Cambridge Assessment International Education

Cambridge International AS & A Level

BIOLOGY **9700/12**

Paper 1 Multiple Choice **May/June 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 is the definition of the resolution of a light microscope?

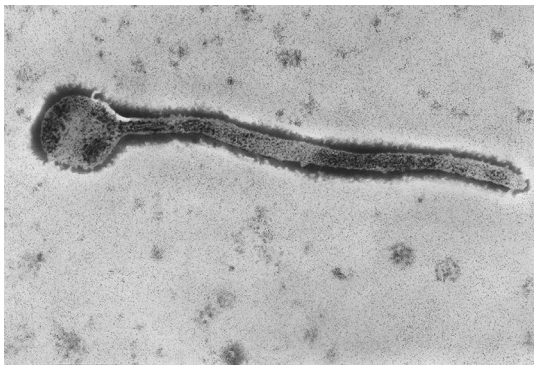
A the degree of sharpness produced by the microscope

B the greatest distance between two objects visible in the same field of view

C the minimum distance that allows two objects to be viewed as separate

D the size of the smallest object visible using the microscope

2 The electron micrograph shows a type of virus at a magnification of ×30 000.



What is the length of the virus?

A 2.2×10^3 nm

B 2.2×10^2 nm

C 2.2×10^1 nm

D 2.2×10^0 nm

3 Which row correctly shows a feature of a cell structure?

	site of protein synthesis	makes lysosomes
A	smooth endoplasmic reticulum	rough endoplasmic reticulum
B	ribosomes	Golgi body
C	rough endoplasmic reticulum	ribosomes
D	Golgi body	smooth endoplasmic reticulum

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

The functions were listed by a number.

1 organises microtubules to produce the spindle during cell division

2 synthesis of polypeptides

3 packaging of hydrolytic enzymes that will remain in the cell

The appearances were listed by a letter.

V membranes which surround an enclosed inner cavity

W non-membrane bound, spherical structures

X a double membrane with many pores

Y non-membrane bound, cylindrical structures

Z membrane-bound sacs, arranged as a flattened stack

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

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

5 The features of some cells and cell structures that make ATP are listed.

1 has outer boundary membrane and folded inner membrane

2 has peptidoglycan cell wall outside an outer boundary membrane

3 has a double boundary membrane and stacks of inner membranes

Which row identifies these components?

	1	2	3
A	bacterium	chloroplast	mitochondrion
B	chloroplast	bacterium	mitochondrion
C	chloroplast	mitochondrion	bacterium
D	mitochondrion	bacterium	chloroplast

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6 Mitochondria are thought to have evolved from prokaryotic cells that were ingested by an ancestral cell.

Which feature have these prokaryotes lost during their evolution into mitochondria?

A cell wall

B circular chromosome

C internal membranes

D ribosomes

7 A student carried out the Benedict's test on a sample and got a negative result.

What should the student do to confirm there are no sugars present in the sample?

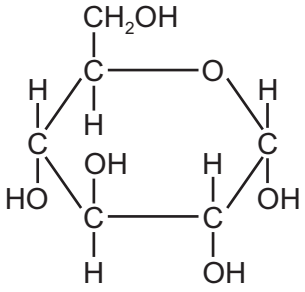
A boil the sample for 5 minutes then repeat the Benedict's test

B boil with alkali, neutralise with hydrochloric acid and repeat the Benedict's test

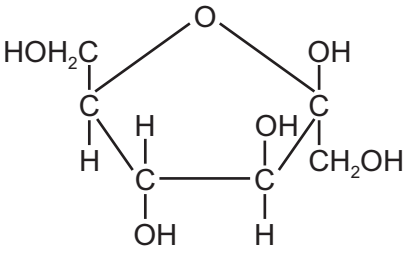
C boil with hydrochloric acid, neutralise with alkali and repeat the Benedict's test

D repeat the Benedict's test but add more Benedict's reagent

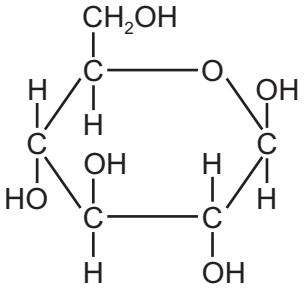
8 The diagrams show three hexoses.



1



2



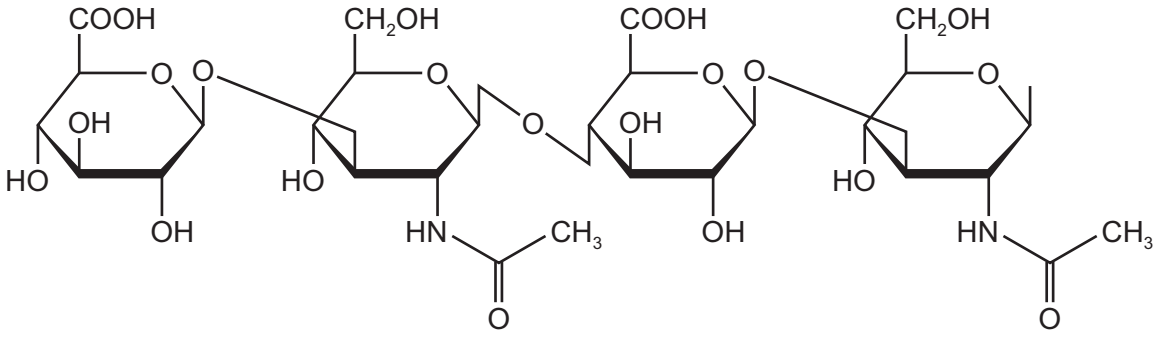
3

In which carbohydrates do these three hexoses occur?

	sucrose	cellulose	glycogen
A	1	2	3
B	1	3	2
C	2	3	1
D	3	2	1

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9 The diagram shows part of the chemical structure of a naturally occurring polysaccharide.



What types of glycosidic bonds are present?

A α-1,3 and α-1,4

B α-1,4 and α-1,6

C β-1,3 and β-1,4

D β-1,4 and β-1,6

10 What is the maximum number of water molecules produced when a triglyceride is synthesised?

A 3 **B** 2 **C** 1 **D** 0

11 What occurs during the formation of a peptide bond between two amino acids?

A OH is removed from COOH and H is removed from an R group.

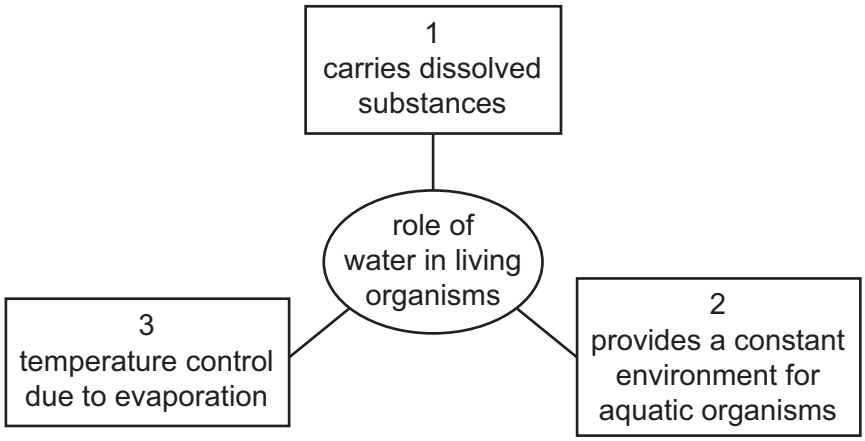
B OH is removed from COOH and H is removed from NH_2.

C H is removed from COOH and OH is removed from an R group.

D O is removed from COOH and 2H is removed from NH_2.

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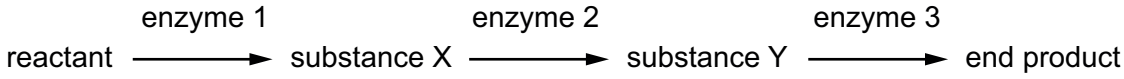
12 The diagram represents roles of water in living organisms.



Which roles are dependent upon hydrogen bonds between water molecules?

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

13 The diagram shows a metabolic pathway.



What would be the effect of adding a small amount of a non-competitive inhibitor of enzyme 2?

A Enzyme 2 would be partially denatured.

B Substance X would increase in concentration.

C Substance Y would no longer be formed.

D The initial reactant would no longer be metabolised.

14 Two enzymes are added to a solution containing a low concentration of a substrate that they can both use.

Which statement is correct?

A Both enzymes will use equal amounts of the substrate.

B Neither enzyme will be able to use the substrate.

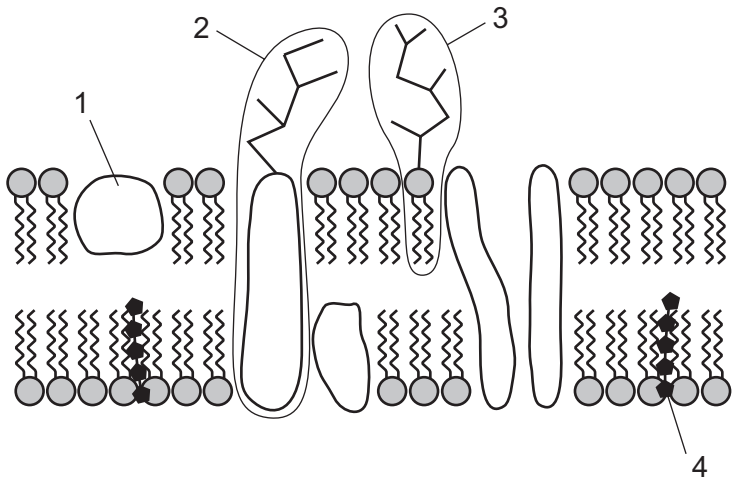
C The enzyme with the lower V_{max} will use less of the substrate than the other enzyme.

D The enzyme with the lower V_{max} will use more of the substrate than the other enzyme.

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15 The diagram shows the fluid mosaic model of membrane structure.

Structures 1, 2, 3 and 4 are types of molecule.



Which types of molecules are always identical?

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

16 What is the role of G protein in cell signalling?

A to act as a membrane-bound enzyme

B to act as a switch releasing a second messenger

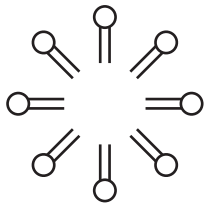
C to amplify the original signal

D to change the shape of the protein receptor

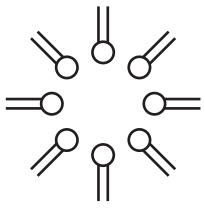
17 When a small quantity of phospholipid is added to a test-tube of water and then shaken vigorously, an emulsion is formed by small droplets called liposomes.

Which diagram shows the arrangement of phospholipid molecules in a cross-section of a liposome?

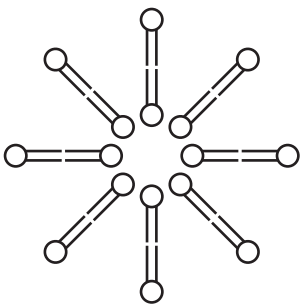
A



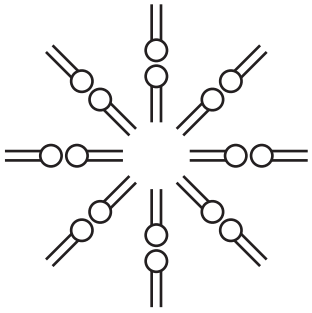
B



C



D



18 What are the features of facilitated diffusion?

1 It uses protein channels in the membrane and is driven by the energy from ATP.

2 It moves molecules from regions of higher concentration to lower concentration and is driven by the kinetic energy of the molecules which are diffusing.

3 It uses protein channels in the membrane, and the maximum rate of diffusion depends on the number of these channels.

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

19 Which description of chromosome structure is correct?

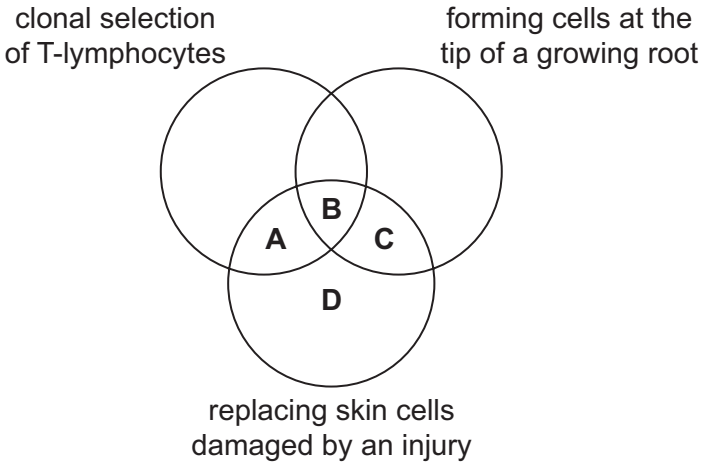
A A chromosome at the beginning of interphase consists of two identical chromatids, each containing one linear molecule of DNA.

B Telomeres are lengths of non-coding DNA found at one end of each chromatid to prevent loss of genes during cell division.

C The two identical chromatids of a chromosome are held together by a centromere in which there is no DNA.

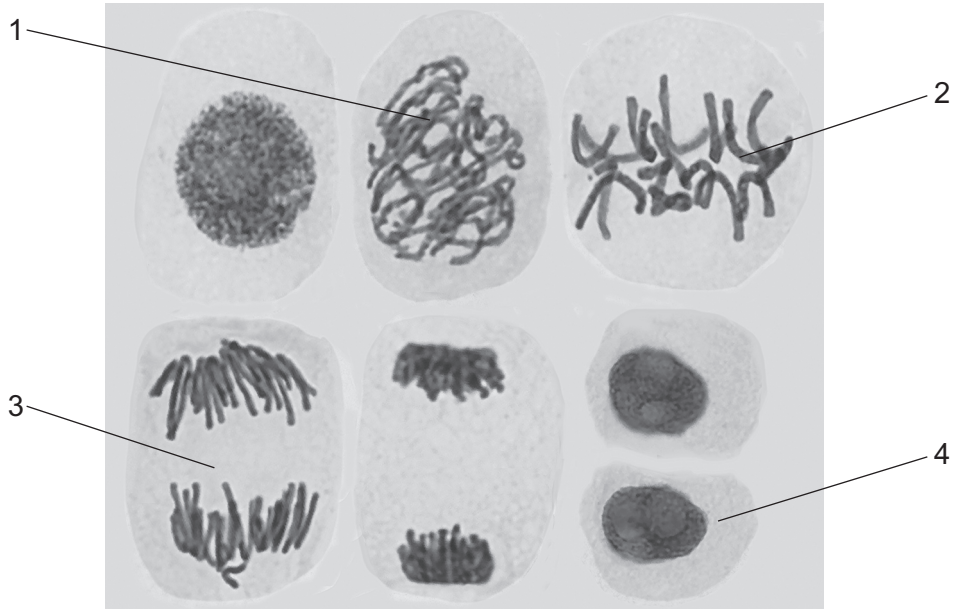
D The very long DNA molecule of each chromatid is coiled and held together by proteins called histones.

20 Which processes involve mitosis?



21 A drug has been developed to treat certain types of cancer. It prevents mitosis by binding to the spindle and preventing sister chromatids being separated and moving to opposite poles of the cell.

The photomicrograph shows cells in different phases of mitosis.



What represents the stages of mitosis that will be able to occur in a cell which is entering prophase when treated with this drug?

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

22 Some viruses have single-stranded DNA as their genetic material. This DNA molecule has to be folded to fit in the protein coat.

Which statements about single-stranded DNA are correct?

1 Single-stranded DNA cannot replicate semi-conservatively.

2 If only the percentage of cytosine is known, then the percentage of guanine can be calculated, but the percentage of adenine and thymine cannot be calculated.

3 Hydrogen bonds may be present within the DNA molecule.

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

23 How many statements are true for semi-conservative replication of DNA in a eukaryotic cell?

1 The process takes place in the nucleus.

2 Adenine will line up against uracil on the complementary strand.

3 Each new molecule will contain one strand of the original molecule.

4 If the original molecule contained 40% guanine each new molecule will contain 20% guanine.

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

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24 Part of the nucleotide sequence of an mRNA molecule is shown, with spaces between the codons.

CAG UAC AGC AAU CUA UAA

The translation of the codons is provided.

codon	amino acid or STOP
AAU	asn
AGC	ser
CAG	gln
CUA	leu
UAA	STOP
UAC	tyr
UAU	tyr

Which events will cause the termination of polypeptide synthesis during translation?

1 Deletion of C from the leu codon.

2 Deletion of C from the tyr codon.

3 The ribosome reaching the UAA codon.

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

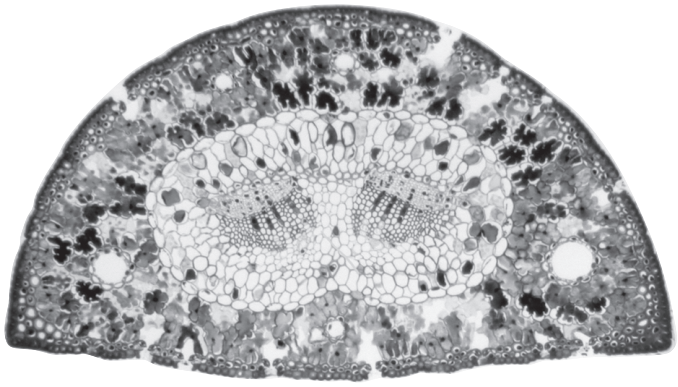
25 External factors change the rate of transpiration, which also affects the water potential gradient of cells in the leaf.

Which combination is correct?

	external factor changing the rate of transpiration	water potential gradient in the leaf
A	decreasing temperature	increases
B	decreasing wind speed	increases
C	increasing relative humidity	decreases
D	increasing sunlight	decreases

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26 The photomicrograph shows a transverse section through a leaf.



×50

Which features of a xerophytic leaf are visible in this section?

1 sunken stomata

2 two layers of epithelium

3 thick cuticle

4 small surface area to volume

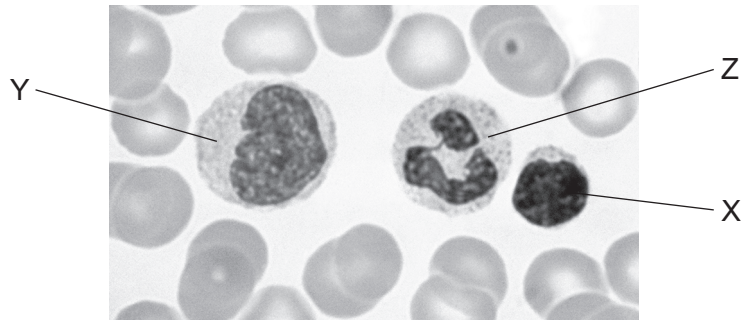
A 1, 2, 3 and 4 **B** 1 and 2 only **C** 1 and 3 only **D** 3 and 4 only

27 Which changes occur as carbohydrates move out of a root cell into a phloem sieve tube?

	water potential in a phloem sieve tube becomes	volume of liquid in phloem sieve tube
A	less negative	decreases
B	less negative	increases
C	more negative	decreases
D	more negative	increases

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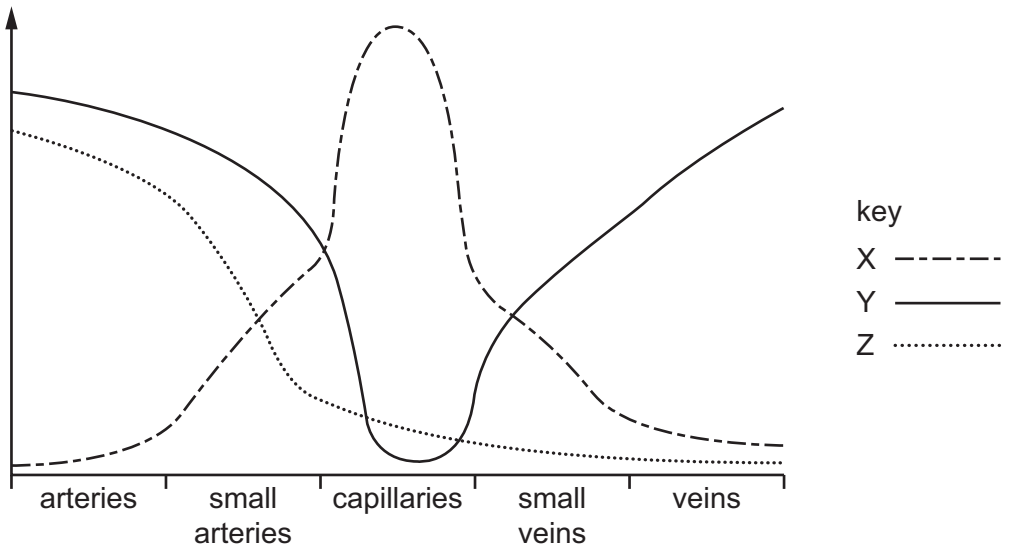
28 The photomicrograph shows three white blood cells labelled X, Y and Z.



Which row correctly identifies these cells?

	cell X	cell Y	cell Z
A	lymphocyte	monocyte	neutrophil
B	lymphocyte	neutrophil	monocyte
C	monocyte	neutrophil	lymphocyte
D	neutrophil	monocyte	lymphocyte

29 The graph represents data on blood vessels and blood flow.



Which row correctly identifies the curves?

	speed of blood flow	pressure of blood	total cross-sectional area
A	X	Y	Z
B	X	Z	Y
C	Y	Z	X
D	Z	X	Y

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30 Which components of blood are present in lymph?

	white blood cells	proteins	sodium ions
A	✓	✓	✓
B	✓	✗	✓
C	✗	✓	✓
D	✗	✓	✗

key

✓ = present

✗ = not present

31 What correctly describes the significance of the increase of the red blood cell count of humans who move from living at low altitude to high altitude?

A After a few weeks at high altitude, the number of red blood cells increases to compensate for the lower availability of oxygen in the air.

B At high altitude, the bone marrow produces more red blood cells to provide binding sites for the increased number of oxygen molecules available.

C At high concentrations of oxygen in the blood, a cytokine stimulates the production of red blood cells to increase the oxygen-carrying capacity of the blood.

D After only a few days at high altitude the number of red blood cells increases considerably to compensate for the lower availability of oxygen in the air.

32 Which structures of the human gas exchange system are supported by cartilage?

	bronchus	bronchiole	trachea
A	✗	✓	✓
B	✗	✓	✗
C	✓	✓	✓
D	✓	✗	✓

key

✓ = cartilage present

✗ = cartilage not present

33 Carbon monoxide, nicotine and tar are components of tobacco smoke.

Which row correctly describes their effect on a smoker's body?

	carbon monoxide	nicotine	tar
A	causes loss of consciousness at very low concentrations	increases the diameter of blood vessels	destroys cilia on cells lining the airways
B	forms a stable compound with haemoglobin	increases blood pressure	stimulates goblet cells to secrete mucus
C	forms carbaminohaemoglobin	increases the diameter of the coronary artery	settles on cells lining the airways
D	forms carboxyhaemoglobin	decreases the heart rate	contains carcinogens

34 Which statements about chronic obstructive pulmonary disease (COPD) are correct?

1 The disease can often be reversed by treatment.

2 The patient's symptoms normally do not change.

3 The patient is normally over 30 years old.

4 The patient coughs frequently, producing a lot of mucus.

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

35 Which of these causative agents of disease can be transmitted by droplet infection?

1 *Vibrio*

2 *Mycobacterium*

3 *Morbillivirus*

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

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36 The table compares total antibiotic use (X) and the percentage of antibiotic-resistant pneumonia cases (Y) in five countries.

country	(X) total antibiotic use / defined dose per 1000 people per day	(Y) percentage of penicillin-resistant pneumonia cases
Austria	13	10
Denmark	11	4
Iceland	17	15
Spain	30	50
USA	24	33

What is supported by the data?

A When X decreases there is an increase in Y.

B When X increases there is an increase in Y.

C When X increases it causes an increase in Y.

D There is no relationship between X and Y.

37 Which statement about the development of resistance to antibiotics in bacteria is correct?

A All mutations in bacteria result in resistance to antibiotics.

B Antibiotics increase the rate of mutation in bacteria.

C Mutations leading to antibiotic resistance only occur when antibiotics are used to treat pathogenic bacteria.

D The proportion of antibiotic-resistant bacteria in a population only increases if the antibiotic is used.

38 A blood cell count can indicate how many white blood cells there are in the blood.

Where else in the body are white blood cells found?

1 bone marrow

2 lymph

3 lungs

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

39 Myasthenia gravis is a disease that results from the immune system failing to distinguish between self and non-self. Antibodies bind to a component of the junctions between a muscle and its nerve.

What correctly describes Myasthenia gravis?

A Impulses in the nerve to the affected muscle cannot be blocked.

B The affected muscle cannot be repeatedly stimulated.

C The affected muscle is permanently stimulated.

D The nerve to the affected muscle does not carry any nerve impulses.

40 A monoclonal antibody, specific for a virus, was treated with an enzyme to break the bonds between the variable and constant regions.

The separated variable and constant regions were then added to cells infected with the virus.

Which statements are correct?

1 The constant regions would bind to different parts of the virus antigens.

2 The viruses could be engulfed by phagocytes if they were present.

3 The variable regions would all bind to the same part of the virus antigens.

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

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