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

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

5197508294

BIOLOGY **9700/23**

Paper 2 Structured Questions AS **May/June 2012**

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 **13** printed pages and **3** blank pages.

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1 Fig. 1.1 is an electron micrograph of a cross section through a blood vessel.

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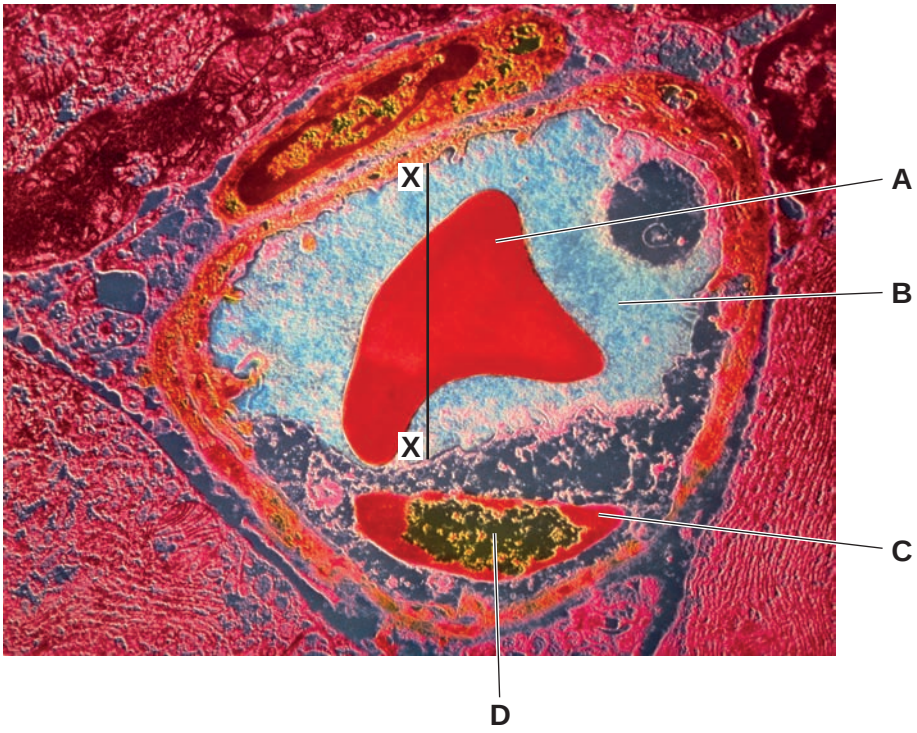


Fig. 1.1

(a) Name the type of blood vessel shown in Fig. 1.1 and describe one **visible** feature which is characteristic of this type of vessel.

type of vessel .....

characteristic feature .....

..... [2]

(b) Name:

(i) structure **A** .....

(ii) the main component of substance **B**. ..... [2]

(iii) Cell **C** in Fig. 1.1 is an endothelial cell.

Name structure **D**.

..... [1]

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(c) The magnification of Fig. 1.1 is × 6000.

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Calculate the diameter of the lumen along the line **X**–**X**.

Show your working and give your answer in micrometres (μm) to the nearest whole number.

answer ..... μm [2]

[Total: 7]

2 Fig. 2.1 shows an apparatus used to measure the rate of water uptake by leafy parts of plants.

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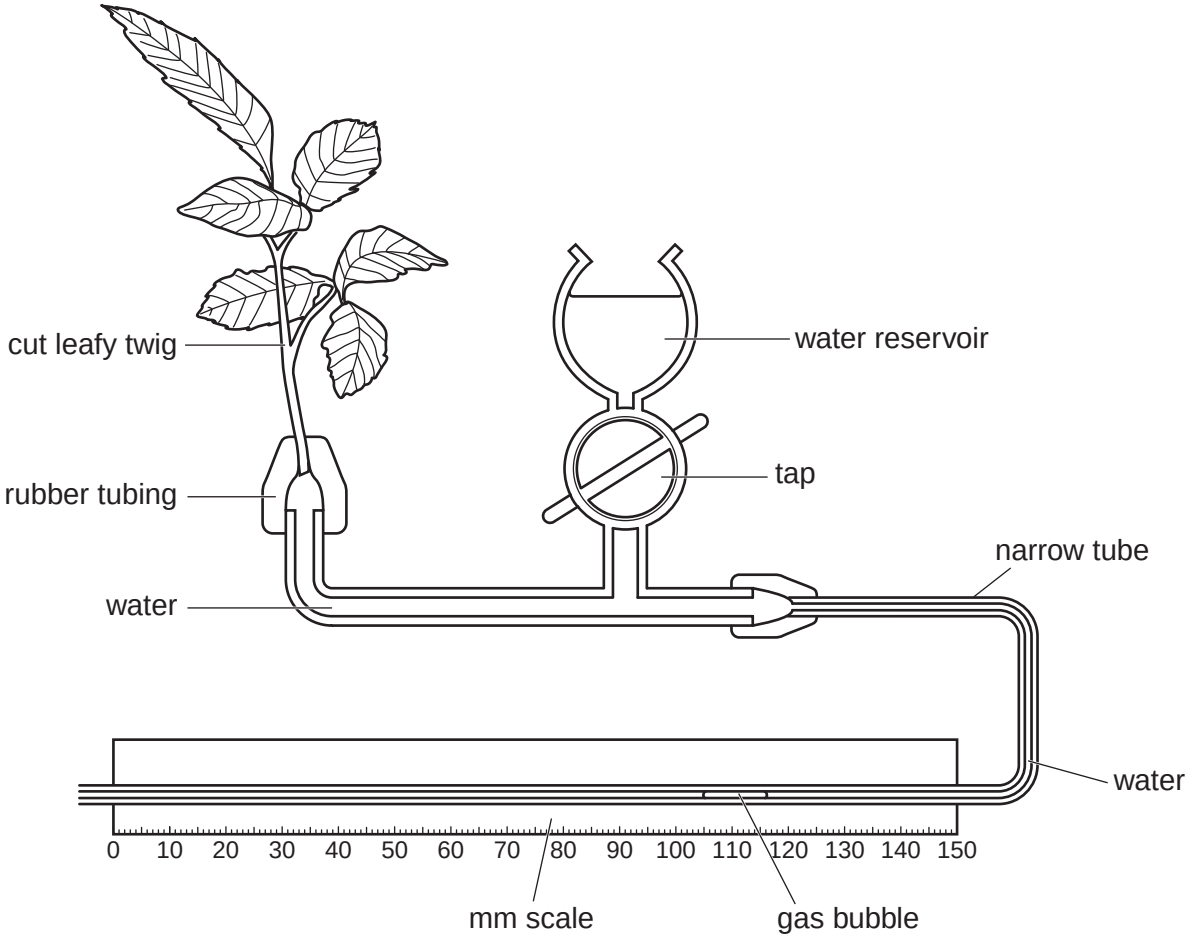


Fig. 2.1

(a) State the name of this apparatus.

.....[1]

(b) Explain why the rate of water uptake by the leafy part of the plant shown in Fig. 2.1 will **not** be the same as the rate of transpiration.

.....

.....

.....

.....[2]

(c) Using the apparatus as shown in Fig. 2.1, the rate of water uptake at 25 °C was found to be greater than at 20 °C.

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(i) Explain the effect of increasing the temperature on the rate of water uptake.

.....

.....

.....

.....

.....

.....[3]

(ii) State two environmental conditions, **other than temperature**, which will affect the rate of water uptake of a leafy twig as shown in Fig. 2.1.

1. .....

2. .....[2]

(d) Transpiration is sometimes described as an 'inevitable consequence of gas exchange' in plants.

Explain this statement.

.....

.....

.....

.....

.....

.....[3]

[Total: 11]

For Examiner's Use

3 Cholera is a disease caused by the bacterium *Vibrio cholerae*. The disease symptoms are caused by a toxin, produced by the bacterium, interacting with proteins in the cell surface membranes of epithelial cells in the human intestine.

The cholera toxin is a protein and is composed of two subunits, **A** and **B**. Subunit **A** is made from one polypeptide and subunit **B** is made from five identical polypeptides.

Fig. 3.1 shows the structure of the cholera toxin.

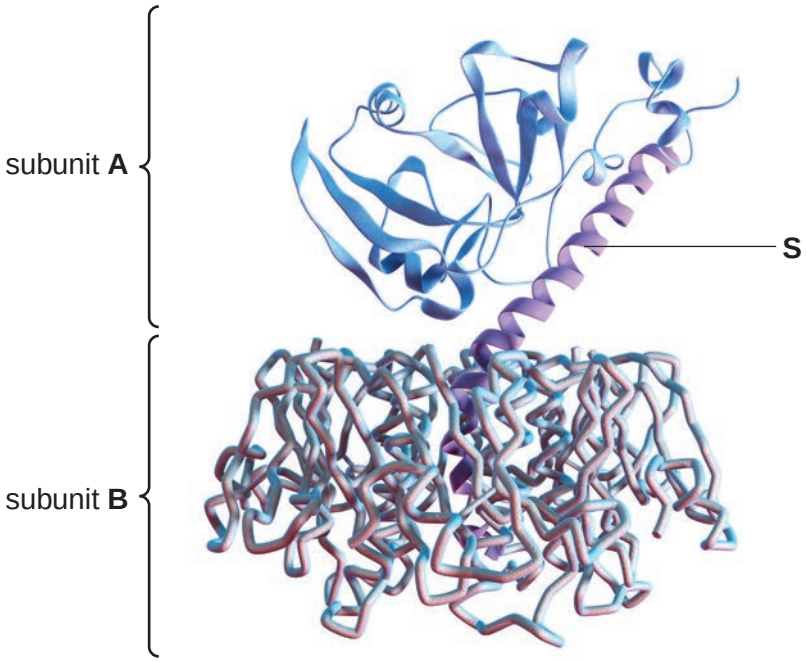


Fig. 3.1

(a) Name:

(i) the level of structure that is only shown by a protein that has more than one polypeptide chain

.....[1]

(ii) the part labelled **S**.

.....[1]

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The cholera toxin interacts with ion channels in the epithelial membranes, resulting in watery diarrhoea.

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These channels open, allowing ions to move from the epithelial cells into the lumen of the intestine.

(b) (i) Name the process by which the ions move in this case.

.....[1]

(ii) Due to the movement of ions into the lumen, water moves from the epithelial cells into the lumen.

Name the process by which water moves and explain why it moves into the lumen.

name .....

explanation .....

.....

.....

.....[3]

Large outbreaks of cholera are often associated with natural disasters. For example, following an earthquake in Pakistan in 2005, an estimated 20 000 cholera cases were reported in the vicinity, compared to approximately 1000 cases in the rest of the country.

(c) (i) Describe the mode of transmission of cholera.

.....

.....

.....

.....

.....[2]

(ii) Explain how natural disasters can sometimes result in transmission to more individuals.

.....

.....

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.....[2]

[Total: 10]

For Examiner's Use

4 The two strands of a DNA molecule are held together by hydrogen bonds between complementary base pairs.

(a) Explain why the hydrogen bonding between the two strands of DNA is important for it to carry out its functions.

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..... [4]

Switching genes on and off allows proteins to be synthesised only when required.

Processes **P** and **Q** occur when a gene is switched on, as shown in Fig. 4.1.



Fig. 4.1

(b) Name processes **P** and **Q**.

P .....

Q ..... [1]

DNA is a very stable molecule. This means that it is not broken down either chemically or by enzymes during the normal life of the cell.

In contrast, mRNA is described as being highly labile. This means that most mRNA molecules are broken down in the cytoplasm within a few hours of their release from the nucleus.

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(c) Suggest the significance of:

(i) DNA being very stable

.....

.....

..... [2]

(ii) mRNA being highly labile.

.....

.....

..... [2]

[Total: 9]

5 Malaria is a disease caused by the parasite, *Plasmodium*. The parasite has a complex life-cycle, part of which involves development within the gut of the female mosquito which is responsible for the transmission of the disease.

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Fig. 5.1 shows part of the life-cycle of the malarial parasite.

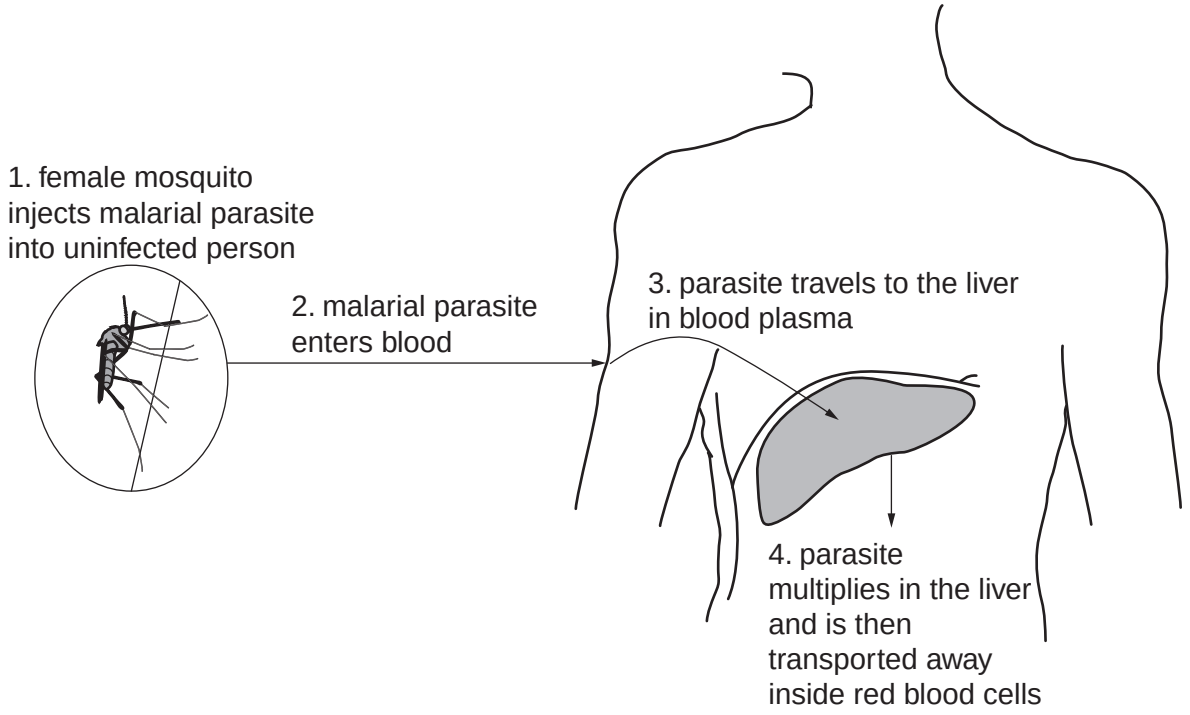


Fig. 5.1

Research has been directed towards the development of a malarial vaccine. Much of this research relies on the fact that *Plasmodium* has different forms in its life cycle.

During trials of a malarial vaccine, the parasites were killed using radioactivity and then injected into volunteers. This method provided some protection against malaria.

(a) Explain why the parasites were killed using radioactivity and not by using high temperatures.

.....

.....

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..... [3]

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(b) With reference to Fig. 5.1, explain why the researchers decided to use the form of the parasite which is injected by mosquitoes and not the form which leaves the liver.

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.....[3]

(c) The volunteers who were injected with the killed parasites produced antibodies, which provided some protection against the disease.

Outline the events that occur following injection of the parasites, which lead to the production of antibodies.

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.....[5]

[Total: 11]

6 Read the following passage.

For Examiner's Use

> Catfish are a commercially important species of freshwater fish used as a human food source. In the wild, catfish are found in all types of large freshwater habitats, such as rivers, lakes and reservoirs. In North America, they are often maintained in catfish ponds, which are artificially constructed habitats. Each pond functions as a self-sustaining ecosystem with its own community of organisms. Catfish feed on living and dead fish, amphibians, insects and even dead mammals found on the bottom of the pond. Different species of phytoplankton are always present in these ponds. They are small organisms found suspended in the water and they are essential for the growth of all the other pond organisms.

(a) With reference to the passage:

(i) state the meaning of the terms *habitat* and *community*

habitat

.....

.....

.....

community

.....

.....

.....[4]

(ii) name the producer in the pond ecosystem

.....[1]

(iii) describe the features of producers.

.....

.....

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.....

.....[3]

For Examiner's Use

(b) Studies on the energy efficiency of raising catfish in ponds have shown that only 15–20% of the energy taken in by the catfish population in their food is used to increase their total biomass.

(i) Explain why only some of the energy taken in by the catfish is used to increase biomass.

.....

.....

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.....

.....[3]

(ii) In the wild, only about 10% of the energy taken in by the catfish in their food is used to increase biomass.

Suggest why this percentage is lower in the wild than in the pond.

.....

.....

.....[1]

[Total: 12]

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