Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

BIOLOGY **9700/11**

Paper 1 Multiple Choice **May/June 2016**

1 hour

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

2740917736

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, 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.
DO **NOT** WRITE IN ANY BARCODES.

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.
Electronic calculators may be used.

This document consists of **16** printed pages.

© UCLES 2016

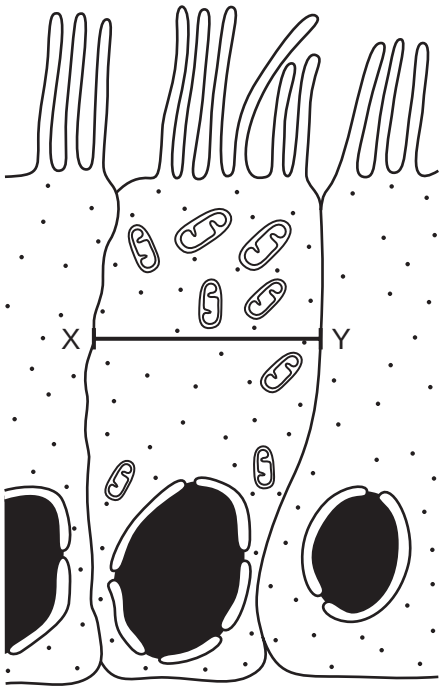
1 Which of the cell organelles will be clearly visible under the high power (×400) of the light microscope?

	lysosomes	endoplasmic reticulum	mitochondria	chloroplasts
A	✓	✓	✗	✗
B	✓	✗	✓	✗
C	✗	✓	✓	✓
D	✗	✗	✗	✓

key
✓ = clearly visible
✗ = not clearly visible

2 The drawing from an electron micrograph shows a ciliated epithelial cell, magnified ×1500, which is found in the trachea.

Line X-Y shows the widest dimension of the cell.



What is the number of these cells that could be found along a 1 cm length of the trachea?

A 5 **B** 50 **C** 500 **D** 5000

3 What are correct locations of ribosomes in the typical eukaryotic cell?

1 free in the cytoplasm

2 attached to the outside of the endoplasmic reticulum

3 attached to the inside of the endoplasmic reticulum

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

© UCLES 2016

4 Visking tubing is an artificial partially permeable membrane used to demonstrate diffusion. Glucose molecules can pass through the pores in the membrane which are approximately 2.4 nm in diameter.

Which of the following could pass through the pores?

1 bacteria

2 haemoglobin

3 ribosomes

4 glycogen

A 1 and 3 **B** 2 and 4 **C** 2 only **D** none of the above

5 What are found in both chloroplasts and typical prokaryotic cells?

A 70S ribosomes and circular DNA

B 70S ribosomes only

C 80S ribosomes and circular DNA

D circular DNA only

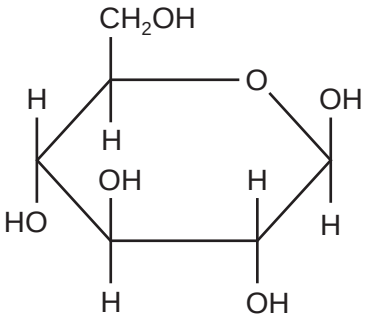
6 Two solutions, 1 and 2, one containing starch and sucrose, and the other containing glucose and protein, were tested with a variety of reagents to confirm their identity.

The table shows the conclusions from the results recorded for the various tests.

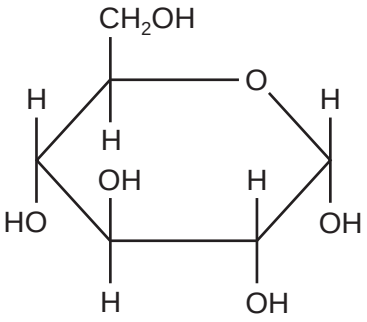
Which row identifies the two solutions?

	add iodine solution		boil with Benedict's solution		boil with Benedict's solution after acid hydrolysis		add biuret solution		
	1	2	1	2	1	2	1	2	key
A	+	–	+	–	–	+	–	+	+ = biological molecule present
B	–	+	+	–	+	–	–	+	– = biological molecule absent
C	+	–	–	+	+	–	–	+	
D	–	+	+	–	+	+	+	–	

7 X and Y are two monomers found in biological polymers.



X



Y

Which monomer is found in each of cellulose, glycogen, amylopectin and amylose?

	cellulose	glycogen	amylopectin	amylose
A	X	Y	X	Y
B	X	Y	Y	Y
C	Y	X	X	X
D	Y	X	Y	X

8 Chitin is a polysaccharide consisting of long straight chains of the monosaccharide acetylglucosamine, linked by 1,4 glycosidic bonds.

Acetylglucosamine is similar in structure to glucose, but contains nitrogen, allowing hydrogen bonds to form between adjacent chains of chitin when they lie parallel to each other.

Which polysaccharide is most similar in structure to chitin?

A amylopectin

B amylose

C cellulose

D glycogen

9 Which statement about triglycerides is correct?

A They are made up of three fatty acids combined with glycogen.

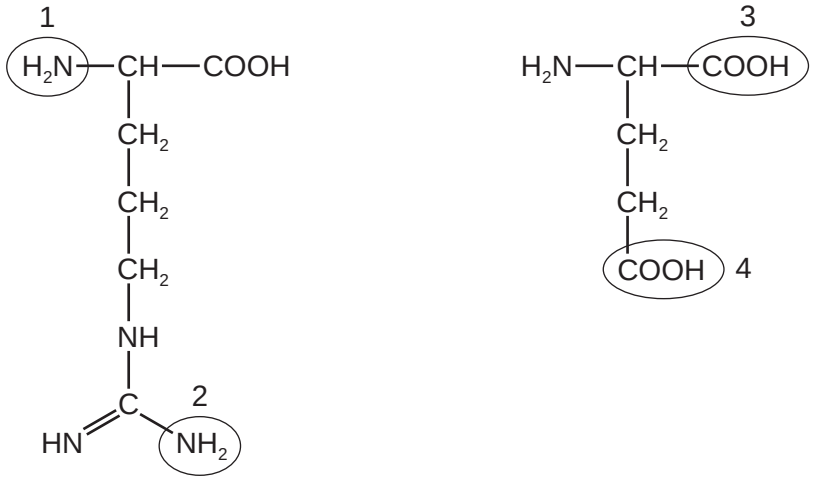
B They are more saturated with hydrogen compared with phospholipids.

C They form a bilayer in the cell surface membranes of cells.

D They have a lower ratio of oxygen to carbon compared with carbohydrates.

© UCLES 2016

10 The diagrams show the structures of two amino acids, one of which has two amine ($–NH_2$) groups and the other has two carboxylic (–COOH) groups.

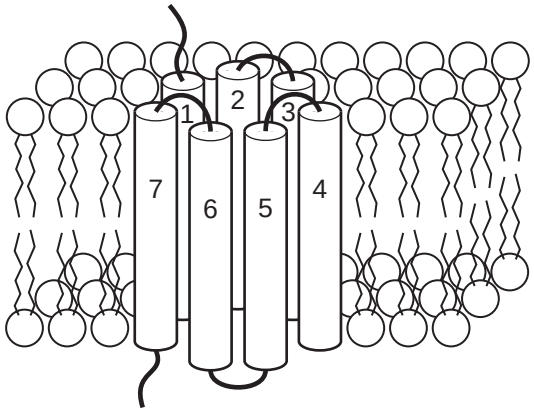


A peptide bond is formed between the two amino acids.

Which groups form the peptide bond?

A 1 and 3 **B** 2 and 3 **C** 2 and 4 **D** 4 and 1

11 Proteins which transport sugars out of cells have been identified. These proteins are called SWEETs. Each SWEET has seven coiled, cylindrical regions which together make up a pore through the cell surface membrane bilayer, as shown in the diagram.



What describes each of the seven coiled regions (1-7) of a SWEET shown in the diagram?

A primary structure held in its shape by bonds such as hydrogen bonds

B primary structure held in its shape by peptide bonds

C secondary structure held in its shape by bonds such as hydrogen bonds

D secondary structure held in its shape by peptide bonds

© UCLES 2016

12 Influenza virus has an enzyme called neuraminidase which breaks down glycoproteins in the membrane of the cell that the virus will infect. The glycoprotein binds to the active site of neuraminidase by induced fit.

Which statements about the induced fit hypothesis of enzyme action are correct?

1 The active site must have a complementary shape to the substrate for them to bind together.

2 This enzyme is less likely to be affected by non-competitive inhibitors than an enzyme working by the lock and key mechanism.

3 The substrate is converted to product by specific R-groups in the active site just like the lock and key mechanism.

A 1 and 2 **B** 2 and 3 **C** 2 only **D** 3 only

13 Which row about competitive inhibitors of enzymes is correct?

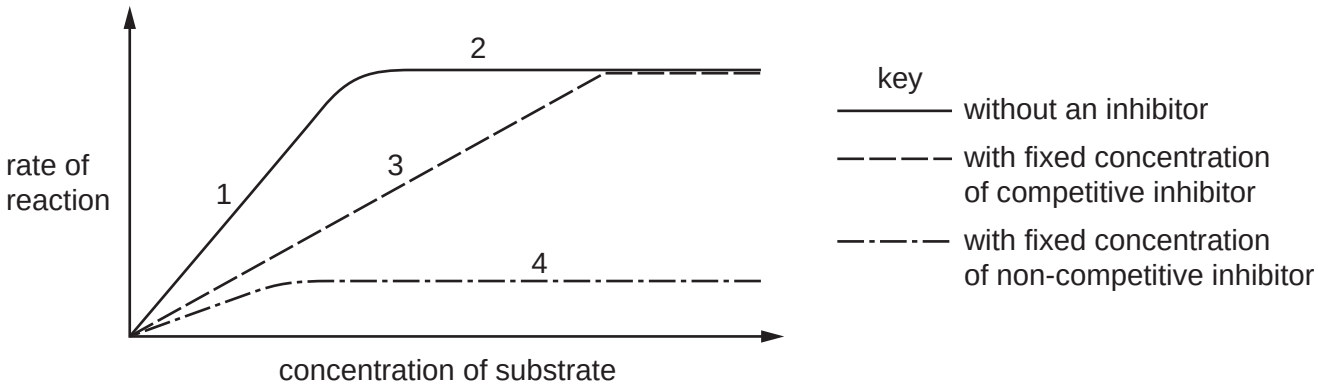
	bind to a site other than the active site	lower the activation energy needed for a reaction to occur
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

key

✓ = true

✗ = false

14 The graph shows the effect of increasing the concentration of substrate on the rate of an enzyme-catalysed reaction.



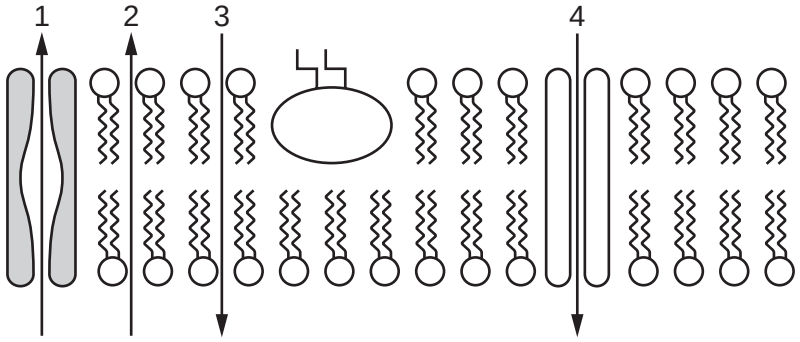
What is limiting the rate of the enzyme-catalysed reaction at 1, 2, 3 and 4 on the graph?

	1	2	3	4
A	enzyme concentration	substrate concentration	competitive inhibitor	non-competitive inhibitor
B	enzyme concentration	substrate concentration	non-competitive inhibitor	competitive inhibitor
C	substrate concentration	enzyme concentration	competitive inhibitor	non-competitive inhibitor
D	substrate concentration	enzyme concentration	non-competitive inhibitor	competitive inhibitor

© UCLES 2016

[Turn over

15 The diagram represents a cell surface membrane of a metabolically active cell and the direction of movement of some molecules through the membrane.



Which row shows a process by which the molecules may be moving through the membrane at each of the points 1, 2, 3 and 4?

	1	2	3	4
A	carbon dioxide by diffusion	water by osmosis	glucose by diffusion	sodium ions by active transport
B	fatty acids by diffusion	oxygen by diffusion	carbon dioxide by diffusion	water by osmosis
C	sodium ions by active transport	carbon dioxide by diffusion	water by osmosis	glucose by facilitated diffusion
D	water by osmosis	oxygen by diffusion	fatty acids by diffusion	glucose by active transport

16 Batrachotoxin is a poison found in frogs in the Columbian jungle. The poison is used by Native Indians to produce poison darts.

The poison works by increasing the permeability of some cell surface membranes to sodium ions, which move out of the cells.

Which statements are correct for cells affected by batrachotoxin?

1 The intracellular fluid has a less negative water potential than the extracellular fluid.

2 The extracellular fluid has a less negative water potential than the intracellular fluid.

3 Water leaves the cells by osmosis, causing the cells to shrink.

4 Water enters the cells by osmosis, causing the cells to swell.

A 1 and 3 **B** 1 and 4 **C** 2 and 3 **D** 2 and 4

© UCLES 2016

17 Which processes occur during prophase of the mitotic cell cycle in an animal cell?

	centrioles replicate	chromosomes condense	spindle fibres form
A	✓	✓	✗
B	✓	✗	✗
C	✗	✓	✓
D	✗	✗	✓

key

✓ = true

✗ = false

18 The protein p53 is produced in a cell in response to DNA damage. This protein stops the cell cycle for a short time just before the DNA is replicated, so that the DNA can be repaired.

At which phase of the cell cycle will this stop occur?

A M **B** G1 **C** S **D** G2

19 Which feature of stem cells enables them to replace cells in tissues such as the skin?

A They are undifferentiated cells that are present at birth.

B They differentiate to form skin cells.

C They divide by mitosis to supply some cells that can differentiate.

D They have the full number of chromosomes.

20 DNA contains the ……X…… base ……Y…… which is joined to adenine with ……Z…… hydrogen bonds.

Which row correctly completes the statement about DNA?

	X	Y	Z
A	purine	thymine	three
B	purine	uracil	three
C	pyrimidine	thymine	two
D	pyrimidine	uracil	two

© UCLES 2016

21 The diagram shows the nucleotide sequence of a small section of a gene which is transcribed.

CGCCGCACGCGC

The table shows the amino acids coded for by 10 mRNA codons.

mRNA codon	amino acid
AAG	Lys
ACG	Thr
CGG CGC CGU	Arg
CCG	Pro
GCC GCG	Ala
GGC	Gly
UGC	Cys

What is the order of the four amino acids in the polypeptide translated from this small section of a gene?

A Ala-Ala-Cys-Ala

B Ala-Arg-Gly-Ala

C Arg-Ala-Pro-Arg

D Arg-Arg-Thr-Arg

22 The statements describe the features of some nucleic acids.

1 carry an amino acid to a ribosome

2 carry a genetic code sequence out of the nucleus

3 carry a genetic code sequence to a ribosome

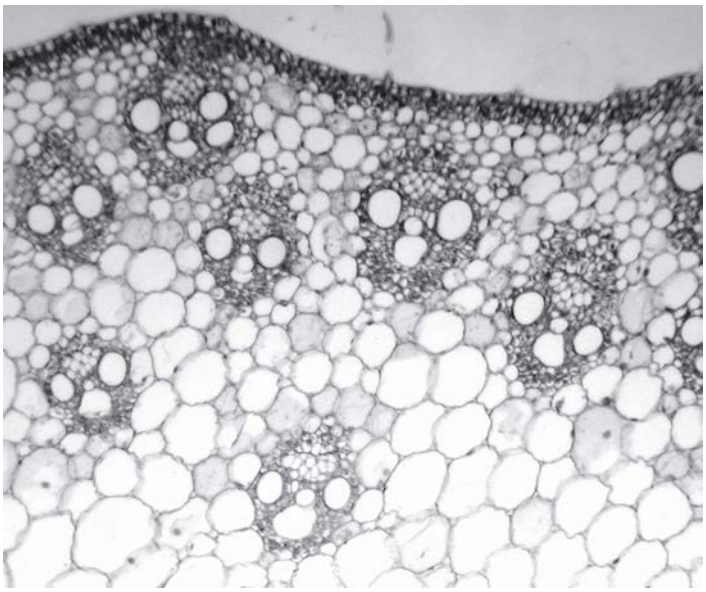
4 hold amino acids in position for translation

Which functions are carried out by tRNA?

A 1 and 2 **B** 1 and 4 **C** 2 and 3 **D** 3 and 4

© UCLES 2016

23 A student was asked to draw a plan diagram of the plant tissue shown in the photomicrograph and to annotate two observable features.



What are correct annotations?

A epidermis darkly stained layer of cells, xylem hollow vessels

B epidermis formed of a single layer of cells, xylem strengthened by lignin

C phloem small cells, xylem empty cells to transport water

D vascular bundles arranged in a regular pattern, xylem large dead cells

24 Water that is present inside a root hair cell may leave the cell and pass to the vascular tissue.

Through which route **must** the water travel?

A apoplast

B plasmodesmata

C symplast

D vacuoles

25 What is a correct definition of the term transpiration?

A diffusion of water from intercellular air spaces to the atmosphere where it evaporates

B evaporation of water from the leaf surface of a plant via the stomata

C loss of water vapour from the aerial parts of a plant to the atmosphere

D movement of water from the xylem to the atmosphere through the cell walls only

© UCLES 2016

26 Which changes to the water potential and the volume of liquid in the phloem sieve tube element occur when sucrose is moved from a photosynthesising leaf into the phloem sieve tube element?

	water potential in phloem sieve tube element	volume of liquid in phloem sieve tube element
A	higher	decreases
B	higher	increases
C	lower	decreases
D	lower	increases

27 Which statement supports the theory of active loading of sucrose into companion cells?

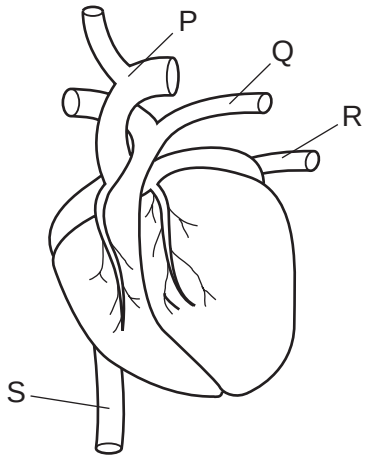
A The pH decreases in the cell wall of the companion cells compared to the cytoplasm.

B The pH decreases in the cytoplasm of the companion cells compared to the cell wall.

C The pH decreases in the plasmodesmata between companion cells and sieve tube elements.

D The pH decreases in the sieve tube elements compared to the companion cells.

28 The diagram is an external view of the mammalian heart and the associated blood vessels.



Which statement about the blood vessels associated with a normal, healthy heart is correct?

A P and Q carry blood with more oxyhaemoglobin than haemoglobin.

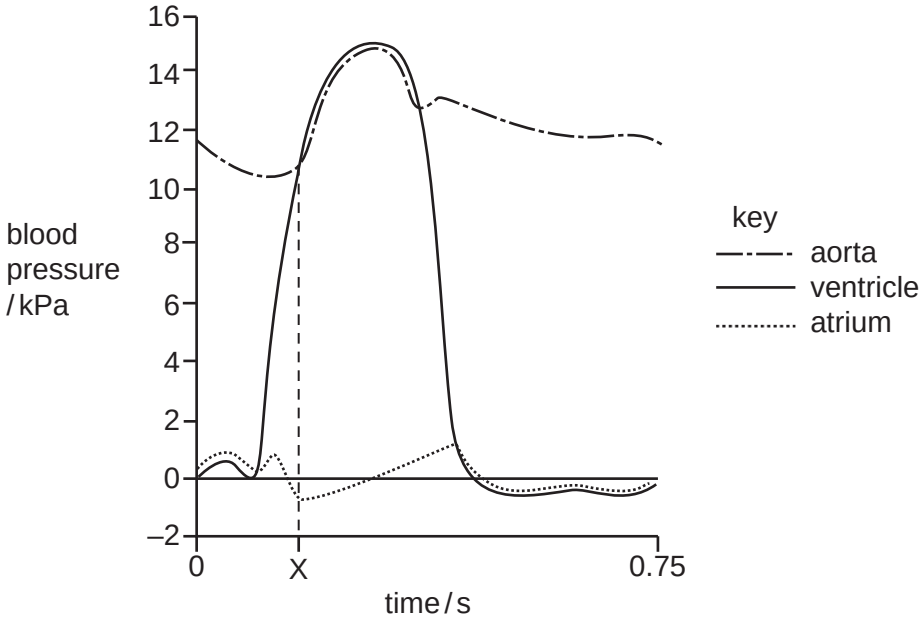
B P and R carry blood that is saturated with oxygen.

C S and P carry blood with a low oxygen concentration.

D S and R carry blood with more haemoglobin than oxyhaemoglobin.

© UCLES 2016

29 The graph shows changes in blood pressure during one cardiac cycle.



What is happening at time X?

	aortic semilunar valve	atrium
A	closing	emptying
B	closing	filling
C	opening	emptying
D	opening	filling

30 Which does **not** occur when a red blood cell arrives at the alveolus?

A Carbaminohaemoglobin releases carbon dioxide from the α-globin and β-globin polypeptide chains.

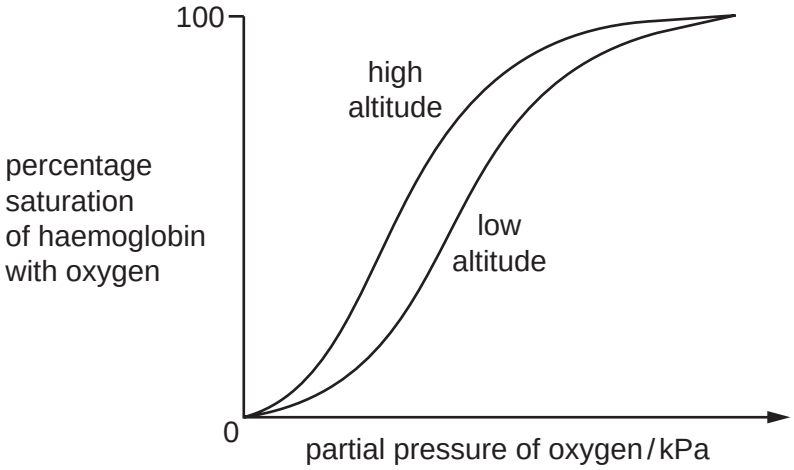
B Carbonic acid in the red blood cell forms carbon dioxide and water.

C Hydrogencarbonate ions diffuse from the plasma into the red blood cell.

D Hydrogen ions are released from haemoglobinic acid and diffuse out of the red blood cell.

© UCLES 2016

31 The graph shows the oxygen dissociation curves for haemoglobin of animals that live at high altitude and animals that live at low altitude.



What explains the oxygen dissociation curve at **high** altitude?

A Haemoglobin has a higher affinity for oxygen.

B Haemoglobin releases oxygen more readily.

C The change in partial pressure of carbon dioxide causes a Bohr effect.

D The decrease in percentage of carbon dioxide causes the curve to shift to the left.

32 Which statement concerning events that occur in the heart is correct?

A As the wave of excitation passes through the atrioventricular node there is a time delay before it passes down the conducting fibres in the septum to the ventricles; this allows the atria to fill before ventricular systole.

B Contraction of the ventricle muscles following atrial systole causes the ventricular blood pressure to rise above the blood pressure in the atria, closing the atrioventricular valve and preventing backflow.

C The band of non-conducting fibres between the atria and ventricles prevents the wave of excitation from the atria reaching the ventricles directly; the wave of excitation passes to the Purkyne fibres and then to the atrioventricular node.

D The primary pacemaker, the sinoatrial node in the left atrium, sends out a wave of excitation that spreads across the walls of the atria, resulting in the movement of blood from the atria into the ventricles.

33 What would be seen in an electron micrograph of a bronchus wall?

1 cartilage cells

2 ciliated cells

3 exocytotic vesicles

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

© UCLES 2016

34 Which parts of the human gas exchange system may typically contain macrophages?

	trachea	bronchus	bronchiole	alveolus
A	✓	✓	✓	✓
B	✓	✓	✓	✗
C	✗	✗	✓	✓
D	✗	✗	✗	✓

✓ = may contain macrophages

✗ = may not contain macrophages

35 An oxygen molecule diffuses from the air in an alveolus through cells to haemoglobin in a red blood cell.

What is the minimum number of cell surface membranes through which this molecule must pass?

A 2 **B** 3 **C** 4 **D** 5

36 Which short-term effects of smoking are caused by carbon monoxide?

1 formation of carboxyhaemoglobin

2 increased risk of blood clotting

3 narrowing the lumen of arteries

A 1 and 2 **B** 1 and 3 **C** 2 and 3 **D** 1 only

37 A person whose immune system is suppressed may become more susceptible to certain diseases.

Which disease will this person **not** become more susceptible to?

A cholera

B measles

C sickle cell anaemia

D TB

38 Which disease is treated with drugs that have a similar molecular structure to DNA nucleotides?

A cholera

B HIV / AIDS

C malaria

D TB

© UCLES 2016

39 Rabies is a viral disease which can be spread to humans by a bite from an infected animal.

One method of treatment is to inject the patient with antibodies specific to the rabies virus.

Which statements about this treatment are correct?

1 The patient will have natural passive immunity to rabies.

2 The injected antibodies will be broken down by the patient.

3 The patient's memory cells will be able to produce this antibody more rapidly in the future.

4 The immunity provided will only be of short duration.

A 1 and 3 **B** 1 and 4 **C** 2 and 3 **D** 2 and 4

40 What are the functions of T-lymphocytes during an immune response?

1 destroy infected body cells

2 differentiate into memory cells

3 secrete antibodies

A 1 and 2 **B** 2 and 3 **C** 1 only **D** 3 only

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.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge International Examinations Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cie.org.uk after the live examination series.

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.

© UCLES 2016