UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

*7785359059*

**BIOLOGY** **9700/23**

Paper 2 Structured Questions AS **May/June 2013**

**1 hour 15 minutes**

Candidates answer on the Question Paper.

No Additional Materials are required.

**READ THESE INSTRUCTIONS FIRST**

Write your Centre number, candidate number and name in the spaces provided at the top of this page.
Write in dark blue or black ink.
You may use a soft pencil for any diagrams, graphs or rough working.
Do not use red ink, staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

Electronic calculators may be used.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **12** printed pages.




UNIVERSITY of CAMBRIDGE International Examinations

Answer **all** the questions.

For Examiner's Use

**1** Fig. 1.1 is an electron micrograph of a transverse section of palisade mesophyll tissue in the leaf of the flowering plant, *Zinnia elegans*.


magnification × 7000

**Fig. 1.1**

**(a)** Name the features labelled **A**, **B** and **C**.

**A** .....

**B** .....

**C** .....

[3]

**(b)** Calculate the width of the vacuole across the line **X**-**Y**.

Show your working and give your answer to the nearest micrometre (μm).

answer ..... μm [2]

**(c)** The membrane surrounding the vacuole, called the tonoplast, has a fluid mosaic structure.

*For Examiner's Use*

Describe the structure of this membrane.

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..... [4]

**(d)** Palisade mesophyll cells have very large vacuoles.

Explain how water moves from the xylem in the leaf into these vacuoles.

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..... [3]

[Total: 12]

**2** Read the following passage.

For Examiner's Use

> A method called *in vitro* translation is often used by scientists to produce proteins in the laboratory. The method uses extracts from animal cells, plant cells or bacteria. These are chosen because they have high levels of protein synthesis. The cells are treated so that the cell walls, if present, and cell membranes are broken down and then treated so that any of the cell's own DNA and mRNA are destroyed. When mRNA from any source is added to these extracts, it will be translated into the corresponding protein.

**(a)** Explain why:

**(i)** the cells are chosen on the basis of their high level of protein synthesis

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..... [2]

**(ii)** the cell walls (if present) and cell membranes need to be broken down

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..... [1]

**(iii)** the cell's own mRNA needs to be destroyed

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..... [1]

**(iv)** mRNA from any source can be translated in any type of extract.

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..... [2]

**(b)** State **two** differences between the cell structures used in translation in prokaryotes and eukaryotes.

*For Examiner's Use*

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..... [2]

**(c)** Scientists usually find that the method of *in vitro* translation is less efficient than *in vivo* translation, which occurs in cells.

Suggest a reason for this.

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..... [1]

[Total: 9]

**3** Fig. 3.1 shows part of the nitrogen cycle.

For Examiner's Use

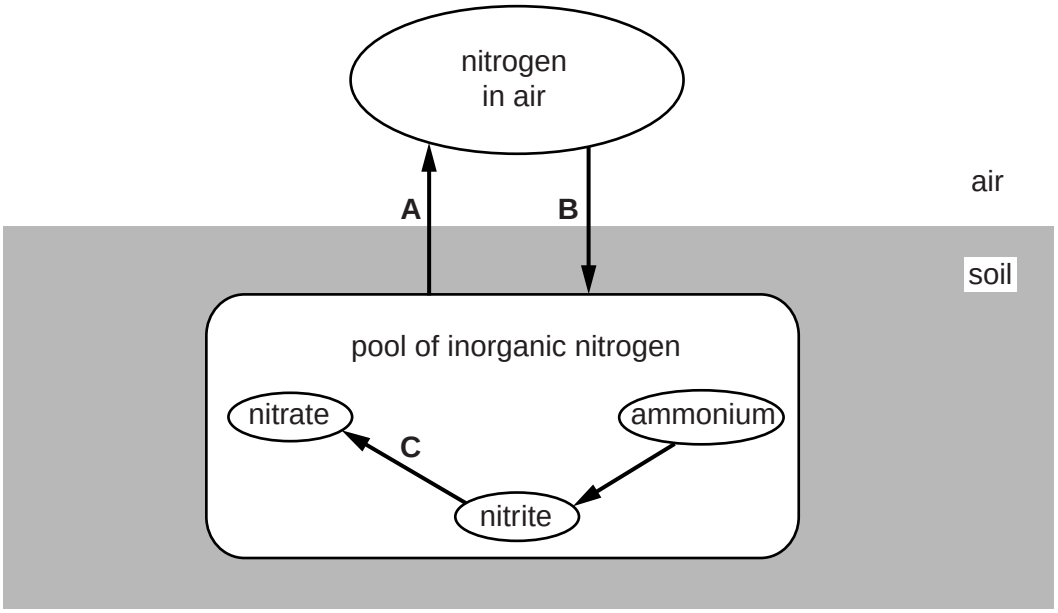


**Fig. 3.1**

**(a) (i)** Name processes **A**, **B** and **C**.

**A** .....

**B** .....

**C** .....

[3]

**(ii)** Dead animal and plant material can also contribute to the pool of inorganic nitrogen in soil.

Describe how this happens.

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..... [3]

**(b)** Other inorganic substances, such as phosphate, are cycled entirely within the soil.

For Examiner's Use

**(i)** State **one** use for phosphate and **one** use for nitrate in organisms.

*phosphate* .....

*nitrate* .....

[2]

**(ii)** Nitrogen and phosphate are both cycled more rapidly in ecosystems where there are high rates of growth within trophic levels and high rates of energy flow between trophic levels.

With reference to the use of **both** nitrogen and phosphate in organisms, explain this statement.

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..... [3]

[Total: 11]

**4** The enzyme, catechol oxidase, causes a brown colour to develop when slices of many fruits, such as apples, are exposed to air.

*For Examiner's Use*

The enzyme catalyses the following reaction:

$$\text{catechol} + \text{oxygen} \xrightarrow{\text{catechol oxidase}} \text{quinone} + \text{water}$$

Quinone is then immediately further oxidized in air to a brown-coloured substance. Catechol and quinone are colourless.

A student investigated the rate of this reaction under different conditions.

**(a)** State how the student could follow the progress of this reaction.

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..... [1]

In the first investigation, the student measured the initial rate of the reaction in varying concentrations of catechol. The results are shown in Fig. 4.1.

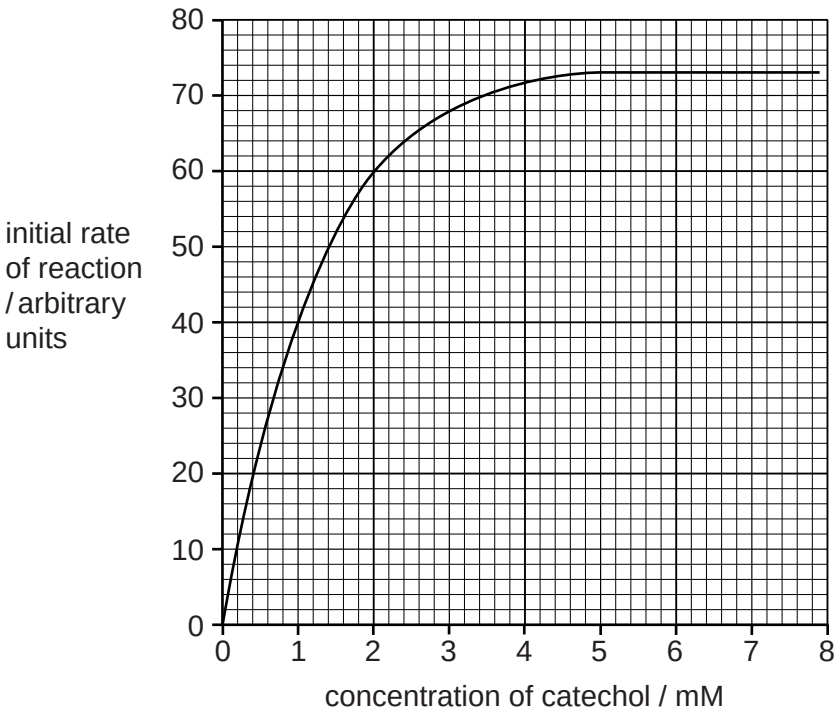


**Fig. 4.1**

**(b)** Explain the results shown in Fig. 4.1.

For Examiner's Use

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..... [5]

**(c)** In a second investigation, the student repeated the experiment, but this time added a competitive inhibitor, para-hydroxybenzoic acid (PHBA), to each reaction mixture.

**(i)** Sketch **on Fig. 4.1** the results that would be obtained for this second investigation. [2]

**(ii)** Explain the effect that PHBA will have on the action of phenoloxidase.

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**(d)** Lemon juice contains citric acid. Adding even a small amount of diluted lemon juice to apple slices slows the appearance of the brown colour.

Suggest an explanation for this observation.

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..... [2]

[Total: 12]

**5** **(a)** Explain the importance of mitosis in multicellular organisms.

For Examiner's Use

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..... [3]

A protein, mitosis-promoting factor (MPF), has been identified in cells. MPF is a globular protein made from two polypeptide chains.

**(b)** Place a tick (✓) in the box next to the type, or types, of protein structure shown by MPF.

primary ☐

secondary ☐

tertiary ☐

quaternary ☐

[1]

The presence of MPF is known to cause prophase to start.

**(c)** Describe the changes that occur during prophase in an animal cell.

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..... [4]

**(d)** MPF normally begins to break down and stops functioning during anaphase.

Suggest the possible consequences of MPF **not** breaking down.

*For Examiner's Use*

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..... [3]

[Total: 11]

**6** Measles is an infectious disease, while lung cancer is not.

*For Examiner's Use*

**(a)** Explain why lung cancer is sometimes referred to as a 'lifestyle disease'.

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..... [2]

**(b)** State the type of pathogen that causes measles and state its mode of transmission.

*pathogen* .....

*transmission* .....

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[2]

**(c)** Between January and April 2011, 118 measles cases were reported in the USA, where measles was previously thought to be virtually eradicated.

Suggest a reason for this rise in measles cases.

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..... [1]

[Total: 5]