Cambridge Assessment International Education

Cambridge International AS & A Level

BIOLOGY **9700/11**

Paper 1 Multiple Choice **October/November 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.

This document has **16** pages.

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1 A student observes a cell using a light microscope. The student then draws the cell.

Which items will the student need to calculate the magnification of the drawing?

1 eyepiece graticule

2 ruler

3 hand lens

4 stage micrometer scale

A 1, 2, 3 and 4

B 1, 2 and 4 only

C 1 and 3 only

D 2 and 4 only

2 Which equations correctly show the relationship between magnification, image size and actual size in microscopy?

1 $\text{magnification} = \frac{\text{image size}}{\text{actual size}}$

2 $\text{magnification} = \frac{\text{actual size}}{\text{image size}}$

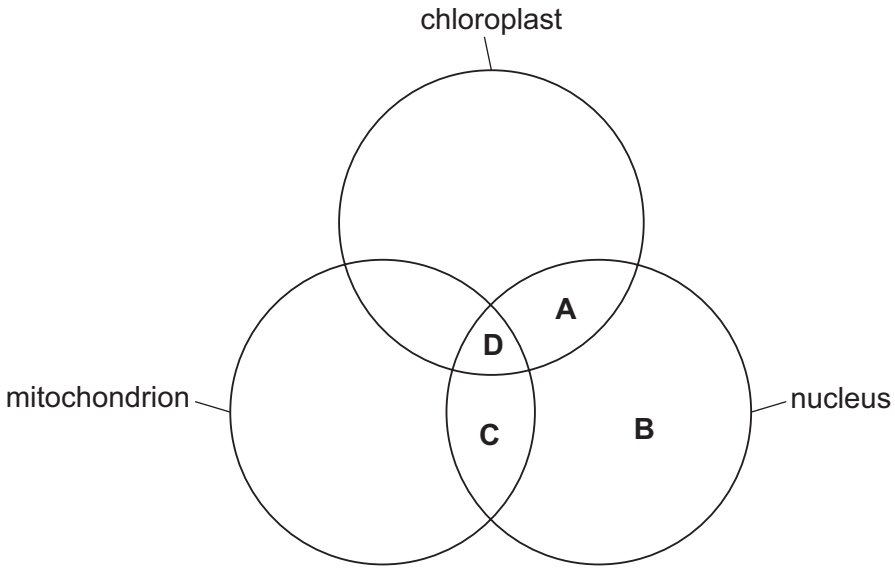
3 $\text{actual size} = \frac{\text{image size}}{\text{magnification}}$

4 $\text{actual size} = \frac{\text{magnification}}{\text{image size}}$

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

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3 In which cell structures does DNA transcription occur?



4 Which rows could correctly identify the nucleic acids present in two different virus particles in a sample of air?

	DNA	RNA
1	✓	✓
2	✓	✗
3	✗	✓
4	✗	✗

key
✓ = nucleic acid present
✗ = nucleic acid not present

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

5 Tests on four samples from a mixture of biological molecules gave the results shown in the table.

test	boiled with excess Benedict's solution	boiled with excess Benedict's solution after acid hydrolysis and neutralisation	biuret reagent	iodine solution
result	blue	red	purple	yellow

Which biological molecules were in the mixture?

A reducing sugar and protein

B reducing sugar, non-reducing sugar and starch

C non-reducing sugar and protein

D non-reducing sugar and starch only

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6 One molecule of X is formed by a single condensation reaction releasing one molecule of water.

What is molecule X?

A a disaccharide

B a phospholipid

C a polysaccharide

D a triglyceride

7 The table shows some information about carbohydrate polymers.

Which row describes glycogen?

	α-1,4 glycosidic bonds	α-1,6 glycosidic bonds	shape of molecule	function of molecule
A	✓	✓	branched	storage
B	✓	✗	helical	storage
C	✗	✓	branched	structural
D	✗	✗	helical	structural

key

✓ = present

✗ = not present

8 The diagrams show four phospholipid molecules.

Which molecule could contribute most to the fluidity of a cell surface membrane?

A



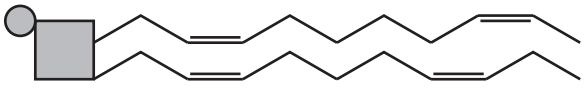
B



C



D



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9 Which properties of phospholipids explain why single layers of phospholipids added to water immediately form bilayers?

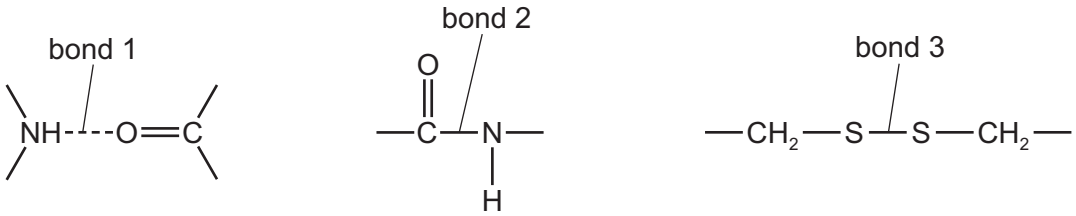
1 The hydrophobic fatty acid chains repel water molecules so the tails pack together.

2 The non-polar fatty acid chains are attracted to each other by hydrophobic interactions.

3 Hydrogen bonds form between the phosphate groups and water.

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

10 The diagrams show three examples of different bonds.



Which bonds hold the tertiary structure of proteins together?

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

11 Which feature of collagen enables it to fulfil a structural role in skin and in tendons?

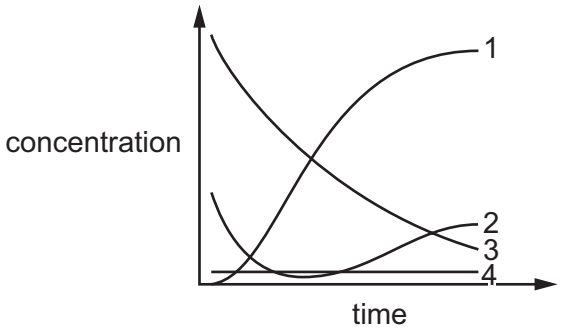
A Adjacent collagen molecules are linked by ester bonds.

B Collagen fibres form layers with the fibres in different directions.

C Collagen molecules are formed as a triple helix of polypeptide chains.

D Polypeptide chains of collagen are tightly folded into compact shapes.

12 The graph shows how the concentrations of four components, 1, 2, 3 and 4, of an enzyme-catalysed reaction change with time.



Which component is the enzyme–substrate complex?

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

13 The table shows the Michaelis–Menten constant, K_m, for three enzymes.

enzyme	K_m / mmol dm^{-3}
C	1.5×10^{-2}
P	3.0×10^{-4}
F	5.0×10^{-6}

Which interpretation of the information is correct?

A Enzyme C has a V_{max} which is half that of enzyme P.

B Enzyme C will reach V_{max} in the shortest time interval.

C Enzyme F has the greatest affinity for its substrate.

D Enzyme P has a V_{max} of 6.0×10^{-3} mmol dm^{-3}.

14 What explains how a signal molecule produced by one cell can be detected by a target cell?

A A signal molecule can bind to any type of cell surface receptor.

B A signal molecule has a complementary shape to a cell surface receptor.

C Signal molecules enter the cell by diffusion.

D Signal molecules enter the cell by endocytosis.

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15 Some enzymes are produced in the cells of the pancreas. The enzymes are secreted when required.

Which process is used to transport these enzymes out of the cells of the pancreas?

A active transport

B facilitated diffusion

C endocytosis

D exocytosis

16 Plant cells were submerged in a solution with a water potential less negative than that found inside the cells.

What describes the condition of the plant cells after 20 minutes?

A burst

B incipient plasmolysis

C plasmolysed

D turgid

17 What will be present in each chromosome at the end of the G_2 phase of the cell cycle?

A two centrioles

B two centromeres

C two molecules of DNA

D two telomeres

18 Which events listed are part of the cell cycle?

1 interphase

2 metaphase

3 cytokinesis

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

19 Which features of an organism are affected by a drug that kills cells that are dividing mitotically?

1 cell repair

2 cell replacement

3 number of stem cells

4 tissue repair

5 tumour formation

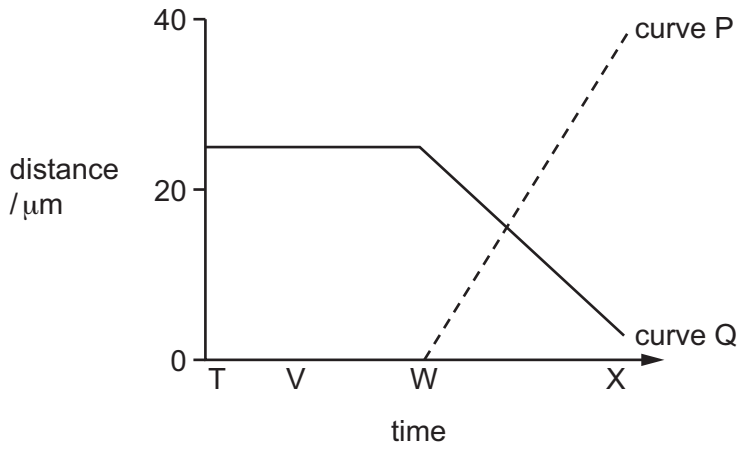
A 1, 2, 3, 4 and 5

B 1, 2 and 3 only

C 1, 4 and 5 only

D 2, 3, 4 and 5 only

20 The graph shows how the distance between sister chromatids (curve P) and the distance between chromatids and centrioles (curve Q) changes during part of mitosis.



Which statements could be correct?

1 T to V represents interphase.

2 T to W represents metaphase.

3 W to X represents anaphase.

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

21 Which statement helps to explain why the two sugar-phosphate chains in a DNA molecule are a constant distance apart?

A Adenine and thymine are held together by the same number of hydrogen bonds as cytosine and guanine.

B Each nucleotide molecule is the same size.

C Each purine base is linked to a pyrimidine base.

D The sugar-phosphate strands of the helix are held together by sulfur bridges.

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22 During DNA replication, what must happen **before** a newly added nucleotide is bonded to the next nucleotide in the strand?

1 complementary base pairing

2 hydrogen bond formation

3 phosphodiester bond formation

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

23 An antibiotic enters bacterial cells through a membrane channel protein, P.

Some bacterial cells have shown resistance to this antibiotic by acquiring a mutation which alters P. This mutation prevents the entry of the antibiotic into the cell.

Which conclusions can be drawn about how resistance to this antibiotic developed in these bacteria?

1 The mutation changed the order of the amino acids in the gene coding for P.

2 The mutation resulted in the production of P with an altered tertiary structure.

3 The antibiotic is a hydrophobic molecule and so cannot cross the phospholipid bilayer to enter the cell.

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

24 What is the correct tRNA anticodon coding for the amino acid proline?

amino acid	DNA triplet code on transcribed strand
alanine	CGT
histidine	GTG
proline	GGT

A CCA **B** CCU **C** GGT **D** GGU

25 The table shows the observations made by a student about three different cell types, P, Q and R, seen in a transverse section of a plant stem, using a light microscope.

	ratio of cell wall width to whole cell width	structures observed in cell contents
P	1 : 10	none
Q	1 : 20	regular pattern of circles in some cells
R	1 : 20	granular appearance of all cells

What type of cells are P, Q and R?

	P	Q	R
A	companion cell	phloem sieve tube element	xylem vessel element
B	companion cell	xylem vessel element	phloem sieve tube element
C	xylem vessel element	companion cell	phloem sieve tube element
D	xylem vessel element	phloem sieve tube element	companion cell

26 Water molecules are attracted to each other. This property is important in the upward movement of water in xylem.

Which term is used to describe the attraction of water molecules to each other?

A adhesion

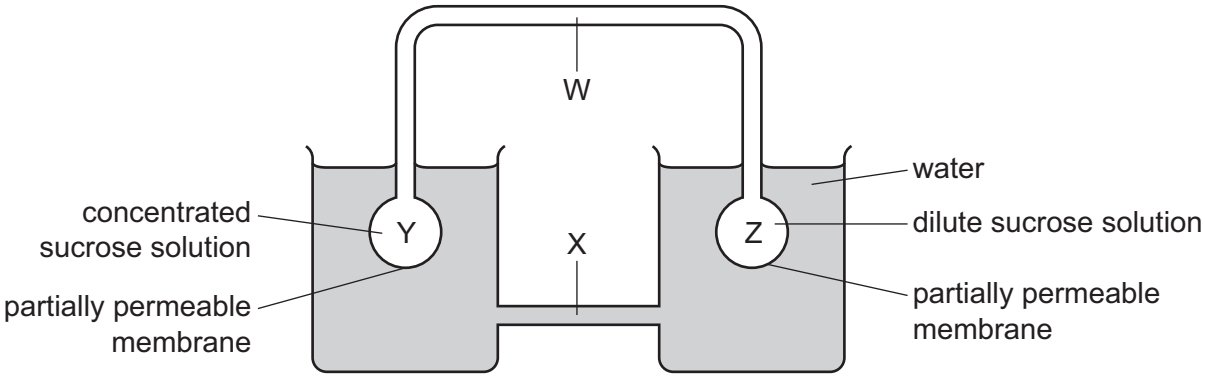
B cohesion

C hydrophilic

D polar

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27 The diagram shows a model to demonstrate mass flow.



In a plant, what are the structures W, X, Y and Z and what is the direction of flow of solution along W?

	phloem	xylem	roots	leaves	direction of flow along W
A	W	X	Y	Z	from Z to Y
B	W	X	Z	Y	from Y to Z
C	X	W	Y	Z	from Y to Z
D	X	W	Z	Y	from Z to Y

28 The parts of the heart that control heart action are listed.

- sinoatrial node (SAN)
- atrioventricular node (AVN)
- Purkyne tissue

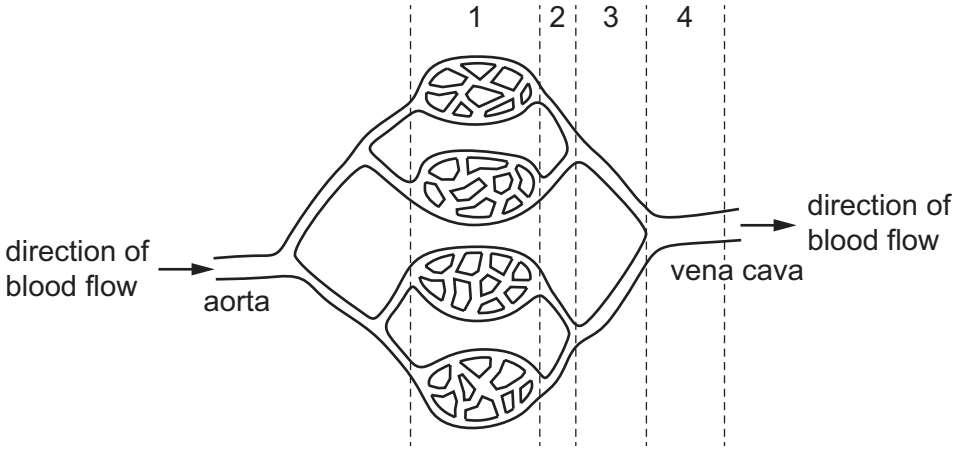
Which row is correct for atrial contraction and ventricular contraction?

	atrial contraction	ventricular contraction
A	AVN produces waves of excitation	SAN produces waves of excitation
B	Purkyne tissue carries waves of excitation	AVN produces waves of excitation
C	SAN and AVN produce waves of excitation	Purkyne tissue carries waves of excitation
D	SAN produces waves of excitation	Purkyne tissue carries waves of excitation

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[Turn over

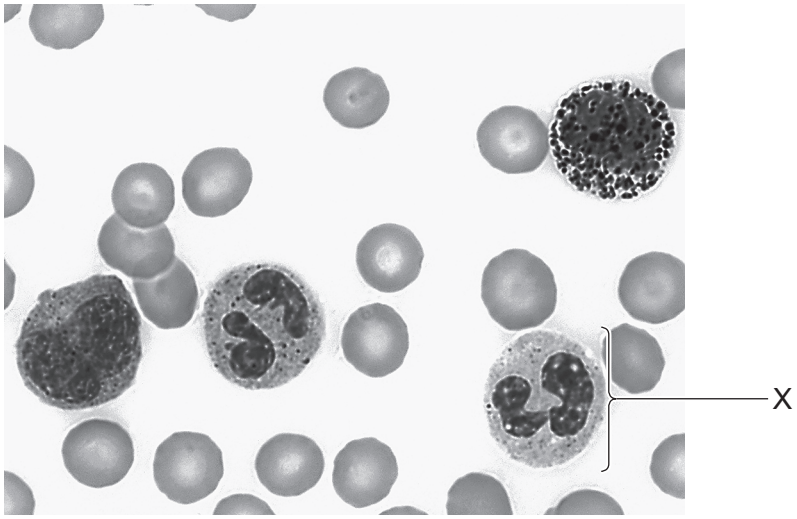
29 The diagram shows part of the circulatory system in a mammal.



Where is the blood pressure and the speed of flow the lowest?

	lowest blood pressure	lowest speed of flow
A	1	4
B	2	3
C	3	2
D	4	1

30 The photomicrograph shows human blood cells.



What type of blood cell is X?

A B-lymphocyte

B monocyte

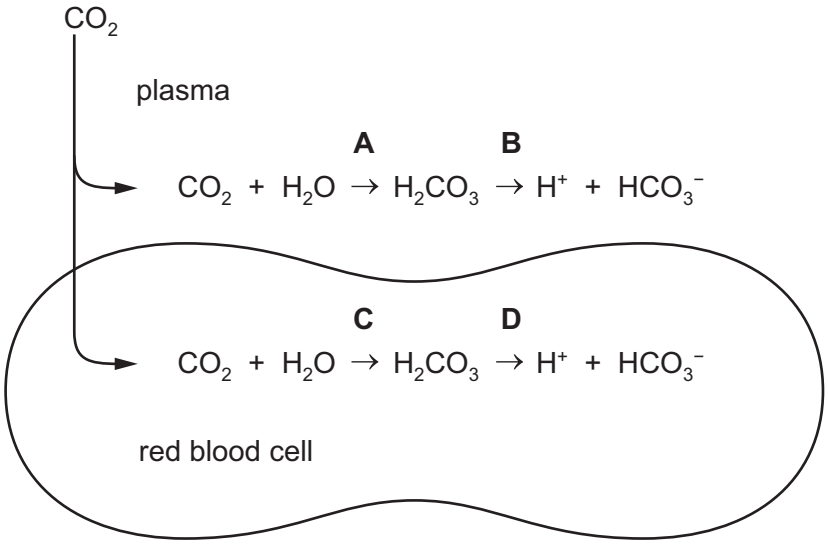
C phagocyte

D T-lymphocyte

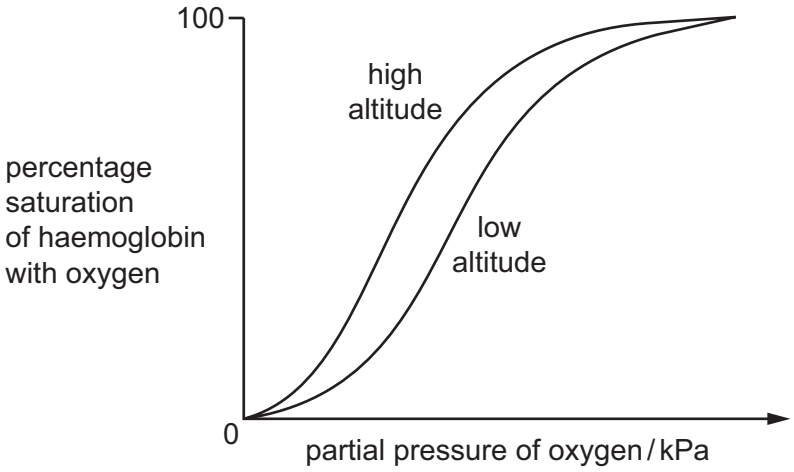
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31 The diagram shows some of the reactions of carbon dioxide when it enters the blood from cells in a metabolically active tissue.

Which reaction is catalysed by the enzyme carbonic anhydrase?



32 The graph shows the oxygen dissociation curves for haemoglobin in animals that live at high altitude and animals that live at low altitude.



What explains the oxygen dissociation curve at **high** altitude?

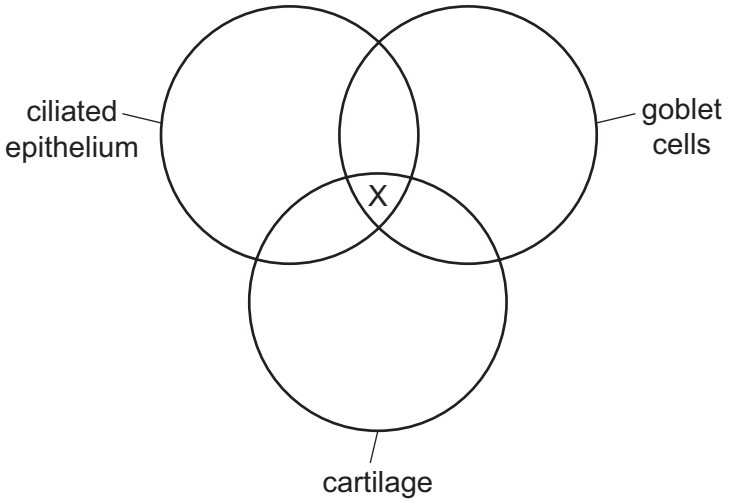
A Haemoglobin has a higher affinity for oxygen.

B Haemoglobin releases oxygen more readily.

C The change in partial pressure of carbon dioxide causes a Bohr effect.

D The decrease in percentage of carbon dioxide causes the curve to shift to the left.

33 The diagram shows three features found in the mammalian gas exchange system.



Which structures of the gas exchange system could be represented by X in the diagram?

A small bronchiole only

B small bronchiole and bronchus

C trachea only

D trachea and bronchus

34 What are short-term effects of nicotine on the cardiovascular system?

1 constriction of small arteries

2 increase in heart rate

3 increase in blood pressure

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

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35 Some features of a disease are listed.

- It can be transmitted by animals to other animals, including humans.
- One mode of transmission is by transfusion with contaminated blood.
- The causative organism can show multiple drug resistance.
- The majority of humans who die from the disease are children.

Which disease has all these features?

A cholera

B HIV / AIDS

C malaria

D tuberculosis

36 The following advice was given to a person travelling to a country where there had been an outbreak of an infectious disease.

- Cook food well and eat it hot.
- Peel fruit and vegetables.
- Drink only cool, boiled water.
- Wash hands often with soap and cool, boiled water.

Which infectious disease would this advice help to protect against?

A cholera

B malaria

C measles

D tuberculosis

37 Which description of multiple drug resistance in bacteria is correct?

A Bacteria have DNA with resistant genes for several different types of antibiotic.

B Different species of bacteria have DNA with resistant genes for one type of antibiotic.

C Large numbers of one species of bacteria are immune to several different types of antibiotic.

D Many different species of bacteria are immune to one type of antibiotic.

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38 Which description of a T-lymphocyte is correct?

A They are only found in blood and secrete cytokines in response to infection.

B They can leave the blood and accumulate at sites of inflammation.

C They can leave the blood and secrete cytotoxins when exposed to bacteria.

D They circulate in the blood and always present antigens in response to infection.

39 Where are antibodies found during an immune response?

	on the surface of memory cells	in blood plasma
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

key

✓ = antibodies found

✗ = antibodies not found

40 Monoclonal antibodies are used in the diagnosis and treatment of disease. They are produced using a technique known as cell fusion.

Which two structures are fused together in this technique?

A antigens and hybridoma cells

B T-lymphocytes and cancer cells

C cancer cells and plasma cells

D hybridoma cells and antibodies

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