Cambridge Assessment International Education

Cambridge International AS & A Level

BIOLOGY **9700/12**

Paper 1 Multiple Choice **May/June 2025**

1 hour 15 minutes

You must answer on the multiple choice answer sheet.

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.

This document has **20** pages. Any blank pages are indicated.

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1 Which row shows possible uses of an eyepiece graticule?

	comparing the diameter of two cells viewed with a ×40 objective lens	calibrating a stage micrometer viewed with a ×10 objective lens
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

key

✓ = possible

✗ = **not** possible

2 Which statement about a light microscope is correct?

A As the distance to see two points as separate points decreases, the resolution also decreases.

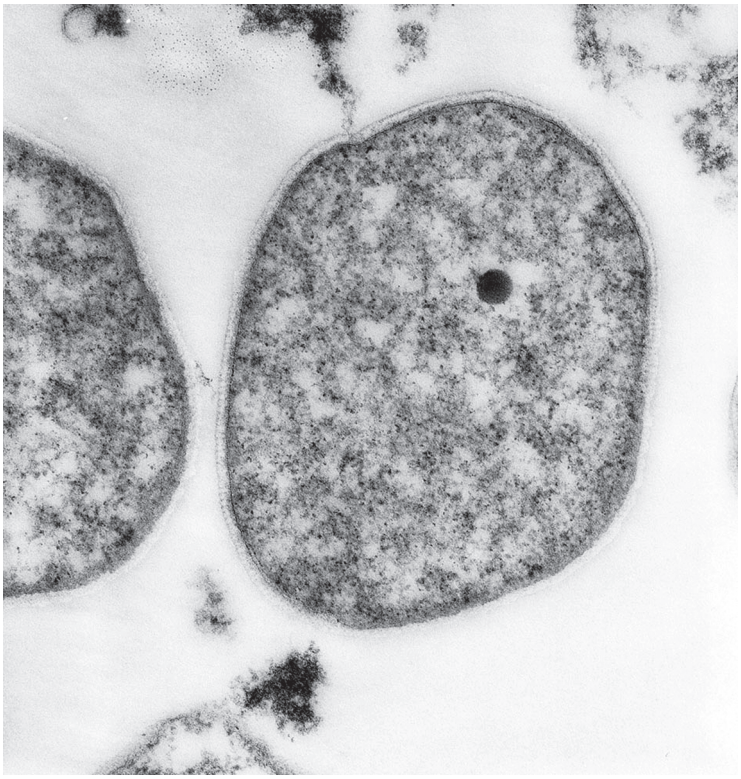
B A bacterium 0.2 μm in diameter will **not** be visible if the resolution is 220 nm.

C Two membranes that are less than 300 nm apart will be visible as two separate membranes if the wavelength of light is 600 nm.

D The resolution will improve with visible light of a longer wavelength, such as red light.

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3 The electron micrograph shows a cell.



×108 000

What is the actual maximum length of the cell?

A 0.509 μm **B** 0.676 μm **C** 1.48 μm **D** 6.76 μm

4 The table compares some biochemical molecules of P, Q, R and S.

	chlorophyll	DNA	RNA	peptidoglycan
P	✓	✓	✓	✗
Q	✗	✓	✓	✗
R	✗	✓	✓	✓
S	✗	✗	✓	✗

key
✓ = present
✗ = **not** present

Which row correctly identifies P, Q, R and S?

	P	Q	R	S
A	chloroplast	virus	mitochondrion	bacterium
B	chloroplast	mitochondrion	bacterium	virus
C	mitochondrion	virus	bacterium	chloroplast
D	virus	bacterium	mitochondrion	chloroplast

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5 Which cell structures contain enzymes **and** are enclosed by a double membrane?

1 nucleus

2 mitochondrion

3 chloroplast

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

6 What is the order of size of cell structures?

	largest →			smallest
A	centrioles	ribosomes	lysosomes	nucleoli
B	centrioles	nucleoli	lysosomes	ribosomes
C	nucleoli	lysosomes	centrioles	ribosomes
D	nucleoli	centrioles	ribosomes	lysosomes

7 A sample of a solution of sucrose tested for reducing sugars remains blue, but when another sample of the same solution is tested for non-reducing sugars the solution turns red.

What explains these results?

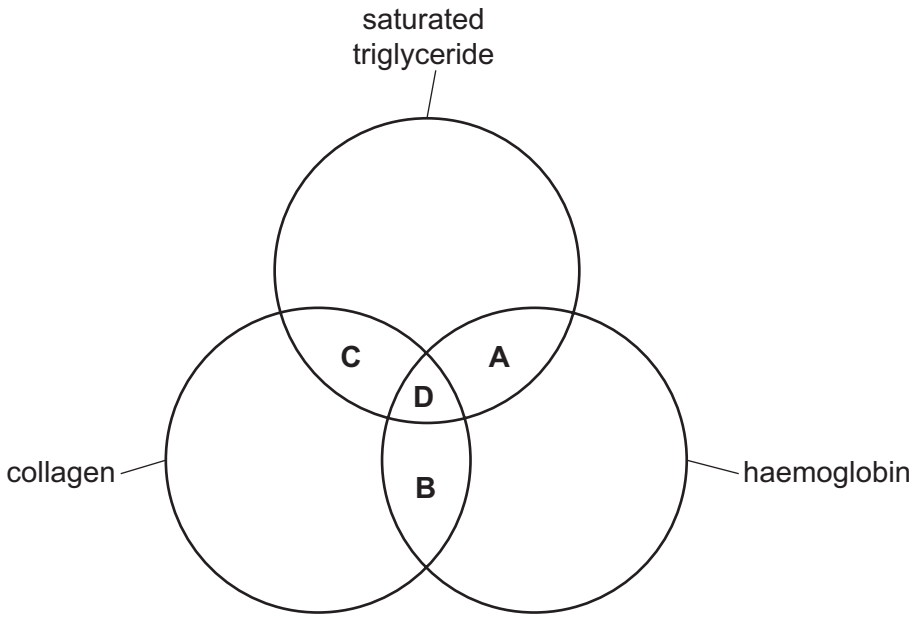
A During the non-reducing sugar test, an acid hydrolyses sucrose to glucose and fructose.

B During the non-reducing sugar test, sucrose molecules condense into polysaccharides.

C The reducing sugar test converts sucrose into glucose and fructose.

D The reducing sugar test hydrolyses monosaccharides to disaccharides.

8 Which molecules contain at least two double bonds?



9 Amylose, amylopectin and glycogen are all polysaccharides.

Enzyme X removes one maltose molecule at a time from the ends of a polysaccharide molecule by hydrolysis of α-1,4-glycosidic bonds.

Which row shows how completely each of these molecules will be hydrolysed by enzyme X?

(Assume that each polysaccharide is composed of the same number of monomers before hydrolysis begins.)

	least completely hydrolysed ⟶		most completely hydrolysed
A	amylose	amylopectin	glycogen
B	amylose	glycogen	amylopectin
C	glycogen	amylose	amylopectin
D	glycogen	amylopectin	amylose

10 Which property of water enables sweating to be an efficient means of losing heat from the body?

A The latent heat of vaporisation of water is high.

B The specific heat capacity of water is high.

C Each water molecule can form a hydrogen bond with four water molecules.

D The forces of cohesion and adhesion on water molecules are very high.

11 Which bonds are found in the levels of structure of a protein molecule?

	primary structure	secondary structure	quaternary structure
A	covalent bond	hydrogen bond	peptide bond
B	covalent bond	ionic bond	disulfide bond
C	peptide bond	hydrogen bond	ionic bond
D	peptide bond	ionic bond	disulfide bond

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12 Prokaryotes and eukaryotes use extracellular enzymes.

Extracellular digestive enzymes are found in the external environments of some prokaryotes.

Some prokaryotes are digested by hydrolytic enzymes during phagocytosis by eukaryotic cells.

Which row shows the locations where extracellular enzymes are produced?

	site of production of digestive enzymes used by prokaryotes	site of production of hydrolytic enzymes used by eukaryotic phagocytes
A	inside cells	inside cells
B	inside cells	outside cells
C	outside cells	inside cells
D	outside cells	outside cells

13 Amylase breaks down starch molecules.

Which substance will have the same number of molecules for the duration of this reaction?

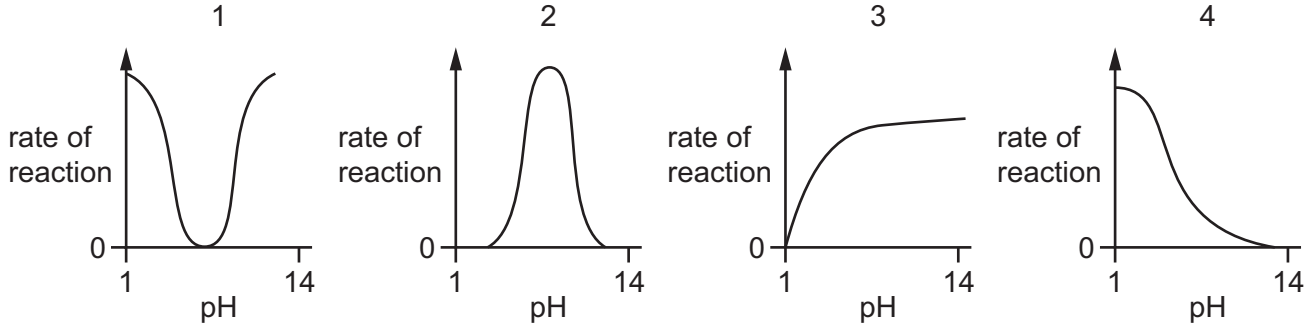
A amylase

B water

C maltose

D amylose

14 Which graphs could show the effect of pH on the rate of enzyme-catalysed reactions?



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

15 After a heart attack, the enzyme lactate dehydrogenase leaks into the blood plasma from damaged heart muscle.

What is required to measure the activity of lactate dehydrogenase activity in a sample of blood plasma?

	sterilisation of blood plasma by heating	incubation of sample with substrate for lactate dehydrogenase	incubation of sample with lactate dehydrogenase inhibitor
A	✓	✓	✓
B	✗	✓	✓
C	✗	✓	✗
D	✗	✗	✓

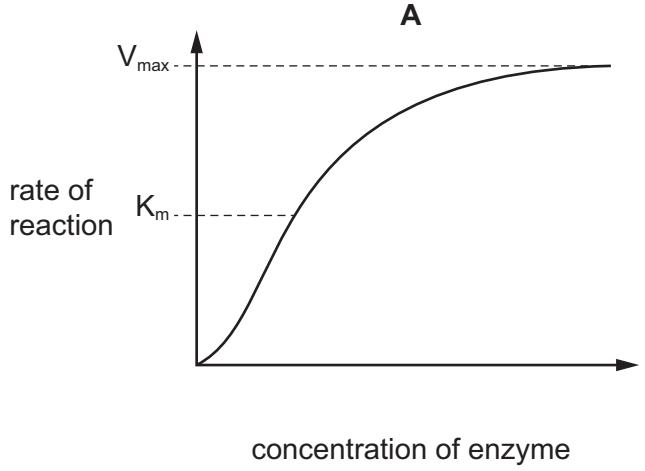
key

✓ = required

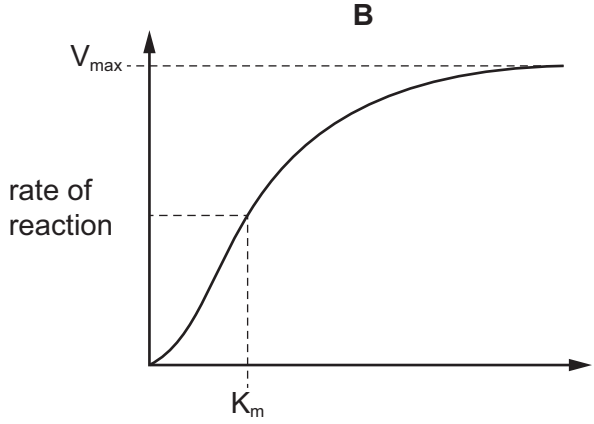
✗ = **not** required

16 Which graph correctly shows K_m and V_{max}?

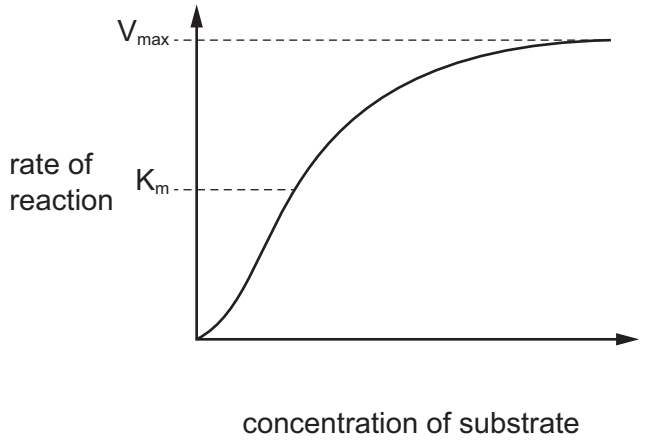
A



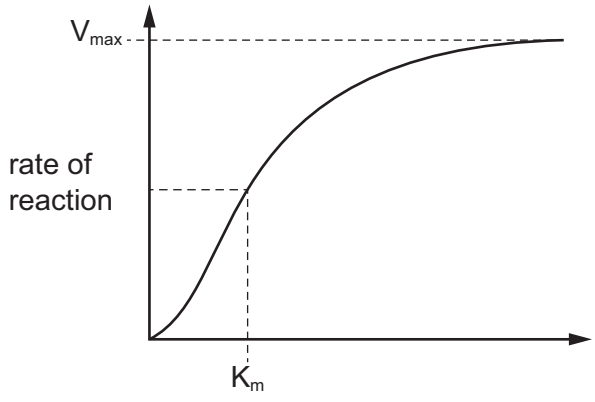
B



C



D



17 Cell membranes become less fluid as the temperature decreases.

Bacteria and yeast cannot regulate their cell temperatures.

How do bacteria and yeast maintain the fluidity of their cell membranes when the temperature decreases?

1 They increase the numbers of unsaturated fatty acids in their phospholipid molecules.

2 They increase the numbers of saturated fatty acids in their phospholipid molecules.

3 They increase the numbers of cholesterol molecules in their cell membranes.

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

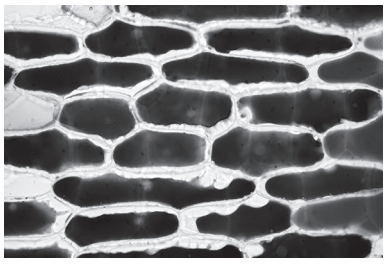
18 Samples X, Y and Z are epidermal tissues cut from an onion. Each epidermal tissue was immersed in one of three different concentrations of a salt solution for 30 minutes.

A student observed each tissue sample with a light microscope. Then the student estimated the concentration of each salt solution using a scale.

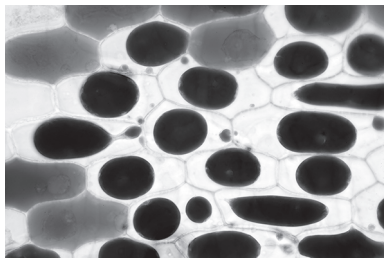
The diagram shows the scale. P, Q and R represent the estimated concentration of the three salt solutions.



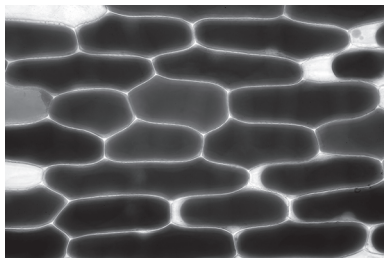
The photomicrographs show the appearance of the tissues in samples X, Y and Z.



sample X



sample Y



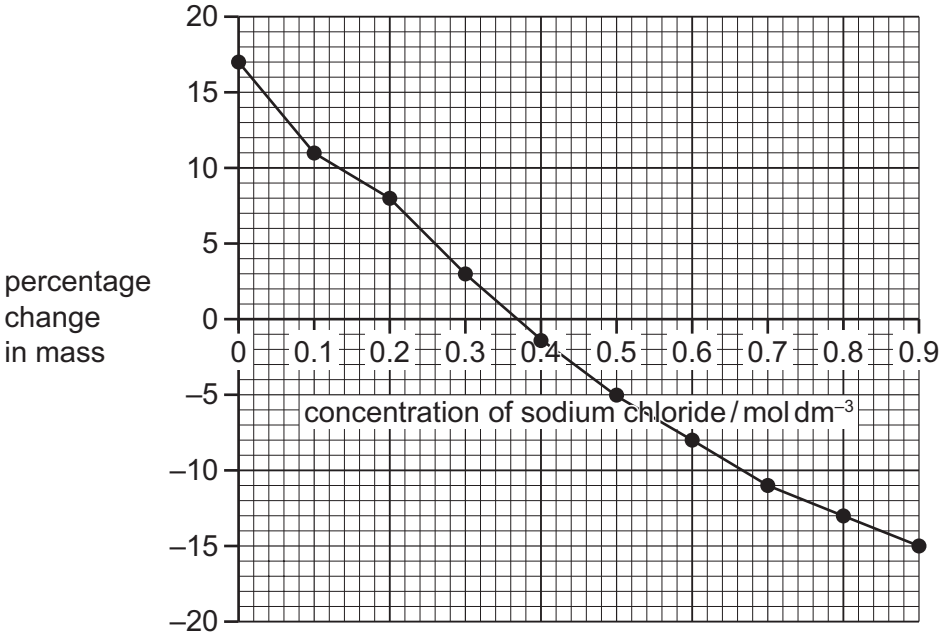
sample Z

Which row shows the estimated concentrations of the salt solutions in which samples Y and Z were immersed?

	sample Y	sample Z
A	P	Q
B	P	R
C	Q	R
D	R	P

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19 The graph shows the results of an osmosis investigation using potato tissue.



What is the concentration of sodium chloride solution that has the equivalent water potential to this potato tissue and what is correct about the movement of water at that point?

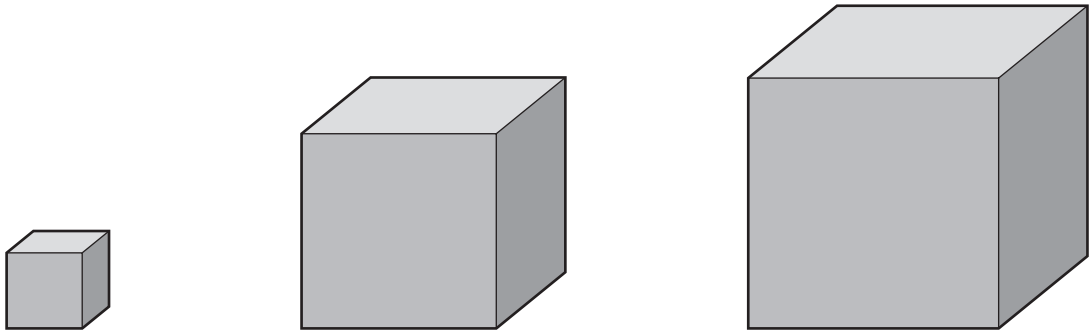
A 0.37 mol dm^{-3} and no net movement of water

B 17 mol dm^{-3} and net movement of water out of the potato tissue

C 0 mol dm^{-3} and no net movement of water

D 0.9 mol dm^{-3} and net movement of water into the potato tissue

20 Some agar was coloured pink using a pH indicator. The pink agar was then used to make three agar cubes with different dimensions.



2 cm × 2 cm × 2 cm 4 cm × 4 cm × 4 cm 5 cm × 5 cm × 5 cm

The cubes were placed in a beaker and covered with 0.1 mol dm^{-3} hydrochloric acid. The temperature of the experiment was standardised at 20 °C.

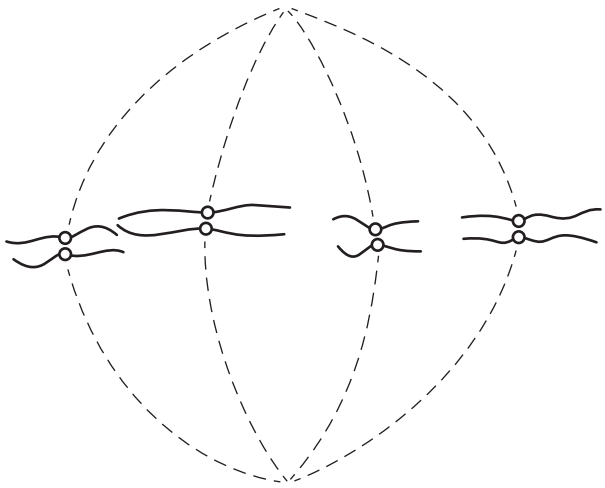
Hydrochloric acid diffused into the agar cubes causing the cubes to become colourless.

What is the surface area to volume ratio of the agar cube that became colourless in the **least** amount of time?

A 0.33 : 1 **B** 0.83 : 1 **C** 1.2 : 1 **D** 3.0 : 1

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21 The diagram shows the arrangement of chromosomes with attached spindle fibres during a stage of mitosis.



Which row correctly identifies the stage of mitosis and describes what is happening?

	stage of mitosis	description
A	anaphase	chromosomes are being pulled towards the centromeres
B	metaphase	sister chromatids are replicating prior to separation
C	metaphase	chromosomes are being positioned along the equator of the cell
D	anaphase	sister chromatids are being pulled towards the poles of the cell

22 During which phase of the cell cycle does DNA replication take place?

A G_1 **B** G_2 **C** M **D** S

23 Human body cells in interphase have 46 chromosomes.

What is correct about the number of telomeres present in prophase of a human body cell?

A 46 as there is one telomere at the end of 46 chromosomes

B 92 as there is one telomere at each end of 46 chromosomes

C 92 as there is one telomere at the end of 92 chromatids

D 184 as there is one telomere at each end of 92 chromatids

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24 Sometimes hydrogen bonds form temporarily between the bases of two strands of RNA.

How many hydrogen bonds form when guanine and uracil each bind to their complementary base?

	guanine	uracil
A	3	3
B	3	2
C	2	3
D	2	2

25 The table shows all the possible DNA triplet codes for some amino acids.

amino acid	DNA triplet code
cysteine	ACA
cysteine	ACG
tryptophan	ACC
isoleucine	TAA
isoleucine	TAG
isoleucine	TAT
methionine	TAC

The amino acid sequence is shown.

methionine – isoleucine – cysteine – tryptophan

What is the maximum number of different DNA sequences that could produce this amino acid sequence?

A 1 **B** 4 **C** 6 **D** 7

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26 Which row is correct for transpiration?

	definition of transpiration	comparison of water potential
A	evaporation of water from leaf surfaces	higher inside air spaces in the leaf than the air outside
B	evaporation of water from leaf surfaces	lower inside air spaces in the leaf than the air outside
C	loss of water vapour from leaves	lower inside air spaces in the leaf than the air outside
D	loss of water vapour from leaves	higher inside air spaces in the leaf than the air outside

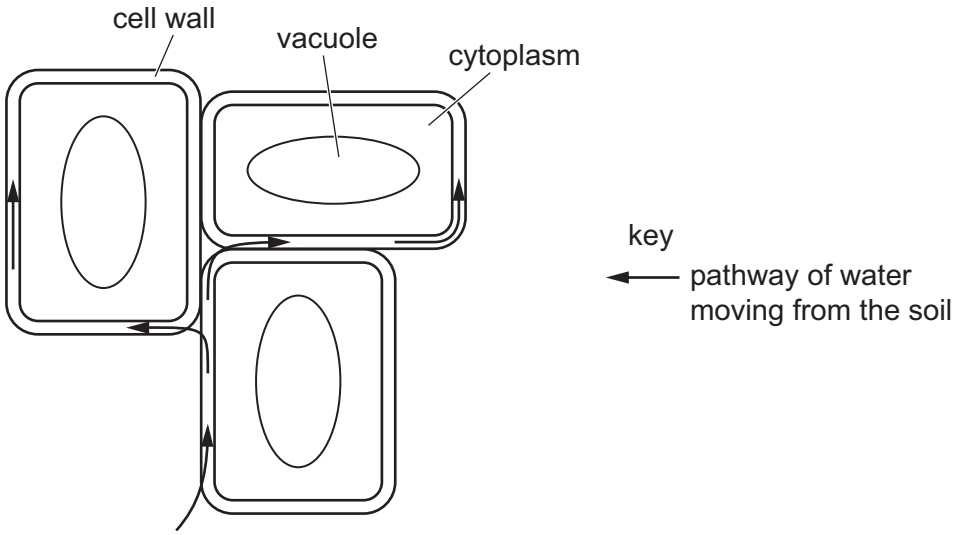
27 Which features of companion cells and xylem vessel elements make them suitable for their function?

	companion cells	xylem vessel elements
A	transport contents of cell in one direction only	lignified walls provide support
B	cellulose walls provide support	nuclei allow cell division
C	nuclei allow cell division	gaps between cells allow rapid transport
D	numerous mitochondria supply energy	absence of cytoplasm allows mass flow

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[Turn over

28 The diagram shows some root cells.



Which statement is correct for the pathway shown by the arrows?

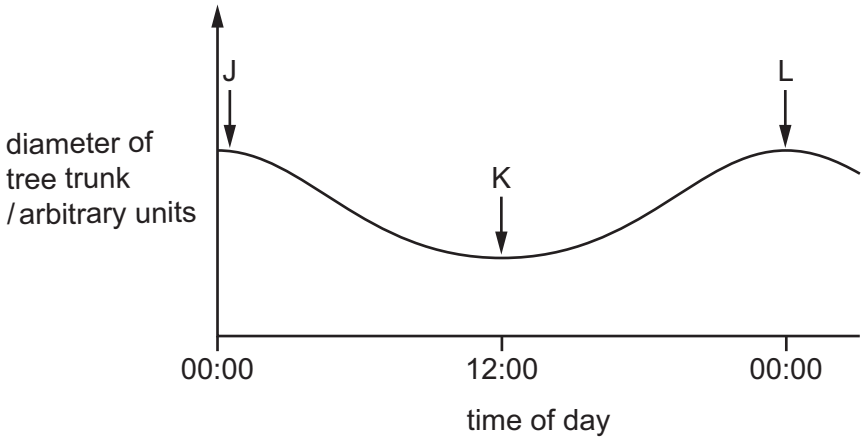
A Water will be blocked by a band of suberin.

B Water will move through the Casparian strip.

C Water will pass easily through the root endodermis.

D Water will pass through plasmodesmata.

29 The graph shows the diameter of a tree trunk at different times.



Which statement is correct?

A J shows the expansion of the trunk as water fills the xylem during transpiration.

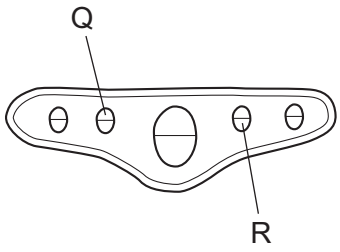
B K shows a reduction in diameter of the trunk as water is lost from the phloem due to translocation.

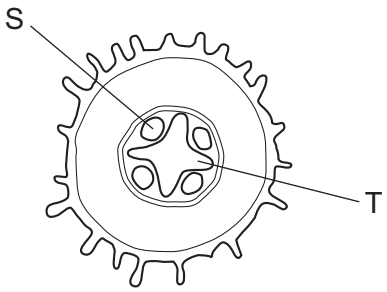
C K shows a reduction in diameter of the trunk due to water held in tension in the xylem.

D L shows the expansion of the trunk as the phloem tissue acts as a sink at night.

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30 The plan diagrams of transverse sections of two plant organs are shown. These are **not** drawn to scale.

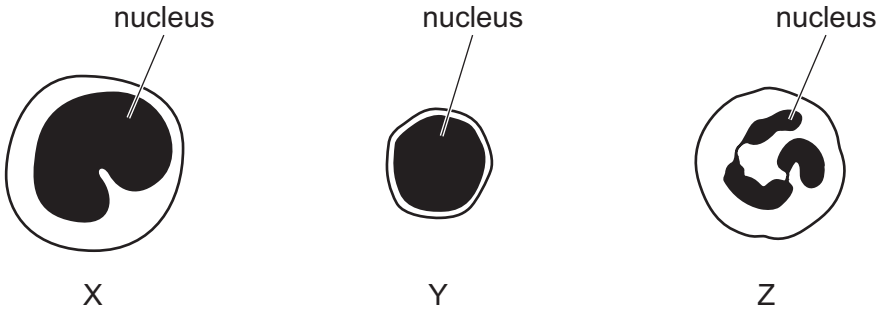




Which tissues contain proton pumps?

A Q and S **B** Q and T **C** R and S **D** R and T

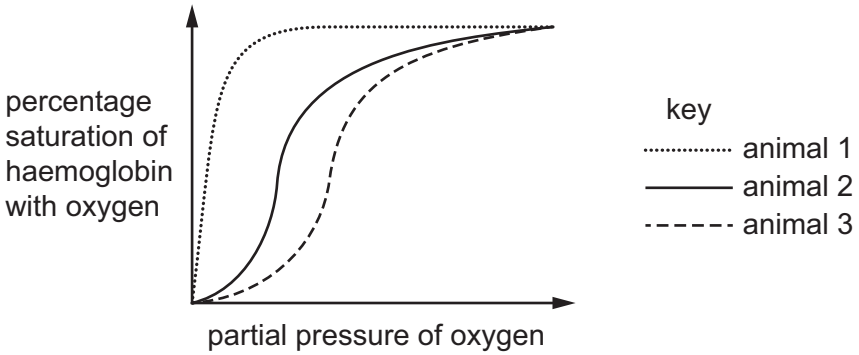
31 The diagrams show three types of blood cells, which are all drawn to the same scale.



Which row shows the characteristics of the cells?

	name of blood cell X	engulfs pathogens by endocytosis	each responds to one antigen
A	monocyte	Y	Z
B	monocyte	Z	Y
C	lymphocyte	Y	Z
D	lymphocyte	Z	Y

32 The graph shows oxygen dissociation curves for three animals. The shape of each curve is influenced by respiration rate and the affinity of haemoglobin for oxygen.



What can be concluded from the graph?

A Animal 1 has haemoglobin adapted to have a higher affinity for oxygen than animal 2.

B Animal 3 has haemoglobin adapted to have a higher affinity for oxygen than animal 2.

C Animal 3 has haemoglobin adapted to maintain a lower respiration rate than animal 2.

D Animal 1 has haemoglobin adapted to maintain a higher respiration rate than animal 2.

33 Which statements about a mammalian heart are correct?

1 The right atrium and right ventricle contain deoxygenated blood going to the lungs.

2 The left atrium and left ventricle contain oxygenated blood going to the pulmonary circulation.

3 The left ventricle has a thicker wall than the right ventricle and delivers blood at higher pressure.

4 The pressure of blood in the aorta is less than that in the pulmonary artery.

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

34 How is **most** carbon dioxide transported in the blood?

A as carbaminohaemoglobin

B as carbonic acid

C as hydrogencarbonate ions

D in solution in cytoplasm

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35 Which row shows the tissues that are present in the wall of the trachea **and** the wall of the bronchus?

	cartilage	ciliated epithelium	smooth muscle
A	✓	✓	✓
B	✓	✓	✗
C	✓	✗	✓
D	✗	✓	✗

key

✓ = present

✗ = **not** present

36 Which factors maintain the diffusion gradient for carbon dioxide at the surface of the alveoli?

1 blood flow around the alveoli

2 breathing movement exchanging air in the lungs

3 thin epithelial lining of the alveoli

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

37 A student made notes about two diseases: hand, foot and mouth disease (HFMD) and Lyme disease.

HFMD is caused by a viral pathogen and is transmitted in a variety of ways including:

- ingestion of water contaminated with faeces
- inhalation of droplets containing the pathogen.

Lyme disease is caused by a bacterial pathogen and is transmitted by the bite of an infected insect.

Which statement makes a correct comparison between the diseases the student wrote about and cholera, malaria or tuberculosis (TB)?

A Antibiotics can be used to kill the vector of the pathogen that causes malaria and the vector of the pathogen that causes Lyme disease.

B HFMD can be transmitted in a similiar way to either cholera or TB.

C The cells of the pathogen that causes HFMD and the cells of the pathogen that causes TB are prokaryotic.

D Transmission of TB and HFMD could be reduced by chlorinating drinking water.

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38 Which statements explain why antibiotics may **not** treat cholera successfully?

1 The infectious organism has developed resistance to the antibiotic.

2 Antibiotics **cannot** harm viruses.

3 Antibiotics do **not** affect pathogens that are eukaryotic.

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

39 The statements describe the phagocytosis of a bacterium by a macrophage.

1 Digestive enzymes break down the bacterium.

2 Lysosome fuses with the vacuole.

3 Macrophage displays the bacterial antigens on its cell surface membrane.

4 Macrophage engulfs the bacterium and encloses it in a vacuole.

5 Receptors on the cell surface membrane of macrophage bind to the bacterium.

Which order is correct for phagocytosis?

A $3 \rightarrow 5 \rightarrow 4 \rightarrow 1 \rightarrow 2$

B $4 \rightarrow 2 \rightarrow 1 \rightarrow 5 \rightarrow 3$

C $5 \rightarrow 4 \rightarrow 2 \rightarrow 1 \rightarrow 3$

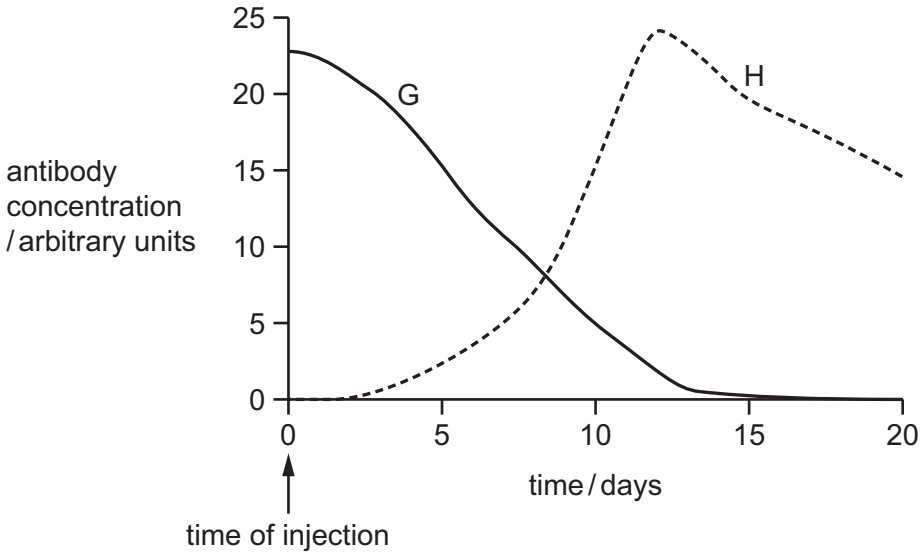
D $5 \rightarrow 4 \rightarrow 3 \rightarrow 1 \rightarrow 2$

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40 Two people, G and H, were each given an injection to protect them against a particular pathogen.

One person was injected with antibodies. The other person was injected with a vaccine.

The graph shows the concentrations of the antibody against this pathogen in the blood of the two people, G and H, during a period of 20 days after their injections.



Which row correctly describes the type of immunity shown by G and H?

	G	H
A	artificial active immunity	artificial passive immunity
B	artificial passive immunity	artificial active immunity
C	natural active immunity	natural passive immunity
D	natural passive immunity	natural active immunity

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