

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

CANDIDATE NAME		
CENTRE NUMBER	CANDIDATE NUMBER	

619404481

BIOLOGY 9700/22

Paper 2 Structured Questions AS

October/November 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 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 Exam	iner's Use
1	
2	
3	
4	
5	
6	
Total	

This document consists of 11 printed pages and 1 blank page.



# Answer all the questions.

For Examiner's Use

1 Fig. 1.1 is a scanning electron micrograph of part of the wall of the bronchus of a healthy human.

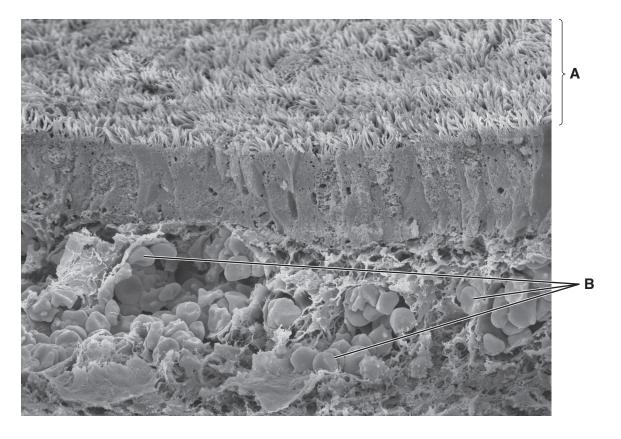


Fig. 1.1

(a)	(i)	Name the structures labelled <b>A</b> .	
			[1]
	(ii)	State the function of the cells labelled <b>B</b> .	
			[1]
(b)	Nar	me two tissues found in the wall of the bronchus that are not visible in Fig. 1.1.	
	1		
	2		[2]

Chronic bronchitis is one of the conditions that contributes to chronic obstructive pulmonary

disease (COPD). (c) State the name of the other condition that contributes to COPD. .....[1] (d) Describe the appearance of a section through the wall of a bronchus in a person with chronic bronchitis. .....[4] (e) Suggest why a person with chronic bronchitis is more likely than a healthy person to suffer from infectious diseases of the gas exchange system. [Total: 11]

For Examiner's Use

For Examiner's Use

2

	White blood cells play an important role in defence.			
		State precisely the type of white blood cell that fits each of the descriptions given in i) to (iv).		
	(i) It is formed in the bone marrow and matures from a monocyte. It conta lysosomes with hydrolytic enzymes.			
		[1]		
	(ii)	It is formed, and matures in, the bone marrow. It contains a lobed nucleus and has the ability to ingest microorganisms by endocytosis.		
		[1]		
	(iii)	When activated, it differentiates into a cell that secretes a chemical, which causes other cells to lyse (burst). It contains a large, spherical nucleus.		
		[1]		
	(iv)	It is formed as a result of a primary immune response and remains in the body. On activation, it has the potential to produce antibodies during a secondary immune response.		
		[1]		
(b)	erac	980, it was announced that the highly infectious viral disease, smallpox, had been dicated. This was mainly due to a worldwide vaccination programme planned by the did Health Organization (WHO).		
(b)	erad Wor	dicated. This was mainly due to a worldwide vaccination programme planned by the		
(b)	erad Wor	dicated. This was mainly due to a worldwide vaccination programme planned by the rid Health Organization (WHO).  Important have been made to control other diseases, such as measles, sickle cell emia and cholera, without the same success as smallpox.		
(b)	erad Wor Atte	dicated. This was mainly due to a worldwide vaccination programme planned by the rid Health Organization (WHO).  Important have been made to control other diseases, such as measles, sickle cell emia and cholera, without the same success as smallpox.		
(b)	erad Wor Atte	dicated. This was mainly due to a worldwide vaccination programme planned by the rid Health Organization (WHO).  Important have been made to control other diseases, such as measles, sickle cell emia and cholera, without the same success as smallpox.		
(b)	erad Wor Atte	dicated. This was mainly due to a worldwide vaccination programme planned by the rid Health Organization (WHO).  Important have been made to control other diseases, such as measles, sickle cell emia and cholera, without the same success as smallpox.		
(b)	erad Wor Atte	dicated. This was mainly due to a worldwide vaccination programme planned by the rid Health Organization (WHO).  Important have been made to control other diseases, such as measles, sickle cell emia and cholera, without the same success as smallpox.		

)	Describe two features of the vaccine that contributed to the success of the smallpox eradication programme.	Fo. Exami
	1	
	2	
	F-0.3	
	[2]	
	Discuss the reasons why vaccination has <b>not</b> eradicated cholera <b>and</b> sickle cell anaemia.	
	cholera	
	sickle cell anaemia	
	[5]	
	[Total: 13]	

[Turn over © UCLES 2011 9700/22/O/N/11

For Examiner's Use

3

One feature	r vinelandii is a bacterium found in the soil that is able to fix atmospheric nitrogen. of nitrogen-fixing bacteria is the ability to synthesise the enzyme nitrogenase, a m- and iron-containing, protein complex.
ioı	olybdenum is a mineral ion found in the soil solution. It enters the cell as molybdatens, through membrane transport proteins. The proteins have the ability to bind to, and hydrolyse, ATP.
Na	ame <b>and</b> describe the mechanism of transport of molybdate ions into the cell.
•••	
	[3]
(ii) St	ate the structures in the bacterial cell where the protein components of trogenase are synthesised.
	[1]
	art of the equation for the reaction that is catalysed by nitrogenase in <i>A. vinelandii</i> shown below.
Co	omplete the equation by naming the product of the reaction.
atmo	ospheric nitrogen ( $N_2$ ) $\xrightarrow{\text{nitrogenase}}$ ATP and hydrogen  [1]

**(b)** Table 3.1 shows the various types of nitrogen fixation that occur throughout the world and gives estimates of the mass of atmospheric nitrogen fixed in a year.

For Examiner's Use

### Table 3.1

type of nitrogen fixation		mass of nitrogen fixed / ×10 <sup>9</sup> kg yr <sup>-1</sup>
	Haber process	50
non-biological	combustion	20
	lightning	10
	agricultural land	90
biological	non-agricultural land	50
	sea	35

			agricultural land	90	
biological		I	non-agricultural land	50	
			sea	35	
(	(i)			e percentage of nitrogen fixation carried on such as A. vinelandii, in agricultural lan	
		Show your w	orking and express your a	nswer to the nearest whole number.	
				answer%	[2]
(	ii)			n gas in the atmosphere remains stable loves nitrogen gas from the atmosphere.	at
					[2]
			olain the benefits to human Indii, in agricultural land.	s of the presence of nitrogen-fixing bacter	ia,
					•••
,					
					[3]

[Total: 12]

**4** (a) Fig. 4.1 shows the structure of deoxyribose sugar.

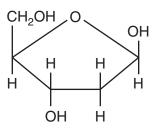


Fig. 4.1

State the differences between the structure of deoxyribose shown in Fig. 4.1 and the ring structure of  $\alpha$ -glucose.

ou may use the space below to help you in your answer.	
	• • • • • • • • • • • • • • • • • • • •

[3]

For Examiner's Use

**(b)** Match the biological macromolecule with the type of bond that is formed when the molecule is synthesised. Choose from the list below.

amylose cellulose triglyceride protein amylopectin mRNA

type of bond(s)	biological macromolecule
β,1-4 glycosidic	
$\alpha$ , 1-4 glycosidic <b>and</b> $\alpha$ , 1-6 glycosidic	
phosphodiester	
peptide	

[4]

Semi-conservative replication of DNA and transcription involve the formation of polynucleoti	de
chains.	

For Examiner's Use

(c)	State the type of reaction that occurs in the formation of a polynucleotide chain.
	[1

(d) Complete Table 4.1 to show four differences between DNA replication and DNA transcription.

Table 4.1

	replication	transcription
1		
2		
3		
4		

[4]

[Total: 12]

5 In 1954, an article was published in the British Medical Journal entitled, *The mortality of doctors in relation to their smoking habits*.

For Examiner's Use

One aspect of the investigation studied a very large number of male doctors in the UK aged 35 years and older. A survey established the quantity of tobacco smoked per day.

Twenty-nine months later, the cause of any deaths in the study group was recorded.

Table 5.1 summarises the results obtained.

Table 5.1

	number of deaths	death rate per year per 1000 men in the study			
cause of death		non- smokers			tobacco smoked / g day <sup>-1</sup>
			1–14	15–24	25 and above
coronary thrombosis (heart attack)	235	3.89	3.91	4.71	5.15
other cardiovascular diseases	126	2.23	2.07	1.58	2.78
lung cancer	36	0.00	0.48	0.67	1.14
other diseases of the gas exchange system	54	0.86	0.88	1.01	0.77

(a)	State which group in the study is most at risk from dying of lung cancer.					
	[1]					
(b)	Using information from Table 5.1 to support your answer, discuss the evidence linking tobacco smoking to disease and early death.					
	[4]					

[Total: 5]

**6** Fig. 6.1 shows a phloem sieve tube element, its companion cell and a mesophyll cell in the leaf of a photosynthesising plant.

For Examiner's Use

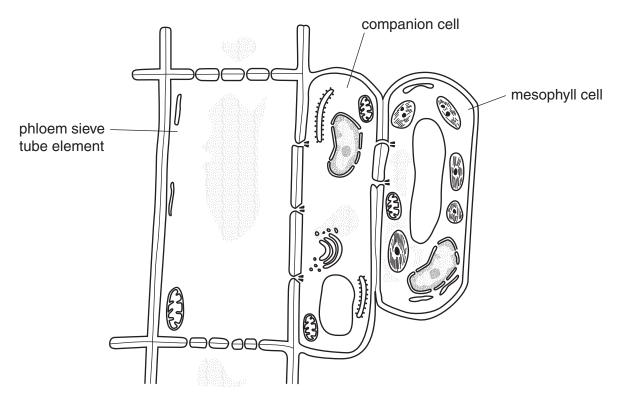


Fig. 6.1

- (a) Use label lines and the letters C to E to identify the following on Fig. 6.1.
  - C a structure involved in ribosome synthesis
  - **D** an organelle that is involved in the modification and packaging of proteins
  - **E** an organelle that is involved in aerobic respiration

[3]

**(b)** The concentration of sucrose in the sap of the phloem sieve tube element is much higher than in the cytoplasm of the photosynthesising cell.

Describe <b>and</b> explain how sucrose is transported from the photosynthesising cell to the phloem sieve tube element.

[Total: 7]

### **BLANK PAGE**

Copyright Acknowledgements:

Question 1, Fig. 1.1 © STEVE GSCHMEISSNER/SCIENCE PHOTO LIBRARY

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

University of Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.