

OXFORD CAMBRIDGE AND RSA EXAMINATIONS Advanced Subsidiary GCE

HUMAN BIOLOGY

2858/01

Case Studies

Monday 10 JANUARY 2005 Morning 45 minutes

Candidates answer on the question paper.
Additional materials:
Electronic calculator
Ruler (cm/mm)

Candidate Name	Centre Number	Candidate Number

TIME 45 minutes

INSTRUCTIONS TO CANDIDATES

- Write your name in the space above.
- Write your Centre number and Candidate number in the boxes above.
- Answer all the questions.
- Write your answers, in blue or black ink, in the spaces provided on the question paper.
- Read each question carefully before starting your answer.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.

FOR EXAMINER'S USE		
Qu.	Max.	Mark
1	23	
2	22	
TOTAL	45	

This question paper consists of 10 printed pages, 2 blank pages and an insert.

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Answer all the questions.

This question is based on the article 'THE GASEOUS EXCHANGE SYSTEM AND INFLUENZA' (Case Study 1) .

1 Fig. 1.3 shows a transverse section through a part of the trachea and some of the surrounding tissues.

A diagram has been removed due to third party copyright restrictions

Details:

A diagram showing a transverse section through part of the trachea and some of the surrounding tissues

Fig. 1.3

(a) (i)	Explain what is meant by the term tissue.
	[2]
(ii)	Identify the tissues labelled R and S in Fig. 1.3.
	R
	S [2]
(iii)	Describe the role of cell P in the gaseous exchange system.
	[2]

(b) Haemagglutination refers to the clumping together of red blood cells. The haemagglutinin protein on the influenza virus will clump red blood cells. Red blood cells with a specific antigen will also clump together in the presence of the corresponding antibody. This is the basis of blood grouping.

Complete Table 1.1 by filling in the correct antigens or antibodies for the ABO blood group system.

Table 1.1

blood group	red blood cell ABO antigens	plasma ABO antibodies
A	А	
В	В	
		none
	none	

(c)	inwards and the virus enters the cell en	e cell surface membrane, the membrane fold nclosed in a membrane-bound vesicle. This anism by which substances can enter cells.	
	State three processes, other than endo	ocytosis, by which substances can enter cells	3.
	1		
	2		
	3	[3]
(d)	The viral RNA enters the nuclei of the ce	ells lining the trachea.	
	(i) State how the RNA enters the nucle	eus of a cell.	
	(ii) State two differences between the s	structure of RNA and DNA.	1]
	RNA	DNA	
	1		
	2		
			2]

(e)	You were told in the case study that, following endocytosis, the pH in the vesicle containing the virus particle is lowered and that this changes the structure of the protein called haemagglutinin.
	Explain how a lowering of the pH could result in a change in the structure of the haemagglutinin protein.
	[2]
	[4]
(f)	The two viral envelope proteins, HA and NA, are synthesised on the ribosomes of the rough endoplasmic reticulum. The two proteins are then packaged and transported to the cell surface membrane.
	State the organelle responsible for the packaging of the two viral proteins.
	[1]
(g)	Neuraminidase inhibitors (NIs) have been shown to reduce the severity and duration of the symptoms of 'flu and can prevent the spread of this virus.
	Describe ways in which the neuraminidase inhibitors may prevent the spread of the virus.
	[4]
	[Total: 23]

[Total: 23]

This question is based on the article 'PNEUMOCOCCAL INFECTION' (Case Study 2).

Pneumococcal disease is caused by the bacterium *Streptococcus pneumoniae*. The structure of this bacterium is similar to that of other prokaryotic cells.

2 (a) State **three** differences between the **structure** of a prokaryote such as *Streptococcus pneumoniae* and a eukaryotic human cell.

prokaryote	eukaryote
1	
2	
3	

	[3]
(b)	In the case study, Sheila says that individuals are at a greater risk if they already have a weakened immune system.
	Suggest how the immune system may be 'already weakened'.
	[2]

(c)	In a report published in 2001, 19 000 patients were hospitalised due to pneumococcal pneumonia. The mortality rate was 21%.
	Calculate how many patients died from pneumococcal pneumonia in 2001. Show your working.
	Answer = [2]
(d)	The pneumococcal vaccine discussed in the interview was described as a 23-valent pneumococcal polysaccharide vaccine (PPV).
	Describe how polysaccharides are produced from monosaccharides such as glucose.
	[41]
(e)	In the case study, Sheila suggests that immunity to one strain of <i>Streptococcus pneumoniae</i> would not provide immunity to all possible strains.
	Explain why the presence of antibodies against one strain of <i>Streptococcus</i> pneumoniae would not provide immunity to other strains.
	[3]

(f)	In the interview, Sheila suggests that kidney disease may lead to a decline in antibody levels. One type of kidney disease known as nephrotic syndrome can lead to a loss of plasma proteins into the urine.
	Suggest why a loss of plasma proteins may be associated with a reduction in antibody levels.
	[11]
	[1]
(g)	Like the tuberculosis (TB) bacterium, Streptococcus pneumoniae infects the lungs.
	Explain how <i>S. pneumoniae</i> may be spread amongst the residents of the care home and their relatives and suggest the precautions which should be taken to prevent this occurring.

[7]
[/]
[Total: 22]

END OF QUESTION PAPER

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