

Chapter 10 review sheet photosynthesis



**ASSIGN
BUSTER**

Biol 1406, Instructor: Alice Zhou Updated 4/18/12 Chapter 10:

Photosynthesis 1. Describe the energy transformation that occurs in photosynthesis. Solar energy to chemical energy specifically stored in sugar.

Solar → Chemical energy (sugar) 2. Write the summary equation of photosynthesis. Solar + $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$ (simple) Complex 3.

Photosynthesis produces organic sugar molecules. Where does the carbon come from in making the sugars? From carbon dioxide 4. Aerobic cellular respiration is catabolic, exergonic and oxygen requiring. What about photosynthesis?

Anabolic, endergonic, O_2 -releasing 5. What is the difference between autotrophs and heterotrophs? Autotrophs create their own food by photosynthesis heterotrophs don't.

6. Name some photoautotrophs. Plants Algae Photosynthetic Bacteria 7. Draw and label these parts of chloroplasts:

thylakoid, granum, stroma, outer and inner membrane. 8. What type of cells in a plant will contain chloroplast? What type of cells contain mitochondria and why?

Every single plant cell will have mitochondria, some plant cells only the green ones will contain chloroplasts. 9. The Nature of Light and Pigments .

What wavelength range is the source of light for photosynthesis? Gamma X-Rays U. V Visible (VIBGYOR: ROYGBIV backwards) Infrared Radio

Small wavelength 350nm 750nm Wavelength b. What are photons? * Massless * Carry fixed amount of energy (packet of energy) * Travels at speed of light

c. What are pigment molecules? Selectively absorbing visible light (chemical) -350-450nm d. Name three types of photosynthetic pigments found in green plants. Note which one is the main one, which ones are accessory pigments.

* Chlorophyll A (MAIN) * Chlorophyll B (minor %) * Carotenoid (minor %) e.

What makes chloroplasts or leaves green and why? Green is being reflected because it is not absorbed. f. How can you easily separate them out experimentally? Paper Chromatography g. Plot an absorption spectrum of chlorophyll a. Be sure to use correct parameters on x and y axis. 10. Organization of pigments in photosystems. a) What is the concept of a photosystem? b) Photosystems are organized into two subcomponents: * antenna complex: Lots of pigments (A, B, and carotenoids) Pigments along with some proteins that organize some pigments about 200 found, scaffold proteins reaction center complex A pair of chlorophyll A are found proteins are organized and shape reactions. PEA are bound here. * (T/F?) In either complex, membrane proteins are present to anchor and support the functions of pigment and other organic molecules. 11. Light interacts with pigments h. When photons strike the pigment molecules in the chloroplast, what immediately happens? _ Photoexcitation____. After that, what can happen to the electrons in the photosystem? Describe two outcomes in diagrams. Electrons fall back to ground state Electrons transferred to PEA Electrons fall back to ground state Electrons transferred to PEA i. In outcome 1, electrons fall back to ground state. Inductive resonance: energy of the excited electron, but not the electron itself, is transferred to a neighboring pigment molecule, exciting the second pigment molecule. Very little energy is lost in this ENERGY transfer. j. In outcome 2, electrons are transferred to PEA (Primary Electron Acceptor): _____ reaction has occurred. The pigment molecule that has lost the electrons is_____, whereas the PEA is reduced because it gains an electron.

This actually happens to two chlorophyll a pigments (RCCA) located at reaction center in a photosystem. k. Draw a diagram of photosystem to illustrates both outcomes as photons interact with pigments: 12. Light reactions l. Describe the events that have led to the redox reaction at the reaction center. 1) Photon strike Antenna Pigments 2) Photoexcitation of pigment electrons 3) Inductive resonance 4) Photoexcitation of another pigment eventually 5) Energy passed on to RCCA (reaction center chlorophyll A) 6) Photoexcitation of RCCA 7) m.

Electrons from PEA flow “ downhill” in energy level through a series of electron carriers embedded in thylakoid membrane. Energy lost by the electrons is used to synthesize _____ molecules through _____ process, similar in mechanisms to oxidative phosphorylation in mitochondria. n. Ultimately electrons are passed from the electron carriers to _____ and reduce it to NADPH by the enzyme NADP+ reductase. o. Draw a diagram of the above events. Note the direction of pumping, diffusion and the site of ATP synthesis. p.

Trace the electron flow in light reactions starting from the source of electrons. (non-cyclic electron flow) q. What supplies the source of all of the electrons in this electron flow to make sure that RCCA will not run out of electrons? What is the by-product of this donation of electrons to RCCA? r. Light reactions produce ATP and NADPH. Why is the synthesis of these two compounds necessary? s. Sum it up: What go into the light reaction and what come out of the light reaction? List all components. 13. Now let’s move onto the next stage: Calvin cycle t. What does it accomplish? . Where does Calvin cycle occur? v. What is the key enzyme? What is special about this

enzyme? w. The immediate product of Calvin cycle is G3P _____ . What other products can be made out of G3P? 14.

Integrating Light Reaction with Calvin Cycle. (understand the relationship) x.

What is the overall flow of electrons in photosynthesis? y. As you turn off the light in your room, the plant in your room ceases light reactions immediately, what about Calvin cycle reactions? z. If an inhibitor inhibits Calvin cycle, would the light reaction keep going?