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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

BIOLOGY **9700/11**

Paper 1 Multiple Choice **October/November 2012**
1 hour

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

4038084388

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, highlighters, 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.

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.

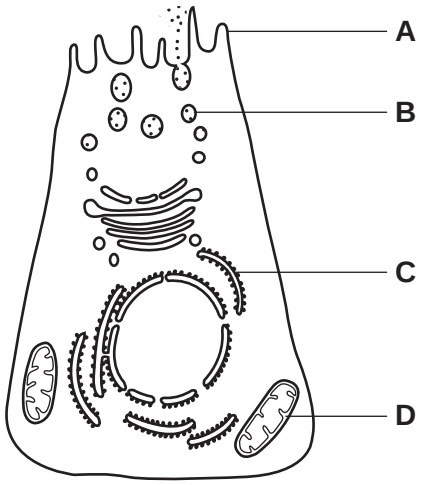
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.

This document consists of **16** printed pages.

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1 The diagram is a drawing from an electron micrograph of a cell.

Which structure indicates that this is a secretory cell?



2 Four students were asked to suggest a set of four labels to add to a plan diagram of a transverse section of a dicotyledonous leaf.

Which student, **A**, **B**, **C** or **D**, suggested a correct set of labels?

	label 1	label 2	label 3	label 4
A	lower epidermis	phloem	spongy mesophyll	palisade mesophyll
B	phloem sieve tubes	upper epidermis	spongy mesophyll	xylem vessel elements
C	spongy mesophyll	endodermis	xylem vessel elements	palisade mesophyll
D	waxy cuticle	xylem	companion cells	spongy mesophyll

3 Which of the following are found in both eukaryotic and prokaryotic cells?

1 cellulose

2 deoxyribose

3 lipids

4 ribose

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

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4 Which row correctly identifies all the locations of ribosomes in a eukaryotic cell?

	free in cytoplasm	in mitochondria	attached to ER	attached to nuclear envelope	in nucleus
A	✓	✓	✓	✓	✓
B	✓	✗	✓	✗	✗
C	✗	✓	✗	✓	✓
D	✗	✗	✓	✓	✗

key
✓ = present
✗ = absent

5 Which statement about the light microscope is correct?

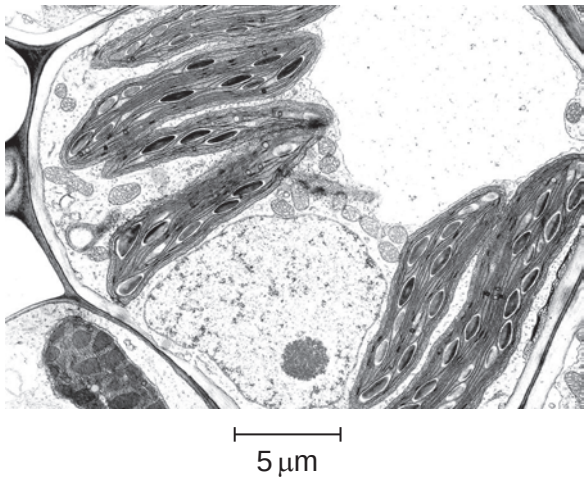
A As the smallest distance to see two points as distinct separate points decreases, the resolution also decreases.

B If the resolution is 220 nm, then a bacterium 0.2 μm in diameter will not be visible.

C If the wavelength of light is 600 nm, then two membranes 300 nm apart will be visible as two distinct membranes.

D Using visible light of a longer wavelength, such as red light, will improve the resolution.

6 The diagram shows the ultrastructure of a cell from a dicotyledonous leaf.



What is the magnification?

A ×280 **B** ×2800 **C** ×3570 **D** ×7000

7 Four students, 1, 2, 3 and 4, each carried out the reducing sugar test and the non-reducing sugar test on a sucrose solution.

Which observations demonstrate that they carried out the correct tests?

student	observations for reducing sugar test	observations for non-reducing sugar test
1	no colour change	changed colour
2	no colour change	red
3	blue	changed colour
4	blue	red

A 2 only

B 3 only

C 4 only

D 1, 2, 3 and 4

8 Which row is correct for each of the molecules?

	β-glucose	collagen	haemoglobin	sucrose
A	hexose sugar with a molecular formula $C_6H_{12}O_6$	structural function, found in tendons and blood vessel walls	contains the elements carbon, hydrogen, iron, nitrogen and sulfur	formed by releasing a molecule of water in a hydrolysis reaction
B	repeating monomer of the polysaccharide, cellulose	a molecule consists of three polypeptide chains, each containing a prosthetic group	each non-protein haem group contains a central iron ion	composed of two monosaccharides linked by a glycosidic bond
C	monomer of the 1,6 glycosidic branches of the polysaccharide, glycogen	molecules lie parallel to each other, with cross-links and staggered ends	has two identical α chains and two identical β chains	formed by condensation of two identical monosaccharides
D	in its ring structure, the hydroxyl group of carbon atom 1 is above the plane of the ring	polypeptide chains interact to produce a fibrous protein	has all four levels of protein structure and at least four types of bond	digestion yields glucose and fructose in equal proportions

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9 Which of the bonds will be last to break as the temperature of an enzyme is increased?

A covalent

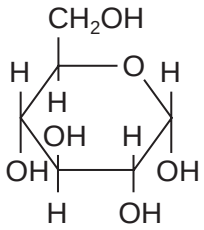
B hydrogen

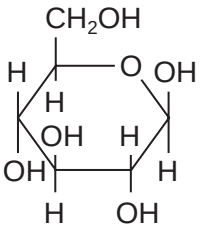
C hydrophobic interactions

D ionic

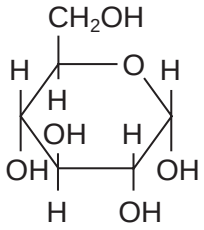
10 Which pair of monosaccharides form sucrose?

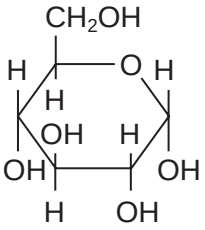
A



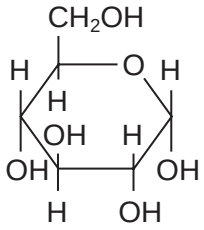


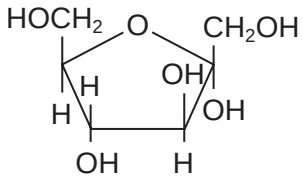
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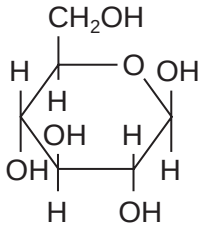


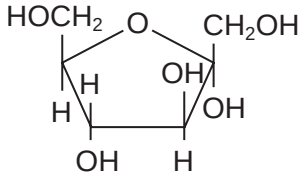
C





D





11 Which statement about triglycerides is correct?

A They are made up of three fatty acids combined with glycogen.

B They are more saturated with hydrogen compared with phospholipids.

C They form a bilayer in the membranes of cells.

D They have a lower ratio of oxygen to carbon compared with carbohydrates.

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12 Which molecules contain C=O bonds?

1 amino acids

2 fatty acids

3 glycerol

A 1 and 2 only

B 1 and 3 only

C 2 and 3 only

D 1, 2 and 3

13 Which of the statements about polysaccharides can be used to describe both amylose and glycogen?

1 contains 1,4 glycosidic bonds

2 contains 1,6 glycosidic bonds

3 polymer of α–glucose

A 1 only

B 1 and 3 only

C 2 and 3 only

D 1, 2 and 3

14 What is the effect of an enzyme in an enzyme-catalysed reaction?

A decreases both the activation energy and the energy yield

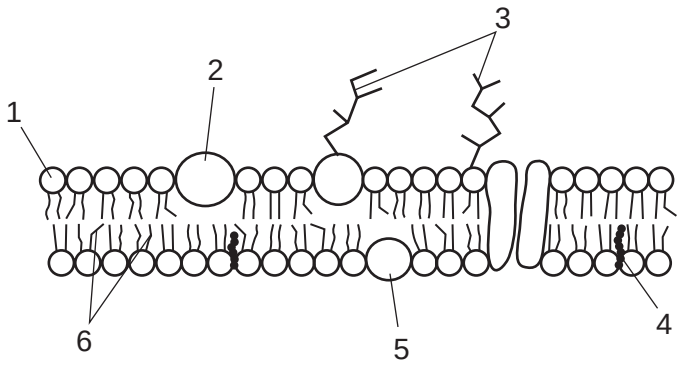
B decreases the activation energy and has no effect on the energy yield

C increases both the activation energy and the energy yield

D increases the energy yield and decreases the activation energy

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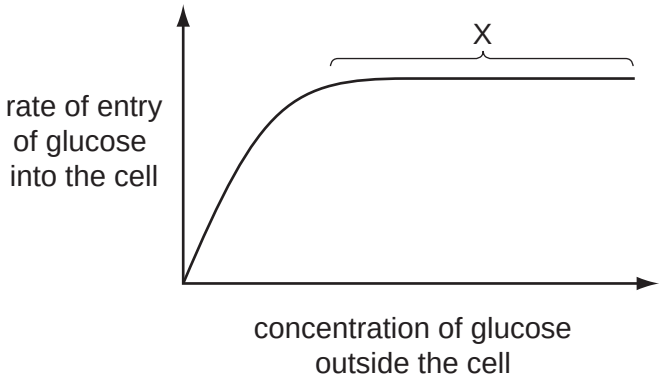
15 The diagram represents the fluid mosaic model of membrane structure.



Which two components contribute to the fluidity of the membrane?

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

16 The graph shows how the rate of entry of glucose into a cell changes as the concentration of glucose outside the cell changes.



What is the cause of the plateau at X?

A All the carrier proteins are saturated with glucose.

B The carrier proteins are denatured and no longer able to function.

C The cell has used up its supply of ATP.

D The concentrations of glucose inside and outside the cell are equal.

17 A molecule can enter a cell by two different passive processes.

Which process would increase the rate at which this molecule enters the cells?

A diffusion

B endocytosis

C facilitated diffusion

D osmosis

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18 Which statement is **incorrect** for mitotic cell division?

A DNA is replicated semi-conservatively during mitosis.

B DNA is normally unchanged from one generation of cells to the next.

C The daughter cells have the potential to produce the same enzymes as the parent cell.

D The same quantity of DNA is distributed to the nuclei of two new cells.

19 The diagram shows the chromosomes of one cell which has been squashed during mitosis.



Which stage of mitosis is shown and what is the haploid chromosome number in this species?

	stage of mitosis	haploid chromosome number
A	anaphase	5
B	anaphase	10
C	metaphase	5
D	metaphase	10

20 What does the process of translation require?

A DNA, free nucleotide bases and mRNA

B DNA, mRNA and RNA polymerase

C mRNA, ribosomes and RNA polymerase

D mRNA, ribosomes and tRNA

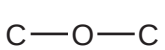
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21 Which features of DNA enable it to meet these requirements as a molecule of inheritance?

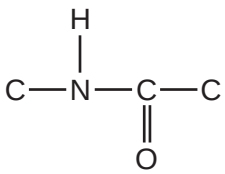
	requirement of DNA molecule			
	ability to remain stable	ability to contain information	ability to transfer information	ability to replicate
A	complementary base pairing	formation of mRNA for translation	sequence of nucleotides	sugar-phosphate backbone
B	formation of mRNA for translation	complementary base pairing	sugar-phosphate backbone	sequence of nucleotides
C	sequence of nucleotides	sugar-phosphate backbone	complementary base pairing	formation of mRNA for translation
D	sugar-phosphate backbone	sequence of nucleotides	formation of mRNA for translation	complementary base pairing

22 Which diagram shows the bond linking the individual units of a nucleic acid?

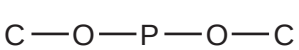
A



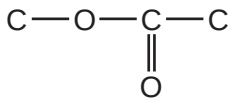
B



C



D



23 Which row correctly identifies xylem vessel elements and sieve tube elements?

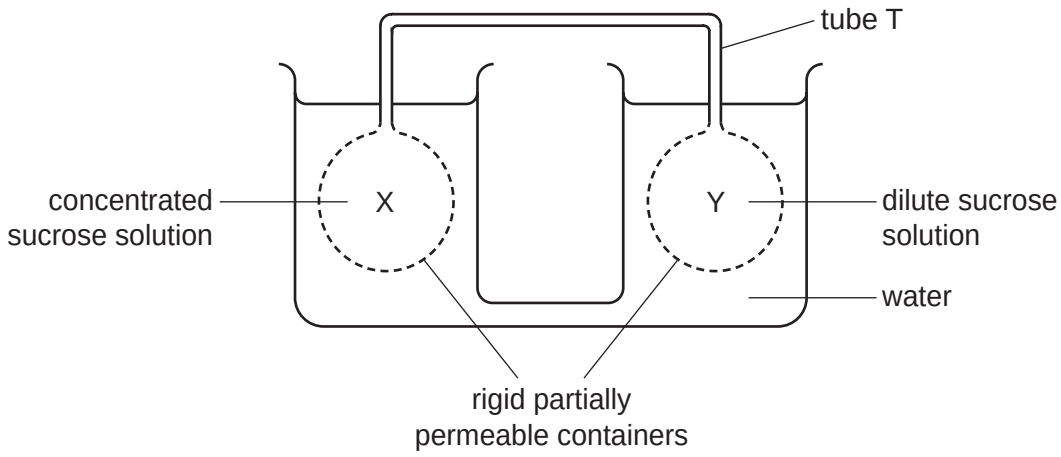
	xylem vessel element		sieve tube element	
	cytoplasm	nucleus	cytoplasm	nucleus
A	✓	✓	✗	✗
B	✗	✓	✗	✗
C	✗	✗	✓	✓
D	✗	✗	✓	✗

key

✓ = present

✗ = absent

24 The diagram shows a model which can be used to demonstrate mass flow.



X and Y are filled with sucrose solutions of different concentrations, causing water to move in or out of X and Y by osmosis or as a result of hydrostatic pressure. Sucrose solution then moves through tube T joining X and Y.

Which description is correct?

	water potential in X compared with Y	direction of movement of sucrose solution in tube T
A	less negative	from X to Y
B	less negative	from Y to X
C	more negative	from X to Y
D	more negative	from Y to X

25 Which of the following statements explain why a stem is both cut and connected to a potometer under water?

1 To prevent plasmolysis of xylem vessel elements

2 To prevent the collapse of xylem vessel elements

3 To prevent air entering xylem vessel elements

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

26 What happens during ventricular systole in a mammalian heart?

A aortic pressure increases

B atrioventricular valves open

C semilunar valves close

D ventricular pressure decreases

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27 Which two statements about the Bohr effect are correct?

1 Increasing the partial pressure of oxygen increases the percentage of oxyhaemoglobin.

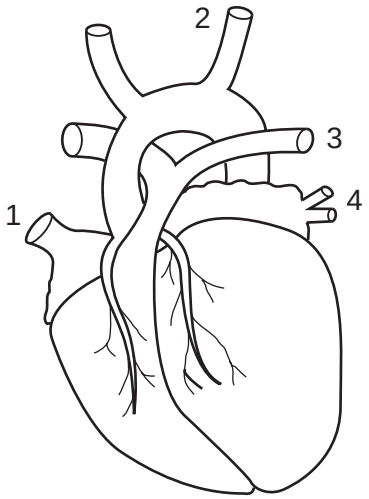
2 Decreasing the partial pressure of carbon dioxide decreases the percentage of oxyhaemoglobin.

3 Increasing the partial pressure of carbon dioxide shifts the dissociation curve of haemoglobin to the left.

4 In low concentrations of carbon dioxide haemoglobin has a high affinity for oxygen.

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

28 The diagram shows the heart and some of its blood vessels.

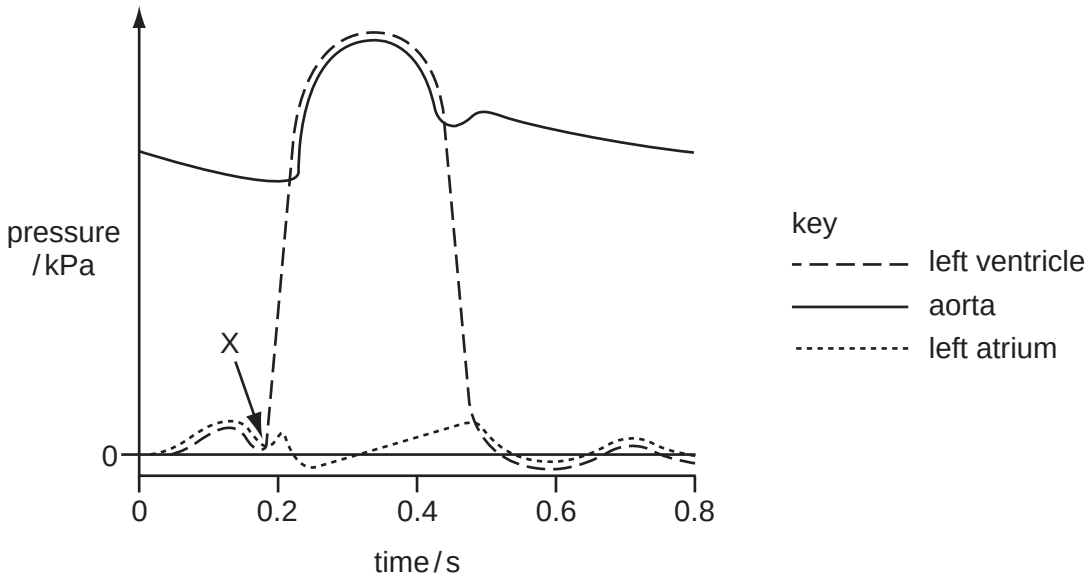


Which combination of numbers correctly identifies the blood vessels that supply blood to the heart and carry blood from the heart?

	to the heart	from the heart
A	1 and 2	3 and 4
B	2 and 3	1 and 4
C	3 and 4	1 and 2
D	4 and 1	2 and 3

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29 The diagram shows pressure changes in the left side of the heart during the cardiac cycle.



What happens at X?

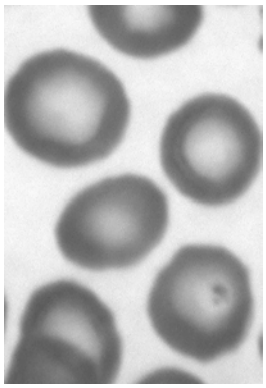
A atrioventricular valves close

B atrioventricular valves open

C semilunar valves close

D semilunar valves open

30 The photograph 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 and 2 only **B** 1 and 3 only **C** 2 and 3 only **D** 1, 2 and 3

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31 Which symptom is specific to emphysema?

A excess mucus secretion by the goblet cells

B inflammation of the bronchial epithelium

C loss of elasticity of the alveolar walls

D thickening of the smooth muscle of the bronchi

32 Haemoglobin can bind to carbon dioxide, carbon monoxide and oxygen.

1 carbon dioxide

2 carbon monoxide

3 oxygen

Which gases share a binding site?

A 1 and 2 only

B 1 and 3 only

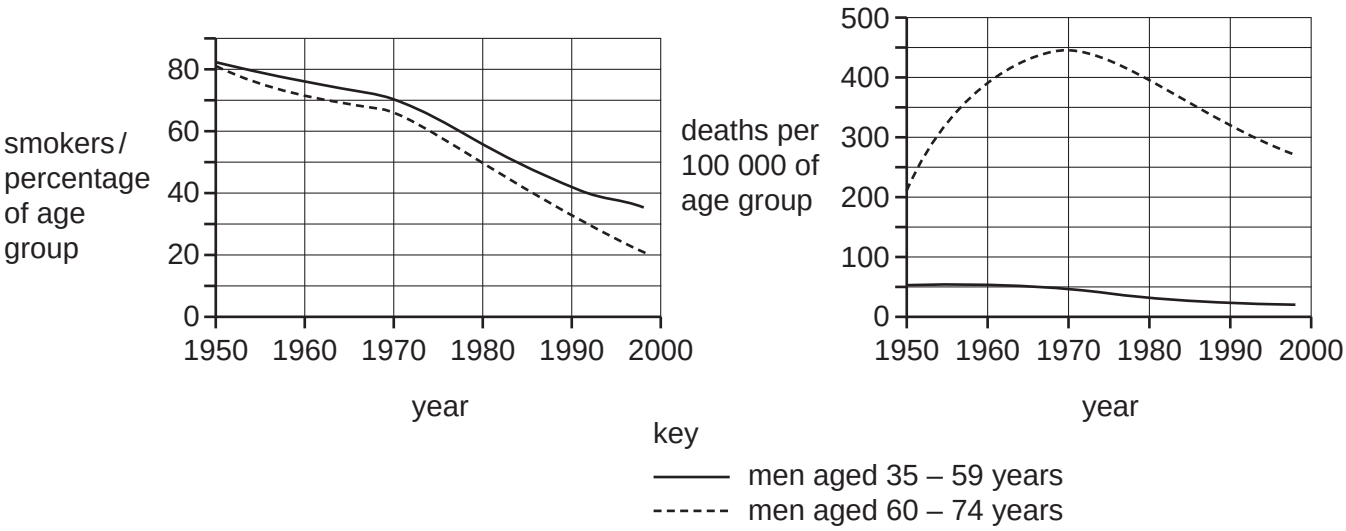
C 2 and 3 only

D 1, 2 and 3

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[Turn over

33 Some studies suggest that smoking increases the risk of developing lung cancer. The two graphs show the percentage of smokers and the deaths from lung cancer in men of two age groups between 1950 and 1998.



Which statement is **not** supported by the data in the graphs?

A Deaths from lung cancer in men aged 35-59 years decreased by 50 % over the period of the study.

B Deaths from lung cancer in men aged 60-74 years increased up to 1970.

C The data for men aged 60-74 years between 1950 to 1970 suggests that lung cancer takes up to 20 years to develop.

D The number of men aged 35-59 years who were smokers decreased by approximately 60 % over the period of the study.

34 Which row correctly matches a function with B-lymphocytes and T-lymphocytes?

	function	B-lymphocytes	T-lymphocytes
A	may become plasma cells	✗	✗
B	may secrete antibodies	✗	✓
C	provides a cell-mediated response	✓	✓
D	provides a humoral response	✓	✗

key
✓ true
✗ false

35 What happens when people are injected with dead bacteria?

A B-lymphocytes produce antibodies.

B B- lymphocytes produce antigens.

C T- lymphocytes produce antibodies.

D T- lymphocytes produce antigens.

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36 Some children are born with Severe Combined Immune Deficiency (SCID). These children do not normally have any T-lymphocytes and suffer from many diseases.

How may these children be cured?

A bone marrow transplantation

B continual use of antibiotics

C transfusion of antibodies

D vaccination against all diseases

37 Which of the following increase the risk of contracting TB?

1 drinking unpasteurised milk

2 eating shellfish which have fed on raw sewage

3 living in overcrowded conditions

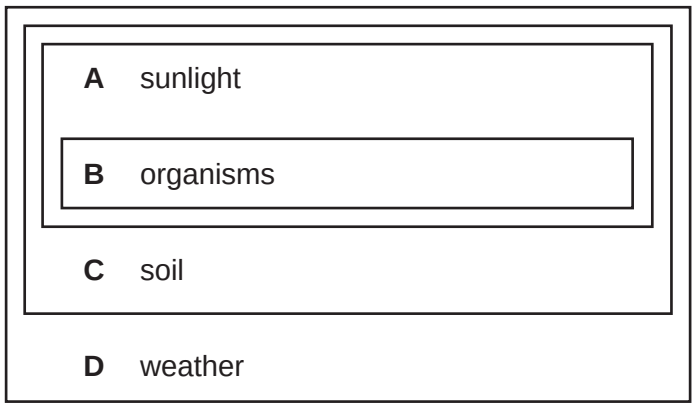
A 2 only

B 1 and 2

C 1 and 3

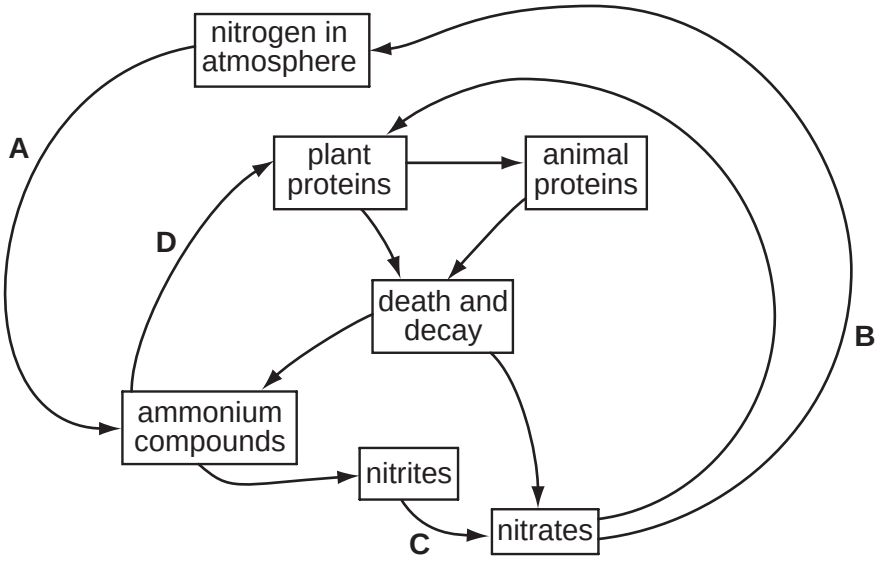
D 2 and 3

38 Which box encloses a community?

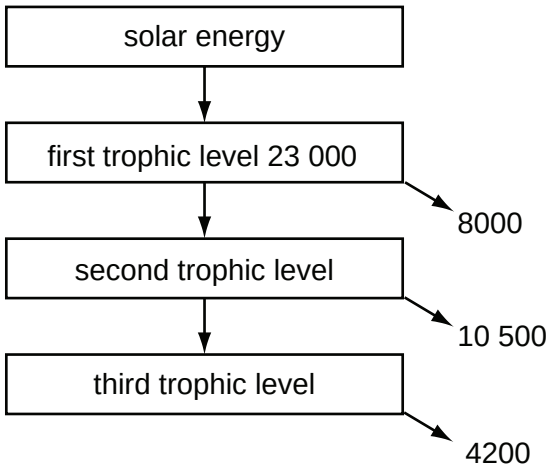


39 The diagram shows a simplified nitrogen cycle.

Which arrow represents the activity of nitrogen-fixing bacteria?



40 The diagram shows some values for gross primary productivity (GPP) and energy flow in an ecosystem, measured in $kJ\,m^{-2}\,y^{-1}$.



What percentage of GPP in the producers can be transferred to the tertiary consumers?

A 1.3 % **B** 6.7 % **C** 18.3 % **D** 19.6 %

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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

BIOLOGY **9700/12**

Paper 1 Multiple Choice **October/November 2012**
1 hour

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

* 2 9 6 9 2 3 5 3 7 2 *

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1 Which eyepiece and objective lens combination of a light microscope enables you to see the greatest number of cells in the field of view?

	eyepiece lens	objective lens
A	×5	×10
B	×5	×40
C	×10	×10
D	×10	×40

2 What are the characteristics of a prokaryotic cell?

	endoplasmic reticulum	genetic material
A	absent	DNA
B	absent	RNA
C	present	DNA
D	present	RNA

3 The following are all features of eukaryotic cells.

1 chloroplast

2 Golgi apparatus

3 lysosome

4 mitochondrion

5 nucleus

Which of these has a single membrane?

A 1 and 2

B 2 and 3

C 3 and 4

D 4 and 5

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4 Plant cells are fixed, stained and viewed through a light microscope.

What would be clearly visible at x400 magnification?

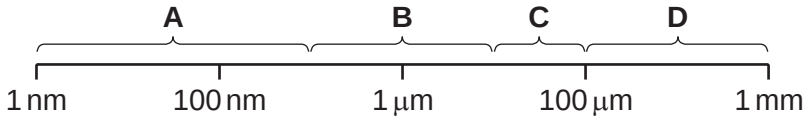
A cristae of mitochondria

B grana of chloroplasts

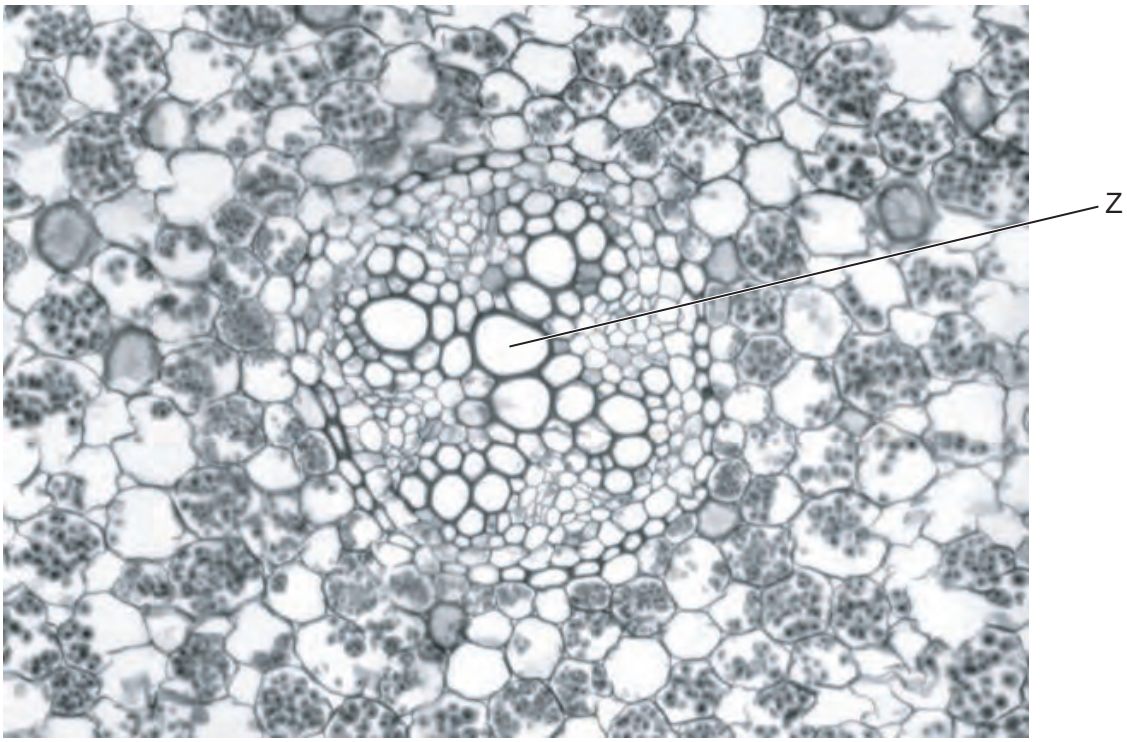
C nucleoli

D ribosomes

5 Which size range would include most prokaryotic cells?



6 The photomicrograph shows some plant tissues and the magnification is ×200.



What is the diameter of the cell marked Z?

A 5 μm **B** 10 μm **C** 50 μm **D** 100 μm

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7 Heating with which solution breaks glycosidic bonds?

A Benedict's solution

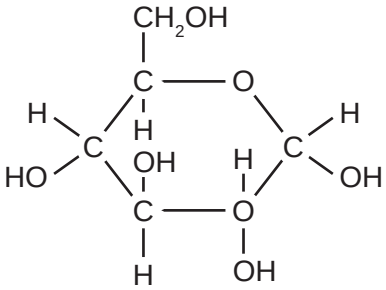
B dilute hydrochloric acid

C dilute sodium hydroxide

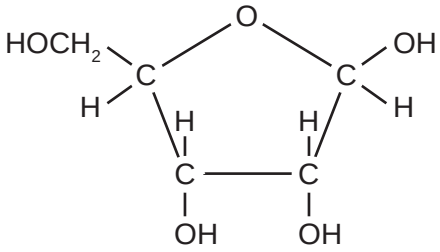
D ethanol

8 The diagram shows four molecules.

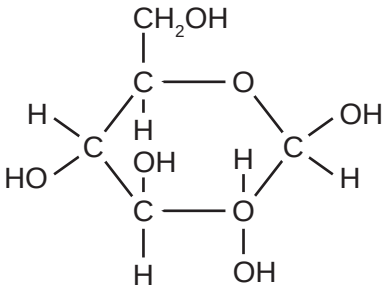
P



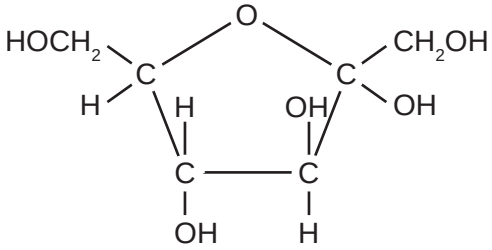
Q



R



S



Which two molecules condense to form sucrose?

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

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

1 glucose

2 glycerol

3 protein

A 1 and 2 only

B 1 and 3 only

C 2 and 3 only

D 1, 2 and 3 only

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10 Haemoglobin consists of two α chains and two β chains. Approximately 5 % of all humans have one amino acid in the β chain different from normal.

Which level(s) of protein structure could be changed in these humans?

A primary only

B primary and quaternary only

C primary, secondary and tertiary only

D quaternary only

11 Which of the statements about polysaccharides can be used to describe both glycogen and amylopectin?

1 contains 1,4 glycosidic bonds

2 contains 1,6 glycosidic bonds

3 polymer of α–glucose

A 1 and 2 only

B 1 and 3 only

C 2 and 3 only

D 1, 2 and 3

12 Which row shows the types of bond found at different levels of protein structures?

	level of protein structure	bonds			
		peptide	hydrogen	ionic	hydrostatic
A	primary	✓	✗	✗	✓
B	secondary	✗	✓	✓	✗
C	tertiary	✗	✓	✓	✓
D	quaternary	✓	✗	✓	✓

key

✓ = present

✗ = absent

13 What is the role of enzymes in metabolism?

A to catalyse the hydrolysis of large molecules only

B to increase the number of collisions between molecules

C to lower the activation energy required to start a reaction

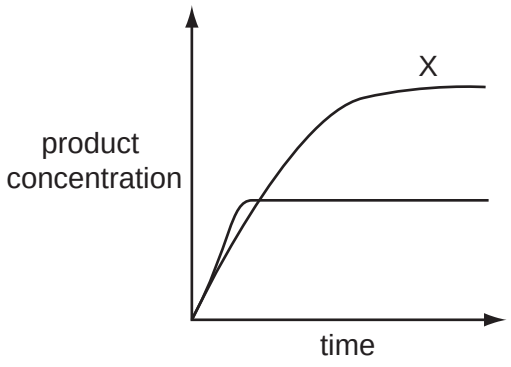
D to supply the activation energy required to start a reaction

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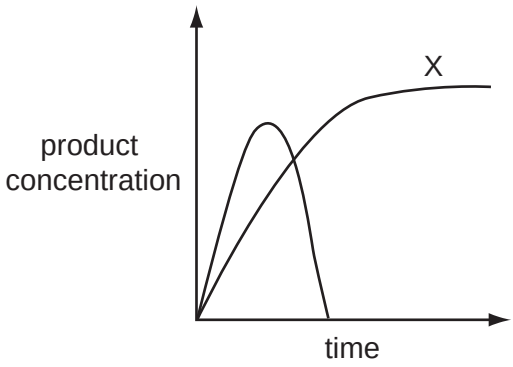
14 Two enzyme experiments were carried out. The first, experiment X, was carried out at a constant temperature of 37 °C. During the second experiment the temperature was increased from 37 °C to 80 °C. All other factors were kept the same.

Which graph shows the results?

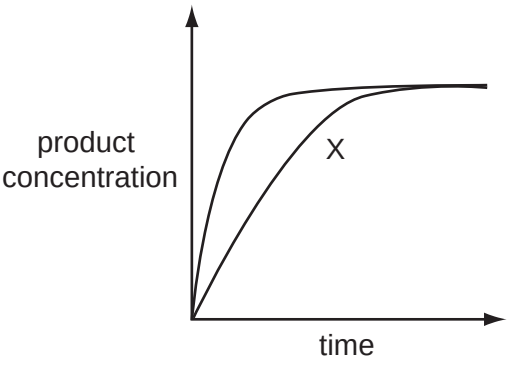
A



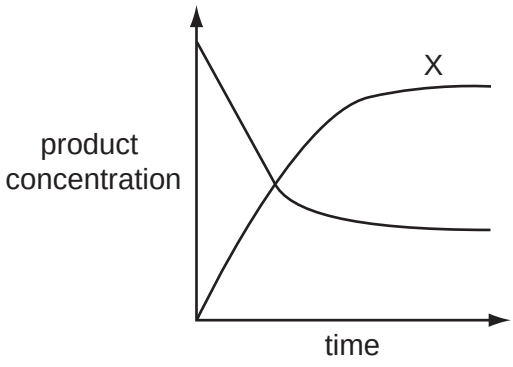
B



C



D



15 Which role of the cell surface membrane is **not** a result of the properties of the phospholipids?

A to allow cytokinesis to occur in mitotic cell division

B to allow entry and exit of the water-soluble gases, oxygen and carbon dioxide

C to allow phagocytosis of a bacterium into cells

D to allow surface membranes to stabilise by binding with water molecules

16 An increase in which component would make the cell surface membrane more fluid?

A cholesterol

B glycolipids

C glycoproteins

D proteins

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17 Which processes that move substances across cell surface membranes result in an equilibrium?

1 active transport

2 diffusion

3 facilitated diffusion

4 osmosis

A 1, 2 and 3 only

B 1, 2 and 4 only

C 1, 3 and 4 only

D 2, 3 and 4 only

18 Diagrams 1 and 2 show how the transverse section through a leaf changes when moved from one solution W to a different solution Y.

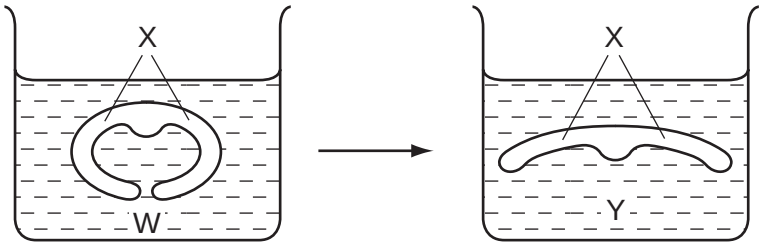


diagram 1 diagram 2

How has the water potential changed in diagram 2?

	difference in cells at X in solution Y compared to the same cells in solution W	difference in solution Y compared to solution W
A	less negative	less negative
B	less negative	more negative
C	more negative	less negative
D	more negative	more negative

19 Immediately after which stage in mitosis in an animal cell does the cytoplasm start to divide?

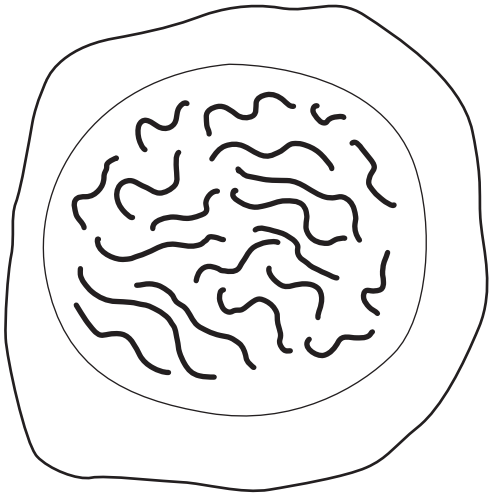
A anaphase

B metaphase

C prophase

D telophase

20 The diagram shows a cell of an organism formed by reduction division.



What is the diploid number for this organism?

A 10 **B** 20 **C** 40 **D** 46

21 Which is **not** a description of a gene?

A a length of DNA which carries coded information as a sequence of nucleotides that can result in the formation of a polypeptide chain

B any section of a molecule that has two strands, each with a sequence of nucleotides that are complementary to each other and are held together by hydrogen bonding

C a sequence of nucleotides which can be copied by complementary base pairing and then be translated at a ribosome

D a sequence of nucleotides that can be transcribed using a polymerase enzyme and free activated nucleotides and which results in the formation of a messenger RNA molecule

22 Which row in the table correctly shows situations in which **both** DNA and RNA are both involved?

	replication	transcription	translation
A	✓	✓	✗
B	✓	✗	✓
C	✗	✓	✗
D	✗	✗	✓

key

✓ involved

✗ not involved

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23 The diagram shows the stages in the production of a polypeptide.

DNA nucleotide sequence template strand	T A C G A C A A T C G C
mRNA sequence	A U G C U G U U A G C G
amino acid sequence	met leu leu ala

Which feature of the triplet code is illustrated by the information given?

A An amino acid can be coded for by more than one triplet.

B The triplet code is non-overlapping and is only read in one direction.

C The triplet code is universal for the DNA of all organisms.

D There are some triplets that code for 'start' and 'stop'.

24 What is correct about the uptake and transport of water in plants?

1 water transported by the symplast pathway enters root hair cells down a water potential gradient

2 water is transported in xylem by the symplast and apoplast pathways to reach the leaves

3 water transported by the apoplast pathway through plasmodesmata must pass through cell surface membranes of endodermal cells

A 1 only

B 3 only

C 1 and 3 only

D 2 and 3 only

25 Which combination of conditions increases the rate of transpiration in plants?

	light intensity	humidity	temperature
A	high	high	low
B	high	low	high
C	low	high	low
D	low	low	high

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26 Which statement explains why sucrose, rather than glucose, is transported by phloem?

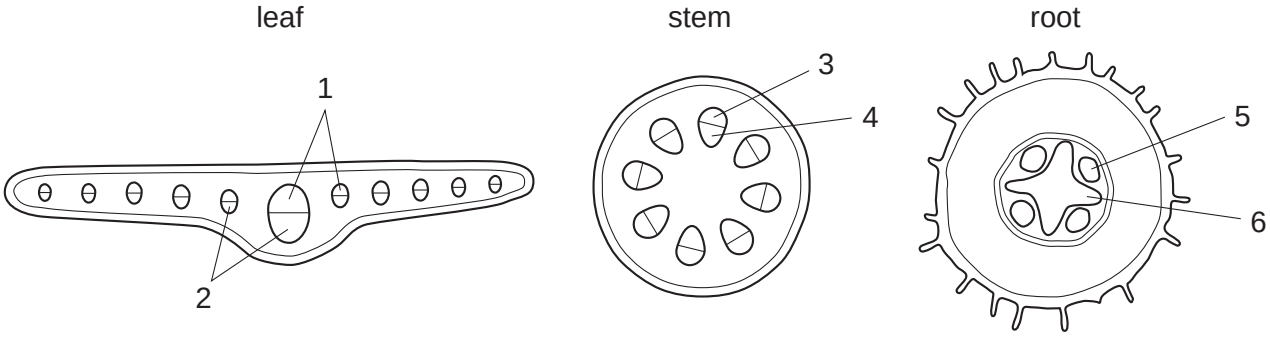
A Sucrose can pass through plant cell surface membranes more easily.

B Sucrose is a disaccharide and is more easily converted to starch.

C Sucrose is a larger molecule.

D Sucrose is a non-reducing sugar, so is less reactive.

27 The diagrams show transverse sections of parts of a plant.

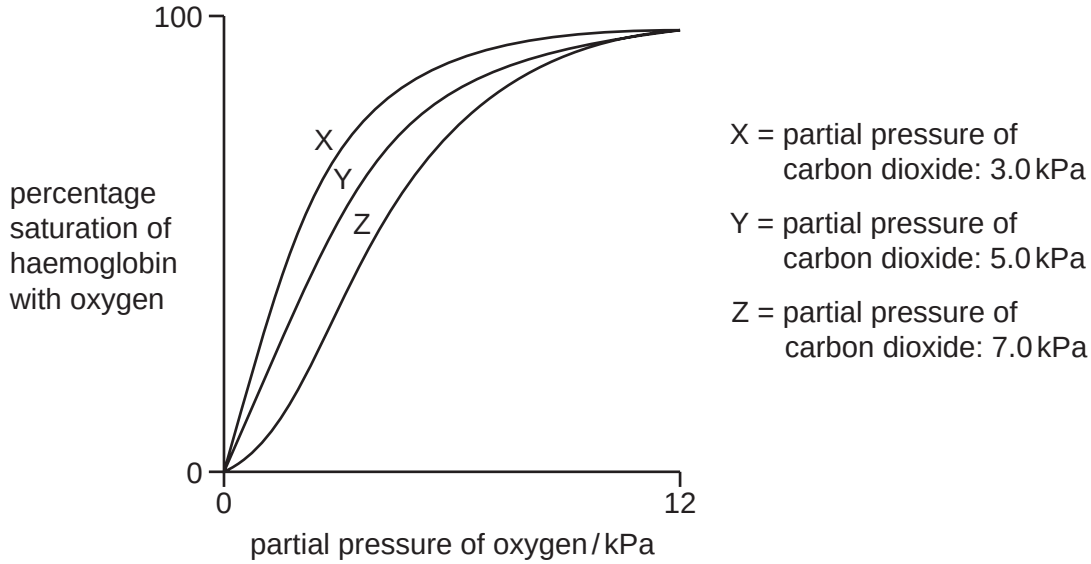


In the transverse sections, what do 1, 2, 3, 4, 5 and 6 represent?

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

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28 The diagram shows the effect of three different concentrations of carbon dioxide on the oxygen dissociation curve for human haemoglobin.



What effect does carbon dioxide have on haemoglobin?

A it makes it less efficient at taking up oxygen and also less efficient at releasing it

B it makes it less efficient at taking up oxygen and more efficient at releasing it

C it makes it more efficient at taking up oxygen and also more efficient at releasing it

D it makes it more efficient at taking up oxygen and less efficient at releasing it

29 Why does the number of red blood cells in a human increase after several weeks at high altitude?

A red blood cells are short-lived

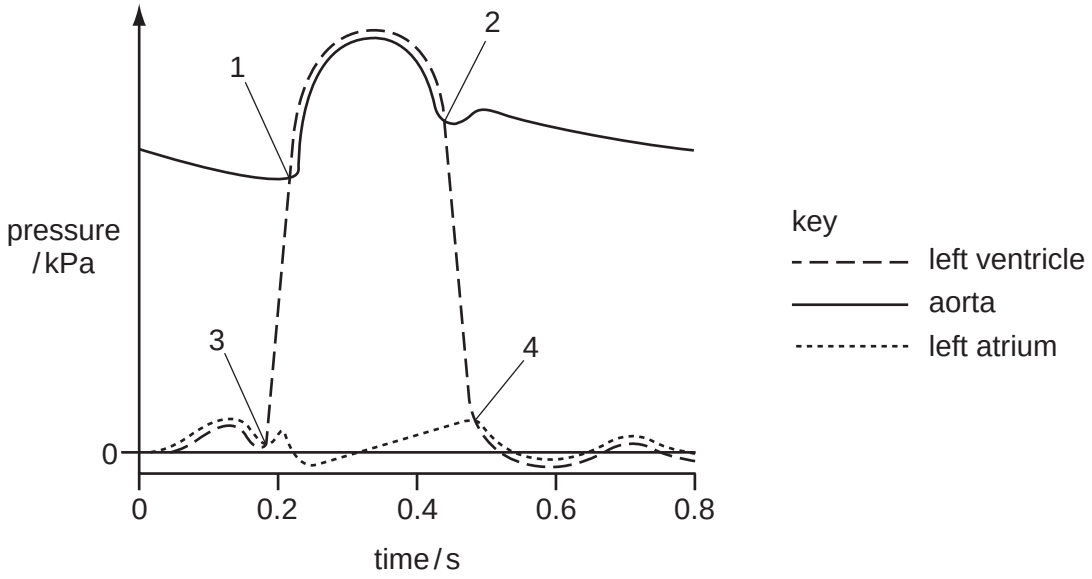
B there is a high partial pressure of oxygen

C to remove glucose from the tissues

D to supply the tissues with enough oxygen

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30 The graph shows the pressure changes in the left atrium, left ventricle and aorta during a cardiac cycle.



With reference to the semilunar valve and atrioventricular valve, what is happening at points 1, 2, 3 and 4?

	semilunar valve		atrioventricular valve	
	opens	closes	opens	closes
A	1	2	3	4
B	1	2	4	3
C	2	3	1	4
D	2	3	4	1

31 Normal venous pressure in the feet is 3.3 kPa. When a person stands very still venous blood pressure in the feet rises to 5.0 kPa.

What causes the high pressure?

A Muscles in the walls of the veins contract, reducing the diameter of the veins.

B Skeletal muscles in the legs are not squeezing blood upward in the veins.

C Systolic blood pressure increases.

D The valves in the veins of the legs allow blood to flow to the feet.

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32 Some people find it difficult to breath out large volumes of air from their lungs. Their breathing is noisy and rapid.

Which disease are they likely to be suffering from?

A atherosclerosis

B coronary heart disease

C emphysema

D lung cancer

33 Which of the following can result in heart failure?

1 increase in blood pressure

2 deposits of fatty material in arteries and veins

3 reduced oxygen supply to cardiac muscle

4 increased risk of blood clotting

A 3 and 4 only

B 1, 2 and 3 only

C 1, 2 and 4 only

D 1, 3 and 4 only

34 An adult human has approximately 5 dm^3 of blood, which circulates about once a minute.

100 cm^3 of arterial blood carries 19 cm^3 of oxygen. 100 cm^3 of venous blood carries 12.5 cm^3 of oxygen.

What is the approximate volume in cm^3 of oxygen taken up per minute in the lungs?

A 32.5 **B** 65 **C** 325 **D** 950

35 Which of the following increases the risk of contracting measles?

1 drinking unpasteurised milk

2 eating shellfish which have fed on raw sewage

3 living in overcrowded conditions

A 3 only

B 1 and 2

C 1 and 3

D 2 and 3

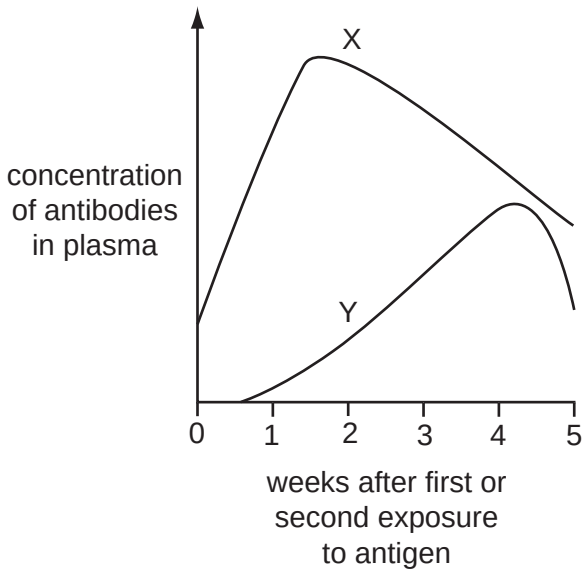
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36 To prevent a disease, dead bacteria may be injected into the body.

What type of immune response is produced?

	natural	active
A	no	no
B	no	yes
C	yes	no
D	yes	yes

37 The graph shows the primary and secondary responses of the immune system to antigens.



What are responses X and Y?

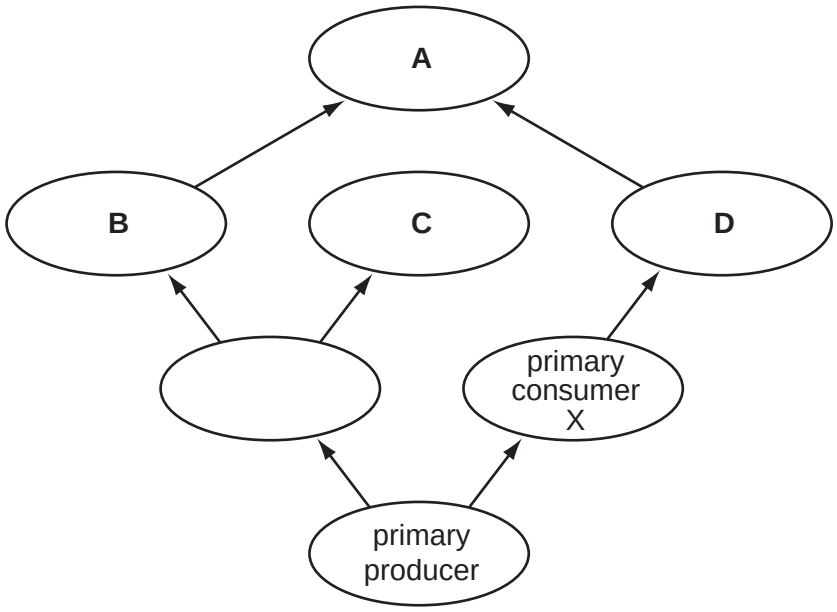
	X	Y
A	primary response	secondary response caused by cloning of B–lymphocytes formed during the primary response
B	primary response	secondary response caused by cloning of T–lymphocytes formed during the primary response
C	secondary response caused by cloning of B–lymphocytes formed during the primary response	primary response
D	secondary response caused by cloning of T–lymphocytes formed during the primary response	primary response

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38 A primary consumer, X, is removed from a community due to a lethal viral infection.

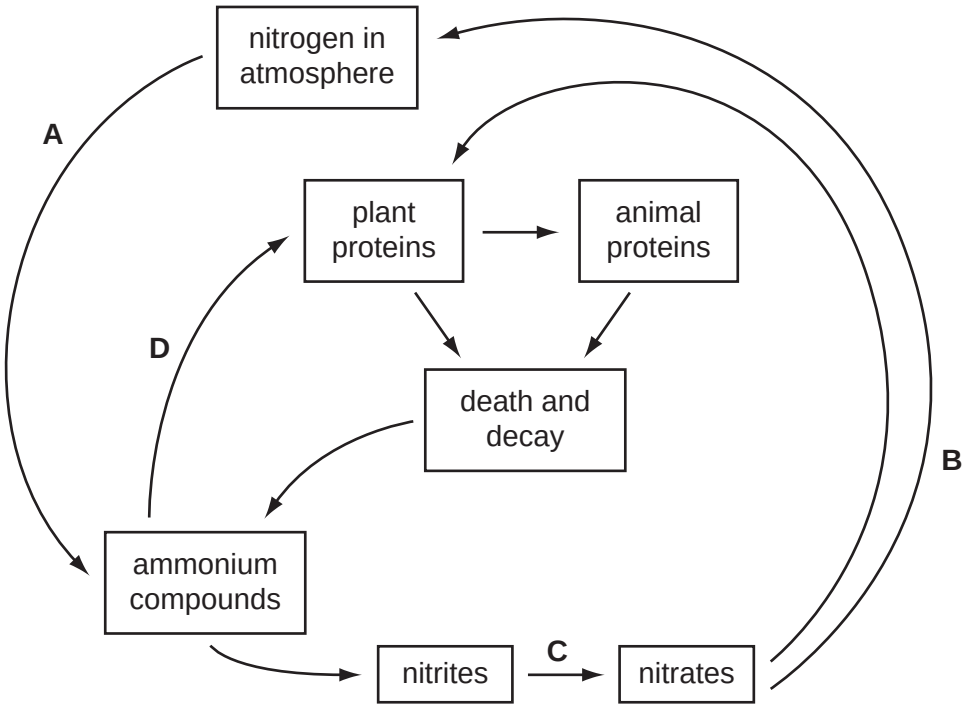
After a time, the size of the populations of some of the organisms shown in the food web changed.

Which population of organisms increased?



39 The diagram shows a simplified nitrogen cycle.

During which stage does nitrification take place?



40 The total rate at which producers synthesise organic material is called gross primary productivity (GPP). The rate at which producers store organic material as new tissue is called net primary productivity (NPP).

What shows the relationship between GPP and NPP?

A NPP = GPP × respiration

B NPP = GPP ÷ respiration

C NPP = GPP + respiration

D NPP = GPP – respiration

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BIOLOGY **9700/13**

Paper 1 Multiple Choice **October/November 2012**
1 hour

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

0296372872

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, highlighters, 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.

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.

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UNIVERSITY of CAMBRIDGE
International Examinations

1 Which feature is found in **both** prokaryotic and plant cells?

A cell wall

B DNA bound to protein

C endoplasmic reticulum

D Golgi apparatus

2 What leaves the nucleus through the pores in the nuclear envelope?

1 DNA

2 mRNA

3 ribosomes

A 1 only

B 2 only

C 1 and 2

D 2 and 3

3 The same plant cells were viewed by a student using an electron microscope and a light microscope.

The electron microscope used a magnification of ×1000.

The light microscope used a ×10 eyepiece lens and a ×100 objective lens.

The student concluded that the image of the plant cell obtained using the electron microscope was clearer and more detailed than the image obtained using the light microscope.

Which explanation supports this conclusion?

A The electron microscope had a poorer resolution than the light microscope, but was better able to distinguish between two separate points.

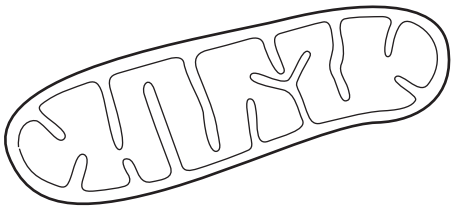
B The magnification used in the two microscopes was the same, but the electron microscope had a better resolution than the light microscope.

C The student used the electron microscope at a higher magnification than the light microscope which led to an improved resolution.

D The two microscopes had the same resolution, but the magnification used in the electron microscope gave an image that was ten times larger than the light microscope.

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4 The diagram shows an organelle drawn at a magnification of ×20 000.



What is the maximum length of the organelle?

A $3 \times 10^{-1}\,\mu m$ **B** $3 \times 10^{0}\,\mu m$ **C** $3 \times 10^{1}\,\mu m$ **D** $3 \times 10^{2}\,\mu m$

5 When drawing a plan diagram of a transverse section of a dicotyledonous leaf, which feature should **not** be included?

A cuticle on the upper epidermis

B palisade mesophyll layer

C vascular bundles in the leaf lamina

D xylem vessel elements

6 What is the general formula for starch?

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

7 Which bonds are the last to break when an enzyme is heated?

A disulfide

B hydrogen

C hydrophobic interactions

D ionic

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

1 amino acids

2 glucose

3 glycerol

4 protein

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

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9 Which of the statements about polysaccharides can be used to describe **both** starch and cellulose?

1 adjacent glucose molecules are rotated by 180°

2 contains glycosidic bonds

3 polymer of α–glucose

A 1 only

B 2 only

C 1 and 3 only

D 2 and 3 only

10 Five biochemical tests were carried out on four unknown substances, **A**, **B**, **C** and **D**.

Following the tests, it was possible to determine the presence or absence of each of the biochemicals in each substance.

Which substance contains glucose, fat and protein?

substance	test				
	reducing sugar	non-reducing sugar	emulsion	iodine	biuret
A	✓	✗	✓	✗	✓
B	✓	✗	✗	✓	✓
C	✗	✓	✓	✓	✗
D	✗	✓	✓	✗	✓

key

✓ = present

✗ = absent

11 What describes a globular protein that is **not** soluble in water?

A having amino acids with hydrophilic R groups facing out

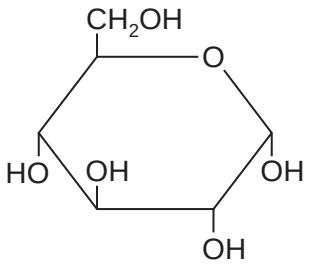
B having amino acids with polar R groups facing out

C having a central core of amino acids with hydrophobic R groups

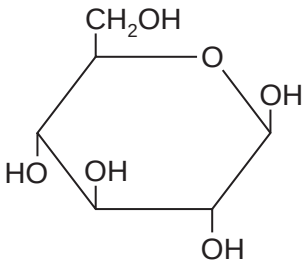
D having amino acids with hydrophobic R groups facing out

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12 Polymers of molecule X or polymers of molecule Y can be formed using glycosidic bonds.



molecule X



molecule Y

Which statement is correct?

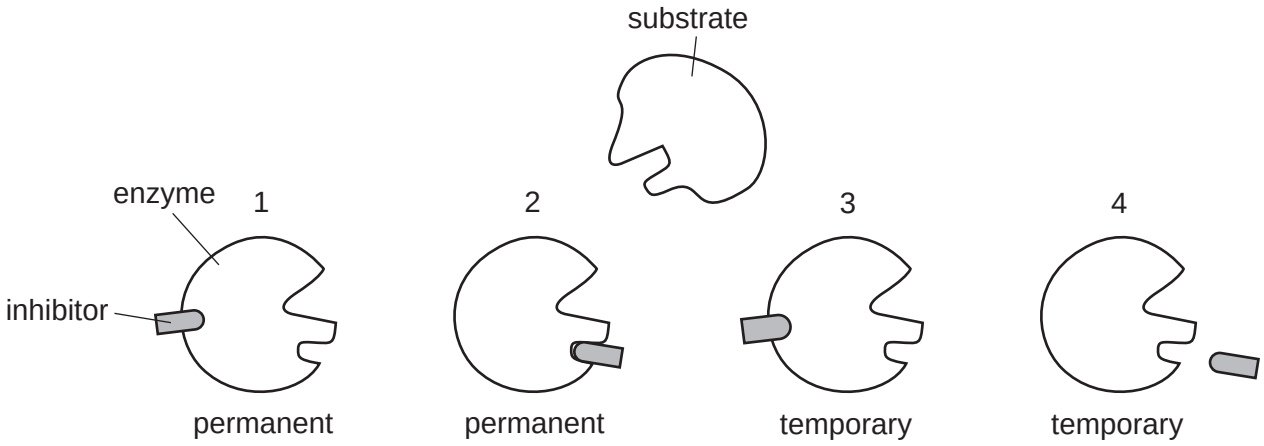
A Many of molecule X join to form amylose.

B Many of molecule X join to form cellulose.

C Many of molecule Y join to form amylopectin.

D Many of molecule Y join to form glycogen.

13 The diagrams show where an inhibitor becomes attached to an enzyme and whether this is permanent or temporary.



Which diagrams represent a non-competitive inhibitor?

A 1 and 2 only

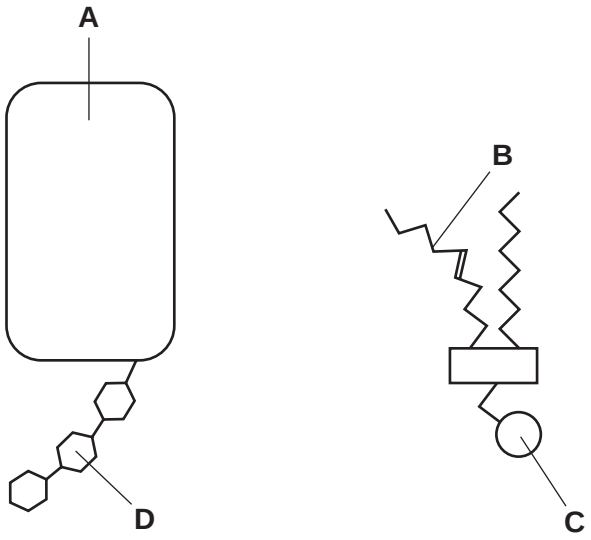
B 2 and 3 only

C 3 and 4 only

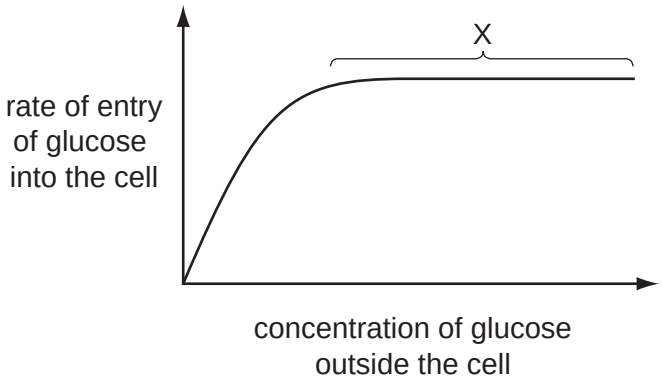
D 1, 2 and 3 only

14 The diagrams show two molecules found in cell surface membranes.

Which part affects the fluidity of the membrane?



15 The graph shows how the rate of entry of glucose into a cell changes as the concentration of glucose outside the cell changes.



What is the cause of the plateau at X?

1 All the carrier proteins are saturated with glucose.

2 The cell has used up its supply of ATP.

3 The concentrations of glucose inside and outside the cell are equal.

A 1 only

B 3 only

C 1 and 2 only

D 2 and 3 only

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16 The following are all processes by which substances can enter cells.

1 phagocytosis

2 active transport

3 facilitated diffusion

Which processes require ATP?

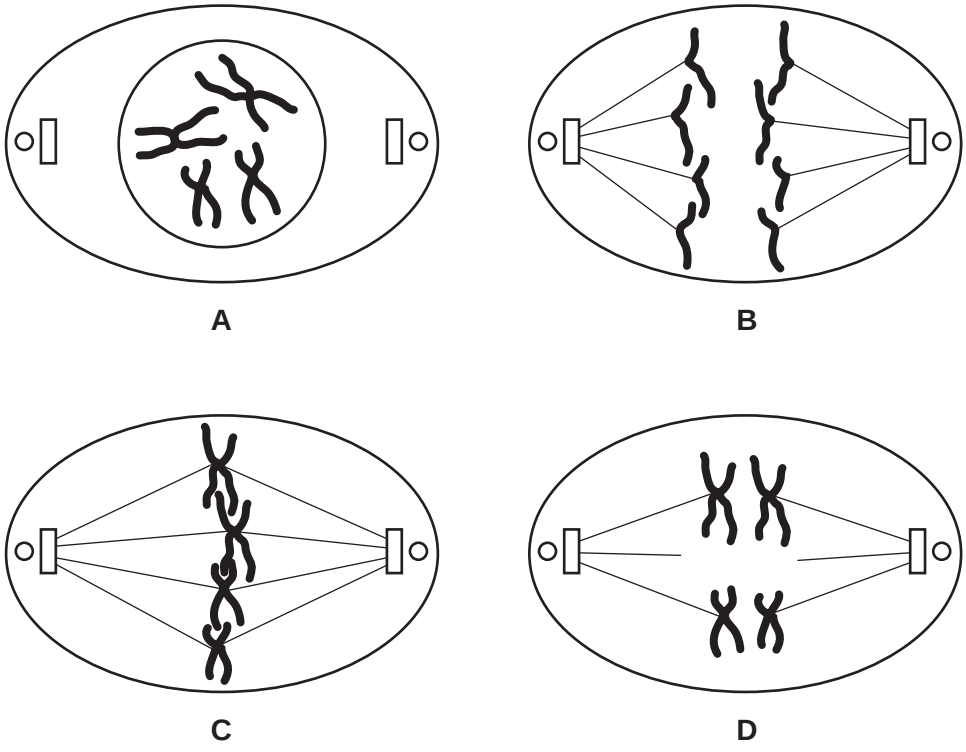
A 1 only

B 2 only

C 1 and 2 only

D 2 and 3 only

17 Which diagram represents a cell undergoing metaphase of mitosis?



18 Colchicine is a substance which inhibits the formation of spindle fibres.

At which stage is the cell cycle interrupted?

A cell division

B DNA replication

C interphase

D mitosis

19 The sequence of nucleotides in DNA in a gene that controls the synthesis of a protein is arranged in triplets, each coding for specific amino acids. The table shows three examples of these triplets.

	triplet code	example
1	DNA code	TAC
2	mRNA code	AUG
3	tRNA code	UAC

Which are the correct codon and anticodon?

	codon	anticodon
A	1	3
B	2	3
C	3	1
D	3	2

20 Enzymes are ……1…… proteins, made up of polypeptides.

A gene is a sequence of ……2……, which are parts of a ……3…… molecule coding for a polypeptide.

Which words correctly complete gaps 1, 2 and 3 in the sentences?

	1	2	3
A	fibrous	amino acids	tRNA
B	fibrous	bases	DNA
C	globular	nucleotides	DNA
D	globular	triplets	mRNA

21 Which process does **not** occur during the formation of messenger RNA?

A condensation

B polymerisation

C replication

D transcription

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22 Which correctly matches the structure and function of sieve tube elements?

	structure	function
A	cellulose cell wall with no lignin	to prevent loss of water
B	end walls modified to form sieve plates	slow down the rate of transport of solutes
C	elongated cells joined end to end	form a tube to transport dissolved mineral ions and water
D	peripheral cytoplasm with no nucleus	to provide as little resistance to flow as possible

23 How do single-celled organisms survive without a specialised transport system?

A Their cell surface membranes are totally permeable.

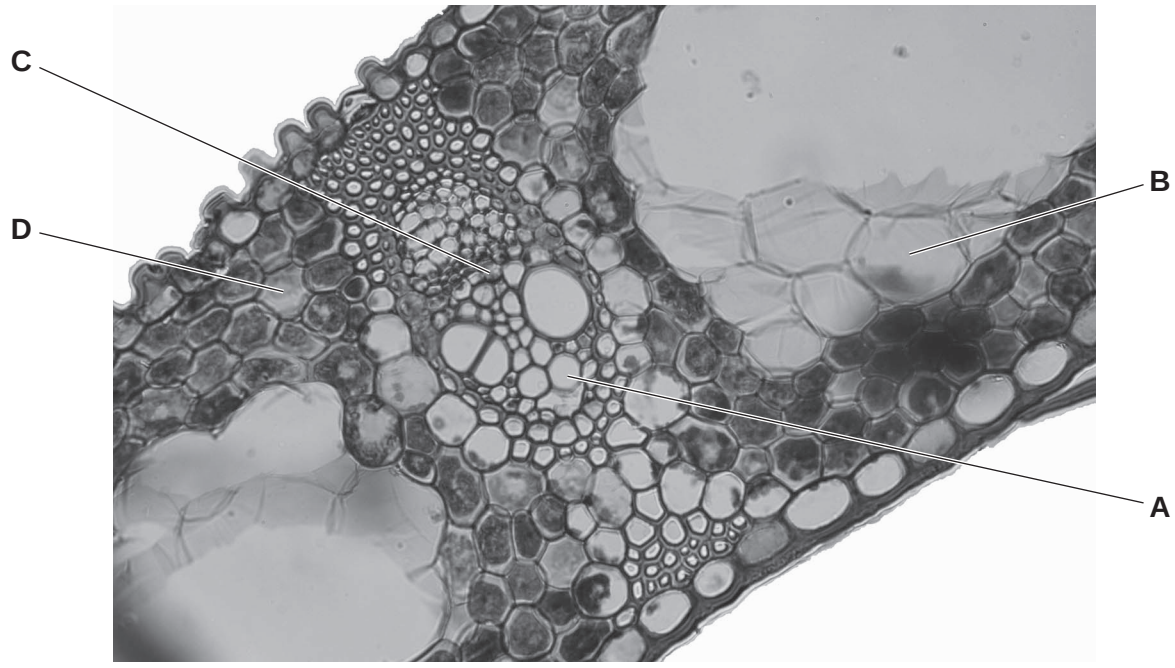
B They do not move very often.

C They do not need to absorb oxygen.

D They have a large surface area to volume ratio.

24 The photomicrograph shows a transverse section of a leaf.

Which cell has the least negative water potential?



25 What occurs during the movement of water through the apoplast pathway?

1 water enters cell wall

2 water enters cytoplasm through plasma membrane

3 water enters vacuoles

4 water moves from cell to cell through plasmodesmata

5 water moves from cell wall to cell wall through intercellular spaces

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

26 Why does the red blood cell count of humans increase when they remain at high altitudes?

A Haemoglobin is not saturated with oxygen in the lungs.

B The partial pressure of oxygen is higher.

C The percentage of oxygen in the air has decreased.

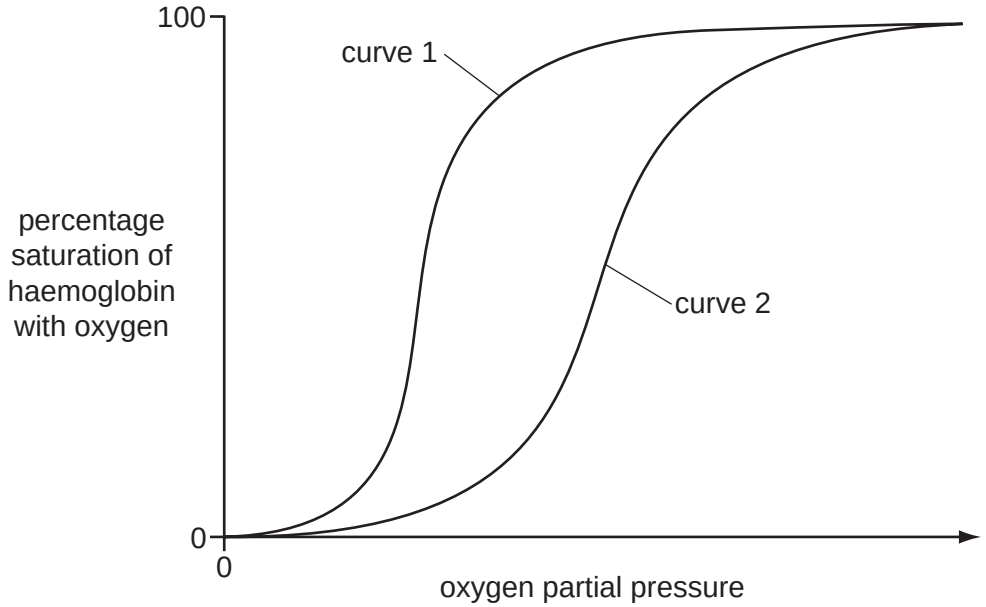
D There is more carbon dioxide, increasing the Bohr effect.

27 Which row correctly shows all the blood vessels that have the features in the table below?

	squamous endothelium present	thick tunica media present	collagen fibres present in tunica externa (adventitia)
A	arteries and capillaries	arteries and veins	veins
B	arteries, capillaries and veins	arteries	arteries and veins
C	arteries and veins	arteries and veins	arteries
D	veins and capillaries	veins	veins

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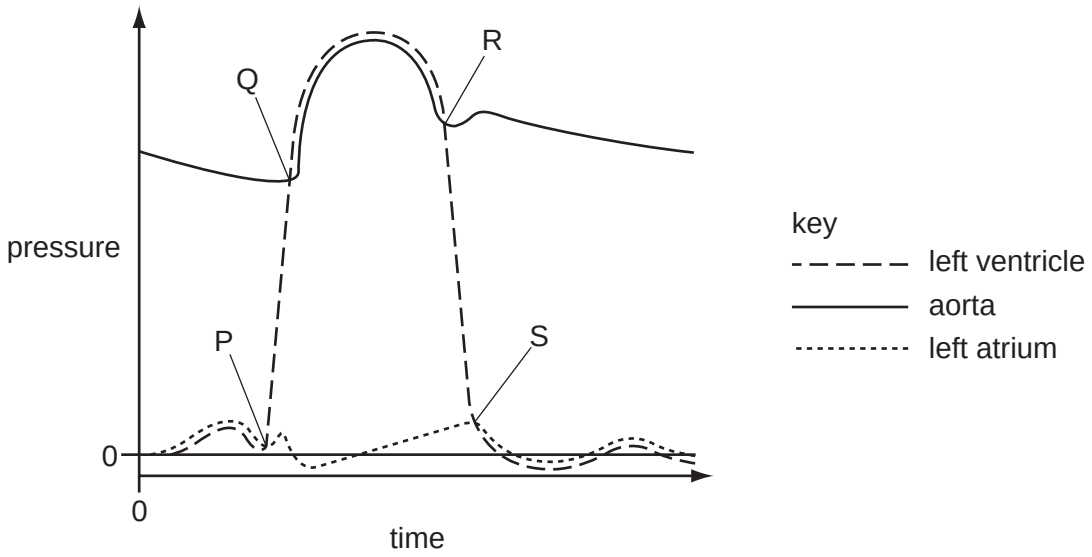
28 The graph shows the dissociation of oxygen from haemoglobin at two different pHs.



Which curve represents the lower pH and in which tissue might the data have been recorded?

	lower pH	tissue
A	curve 1	active muscle
B	curve 1	resting muscle
C	curve 2	active muscle
D	curve 2	resting muscle

29 The diagram shows changes in pressure in the left side of the heart during the cardiac cycle.



Which statement about the heart valves is correct?

A At P, the atrioventricular valve opens.

B At Q, the semilunar valve opens.

C At R, the semilunar valve opens.

D At S, the atrioventricular valve closes.

30 When a person suffers an asthma attack, the tubes of the gas exchange system narrow and extra mucus is produced.

Which of these changes occur during an asthma attack?

1 Activity of ciliated epithelium increases.

2 Endocytosis in goblet cells increases.

3 Smooth muscles more active.

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

31 Which symptoms may be seen in a person affected by chronic obstructive pulmonary disease (COPD)?

1 persistent cough

2 less elastic alveoli

3 increased risk of lung infection

4 shortness of breath

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

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32 Which row shows the effects of chronic bronchitis?

	T-helper cells	bronchioles	infection
A	destroyed	inflamed	absent
B	destroyed	narrowed	present
C	increased	stiffened	absent
D	increased	scarred	present

33 An oxygen molecule diffuses directly from the air in an alveolus to haemoglobin in a red blood cell.

What is the minimum number of cell surface membranes through which this molecule must pass?

A 2 **B** 3 **C** 4 **D** 5

34 For some diseases, one of the most effective measures for prevention and control is tracing people who have been in contact with infected people.

For which disease would tracing the contacts of infected people help in its prevention and control?

A Cholera, as it can be treated successfully with carefully selected antibiotics.

B Malaria, as it is transmitted by animals, so the transmission cycle of the pathogen can be broken.

C Measles, as it can cause an epidemic and can be controlled by other methods.

D Sickle cell anaemia, as it is genetically inherited, so there is time to act before more individuals are affected.

35 A child is vaccinated against a viral disease. A few weeks later she is exposed to the same virus.

What is the expected response to this exposure?

A increased numbers of B-lymphocytes

B increased numbers of T-lymphocytes

C large numbers of antibodies are released

D large numbers of antigens are released

36 Why has it proved difficult to develop an effective vaccine against malaria?

A Mosquitoes have many stages in their life cycles.

B The human immune system does not recognise the antigens of the parasite.

C The parasites can only be attacked when outside the liver cells and red blood cells.

D Vaccines are rapidly broken down by proteases in the stomach.

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37 Which statement describes a role of lymphocytes in the immune response?

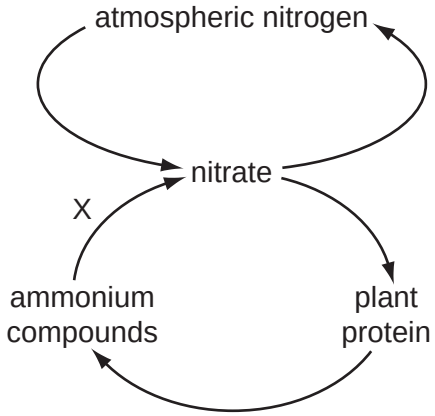
A B-lymphocytes divide to produce killer lymphocytes.

B B-lymphocytes produce memory cells.

C T-lymphocytes are involved in the humoral response.

D T-lymphocytes clone producing antibody-secreting cells.

38 The diagram shows some of the processes that are involved in the cycling of nitrogen in an ecosystem.



Which type of bacterium is found at X?

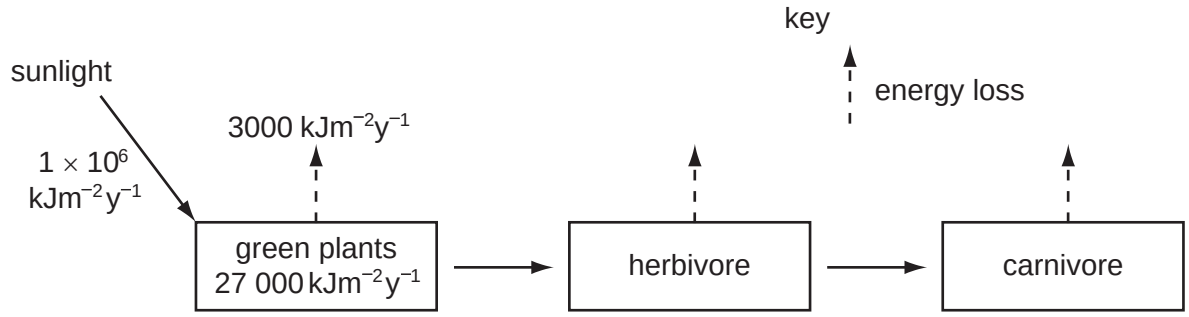
A decomposing

B denitrifying

C nitrifying

D nitrogen fixing

39 The diagram shows the flow of energy through a food chain.



What percentage of the energy is used by the green plants for photosynthesis?

A 0.03 % **B** 0.30 % **C** 2.70 % **D** 3.00 %

40 A tree carries out photosynthesis and provides organic compounds for other organisms in a forest.
It takes carbon dioxide from and returns oxygen to the atmosphere.
It takes water from the soil into its roots and its leaves lose water to the atmosphere.
Many other organisms live in the tree.

Which term describes the tree?

A niche

B community

C ecosystem

D trophic level

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