Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

BIOLOGY **9700/12**

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)

6240518218

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 **15** printed pages and **1** blank page.

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1 Some features of cells are listed.

1 cell wall

2 cell surface membrane

3 ribosomes

Which features can be found in plant cells and in prokaryotic cells?

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

2 Which of these statements about light microscopy are correct?

1 The greater the resolution of a light microscope, the greater the detail that can be seen.

2 The greater the magnification of a light microscope, the greater the detail that can be seen.

3 Increasing the magnification of a light microscope up to its limit of resolution allows more detail to be seen.

4 The shorter the wavelength of light used in a light microscope, the greater the detail that can be seen.

A 1, 2, 3 and 4

B 1, 3 and 4 only

C 1 and 2 only

D 4 only

3 Which type of cell contains the highest proportion of cell structures bound by a single membrane?

A ciliated epithelial cell

B goblet cell

C red blood cell

D smooth muscle cell

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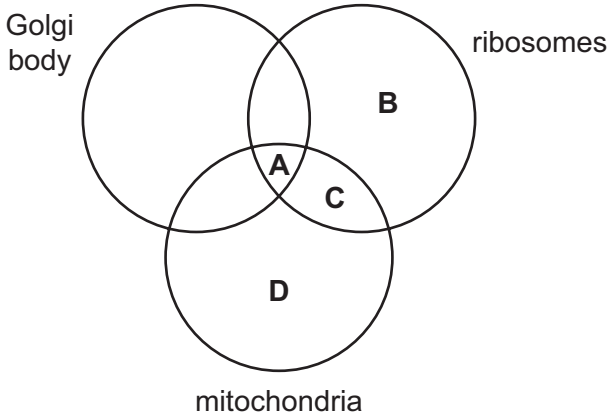
4 The table shows a variety of structures which may be found in cells.

Which row shows structures that could be found in the root cells of a plant?

	plasmodesmata	glycogen granules	Golgi body	mitochondria
A	✓	✓	✗	✗
B	✓	✗	✓	✓
C	✗	✓	✓	✓
D	✗	✗	✓	✓

key
✓ = present
✗ = absent

5 Which of these cell structures are present in *Plasmodium*?

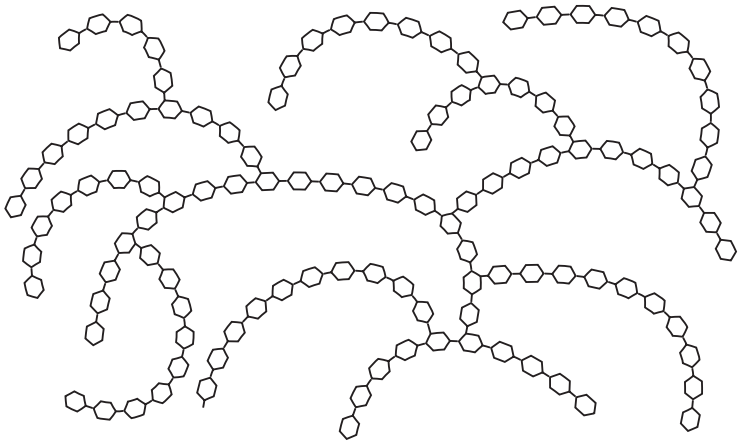


6 A student was asked to estimate the concentration of glucose in a solution using the Benedict's test. The student was provided with a 1.0 mol dm^{-3} glucose solution and was told to make a 0.6 mol dm^{-3} solution by proportional dilution.

Which row shows the correct volumes of both 1.0 mol dm^{-3} glucose solution and distilled water needed to make the 0.6 mol dm^{-3} solution?

	volume of 1.0 mol dm^{-3} glucose solution / cm^3	volume of distilled water / cm^3
A	12	8
B	10	10
C	8	12
D	6	14

7 The diagram shows part of a carbohydrate molecule formed by glucose.



What is the name of the molecule?

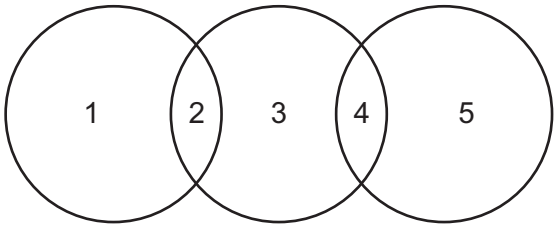
A amylose

B cellulose

C glycogen

D starch

8 The diagram shows the relationship between some biological molecules.



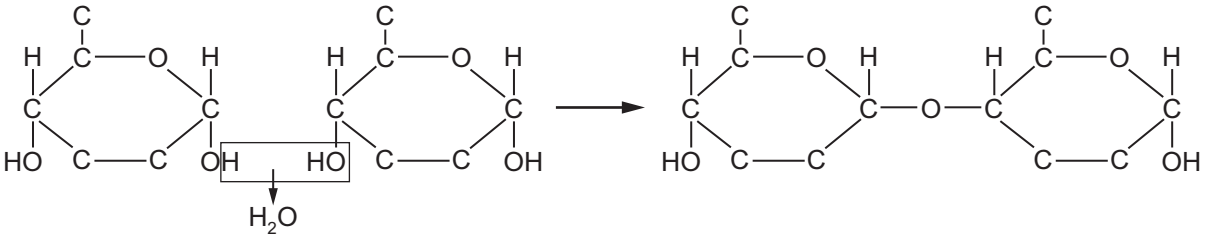
Which row is correct?

	1	2	3	4	5
A	α-glucose	carbohydrate	sucrose	monomer	fructose
B	cellulose	polymer	starch	carbohydrate	amylase
C	fructose	reducing sugar	β-glucose	monomer	amino acid
D	haemoglobin	protein	amylose	polymer	cellulose

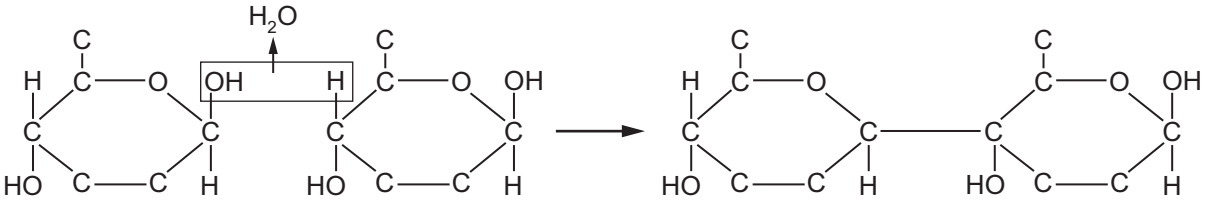
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9 Which diagram shows the reaction that occurs to join two of the monomers that form cellulose?

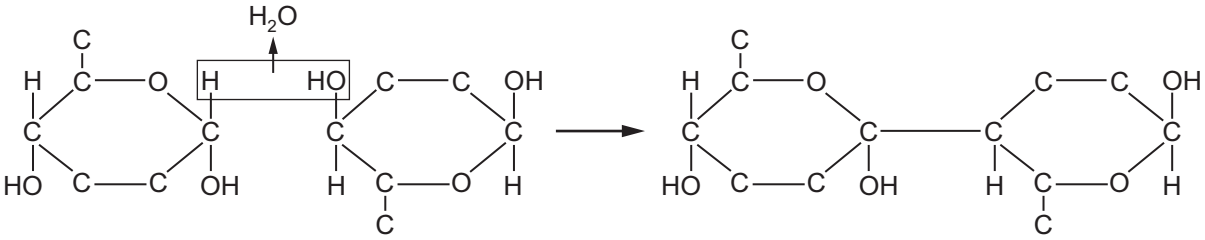
A



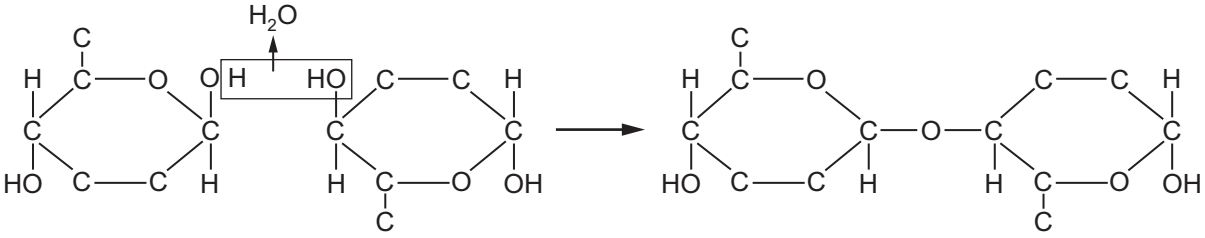
B



C



D



10 Which molecules contain C=O bonds?

1 amino acids

2 fatty acids

3 glycerol

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

11 Which row describes a collagen molecule?

	bonds stabilising the molecule	properties	primary structure	helix
A	disulfide	high temperatures increase flexibility	high proportion of glycine	double
B	disulfide	resistant to stretching	repeat sequences of three amino acids	single
C	hydrogen	high tensile strength	repeat sequences of three amino acids	triple
D	hydrogen	insoluble in water	high proportion of glycine and proline	alpha

12 A student investigated the hydrolysis of the lipid in high-fat milk, using the enzyme lipase.

- 1 cm^3 of enzyme solution was added to 10 cm^3 of high-fat milk.
- The temperature was kept constant.
- The pH of the reaction mixture was recorded at time 0 minutes and every minute for 20 minutes.

Which statements could be supported by the results of the investigation?

1 Less product is made as time proceeds because the substrate is decreasing.

2 The pH of the reaction mixture changes more rapidly in the first few minutes and then changes less rapidly.

3 The product gradually causes more lipase molecules to denature.

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

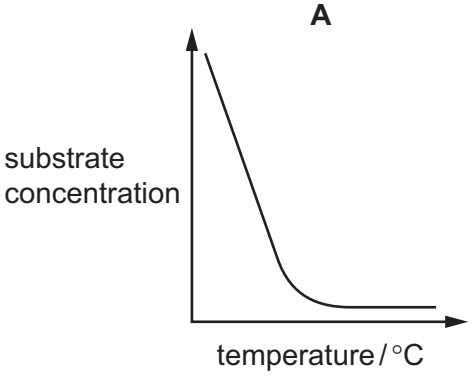
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13 A student carried out an investigation into the effect of temperature on the rate of an enzyme-catalysed reaction.

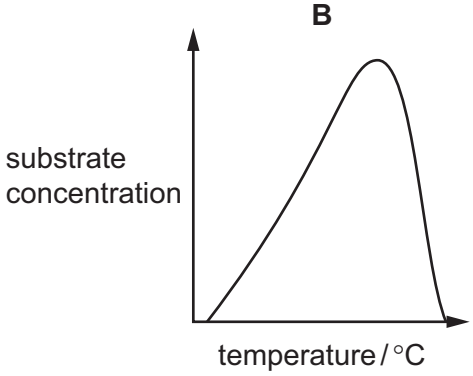
At each temperature, the substrate concentration was measured after 10 minutes. All the other variables were kept constant.

Which graph shows the effect of increasing temperature on the substrate concentration after 10 minutes?

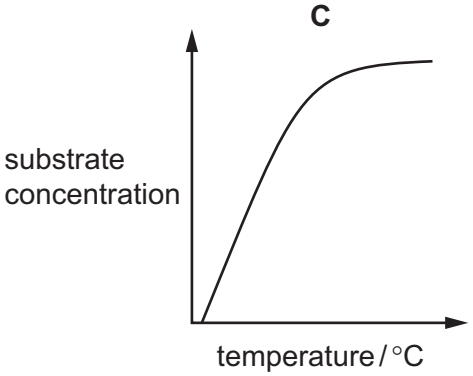
A



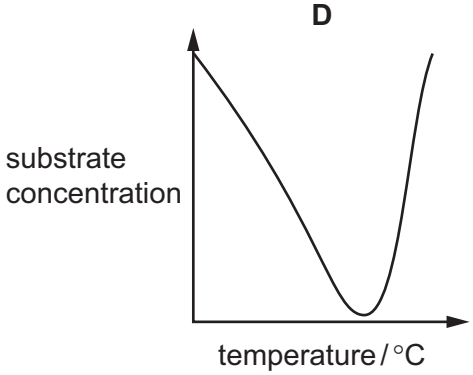
B



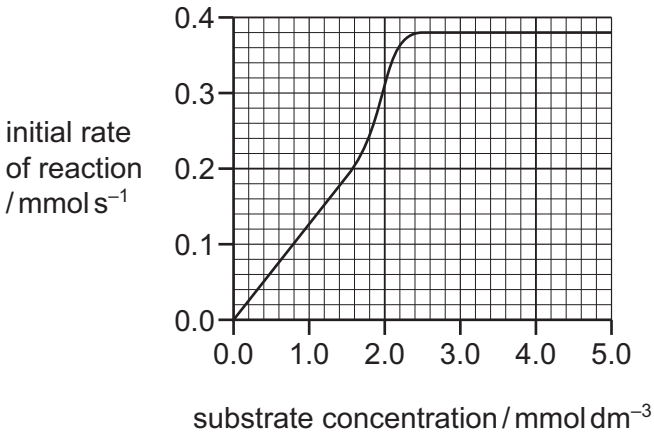
C



D



14 The graph shows how the rate of an enzyme-catalysed reaction depends on the concentration of substrate.



What is the Michaelis-Menten constant (K_m) for this enzyme under these conditions?

A 0.19 mmol dm^{-3}

B 0.38 mmol dm^{-3}

C 1.5 mmol dm^{-3}

D 5.0 mmol dm^{-3}

15 The formula shows how the rate of diffusion across a cell surface membrane can be calculated.

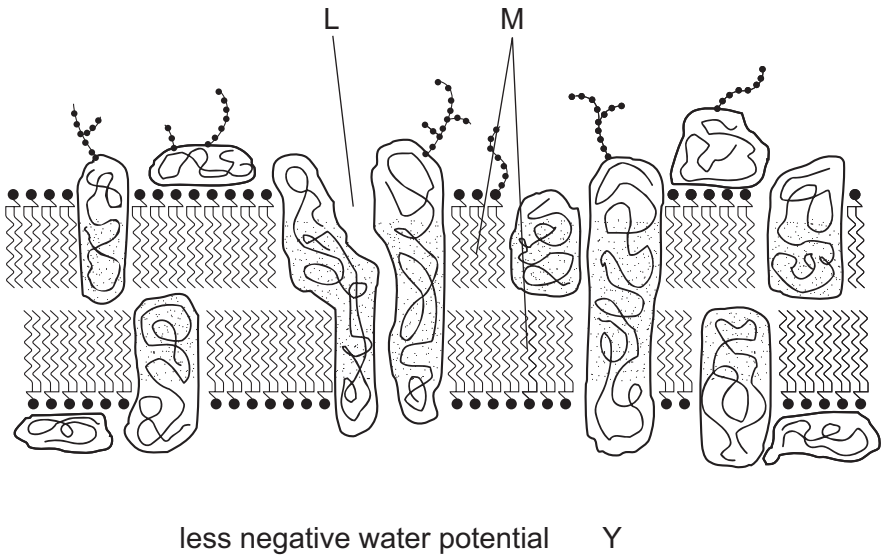
$$\frac{\text{surface area} \times \text{difference in concentration}}{\text{thickness of membrane}}$$

Which row shows how the fastest rate of diffusion can be achieved?

	surface area available	difference in concentration	thickness of membrane
A	high	high	high
B	high	high	low
C	low	high	low
D	low	low	high

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16 The diagram shows part of the cell surface membrane of an active animal cell.



Which statements correctly describe the net movement of molecules across this membrane?

1 Oxygen diffuses through molecules M from X to Y.

2 Carbon dioxide diffuses through molecules M from X to Y.

3 Water moves from Y to X through molecule L.

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

17 Some epidermal cells from a well-watered plant are placed in three solutions which have different water potentials.

Which row correctly shows the state of the plant cells in each of the solutions?

	water potential of solution		
	lower than cells	equal to cells	higher than cells
A	plasmolysed	turgid	plasmolysed
B	plasmolysed	turgid	turgid
C	turgid	plasmolysed	plasmolysed
D	turgid	plasmolysed	turgid

18 One of the chromosomes in a nucleus has a telomere which contains many repeats of the base sequence TTAGGG.

This chromosome was extracted from four different cells and the total number of bases in the telomere was determined.

Which total number of bases was found in the cell that had undergone the most mitotic divisions?

A 5548 **B** 5580 **C** 5645 **D** 5700

19 The chromosome content of each daughter cell must be identical to that of the mother cell for successful cell replacement when repairing tissues.

Which stages of mitosis make sure that each daughter cell receives one chromatid from each chromatid pair?

A prophase and metaphase

B metaphase and anaphase

C anaphase and telophase

D telophase and interphase

20 Which of these statements about cytokinesis is always true?

1 Cell structures replicate.

2 Cell structures are shared between two cells.

3 Nuclear envelope reforms.

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

21 Which statement is correct about the number of telomeres present in prophase of a human body cell?

A 46 as there is one telomere at the end of 46 chromosomes

B 92 as there is one telomere at each end of 46 chromosomes

C 92 as there is one telomere at the end of 92 chromatids

D 184 as there is one telomere at each end of 92 chromatids

22 Which statement explains why DNA replication is described as semi-conservative?

A Half of each original strand is conserved in each new molecule of DNA.

B Half of the base sequence of each strand is conserved in each new molecule of DNA.

C Only one strand of DNA is used as a template during replication.

D The template for each new molecule of DNA is one strand of the original molecule.

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23 A section of a DNA molecule has the coding sequence: AGGCAATGGC.

Which statements are correct?

1 This coding sequence contains 3 pyrimidines.

2 The double-stranded DNA of this section contains 26 hydrogen bonds between complementary bases.

3 The double-stranded DNA of this section has 20 sugar-phosphate bonds.

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

24 XNA is a laboratory-made nucleic acid made of nucleotides in which one component has been replaced by chemical X. The chemical X is not found in nature. The part of the molecule responsible for coding is not changed.

Which organic component of a DNA or RNA nucleotide has been replaced by X?

A five-carbon sugar

B phosphate group

C purine base

D pyrimidine base

25 Which statements about tRNA are correct?

1 Hydrogen bonds between bases temporarily hold tRNA against mRNA.

2 The base sequences in the tRNA molecules are the same as the base sequences in the mRNA that is being translated.

3 The specificity of the tRNA molecule for glycine and the specificity of the enzyme that loads glycine are both necessary for correct loading.

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

26 What is the role of ATP in a companion cell when sucrose is loaded into a sieve tube element?

A moving sucrose into the sieve tube element

B removing protons from the sieve tube element

C removing protons out of the cytoplasm of the companion cell

D taking up sucrose into the cytoplasm of the companion cell

27 A potometer was used to measure the transpiration rate of a leafy shoot.

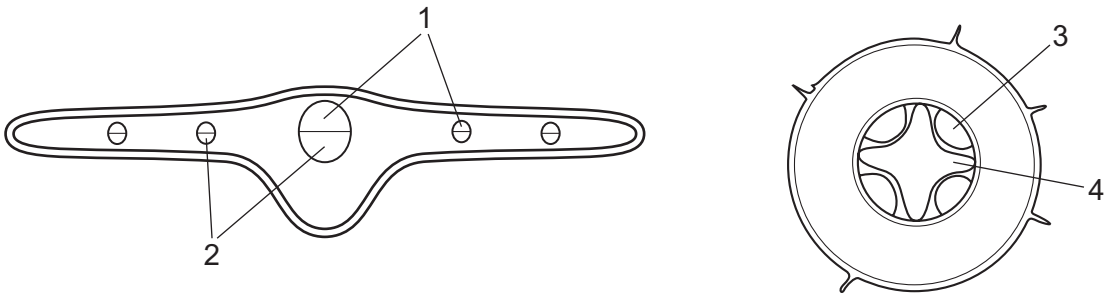
What could be the correct units?

A cm min **B** $cm^2\,min^{-1}$ **C** $cm^3\,g^{-1}\,min$ **D** $cm^3\,min^{-1}$

28 Which combination of features is characteristic of a phloem sieve tube element as it is loaded from a source?

	water potential of the phloem sieve tube element	lignification of the cell wall
A	higher than source	absent
B	higher than source	present
C	lower than source	absent
D	lower than source	present

29 The diagrams show transverse sections of parts of a plant.



Which structures, labelled 1 to 4, transport water **and** sucrose?

	1	2	3	4
A	✓	✗	✓	✗
B	✓	✗	✗	✓
C	✗	✓	✓	✗
D	✗	✓	✗	✓

key
✓ = correct
✗ = incorrect

30 Which statement explains why the ventricles contract after the atria?

A The band of fibres between the atria and the ventricles conducts the excitation wave slowly.

B The excitation wave has to pass through a small area of conducting fibres in the septum.

C The excitation wave has to travel further to reach the base of the ventricles than to spread across the atria.

D The excitation wave travels slowly through the Purkyne tissue to reach the base of the septum.

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31 If the left atrioventricular valve in the heart does not close completely it results in blood flowing back into the atrium during ventricular systole.

What would be the immediate effect of this back flow?

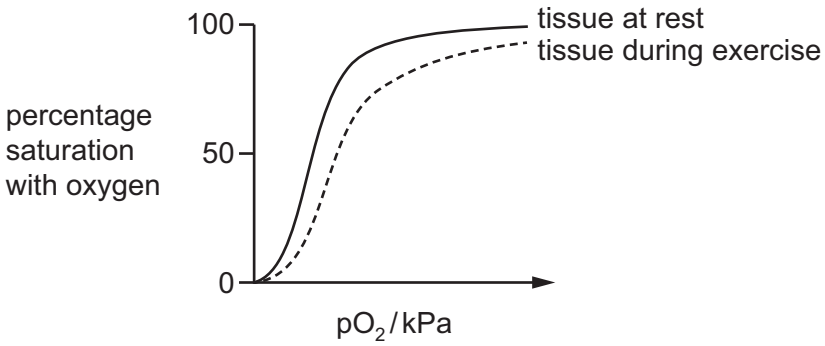
A blood flowing from the heart carries less oxygen because less blood enters the lungs

B diastolic pressure in the left ventricle falls because less blood enters the pulmonary artery

C lower systolic pressure in the left atrium and less blood enters the pulmonary artery

D raised pressure in the left atrium and less blood enters the aorta

32 The graph shows two oxygen dissociation curves, one for a tissue at rest and one for the same tissue during exercise.



What factors have caused the difference in the position of the dissociation curve during exercise compared with the dissociation curve for the tissue at rest?

1 increase in pH

2 decrease in pH

3 increase in haemoglobin affinity for O_2

4 decrease in haemoglobin affinity for O_2

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

33 Which of these statements about the formation of haemoglobinic acid are correct?

1 It can only occur with the dissociation of oxygen from haemoglobin.

2 It removes excess hydrogen ions preventing blood becoming too acidic.

3 It is linked to the action of carbonic anhydrase.

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

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34 Which of these structures contain cartilage and cilia?

1 bronchi

2 bronchioles

3 trachea

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

35 What correctly describes the effect of carcinogens on lung tissue that causes a tumour to develop?

A Cells in damaged alveoli walls divide more rapidly to replace damaged areas.

B Cilia are paralysed and mucus accumulates in the lungs causing DNA to change.

C DNA changes, causing bronchial epithelial cells to divide by mitosis in an uncontrolled way.

D Haemoglobin carries less oxygen, causing bronchial cells to divide by mitosis in an uncontrolled way.

36 Which row identifies both the type of pathogen that causes cholera and the way in which cholera is transmitted from person to person?

	type of pathogen	method of transmission
A	bacteria	drinking water contaminated with the pathogen
B	bacteria	inhaling water droplets contaminated with the pathogen
C	virus	drinking water contaminated with the pathogen
D	virus	inhaling water droplets contaminated with the pathogen

37 Why do people with HIV/AIDS have a higher occurrence of malaria than people without HIV/AIDS?

A HIV/AIDS and malaria are both diseases where the pathogen travels in blood.

B HIV/AIDS and malaria are both transmitted in blood.

C HIV/AIDS infects T-lymphocytes which are used by the malaria pathogen.

D HIV/AIDS suppresses the immune response to the malaria pathogen.

38 How many variable regions are there on a typical Y-shaped antibody molecule?

A 2 **B** 3 **C** 4 **D** 6

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39 Where are antigens found?

	on the surface of pathogen	on the surface of macrophage
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

key

✓ = antigens found

✗ = antigens not found

40 When an organ is transplanted from one person to another, rejection of the non-self organ must be avoided. At the same time, the immune system of the recipient must be maintained to prevent death from infections.

What prevents rejection of the transplanted organ?

A continued activity of B-lymphocytes

B natural active immunity

C natural passive immunity

D suppression of T-lymphocyte activity

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