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

BIOLOGY **9700/01**

Paper 1 Multiple Choice

October/November 2006

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.

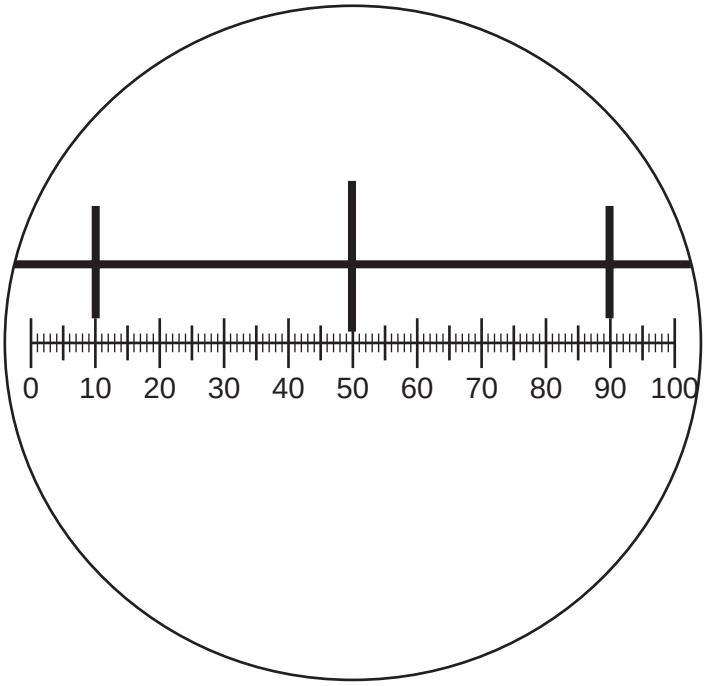
Read the instructions on the Answer Sheet very carefully.

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.

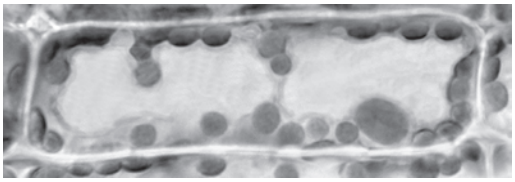
This document consists of **19** printed pages and **1** blank page.

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



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

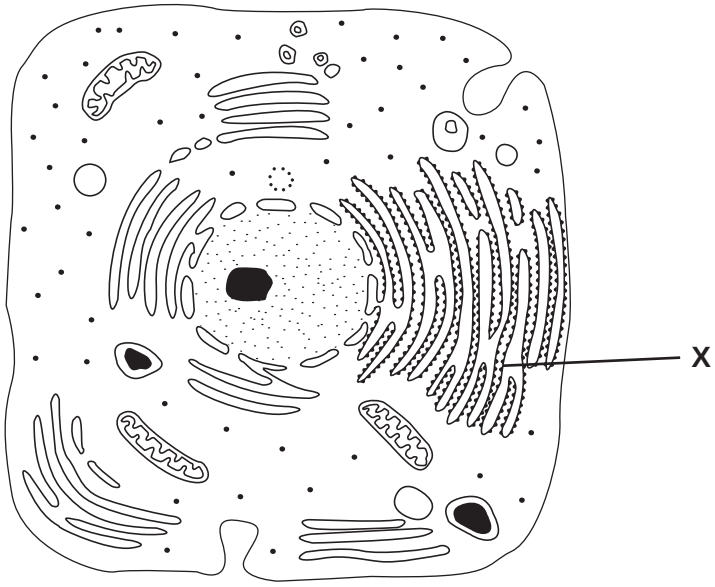




What is the width of a chloroplast?

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

2 The diagram shows an electron micrograph of a typical animal cell.



What is the function of the membrane system labelled **X**?

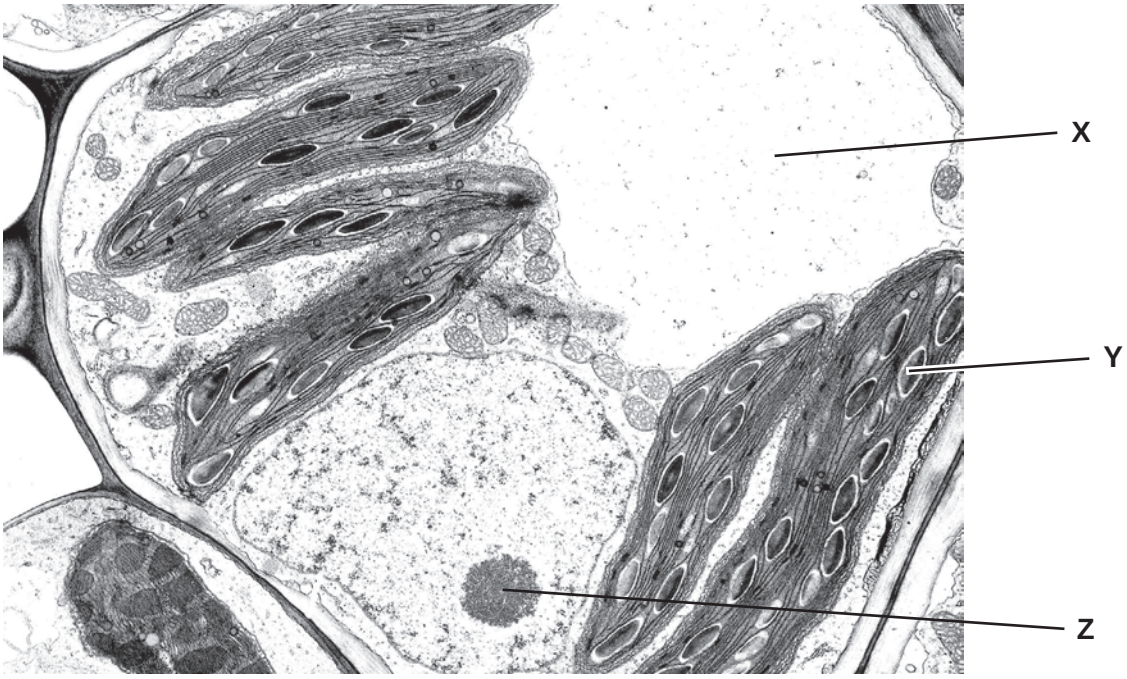
A carbohydrate metabolism

B lipid synthesis

C protein synthesis

D protein synthesis and transport

3 The diagram shows an electron micrograph of a plant cell.



What do structures **X**, **Y** and **Z** contain?

	X	Y	Z
A	air	chlorophyll	protein
B	mineral ions	starch	DNA and RNA
C	water	mineral ions	starch
D	starch	DNA and RNA	mineral ions

4 Which organelles are found in the cells of both eukaryotes and prokaryotes?

A chloroplasts

B Golgi apparatus

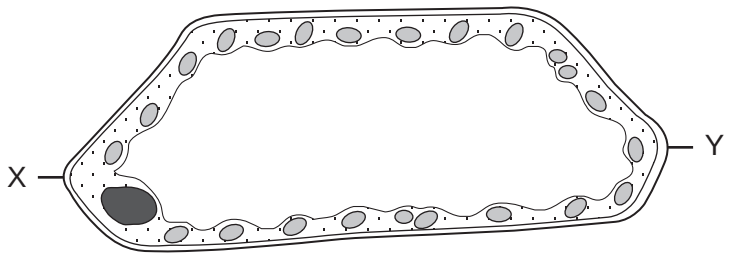
C mitochondria

D ribosomes

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5 The diagram shows a high-power drawing of a plant cell.

The actual length of the cell between X and Y was 160 μm.



What is the magnification of the cell?

A × 50 **B** × 100 **C** × 500 **D** × 1000

6 Which statement is true for cellulose, but **not** true for protein?

A It is found in cell surface membranes.

B It is synthesised from identical sub-units.

C It is used as an energy source.

D It may be a structural component.

7 Heating with which solution breaks glycosidic bonds?

A Benedict's solution

B dilute hydrochloric acid

C dilute sodium hydroxide

D ethanol

8 Which level of protein structure maintains the globular shapes of enzymes?

A primary

B secondary

C tertiary

D quaternary

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9 Which type of bond is involved in maintaining primary, secondary and tertiary structure in protein molecules?

	level of structure		
	primary	secondary	tertiary
A	disulphide	ionic	hydrogen
B	covalent	peptide	ionic
C	ionic	disulphide	covalent
D	peptide	hydrogen	disulphide

10 What is the function of iron in the haemoglobin molecule?

A It binds oxygen to the haemoglobin molecule.

B It makes the haemoglobin more soluble in the red blood cell.

C It stabilises the quaternary structure of the protein.

D It undergoes reversible oxidation and reduction.

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

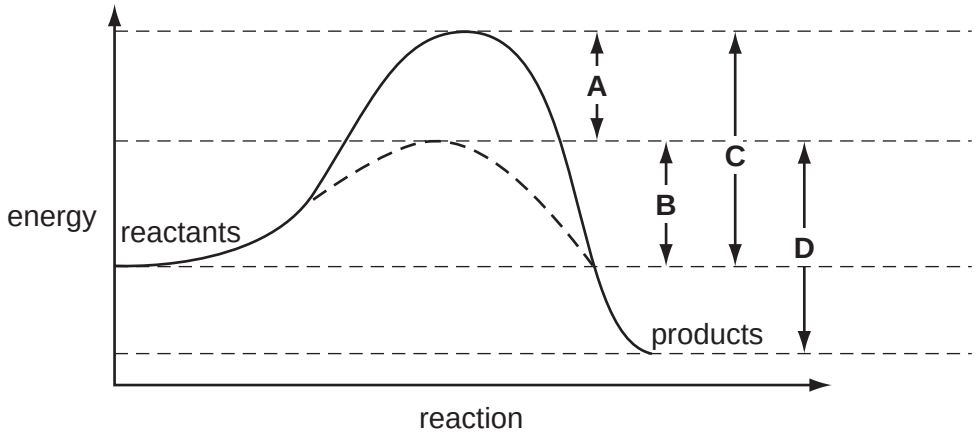
4 its molecules form hydrogen bonds

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

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12 The graph shows the activation energy of an enzyme-catalysed reaction and the same reaction without a catalyst.

Which arrow shows the activation energy of the uncatalysed reaction?



13 How does increasing substrate concentration affect the rate of an enzyme-catalysed reaction in the presence of a competitive inhibitor?

A The rate of the reaction decreases.

B The rate of the reaction decreases initially and then recovers.

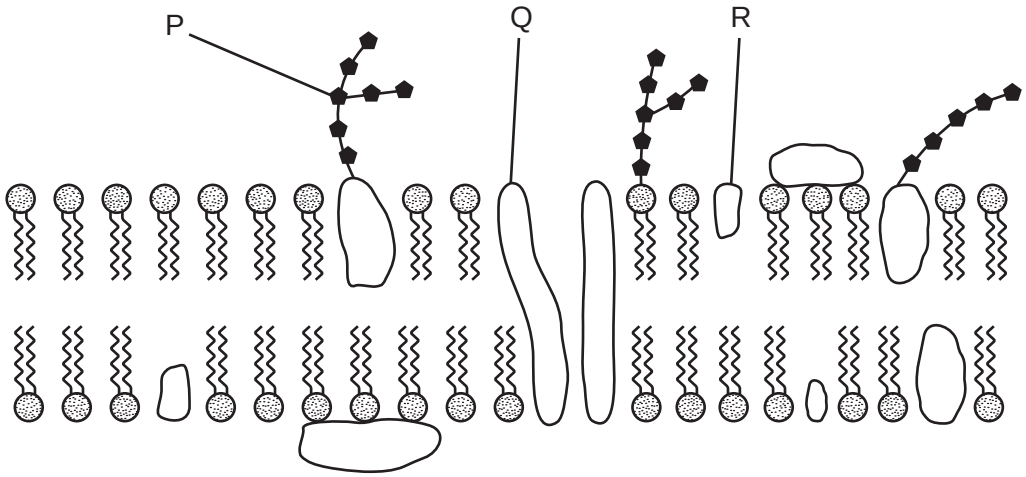
C The rate of the reaction increases.

D The rate of the reaction is not affected.

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14 The diagram shows part of a cell surface membrane.

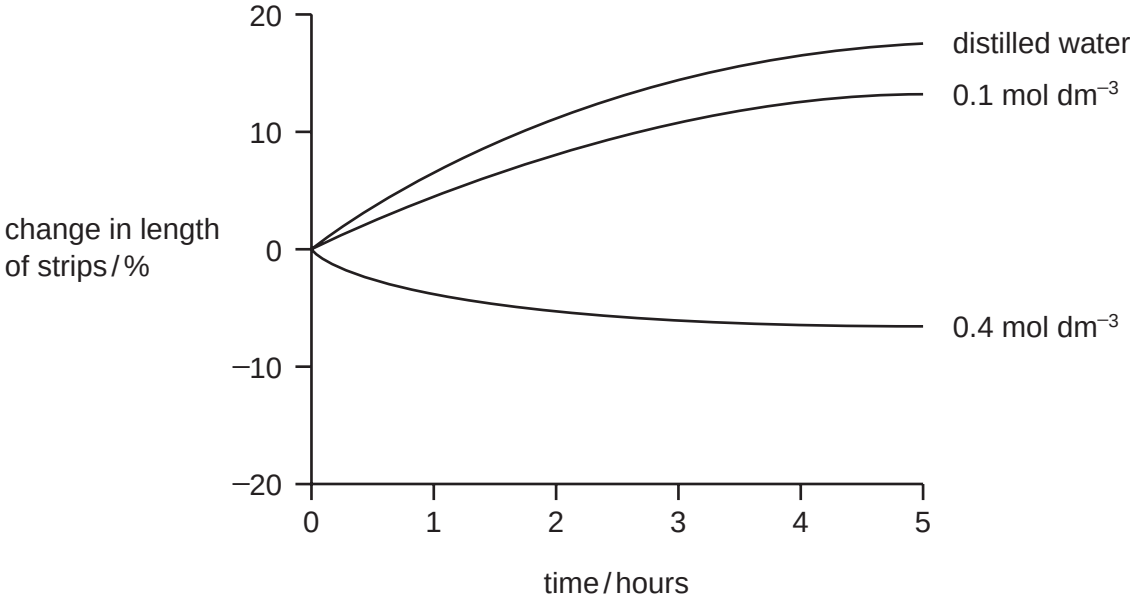


What is the correct function for each of the structures labelled?

	regulates membrane fluidity	forms hydrogen bonds with water to stabilise membrane	transports ions and large polar molecules
A	R	R	Q
B	P	Q	R
C	Q	R	P
D	R	P	Q

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15 Strips of potato tuber tissue were immersed in distilled water or in sucrose solutions of different concentrations. The graph shows the percentage change in length of the strips.



Which statement explains the change that occurred in the potato strips immersed in 0.1 mol dm^{-3} sucrose solution?

A Sucrose molecules diffused into the potato cells.

B Sucrose molecules were actively transported into the potato cells.

C The water potential of the sucrose solution was less negative than the water potential inside the cells.

D The water potential of the sucrose solution was more negative than the water potential inside the cells.

16 Which process would allow the movement of large protein molecules **out** of the cell?

A active transport

B exocytosis

C facilitated diffusion

D phagocytosis

17 To which of the processes shown does mitosis make a contribution?

	genetic variation	increase in cell number	replacement of damaged cells
A	✗	✓	✓
B	✓	✗	✗
C	✓	✓	✗
D	✗	✗	✓

key

✓ contributes to process

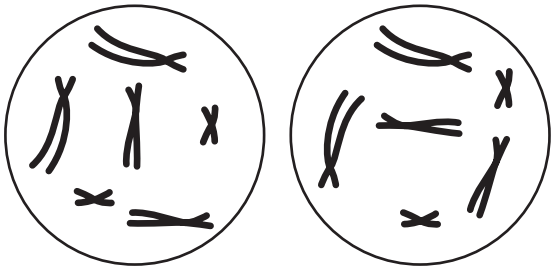
✗ does not contribute to process

18 The diagram shows the chromosomes of a cell at late prophase of mitosis.

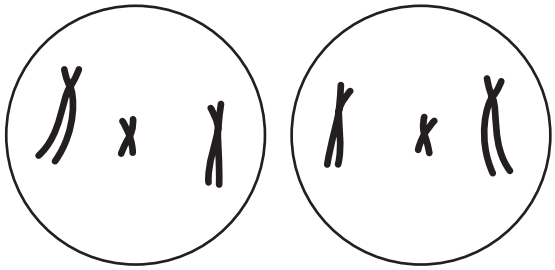


What will be the appearance of the products of this cell division as they enter prophase of their next division?

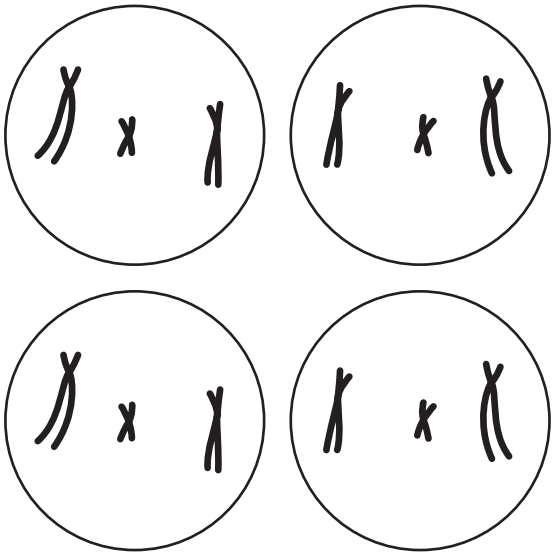
A



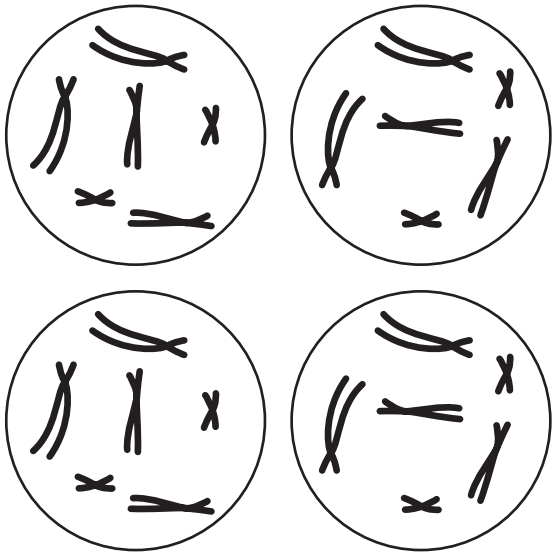
B



C



D



19 A diploid nucleus in a species of fruit fly has 8 chromosomes.

How many DNA molecules are present in the nucleus at the end of interphase?

A 4 **B** 8 **C** 16 **D** 32

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20 What is the function of the enzyme DNA polymerase in a cell?

A to synthesise a polypeptide using DNA as a template

B to synthesise a strand of DNA using a polypeptide as a template

C to synthesise a strand of DNA using DNA as a template

D to synthesise a strand of mRNA using DNA as a template

21 A culture of bacteria had all its DNA labelled with the heavy isotope of nitrogen, ^{15}N. The culture was then allowed to reproduce using nucleotides containing normal ^{14}N. The DNA was examined using a centrifuge after one generation and again after two generations.

The diagram shows the position of the DNA band at **Z** in the centrifuge tube when the DNA was first labelled.



In which pattern would the DNA be found after the first and after the second cell generations?

	after first generation	after second generation
A	half at **X** and half at **Y**	quarter at **X**, quarter at **Z** and half at **Y**
B	half at **X** and half at **Z**	quarter at **X**, quarter at **Z** and half at **Y**
C	all at **Y**	half at **X** and half at **Y**
D	all at **Z**	half at **Y** and half at **Z**

22 What terminates the formation of a polypeptide chain during protein synthesis in cells?

A when a ‘stop’ codon is reached on the mRNA molecule

B when a ‘stop’ codon is reached on the tRNA molecule

C when the ribosome reaches the end of the mRNA molecule

D when the ribosome reaches the end of the tRNA molecule

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23 Mammalian skin cells in tissue culture were supplied with a source of radioactive thymine.

At which stage in the cell cycle will the thymine be used in the nuclei?

A interphase

B metaphase

C prophase

D telophase

24 Which organelles occur in large numbers in companion cells in phloem?

A chloroplasts

B lysosomes

C mitochondria

D starch grains

25 A water potential gradient causes water to move through xylem.

Which process is mainly responsible for this water potential gradient?

A capillarity

B osmosis

C translocation

D transpiration

26 During transpiration, what is the site of evaporation of water in the leaves?

A air spaces

B mesophyll cell walls

C stomata

D walls of xylem vessels

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27 The table summarises some characteristics of arteries, veins and capillaries.

	characteristics	arteries	veins	capillaries
1	blood pressure	high	low	low
2	lumen	wide	narrow	narrow
3	wall	thick	thin	single cell

Which lines in the table are correct?

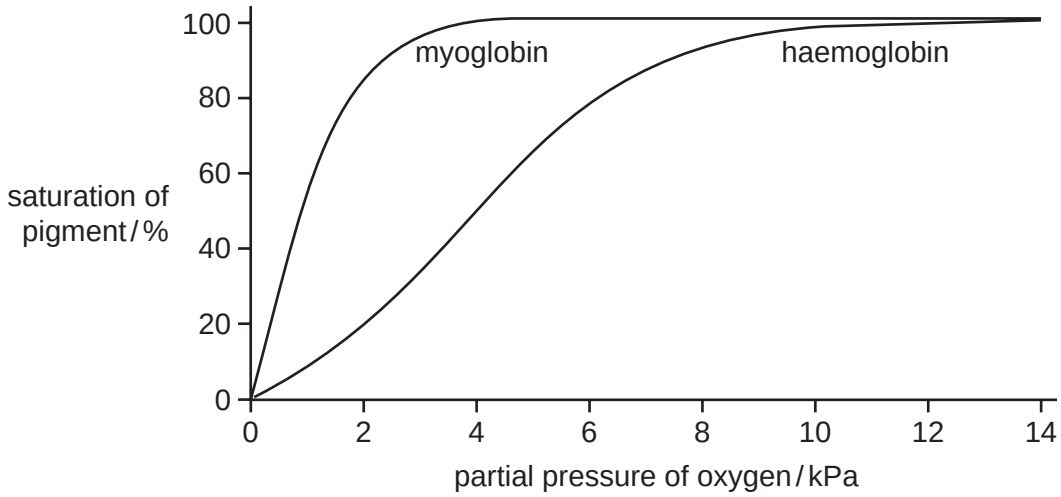
A 1 and 2 only

B 1 and 3 only

C 2 and 3 only

D 1, 2 and 3

28 The graph shows the oxygen dissociation curves of the pigments myoglobin and haemoglobin.



Using information contained in the graph, what is the comparison between haemoglobin and myoglobin at a partial pressure of oxygen of 2 kPa?

A haemoglobin combines with more oxygen than myoglobin

B haemoglobin combines with oxygen when myoglobin releases oxygen

C haemoglobin has a lower affinity for oxygen than myoglobin

D haemoglobin has a saturation of 20 % when myoglobin is fully saturated

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29 When climbing a very high mountain there is a risk of altitude sickness.

What causes altitude sickness?

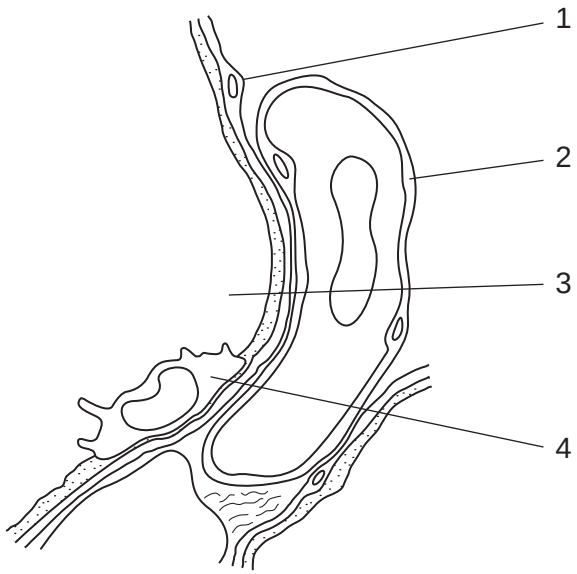
A A high concentration of carbon dioxide accumulates in the blood.

B Oxygen partial pressure decreases.

C Red blood cell production increases.

D The proportion of oxygen in the air decreases.

30 The diagram shows a magnified section through the lung tissue.

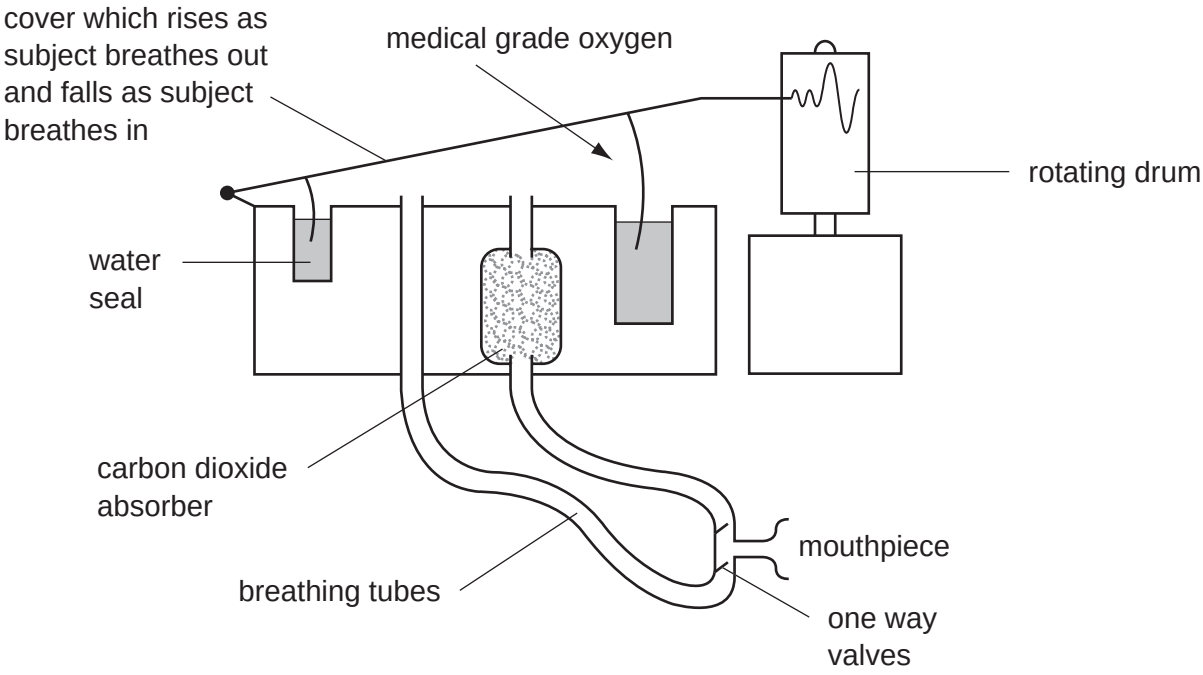


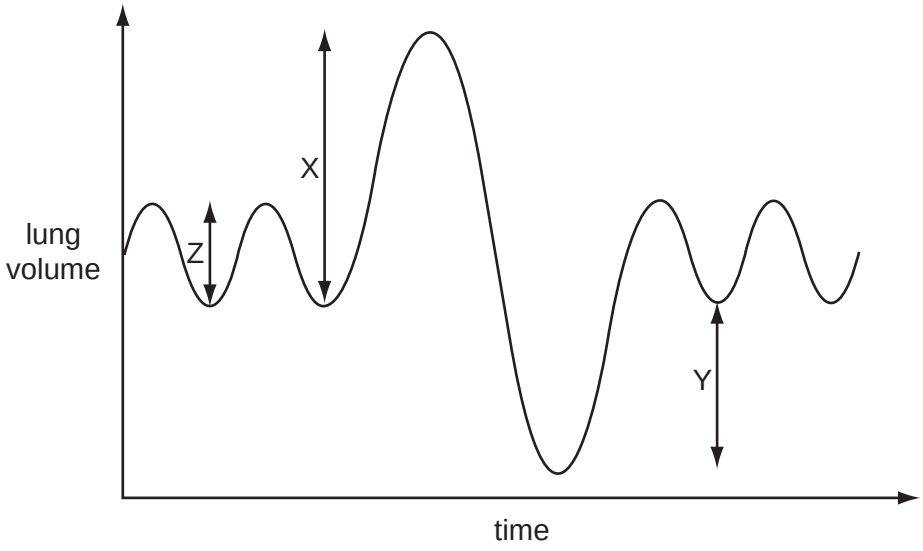
What are 1, 2, 3 and 4?

	1	2	3	4
A	alveolar epithelial cell	blood capillary wall	lumen of alveolus	macrophage
B	blood capillary wall	alveolar epithelial cell	blood plasma	phagocyte
C	wall of bronchiole	arteriole wall	lumen of bronchiole	blood capillary wall
D	alveolar epithelial cell	macrophage	lumen of alveolus	blood capillary wall

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31 The first diagram shows a spirometer, which is an apparatus used to measure changes in lung volume. The cover rises during exhalation and falls during inhalation, producing a trace on the rotating drum. The second diagram shows a typical trace from a spirometer.

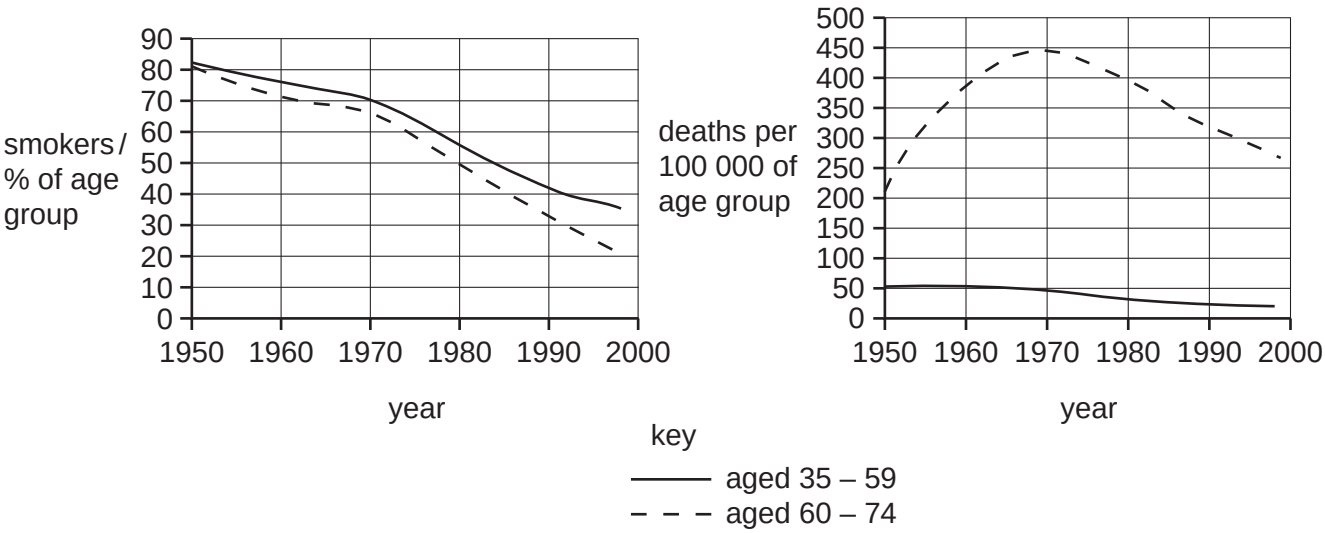




Which would give the vital capacity?

A X + Y **B** X – Y **C** X + Z **D** Y + Z

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



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

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

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

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

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

33 The table shows four infectious diseases and the pathogen responsible.

Which row in the table is correct?

	disease			
	cholera	malaria	TB	AIDS
A	bacterium	bacterium	virus	protoctista
B	bacterium	protoctista	bacterium	virus
C	virus	protoctista	protoctista	virus
D	protoctista	virus	bacterium	bacterium

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34 For which diseases is treatment with antibiotics likely to be effective?

	cholera	malaria	TB
A	✓	✓	✗
B	✗	✓	✓
C	✓	✗	✓
D	✓	✓	✓

35 What is the difference between B and T lymphocytes in the immune system?

	B lymphocytes	T lymphocytes
A	do not produce memory cells	produce memory cells
B	formed from bone marrow cells	formed from cells in the thymus
C	form plasma cells which secrete antibodies into the blood stream	do not form plasma cells
D	stimulate macrophages to carry out phagocytosis	do not stimulate macrophages to carry out phagocytosis

36 Cells which divide and give rise to lymphocytes are called stem cells.

Where in the human body do these stem cells divide?

A bone marrow

B lymph nodes

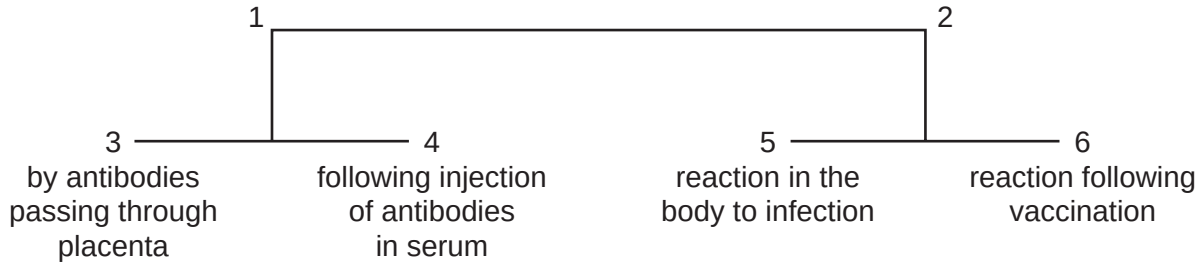
C spleen

D thymus

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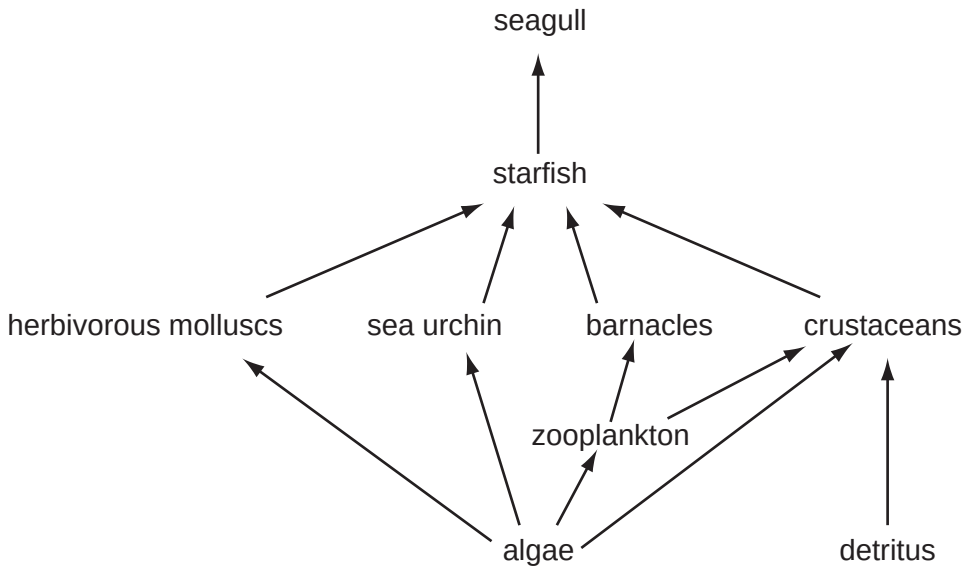
37 The numbers on the diagram refer to different types of immunity.



Which term is correct for each of these numbers?

	1	2	3	4	5	6
A	active	passive	natural	artificial	natural	artificial
B	active	passive	artificial	natural	artificial	natural
C	passive	active	natural	artificial	natural	artificial
D	passive	active	artificial	natural	artificial	natural

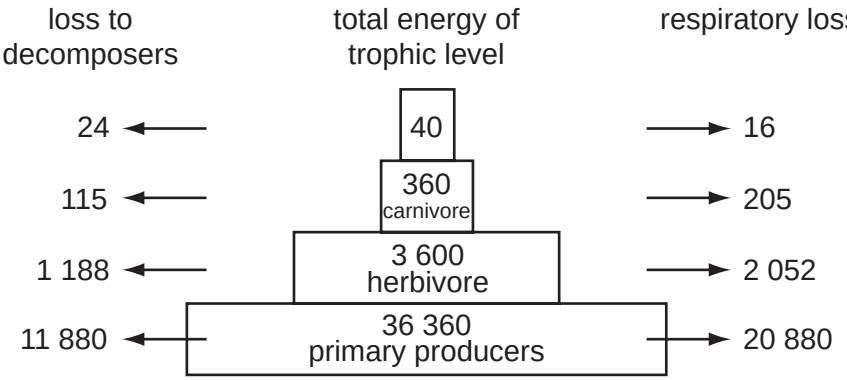
38 The diagram shows a food web.



How many trophic levels are represented in the food web?

A 3 **B** 4 **C** 5 **D** 6

39 The diagram represents loss of energy from a food chain to decomposers, transfer of energy to the next trophic level and energy loss through respiration. All figures are in kJ m^{-2} y^{-1}.



What is illustrated by this diagram?

A Carnivores lose more energy than herbivores.

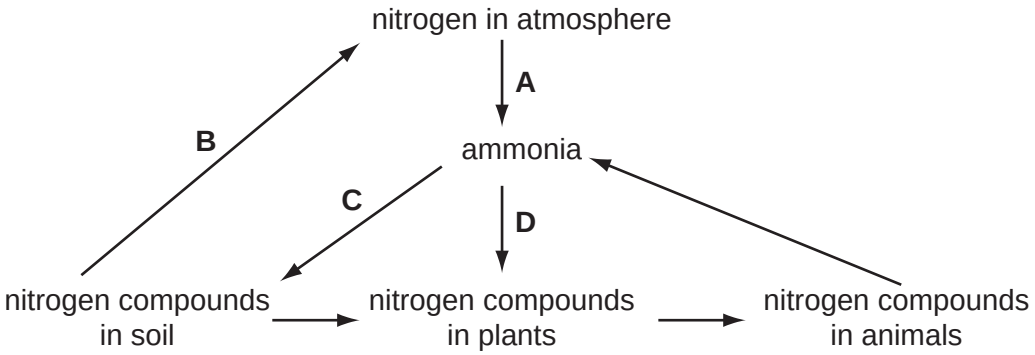
B Energy loss to decomposers is higher than respiratory loss.

C Energy transfer between trophic levels is about 10%.

D The energy of the final trophic level is not used.

40 The diagram represents part of the nitrogen cycle.

Which process is carried out by nitrifying bacteria?



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