BIOLOGY 2017

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: A

Explanation:

Photosynthesis is the process by which plants capture light energy and use it to produce their own organic compounds.

Question 2

Answer: D

Explanation:

The site of photosynthesis is the chloroplast.

Question 3

Answer: B

Explanation:

The light-dependent stage of photosynthesis occurs in the thylakoid membrane.

Question 4

Answer: C

Explanation:

The light-independent stage occurs in the stroma.

Question 5

Answer: B

Explanation:

In periods of high light intensity the rate of photosynthesis will increase until another factor such as temperature becomes limiting.

Question 6

Answer: D

Explanation:

Chloroplasts are one of many types of organelles in the plant cell. They are considered to have originated from cyanobacteria through endosymbiosis—when a eukaryotic cell engulfed a photosynthesizing cyanobacterium that became a permanent resident in the cell.

Question 7

Answer: C

Explanation:

Chlorophyll is a green pigment and absorbs wavelengths mostly from the red light part of the spectrum.

Question 8

Answer: C

Explanation:

ATP produced during the light-dependent phase of photosynthesis is used to provide energy for the reactions in the light-independent stage.

Question 9

Answer: D

Explanation:

Glucose is a major product of photosynthesis. Plants are autotrophs who synthesise their own organic compounds.

Question 10

Answer: B

Explanation:

During the light-dependent stage, water is split to produce O_2 and H^+. The oxygen is released as a by-product during this stage.

SECTION B: Short-answer questions

Question 1

a. The cells of the plant are carrying out photosynthesis and releasing oxygen (1 mark) via the process of the light dependant stage of photosynthesis (1 mark)

2 marks

b. The time taken for the indicator to change from yellow to green decreased

1 mark

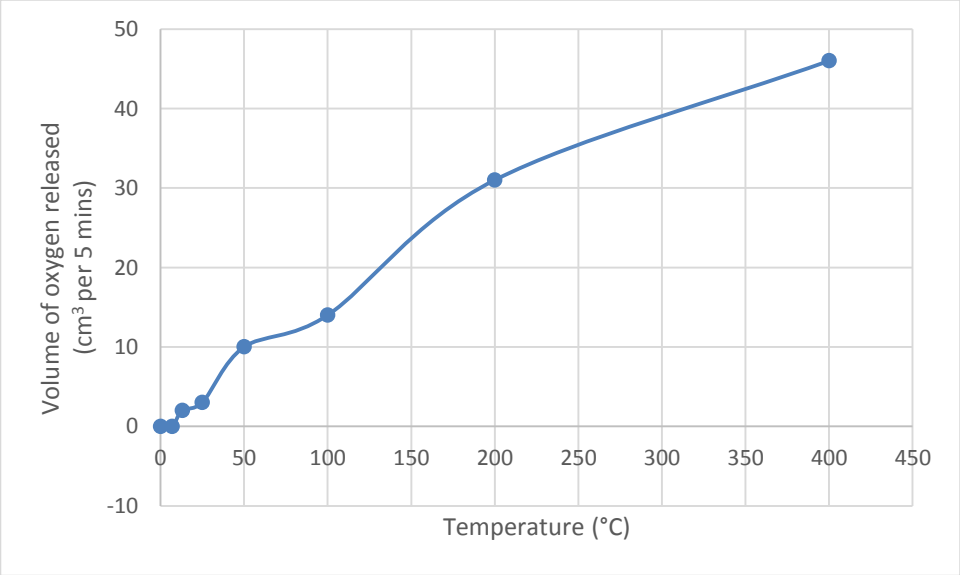
c. The rate of photosynthesis was the highest at a hydrogen carbonate concentration of 2% (1 mark). This is supported by the fact that the time taken for the indicator to change from yellow to green was the fastest at this concentration (1 mark). This indicates that oxygen was being released at the fastest rate at this concentration (1 mark)

3 marks

d. This is because there must be another factor that is limiting the rate of photosynthesis (1 mark) such as the light intensity (1 mark)

2 marks

e.



1 mark for each of the following:

Axes correctly labelled
Units correct
Data plotted correctly

3 marks

f. As the temperature increases so does the volume of oxygen released.

1 mark

g. Light intensity

1 mark

Total 13 marks

Question 2

a. carbon dioxide + water → oxygen + glucose

1 mark

b.

i. They are considered to have originated from cyanobacteria through endosymbiosis—when a eukaryotic cell engulfed a photosynthesizing cyanobacterium that became a permanent resident in the cell.

ii. Chlorophyll

iii.

Name of structure	**Stage of photosynthesis**	**Inputs**	**Outputs**
B: Stroma	Light-independent	CO_2 ATP NADPH	glucose water
E: Thylakoid	Light-dependent	Water ADP NADP	oxygen ATP NADPH

1 mark for each correct box correctly completed

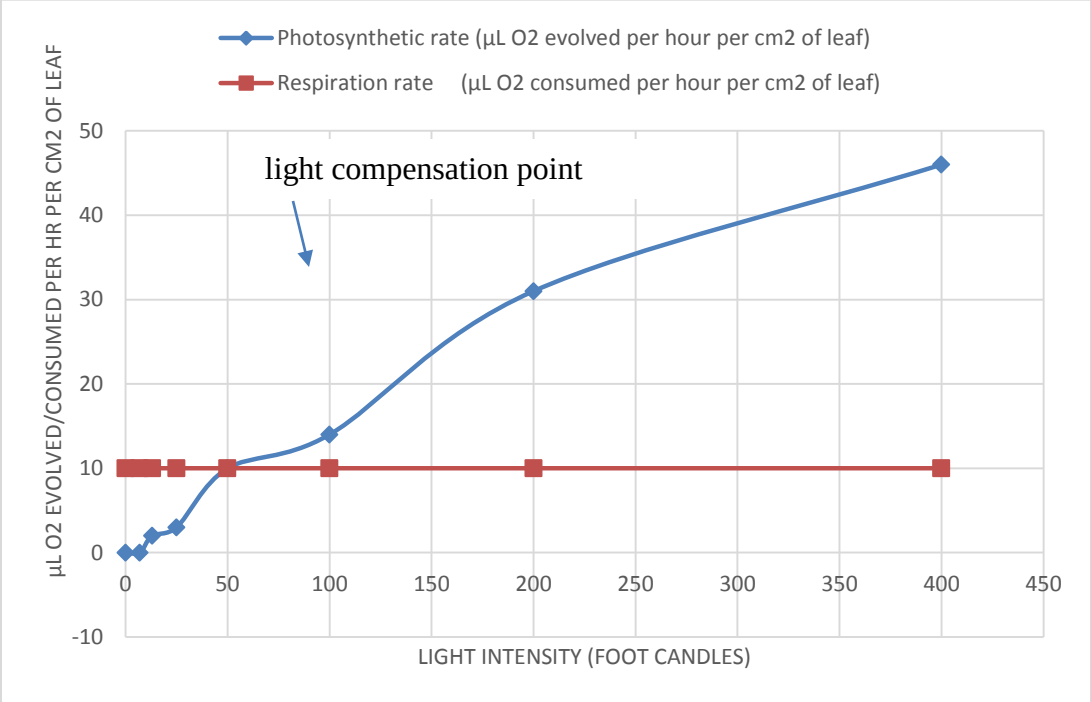
iv. Chloroplasts can synthesise their own enzymes for photosynthesis and therefore have ribosomes (1 mark) this provides and advantage to the overall functioning of the cell as it conserves energy, enzymes are synthesized where they are required (1 mark)

2 + 1 + 8 + 2 = 13 marks

Total 14 marks

Question 3

a.



1 mark for each of the following:

Axes correctly labelled
Units correct AND legend included
Data plotted correctly

3 marks

b. A higher light intensity means that more chlorophyll molecules can be excited and provide the energy required for photosynthesis (1 mark) this results in a higher rate of photosynthesis (1 mark)

2 marks

c.

i. See above

ii. At a light intensity of 50 foot candles the O_2 evolved is the same as the O_2 consumed. What does this mean in terms of the rate of photosynthesis and respiration? Label this point on the graph above in **a.**
This means that the rate of photosynthesis and the rate of respiration are equal (1 mark). See above for 2nd mark.

1 + 2 = 3 marks
Total 8 marks