of light (visible or invisible) that creates a photoelectric effect. Chlorophyll and pigments accessories | Back to the top A pigment is any substance that absorbs the light. The color of the pigment derives from the wavelengths of reflected light (in other words, those not absorbed). Chlorophyll, the common green pigment to all photosynthetic cells, absorbs all the wavelengths of visible light except green, which reflects to be detected by our eyes. The black pigments absorb all the wavelengths that strike them. The white pigments / lighter colors reflect everything or almost all the energy that strikes them. The pigments have its characteristic absorption spectra, the absorption model of a given pigment. Absorption and transmission of different wavelengths of light from a hypothetical pigment. Image from Pureve et al., Life: The science of biology, the 4th edition, of Sinauer Associates (www.sinauer.com) and Wh Freeman (www.whfreeman.com), used with permission. Chlorophyll is a complex molecule. Several chlorophyll changes occur between plants and other photosynthetic organisms. All photosynthetic organisms (plants, some protistsans, proclorobacteria and cyanobacteria) have chlorophyll a. The accessories pigments absorb the energy that chlorophyll does not absorb. The accessories pigments include chlorophyll b (also C, D and and in algae and protoNatans), xanthophills and carotenoids (such as beta-carotene). The chlorophyll absorbs its energy from blue and reddish orange red wavelengths, and little from intermediate wavelengths (green-yellow-orange). Molecular model of chlorophyll. The above image indicated by . Molecular model of carotene. The above image indicated by . Carotenoids and chlorophyll b absorb part of energy in green wavelength. Why not so much in orange and yellow wavelengths? Both chlorophiles also absorb in the orange red extremity of the spectrum (with longer wavelengths and lower energy). The origins of photosynthetic organisms in the sea can explain this. Short wavelengths (with more energy) does not penetrate much below 5 meters deep in sea water. The ability to absorb some energies from longer wavelengths (therefore more penetrating) could have been an advantage to early photosynthetic algae that were unable to be in the upper (photographic) area of the sea all the time. The molecular structure of chlorophiles. Image from Pureve et al., Life: The science of biology, the 4th edition, of Sinauer Associates (www.sinauer.com) and Wh Freeman (www.whfreeman.com), used with permission. The spectrum of action of photosynthesis is the relative effectiveness of the different wavelengths of light to generate electrons. If a pigment absorbs light energy, one of the three things will occur. Energy is dissipated as heat. The energy can be issued immediately as one Longer wave, a phenomenon known as fluorescence. The energy can trigger a chemical reaction, as in photosynthesis. Chlorophyll active only a chemical reaction when it is associated with protein à €

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