Cambridge Assessment International Education

Cambridge International AS & A Level

BIOLOGY **9700/13**

Paper 1 Multiple Choice **October/November 2024**

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.

[Turn over

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 a ×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 Which cell structure is found in human cells **and** typical plant cells?

A 70S ribosomes

B cilia

C plasmodesmata

D tonoplast

3 Which statements are correct for a typical prokaryotic cell?

1 It contains 70S ribosomes.

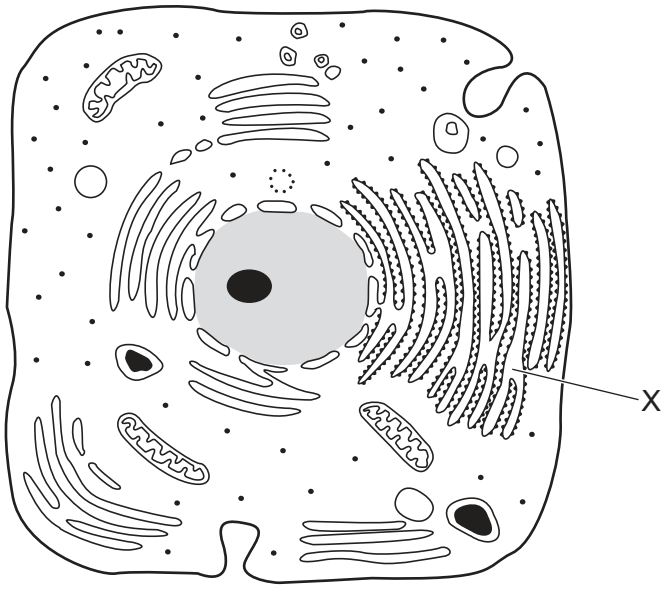
2 It contains a cellulose cell wall.

3 It contains circular DNA.

4 It is up to 5 μm in diameter.

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

4 The diagram shows a typical animal cell.



What is the function of the membrane system labelled X?

A lipid synthesis only

B protein synthesis and transport

C protein synthesis only

D protein transport only

5 What describes a lysosome?

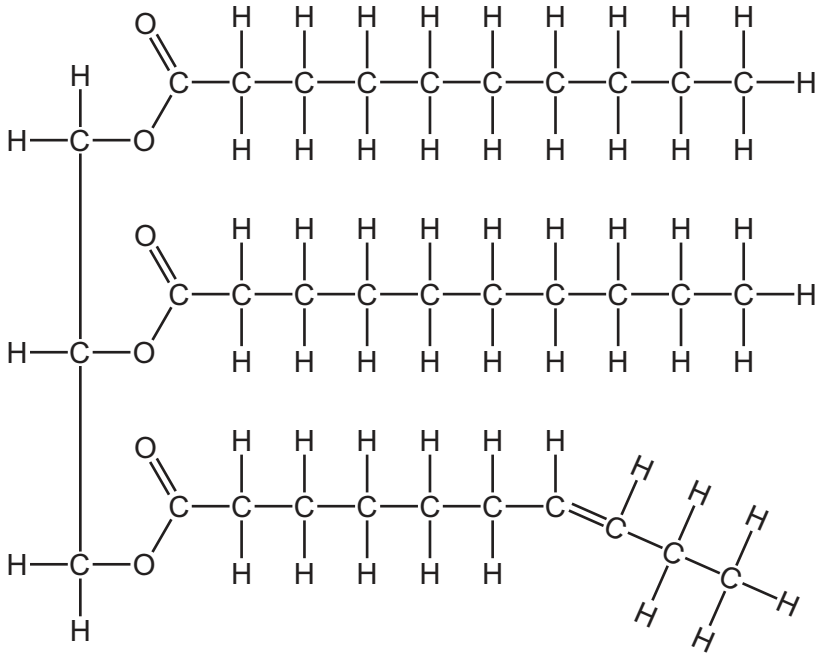
A a vesicle containing enzymes, enclosed by a double membrane, that is budded off the endoplasmic reticulum

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

6 The diagram shows a triglyceride.



What will be the products after hydrolysis of this triglyceride?

A 1 molecule of glycogen, 3 unsaturated fatty acids and 3 molecules of water

B 1 molecule of glycerol, 2 saturated fatty acids and 1 unsaturated fatty acid

C 1 molecule of glycogen, 2 saturated fatty acids and 1 unsaturated fatty acid

D 1 molecule of glycerol, 1 saturated fatty acid, 2 unsaturated fatty acids and 3 molecules of water

7 Which description lists all the components of a human haemoglobin molecule?

A four polypeptides that are all the same and one haem group

B four polypeptides that are **not** all the same and one haem group

C four polypeptides that are all the same and four haem groups

D four polypeptides that are **not** all the same and four haem groups

8 HIV-1 protease is an enzyme produced by the HIV virus.

Two identical chains of 99 amino acids form the enzyme. In each chain, amino acids 25, 26 and 27 in the sequence form part of the active site.

Which orders of protein structure control the shape of the active site?

A primary, secondary, tertiary and quaternary

B primary, secondary and tertiary only

C primary and quaternary only

D quaternary only

9 Which statements are correct reasons for how animals cool down in hot environments using latent heat of vaporisation of water?

1 Some animals lie down and roll in wet soil.

2 Fish move into deeper water.

3 Some animals lick their fur to make it wet.

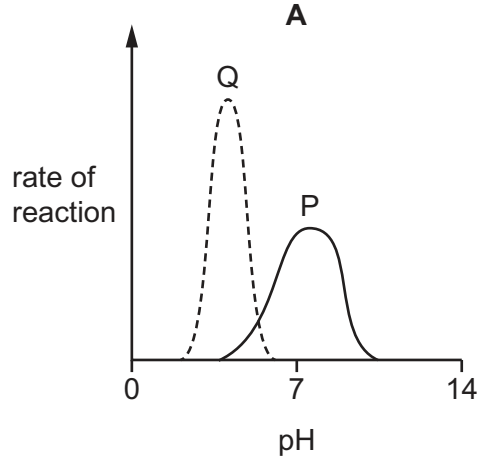
4 Some animals breathe quickly with a wet tongue hanging out of their mouth.

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

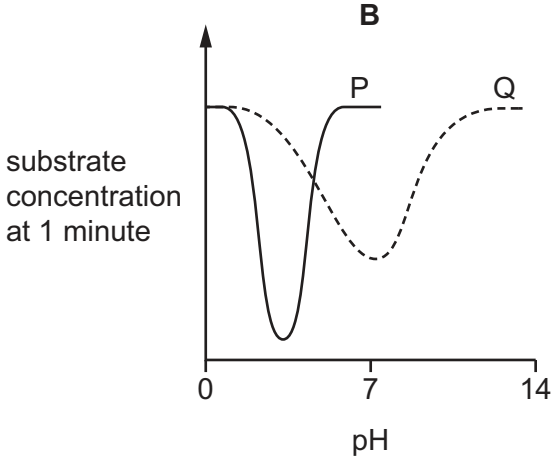
10 Two different enzymes, P and Q, are investigated to find the optimum pH for each enzyme. The results show that P works only in acidic conditions. Q has an optimum pH which is slightly alkaline.

Which graph shows the correct results for P and Q?

A



B



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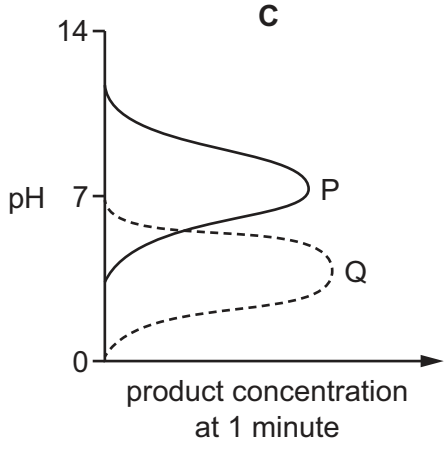
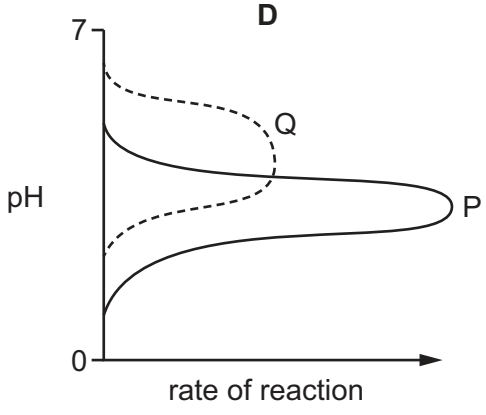
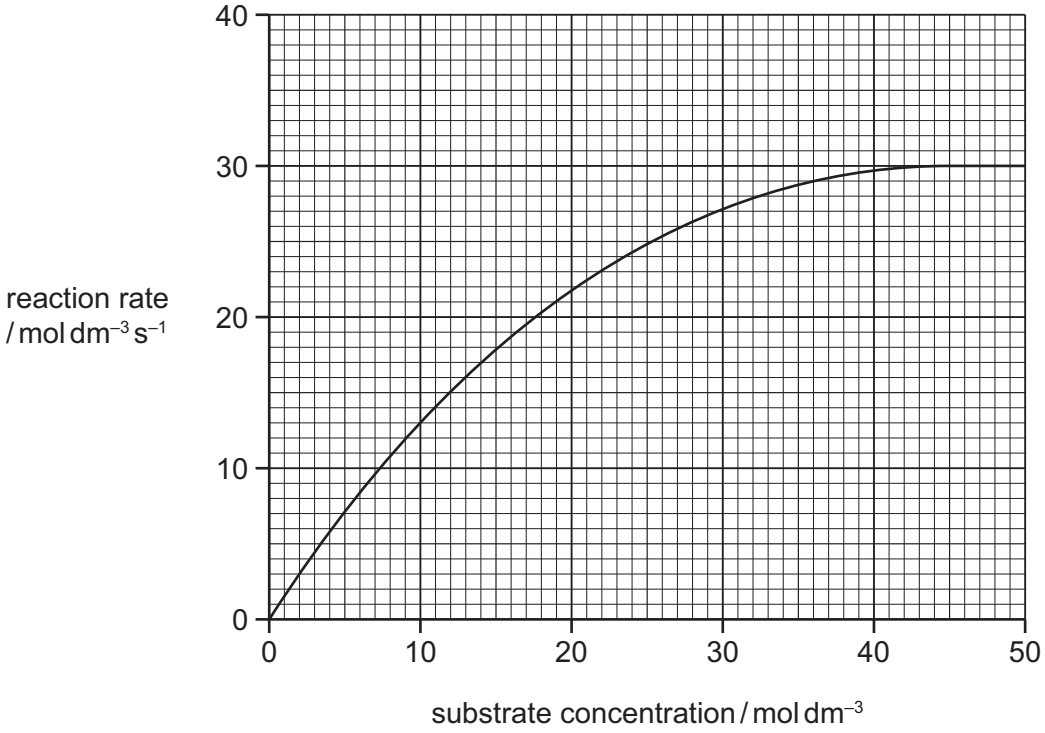


D



11 A student investigated the effect of substrate concentration on the rate of an enzyme-catalysed reaction.

The student plotted the results in a graph.



What is the K_m for this enzyme-catalysed reaction?

A 12 mol dm^{-3}

B 15 mol dm^{-3} s^{-1}

C 30 mol dm^{-3} s^{-1}

D 50 mol dm^{-3}

12 Which statements could be used to describe enzyme molecules **and** antibody molecules?

1 Hydrogen bonds stabilise the structure of the protein and are important for it to function efficiently.

2 Hydrophilic R-groups point in to the centre of the molecule and cause it to curl into a spherical shape.

3 The tertiary structure of the protein molecule plays an important role in the functioning of the protein.

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

13 Which description identifies a reversible, non-competitive enzyme inhibitor?

A It can attach to the active site.

B It can attach to a site other than the active site.

C It can attach to the active site and another site simultaneously.

D It can attach to either the active site or another site.

14 Before mitochondria are extracted from cells for microscopy, they are usually kept in a $0.25\,mol\,dm^{-3}$ sucrose solution.

Why is the sucrose solution used?

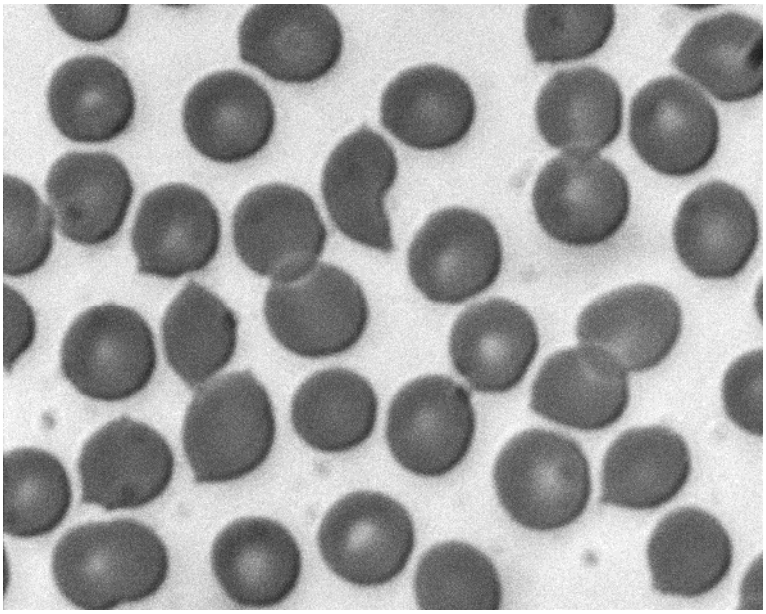
A to act as a solvent

B to enable the rate of reaction of the mitochondria to be determined

C to prevent the mitochondria from changing in dimension

D to provide a source of energy

15 The photomicrograph shows a type of blood cell.



Which statements about these cells are correct?

1 Oxygen diffuses through the phospholipid bilayer.

2 Sodium ions diffuse through the phospholipid bilayer.

3 Water passes in and out of these cells by osmosis.

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

16 Which row is correct for parts of a phospholipid molecule?

	can be saturated or unsaturated	can also be found in a triglyceride
A	head	tail
B	tail	head
C	head	head
D	tail	tail

17 A student filled dialysis tubing with a sucrose solution and knotted both ends. This formed a cylinder with a length of 5.0 cm and a radius of 2.0 cm.

What is the surface area to volume ratio for this cylinder of dialysis tubing?

A 0.7 : 1.0 **B** 1.0 : 1.0 **C** 1.4 : 1.0 **D** 2.5 : 1.0

18 Which process does **not** involve mitosis?

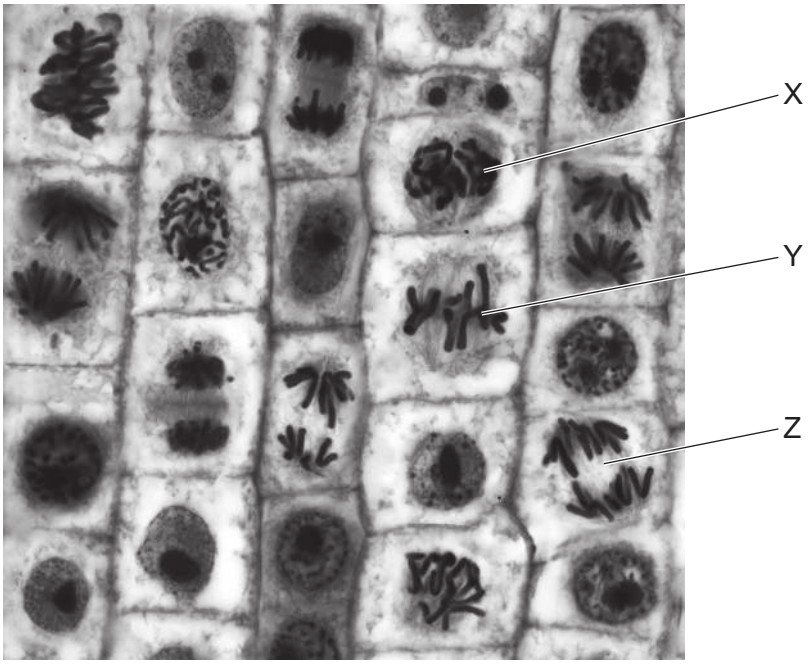
A asexual reproduction

B growth of unicellular organisms

C repair of tissues by cell replacement

D replacement of damaged or dead cells

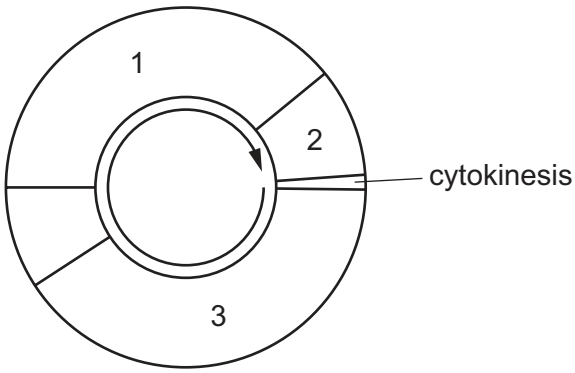
19 The photomicrograph shows cells in an onion root tip.



Which labelled cells are in anaphase, metaphase and prophase?

	anaphase	metaphase	prophase
A	X	Y	Z
B	Y	Z	X
C	Z	X	Y
D	Z	Y	X

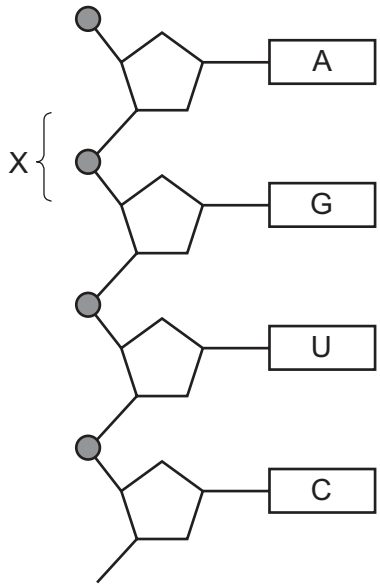
20 The diagram shows an outline of the mitotic cell cycle.



Which numbered stages of the cell cycle include a period of time when each chromosome consists of sister chromatids joined by a centromere?

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

21 The diagram shows part of a nucleic acid molecule.



What is the name of bond X?

A glycosidic bond

B hydrogen bond

C peptide bond

D phosphodiester bond

22 XNA is a laboratory-made nucleic acid. XNA is made of nucleotides in which one component has been replaced by chemical X. The chemical X is organic but is **not** found in nature. The part of the molecule responsible for coding is **not** changed.

Which component of a DNA or RNA nucleotide has been replaced by the organic chemical X?

A five-carbon sugar

B phosphate group

C purine base

D pyrimidine base

23 Which strand of DNA does RNA polymerase bind to?

A lagging strand

B leading strand

C non-transcribed strand

D template strand

24 Which processes occur during the formation of messenger RNA?

1 condensation

2 polymerisation

3 replication

4 transcription

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

25 The anticodon for the amino acid tryptophan is ACC.

What shows a template DNA sequence that includes the DNA triplet for tryptophan?

A UGG CGU CCG

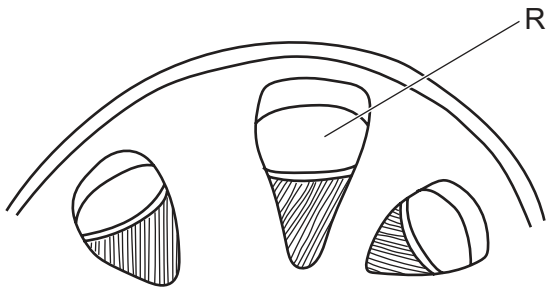
B GCU GAC ACG

C CTT TGG ATG

D CCT ACC CAT

26 A student drew a plan diagram of some plant tissue.

The diagram is shown. It contains a mistake in the way that it is drawn.



The maximum width of R is 15 mm on the diagram and its actual width is 250 μm.

The student was asked to draw a scale bar on their diagram.

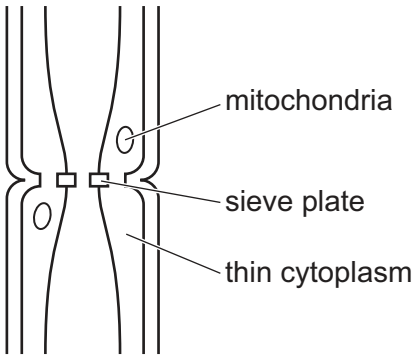
Which row is correct?

	part of the plant drawn	location of drawing mistake	length of scale bar in mm to correctly represent 100 μm
A	root	phloem	6
B	root	xylem	170
C	stem	phloem	170
D	stem	xylem	6

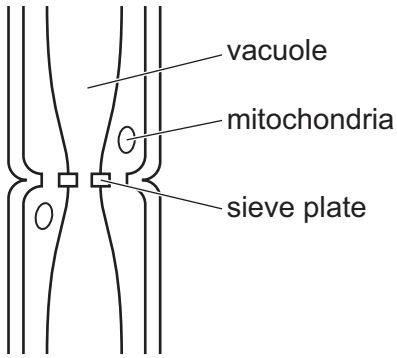
27 Four students have drawn and labelled part of a structure seen on an electron micrograph.

Which student has labelled their drawing correctly?

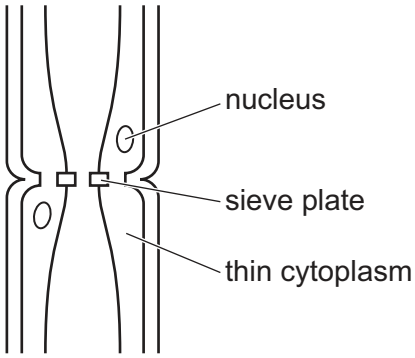
A



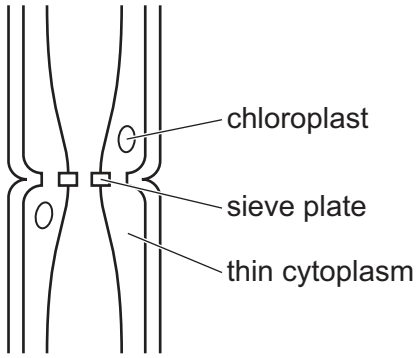
B



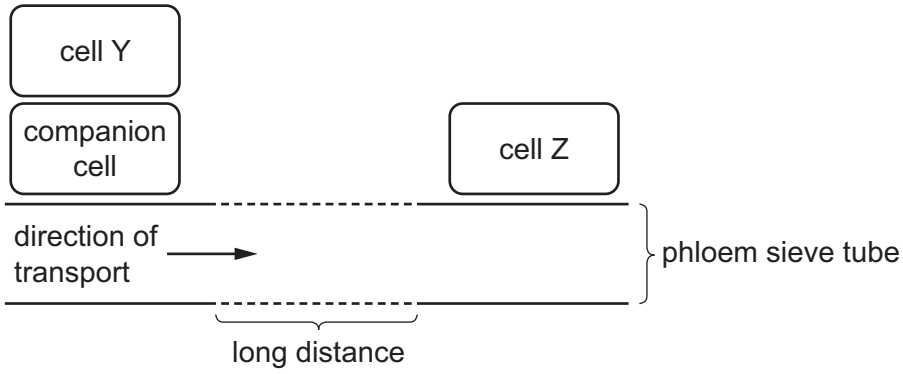
C



D



28 The diagram shows some structures used for transport in the phloem.



Which statement is correct?

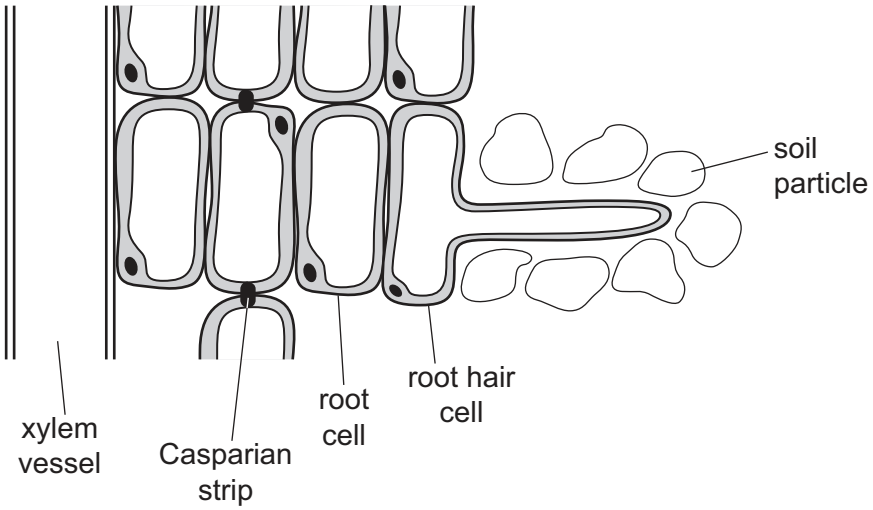
A Cell Y is the sink cell.

B Cell Z can be above or below cell Y in the plant.

C Cell Z must be in a photosynthetic tissue.

D Cell Y allows glucose to move to the sieve tube via the companion cell.

29 The diagram shows a section through a root of a dicotyledonous plant.



Which statement correctly describes the movement of water and solutes through this root?

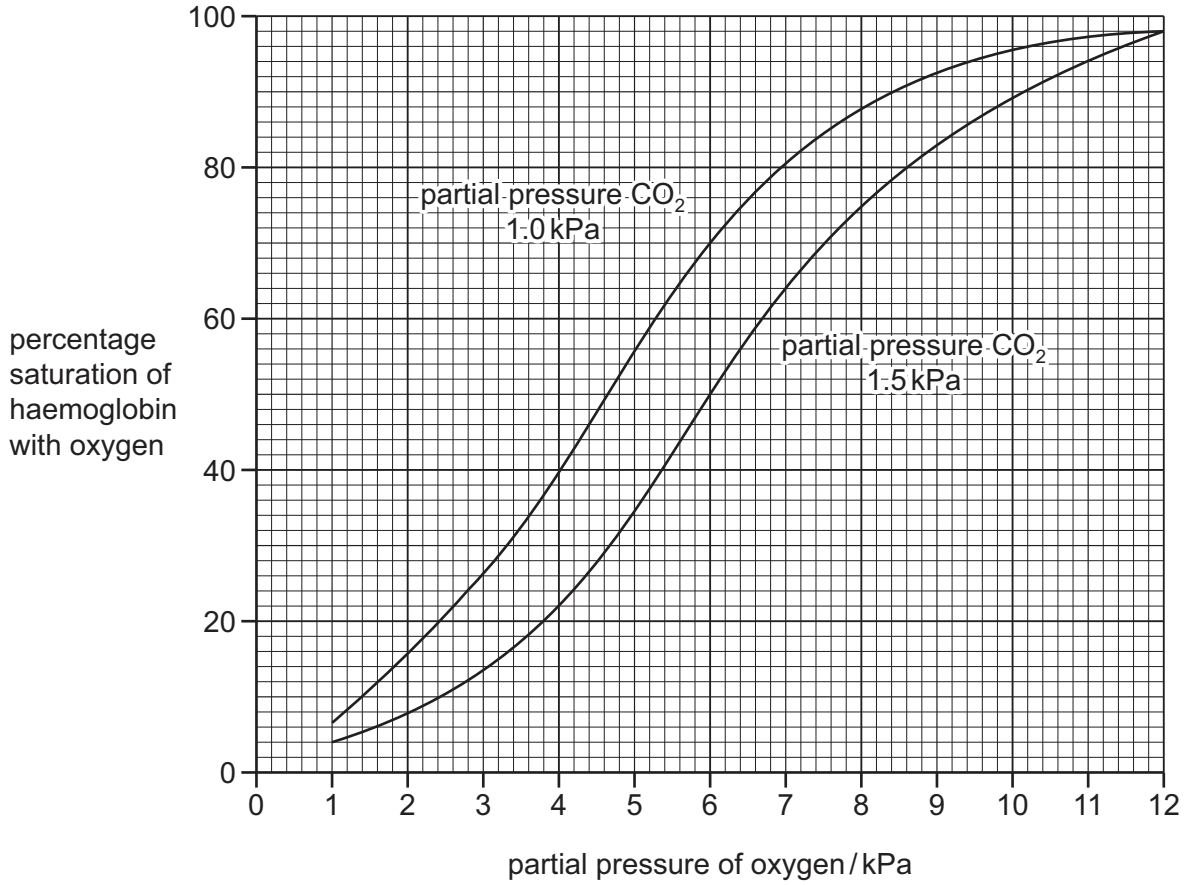
A A layer of suberin causes water and solutes to move from the apoplast pathway into the symplast pathway.

B A layer of suberin causes water and solutes to move from the symplast pathway into the apoplast pathway.

C The tonoplast causes water and solutes to move from the symplast pathway into the apoplast pathway.

D The tonoplast causes water and solutes to move from the apoplast pathway into the symplast pathway.

30 The graph shows the effect of different partial pressures of carbon dioxide (CO_2) on the oxygen dissociation curve for haemoglobin.



What is the change in percentage oxygen saturation of haemoglobin at a partial pressure of oxygen of 6 kPa as the partial pressure of carbon dioxide changes from 1.0 kPa to 1.5 kPa?

A –26% **B** –20% **C** 20% **D** 46%

31 What happens in the heart at the start of ventricular diastole?

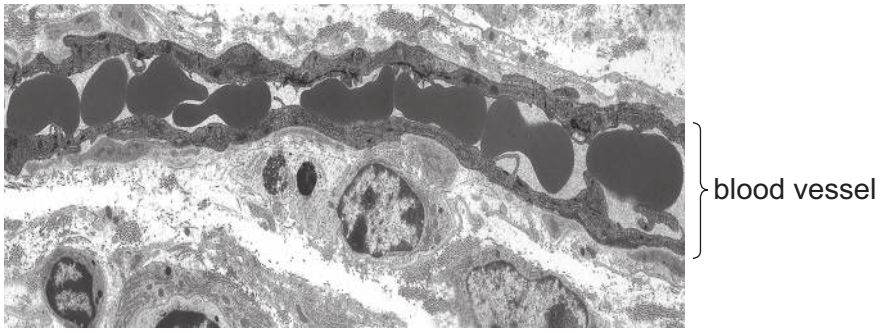
A The semilunar valves open.

B The atrioventricular valves open.

C The pressure in the atria rises above the pressure in the ventricles.

D The pressure in the left atrium rises more than the pressure in the right atrium.

32 The electron micrograph shows a longitudinal section through a blood vessel.



Which type of blood vessel is shown?

A arteriole

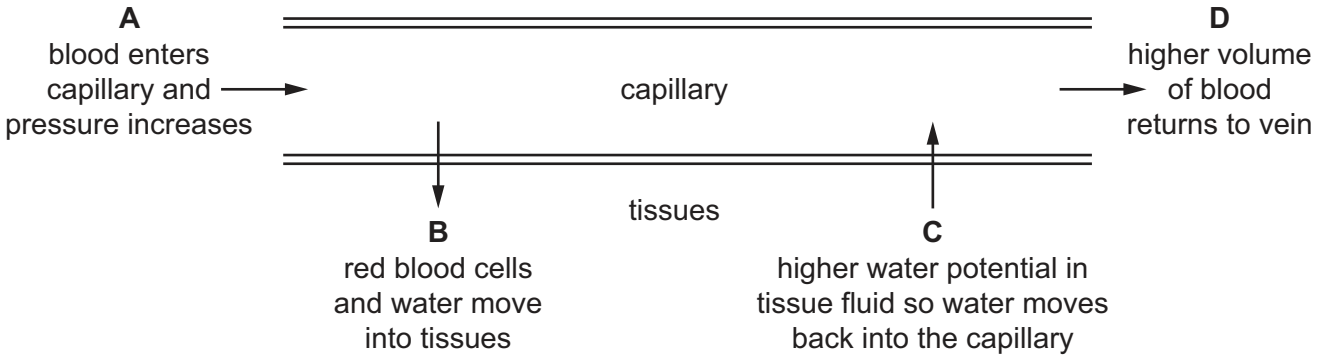
B capillary

C vein

D venule

33 A student drew a sketch to show the formation of tissue fluid.

Which label is correct?



34 Which structures are present in the trachea **and** also in all bronchioles?

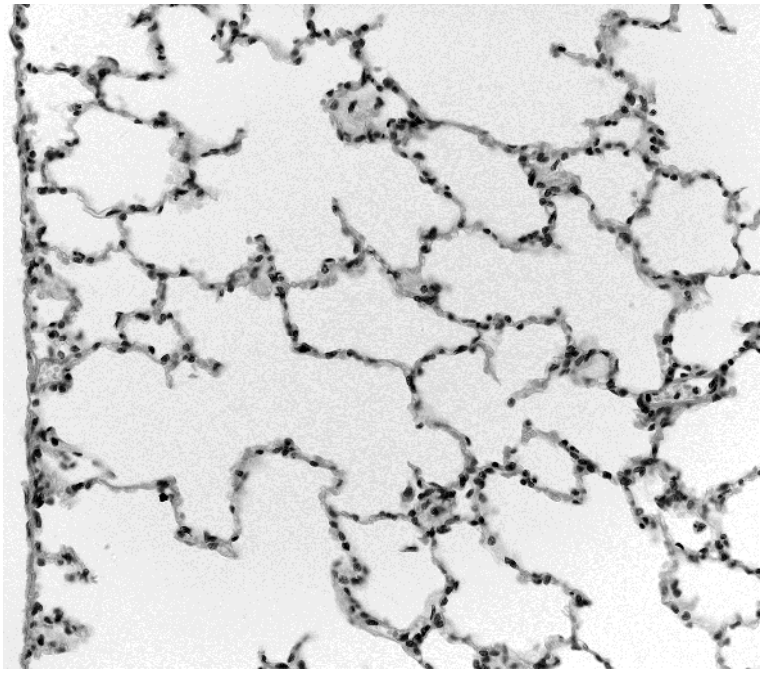
1 cartilage

2 smooth muscle

3 epithelial cells

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

35 The photomicrograph shows a section through part of the gas exchange system.



Which tissue can be seen?

A cartilage

B ciliated epithelium

C smooth muscle

D squamous epithelium

36 What is the function of the goblet cells in the gas exchange system?

A to increase the surface area

B to move mucus

C to release mucus

D to trap dust and pathogens

37 Which organisms have cell walls that can be affected by penicillin?

1 bacteria

2 protoctists

3 viruses

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

38 Each year, there are 462 000 deaths from malaria in children under 5 years old globally.

Insecticide-treated nets could prevent 50% of malaria cases and reduce deaths of children under 5 years old by 18%.

How many children could be saved by using insecticide-treated nets?

A 41 580 **B** 83 160 **C** 231 000 **D** 332 640

39 Which row is correct?

	involved in phagocytosis	secrete antibodies
A	T-lymphocytes	B-lymphocytes
B	T-lymphocytes	T-lymphocytes
C	B-lymphocytes	B-lymphocytes
D	B-lymphocytes	T-lymphocytes

40 Four steps that occur during the primary immune response to a pathogen are listed.

P B-lymphocytes divide by mitosis.

Q T-helper cells interact with macrophages that have digested pathogens.

R Plasma cells secrete antibodies.

S T-helper cells activate other lymphocytes.

These steps can be arranged in the sequence in which they occur.

Which step occurs third in the sequence?

A P **B** Q **C** R **D** S

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