Photosynthesis: Light-Dependent and Light-Independent Stages

Biology · Practice Test · 18 Questions

1. What is the overall equation for photosynthesis?

A) $6CO_2 + 6H_2O$ + light energy -> $C_6H_{12}O_6 + 6O_2$
B) $C_6H_{12}O_6 + 6O_2$ -> $6CO_2 + 6H_2O$ + energy
C) $6O_2 + 6H_2O$ + light energy -> $C_6H_{12}O_6 + 6CO_2$
D) $C_6H_{12}O_6$ + light energy -> $6CO_2 + 6H_2O + 6O_2$

2. Where does the light-dependent stage of photosynthesis occur?

A) Stroma
B) Thylakoid membranes
C) Outer chloroplast membrane
D) Intermembrane space

3. What are the main chemical energy carriers produced during the light-dependent stage?

A) Glucose and starch
B) ATP and NADPH
C) CO_2 and H_2O
D) ADP and Pi

4. In which part of the chloroplast does the Calvin cycle (light-independent stage) take place?

A) Thylakoid lumen
B) Grana
C) Stroma
D) Outer membrane

5. What is photophosphorylation?

A) The splitting of water using light energy.
B) The synthesis of ATP using light energy.
C) The fixation of CO_2 into carbohydrates.
D) The release of oxygen from the chloroplast.

6. Which type of photophosphorylation produces both ATP and NADPH?

A) Cyclic photophosphorylation
B) Non-cyclic photophosphorylation
C) Photorespiration
D) Photolysis

7. The chloroplast has a double envelope. What is the function of the inner membrane?

A) To be highly permeable to all metabolites.
B) To control metabolite exchange.
C) To absorb light energy.
D) To house the Calvin cycle enzymes.

8. What is the stroma of the chloroplast?

A) A stack of flattened sacs.
B) The aqueous, enzyme-rich matrix containing DNA and ribosomes.
C) The space between the outer and inner membranes.
D) The site of photolysis.

9. What is a granum?

A) A single flattened sac within the thylakoid system.
B) A stack of 10-100 thylakoids.
C) The outer boundary of the chloroplast.
D) The fluid-filled space outside the thylakoids.

10. Which pigment is the primary chlorophyll in Photosystem II (PSII) and Photosystem I (PSI) reaction centers?

A) Chlorophyll b
B) Carotenoids
C) Chlorophyll a (P680 and P700)
D) Xanthophylls

11. What is the role of antenna complexes in photosynthesis?

A) To directly produce ATP.
B) To funnel light energy to the reaction center.
C) To split water molecules.
D) To reduce NADP+.

12. How are palisade mesophyll cells adapted for light interception?

A) They are irregularly shaped and loosely packed.
B) They contain few chloroplasts and are located at the bottom of the leaf.
C) They are tall, tightly packed, and contain many chloroplasts pushed to the periphery.
D) They have thick cell walls to prevent water loss.

13. What is the reaction center of Photosystem II (PSII) called and what wavelength of light does it absorb?

A) P700, 700nm
B) P680, 680nm
C) P500, 500nm
D) P800, 800nm

14. What is the function of the oxygen-evolving complex on the lumen side of PSII?

A) To pump protons into the stroma.
B) To release O2, H+, and electrons from water.
C) To excite electrons in P700.
D) To produce ATP.

15. Which molecule acts as the primary electron acceptor after excitation at PSII?

A) Plastoquinone (PQ)
B) Ferredoxin (Fd)
C) Pheophytin
D) Plastocyanin (PC)

16. During electron transport from PSII to PSI, protons are pumped from the stroma to the lumen via which complex?

A) Photosystem I
B) Plastoquinone
C) Cytochrome b6f complex
D) ATP synthase

17. What is the reaction center of Photosystem I (PSI) called and what wavelength of light does it absorb?

A) P680, 680nm
B) P700, 700nm
C) P500, 500nm
D) P800, 800nm

18. Which enzyme is responsible for reducing NADP+ to NADPH using electrons from ferredoxin?

A) Rubisco
B) Phosphoglycerate kinase
C) G3P dehydrogenase
D) Ferredoxin-NADP+ reductase (FNR)