

Review Sheet Photosynthesis

Lester BIOL 150

General things to do to prepare for the exam:

- study the PowerPoints
- write out the answers to the learning objectives found with each PowerPoint
- listen to my lecture recordings

Chapter 10

Do all ecosystems depend on the sun for energy? Explain why or why not.

In terms of carbon source and energy source, compare and contrast photoautotroph with chemoheterotroph. Give examples of each.

Define primary producers, primary consumers, secondary consumers etc.

Where did mitochondria and chloroplasts come from? Explain that theory.

Describe the various pigments found in plant leaves. Why do leaves change color in the fall?

How do carbon dioxide and oxygen enter and exit a leaf?

Describe and label a chloroplast.

Compare and contrast the simplified equations for photosynthesis and cell respiration.

Describe how photosynthesis is a redox process. What gets oxidized and what gets reduced?

Compare and contrast substrate-level phosphorylation, oxidative phosphorylation, and photophosphorylation. Where and how does each one occur?

Describe the key events of the light reactions, in particular following the flow of electrons from start to finish. Include photosystems, ETC, reactants, products, locations, and energy for linear electron flow.

Describe cyclic electron flow.

Describe the key events of the Calvin cycle (carbon fixation). Include reactants, products, locations, and energy.

Describe the electromagnetic spectrum. How does EM radiation travel? List the colors of the visible spectrum, in the correct order.

How does wavelength correlate with energy?

How do we see/interpret the color of something? Talk about wavelengths.

Describe photorespiration. How is it beneficial to plants? How is it potentially harmful to plants?

What does C3 plant mean?

How are CAM plants different from regular plants? Give examples of CAM plants.

Sample Test Questions

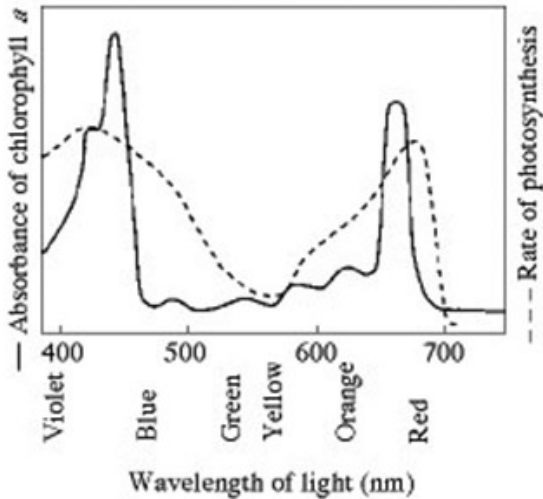
Under what conditions do photosynthesis and cellular respiration occur in plants?

- A) Photosynthesis and cellular respiration occur only in the light.
- B) Photosynthesis occurs only in the light, and cellular respiration occurs only in the dark.
- C) Photosynthesis occurs only in the light, and cellular respiration occurs in both the dark and the light.
- D) Photosynthesis and cellular respiration occur in both the dark and the light.

The oxygen released by photosynthesis is produced by which of the following processes?

- A) splitting water molecules
- B) chemiosmosis
- C) the electron transfer system of photosystem I
- D) the electron transfer system of photosystem II

Use the following figure to answer the question.



What wavelength of light in the figure is most effective in driving photosynthesis?

- A) 420 nm
- B) 575 nm
- C) 625 nm
- D) 730 nm

A spaceship is designed to support animal life for a multiyear voyage to the outer planets of the solar system. Plants will be grown to provide oxygen and to recycle carbon dioxide. Since the spaceship will be too far from the sun for photosynthesis, an artificial light source will be needed. What wavelengths of light should be used to maximize plant growth with a minimum of energy expenditure?

- A) full-spectrum white light
- B) green light
- C) a mixture of blue and red light
- D) UV light

In autumn, chlorophyll is degraded in the leaves of deciduous trees. Why do the leaves change color to shades of yellow, orange, or red?

- A) Sugars from sap fill the leaves prior to winter.
- B) Degraded chlorophyll changes into many other colors.
- C) In the absence of photosynthesis, the leaves produce energy exclusively by aerobic cellular respiration.
- D) Other pigments such as carotenoids are still present in the leaves.

Which molecule is the final electron acceptor for electrons from photosystem I?

- A) oxygen
- B) chlorophyll in photosystem II
- C) carbon dioxide
- D) NADP+

What are the products of cyclic electron flow during the light reactions of photosynthesis?

- A) heat and fluorescence
- B) ATP
- C) ATP and NADPH
- D) ADP and NADP+

Where are ATP synthase complexes located in plant cells?

- A) thylakoid membrane only
- B) inner mitochondrial membrane only
- C) thylakoid membrane and inner mitochondrial membrane
- D) thylakoid membrane and plasma membrane

In photosynthetic cells, synthesis of ATP by chemiosmosis occurs during:

- A) photosynthesis only
- B) respiration only
- C) photosynthesis and respiration
- D) photosynthesis, respiration, and fermentation

In a plant, which of the following reactions produce molecular oxygen (O₂)?

- A) the light reactions alone
- B) the Calvin cycle alone
- C) the light reactions and the Calvin cycle
- D) neither the light reactions nor the Calvin cycle

Where in a plant cell does the Calvin cycle take place?

- A) stroma of the chloroplast
- B) thylakoid membrane
- C) interior of the thylakoid (thylakoid space)
- D) outer membrane of the chloroplast

Which of the following sequences correctly represents the flow of electrons during photosynthesis?

- A) NADPH → O₂ → CO₂
- B) H₂O → NADPH → Calvin cycle
- C) NADPH → chlorophyll → Calvin cycle
- D) NADPH → electron transport chain → O₂

CAM plants keep stomata closed in the daytime, thus reducing loss of water. They can do this because they:

- A) fix CO₂ into organic acids during the night
- B) fix CO₂ into sugars in the bundle-sheath cells
- C) fix CO₂ into pyruvate in the mesophyll cells
- D) use photosystem I and photosystem II at night

Which of the following does *not* occur during the Calvin cycle?

- A) carbon fixation
- B) oxidation of NADPH
- C) release of oxygen
- D) regeneration of the CO₂ acceptor

Which process is most directly driven by light energy?

- A) creation of a pH gradient by pumping protons across the thylakoid membrane
- B) reduction of NADP⁺ molecules
- C) transfer of energy from pigment molecule to pigment molecule
- D) ATP synthesis