Cambridge Assessment International Education

Cambridge International AS & A Level

BIOLOGY **9700/11**

Paper 1 Multiple Choice **May/June 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.

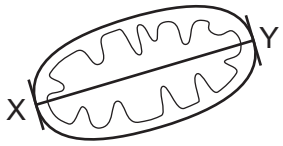
INFORMATION

- 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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[Turn over

1 The diagram shows a mitochondrion drawn from an electron micrograph.



The actual length of the mitochondrion, using the line X–Y, is 3000 nm.

What is the magnification of the drawing of the mitochondrion?

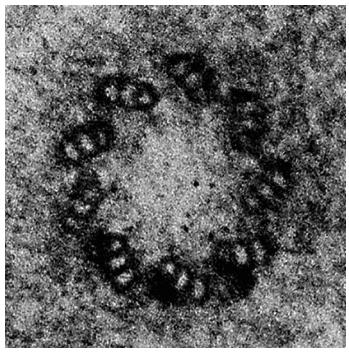
A ×100 **B** ×1000 **C** ×10 000 **D** ×100 000

2 A specimen of plant tissue is observed twice with a microscope, firstly using red light with a wavelength of 650 nm and then using green light with a wavelength of 510 nm.

What happens to the magnification and resolution when using green light compared to red light?

	magnification	resolution
A	decreases	decreases
B	increases	increases
C	remains the same	decreases
D	remains the same	increases

3 The electron micrograph shows a structure found in the cytoplasm of an animal cell.



What is this cell structure?

A centriole

B lysosome

C ribosome

D vesicle

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4 Which cell structures contain nucleic acid?

1 Golgi body

2 lysosome

3 mitochondria

4 ribosomes

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

5 Which statements about mitochondria, chloroplasts or prokaryotes are correct?

1 Mitochondria and chloroplasts have a fully permeable inner membrane and a partially permeable outer membrane.

2 Prokaryotes and chloroplasts have 70S ribosomes that are the sites for translation and polypeptide synthesis.

3 Prokaryotes and mitochondria have an outer membrane and an inner, folded membrane where ATP synthesis occurs.

4 Prokaryotes and mitochondria have circular DNA where genes coding for information are located.

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

6 The very large (1000 nm) *Pandora* viruses found in Chile and Australia are considered to be viruses because they cannot replicate their own genome and cannot make proteins.

They also share essential structural features with other viruses.

What are the essential structural features of viruses?

1 non-cellular

2 protein coat

3 both DNA and RNA

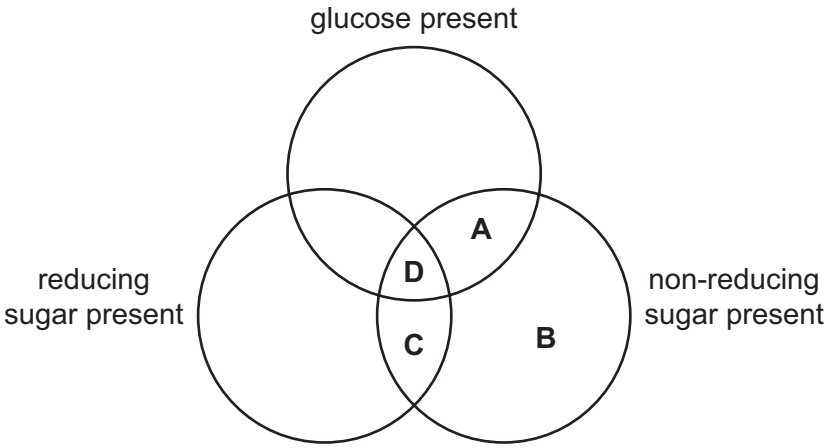
4 either DNA or RNA

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

7 A sample of food was heated with Benedict's solution which changed colour to green.

A second sample of the same food was boiled with dilute hydrochloric acid and neutralised using sodium hydrogencarbonate. It was then heated with Benedict's solution which changed colour to red.

What did these results show?



8 Which pair of molecules only includes macromolecules that can be found in animal cells?

A amylase and amylopectin

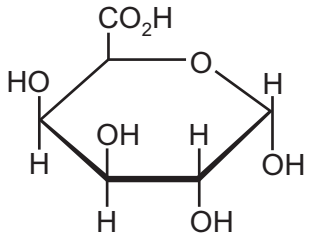
B collagen and glycogen

C deoxyribose and starch

D sucrose and haemoglobin

9 Homogalacturonan is a polysaccharide found in plant cell walls.

The diagram shows a molecule of the monomer used to form homogalacturonan.



A student studied the structure of this monomer and compared it with the structure of the monomer used to form cellulose.

Which carbon atoms in the monomer in the diagram have hydroxyl groups arranged in different positions to those found in the cellulose monomer?

A carbon one and carbon four

B carbon one only

C carbon three and carbon four

D carbon three only

10 Which statement is correct for triglycerides and phospholipids?

A A phosphate group is joined to a glycerol molecule.

B Hydrocarbon chains may be saturated or unsaturated.

C They are polar molecules.

D They contain three ester bonds.

11 Which description of collagen is correct?

A A collagen molecule consists of three polypeptide chains, each in the shape of a helix. The three chains are wound together into a triple helix called a fibre.

B A collagen molecule consists of three polypeptide chains, each of which is an α-helix. The three chains are wound tightly together into a triple helix. Many of these triple helices bind together as a fibre.

C A collagen molecule consists of three polypeptide chains wound tightly into a triple helix called a fibre.

D A collagen molecule consists of three polypeptide chains in which every third amino acid is glycine. The three polypeptides are wound tightly together into a triple helix. Many of these helices form a fibre.

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12 In a healthy human, the mean value for the number of haemoglobin molecules in one red blood cell is 260 million.

How many α-globin chains does one red blood cell contain in a healthy human?

A 1.3×10^8 **B** 2.6×10^8 **C** 5.2×10^8 **D** 1.04×10^9

13 Which statements about a peptide bond are correct?

1 It joins two monomers which are always identical to each other.

2 It contains four different atoms.

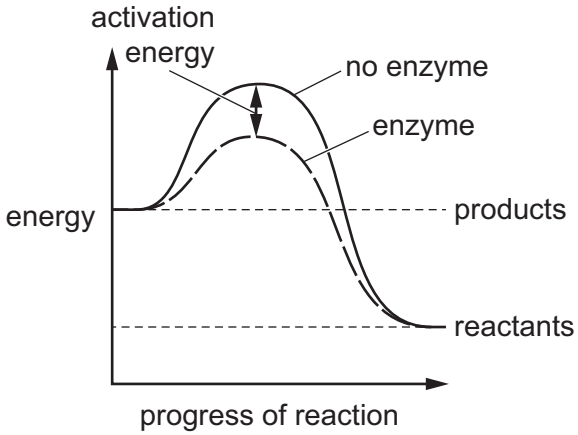
3 It can be broken by the addition of water at room temperature.

4 It is important in the primary structure of proteins.

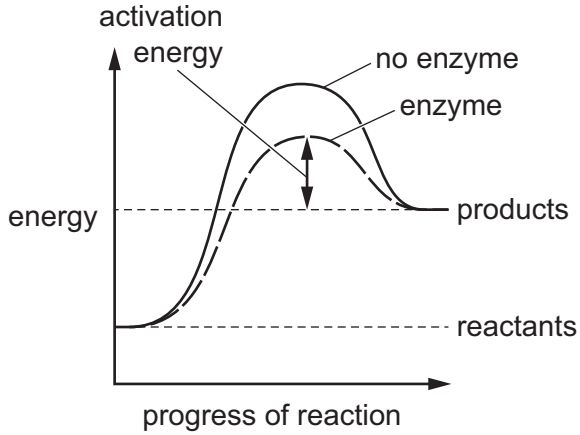
A 1, 2 and 3 **B** 1 and 3 only **C** 2, 3 and 4 **D** 2 and 4 only

14 Which graph correctly shows the activation energy of a reaction when an enzyme is added?

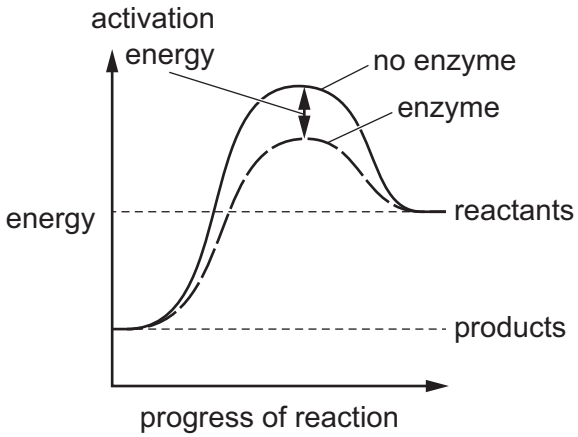
A



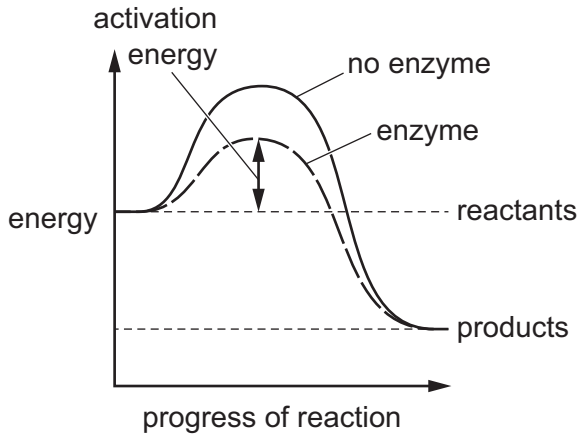
B



C



D



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15 The enzyme lactase is found in the membranes of epithelial cells lining the small intestine.

The enzyme is formed by a single polypeptide that folds to give three regions.

- an active site with the free amino group outside the cell
- a short section inside the membrane
- a short section inside the cell

What type of amino acid would be found in each of the three regions?

	outside the cell	inside the membrane	inside the cell
A	hydrophilic	hydrophobic	hydrophilic
B	hydrophilic	hydrophobic	hydrophobic
C	hydrophobic	hydrophilic	hydrophobic
D	hydrophobic	hydrophobic	hydrophilic

16 A student wrote three statements about cell signalling.

1 A signal chemical always has the same shape as a protein receptor on a target cell.

2 An increase in temperature may decrease the effect of cell to cell signalling.

3 A mutation may decrease production of active protein receptors for the cell surface membrane.

Which statements are correct?

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

17 At which stages of mitosis are chromosomes composed of two chromatids that are held together by a centromere?

A anaphase and telophase

B anaphase and prophase

C metaphase and prophase

D metaphase and telophase

18 The jellyfish, *Turritopsis dohrnii*, is described as being immortal. If *T. dohrnii* is not eaten by predators or diseased, it seems to be able to live forever. There is no way to determine the biological age of a *T. dohrnii* individual.

Which feature of the cells in *T. dohrnii* could explain these observations?

A very long G phases in the cell cycle

B a very short S phase in the cell cycle

C an ability to restore telomeres to their original length

D fewer chromosomes than other eukaryotic organisms

19 Some chemicals, used to stop tumour growth, work by preventing the DNA double helix from uncoiling and separating.

During which stage of the cell cycle would they act?

A anaphase

B interphase

C metaphase

D prophase

20 Four nucleotides, **A**, **B**, **C** and **D**, each consist of three phosphate groups, a nitrogenous base and a pentose sugar. Characteristics of the base and sugar components before they are joined to form each nucleotide are shown in the table.

Which nucleotide could pair with an adenine base during DNA replication?

	ring structure of nitrogenous base	ratio of carbon to oxygen atoms in pentose sugar
A	double	1 : 1
B	double	5 : 4
C	single	1 : 1
D	single	5 : 4

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21 The statements describe the process of translation.

1 A peptide bond forms between adjacent amino acids.

2 Hydrogen bonds form between the anticodon and the codon.

3 mRNA binds to the ribosome.

4 tRNA enters the ribosome carrying a specific amino acid.

In which order does this process take place?

A $3 \rightarrow 2 \rightarrow 1 \rightarrow 4$

B $3 \rightarrow 4 \rightarrow 2 \rightarrow 1$

C $4 \rightarrow 2 \rightarrow 1 \rightarrow 3$

D $4 \rightarrow 2 \rightarrow 3 \rightarrow 1$

22 The sequence of amino acids in a section of a polypeptide is:

… histidine–proline–aspartic acid–leucine...

amino acid	possible DNA triplet codes	
aspartic acid	CTA	CTG
histidine	GTA	GTG
leucine	GAT	GAC
proline	GGA	GGG

What is a correct sequence of mRNA codons for this polypeptide section?

A …CAC CCC GAA CUG…

B …CAU CCU GAC CUA…

C …GTA CCA CTG GAT…

D …GUA GGA CUG GAU…

23 What contributes to the upward movement of water in a xylem vessel of a plant?

1 cohesion of water molecules by hydrogen bonding

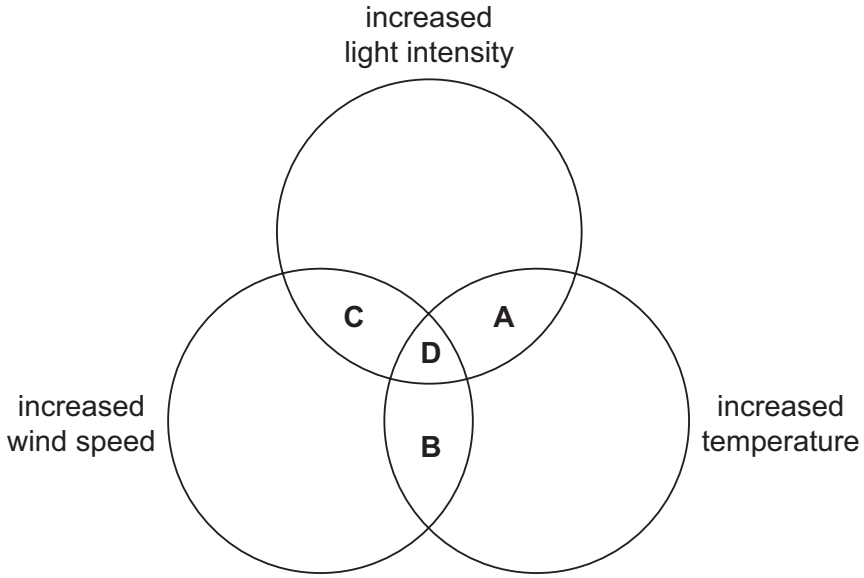
2 adhesion of water molecules to the cellulose walls of xylem vessels by hydrogen bonding

3 removal of water from xylem vessels in a leaf reduces the hydrostatic pressure in the xylem

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

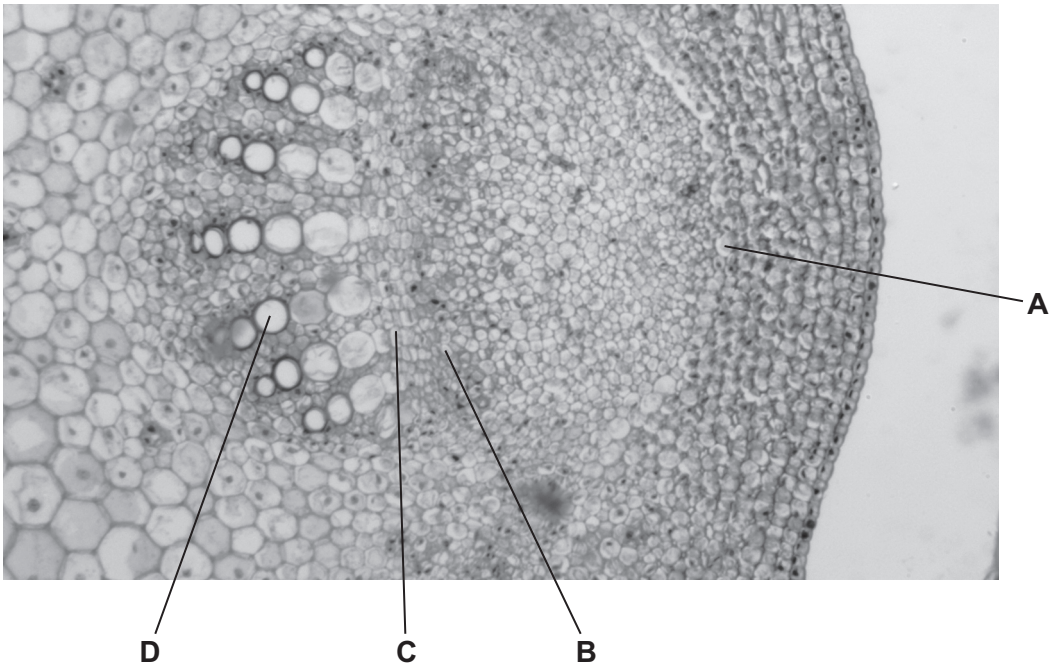
24 The diameter of a tree trunk usually decreases slightly during the day.

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

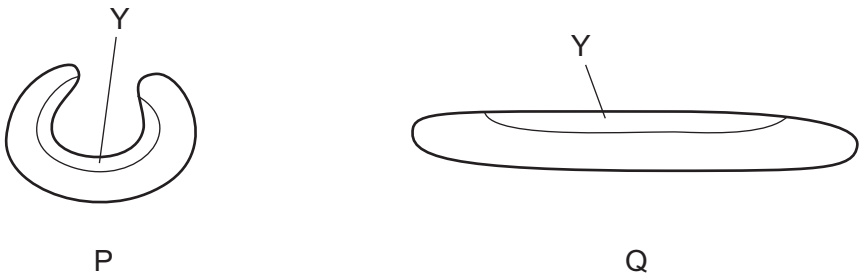


25 The diagram shows a transverse section of a stem.

Which area is the phloem?



26 The diagram shows a xerophytic leaf in different conditions, P and Q.



Which statements describe the difference between the cells in layer Y in conditions P and Q?

1 more negative water potential in P than Q

2 more cells plasmolysed in P

3 cells less turgid in Q

4 water potential becomes zero in Q

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

27 Different substances, such as sucrose and amino acids, can move in different directions in the phloem sieve tube elements.

Which statement explains this?

A Active transport occurs in some phloem sieve tube elements and mass flow occurs in other sieve tube elements.

B Both active transport and mass flow occur in each individual phloem sieve tube element.

C Mass flow occurs in both directions at the same time in each individual phloem sieve tube element.

D Mass flow occurs in different directions in different phloem sieve tube elements at the same time.

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28 The statements list some of the events in a cardiac cycle. The statements are not in the correct order.

Which statement describes the fourth of these events to occur in the cardiac cycle?

1 The impulse travels through Purkyne tissue.

2 A wave of excitation sweeps across the atria.

3 The atrioventricular node delays the impulse for a fraction of a second.

4 The sinoatrial node contracts.

5 The wave of excitation sweeps upwards from the base of the ventricles.

6 The ventricles contract.

7 The atria contract.

A 1 **B** 3 **C** 4 **D** 7

29 Which row correctly identifies components of **both** lymph and tissue fluid?

	antibodies	red blood cells	sodium ions	white blood cells
A	✓	✓	✓	✓
B	✓	✗	✓	✓
C	✗	✓	✗	✗
D	✗	✗	✓	✓

key

✓ = component present

✗ = component not present

30 Which row is correct for the mean blood pressure in different parts of the human circulatory system?

	mean blood pressure				key
	right atrium	artery in arm	vein in arm	capillary in arm	
A	+	++++	++	+++	++++
B	++	++++	+++	+	+++
C	+++	++	++++	+	++
D	++++	+++	+	++	+

highest mean blood pressure

↓

lowest mean blood pressure

31 Which mechanism accounts for the way most of the carbon dioxide is transported in blood?

A Carbon dioxide dissolves in plasma and is carried in solution.

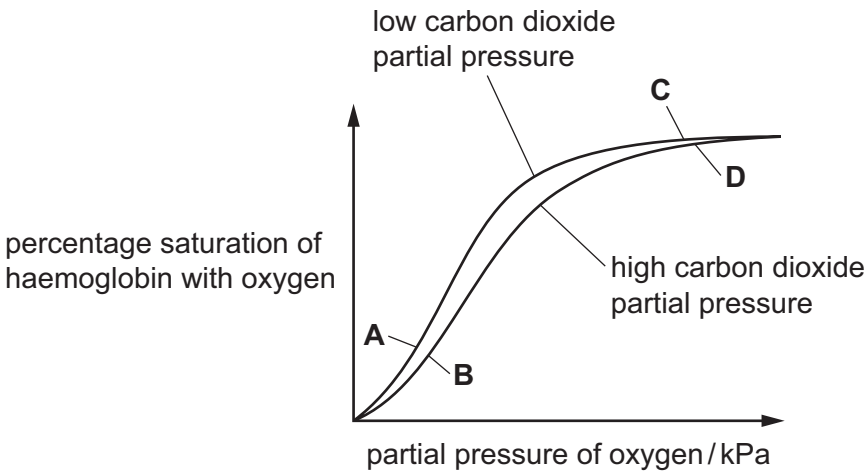
B Carbon dioxide is converted to carbaminohaemoglobin inside red blood cells.

C Carbon dioxide is converted to carboxyhaemoglobin inside red blood cells.

D Carbon dioxide is converted to hydrogencarbonate ions inside red blood cells.

32 The graph shows the dissociation curves for haemoglobin at two different partial pressures of carbon dioxide.

At which position on the graph, **A**, **B**, **C**, or **D**, is the concentration of haemoglobinic acid lowest in red blood cells?



33 The table shows the partial pressure of carbon dioxide and oxygen in two blood vessels.

	partial pressure of gas in pulmonary artery / kPa	partial pressure of gas in pulmonary vein / kPa
carbon dioxide	6	5
oxygen	5	15

What explains the difference in the partial pressures of oxygen in the pulmonary artery and pulmonary vein?

A Oxygen diffuses from the alveoli into the blood in the capillaries.

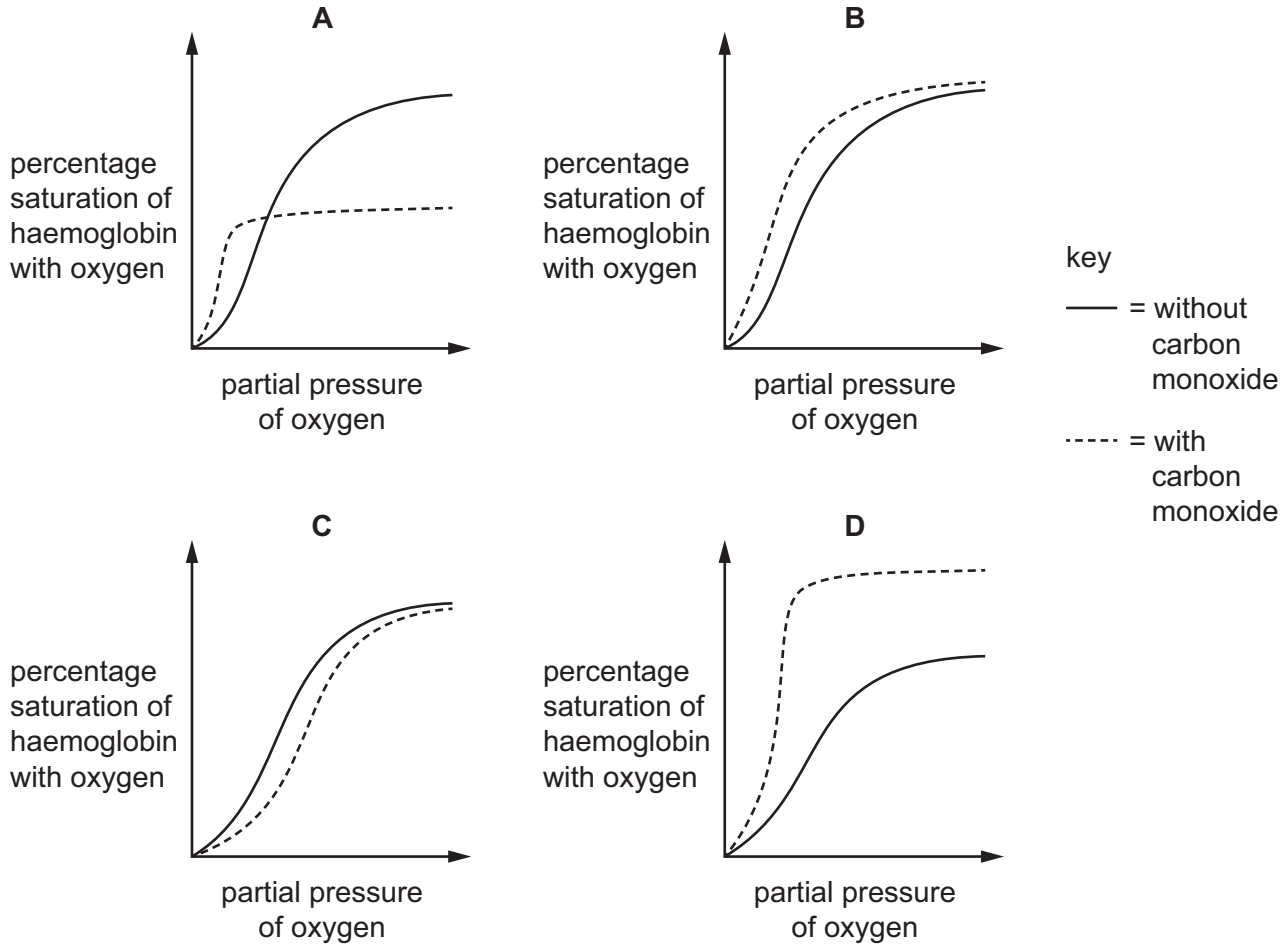
B Carbon dioxide diffuses into the alveoli from the blood in the capillaries.

C Oxygen diffuses from the body cells into the blood in the capillaries.

D Carbon dioxide diffuses into the body cells from the blood in the capillaries.

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34 Which graph shows the effect of carbon monoxide on the percentage saturation of haemoglobin with oxygen?



35 Which row shows the correct methods of transmission of the named pathogens?

	method of transmission		
	airborne droplets	insect vector	water
A	*Morbillivirus*	*Mycobacterium*	*Vibrio*
B	*Mycobacterium*	*Plasmodium*	*Vibrio*
C	*Plasmodium*	*Vibrio*	*Morbillivirus*
D	*Vibrio*	*Plasmodium*	*Mycobacterium*

36 Which disease is caused by a eukaryote?

A cholera

B malaria

C measles

D smallpox

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37 What is the initial mechanism by which bacteria become resistant to antibiotics?

A genetic mutation

B overuse of antibiotics

C natural selection

D patients not finishing a course of antibiotics

38 What are functions of T-lymphocytes?

1 production of cytokines

2 production of toxins

3 recognition of an antigen bound to an antigen-presenting cell

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

39 What is correct about the role of memory cells in long-term immunity?

1 They divide to form plasma cells and memory cells when the pathogen enters the body a second time.

2 They produce a fast response so that the person infected with the pathogen does not become ill again.

3 They produce more antibodies than were produced during the primary immune response.

4 They remain in the blood and lymphatic system after the pathogen has been destroyed.

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

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40 Which events result in a person developing actively acquired immunity?

1 becoming infected by TB bacteria

2 drinking breast milk

3 receiving an injection of antigens

4 receiving an injection of antibodies

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

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