

# Photosynthesis

## Question Paper 2

Level	A Level
Subject	Biology
Exam Board	OCR
Module	Communication, homeostasis and energy
Topic	Photosynthesis
Booklet	Question Paper 2

**Time allowed:** 39 minutes

**Score:** /29

**Percentage:** /100

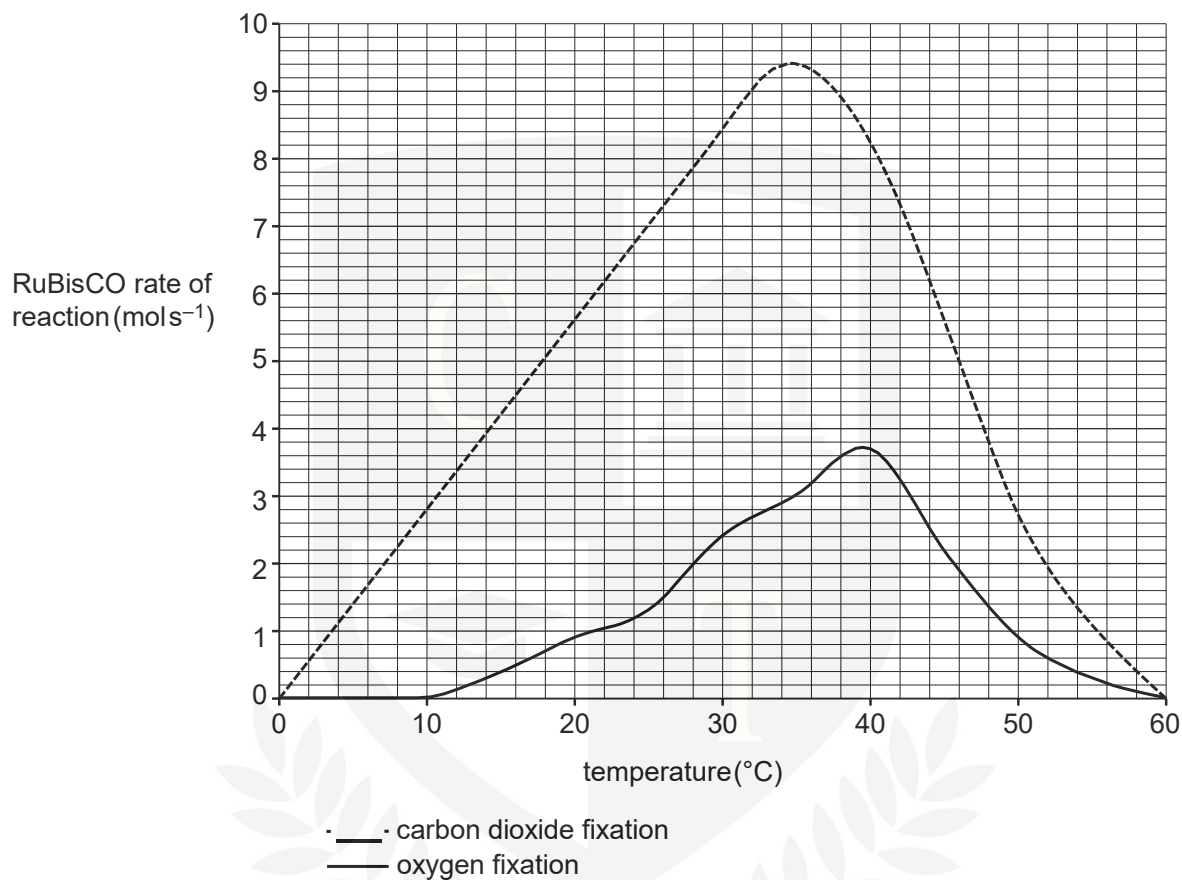
**Grade Boundaries:**

A*	A	B	C	D	E
>69%	56%	50%	42%	34%	26%

## Question 1

RuBisCO is an enzyme that fixes carbon dioxide in photosynthesis. In some conditions, RuBisCO also carries out oxygen fixation.

The graph below shows how the carbon dioxide and oxygen fixing activities of RuBisCO are affected by temperature.



What are the correct percentage changes in RuBisCO carbon dioxide and oxygen fixing activities between 30 °C and 40 °C?

- A carbon dioxide fixation –12.7%, oxygen fixation 23.3%
- B carbon dioxide fixation –14.6%, oxygen fixation 18.9%
- C carbon dioxide fixation –2.4%, oxygen fixation 54.2%
- D carbon dioxide fixation –3.6%, oxygen fixation 35.1%

**[Total: 1]**

## Question 2

(a) Fig. 1.1 is a diagram representing a three-dimensional view of a chloroplast.

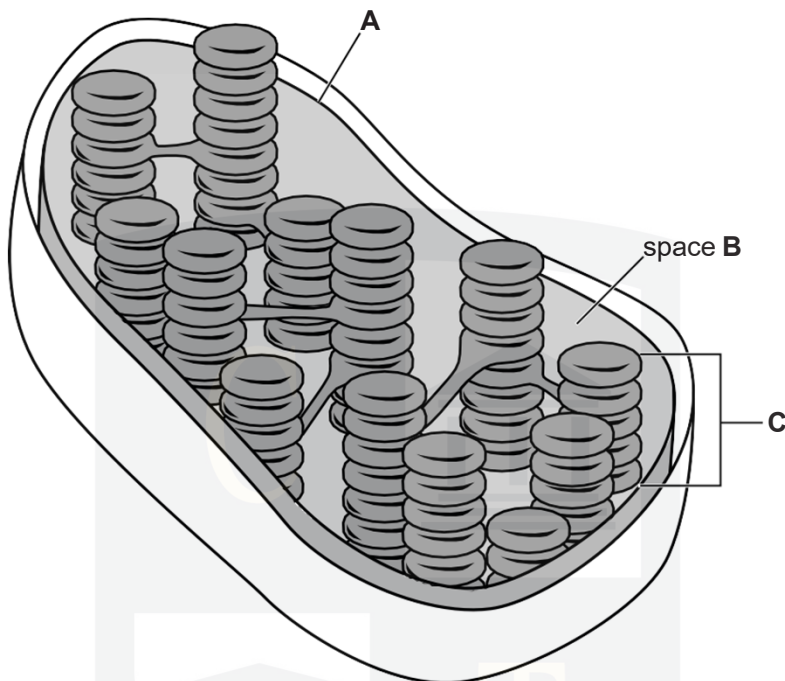


Fig. 1.1

(i) Name parts **A** to **C** in Fig. 1.1. [3]

(ii) Describe **two** ways in which the structure of part **C** is adapted to its function. [2]

(iii) A key aspect of photosynthesis is the metabolic pathway involving carbon dioxide.

Place a tick (✓) in the appropriate box to indicate the part of the chloroplast (**A**, **B** or **C**) in which the metabolic pathway involving carbon dioxide is located.

<b>A</b>	
<b>B</b>	
<b>C</b>	

[1]

(b) Fig. 1.2 shows the theoretical and actual relationship between light intensity and the rate of photosynthesis.

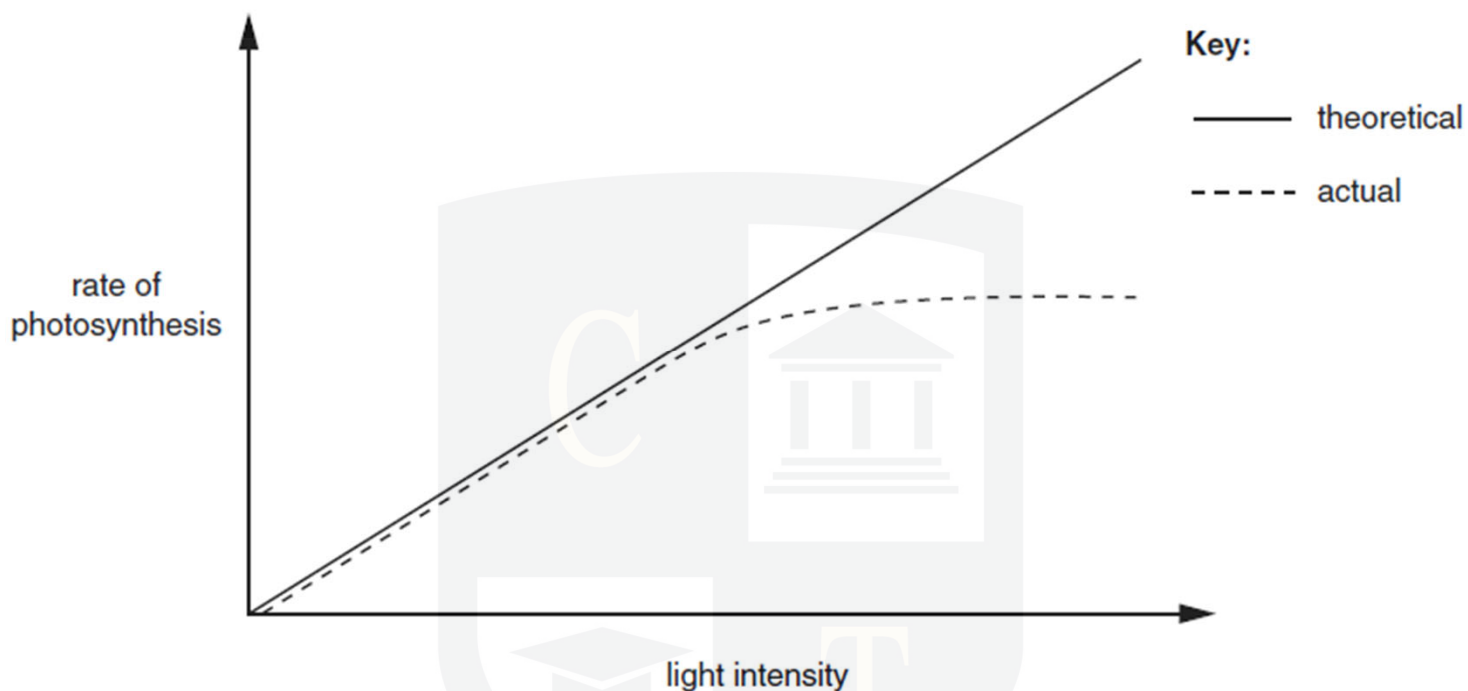


Fig. 1.2

With reference to the biochemistry of photosynthesis, explain why the theoretical rate of photosynthesis is **not** achieved at higher light intensities.

[2]

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(c) Plants are usually adapted to living in conditions of different light intensities.

The rate of photosynthesis at different light intensities for two different species of plant was investigated. The results are shown in Fig. 1.3.

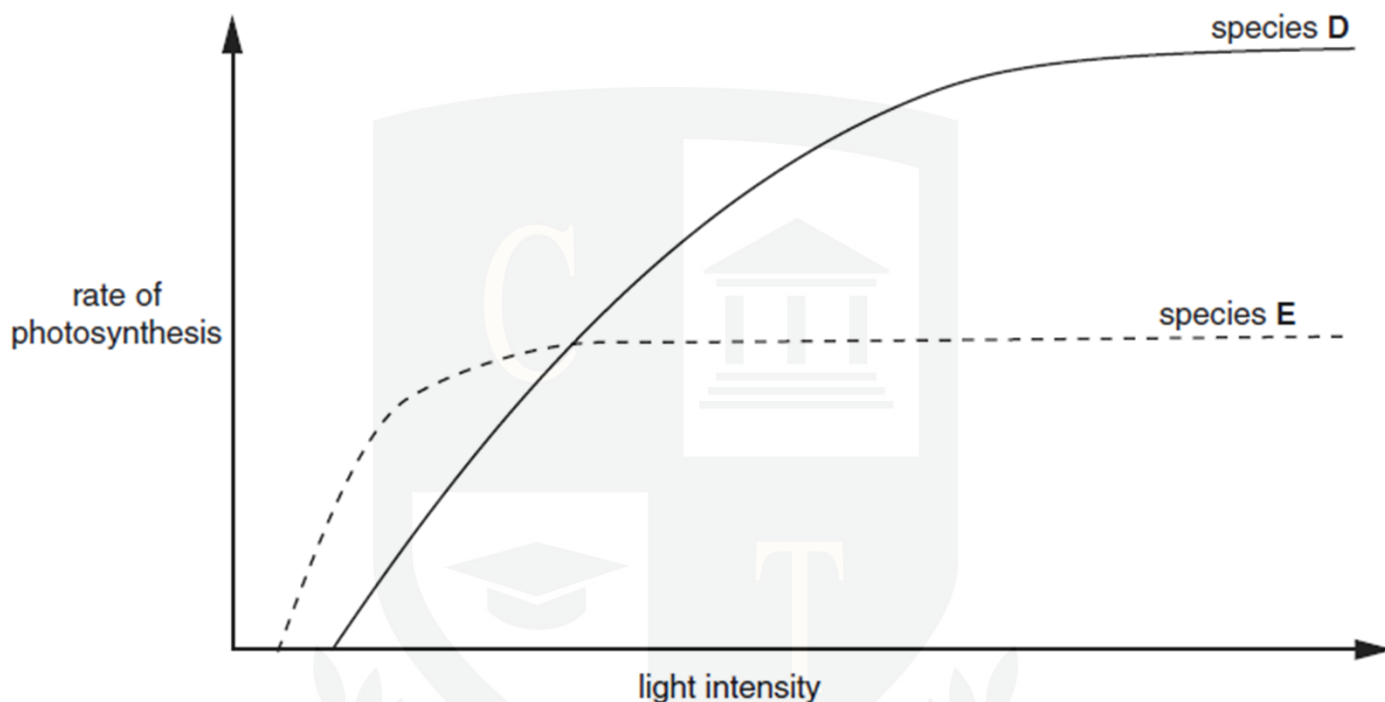


Fig. 1.3

- (i) Using the information in Fig. 1.3, explain which of the two species, **D** or **E**, is better adapted to living in **shady** conditions. [2]

- (ii) The leaf of a plant that is adapted to living in shade will differ from the leaf of a plant that is adapted to living in sunlight.

Suggest **one** way in which the **structure** of these leaves will differ. [1]

(d) Plants are autotrophs. Most other organisms are heterotrophs.

Outline the ways in which heterotrophic organisms are dependent on plants. [3]

[Total : 14]

### Question 3

Photosynthesis involves two main stages:

- the light-dependent stage, which involves photosystems
- the light-independent stage, which involves the Calvin cycle.

(a) Photosynthetic pigments are arranged in groups known as photosystems I and II.

(i) Name the primary photosynthetic pigment in these photosystems. [1]

(ii) Name an accessory pigment. [1]

(iii) State the advantage to the plant of having a range of accessory pigments in photosystems. [1]

(iv) Name the compound that is synthesised in the light-dependent stage as a result of the generation of an electrical and pH gradient across the thylakoid membrane. [1]

(b) The Calvin cycle takes place in the stroma of the chloroplast.

(i) Identify the enzyme that catalyses the fixation of carbon dioxide. [1]

(ii) Identify the first stable product of carbon dioxide fixation. [1]

(iii) Identify the compound that is regenerated in the Calvin cycle so that more carbon dioxide can be fixed. [1]

(iv) Name **two different polysaccharides** that can be synthesised from the end products of the light-independent stage of photosynthesis. [1]

[Total: 8]

## Question 4

The molecules listed below are all associated with photosynthesis.

**amino acid**

**reduced NADP**

**ATP**

**ribulose biphosphate (RuBP)**

**carbon dioxide**

**rubisco**

**glycerate-3-phosphate (GP)**

**triose phosphate (TP)**

**oxygen**

**water**

From these molecules, identify:

- (a) the enzyme. [1]
- (b) a product of the light-dependent reaction that is **used** in the light-independent reaction. [1]
- (c) a 3-carbon compound. [1]
- (d) a compound that can be made from TP but is **not** part of the Calvin cycle. [1]
- (e) a 5-carbon compound. [1]
- (f) a product of the light-dependent reaction that **is not** used in the light-independent reaction [1]

**[Total: 6]**