Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTER NUMBER

CANDIDATE NUMBER

BIOLOGY (US) **9184/23**

Paper 2 Structured Questions AS **May/June 2014**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

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

Answer **all** questions.

Electronic calculators may be used.

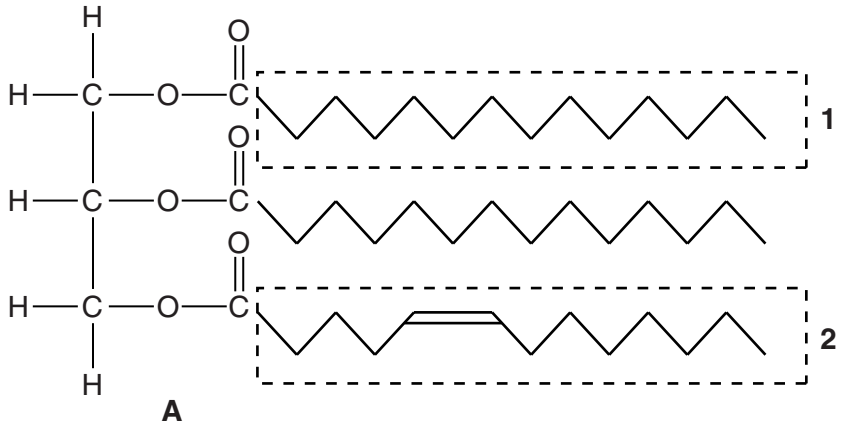
At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

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

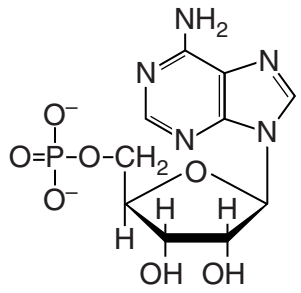
CAMBRIDGE International Examinations

Answer **all** the questions.

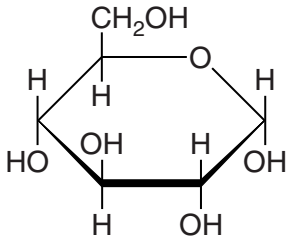
1 Fig. 1.1 shows the structures of four biological molecules **A**, **B**, **C** and **D**.



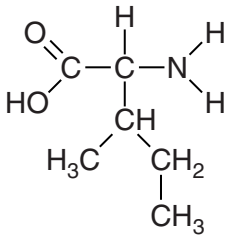
A



B



C



D

Fig. 1.1

(a) Give the letter, **A** to **D**, of the molecule in Fig. 1.1 which:

(i) is a nucleotide .....

(ii) can form peptide bonds .....

(iii) contains ester bonds. ..... [3]

(b) Some of the molecules in Fig. 1.1 can form polymers.

(i) Name a polymer which can be formed only from many molecules of **C**.

.....[1]

(ii) State one way, visible in Fig. 1.1, in which the part labeled **1** of molecule **A** ... the part labeled **2**.

.....

.....

.....[1]

(iii) Molecule **D** can form macromolecules with other similar monomers.

These macromolecules have three dimensional shapes held in place by interactions or bonds other than those between adjacent monomers.

Name two of these interactions or bonds.

1. .....

2. .....
[2]

[Total: 7]

2 Vaccination can protect against the infectious disease tuberculosis (TB).

(a) Define the terms:

(i) *vaccination*

.....

.....

.....

.....[2]

(ii) *infectious disease.*

.....

.....

.....

.....[2]

(b) TB is an important disease worldwide. Table 2.1 shows recent information about TB cases reported during one year in six different countries.

Table 2.1

country	**region**	**number of cases**	**number of cases per 100 000 population**
Germany	Europe	4000	5
India	Asia	2 300 000	185
Japan	Asia	27 000	21
South Africa	Africa	490 000	981
Swaziland	Africa	15 000	1287
United Kingdom	Europe	7900	13

With reference to Table 2.1, explain the advantage of calculating the number of [illegible] per 100 000 population rather than stating the number of cases alone.

.....

.....

.....

.....

.....

.....[2]

(c) Describe how a person may become infected with TB.

.....

.....

.....

.....

.....

.....[3]

(d) Suggest why TB is more likely to be fatal in people who have HIV/AIDS than in those who do not have HIV/AIDS.

.....

.....

.....

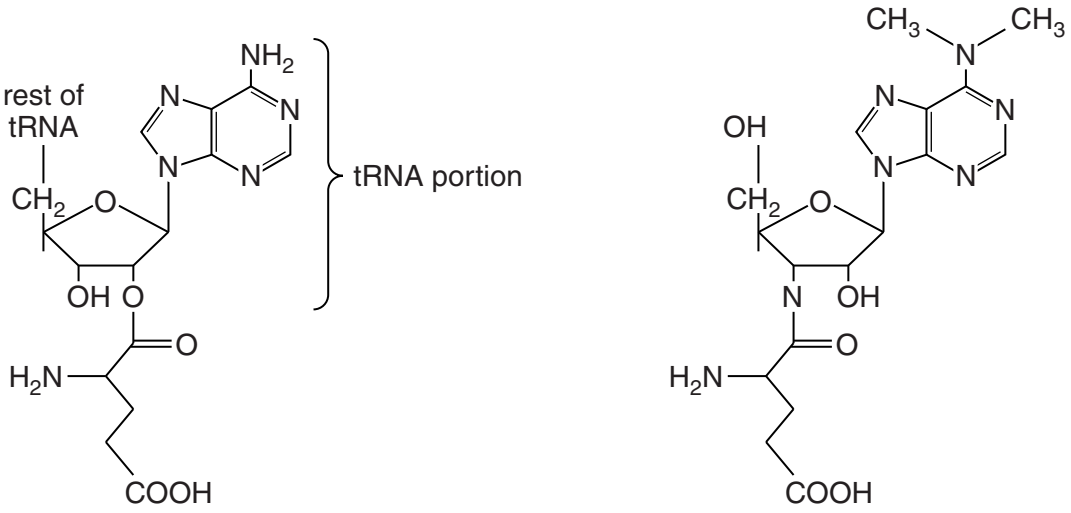
.....[2]

[Total: 11]

3 The enzyme glutamyl-tRNA reductase (GluTR) is present in many bacteria to ma[illegible]t which is essential to their survival.

GluTR acts on the substrate glutamyl-tRNA, which is composed of the amino acid glutamic attached to a tRNA.

Fig. 3.1 shows the structure of glutamyl-tRNA and another compound called glutamycin.



glutamyl-tRNA **glutamycin**

Fig. 3.1

(a) Explain how glutamycin can act as an inhibitor for the enzyme GluTR.

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.....

.....

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.....

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.....[4]

(b) The bacteria take in glutamic acid by active transport.

Describe the process of active transport.

.....

.....

.....

.....

.....

.....

.....[3]

(c) In leguminous plants, glutamic acid is also essential for the formation of root nodules containing the bacterium *Rhizobium.*

(i) Name the stage in the nitrogen cycle carried out by *Rhizobium.*

.....[1]

(ii) Suggest advantages of *Rhizobium* living in root nodules of leguminous plants.

.....

.....

.....

.....

.....[2]

(iii) Explain the role of *Rhizobium* in the growth of leguminous plants.

.....

.....

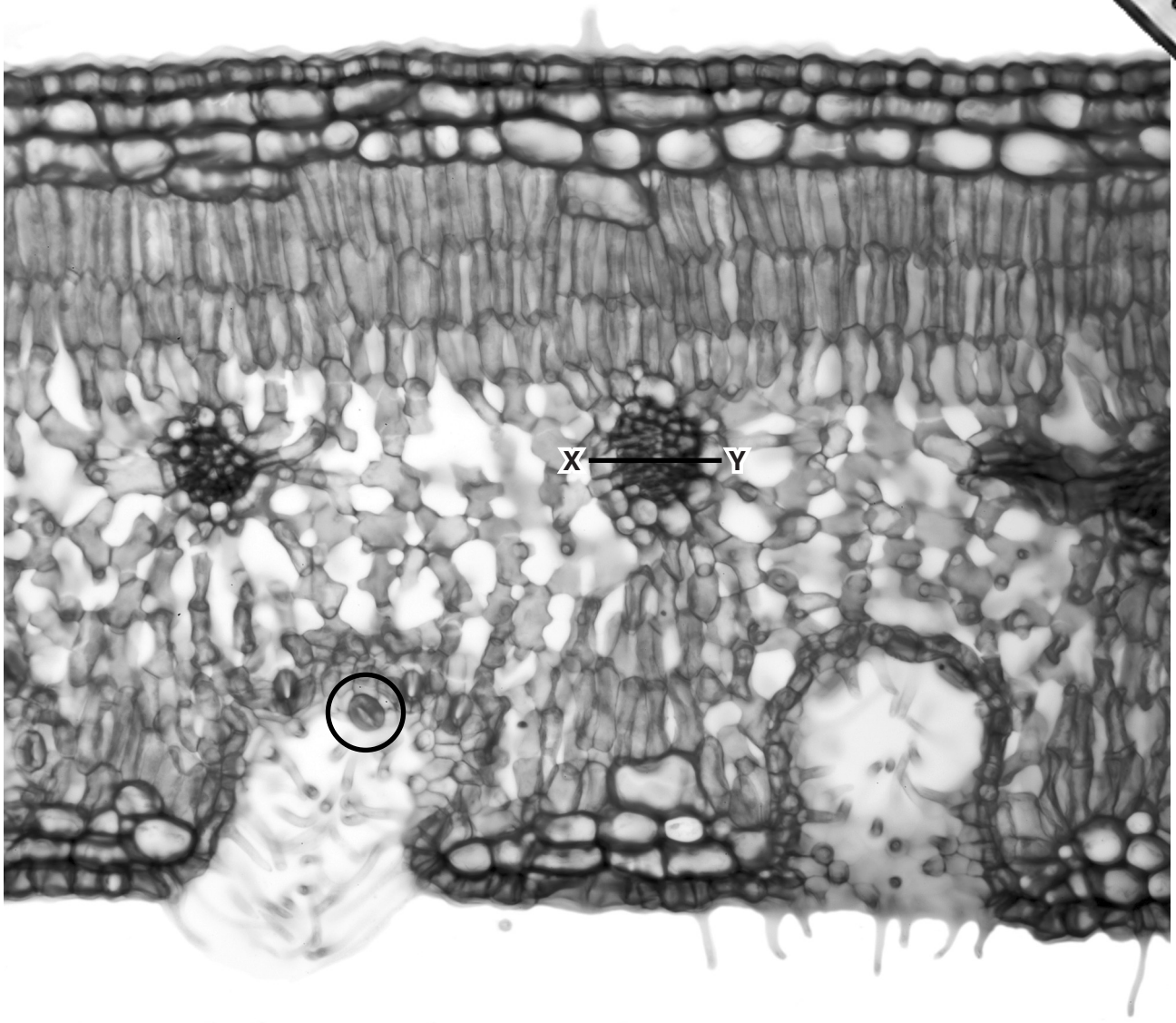
.....

.....

.....[2]

[Total: 12]

4 Fig. 4.1 is a light micrograph of a section through a leaf of the xerophytic plant *Neri*
An area containing one of the plant's stomata is circled.



Magnification × 60

Fig. 4.1

(a) List three adaptations, visible in Fig. 4.1, which are characteristic of xerophytic plants.

1. .....

2. .....

3. .....

[3]

(b) Calculate the diameter of the vascular bundle across the line **X-Y**.

Show your working and give your answer to the nearest 100 μm.

answer..... μm [2]

(c) Describe the process of transpiration in plants such as *N. oleander*.

.....

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.....

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.....

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.....[4]

[Total: 9]

5 When hemoglobin in red blood cells travels through the capillaries of the lungs it binds [illegible] to form oxyhemoglobin. When oxyhemoglobin reaches respiring tissues, it dissociates [illegible] oxygen.

(a) Explain what causes oxyhemoglobin to dissociate readily in actively respiring tissues.

.....

.....

.....

.....

.....

.....

.....

.....[3]

(b) When people move to high altitudes there is an increased production of red blood cells. Explain why more red blood cells are produced when people move to higher altitudes.

.....

.....

.....

.....

.....

.....[3]

(c) Some people who move to live at high altitudes can develop chronic mountain sickness. A feature of this condition makes it difficult for the heart to pump blood around the body due to the increased production of red blood cells.

The *EPAS*1 gene codes for a type of protein called a transcription factor, which helps to regulate the transcription of genes involved in red blood cell production. Some people have a mutated version of this gene that prevents the over-production of red blood cells.

(i) Explain what is meant by *transcription*.

.....

.....

.....

.....

.....

.....[3]

(ii) Describe how a mutated version of the *EPAS*1 gene can cause a change in the transcription factor protein produced.

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.....

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.....

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.....

.....

.....[3]

(iii) Some transcription factors may prevent transcription.

Suggest two ways in which they may do this.

1. .....

.....

2. .....

.....
[2]

[Total: 14]

6 Fig. 6.1 shows a section of diseased artery from a smoker.

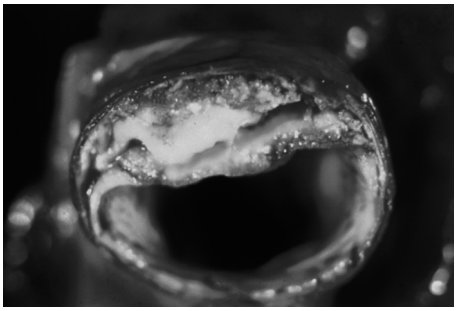

Fig. 6.1

(a) **(i)** With reference to Fig. 6.1, describe how this diseased artery differs in appearance from a healthy one.

.....

.....

.....

.....[2]

(ii) State one way in which nicotine in tobacco smoke affects arteries.

.....

.....[1]

(b) Arteries and capillaries have different structures related to their different functions.

For each type of blood vessel, give **one** structural feature and the function that it provides.

(i) artery:

structural feature .....

function .....

.....
[2]

(ii) capillary:

structural feature .....

function .....

.....
[2]

[Total: 7]