



BIOLOGY 2020

Unit 3

Key Topic Test 5 – Photosynthesis

Recommended writing time*: 45 minutes

Total number of marks available: 45 marks

SOLUTIONS

SECTION A: Multiple-choice questions (1 mark each)

Question 1

Answer: D

Explanation:

Photosynthesis converts light energy into chemical energy in the form of glucose.

Question 2

Answer: C

Explanation:

Photosynthesis is a multistage process occurring in the thylakoid and stroma in the chloroplast therefore chloroplast is the best answer.

Question 3

Answer: A

Explanation:

Stacks of grana (singular) are called granum.

Question 4

Answer: D

Explanation:

Ribosomes are the site of protein synthesis where enzymes are made for the many enzyme-based reactions in the stroma

Question 5

Answer: B

Explanation:

Multiple layers increase the surface area available for the capture of light in chlorophyll.

Question 6

Answer: A

Explanation:

Binary fission is the reproductive strategy found in prokaryotes, so the presence of binary fission in chloroplasts suggests bacterial origins

Question 7

Answer: C

Explanation:

As both chloroplasts and mitochondria are thought to have arisen from prokaryotes, this information suggests that chloroplasts joined eukaryotic cells after mitochondria.

Question 8

Answer: D

Explanation:

Water is the input into the light dependent stage.

Question 9

Answer: C

Explanation:

Coenzymes carry protons, electrons and energy to the light independent stage.

Question 10

Answer: C

Explanation:

As carbon dioxide is required for light independent reactions, once it is used by the plant the rate of light independent reactions will increase

Question 11

Answer: C

Explanation:

The Calvin cycle occurs in the light independent stage where carbon dioxide and hydrogen are converted into glucose

Question 12

Answer: D

Explanation:

Limiting factors impact on the rate of reactions that occur. As photosynthetic reactions are enzyme based, they act as a limiting factor as they affect reactions

Question 13

Answer: A

Explanation:

To increase the rate of photosynthesis, the limiting factors would have to change. Both temperature and carbon dioxide levels would increase to enable the rate to increase

Question 14

Answer: A

Explanation:

Amount of sunlight would be a limiting factor as the rainforest floor is shaded by the larger trees

Question 15

Answer: A

Explanation:

Both increasing temperature and increasing carbon dioxide would increase photosynthetic rates.

SECTION B: Short-answer questions**Question 1****a.**

Structure	Name	Function associated with photosynthesis
A	Thylakoid or grana	Site of light dependent reaction (chlorophyll – light capture)
B	Ribosome	Protein synthesis to produce enzymes for Calvin cycle
C	Stroma	Site of light independent reaction (Calvin cycle)
D	Granum	Stack of thylakoid membranes to increase light capture
E	DNA	Instructions for protein synthesis

10 marks

b. Circular DNA (1) as found in prokaryotic cells (1) small ribosomes (1) similar size to prokaryotes (1)

4 marks

c. Enzymes (1) RuBisCo (1)

2 marks

d. Circular DNA like bacteria (1), chloroplasts undergo binary fission like bacteria (1), chloroplasts have ribosomes that are similar in structure to bacteria (1)

3 marks

Question 2**a.**

Label	Name
A	Light
B	Water
C (Process)	Water splitting
D	Oxygen
E(Structure)	Thylakoid or grana
F	ATP
G	NADPH
H	ADP + Pi
I	NADP
J	Carbon dioxide
K (Process)	Calvin cycle
L(structure)	Stroma
M	Glucose

13 marks

Question 3

a. At the light saturation point an increase in light does not cause an increase in the rate of photosynthesis (1) Other limiting factors like carbon dioxide levels may cause the rate to plateau (1)

2 marks

b. The compensation point is where the rate of production of carbon dioxide by respiration equals the rate of use of carbon dioxide by photosynthesis

1 mark

Total 45 marks