Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

BIOLOGY **9700/12**

Paper 1 Multiple Choice **February/March 2016**

1 hour

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

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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 **15** printed pages and **1** blank page.

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1 A student has drawn a cell structure as seen using a light microscope.

The magnification of the drawing is ×600.

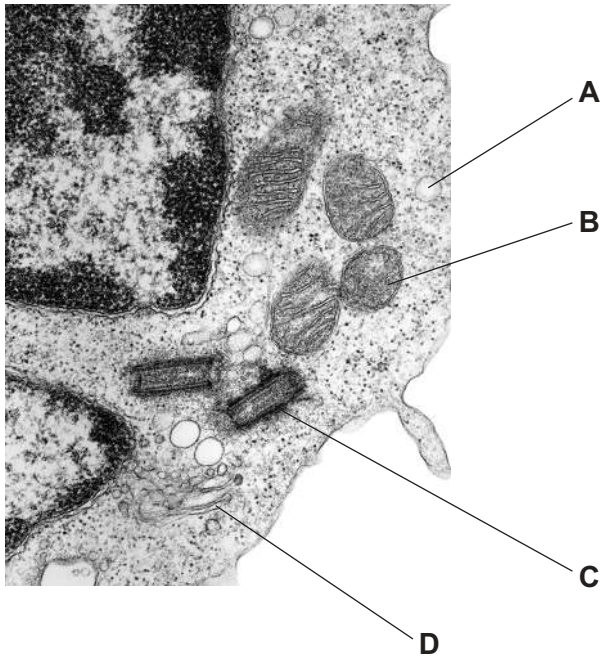
The length of the structure on the drawing is 6 mm.

What is the actual length of the cell structure?

A $1 \times 10^{-1}\,\mu m$ **B** $1 \times 10^{0}\,\mu m$ **C** $1 \times 10^{1}\,\mu m$ **D** $1 \times 10^{2}\,\mu m$

2 The electron micrograph shows part of a eukaryotic cell.

Which of the labelled organelles is a site of protein synthesis?



3 Inside a cell, a damaged mitochondrion can be surrounded and enclosed by a membrane to form a vesicle.

What happens after the fusion of a lysosome with the vesicle?

A ATP production by the mitochondrion increases.

B Enzymes from the lysosome repair the mitochondrion.

C Hydrolytic enzymes catalyse the breakdown of the mitochondrion.

D The mitochondrion is released from the cell by exocytosis.

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4 Which units are the most appropriate to record the diameter of a lymphocyte and a red blood cell?

	lymphocyte	red blood cell
A	mm	mm
B	mm	μm
C	μm	mm
D	μm	μm

5 Which structures will be present in a cell that causes cholera?

1 circular DNA

2 naked DNA

3 70S ribosomes

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

6 What may take place during a hydrolysis reaction?

1 a molecule of water is produced

2 a glycosidic bond is broken

3 a sucrose molecule is split into fructose and glucose

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

7 The table shows some information about four carbohydrate polymers.

polymer	α-1,4 glycosidic bonds	α-1,6 glycosidic bonds	shape of molecule
1	✓	✗	helical
2	✗	✓	branched
3	✓	✓	helical
4	✓	✓	branched

key

✓ = present

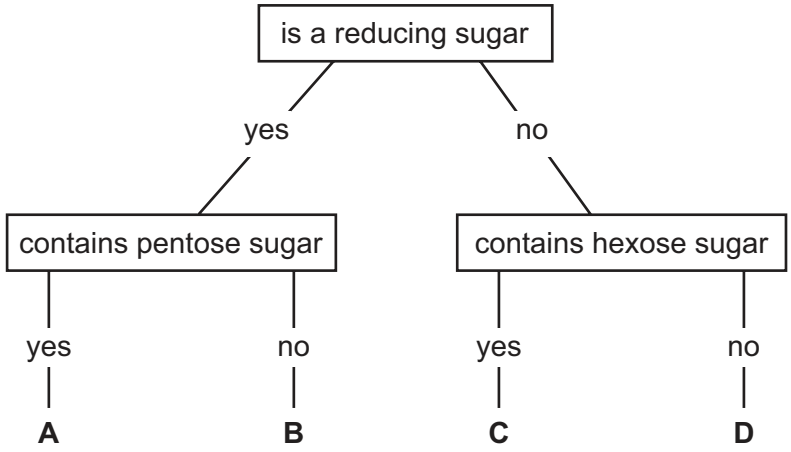
✗ = absent

Which two polymers form starch?

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

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8 Which molecule in the key is sucrose?



9 Which statements about triglycerides and phospholipids are correct?

1 Triglycerides and phospholipids both have a hydrophobic region.

2 Triglycerides are non-polar molecules and phospholipids are polar.

3 Fatty acids in a triglyceride may be saturated or unsaturated but in a phospholipid they are always saturated.

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

10 When proteins are mixed with some organic solvents, hydrophobic interactions and hydrogen bonding are changed in the protein molecules.

Which levels of protein structure would be affected?

	level of protein structure		
	secondary	tertiary	quaternary
A	✓	✓	✗
B	✓	✗	✓
C	✗	✓	✓
D	✓	✓	✓

key

✓ = affected

✗ = not affected

11 The rate of enzyme-catalysed reactions in human cells is regulated.

What may be involved in such regulation?

1 a change in enzyme concentration

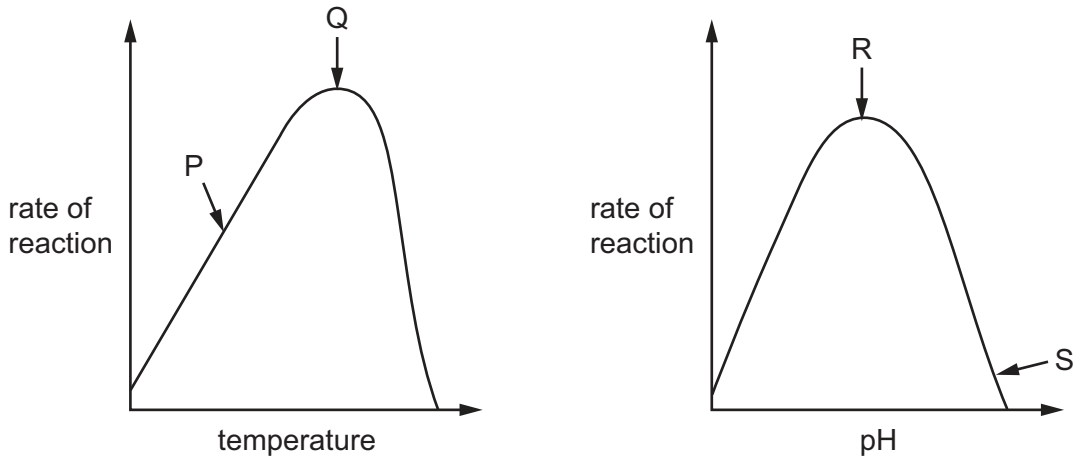
2 a change in substrate concentration

3 inhibition by the final product of the reaction

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

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12 The graphs show the effects of temperature and pH on enzyme activity.



Which statement is a correct explanation of the enzyme activity?

A At P, hydrogen bonds are formed between enzyme and substrate.

B At Q, the kinetic energy of enzyme and substrate is highest.

C At R, disulfide bonds in the enzyme begin to break.

D At S, the enzyme is completely denatured.

13 Which statement correctly describes the action of competitive enzyme inhibitors?

A They bind permanently to the active site.

B They change the shape of the active site.

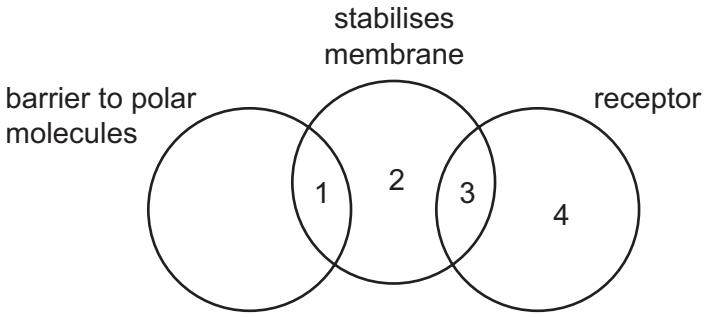
C They limit the formation of enzyme-substrate complexes.

D They lower the activation energy of the reaction.

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[Turn over

14 Which row correctly links molecules in the cell surface membrane with their roles?



	1	2	3	4
A	glycolipid	cholesterol	glycoprotein	phospholipid
B	glycolipid	glycoprotein	phospholipid	cholesterol
C	glycoprotein	phospholipid	cholesterol	glycolipid
D	phospholipid	cholesterol	glycolipid	glycoprotein

15 Antimycin is a chemical that inhibits the function of mitochondria.

Which methods of transport across the cell surface membrane would be inhibited by antimycin?

1 active transport

2 facilitated diffusion

3 endocytosis

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

16 Which statements about the cell cycle are correct?

1 The cell cycle consists of both interphase and mitosis.

2 DNA replication takes place in interphase.

3 A cell can remain in interphase for several months.

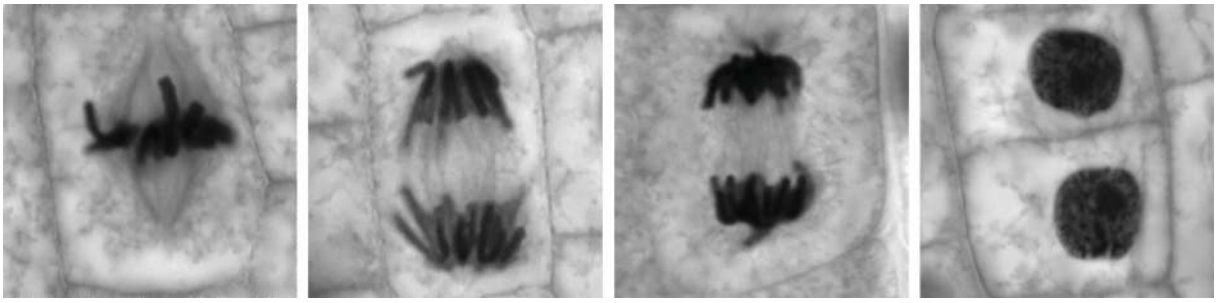
A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

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17 The diagram shows cells in different stages of the cell cycle.

Which is the last stage before cytokinesis?

A **B** **C** **D**



18 How many of the listed structures typically contain genetic material that has telomeres?

- bacterial cell
- chloroplast
- mitochondrion
- nucleus

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

19 What does the enzyme DNA polymerase synthesise in a cell?

A a polypeptide using DNA as a template

B a strand of DNA using a polypeptide as a template

C a strand of DNA using DNA as a template

D a strand of mRNA using DNA as a template

20 21.2% of the bases in a molecule of DNA are cytosine.

What percentage would be adenine?

A 21.2% **B** 28.8% **C** 42.4% **D** 57.6%

21 One gene provides the code for the production of which type of molecule?

A amino acid

B DNA

C nucleotide

D polypeptide

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22 The table shows the mode of action of two antibacterial drugs that can affect the synthesis of proteins.

antibacterial drug	rifampicin	streptomycin
mode of action	binds to RNA polymerase	causes errors in translation

If bacteria are treated with **both** drugs, what will be the immediate effects?

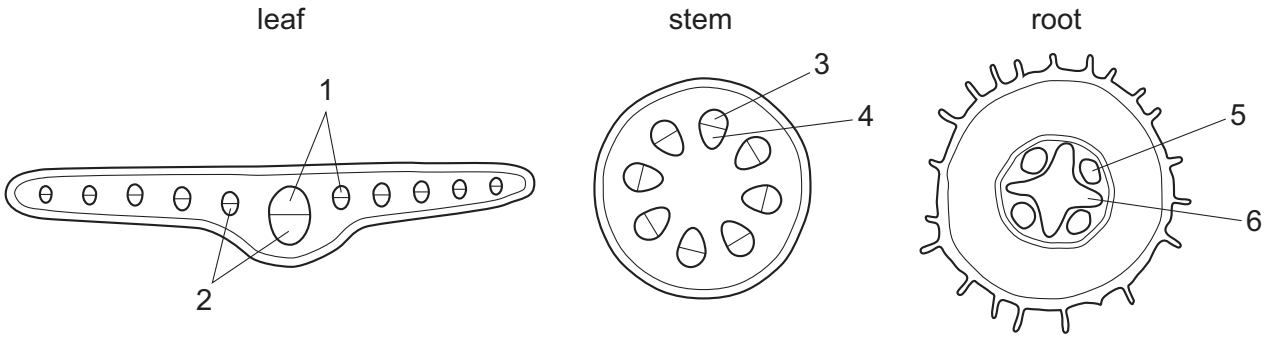
1 Transcription will stop, but faulty proteins may continue to be synthesised.

2 If translation has started, proteins may be faulty.

3 Translation will be inhibited.

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

23 The diagrams show transverse sections of parts of a plant.



In the transverse sections, which tissues transport sucrose?

	1	2	3	4	5	6
A	✓	✗	✓	✗	✗	✓
B	✓	✗	✗	✓	✗	✓
C	✗	✓	✓	✗	✓	✗
D	✗	✓	✗	✓	✓	✗

key
✓ = yes
✗ = no

24 Which statement describes movement through a plant in the apoplast pathway?

A Water moves through the cell walls.

B Water moves through the cytoplasm.

C Water moves through the plasmodesmata.

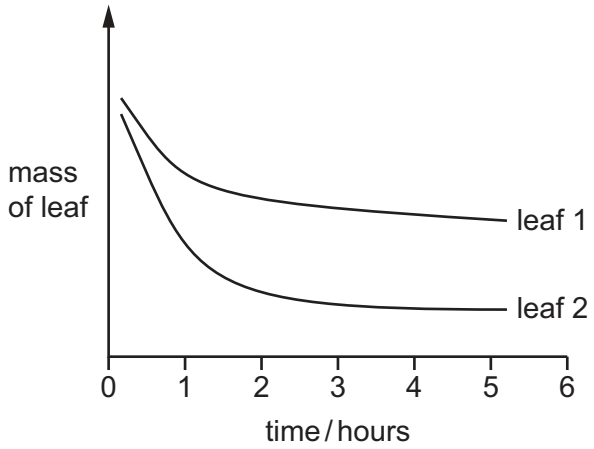
D Water moves through the vacuoles.

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25 Which changes to the water potential and the volume of liquid in the phloem occur when sucrose is moved from the phloem sieve tube to an actively dividing root tip?

	water potential in phloem sieve tube becomes	volume of liquid in phloem sieve tubes
A	less negative	decreases
B	less negative	increases
C	more negative	decreases
D	more negative	increases

26 The diagram shows the results of an experiment using leaves with the same surface area from two different species of plant. Each leaf was left on a balance in daylight in a closed room and its mass recorded at 1 hour intervals.



Which features of leaf 2 could explain these results?

1 more stomata per unit area of leaf

2 fewer trichomes (hairs) on the leaf

3 sunken stomata

4 thinner cuticle

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

27 Which evidence supports the cohesion-tension theory for the movement of water in flowering plants?

1 When the rate of transpiration of a tree is at its maximum, the diameter of the trunk is at its minimum.

2 When a plant shoot is removed close to the base of the stem, sap leaks out from the cut.

3 Evaporation of water from a porous pot can exert a force that draws water up a glass tube attached underneath the pot.

4 Droplets of water form at the edge of leaves of plants growing in conditions of soil with high water content and air with high humidity.

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

28 Cardiac muscle is made up of many fibres that form the walls of the chambers of the heart.

When the heart contracts, these fibres shorten in length so the muscle creates a force that exerts a pressure on the blood, causing it to move.

Which statement explains the difference in thickness of the walls of ventricles of the heart?

A There is more muscle in the wall of the right ventricle than that of the left ventricle because more pressure is needed to push blood into the aorta than into the pulmonary artery.

B The number of muscle fibres in the left ventricle is greater than the number in the right ventricle so their contraction has more force, exerting more pressure on blood.

C The space available to fill with blood inside the left ventricle is smaller than that of the right ventricle so more pressure is needed to force blood out.

D The wall of the right ventricle is thicker than that of the left ventricle because it has to resist more pressure when the muscle of the right ventricle contracts.

29 Which reactions take place at a higher rate in a capillary in an alveolus than in a capillary in active muscle?

1 carbon dioxide + water $\rightarrow$ carbonic acid

2 carbon dioxide + haemoglobin $\rightarrow$ carboxyhaemoglobin

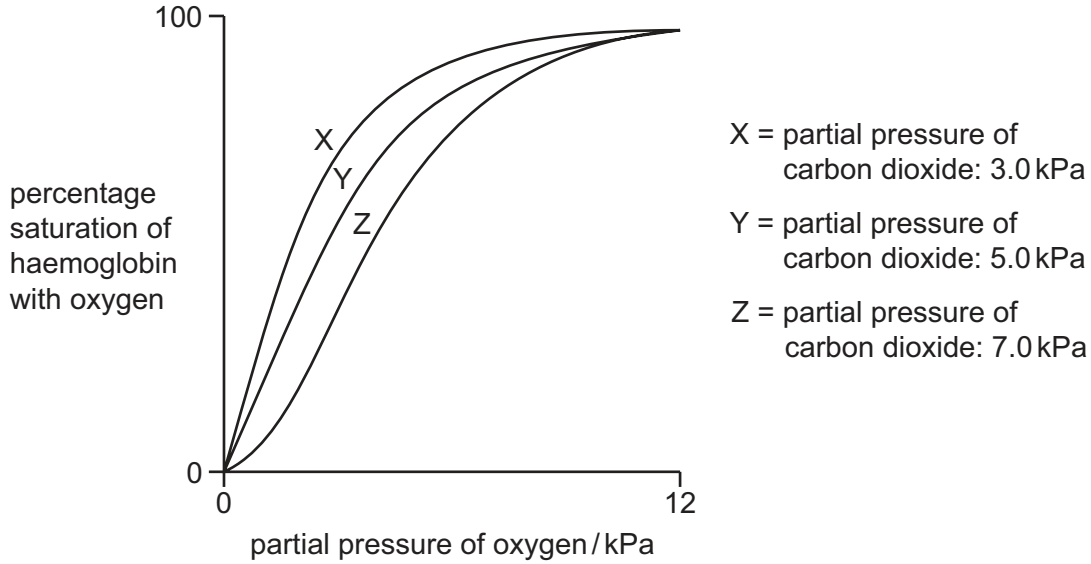
3 haemoglobin + hydrogen ions $\rightarrow$ haemoglobinic acid

4 hydrogencarbonate ions + hydrogen ions $\rightarrow$ carbon dioxide + water

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

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30 The diagram shows the effect of three different concentrations of carbon dioxide on the oxygen dissociation curve for human haemoglobin.



What effect does increasing carbon dioxide concentration have on haemoglobin?

A It makes it less efficient at taking up oxygen and less efficient at releasing it.

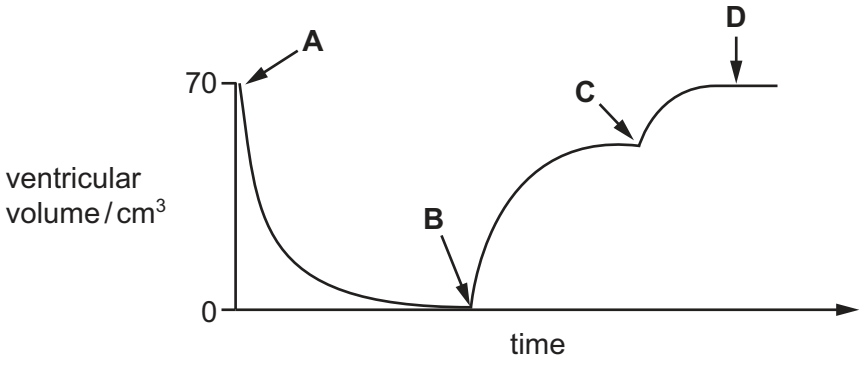
B It makes it less efficient at taking up oxygen and more efficient at releasing it.

C It makes it more efficient at taking up oxygen and less efficient at releasing it.

D It makes it more efficient at taking up oxygen and more efficient at releasing it.

31 The graph shows the changes that take place in the volume of the left ventricle during one cardiac cycle.

Which point on the graph represents the start of atrial systole?



32 The following tissues carry an electrical impulse during the cardiac cycle.

1 atrioventricular node

2 muscle wall of atria

3 Purkyne tissue

4 sinoatrial node

In what order does the electrical impulse travel during the cardiac cycle?

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

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

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

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

33 Some of the effects of smoking are listed.

1 It causes coughing.

2 It increases blood pressure.

3 It decreases the transport of oxygen.

4 It increases the risk of cancer.

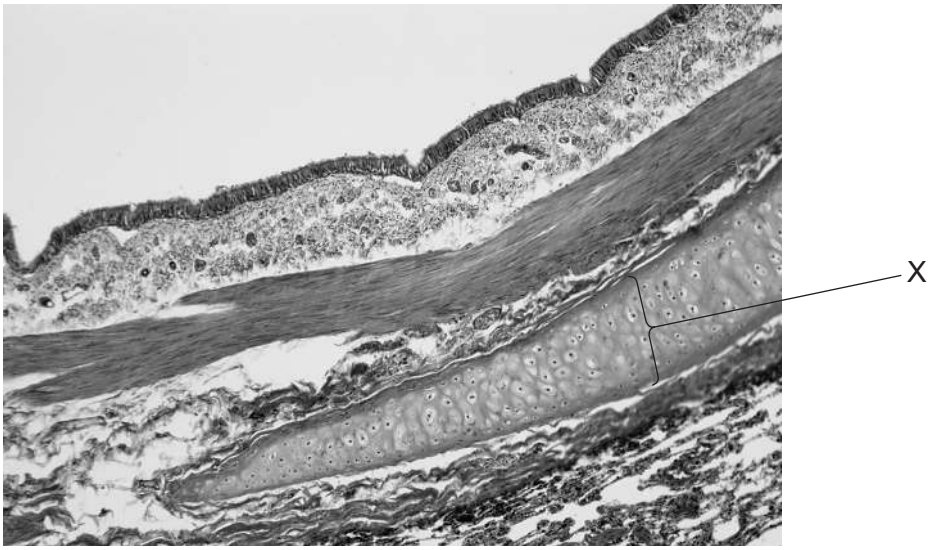
5 It prevents cilia from moving.

Which components of tobacco smoke cause these effects?

	tar	carbon monoxide	nicotine
A	1, 3 and 4	2	4 and 5
B	1, 4 and 5	3	2
C	1 and 5	3 and 5	4
D	3 and 4	1, 2 and 5	2 and 4

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34 The photomicrograph shows a section through part of a bronchus wall.



What is the function of the tissue labelled X?

A contracts to constrict the airway

B helps to widen the airway when at high altitudes

C produces mucus to trap dust particles and bacteria

D supports the airway to prevent collapse

35 Which of the following increase the risk of contracting TB?

1 drinking unpasteurised milk

2 eating shellfish which have fed on raw sewage

3 living in overcrowded conditions

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

36 One control method to reduce the spread of malaria is to use an insecticide. It can be used to treat mosquito nets.

Another control method is to completely cover areas of water with insoluble polystyrene balls that float on the surface.

Using this information, what are the reasons for these control methods?

	nets treated with insecticide	polystyrene balls
A	kills all male mosquitoes	prevents adult mosquitoes from laying eggs
B	kills all mosquitoes	releases toxins that kill mosquito larvae
C	kills some mosquitoes	restricts the breathing of the mosquito larvae
D	prevents mosquitoes from breeding	reduces nutrient supply for mosquito larvae

37 What is **not** an example of antibiotic action?

A damage to cell surface membranes

B prevention of protein synthesis

C prevention of synthesis of new cell walls

D stimulation of antibody production

38 Which row correctly identifies the roles of B-lymphocytes and T-lymphocytes?

	secrete antibodies	secrete cytokines	provide humoral response
A	B-lymphocytes	T-lymphocytes	B-lymphocytes
B	B-lymphocytes	T-lymphocytes	T-lymphocytes
C	T-lymphocytes	B-lymphocytes	B-lymphocytes
D	T-lymphocytes	B-lymphocytes	T-lymphocytes

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39 A person's blood group is determined by antigens present on the red blood cells. The table shows the antigens and antibodies in the blood of people with different blood groups.

blood group	antigens on red blood cells	antibodies in plasma
A	A	anti-B
B	B	anti-A
AB	A and B	neither
O	neither	anti-A and anti-B

During a blood transfusion, it is essential that the recipient's blood does **not** contain antibodies to the donor's blood.

Which blood groups can be given to a person with blood group B?

A A and B **B** AB and B **C** AB and O **D** B and O

40 An enzyme hydrolyses the two heavy polypeptide chains of an antibody molecule. The hydrolysis occurs at the hinge region and breaks the antibody into three fragments.

How many of these fragments are able to bind to antigens?

A 0 **B** 1 **C** 2 **D** 3

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