AP BIOLOGY CELLULAR ENERGETICS ACTIVITY #4 NAME_____

DATE____HOUR____

Photosynthesis

SUMMARY EQUATION

SITE OF PHOTOSYNTHESIS -- PLANTS



SITE OF PHOTOSYNTHESIS – PROKARYOTES

STRUCTURE OF CHLOROPLASTS

OVERVIEW OF PHOTOSYNTHESIS







LIGHT REACTIONS – CYCLIC ELECTRON FLOW



LIGHT REACTIONS – NONCYCLIC ELECTRON FLOW



CALVIN CYCLE



QUESTIONS

1. Define the following terms.

Term	Definition
Autotrophic Nutrition	
Heterotrophic Nutrition	

2. Complete the following chart comparing the two types of autotrophs.

Type of Autotroph	Energy Source	Example

- 3. Where does photosynthesis occur within plants?
- 4. Water and carbon dioxide are both required for photosynthesis.
 - a. How does the water get to the site of photosynthesis?
 - b. How does the carbon dioxide get to the site of photosynthesis?

- 5. Write the summary equation for photosynthesis.
- 6. In one form of the summary equation, water is written on both sides of the equation.
 - a. Why?_____
 - b. During what stage of photosynthesis is water produced?
 - c. During what stage of photosynthesis is water consumed?
- 7. The simplest form of the summary equation for photosynthesis is:

$$CO_2 + H_2O \rightarrow CH_2O + O_2$$

What is the advantage of writing the equation in this form?

8. What is the source of the O₂ produced in photosynthesis?

- 9. Photosynthesis is described as an endergonic redox process.
 - a. Why endergonic?_____
 - b. What substance is oxidized?_____
 - c. To what is it oxidized?_____
 - d. What substance is reduced?_____
 - e. To what is it reduced?_____
- 10. What are the two stages of photosynthesis and briefly describe what happens during each stage?

Stage	Events

11. What is the difference between an absorption spectrum and an action spectrum?

Absorption Spectrum	Action Spectrum

12. Describe the significance of the graph at the right.



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- 13. What pigments are involved (directly and indirectly) in photosynthesis?
- 14. In general, describe the structure of a photosystem.

Where, within the chloroplast, are the photosystems located?

15. Compare and contrast the two photosystems in photosynthesis.

Photosystem I	Photosystem II

- 18. Match the structure or description with the correct letter on the diagram below.
 - Granum

 Thylakoids

 Stroma

 Outer membrane

 Inner membrane

 Intermembrane space

 Location of photosystems

 Site of Calvin Cycle



19. The chemiosmotic synthesis of ATP occurs in both the mitochondria and chloroplasts. Complete the following chart providing the location of each component involved in the synthesis of ATP

Component	Location in Mitochondria	Location in Chloroplasts
High [H+]		
Low [H+]		
Electron Transport Chain		
ATP Synthase Complex		
ATP production		

- 20. The synthesis of ATP in both the mitochondria and chloroplasts requires the input of energy. What is the source of the energy for ATP production in the:
 - a. Mitochondria?
 - b. Chloroplasts?

21. What are the reactants and products of the light reactions of photosynthesis?

Reactants	Products

22. Complete the following diagram by correctly identifying the molecules. Write in the name of the molecule in the blank provided.



- 23. What process is occurring in the diagram shown in question 24?
- 24. What is the role of rubisco in the Calvin cycle?
- 25. For each glyceraldehyde phosphate molecule that exits the Calvin cycle:

_____ molecules of CO₂ enter the cycle

_____ molecules of ATP are used

- _____ molecules of NADPH are used
- turns of the Calvin cycle are required
- 26. For each glucose molecule produced by photosynthesis:
 - _____ molecules of CO₂ are used
 - _____ molecules of ATP are used
 - _____ molecules of NADPH are used
 - _____turns of the Calvin cycle are required
- 27. Where does the Calvin cycle occur within the chloroplasts?
- 28. What are the reactants and products of the Calvin cycle?

Reactants	Products