Cambridge Assessment International Education

Cambridge International AS & A Level

BIOLOGY **9700/11**

Paper 1 Multiple Choice **October/November 2022**

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.

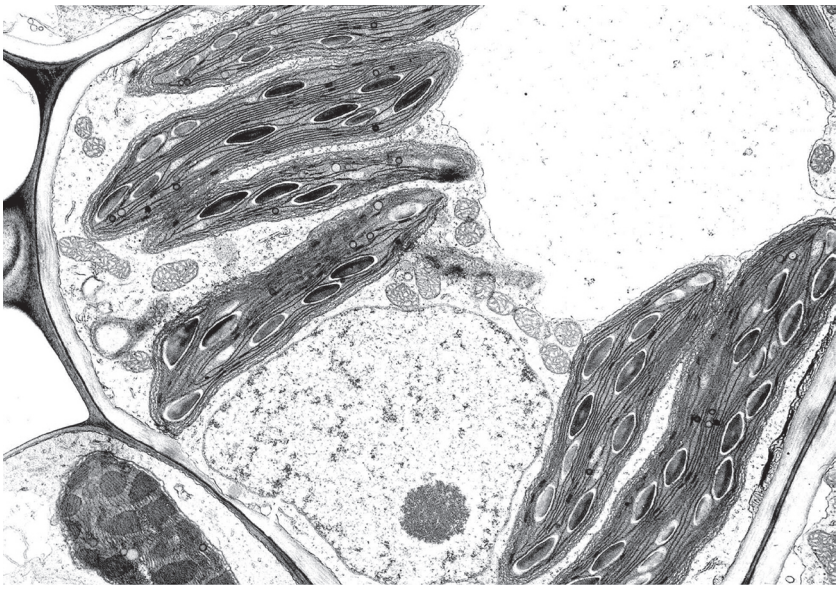
INFORMATION

- 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 **16** pages.

[Turn over

1 The photomicrograph shows part of a plant cell.



What is the magnification of the cell?

A ×250 **B** ×400 **C** ×1000 **D** ×4000

2 Which row matches each organelle with its function?

	microtubules	rough endoplasmic reticulum	Golgi body	centrioles
A	make cilia and spindle	separates some processes from cytoplasm	makes lysosomes	assemble the spindle during nuclear division
B	move vesicles within the cell	assembles amino acids to make proteins	contains enzymes for destroying worn out parts of the cell	move chromosomes apart during anaphase
C	move chromatids apart during anaphase	modifies proteins which may be released from cell	makes glycoproteins	move cilia
D	form part of the cytoskeleton	makes triglycerides and phospholipids	modifies proteins by adding carbohydrates	move individual cells

3 Where are 80S ribosomes found?

1 chloroplasts

2 cytoplasm of eukaryotes

3 mitochondria

4 cytoplasm of prokaryotes

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

4 Which feature, when present in an organism, enables it to be identified as a prokaryote?

A cytoplasmic DNA

B cell wall

C nucleus

D ribosomes

5 What is the function of the nucleolus?

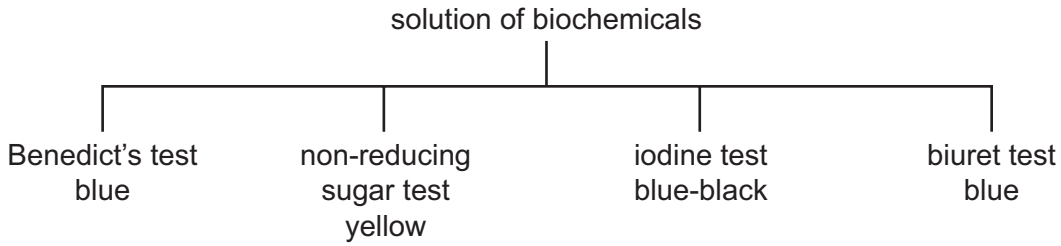
A the formation and breakdown of the nuclear envelope

B the formation of rough endoplasmic reticulum

C the synthesis of ribosomal proteins

D the synthesis of rRNA

6 The diagram shows the results of a number of tests on a solution of biochemicals.



Which substances are present in the solution?

A non-reducing sugar and starch only

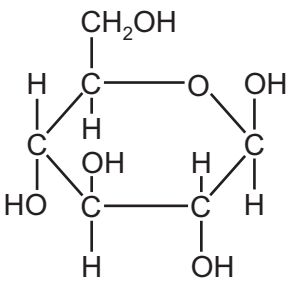
B protein, non-reducing sugar and starch

C starch and reducing sugar

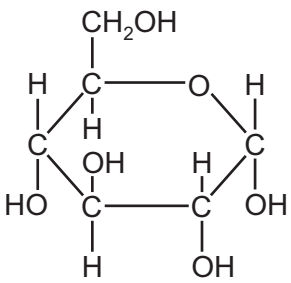
D starch only

7 Which diagram shows the ring form of β-glucose?

A



B



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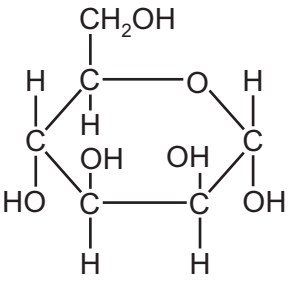

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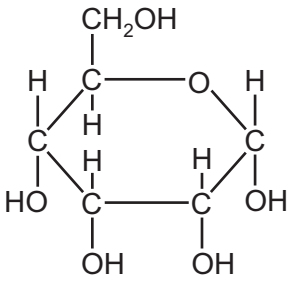


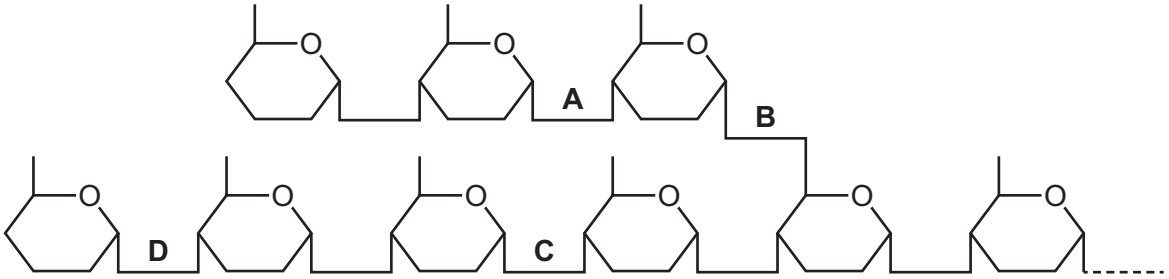
8 Which row correctly matches the example with the type of molecule?

	disaccharide	macromolecule	monomer	polymer
A	fructose	glycogen	glucose	starch
B	starch	haemoglobin	ribose	glycogen
C	maltose	ribonucleic acid	sucrose	cellulose
D	sucrose	cellulose	fructose	collagen

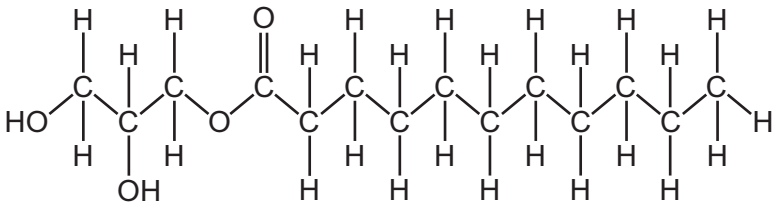
9 The enzyme α-amylase hydrolyses amylopectin but it is not able to hydrolyse some of its glycosidic bonds.

- It only hydrolyses 1,4 glycosidic bonds.
- It is not able to hydrolyse the last bond of a chain.
- It is not able to hydrolyse the bonds in a chain of three units attached by a 1,6 glycosidic bond to another chain.

Which glycosidic bond can be hydrolysed by α-amylase?



10 Molecule X is a lipid.



molecule X

Which row is correct for molecule X and a triglyceride?

	molecule X contains	triglyceride contains
A	one unsaturated fatty acid	saturated fatty acids
B	no ester bonds	three ester bonds
C	one fatty acid	three fatty acids
D	two fatty acids	three fatty acids

11 Bread contains a mixture of polypeptides known as gluten.

Two of the polypeptides found in gluten are glutenin and gliadin.

Which statement describes the tertiary structure of a protein?

A Disulfide bonds form between glutenin and gliadin.

B A large proportion of the amino acids in gliadin are glutamine.

C α-helical sections are found in glutenin and gliadin.

D Amino acids with hydrophobic R groups are found on the inside of glutenin.

12 A student was provided with two test-tubes, one containing $10\,cm^3$ of solution P and one containing $10\,cm^3$ of solution Q. When these solutions were mixed together and left for 24 hours, the concentration of P decreased but the concentration of Q remained the same.

The student wrote the following conclusions.

1 P may break down over time.

2 Q may be a biological catalyst.

3 P may be the substrate for Q.

Which conclusions could be supported by the information?

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

13 Which statements are correct for the lock and key hypothesis **and** the induced fit hypothesis of enzyme action?

1 The substrate is the same shape as the active site.

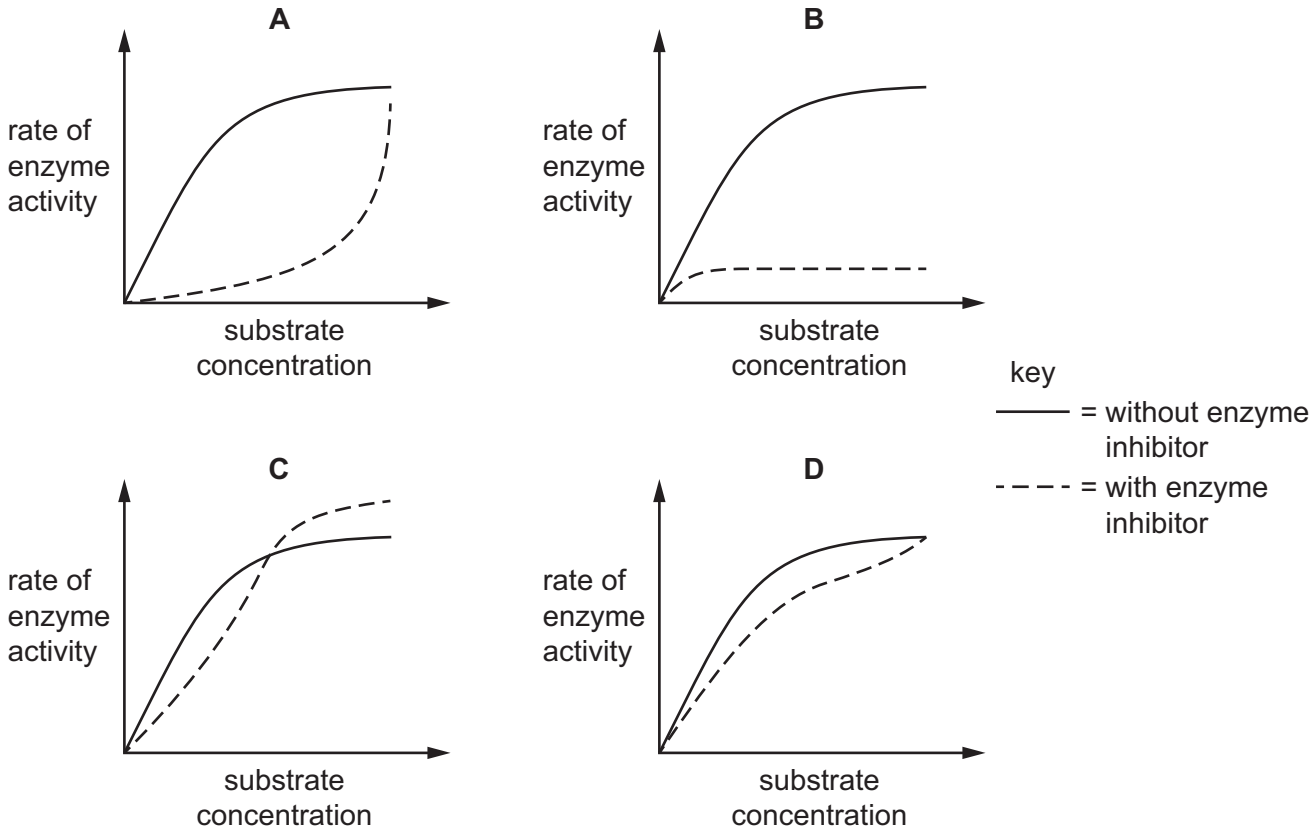
2 The substrate is held in place in the active site by temporary bonds.

3 The enzyme and sometimes the substrate change shape slightly as the substrate molecule enters the enzyme.

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

14 A student investigated the rate of enzyme activity with increasing substrate concentration. The experiment was repeated with the addition of a reversible non-competitive enzyme inhibitor. A graph was plotted to show the results.

Which graph represents the results of the two experiments?



15 A cuboidal epithelium cell has a length of 2 μm.

The cell is an approximate cube shape.

What is the most accurate estimate of the surface area : volume ratio of this cuboidal epithelium cell?

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

16 Which statement is correct for facilitated diffusion **and** active transport?

A As the direction of the concentration gradient changes so does the direction of movement of the molecules.

B Molecules always move at the same rate as simple diffusion.

C Specific molecules are transported across a membrane.

D The molecule ATP is required to move specific molecules quickly through proteins in the membrane.

17 Equal sized potato pieces were placed into a test-tube and covered with a sucrose solution. The test-tube was left for 30 minutes. All other variables were standardised.

After 30 minutes, the potato piece had not changed in size.

What can be concluded from this result?

A The concentration of sucrose is the same in the potato and in the solution and there is no more movement of water into or out of the potato.

B The concentration of sucrose is the same in the potato and in the solution and there is no net movement of water into the potato.

C The water potential is the same in the potato and in the sucrose solution and there is no more movement of water into or out of the potato.

D The water potential is the same in the potato and in the sucrose solution and there is no net movement of water into or out of the potato.

18 How many of these processes produce genetically identical cells?

- growth of plant roots
- replacement of dead human skin cells
- repair of damaged muscle tissue
- asexual reproduction of coral

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

19 Which row shows the correct number of each component of a single chromosome at the end of prophase of mitosis?

	centromeres	chromatids	polynucleotide strands	telomeres
A	1	0	2	2
B	1	2	4	4
C	2	0	4	2
D	2	2	2	4

20 Which processes occur during interphase?

1 DNA replication

2 microtubule organisation

3 synthesis of ribosomes

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

21 Embryonic stem cells are able to replicate continuously.

What happens to the telomeres during repeated mitotic cell cycles of embryonic stem cells?

A Their lengths increase.

B Their lengths decrease.

C They are completely lost.

D They stay the same length.

22 Which nitrogenous bases are pyrimidines?

A adenine and thymine

B cytosine and guanine

C thymine and uracil

D uracil and guanine

23 DNA replication in bacteria was investigated. Bacteria were grown in a medium with only heavy nitrogen, ^{15}N, until all of the bacterial DNA was heavy.

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

The bacteria continued to reproduce, and a sample of bacteria was collected from the second generation and the DNA analysed.

Hybrid DNA contains heavy and light DNA.

Which row is correct for the second generation?

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

[Turn over

24 The sequence shows the series of bases at the start of a gene.

TAC CGA CCA CCA CAA CCA CGA...

After transcription, the mRNA was translated via tRNA into a sequence of amino acids. When this part of the polypeptide was analysed, it was found to contain the amino acids in the table.

amino acid	number present
Ala	2
Gly	3
Met	1
Val	1

What is the sequence of amino acids in this part of the polypeptide?

A Met Ala Gly Ala Gly Gly Val

B Met Ala Gly Gly Val Gly Ala

C Met Gly Ala Ala Val Ala Gly

D Met Gly Ala Ala Gly Gly Val

25 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 the drugs rifampicin **and** streptomycin, what will be the immediate effects?

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

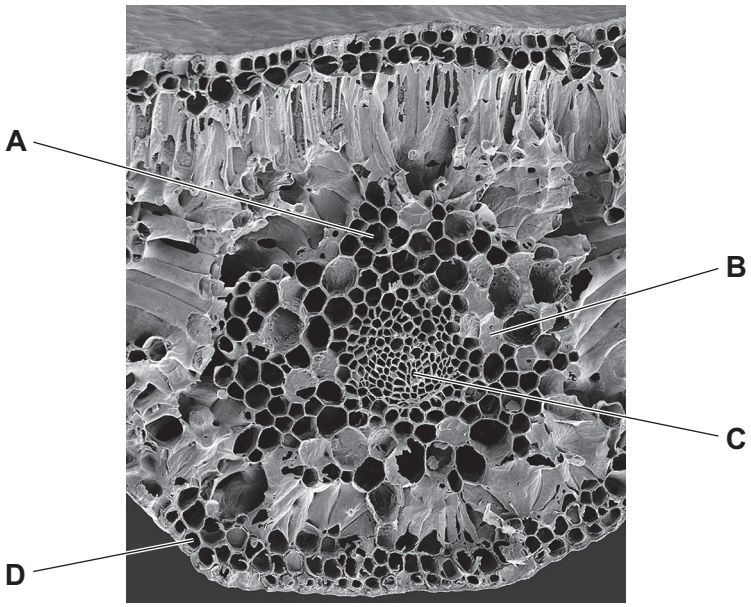
2 If translation has started, proteins may be faulty.

3 Translation will be inhibited.

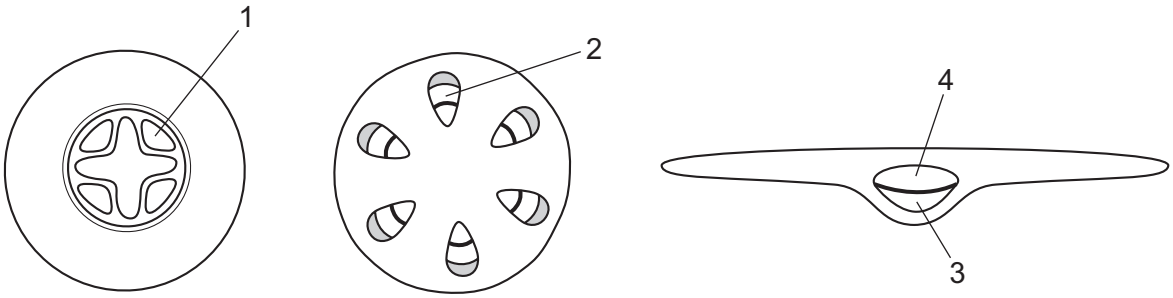
A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

26 The electron micrograph shows a cross-section of a leaf vein and some neighbouring cells.

Which structure contributes to mass flow by the use of proton pumps?



27 The diagrams show some tissue types in plant organs.



Which row identifies the tissue types?

	1	2	3	4
A	phloem	phloem	phloem	xylem
B	phloem	xylem	phloem	xylem
C	xylem	phloem	xylem	phloem
D	xylem	xylem	phloem	xylem

[Turn over

28 Which description of xylem vessel elements is correct?

A cells joined to form a tube, pits at intervals, sieve plates between cells, surrounded by the endodermis in roots

B contains cells joined end to end, containing cytoplasm, cell walls with lignin, located to the outside of phloem in vascular bundles

C contains elongated cells with end walls broken down, located in vascular bundles in the stem and leaves

D dead elongated cells, lignified cell walls with pits at intervals, associated with companion cells in the roots only

29 Which properties of lignin are important for the function of xylem vessels in the stem of a tall plant, such as a tree?

1 It is inflexible so does not bend easily.

2 It is not permeable to water.

3 It is strong to resist collapse under pressure.

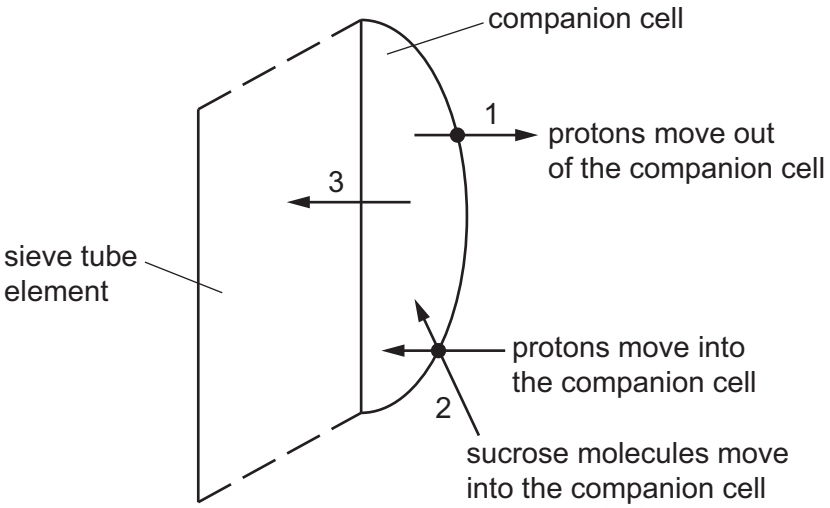
4 It has weaker adhesion to water molecules than cellulose.

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

30 Which row is correct for the sucrose concentrations and the water potentials in a source and a sink in a potato plant, at 12:00 p.m.?

	sucrose concentration		water potential	
	source	sink	source	sink
A	higher	lower	higher	lower
B	higher	lower	lower	higher
C	lower	higher	higher	lower
D	lower	higher	lower	higher

31 The diagram shows one possible way in which sucrose may be loaded into a sieve tube element.



Which steps require ATP?

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

32 Which statements about arteries are correct?

1 Artery walls can resist high pressure.

2 Arteries pump blood out of the heart.

3 Blood in arteries has the same flow rate as in veins.

4 The pulse in arteries is the result of a surge in blood that causes expansion of the artery wall.

5 There are semilunar valves at the junction of arteries with the heart.

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

33 What happens during ventricular systole in a mammalian heart?

1 The atrioventricular node transmits an electrical signal to the apex of the heart.

2 The pressure in the ventricles drops below the pressure in the atria.

3 The atrioventricular valves close and the semilunar valves open.

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

34 A shortage of protein in the diet of children can lead to a disease that causes excess tissue fluid to build up in the abdomen.

What explains why a build-up of excess tissue fluid can occur in this disease?

A A shortage of plasma proteins decreases blood water potential; less tissue fluid returns to the blood.

B A shortage of plasma proteins increases blood water potential; less tissue fluid returns to the blood.

C A shortage of protein in the diet causes weak cardiac muscle, reducing hydrostatic pressure.

D A shortage of protein in the tissue fluid decreases its water potential; more water leaves the blood.

35 Red blood cells may contain a molecule known as 2,3-bisphosphoglycerate (2,3-BPG).

When 2,3-BPG binds to haemoglobin, a higher partial pressure of oxygen is needed to bring about 50% saturation of haemoglobin with oxygen.

Which statements about the effect of 2,3-BPG are correct?

1 2,3-BPG in red blood cells causes the oxygen dissociation curve to shift to the right.

2 The binding of 2,3-BPG to haemoglobin reduces the Bohr effect.

3 The binding of 2,3-BPG to haemoglobin lowers the affinity of the haemoglobin for oxygen.

4 When 2,3-BPG is not present, oxyhaemoglobin is less likely to unload oxygen.

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

36 Carbon dioxide is continually produced by respiring cells. It diffuses into red blood cells and dissociates into hydrogen ions (H^+) and hydrogen carbonate ions (HCO_3^-). HCO_3^- then diffuses out of the cell in exchange for chloride ions (Cl^-) in the chloride shift.

What is the importance of the chloride shift?

A It helps to maintain a neutral pH in the red blood cell by acting as a buffer.

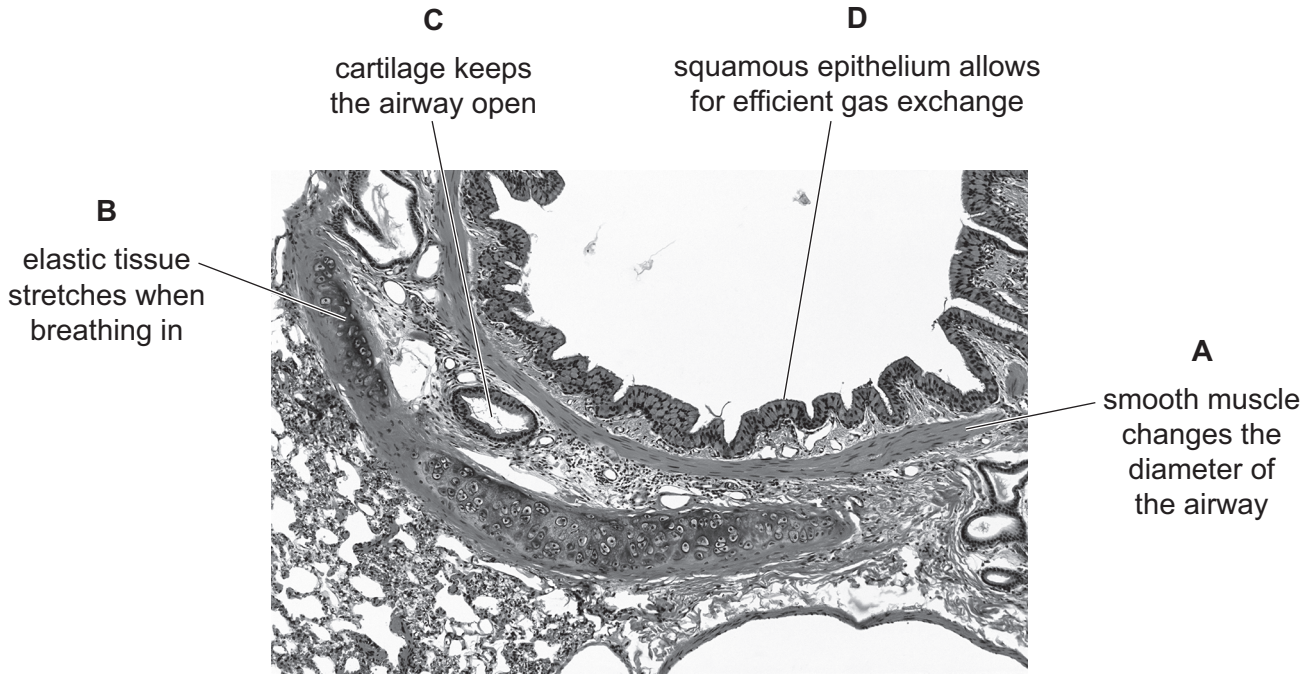
B It maintains a balance of positive and negative charge between the cell and the plasma.

C It causes the oxygen dissociation curve to shift to the left, releasing more oxygen.

D It prevents carbon dioxide combining with haemoglobin, allowing haemoglobin to combine with oxygen.

37 The photomicrograph shows a section through a bronchus.

Which annotated label is correct?



38 Penicillin is an antibiotic used to treat infections caused by bacteria.

Which events explain how bacteria become resistant to penicillin?

1 The number of bacteria with the allele for resistance to penicillin increases.

2 Resistance to penicillin is the result of a mutation in a bacterium.

3 Bacteria with the allele for resistance to penicillin pass the allele to their daughter cells.

4 The mutation for resistance to penicillin is always caused by the presence of penicillin.

A 1, 2, 3 and 4

B 1, 2 and 3 only

C 1 and 4 only

D 2 and 3 only

39 Which statements explain why some vaccines can be taken by mouth but tuberculosis (TB) vaccine has to be injected?

1 Macrophages present antigens in vaccines to stimulate an immune response.

2 The TB antigens necessary to produce an immune response are proteins which would be digested in the stomach and small intestine.

3 There are no B-lymphocytes and T-lymphocytes in the stomach.

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

40 A student wrote the following statements about the production of monoclonal antibodies.

Which statement is **not** correct?

A Non-self antigen is injected into a mammal.

B Plasma cells secrete the specific antibody in response to a non-self antigen.

C Selected hybridoma cells divide by mitosis to form a clone.

D T-lymphocytes are fused with cancer cells to form hybridoma cells.