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

BIOLOGY **9700/13**

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

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

* 0 2 9 6 3 7 2 8 7 2 *

READ THESE INSTRUCTIONS FIRST

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

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

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

This document consists of **15** printed pages and **1** blank page.

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

A cell wall

B DNA bound to protein

C endoplasmic reticulum

D Golgi apparatus

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

1 DNA

2 mRNA

3 ribosomes

A 1 only

B 2 only

C 1 and 2

D 2 and 3

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

The electron microscope used a magnification of ×1000.

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

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

Which explanation supports this conclusion?

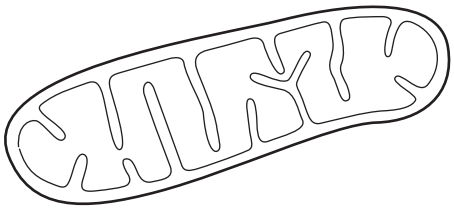
A The electron microscope had a poorer resolution than the light microscope, but was better able to distinguish between two separate points.

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

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

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

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



What is the maximum length of the organelle?

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

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

A cuticle on the upper epidermis

B palisade mesophyll layer

C vascular bundles in the leaf lamina

D xylem vessel elements

6 What is the general formula for starch?

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

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

A disulfide

B hydrogen

C hydrophobic interactions

D ionic

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

1 amino acids

2 glucose

3 glycerol

4 protein

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

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

1 adjacent glucose molecules are rotated by 180°

2 contains glycosidic bonds

3 polymer of α–glucose

A 1 only

B 2 only

C 1 and 3 only

D 2 and 3 only

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

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

Which substance contains glucose, fat and protein?

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

key

✓ = present

✗ = absent

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

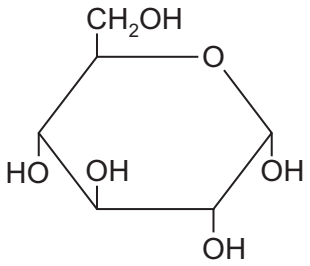
A having amino acids with hydrophilic R groups facing out

B having amino acids with polar R groups facing out

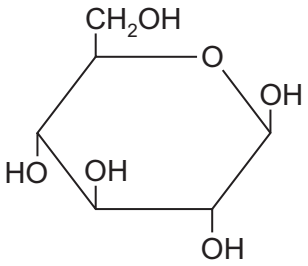
C having a central core of amino acids with hydrophobic R groups

D having amino acids with hydrophobic R groups facing out

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



molecule X



molecule Y

Which statement is correct?

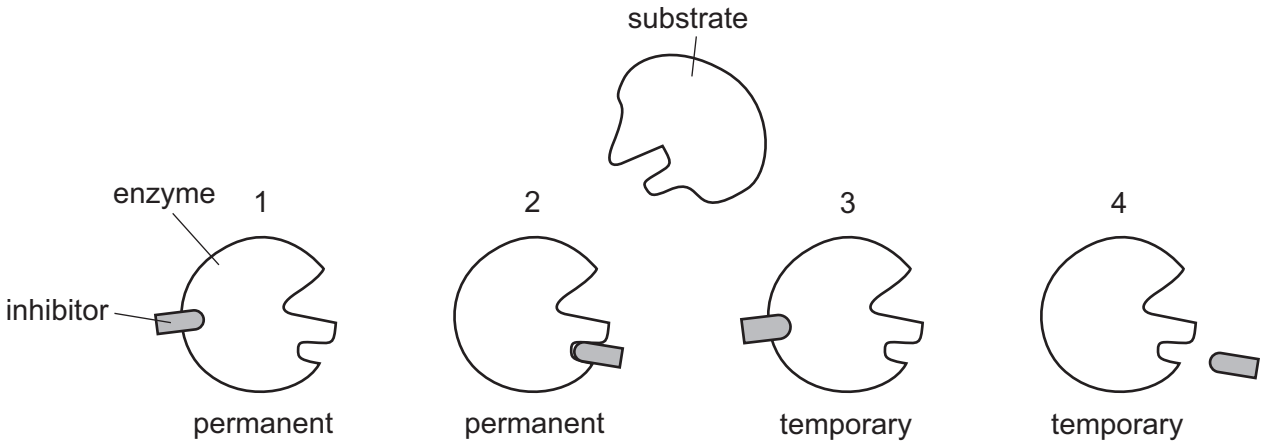
A Many of molecule X join to form amylose.

B Many of molecule X join to form cellulose.

C Many of molecule Y join to form amylopectin.

D Many of molecule Y join to form glycogen.

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



Which diagrams represent a non-competitive inhibitor?

A 1 and 2 only

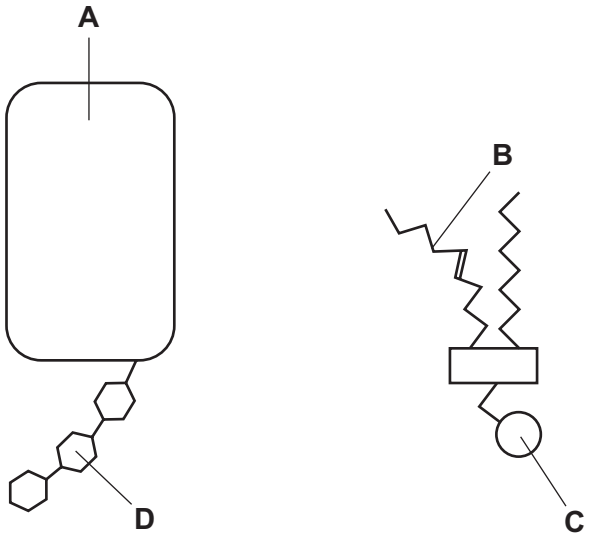
B 2 and 3 only

C 3 and 4 only

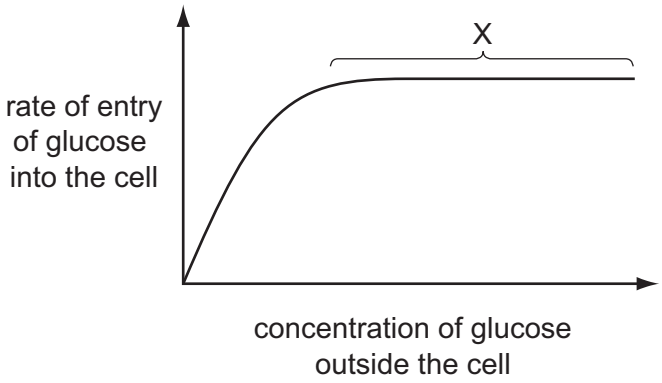
D 1, 2 and 3 only

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

Which part affects the fluidity of the membrane?



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



What is the cause of the plateau at X?

1 All the carrier proteins are saturated with glucose.

2 The cell has used up its supply of ATP.

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

A 1 only

B 3 only

C 1 and 2 only

D 2 and 3 only

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

1 phagocytosis

2 active transport

3 facilitated diffusion

Which processes require ATP?

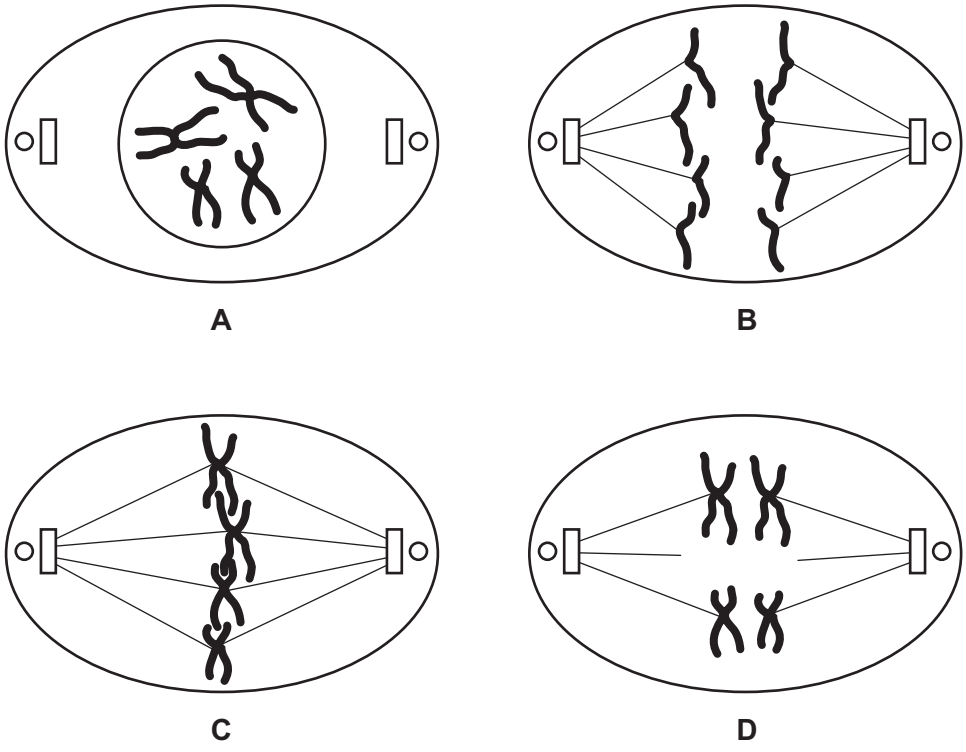
A 1 only

B 2 only

C 1 and 2 only

D 2 and 3 only

17 Which diagram represents a cell undergoing metaphase of mitosis?



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

At which stage is the cell cycle interrupted?

A cell division

B DNA replication

C interphase

D mitosis

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

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

Which are the correct codon and anticodon?

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

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

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

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

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

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

A condensation

B polymerisation

C replication

D transcription

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

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

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

A Their cell surface membranes are totally permeable.

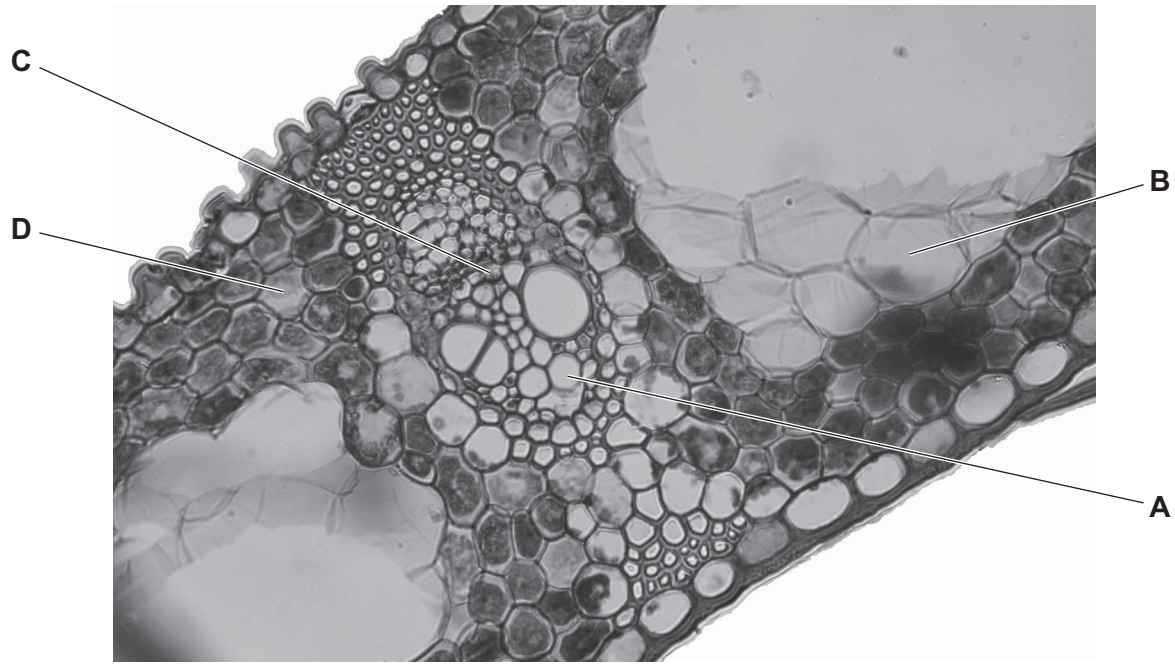
B They do not move very often.

C They do not need to absorb oxygen.

D They have a large surface area to volume ratio.

24 The photomicrograph shows a transverse section of a leaf.

Which cell has the least negative water potential?



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

1 water enters cell wall

2 water enters cytoplasm through plasma membrane

3 water enters vacuoles

4 water moves from cell to cell through plasmodesmata

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

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

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

A Haemoglobin is not saturated with oxygen in the lungs.

B The partial pressure of oxygen is higher.

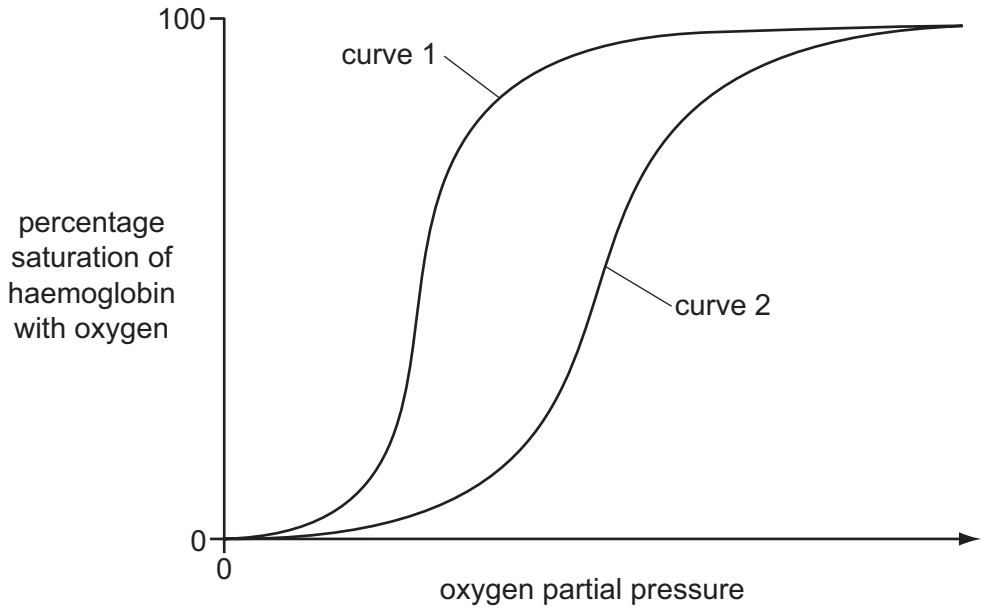
C The percentage of oxygen in the air has decreased.

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

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

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

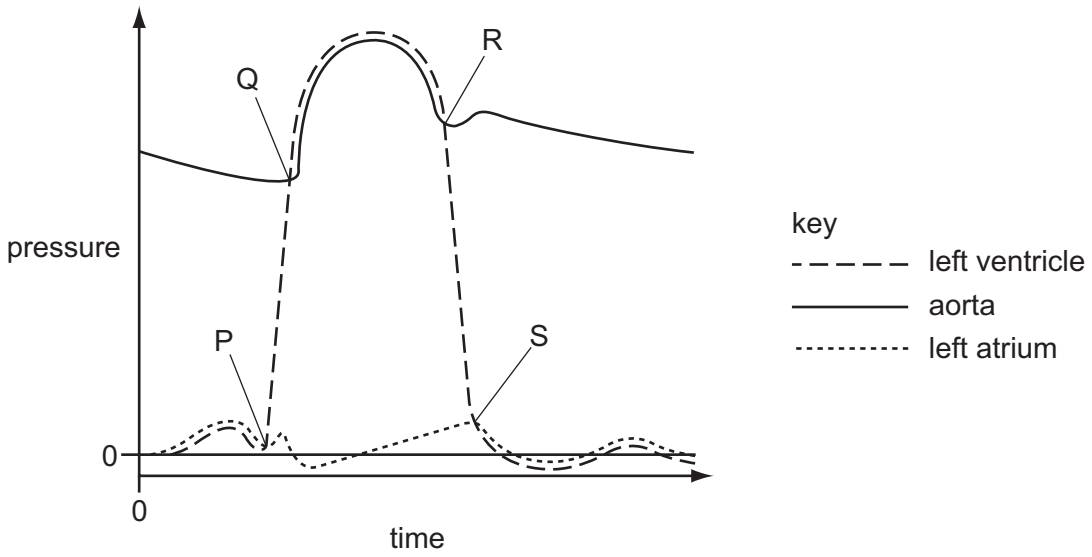
28 The graph shows the dissociation of oxygen from haemoglobin at two different pHs.



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

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

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



Which statement about the heart valves is correct?

A At P, the atrioventricular valve opens.

B At Q, the semilunar valve opens.

C At R, the semilunar valve opens.

D At S, the atrioventricular valve closes.

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

Which of these changes occur during an asthma attack?

1 Activity of ciliated epithelium increases.

2 Endocytosis in goblet cells increases.

3 Smooth muscles more active.

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

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

1 persistent cough

2 less elastic alveoli

3 increased risk of lung infection

4 shortness of breath

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

32 Which row shows the effects of chronic bronchitis?

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

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

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

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

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

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

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

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

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

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

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

What is the expected response to this exposure?

A increased numbers of B-lymphocytes

B increased numbers of T-lymphocytes

C large numbers of antibodies are released

D large numbers of antigens are released

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

A Mosquitoes have many stages in their life cycles.

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

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

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

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

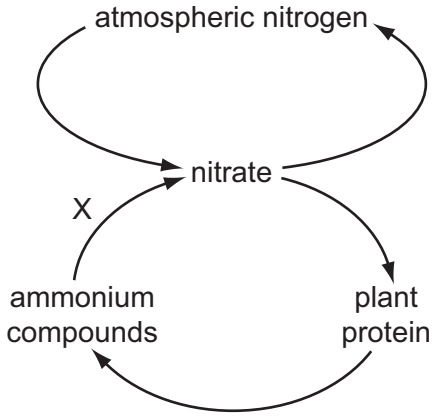
A B-lymphocytes divide to produce killer lymphocytes.

B B-lymphocytes produce memory cells.

C T-lymphocytes are involved in the humoral response.

D T-lymphocytes clone producing antibody-secreting cells.

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



Which type of bacterium is found at X?

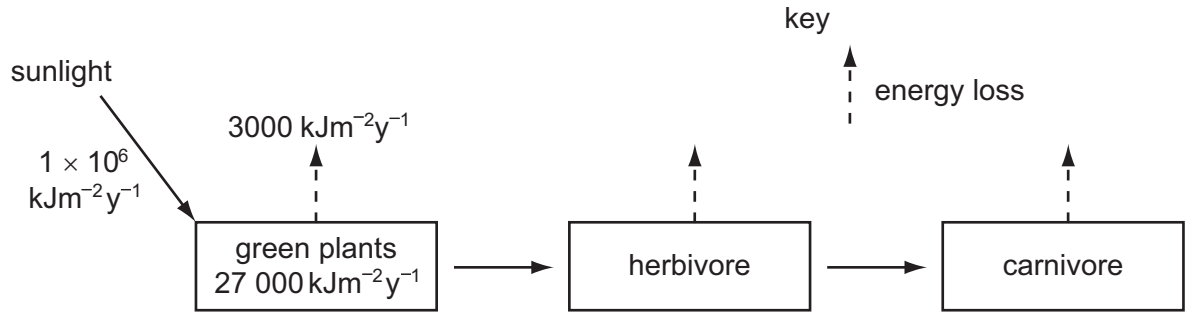
A decomposing

B denitrifying

C nitrifying

D nitrogen fixing

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



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

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

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

Which term describes the tree?

A niche

B community

C ecosystem

D trophic level

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