



**BIOLOGY
STANDARD LEVEL
PAPER 2**

Wednesday 13 November 2002 (afternoon)

1 hour

Name

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Number

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INSTRUCTIONS TO CANDIDATES

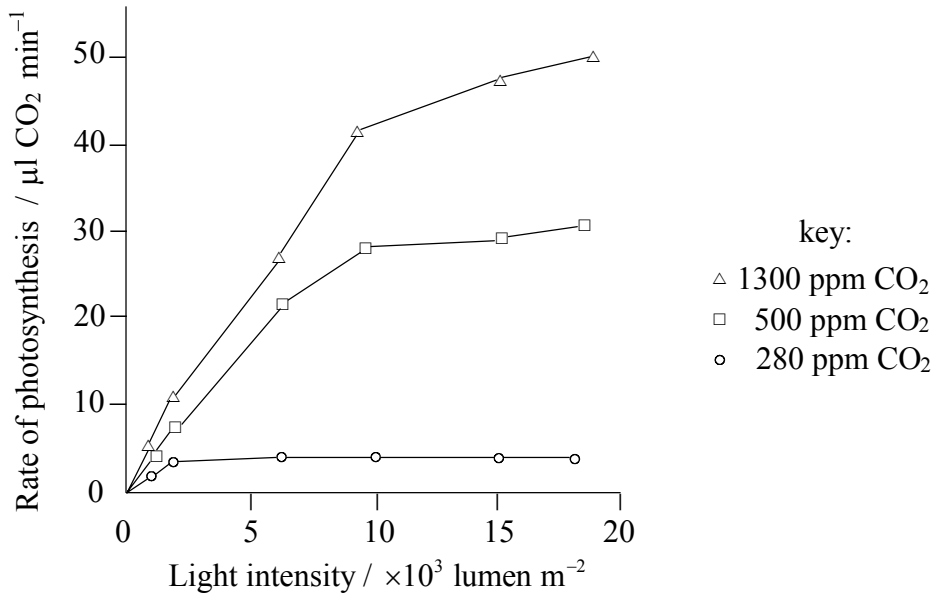
- Write your candidate name and number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Section A: Answer all of Section A in the spaces provided.
- Section B: Answer one question from Section B. Write your answers in a continuation answer booklet, and indicate the number of booklets used in the box below. Write your name and candidate number on the front cover of the continuation answer booklets, and attach them to this question paper using the tag provided.
- At the end of the examination, indicate the number of the Section B question answered in the box below.

QUESTIONS ANSWERED		EXAMINER	TEAM LEADER	IBCA
SECTION A	ALL	/20	/20	/20
SECTION B QUESTION	/20	/20	/20
NUMBER OF CONTINUATION BOOKLETS USED	TOTAL /40	TOTAL /40	TOTAL /40

SECTION A

Candidates must answer **all** questions in the spaces provided.

1. There are many abiotic factors that affect the rate of photosynthesis in terrestrial plants. Wheat is an important cereal crop in many parts of the world. Wheat seedlings were grown at three different concentrations of carbon dioxide (in parts per million) and the rate of photosynthesis was measured at various light intensities.



[Source: adapted from J P Kimmins, *Forest Ecology*, (2nd edition) page 161]

- (a) Describe the relationship between the rate of photosynthesis and light intensity for wheat seedlings grown at a CO_2 concentration of 500 ppm. [2]

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- (b) Outline the effect of CO_2 concentration on the rate of photosynthesis of the wheat seedlings. [3]

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(This question continues on the following page)

(Question 1 continued)

- (c) The normal atmospheric concentration of CO₂ is 370 ppm. Deduce the effect of doubling the CO₂ concentration to 740 ppm on the growth of wheat plants. [2]

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Leaf area and chlorophyll levels were measured in sun leaves and shade leaves of *Hedera helix* (English Ivy) and *Prunus laurocerasus* (Cherry Laurel). Sun leaves developed under maximal sunlight conditions while shade leaves developed at reduced sunlight levels in the shadow of other leaves.

Species	Leaf Type	Chlorophyll / µg ml ⁻¹	Leaf Area / cm ²
Ivy	Shade	4.3	72.6
	Sun	3.8	62.9
Laurel	Shade	4.7	38.7
	Sun	4.2	25.7

[Source: D Curtis, *Plant Ecology independent project*, 1990]

- (d) Calculate the percentage increase in the amount of chlorophyll in shade leaves of ivy compared to sun leaves of ivy. [1]

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- (e) Suggest a reason for the differences in chlorophyll concentration and leaf area in sun and shade leaves in these two species. [2]

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2. (a) Distinguish between diffusion and osmosis. [1]

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(b) Explain how the properties of phospholipids help to maintain the structure of the cell surface membrane. [2]

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(c) State the composition and the function of the plant cell wall. [2]

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3. (a) State the difference between an antigen and an antibody. *[1]*

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(b) Explain antibody production. *[3]*

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(c) State **two** other substances, apart from antibodies, transported by the blood. *[1]*

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SECTION B

Answer **one** question. Up to two additional marks are available for the construction of your answer. Write your answers in a continuation answer booklet. Write your name and candidate number on the front cover of the continuation answer booklets, and attach them to this question paper using the tag provided.

4. (a) Describe with the aid of a diagram the phases of a sigmoid population growth curve. [4]
- (b) Discuss the ethical issues that relate to family planning and contraception. [8]
- (c) Describe the causes and effects of the increased greenhouse effect. [6]
5. (a) Draw a diagram of the molecular structure of a portion of DNA. [4]
- (b) Describe the consequence of a base substitution mutation with regards to sickle cell anaemia. [7]
- (c) Explain evolution of a species by natural selection in response to environmental change. [7]
6. (a) Draw a diagram of the human gas exchange system. [5]
- (b) Explain how and why the breathing rate varies with exercise. [9]
- (c) Outline **one** health problem concerned with the blood transport system. [4]
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