Cambridge International AS & A Level

Cambridge Assessment International Education
Cambridge International Advanced Subsidiary and Advanced Level

BIOLOGY **9700/13**

Paper 1 Multiple Choice **May/June 2019**

1 hour

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

8538879965

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.

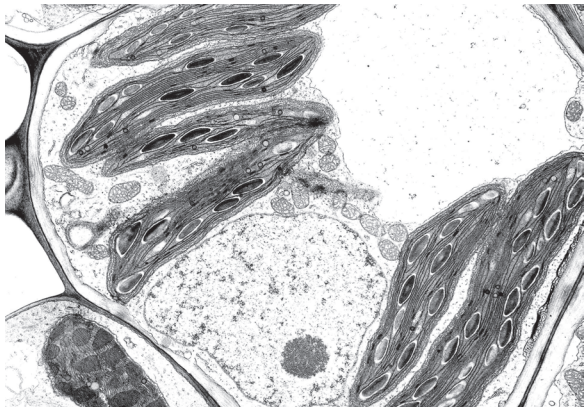
This document consists of **17** printed pages and **3** blank pages.

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1 Which combination of lenses for a light microscope will give the greatest magnification?

	eyepiece lens	objective lens
A	×5	×100
B	×10	×40
C	×15	×40
D	×15	×100

2 The photomicrograph shows some mesophyll tissue from a dicotyledonous leaf.

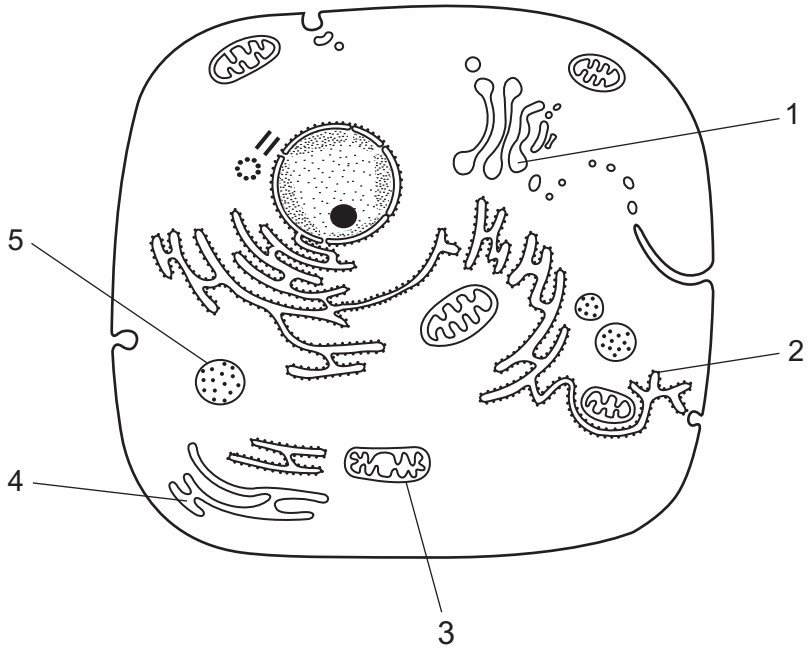


What is the magnification of the photomicrograph?

A ×280 **B** ×2800 **C** ×3570 **D** ×7000

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3 The diagram shows a typical animal cell as seen using an electron microscope.



Which of the numbered structures are needed for proteins to be secreted at the cell surface membrane?

A 2, 3, 4 and 5 **B** 1, 2 and 4 **C** 1 and 3 **D** 5 only

4 Lysosomes vary in shape and size, making them difficult to identify.

What describes a lysosome?

A a vesicle containing enzymes, enclosed by a double membrane, that is budded off the endoplasmic reticulum

B a vesicle containing hydrolytic enzymes and surrounded by a single membrane, found only in phagocytes

C a vesicle enclosed by a single membrane, containing several different hydrolytic enzymes that may act inside or outside the cell

D a vesicle surrounded by a double membrane, containing enzymes which can hydrolyse damaged organelles in a cell

5 Which statements about ATP are correct?

1 It is produced in mitochondria only.

2 It can be hydrolysed to form ADP.

3 It contains deoxyribose.

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

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6 A single-celled organism lives inside the body of a fish. This single-celled organism is rod-shaped, 700 μm long, enclosed in a cell wall and has cytoplasm containing thousands of copies of small, circular DNA.

Which statement about this single-celled organism is correct?

A It is a eukaryote, because it can be seen without using a microscope.

B It is a eukaryote, because it is too large to be a prokaryote.

C It is a plant, because it is enclosed in a cell wall.

D It is a prokaryote, because it has small, circular DNA in its cytoplasm.

7 A solution of amylase was added to a suspension of starch. The mixture was stirred and kept at 40 °C for 45 minutes.

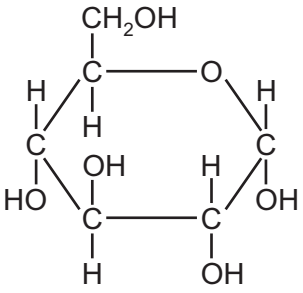
Samples were then tested with various reagents.

What is the expected set of results?

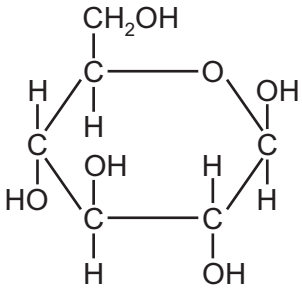
	test and resulting colour		
	iodine test	Benedict's test	biuret test
A	black	blue	blue
B	black	orange	purple
C	brown	blue	blue
D	brown	orange	purple

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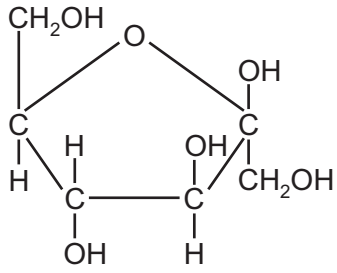
8 The diagram shows three hexose sugars.



1



2



3

Which row correctly shows examples of carbohydrates in which these three hexose sugars occur?

	sucrose	cellulose	amylose
A	1	2	3
B	1	3	2
C	2	3	1
D	3	2	1

9 What can occur as a result of a condensation reaction?

1 A disaccharide is formed.

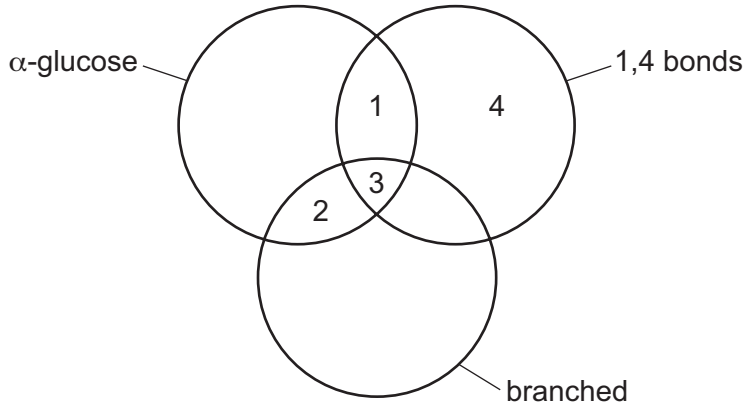
2 A glycosidic bond is broken.

3 A molecule of water is produced.

4 Two monosaccharides join together.

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

10 The diagram shows some relationships between features of carbohydrates.



Which row correctly matches the carbohydrate with some of its features?

	1	2	3	4
A	amylopectin	sucrose	glycogen	cellulose
B	amylose	glycogen	amylopectin	cellulose
C	cellulose	amylopectin	glycogen	sucrose
D	glycogen	cellulose	amylose	amylopectin

11 Which row describes a triglyceride?

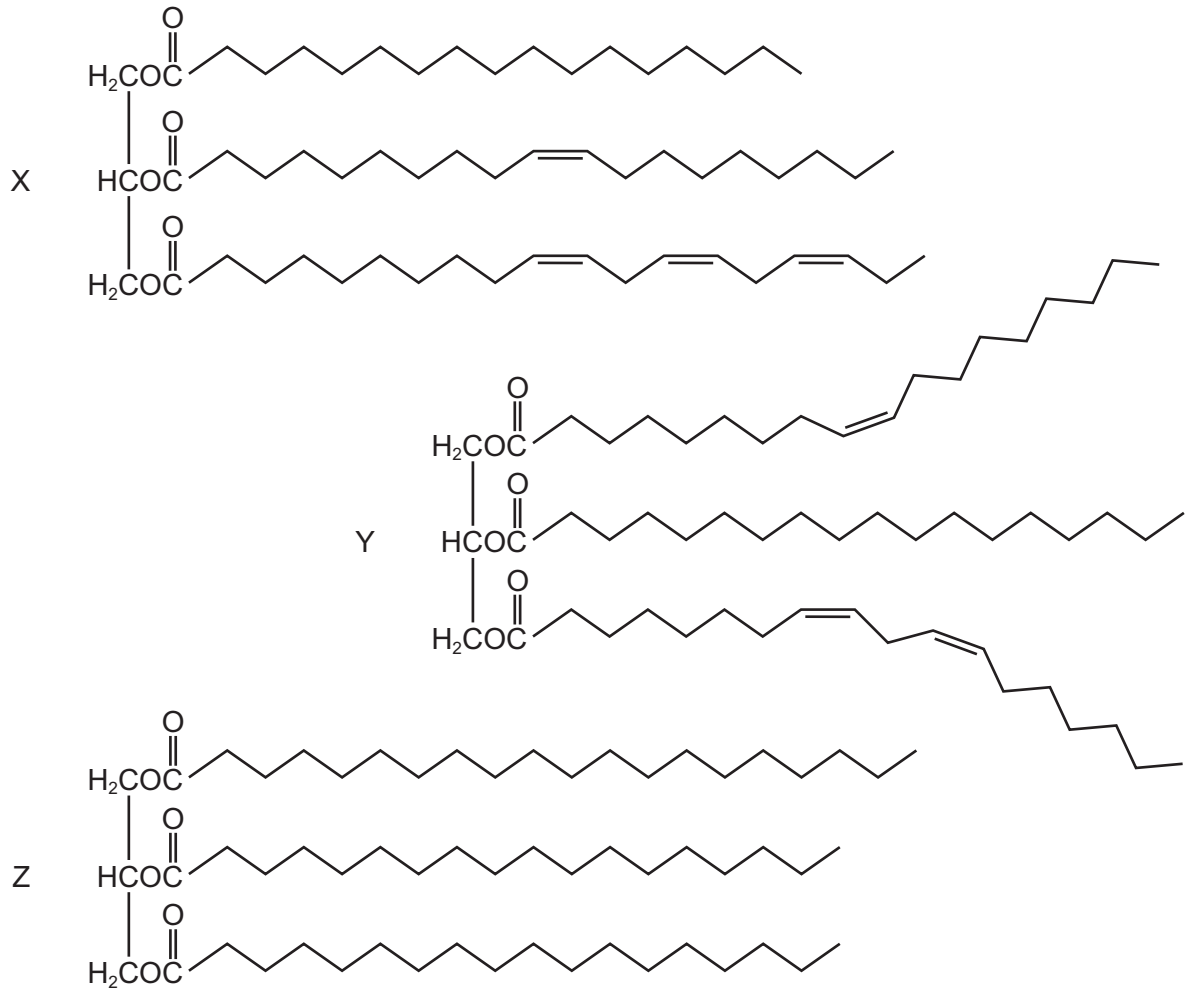
	hydrophilic	insoluble in alcohol
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

key

✓ = correct

✗ = not correct

12 The diagram shows three triglycerides, X, Y and Z.



What is correct for these triglycerides?

	contains saturated fatty acids	contains unsaturated fatty acids	contains more than two different fatty acids
A	X, Y and Z	X and Y	X and Y
B	X, Y and Z	Z	X and Y
C	X and Y	X, Y and Z	X, Y and Z
D	Z	X and Y	X, Y and Z

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[Turn over

13 Which features of collagen result in it having high tensile strength?

1 Bonds form between adjacent molecules.

2 Each three-stranded molecule is held together by hydrogen bonds.

3 Every third amino acid in the polypeptide is small.

4 The primary structure is held together by peptide bonds.

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

14 Which levels of protein structure would always be changed if an enzyme works by the induced fit hypothesis?

	primary	secondary	tertiary	quaternary
A	✓	✓	✓	✓
B	✓	✓	✗	✗
C	✗	✓	✗	✗
D	✗	✗	✓	✗

key

✓ = always changed

✗ = not changed

15 The enzyme β-galactosidase can catalyse the hydrolysis of four substrates, **A**, **B**, **C** and **D**, with similar structures.

Each substrate has a different K_m value.

For which substrate does β-galactosidase have the **lowest** affinity?

A $K_m = 4 \times 10^{-3}\,\text{mol}\,\text{dm}^{-3}$

B $K_m = 1 \times 10^{-3}\,\text{mol}\,\text{dm}^{-3}$

C $K_m = 2 \times 10^{-4}\,\text{mol}\,\text{dm}^{-3}$

D $K_m = 1 \times 10^{-4}\,\text{mol}\,\text{dm}^{-3}$

16 Which is correct for competitive inhibitors of enzymes?

1 They occupy the active site of an enzyme.

2 They have exactly the same shape as the substrate.

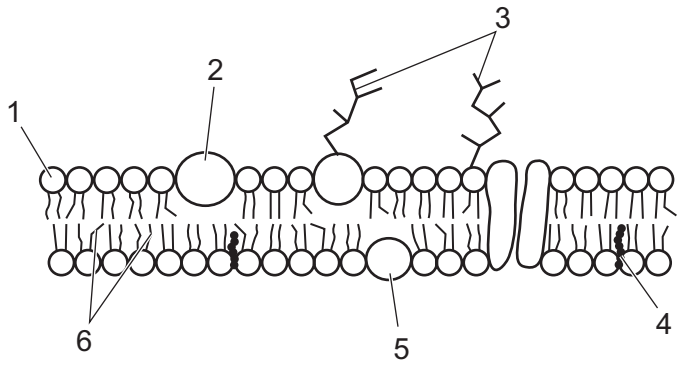
3 They can be used to control the rate of enzyme activity.

4 They can bind to a site on an enzyme other than the active site.

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

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17 The diagram represents the fluid mosaic model of membrane structure.



Which two of the numbered components contribute to the fluidity of the membrane?

A 1 and 3 **B** 2 and 4 **C** 3 and 5 **D** 4 and 6

18 The cell surface membranes of some cells are largely made up of phospholipids and cholesterol, with few proteins.

Which transport mechanisms will be reduced across these membranes?

1 facilitated diffusion

2 active transport

3 diffusion

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

19 One of the glycoproteins present in the cell surface membrane of human cells is called ICAM-1.

ICAM-1 is a cell adhesion molecule and it is also used by the common cold virus to attach to human cells.

Which statements are true about ICAM-1?

1 A drug binding to ICAM-1 to block the common cold virus could stop cells attaching to each other.

2 Part of the ICAM-1 structure must be complementary to proteins in the coat of the common cold virus.

3 The ICAM-1 structure must have hydrophobic parts to stabilise it within the cell membrane.

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

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20 A student weighed a cylinder of potato and then put it into a test-tube containing a salt solution.

The potato cylinder was removed from the salt solution after one hour. It was blotted dry and then reweighed. The student recorded that the potato had lost mass.

Which row shows the correct explanation for the results the student collected?

	water potential of the potato cells before soaking	condition of the potato cells after soaking
A	higher	plasmolysed
B	higher	turgid
C	lower	plasmolysed
D	lower	turgid

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

Which of the 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

22 The enzyme telomerase prevents loss of telomeres after many mitotic cell cycles.

Which cells need to transcribe telomerase enzyme?

1 stem cells

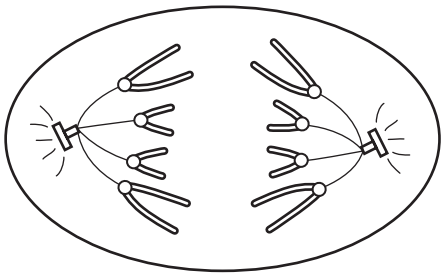
2 activated memory B-lymphocytes

3 helper T-lymphocytes secreting cytokines

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

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23 The diagram shows a cell during mitosis.



Which description correctly identifies the cell?

A a plant cell during anaphase

B a plant cell during metaphase

C an animal cell during anaphase

D an animal cell during metaphase

24 A gene codes for the production of a protein, p53, that binds to damaged DNA during interphase and prevents its replication. A carcinogen in cigarette smoke mutates this gene.

Which statement explains why this mutation may cause cancer?

A Cells with no p53 are allowed to undergo mitosis.

B Cells with no p53 allow their damaged DNA to replicate.

C The carcinogen in cigarette smoke increases the rate of cell division.

D The p53 causes uncontrolled cell division.

25 What is the role of DNA polymerase?

A condensation reactions to produce DNA nucleotides for replication

B correct alignment of RNA nucleotides along a template strand of DNA

C formation of bonds to complete the sugar-phosphate backbone

D formation of glycosidic bonds between complementary base pairs

26 Which row represents the correct features of the nitrogenous base thymine?

	has a single ring structure	is a purine	forms two hydrogen bonds with its complementary base	pairs with cytosine
A	✓	✓	✗	✗
B	✓	✗	✓	✗
C	✗	✓	✗	✓
D	✗	✗	✓	✓

key

✓ = correct

✗ = not correct

27 Meselson and Stahl investigated DNA in bacteria. They grew bacteria in a medium with only heavy nitrogen, ^{15}N, until all of the bacterial DNA was heavy.

These bacteria were moved from a heavy nitrogen medium and cultured in a medium with only light nitrogen, ^{14}N.

A sample of bacteria was collected from the second generation and their DNA analysed.

Hybrid DNA contains both heavy and light DNA.

Which row shows the percentage of heavy DNA strands and the percentage of hybrid DNA molecules in the second generation produced in the medium containing light nitrogen?

	percentage of heavy DNA strands	percentage of hybrid DNA molecules
A	25	25
B	25	50
C	50	25
D	50	50

28 The table shows the DNA triplet codes for some amino acids.

amino acid	DNA triplet code	amino acid	DNA triplet code
arginine	GCA	glycine	CCA
arginine	GCC	glycine	CCG
arginine	GCG	glycine	CCT
asparagine	TTA	lysine	TTC
asparagine	TTG	lysine	TTT
STOP	ATC	proline	GGA
cysteine	ACA	proline	GGC
cysteine	ACG	valine	CAC

The base sequence on the DNA strand coding for a polypeptide is shown.

CCA TTC ACG GCG TTA GCA

Two mutations occur in this sequence during DNA replication.

Which mutated DNA would have **no** effect on the polypeptide synthesised?

A CCA ATC ACG GCG TTG GCA

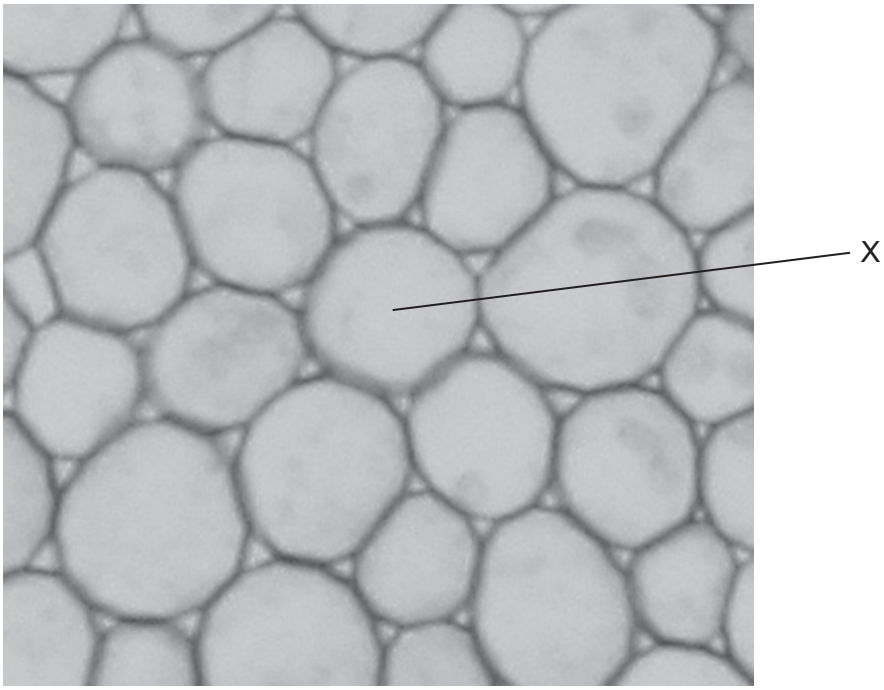
B CCA TTC ACA GCA TTA GCA

C CCA TTC ACG CCG TTA GCC

D CCT TTC ACG GCG TTA GGA

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29 A group of students were asked to look at the photomicrograph of a cross-section of unfamiliar material and make observations.



The students described X as:

1 circular

2 a hollow tube

3 a spherical structure.

Which descriptions are correct?

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

30 Irrigating crop plants with water containing low concentrations of salt causes an increase in the concentration of salt in the soil.

What explains why the increase in salt concentration eventually kills the crop?

	water potential in roots	water potential in soil	direction of water movement
A	↓		into the roots
B	↑		into the soil solution
C		↓	out of the roots
D		↑	into the roots

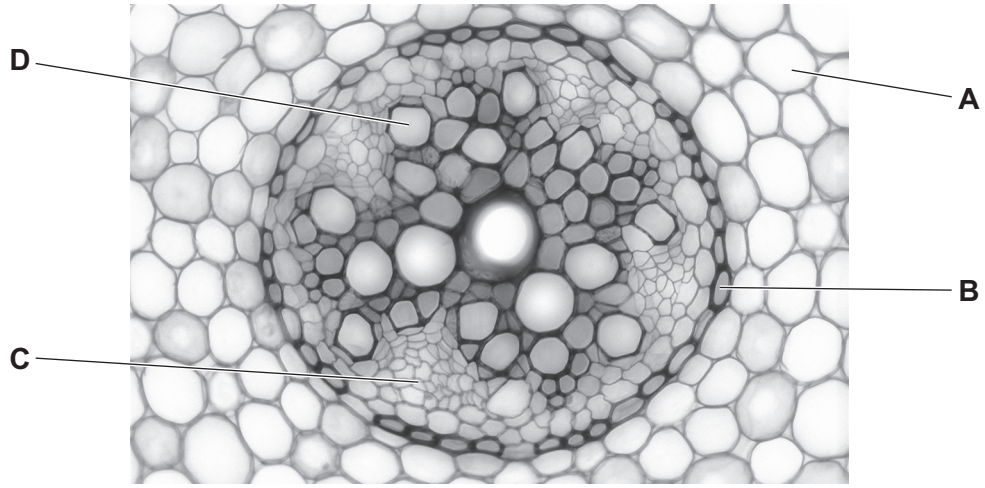
key

↑ = water potential increases

↓ = water potential decreases

31 The photomicrograph shows a transverse section through part of a plant root.

Which tissue inhibits the path of water through the apoplastic pathway?



32 The table shows some information about three blood vessels, P, Q and R, from a mammal.

	diameter / mm	wall thickness / mm	percentage composition of wall		
			muscle	collagen	elastin
P	25	2	22	33	40
Q	20	1	25	40	25
R	4	1	35	25	30

Which row identifies blood vessels P, Q and R?

	P	Q	R
A	artery	vein	artery
B	artery	vein	capillary
C	vein	artery	capillary
D	vein	artery	vein

33 Which row correctly identifies the locations in which a type of molecule or cell is present?

	type of molecule or cell	blood	lymph	tissue fluid
A	antigen	✓	✓	✓
B	glucose	✓	✗	✓
C	lymphocyte	✗	✓	✗
D	neutrophil	✗	✓	✓

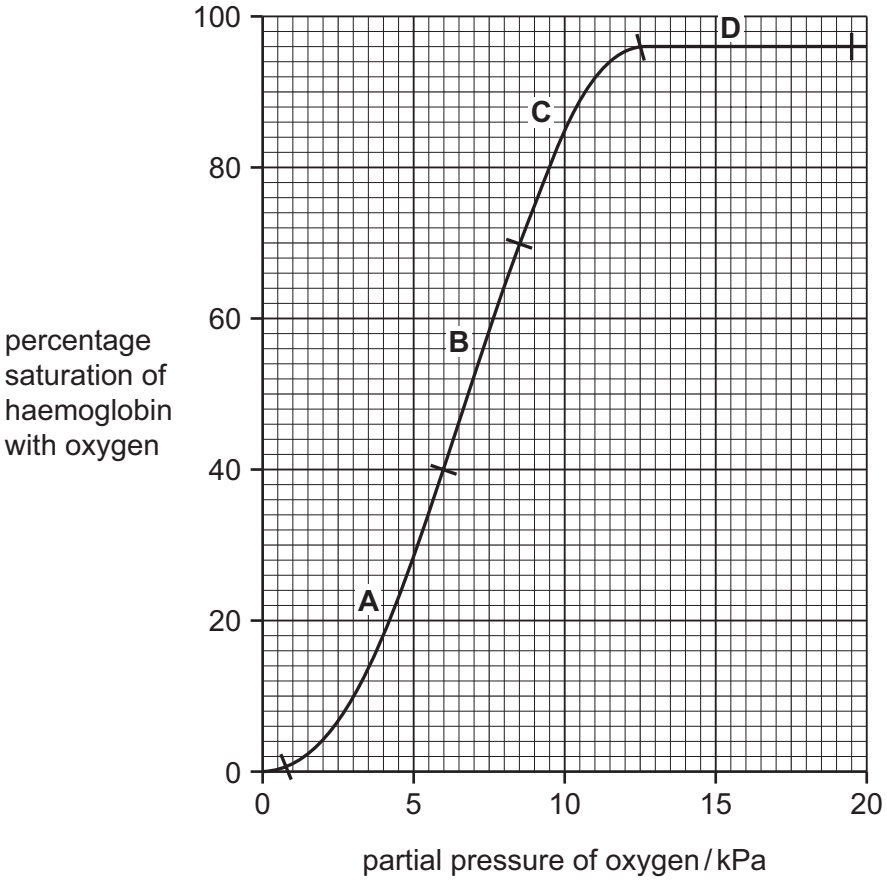
key

✓ = is present

✗ = is not present

34 The graph shows the percentage saturation of haemoglobin with oxygen at different partial pressures of oxygen.

Which range of partial pressures of oxygen results in the greatest change of percentage saturation of haemoglobin per kPa?



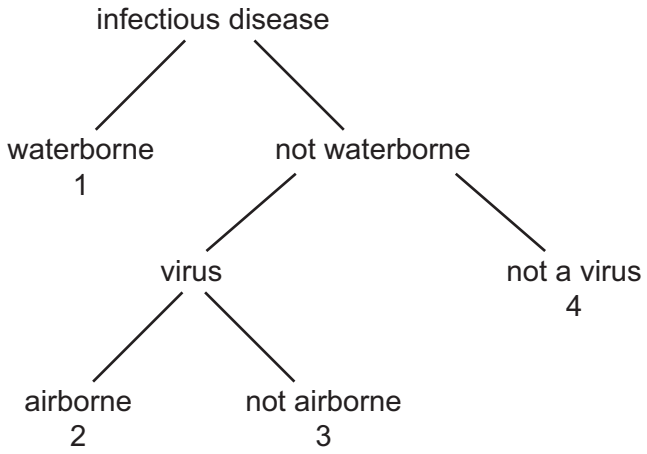
35 How many layers of cell surface membrane separate an oxygen molecule in the air space of an alveolus from the nearest haemoglobin molecule?

A 3 **B** 4 **C** 5 **D** 6

36 Which biochemical is formed and what happens to the oxygen dissociation curve of adult haemoglobin when carbon dioxide combines with haemoglobin?

	biochemical formed	oxygen dissociation curve
A	carbaminohaemoglobin	shifts to the left
B	carbaminohaemoglobin	shifts to the right
C	carboxyhaemoglobin	shifts to the left
D	carboxyhaemoglobin	shifts to the right

37 The diagram has been used to identify four infectious diseases.



Which row correctly identifies the infectious diseases?

	1	2	3	4
A	cholera	measles	HIV / AIDS	TB
B	cholera	smallpox	malaria	measles
C	malaria	HIV / AIDS	TB	cholera
D	malaria	TB	measles	cholera

38 How does penicillin affect bacteria?

A It inhibits DNA replication by binding to nucleotides.

B It inhibits translation by preventing tRNA binding to ribosomes.

C It is a competitive inhibitor of an enzyme in cell wall synthesis.

D It is a competitive inhibitor of an enzyme in protein synthesis.

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39 Growth factors are chemicals that stimulate a cell to divide.

Growth factors are transported around the body in the blood, and they attach to cells that have complementary growth factor receptors on their surface.

Some cells have too many growth factor receptors on their surface and so the cells continue to divide, forming a tumour.

Trastuzumab is used as a treatment for some cancers.

Trastuzumab works by binding to a specific growth factor receptor on a tumour cell. This stops the cell dividing and the cell dies.

What is trastuzumab?

A a monoclonal antibody

B a vaccine

C an antibiotic

D an enzyme inhibitor

40 What describes artificial active immunity?

A protection against a pathogen by an injection of antibodies

B protection against a pathogen by drinking colostrum containing antibodies

C stimulation of lymphocytes by antigens contained in a vaccine

D stimulation of lymphocytes by antigens on the surface of invading pathogens

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