Cambridge Assessment International Education

Cambridge International AS & A Level

BIOLOGY **9700/11**

Paper 1 Multiple Choice **May/June 2020**

1 hour

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.

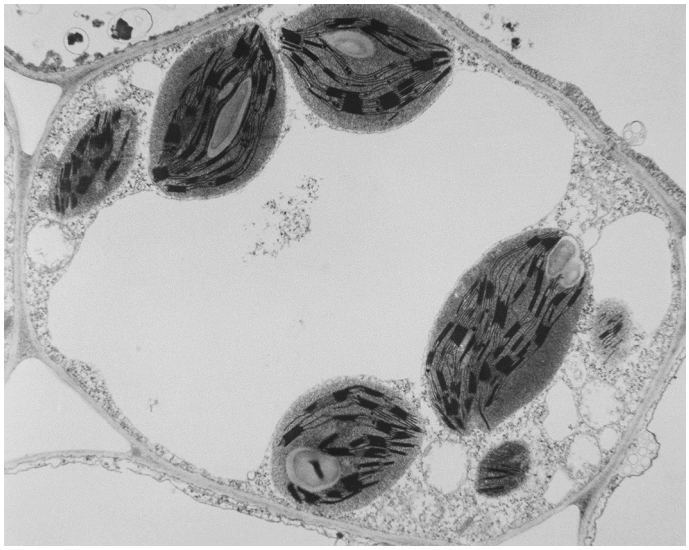
INFORMATION

- The total mark for this paper is 40.
- Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
- Any rough working should be done on this question paper.

This document has **20** pages. Blank pages are indicated.

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1 The photomicrograph shows the ultrastructure of part of a cell.



Which statement about the type of cell shown in the photomicrograph is correct?

A It is a plant cell because it has both chloroplasts and a nucleus.

B It is a plant cell because it has chloroplasts.

C It is an animal cell because it has a cell membrane.

D It is an animal cell because it has mitochondria.

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2 Which structures are found in typical eukaryotic cells?

1 70S ribosomes

2 80S ribosomes

3 linear DNA (chromosomes)

4 circular DNA

A 1, 2, 3 and 4

B 1, 2 and 3 only

C 1 and 4 only

D 2 and 3 only

3 A student examined a slide of human blood with a light microscope and made a careful drawing of the different cell types. The student used an eyepiece graticule so that the relative sizes of the different cell types were drawn accurately.

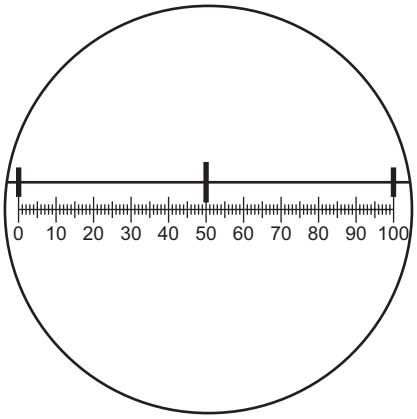
In the drawing:

- red blood cells were 7 mm in diameter
- lymphocytes were 6 mm in diameter
- neutrophils were 14 mm in diameter.

What is the linear magnification of the drawing?

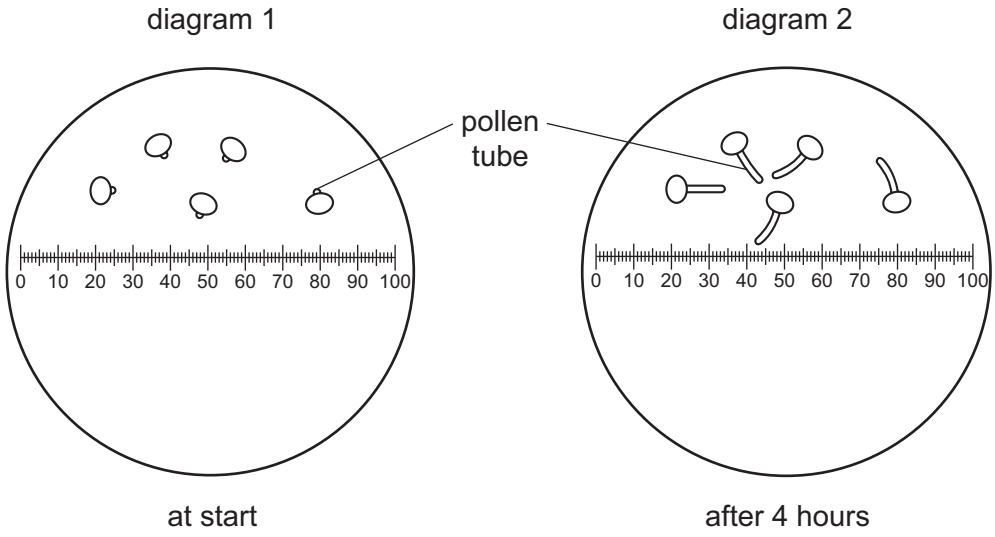
A ×10 **B** ×40 **C** ×100 **D** ×1000

4 The diagram shows a graduated slide, with divisions of 0.1 mm viewed using an eyepiece graticule.



Pollen grains were grown in a sugar solution and viewed using the eyepiece graticule.

Diagram 1 shows the pollen grains at the start. Diagram 2 shows the pollen grains after four hours.



What is the growth rate of the pollen tubes?

A $5\,\mu mh^{-1}$ **B** $10\,\mu mh^{-1}$ **C** $5\,mmh^{-1}$ **D** $10\,mmh^{-1}$

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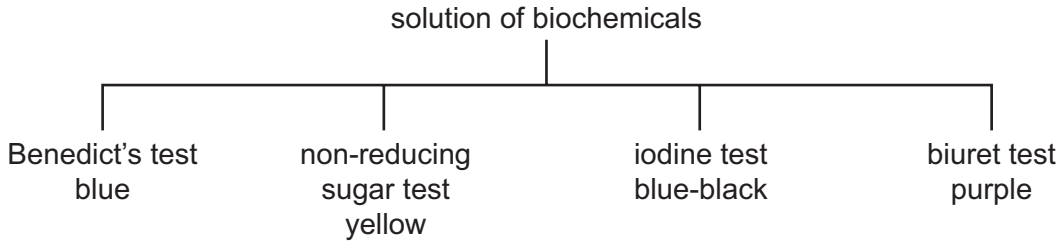
5 The table shows a comparison between two features of a typical eukaryotic cell and a typical prokaryotic cell.

Which row shows the correct comparison between these cells?

	presence of centromeres		presence of telomeres	
	eukaryotic cell	prokaryotic cell	eukaryotic cell	prokaryotic cell
A	✓	✓	✗	✗
B	✓	✗	✓	✗
C	✗	✓	✗	✓
D	✗	✗	✓	✓

key
✓ = present
✗ = not present

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



Which substances are present in the solution?

A amylose, amylopectin and lipid

B glucose, starch and catalase

C sucrose, amylase and triglyceride

D sucrose, starch and catalase

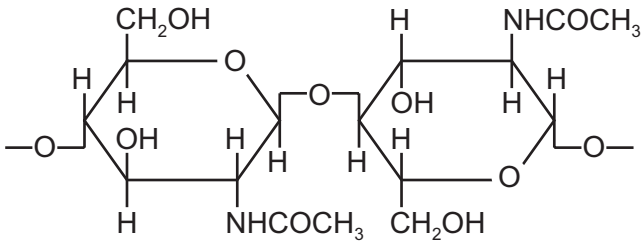
7 Maltose and sucrose are disaccharides. Maltose is formed from two molecules of glucose, whilst sucrose is formed from fructose and glucose.

Which row shows the molecular formulae of the two disaccharides?

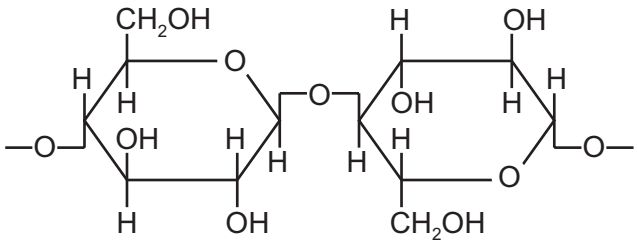
	maltose	sucrose
A	$C_{12}H_{22}O_{11}$	$C_{12}H_{22}O_{11}$
B	$C_{12}H_{22}O_{11}$	$C_{12}H_{24}O_{12}$
C	$C_{12}H_{24}O_{12}$	$C_{12}H_{22}O_{11}$
D	$C_{12}H_{24}O_{12}$	$C_{12}H_{24}O_{12}$

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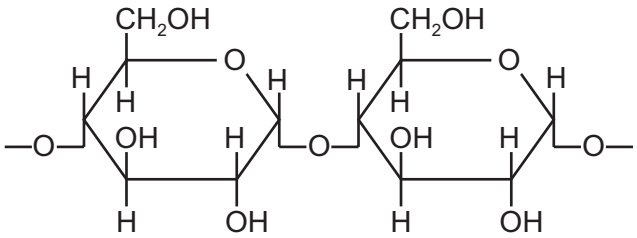
8 The diagrams show short sections of some common polysaccharides and modified polysaccharides.



1



2



3

The polysaccharides can be described as:

- F is composed of β-glucose monomers with 1,4 glycosidic bonds
- G is composed of α-glucose monomers with 1,4 glycosidic bonds
- H is composed of N-acetylglucosamine monomers with β-1,4 glycosidic bonds.

Which row correctly matches the numbered diagrams to the descriptions of the polysaccharides?

	polysaccharide F	polysaccharide G	polysaccharide H
A	2	1	3
B	2	3	1
C	3	1	2
D	3	2	1

9 Which molecules contain at least two double bonds?

1 unsaturated fatty acid

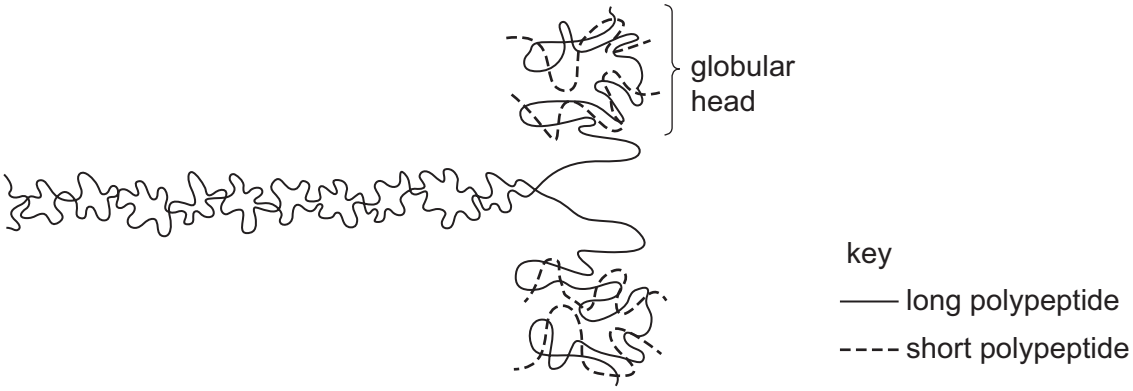
2 collagen

3 haemoglobin

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

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10 The diagram shows a protein molecule.



Two long polypeptides each form α-helices for much of their length and these twist together into a fibre.

At one end, each of these polypeptides coils into a globular head.

Two short polypeptides bind to each globular head.

What describes the protein structure of this molecule?

A quaternary structure because each molecule consists of six polypeptides

B secondary structure because the long polypeptides form α-helices

C tertiary structure because the α-helices form a fibre

D tertiary structure because the heads form globular proteins

11 Which types of bond will keep a folded protein in its precise shape for the longest time as the temperature rises?

A disulfide

B hydrogen

C hydrophobic interactions

D ionic

12 Protease enzymes are found in many locations inside and outside the cells. Four of these locations are listed.

1 lysosomes

2 lumen of the stomach

3 at a telophase spindle

4 mucus in the trachea

Which of these locations are sites of intracellular hydrolysis?

A 1, 2, 3 and 4

B 1, 2 and 4 only

C 1 and 3 only

D 2 and 4 only

13 An enzyme is modified for industrial use. It has a lower Michaelis-Menten constant (K_m) than the unmodified enzyme.

What is true of the modified enzyme?

A It is more specific.

B It has a higher affinity for its substrate.

C It has a lower maximum rate of reaction (V_{max}).

D It needs more substrate to become saturated.

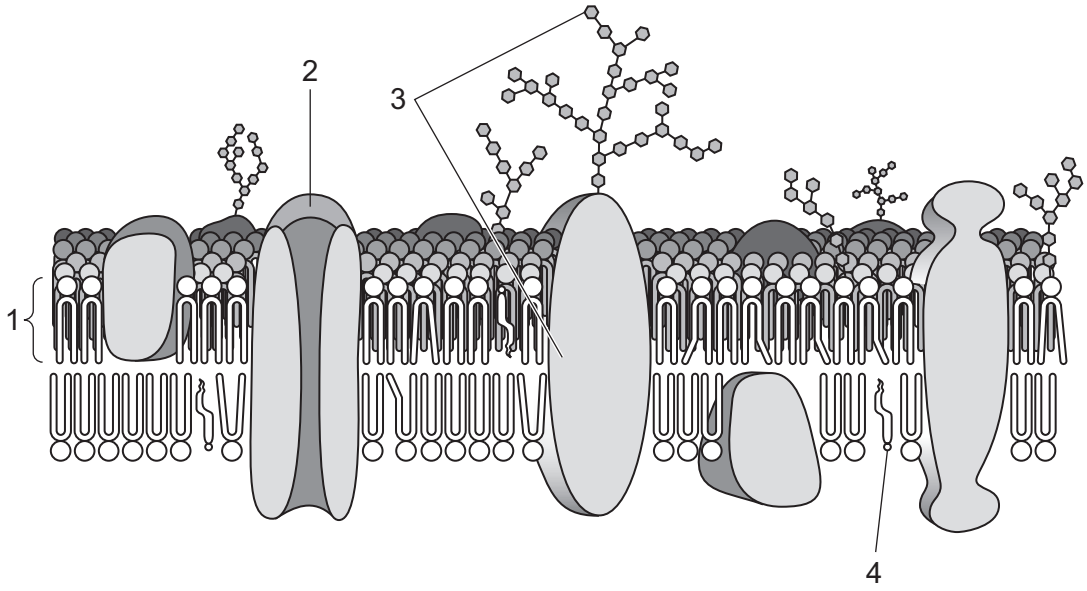
14 A decrease in some factors will increase the fluidity of the cell surface membrane.

Which pair of factors, when decreased, will increase the fluidity of the cell surface membrane?

	a decrease in
A	• distance between phospholipid molecules • proportion of short fatty acid chains
B	• distance between phospholipid molecules • temperature
C	• proportion of phospholipids with saturated fatty acid chains • proportion of long fatty acid chains
D	• proportion of phospholipids with unsaturated fatty acid chains • temperature

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15 The diagram shows a cell surface membrane.



Which statements about the labelled molecules in the membrane are correct?

- 1 is involved in the diffusion of ions.
- 2 is involved in facilitated diffusion.
- 3 is involved in the recognition of antigens.
- 4 is involved in membrane fluidity.

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

16 Equal sized potato pieces were placed into test-tubes containing equal volumes of different concentrations of sucrose solution and left for 30 minutes. All other variables were controlled.

After 30 minutes, the potato piece in one of the concentrations of sucrose solution had not changed in size.

What can be concluded from this result?

1 There is no net movement of water into or out of the potato.

2 The water potential of the potato is the same as the water potential of the sucrose solution.

3 The concentration of sucrose in the potato is the same as the concentration of the sucrose solution.

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

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17 Which feature of stem cells enables them to replace cells in tissues such as the skin?

A They are undifferentiated cells that are present at birth.

B They differentiate to form skin cells.

C They divide by mitosis to supply some cells that can differentiate.

D They have the full number of chromosomes.

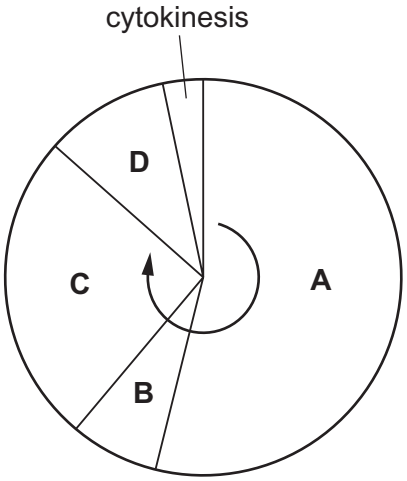
18 During prophase, a scientist stains the chromosomes of a diploid animal cell with a fluorescent dye to stain telomeres. This cell has 32 chromosomes.

How many telomeres will the scientist observe?

A 32 **B** 64 **C** 96 **D** 128

19 The diagram shows the cell cycle.

During which phase do chromosomes condense and become visible?



20 What is correct for thymine?

	has a single ring structure	is a pyrimidine	joins its complementary base with 3 hydrogen bonds
A	✓	✓	✓
B	✓	✓	✗
C	✓	✗	✗
D	✗	✗	✓

key

✓ = correct

✗ = incorrect

21 A short piece of DNA 15 base pairs long was analysed to find the number of nucleotide bases in each of the polynucleotide strands. Some of the results are shown below.

	number of nucleotide bases			
	A	C	G	T
strand 1		6		3
strand 2				4

How many nucleotides containing guanine were present in strand 1?

A 2 **B** 3 **C** 4 **D** 6

22 Scientists grew bacteria in a medium containing heavy nitrogen, ^{15}N, as the only source of nitrogen.

After many generations, all of the bacterial DNA contained heavy nitrogen.

These bacteria were then moved from the heavy nitrogen medium into a medium with only light nitrogen, ^{14}N.

Some bacteria were collected from each of the **next** three generations and their DNA was analysed.

Hybrid DNA contains both heavy and light nitrogen.

Which row shows the correct DNA of the first and third generations?

	DNA of first generation	DNA of third generation
A	all hybrid	half hybrid, half light
B	all hybrid	one quarter hybrid, three quarters light
C	half hybrid, half heavy	half hybrid, one quarter heavy, one quarter light
D	half hybrid, half light	one quarter hybrid, three quarters light

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23 A population of bacteria is exposed to the antibiotic penicillin. Most of the bacteria die.

However, some bacteria in the population have an allele coding for an enzyme that breaks down penicillin. These bacteria are able to survive.

Which could explain how these bacterial cells acquired this allele?

1 An error during DNA replication.

2 An error during transcription.

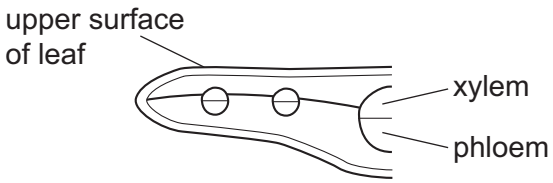
3 An error during translation.

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

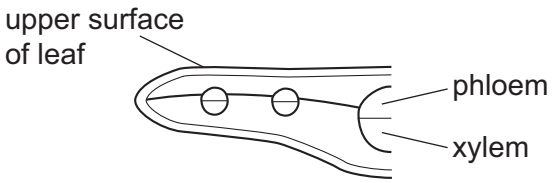
24 A dicotyledonous leaf has a palisade mesophyll layer that is approximately twice as thick as the spongy mesophyll layer.

Which plan diagram is correct?

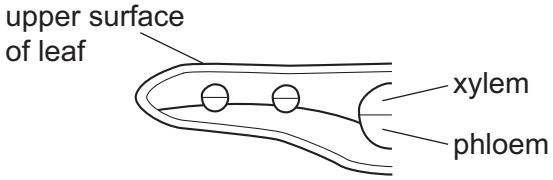
A



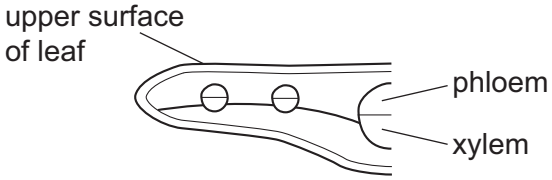
B



C



D



25 A number of processes contribute to maintaining a water potential gradient in plants allowing water to reach the highest parts of a plant.

Which processes are responsible for maintaining this water potential gradient?

1 capillarity

2 osmosis

3 transpiration

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

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26 What is a correct statement about the movement of substances absorbed by roots?

A Ions have to pass through cell walls to cross the endodermis.

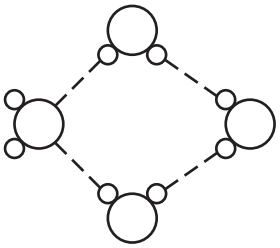
B Ions move through the symplastic pathway only until they reach the Casparian strip.

C Soil water has a more negative water potential than the xylem sap.

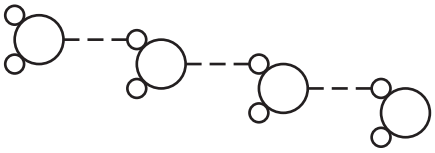
D Water passes through the symplastic pathway along a water potential gradient.

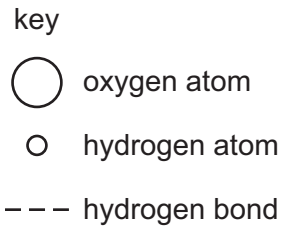
27 Which arrangement of four molecules of water shows how water may cohere when moving up a xylem vessel?

A

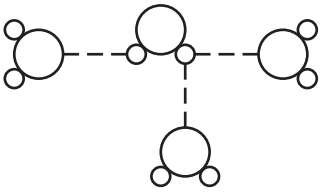


B

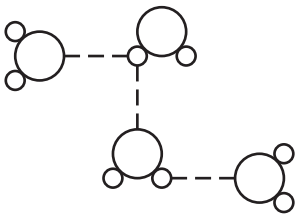




C



D



28 Which statement about sucrose loading into companion cells and then into the phloem sieve tube element is **not** correct?

A Hydrogen ions and sucrose molecules move into the companion cells using a carrier protein.

B Hydrogen ions are pumped out of the companion cells by active transport.

C Sucrose molecules are carried into the companion cells down the concentration gradient for sucrose.

D Sucrose molecules move from a companion cell into the sieve tubes of the phloem through plasmodesmata.

29 What explains why the left and right sides of the heart contract simultaneously?

A Both atria have a sinoatrial node.

B Both sides of the heart are supplied by the same coronary artery.

C Purkyne tissue links the two sides of the heart.

D There is no barrier to electrical excitation between two sides of the heart.

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30 The statements list some of the events in the cardiac cycle. They are not in the correct order.

1 The impulse travels through Purkyne tissue.

2 A wave of excitation sweeps across the atria.

3 The atrioventricular node delays the impulse for a fraction of a second.

4 The sinoatrial node contracts.

5 The wave of excitation sweeps upwards from the base of the ventricles.

6 The ventricles contract.

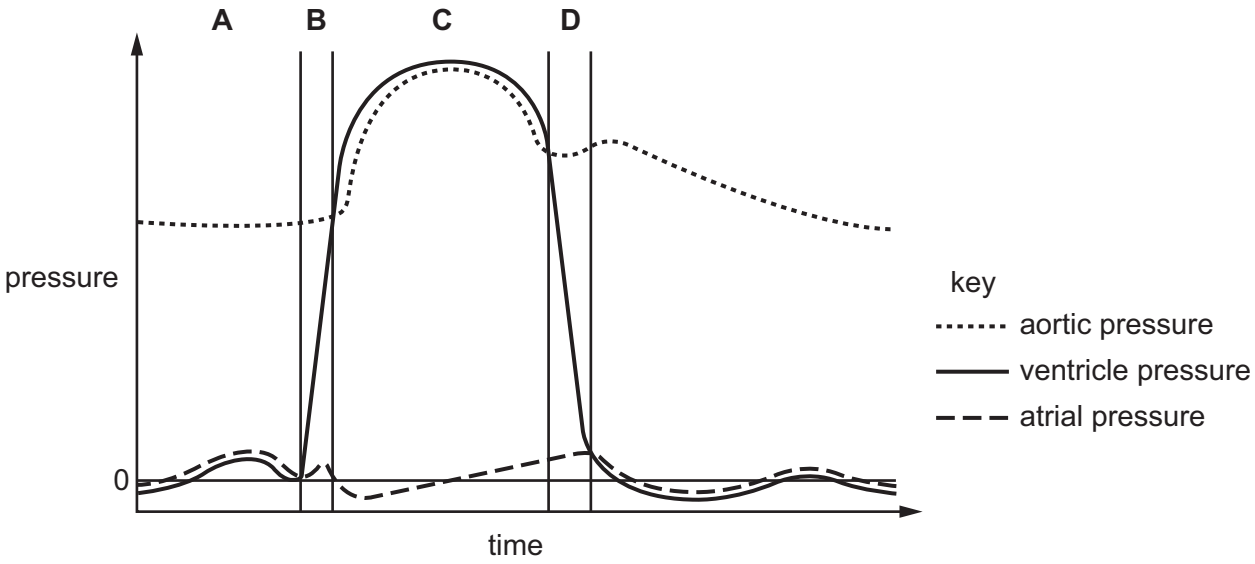
7 The atria contract.

Which statement describes the third of these events to occur in the cardiac cycle?

A 1 **B** 3 **C** 4 **D** 7

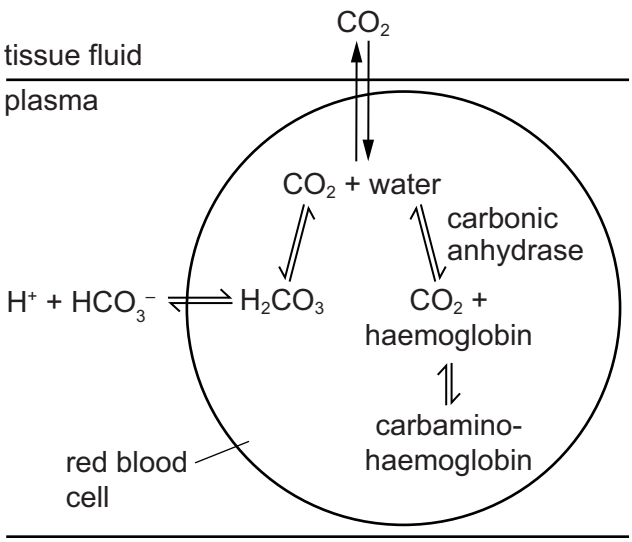
31 The diagram shows pressure changes in different parts of the heart during one cardiac cycle.

During which period are the semilunar valves open and the atrioventricular valves closed?

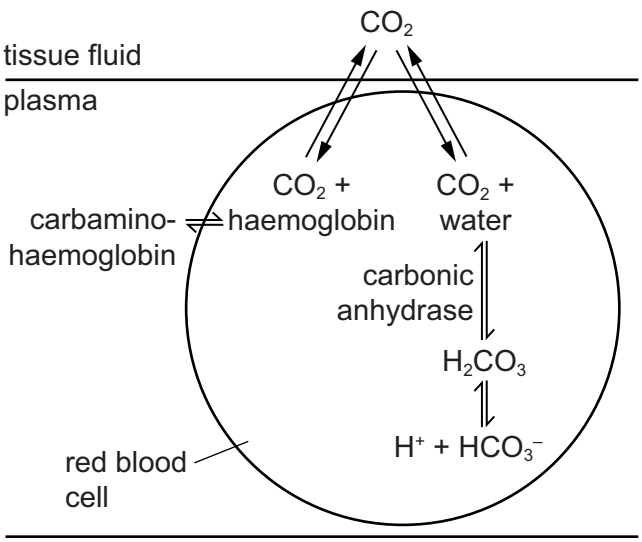


32 Which diagram shows the events that occur during transport of carbon dioxide by the blood?

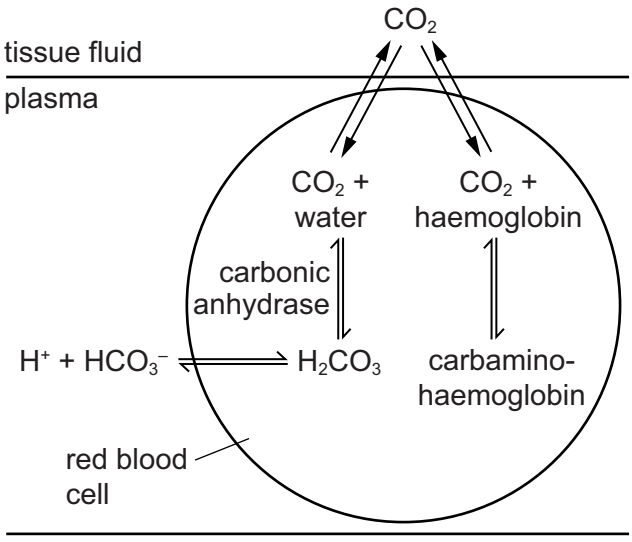
A



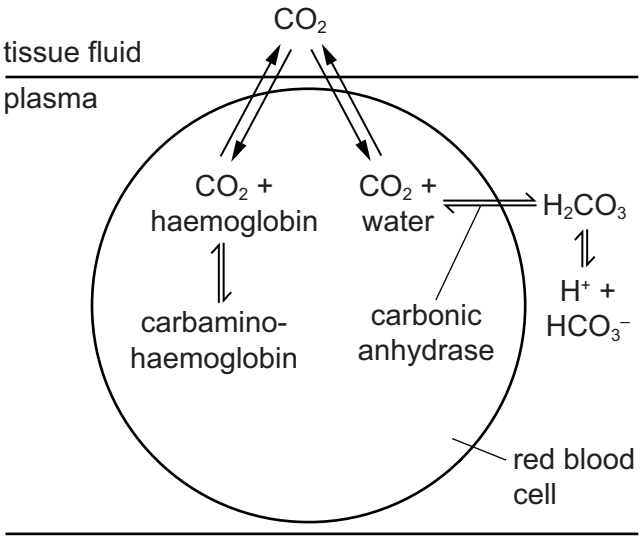
B



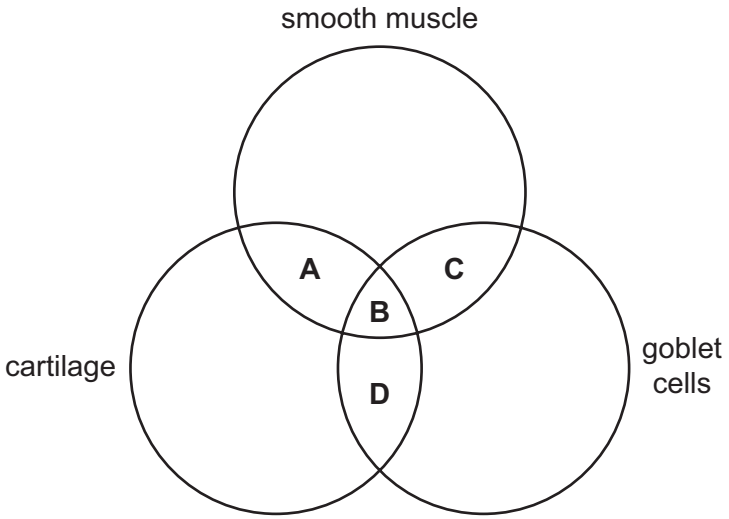
C



D



33 Which structures are found in bronchi?



34 Which tissue in the respiratory system is correctly linked to its function?

	tissue	function
A	cartilage	stretch and recoil to force air out
B	ciliated epithelium	gives protection from suspended particles in the air
C	elastic fibres	contract and relax to adjust diameter of bronchioles
D	smooth muscle	keeps trachea and bronchi open

35 Chronic obstructive pulmonary disease (COPD) includes emphysema.

Which effects does emphysema have on gaseous exchange?

1 surface area to volume ratio of lungs decreases

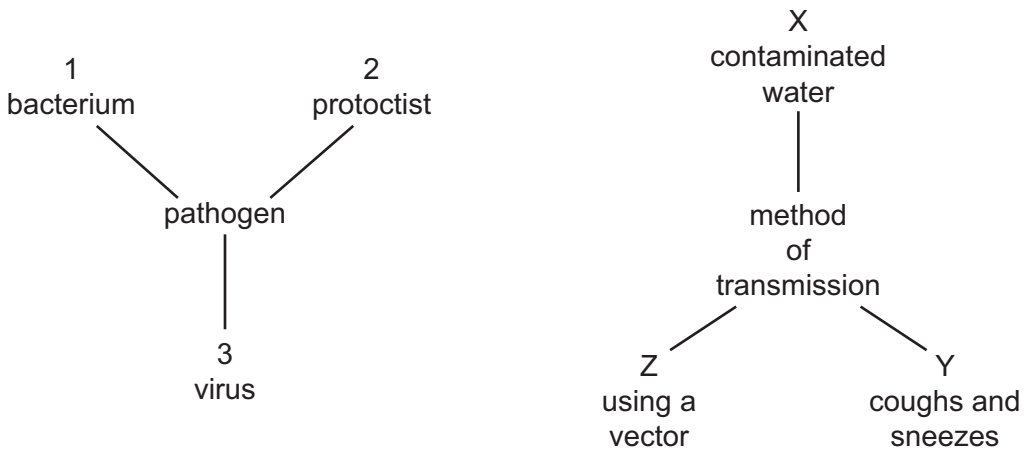
2 distance of the diffusion pathway decreases

3 volume of oxygen diffused per unit time decreases

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

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36 The diagram shows some of the pathogens that cause disease in humans and some of the ways they are transmitted.



Which row matches the correct number for the pathogen with the correct letter for their mode of transmission for cholera and measles?

	cholera	measles
A	1 and X	3 and Y
B	1 and Y	3 and Y
C	2 and X	2 and Z
D	3 and Z	1 and X

37 Which factors would increase the global distribution of malaria?

1 a fall in annual rainfall

2 an increase in the use of antibiotics

3 a rise in global air temperatures

4 increasing irrigation of land for farming

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

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38 The antibiotic teixobactin was discovered in January 2015. Teixobactin kills some bacteria such as *Staphylococcus* and *Mycobacterium*.

Most antibiotics work by binding to proteins. Teixobactin binds to lipids that are used in the synthesis of bacterial cell walls. This means that it is unlikely that bacteria will quickly develop resistance to teixobactin.

Which statements explain why bacteria are unlikely to quickly develop resistance to teixobactin?

1 A mutation in the gene coding for a protein allows selection for resistance.

2 Teixobactin binds to a lipid rather than to a protein.

3 The structure of a lipid is not encoded by DNA.

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

39 Which row correctly describes the type of immunity gained from being injected with an antitoxin?

	active	artificial	passive	natural
A	✓	✓	✗	✗
B	✓	✗	✗	✓
C	✗	✓	✓	✗
D	✗	✗	✓	✓

key

✓ = correct

✗ = not correct

40 Where are antibodies found during an immune response?

	on surface of pathogen	in blood plasma
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

key

✓ = antibodies found

✗ = antibodies not found

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