Cambridge Assessment International Education

Cambridge International AS & A Level

BIOLOGY **9700/12**

Paper 1 Multiple Choice **February/March 2021**

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

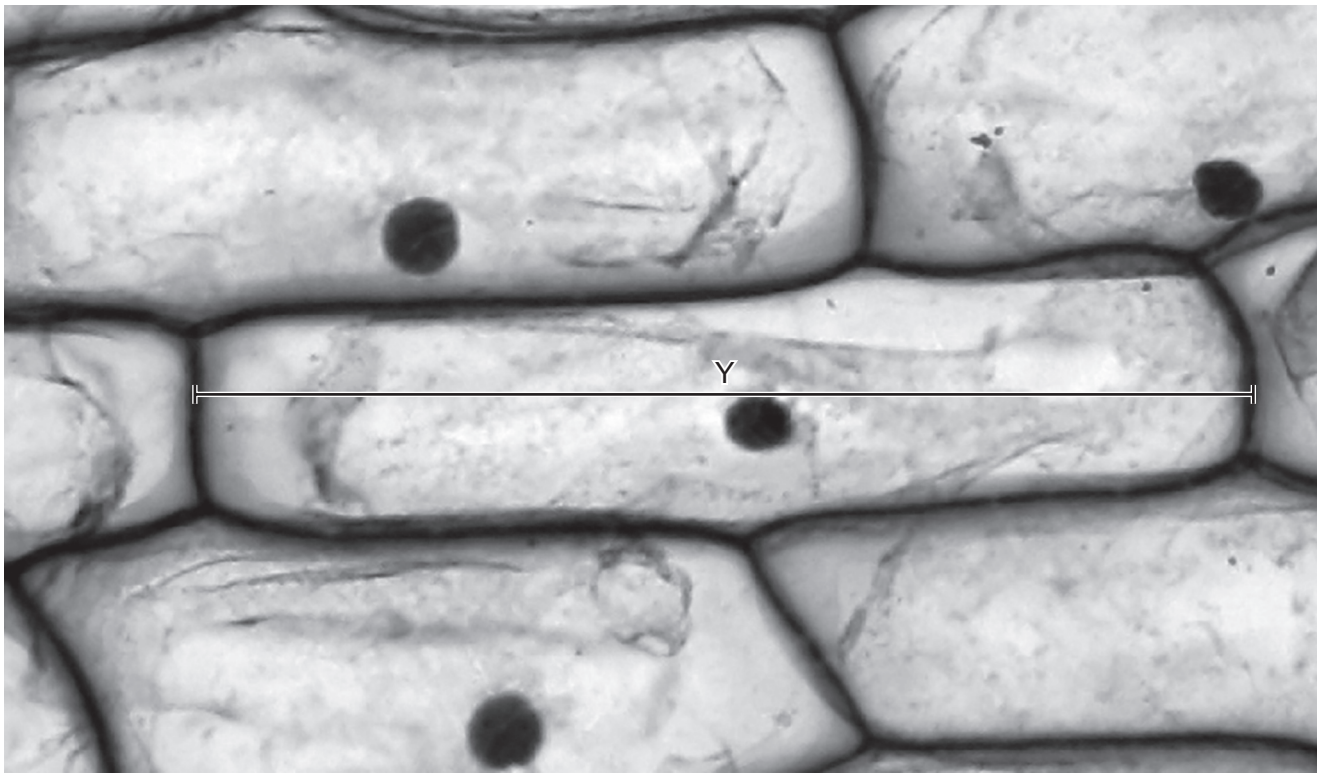
- There are **forty** questions on this paper. Answer **all** questions.
- For each question there are four possible answers **A**, **B**, **C** and **D**. Choose the **one** you consider correct and record your choice in soft pencil on the multiple choice answer sheet.
- Follow the instructions on the 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.
- Any rough working should be done on this question paper.

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1 The photomicrograph shows onion cells.



The actual length of the onion cell labelled Y is 350 μm.

What is the magnification of the photomicrograph?

A ×2.5 **B** ×25 **C** ×40 **D** ×400

2 Which row correctly shows the presence of a cell structure in typical plant cells and in typical prokaryotic cells?

		typical plant cells	typical prokaryotic cells
A	centrioles	✓	✗
B	70S ribosomes	✓	✓
C	lysosomes	✓	✓
D	cellulose cell walls	✓	✓

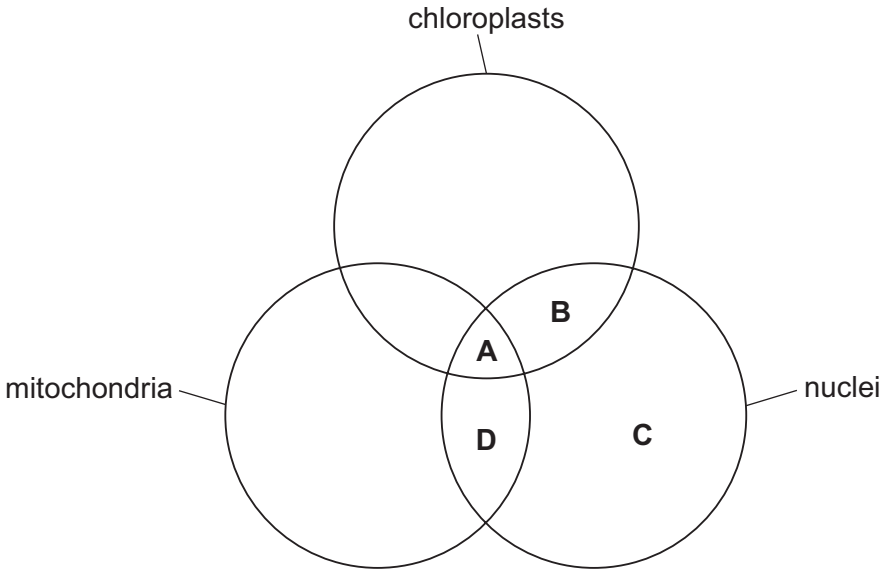
key

✓ = present

✗ = not present

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3 Which letter identifies cell structures where semi-conservative replication of DNA occurs?



4 Which parts of a cell contain ribosomes?

1 chloroplast

2 mitochondrion

3 Golgi body

4 cytoplasm

A 1, 2, 3 and 4

B 1, 2 and 3 only

C 1, 2 and 4 only

D 3 and 4 only

5 Which range of cell diameters is typical for prokaryotic cells?

A 1 nm to 5×10^2 nm

B 1×10^3 nm to 5 μm

C 1×10^1 μm to 5×10^2 μm

D 1×10^2 μm to 5×10^3 μm

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[Turn over

6 Which row shows a combination of molecules that could be found together in a single isolated virus?

	carbohydrate	DNA	phospholipid	lipid	protein	RNA
A	✓	✓	✓	✓	✓	✓
B	✓	✗	✓	✗	✗	✓
C	✗	✓	✗	✗	✗	✓
D	✗	✓	✗	✗	✓	✗

key
✓ = present
✗ = not present

7 A student carried out four biochemical tests on a sample of food.

test	observation
emulsion	cloudy
Benedict's	yellow
biuret	purple
iodine	yellow

Which conclusion is supported by the results?

A Fat is **not** present.

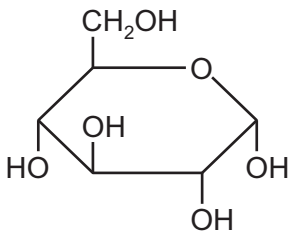
B Glucose is present.

C Protein is present.

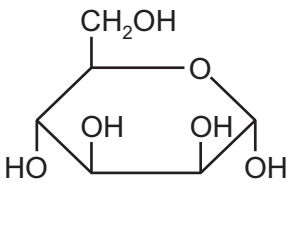
D Starch is present.

8 Which diagram represents a molecule of α-glucose?

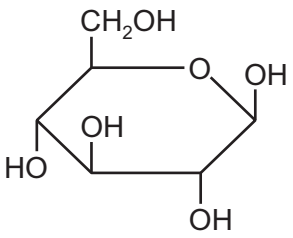
A



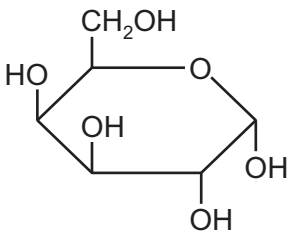
B



C



D



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9 Which statements about glycosidic bonds are correct?

1 Condensation between glucose and fructose uses water and forms sucrose.

2 Glycogen contains α-1,4 glycosidic bonds and α-1,6 glycosidic bonds formed by condensation.

3 The hydrolysis of amylopectin uses water to break glycosidic bonds and release α-glucose.

4 Amylose contains β-1,6 glycosidic bonds formed by condensation.

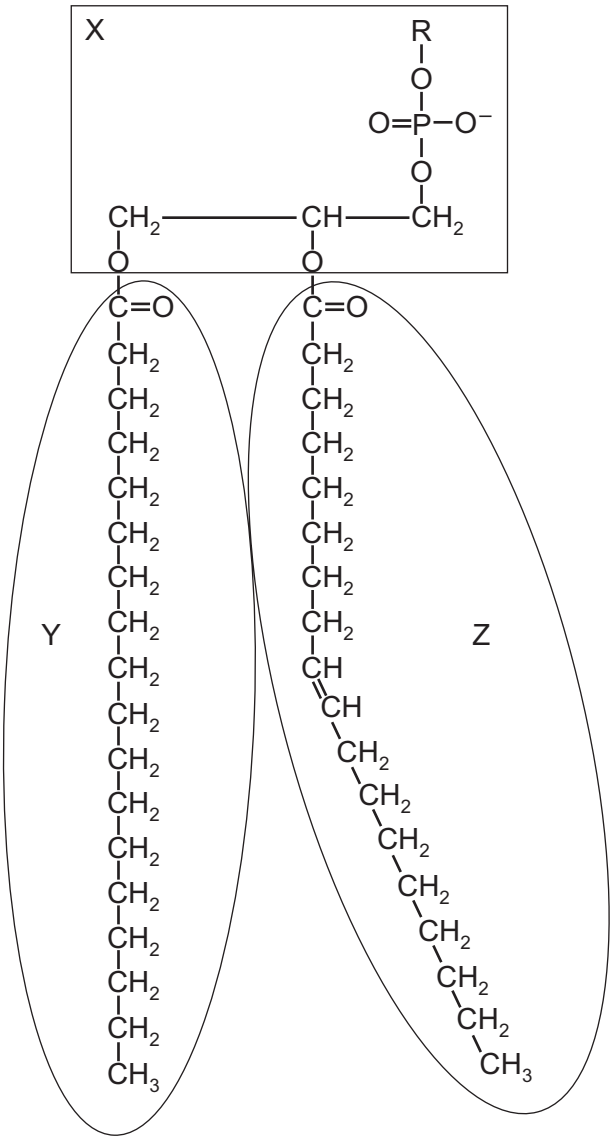
A 1, 2 and 3 **B** 1, 3 and 4 **C** 2 and 3 only **D** 2 and 4

10 A triglyceride has .....1..... bonds formed by joining fatty acids to .....2..... .

Which row correctly completes this sentence?

	1	2
A	ester	glycine
B	hydrogen	glycerol
C	ester	glycerol
D	hydrogen	glycine

11 The diagram shows a phospholipid molecule divided into three regions, X, Y and Z. R, in region X, represents a range of possible chemical groups.



Regions X, Y and Z affect the properties of cell surface membranes in different ways.

Which row shows the effect of each region on the properties of a cell surface membrane?

	increases permeability of hydrophobic region	repels polar molecules	attracts water molecules
A	X	X	Y and Z
B	Y	Y and Z	X
C	Y and Z	X	Y and Z
D	Z	Y and Z	X

12 Which statement about collagen is correct?

A Tissues containing collagen fibres cannot stretch.

B Each polypeptide chain forms an alpha helix.

C Three helices are held together by hydrogen bonds.

D Three polypeptide chains form a single collagen fibre.

13 Catechol is a chemical found in a number of fruits. Catechol can be oxidised to a quinone by the enzyme catechol oxidase.

Catechol oxidase is inhibited by parahydroxybenzoic acid (PHBA), which is structurally similar to catechol. In the presence of PHBA, the Michaelis-Menten constant (K_m) for catechol oxidase increases.

How does PHBA inhibit catechol oxidase?

1 PHBA and catechol can both bind to the enzyme but not at the same time.

2 PHBA is a non-competitive inhibitor of catechol oxidase.

3 PHBA decreases the V_{max} of the reaction.

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

14 Which statements about the fluid mosaic model of a membrane are correct?

1 The movement of phospholipids in the membrane is reduced if the fatty acid tails are saturated.

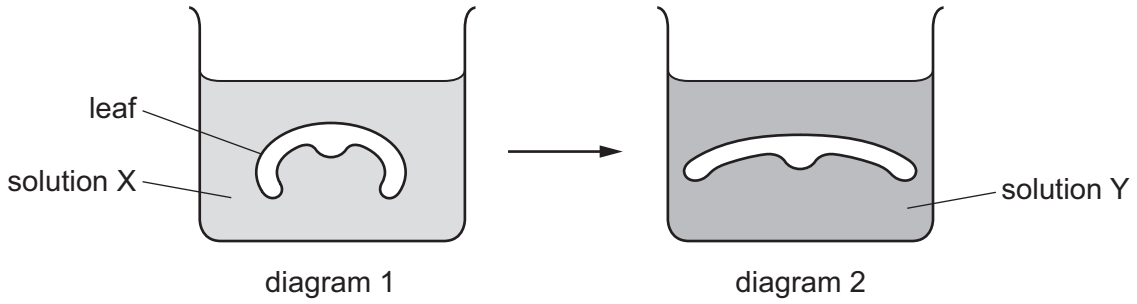
2 Glycoproteins in the outer layer of the membrane can move.

3 Channel proteins are fixed in position.

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

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15 Diagram 1 and diagram 2 show how the transverse section through a leaf changes when the leaf is moved from solution X to solution Y.



Which row describes the water potential of the leaf cells and surrounding solutions in diagram 2 compared with diagram 1?

	water potential of leaf cells in diagram 2 compared with water potential of leaf cells in diagram 1	water potential of solution Y compared with water potential of solution X
A	less negative	less negative
B	less negative	more negative
C	more negative	less negative
D	more negative	more negative

16 Which features must always be present for water to move between two solutions by osmosis?

1 carrier proteins

2 cell surface membrane

3 selectively permeable membrane

4 water potential gradient

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

17 When living pancreatic cells were placed in a solution of a red stain called neutral red, the cytoplasm became red. The cells were then removed from the solution of neutral red.

The red stain in the cytoplasm moved into vesicles, which were exported from the cell, eventually leaving the cell colourless.

Which transport mechanisms could explain how the red stain entered and left the cells?

A active transport and facilitated diffusion

B diffusion and exocytosis

C facilitated diffusion and endocytosis

D osmosis and exocytosis

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18 DNA molecules in a eukaryotic cell must be packaged compactly because their combined length is much greater than the diameter of the nucleus.

Which structures are required during the process of packaging DNA molecules compactly?

A chromatids

B chromosomes

C histone proteins

D telomeres

19 Which statements about mitosis are correct?

1 Mitosis results in genetically identical cells.

2 Mitosis is involved in asexual reproduction.

3 Mitosis occurs immediately after cytokinesis.

4 Mitosis can be used to repair damaged cells.

A 1, 2, 3 and 4

B 1, 2 and 4 only

C 1 and 2 only

D 3 and 4 only

20 A human chromosome is made up of different parts. Some parts of a typical human chromosome are more numerous than others.

Which parts are listed in order from least numerous to most numerous in a human white blood cell?

A centromere → chromatid → histone protein

B DNA molecule → telomere → centromere

C histone protein → telomere → DNA molecule

D telomere → centromere → chromatid

21 A piece of double-stranded DNA containing 12×10^3 nucleotides is transcribed and translated to produce a single polypeptide.

What is the maximum number of amino acids in this polypeptide?

A 6×10^3 **B** 4×10^3 **C** 2×10^3 **D** 1×10^3

22 Which statements about complementary base pairing are correct?

1 Cytosine forms two hydrogen bonds with guanine.

2 Purines and pyrimidines are different sizes.

3 Adenine forms the same number of hydrogen bonds with thymine as it does with uracil.

4 The base pairs in a molecule of DNA are of equal length and equal width.

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

23 What are the products when a DNA molecule replicates?

A two molecules of DNA each made of a sequence of paired bases

B two molecules of DNA each made of a sequence of paired nucleotides

C two strands of DNA each made of a sequence of paired bases

D two strands of DNA each made of a sequence of paired nucleotides

24 Which descriptions apply to phloem sieve tube elements and to xylem vessel elements?

1 no cytoplasm

2 no end walls

3 no nucleus

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

25 Some of the parts of a plant root involved in water transport are listed.

1 Casparian strip

2 cell walls of cortex cells

3 endodermal cells

4 epidermal cells

5 xylem vessels

Which sequence shows part of a pathway through which water can move across a root?

A $2 \rightarrow 3 \rightarrow 5$ **B** $2 \rightarrow 1 \rightarrow 5$ **C** $4 \rightarrow 2 \rightarrow 1$ **D** $4 \rightarrow 3 \rightarrow 2$

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26 What is an example of a mass flow system in a plant?

A the loading of amino acids from the surrounding tissues into companion cells

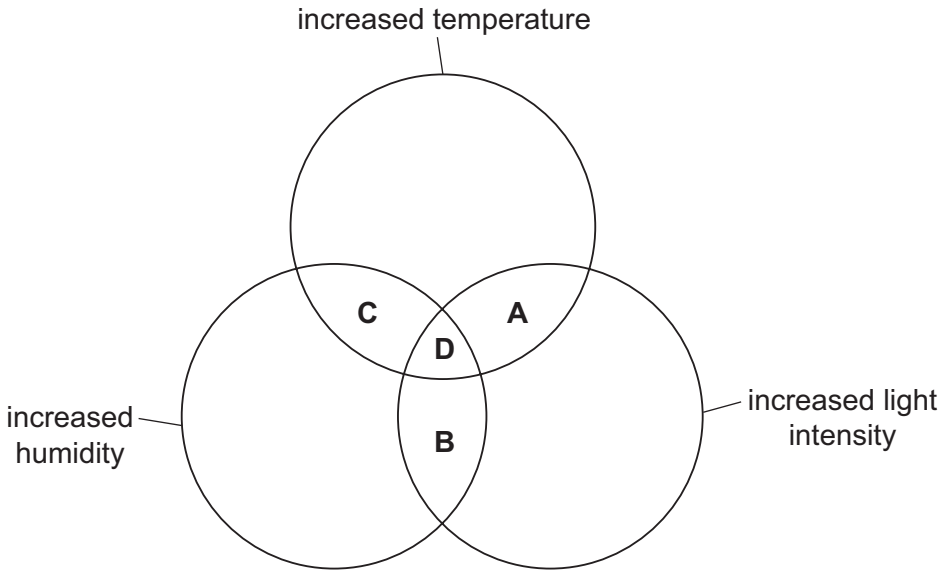
B the movement of sap through the phloem sieve tubes in the stem

C the movement of water across the root along the symplastic pathway

D the movement of water vapour from the internal spaces in the leaf out through the stomata

27 The diameter of a tree trunk usually decreases slightly during the day.

Which changes in environmental factors during the day could cause the diameter to decrease even more?



28 Which statement about the role of co-transporter proteins in the movement of sucrose is correct?

A Co-transporter proteins pump hydrogen ions into phloem sieve tubes along with sucrose.

B Hydrogen ions diffuse through co-transporter proteins with sucrose into companion cells.

C Plasmodesmata move sucrose into phloem sieve tubes via co-transporter proteins.

D Sucrose is moved through co-transporter proteins by active transport.

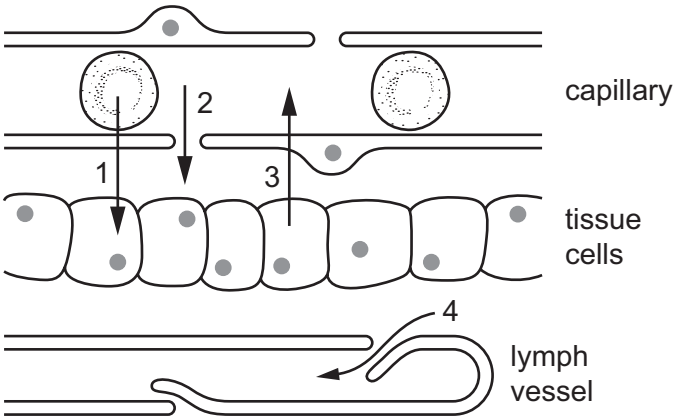
29 Which row correctly describes the heart during atrial systole?

	wall of ventricle	atrioventricular valve	semilunar valve
A	contracted	closed	closed
B	contracted	open	open
C	relaxed	closed	open
D	relaxed	open	closed

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[Turn over

30 The diagram shows a capillary, some tissue cells and a lymph vessel.



Which row correctly identifies arrows 1, 2, 3 and 4?

	1	2	3	4
A	diffusion of glucose	flow of water and small solutes	diffusion of carbon dioxide	flow of tissue fluid
B	diffusion of glucose	flow of water and plasma proteins	osmosis of water	diffusion of oxygen
C	diffusion of oxygen	flow of water and small solutes	diffusion of carbon dioxide	flow of tissue fluid
D	diffusion of oxygen	flow of water and plasma proteins	osmosis of water	diffusion of carbon dioxide

31 The table shows the results used to draw an oxygen dissociation curve for adult haemoglobin.

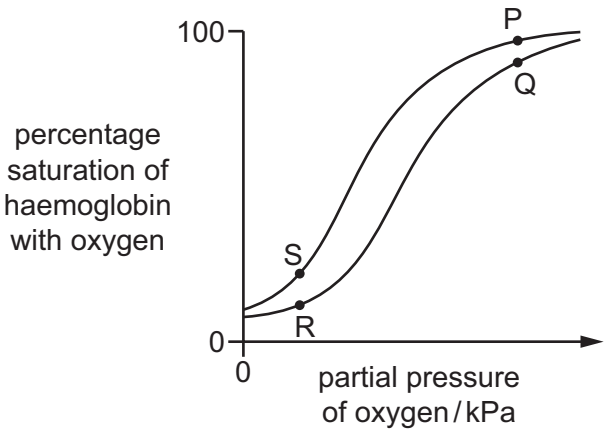
partial pressure of oxygen / kPa	1	2	3	4	5	6	7
volume of oxygen per gram of haemoglobin / $cm^3 g^{-1}$	0.11	0.32	0.58	0.77	0.96	1.07	1.15

What is the percentage increase in the volume of oxygen per gram of haemoglobin when the partial pressure of oxygen increases from 3 kPa to 5 kPa?

A 32.8% **B** 39.6% **C** 60.4% **D** 65.5%

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32 The graph shows the oxygen dissociation curves for adult haemoglobin at two carbon dioxide concentrations.



Which letters show measurements taken in the capillaries of the lungs and in the capillaries of active muscle?

	lungs	active muscle
A	P	R
B	P	S
C	Q	R
D	Q	S

33 Which substances can combine with adult haemoglobin and reduce the oxygen-carrying capacity of the blood?

1 carbon dioxide

2 carbon monoxide

3 hydrogencarbonate ions

4 hydrogen ions

A 1, 2, 3 and 4

B 1, 2 and 4 only

C 1 and 3 only

D 2 and 4 only

34 How many times must a molecule of carbon monoxide pass through a cell surface membrane as it diffuses from an air space in an alveolus, through a cell in the capillary wall, into a red blood cell?

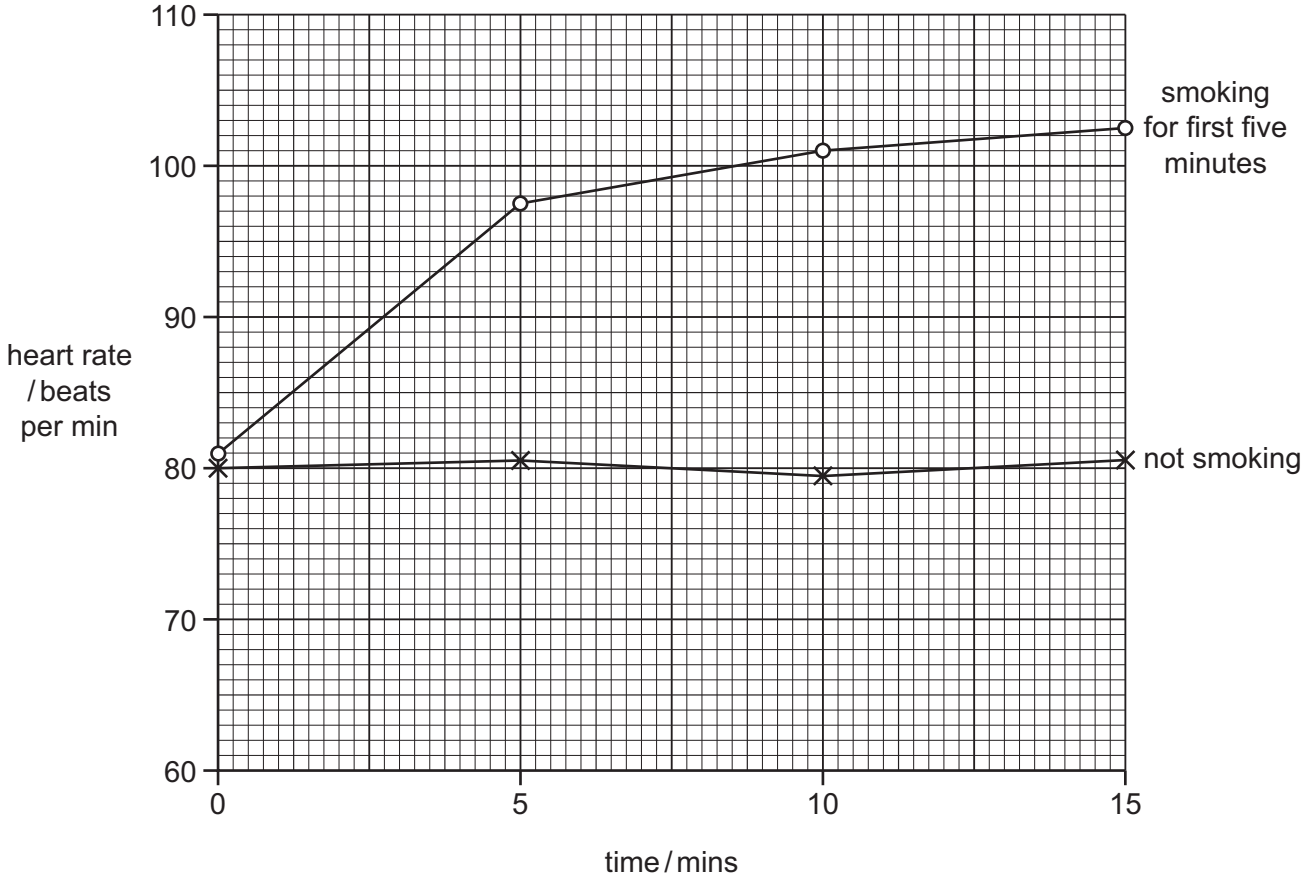
A 3 **B** 4 **C** 5 **D** 6

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35 The heart rate of a person at rest was recorded at intervals over two 15-minute periods.

During the first five minutes of the second 15-minute period, the person smoked a cigarette.

The graph shows the results recorded during the two 15-minute periods.



What can be concluded from the graph?

A Carbon monoxide affects the heart rate.

B Carbon monoxide binds to haemoglobin increasing the flow of blood.

C Nicotine increases the heart rate so is a stimulant.

D The heart rate increases as a result of smoking.

36 Emphysema is a type of chronic obstructive pulmonary disease (COPD). A person with emphysema has difficulties in breathing out.

Why does emphysema cause difficulties in breathing out?

A Smooth muscle fibres in the airways are destroyed.

B Too little mucus is produced in the bronchi.

C The elasticity of the alveoli decreases.

D The surface area of the alveoli becomes larger.

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37 Which factors contribute to outbreaks of measles after natural disasters?

1 contamination of drinking water with untreated sewage

2 lack of effective vaccination coverage in the population before the disaster

3 people living in overcrowded accommodation

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

38 There are two main classes of antibiotics, broad spectrum and narrow spectrum.

Broad spectrum antibiotics affect a wide range of bacteria, while narrow spectrum antibiotics affect specific types of bacteria.

Which uses of antibiotics may result in antibiotic-resistant bacteria?

1 a broad spectrum antibiotic given to reduce the effects of the influenza virus

2 a broad spectrum antibiotic to treat *Mycobacterium tuberculosis* in humans

3 a narrow spectrum antibiotic to treat diarrhoea and sickness in cattle

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

39 People with the autoimmune disease myasthenia gravis can have a treatment to relieve the symptoms. In this treatment, one of the components of their blood is removed.

Which blood component is removed?

A antibodies

B macrophages

C neutrophils

D red blood cells

40 Why are spleen cells fused with myeloma cells during monoclonal antibody production?

A so that the antibodies become specific for the necessary antigen

B so that the resulting hybridoma cells can reproduce indefinitely

C to allow antibodies that are **not** specific for the required antigen to be removed

D to increase the rate of production of antibodies produced by the hybridoma cells

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