

Student Name: _____



BIOLOGY 2017

Unit 3

Key Topic Test 5 – Photosynthesis

Recommended writing time*: 45 minutes

Total number of marks available: 45 marks

QUESTION BOOK

* The recommended writing time is a guide to the time students should take to complete this test. Teachers may wish to alter this time and can do so at their own discretion.

Conditions and restrictions

- Students are permitted to bring into the room for this test: pens, pencils, highlighters, erasers, sharpeners and rulers.
- Students are NOT permitted to bring into the room for this test: blank sheets of paper and/or white out

Materials supplied

- Question book of 12 pages.

Instructions

- Print your name in the space provided on the top of the front page.
- All written responses must be in English.

Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic communication devices into the room for this test.

SECTION A – Multiple-choice questions

Instructions for Section A

Answer **all** questions.

Choose the response that is **correct** for the question.

A correct answer scores 1, an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

Question 1

Photosynthesis is the process

- A. by which plants capture light energy and use it to produce their own organic compounds.
- B. by which bacteria capture glucose and use it to produce energy.
- C. by which animals produce energy.
- D. that only occurs in prokaryotic organisms.

Question 2

Photosynthesis occurs in

- A. mitochondria.
- B. ribosomes.
- C. The golgi apparatus.
- D. chloroplasts.

Question 3

The light-dependent stage of photosynthesis occurs in the

- A. cristae.
- B. thylakoid membrane.
- C. stroma.
- D. chlorophyll.

Question 4

The light-independent stage occurs in the

- A. cristae.
- B. thylakoid membranes.
- C. stroma.
- D. chlorophyll.

Question 5

In periods of high light intensity the rate of photosynthesis will

- A. increase indefinitely.
- B. increase until another factor such as carbon dioxide becomes limiting.
- C. decrease indefinitely.
- D. decrease until another factor such as carbon dioxide becomes limiting..

Question 6

Chloroplasts are thought to have arisen from

- A. animal cells.
- B. plant cells.
- C. fungal cells.
- D. cyanobacteria.

Question 7

Green plants have an abundance of chlorophyll and absorb light energy mainly from the wavelengths of

- A. green light.
- B. violet light.
- C. red light.
- D. yellow light.

Question 8

ATP is produced during the light-dependent stage. What is this ATP used for?

- A. it is a waste product and is not used for anything.
- B. to split water.
- C. to provide the energy required for the light-independent stage.
- D. to absorb the light energy required for photosynthesis.

Question 9

A major product of photosynthesis is

- A. carbon dioxide.
- B. ATP.
- C. NADPH.
- D. glucose.

Question 10

At what stage of photosynthesis is oxygen released as a by-product?

- A. The light-independent stage.
- B. The light-dependent stage.
- C. During the Calvin cycle.
- D. During the Krebs cycle.

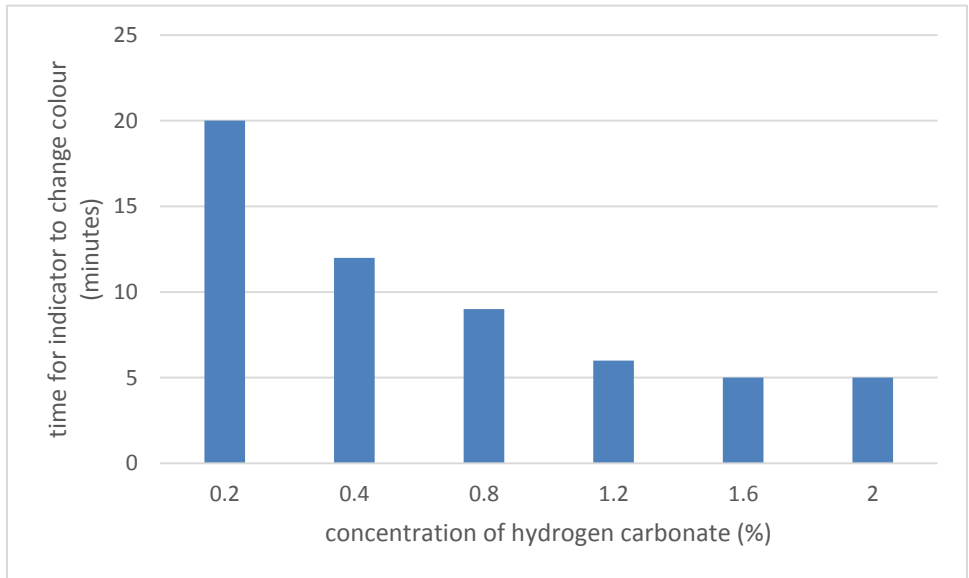
SECTION B - Short-answer questions

Instructions for Section B
Answer **all** questions in the spaces provided. Write using black or blue pen.

Question 1

An investigation was set up to find out if the concentration of carbon dioxide affected the rate of photosynthesis. A water plant was placed in each of six test tubes containing water and different concentrations of hydrogen carbonate. The hydrogen carbonate releases carbon dioxide into the water. An indicator was added to each test tube. The indicator changes from yellow to green when oxygen is released. Each test tube was illuminated by a lamp placed behind as shown in the diagram below.

The time for the indicator to change from yellow to green was recorded and plotted on the chart below.



- a. Describe what is occurring at the cellular level in the plant that causes the indicator to change from yellow to green.

2 marks

- b. What was the effect of increasing the hydrogen carbonate concentration from 0.2 to 0.4%?

1 mark

- c. At what concentrations of hydrogen carbonate was the rate of photosynthesis highest?
Explain your response.

3 marks

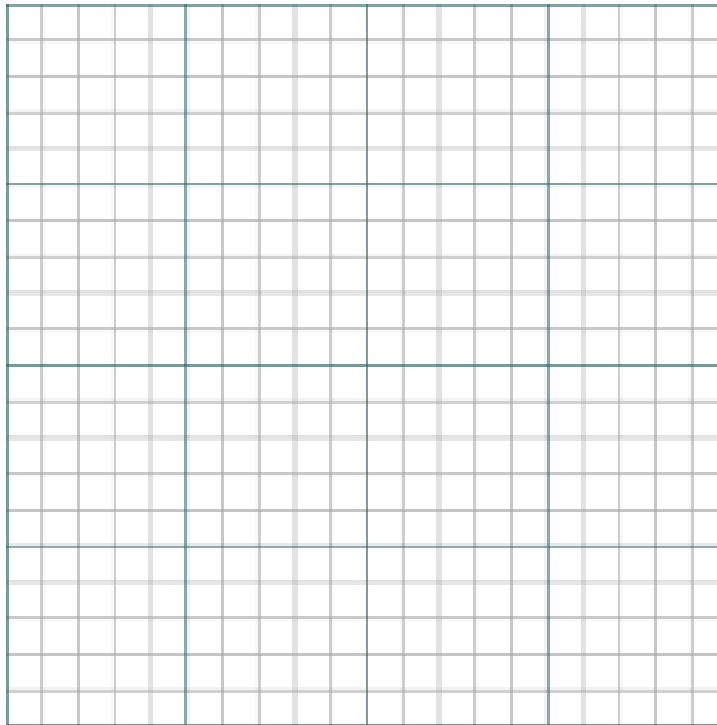
- d. When the concentration of hydrogen carbonate was increased from 1.6 to 2.0% the time taken for the indicator to change was the same. Explain why this is so.

2 marks

- e. Another student investigated the effect of temperature on the rate of photosynthesis in a water plant. The results are shown in the following table.

Temperature (°C)	Volume of oxygen released (cm ³ per 5 minutes)
5	2
15	4
25	7
35	10
45	12

Plot these results on the graph below.



3 marks

f. Describe the effect of temperature on the volume of oxygen produced.

1 mark

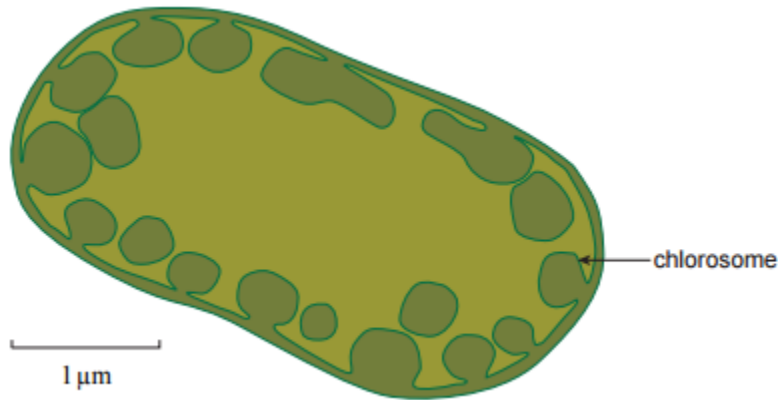
g. Name one other factor which influences the rate of photosynthesis.

1 mark

Total 13 marks

Question 2

The following diagram shows a green sulfur bacterium. Green sulfur bacteria are anaerobic photoautotrophic bacteria. Although they have no chloroplasts they are able to photosynthesise by using infoldings of the cell membrane called ‘chlorosomes’.



a. Write the word equation for the formation of glucose by the green sulfur bacteria.

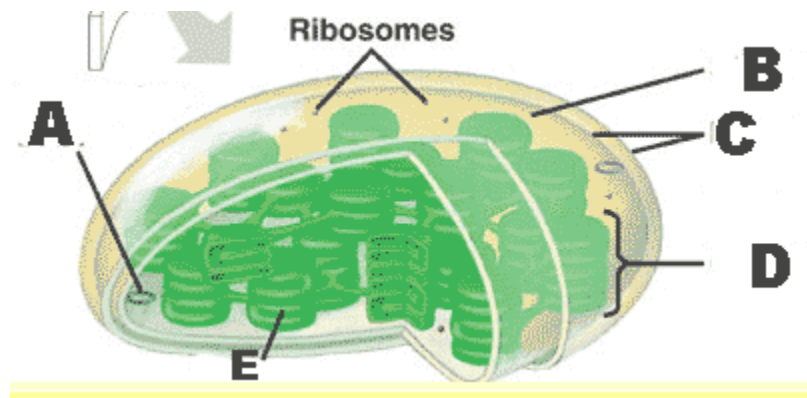
_____ 1 mark

b. Chloroplasts are specialised photosynthetic organelles found in some eukaryotic cells.

i. Describe the process that is thought to have resulted in the presence of chloroplasts in photosynthetic eukaryotic cells.

ii. Name the pigment responsible for capturing light energy during photosynthesis.

iii. The following diagram represents a chloroplast.



Complete the following table.

Name of structure	Stage of photosynthesis	Inputs	Outputs
B:			
E:			

iv. Provide a reason as to why chloroplast might have ribosomes and what advantages this might confer to the overall functioning of the cell.

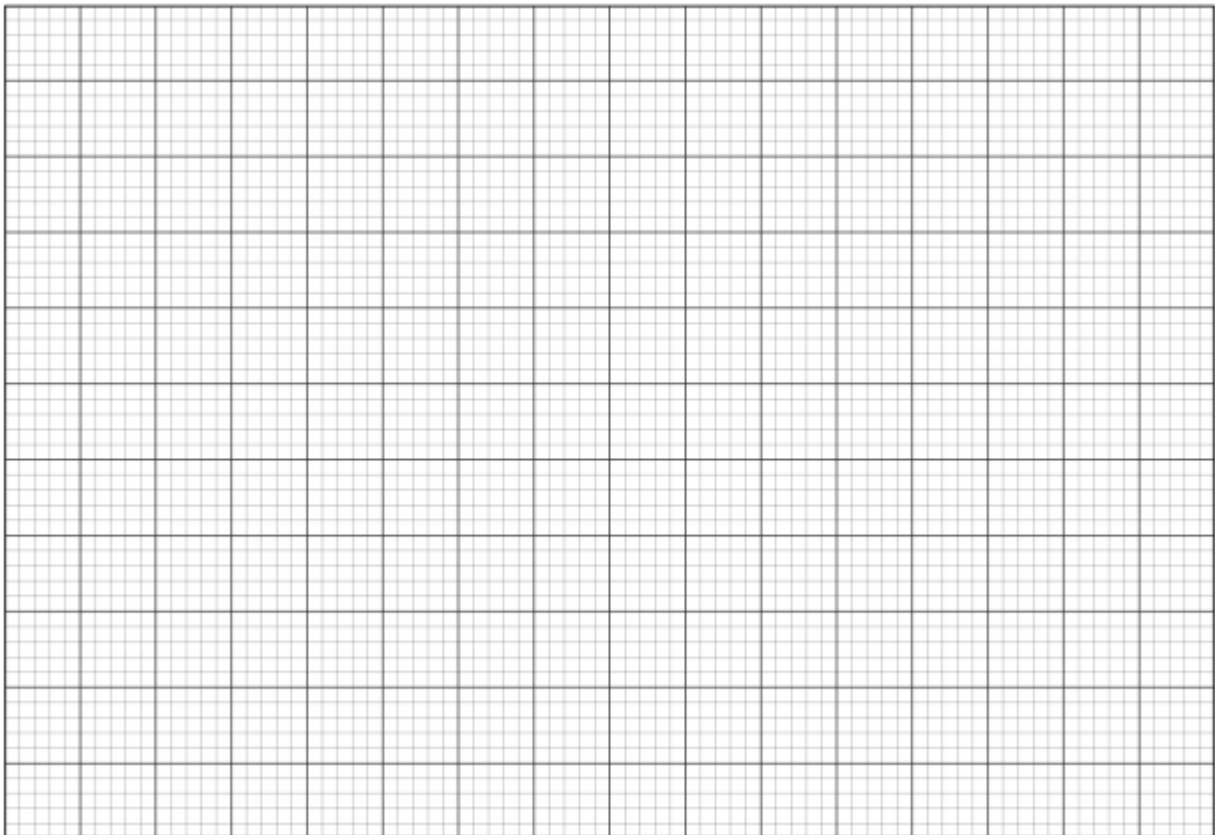
2 + 1 + 8 + 2 = 13 marks
Total 14 marks

Question 3

Florists often sell cut flowers. A cut flower consists of a stem cutting with some leaves and flowers. A biologist conducted an experiment to investigate the effects of light intensity on leaf condition and vase life in cut flowers. The results are shown in the following table.

Light intensity (Foot candles)	Photosynthetic rate ($\mu\text{L O}_2$ evolved per hour per cm^2 of leaf)	Respiration rate ($\mu\text{L O}_2$ consumed per hour per cm^2 of leaf)	Vase life (days)
400	46	10	11+
200	31	10	11+
100	14	10	11
50	10	10	11
25	3	10	9
13	2	10	8
7	No data	No data	8
0	No data	No data	7

- a. Graph the relationship between light intensity and the rate of photosynthesis in the cut flowers.



3 marks

- b.** In the experiment the rate of photosynthesis increased with light intensity. Explain why this is so.

2 marks

- c.** The rate of respiration was also measured in the cut flowers at varying light intensities.
- i.** Plot the rate of respiration versus light intensity on the same graph you produced in **a**.
- ii.** At a light intensity of 50 foot candles the O₂ evolved is the same as the O₂ consumed. What does this mean in terms of the rate of photosynthesis and respiration? Label this point on the graph above in **a**.

1 + 2 = 3 marks
Total 8 marks

END OF KEY TOPIC TEST