Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

BIOLOGY **9700/11**

Paper 1 Multiple Choice **May/June 2015**

1 hour

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

5018780836

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 **18** printed pages and **2** blank pages.

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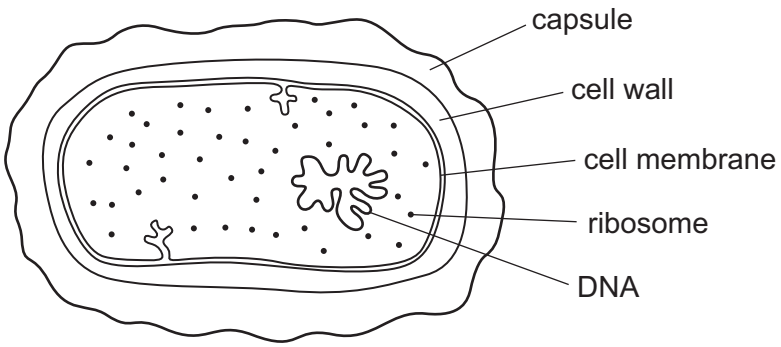
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1 What are the appropriate units for measuring diameters of alveoli, diameters of white blood cells and the width of cell walls?

	diameters of alveoli	diameters of white blood cells	width of cell walls
A	mm	μm	μm
B	μm	mm	μm
C	μm	μm	nm
D	mm	mm	nm

2 The diagram shows a high-power drawing of a bacterium.



Which three components are found in **both** this bacterium and an animal cell?

A capsule, cell membrane and cell wall

B capsule, DNA and ribosome

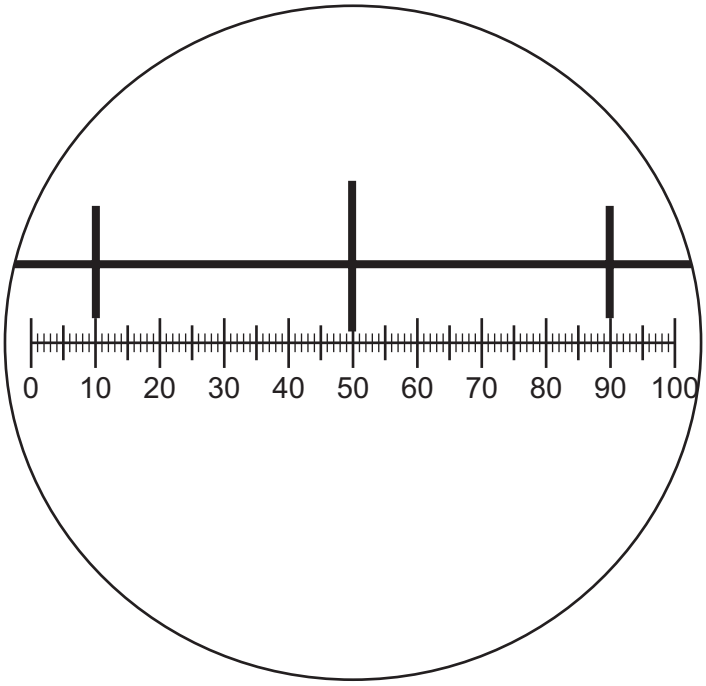
C cell membrane, cell wall and DNA

D cell membrane, DNA and ribosome

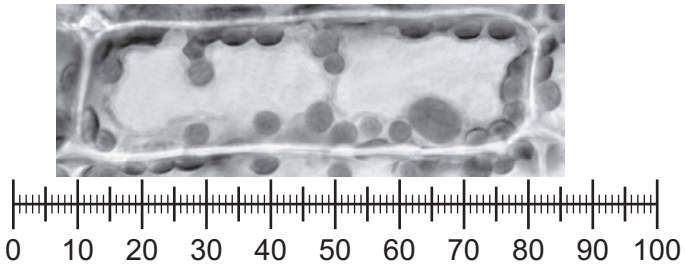
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3 The diagram shows a stage micrometer scale on which the small divisions are 0.1 mm. It is viewed through an eyepiece containing a graticule.



The stage micrometer scale is replaced by a slide of a plant cell.



What is the width of a chloroplast?

A 0.5 mm **B** 10 μm **C** 50 μm **D** 100 μm

4 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

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5 What is the function of the nucleolus?

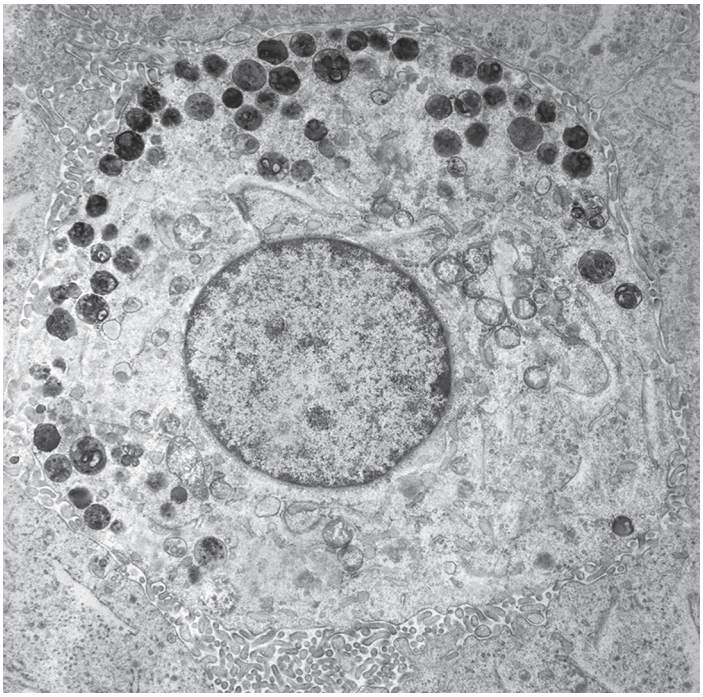
A The formation and breakdown of the nuclear envelope.

B The formation of rough endoplasmic reticulum.

C The synthesis of ribosomal proteins.

D The synthesis of rRNA.

6 The electronmicrograph shows a cell.



×5700

What is the actual diameter of the nucleus?

A 0.6 μm **B** 6 μm **C** 35 μm **D** 350 μm

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7 A student carried out four tests for biological molecules on a solution. The observations are shown in the table.

test for biological molecules	observation
iodine solution	orange
biuret	purple
Benedict's	orange
emulsion	cloudy

Which molecules may be present in this solution?

A glucose, starch, protein

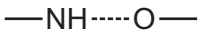
B lipid, protein, glucose

C protein, starch, sucrose

D starch, protein, lipid

8 The diagrams show different types of bond found in biological molecules.

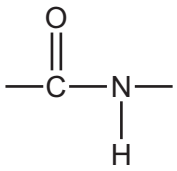
1



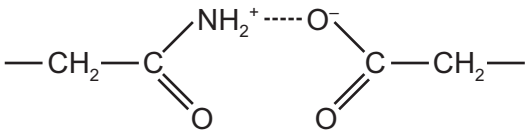
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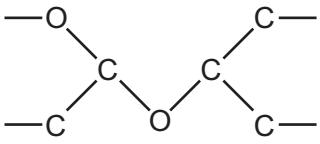
3



4



5



Which combination of bonds could **not** be found in a protein with a tertiary structure?

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

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9 Which row shows the correct match between the descriptions of biological molecules and where they are found?

1 a linear polymer of 1,4 linked β-glucose molecules

2 a bipolar, phosphate containing molecule

3 a highly branched polymer of 1,4 and 1,6 linked α-glucose molecules

	1	2	3
A	eukaryote and prokaryote cell walls	cell surface membranes of both eukaryotes and prokaryotes	forming storage granules in the cells of prokaryotes
B	eukaryote cell walls	cell surface membranes of both eukaryotes and prokaryotes	forming storage granules in the cells of some eukaryotes
C	eukaryote cell walls	cell surface membranes of both eukaryotes and prokaryotes	forming starch grains in the cells of all eukaryotes
D	forms storage granules in the cells of eukaryotes	prokaryote cell walls	eukaryote cell walls

10 Which is the correct description for the structure of amylose and cellulose?

	amylose	cellulose
A	α-glucose 180° rotation 1,4 and 1,6 linkages	β-glucose no rotation 1,4 linkages
B	α-glucose no rotation 1,4 linkages	β-glucose 180° rotation 1,4 linkages
C	α-glucose no rotation 1,4 linkages	α-glucose 180° rotation 1,4 and 1,6 linkages
D	β-glucose no rotation 1,4 linkages	α-glucose 180° rotation 1,4 linkages

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11 Which description is correct?

A A collagen molecule has a high proportion of the amino acid glycine, which has a very small side chain.

B A group of three collagen fibres forms a strong, insoluble coiled structure termed a triple helix.

C Each of the collagen polypeptides in a collagen molecule has a regular spiral arrangement of many alpha helices.

D Peptide bonds are present between amino acids of the same polypeptide and between the different polypeptides forming the collagen molecule.

12 Polar molecules form hydrogen bonds with each other.

Which properties of water result from its molecules being polar?

1 good solvent

2 high specific heat capacity

3 high surface tension

4 cohesive

A 1, 2, 3 and 4

B 1, 2 and 3 only

C 1, 2 and 4 only

D 3 and 4 only

13 Which statements about the effect of **all** enzyme inhibitors are correct?

1 change the shape of the active site

2 denature the enzyme

3 reduce the rate of the enzyme-catalysed reaction

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

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14 The graphs show the rate of reaction of an enzyme-catalysed reaction.

Which graph shows the effect of increasing the concentration of the substrate at two different concentrations of a competitive inhibitor?

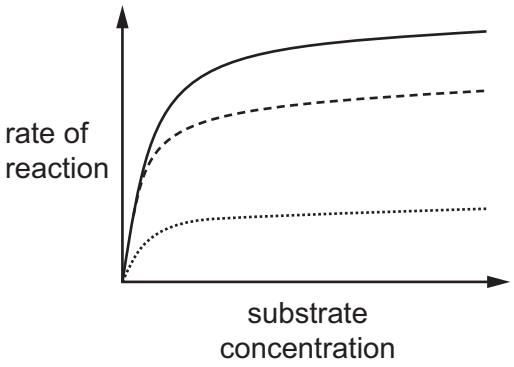
key

——— no inhibitor

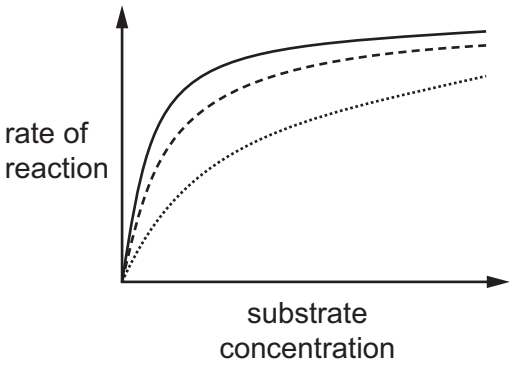
- - - - - - low concentration of inhibitor

..... high concentration of inhibitor

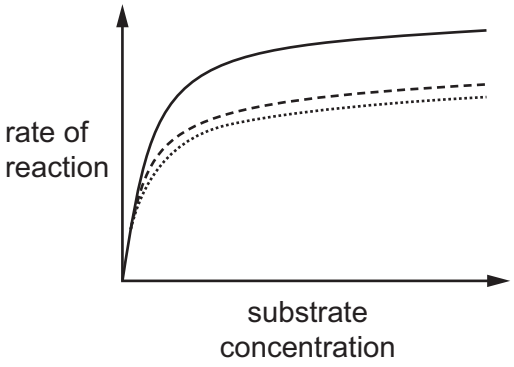
A



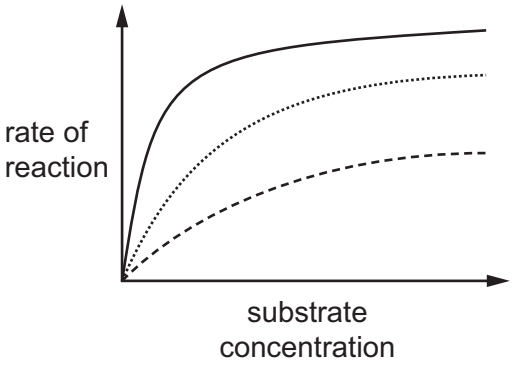
B



C



D



15 Which type of cell has a large number of glycoproteins on the cell surface membrane?

A ciliated cell

B goblet cell

C lymphocyte

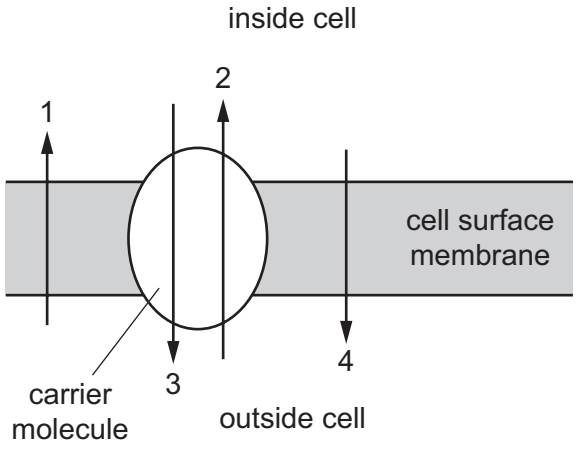
D red blood cell

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16 The diagram shows the transport of ions across the cell surface membrane. Inside the cell there is a low concentration of sodium ions (Na^+) and a high concentration of potassium ions (K^+). Outside the cell there is a low concentration of K^+ and a high concentration of Na^+.

The carrier molecule is a pump which exchanges Na^+ for K^+.



Which ionic movements are represented by the arrows?

	active transport of K^+	active transport of Na^+	diffusion of Na^+	diffusion of K^+
A	2	3	1	4
B	2	3	4	1
C	3	2	1	4
D	3	2	4	1

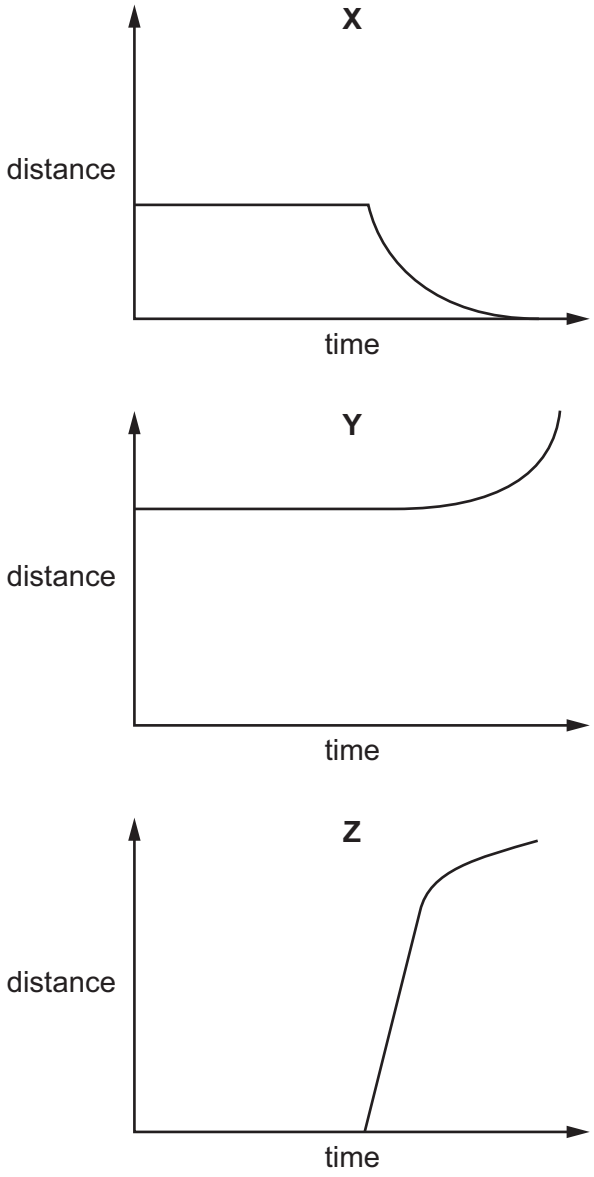
17 Which set of factors will produce the **most** fluid cell surface membrane?

	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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18 The graphs show various measurements taken from metaphase of mitosis onwards. The graphs are to scale when compared to one another.



Which row correctly identifies each graph?

	X	Y	Z
A	distance between poles of spindle	distance between sister chromatids	distance of centromere from pole of spindle
B	distance between poles of spindle	distance of centromere from pole of spindle	distance between sister chromatids
C	distance of centromere from pole of spindle	distance between poles of spindle	distance between sister chromatids
D	distance of centromere from pole of spindle	distance between sister chromatids	distance between poles of spindle

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19 A scientist counted 22 chromosomes in each of the root cells of a xerophytic plant.

What is the diploid and haploid number of chromosomes for this species?

	diploid number	haploid number
A	11	22
B	22	11
C	22	44
D	44	22

20 Which row shows two pairs of nucleotides formed during transcription?

	first base pair transcribed		second base pair transcribed	
	bases	number of hydrogen bonds	bases	number of hydrogen bonds
A	AU	2	CG	2
B	AU	2	CG	3
C	AU	2	TU	2
D	AU	3	CG	2

21 Which row correctly identifies the features of DNA and RNA molecules?

	DNA and RNA contain both purine and pyrimidine bases	DNA and RNA both contain a pentose sugar	hydrogen bonds form between bases in some RNA
A	✓	✓	✓
B	✓	✓	✗
C	✓	✗	✓
D	✗	✓	✗

key

✓ = correct statement

✗ = incorrect statement

22 Two polynucleotide strands make up a DNA molecule.

What is a correct description?

A The percentage of cytosine is 50% of that of guanine in the whole molecule.

B The percentage of cytosine is the same as that of guanine in each strand.

C The percentage of cytosine is the same as that of guanine in the whole molecule.

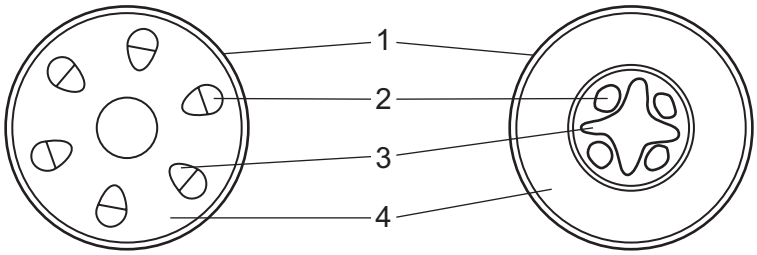
D The percentage of cytosine is the same in each strand of the molecule.

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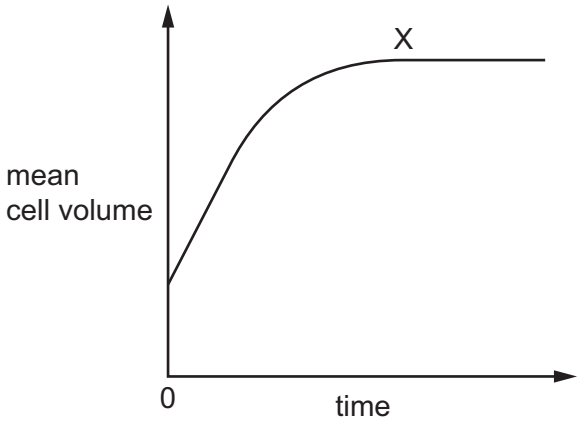
23 The diagram shows transverse sections of two plant structures.



Which row shows the correct labels?

	1	2	3	4
A	cuticle	phloem	xylem	pith
B	cuticle	xylem	phloem	cortex
C	epidermis	phloem	xylem	cortex
D	epidermis	xylem	phloem	pith

24 A tissue composed of plasmolysed plant cells was put into distilled water. The graph shows how the mean cell volume changes with time.



What is the cause of the plateau at X?

1 water potential in the plant cell has become more negative

2 cells have become fully turgid

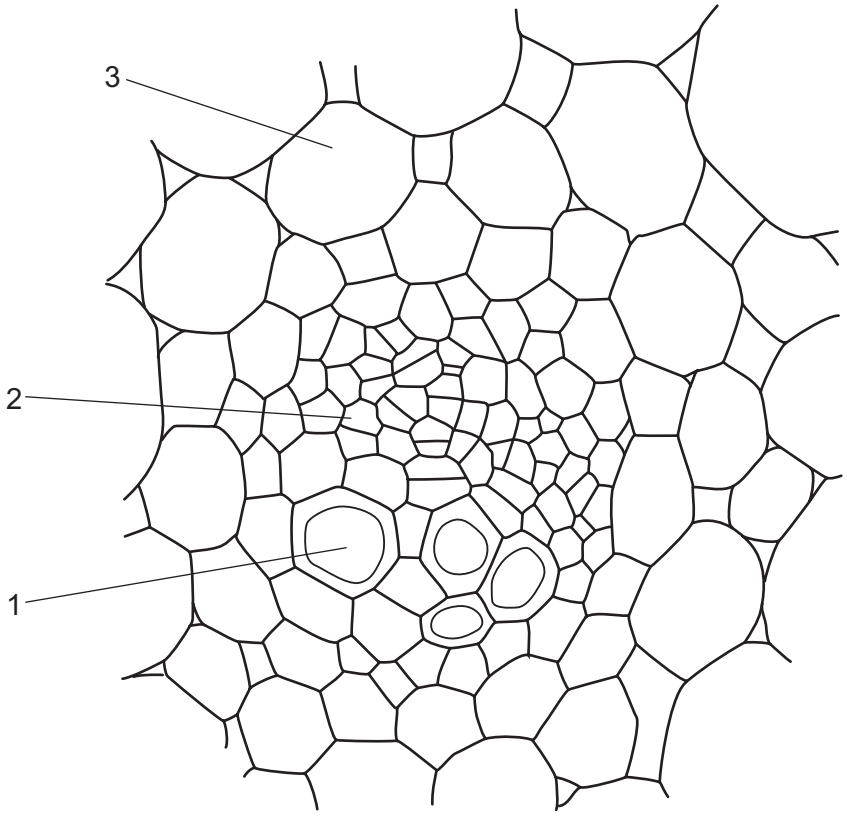
3 no net movement of water into cells

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

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25 The diagram shows a vascular bundle from the stem of a plant.



Which row describes the functions of the labelled cells?

	transports sucrose	transports ions	stores starch
A	1	2	3
B	2	1	3
C	2	3	1
D	3	1	2

26 Which changes to the water potential and the volume of liquid in the phloem occur when amino acids are moved into a sink from phloem sieve tubes?

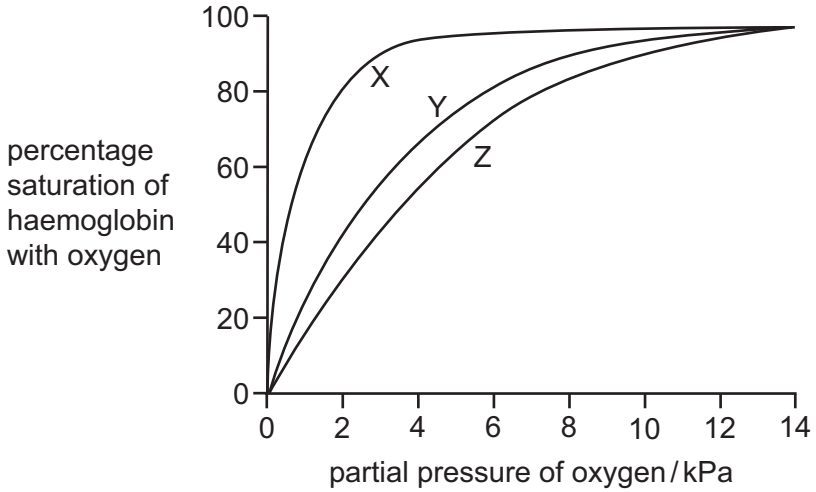
	water potential in a phloem sieve tube	volume of liquid in phloem sieve tubes
A	higher	decreased
B	higher	increased
C	lower	decreased
D	lower	increased

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27 The graph shows the oxygen dissociation curves for haemoglobin from three different animals.



Which of the haemoglobins, X, Y or Z, would be present in each of the animals 1, 2 or 3?

1 an adult human

2 a fish living in water that has a very low oxygen concentration

3 a very active mammal whose tissues have a much higher rate of respiration than an adult human

	1	2	3
A	X	Y	Z
B	Y	X	Z
C	Y	Z	X
D	Z	Y	X

28 What explains how the uptake of oxygen is maximised as blood passes through the capillaries of the lungs?

A Each haemoglobin molecule can temporarily bind to four oxygen atoms.

B Oxyhaemoglobin formation increases the capacity of red blood cells to transport oxygen.

C The binding of the first oxygen molecule to haemoglobin decreases the molecule's affinity for binding other oxygen molecules.

D The dissociation of carbon dioxide from carboxyhaemoglobin allows more haemoglobin to be available for oxygen binding.

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29 What happens after carbonic anhydrase has catalysed a reaction involved in the transport of carbon dioxide?

A the dissociation of oxyhaemoglobin to haemoglobin and oxygen

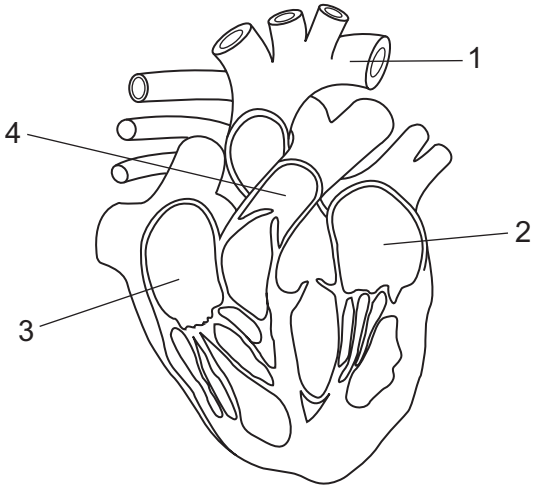
B the formation of carbaminohaemoglobin from carbon dioxide and haemoglobin

C the formation of carbon dioxide and water from carbonic acid

D the formation of oxyhaemoglobin from haemoglobin and oxygen

30 The diagram shows a section through the heart and the associated blood vessels.

What is correct for the flow of blood through the heart?



A 1 → 2 → 3 → 4

B 2 → 1 → 3 → 4

C 3 → 4 → 1 → 2

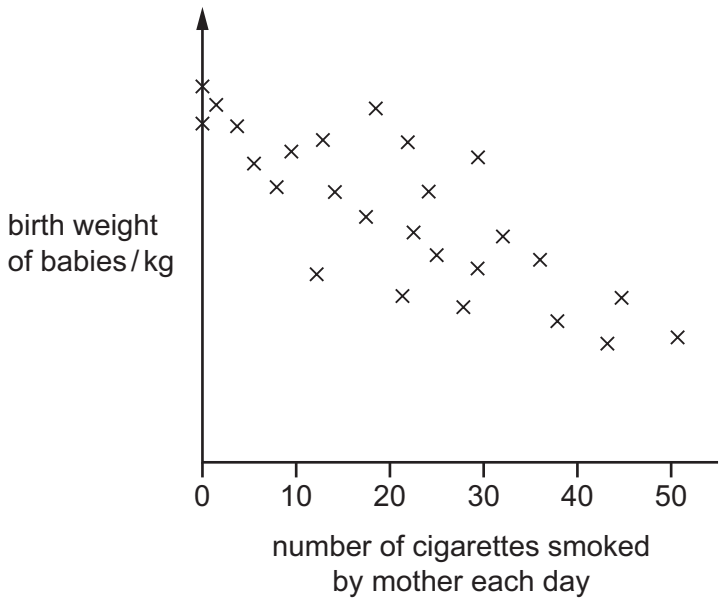
D 4 → 3 → 2 → 1

31 Which row shows a function of each of the named tissues in the gas exchange system?

	cartilage	ciliated epithelium	smooth muscle	elastic fibres
A	keep the airways open	move mucus out of the airways	change the diameter of the bronchioles	allows alveoli to expand during breathing in
B	prevent choking	secrete mucus	contracts to increase air flow	helps to support the trachea
C	prevent the trachea collapsing when coughing	keep a layer of mucus lining the air ways	trap bacteria and dirt in air	cause elastic recoil when breathing out
D	support the small bronchioles	trap bacteria and dirt in air	control the flow of air to and from the alveoli	allows stretching of trachea for movement

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32 The graph shows the results of a study to determine whether there is a link between the number of cigarettes smoked by a mother and the birth weight of her baby.



Which conclusions can be drawn from this graph?

1 As the number of cigarettes smoked increases, the weight of the baby always decreases.

2 Factors, other than smoking, affect the birth weight of a baby.

3 Nicotine, tar and carbon monoxide slow the growth of an unborn baby.

4 The majority of all smokers smoke between 10 and 35 cigarettes per day.

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

33 What is a feature of coronary bypass surgery?

A A section of a healthy vein or artery is attached to the aorta at one end and a coronary artery at the other end to bypass diseased sections of coronary artery.

B A section of healthy vein or artery is used to bypass the diseased section of aorta in the region where the branches to the coronary arteries occur.

C Blockages in coronary arteries with atherosclerosis are cleared surgically by temporarily using an artificial heart to re-route blood and bypass the heart.

D The section of diseased coronary artery is removed and then replaced by using a section of a healthy vein or artery of a similar diameter.

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34 The first column in the table contains statements about disease. Columns headed 1-4 represent four different named diseases.

statements	1	2	3	4
infectious disease		✓	✓	✓
can be treated with antibiotics			✓	✓
caused by a virus		✓		
degeneration of lung tissue	✓			✓

key
✓ = true

What is the correct set of column headings for the table above?

	1	2	3	4
A	bronchitis	measles	TB	smallpox
B	emphysema	HIV / AIDS	cholera	TB
C	emphysema	measles	cholera	lung cancer
D	lung cancer	HIV / AIDS	measles	TB

35 Which row is correct for malaria?

	nature of disease	method of transmission	pathogen
A	infectious	insect vector	species of *Plasmodium*
B	infectious	water-borne	species of *Vibrio*
C	non-infectious	insect vector	species of *Plasmodium*
D	non-infectious	water-borne	species of *Vibrio*

36 During an outbreak of a very infectious disease, vulnerable people need immediate protection.

Which type of immunity would be given to these people?

	natural	artificial
active	**A**	**B**
passive	**C**	**D**

37 Which cells become memory cells in the immune response?

1 B-lymphocytes

2 T-lymphocytes

3 phagocytes

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

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38 Which soil would have the smallest number of denitrifying bacteria?

A compressed agricultural soil

B poorly drained forest soil

C water-logged clay soil

D well-aerated garden soil

39 In an ecosystem, at which stage is most energy lost?

A sunlight → trophic level 1

B trophic level 1 → trophic level 2

C trophic level 2 → trophic level 3

D trophic level 3 → trophic level 4

40 Two species of animal are found in the same area of forest and grassland. In the spring and summer they eat the same plant food. However, in the autumn and winter one eats nuts in the forest and the other eats roots on the grassland.

Both species are preyed upon by the same predator. Numbers of root-eating animals are reduced most by this, but they recover faster since they reproduce faster.

What can be concluded about these two species of animals?

1 They are part of the same community.

2 They are at different trophic levels.

3 They occupy different habitats.

4 They have different niches.

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

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BIOLOGY **9700/12**

Paper 1 Multiple Choice **May/June 2015**

1 hour

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

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READ THESE INSTRUCTIONS FIRST

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1 What is the diameter of a typical plant cell?

A $4.0 \times 10^1\ \mu m$

B $1.0 \times 10^0\ \mu m$

C 4.0×10^2 nm

D 1.0×10^2 nm

2 A specimen is viewed under a microscope using green light with a wavelength of 510 nm.

If the same specimen is viewed under the same conditions, but using red light with a wavelength of 650 nm instead, what effect will this have on the magnification and on the resolution of the microscope?

	magnification	resolution
A	decreased	remains the same
B	increased	increased
C	remains the same	decreased
D	remains the same	increased

3 What is the function of plasmodesmata in plant cells?

A to act as a barrier to water soluble substances

B to allow active transport of ions and sucrose between cells

C to allow the symplastic movement of substances between cells

D to enable cells to recognise each other

4 Which size of ribosome is found in both chloroplasts and mitochondria?

A 60S **B** 70S **C** 80S **D** 90S

5 Which function is correct for the description of the cell structure?

	function	cell structure
A	organises microtubules to produce the spindle	membrane-bound sacs, arranged as a flattened sac
B	packages hydrolytic enzymes used in cell	non-membrane bound cylindrical structures
C	synthesises lipids	membranes which surround an enclosed inner cavity
D	synthesises polypeptides	membrane bound spherical structure

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6 Ribosomes consist of two subunits, each containing rRNA. An analysis of **all** the 70S ribosomes from a single cell of the bacterium, *Escherichia coli*, showed that there were:

- 38 000 rRNA molecules
- 2 main types of rRNA molecule
- 19 000 copies of each type of rRNA molecule

How many 70S ribosomes were there in the *E. coli* cell?

A 9500 **B** 19 000 **C** 38 000 **D** 76 000

7 Which type of bond holds together an α-helix or β-pleated sheet of a protein?

A disulfide

B hydrogen

C ionic

D peptide

8 What describes only the quaternary structure of haemoglobin?

1 α-helix

2 a dipeptide

3 a globular structure

4 the specific order of amino acids

5 four polypeptide chains joined together

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

9 The statements are about the properties of water.

1 ability to form hydrogen bonds with other molecules

2 less dense when frozen

3 able to hold a lot of heat

What allows a small insect to rest on the surface of a pond?

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

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10 Which bonds hold together the structure of cellulose?

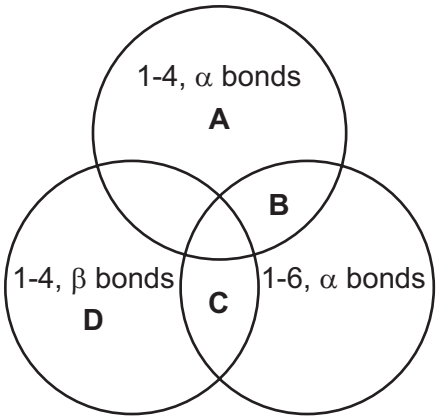
1 glycosidic

2 hydrogen

3 ionic

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

11 Which bonds are found in glycogen?



12 Solutions of biological molecules are tested for sugars. The table shows the colours of the solutions after testing.

solution	heated with Benedict's solution	boiled with hydrochloric acid, neutralised, then heated with Benedict's solution
1	blue	orange
2	green	green
3	yellow	red

Which may contain non-reducing sugars?

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

13 Which levels of protein structure are always involved when competitive and non-competitive inhibitors bind to enzymes?

	competitive	non-competitive
A	primary, secondary and tertiary	secondary
B	quaternary and tertiary	quaternary and tertiary
C	secondary	primary and tertiary
D	tertiary	tertiary

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14 Which statements are true about the optimum temperature of **all** enzymes?

1 It is the temperature at which the enzymes work best.

2 It is the highest temperature at which the enzyme will work.

3 It is between 35 °C and 40 °C.

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

15 Which description of cell surface membrane permeability is correct?

A An increase in the concentration of cholesterol molecules in the cell surface membrane can increase its permeability to hydrophilic substances.

B Cell surface membrane permeability to large hydrophilic molecules is high and can be increased by membrane transport proteins involved in facilitated diffusion.

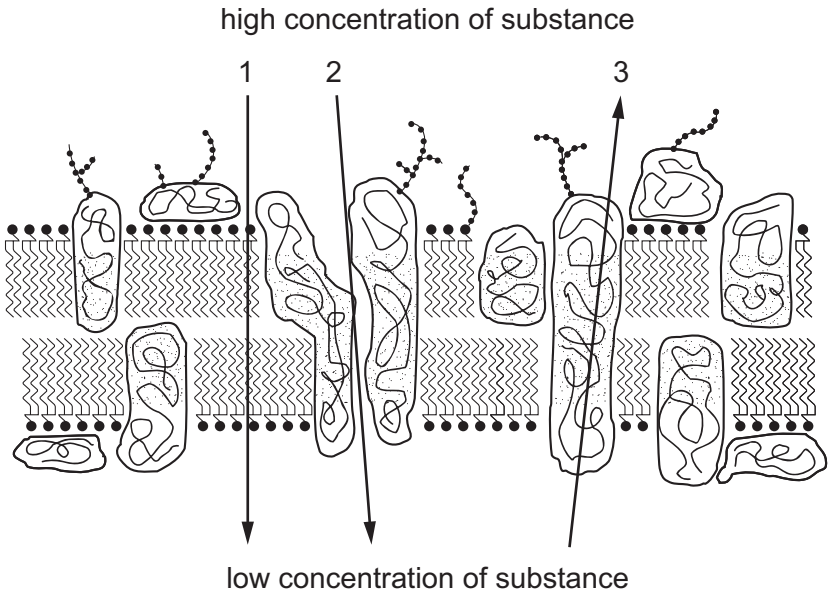
C The permeability of the cell surface membrane to ions is increased with an increase in the proportion of saturated fatty acids in the phospholipids.

D Without the presence of carrier and channel membrane proteins, the cell surface membrane has a low permeability to large polar molecules.

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16 The diagram represents a cell surface membrane.



Three pathways through the membrane are shown.

Which process is represented by each arrow?

	1	2	3
A	active transport	diffusion	facilitated diffusion
B	diffusion	active transport	facilitated diffusion
C	diffusion	facilitated diffusion	active transport
D	facilitated diffusion	diffusion	active transport

17 Which set of factors will produce the **most** fluid cell surface membrane?

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

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18 The protein p53 is produced in a cell in response to DNA damage.

A scientist exposed three groups of cells, X, Y and Z, to different conditions.

group of cells	conditions cells were exposed to
X	ionising radiation
Y	ultra-violet light
Z	nicotine

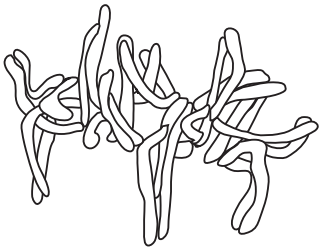
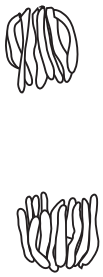
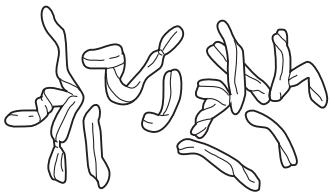
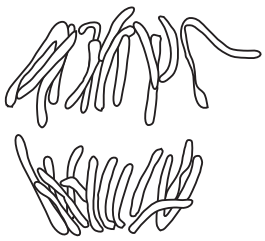
In which groups of cells would the scientist find large quantities of p53 mRNA?

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

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19 Which row is correct?

	diagram	stage
A		interphase
B		metaphase
C		telophase
D		anaphase

20 What is needed to transcribe DNA?

A DNA ligase

B DNA polymerase

C ribosomes

D RNA polymerase

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21 In a ribosome, which bond holds together two adjacent amino acids?

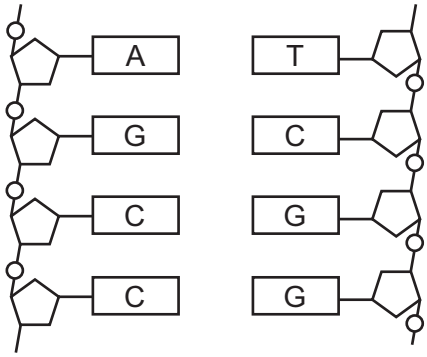
A disulfide

B hydrogen

C ionic

D peptide

22 The diagram shows part of a DNA molecule.



How many hydrogen bonds are involved in holding these strands of DNA together?

A 11 **B** 9 **C** 8 **D** 4

23 Which features of these cells make them suitable for their function?

	companion cells	xylem vessel elements
A	circulating contents allow transport in both directions	lignified walls provide support
B	cellulose walls provide support	nuclei allow cell division
C	nuclei allow cell division	gaps between cells allow rapid transport
D	numerous mitochondria supply energy	absence of cytoplasm allows mass flow

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24 What is the sequence of events in the translocation of sucrose?

A active loading of sucrose into sieve elements at the source, increased hydrostatic pressure, mass flow, unloading at the sink

B hydrolysis of storage compounds in sinks, lowered water potential, unloading of sucrose from sieve elements, mass flow from the source

C lowered pressure in sieve elements at the source, movement of sucrose down the pressure gradient, mass flow down a diffusion gradient to the sink

D mass flow of dissolved sucrose into the sieve element at the source, lowered hydrostatic pressure, diffusion of sucrose to sink, active unloading

25 Where does water evaporate from during transpiration?

A inside the guard cells

B the outer surface of the epidermal cell layer

C the sub-stomatal cavity

D the surface of spongy mesophyll cell walls

26 Which changes to the water potential and the volume of liquid in the phloem occur when amino acids are taken out of a sink in a phloem sieve tube?

	water potential in phloem sieve tubes	volume of liquid in phloem sieve tubes
A	higher	decreased
B	higher	increased
C	lower	decreased
D	lower	increased

27 Which reaction takes place in a capillary in the lungs?

A the formation of carbaminohaemoglobin from carbon dioxide and haemoglobin

B the formation of carbon dioxide and water from hydrogen carbonate ions and hydrogen ions

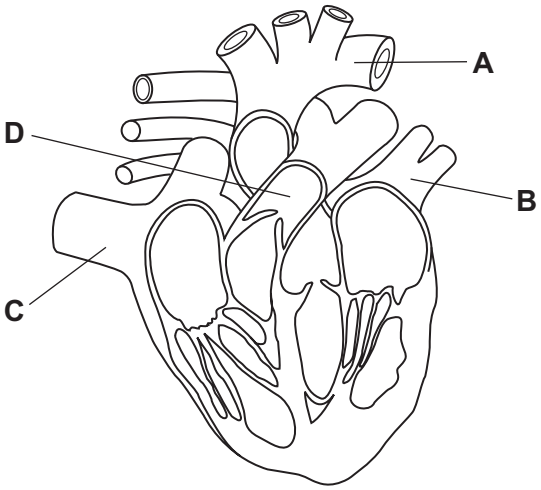
C the formation of carbonic acid from carbon dioxide and water

D the formation of haemoglobinic acid from haemoglobin and hydrogen ions

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28 Which structure is correctly identified?



A aorta

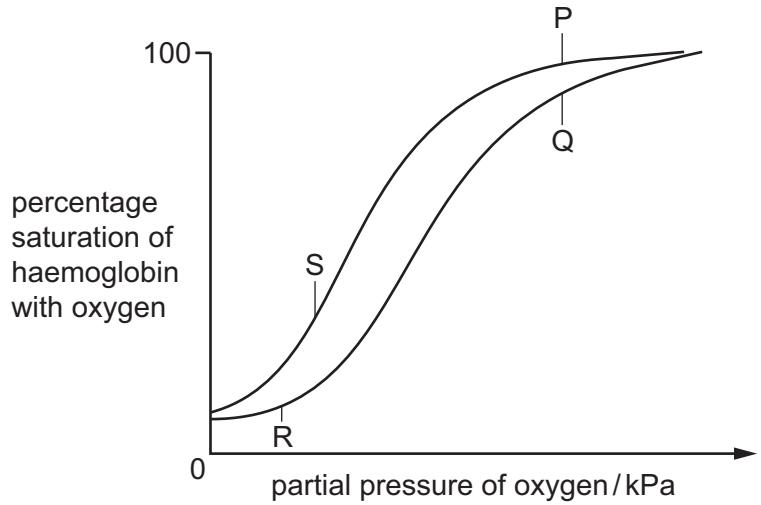
B pulmonary artery

C pulmonary vein

D vena cava

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29 Resting muscle has a lower respiration rate than active muscle. The graph shows the oxygen dissociation curves for haemoglobin at carbon dioxide concentrations that are found in a resting muscle and an active muscle.
P and Q are at the partial pressures of oxygen found in the lungs.
R and S are at the partial pressures of oxygen found in **either** a resting muscle **or** an active muscle.



Which statements are correct?

1 The % saturation at P minus the % saturation at S represents the amount of oxygen delivered to a resting muscle.

2 The % saturation at Q represents the amount of oxygen carried to an active muscle.

3 The % saturation at R represents the amount of oxygen required by a resting muscle.

4 The % saturation at P minus the % saturation at Q represents the amount of oxygen delivered to an active muscle.

5 The % saturation at Q minus the % saturation at S represents the amount of oxygen delivered to a resting muscle.

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

30 What does **not** help to maximise uptake of oxygen as blood flows through capillaries in the lungs?

A Dissociation of carbon dioxide from carboxyhaemoglobin allows more haemoglobin to be available for oxygen binding.

B Each haemoglobin molecule can temporarily bind to eight oxygen atoms.

C Oxyhaemoglobin formation increases the capacity of red blood cells to transport oxygen.

D The binding of the first oxygen molecule to haemoglobin increases the molecule's affinity for binding other oxygen molecules.

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31 What correctly describes the role of elastic fibres in the lungs?

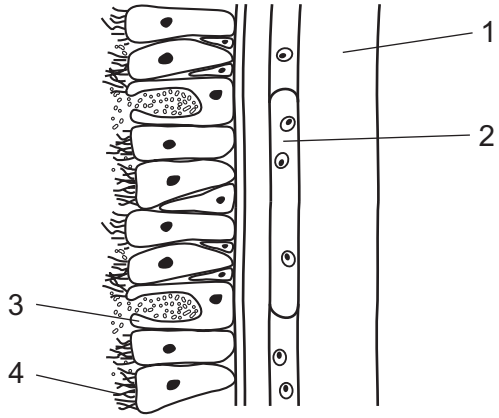
A They allow the walls of stretched alveoli to recoil as air is breathed out.

B They increase in the walls of alveoli as a result of the release of the enzyme elastase.

C They increase in the walls of the alveoli as emphysema develops.

D They prevent the walls of the alveoli from collapsing as air is breathed in.

32 The diagram represents a section through the wall of a bronchus (not to scale).



In a person with chronic obstructive pulmonary disease (COPD), what happens in each of the numbered structures?

	1	2	3	4
A	contracts	contracts	inhibited	not affected
B	contracts	not affected	overactive	inhibited
C	relaxes	contracts	inhibited	paralysed
D	relaxes	not affected	overactive	overactive

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33 The symptoms of two diseases are listed.

disease 1	disease 2
persistent cough	shortness of breath
pain when breathing	wheezing
loss of weight	fatigue

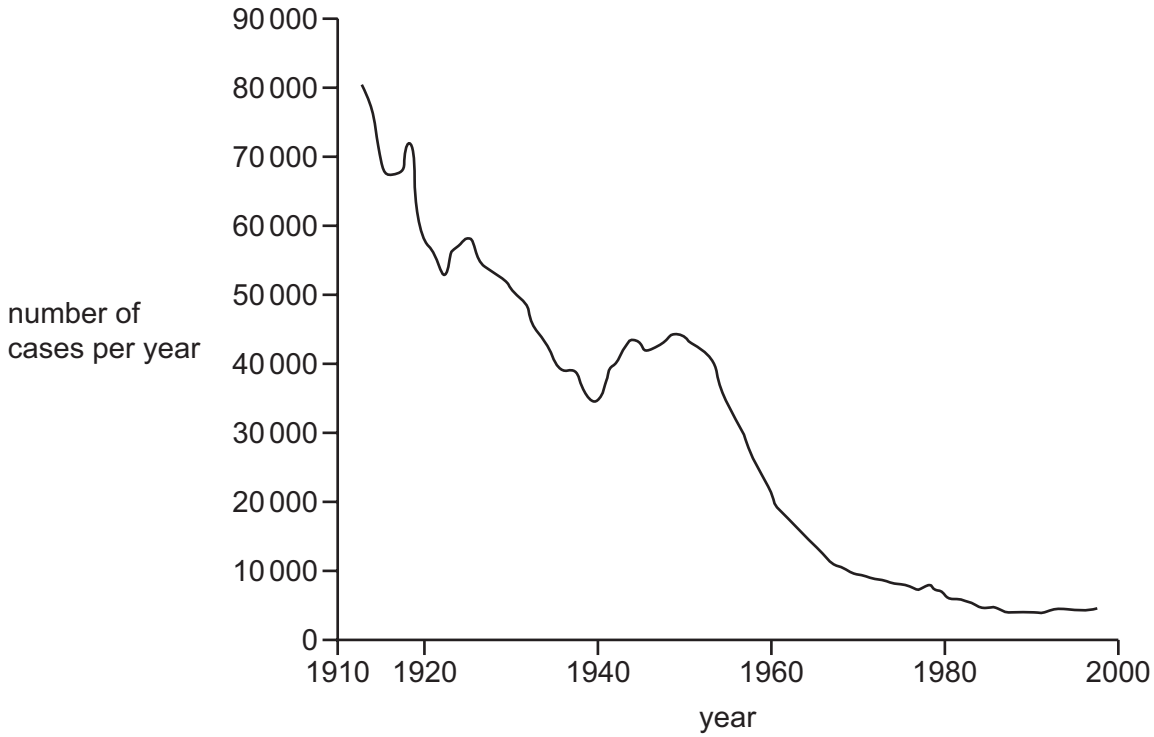
Which row identifies diseases 1 and 2?

	disease 1	disease 2
A	chronic bronchitis	emphysema
B	emphysema	lung cancer
C	lung cancer	chronic bronchitis
D	lung cancer	emphysema

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34 The graph shows the fall in cases of tuberculosis (TB) in a country between 1910 and 2000.



Which factors could have contributed to the fall over this period?

1 pasteurisation of milk

2 the provision of new housing

3 chemical treatment of sewage

4 identification of contacts of people infected with TB

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

35 Which row is correct for cholera?

	nature of disease	method of transmission	causative agent (pathogen)
A	infectious	insect vector	species of *Plasmodium*
B	infectious	water-borne	species of *Vibrio*
C	non-infectious	insect vector	species of *Plasmodium*
D	non-infectious	water-borne	species of *Vibrio*

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[Turn over

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36 Which action is taken by a B-lymphocyte activated by an antigen?

A It attaches to the infected cell displaying the antigen and destroys it.

B It divides repeatedly to form a clone of genetically identical plasma cells.

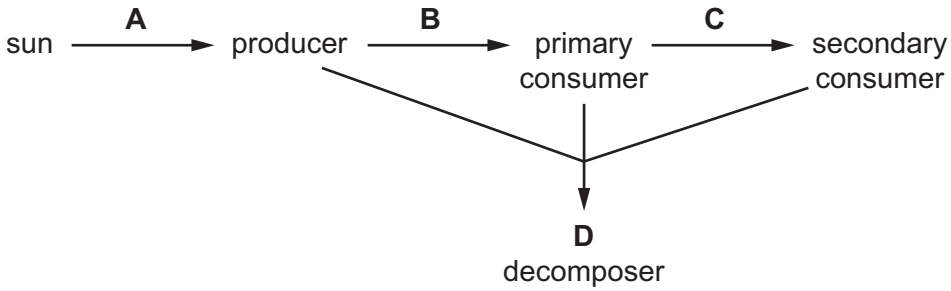
C It engulfs the infected body cell which displays the antigen.

D It secretes cytokines which stimulate T-lymphocytes to produce plasma cells.

37 The synthesis of specific antibodies in response to vaccination is an example of which type of immunity?

	natural	artificial
active	**A**	**B**
passive	**C**	**D**

38 At which stage of a food chain in a tropical grassland is the energy transfer least efficient?



39 A farmer grows a different crop in a field each year for three years.

In the fourth year he grows a leguminous crop, such as clover, and then ploughs this into the soil. The next year he starts the rotation again.

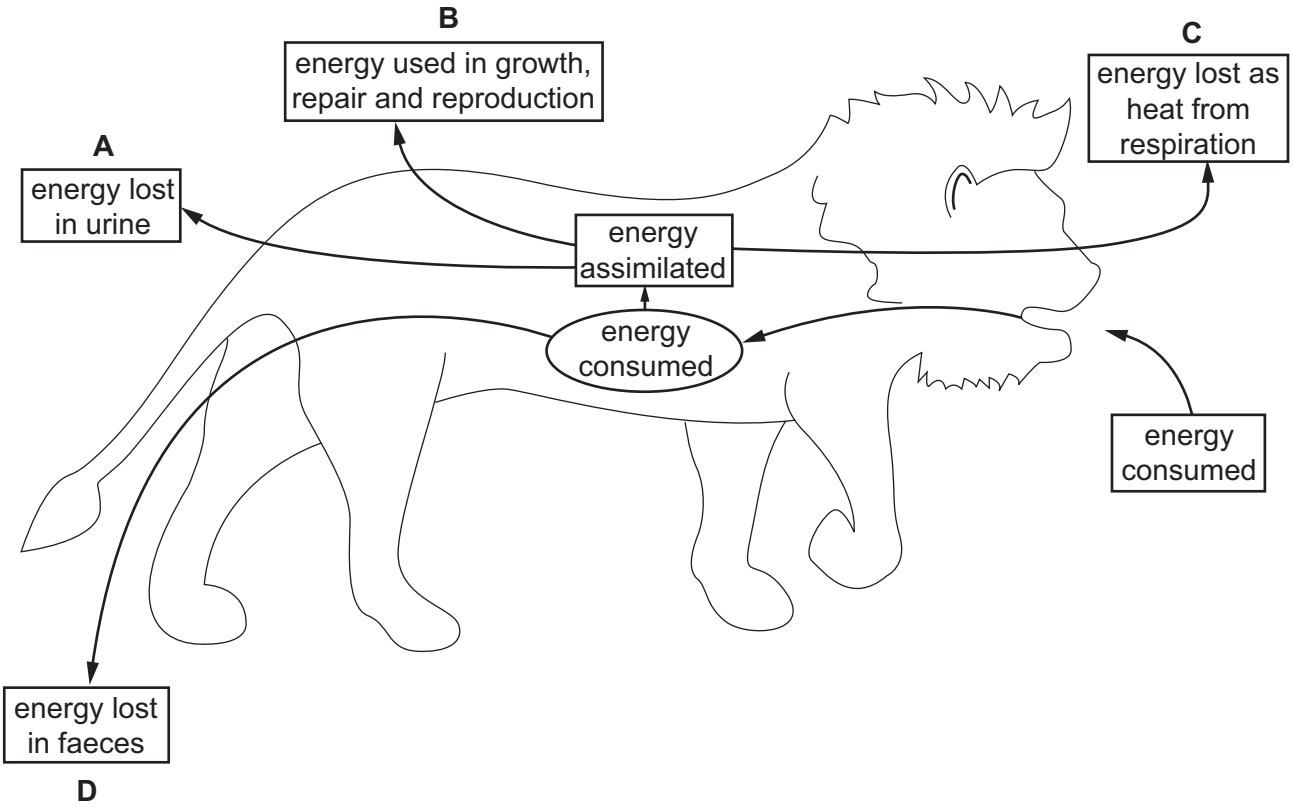
How does the fourth year crop add mineral ions to the soil?

	decomposition	nitrification	nitrogen fixation
A	no	yes	yes
B	yes	no	yes
C	yes	yes	no
D	yes	yes	yes

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40 Of the prey consumed by the lion, into which box does the largest amount of energy go?



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Cambridge International AS & A Level

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Cambridge International Advanced Subsidiary and Advanced Level

BIOLOGY **9700/13**

Paper 1 Multiple Choice **May/June 2015**

1 hour

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

2027041770

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 **16** printed pages.

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CAMBRIDGE International Examinations

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1 What are found in both mitochondria and typical prokaryotic cells?

A 70S ribosomes and circular DNA

B 70S ribosomes only

C 80S ribosomes and circular DNA

D circular DNA only

2 Which statements about light microscopes are correct?

1 To calculate the magnification of a light microscope the eyepiece lens and objective lens magnifications are added together.

2 As the magnification increases the resolution decreases.

3 The resolution of a light microscope is limited by the wavelength of light.

4 The scale on a stage micrometer is resolved more clearly than an eyepiece graticule.

A 1, 2, 3 and 4

B 1, 3 and 4 only

C 2 and 3 only

D 2 and 4 only

3 Which comparison of a phloem companion cell with a B-lymphocyte is correct?

A Both cell types have proteins embedded in their cell surface membranes.

B B-lymphocytes have a spherical nucleus but companion cells do not have a nucleus.

C Companion cells always contain chloroplasts, which are not present in B-lymphocytes.

D Neither B-lymphocytes nor companion cells possess plasmodesmata.

4 Ribosomes exist as separate subunits that bind together during protein synthesis.

What do these subunits consist of?

A mRNA and protein

B mRNA and tRNA

C rRNA and protein

D rRNA and tRNA

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5 Which structures in plant cells have a double membrane?

A chloroplasts and vacuoles

B lysosomes and nuclei

C mitochondria and vacuoles

D nuclei and mitochondria

6 What is the diameter of a typical prokaryote, such as *Streptococcus*?

A 7.5×10^{1} nm

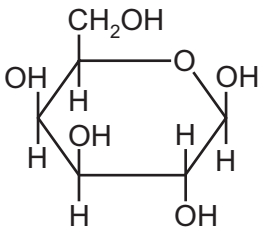
B 7.5×10^{2} nm

C 7.5×10^{0} μm

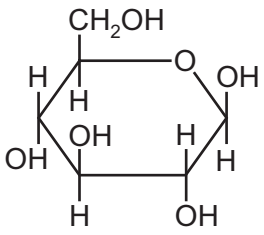
D 7.5×10^{1} μm

7 Which molecule is α-glucose?

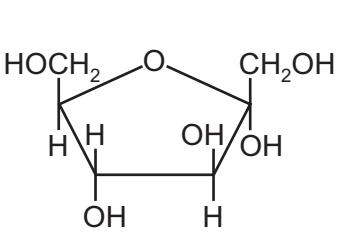
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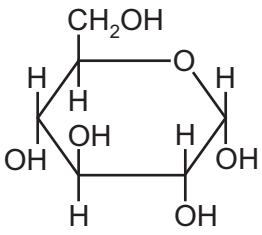
B



C

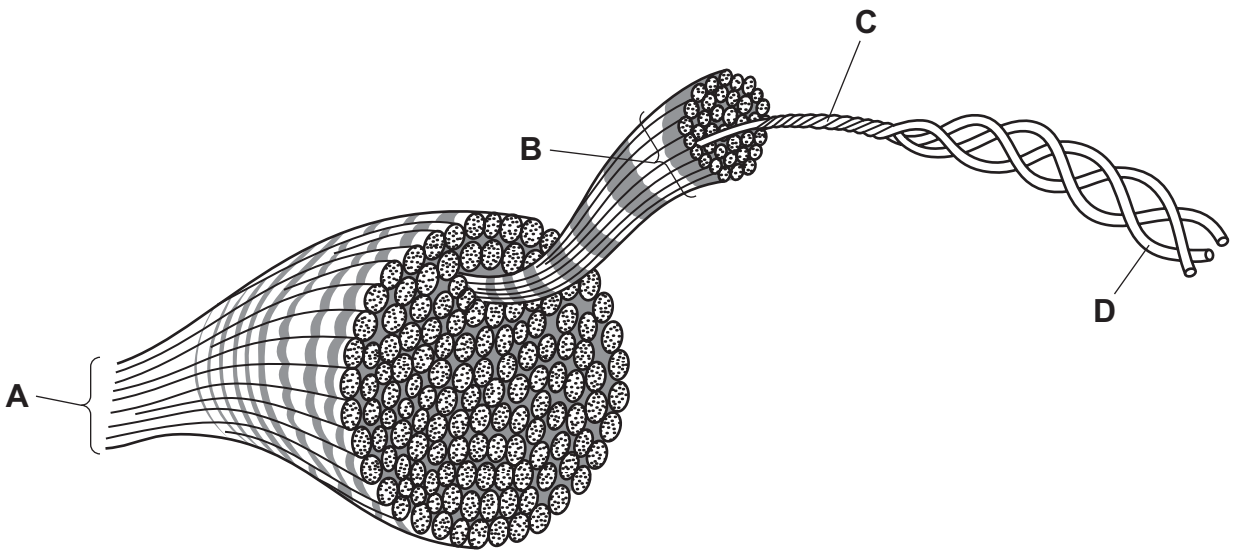


D



8 The diagram shows the three dimensional structure of collagen.

Which labelled part represents a molecule of collagen?



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9 Which type of bond does **not** hold together the tertiary structure of a protein?

A disulfide

B hydrogen

C hydrophobic interactions

D peptide

10 Which properties of water are a result of only cohesion?

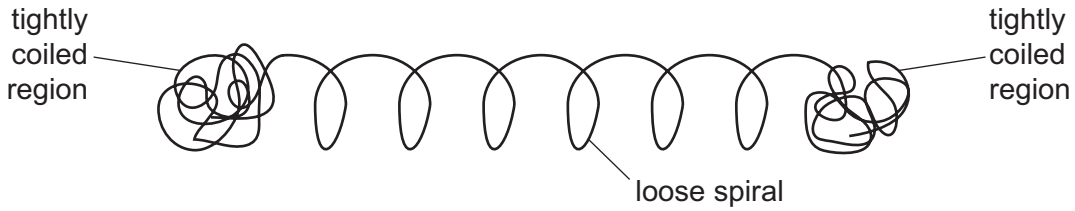
1 The water has a high surface tension.

2 Water moves up xylem vessels.

3 Water is an excellent solvent.

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

11 The protein glutenin gives bread dough its elasticity. The diagram represents a polypeptide of glutenin.



What describes the structure of glutenin?

A quaternary structure because there are both globular and fibrous regions

B quaternary structure because there are both spiral and tightly coiled regions

C secondary structure because the loose spiral is an α-helix

D tertiary structure because the different regions form a 3D shape

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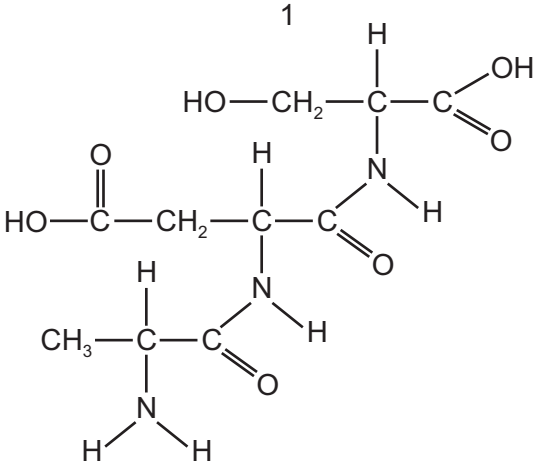
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12 A student carried out four tests for biological molecules. The observations are shown in the table.

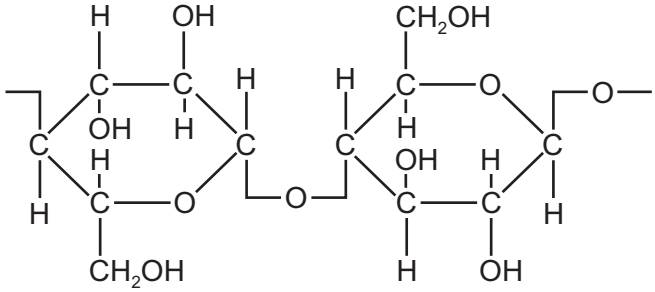
test	observations
iodine	orange
biuret	purple
Benedict's	orange
emulsion	clear

Which molecules are present in the solution?

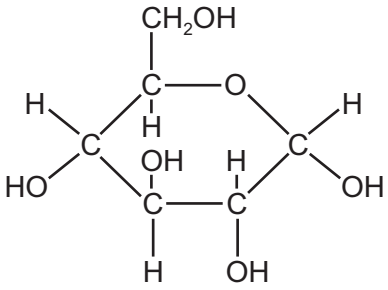
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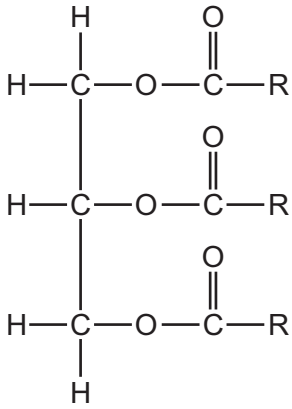
2



3



4



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

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13 Some inhibitors of enzyme reactions bind to the enzyme-substrate complex.

Which statements about this type of inhibition are correct?

1 The active site changes shape.

2 The inhibitor is non-competitive.

3 The initial rate of reaction is reduced.

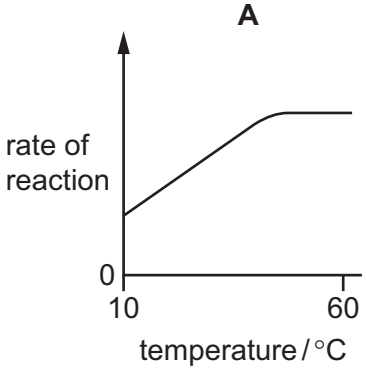
4 The maximum rate of reaction (V_{max}) stays the same.

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

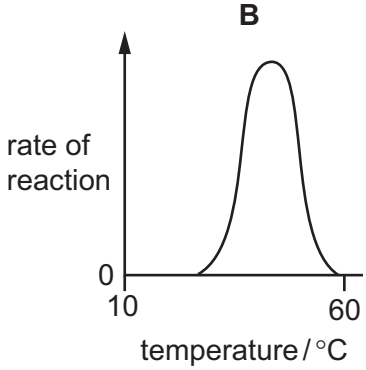
14 The enzyme DNA polymerase is used in DNA replication. This enzyme was extracted from bacteria living in natural hot water springs where the water temperature is between 85 °C and 95 °C.

Which graph would represent the relationship between temperature and the rate of DNA replication when catalysed by the enzyme from these bacteria?

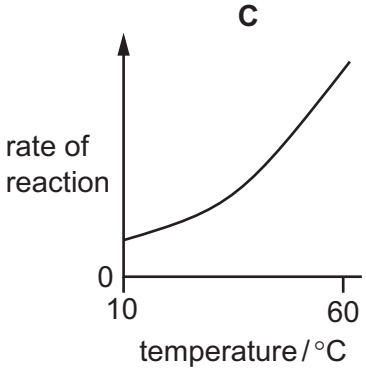
A



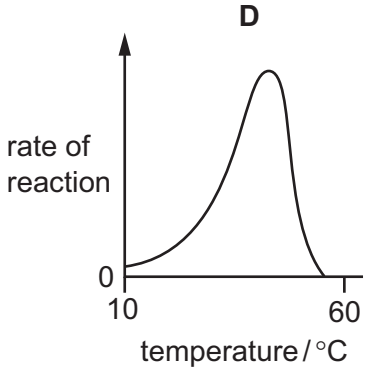
B



C



D



15 What supports the view that a membrane protein is involved in active transport?

A It allows movement of molecules across a membrane if concentration differences exist.

B It can only function if mitochondria are supplied with sufficient oxygen.

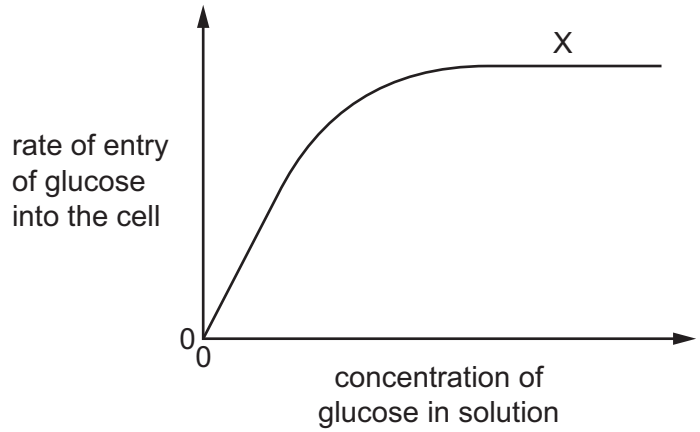
C It has a tertiary structure with a binding site with a specific shape.

D It is found in the cell surface membranes and the mitochondrial membranes.

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16 The graph shows the effect of increasing the concentration of glucose in a solution on the rate of entry of glucose into a cell.



What are **not** causes of the plateau at X?

1 All the carrier proteins are saturated with glucose.

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

3 The cell has used up its supply of ATP.

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

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

17 Which set of factors will produce the **least** fluid cell surface membrane?

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

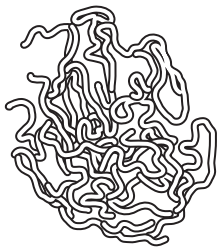
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18 The diagrams show chromosomes at different stages of mitosis.

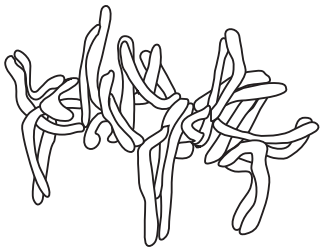
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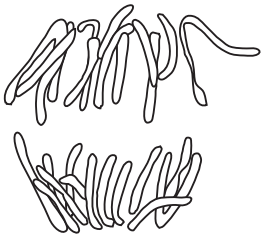
X



Y



Z



Which shows the correct order of the cell cycle?

A W → X → Y → Z

B X → Y → Z → W

C Y → Z → W → X

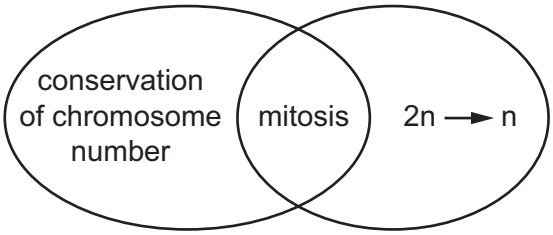
D Z → W → X → Y

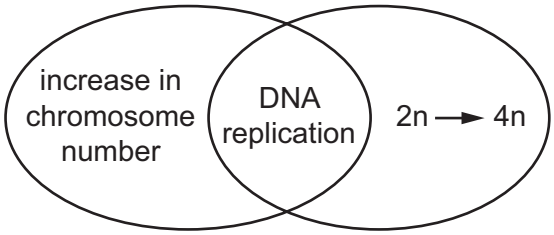
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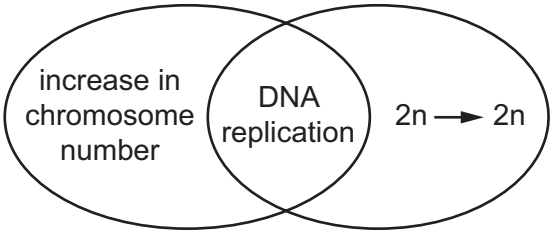
19 Which diagrams show the correct relationships?

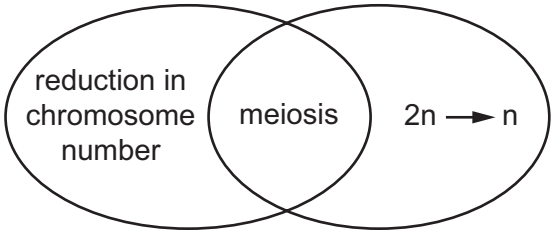
A



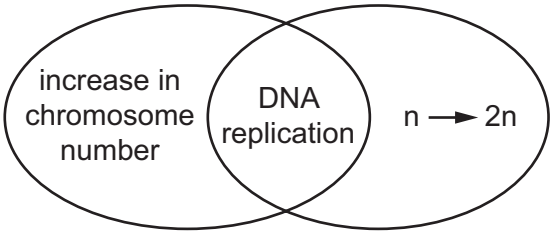


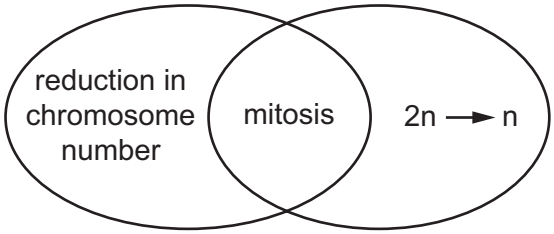
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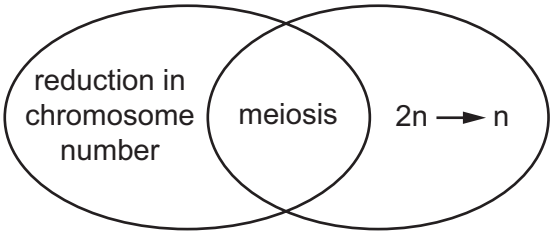


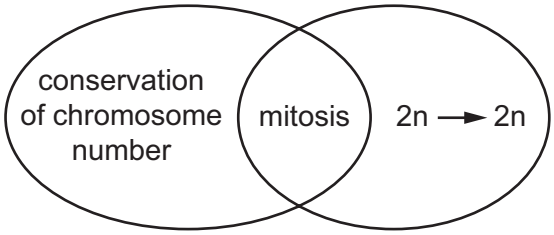
C





D





20 Which row correctly describes adenine?

	complementary base	component on nucleotide strand it is attached to	ring structure
A	thymine	deoxyribose	double
B	thymine	phosphate	single
C	uracil	phosphate	double
D	uracil	ribose	single

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21 Which row shows two pairs of nucleotides formed when mRNA is translated?

	first base pair translated		second base pair translated	
	bases present	number of hydrogen bonds	bases present	number of hydrogen bonds
A	AT	2	TU	2
B	AU	2	AT	2
C	AU	2	GC	3
D	AU	3	GC	3

22 Sickle cell anaemia is caused by a mutation in an allele of the gene that codes for the β-globin polypeptide of haemoglobin.

The diagram shows the sequence of bases in a small section of the coding strand of DNA for both the HbA (normal) and HbS (sickle cell) β-globin alleles.

HbA CTGACTCCTGAGGAGAAGTCT

HbS CTGACTCCTGTGGAGAAGTCT

How will the mutation in the HbS allele result in the production of an altered version of the β-globin polypeptide?

A A tRNA molecule with the anticodon GUG will hydrogen bond to the altered codon on mRNA.

B All the amino acids coded for after the mutation will differ from those in the HbA protein.

C mRNA transcribed from the HbS allele will contain the codon CAC instead of the codon CTC.

D The ribosome will be unable to continue translation of the HbS mRNA after the altered codon.

23 Which force holds water molecules on the surface of cell walls?

A adhesion

B capillarity

C cohesion

D surface tension

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24 The statements are about the properties of water.

1 requires a lot of heat to evaporate

2 holds a lot of heat

3 is able to form hydrogen bonds with other water molecules

4 is able to form hydrogen bonds with other polar molecules

Which properties are important for translocation in phloem?

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

25 Which changes to the water potential and the volume of liquid in the phloem occur when amino acids are moved into a phloem sieve tube at a source?

	water potential in phloem sieve tubes	volume of liquid in phloem sieve tubes
A	higher	decreased
B	higher	increased
C	lower	decreased
D	lower	increased

26 Which feature of transport in xylem depends on the use of energy?

A mass flow of water to the leaves

B osmosis of water into xylem

C uptake of ions into the root

D transpiration of water from the leaves

27 What is correct about the transport of carbon dioxide by blood?

1 The enzyme carbonic anhydrase catalyses the formation of carbonic acid in red blood cells.

2 Carbon dioxide diffuses from respiring cells to red blood cells and reacts with water.

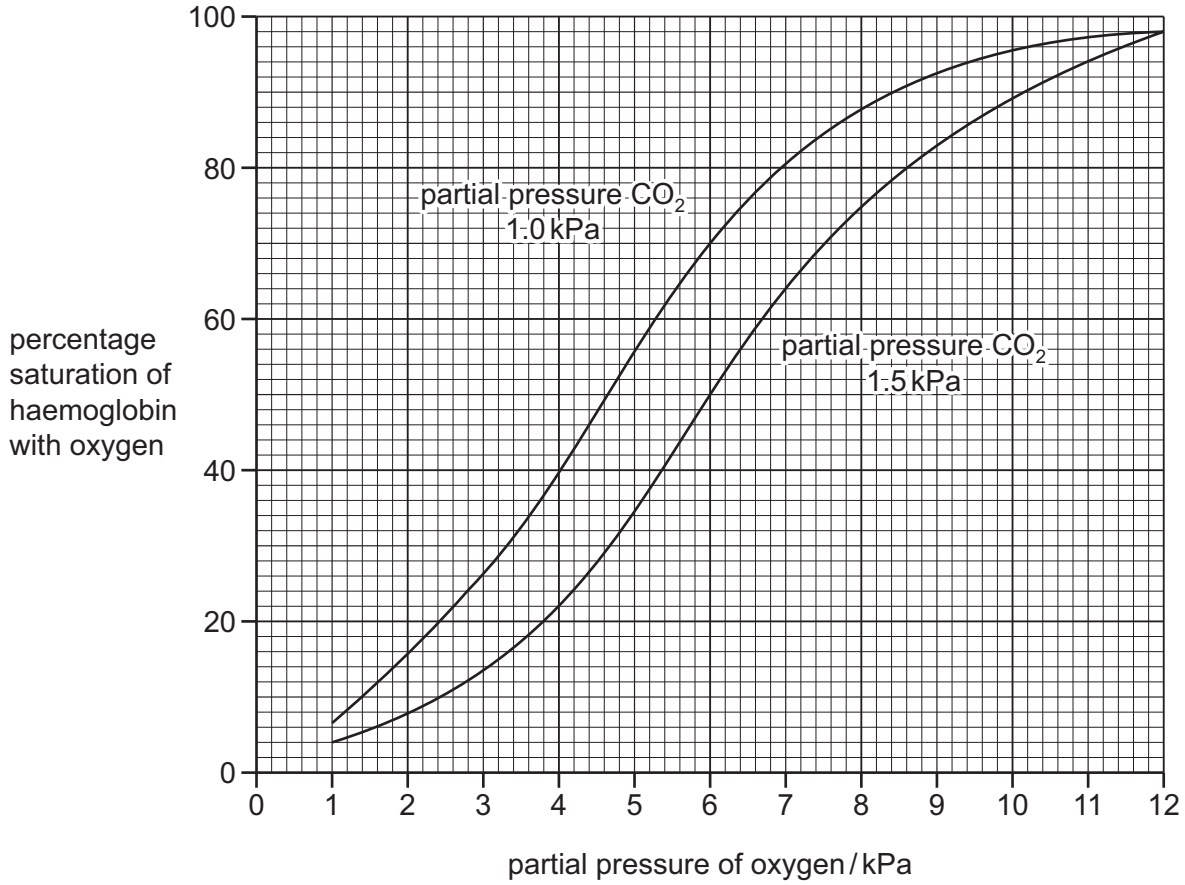
3 Carbonic acid dissociates forming hydrogen ions that combine with haemoglobin to form carbaminoglobin.

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

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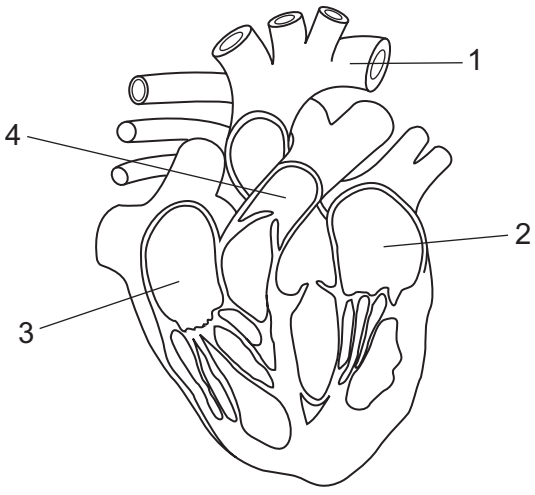
28 The graph shows the effect of different partial pressures of carbon dioxide (CO_2) on the oxygen dissociation curve for haemoglobin.



What is the change in percentage oxygen saturation of haemoglobin at a partial pressure of oxygen of 6 kPa as the partial pressure of carbon dioxide changes from 1.0 kPa to 1.5 kPa?

A –26% **B** –20% **C** 20% **D** 46%

29 Which structures transport deoxygenated blood?



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

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30 Which effect could be due to a reduced concentration of carbonic anhydrase?

A carbaminohaemoglobin concentrations will decrease

B less oxygen is released from oxyhaemoglobin in respiring tissues

C the pH of the blood will be lowered

D the rate of dissociation of carbonic acid is increased

31 Which row identifies the effects on the body of nicotine in tobacco smoke?

	reduces the diameter of small arteries (arterioles)	increases the secretion of adrenaline	combines with haemoglobin
A	✓	✓	✓
B	✓	✓	✗
C	✓	✗	✓
D	✗	✓	✓

key
✓ = true
✗ = false

32 Lung cancer and chronic obstructive pulmonary disease (COPD) share a number of common symptoms.

Which symptom is typical of lung cancer and not COPD?

A coughing up blood

B mucus production increases

C persistent cough that does not go away

D wheezing (difficulty breathing)

33 A person breathes in small particles from a very dusty environment.

What effect will this have on B-lymphocytes and goblet cells?

	B-lymphocytes	goblet cells
A	less active	more active
B	less active	no change
C	more active	more active
D	no change	less active

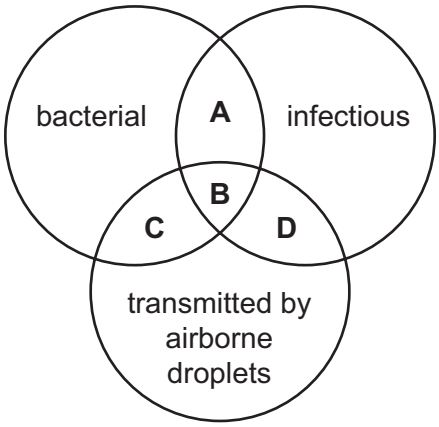
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[Turn over

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34 The diagram shows properties of diseases.

What shows the properties that are common to **both** tuberculosis (TB) and measles?



35 Strains of *Mycobacterium* have been found that are:

- multiple drug-resistant (MDR) – resistant to the drugs most commonly used to control tuberculosis (TB)
- extensively drug-resistant (XDR) – resistant to the drugs most commonly used to control TB and to some of the drugs less commonly used to control TB
- totally drug-resistant (TDR) – resistant to all known drugs used to control TB.

Comparisons of some of these strains of *Mycobacterium* found differences in the thickness of their cell walls, as shown in the table.

Mycobacterium	thickness of cell wall / nm
non-resistant	15
MDR	17
TDR	20

What conclusions may be drawn from this information?

A Bacteria secrete thicker cell walls when in contact with a mixture of drugs.

B The cell walls of TDR bacteria are impermeable to drugs.

C Thicker cell walls may form a physical barrier to drugs.

D XDR bacteria have cell walls between 17 and 20 nm thick.

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36 What describes natural passive immunity?

A protection against a pathogen by an injection of antibodies

B protection against a pathogen by drinking colostrum containing antibodies

C stimulation of lymphocytes by antigens contained in a vaccine

D stimulation of lymphocytes by antigens on the surface of invading pathogens

37 What happens when people are injected with dead bacteria?

A B-lymphocytes produce antibodies.

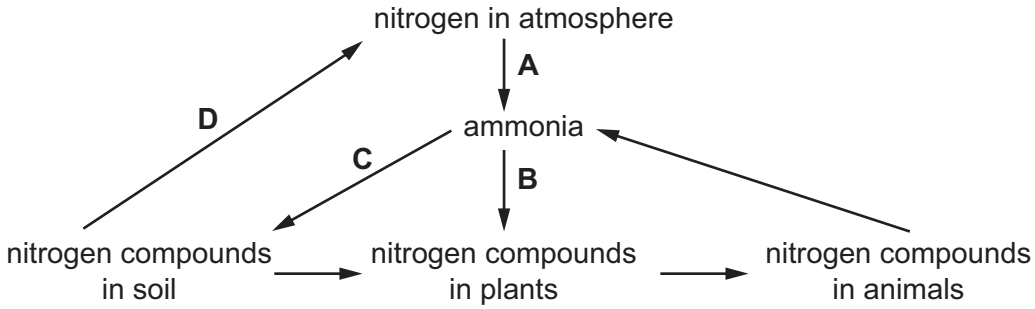
B B-lymphocytes produce antigens.

C T-lymphocytes produce antibodies.

D T-lymphocytes produce antigens.

38 The diagram represents part of the nitrogen cycle.

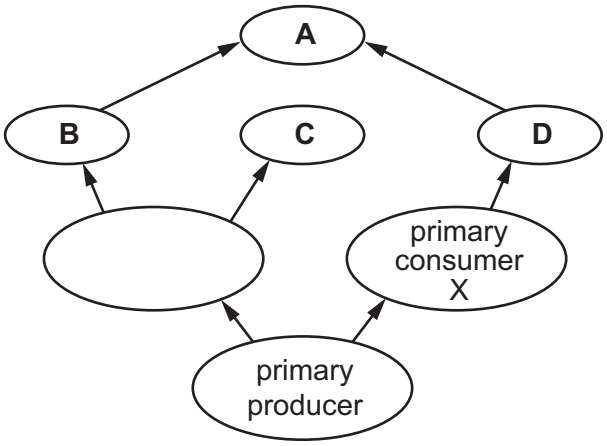
Which process is carried out by nitrifying bacteria?



39 A primary consumer, X, is lost 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?



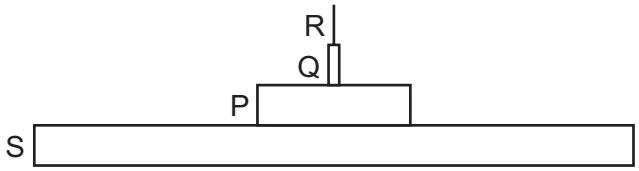
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40 The table shows the results of a field study of four species in a food chain in an area of woodland.

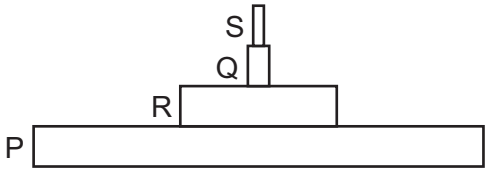
species	number of individuals	biomass of one individual / arbitrary units	energy value per unit mass / arbitrary units
P	10 000	0.100	1.0
Q	5	10.000	2.0
R	500	0.002	1.8
S	3	300 000.000	0.5

Which is the correct pyramid of energy from these data?

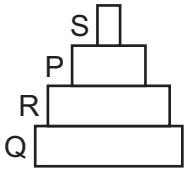
A



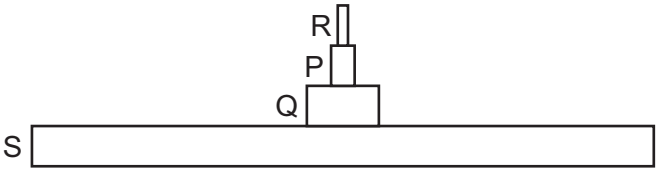
B



C



D



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