Cambridge Assessment International Education

Cambridge International AS & A Level

BIOLOGY **9700/12**

Paper 1 Multiple Choice **February/March 2022**

1 hour 15 minutes

You must answer on the multiple choice answer sheet.

1106378042

You will need: Multiple choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

INSTRUCTIONS

- 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 multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.

INFORMATION

- The total mark for this paper is 40.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.

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1 Which cell organelles are clearly visible when viewed with a light microscope at high power (×400)?

	ribosomes	endoplasmic reticulum	centrioles	chloroplasts
A	✓	✓	✗	✗
B	✓	✗	✓	✗
C	✗	✓	✓	✓
D	✗	✗	✗	✓

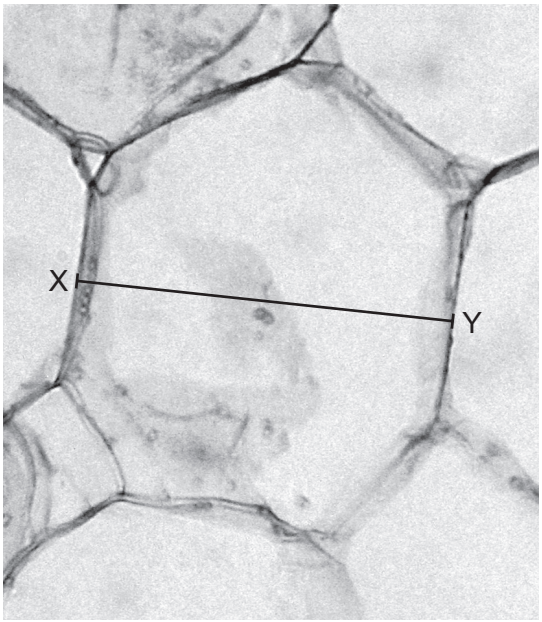
key
✓ = clearly visible
✗ = not clearly visible

2 Microvilli and root hairs are characteristic structures of some cell types.

Which row identifies some features of a microvillus and a root hair?

	surrounded by cell wall	more than one present on a cell
A	root hair	microvillus
B	microvillus	microvillus
C	root hair	root hair
D	microvillus	root hair

3 The photomicrograph is of a plant cell. The cell is 25 μm in width from X to Y.



What is the magnification of the photomicrograph?

A 2.0×10^1 **B** 2.0×10^2 **C** 2.0×10^3 **D** 2.0×10^4

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4 Which eukaryotic cell structures all contain nucleic acids?

A cytoplasm, Golgi bodies, mitochondria, nuclei

B centrioles, chloroplasts, mitochondria, ribosomes

C centrioles, mitochondria, nuclei, ribosomes

D chloroplasts, mitochondria, cytoplasm, ribosomes

5 Which statements about viruses are correct?

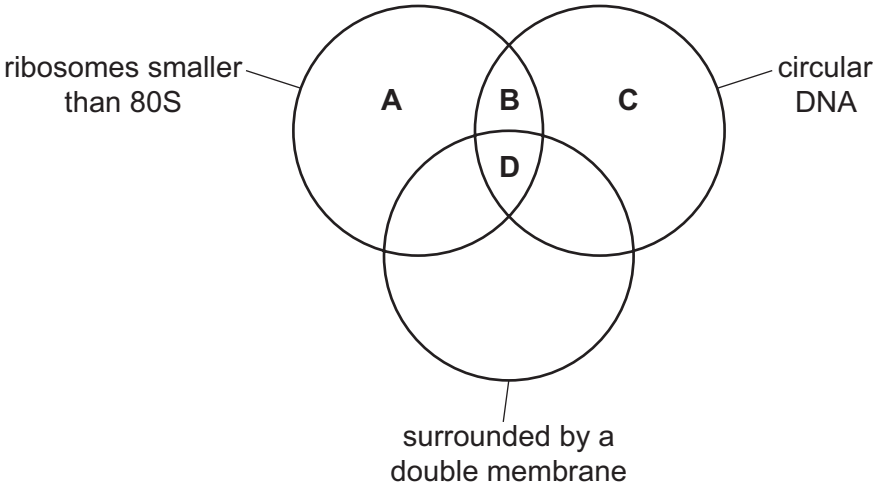
1 They contain DNA or RNA.

2 They use host cells to synthesise virus proteins.

3 They can have a protective coat of peptidoglycan.

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

6 What are features of prokaryote cells, chloroplasts and mitochondria?



7 A student used Benedict's solution to test a sample known to contain carbohydrate.

At the end of the test the solution was blue.

Which carbohydrate could be present in the sample?

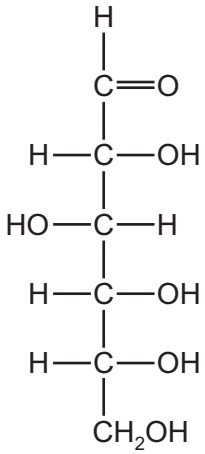
A glucose

B fructose

C maltose

D sucrose

8 Sugars with a ring structure can also have a linear structure.



Which sugar molecules could be represented by the linear structure in the diagram?

1 ribose

2 deoxyribose

3 glucose

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

9 Which row matches each molecule to a type of bond that is present?

	ester bond	hydrogen bond	disulfide bond
A	amylase	haemoglobin	catalase
B	glycerol	glycogen	collagen
C	lipid	amylopectin	amylose
D	phospholipid	cellulose	antibody

10 Which row shows features of a carbohydrate polymer found inside animal cells?

	α-1,4 glycosidic bonds	α-1,6 glycosidic bonds	shape of molecule
A	✓	✓	branched
B	✓	✗	helical
C	✗	✓	branched
D	✗	✗	helical

key

✓ = present

✗ = absent

11 The statements describe the structure of a polysaccharide found in the cell walls of certain plants.

1 The polysaccharide is composed of two different monosaccharides.

2 The monosaccharides are joined by 1,4 glycosidic bonds.

3 The polysaccharide contains pentose sugars.

Which statements are also true for cellulose?

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

12 The general formula for a saturated fatty acid is $C_nH_{2n}O_2$.

Which of these fatty acids are **unsaturated**?

1 $C_{10}H_{19}COOH$

2 $C_{15}H_{31}COOH$

3 $C_{17}H_{31}COOH$

4 $C_{18}H_{32}COOH$

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

13 What enables triglycerides to perform their functions in living organisms?

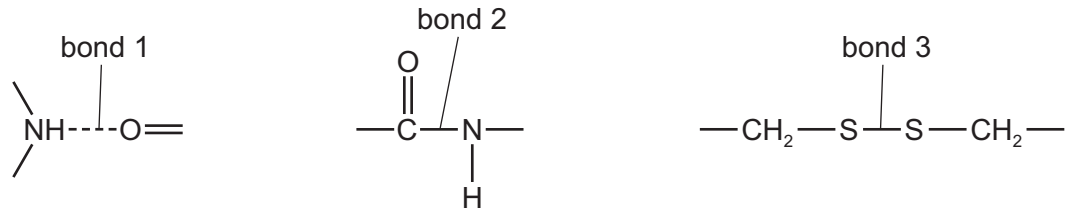
1 Triglycerides have hydrophobic and hydrophilic regions.

2 Triglycerides have a high ratio of carbon–hydrogen bonds to carbon atoms.

3 Hydrolysis of triglycerides releases metabolic water.

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

14 The diagrams show three examples of different bonds.



Which bonds can hold the quaternary structure of proteins together?

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

15 Which row correctly describes the primary structure, secondary structure, tertiary structure and quaternary structure of some proteins?

	primary structure	secondary structure	tertiary structure	quaternary structure
A	determines the folding of the polypeptide	depends on hydrogen bonding between the side-chains of amino acids	defines the overall shape and folding of the protein	formed when two or more identical polypeptides join together
B	defines the order of amino acids in the polypeptide	usually forms immediately after polypeptide synthesis	is held together by all the types of bonding that occur in proteins	found in globular proteins such as haemoglobin but never in fibrous proteins
C	involves covalent bonds only	involves interactions between –H and =O	essential for the function of enzymes and receptors	formed when two or more polypeptides join together
D	involves peptide bonds between the side-chains of amino acids	involves folding between local regions within a polypeptide molecule	changes reversibly when bound to non-competitive inhibitors	can involve hydrogen bonds, covalent bonds and hydrophobic interactions

16 Which relationships could be investigated using a colorimeter?

1 the effect of light intensity on the rate at which a solution of a light-sensitive dye changes from green to colourless

2 the effect of temperature on the rate of breakdown of cell membranes in tissues with pigmented cells, such as beetroot (red beet)

3 the effect of pH on the rate of release of oxygen from the breakdown of hydrogen peroxide by catalase

4 the effect of light intensity on the rate of change of skin colour of lizards that become paler in bright light

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

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17 Which transport mechanism does **not** require a concentration gradient to be present in order to take place?

A exocytosis

B facilitated diffusion

C osmosis

D transpiration

18 High concentrations of ethanol disrupt cell membrane structure by denaturing proteins and increasing the separation of adjacent phospholipid molecules. As a result, cell membranes can decrease in thickness by up to 30% and become more permeable.

Yeast cells release ethanol as a waste product of metabolism. In response to increased ethanol concentration in their environment, yeast cells are able to increase the tolerance of their cell membranes to ethanol.

Which statement correctly explains a response to ethanol that could account for the increase in tolerance of yeast cell membranes to ethanol?

A Decreasing the ratio of saturated fatty acids to unsaturated fatty acids within cell membranes helps to prevent the tails of phospholipids on one side of the bilayer from sliding past the tails of phospholipids on the other side of the bilayer.

B Increasing the proportion of palmitoleic acid (a C16 unsaturated fatty acid) to oleic acid (a C18 unsaturated fatty acid) in the phospholipids of the bilayer increases the fluidity of the cell membrane.

C Activating a cell-signalling pathway triggers the unfolded protein response in the endoplasmic reticulum. The unfolded protein response pauses protein synthesis and initiates cell death in yeast cells with a high proportion of mis-folded proteins.

D Increasing the proportion of ergosterol in the cell membrane prevents the accumulation of polar molecules, such as ethanol, within the cell. Ergosterol in yeast cells has a similar effect on membrane permeability as cholesterol in mammalian cells.

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19 In an investigation, a plant cell was placed in pure water.

The initial rate at which water molecules entered the cell, R, was greater than the initial rate at which water molecules left the cell.

In a second investigation, a plant cell of the same type was placed in a solution with a water potential equal to that of the cell contents.

What will happen in the second investigation over a period of five minutes?

A Water molecules will not enter or leave the cell because the water potential of the cell contents is equal to that of the solution.

B Water molecules will enter and leave the cell in equal amounts, both at an initial rate that is less than R in the first investigation.

C Water molecules will enter and leave the cell in equal amounts, both at an initial rate that is greater than R in the first investigation.

D Water molecules will enter and leave the cell in equal amounts, both at an initial rate that is equal to R in the first investigation.

20 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** G_1 **C** S **D** G_2

21 Some parts of a typical human chromosome are more numerous than others.

Which parts are listed in order from the most numerous to the least numerous?

A centromere, nucleotide, histone

B DNA molecule, telomere, centromere

C histone, telomere, DNA molecule

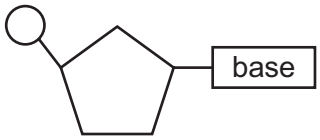
D telomere, centromere, nucleotide

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22 Which row correctly describes a stage of mitosis?

	stage of mitosis	nuclear envelope	centromeres	spindle
A	prophase	disappears	replicate	spindle microtubules begin to form
B	metaphase	not present	move to the poles of the cell	spindle microtubules fully formed
C	anaphase	begins to reform	split into two	some spindle microtubules shorten
D	telophase	reforms	at maximum distance from cell equator	spindle microtubules break down

23 The diagram represents a nucleotide containing adenine.



Which statements about this nucleotide are correct?

1 The carbohydrate is a pentose.

2 The base contains nitrogen.

3 Base pairing occurs with uracil.

4 Adenine is a pyrimidine.

A 1, 2, 3 and 4

B 1, 2 and 3 only

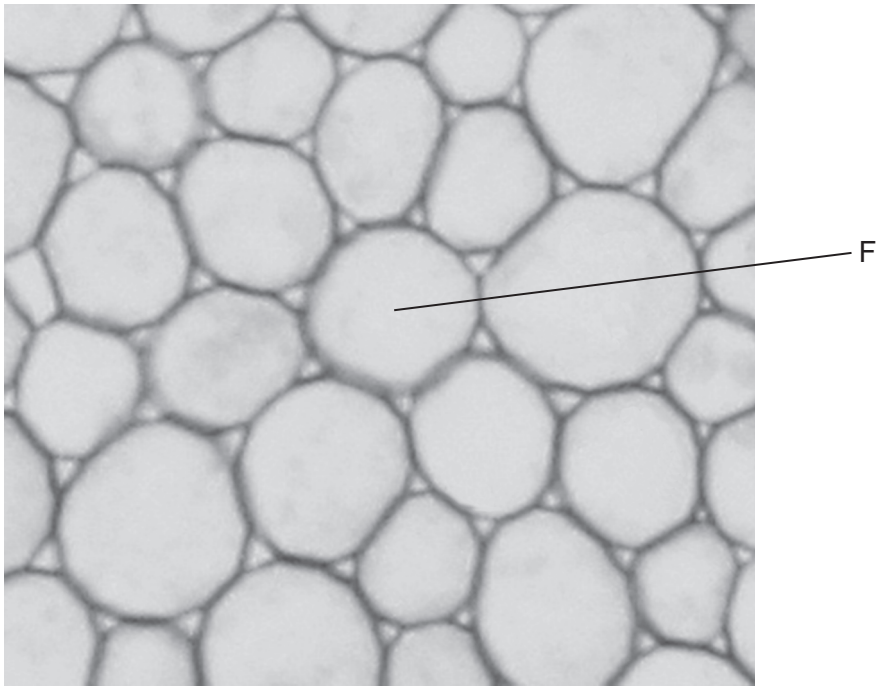
C 1 and 2 only

D 3 and 4 only

24 Which row is correct for the replication of a DNA molecule?

	direction of DNA synthesis	enzyme that adds complementary nucleotides to lagging strand
A	3′ to 5′	DNA polymerase
B	3′ to 5′	DNA ligase
C	5′ to 3′	DNA polymerase
D	5′ to 3′	DNA ligase

25 Some students were asked to look at the photomicrograph of a cross-section of unfamiliar material and describe what they could see.



The students described the cross-section of F as:

1 circular

2 a hollow tube

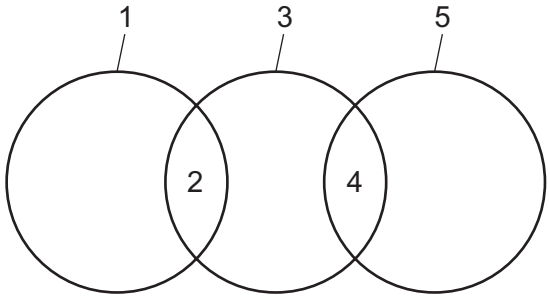
3 spherical.

Which descriptions of the cross-section of F correctly state what the students could actually see?

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

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26 The diagram shows the relationship between phloem sieve tube elements, xylem vessel elements and companion cells.



Which row correctly identifies what could be represented by the numbers 1, 2, 3, 4 and 5?

	1	2	3	4	5
A	companion cells	endoplasmic reticulum	phloem sieve tube elements	no nucleus	xylem vessel elements
B	companion cells	nucleus	phloem sieve tube elements	cytoplasm	xylem vessel elements
C	phloem sieve tube elements	mitochondria	companion cells	nucleus	xylem vessel elements
D	xylem vessel elements	no cytoplasm	phloem sieve tube elements	vacuole	companion cells

27 Why does an air bubble in a xylem vessel element stop the flow of water?

1 loss of adhesion

2 loss of cohesion

3 collapse of xylem vessel element

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

28 Which changes to the water potential and the volume of solution in a phloem sieve tube occur when amino acids are moved into a sink from the phloem sieve tube?

	water potential in the phloem sieve tube becomes	volume of solution in the phloem sieve tube
A	higher	decreases
B	higher	increases
C	lower	decreases
D	lower	increases

29 Which feature of some xerophytic leaves reduces the rate of transpiration by decreasing the water potential gradient between the internal leaf surface and the atmosphere?

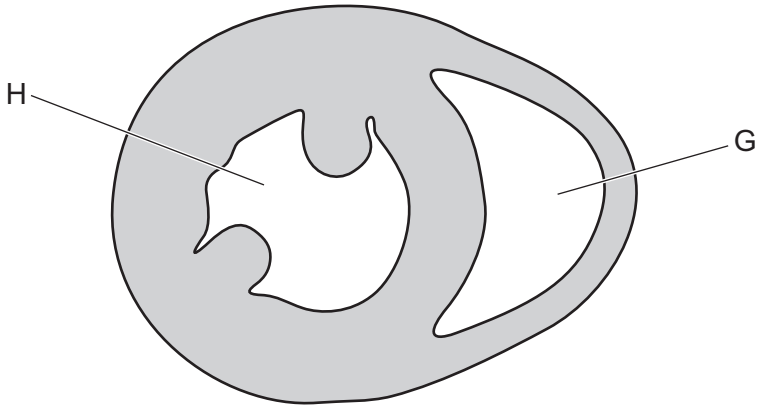
A a thick waxy cuticle on the upper surface of the leaf

B leaves reduced to spines with a small surface area to volume ratio

C stomata located in sunken pits on the leaf surface

D elongated leaves that are swollen storing large amounts of water

30 The diagram shows a cross-section through a mammalian heart.



Which chambers of the heart are represented by G and H?

	G	H
A	left ventricle	right ventricle
B	right atrium	left atrium
C	right atrium	right ventricle
D	right ventricle	left ventricle

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31 Blood entering the heart from the vena cava passes through, or past, several structures before entering the lungs.

Five of these structures are included in this list.

atrioventricular node

aorta

semilunar valve

left atrium

pulmonary vein

Purkyne tissue

sinoatrial node

pulmonary artery

After arranging these five structures in the correct order of blood flow from the vena cava to the lungs, which structure will be third?

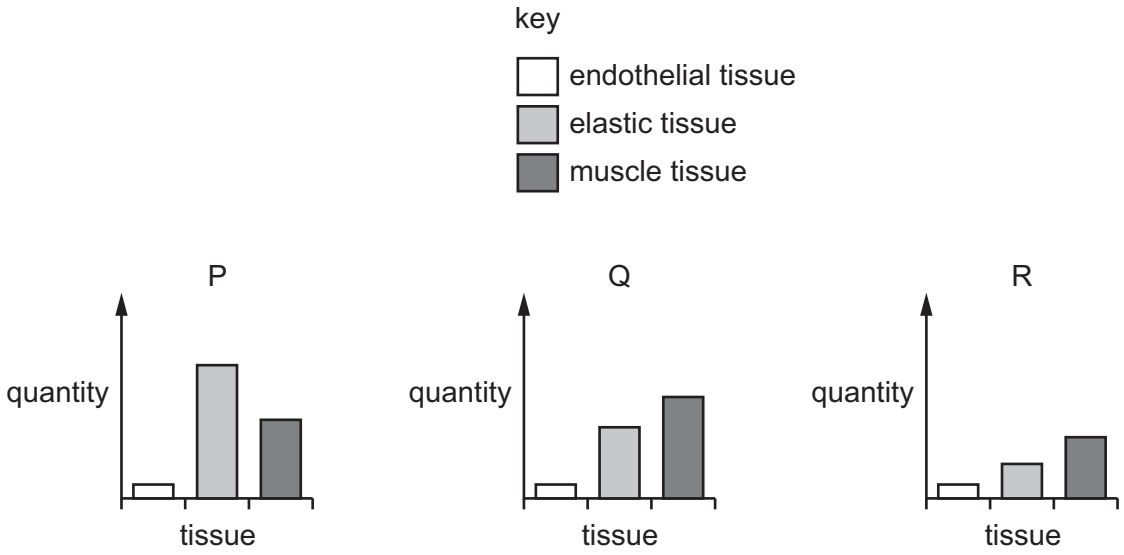
A atrioventricular node

B Purkyne tissue

C semilunar valve

D sinoatrial node

32 The bar charts show the quantity of endothelial tissue, elastic tissue and muscle tissue in the walls of three blood vessels, P, Q and R.



Which row correctly identifies the three blood vessels?

	P	Q	R
A	elastic artery	muscular artery	vein
B	vein	elastic artery	muscular artery
C	muscular artery	elastic artery	vein
D	elastic artery	vein	muscular artery

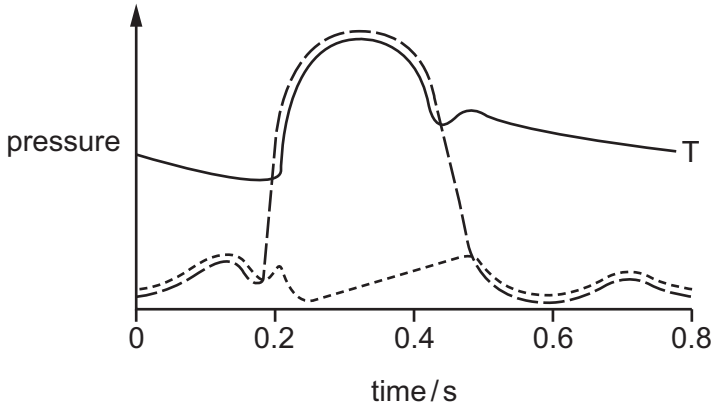
33 The maximum pressure in each of the four chambers of a healthy human heart was recorded during one cardiac cycle. The maximum pressures recorded were 3 mm Hg, 10 mm Hg, 25 mm Hg and 120 mm Hg.

Which value was recorded for the right ventricle?

A 3 mm Hg **B** 10 mm Hg **C** 25 mm Hg **D** 120 mm Hg

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34 The graph shows the pressure changes in three structures of the **right side** of the heart during the cardiac cycle.



What is represented by the line labelled T?

A pressure changes in the pulmonary artery

B pressure changes in the right atrium

C pressure changes in the right ventricle

D pressure changes in the vena cava

35 Which statement helps to explain why there is no cartilage in the walls of the bronchioles?

A Cartilage would make the bronchioles too narrow.

B Gases must diffuse across the walls of the bronchioles.

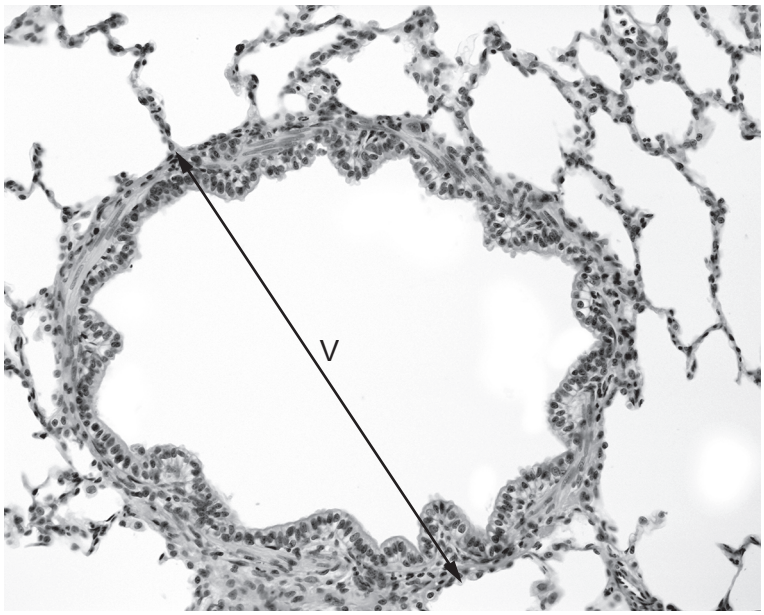
C Smooth muscle is sufficient to support the walls of the bronchioles.

D The bronchiole walls do not need to change shape.

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[Turn over

36 The photomicrograph shows a cross-section of part of the gas exchange system of a mammal.



What is shown by the line labelled V?

A the diameter of an alveolus

B the diameter of a bronchiole

C the diameter of a capillary

D the diameter of a trachea

37 Which feature of the disease cholera decreases the spread of the pathogen *Vibrio cholerae*?

A Immunity to cholera after vaccination is short lived, lasting less than two years after vaccination in 50% of people.

B Up to 98% of people infected with *Vibrio cholerae* are symptomless carriers.

C Cholera rapidly kills up to 50% of people with symptoms if they are not treated.

D Simple rehydration therapy successfully treats about 99% of people with symptoms of cholera.

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38 Which row shows how penicillin kills bacteria?

	process inhibited by penicillin	effect on bacteria
A	formation of peptidoglycan cross-links	water enters and bacteria burst
B	breakdown of peptidoglycan cross-links	water enters and bacteria burst
C	formation of peptidoglycan cross-links	water leaves and bacteria dehydrate
D	breakdown of peptidoglycan cross-links	water leaves and bacteria dehydrate

39 In the hybridoma method, what is grown by cell culture to produce monoclonal antibodies?

A antigens

B clones

C lymphocytes

D myeloma cells

40 Which type of immunity does a baby have at birth?

A active artificial

B active natural

C passive artificial

D passive natural

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