Cambridge Assessment International Education

Cambridge International AS & A Level

BIOLOGY **9700/14**

Paper 1 Multiple Choice **October/November 2025**

1 hour 15 minutes

You must answer on the multiple choice answer sheet.

4564272684

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.

1 Which structures are visible in an appropriately stained plant cell using a high power (×400) light microscope?

	centrioles	mitochondria	starch grains
A	✓	✗	✓
B	✓	✗	✗
C	✗	✓	✗
D	✗	✓	✓

key

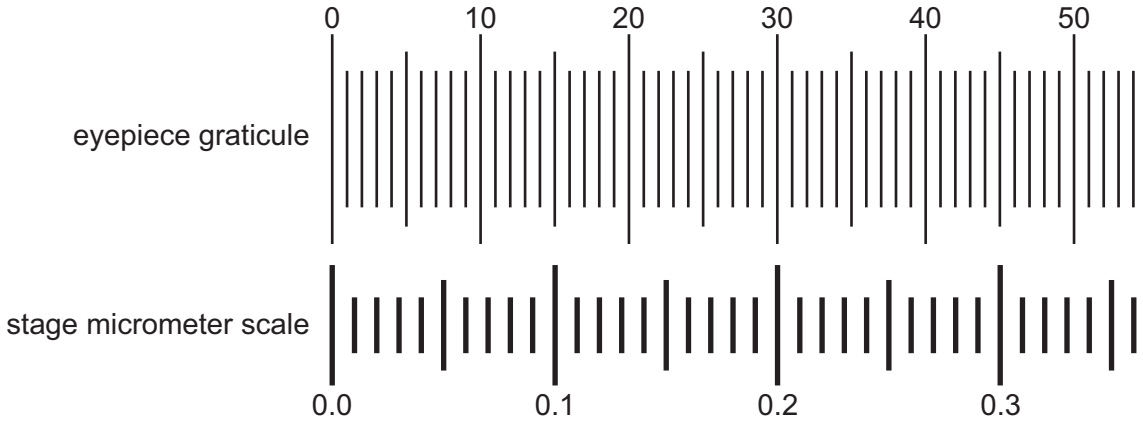
✓ = visible

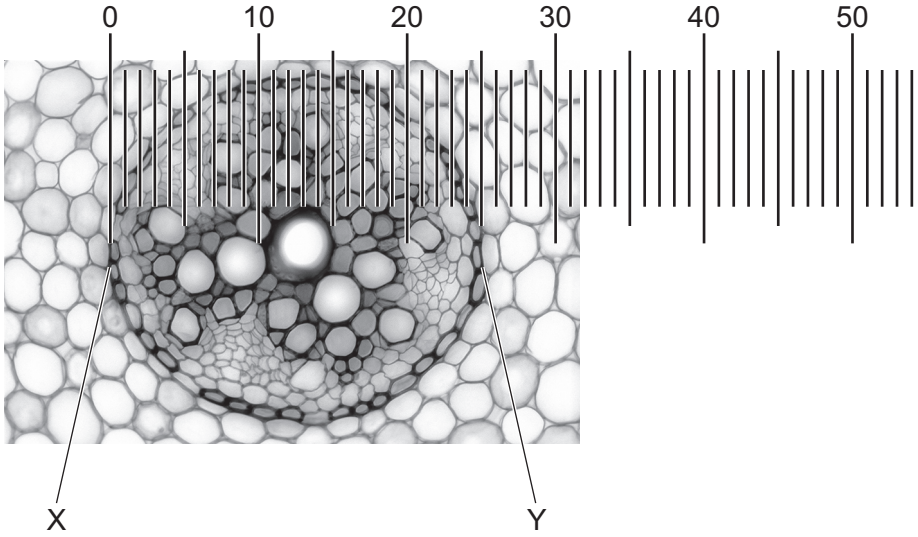
✗ = **not** visible

2 The images show an eyepiece graticule and a stage micrometer scale viewed through a microscope.

The smallest divisions of the stage micrometer scale are 0.01 mm.

The images also show a photomicrograph of a transverse section through a plant root using the same eyepiece graticule and the same magnification.





What is the actual width of the vascular tissue in the plant root between X and Y?

A 17 μm **B** 25 μm **C** 170 μm **D** 250 μm

3 It is thought that some organelles in eukaryotic cells evolved from free-living prokaryotes.

Which organelles have features that suggest they evolved from free-living prokaryotic ancestors?

A chloroplasts and mitochondria

B chloroplasts and Golgi bodies

C mitochondria and smooth endoplasmic reticulum

D Golgi bodies and smooth endoplasmic reticulum

4 A student completed a table showing the structures that are found in four different types of cells.

cell structure	cell Q	cell R	cell S	cell T
cell surface membrane	✓	✓	✓	✓
cellulose cell wall	✓	✓	✗	✓
chloroplast	✓	✗	✗	✗
mitochondrion	✓	✓	✗	✓
nucleus	✓	✓	✗	✗

key

✓ = present

✗ = **not** present

How many of these types of cells can be found in plants?

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

5 Some features of cells are listed.

1 cytoplasm

2 cell surface membrane

3 ribosomes

Which features are found in animal cells and also in prokaryotic cells?

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

6 Trehalose is a non-reducing disaccharide.

Separate samples of a mixture of fructose and trehalose were tested with Benedict's solution before and after acid hydrolysis.

What will be the results of these Benedict's tests?

	before acid hydrolysis	after acid hydrolysis
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

key

✓ = positive result with Benedict's test

✗ = negative result with Benedict's test

7 Which molecules have a structural formula that contains C=O bonds?

1 glucose

2 glycerol

3 protein

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

8 Which statement about monosaccharides and disaccharides is correct?

A Sucrose is a non-reducing disaccharide produced from two identical monosaccharides joined together by a condensation reaction.

B The hydrolysis of the reducing disaccharide maltose produces a reducing monosaccharide, and a non-reducing monosaccharide.

C Maltose is a non-reducing disaccharide that contains two identical reducing monosaccharides connected by a glycosidic bond.

D The addition of a water molecule to the glycosidic bond in a sucrose disaccharide produces two different reducing monosaccharides.

9 Which row is correct for glycogen?

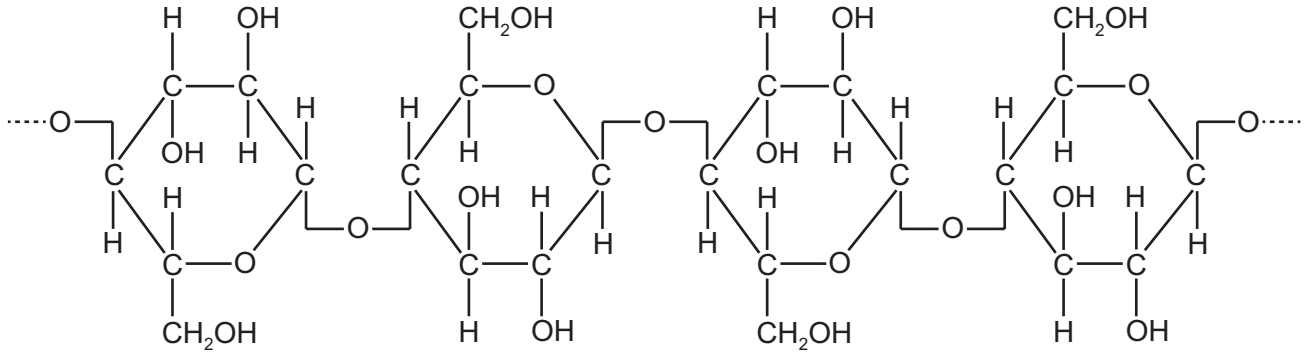
	glycogen is hydrolysed rapidly due to its branched structure	glycogen is insoluble so the water potential of cells is unaffected	glycogen is a compact molecule because it contains many β-glucose molecules
A	✓	✓	✓
B	✓	✓	✗
C	✗	✗	✓
D	✗	✓	✗

key

✓ = correct for glycogen

✗ = incorrect for glycogen

10 The diagram shows a section of a polysaccharide.



Which statement about this polysaccharide is correct?

A It coils into a tight helix that provides a compact shape for energy storage in cells.

B It has high tensile strength when arranged into fibrils in plant cell walls.

C It folds into a globular shape that is soluble in water and easily transported.

D It combines with protein molecules to act as cell markers on the cell surface membrane.

11 Thermostable enzymes can maintain their tertiary structure at high temperatures.

Scientists studying the primary structure of a thermostable enzyme found that the enzyme contained:

- more charged amino acids
- fewer polar amino acids that are **not** charged
- more hydrophobic amino acids

than enzymes that are **not** thermostable.

Which row shows a correct comparison between this thermostable enzyme and an enzyme that is **not** thermostable?

	number of amino acids forming interactions at the centre of a thermostable enzyme compared to an enzyme that is **not** thermostable	number of ionic bonds in a thermostable enzyme compared to the number in an enzyme that is **not** thermostable
A	less than	more than
B	less than	less than
C	more than	less than
D	more than	more than

12 Collagen is a strong, elastic molecule that is often found in the connective tissues of animals. Glycine is an amino acid found at regular positions in the primary structure of a collagen polypeptide.

Which row shows features of collagen that contribute to its strength and elasticity?

	glycine is found on the outside of the helical polypeptides to allow them to lie closer together	disulfide bonds form between glycine amino acids to join the polypeptides together
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

key

✓ = contributes to the strength and elasticity of collagen

✗ = does **not** contribute to the strength and elasticity of collagen

13 Which statements describe the action of an extracellular enzyme?

1 synthesis of a polynucleotide in the nucleus during DNA replication

2 digestion of macromolecules in the lumen of the small intestine

3 synthesis of ATP molecules in the mitochondria

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

14 Which statement about the induced-fit hypothesis of enzyme action is correct?

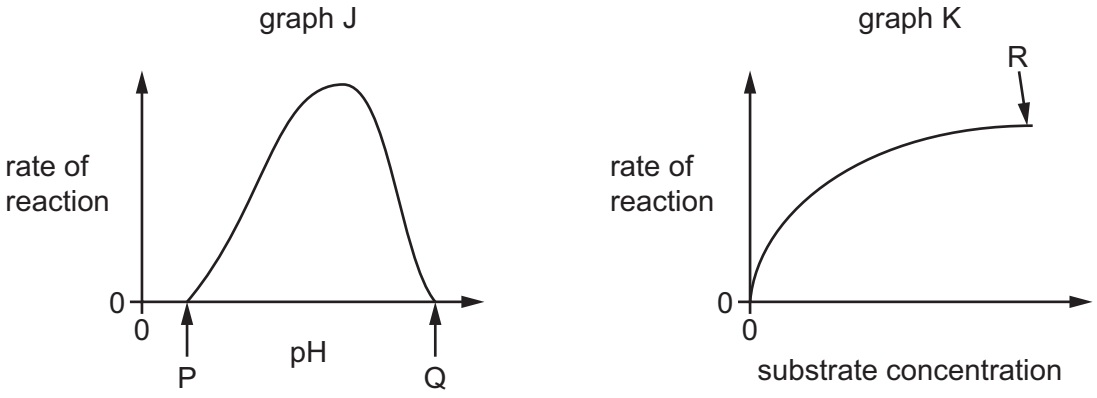
A An enzyme that uses the induced-fit mechanism will increase the activation energy of a reaction.

B The binding of a substrate causes conformational changes in an enzyme.

C The active site of an enzyme changes to become the same shape as the substrate.

D An enzyme that uses an induced-fit mechanism has decreased specificity to the substrate.

15 Graph J shows the effect of pH on the rate of an enzyme reaction. Graph K shows the effect of substrate concentration on the rate of an enzyme reaction.



A student wrote four statements about the graphs.

1 In graph J, the enzyme is denatured at point Q.

2 In graph J, the enzyme is inactive at point P.

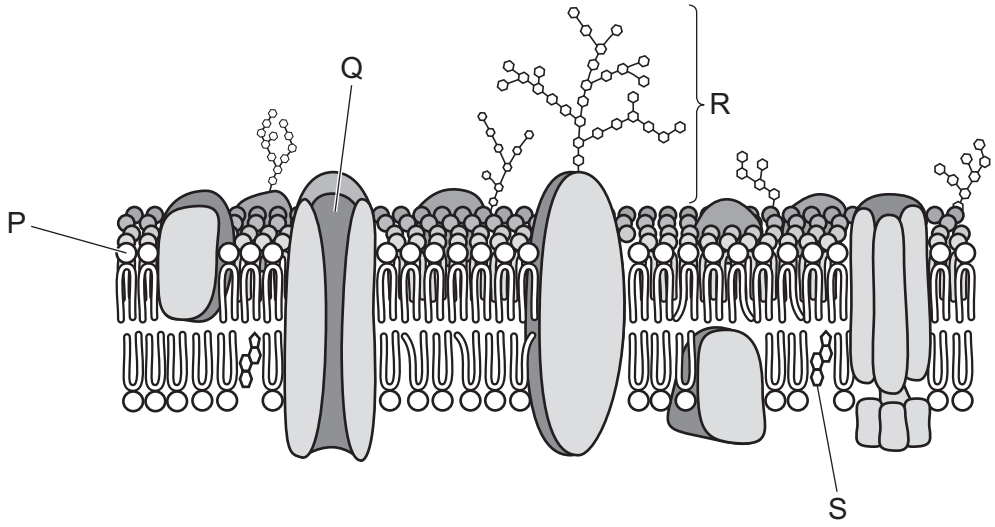
3 In graph K, the rate of reaction is directly proportional to the substrate concentration.

4 In graph K, V_{max} is reached at point R.

Which statements are correct?

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

16 The diagram shows a section through a cell surface membrane.



What is a correct role for a labelled molecule?

A P is involved in controlling membrane stability.

B Q is involved in active transport.

C R is involved in cell signalling.

D S is involved in diffusion of ions.

17 When red blood cells are put into distilled water they burst (haemolysis).

Which statements explain this haemolysis?

1 The water potential of the surrounding liquid is lower than the water potential of the contents of the red blood cell.

2 The cell surface membranes of red blood cells are **not** supported by cell walls.

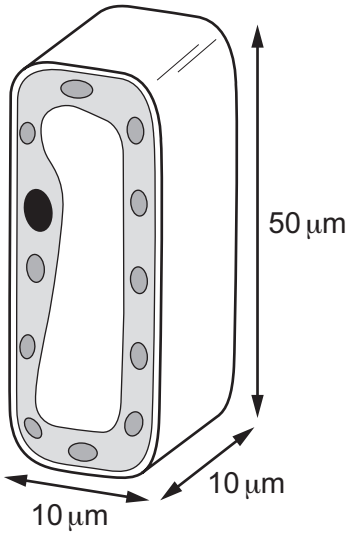
3 More water moves into the red blood cells by osmosis than leaves the cells.

4 Water enters the red blood cells by osmosis but does **not** leave the cells.

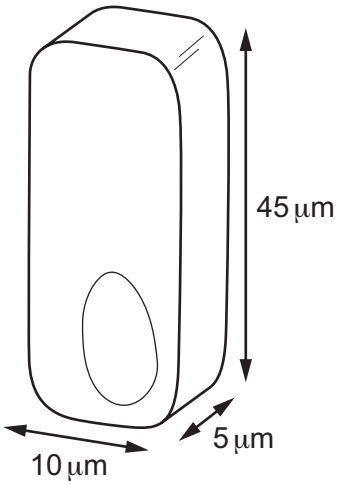
A 1 and 3 **B** 1 and 4 **C** 2 and 3 **D** 2 and 4

18 The diagrams show the shape and size of two types of cell.

palisade mesophyll cell
surface area = 2200 μm^2



columnar epithelial cell
volume = 2250 μm^3



not to scale

Which statement about the palisade cell and epithelial cell shown in the diagrams is correct?

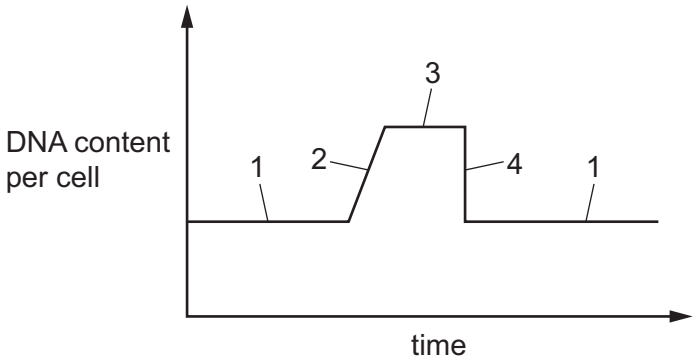
A An increase in surface area reduces the distance for gases to reach the centre of the cell.

B The surface area of the palisade mesophyll cell is 500 μm^2 greater than the columnar epithelial cell.

C The surface area to volume ratio is greater in the columnar epithelial cell than the palisade mesophyll cell.

D The volume of the palisade mesophyll cell is 2500 μm^3 greater than that of the columnar epithelial cell.

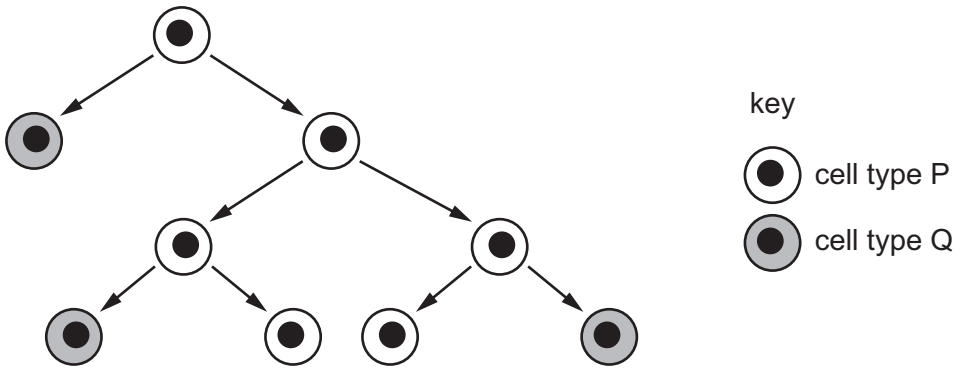
19 The DNA content of a cell changes as the mitotic cell cycle proceeds through a series of stages.



Which row correctly identifies when DNA replicates and when the nuclear envelope breaks down?

	DNA replicates	nuclear envelope breaks down
A	1	3
B	1	4
C	2	3
D	2	4

20 The diagram shows three cycles of cell division from an original cell of cell type P in bone marrow. Some of the cells that form are cell type Q.

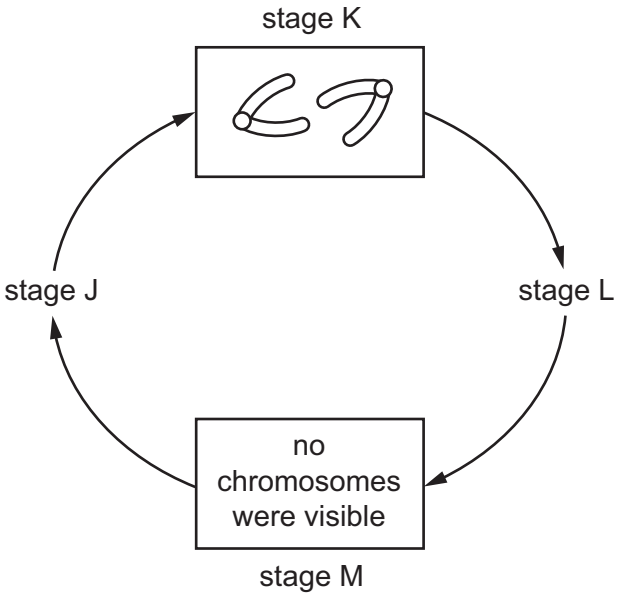


not to scale

Which row correctly identifies cell type P and cell type Q?

	cell type P	cell type Q
A	cancer cell	differentiated cell
B	cancer cell	stem cell
C	differentiated cell	stem cell
D	stem cell	differentiated cell

21 A student made a drawing of two chromosomes at stage K of a mitotic cell cycle.



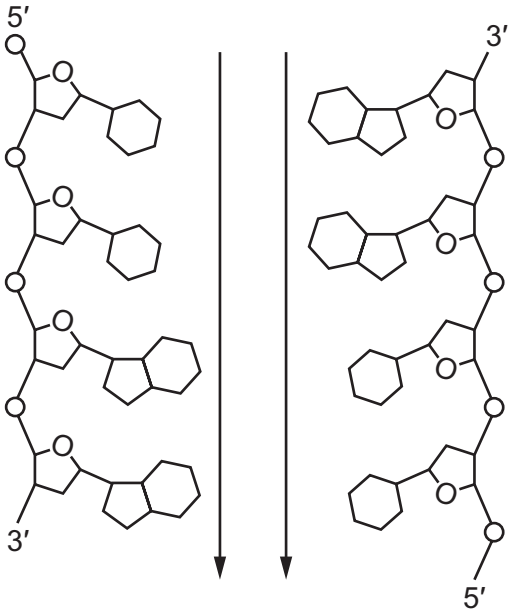
Which row shows the possible events that occur in stages J, L and M?

	J	L	M
A	spindle attachment	cytokinesis	DNA replication
B	chromosome condensation	spindle attachment	cytokinesis
C	DNA replication	chromosome condensation	spindle attachment
D	cytokinesis	DNA replication	chromosome condensation

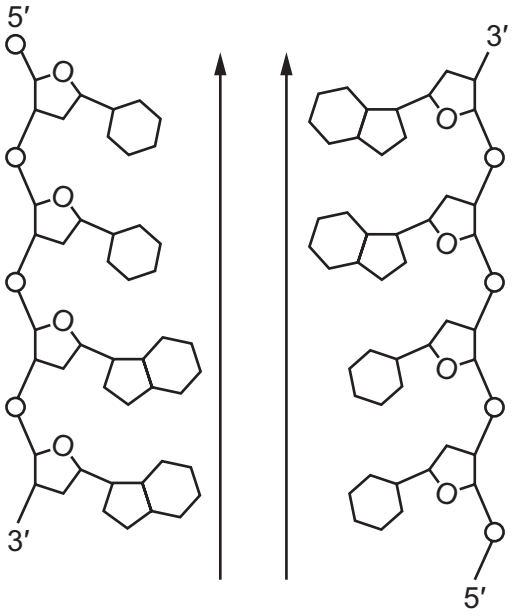
22 During DNA replication, the two original strands of a DNA molecule separate.

Which diagram shows the direction in which DNA polymerase moves along each of the original strands during DNA replication?

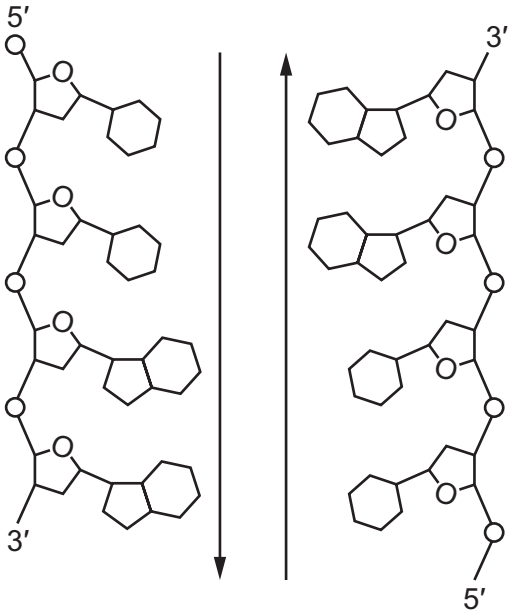
A



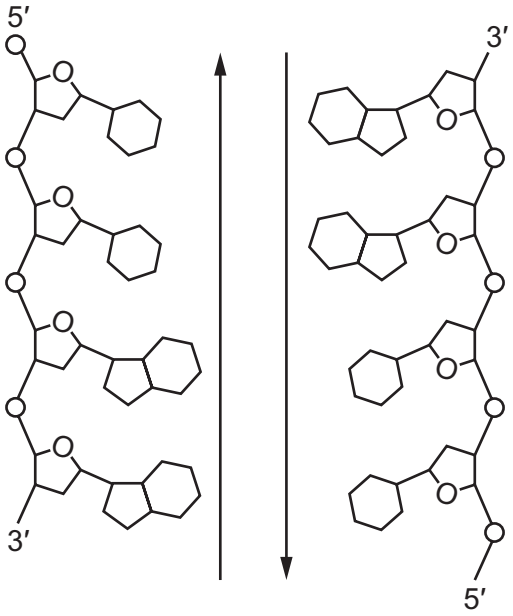
B



C



D



23 Which statements about anticodons are correct?

1 The base sequence of an anticodon will always be the same as that of the corresponding triplet on the transcribed DNA strand.

2 There are 20 naturally occurring amino acids, so therefore there are only 20 anticodons as each anticodon is specific for only one amino acid.

3 The formation of hydrogen bonds between the bases of the anticodon with those of the complementary mRNA codon must occur before the new peptide bond can form.

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

24 Part of a DNA molecule is transcribed to form an RNA molecule that is then modified.

Which row describes the RNA molecule before and after modification?

	before modification	after modification
A	contains exons and introns	contains exons only
B	contains exons and introns	contains introns only
C	contains exons only	contains introns only
D	contains introns only	contains exons only

25 When a gene mutation occurs, which of the following may be altered, resulting in the production of a non-functional protein?

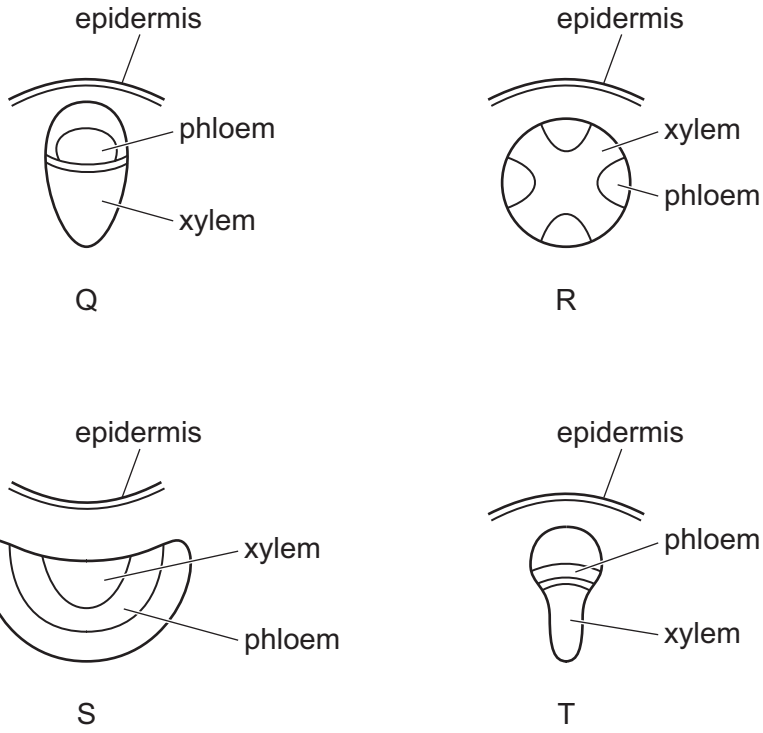
1 amino acid sequence

2 DNA nucleotide sequence

3 mRNA nucleotide sequence

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

26 The diagrams show the arrangements of phloem and xylem tissues in some plant organs.



Where will arrangements Q, R, S and T be found in plants?

	Q	R	S	T
A	leaf	root	stem	root
B	root	stem	root	leaf
C	stem	stem	leaf	root
D	stem	root	leaf	stem

27 Which feature of xylem vessel elements allows them to have reduced resistance to water movement?

A Lignin forms an incomplete secondary wall.

B New vessels transport extra water as a plant grows.

C There are no cross walls between vessel elements.

D Vessel elements join to form narrow tubes.

28 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.

29 What is the correct name for the attraction due to the hydrogen bonding between water molecules during mass flow in plants?

A transpiration

B cohesion

C tension

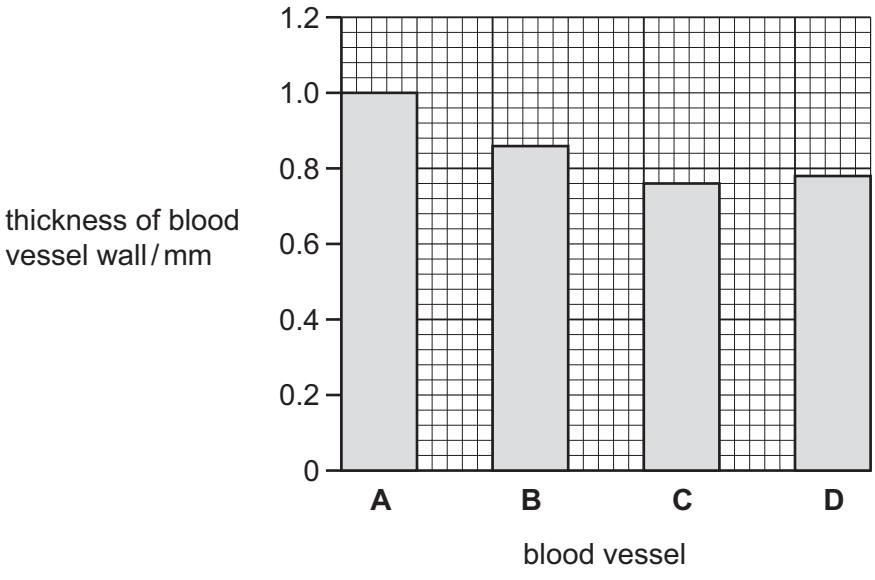
D adhesion

30 Which row shows the cause of mass flow in the phloem and the direction of movement of phloem sap by mass flow?

	cause of mass flow in the phloem	direction of movement of phloem sap by mass flow
A	hydrostatic pressure gradient	sink to source
B	hydrostatic pressure gradient	source to sink
C	water potential gradient	sink to source
D	water potential gradient	source to sink

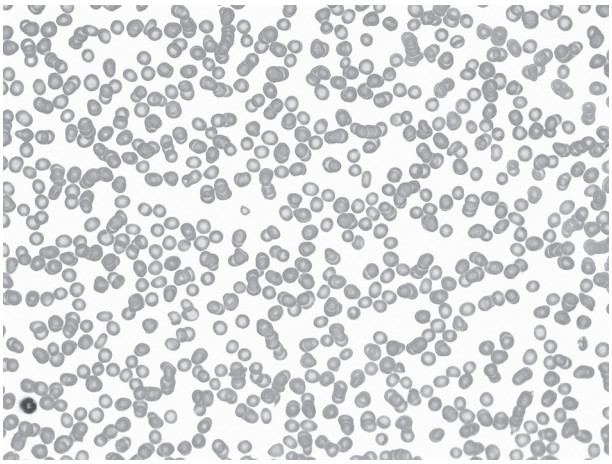
31 The graph shows the thickness of the walls of the main blood vessels to and from a mammalian heart.

Which blood vessel is the pulmonary artery?

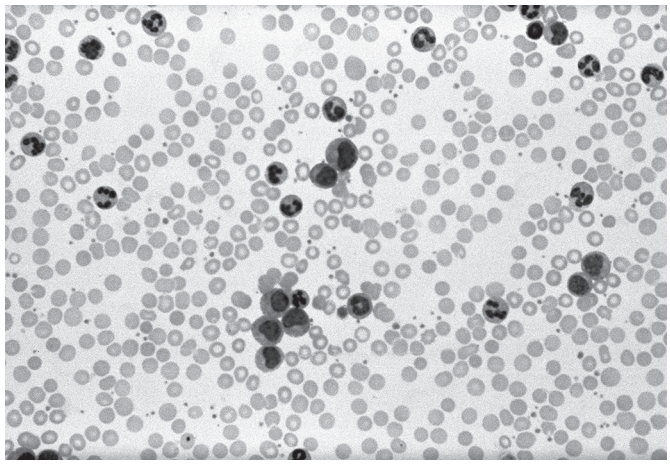


32 The photomicrographs show blood smears from two different people. Person J does **not** have a disorder that affects their blood. Person K does have a disorder that affects their blood.

person J



person K



The table shows some disorders that increase or decrease the number of neutrophils, red blood cells or lymphocytes.

	disorders related to blood count changes	
	increase	decrease
neutrophil	chronic inflammation	autoimmune neutropenia
red blood cell	heart failure	anaemia
lymphocyte	chronic leukaemia	sepsis

Which disorder does person K have?

A autoimmune neutropenia

B heart failure

C sepsis

D chronic leukaemia

33 Which statement correctly describes the Bohr shift?

A the decrease in affinity of haemoglobin for oxygen that occurs when pH is lowered

B the increase in affinity of haemoglobin for oxygen that occurs when oxygen concentration rises

C the increase in affinity of haemoglobin for oxygen that occurs when pH is at an optimum

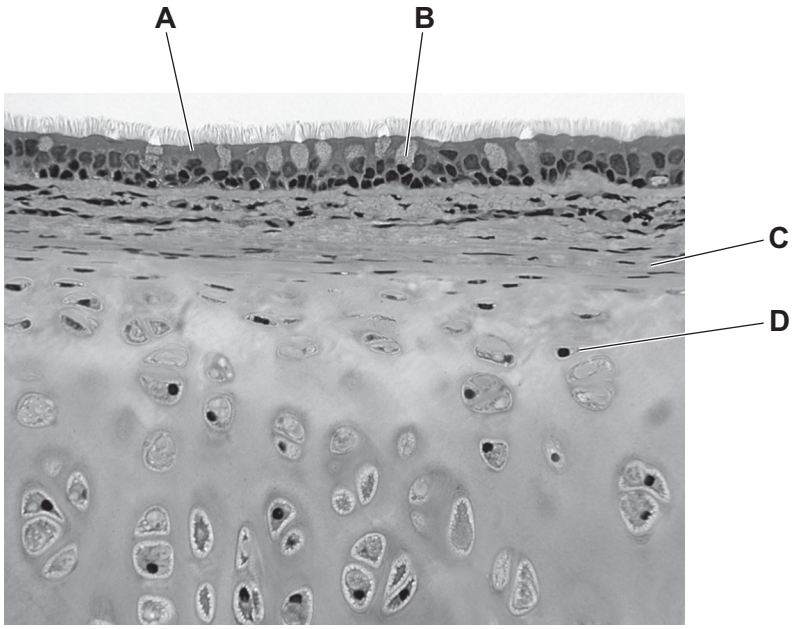
D the release of oxygen from oxyhaemoglobin in the absence of carbonic acid

34 Which row correctly describes the features for two of the heart chambers?

	left atrium	left ventricle
A	large force of contraction to allow blood to travel a long distance	large force of contraction to allow blood to travel a long distance
B	small force of contraction as blood only needs to travel a short distance	large force of contraction to allow blood to travel a long distance
C	small force of contraction as blood only needs to travel a short distance	small force of contraction as blood only needs to travel a short distance
D	large force of contraction to allow blood to travel a long distance	small force of contraction as blood only needs to travel a short distance

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

Which row shows the correct name and function of one of the labelled structures in the photomicrograph?



	name	function
A	ciliated epithelial cell	traps particles
B	goblet cell	secretes mucus
C	cartilage	prevents collapse of trachea
D	smooth muscle	contracts to expand airways

[Turn over

36 Infectious diseases may be caused by bacteria, protoctists and viruses. Different pathogens may be transmitted by airborne droplets, from faeces to mouth (faecal-oral), by sexual intercourse and by vectors.

Four examples of infectious diseases are listed.

1 cholera

2 HIV/AIDS

3 malaria

4 tuberculosis

Which table classifies the four diseases correctly to show the type of pathogen that causes the disease and the mode of transmission?

A

	bacterium	protoctist	virus
droplet			2
faecal-oral	1		
sexual		3	
vector			4

B

	bacterium	protoctist	virus
droplet		2	
faecal-oral	1		
sexual			3
vector		4	

C

	bacterium	protoctist	virus
droplet	4		
faecal-oral	1		
sexual			2
vector		3	

D

	bacterium	protoctist	virus
droplet	3		
faecal-oral		2	
sexual	1		
vector			4

37 Scientists investigated the sensitivity and resistance of a bacterium called *Clostridium difficile* to four antibiotics. Colonies of bacteria were grown on agar plates for 24 hours, after which a different antibiotic was added to each plate. The number of bacterial colonies that died, stopped growing and continued growing were then counted. A bacterial colony is a group of bacterial cells that have multiplied from one bacterium.

Which antibiotic would be the best to treat a person infected with *Clostridium difficile*?

	antibiotic	number of colonies that died	number of colonies that stopped growing	number of colonies that continued growing
A	ampicillin	2	5	13
B	clindamycin	4	8	6
C	metronidazole	13	6	1
D	cefoxitin	9	5	4

38 A vaccine is used to create artificial active immunity. After a person has been given a vaccine, it takes a period of time before they develop long-term immunity to the disease.

Which statement about this period of time explains the delay in developing long-term immunity?

A **No** memory cells have been produced from B-lymphocytes.

B **No** plasma cells have been produced from B-lymphocytes.

C The primary immune response has **not** produced enough antibodies.

D The secondary immune response has **not** produced enough antibodies.

39 An antiserum to a snake toxin can be obtained by injecting the toxin into a horse. The antiserum is made from blood plasma taken from the horse a few weeks later. The antiserum is injected into a person who has been bitten by the same species of snake.

Which type of immunity occurs as a result of using this antiserum?

A artificial active

B artificial passive

C natural active

D natural passive

40 Which statement describes the feature of monoclonal antibodies that allows them to accurately treat a specific disease?

A They bind to human hormones to produce a colour change.

B A fluorescent dye can be attached to them.

C They have active sites that are complementary to antigens.

D They can carry toxic chemicals.

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