Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

BIOLOGY **9700/11**

Paper 1 Multiple Choice **May/June 2017**

1 hour

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

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READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

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 separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
Electronic calculators may be used.

This document consists of **17** printed pages and **3** blank pages.

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1 Which definition of the magnification of a drawing of a leaf is correct?

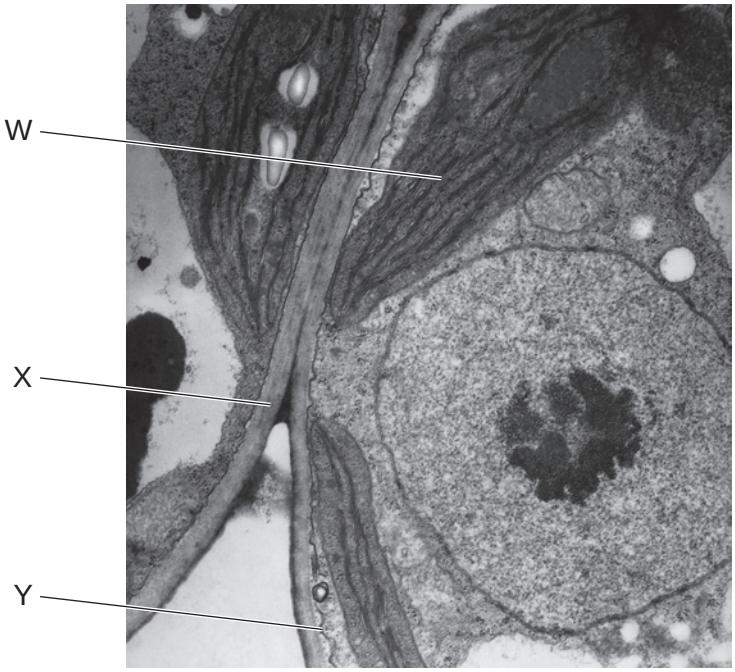
A the actual size of an object multiplied by the magnification of the microscope

B the difference in size between an actual object and a drawing of the object

C the increase in size of an object when observed using a microscope

D the size of the drawing of a specimen in comparison to the actual size

2 The electron micrograph shows part of two cells.



Which labelled features identify these cells as eukaryotic?

A W, X and Y **B** W and X only **C** W only **D** X only

3 Plant cells are fixed, stained and viewed using a student microscope. The light source was natural light.

What would be clearly visible at ×400 magnification?

A cristae of mitochondria

B grana of chloroplasts

C nucleoli

D ribosomes

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4 Which lengths are equivalent to 1 µm?

1 1000 mm

2 0.001 nm

3 0.001 mm

4 1 000 000 nm

5 0.01 mm

6 1000 nm

A 1 and 4 **B** 2 and 5 **C** 3 and 4 **D** 3 and 6

5 Some secretory cells synthesise and release glycoproteins.

What is the correct order of the sequence of events as they occur in the secretory cell?

1 exocytosis

2 product accumulates in secretory vesicle

3 mRNA binds to ribosomes

4 synthesis of glycoprotein

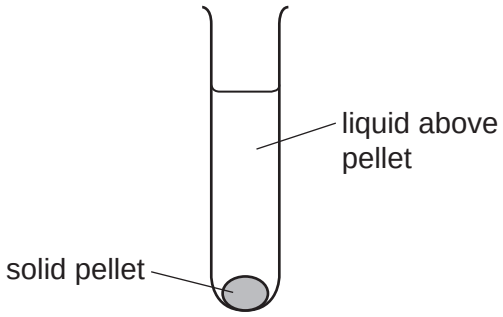
A 3, 4, 1, 2 **B** 3, 4, 2, 1 **C** 4, 3, 1, 2 **D** 4, 3, 2, 1

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6 A scientist carried out an experiment to separate the organelles in an animal cell by mass.

The scientist mixed the cells with a buffer solution which had the same water potential as the cells. He then broke the cells open with a blender to release the organelles.

The extracted mixture was filtered and then spun in a centrifuge at a speed to separate the heaviest organelle. This sank to the bottom, forming a solid pellet, 1.



The liquid above pellet 1 was poured into a clean centrifuge tube and spun in the centrifuge at a higher speed to separate the next heaviest organelle. This organelle sank to the bottom, to form a solid pellet, 2.

He repeated this procedure twice more to obtain pellet 3 and pellet 4, each containing a single organelle.

What is the function of the organelle extracted in pellet 3?

A digestion of old organelles

B production of ATP

C synthesis of mRNA

D synthesis of protein

7 What is the general formula for amylopectin?

A $(C_5H_{10}O_5)_n$ **B** $(C_5H_{10}O_6)_n$ **C** $(C_6H_{12}O_6)_n$ **D** $(C_6H_{10}O_5)_n$

8 Which statement describes how the molecular structure of starch is suited to its function?

A Amylose has a branched structure and amylopectin is coiled to give a compact molecule for transport.

B In the breakdown of amylose and amylopectin, many condensation reactions release stored energy.

C In the formation of amylose and amylopectin, many hydrolysis reactions allow the release of stored energy.

D The amylose-amylopectin complex is insoluble and does not affect the water potential of the cell.

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9 Cows and whales are mammals that produce milk to feed their babies. Newborn whales grow faster than newborn cows. The milk of both cows and whales contains saturated fatty acids with different chain lengths.

The table shows the percentage of saturated fatty acids of different lengths in cow and whale milk.

chain length of saturated fatty acid / number of carbon atoms	percentage of saturated fatty acids in milk	
	cow	whale
4–12	22.2	0
14	10.6	13.8
16	25.5	27.9
18	40.1	29.4
> 18	1.6	28.9

Which statement about the ratio of short fatty acids (4–16 carbons) to long fatty acids (18 or more carbons) in the milk of cows and whales is correct?

A The ratio in cow milk is higher because young cows need more energy than young whales.

B The ratio in cow milk is lower because young cows need less energy than young whales.

C The ratio in whale milk is higher because young whales need less energy than young cows.

D The ratio in whale milk is lower because young whales need more energy than young cows.

10 The structure of phospholipids and triglycerides include the following.

1 glycerol linked to fatty acids

2 hydrophobic fatty acid chains

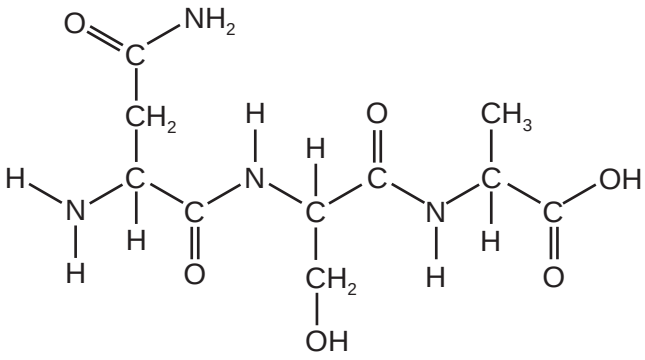
3 saturated fatty acid chains

Which structures enable the formation of a lipid bilayer in cell surface membranes?

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

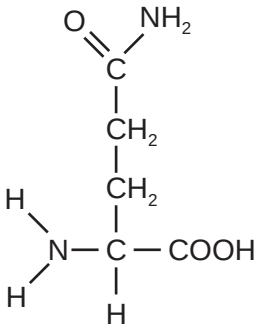
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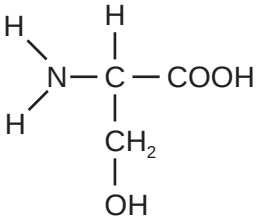
11 The diagram shows the molecular structure of a peptide.

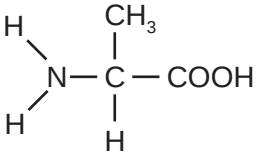


Which molecules would result from the complete hydrolysis of the peptide?

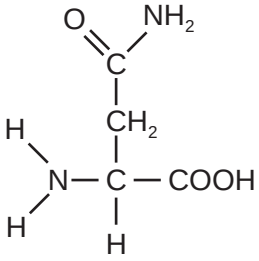
A

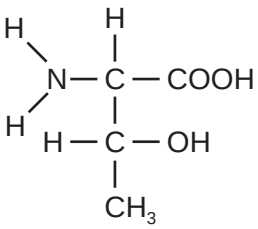


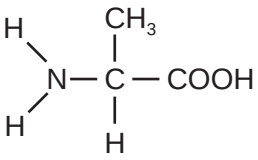




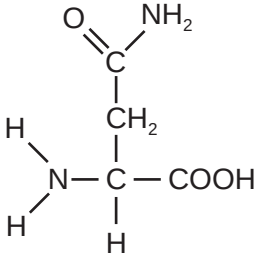
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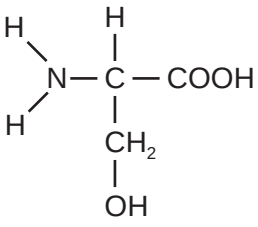


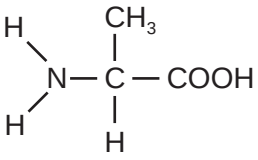




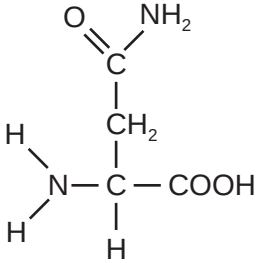
C

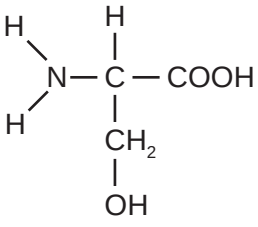


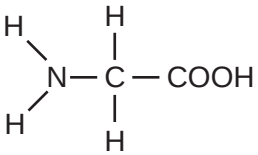




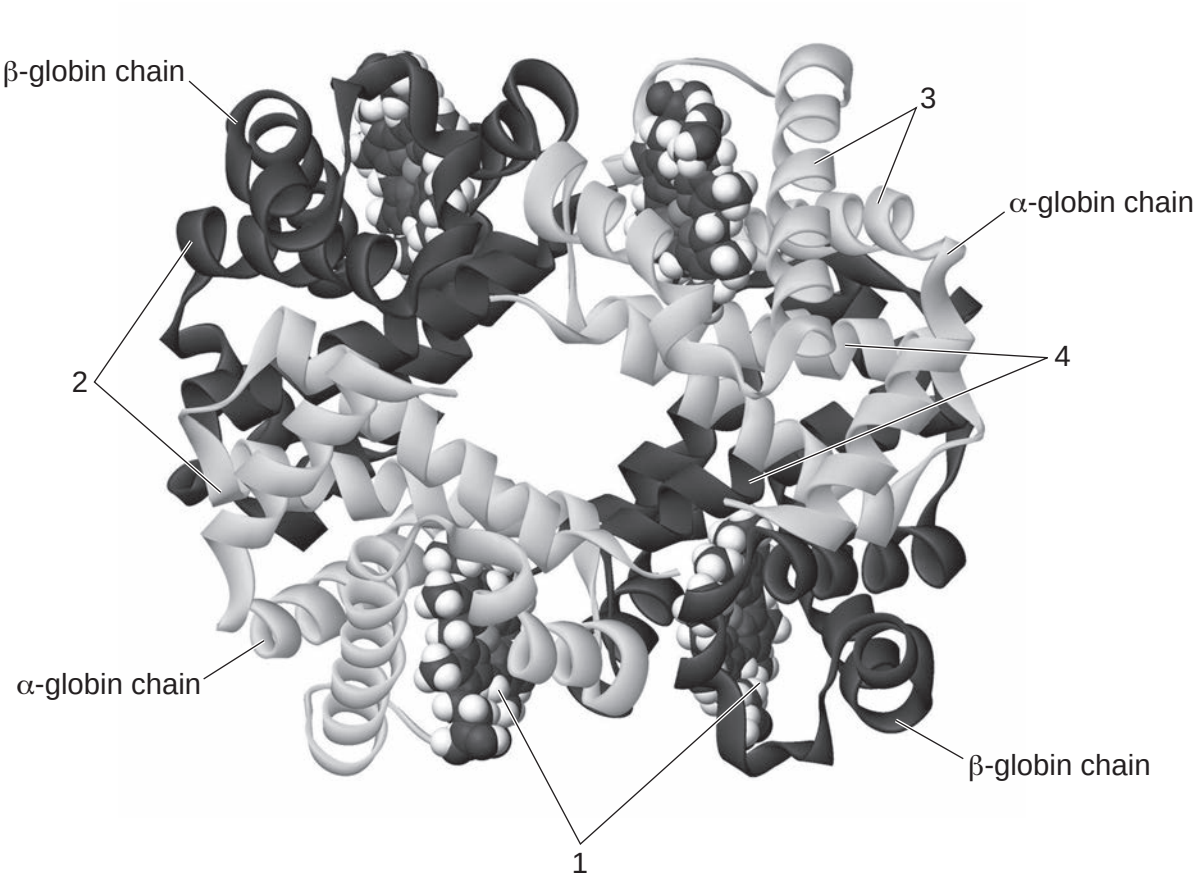
D







12 The diagram shows a haemoglobin molecule.



Which row identifies the different parts of the molecule?

	1	2	3	4
A	α-helix	β-pleated sheet	binding site	hydrophobic amino acids
B	binding site	hydrophilic amino acids	α-helix	hydrophobic amino acids
C	haem group	hydrophobic amino acids	α-helix	hydrophilic amino acids
D	hydrophobic amino acids	β-pleated sheet	haem atom	binding site

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[Turn over

13 Bacterial cells divide by a process called binary fission.

Which macromolecules must be synthesised for binary fission?

1 cell membrane proteins and RNA

2 DNA and peptidoglycan

3 enzymes and cellulose

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

14 A student carried out experiments to investigate the effect of enzyme concentration on the rate of hydrolysis (break down) of protein in milk.

When the enzyme and milk were mixed, the protein was hydrolysed and the mixture changed from cloudy to clear.

The student investigated five different enzyme concentrations and recorded the time taken to reach the end-point for each.

What is an appropriate control for this investigation?

A Carrying out a further experiment where the enzyme solution is replaced with water.

B Carrying out each experiment in a thermostatically regulated water-bath at 35 °C.

C Performing three repeat experiments for each of the five enzyme concentrations.

D Using the same volume of enzyme solution for each of the five experiments.

15 What determines the specificity of an enzyme?

1 the bonding between R groups of the polypeptide

2 the optimum pH of the enzyme

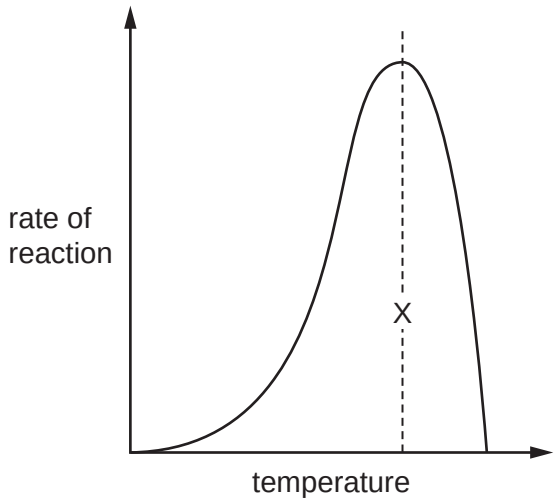
3 the peptide bonds between amino acids of the polypeptide

4 the shape of the substrate molecule

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

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16 The graph shows the effect of temperature on the rate at which the enzyme in a biological washing powder digests and removes fruit juice stains.



Which statements explain the shape of the graph at temperatures higher than X?

1 Bonds are broken between the R groups of the amino acids in the polypeptide chains of the enzyme.

2 There are more collisions between the enzyme and its substrate.

3 The tertiary structure of the enzyme is altered.

4 The shapes of the active site and the substrate are no longer complementary.

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

17 What describes a carrier protein in cell surface membranes?

A a glycoprotein that is found on the outer surface of the membranes allowing cell recognition

B a glycoprotein that is involved in moving substances through the membranes by both active and passive transport

C a protein that allows the attachment of signalling molecules which brings about changes within the cell

D a protein that is involved in moving substances through the membranes by passive transport through water-filled pores

18 What could happen to a typical bacterium when it is placed in surroundings which have a less negative water potential than that inside the cell?

A The bacterium will burst because the cell wall has no structural function.

B The bacterium will die since water leaves the cell by osmosis.

C There is no change because the cell wall is impermeable to water.

D There will be a net movement of water into the bacterium.

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19 By which process do hydrogencarbonate ions leave red blood cells?

A active transport

B endocytosis

C facilitated diffusion

D phagocytosis

20 In an experiment, fluorescent dyes were used to label proteins on the outer surface of cell surface membranes. Living human cells were labelled with one colour of fluorescent dye and mouse cells with a different colour of fluorescent dye.

A human cell and a mouse cell are then fused to form a hybrid cell.

At first, the different fluorescent labels remain separate, but after 40 minutes they are distributed randomly across the hybrid cell surface membrane.

What does this experiment show?

A Proteins are found only on the outer surface of cell surface membranes.

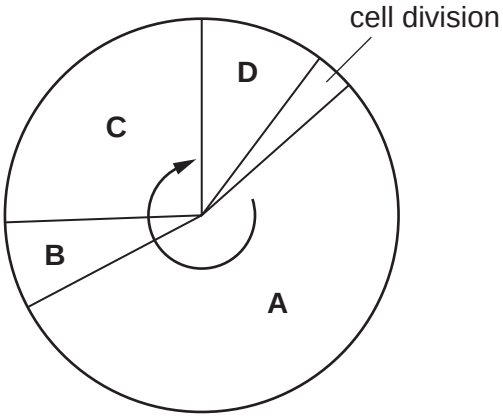
B Proteins in the outer layer of a bilayer do not penetrate into the inner layer.

C Proteins move freely in the phospholipids of a bilayer.

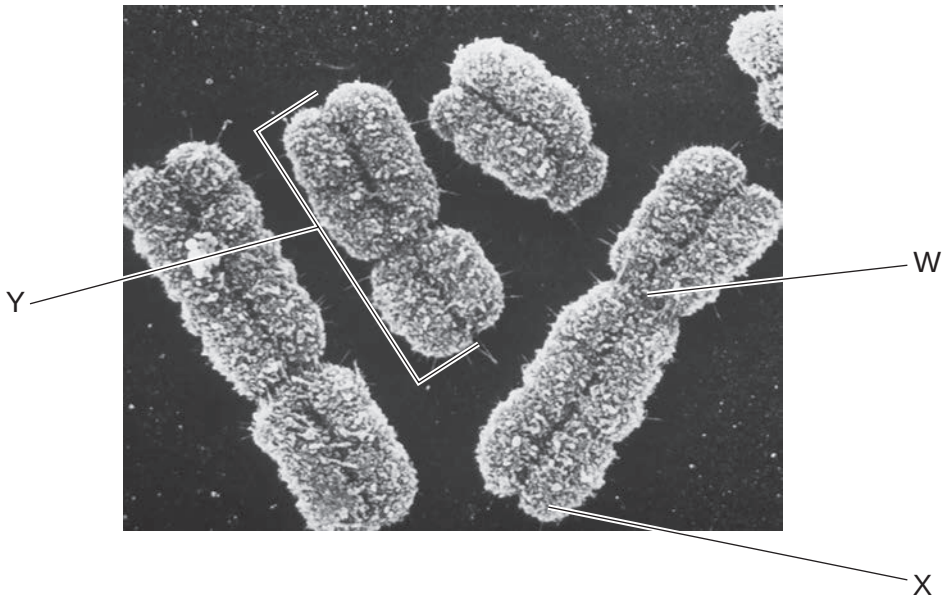
D The cell surface membranes of the two cells are bilayers.

21 The diagram shows the mitotic cell cycle.

During which phase is DNA replicated?



22 The electron micrograph shows a group of human chromosomes.



Which label is correct for each of the structures labelled W, X and Y?

	W	X	Y
A	centriole	centromere	chromatid
B	centriole	centromere	microtubule
C	centromere	telomere	chromatid
D	centromere	telomere	microtubule

23 Which statement about the behaviour of chromosomes during mitosis is correct?

A They attach to the spindle fibres to contain them within the nucleus.

B They condense to prevent further translation of genes.

C They reach the poles of the cell and become longer and thinner.

D They replicate to produce sufficient DNA to form two new nuclei.

24 What is the smallest unit of a DNA molecule that can be altered by a mutation **and** cause a change to the coding of a polypeptide?

A base

B codon

C gene

D nucleotide

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[Turn over

25 Which statements about tRNA are correct?

1 contains base pairing

2 contains hydrogen bonds

3 is single stranded

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

26 The table shows the role of four different proteins involved in DNA replication.

protein	helicase	topoisomerase	single-strand binding protein	DNA polymerase
role	unwinds the parental DNA double helix	breaks and rejoins the DNA strands	binds to separated DNA strands to stabilise them	synthesises strand of DNA

Which shows the function of these proteins?

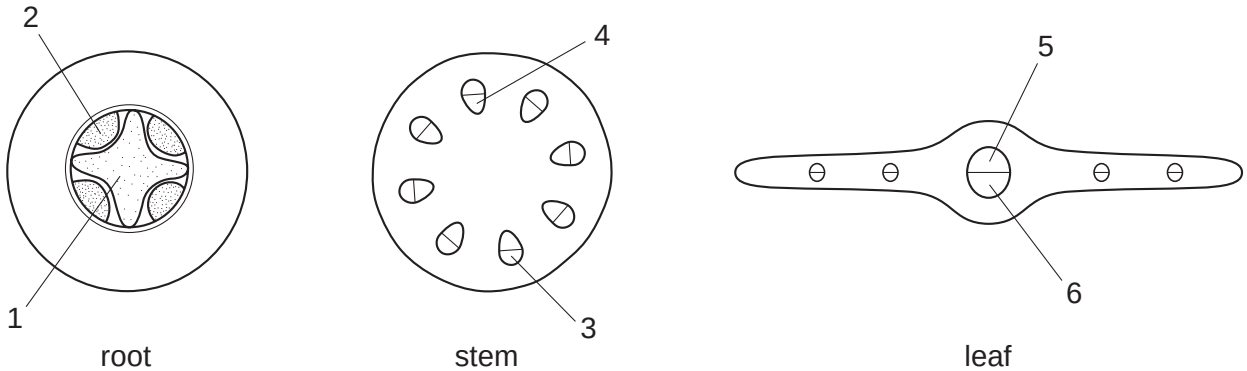
	helicase	topoisomerase	single-strand binding protein	DNA polymerase
A	adds DNA nucleotides to the 3' end of a growing polynucleotide strand	prevents original strands reforming complementary base pairs	enables tension caused by unwinding to be released	makes strands available as templates
B	enables tension caused by unwinding to be released	prevents original strands reforming complementary base pairs	makes strands available as templates	adds DNA nucleotides to the 3' end of a growing polynucleotide strand
C	enables tension caused by unwinding to be released	makes strands available as templates	adds DNA nucleotides to the 3' end of a growing polynucleotide strand	prevents original strands reforming complementary base pairs
D	makes strands available as templates	enables tension caused by unwinding to be released	prevents original strands reforming complementary base pairs	adds DNA nucleotides to the 3' end of a growing polynucleotide strand

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27 Which type of sugar and which type of bond are found in a DNA molecule?

	type of sugar	type of bond
A	non-reducing	glycosidic
B	non-reducing	hydrogen
C	reducing	peptide
D	reducing	hydrogen

28 The diagrams represent transverse sections of three plant organs.



root stem leaf

Which row is correct for phloem?

	root	stem	leaf
A	1	3	5
B	1	4	6
C	2	3	6
D	2	4	5

29 Sucrose moves from a phloem sieve tube element into a root cell.

Which changes to the water potential and the volume of liquid in the phloem sieve tube element are correct?

	water potential	volume of liquid
A	becomes higher	decreases
B	becomes higher	increases
C	becomes lower	decreases
D	becomes lower	increases

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30 Which statements about water movement in plants are correct?

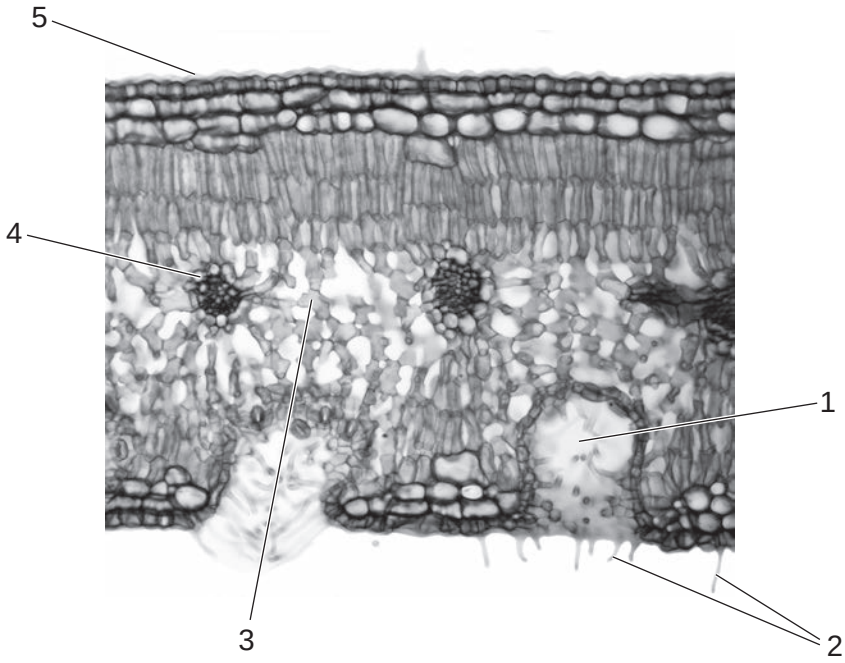
1 Water can pass through cellulose cell walls.

2 Water can pass through lignified cell walls.

3 Water cannot pass through suberin in cell walls.

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

31 The photomicrograph is a transverse section of a leaf.



Which features are characteristic of xerophytes?

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

32 A maize crop is successfully growing in a field in which the water potential of the soil is –40 KPa.

What is the most likely water potential of the cell sap in the root hair cell?

A –60 KPa **B** –40 KPa **C** –20 KPa **D** 0 KPa

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33 The contraction of the heart is coordinated through electrical impulses passing through the cardiac muscle.

Which is the correct order of part of the sequence of these impulses?

A right and left atria → sinoatrial node → atrioventricular node → ventricular walls

B sinoatrial node → right and left atria → atrioventricular node → Purkyne tissue

C sinoatrial node → right and left atria → Purkyne tissue → atrioventricular node

D sinoatrial node → right and left atria → Purkyne tissue → ventricular walls

34 Which features enable the aorta to withstand ventricular systole?

A collagen fibres and elastin fibres

B collagen fibres and smooth muscle

C elastin fibres and endothelium

D endothelium and smooth muscle

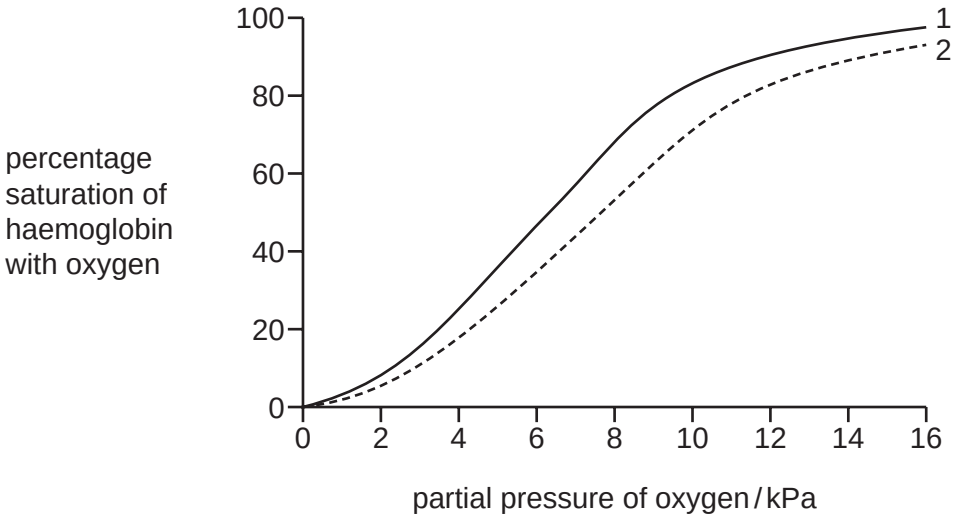
35 Which row is correct for the pulmonary artery?

	blood carried	muscle in walls	lumen size
A	deoxygenated	thick	small
B	deoxygenated	thin	large
C	oxygenated	thick	small
D	oxygenated	thin	large

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[Turn over

36 The graph shows oxygen dissociation curves of adult oxyhaemoglobin in different carbon dioxide concentrations, 1 and 2.



Which conditions could change the shape of curve 1 to the shape of curve 2?

A high carbon dioxide concentration causing a decrease in pH

B high carbon dioxide concentration causing an increase in pH

C low carbon dioxide concentration causing a decrease in pH

D low carbon dioxide concentration causing an increase in pH

37 Which characteristic of the human gaseous exchange surface and the lungs, maintains the necessary concentration gradients for carbon dioxide and oxygen?

A good ventilation of the lungs

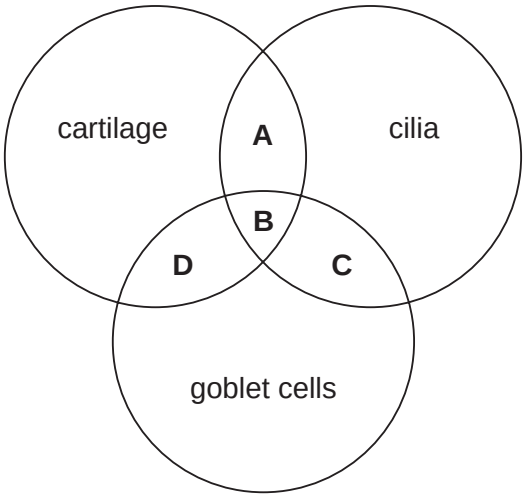
B large surface area of the alveoli

C low resistance to air flow

D the walls of the alveoli are thin

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38 Which identifies the tissues present in the trachea?



39 The global mortality figures for some diseases in 2002 are shown in the table.

cause of death	millions of deaths	percentage of all deaths
HIV / AIDS	2.8	4.4
TB	1.6	2.7
malaria	1.3	2.2
measles	0.6	1.1

How many millions of people died in 2002 from the bacterial diseases listed in the table?

A 0.6 **B** 1.6 **C** 2.2 **D** 2.7

40 B-lymphocytes and T-lymphocytes are often unable to respond to the antigens on pathogens that are intracellular parasites.

What is the reason for this?

A The antigens are constantly mutating.

B The antigens can destroy the lymphocytes.

C The lymphocytes do **not** encounter the antigens.

D The lymphocytes do **not** recognise the antigens.

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