Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

BIOLOGY **9700/11**

Paper 1 Multiple Choice **October/November 2015**

1 hour

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

9586539003

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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1 Which size of ribosome is found in chloroplasts and typical prokaryotic cells?

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

2 Pancreatic cells have a diameter of 35 μm.

Red blood cells have a diameter of 7000 nm.

Which statement is correct?

A Pancreatic cells are 5 times larger than red blood cells.

B Pancreatic cells are 50 times larger than red blood cells.

C Pancreatic cells are 5 times smaller than red blood cells.

D Pancreatic cells are 50 times smaller than red blood cells.

3 Which process occurs in a mature red blood cell?

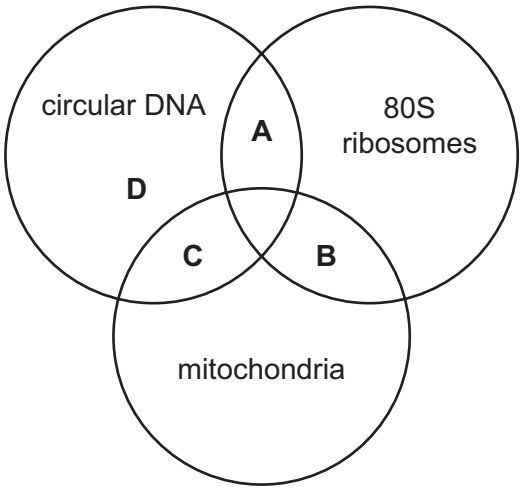
A active transport

B cell division

C transcription

D translation

4 Which structures are present in a *Vibrio cholerae* cell?



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5 Which features of microvilli and root hairs are correct?

	increase cell surface area	cannot be resolved with the light microscope	contain vacuoles	more than one present on a cell
A	microvilli	microvilli	root hairs	microvilli
B	microvilli	root hairs	microvilli	microvilli
C	root hairs	microvilli	root hairs	root hairs
D	root hairs	root hairs	microvilli	root hairs

6 Which order of organelles is correct when a protein is synthesised and secreted?

A Golgi body → lysosome → ribosome → nucleus

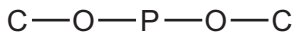
B nucleus → ribosome → Golgi body → vesicle

C ribosome → nucleus → lysosome → Golgi body

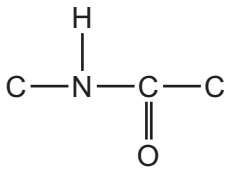
D vesicle → Golgi body → nucleus → ribosome

7 Which diagram shows the bond linking the individual units of both glycogen and amylose?

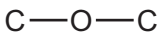
A



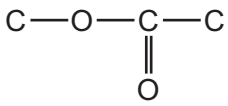
B



C



D



8 Tests for biological molecules were carried out on three solutions.

The observations were as follows.

solution 1 Benedict's test – blue to orange

solution 2 Benedict's test after acid hydrolysis – blue to red

solution 3 biuret test – blue to purple

Which observations would show the solutions that contained sucrose and amylase?

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

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[Turn over

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9 Which row describes a triglyceride?

	hydrophilic	insoluble in alcohol
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

key

✓ = correct

✗ = not correct

10 A solution containing equal masses of amylose and amylopectin is completely hydrolysed.

Which molecules will be found after the hydrolysis?

A α-glucose only

B β-glucose only

C equal masses of α-glucose and β-glucose

D more α-glucose than β-glucose

11 When a lake begins to freeze, which properties of water are needed for fish to survive?

1 Water has a high surface tension.

2 Water has a high latent heat of vaporisation.

3 Water has a high thermal capacity.

4 Water has its maximum density at 4 °C.

	1	2	3	4
A	✓	✓	✓	✗
B	✓	✗	✓	✗
C	✗	✓	✗	✓
D	✗	✗	✓	✓

key

✓ = needed

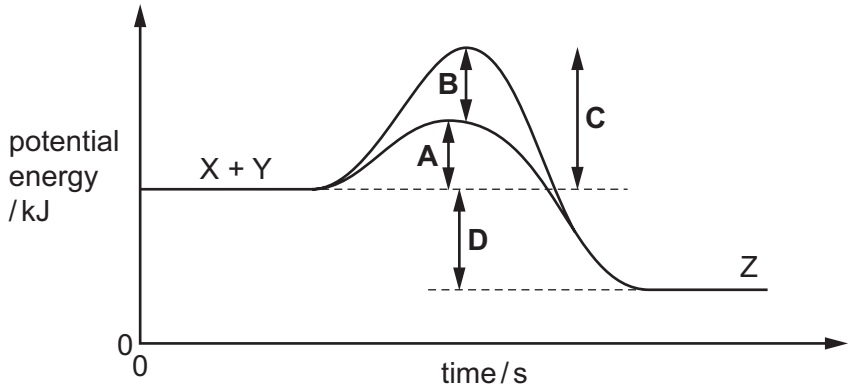
✗ = not needed

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12 The graph shows the energy levels involved in an enzyme-catalysed reaction. Substrate molecules X and Y combine to give product Z.

Which arrow shows the reduction in activation energy due to the enzyme?



13 Which statements about enzyme inhibitors are correct?

1 Competitive inhibitors may be similar shapes to the substrate.

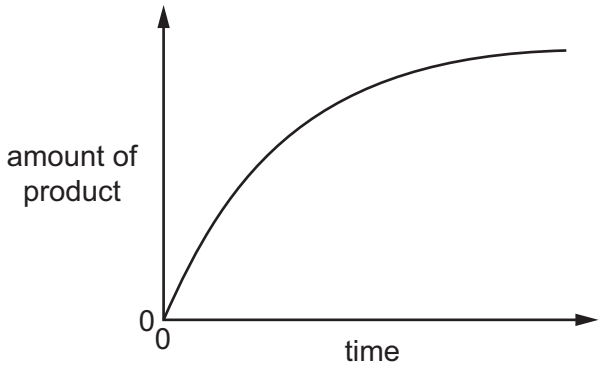
2 Competitive inhibitors bind to the active site.

3 Non-competitive inhibitors alter the shape of the enzyme.

4 Non-competitive inhibitors bind to the substrate.

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

14 A fixed volume of the enzyme catalase was added to a fixed volume of hydrogen peroxide solution. The diagram shows how the amount of product changed over the course of the reaction.



What explains the shape of this graph?

A The active sites become saturated.

B The enzyme was denatured.

C The hydrogen peroxide inhibited the reaction.

D The substrate molecules were used up.

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15 Which descriptions are correct about transport across cell surface membranes?

	active processes	passive processes
A	endocytosis and exocytosis	diffusion and osmosis
B	exocytosis and facilitated diffusion	osmosis and endocytosis
C	facilitated diffusion	exocytosis and osmosis
D	facilitated diffusion and exocytosis	endocytosis and diffusion

16 The statements are comparisons of endocytosis and exocytosis.

- Both are mechanisms that involve vesicles or vacuoles and the transport of materials across the cell surface membrane.
- Both mechanisms occur to allow bulk transport across the cell surface membrane.
- Endocytosis involves taking materials into the cell whereas exocytosis involves the release of materials from the cell.
- Some of the cell surface membrane is lost when endocytosis occurs and there is an increase in the cell surface membrane when exocytosis occurs.

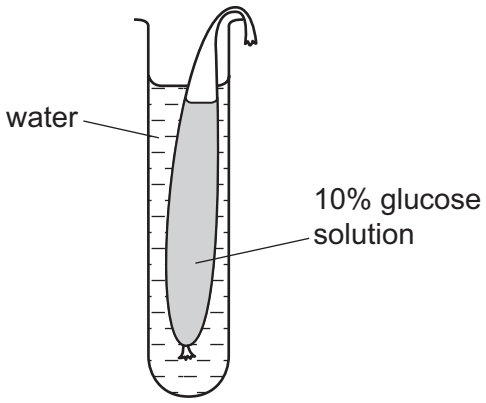
How many of the statements are correct?

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

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17 The diagram shows apparatus set up to investigate the effect of putting a 10% glucose solution in a selectively permeable bag (Visking tubing) and surrounding it with water.



Samples from the surrounding water were tested with Benedict's solution after 10 minutes and after 20 minutes. The change in volume of glucose solution was observed after 20 minutes.

Which row is correct?

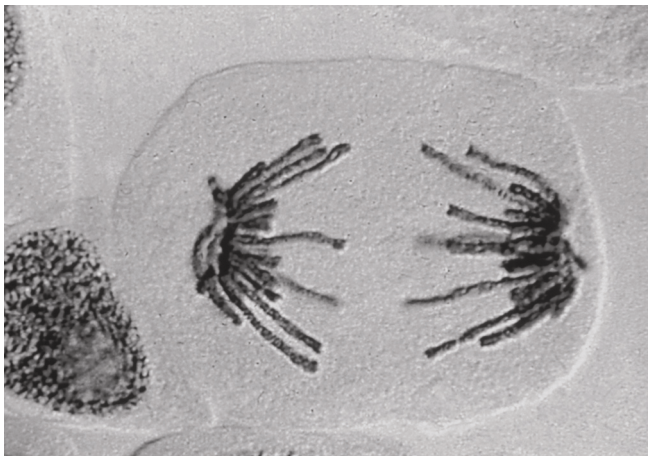
	result of Benedict's test		volume of glucose solution in Visking tubing / cm^3
	after 10 minutes	after 20 minutes	
A	green	blue	increased
B	green	orange	increased
C	red	orange	decreased
D	yellow	green	decreased

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18 The photomicrograph shows a cell during mitosis.



What is happening in this cell?

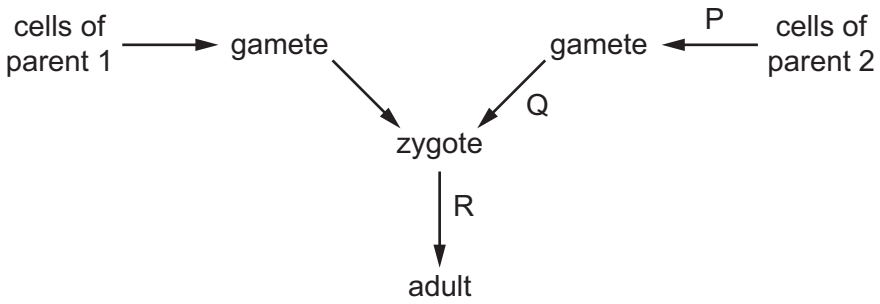
1 Centrioles are replicating.

2 Spindle microtubules are shortening.

3 Chromatin is condensing.

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

19 The diagram represents stages in the life cycle of an organism.



Which arrow represents a process that results in haploid cells and which represents mitosis?

	produces haploid cells	mitosis
A	P	Q
B	Q	R
C	R	Q
D	P	R

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20 The statements describe the features of some nucleic acids.

1 carry an amino acid to a ribosome

2 carry a genetic code sequence out of the nucleus

3 carry a genetic code sequence to a ribosome

Which functions are carried out **only** by mRNA?

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

21 The antibiotic chloramphenicol prevents prokayotes from reproducing by inhibiting the enzyme which catalyses the formation of peptide bonds during translation.

What will be prevented by the action of this antibiotic?

A binding of amino acids to tRNA

B condensation of amino acids

C pairing between codons and anticodons

D positioning of amino acids by tRNA

22 Which row shows two pairs of nucleotide bases in a molecule of DNA?

	first base pair		second base pair	
	bases present	number of hydrogen bonds	bases present	number of hydrogen bonds
A	AC	2	GT	3
B	AC	3	GT	2
C	AT	2	GC	3
D	AT	3	GC	2

23 By which process does sucrose move through phloem sieve tube elements?

A active transport

B diffusion

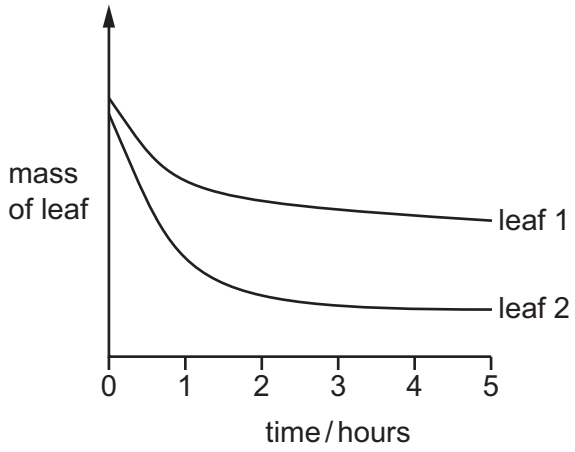
C facilitated diffusion

D mass flow

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24 The diagram shows the results of an experiment using leaves with the same surface area from two different species. Each leaf was left on a balance in daylight in a closed room and their mass recorded at 1 hour intervals.



What could explain these results?

A Leaf 1 has a thicker cuticle than leaf 2.

B Leaf 1 is thinner than leaf 2.

C Leaf 2 has stomata protected by hairs and leaf 1 does not.

D Leaf 2 has sunken stomata and leaf 1 does not.

25 Which description of the movement of water through a leaf is **not** correct?

A Water evaporates into an air space from the higher water potential in the cell wall of a mesophyll cell.

B Water moves from the higher water potential of the cytoplasm of a mesophyll cell to the lower water potential in its cell wall.

C Water moves from the lower water potential of a xylem vessel to the higher water potential of a mesophyll cell.

D Water vapour diffuses from an air space, through an open stoma, to the lower humidity of the surrounding air.

26 Which changes to the water potential and the volume of liquid in the phloem occur when carbohydrate is taken out of a root into phloem sieve tubes?

	water potential in a phloem sieve tube becomes	volume of liquid in phloem sieve tubes
A	less negative	decreased
B	less negative	increased
C	more negative	decreased
D	more negative	increased

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27 Which reactions take place in a capillary in the lungs?

1 carbonic acid is formed from carbon dioxide and water

2 carbaminohaemoglobin is formed from carbon dioxide and haemoglobin

3 haemoglobinic acid is formed from haemoglobin and hydrogen ions

4 carbon dioxide and water are formed from hydrogen carbonate ions and hydrogen ions

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

28 Red blood cells may contain a molecule known as 2,3-bisphophoglycerate (2,3BPG). When 2,3BPG binds to haemoglobin a higher partial pressure of oxygen is needed to bring about 50% saturation of haemoglobin with oxygen.

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

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

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

3 Binding of 2,3BPG to haemoglobin reduces the Bohr effect.

4 When 2,3BPG is absent, oxyhaemoglobin is less likely to unload oxygen.

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

29 Which statements about arteries are correct?

1 Artery walls can resist high pressure.

2 Arteries pump blood out of the heart.

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

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

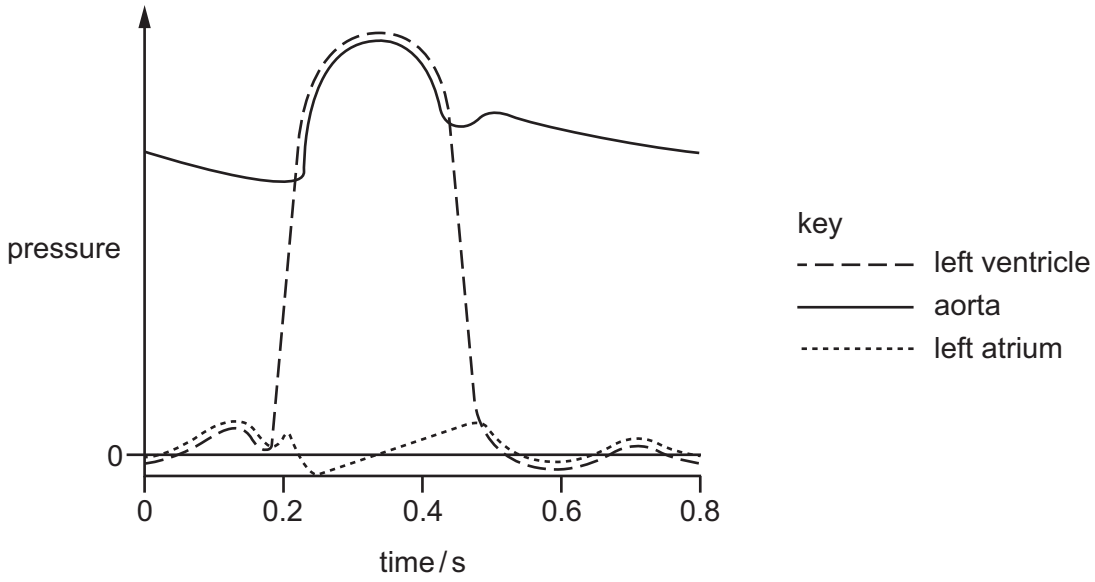
5 There are semilunar valves at the junction of arteries with the heart.

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

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30 The graph shows the changes in pressure that occur in the left side of the heart during one cardiac cycle.



What is the heart rate in beats per minute?

A 75 **B** 80 **C** 120 **D** 150

31 Which statements are correct?

1 Tissue fluid has less protein and no red blood cells compared to plasma.

2 Lymph may contain lipids, carbon dioxide and phagocytes.

3 Tissue fluid contains glucose, amino acids, urea and carbon dioxide.

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

32 What would be seen in a photomicrograph of the wall of the trachea?

	tissue		
	elastic fibres	epidermis	smooth muscle
A	✓	✓	✓
B	✓	✓	✗
C	✓	✗	✓
D	✗	✓	✗

key
✓ = present
✗ = absent

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33 Which process leads to atherosclerosis?

A a blood clot forming in a coronary artery

B contraction of muscles in arteries caused by nicotine

C formation of plaques in an artery wall

D loss of elasticity in an artery wall causing it to burst

34 Some symptoms of chronic obstructive pulmonary disease (COPD) are listed.

1 bursting of alveoli

2 increase in secretion of mucus

3 loss of elastic fibres

4 narrowing of airways

5 reduction in surface area for gaseous exchange

Which of these are also the symptoms of emphysema?

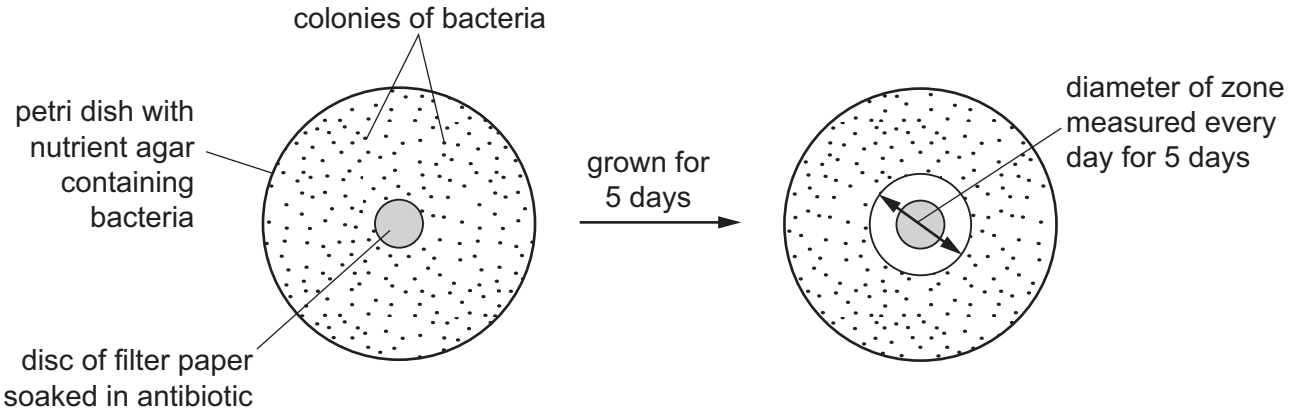
A 1, 2 and 4 **B** 1, 3 and 5 **C** 2, 3 and 4 **D** 2, 4 and 5

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[Turn over

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35 The diagram shows one way of testing the effect of an antibiotic on bacteria.



The table shows the results of testing five different types of bacteria. Zones of less than 13 mm show the presence of resistant bacteria.

type of bacteria	diameter of zone / mm				
	day 1	day 2	day 3	day 4	day 5
1	24.10	21.90	19.00	17.60	14.30
2	18.60	15.40	12.20	9.00	0.00
3	17.90	12.80	12.40	11.10	10.90
4	19.40	15.30	13.20	8.10	0.00
5	22.00	21.00	20.50	20.40	20.40

Which statement can be supported by this data?

A All the types of bacteria become resistant to antibiotics over time.

B Only types 2, 3 and 4 of the bacteria show resistance to the antibiotic.

C The antibiotic can be used to treat types 1 and 3 only.

D Type 5 of the bacteria can never become resistant to the antibiotic.

36 What describes a function of a macrophage?

A They are found in tissues and secrete cytokines in response to infection.

B They can leave the blood and accumulate at sites of inflammation.

C They can leave the blood and secrete cytotoxins when exposed to damaged cells.

D They circulate in the blood and produce antigens in response to infection.

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37 There has been an increase in the number of cases of the disease whooping cough.

A pregnant woman is vaccinated against whooping cough to protect the new born baby from this disease.

How does the immune response of the mother help to protect a new born baby from whooping cough?

	before birth, baby receives from mother	type of protection gained by baby
A	antibodies	natural passive
B	antigens	artificial active
C	memory cells	artificial passive
D	pathogens	natural active

38 A tree carries out photosynthesis and provides organic compounds for other organisms in a forest.

It takes carbon dioxide from the atmosphere 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 population

B community

C ecosystem

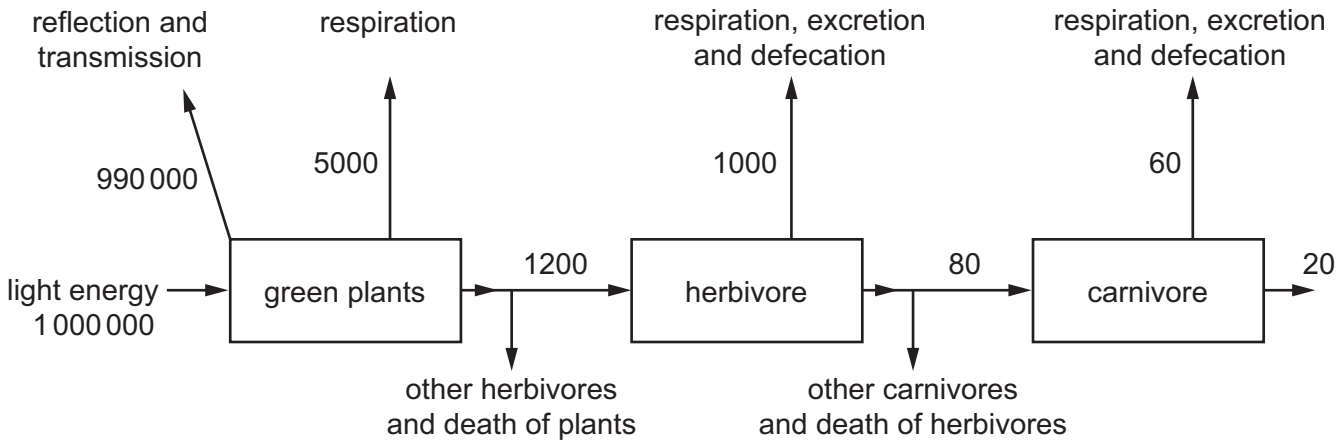
D trophic level

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[Turn over

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39 The diagram shows the flow of energy through a food chain. Figures are in kJ m^{-2} $year^{-1}$.



What percentage of light energy is available to the herbivore?

A 0.12 % **B** 0.38 % **C** 0.50 % **D** 1.00 %

40 Why does the application of nitrate fertilisers cause an increase in crop production?

A Green plants manufacture more protein.

B More nitrogen is fixed in leguminous plants.

C The fertiliser adds energy to the ecosystem.

D The number of denitrifying bacteria decreases.

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BIOLOGY **9700/12**

Paper 1 Multiple Choice **October/November 2015**

1 hour

Additional Materials: Multiple Choice Answer Sheet
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3152832431

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1 Which size of ribosome is found in mitochondria?

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

2 Different units are used when measuring biological specimens.

Which measurement in mm has **not** been correctly converted into **both** μm and nm?

	mm	μm	nm
A	1.0	1.0×10^3	1.0×10^6
B	2.5	2.5×10^3	2.5×10^6
C	5.0	5.0×10^4	5.0×10^7
D	25.0	2.5×10^4	2.5×10^7

3 Which features of microvilli and root hairs are correct?

	increase cell surface area	cannot be resolved with the light microscope	contain vacuoles	more than one present on a cell
A	microvilli	microvilli	root hairs	root hairs
B	microvilli	root hairs	microvilli	microvilli
C	root hairs	microvilli	root hairs	microvilli
D	root hairs	root hairs	microvilli	root hairs

4 Lysosomes have a variety of different shapes and sizes, making them difficult to identify.

What describes a lysosome?

A a vesicle containing enzymes, enclosed by a double membrane, that is budded off the endoplasmic reticulum

B a vesicle containing hydrolytic enzymes and surrounded by a single membrane, found only in phagocytes

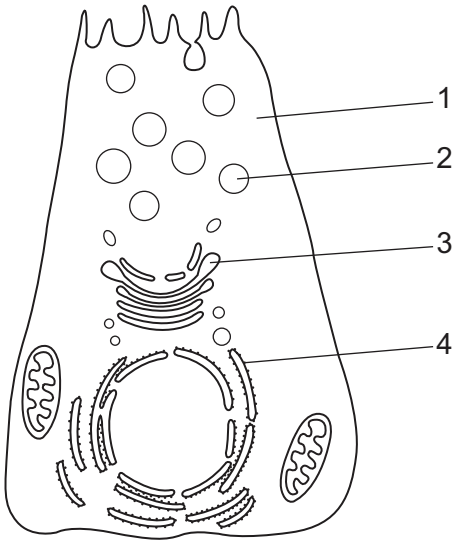
C a vesicle enclosed by a single membrane, containing several different hydrolytic enzymes that may act inside or outside the cell

D a vesicle surrounded by a double membrane, containing enzymes which can hydrolyse damaged organelles in a cell

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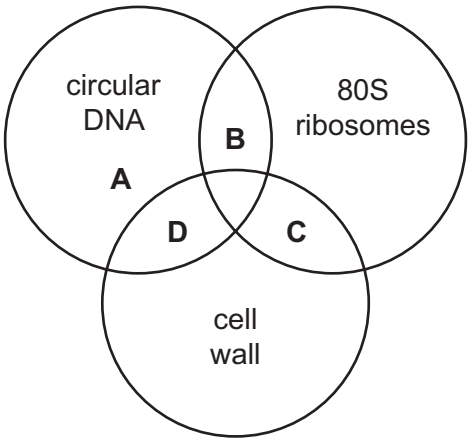
5 Radioactively-labelled amino acids were introduced into a tracheal cell that uses them to make mucus (a glycoprotein).



What route will the amino acids take?

	first → last			
A	1	2	3	4
B	1	4	3	2
C	4	1	2	3
D	4	3	2	1

6 Which structures are present in a *Vibrio cholerae* cell?



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7 The colour of a positive Benedict's test is due to the formation of copper oxide. The mass of copper oxide is proportional to the mass of reducing sugar present.

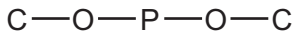
Samples of fruit juice were tested for the presence of reducing sugars and non-reducing sugars using the Benedict's test. The results show the mass of copper oxide after boiling with Benedict's solution and after acid hydrolysis and boiling with Benedict's solution.

Which sample contained the most **non-reducing** sugar?

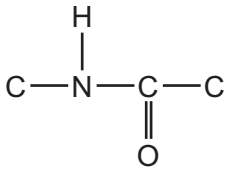
	mass of precipitate / mg	
	after boiling with Benedict's solution	after acid hydrolysis and boiling with Benedict's solution
A	20	20
B	30	45
C	50	55
D	65	75

8 Which diagram shows the bond linking the individual units of both cellulose and glycogen?

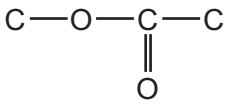
A



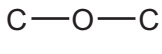
B



C



D



9 Which row describes a triglyceride?

	hydrophilic	soluble in alcohol
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

key

✓ correct

✗ not correct

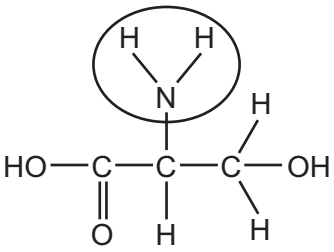
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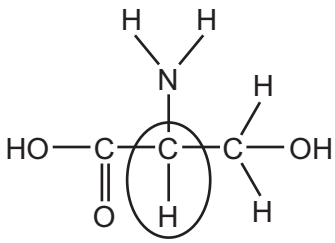
10 The diagrams show the amino acid serine.

Which circled area is different in all other amino acids?

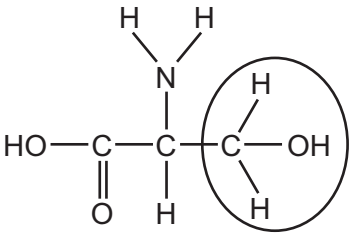
A



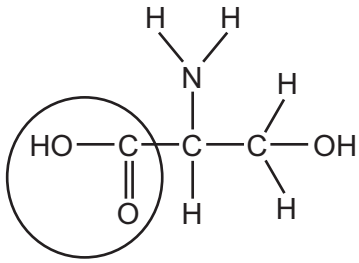
B



C



D



11 As a frozen lake warms after a cold winter, mineral nutrients are brought to the surface.

Which properties of water contribute to this process?

1 Its greatest density is at 4 °C.

2 It has high specific heat capacity.

3 It is a solvent.

4 Its molecules form hydrogen bonds.

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

12 Which statements describe some enzyme actions?

1 Enzymes hold reacting molecules in such a way that their reactive groups are brought close together.

2 In an enzyme-catalysed reaction, more molecules have sufficient energy to react than in the absence of the enzyme.

3 Reactions catalysed by enzymes take place at a lower temperature than they would without the enzyme.

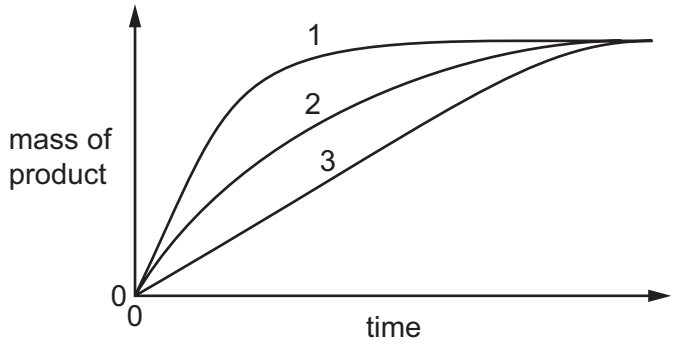
A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

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13 The diagram shows the mass of product formed over time in three reactions using the same substrate and enzyme.

The volumes of substrate, enzyme and temperature were kept constant in each reaction.



Which statement explains the difference in these reactions?

A The pH in reactions 2 and 3 has denatured the enzyme.

B There is a non-competitive inhibitor present in reaction 3.

C There is the highest concentration of enzyme in reaction 1.

D There is the highest concentration of substrate in reaction 1.

14 Tyrosinase is an enzyme that catalyses the conversion of the amino acid tyrosine into the black pigment melanin. It is responsible for the black fur colour of some rabbits.

A group of rabbits kept at 30 °C resulted in 90% of the rabbits with light fur colour. A second group of rabbits kept at 10 °C resulted in 90% of the rabbits with black fur colour.

Which hypothesis is supported by these results?

A An inhibitor is present in rabbit skin cells that can bind strongly to tyrosinase when the external temperature is 30 °C.

B At 10 °C external temperature there are fewer tyrosinase-tyrosine complexes formed and less melanin is produced.

C Tyrosinase is an enzyme that is coded for by a gene that is switched off when the external temperature is 10 °C.

D Tyrosinase is a temperature-sensitive molecule that is only activated when the external temperature is 30 °C.

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15 Which descriptions are correct for transport across cell surface membranes?

	active processes	passive processes
A	active transport	exocytosis and osmosis
B	endocytosis and exocytosis	facilitated diffusion and osmosis
C	exocytosis and active transport	osmosis and endocytosis
D	facilitated diffusion and exocytosis	endocytosis and diffusion

16 The stages of an investigation using plant tissue are listed below.

- A freshly cut slice of plant tissue was rinsed in distilled water, dried and weighed.
- This slice was placed in a solution with a water potential of −4 arbitrary units for thirty minutes.
- The slice was removed from the solution, dried and reweighed.
- The mass of the slice was the same as its original mass.

Which conclusions can be drawn from this investigation?

1 The water potential of the cells of the plant tissue is −4 arbitrary units.

2 The cell sap of the plant tissue has a lower water potential than the surrounding solution.

3 There has been no net movement of water.

4 The cell wall of the plant tissue will not be in contact with the cell membrane.

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

17 What explains the effect on a red blood cell of being placed into pure water?

A Less water leaves the cell than enters it, so the cell shrinks.

B More water enters the cell than leaves it, so the cell swells and bursts.

C Water enters the cell and none leaves it, so the cell swells and bursts.

D Water enters the cell and more leaves it, so the cell shrinks.

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18 Which statements about a diploid cell are correct?

1 can divide by mitosis to repair itself

2 has two complete sets of chromosomes

3 can undergo a reduction division to form haploid cells

4 can undergo mitotic division to allow growth to occur

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

19 Which metabolic processes will be very active in a cell that has just completed cytokinesis?

1 ATP formation

2 DNA replication

3 protein synthesis

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

20 What occurs during DNA replication and transcription and translation?

1 ATP provides energy.

2 Condensation reactions occur to form a polymer.

3 Hydrogen bonds form between purine and pyrimidine bases.

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

21 Ricin is a toxic protein which inactivates ribosomes.

Which effect will this have on protein synthesis?

A Amino acids will be unable to bind to the binding sites on specific tRNA molecules.

B Anticodons on mRNA molecules will not base pair to codons on tRNA molecules.

C Peptide bonds will not form between adjacent amino acids in the growing polypeptide.

D RNA nucleotides will be unable to join by condensation reactions to form rRNA.

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22 Which row shows two pairs of nucleotide bases in a molecule of DNA?

	first base pair		second base pair	
	bases present	number of hydrogen bonds	bases present	number of hydrogen bonds
A	AT	2	CG	2
B	AT	2	CG	3
C	TA	3	GC	2
D	TA	3	GC	3

23 What is the role of the Casparian strip?

A to act as a site for active transport of ions into the xylem

B to increase root pressure, increasing transpiration

C to lower the water potential in the xylem

D to prevent water moving back into the cortex from the xylem

24 Sucrose is loaded into companion cells and phloem sieve tube elements by active transport and diffusion using transport proteins and plasmodesmata.

Which row shows how sucrose is loaded?

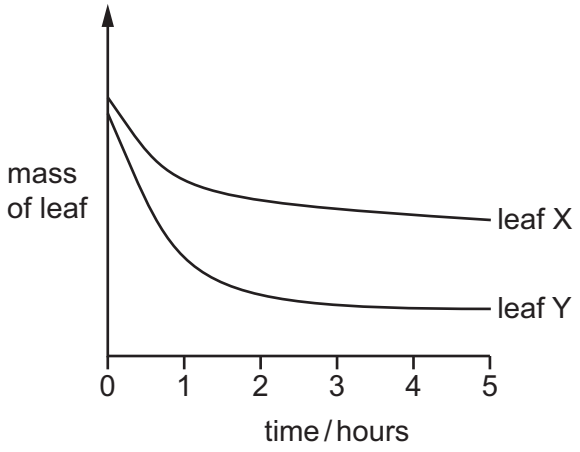
	active transport	diffusion	transport proteins	plasmodesmata
A	into companion cell	into phloem sieve tube element	into companion cell	into phloem sieve tube element
B	into companion cell	into phloem sieve tube element	into phloem sieve tube element	into companion cell
C	into phloem sieve tube element	into companion cell	into companion cell	into phloem sieve tube element
D	into phloem sieve tube element	into companion cell	into phloem sieve tube element	into companion cell

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25 Which changes to the water potential and the volume of liquid in the phloem occur when sucrose is transferred from leaves into phloem sieve tubes to be transported to a sink?

	water potential in phloem sieve tubes becomes	volume of liquid in phloem sieve tubes
A	less negative	decreased
B	less negative	increased
C	more negative	decreased
D	more negative	increased

26 The diagram shows the results of an experiment using leaves with the same surface area from two different species. Each leaf was left on a balance in daylight in a closed room and their mass recorded at 1 hour intervals.



Which features of leaf X could explain these results?

1 thinner cuticle

2 sunken stomata

3 ability to roll the leaf

4 no trichomes on the leaf

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

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27 Which components of blood are found in tissue fluid?

	glucose	proteins	white blood cells
A	✓	✓	✓
B	✓	✓	✗
C	✓	✗	✓
D	✗	✓	✓

key
✓ = present
✗ = absent

28 Which reactions take place in a capillary in an active tissue?

1 carbon dioxide and water are formed from hydrogencarbonate ions and hydrogen ions

2 carbonic acid is formed from carbon dioxide and water

3 carbaminohaemoglobin is formed from carbon dioxide and haemoglobin

4 haemoglobin and hydrogen ions are formed from haemoglobinic acid

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

29 What happens to the atrioventricular valves and to the semilunar valves during atrial systole and ventricular systole?

	atrial systole		ventricular systole	
	atrioventricular valves	semilunar valves	atrioventricular valves	semilunar valves
A	open	closed	closed	open
B	open	closed	open	open
C	closed	open	closed	closed
D	closed	open	open	closed

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30 Red blood cells may contain a molecule known as 2,3-bisphophoglycerate (2,3BPG). When 2,3BPG binds to haemoglobin a higher partial pressure of oxygen is needed to bring about 50% saturation of haemoglobin with oxygen.

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

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

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

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

4 When 2,3BPG is absent, oxyhaemoglobin is less likely to unload oxygen.

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

31 Which row about the human gas exchange system is correct?

		trachea	bronchus	alveolus
A	cartilage	present	present	absent
B	ciliated epithelium	absent	present	absent
C	goblet cells	present	absent	absent
D	smooth muscle	present	present	present

32 Which of the effects are caused by breathing in **both** carbon monoxide **and** nicotine from cigarette smoke?

1 increased heart rate

2 increased risk of cardiovascular disease

3 increased risk of emphysema

4 increased risk of lung cancer

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

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33 Which statements about chronic obstructive pulmonary disease (COPD) are correct?

1 The disease can often be reversed by treatment.

2 The patient's symptoms normally do not change.

3 The patient is normally over 30 years old.

4 The patient coughs a lot, bringing up mucus.

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

34 Why is it necessary for a person with a bacterial infection to take antibiotics at evenly spaced time intervals?

A to increase the concentration of antibiotic slowly to a level which is lethal to the bacteria

B to maintain a concentration of antibiotic in the body which is lethal to the bacteria

C to prevent the development of resistant strains of bacteria

D to select and kill the resistant strains of bacteria

35 Which statement is correct for a neutrophil?

A They are found in tissues and secrete cytokines in response to infection.

B They can leave the blood and accumulate at sites of inflammation.

C They can leave the blood and secrete cytotoxins when exposed to damaged cells.

D They circulate in the blood and present antigens in response to infection.

36 What describes artificial 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

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37 Which statements correctly describe lymphocytes?

1 Each B-lymphocyte has the ability to make several types of antibody molecules.

2 Some B-lymphocytes and T-lymphocytes become memory cells.

3 Plasma cells secrete antibodies into the blood plasma.

4 Some T-lymphocytes stimulate macrophages to kill infected cells.

A 1, 2, 3 and 4

B 1, 2 and 3 only

C 2, 3 and 4 only

D 1 and 4 only

38 Which group could be a population?

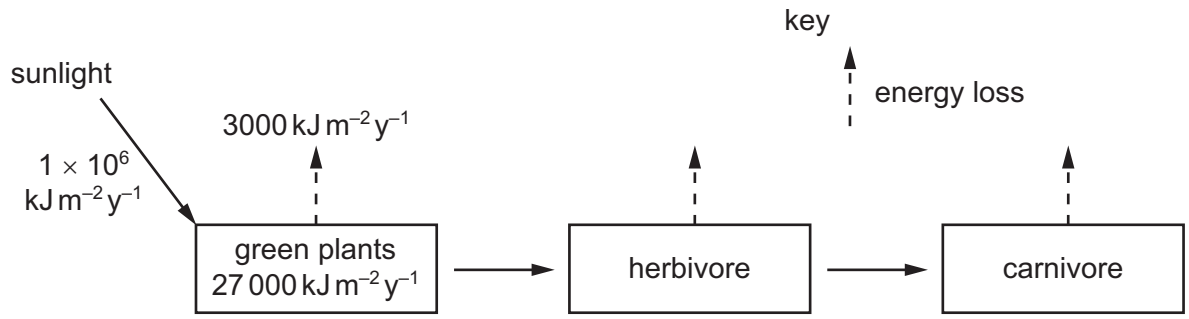
A all the animals and plants on an isolated island

B all the birds counted in one day in a garden

C all the bacteria in a colony of *Bacillus subtilis*

D all the insects occupying three hectares of farmland

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%

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40 Anaerobic bacteria are found in large numbers in waterlogged soils.

Which effect does this have on soil fertility and why?

	soil fertility	reason
A	decreased	bacteria convert nitrate to ammonia
B	decreased	bacteria convert nitrate to nitrogen gas
C	increased	bacteria cause decomposition
D	increased	bacteria cause nitrogen fixation

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Cambridge International AS & A Level

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BIOLOGY **9700/13**

Paper 1 Multiple Choice **October/November 2015**

1 hour

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

2701008671

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 Which size of ribosome is found in chloroplasts?

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

2 Different units are used when measuring biological specimens.

In which rows are the same measurements correctly expressed in each of the units shown in the column headings?

	mm	μm	nm
1	1.0	1.0×10^3	1.0×10^6
2	2.5	2.5×10^3	2.5×10^6
3	5.0	5.0×10^4	5.0×10^7
4	25.0	2.5×10^4	2.5×10^7

A 1, 2, 3 and 4

B 1, 2 and 4 only

C 1 and 2 only

D 3 and 4 only

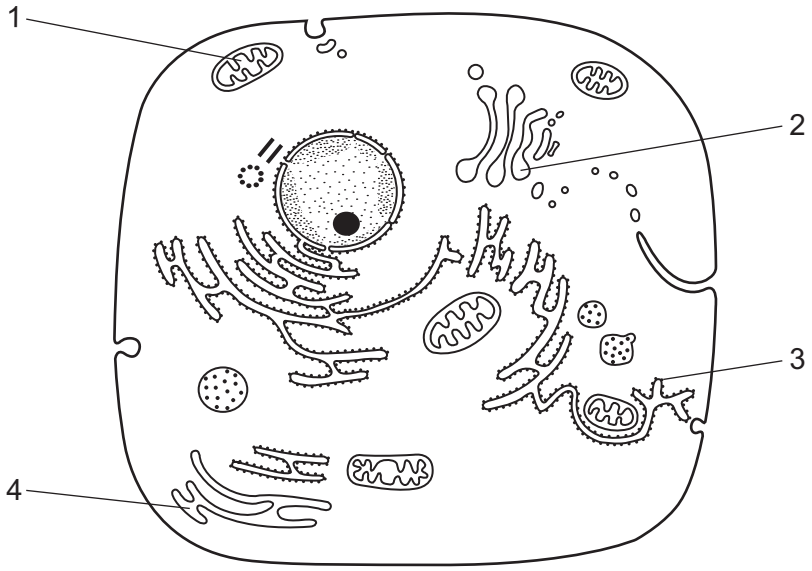
3 Which features of cilia and root hairs are correct?

	increase cell surface area	cannot be resolved with the light microscope	contain vacuoles	more than one present on a cell
A	cilia	cilia	root hairs	root hairs
B	cilia	root hairs	cilia	cilia
C	root hairs	cilia	root hairs	cilia
D	root hairs	root hairs	cilia	root hairs

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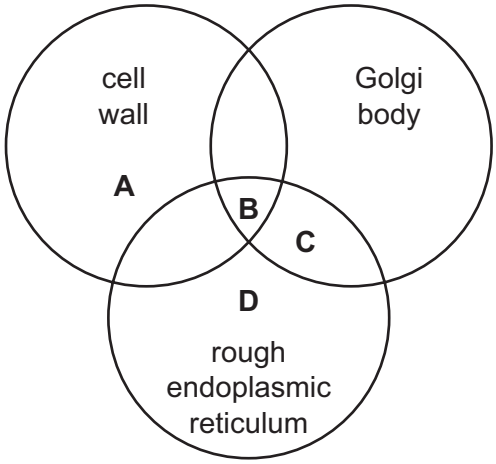
4 The diagram shows a typical animal cell. Each labelled structure is involved with the synthesis of biological molecules.



Within which structures are glycoproteins, proteins and steroids synthesised?

	glycoproteins	proteins	steroids
A	2	3	1
B	2	3	4
C	4	2	3
D	4	1	2

5 What is present in a *Vibrio cholerae* cell?



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6 What is correct for a typical prokaryotic cell?

	cell wall	cell diameter	ribosomes
A	cellulose	1-5 μm	70S
B	cellulose	5-40 μm	70S and 80S
C	peptidoglycan	1-5 μm	70S
D	peptidoglycan	5-40 μm	70S and 80S

7 The table shows the results of tests carried out on a sample of biological molecules.

test	colour observed
Benedict's	blue
biuret	purple
iodine	blue-black

Which shows the types of molecules present in the sample?

	protein	reducing sugar	starch
A	✓	✗	✗
B	✗	✓	✗
C	✓	✗	✓
D	✗	✓	✓

key
✓ present
✗ absent

8 The synthesis of biological molecules requires the formation of bonds.

Which row is correct?

	a bond forms between the phosphate of one monomer and the sugar of the next monomer	a β-1,4 bond forms between the monomers to give an unbranched chain	the hydroxyl group of the carboxylic acid group is removed and a carbon-nitrogen bond is formed to give an unbranched chain
A	polynucleotide	amylose	polypeptide
B	polynucleotide	cellulose	polypeptide
C	phospholipid	amylose	polynucleotide
D	phospholipid	cellulose	polynucleotide

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9 Which row describes a triglyceride?

	hydrophobic	insoluble in alcohol
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

key

✓ correct

✗ not correct

10 High concentrations of urea break all bonds, except covalent bonds, in protein molecules.

Which level of protein structure would remain unchanged when a protein is treated with urea?

A primary

B secondary

C tertiary

D quaternary

11 Haemoglobin, a globular protein, consists of four polypeptide chains, two alpha chains and two beta chains. In normal individuals, in the DNA which codes for each beta chain, the sixth triplet has a code for glutamic acid.

In individuals with sickle cell anaemia this base triplet mutates and codes for valine.

What does this mutation change in the haemoglobin molecule?

A the iron content

B the primary structure

C the quaternary structure

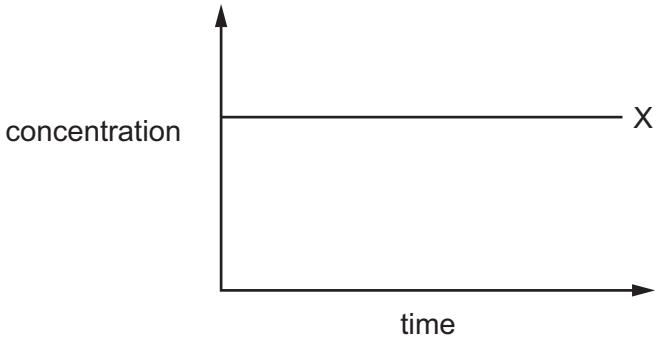
D the secondary structure

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12 The graph shows the concentration of one of the substances which is involved in an enzyme-catalysed reaction.



Which substance is shown by line X?

A enzyme

B enzyme-product complex

C enzyme-substrate complex

D substrate

13 What describes the induced fit mode of action of an enzyme?

A The binding of the active site to the substrate causes the enzyme to change shape.

B The substrate and active site have complementary shapes that form temporary bonds.

C The substrate causes a change in enzyme shape so the active site can bind.

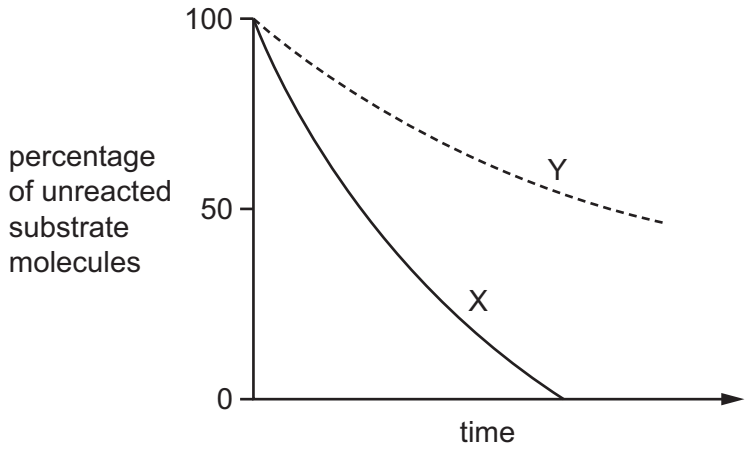
D The substrate changes shape so it can bind to the active site.

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14 Line X represents the course of an enzyme-catalysed reaction under optimum conditions.

Line Y shows the action of the same enzyme on the same substrate but with one variable changed: substrate concentration or pH or temperature.



Which changes to the variables could give the results shown by line Y?

1 decreased substrate concentration

2 higher pH

3 lower temperature

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

15 Which descriptions are correct about transport across cell surface membranes?

	active processes	passive processes
A	active transport	exocytosis and osmosis
B	active transport and exocytosis	endocytosis and diffusion
C	endocytosis and exocytosis	diffusion and osmosis
D	exocytosis and active transport	osmosis and endocytosis

16 Which statements about the fluid mosaic model of a membrane are correct?

1 Saturated fatty acid tails inhibit the movement of phospholipids in the membrane.

2 Glycoproteins in the outer layer of the membrane can move.

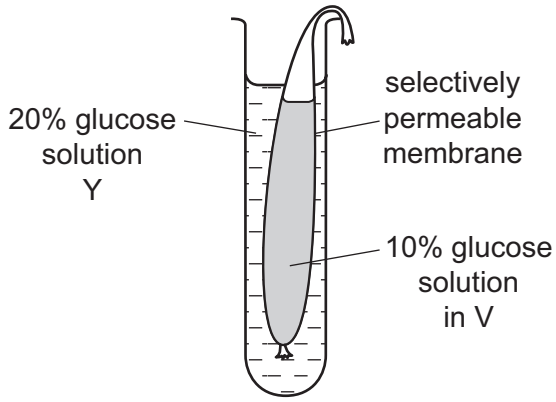
3 Channel proteins are fixed in position.

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

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17 The diagram shows apparatus set up to investigate diffusion.



What shows net diffusion of glucose and water molecules?

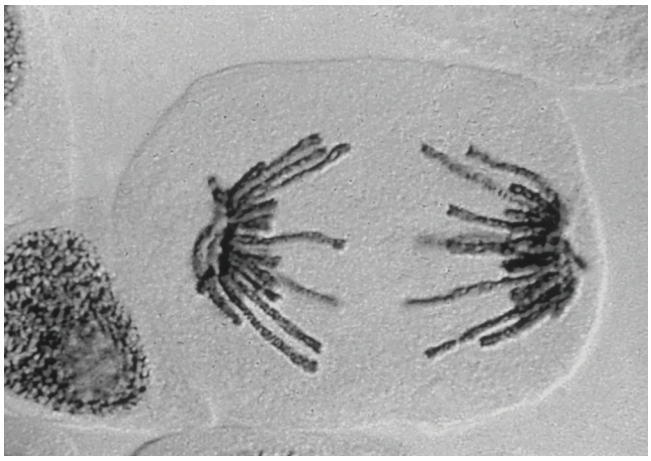
A glucose and water into V

B glucose and water into Y

C glucose into V and water into Y

D glucose into Y and water into V

18 The photomicrograph shows a cell undergoing mitosis.



What is happening in this cell?

A Centrioles are replicating.

B Chromatin is condensing.

C DNA is replicating.

D Spindle microtubules are shortening.

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19 Which row shows the products of mitosis, reduction division (meiosis) and fertilisation?

	products of mitosis	products of meiosis	product of fertilisation
A	four diploid cells	two diploid cells	diploid cell
B	four haploid cells	four diploid cells	haploid cell
C	two diploid cells	four haploid cells	diploid cell
D	two diploid cells	two haploid cells	haploid cell

20 Which statements describe how a gene mutation can lead to the production of a non-functional protein?

1 During transcription an incorrect nucleotide is added to a DNA molecule.

2 A codon in the mRNA transcribed from the mutated gene is changed.

3 The order of the bases in an anticodon on tRNA is altered during translation.

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

21 Some antibiotics kill prokaryotes by binding to RNA polymerase.

What effect will this have on protein synthesis?

A Codons on mRNA will be unable to hydrogen bond to complementary anticodons on tRNA.

B Condensation reactions joining RNA nucleotides will not take place to form mRNA.

C DNA will not unwind and unzip to allow for base-pairing with RNA nucleotides.

D Free RNA nucleotides will not base-pair to exposed bases on the DNA template strand.

22 Which row correctly describes cytosine?

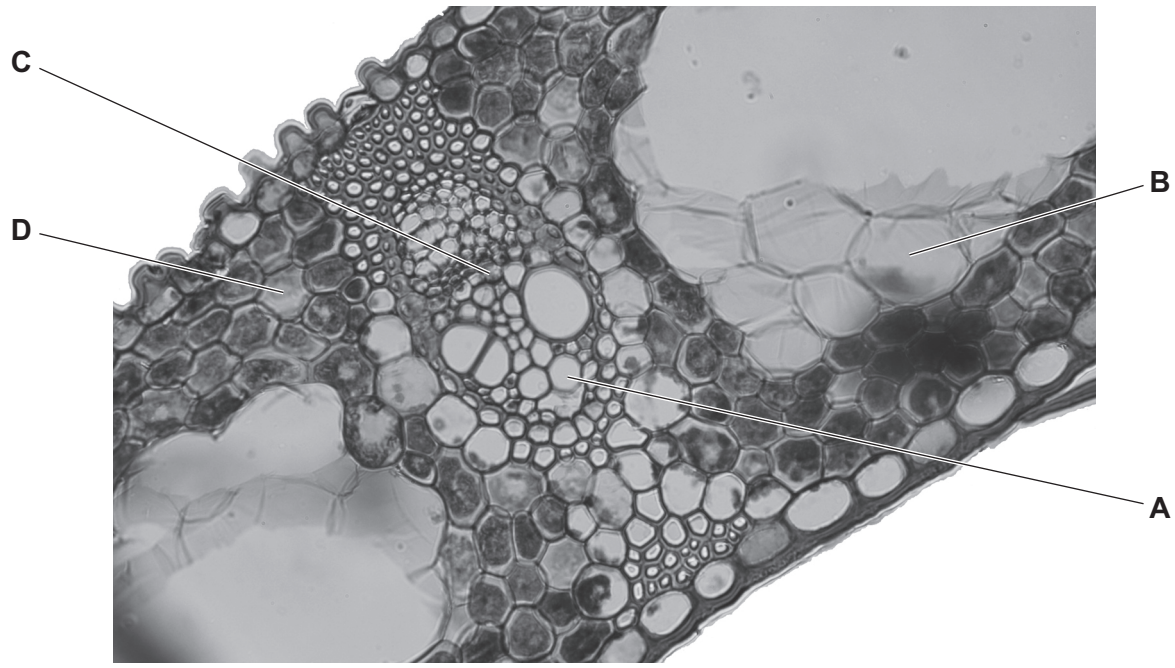
	ring structure	number of hydrogen bonds it forms with its complementary base	type of base
A	double	three	purine
B	double	two	pyrimidine
C	single	three	pyrimidine
D	single	two	purine

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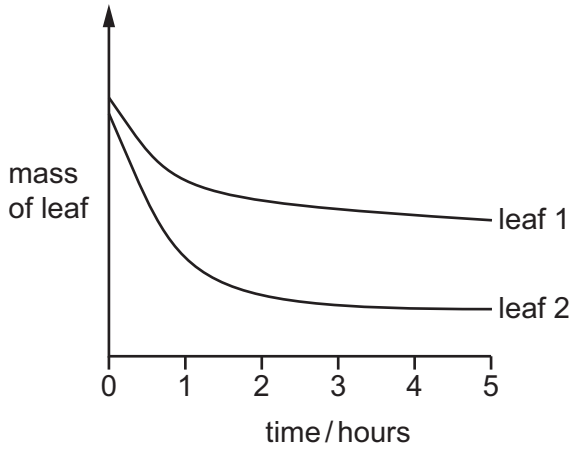
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23 The photomicrograph shows a transverse section of a leaf.

Which cell has the least negative water potential?



24 The diagram shows the results of an experiment on transpiration using two different leaves. Each leaf was left on a balance in daylight in a closed room and their mass recorded at 1 hour intervals.



Which conclusions could be correct?

1 The loss in mass is mainly due to evaporation of water.

2 The stomata in both leaves close after 1 hour.

3 Leaf 1 has a larger surface area than leaf 2.

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 Which processes are involved in the transport of sucrose in plants?

1 active transport

2 mass flow

3 osmosis

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

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

	water potential in phloem sieve tubes becomes	volume of liquid in phloem sieve tubes
A	less negative	decreased
B	less negative	increased
C	more negative	decreased
D	more negative	increased

27 Which reactions take place in a capillary in an active tissue?

1 the formation of carbonic acid from carbon dioxide and water

2 the formation of carbaminohaemoglobin from carbon dioxide and haemoglobin

3 the formation of haemoglobinic acid from haemoglobin and hydrogen ions

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

A 1, 2, 3 and 4

B 1, 2 and 3 only

C 2 and 4 only

D 3 and 4 only

28 What is present in the blood in human veins?

1 collagen

2 carbonic anhydrase

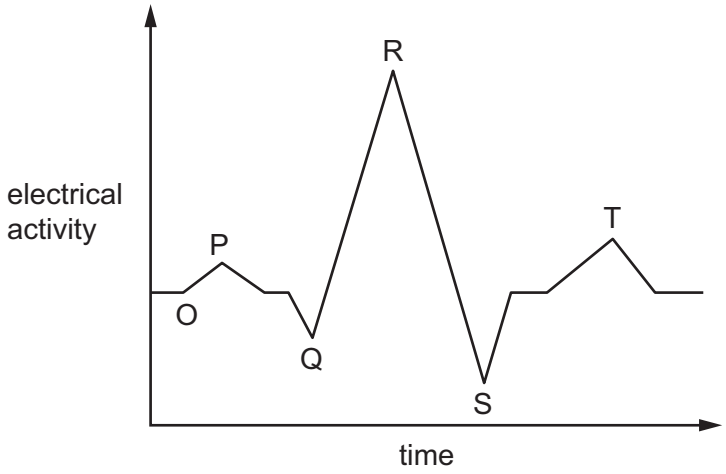
3 oxyhaemoglobin

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

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29 The diagram shows the electrical activity in cardiac muscle during one heart beat.



What is happening at each of the labelled stages in the cardiac cycle?

	O	P	QRS	T
A	atria contract	atrio-ventricular valve opens	atria relax	ventricles contract
B	impulse leaves AVN	ventricles contract	atria relax	atrio-ventricular valve closes
C	impulse leaves SAN	atria contract	ventricles contract	ventricles relax
D	ventricles relax	atria contract	atrio-ventricular valve closes	ventricles relax

30 Which statement about the pulmonary artery is correct?

A it contains a series of valves

B it contains blood at high pressure

C it contains blood moving towards the heart

D it contains oxygenated blood

31 Red blood cells may contain a molecule known as 2,3-bisphophoglycerate (2,3BPG). When 2,3BPG binds to haemoglobin a higher partial pressure of oxygen is needed to bring about 50% saturation of haemoglobin with oxygen.

Which statement about the effect of 2,3BPG is correct?

A 2,3BPG in red blood cells causes the oxygen dissociation curve to shift to the left.

B Binding of 2,3BPG to haemoglobin reduces the Bohr effect.

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

D When 2,3BPG is absent, oxyhaemoglobin is less likely to unload oxygen.

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32 What is a correct location of cartilage and smooth muscle in the human gas exchange system?

	cartilage	smooth muscle
A	bronchioles	bronchioles
B	bronchioles	trachea
C	trachea	alveoli
D	trachea	bronchi

33 Which factors maintain the diffusion gradient for carbon dioxide at the surface of the alveoli?

1 blood flow past the alveoli

2 breathing movement exchanging air in the lungs

3 thin epithelial lining of the alveoli

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

34 The surface tension of the layer of liquid lining the alveoli tends to pull the walls inwards so alveoli could collapse.

Which statements could explain how this is prevented?

1 alveolar fluid is moved around by cilia

2 elastic fibres keep the alveoli open

3 epithelial cells secrete a chemical that reduces the cohesion in water

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

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[Turn over

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35 The data shows how the number of human deaths caused by the bacterium *Staphylococcus aureus* has changed over a period of five years.

Methicillin is an antibiotic used to treat a disease caused by *S. aureus*.
MRSA is methicillin-resistant *S. aureus*.

year	total number of deaths caused by *S. aureus*	total number of deaths caused by MRSA
1	369	355
2	452	431
3	456	681
4	420	890
5	428	1512

Which statement is **not** supported by this data?

A More people have MRSA so the disease spreads.

B MRSA is more likely to lead to death than *S. aureus*.

C Resistant strains of MRSA are becoming more common.

D *S. aureus* will always cause humans to die.

36 What describes natural active 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

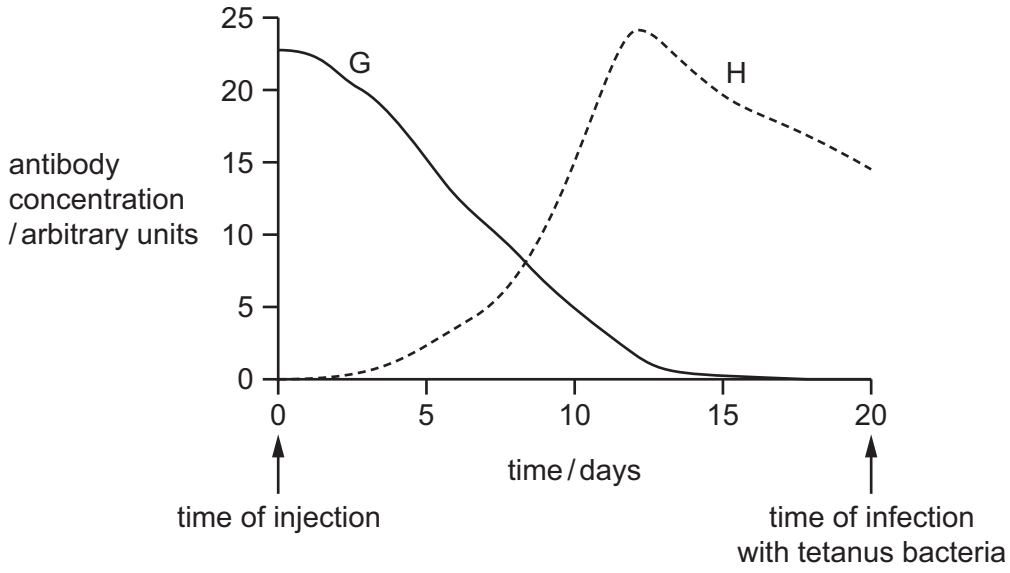
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37 The bacterium that causes the disease tetanus produces a toxin that acts as an antigen.

The graph shows the concentration of an antibody in the blood of two people, G and H.

On day 0, G was injected with antibodies to the tetanus toxin and H was injected with the vaccine for tetanus.



What would be the result after G and H were infected with the tetanus bacteria on day 20?

A concentration of antibodies in H would remain constant

B G would fail to produce tetanus antibodies

C G would peak in antibody production 12 days after infection

D H would produce a new antibody peak 12 days after infection

38 What name is given to all the organisms of the same species living in an area?

A community

B ecosystem

C niche

D population

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

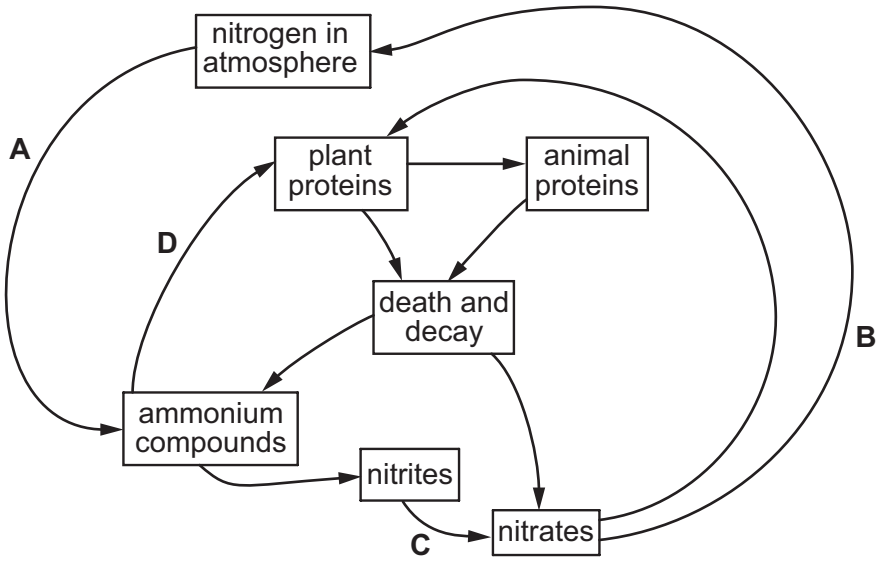
species	number of individuals	biomass of one individual / arbitrary units	energy value per unit mass / arbitrary units
R	10 000	0.1	1.0
S	5	10.0	2.0
T	500	0.002	1.8
U	3	300 000.0	0.5

What is the energy flow in the food chain?

	from → to			
A	R	T	S	U
B	S	T	R	U
C	U	R	S	T
D	U	S	T	R

40 The diagram shows a simplified nitrogen cycle.

Which arrow represents the activity of nitrogen-fixing bacteria?



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