**AP BIO PHOTOSYNTHESIS TEST**

1. Photosynthesis is a redox process in which
2. CO2 is reduced and water is oxidized.
3. NADP+ is reduced and RuBP is oxidized.
4. CO2, NADP+ and water are reduced.
5. O2 acts as an oxidizing agent and water acts as a reducing agent.
6. G3P is reduced and the electron transport chain is oxidized.
7. Blue light has more energy than red light. Therefore, blue light
8. has a longer wavelength than red light.
9. has a shorter wavelength than red light.
10. contains more photons than red light.
11. has a broader electromagnetic spectrum than red light.
12. is absorbed faster by chlorophyll a.
13. A spectrophotometer can be used to measure
14. the absorption spectrum of a substance.
15. the action spectrum of a substance.
16. the amount of energy in a photon.
17. the wavelength of visible light.
18. the efficiency of photosynthesis.
19. The chlorophyll known as P680 is reduced by electrons from
20. photosystem I.
21. photosystem II.
22. water.
23. NADPH.
24. accessory pigments.
25. Chloroplasts can make carbohydrates in the dark if provided with
26. ATP, NADPH and CO2
27. an artificially induced proton gradient.
28. organic acids or four-carbon compounds.
29. a source of hydrogen.
30. photons and CO2.
31. In the chemiosmotic synthesis of ATP, H+ diffuses through the ATP synthase
32. from the stroma into the thylakoid compartment.
33. from the thylakoid compartmnt into the stroma.
34. from the cytoplasm into the matrix.
35. from the cytoplasm into the stroma.
36. from the intermembrane space into the stroma.
37. For every CO2 molecule fixed by photosynthesis, how many molecules of O2 are released?
38. 1
39. 2
40. 3
41. 6
42. 12
43. How many turns of the Calvin cycle are required to produce one molecule of glucose?
44. 1
45. 2
46. 3
47. 6
48. 12
49. The stage of photosynthesis that actually produces sugar is
50. the Calvin cycle
51. photosystem I
52. photosystem II
53. the light reactions
54. the splitting of water
55. Which of the following statements is a correct distinction between autotrophs and heterotrophs?
56. Only heterotrophs require chemical compounds from the environment.
57. Cellular respiration is unique to heterotrophs.
58. Only heterotrophs have mitochondria.
59. Autotrophs, but not heterotrophs, nourish themselves beginning with nutrients that are entirely inorganic.
60. Only heterotrophs require oxygen.
61. Which of the following is **NOT** true of rubisco?
62. It is a protein.
63. It speeds up a chemical reaction.
64. It lowers the energy of activation.
65. It catalyzes a phosphorylation reaction.
66. It has an affinity for both O2 and CO2.
67. Plants that fix CO2 into organic acids at night when the stomata are open and carry out the Calvin cycle during the day when the stomata are closed are called
68. C3 plants
69. C4 plants
70. CAM plants
71. Only a and b are correct
72. a, b, and c are correct
73. Photorespiration lowers the efficiency of photosynthesis by removing which of the following from the Calvin cycle?
74. carbon dioxide molecules
75. glyceraldehyde phosphate molecules
76. ATP molecules
77. ribulose biphosphate molecules
78. RuBP carboxylase molecules
79. Assume a thylakoid membrane is somehow punctured so that the interior of the thylakoid is no longer separated from the stroma. This damage will have the most direct effect on which of the following processes?
80. the splitting of water
81. the absorption of light energy by chlorophyll
82. the flow of electrons from photosystem II to photosystem I
83. the synthesis of ATP
84. the reduction of NADP+
85. Which of the following statements about the light reactions of photosynthesis is **FALSE**?
86. The splitting of water molecules provides a source of electrons.
87. Chlorophyll (and other pigments) absorb light energy which excites electrons.
88. an electron transport chain is used to create a proton gradient.
89. The proton gradient is used to reduce NADP.
90. Some electrons are recycled and some are not.
91. Which of the following are products of the Calvin cycle and are utilized in the light reactions of photosynthesis?
92. CO2and glucose
93. H2O and O2
94. ADP, Pi, and NADP+
95. electrons and H+
96. Both b and c are correct
97. The primary function of the light reactions of photosynthesis is
98. to produce energy-rich glucose from carbon dioxide and water
99. to produce energy-rich ATP and NADPH
100. to produce NADPH used in respiration
101. to convert light energy to the chemical energy of PGAL
102. to use ATP to make glucose
103. The reactions of the Calvin cycle require all of the following molecules **EXCEPT**
104. CO2
105. ATP
106. RuBP
107. glucose
108. NADPH
109. All of the following statements are true **EXCEPT**
110. Thylakoid membranes contain the photosynthetic pigments.
111. The O2 released during photosynthesis comes from water.
112. Glyceraldehyde phosphate (G3P) is produced only in the light reactions of photosynthesis.
113. The light reactions of photosynthesis provide the energy for the Calvin cycle.
114. When chlorophyll is reduced, it gains electrons.
115. You have just discovered a new flower species that has a unique photosynthetic pigment. The leaves of this plant appear to be reddish yellow. What wavelengths of visible light are not being absorbed by this pigment?
116. red and yellow
117. blue and violet
118. green and yellow
119. blue, green and red
120. green, blue and violet
121. All of the events listed below occur in the energy-capturing light reactions of photosynthesis **EXCEPT**:
122. Oxygen is produced.
123. NADP+ is reduced to NADPH.
124. Carbon dioxide is incorporated into PGA.
125. ADP is phosphorylated to yield ATP.
126. Light is absorbed.
127. The chemiosmotic process in chloroplasts involves the
128. establishment of a proton gradient.
129. diffusion of electrons through the thylakoid membrane.
130. oxidation of water to produce ATP energy.
131. movement of water by osmosis into the thylakoid space from the stroma.
132. reduction of carbon dioxide to glucose by NADPH and ATP.
133. Which of the following enzymes is probably the most abundant protein in the world?
134. PEP carboxylase
135. hexokinase
136. rubisco
137. aldolase
138. pyruvate kinase
139. In C4 photosynthesis, carbon fixation takes place in the cells, and then is transferred as malic or aspartic acid to cells where carbon dioxide is released for entry into the Calvin cycle.
140. mesophyll; bundle sheath
141. stomatal; mesophyll
142. bundle sheath; epidermal
143. epidermal; mesophyll
144. stomatal; epidermal
145. Which of the following events in the functioning of photosystem II is **FALSE**?
146. Light energy excites electrons in an antenna pigment in a photosynthetic unit.
147. The excitation is passed along to a molecule of P680 chlorophyll in the photosynthetic unit.
148. The P680 chlorophyll donates a pair of protons to NADPH, which is thus converted to NADP+.
149. The electron vacancies in P680 are filled by electrons derived from water.
150. The splitting of water yields molecular oxygen as a by-product.
151. All of t he following compounds are required (i.e., are necessary constituents for chemical reactions) at some stage of green plant photosynthesis **EXCEPT**
152. adenosine triphosphate
153. NADP
154. water
155. oxygen
156. carbon dioxide
157. When a chlorophyll molecule in photosystem I traps light, it loses an electron. In noncyclic electron flow, this electron is replaced
158. from one of the antenna pigments
159. from the other end of photosystem I
160. by a donation from photosystem II
161. by a donation from an unexcited chlorophyll molecule
162. from one of the hydrogen atoms in NADP
163. Where does the Calvin cycle of photosynthesis take place?
164. stroma of the chloroplast
165. thylakoid membrane
166. cytoplasm surrounding the chloroplast
167. chlorophyll molecule
168. outer membrane of the chloroplast
169. CAM plants can keep stomata closed in daytime, thus reducing loss of water. They can do this because they can
170. fix CO2 into organic acids during the night.
171. fix CO2into sugars in the bundle-sheath cells.
172. fix CO2into pyruvic acid in the mesophyll cells.
173. use the enzyme phosphofructokinase, which out competes rubisco for CO2.
174. use photosystems I and II at night.
175. All of the following statements are correct regarding the Calvin cycle of photosynthesis **EXCEPT**:
176. The energy source utilized is the ATP and NADPH obtained through the light reactions.
177. These reactions begin soon after sundown and end before sunrise.
178. The 5-carbon sugar RuBP is constantly being regenerated.
179. One of the end products is glyceraldehyde phosphate (G3P).
180. The pathway used is the Calvin cycle.
181. Cyclic electron flow in the chloroplast produces
182. ATP
183. NADPH
184. glucose
185. only a and b are correct
186. a, b and c are correct
187. In plant cells, ATP is made in response to light. An electron transport chain is involved. This electron transport chain is found in the
188. thylakoid membranes of chloroplasts.
189. stroma of chloroplasts.
190. inner membrane of mitochondria.
191. matrix of mitochondria.
192. cytoplasm.
193. The process of noncyclic photophosphorylation uses light energy to synthesize
194. ADP and ATP
195. ATP and P700
196. ATP and NADPH
197. ADP and NADP
198. P700 and P680
199. In plant cells, where is ATP synthesis located
200. thylakoid membrane
201. plasma membrane
202. inner mitochondrial membrane
203. a and c are correct
204. a, b and c are correct
205. What are the basic products of the light reactions that are subsequently used by the Calvin cycle?
206. oxygen and carbon dioxide
207. carbon dioxide and RuBP
208. water and carbon
209. electrons and photos
210. ATP and NADPH
211. In the thylakoid membranes, what is the main role of the antenna pigment molecules?
212. to split water and release oxygen to the reaction center chlorophyll
213. to harvest photons and transfer light energy to the reaction center chlorophyll
214. to synthesize ATP from ADP and Pi
215. to pass electrons to ferredoxin and the NADPH
216. to concentrate photons inside the stroma
217. Which of the following is **NOT** directly associated with photosystem II?
218. splitting water
219. release of oxygen
220. harvesting light energy by chlorophyll
221. photophosphorylation
222. P680
223. Which of the following is **NOT** directly associated with photosystem I?
224. harvesting light energy by chlorophyll
225. receiving electrons from plastocyanin (Pc).
226. P700
227. splitting water
228. passing electrons to ferredoxin
229. Accessory pigments within chloroplasts are responsible for
230. driving the splitting of water molecules.
231. absorbing photons of different wavelengths of light and passing that energy to P680 and P700.
232. extending the absorption spectrum of chlorophyll a so that it can absorb more light.
233. passing electrons across the thylakoid membrane to the reaction-center molecules.
234. anchoring chlorophyll a within the reaction center.
235. On which of the following features do most plant and animal cells differ?
236. active transport mechanisms
237. mitochondrial function
238. primary energy source
239. transcription
240. structure of nucleus

For Questions 41 - 50, compare the light reactions with the Calvin cycle of photosynthesis in plants. Use the

following key:

a. light reactions

b. the Calvin cycle alone

c. both the light reactions and the Calvin cycle

d. neither the light reactions nor the Calvin cycle

e. occurs in the chloroplast but is not part of photosynthesis

41. Produces molecular oxygen (O2).

42. Forms a proton gradient.

43. Requires ATP.

44. Requires ADP.

45. Produces NADH.

46. Produces NADPH.

47. Produces triose sugars.

48. Is inactive in the dark.

49. Requires CO2.

50. Requires glucose.

**AP BIO PHOTOSYNTHESIS TEST**

Time - 25 minutes

Answer all parts of question. Number your answer as the question is numbered.

Answers must be in essay for. Outline form is NOT acceptable. Labeled diagrams may be used to supplement discussion, but in no case will a diagram alone suffice. It is important that you read each question completely before you begin to write.

1. Membranes are important structural features of cells.

(a) Describe how membrane structure is related to the transport of materials across a membrane.

(b) Describe the role of membranes in the synthesis of ATP in either respiration or photosynthesis.