

# Unit 3 Biology

## Revision Booklet 2

### Topics

Photosynthesis

&

Respiration

Name: .....

**Question 7**     2011

a. Write the word or chemical equation for aerobic cellular respiration.

1 mark

b. Cyanide inactivates metabolic reactions at the cristae of mitochondria. Cyanide poisoning often results in death. Explain why.

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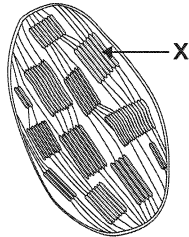
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2 marks

The diagram below shows a chloroplast.



c. Describe the chemical changes that occur at location X when light is present.

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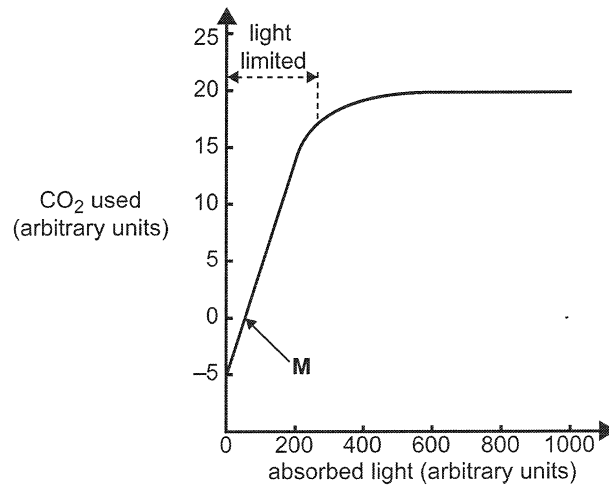
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2 marks

The graph below shows the rate of carbon dioxide exchange between a leaf and its external environment as light intensity is altered. All other variables are kept constant throughout the experiment.



d. i. Outline what is occurring at point M in terms of chemical reactions.

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ii. Explain why the graph line becomes nearly horizontal from about 600 units of absorbed light.

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1 + 1 = 2 marks

RuBisCo is an enzyme found in chloroplasts. Its normal function is to catalyse the reaction in which carbon dioxide is a substrate. In certain plants, when the level of carbon dioxide is low in the leaf, RuBisCo uses oxygen as the substrate and releases hydrogen peroxide and ammonia.

e. Explain why it is beneficial for a plant to have a high level of carbon dioxide in its leaves.

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2 marks

Total 9 marks

**Question 3 (2010)**

*Elysia chlorotica* is a bright green sea slug, with a soft leaf-shaped body. It has a life span of 9 to 10 months. This sea slug is unique among sea slugs as it is able to survive on solar power.

*E. chlorotica* acquires chloroplasts from the algae it eats, and stores them in the cells that line its digestive tract.

Young *E. chlorotica* fed with algae for two weeks can survive for the rest of their lives without eating.

- a. What is the product of photosynthesis that provides the energy that enables *E. chlorotica* to survive for so long without eating?

\_\_\_\_\_

1 mark

The product of photosynthesis must undergo a three-stage process for the slug to access the energy in the product.

- b. Name and give a brief description of each of these stages.

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\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
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3 marks

A watery environment can have a low concentration of dissolved gases.

- c. Explain how having chloroplasts allows *E. chlorotica* to overcome this disadvantage.

\_\_\_\_\_  
\_\_\_\_\_

1 mark

Total 5 marks

**Question 3** 2009

As a result of the light-dependent stage of photosynthesis, charged (energy) carriers are produced.

a. Name one of these charged carriers.

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1 mark

Availability of light is a limiting factor in photosynthesis.

b. Name one other limiting factor.

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1 mark

All algae, cyanobacteria and plants that photosynthesise contain the pigment chlorophyll a. Some also contain additional pigments such as carotene and chlorophyll b.

c. What is the purpose of such additional photosynthetic pigments?

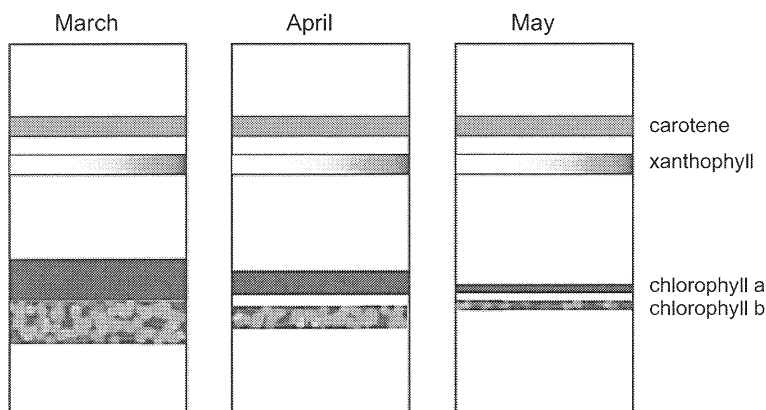
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1 mark

The leaves of a particular species, species X, of a tree in Victoria were investigated at monthly intervals and the following pigments were observed to be present in the months shown. The size of each band is proportional to the amount of pigment present.



Some trees have leaves throughout winter while others shed their leaves.

d. Explain to which of these two groups species X belongs.

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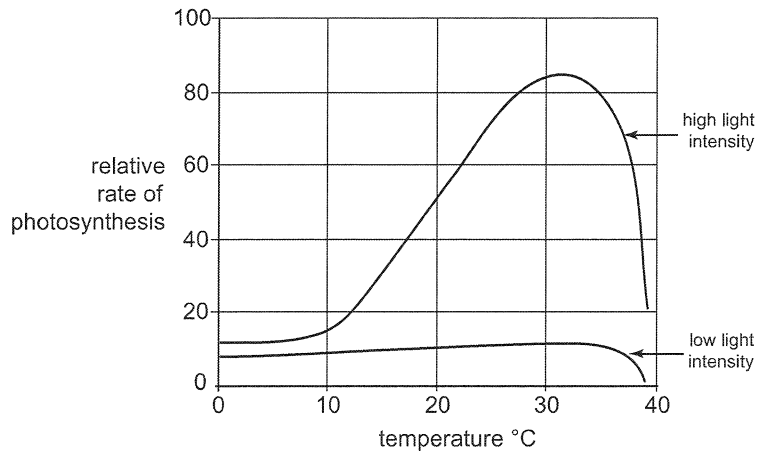
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2 marks

Scientists exposed two groups of identical plants to a range of temperatures. One group was kept in a low light intensity and the other in a high light intensity environment. The following graph summarises the results obtained by the scientists.



- e. Account for the difference in the rate of photosynthesis for the two groups of plants over the range of temperatures shown.

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2 marks

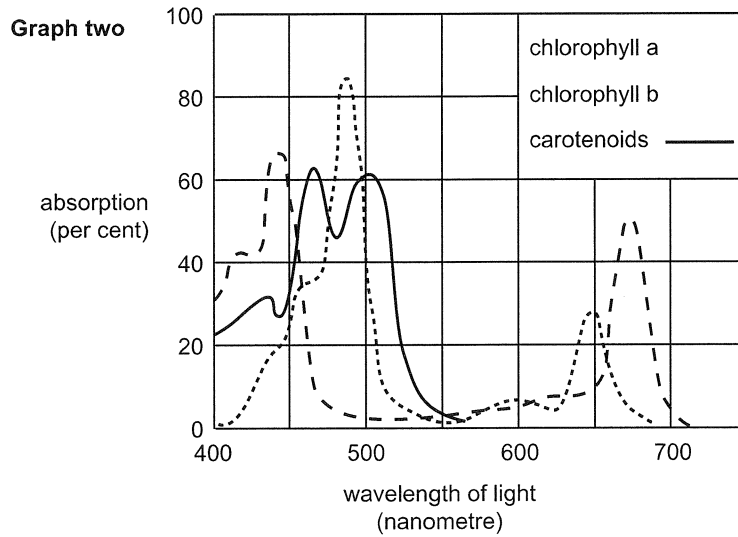
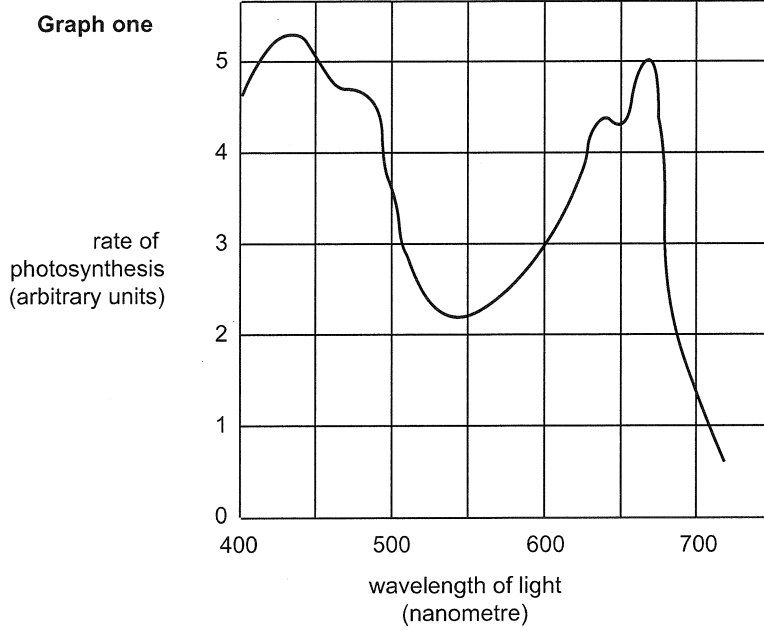
Total 7 marks

**Question 3** 2008

The following diagrams show

**Graph one** The rate of photosynthesis in a green plant at different wavelengths of light

**Graph two** The estimated absorption of the different wavelengths of light by the different plant pigments



- a. Explain why the graph showing the rate of photosynthesis has approximately the same shape as the absorption graphs of the plant pigments.

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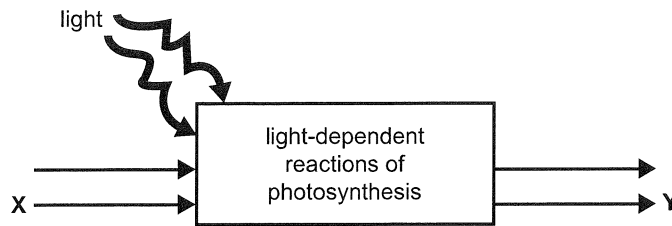
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1 mark

The following diagram shows a simplified representation of the first stage of photosynthesis.



- b. i. Name one input item that X could represent.

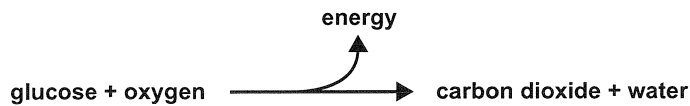
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- ii. Name one output item that Y could represent.

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1 + 1 = 2 marks

The breakdown of glucose in aerobic respiration can be represented by the simplified equation

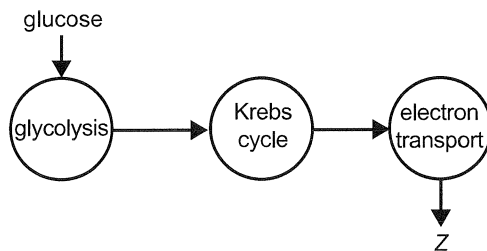


- c. What is the energy yield per molecule of glucose as a result of aerobic respiration?

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1 mark

The breakdown of glucose in aerobic respiration can also be represented as occurring in three particular stages as indicated below.



- d. i. Within a cell, where does the electron transport stage of aerobic respiration occur?

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- ii. Describe what happens during the electron transport stage. In your answer include the name of product Z.

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1 + 2 = 3 marks

Total 7 marks

**SECTION B – continued**  
**TURN OVER**

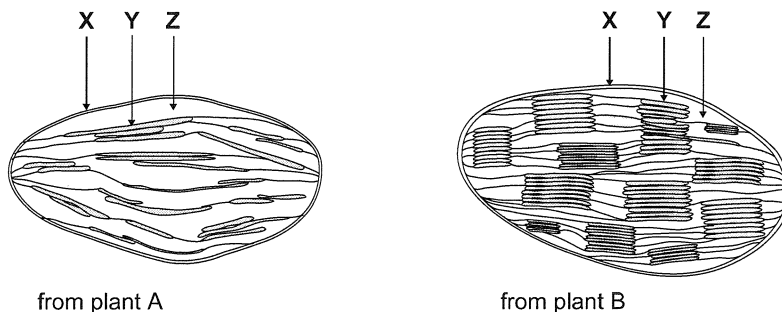


**Question 4** 2007

The bird's-nest fern, *Alocasia macrorrhiza*, usually grows in deeply shaded rainforests and has dark green fronds. Sometimes it is found in open, sunny locations by roadsides where it tends to have lighter coloured fronds.

Two bird's-nest ferns, one from each of the two habitats described above, were examined. A sample of cells from a frond of each of the ferns was collected.

These cells were examined under an electron microscope and a typical chloroplast from each habitat (deeply shaded rainforest and sunny location) was drawn. These drawings are shown below.



- a. Which of the labelled parts, X, Y or Z, absorb light energy? Name the part.

\_\_\_\_\_

1 mark

- b. Which drawing, A or B, shows a chloroplast from the rainforest habitat? Explain the reason for your choice in terms of the relationship between structure and function.

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\_\_\_\_\_

2 marks

- c. Name the process by which the chemical reactants for the light-dependent reactions of photosynthesis enter a chloroplast.

\_\_\_\_\_

1 mark

Chloroplasts contain large numbers of ribosomes.

- d. Explain the importance of the presence of these ribosomes.

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1 mark

It is now widely accepted by biologists that chloroplasts and mitochondria were once independent prokaryotic organisms which came to live symbiotically inside larger eukaryotic cells. This idea is known as the endosymbiotic theory.

- e. Name one structural feature of chloroplasts or mitochondria and outline how it supports the endosymbiotic theory for the origin of these organelles.

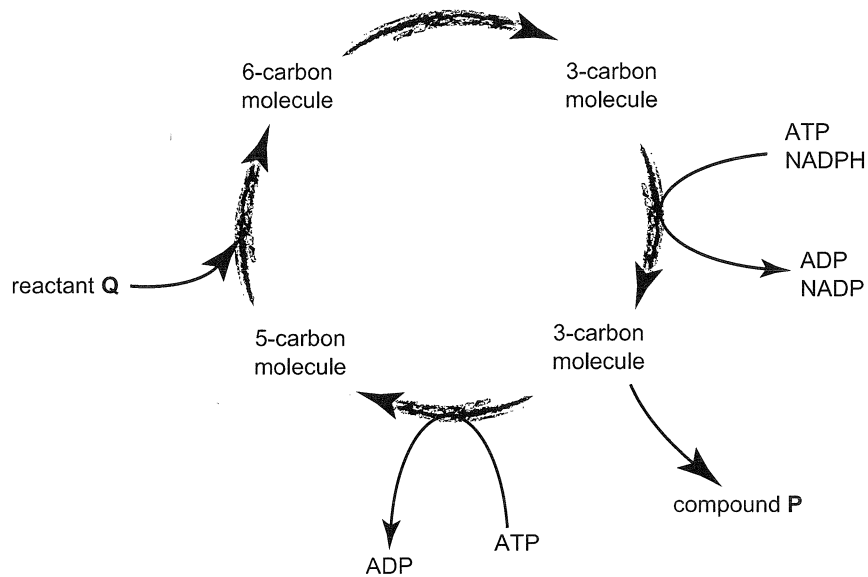
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1 mark

The simplified diagram below summarises the light-independent reactions (Calvin cycle) of photosynthesis.



- f. Name reactant Q.

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1 mark

You will note that during the light-independent reactions many energy-carrier molecules of NADPH and ATP are used.

- g. What is the source of these energy carriers?

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1 mark

- h. What is compound P?

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1 mark

Total 9 marks