Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

BIOLOGY **9700/13**

Paper 1 Multiple Choice **May/June 2018**

1 hour

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

0862222628

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 2018

CAMBRIDGE International Examinations

1 Which steps are needed to find the actual width of a xylem vessel viewed in transverse section using a ×10 objective lens?

1 Convert from mm to μm by multiplying by 10^{-3}.

2 Calibrate the eyepiece graticule using a stage micrometer on ×4 objective lens.

3 Measure the width of the xylem vessel using an eyepiece graticule.

4 Multiply the number of eyepiece graticule units by the calibration of the eyepiece graticule.

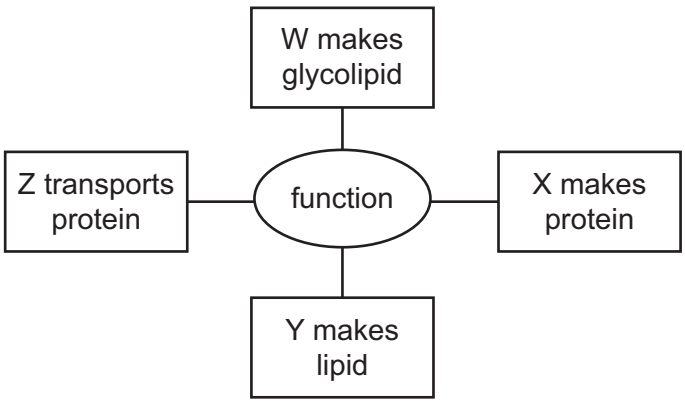
A 1, 2, 3 and 4

B 1 and 2 only

C 2, 3 and 4 only

D 3 and 4 only

2 The diagram shows functions of four cell structures, W, X, Y and Z.



Which row correctly matches the cell structure with the letter representing a function?

	Golgi body	ribosome	rough endoplasmic reticulum	smooth endoplasmic reticulum
A	W	X	Z	Y
B	X	Z	Y	W
C	Y	W	X	Z
D	Z	Y	W	X

© UCLES 2018

3 Which cell structures produce ATP?

1 chloroplasts

2 mitochondria

3 nucleus

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

4 When mucus is secreted from a goblet cell these events take place.

1 addition of carbohydrate to protein

2 fusion of the vesicle with the cell surface membrane

3 secretion of a glycoprotein

4 separation of a vesicle from the Golgi body

What is the sequence in which these events take place?

A $1 \rightarrow 4 \rightarrow 2 \rightarrow 3$

B $1 \rightarrow 4 \rightarrow 3 \rightarrow 2$

C $4 \rightarrow 1 \rightarrow 2 \rightarrow 3$

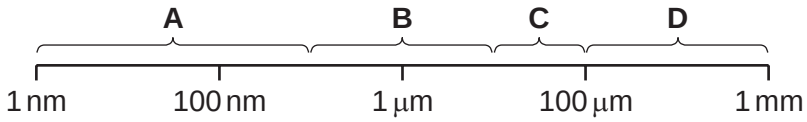
D $4 \rightarrow 1 \rightarrow 3 \rightarrow 2$

5 Which row could be correct for a virus?

	carbohydrate	DNA	phospholipid	lipid	protein	RNA
A	✓	✓	✓	✓	✓	✓
B	✓	✗	✓	✗	✗	✓
C	✗	✓	✗	✗	✗	✓
D	✗	✓	✗	✗	✓	✗

key
✓ = present
✗ = not present

6 Which size range would include most prokaryotic cells?



7 Solutions of three biological molecules are tested for sugars. The table shows the colours of the solutions after testing.

solution	heated with Benedict's solution	boiled with hydrochloric acid, neutralised, then heated with Benedict's solution
1	blue	orange
2	green	green
3	orange	red

Which solutions contained glucose before testing?

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

8 A solution containing equal masses of amylose and amylopectin is completely hydrolysed.

Which molecules will be found after the hydrolysis?

A α-glucose only

B β-glucose only

C equal masses of α-glucose and β-glucose

D more α-glucose than β-glucose

9 Which molecules contain the following bonds?

	ester	hydrogen	disulfide
A	amylase	haemoglobin	catalase
B	glycerol	glycogen	collagen
C	lipids	amylopectin	amylose
D	phospholipids	cellulose	antibodies

10 Which feature of phospholipids enables a bilayer to form?

A They are insoluble in water.

B They are polar molecules.

C They have hydrophobic and hydrophilic components.

D They may contain saturated or unsaturated fatty acids.

© UCLES 2018

11 Which description is correct for collagen?

A A collagen molecule has a high proportion of the amino acid glycine, which has a very small R group.

B A group of three collagen fibres forms a strong, insoluble coiled structure termed a triple helix.

C Each of the collagen polypeptides in a collagen molecule has a regular spiral arrangement of many alpha helices.

D Peptide bonds are present between amino acids of the different polypeptides forming the collagen molecule.

12 Which statement about the properties of water is correct?

A Bonds between hydrogen atoms cause water to have a high specific heat capacity.

B The high latent heat of vaporisation of water is due to the presence of hydrogen bonds.

C The high specific heat capacity of water causes cooling during evaporation.

D Water can dissolve amylopectin as it has hydrophilic side chains.

13 Catechol is a chemical found in a number of fruits. Catechol can be oxidised to a quinone by the enzyme catechol oxidase.

Catechol oxidase is inhibited by parahyroxybenzoic acid (PHBA) which is structurally similar to catechol.

Catechol oxidase is also inhibited by phenylthiourea (PTU) which binds to a copper atom in the enzyme.

How do both these inhibitors reduce the enzyme activity?

1 altering the specificity of the enzyme

2 competing with substrates for the active site

3 decreasing the V_{max} of the reaction

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

14 Four students investigated the effect of catalase on hydrogen peroxide.

Each student started a digital clock at the beginning of the experiment and stopped the clock after 25 bubbles had been counted.

The time recorded on the digital clock is shown below.

hours	minutes	seconds	hundredths of a second
00	01	33	54

Which of the times recorded by the students is appropriate for this experiment?

A 1.34 minutes

B 1 minute 33.54 seconds

C 94 seconds

D 93.54 seconds

15 What is the effect of an enzyme in an enzyme-catalysed reaction?

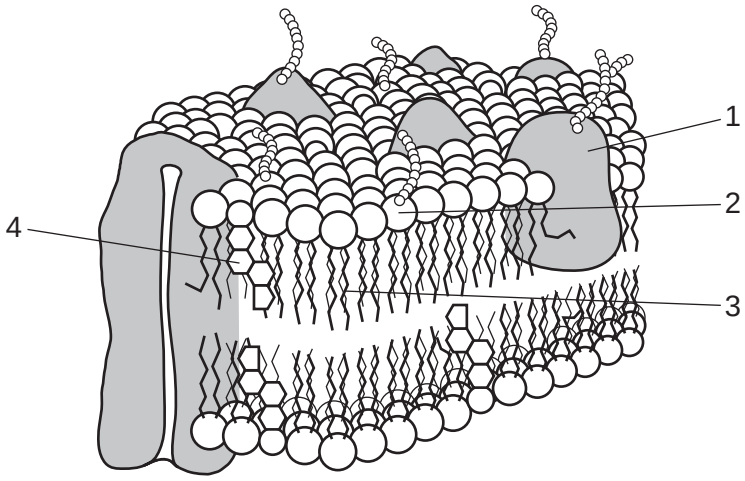
A decreases the activation energy and decreases the energy yield

B decreases the activation energy and has no effect on the energy yield

C increases the activation energy and increases the energy yield

D increases the energy yield and decreases the activation energy

16 The diagram shows part of the cell surface membrane.



Which components act as antigens?

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

© UCLES 2018

17 Which processes use energy in the form of ATP?

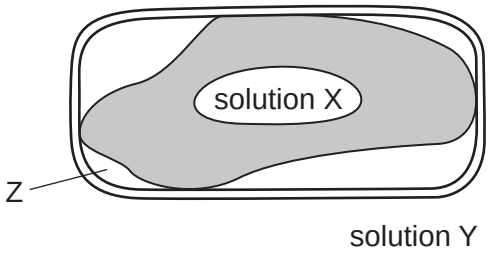
1 endocytosis

2 exocytosis

3 facilitated diffusion

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

18 The diagram shows a partially plasmolysed plant cell.



What is found at Z?

A air

B solution X

C solution Y

D water

19 Which features of an organism are affected by a drug that stops mitosis?

1 cell repair

2 cell replacement

3 number of stem cells

4 tissue repair

5 tumour formation

A 1, 2, 3, 4 and 5

B 1, 2 and 3 only

C 1, 4 and 5 only

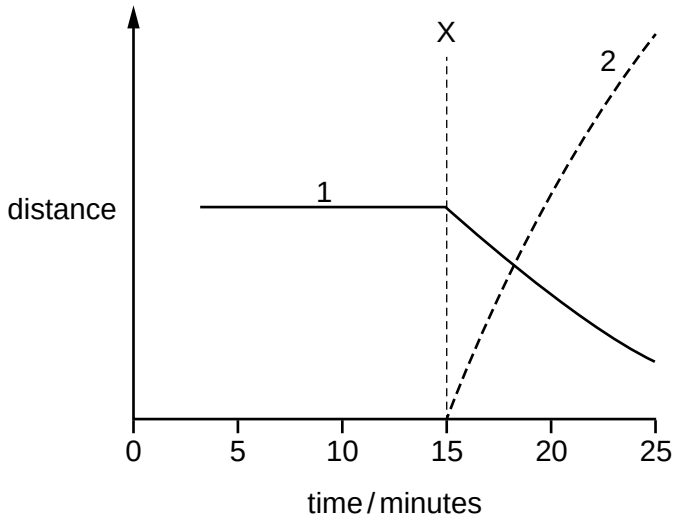
D 2, 3, 4 and 5 only

© UCLES 2018

20 Which row shows the appearance of a chromosome at the beginning of prophase of mitosis and the number of DNA strands in the chromosome?

	appearance of one chromosome	number of DNA strands
A		2
B		4
C		1
D		2

21 The graph shows measurements taken during one mitotic cell cycle.

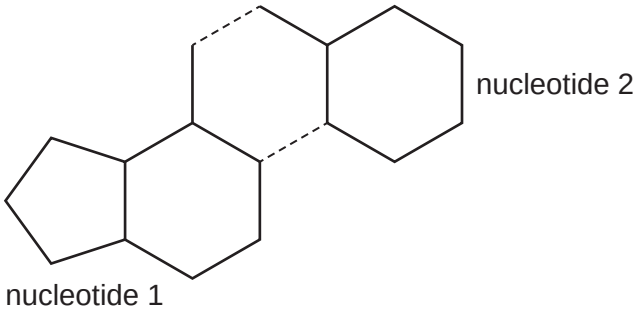


Which stage of mitosis begins at X and which measurements are shown by curves 1 and 2?

	stage beginning at X	distance between centromeres of chromosomes and poles of spindle	distance between centromeres of sister chromatids
A	anaphase	1	2
B	anaphase	2	1
C	metaphase	1	2
D	metaphase	2	1

22 The diagram shows the outline structure of two nucleotide bases which occur in DNA.

This pair is held together by two hydrogen bonds, shown as dashed lines.



Which row correctly identifies these two nucleotide bases?

	nucleotide 1	nucleotide 2
A	adenine	thymine
B	cytosine	guanine
C	guanine	cytosine
D	thymine	adenine

23 DNA polymerase catalyses condensation reactions between molecules during semi-conservative replication of DNA.

Which two molecules are joined by DNA polymerase?

A base and base

B base and nucleotide

C nucleotide and nucleotide

D phosphate and deoxyribose

24 What occurs during each of DNA replication and transcription and translation?

1 ATP provides energy.

2 Condensation reactions occur to form a polymer.

3 Hydrogen bonds form between purine and pyrimidine bases.

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

© UCLES 2018

25 Part of a sequence of DNA from a person with a genetic disease is:

TAGTAACCACAAAGG

The corresponding sequence of DNA from a person without this genetic disease is:

TAGTAAAAACCACAAAGG

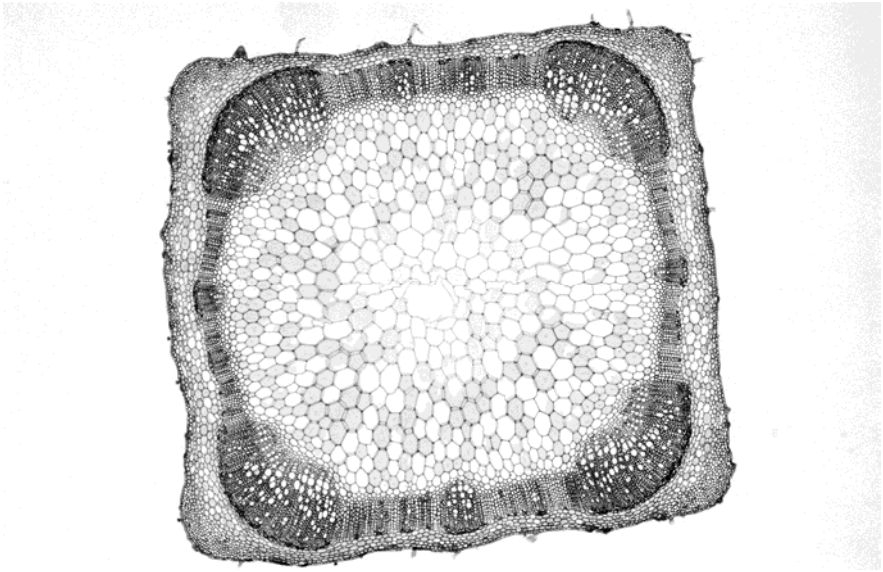
The possible mRNA codons for some amino acids are shown in the table.

amino acid	mRNA codons			
1	GGU	GGC	GGA	GGG
2	AUU	AUC	AUA	
3	UUU	UUC		
4	UCU	UCC	UCA	UCG

Which amino acid is missing from a person with this genetic disease?

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

26 The photomicrograph shows a section through a plant organ.



Which statement could be used to describe this organ?

A The central region of this organ has supporting tissue.

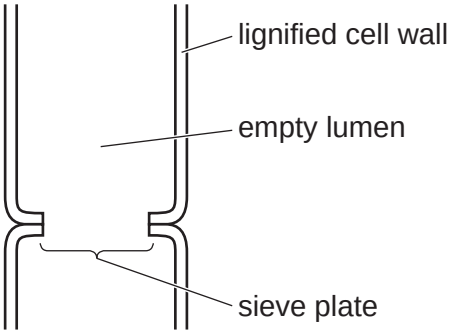
B The endodermis tissue is a thick layer around the edge of the organ.

C The epidermis tissue in this organ has unicellular extensions (trichomes).

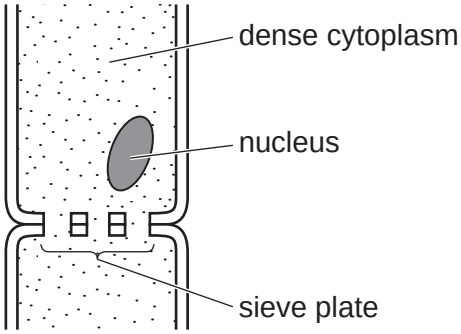
D The xylem tissue is found in greatest density in the centre of the organ.

27 Which diagram correctly represents part of a sieve tube element?

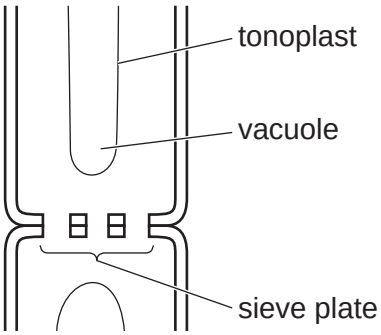
A



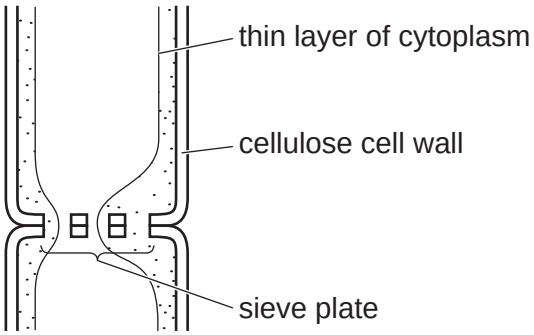
B



C



D



28 Which of the processes involved in water movement through xylem vessels depends on hydrogen bonding between water molecules?

A adhesion

B cohesion

C evaporation

D hydrostatic pressure

29 Which statements about water movement in plants are correct?

1 Water can pass through cellulose.

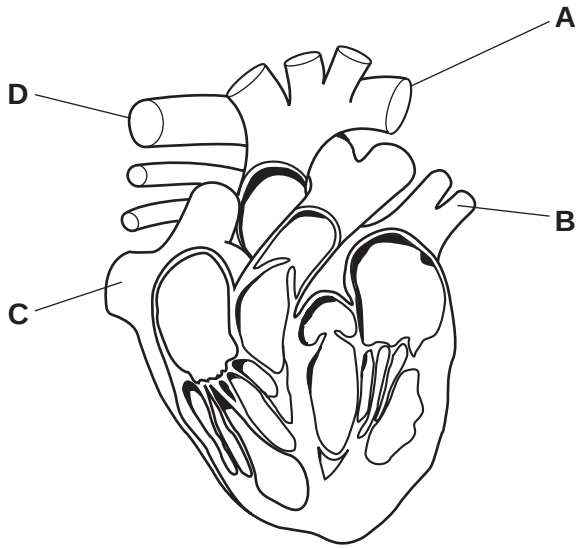
2 Water cannot pass through lignin.

3 Water can pass through suberin.

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

© UCLES 2018

30 Which blood vessel has the thickest walls?



31 Which statement about the role in the mammalian circulatory system of the heart, blood vessels and blood is correct?

A The contraction of heart muscle causes blood to enter arteries that pump the blood to organs, causing the formation of tissue fluid between cells before returning to the heart in veins.

B The heart connects two sets of blood vessels so that oxygen from the lungs can be distributed by red blood cells and wastes can be collected from tissues by blood plasma for removal.

C The heart muscle contracts and relaxes causing blood, carrying materials from one part of the body to another, to move through blood vessels that connect the different parts of the body.

D The heart provides enough pressure to push blood through arteries to capillaries between cells causing filtration of blood and the formation of tissue fluid which diffuses back into veins.

32 What explains how the maximum uptake of oxygen occurs as blood passes through the capillaries of the lungs?

A Each haemoglobin molecule can temporarily bind to four oxygen atoms.

B Oxyhaemoglobin formation increases the capacity of red blood cells to transport oxygen.

C The binding of the first oxygen molecule to haemoglobin decreases the molecule's affinity for binding other oxygen molecules.

D The dissociation of carbon dioxide from carboxyhaemoglobin allows more haemoglobin to be available for oxygen binding.

© UCLES 2018

33 At high altitudes, the oxygen content of the air may be a third of that at sea level.

As a person climbs a mountain, their body gradually adjusts to the high altitude.

What is increased during this period of adjustment?

A the concentration of haemoglobin in the red blood cells

B the oxygen-carrying capacity of the haemoglobin

C the number of red blood cells per mm^3 of blood

D the rate at which haemoglobin releases oxygen to the tissues

34 What helps to maintain a concentration gradient between blood and the air in the alveolus?

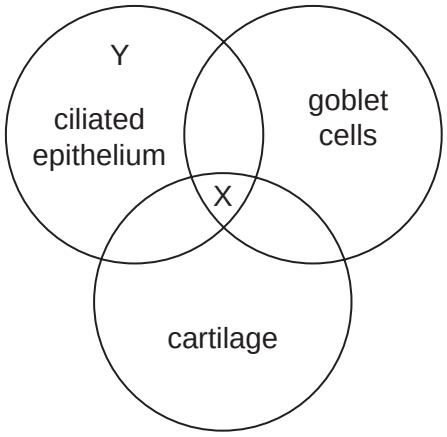
A the flow of blood through the lungs

B the presence of haemoglobin in blood cells

C the single-celled alveolar walls

D the squamous epithelium of capillaries

35 The diagram shows three features found in the tissues of the gas exchange system.



Which structures of the gas exchange system could be represented at position X and at position Y in the diagram?

1 bronchiole

2 trachea

3 bronchus

	X	Y
A	1	2 and 3
B	1 and 3	2
C	2	1 and 3
D	2 and 3	1

© UCLES 2018

36 Blood tests on people who regularly smoke cigarettes show that approximately 5% of their haemoglobin carries carbon monoxide.

People who smoke e-cigarettes inhale a vapour with no carbon monoxide. A person who smokes cigarettes regularly, switches to e-cigarettes and a blood test is carried out after a month.

Which chemical in the blood would be found in a lower concentration in this blood test?

A carbaminohaemoglobin

B carbonic anhydrase

C carboxyhaemoglobin

D hydrogencarbonate ions

37 Emphysema is a type of chronic obstructive pulmonary disease, COPD. People with emphysema have a very low level of a plasma protein which inhibits the enzyme elastase.

Elastase breaks down the elastic fibres in the bronchioles and alveoli.

Which are effects of the low levels of inhibitor in people with emphysema?

1 alveoli do not stretch and recoil properly during inhalation and exhalation

2 blood is poorly oxygenated resulting in a rapid breathing rate

3 bronchioles collapse during exhalation trapping air in the alveoli

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

38 Some antibiotics work by binding to ribosomes.

Which statement explains why these antibiotics kill bacteria cells but do not kill most human cells?

A mRNA in bacteria is formed in the cytoplasm from naked DNA.

B The antibiotics cannot pass through human cell membranes.

C The codes used for amino acids in bacteria are different from those used by humans.

D The ribosomes of bacteria have a different structure from those of humans.

39 Where are antigens found?

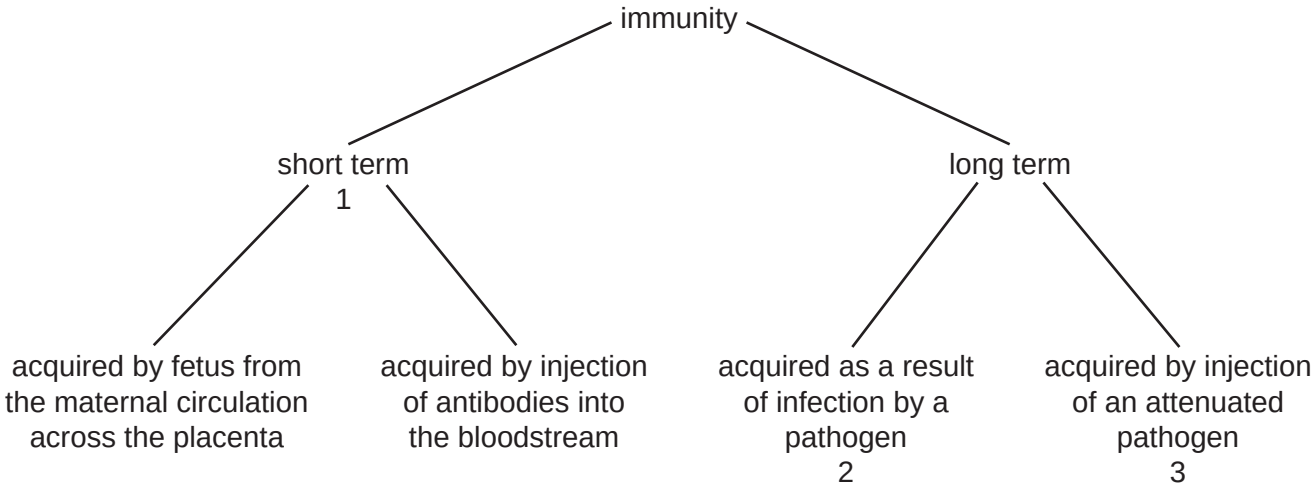
	on the surface of pathogen	on the surface of macrophage	in blood plasma
A	✓	✓	✗
B	✓	✗	✓
C	✗	✓	✗
D	✗	✗	✓

key

✓ = antigens found

✗ = antigens not found

40 The diagram allows the identification of different types of immunity.



Which row correctly identifies the types of immunity labelled 1, 2 and 3?

	1	2	3
A	active	artificial	natural
B	active	natural	artificial
C	passive	artificial	natural
D	passive	natural	artificial

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 2018