

Name _____

Photosynthesis

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 1) The products of photosynthesis are 1) _____
 - A) carbon dioxide, chlorophyll, and oxygen.
 - B) glucose and oxygen.
 - C) glucose and carbon dioxide.
 - D) glucose and water.
 - E) carbon dioxide, water, and energy.

- 2) What structural feature of a leaf allows a leaf to obtain CO₂ from the air? 2) _____
 - A) mesophyll
 - B) chloroplast
 - C) stomata
 - D) cuticle
 - E) epidermis

- 3) What factors influence the rate of photosynthesis? 3) _____
 - A) water availability
 - B) temperature
 - C) light intensity
 - D) CO₂
 - E) all of these

- 4) Imagine a scientist discovers a mutant plant seedling that appears to lack stomata. What would be the effect of this? 4) _____
 - A) CO₂ would not be able to enter as a reactant for photosynthesis.
 - B) Water would not be able to enter the plant cells.
 - C) Visible wavelengths of light would be unable to reach the chloroplasts.
 - D) Additional ATP would be produced by the cells of the plant seedling and the plant would grow taller.

- 5) You are experimenting with different types of lighting for your indoor green plants. Which of the following colors of light will be most effective? 5) _____
 - A) red-green
 - B) green
 - C) red-blue
 - D) orange-yellow
 - E) blue

- 6) Which sequence accurately reflects the flow of electrons in photosynthesis? 6) _____
 - A) Photosystem I → Photosystem II → NADP → H₂O
 - B) Photosystem II → Photosystem I → NADP → H₂O
 - C) H₂O → Photosystem I → Photosystem II → NADP
 - D) Photosystem I → Photosystem II → H₂O → NADP
 - E) H₂O → Photosystem II → Photosystem I → NADP

- 7) Light-dependent photosynthetic reactions produce _____
A) Glucose, ATP, O₂.
B) ATP, NADPH, H₂O.
C) ATP, NADPH, O₂.
D) ATP, NADPH, CO₂.
E) Glucose, ATP, CO₂.
- 8) What is the role of water in photosynthesis? _____
A) to provide H₂
B) to provide electrons
C) to provide oxygen
D) to maintain turgor pressure
E) all of these
- 9) The energy of the movement of electrons down their concentration gradient via electron transport within chloroplasts and mitochondria is used to generate molecules of _____
A) O₂. B) ATP. C) glucose. D) H₂O. E) CO₂.
- 10) Which process of photosynthesis is linked to the production of ATP? _____
A) generation of NADPH
B) photosystem II
C) fixing of carbon
D) synthesis of O₂
E) splitting of a water molecule
- 11) Suppose you are studying photosynthesis in a research lab. You grow your plants in a chamber with a source of water that has a radioactively labeled oxygen atom. What photosynthetic product will be radioactive? _____
A) ATP B) glucose C) RuBP D) oxygen E) NADPH
- 12) Which of the following is TRUE about the light-dependent reactions? _____
A) ATP is the final electron acceptor.
B) Photosystem II generates ATP, while photosystem I generates NADPH.
C) NADPH and ATP are both synthesized on an electron transport chain that connects photosystem I and photosystem II.
D) Photosystem I generates ATP, while photosystem II generates NADPH.
- 13) The primary function of the light reactions of photosynthesis is _____
A) to use the ATP to make glucose.
B) to convert light energy to the chemical energy of lipids.
C) to produce energy-rich glucose from carbon dioxide and water.
D) to produce energy-rich ATP and NADPH.
E) to produce NADPH used in respiration.
- 14) How many molecules of CO₂ are fixed to form one molecule of glucose? _____
A) 3 B) 2 C) 9 D) 12 E) 6

- 15) The term "cycle" is used to describe the light-independent reactions (Calvin-Benson cycle) because 15) _____
A) CO₂ is fixed.
B) the process depends on products from the light-dependent reactions.
C) the process begins and ends with RuBP.
D) the same reactions occur every time.
E) glucose is synthesized during the process.
- 16) What is the correct order for the reactions of the Calvin-Benson cycle? 16) _____
A) synthesis of G3P, carbon fixation, regeneration of RuBP
B) carbon fixation, synthesis of G3P, regeneration of RuBP
C) carbon fixation, regeneration of RuBP, synthesis of G3P
D) synthesis of G3P, regeneration of RuBP, carbon fixation
E) regeneration of RuBP, carbon fixation, synthesis of G3P
- 17) All of the following are part of the Calvin-Benson cycle EXCEPT 17) _____
A) generation of ATP.
B) regeneration of RuBP.
C) synthesis of G3P.
D) carbon fixation.
E) All of the above are part of the cycle.
- 18) Suppose the stomata of a typical C₃ plant close in the middle of the day. What will occur? 18) _____
A) Carbon dioxide release will increase.
B) The rate of photosynthesis will decrease.
C) The rate of photosynthesis will increase because water is being conserved.
D) There will be no effect on photosynthesis.
E) Oxygen will be rapidly consumed.
- 19) Which of the following provides O₂ as an end product? 19) _____
A) cellular respiration
B) light-dependent reaction
C) light-independent reaction
D) glycolysis
E) phosphorylation
- 20) In the C₃ cycle, where does the carbon come from to form glucose? 20) _____
A) from atmospheric CO₂
B) from water
C) from chlorophyll
D) from enzymes
E) from ATP and NADPH
- 21) Glucose is made during which of the following reactions? 21) _____
A) light-dependent reactions only
B) light-independent reactions only
C) both light dependent and independent reactions
D) neither the light or dark reactions

- 22) ATP is required during which of the following reactions? 22) _____
A) during the light-dependent reactions only
B) during the light-independent reactions only
C) during both light dependent and independent reactions
D) ATP is not required during either the light dependent or independent reactions.
- 23) NADPH is synthesized during which of the following reactions? 23) _____
A) during the light-independent reactions only
B) during the light-dependent reactions only
C) during both light dependent and independent reactions
D) NADPH is not utilized during either the light dependent or independent reactions.
- 24) What kind of habitat does a C₄ pathway plant favor? 24) _____
A) cool and dry
B) wet and cloudy
C) cool and moist
D) hot and dry
E) totally aquatic
- 25) Where does the C₄ cycle get its name? 25) _____
A) Four CO₂ molecules are released.
B) PEP is a four-carbon molecule.
C) The first product in the cycle has four carbons.
D) Only four carbons are used in the cycle.
E) It is a four-step process.
- 26) When water supplies are plentiful for the plant 26) _____
A) the stomata remain open.
B) CO₂ uptake will increase.
C) O₂ uptake will increase.
D) the stomata will close.
E) Both A and B are correct.
- 27) C₃ plants are adapted to _____ conditions, while C₄ plants are adapted to _____ 27) _____
environmental conditions.
A) high light; low light
B) drought; rainy
C) wet; dry
D) dry; wet
E) temperate; cool and rainy
- 28) You are carrying out an experiment on several aquatic plants in your fish tank. You decide to 28) _____
expose 2 of the plants to green light and 2 of the plants to blue light. You want to determine which
type of light is best for the light dependent reactions so you decide to measure the amount of
oxygen bubbles produced to reach your conclusions. Which of the following results would be
expected?
A) There would be the same number of bubbles from plants in either blue or green light.
B) There would be more bubbles from the plants in green light compared to blue light.
C) There would be more bubbles from the plants in blue light compared to green light.
D) There would be no bubbles produced in either situation.

29) You are conducting an experiment to track what happens to the carbons from CO₂ molecules used in the light independent reactions of photosynthesis. You add a radioactive tag to the carbons of the CO₂ reactants and then collect the products following the reactions. Which products would then be radioactive? 29) _____

- A) water
- B) ATP
- C) glucose
- D) both B and C
- E) both A and B

30) Imagine you are conducting a photosynthesis experiment on a plant in the lab. You block any sunlight (or artificial light) from reaching the plant. Your teacher tells you that this will affect even the light independent reactions. Your classmate leans over to you and asks "If those reactions are not light dependent, how will they be affected?" What answer should you give him? 30) _____

- A) The light independent reactions require light so that water can be made. Without that water production, the plant dies.
- B) The light independent reactions won't be affected at all. The teacher must be confused.
- C) The light independent reactions will be affected because light must hit the stroma as a reactant in generating glucose.
- D) The light dependent reactions are needed to generate the energy required to make glucose.

TRUE/FALSE. Write 'T' if the statement is true and 'F' if the statement is false.

31) The grana are disk-shaped, interconnected membranous sacs embedded in the stroma that form thylakoids when stacked on one another. True or False? 31) _____

32) The photosystems are involved in the light-dependent reactions of photosynthesis. True or False? 32) _____

33) Carbon dioxide is required in the light-dependent reaction. True or False? 33) _____

34) The carotenoids and other accessory pigments in the chloroplast help harvest light energy toward the reaction center chlorophyll molecules. True or False? 34) _____

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

35) Give the chemical equation for photosynthesis. For each reactant, indicate where the plant acquires it. For each product, note during what part of photosynthesis it is produced. 35) _____

36) How are the light-dependent and light-independent reactions related to one another? 36) _____

37) Why does photorespiration reduce photosynthesis efficiency? 37) _____