



**BIOLOGY**  
**STANDARD LEVEL**  
**PAPER 2**

Monday 21 May 2001 (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

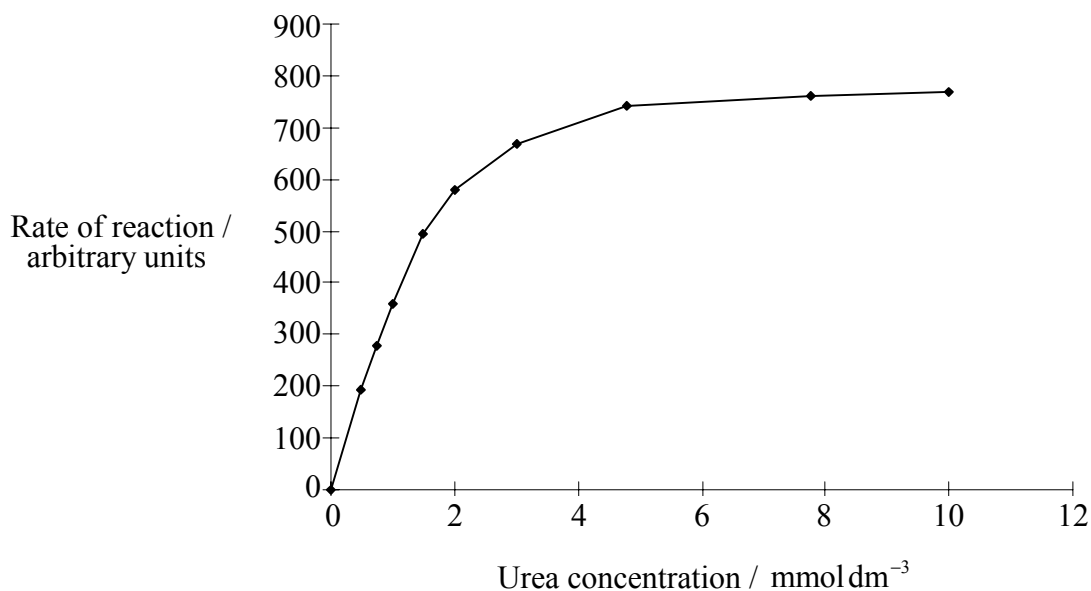
**SECTION A**

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

1. Urease is a nickel-containing enzyme found in plants, fungi and some bacteria. It catalyses the hydrolysis of urea.



Different concentrations of urea were hydrolysed using urease extracted from jack beans. In all cases optimum conditions for urease were used, pH 7.5 and 30 °C. The concentration of urea was monitored in order to determine the rate of reaction. The results of this experiment are shown in the graph below.



- (a) Estimate the rate of reaction at a urea concentration of 4  $\text{mmol dm}^{-3}$ . [1]

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- (b) Describe, using only the data in the graph, how the concentration of urea affects the enzyme activity. [2]

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- (c) Predict, by drawing a curve on the graph above, the results expected if the same experiment was performed at pH 6.5 [2]

*(This question continues on the following page)*

(Question 1 continued)

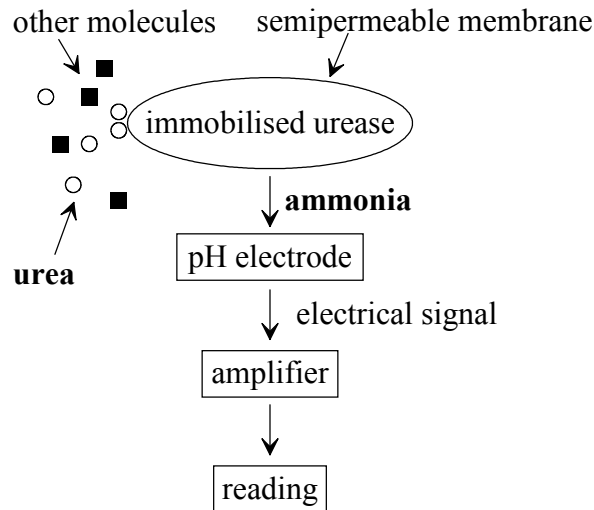
- (d) Predict, with a reason, the result of the experiment if it was performed at 90 °C. [1]

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- (e) State **one** function of the kidney other than the excretion of urea. [1]

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- (f) The following chart shows how immobilised urease is used in a hand-held biosensor to measure urea level in blood or urine. The ammonia produced by hydrolysis is detected by the biosensor. The signal is then amplified to obtain a reading for the concentration of urea.



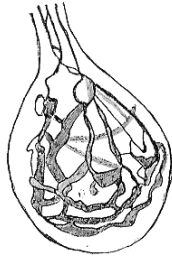
- (i) State an advantage of this biosensor for people suffering from kidney problems. [1]

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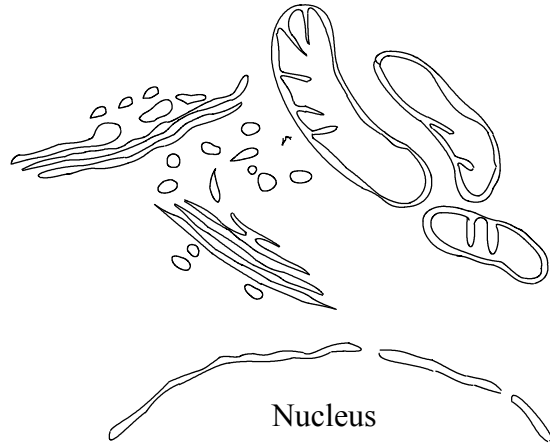
- (ii) Explain why the other molecules present in urine or in blood are not detected. [1]

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2. In 1898, Camillo Golgi found structures in the cytoplasm of brain cells using a light microscope. A copy of his original drawing (Figure I) is shown below. The structure is now known as the Golgi apparatus. A drawing of part of a cell as seen under the electron microscope is also shown (Figure II).



**Figure I**



**Figure II**

(a) On the electron microscope drawing, identify the Golgi apparatus with clear labelling. [1]

(b) With reference to the two drawings explain the advantages of using an electron microscope. [2]

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(c) The Golgi apparatus in the electron micrograph was involved in the production of pancreatic enzymes. Explain the need for enzymes in digestion. [2]

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3. (a) Draw labelled arrows connecting the boxes below to show the processes involved in the carbon cycle. [3]

carbon dioxide in atmosphere

carbon compounds in plants

carbon compounds in animals

fossil fuels

- (b) State the name of a carbon compound found in plants. [1]

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- (c) Explain the role of saprotrophs in ecosystems. [2]

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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) Outline the process of karyotyping and its uses. [5]
- (b) Describe the inheritance of ABO blood groups. [5]
- (c) Explain the relationship between Mendel's Law of Segregation and the movement of chromosomes in meiosis. [8]
5. (a) Outline the absorption of light by photosynthetic pigments in plants. [5]
- (b) Describe the effect of different light intensities on the rate of photosynthesis. [5]
- (c) Explain how the rate of photosynthesis can be determined by using direct and indirect methods. [8]
6. (a) Outline the role of phagocytic leucocytes. [4]
- (b) During an infection, B-lymphocytes produce, by mitosis, clones of identical cells programmed to produce antibodies. Describe briefly the process of mitosis. [6]
- (c) Antibodies are proteins that are specific to one type of antigen. Explain the relationship between **one** gene and **one** polypeptide and its significance in the formation of antibodies. [8]
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