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

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

9972149363

BIOLOGY **9700/23**

Paper 2 Structured Questions AS **May/June 2010**

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 pen.
You may use a soft pencil for any diagrams, graphs, or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
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.

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1	
2	
3	
4	
5	
6	
Total	

This document consists of **15** printed pages and **1** blank page.

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Answer **all** the questions.

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1 Fig. 1.1 shows part of an animal cell viewed with an electron microscope.

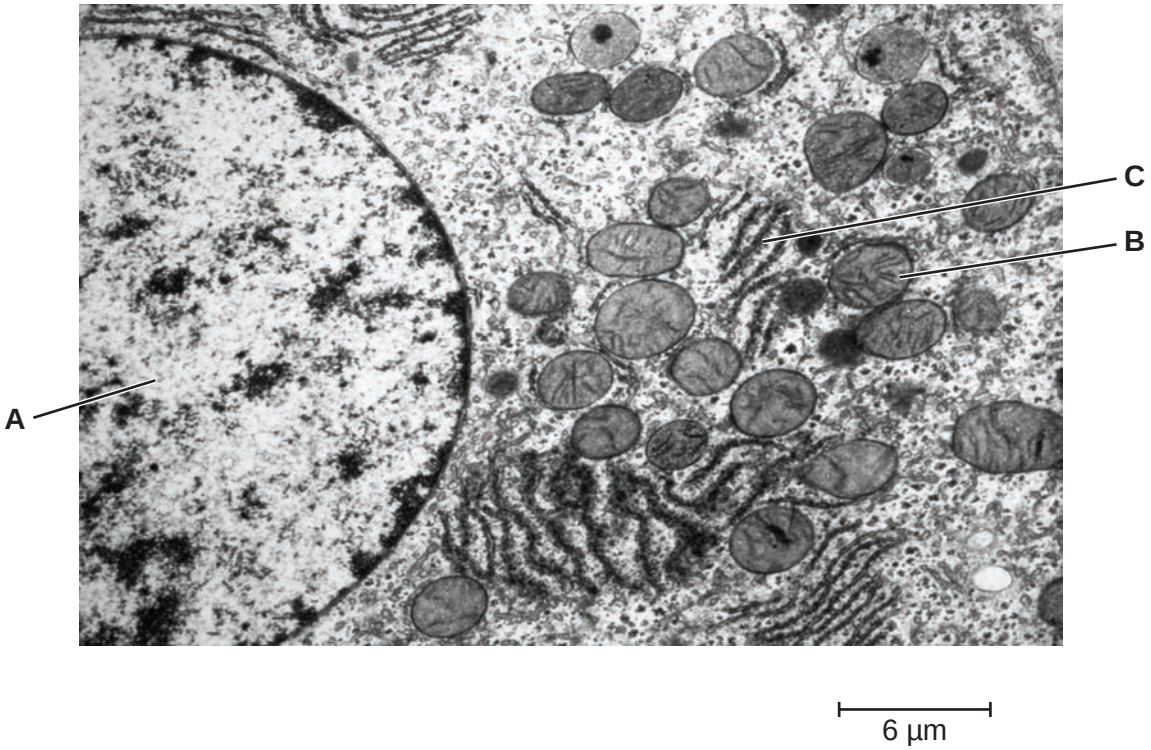


Fig. 1.1

(a) Name the structures **A** to **C.**

A .....

B .....

C .....[3]

(b) **(i)** State the function of structure **C**.

.....[1]

(ii) Explain why structure **C** cannot be seen using a light microscope.

.....

.....

.....

.....[2]

(c) Suggest **one** disadvantage of the electron microscope compared to the light microscope for the study of cells.

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.....

.....[1]

(d) Calculate the magnification of the image in Fig. 1.1.

Show your working and give your answer to the nearest whole number.

Answer = ...[2]

[Total: 9]

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[Turn over

2 Fig. 2.1 shows a diagram of a section through a human heart.

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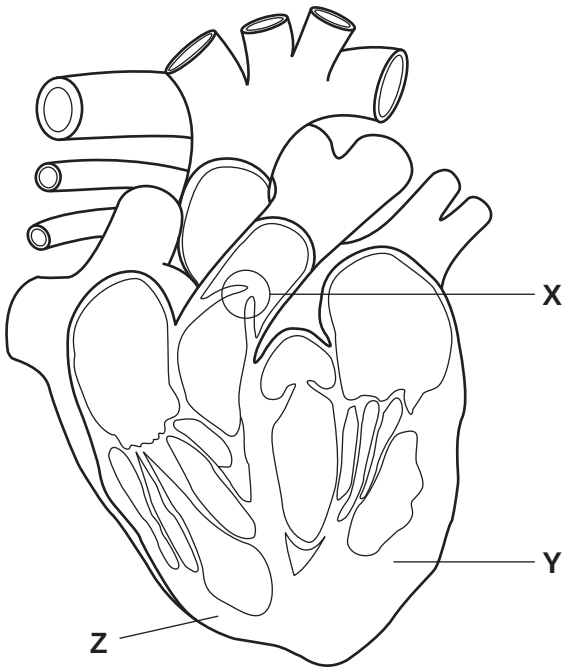


Fig. 2.1

(a) State the name and function of the circled structure labelled **X**.

name .....

function .....

.....

.....[3]

(b) Explain why the region labelled **Y** is thicker than the region labelled **Z**.

.....

.....

.....

.....

.....

.....[3]

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(c) Cardiac muscle is described as myogenic as it naturally contracts and relaxes. With reference to the structures and tissues within the heart, describe how the cardiac cycle is initiated and coordinated.

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.....[5]

[Total: 11]

3 The amino acid sequence of the protein hormone insulin is shown in Fig. 3.1.

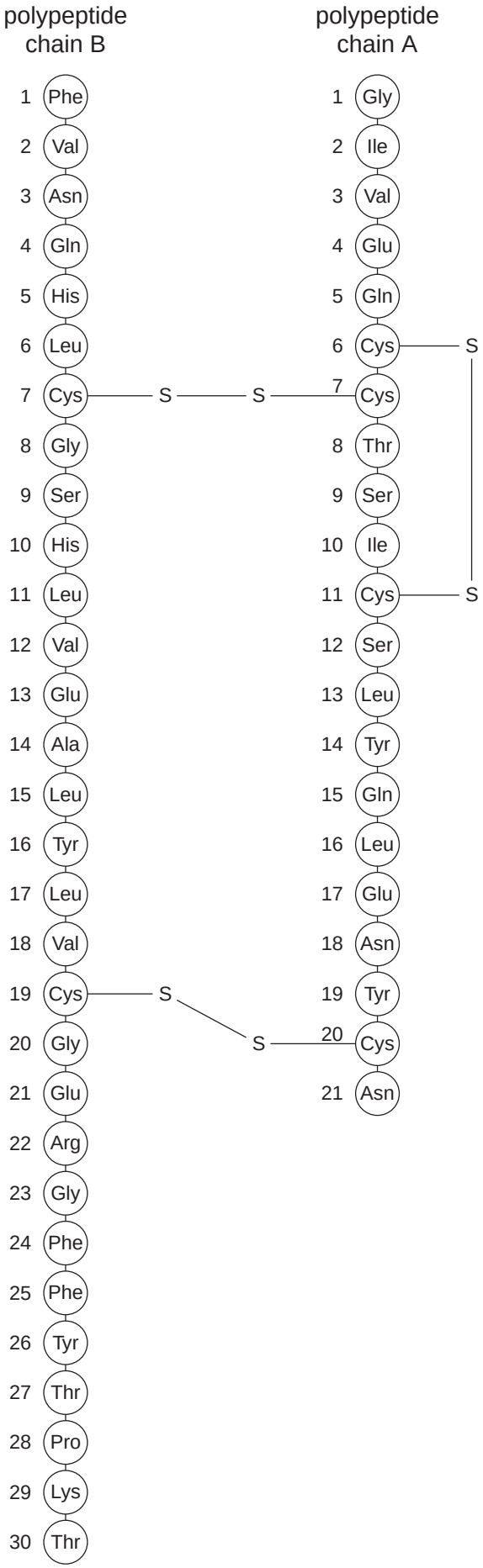


Fig. 3.1

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(a) With reference to Fig. 3.1, state

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(i) which two levels of protein structure are shown

1. .....

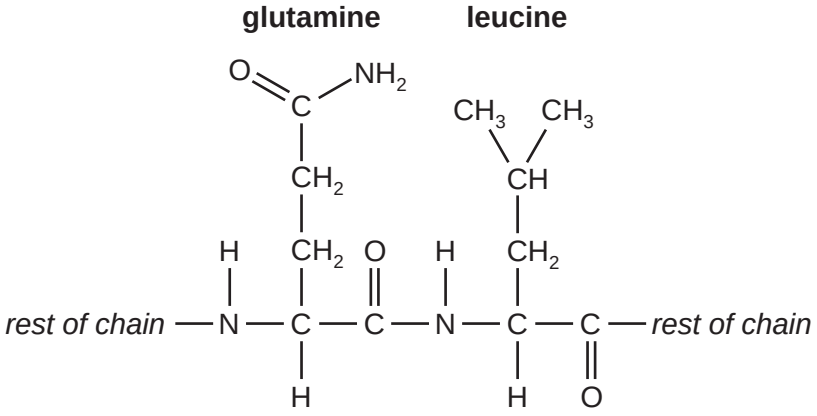
2. .....[2]

(ii) the name of the structures responsible for holding the two polypeptide chains together.

.....[1]

(b) Many people with diabetes need to take regular injections of insulin. Insulin in the form shown in Fig. 3.1 cannot be taken by mouth as it would be hydrolysed by proteases in the gut.

In the space below, draw a diagram to show how the peptide bond between glutamine 15 and leucine 16 in polypeptide chain A could be hydrolysed and show the products of the hydrolysis.



[3]

[Total: 6]

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4 The control of malaria is one of the top priorities of the World Health Organization (WHO). At present, there is no effective vaccine for the disease, so other preventative measures must be taken to control the spread of malaria.

(a) Describe **one** method of controlling the spread of malaria by targeting its vector and explain its effect.

.....

.....

.....[2]

(b) Explain why it has been difficult to develop an **effective** vaccine for malaria.

.....

.....

.....

.....

.....

.....

.....[3]

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(c) Another method of preventing malaria is to take drugs, such as chloroquine, but resistance to these drugs among certain species of the malarial parasite is increasing. New drugs are being developed.

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A laboratory investigation was carried out to determine the effect of a new drug on two strains of the malarial parasite *Plasmodium falciparum*. The results are shown in Fig. 4.1.

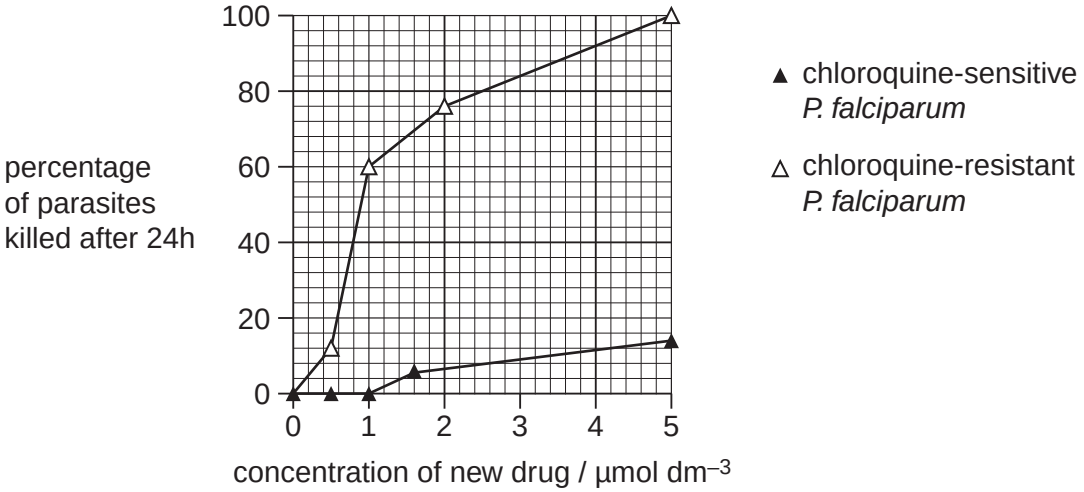


Fig. 4.1

With reference to Fig. 4.1, compare the effect of increasing the concentration of the drug on the chloroquine-resistant and chloroquine-sensitive strains of *P. falciparum*.

.....

.....

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.....

.....

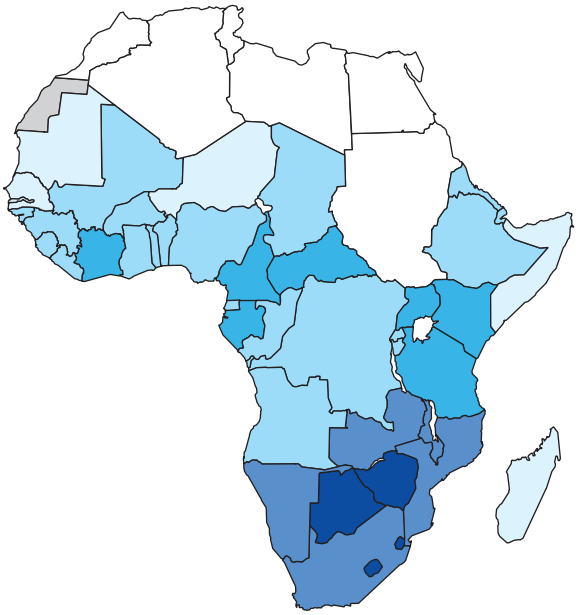
.....

.....[3]

(d) When a person becomes infected with the Human Immunodeficiency Virus (HIV) they become more susceptible to infection by the malarial parasite.

Fig. 4.2 shows maps of Africa produced by the WHO.

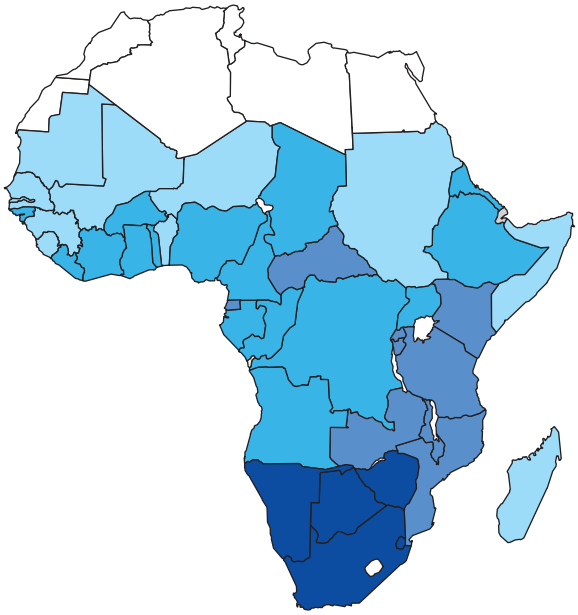
- Fig. 4.2a shows the percentage population of each country testing positive for HIV
- Fig. 4.2b shows the percentage **increase** in malaria as a result of HIV infection in each country.



HIV prevalence (%)

- 20.0% – 28.0%
- 10.0% – <20.0%
- 5.0% – <10.0%
- 1.0% – <5.0%
- <1.0%
- No data available
- Not included in analysis

Fig. 4.2a



Malaria prevalence (%)

- 50%–110% increase
- 8%–49% increase
- 3%–7% increase
- 0%–2% increase
- Not included in analysis

Fig. 4.2b

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(i) Explain how the information in Fig. 4.2 supports the idea that there is a link between HIV infection and susceptibility to malaria.

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.....

.....

.....

.....[2]

(ii) Suggest how HIV infection may have led to an increase in malarial infections in these countries.

.....

.....

.....

.....[2]

[Total: 12]

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5 **(a)** Some bacteria, such as *Rhizobium*, carry out nitrogen fixation, which is an important process in the nitrogen cycle.

Explain what is meant by the term *nitrogen fixation*.

.....

.....

.....

.....[3]

(b) An important enzyme in the nitrogen cycle is urease, which catalyses the hydrolysis of urea to ammonia. This reaction is shown below:

$$(NH_2)_2CO + H_2O \xrightarrow{\text{urease}} 2NH_3 + CO_2$$

(i) State the name of this process in the nitrogen cycle.

.....[1]

(ii) Explain the importance of this process in making nitrogen from animals available for uptake by plants.

.....

.....

.....

.....[2]

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(c) The enzyme urease is known to be affected by competitive inhibitors. A student carried out an investigation to determine the percentage of urea hydrolysed by urease at various time intervals

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- without any inhibitor
- with a competitive inhibitor.

The experiment was carried out in test tubes set up as follows:

Tube **A** – 1 cm^3 of urease solution, 10 cm^3 pH 7.5 buffer solution, 1 cm^3 urea solution.
Tube **B** – 1 cm^3 urease solution, 9 cm^3 pH 7.5 buffer solution, 1 cm^3 inhibitor, 1 cm^3 urea solution.
Tube **C** – 1 cm^3 water, 10 cm^3 pH 7.5 buffer solution, 1 cm^3 urea solution.

The results are shown in the table below.

time / min	percentage of urea remaining		
	Tube **A**	Tube **B**	Tube **C**
0	100	100	100
5	55	99	100
10	29	98	100
15	14	96	100
20	8	95	100
25	5	92	100
30	3	90	100

(i) State how Tube **C** acts as a control for this investigation.

.....

.....[1]

(ii) Explain the difference in results between Tube **A** and Tube **B**.

.....

.....

.....

.....

.....

.....

.....[4]

[Total: 11]

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6 Various structures in the human gas exchange system are adapted in different ways to perform their specific functions.

(a) Complete the table below using a tick ✓ or cross ✗ in each box to show whether or not the structure shows the particular feature.

Two boxes have been completed for you.

	lined with cilia	reinforced with cartilage	site of gas exchange	contains smooth muscle
trachea			✗	
bronchus				
bronchiole				✓
alveolus				

[4]

(b) State the two ways in which the concentration gradients of oxygen and carbon dioxide are maintained for efficient gas exchange.

1. .....

.....

2. .....

.....[2]

(c) The alveoli in the lungs have elastic fibres in their walls.

(i) State **one** function of the elastic fibres.

.....

.....[1]

(ii) Name the medical condition caused by breakdown of the elastic fibres.

.....[1]

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(d) Cigarette smoke contains tar, a substance which has several harmful effects on **the cells** lining the gas exchange system.

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Outline three of these effects.

1. .....

.....

2. .....

.....

3. .....

.....[3]

[Total: 11]

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