Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

BIOLOGY **9700/11**

Paper 1 Multiple Choice **May/June 2018**

1 hour

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

5924034730

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 **20** printed pages.

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CAMBRIDGE International Examinations

1 Which statements about resolution and magnification are correct?

	resolution	magnification
A	the ability to distinguish between two separate objects that are very close together	the number of times larger an image is compared with the real size of the object
B	the clarity of the image formed by the microscope	the power of the microscope to focus on very small objects
C	the number of times larger an image is compared with the real size of the object	the ability to distinguish between two separate objects that are very close together
D	the power of the microscope to focus on very small objects	the clarity of the image formed by the microscope

2 An eyepiece graticule has a scale with 100 divisions. A stage micrometer has a scale with 50 divisions, each of which is 0.040 mm apart.

Using a ×40 objective lens, the whole length of this stage micrometer scale lines up with 15 divisions of the eyepiece graticule.

What is the actual length of the 100 division scale of the eyepiece graticule?

A 1.3 mm **B** 13 mm **C** 75 μm **D** 750 μm

3 A prokaryotic cell which is 1 μm in diameter, is magnified 50 000 times in an electron micrograph.

What is the diameter of the cell in the electron micrograph?

A 5×10^{-1} mm

B 5×10^{0} mm

C 5×10^{1} mm

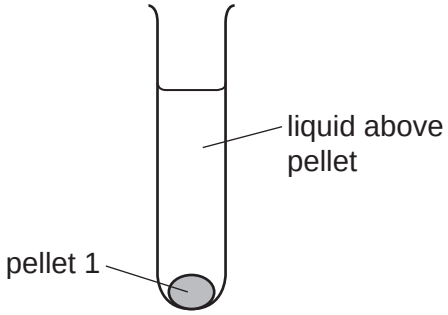
D 5×10^{2} mm

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4 A scientist carried out an experiment to separate cell structures in animal cells.

The cells were broken open to release the cell structures.

This extract was filtered into a centrifuge tube and then spun in a centrifuge. The heaviest cell structure sank to the bottom forming pellet 1, as shown in the diagram.



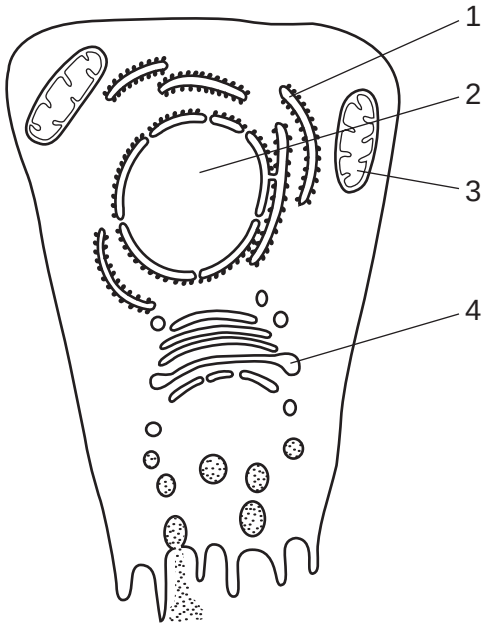
The liquid above pellet 1 was poured into a clean centrifuge tube and spun in the centrifuge at a higher speed to separate the next heaviest cell structure. This cell structure sank to the bottom, forming pellet 2.

This procedure was repeated twice more to obtain pellet 3 and pellet 4, each containing a single type of cell structure.

Which row shows the order in which the cell structures were collected?

	pellet 1	pellet 2	pellet 3	pellet 4
A	nucleus	lysosomes	mitochondria	ribosomes
B	nucleus	mitochondria	lysosomes	ribosomes
C	ribosomes	lysosomes	mitochondria	nucleus
D	ribosomes	mitochondria	lysosomes	nucleus

5 Radioactively-labelled nucleotides are introduced into a cell.



In which cell structures will the radioactivity first become concentrated?

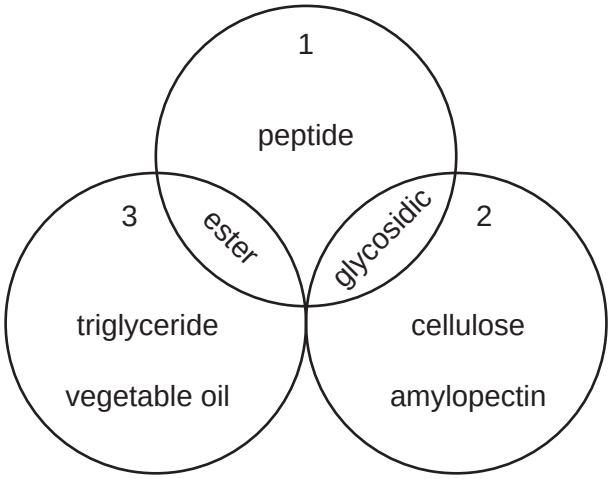
A 1 and 2 **B** 1 and 4 **C** 2 and 3 **D** 3 and 4

6 What is the general formula for amylose?

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

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7 The diagram shows relationships between some important molecules and bonds.



What is represented by circles numbered 1, 2 and 3?

	1	2	3
A	bonds formed by condensation	carbohydrates	lipids
B	bonds formed by condensation	lipids	carbohydrates
C	bonds formed by hydrolysis	carbohydrates	lipids
D	bonds formed by hydrolysis	lipids	carbohydrates

8 In unsaturated lipid molecules, where are double bonds located?

A between fatty acids and glycerol

B within fatty acids and within glycerol

C within fatty acids only

D within glycerol only

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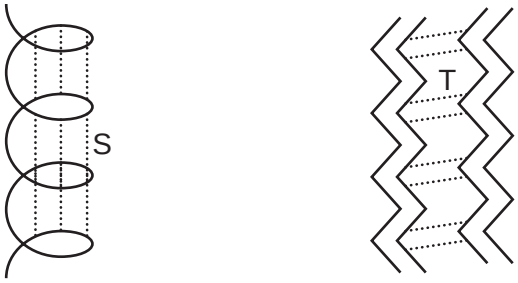
[Turn over

9 Phospholipids and triglycerides are important biological molecules.

Which properties are correct for these molecules?

	non-polar	partially hydrophobic
A	phospholipid	phospholipid
B	phospholipid	triglyceride
C	triglyceride	phospholipid
D	triglyceride	triglyceride

10 The diagrams show two arrangements of amino acids in a protein.



Which row correctly names the bonds at S or T?

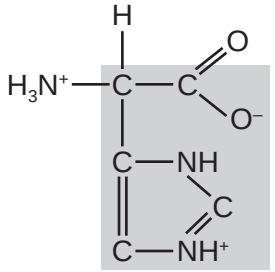
	ionic bond	hydrogen bond
A	absent	S and T
B	S only	T only
C	S and T	absent
D	T only	S and T

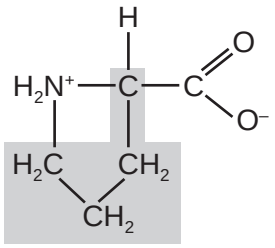
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11 Students were asked to highlight only the R groups of two ring-shaped amino acids.

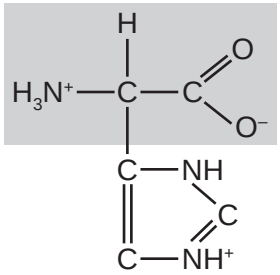
Which pair of diagrams are correct for both amino acids?

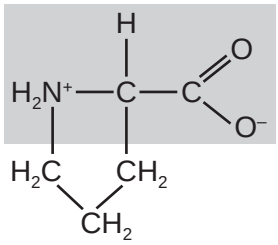
A



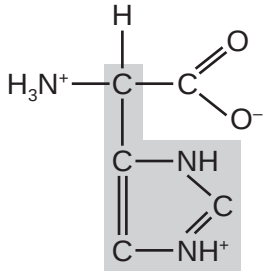


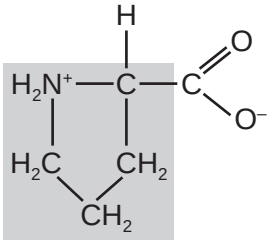
B



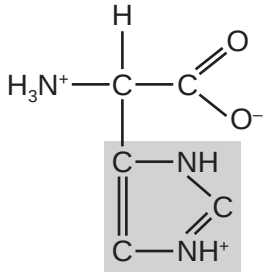


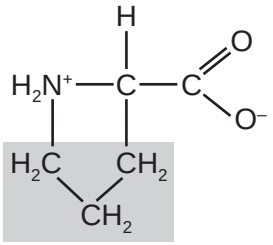
C





D





12 Which words from the table correctly complete the paragraph about enzymes?

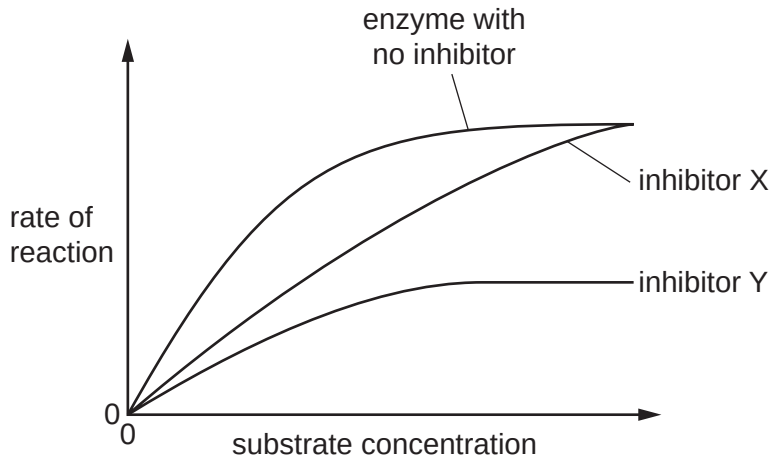
When the pH of an environment is decreased below the optimum pH of an enzyme, ……1…… bonds between adjacent ……2…… groups, holding the ……3…… structure, are disrupted.

	1	2	3
A	hydrogen and ionic	R	tertiary
B	hydrogen	hydroxyl	secondary
C	ionic and peptide	R	primary and tertiary
D	peptide	amine	primary

13 The effect of substrate concentration on an enzyme-catalysed reaction was measured in three different conditions:

- with no inhibitor
- with a competitive inhibitor
- with a non-competitive inhibitor.

The graph shows the results.



Which statement is correct?

A X is a competitive inhibitor which binds to a site other than the active site of the enzyme.

B X is a non-competitive inhibitor which has a similar shape to the active site of the enzyme.

C Y is a competitive inhibitor which has a similar shape to the active site of the enzyme.

D Y is a non-competitive inhibitor which binds to a site other than the active site of the enzyme.

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14 Which statements about the cell surface membrane are correct?

1 Channel proteins allow water soluble ions and molecules across the membrane.

2 Glucose can pass into the cell via carrier proteins.

3 Oxygen passes freely through the membrane as it is soluble in lipids.

4 Some glycoproteins act as antigens.

A 1, 2, 3 and 4

B 1, 3 and 4 only

C 1 and 2 only

D 2, 3 and 4 only

15 Which of these features increase the efficiency of ion uptake by a root hair cell?

1 many mitochondria in the cell

2 high concentration of ions in the vacuole

3 protein carriers in the cell surface membrane

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

16 What can increase the fluidity of the cell surface membrane at low temperatures?

1 double bonds between carbon atoms in the fatty acid chains

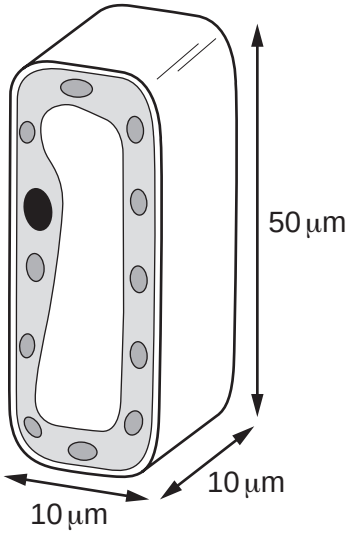
2 cholesterol

3 fatty acids having shorter chains

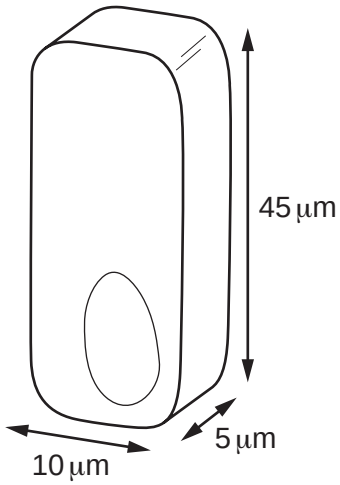
A 1, 2 and 3 **B** 1 and 3 only **C** 1 only **D** 2 and 3 only

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17 The diagrams show the shape and size of two types of cell.



palisade mesophyll cell
surface area = 2200 μm^2



columnar epithelial cell
volume = 2250 μm^3

Which statement is correct about the palisade cell and epithelial cell shown in the diagrams?

A An increase in surface area reduces the distance for gases to reach the centre of the cell.

B The surface area of the palisade mesophyll cell is 500 μm^2 greater than the columnar epithelial cell.

C The surface area to volume ratio is greater in the columnar epithelial cell than the palisade mesophyll cell.

D The volume of the palisade mesophyll cell is 2500 μm^3 greater than that of the columnar epithelial cell.

18 A student observed the cells in the growing region (meristem) of an onion root and obtained the data shown.

stage	number of cells
interphase	886
prophase	73
metaphase	16
anaphase	14
telophase	11

Which percentage of cells contains chromosomes that appear as two chromatids?

A 7.3 **B** 8.9 **C** 95.9 **D** 97.5

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19 Which of these events are part of mitosis?

1 interphase

2 telophase

3 cytokinesis

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

20 During which phase of the cell cycle does DNA replication take place?

A G_1 **B** G_2 **C** M **D** S

21 Which row is correct for guanine?

	has a double ring structure	is a purine	joins its complementary base with three hydrogen bonds
A	✓	✓	✓
B	✓	✗	✓
C	✗	✓	✗
D	✗	✗	✓

key

✓ = correct

✗ = incorrect

22 Meselsohn and Stahl investigated DNA in bacteria. They grew bacteria in a medium with only heavy nitrogen, ^{15}N, until all of the bacterial DNA was heavy.

These bacteria were moved from a heavy nitrogen medium and cultured in a medium with only light nitrogen, ^{14}N.

A sample of bacteria was collected from the first generation in the medium containing light nitrogen and their DNA was analysed.

Hybrid DNA contains both heavy and light DNA.

Which row shows the percentage of heavy DNA strands and the percentage of hybrid DNA molecules in the first generation produced in the medium containing light nitrogen?

	percentage of heavy DNA strands	percentage of hybrid DNA molecules
A	25	50
B	50	50
C	50	100
D	75	100

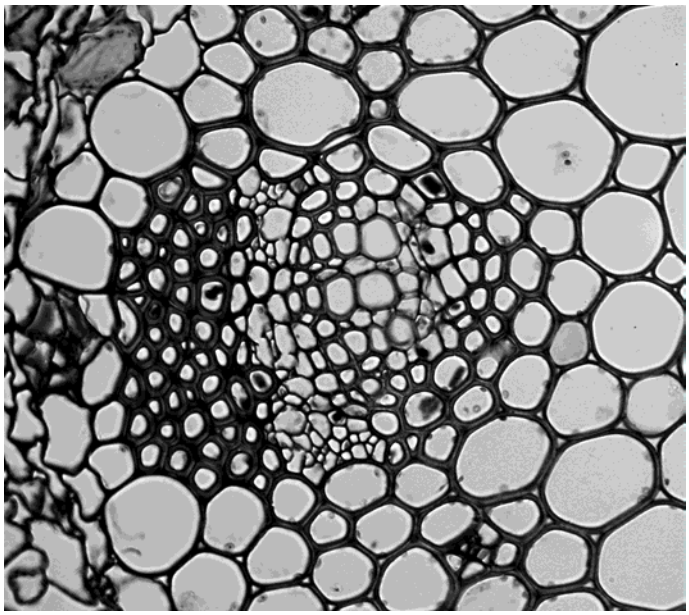
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23 Which is the correct DNA triplet on the original DNA template that codes for the amino acid histidine (His)?

amino acid	anticodon
Ala	CGU
His	GUA
Ser	UCA

A CAU **B** CGT **C** GTA **D** GUA

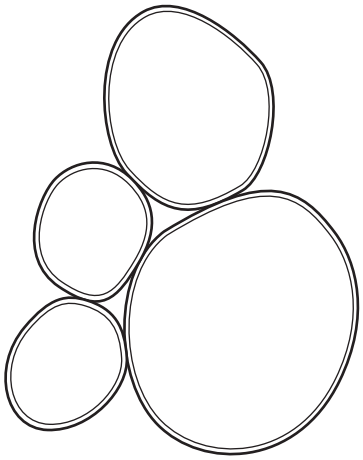
24 The photomicrograph shows tissues in a stained transverse section of a plant stem.



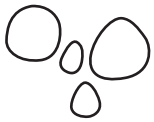
Students are asked to draw four adjacent xylem vessel elements.

Which drawing, all drawn to the same scale, is correct?

A



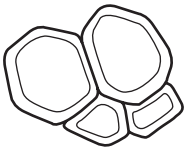
B



C



D



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25 What is a function of the hairs (trichomes) on xerophytic leaves?

A adding a waterproof layer

B protecting the stomata

C reducing the surface area

D trapping a layer of moist air

26 Which features of companion cells are essential to their function?

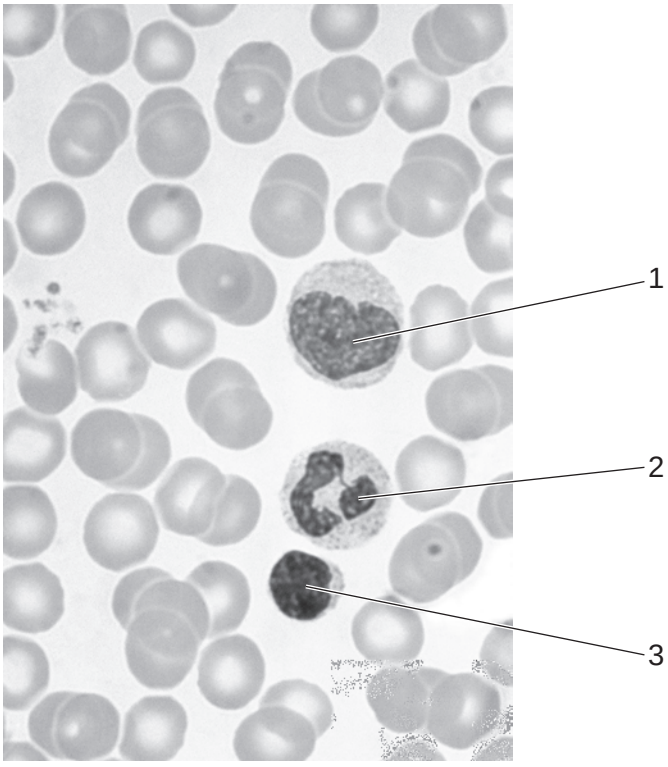
1 They are connected by plasmadesmata to the sieve tube elements.

2 They have a thinner cell wall than a sieve tube element.

3 They contain a nucleus and mitochondria.

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

27 The photomicrograph shows a human blood smear.

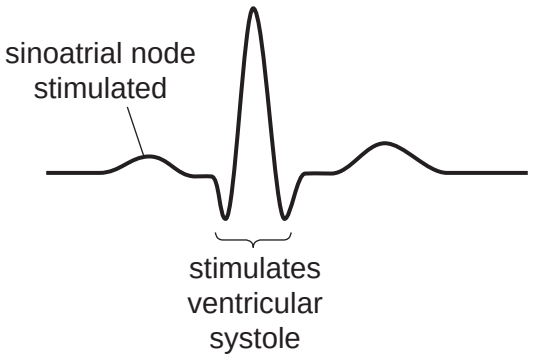


Which row identifies the labelled cells?

	1	2	3
A	lymphocyte	monocyte	neutrophil
B	lymphocyte	neutrophil	monocyte
C	monocyte	lymphocyte	neutrophil
D	monocyte	neutrophil	lymphocyte

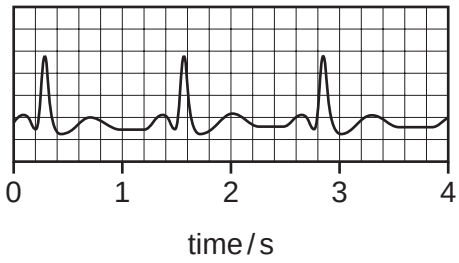
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28 The diagram shows the changes in electrical activity in the heart muscle during one cardiac cycle. This is called an electrocardiograph (ECG).

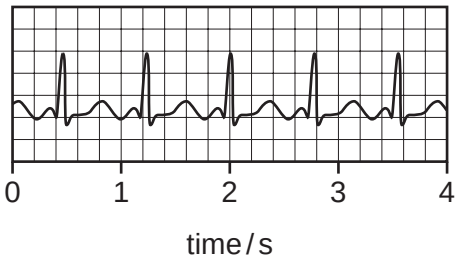


Which electrocardiogram shows a rate of 75 beats per minute?

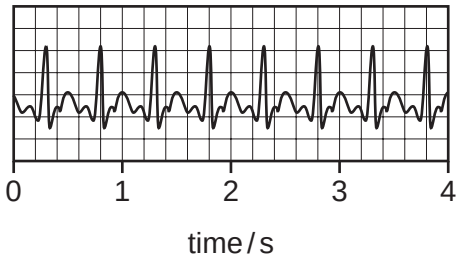
A



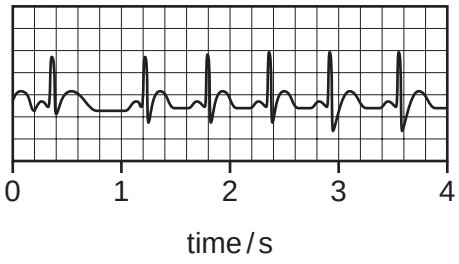
B



C



D



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

A Carbaminohaemoglobin concentrations will decrease.

B Less oxygen is released from oxyhaemoglobin for active tissues.

C The pH of the blood will be lowered.

D The rate of dissociation of carbonic acid is increased.

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30 Which statement correctly compares blood plasma and tissue fluid in a healthy person?

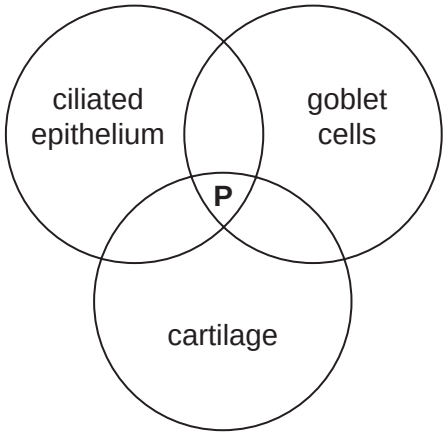
A Blood plasma contains more protein than tissue fluid.

B Both blood plasma and tissue fluid contain red blood cells.

C Tissue fluid contains white blood cells whereas blood plasma does not.

D Tissue fluid is formed from blood plasma and is not returned to blood plasma.

31 The diagram shows three features found in tissues of the gas exchange system.



Which tubes of the gas exchange system could be represented at position **P** in the diagram?

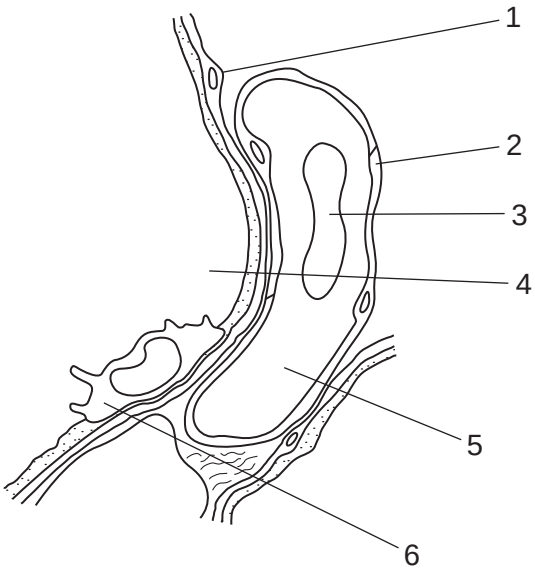
	bronchus	bronchiole	trachea
A	✓	✓	✓
B	✓	✓	✗
C	✓	✗	✓
D	✗	✓	✓

key

✓ = yes

✗ = no

32 The diagram shows a magnified section of part of the lungs containing specialised tissues.



Which row is correct for structures labelled 1 to 6?

	contains high proportion of		
	carbonic anhydrase	HCO_3^- ions	lysosomes
A	1	3	4
B	2	4	5
C	3	5	6
D	4	6	1

33 A short-term effect of smoking is a decreased blood supply to the fingers and toes.

Which component of cigarette smoke causes this effect?

A carbon monoxide

B carcinogens

C nicotine

D tar

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34 The symptoms of two diseases are listed.

disease 1	disease 2
coughing up blood pain when breathing loss of weight	shortness of breath difficulty breathing out fatigue

Which row identifies diseases 1 and 2?

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

35 Which statements about a non-infectious disease may be correct?

1 It can result from a mutation.

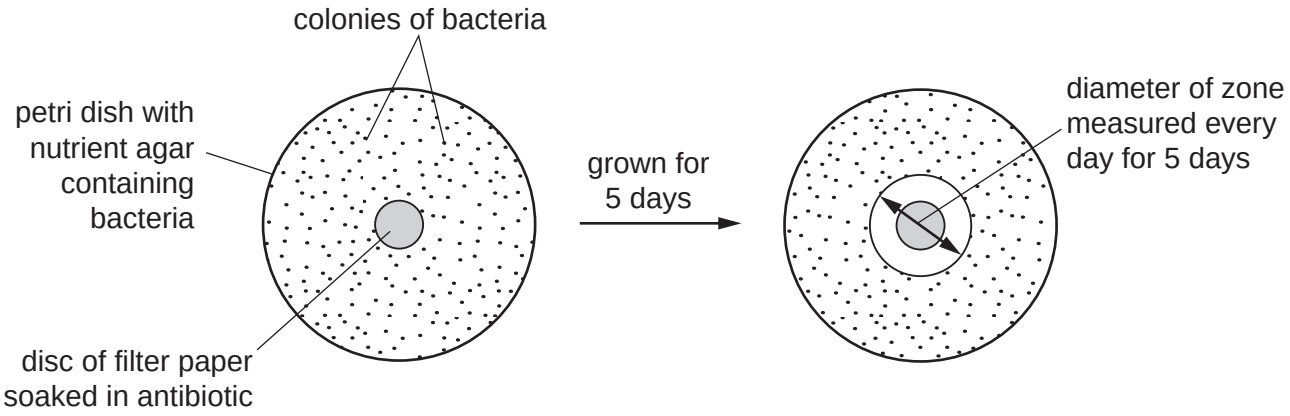
2 It can be transmitted by an insect vector.

3 It can be transmitted from mother to child.

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

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36 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 13.0 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	24.1	21.9	19.0	17.6	14.3
2	18.6	15.4	12.2	9.0	2.0
3	17.9	12.8	12.4	11.1	10.9
4	19.4	15.3	13.2	8.1	2.0
5	22.0	21.0	20.5	20.4	20.4

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.

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37 Some animals have genes that code for small peptides called cathelicidins. These peptides kill a wide range of bacteria by attaching to lipids in bacterial membranes, so weakening or disrupting them.

Scientists have produced a synthetic version of the cathelicidin that kills bacteria that are resistant to a number of antibiotics such as tetracycline.

Which pair of statements explain how this synthetic cathelicidin might help with the problem of antibiotic resistance?

1 It is synthetic so bacteria can never become resistant to it.

2 It could be used instead of tetracycline, allowing tetracycline resistance to be reduced.

3 The only way a bacterium could develop resistance to it is by altering all the lipids in its membranes.

4 It could be used to kill multidrug-resistant strains of bacteria for which there is no effective antibiotic.

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

38 Hybridomas are used as a basis for the production of large numbers of monoclonal antibodies.

Which statement describes how hybridomas are made?

A fusing activated T-lymphocytes with cancer cells

B fusing B-lymphocytes with cancer cells

C fusing memory cells with cancer cells

D fusing T-lymphocytes with cancer cells

39 Which statement about the properties of the antigen binding sites in antibody molecules is correct?

A They are located on the light chains only.

B They have a hinge region to give flexibility for different antigens.

C They have binding sites for receptors on phagocytes.

D They have variable amino acid sequences for different antigens.

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40 The statements describe ways in which different types of monoclonal antibodies can work.

1 binding to proteins on cell surfaces and triggering the immune system

2 blocking molecules on cell surfaces that inhibit T-cells

3 blocking cell signalling receptors that trigger cell division

4 blocking cell signalling receptors that trigger the immune response

Which types of monoclonal antibody could be used to treat cancer?

A 1, 2, 3 and 4

B 1, 2 and 3 only

C 1 and 4 only

D 2, 3 and 4 only

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