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

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

8573763162

BIOLOGY **9700/22**

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 **14** printed pages and **2** blank pages.

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Answer **all** the questions.

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1 **(a)** The cells in Fig. 1.1 are from the same organism and look the same. The cells in Fig. 1.1(a) have been produced by mitosis and the cells in Fig. 1.1(b) have been produced by meiosis**.**

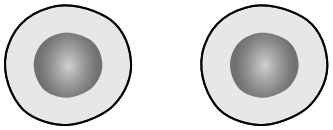


Fig. 1.1(a)

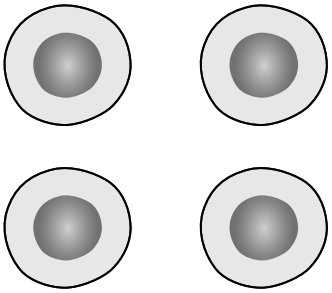


Fig. 1.1(b)

(i) Complete the table to show two differences between cells that have been produced by mitosis compared to cells that have been produced by meiosis.

mitosis	**meiosis**

[2]

(ii) Explain why the organism produces cells by meiosis.

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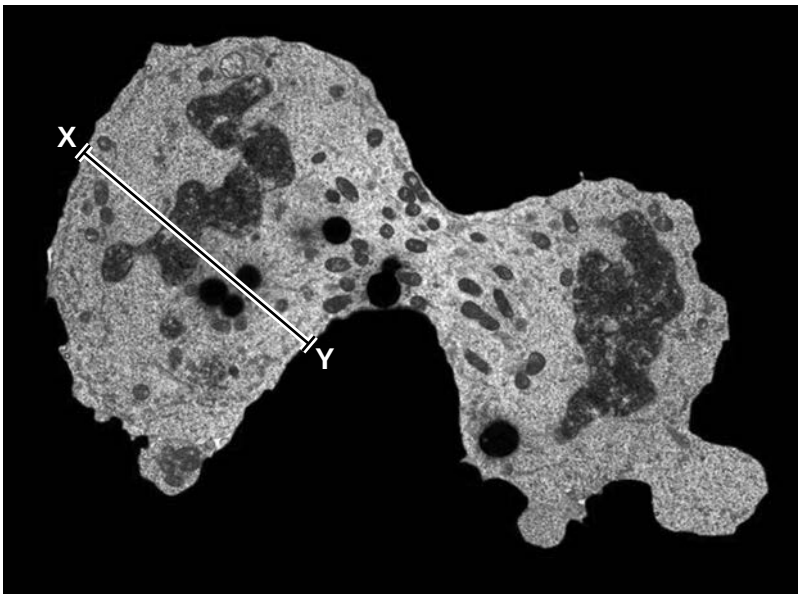
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(b) Fig. 1.2 is a transmission electron micrograph of a dividing cancer cell.

For Examiner's Use



magnification x 3000

Fig. 1.2

(i) Calculate the actual width of the cell shown in Fig. 1.2 at **X**-**Y**.

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

answer ..... μm [2]

(ii) The cancer cell shown in Fig. 1.2 has more mitochondria and rough endoplasmic reticula (RER) compared to the non-cancerous cell from which it originated.

Suggest why this is so.

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[Total: 8]

2 Fig. 2.1 shows xylem tissue in a longitudinal section through the stem of a dicotyledonous plant.

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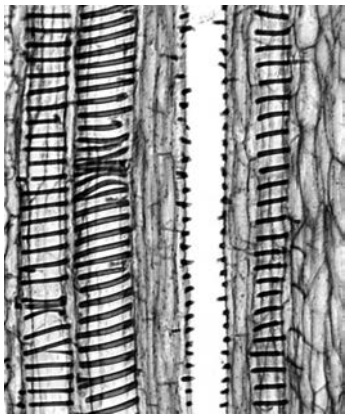


Fig. 2.1

(a) Describe and explain how the structure of xylem vessels is suited to their function.

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(b) It is possible to obtain images, such as Fig. 2.1, at the same magnification with both the light microscope and the electron microscope.

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State the advantages of using the light microscope, rather than using the electron microscope, in studies of tissues.

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..... [2]

[Total: 7]

3 **(a)** Explain why tuberculosis (TB) is known as an **infectious** disease.

For Examiner's Use

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(b) Outline the role of antibiotics in the treatment of infectious diseases, such as TB.

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Tobacco smoking is a risk factor for a number of diseases. This means that it increases the risk of developing disease. In 2009, the World Health Organization (WHO) published a factsheet stating that tobacco smoking:

- may be responsible for more than 20% of the new cases of TB globally
- increases the risk of becoming infected and having active TB
- increases the risk of dying from TB
- is a risk factor for TB in all socioeconomic groups.

Projects have been set up in a number of different countries to tackle this health problem. One project involves health workers encouraging TB patients to give up smoking.

(c) Suggest what epidemiological evidence would lead to the conclusion that tobacco smoking is a risk factor for TB.

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(d) Suggest **and** explain how the effects of smoking can increase the risk of becoming infected with TB.

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..... [3]

(e) Many smokers know that tobacco smoking is a risk factor for coronary heart disease, but continue to smoke. Some of these smokers have stated that they expect medical practitioners to cure them if they develop coronary heart disease.

List two treatments used by medical practitioners to treat coronary heart disease.

1. .....

2. ..... [2]

[Total: 14]

For Examiner's Use

For Examiner's Use

4 Polysaccharides are synthesised by condensation reactions between monosaccharide or disaccharide subunits (monomers).

(a) Name the type of bond formed when polysaccharides are synthesised.

..... [1]

(b) Disaccharides are formed following synthesis from monosaccharides or as a result of polysaccharide hydrolysis.

Cellobiose, maltose, sucrose and trehalose are four different disaccharides found in nature. Fig. 4.1 shows the molecular structure of these disaccharides.

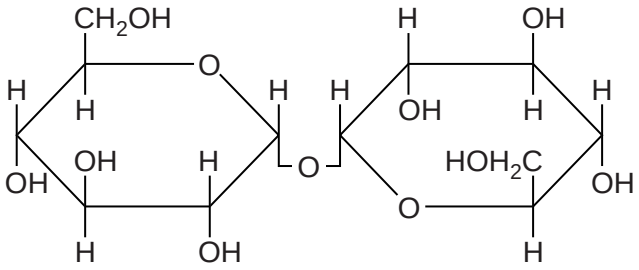
Identify the disaccharides, labelled **A** to **D**, using the information below.

- The disaccharide cellobiose is formed from the hydrolysis of the polysaccharide cellulose.
- When cellobiose is hydrolysed, two **β-glucose** molecules are produced.
- One of the disaccharides is sucrose.
- Trehalose is a disaccharide that is synthesised from two **α-glucose** molecules.
- The disaccharide maltose is formed from the hydrolysis of amylose, a component of starch.

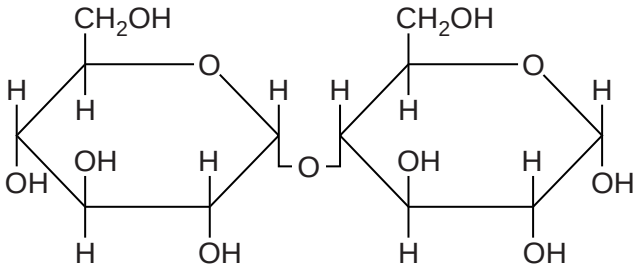
Write the name of the disaccharides in the spaces provided on Fig. 4.1.

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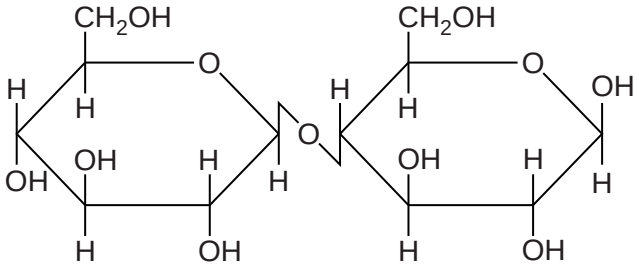
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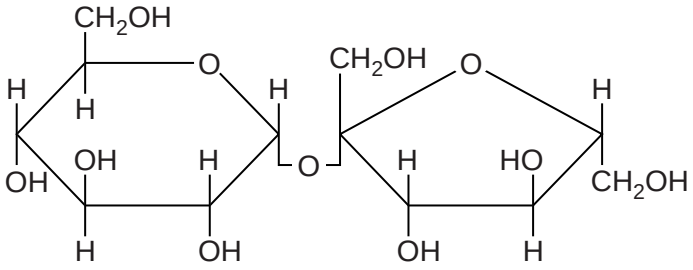
A .....



B .....



C .....



D .....

[3]

Fig. 4.1

In some organisms, trehalose is used as an energy store and gives protection against the harmful effects of very low temperatures. Trehalose is sometimes referred to as a cryoprotectant, allowing organisms to survive in freezing conditions.

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Freezing temperatures can damage the cell surface membrane and membranes within the cell.

(c) Explain the importance of the cell surface membrane to cells.

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..... [3]

(d) Freezing temperatures can also completely stop enzyme activity by causing the molecules to undergo 'cold denaturation'. Enzyme activity is not recovered when temperatures are increased to a normal working temperature range.

(i) Explain the mode of action of enzymes.

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..... [3]

(ii) Suggest how the molecular structure of the enzyme changes during 'cold denaturation'.

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..... [2]

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(e) Cryoprotectants, such as trehalose, are of particular interest in their application to preserving cells, tissues or organisms for future use.

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An investigation was carried out to find the protective effect given by different concentrations of two cryoprotectants, trehalose and glycerol, on a respiratory enzyme.

The enzyme was subjected to a freezing temperature and then returned to its optimum temperature. The activity of the enzyme was measured at its optimum temperature.

Fig. 4.2 is a graph showing the results of the investigation.

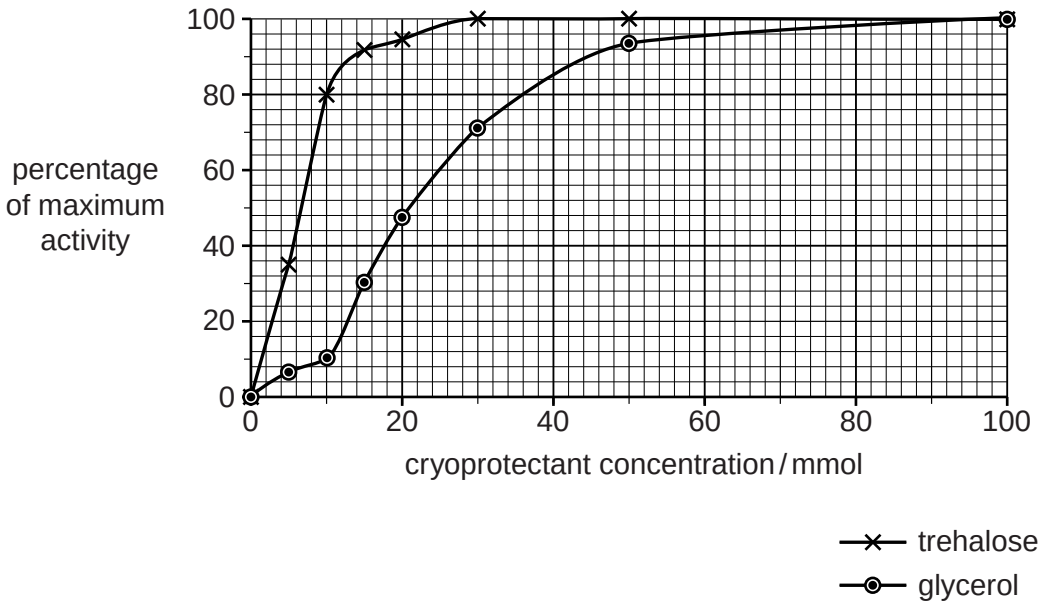


Fig. 4.2

With reference to Fig. 4.2, **describe** the results of the investigation.

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[Total: 16]

5 **(a)** Complete the table to **describe** three differences between DNA replication and DNA transcription.

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DNA replication	DNA transcription

[3]

(b) Errors during replication may lead to gene mutations.

Define the term *gene mutation*.

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..... [2]

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(c) Some disease-causing organisms undergo frequent mutation, changing their surface antigens and making the disease much more difficult to control with a vaccination programme.

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(i) Explain why existing vaccines may no longer be effective when the surface antigens of a disease-causing organism change.

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..... [2]

(ii) State precisely the type of immunity gained by a person who has been vaccinated.

..... [1]

(d) The virus causing measles is said to be antigenically stable as it rarely mutates. Measles vaccination programmes have been successful in preventing epidemics in many areas.

Outline **two** reasons why measles is still common in many parts of the world, even though the vaccine is available.

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..... [2]

[Total: 10]

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6 **(a)** The statements below are some of the events that occur in the initiation and control of heart action during one cardiac cycle.

Place the events in the correct sequence, using **1** as the first event in the sequence.

event	correct sequence
Purkyne tissue conducts the wave of excitation	
atrioventricular node sends out a wave of excitation	
atria contract	
ventricles contract	
sinoatrial node sends out a wave of excitation	

[3]

(b) The wall of the left ventricle contains more cardiac muscle than the wall of the right ventricle.

Explain the difference in the thickness of the walls of the left and right ventricles of the heart, in terms of their functions.

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..... [2]

[Total: 5]

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