

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

BIOLOGY 9700/01

Paper 1 Multiple Choice May/June 2009

1 hour

Additional Materials: Multiple Choice Answer Sheet

Soft clean eraser

Soft pencil (type B or HB is recommended)

#### **READ THESE INSTRUCTIONS FIRST**

Write in soft pencil.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.

Choose the one you consider correct and record your choice in soft pencil on the separate Answer Sheet.

#### Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer. Any rough working should be done in this booklet.

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1 What are the appropriate units for measuring diameters of alveoli, diameters of white blood cells and the width of cell walls?

	diameters of alveoli	diameters of white blood cells	width of cell walls
Α	mm	μ <b>m</b>	μm
В	μ <b>m</b>	mm	μm
С	μ <b>m</b>	μ <b>m</b>	nm
D	mm	mm	nm

- 2 Cells which do not have nucleoli die because they do not have
  - A centrioles and cannot divide.
  - **B** mitochondria and cannot release energy.
  - **C** mRNA and cannot transcribe DNA.
  - **D** ribosomes and cannot synthesise protein.
- **3** What describes the features of an electron microscope?

	maximum magnification	resolution/nm	specimen
Α	$2.5 \times 10^3$	$2.5 \times 10^{2}$	dead
В	$2.5 \times 10^{4}$	$5.0 \times 10^{-1}$	living
С	$2.5 \times 10^5$	$5.0 \times 10^{-1}$	dead
D	5.0 × 10 <sup>5</sup>	$2.5\times10^2$	living

**4** A plan diagram is made of a transverse section of a leaf.

Which features should be seen in the diagram?

- 1 the overall distribution of tissues
- 2 the relative thicknesses of the tissue layers
- 3 those cells which contain chloroplasts
- **A** 1 and 2 only **B** 1 and 3 only **C** 2 and 3 only **D** 1, 2 and 3

5 The table shows some of the structural features present or absent in four different cell types.

Which identifies the cell type for each column of features?

key

√ = feature present

**x** = feature absent

cell wall	✓	✓	x	1
centrioles	X	X	✓	x
chloroplast	✓	X	X	x
Golgi apparatus	✓	✓	✓	x
large vacuole	✓	✓	X	x
Α	ciliated epithelial cell	prokaryotic cell	root cortex cell	spongy mesophyll cell
В	root cortex cell	spongy mesophyll cell	prokaryotic cell	ciliated epithelial cell
С	prokaryotic cell	ciliated epithelial cell	spongy mesophyll cell	root cortex cell
D	spongy mesophyll cell	root cortex cell	ciliated epithelial cell	prokaryotic cell

**6** Which types of bonds maintain the tertiary structure of a protein molecule?

	disulfide	hydrogen	ionic	peptide
Α	✓	✓	✓	X
В	X	✓	✓	x
С	X	✓	X	✓
D	✓	X	X	✓

- 7 What is the general formula for starch?

  - **A**  $(C_5H_{10}O_5)_n$  **B**  $(C_5H_{10}O_6)_n$  **C**  $(C_6H_{10}O_5)_n$  **D**  $(C_6H_{12}O_6)_n$

8 The hexose sugar molecule in the diagram has its six carbon atoms numbered.

Which carbon atoms join by glycosidic bonds to form amylose and amylopectin?

	amylose	amylopectin	
Α	1 to 4	1 to 4 and 1 to 6	
В	1 to 6	1 to 4 and 1 to 6	
С	1 to 4 and 1 to 6	1 to 4	
D	1 to 4 and 1 to 6	1 to 6	

- **9** Which statement about triglycerides is correct?
  - A They are made up of three fatty acids combined with glycogen.
  - **B** They are more saturated with hydrogen compared with phospholipids.
  - **C** They form a bilayer in the membranes of cells.
  - **D** They have a lower ratio of oxygen to carbon compared with carbohydrates.
- 10 When a peptide bond is formed, which statement is correct?
  - **A** One amino acid loses a hydroxyl group from its amine group.
  - **B** One amino acid loses a hydroxyl group from its carboxyl group.
  - **C** Both amino acids lose a hydrogen atom from their amine group.
  - **D** Both amino acids lose a hydrogen atom from their carboxyl group.
- 11 Which sequence correctly identifies the change in colours during the Benedict's test?
  - **A** blue  $\rightarrow$  brown  $\rightarrow$  red  $\rightarrow$  green  $\rightarrow$  yellow
  - **B** blue  $\rightarrow$  green  $\rightarrow$  yellow  $\rightarrow$  brown  $\rightarrow$  red
  - **C** blue  $\rightarrow$  red  $\rightarrow$  green  $\rightarrow$  yellow  $\rightarrow$  brown
  - **D** blue  $\rightarrow$  yellow  $\rightarrow$  brown  $\rightarrow$  red  $\rightarrow$  green

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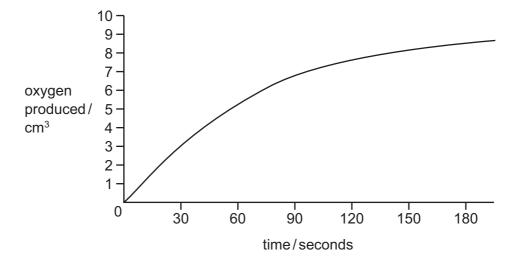
12 Lactose is a disaccharide present in the milk of mammals.

How will a baby mammal benefit from having this sugar, instead of a monosaccharide, in the milk?

- A Condensation of disaccharides enables rapid production of glycogen.
- **B** Disaccharides can be transported across membranes for more rapid absorption.
- C Disaccharides have a higher energy value than triglycerides.
- **D** Hydrolysis of the glycosidic bond gives a gradual release of monosaccharide.
- 13 When investigating the rate of reaction of the enzyme lipase on the hydrolysis of triglycerides, the pH must be maintained at an optimum to prevent the lipase denaturing.

What is the reason for this?

- **A** The addition of water molecules produced by hydrolysis increases pH.
- **B** The products of hydrolysis decrease the pH.
- **C** The products of hydrolysis increase the pH.
- **D** The removal of water molecules used in hydrolysis decreases pH.
- **14** Catalase was added to hydrogen peroxide solution. The volume of oxygen produced was measured at intervals. The results are shown on the graph.



What was the initial rate of reaction?

- **A**  $0.05\,\mathrm{cm}^3\,\mathrm{s}^{-1}$
- **B**  $0.10\,\mathrm{cm}^3\,\mathrm{s}^{-1}$
- **C**  $1.00 \, \text{cm}^3 \, \text{s}^{-1}$
- **D**  $10.0 \,\mathrm{cm}^3 \,\mathrm{s}^{-1}$

								O				
15	Sor	ne viruse	es are ab	le t	o bind to th	e cell	sur	face membrar	ne befo	ore entering	the host of	cell.
	Wh	ich sequ	ence of e	eve	nts will lead	l to a v	/iru:	s invading a c	ell?			
	Α	binding	to a cho	lest	erol moleci	ule, fol	low	ed by endocy	tosis			
	В	binding	to a glyc	opr	otein recep	tor, fo	llov	ved by exocyto	osis			
	С	binding	to a prot	ein	receptor, for	ollowe	d b	y endocytosis				
	D	binding	to the hy	/drc	philic porti	on of a	a ph	ospholipid, fo	llowed	by exocyto	sis	
16	Wh	ich state	ment abo	out	the fluid mo	osaic r	nod	lel of membra	ne stru	ıcture is cor	rect?	
	Α	The les	s unsatu	rate	ed the fatty	acid ta	ails	of the phosph	olipid,	the more fl	uid the me	mbrane.
	В	The mo	re unsat	urat	ted the fatty	acid	tails	s of the phosp	holipid	, the more	fluid the m	embrane
	С	The hig	her the to	emp	perature, th	e less	flui	d the membra	ine.			
	D	The low	er the te	mp	erature, the	more	flu	id the membra	ane.			
17	Wh	ich pair d	of factors	is is i	inversely pr	oporti	ona	ıl to the rate o	f diffus	ion?		
	Α	·				•		over which d				
	В		•					d size of diffus				
	С							ition gradient				
	D		_					s and distance	over \	which diffus	sion occurs	3
18	For	organisi	ms undei	rgoi	ng sexual r	eprod	ucti	on, a reductio	n divis	ion occurs	before fer	ilisation.
	Wh	ich reaso	ons expla	ain v	why this is i	neces	sary	/?				
		1	increas	e g	enetic varia	tion						
		2	prevent	do	ubling of th	e chro	mo	some number	•			
		3	reduce	the	chances o	f muta	tior	1				
	Α	1 only		В	2 only		С	2 and 3 only	D	1, 2 and 3	}	
19	Col	chicine is	s a chem	nica	I that stops	chron	natio	ds from separ	ating d	luring mitos	is.	
	Wh	ich phas	e will the	ce	ll reach and	then	sto	p dividing?				
	Α	anapha	se									
	В	metaph										
	С	prophas	se									

**D** telophase

20 In the DNA sequence for sickle cell anaemia, adenine replaces thymine in a CTT triplet, forming the triplet CAT. During synthesis of the sickle cell haemoglobin molecule, the amino acid valine is incorporated instead of glutamic acid.

What is the anticodon in the transfer RNA molecule carrying this valine?

A CAU

**B** CUA

C GAU

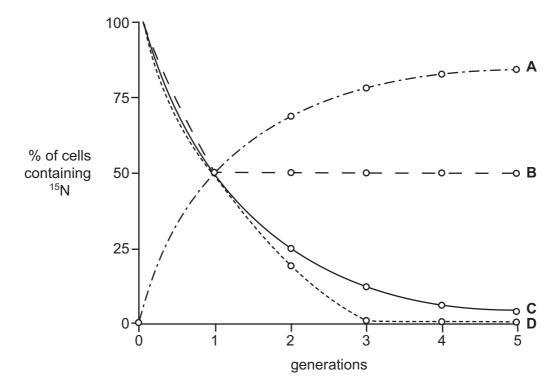
**D** GUA

21 Which statements are correct about DNA transcription and translation?

	transcription	translation
Α	is semi-conservative	produces mRNA
В	produces mRNA	is semi-conservative
С	occurs at the surface of ribosomes	produces mRNA
D	produces mRNA	occurs at the surface of ribosomes

22 Bacteria were cultured in a medium containing heavy nitrogen (<sup>15</sup>N) until all the DNA was labelled. These bacteria were then grown in a medium containing only normal nitrogen (<sup>14</sup>N) for five generations. The percentage of cells containing <sup>15</sup>N in each generation was estimated.

Which curve provides evidence that DNA replication is semi-conservative?



23 The table shows the sugars and some bases found in RNA and DNA.

#### Which is correct?

	RNA	DNA
Α	ribose	thymine
В	ribose	uracil
С	thymine	deoxyribose
D	uracil	ribose

**24** What is transpiration and which advantage does it give to the plant?

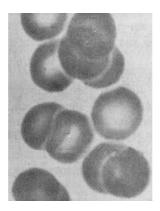
	transpiration	advantage to the plant
A	evaporation of water from leaf surfaces	maintains the water potential
В	evaporation of water from leaf surfaces	stomata are open for gas exchange
С	loss of water vapour from leaves	maintains the water potential
D	loss of water vapour from leaves	stomata are open for gas exchange

- Which statement explains why the circumference (girth) of a tree is less at midday and increases at night?
  - A Mineral uptake by the root hair cells decreases during the night because root pressure has decreased.
  - **B** Stomata close during the night and there is a build-up of water in the vascular tissue within the stem.
  - **C** The phloem sieve tubes fill with dissolved solutes because the translocation rate reduces during the night.
  - **D** There is less tension in the xylem vessels during the night because the rate of transpiration is at a minimum.

**26** Different substances, such as sucrose and amino acids, can move in different directions in the phloem sieve tubes.

Which statement explains this?

- A Active transport occurs in some phloem sieve tubes and mass flow in other phloem sieve tubes.
- **B** Both active transport and mass flow occur in each individual phloem sieve tube.
- **C** Mass flow occurs in both directions at once in each individual phloem sieve tube.
- **D** Mass flow occurs in different directions in different phloem sieve tubes at the same time.
- **27** The photograph shows a type of blood cell.



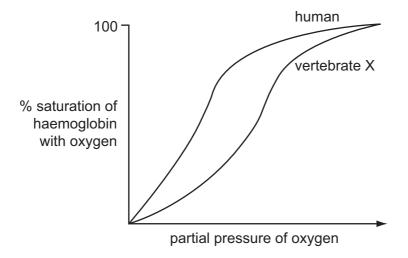
Which statements about these cells are correct?

- 1 Oxygen diffuses through the phospholipid bilayer.
- 2 Sodium ions diffuse through the phospholipid bilayer.
- 3 Water passes in and out of these cells by osmosis.
- **A** 1 and 2 only **B** 1 and 3 only **C** 2 and 3 only **D** 1, 2 and 3
- When one molecule of oxygen combines with haemoglobin it makes it easier for the next oxygen molecule to bind, which makes it easier for the next molecule of oxygen to bind.

Which orders of protein structure change to allow this to happen?

- A primary and quaternary
- **B** primary and secondary
- C secondary and tertiary
- **D** tertiary and quaternary

29 The graphs show changes in the percentage saturation of haemoglobin in the blood of humans and of another vertebrate animal. The partial pressure of CO<sub>2</sub> remains constant at 1.0 kPa and the temperature is constant at 25 °C.



Which conclusion is justified from the graph?

- **A** At the temperature of 25 °C the affinity of haemoglobin for oxygen increases more in humans than in vertebrate X.
- **B** Haemoglobin does not become fully saturated in the lungs of vertebrate X.
- **C** Oxygen is more easily released from haemoglobin in the muscle of vertebrate X than in human muscle.
- **D** The Bohr effect in the haemoglobin of vertebrate X is greater than in human haemoglobin.
- **30** Which component of cigarette smoke makes blood platelets more sticky and therefore increases the risk of blood clot formation?
  - A carbon monoxide
  - **B** carcinogens
  - C nicotine
  - **D** tar
- **31** When a person suffers an asthma attack, the tubes of the gas exchange system narrow and extra mucus is produced.

Which of these changes occur during an asthma attack?

- Activity of ciliated epithelium increases.
- 2 Endocytosis in goblet cells increases.
- 3 Smooth muscles respire faster.
- **A** 1 and 2 only **B** 1 and 3 only **C** 2 and 3 only **D** 1, 2 and 3

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**32** A person inhales minute particles from a very dusty environment.

Which effect will this have on B-lymphocytes and goblet cells?

	B-lymphocytes	goblet cells
Α	less active	less active
В	less active	more active
С	more active	less active
D	more active	more active

### 33 Four ways of being immune are

- 1 having memory cells after an infection
- 2 having memory cells after being injected with dead bacteria
- 3 being injected with antibodies
- 4 receiving antibodies from breast milk

Which row in the table correctly shows the types of immunity?

	natural active	artificial active	natural passive	artificial passive
Α	1	2	3	4
В	1	2	4	3
С	2	1	3	4
D	2	1	4	3

**34** A graft of tissue, such as skin, from a different person is usually rejected by the body.

Which statement about graft rejection is correct?

- **A** The graft is rejected by T-lymphocytes because they circulate in the blood and can gather at the graft site.
- **B** The graft is rejected by B-lymphocytes because they make and release antibodies which react with the surface antigens on the graft cells.
- **C** The graft is rejected by B-lymphocytes because T-lymphocytes are not stimulated to produce antibodies.
- **D** The graft is rejected by T-lymphocytes because the graft tissue causes T-lymphocytes to release antibodies.

- 35 Which statement about both B- and T-lymphocytes is correct?
  - **A** They become active only when a specific antibody binds to their surface receptor.
  - **B** They divide to form clones when meeting an antitoxin in a cell.
  - **C** They produce memory cells to respond to an antigen when exposed in the future.
  - **D** They release hormone-like cytokines which stimulate release of antibodies.
- **36** Why is it necessary for a person with a bacterial infection to be told to take antibiotics at evenly spaced time intervals?
  - A to increase the concentration of antibiotic slowly to a level which is lethal to the bacteria
  - **B** to maintain concentration of antibiotic in the body which is lethal to the bacteria
  - **C** to prevent the development of resistant strains of bacteria
  - **D** to select and kill the resistant strains of bacteria
- 37 How are the diseases cholera, malaria and HIV/AIDS transmitted?

	cholera	malaria	HIV/AIDS
Α	air	body fluid	insect
В	body fluid	water	air
С	insect	air	water
D	water	insect	body fluid

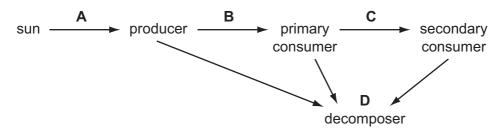
**38** A farmer grows a different crop in a field each year for three years.

In the fourth year he grows a leguminous crop, such as clover, and then ploughs this into the soil. The next year he starts the rotation again.

How does the fourth year crop add mineral ions to the soil?

	decomposition	nitrification	nitrogen fixation
Α	no	yes	yes
В	yes	no	yes
С	yes	yes	no
D	yes	yes	yes

39 At which stage of a food chain of tropical grassland is the energy transfer least efficient?



- **40** Which soil would have the smallest number of denitrifying bacteria?
  - A compressed agricultural soil
  - B poorly drained forest soil
  - C water-logged clay soil
  - D well-aerated garden soil

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