Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

BIOLOGY **9700/12**

Paper 1 Multiple Choice **May/June 2017**

1 hour

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

MODIFIED LANGUAGE

8006226808

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

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1 Which organelles are enclosed in a single phospholipid bilayer and contain hydrolytic enzymes?

A endocytotic vesicles

B Golgi body

C lysosomes

D mitochondria

2 The DNA of prokaryotes is naked and circular.

Which statement describes how the DNA of eukaryotes differs from that of prokaryotes?

A It has a nuclear envelope around it and is a double helix.

B It has a nuclear envelope around it and is circular.

C It has proteins attached to it and is a double helix.

D It has proteins attached to it and is linear.

3 The recently discovered *Pandoravirus* measures 1000 nm in diameter.

The *Mimivirus* has a diameter of 400 nm.

What can be detected using a light microscope with a maximum resolution of 0.25 μm?

A both the *Mimivirus* and the *Pandoravirus*

B neither the *Mimivirus* nor the *Pandoravirus*

C the *Mimivirus,* but not the *Pandoravirus*

D the *Pandoravirus*, but not the *Mimivirus*

4 What are found in chloroplasts **and** mitochondria?

1 DNA

2 70S ribosomes

3 mRNA

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

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5 Boiling the bones and teeth from dead animals can be used to produce a type of glue.

The glue is formed from the collagen fibres present in bones and teeth.

Which statement describes the changes to collagen that occur when the glue is produced?

A The fibres of collagen become more coiled.

B The fibres of collagen become more flexible.

C The helices of collagen molecules unwind.

D The molecules of collagen dissolve in water.

6 What describes the primary structure of a protein?

A α-helix

B a dipeptide

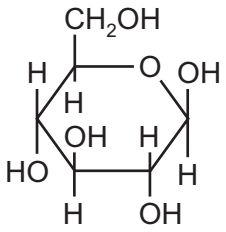
C a globular structure

D the specific order of amino acids

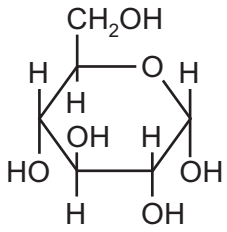
7 The diagrams show four monosaccharides with the formula $C_6H_{12}O_6$.

Which diagram shows α-glucose?

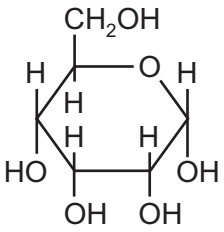
A



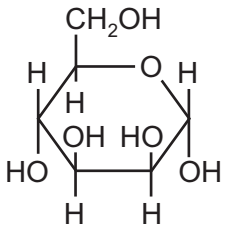
B



C



D



8 Complete digestion of polysaccharides requires all the glycosidic bonds between the monomers to be broken.

Amylase only breaks α-1,4 glycosidic bonds.

Which row shows how completely amylase can digest molecules of cellulose, amylopectin or amylose?

	polysaccharide		
	cellulose	amylopectin	amylose
A	–	++	+
B	–	+	++
C	+	++	–
D	++	–	+

key

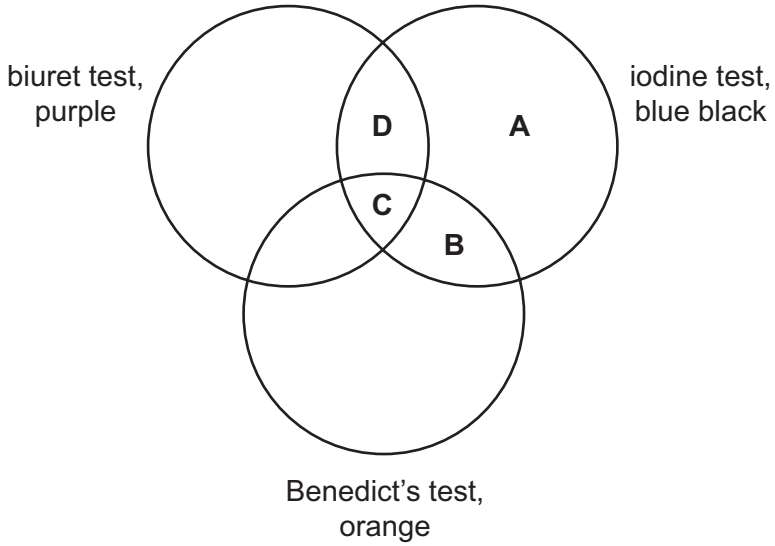
– no digestion

\+ some digestion

++ most digestion

9 The diagram shows the results of tests on four solutions containing biological molecules.

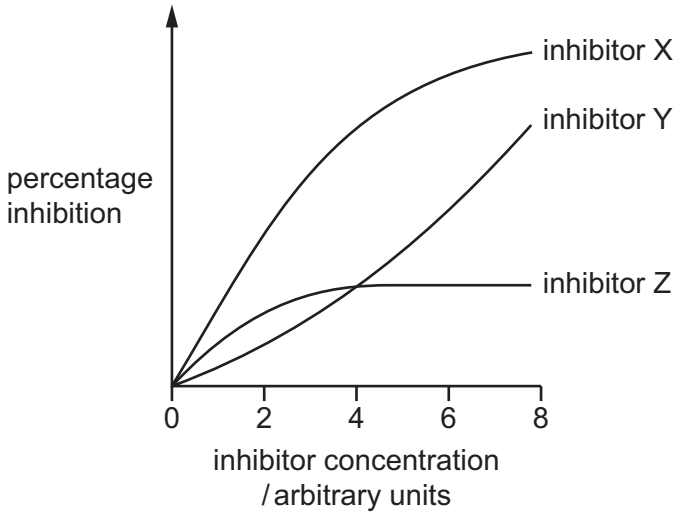
Which shows the solution that contains only starch and protein?



10 The enzyme invertase catalyses the breakdown of sucrose to glucose and fructose.

Three different enzyme inhibitors of invertase X, Y and Z were investigated. The percentage inhibition of invertase was measured at different concentrations of inhibitor.

The graph shows the result of the investigation.



Which are valid conclusions from these results?

1 The higher the concentration of inhibitor X, the less sucrose is broken down.

2 The production of glucose and fructose using inhibitor Y is higher than when inhibitor Z is used.

3 The production of glucose and fructose at an inhibitor concentration of 2 arbitrary units is lower than at an inhibitor concentration of 4 arbitrary units, for all inhibitors.

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

11 The following statements are about enzymes.

1 Folding of an enzyme molecule causes the formation of the active site.

2 The shape of the active site changes to enable the substrate to bind.

3 Temporary bonds hold the substrate in the active site.

4 More enzyme-substrate complexes are formed at the optimum temperature.

Which statements are correct for the induced fit hypothesis?

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

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12 How is the Michaelis-Menten constant (K_m) used?

A to assess the efficiency of an enzyme in catalysing a reaction

B to compare the affinity of enzymes for their substrate

C to find the maximum velocity of an enzyme (V_{max})

D to find the rate at which substrate is loaded by an enzyme

13 Proteins in the cell surface membranes of human cells and mouse cells were labelled with fluorescent dyes. The human cells were labelled with a red dye and the mouse cells were labelled with a green dye.

A human cell and a mouse cell were then fused to form a hybrid cell.

At first the different dyes remained separate. After 40 minutes the two dyes were evenly distributed in the hybrid cell surface membrane.

What explains this observation?

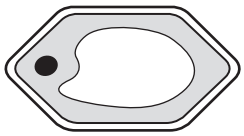
A All protein molecules in the cell surface membrane are fixed to structures within the cell, but phospholipid molecules move freely between them.

B Groups of protein and phospholipid molecules in the cell surface membrane are attached to each other and move together.

C Only protein molecules in the outer layer of the cell surface membrane can move freely between phospholipid molecules.

D Protein molecules in the outer layer of the cell surface membrane and those which span the bilayer can move freely between phospholipid molecules.

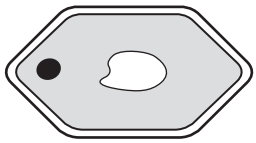
14 The diagram shows a plant cell.



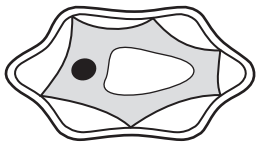
The plant cell is put into a solution with a water potential less negative than the cell contents.

What will happen to the appearance of the cell?

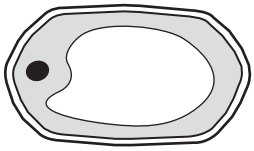
A



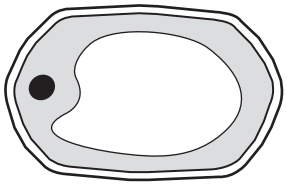
B



C

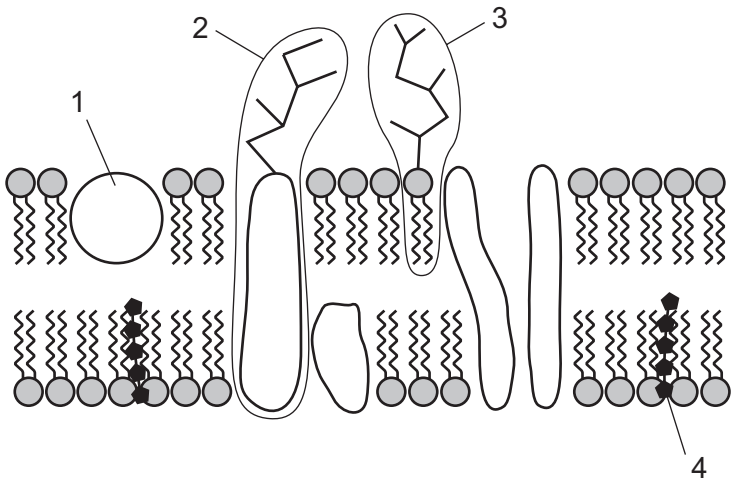


D



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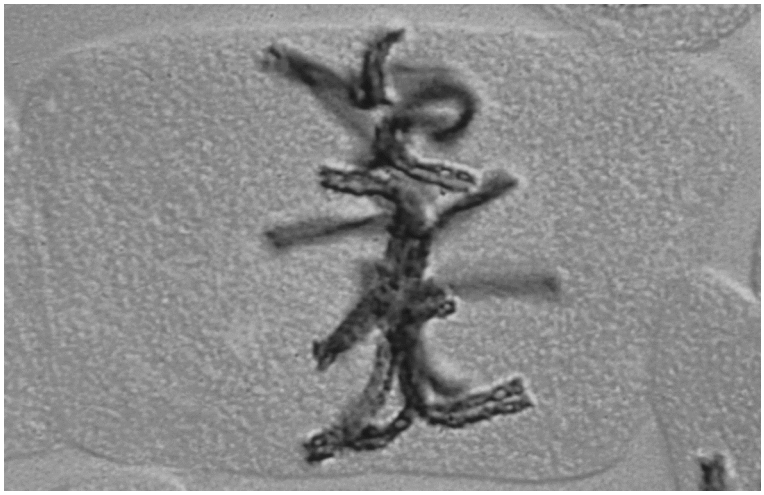
15 The diagram shows the fluid mosaic model of membrane structure.



Which molecules in the membrane are identical?

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

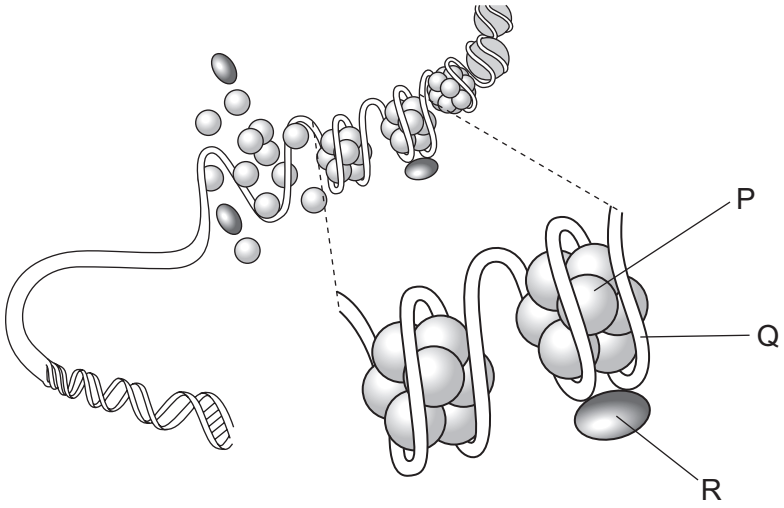
16 The photomicrograph shows a stage of mitosis.



What would be correct for the next stage in mitosis?

	paired chromatids	nuclear membrane
A	absent	absent
B	absent	re-forming
C	present	absent
D	present	breaking down

17 The diagram shows part of the organisation of a DNA molecule and the associated histones.



Which statement about the features labelled P, Q and R during prophase of mitosis is correct?

A The coiled DNA molecule forms Q and wraps around the histones of R to form small clusters held in place by histone P.

B The groups of histones, P, and its associated DNA, Q, move closer together as the chromosome condenses around R.

C The histones P and R are made of protein around which the DNA molecule, Q, is wrapped so that the DNA molecule can fit inside the nucleus.

D The linked groups of histones P and R and the associated DNA, Q, form strands that fold and twist together to form a chromatid.

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18 The bacterium *Escherichia coli* divides once every 50 minutes at 36 °C.

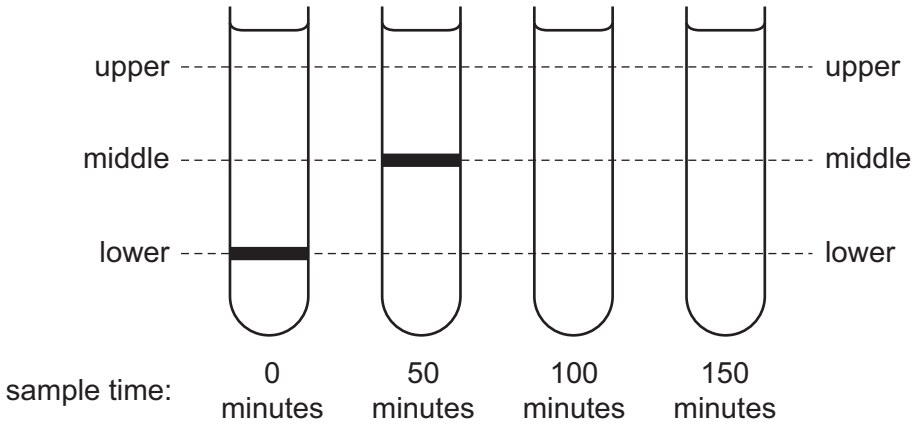
E. coli were grown on a medium containing only heavy nitrogen, ^{15}N, until all of the bacterial DNA contained heavy nitrogen (0 minutes).

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

Some bacteria were collected after each of three generations. Their DNA was extracted and centrifuged.

Hybrid DNA contains heavy and light nitrogen.

The diagram shows the possible positions (upper, middle and lower) of the bands of DNA. The actual positions of bands in the first two samples are shown.



Which proportion of the DNA of the sample taken at 150 minutes will be at the upper position?

A 25% **B** 50% **C** 75% **D** 100%

19 Different tissues in a plant were supplied with a radioactively labelled substance to identify which tissues were actively synthesising mRNA.

Which radioactively labelled substances would be most suitable for this experiment?

1 adenine

2 ribose

3 inorganic phosphate

4 uracil

A 1, 2, 3 and 4

B 1, 2 and 3 only

C 2 and 4 only

D 4 only

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20 Electron micrographs may show large numbers of ribosomes forming chains along mRNA molecules.

What is the advantage of this arrangement, compared to when ribosomes appear singly on the mRNA?

A Different polypeptides can be produced simultaneously.

B Fewer tRNA molecules are required to translate the polypeptide.

C Large polypeptide chains can be produced.

D Polypeptides can be produced more rapidly.

21 Which row is correct for adenine?

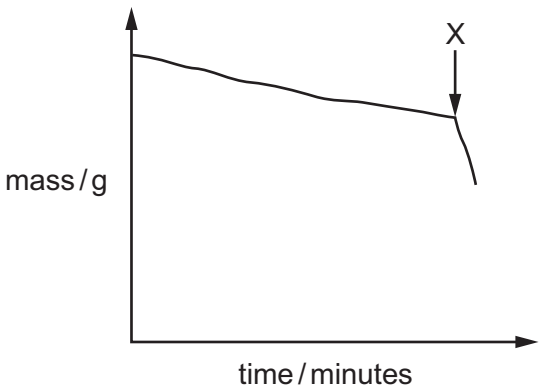
	has a single ring structure	is a purine	joins to its complementary base with 3 hydrogen bonds
A	✓	✓	✓
B	✓	✗	✗
C	✗	✓	✗
D	✗	✗	✓

key

✓ = correct

✗ = incorrect

22 The graph shows the loss of mass in a potted plant due to transpiration.



What could have occurred at point X on the graph?

A A plastic bag was placed around the plant.

B The lower epidermis was sealed with petroleum jelly.

C The plant was placed into a dark cupboard.

D Warm moving air was blown over the plant.

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23 Which row is correct for a phloem sieve tube element?

	cell surface membrane	cytoplasm	nucleus	80S ribosomes
A	✓	✓	✓	✓
B	✓	✓	✓	✗
C	✓	✓	✗	✗
D	✗	✗	✗	✗

key

✓ = present

✗ = absent

24 An aphid, such as a greenfly, uses a tubular mouthpart called a stylet to feed on nutrients in the plant.

It inserts the stylet through the surface of a stem or leaf.

When a stylet is cut near the aphid's head, leaving the stylet in the plant, a liquid with a low water potential continues to flow out of the plant.

Which statement explains this?

A The stylet is in a phloem sieve tube element in which there is a high concentration of solutes.

B The stylet is in a phloem sieve tube element in which there is a low concentration of solutes.

C The stylet is in a xylem vessel element in which there is a high concentration of solutes.

D The stylet is in a xylem vessel element in which there is a low concentration of solutes.

25 Which statement correctly describes transport pathways in dicotyledonous plants?

A In the apoplast pathway, water may move through plasmodesmata.

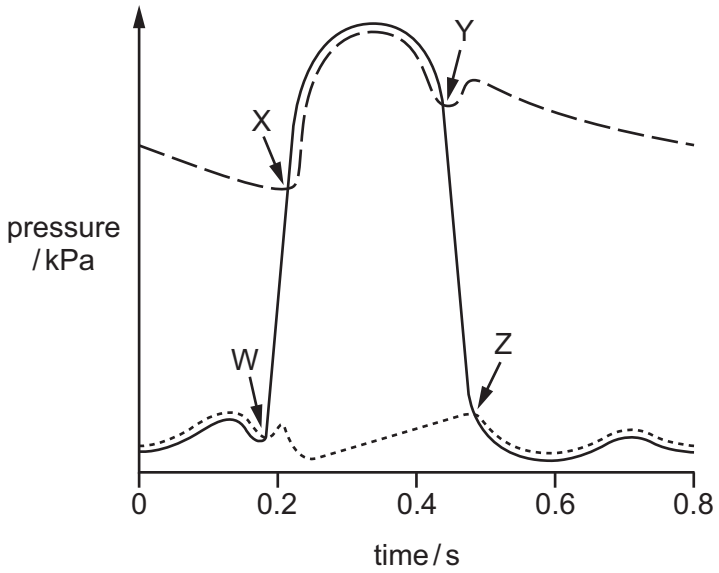
B In the symplast pathway, water may move through intercellular spaces.

C The apoplast pathway may be blocked by the Casparian strip.

D The symplast pathway may be blocked by the tonoplast.

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26 The graph shows pressure changes during a cardiac cycle.



Which row correctly identifies W, X, Y, and Z?

	W	X	Y	Z
A	atrioventricular valves close	semi-lunar valves close	semi-lunar valves open	atrioventricular valves open
B	atrioventricular valves close	semi-lunar valves open	semi-lunar valves close	atrioventricular valves open
C	semi-lunar valves close	atrioventricular valves open	atrioventricular valves close	semi-lunar valves open
D	semi-lunar valves open	atrioventricular valves close	atrioventricular valves open	semi-lunar valves close

27 What is systolic blood pressure?

A the blood pressure in the arteries when the heart is relaxing

B the blood pressure in the left ventricle at the end of a contraction

C the maximum blood pressure in the arteries

D the maximum blood pressure in the right ventricle

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28 When they remain at high altitudes the red blood cell count of humans increases.

Why does this occur?

1 to increase the Bohr effect

2 to increase the diffusion gradient for oxygen in the lungs

3 to maintain transport of oxygen

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

29 Which comparisons of blood, tissue fluid and lymph are correct?

1 Blood has a higher concentration of proteins than tissue fluid because the larger proteins are too big to pass through the endothelial pores into tissue fluid.

2 Lymph has a higher concentration of lymphocytes than tissue fluid as a high number of lymphocytes are located in lymph nodes.

3 Macrophages are too large to leave the blood to enter tissue fluid whereas neutrophils, which are much smaller, can enter tissue fluid and pass into lymph.

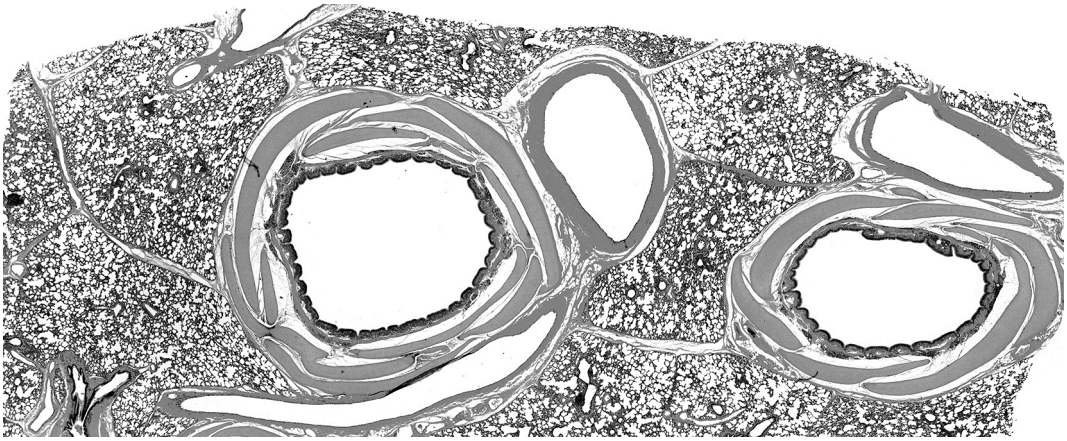
A 1, 2 and 3 **B** 1 and 2 only **C** 2 and 3 only **D** 3 only

30 A number of different tissues occur in the walls of major blood vessels.

Which row correctly identifies the main tissues found in the three layers of the wall of an artery?

	outer layer (tunica externa)	middle layer (tunica media)	inner layer (tunica intima)
A	collagen	elastic	endothelium
B	collagen	muscle	elastic
C	elastic	collagen	endothelium
D	muscle	collagen	elastic

31 The photomicrograph shows a section through lung tissue.



Which structures are present in this photomicrograph?

	artery	vein	bronchioles	bronchus	trachea
A	✓	✓	✗	✓	✗
B	✓	✗	✓	✗	✓
C	✗	✓	✓	✓	✗
D	✗	✗	✗	✓	✓

key

✓ = present

✗ = absent

32 An athlete who smokes just before a race may not be able to run at their maximum speed because less oxygen is carried by the blood.

Which explanation is correct?

A Carbon dioxide binds to haemoglobin forming carbaminohaemoglobin.

B Carbon dioxide binds to haemoglobin forming carboxyhaemoglobin.

C Carbon monoxide binds to haemoglobin forming carbaminohaemoglobin.

D Carbon monoxide binds to haemoglobin forming carboxyhaemoglobin.

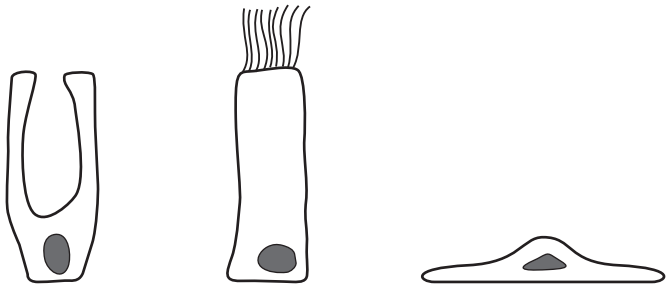
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33 Some of the requirements of an efficient gas exchange system are a large surface area and a short diffusion distance.

What is correct about how alveoli are adapted to meet these requirements?

	large surface area	short diffusion distance
A	collagen and elastin fibres that allow the alveoli to stretch	an extracellular layer round the alveolus wall contains blood capillaries
B	gases dissolve in a layer of liquid to speed up diffusion	walls of alveoli are squamous epithelium
C	many folded interconnected alveoli	capillaries are next to alveolus wall
D	sac shape of alveoli formed by squamous cells	red blood cells are very close to capillary walls

34 The diagram shows three types of cell found in the human gas exchange system.



Apart from causing cancer, which cell types will be directly affected when a person is exposed to tar in cigarette smoke?

A X, Y and Z **B** X and Y only **C** X and Z only **D** Y and Z only

35 Some common antibiotics are listed. The action of each antibiotic is described.

1 rifampicin – inhibits RNA polymerase

2 streptomycin – inhibits 70S ribosomes

3 neomycin – inhibits DNA synthesis

4 ampicillin – inhibits peptidoglycan synthesis

Which of these antibiotics will affect the activities of bacterial cells **only**?

A 1, 2, 3 and 4

B 1, 2 and 3 only

C 2 and 4 only

D 4 only

36 What could cause an outbreak of malaria in a country after it had been eliminated?

1 mosquitoes become resistant to insecticides

2 migration of population due to war

3 malarial parasites become resistant to quinine

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

37 Which disease is caused by a bacterium and can be spread by airborne droplets?

A cholera

B measles

C smallpox

D tuberculosis (TB)

38 Smallpox has been eradicated, but malaria and cholera have not.

Which statements correctly explain this?

1 Cholera pathogens in the intestines are not destroyed by antibiotics.

2 Plasmodium antigens change during the life cycle.

3 Smallpox antigens remain stable.

4 Vaccines only work against viruses.

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

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39 When a person is given a vaccination immunity to certain pathogens develops.

Which of the effects of vaccination are correct?

1 production of antibodies to protect against future infections

2 results in artificial active immunity

3 stimulation of appropriate lymphocytes

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

40 What is the first response by the immune system to a pathogen?

A ingestion of the pathogen by phagocytes

B production of antibodies

C production of antigens

D stimulation of B memory cells

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