Cambridge Assessment International Education

Cambridge International AS & A Level

BIOLOGY **9700/13**

Paper 1 Multiple Choice **October/November 2020**

1 hour

You must answer on the multiple choice answer sheet.

You will need: Multiple choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

INSTRUCTIONS

- 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 multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.

INFORMATION

- The total mark for this paper is 40.
- Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
- Any rough working should be done on this question paper.

This document has **16** pages. Blank pages are indicated.

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1 What are the appropriate units for measuring diameters of alveoli, diameters of white blood cells and the width of cell walls?

	diameters of alveoli	diameters of white blood cells	width of cell walls
A	mm	mm	nm
B	mm	μm	μm
C	μm	mm	μm
D	μm	μm	nm

2 The actual diameter of a prokaryotic cell is 0.5 μm. An electron micrograph of the cell has a magnification of ×50 000.

What is the diameter of the cell in the image?

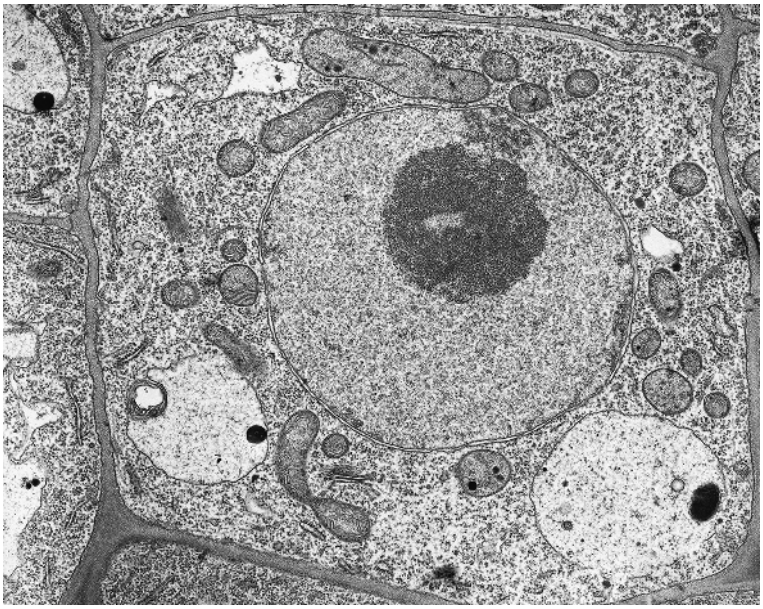
A 2.5×10^{-1} mm

B 2.5×10^{0} mm

C 2.5×10^{1} mm

D 2.5×10^{2} mm

3 The electron micrograph shows some cell structures.



Some cell structures are listed.

1 nucleolus

2 chloroplast

3 microtubules

4 ribosomes

5 mitochondria

6 plasmodesmata

Which cell structures can be seen in the electron micrograph?

A 1, 2, 3 and 4 **B** 1, 4, 5 and 6 **C** 2, 3, 5 and 6 **D** 2, 4, 5 and 6

4 Which part of the cell is often continuous with the rough endoplasmic reticulum?

A cell surface membrane

B Golgi body

C mitochondrion

D nuclear envelope

5 Which statements about ATP are correct?

1 It is produced in chloroplasts.

2 It is used during protein synthesis.

3 It contains deoxyribose.

4 It is used in facilitated diffusion.

5 It is used to load sucrose into companion cells.

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

6 Four students were asked to match the function with the appearance of some cell structures in an animal cell.

The functions were listed by number.

1 mRNA passes through to the ribosome

2 organises microtubules to produce the spindle during cell division

3 synthesis of lipids

The appearances were listed by letter.

V membranes which surround an enclosed inner cavity

W non-membrane-bound, spherical structures

X a double membrane with pores

Y non-membrane-bound, cylindrical structures

Z membrane-bound sacs, arranged as a flattened stack

Which student correctly matched the numbered functions with the appearance of the cell structure?

	1	2	3
A	V	W	Z
B	V	Y	W
C	X	W	V
D	X	Y	V

7 A student carried out tests for biological molecules on the **same** sample of milk.

The tests and their results were as follows.

- Heating to 80 °C with Benedict's solution gave a red colour.
- Boiling with acid, followed by neutralisation, then heating to 80 °C with Benedict's solution also gave a red colour.
- Adding Biuret solution gave a purple colour.
- Adding iodine solution gave a yellow colour.

Which biological molecules **must** be present in the milk?

1 non-reducing sugars

2 protein

3 reducing sugars

4 starch

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

8 Which row is correct for carbohydrates?

	monomer	polymer	macromolecule
A	fructose	amylose	cellulose
B	glucose	deoxyribose	amylopectin
C	monosaccharide	glycogen	deoxyribose
D	sucrose	starch	glycogen

9 Which molecules contain 1,6 glycosidic bonds?

1 amylopectin

2 glycogen

3 starch

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

10 Which row correctly shows the ratio of carbon atoms to hydrogen atoms for glucose, a saturated fatty acid and sucrose?

	ratio of carbon atoms to hydrogen atoms		
	glucose	saturated fatty acid	sucrose
A	1 : 2	1 : 2	1 : 1.8
B	1 : 2	4 : 1	1 : 2
C	2 : 1	1 : 4	2 : 1
D	2 : 1	2 : 1	1.8 : 1

11 Which row shows a correct comparison between a phospholipid molecule and a triglyceride molecule?

	phospholipid molecule	triglyceride molecule
A	contains a hydrophobic phosphate group	is a hydrophobic molecule
B	contains one glycerol molecule	contains three glycerol molecules
C	fewer ester bonds	more ester bonds
D	more fatty acids	fewer fatty acids

12 Adult human haemoglobin typically consists of two α chains and two β chains.

Approximately 5% of humans have one amino acid in the β chain that has been changed. This change affects the structure and stability of haemoglobin.

Which levels of protein structure could be affected in the haemoglobin of the humans with the changed amino acid?

A primary only

B primary and quaternary only

C secondary, tertiary and quaternary only

D primary, secondary, tertiary and quaternary

13 Lysozyme occurs in human tears, saliva, milk and mucus.

Lysozyme has a role in the immune system and hydrolyses peptidoglycan.

Which description of lysozyme is correct?

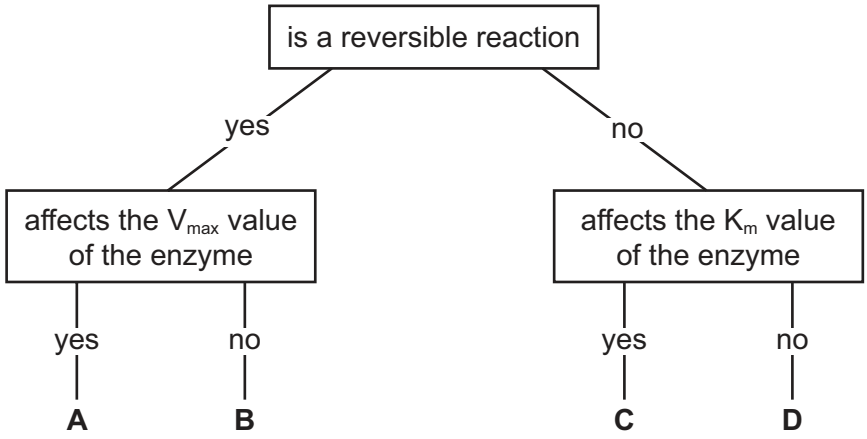
A It is an extracellular antibody.

B It is an intracellular antibody.

C It is an extracellular antibacterial protein.

D It is an intracellular antibacterial protein.

14 Which letter in the flow diagram shows the effect of adding a competitive inhibitor to an enzyme-catalysed reaction?



15 The cell surface membrane structure is described as a 'fluid mosaic'.

Which statement describes the 'mosaic' part of the cell surface membrane?

A the different patterns that are obtained by the moving phospholipid molecules

B the random distribution of cholesterol molecules within the phospholipid bilayer

C the regular pattern produced by the phospholipid heads and membrane proteins

D the scattering of the different proteins within the phospholipid bilayer

16 Solute X is at a higher concentration outside a cell than in the cytoplasm.

Which processes may allow solute X to be moved through the cell surface membrane?

A active transport, diffusion and facilitated diffusion

B active transport, diffusion and osmosis

C diffusion, facilitated diffusion and osmosis

D exocytosis, facilitated diffusion and osmosis

17 Three molecules found in prokaryotes are listed.

1 phospholipid

2 protein

3 peptidoglycan

Which molecules are found in prokaryotic cell surface membranes?

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

18 What happens to the surface area to volume ratio of a cube when the length of each side is doubled?

A The ratio decreases by a quarter.

B The ratio decreases by half.

C The ratio doubles.

D The ratio increases by four times.

19 Three parts of a chromosome and their functions are listed.

part		function	
p1	centromere	f1	holds the coils of DNA together
p2	histone proteins	f2	holds two chromatids together
p3	telomere	f3	prevents loss of genes

Which part is matched with its correct function?

A p1 and f2 **B** p2 and f2 **C** p2 and f3 **D** p3 and f1

20 Which features of mitosis are important for a single-celled organism?

1 asexual reproduction

2 production of genetically identical cells

3 growth

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

21 Some events in the cell cycle are listed.

Which events are part of mitosis?

1 interphase

2 metaphase

3 cytokinesis

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

22 Which row represents the correct features of guanine?

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

key

✓ = correct

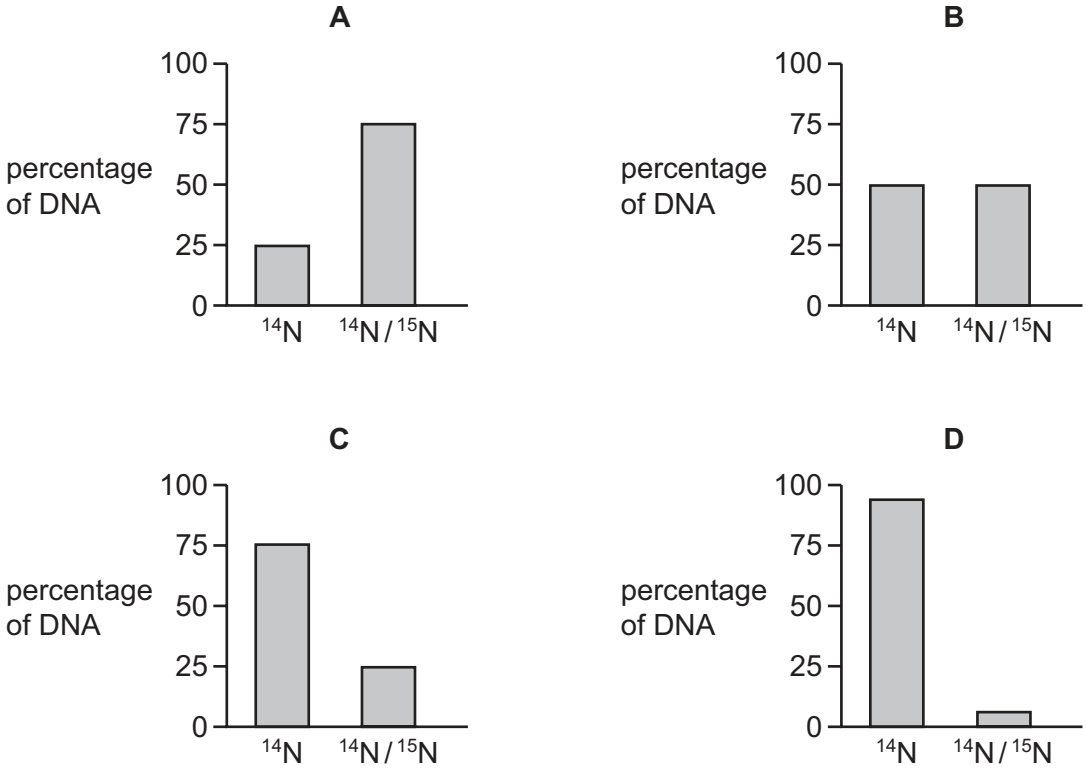
✗ = not correct

23 Bacteria were grown in a medium containing ^{15}N. After several generations, all of the DNA contained ^{15}N.

Some of these bacteria were transferred to a medium containing the common isotope of nitrogen, ^{14}N. The bacteria were allowed to divide once. The DNA of some of these bacteria was extracted and analysed. This DNA was all hybrid DNA containing equal amounts of ^{14}N and ^{15}N ($^{14}N/^{15}N$).

In another experiment, some bacteria from the medium with ^{15}N were transferred into a medium of ^{14}N. The bacteria were allowed to divide three times. The DNA of some of these bacteria was extracted and analysed.

What is the composition of this DNA?



24 A molecule of transfer RNA (tRNA) has the anticodon sequence UAC.

What will be the corresponding nucleotide sequence in the DNA?

A ATG **B** AUG **C** TAC **D** TUG

25 Some of the features present in transport tissues in plants are listed.

1 lignified walls
2 cytoplasm
3 many mitochondria
4 pits
5 plasmodesmata
6 sieve plates

Which of these features are present in xylem vessel elements?

A 1, 2, 4 and 5 **B** 1 and 4 only **C** 2, 3, 5 and 6 **D** 2, 3 and 5 only

26 The diameter of a tree trunk usually decreases slightly during the day and increases slightly at night.

Which three environmental factors, if increased, could cause the largest decrease in diameter?

A humidity, temperature, wind speed

B humidity, light intensity, temperature

C humidity, light intensity, wind speed

D light intensity, temperature, wind speed

27 Sucrose moves within a phloem sieve tube from a source to a sink by mass flow.

Which type of gradient within the phloem sieve tube between the source and sink causes the movement of sucrose?

A diffusion gradient

B hydrostatic gradient

C concentration gradient

D water potential gradient

28 Which are present in the walls of veins?

	endothelium	smooth muscle	elastic tissue	collagen fibres
A	✓	✗	✓	✓
B	✗	✓	✗	✓
C	✓	✓	✓	✗
D	✓	✓	✓	✓

key
✓ = present
✗ = not present

29 Which row is correct for the location of a type of molecule or cell?

	type of molecule or cell	blood	lymph	tissue fluid
A	antibodies	✗	✓	✓
B	plasma proteins	✓	✗	✗
C	lymphocytes	✓	✓	✓
D	phagocytes	✓	✗	✓

key
✓ = present
✗ = not present

30 What effect does decreasing carbon dioxide concentration have on haemoglobin?

A It is less efficient at taking up oxygen and less efficient at releasing oxygen.

B It is less efficient at taking up oxygen and more efficient at releasing oxygen.

C It is more efficient at taking up oxygen and less efficient at releasing oxygen.

D It is more efficient at taking up oxygen and more efficient at releasing oxygen.

31 Why does the red blood cell count increase in humans as they start living at high altitude?

A to allow more carbon dioxide to be excreted by the lungs, preventing a fall in blood pH

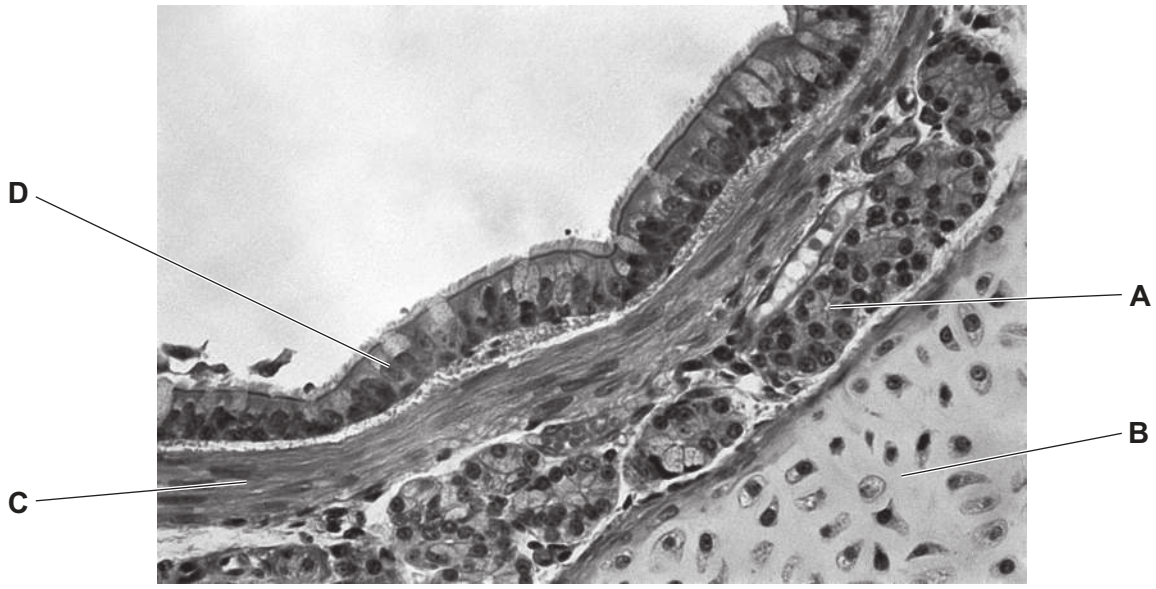
B to allow more oxygen to be taken up by the haemoglobin as the partial pressure of oxygen is lower

C to allow more oxygen to be taken up by the lungs as there is a lower percentage of oxygen in the air

D to allow more oxygen to be transported as the affinity of haemoglobin for oxygen is lowered

32 The diagram shows a photomicrograph of part of a bronchus.

Which label identifies smooth muscle?



33 Which statements about all bronchioles are correct?

1 They have epithelium.

2 They have goblet cells.

3 They have muscle tissue.

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

34 Which row shows the effects of emphysema?

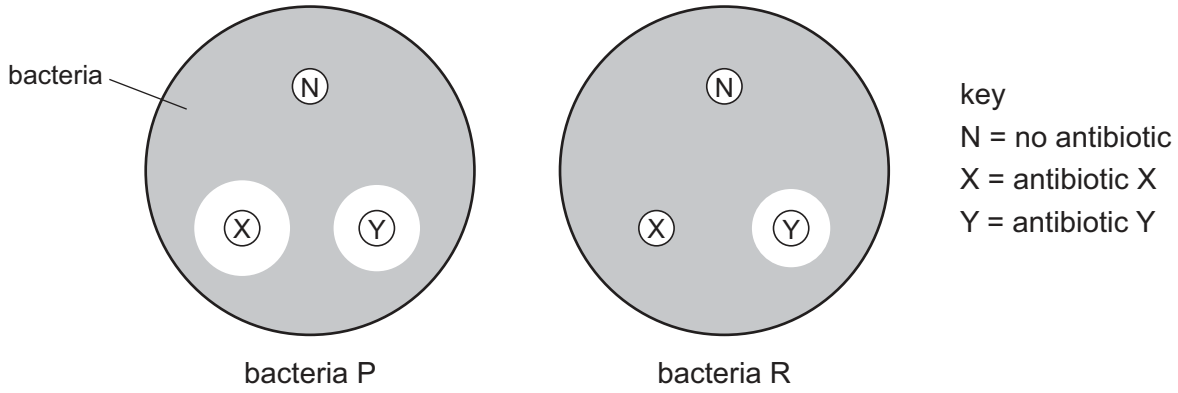
	alveoli	elastin	number of capillaries
A	burst	less	decrease
B	burst	more	increase
C	shrink	less	increase
D	shrink	more	decrease

35 Which row is correct?

	disease	transmission	infectious or non-infectious
A	HIV/AIDS	genetic	infectious
B	lung cancer	pathogen	infectious
C	sickle cell anemia	genetic	non-infectious
D	TB	pathogen	non-infectious

36 The diagrams show the result of incubating two species of bacteria, P and R, on separate Petri dishes each containing nutrient agar.

Three filter paper discs have been added to each Petri dish.



bacteria P bacteria R

Which statement is correct?

A Antibiotics X and Y are resistant to bacteria P.

B Bacteria P are resistant to both antibiotics.

C Bacteria R have a mutation that makes them resistant to antibiotic Y.

D N is a control disc showing bacteria R grow when antibiotic Y is not present.

37 The statements are about infectious diseases.

1 Disease may be spread between humans by contact.

2 Disease-causing organism has many antigenic variations.

3 Spread of disease may be influenced by climate.

4 A vaccination programme is available.

Which row matches the correct statement numbers with each disease?

	cholera	measles	malaria
A	1	1 and 2	1 and 3
B	1 and 4	4	2
C	2 and 3	1 and 3	1 and 4
D	4	1 and 4	2 and 3

38 Muscle cells have cell surface receptors for the neurotransmitter, ACh. These receptors allow the muscle to respond to a nerve impulse.

In the condition myasthenia gravis, the helper T cells stimulate a clone of B cells to become plasma cells and secrete antibodies that bind to and block these ACh receptors. The muscles cannot be stimulated and begin to break down.

A short-term treatment for myasthenia gravis is to inject monoclonal antibodies into the blood.

What is the target of these monoclonal antibodies?

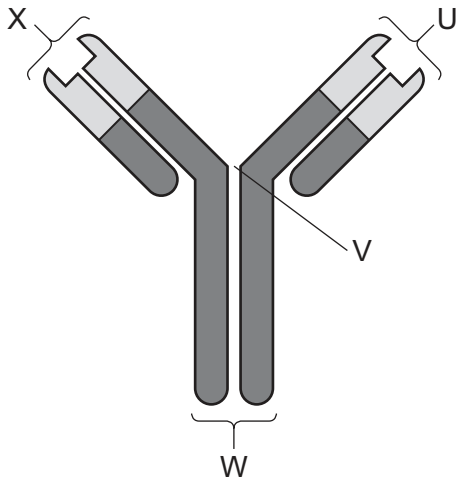
A antibodies that bind to ACh receptors

B muscle cell surface ACh receptors

C plasma cells secreting anti-ACh receptor antibodies

D the stimulating neurotransmitter ACh

39 The diagram shows the simplified structure of an antibody.



Which statement is correct?

A U and X allow the antibody to bind to two different antigens.

B V allows the antibody to fit around the antigen.

C W can bind to one specific antigen.

D X can bind with a specific phagocyte receptor.

40 Why have vaccination programmes eradicated smallpox but not TB?

A Vaccination can provide immunity only for smallpox but not for TB.

B Only TB is associated with poor living conditions.

C The smallpox virus showed little variation of antigens.

D The TB pathogen is a bacterium and the smallpox pathogen is a virus.

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