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

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

8436799169

BIOLOGY **9700/22**

Paper 2 Structured Questions AS **May/June 2011**

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.
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.

For Examiner's Use	
1	
2	
3	
4	
5	
6	
Total	

This document consists of **12** printed pages and **4** blank pages.

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1 Fig. 1.1 is a photomicrograph of a root tip of onion, *Allium cepa*, showing cells in interphase and in stages of mitosis.

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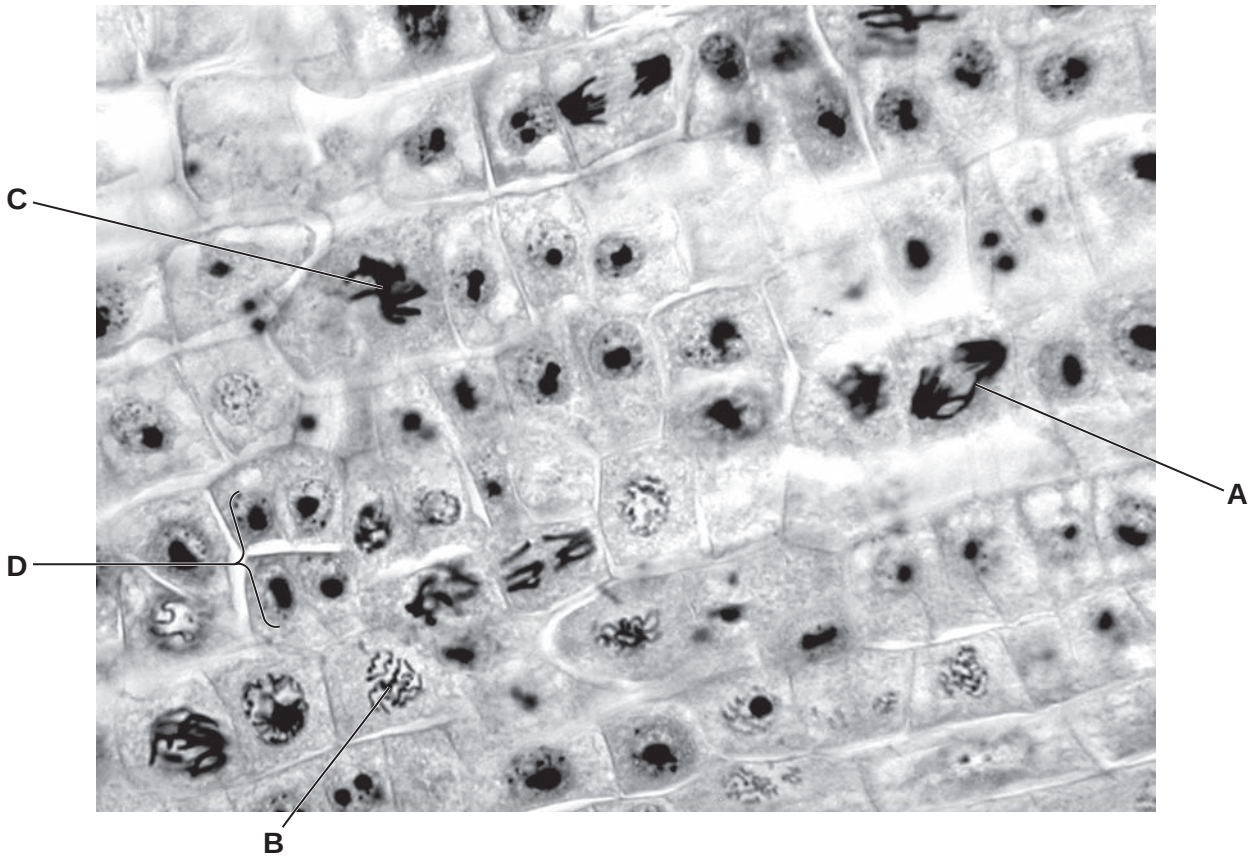


Fig. 1.1

(a) Name the stages of mitosis shown in cells **A**, **B** and **C**.

A .....

B .....

C .....[3]

(b) Suggest why the cells labelled **D** are smaller than most of the other cells in Fig. 1.1.

.....

.....

.....[1]

(c) Interphase is often described as a 'resting stage'.

Explain why the term 'resting stage' is not an appropriate description for cells in interphase.

.....

.....

.....[2]

[Total: 6]

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2 Read the passage below. Parts of the passage are in **bold type**. These are examples of ecological terms and are labelled **A** to **F**.

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A class of students carried out an ecological study of **a defined area of seashore (A)** in Brittany, France. One group decided to study a **rockpool (B)** and recorded information such as the **oxygen concentration and temperature of the seawater (C)**. After investigating **all the different living organisms (D)** present in the rockpool, the students decided to study in more detail the **group of limpets, *Patella vulgata* (E)**. They collected information about the **role of the limpets within the rockpool, including interactions with other organisms (F)**. For example, limpets grazed on green seaweeds, while the shore crab, *Carcinus maenas*, fed on small limpets.

(a) State the correct letter, **A** to **F**, from the passage above that corresponds to each of the ecological terms below.

habitat	
ecosystem	
abiotic component	
ecological niche	
population	
community	

[4]

(b) State the trophic levels to which each of the organisms named in the passage belong **and** outline the energy losses that occur in the food chain.

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.....[4]

[Total: 8]

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For Examiner's Use

3 **(a)** Explain how the structure of red blood cells is suited to their function of transporting oxygen to body tissues.

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.....

.....[3]

(b) The circulating red blood cell is metabolically active but only lives for about 120 days. During this time, some important enzymes are gradually broken down and this may contribute to the death of the cell.

Explain why the red blood cell is **not** able to replace important enzymes that have been broken down.

.....

.....

.....

.....

.....[2]

(c) Red blood cells are broken down by phagocytic cells in the liver and spleen. The haemoglobin is broken down into haem and globin before further processing. Some of the components of haemoglobin are re-used in the body.

(i) Name the mineral ion released from the breakdown of haem.

.....[1]

(ii) State the products of globin hydrolysis.

.....[1]

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Haemoglobin plays an important role in carrying oxygen and carbon dioxide.

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Fig. 3.1 summarises some of the events that occur as blood enters a capillary located in an area of actively respiring cells.

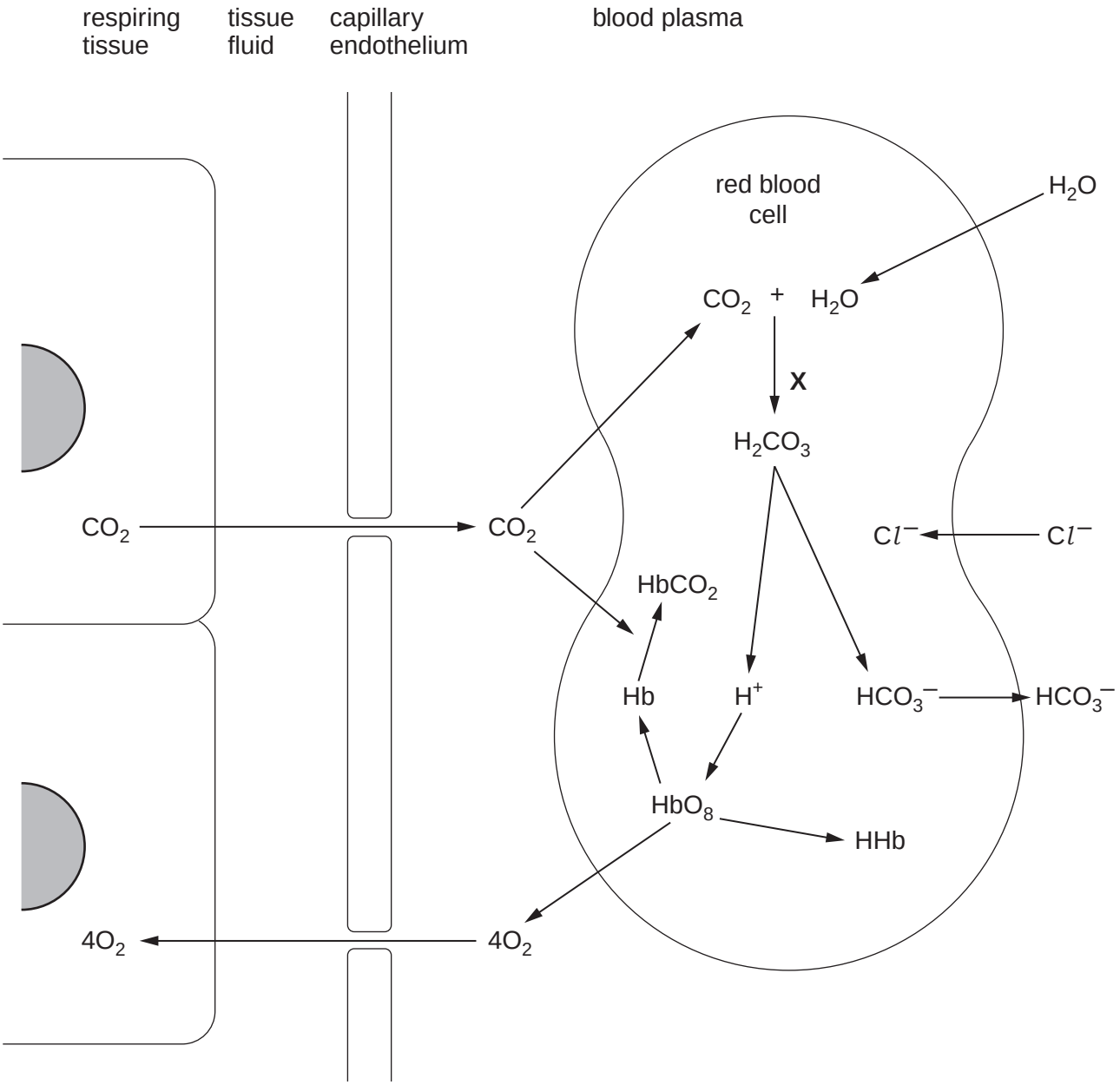


Fig. 3.1

(d) State the name of the enzyme that catalyses the reaction occurring at **X**.

.....[1]

(e) With reference to Fig. 3.1, describe **and** explain how carbon dioxide (CO_2) and hydrogen ions (H^+) play a role in the unloading of oxygen from haemoglobin.

For Examiner's Use

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.....[5]

[Total: 13]

For Examiner's Use

4 Tuberculosis (TB) is an infectious disease that kills about three million people worldwide each year.

(a) Name the pathogenic organism that causes tuberculosis.

.....[1]

Fig. 4.1 is a transmission electron micrograph of the organism that causes tuberculosis.



Fig. 4.1

(b) (i) The actual length of the cell between **X** and **Y** in Fig. 3.1 is 2 µm.

Calculate the magnification of the electron micrograph.

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

magnification × .....[2]

(ii) The organism that causes tuberculosis is a prokaryote. State three features of prokaryotes.

1. .....

2. .....

3. .....[3]

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In the 1940s, the use of antibiotics led to a steady decrease in the number of new cases of tuberculosis. However, in many developed countries, the number of new cases stopped decreasing in the mid-1980s and is now increasing.

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(c) (i) State **one** factor, other than drug therapy, that contributed to the **steady decrease** in the number of new cases of tuberculosis.

.....[1]

(ii) Outline three reasons why, in many developed countries, the number of new cases of tuberculosis is now increasing.

1. .....

.....

2. .....

.....

3. .....

.....[3]

(d) Streptomycin was the first antibiotic to be discovered that was effective against the pathogen that causes tuberculosis. Streptomycin causes the death of the pathogen by binding to ribosomes and inhibiting protein synthesis.

(i) Suggest two ways in which streptomycin acts at ribosomes to inhibit protein synthesis.

1. .....

.....

.....

2. .....

.....

.....[2]

(ii) Streptomycin does not harm mammalian cells.

Suggest an explanation for this.

.....

.....[1]

[Total: 13]

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5 **(a)** Fig. 5.1 represents a molecule of a triglyceride.

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Name the components **A** and **C** and name the bond **B**.

Write your answers on the dotted lines provided in Fig. 5.1.

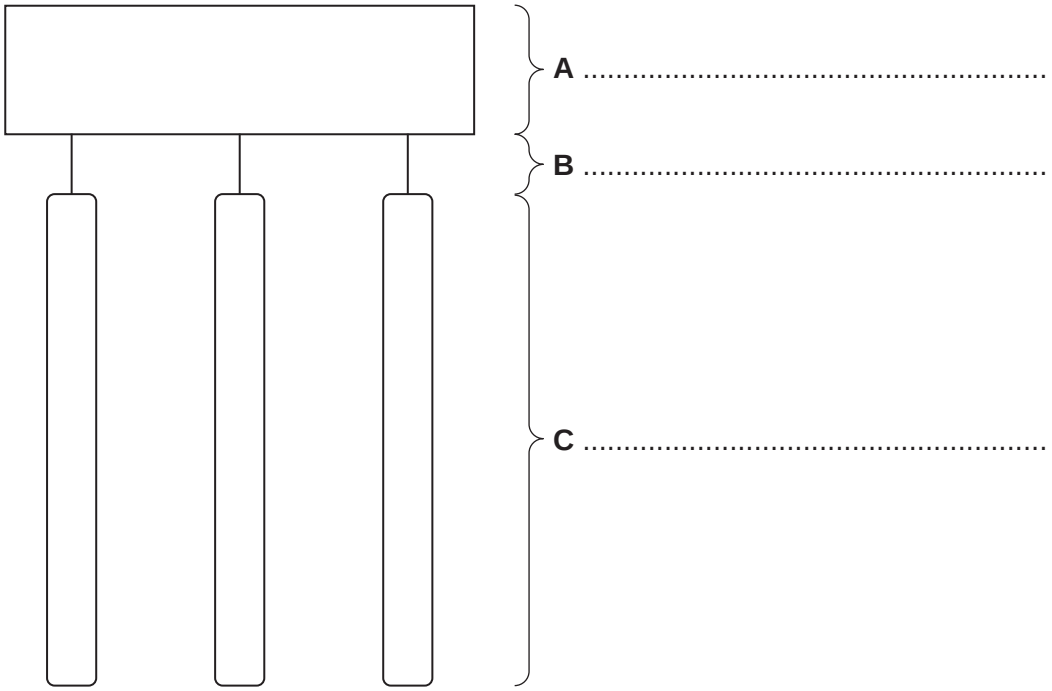


Fig. 5.1 [3]

(b) A phospholipid is sometimes described as a modified triglyceride.

(i) State how the structure of a phospholipid differs from a triglyceride.

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.....[2]

(ii) Explain how a phospholipid is suited to its role in cell membranes.

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.....[3]

A student carried out an investigation into the digestion of triglycerides using lipase.

For Examiner's Use

Ten cm^3 of olive oil, adjusted to pH 8.0, was added to a test-tube, which was then put in a water bath at 37 °C for ten minutes.

One cm^3 of lipase solution was incubated at the same temperature in a separate test-tube before being added to the olive oil.

The initial pH of the reaction mixture was measured using a pH meter. The pH was recorded at five minute intervals for 60 minutes.

(c) Suggest why the olive oil was adjusted to pH 8.0 before the lipase was added.

.....[1]

(d) Fig. 5.2 shows the results of the investigation.

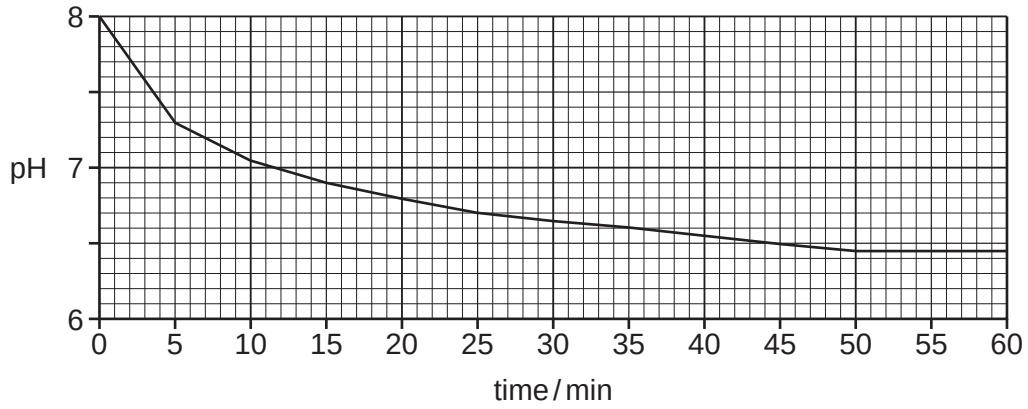


Fig. 5.2

With reference to Fig. 5.2,

For Examiner's Use

(i) describe the results of the investigation

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.....[2]

(ii) explain the results of the investigation.

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.....[4]

[Total: 15]

For Examiner's Use

6 Leaves of tobacco plants, *Nicotiana spp*, have a high concentration of nicotine, the addictive component of tobacco smoke. Scientists are continually seeking ways to produce tobacco plants that have reduced nicotine content.

(a) Describe **and** explain the effects of nicotine on the cardiovascular system that can contribute to a person developing **coronary heart disease**.

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.....[4]

(b) The production of low-nicotine cigarettes and cigars is considered a strategy that may reduce the harmful effects of smoking.

Explain whether or not you agree with this statement.

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.....[1]

[Total: 5]

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Fig. 4.1 Pasieka/Science Photo Library

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