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

BIOLOGY **9700/01**

Paper 1 Multiple Choice

May/June 2005

1 hour

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

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 **17** printed pages and **3** blank pages.

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1 What identifies a cell as a prokaryote?

A The DNA is associated with protein.

B The DNA is in a circular form.

C The DNA is in the form of a double spiral.

D The DNA is surrounded by a membrane system.

2 A lysosome measures 0.4 μm in diameter.

What is the diameter in nm?

A 4 nm **B** 40 nm **C** 400 nm **D** 4000 nm

3 What describes resolution in microscopy?

A the ability to distinguish between two objects that are very close together

B the clarity of the image formed by the microscope

C the number of times the image has been magnified by the objective lens

D the power of the microscope to focus on very small objects

4 What is a function of the smooth endoplasmic reticulum?

A aerobic respiration

B intracellular digestion

C synthesis of steroids

D transport of proteins

5 When mitochondria are extracted from cells for biochemical study, they are usually kept in a 0.25 mol dm^{-3} sucrose solution.

Why is the sucrose solution used?

A to act as a solvent

B to enable the rate of respiration of the mitochondria to be determined

C to prevent the mitochondria from changing in structure

D to provide a source of energy

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6 For which process is the large surface area of the cristae in the mitochondria important?

A energy radiation

B enzyme reaction

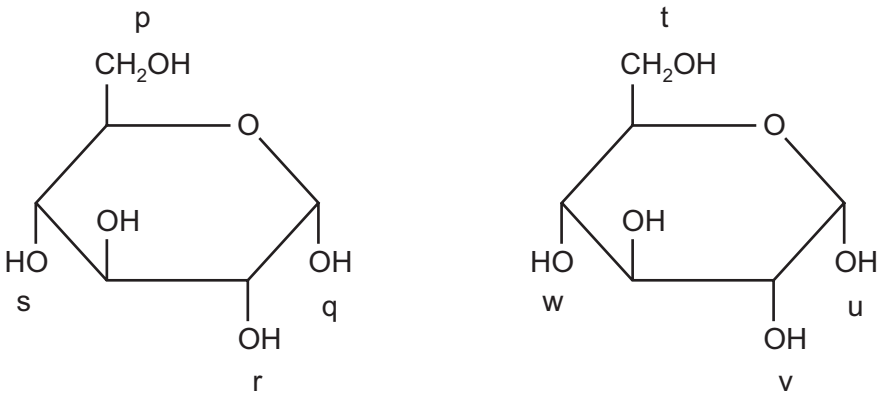
C gaseous exchange

D protein synthesis

7 Which levels of protein structure are demonstrated by a haemoglobin molecule?

	primary	secondary	tertiary	quaternary
A	✓	✗	✗	✗
B	✓	✓	✗	✗
C	✓	✓	✓	✗
D	✓	✓	✓	✓

8 The diagram shows two molecules of glucose. Four possible bonding positions are labelled p, q, r, and s, and t, u, v, w.



When these two molecules condense to form glycogen, where could bonds form?

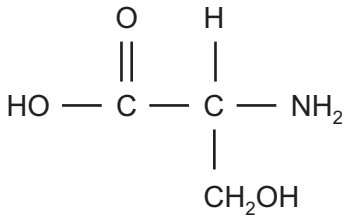
A p - u or p - v

B p - u or q - w

C p - v or q - w

D p - w or v - w

9 The diagram shows a molecule.



Which test on a polymer of this molecule would give a positive result?

A adding biuret solution

B adding iodine in potassium iodide solution

C heating with Benedict's solution

D shaking with ethanol then pouring into water

10 Which property of water minimises temperature changes in cells and organisms?

A cohesion

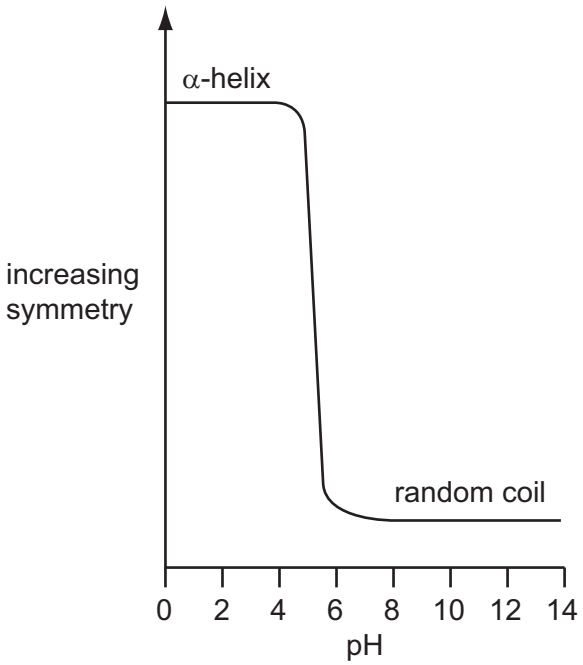
B heat of vaporisation

C maximum density at 4 °C

D specific heat capacity

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11 The graph shows the effect of pH on the structure of a protein which consists entirely of repeating residues of one amino acid.



Which statement is true?

A At pH2 the protein has lost its secondary structure.

B At pH2 the protein has lost its tertiary structure.

C At pH10 the protein has lost its primary structure.

D At pH10 the protein has lost its secondary structure.

12 Which types of bonds hold the tertiary structure of a protein molecule?

	disulphide	glycosidic	hydrogen	ionic	peptide
A	✗	✓	✗	✗	✓
B	✗	✗	✓	✗	✓
C	✓	✓	✗	✓	✗
D	✓	✗	✓	✓	✗

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13 The initial rate of a reaction catalysed by an enzyme was measured at various substrate concentrations.

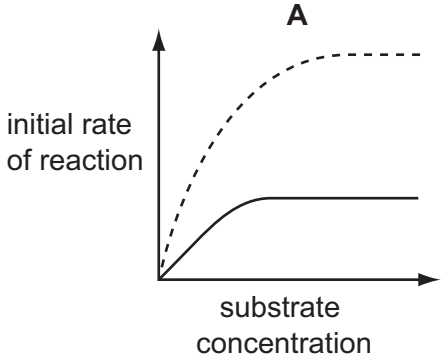
Which graph shows the effect of a low concentration of non-competitive inhibitor on the reaction?

key

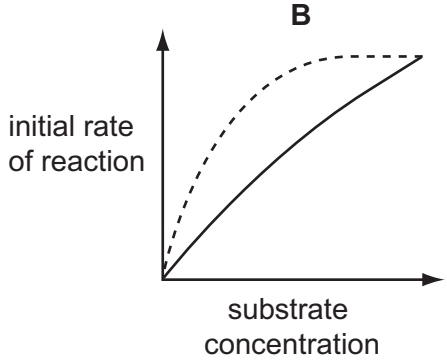
- - - - - - uninhibited reaction

——— inhibited reaction

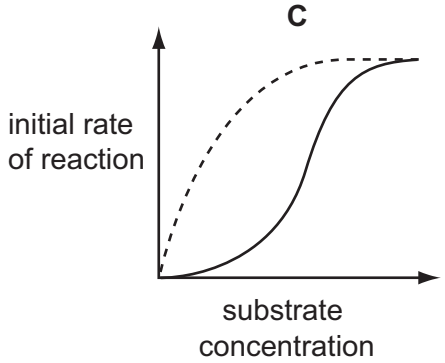
A



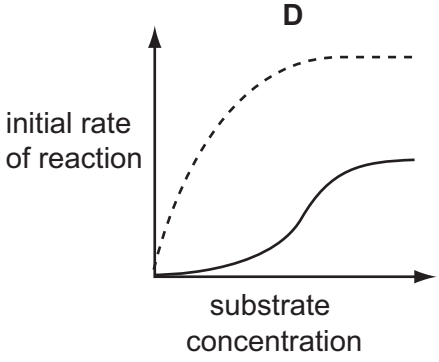
B



C

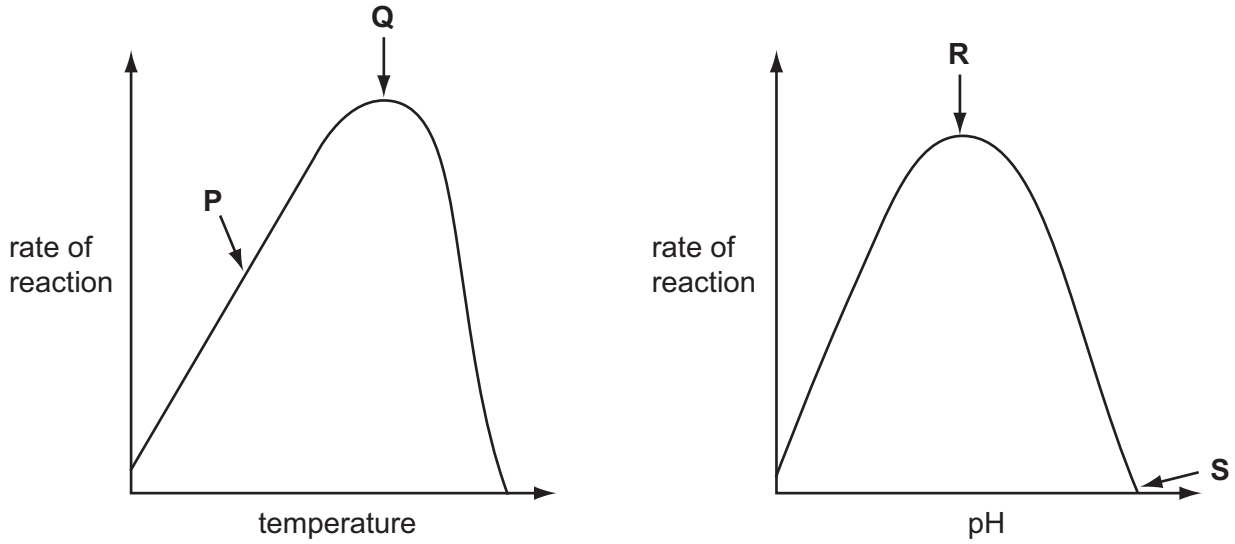


D



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14 The graphs show the effects of temperature and pH on enzyme activity.



Which statement explains the enzyme activity at the point shown?

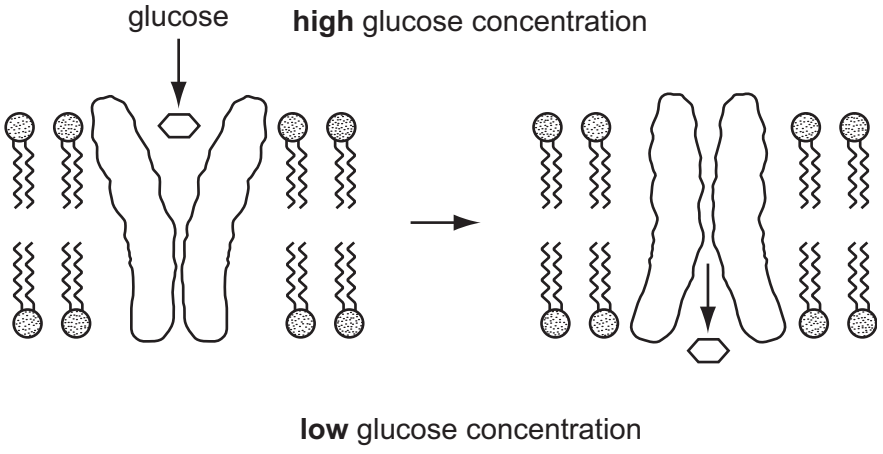
A At **P**, hydrogen bonds are formed between enzyme and substrate.

B At **Q**, the kinetic energy of enzyme and substrate is highest.

C At **R**, peptide bonds in the enzyme begin to break.

D At **S**, the substrate is completely denatured.

15 The diagram represents stages in glucose uptake through a cell surface membrane.



Which process is shown?

A active transport

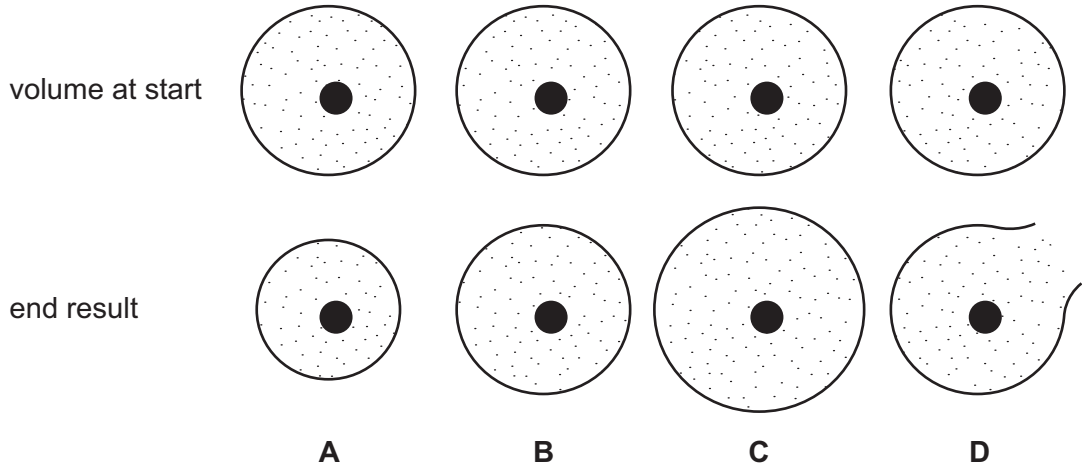
B facilitated diffusion

C osmosis

D simple diffusion

16 Identical animal cells were placed in solutions of differing water potentials. The diagram shows the volume of the cells at the start and the end result.

Which cell was placed in the solution with the lowest (most negative) water potential?



17 Which molecule prevents the cell surface membrane from becoming too fluid or too rigid?

A cholesterol

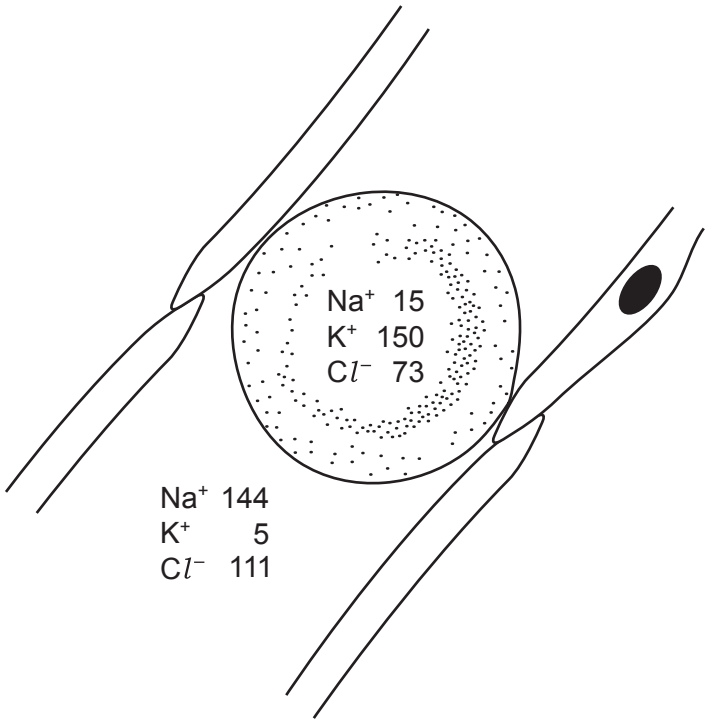
B glycolipid

C glycoprotein

D phospholipid

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18 The diagram shows a red blood cell and the concentrations of ions, in mmol dm^{-3}, in the plasma and in the cell.



Which ions are actively transported into and out of the cell?

	into cell	out of cell
A	Cl^-	K^+
B	K^+	Na^+
C	Na^+	Cl^-
D	Na^+	K^+

19 During which process does mitosis occur?

A the production of antibodies from B-lymphocyte memory cells

B the production of cancerous tissue in alveoli

C the production of mucus from goblet cells

D the production of plaques in atherosclerosis

20 What happens to chromosomes in prophase of mitosis?

A They are formed by replication of DNA.

B They attach to the spindle fibres.

C They divide to form chromatids.

D They shorten and become visible.

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



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

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

22 The table shows the percentages of bases in DNA from various types of cell.

source of DNA	adenine	guanine	thymine	cytosine
calf thymus	28.2	21.5	27.8	22.5
bull spleen	27.9	22.7	27.3	22.1
bull sperm	28.7	22.2	27.2	22.0
rat bone marrow	28.6	21.4	28.4	21.5
yeast	31.3	18.7	32.9	17.1

What is a valid deduction from these data?

A DNA occurs in about the same amounts in all cells from the same species.

B Minute differences in DNA from different cells have large effects.

C The four bases show complementary base pairing.

D The structure of DNA is similar in both yeast and animal cells.

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23 Which statement correctly describes the transcription of DNA?

A It is a semi-conservative process.

B It occurs at the surface of the ribosome.

C It produces messenger RNA.

D It produces polypeptides.

24 One of the codons for the amino acid phenylalanine is UUC.

Which diagram shows how the tRNA carrying phenylalanine pairs with the corresponding section of mRNA?

A
tRNA	AAG
mRNA	UUC

B
tRNA	TTG
mRNA	UUC

C
tRNA	UUC
mRNA	AAG

D
tRNA	UUC
mRNA	TTG

25 Which type of tissue is present in the walls of all blood vessels?

A elastic

B endothelial

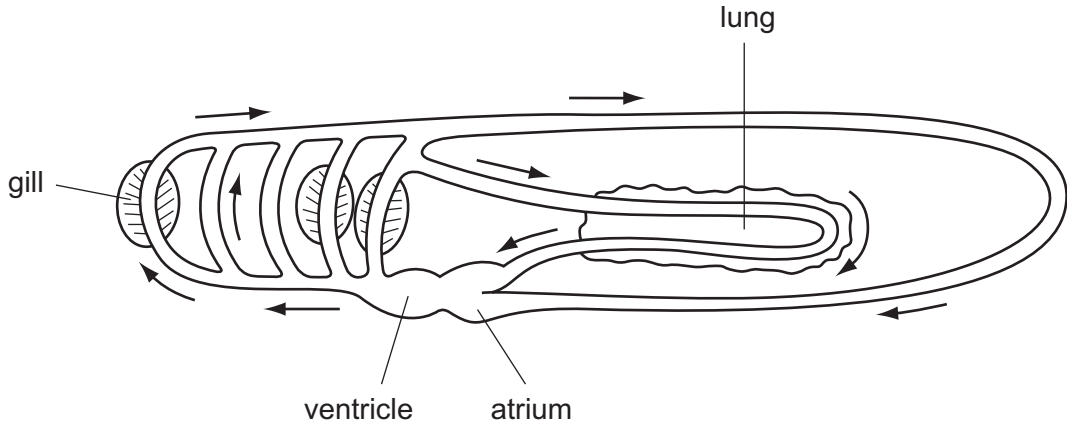
C fibrous

D smooth muscle

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26 The mammalian circulatory system is described as a closed double circulation.

The diagram shows the circulatory system in a different organism. The arrows show the direction of blood flow in the vessels.



How is the circulatory system in this organism described?

A closed double

B closed single

C open double

D open single

27 What is the state of the valves in the mammalian heart when the pressure in the ventricles reaches its maximum?

	semilunar valves	atrioventricular valves
A	closed	closed
B	closed	open
C	open	closed
D	open	open

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

What causes the high pressure?

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

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

C Systolic blood pressure increases.

D The semilunar valves in the veins of the leg cease to function.

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29 What is the main function of a companion cell in mature phloem tissue?

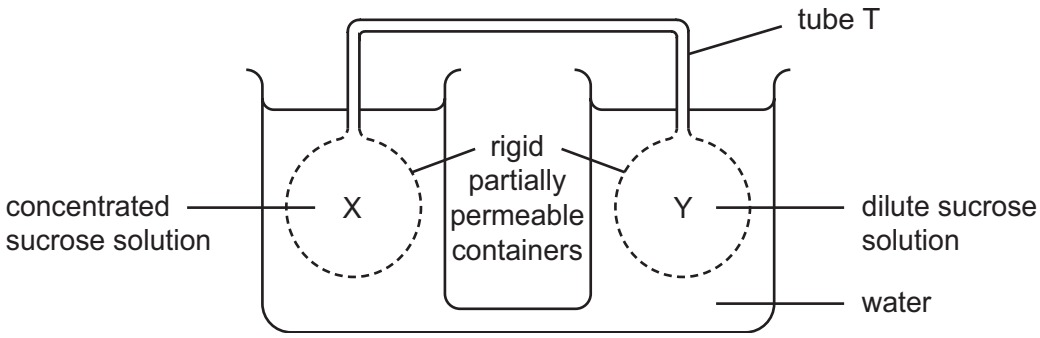
A providing cytoplasmic contact with the sieve tube for loading

B providing structural support for the sieve tube element

C providing the nucleus for cell division in the phloem

D providing the source of assimilates for storage

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



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

Which description of this is correct?

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

31 What are the approximate diameters of a trachea, an alveolus, a bronchiole and a bronchus?

	trachea / mm	alveolus / mm	bronchiole / mm	bronchus / mm
A	18	0.25	0.50	12
B	18	0.50	0.25	12
C	12	0.25	0.50	18
D	12	0.50	0.25	18

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32 What is an effect of inhaling tobacco smoke?

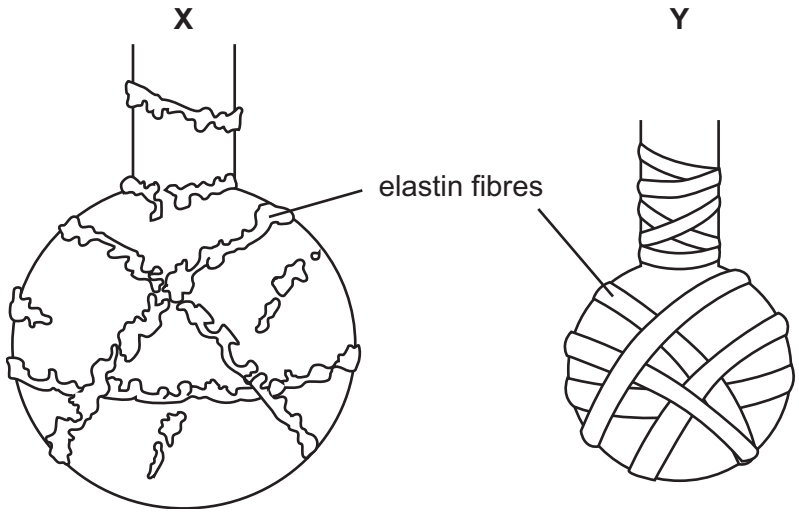
A decreased mucus production by goblet cells

B increased movement of cilia in bronchial epithelium

C reduced oxygen transport by blood

D thinning of bronchial epithelium

33 The diagram shows two alveoli.



A cigarette smoker has more alveoli like **X** and fewer like **Y**.

From which disease does he suffer?

A atherosclerosis

B chronic bronchitis

C emphysema

D lung cancer

34 A village has improved its supply of clean water, sewage treatment, insect control and milk pasteurisation.

Which disease, present in the village, will **not** be reduced by these measures?

A cholera

B HIV / AIDS

C malaria

D tuberculosis (TB)

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35 Some antibiotics are used in animal feed to reduce disease.

What explains why these antibiotics should not be used in the treatment of human diseases?

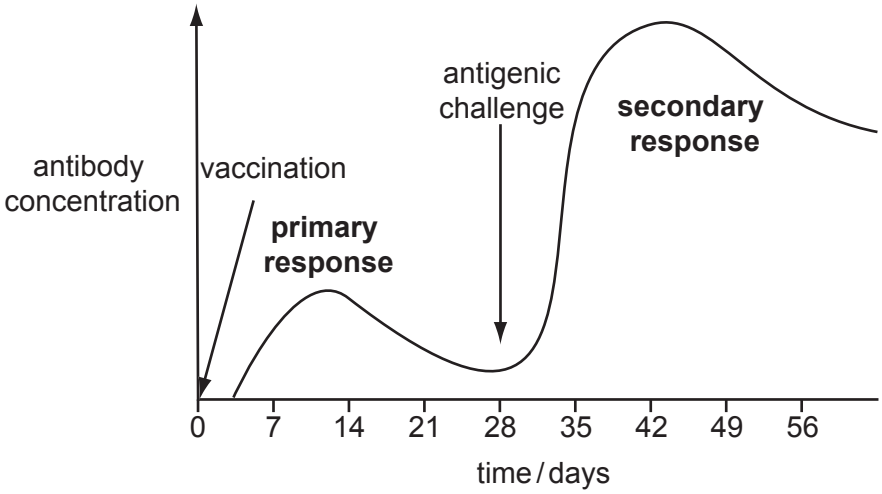
A Humans may be allergic to these antibiotics.

B Human cells may stop responding to these antibiotics.

C Pathogenic bacteria may develop resistance to these antibiotics.

D Useful gut bacteria may be killed by these antibiotics.

36 The graph shows the level of antibody in serum following vaccination and a challenge with the same antigen 28 days later.



Which cells account for the difference in antibody concentration at the peaks of the primary and secondary responses?

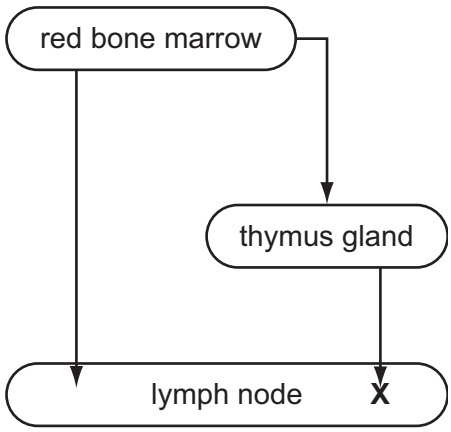
A B-lymphocytes

B memory cells

C phagocytes

D T-lymphocytes

37 The diagram shows the relationship between the red bone marrow, the thymus gland and the lymph nodes.



What does **X** represent?

A antibodies

B B-lymphocytes

C macrophages

D T-lymphocytes

38 Which agricultural practice will **not** provide an alternative to the use of ammonium nitrate as a fertiliser to increase the productivity of wheat?

A growing wheat and another cereal crop in the same field in alternate years

B growing wheat and beans in the same field in alternate years

C ploughing animal waste such as dung into the soil

D using synthetic urea as a fertiliser

39 Which stage in the nitrogen cycle is linked to its bacteria?

	stage	bacteria
A	ammonium ions → nitrate ions	nitrogen-fixing
B	ammonium ions → nitrite ions	nitrifying
C	nitrate ions → atmospheric nitrogen	nitrogen-fixing
D	atmospheric nitrogen → ammonium ions	nitrifying

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40 What is the ecological definition of the term *community*?

A all the food webs in an ecosystem

B all the individuals of one species in an area

C all the organisms in an area

D the living organisms and their non-living environment

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