Cambridge Assessment International Education

Cambridge International AS & A Level

BIOLOGY **9700/14**

Paper 1 Multiple Choice **May/June 2025**

1 hour 15 minutes

You must answer on the multiple choice answer sheet.

6051780241

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 **20** pages. Any blank pages are indicated.

1 Plant cells are stained and then viewed with a simple light microscope, using daylight as the only light source.

Which cell structures are clearly visible at a magnification of ×400?

A chloroplast grana

B lysosomes

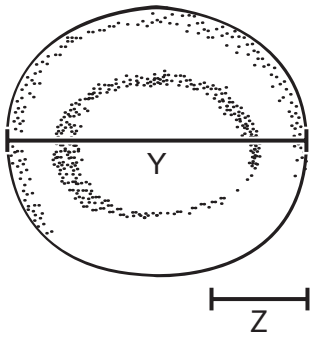
C nucleoli

D ribosomes

2 The diagram shows an image of a cell with a scale bar.

The scale bar (Z) represents an actual size of 15 μm.

Distance Y represents the diameter of the cell image.



Which calculation to find the actual diameter of the cell is correct?

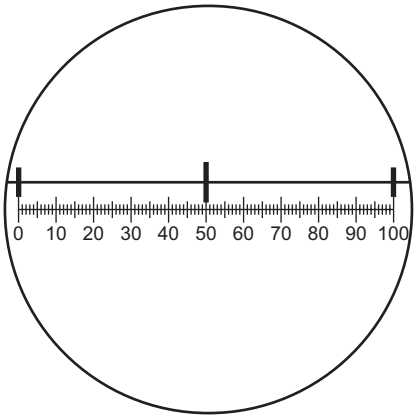
A $15 \times (Y + Z)$

B $Y \times \left(\frac{Z}{15}\right)$

C $\left(\frac{Y}{Z}\right) \times 15$

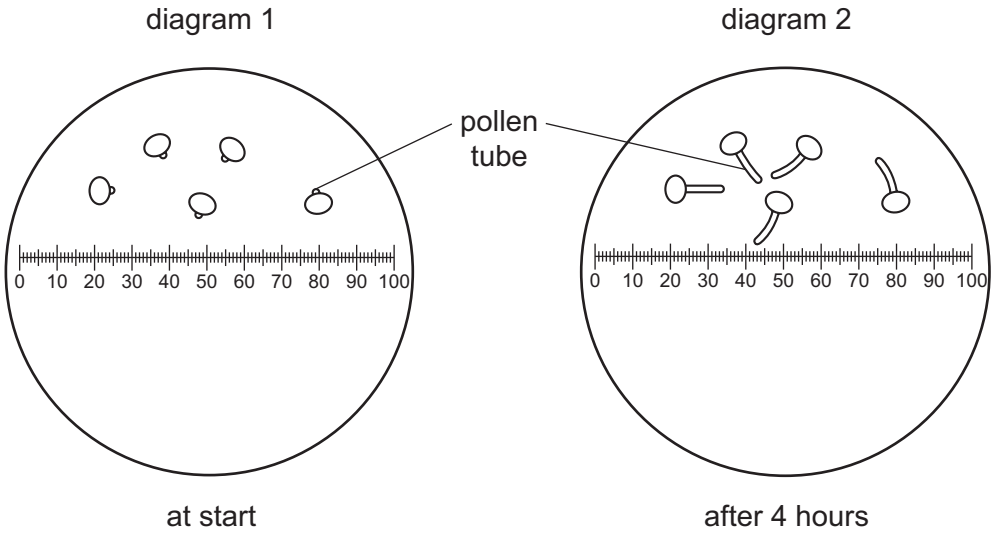
D $\left(\frac{Y}{15}\right)$

3 The diagram shows a stage micrometer, with divisions of 0.1 mm, viewed using an eyepiece graticule.



Pollen grains were grown in a sugar solution and viewed using the eyepiece graticule.

Diagram 1 shows the pollen grains at the start. Diagram 2 shows the pollen grains after 4 hours.



What is the growth rate of the pollen tubes?

A $5\,\mu m\,h^{-1}$ **B** $10\,\mu m\,h^{-1}$ **C** $5\,mm\,h^{-1}$ **D** $10\,mm\,h^{-1}$

4 What are found in chloroplasts **and** also in mitochondria?

1 DNA

2 70S ribosomes

3 mRNA

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

5 A long-distance runner has become adapted to run faster for longer after regular training.

Which cell structure in a muscle cell has increased in number to allow this adaptation?

A lysosome

B mitochondrion

C nucleus

D smooth endoplasmic reticulum

6 Some functions carried out within eukaryotic cells are listed.

1 lysosome production

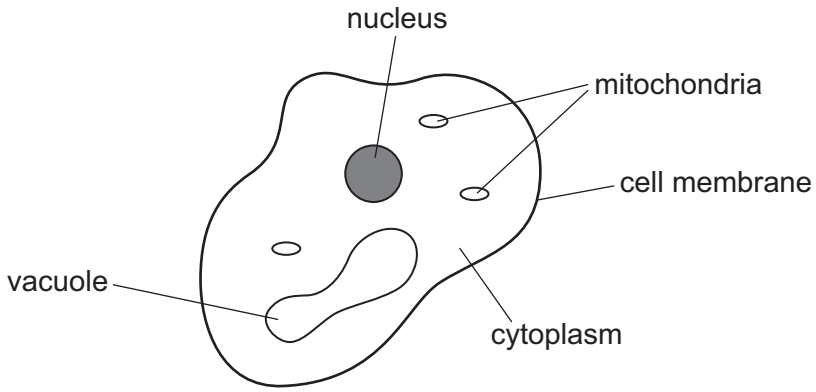
2 polypeptide modification

3 exocytosis

Which functions are carried out by the Golgi body?

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

7 The diagram shows the structure of a unicellular organism.



Which statement is correct for this organism?

A It contains a nucleus so it is **not** prokaryotic.

B It contains mitochondria so it is **not** a plant.

C It does **not** have a cell wall so it must be eukaryotic.

D It is unicellular so it must be a bacterium.

8 Diastase is an enzyme that breaks down starch into maltose.

A sample of starch is treated with boiled diastase and left for 15 minutes.

Samples of the mixture are then tested with iodine solution and with Benedict's solution.

What is the correct result?

	iodine solution	Benedict's solution
A	blue-black	blue
B	blue-black	red
C	brown	blue
D	brown	red

9 Which molecule is required for this reaction to occur?

$$C_{12}H_{22}O_{11} + H_2O \rightarrow C_6H_{12}O_6 + C_6H_{12}O_6$$

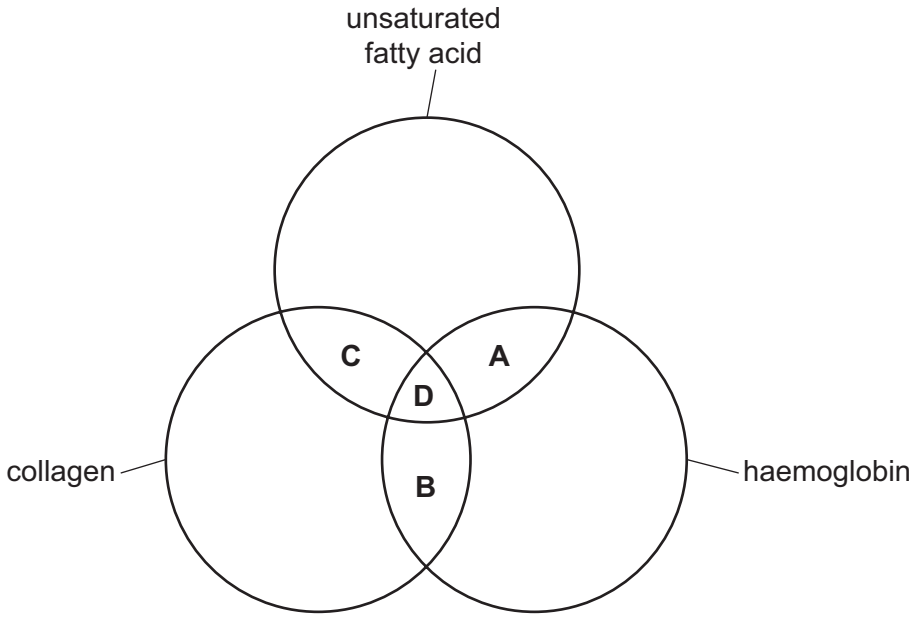
A catalase

B copper sulfate

C hydrochloric acid

D sodium hydroxide

10 Which molecules contain **at least** two double bonds?



11 Which description of globular proteins is correct?

A They are only found in cell surface membranes.

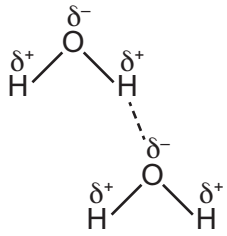
B They only contain amino acids with hydrophilic R groups.

C They can change shape by using energy from ATP.

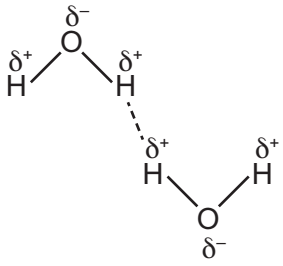
D They always have a quaternary structure of at least three polypeptides.

12 Which diagram shows where a hydrogen bond occurs between two water molecules?

A



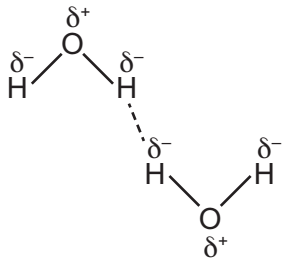
B



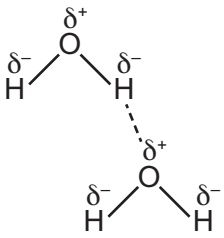
key

---- hydrogen bond

C



D



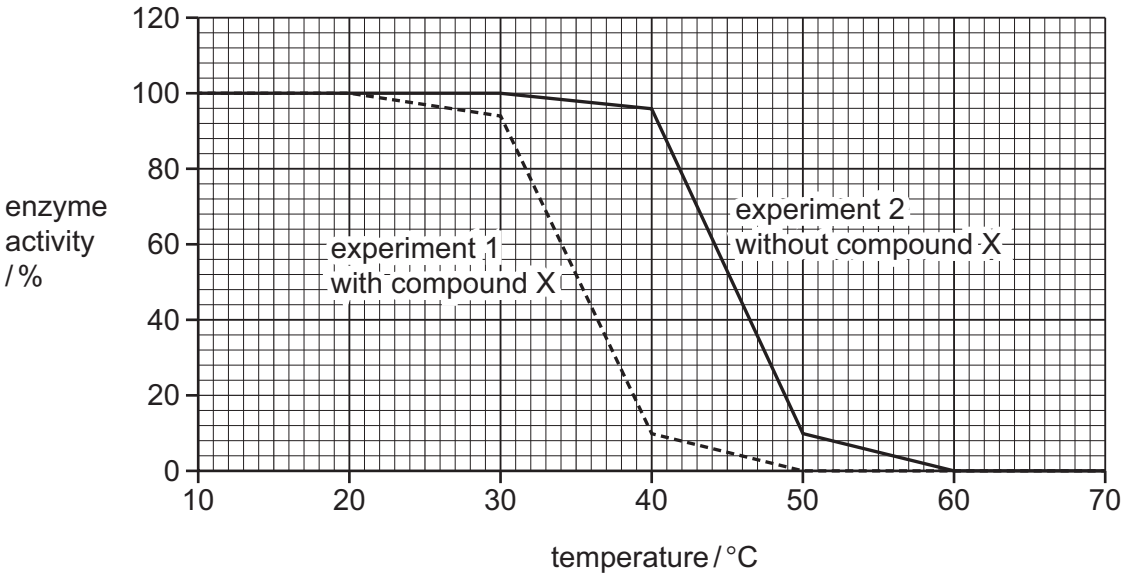
13 Some detergents disrupt hydrogen bonds between water molecules.

Which row shows the correct effects of detergent on the specific heat capacity and latent heat of vaporisation of water?

	specific heat capacity	latent heat of vaporisation
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

14 An investigation was carried out to see if compound X could improve the thermostability of an enzyme. Thermostable enzymes will function well at high temperatures.

The results of the investigation are shown.



Which row is correct?

	compound X makes the enzyme more thermostable	at 40 °C in experiment 1 most of the enzyme active sites will **no longer** be complementary to the substrate	at 45 °C in experiment 2 approximately half of the enzymes are forming enzyme–substrate complexes
A	✓	✗	✗
B	✓	✓	✗
C	✗	✓	✓
D	✗	✗	✓

key

✓ = correct

✗ = **not** correct

15 The table shows the results from an investigation into the effect of temperature on an enzyme-catalysed reaction. All other variables were standardised.

temperature / °C	rate of reaction / arbitrary units
10	3
20	7
30	16
40	33
50	32
60	14

What is the correct conclusion?

A 40 °C was the optimum temperature.

B The data for 50 °C was anomalous.

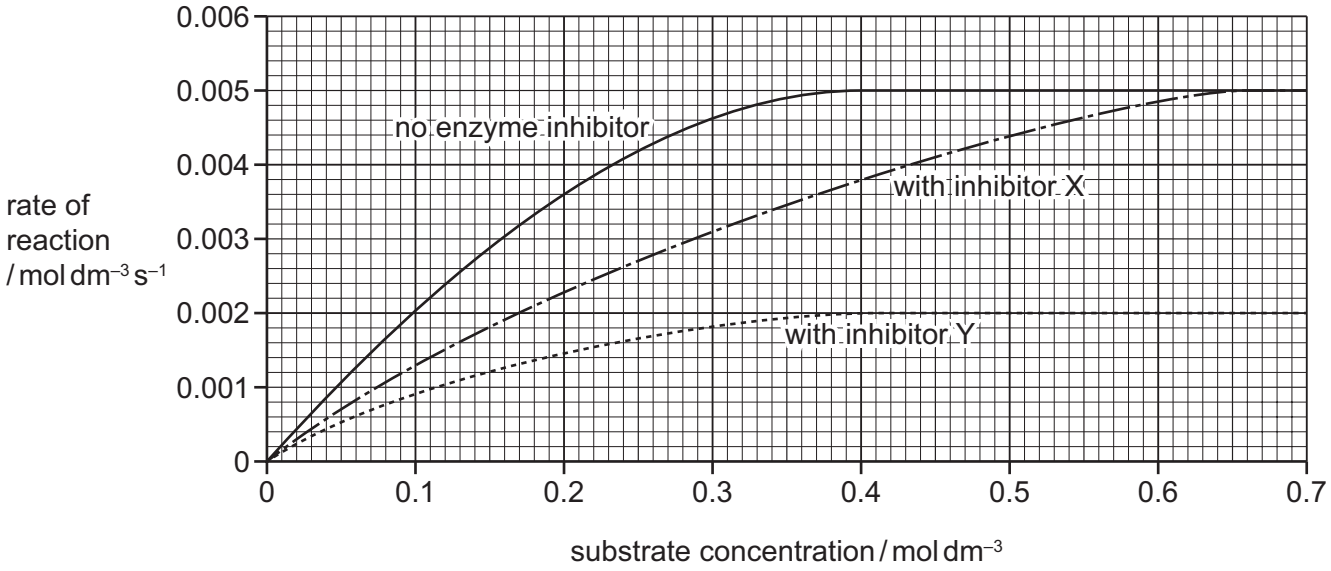
C The optimum temperature was between 30 °C and 50 °C.

D All the enzymes denatured at 60 °C.

16 The graph shows how the rate of a reaction changes with substrate concentration in the presence of:

- no inhibitor
- inhibitor X
- inhibitor Y.

One of the inhibitors is competitive and the other inhibitor is non-competitive.



What is the correct estimate of K_m for the reaction shown when a competitive inhibitor is present?

A 0.11 mol dm^{-3}

B 0.23 mol dm^{-3}

C 0.38 mol dm^{-3}

D 0.65 mol dm^{-3}

17 Which of these substances can pass directly through cell surface membranes **without** using a carrier protein or channel protein?

1 K^+ and Cl^-

2 CO_2

3 $C_6H_{12}O_6$

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

18 Which of these statements about facilitated diffusion are correct?

1 It is limited by the number of transport proteins.

2 It transports molecules against their concentration gradient.

3 It requires a source of ATP.

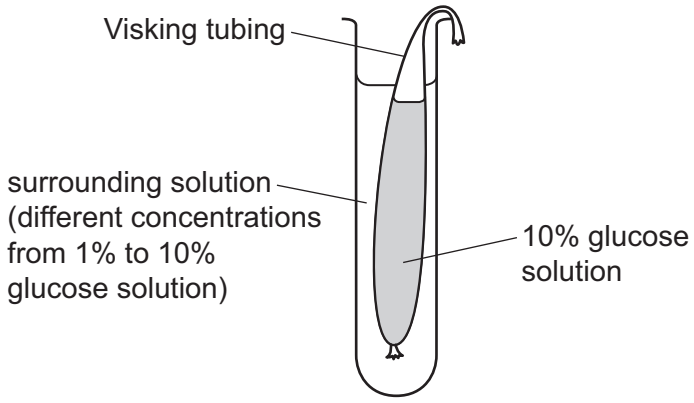
A 1, 2 and 3 **B** 1 and 3 only **C** 1 only **D** 2 and 3 only

19 A cell absorbs amino acids. This cell then synthesises and exports a digestive enzyme. Different cell structures are involved with different stages of this process.

Which row shows a possible sequence of cell structures that the amino acids pass through?

	cell surface membrane	Golgi body	rough endoplasmic reticulum	secretory vesicle
A	1st	2nd	3rd	4th
B	1st	3rd	4th	2nd
C	4th	2nd	1st	3rd
D	4th	1st	2nd	3rd

20 The diagram shows apparatus set up to investigate the effect of changing the initial concentration of glucose in the surrounding solution on the movement of molecules through a selectively permeable membrane (Visking tubing) in 15 minutes.



Which statements are correct as the initial concentration of glucose solution in the surrounding solution increases?

1 Net diffusion of water increases.

2 Glucose molecules reach an equilibrium quicker.

3 There is less change in the volume of the surrounding solution.

4 Net diffusion of glucose increases.

A 1, 2, 3 and 4

B 1, 2 and 4 only

C 1 and 3 only

D 2 and 3 only

21 The epithelium that lines the stomach is damaged by acid and is renewed every two days.

Why is mitosis required to repair the damage?

A Mitosis repairs damaged cells.

B Mitosis produces new genetically similar cells.

C Mitosis provides genetically identical replacement cells.

D Mitosis doubles the original cell number.

22 What is the role of telomeres?

A allowing the chromatids to reach the poles during mitosis

B holding sister chromatids together

C making sure that the sister chromatids are of identical length

D preventing loss of genes during DNA replication

23 Which features of mitosis help to maintain the genetic composition of the cell?

1 the longitudinal division of the centromeres

2 the DNA of the parent cells replicates before mitosis begins

3 the pulling apart of the chromatids to opposite poles

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

24 DNA forms a leading strand and a lagging strand during semi-conservative replication.

Which row correctly matches the strands to their properties?

	the strand that is replicated by joining together short sequences of DNA in a 3′ to 5′ direction	the strand that requires DNA ligase
A	lagging	lagging
B	lagging	leading
C	leading	leading
D	leading	lagging

25 How many genes could code for one collagen molecule?

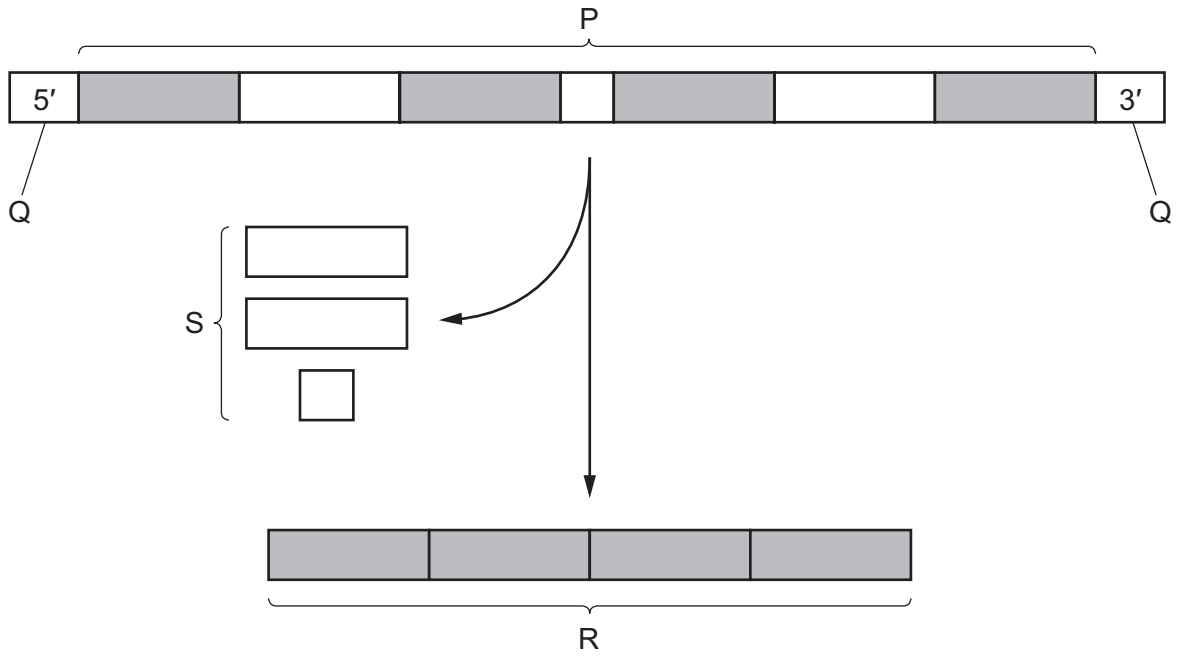
A 1 gene only

B 2 genes only

C 3 genes only

D 1 gene or 2 genes or 3 genes

26 The diagram shows some events during the formation of an mRNA molecule at transcription.



What is correctly identified in the diagram?

A P are introns.

B Q are exons.

C R is a primary transcript.

D S are non-coding sequences.

27 Two plants, K and L, are parasites of other plants. Both species grow structures that invade the vascular tissue of plants.

Plant K grows into xylem tissue of other plants.

Plant L grows into phloem tissue of other plants.

Which substances could plants K and L take from the plants that they parasitise?

	plant K	plant L
A	water only	water and sucrose only
B	water and minerals	water, amino acids and sucrose
C	water only	amino acids and sucrose only
D	water and minerals	water and sucrose only

28 Which statements are correct for the apoplast pathway?

1 Water enters the cell wall.

2 Water moves by osmosis.

3 Water moves from cell wall to cell wall.

4 Water moves through plasmodesmata.

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

29 Mass flow is the bulk movement of materials from one place to another.

Which vessels carry fluids by mass flow?

1 artery

2 phloem sieve tube element

3 vein

4 xylem vessel element

A 1, 2, 3 and 4

B 1, 2 and 3 only

C 1 and 3 only

D 2 and 4 only

30 Which features are present in companion cells **and** also in phloem sieve tube elements?

	ribosomes	plasmodesmata
A	✓	✗
B	✓	✓
C	✗	✓
D	✗	✗

key

✓ = present

✗ = **not** present

31 Which two terms describe the mammalian circulatory system?

A open and double circulation

B closed and double circulation

C closed and single circulation

D open and single circulation

32 One function of an arteriole is to increase or decrease the flow of blood to tissues.

Which of these **must** be present in an arteriole wall to allow this function?

1 collagen

2 endothelium

3 smooth muscle

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

33 The table shows the blood pressures in different parts of the circulatory system of a person sitting at rest.

parts of the circulatory system	blood pressure / kPa
aorta	16.0
arteriole	11.3
arterial end of capillary	4.7
venous end of capillary	1.3
vein	0.6

What is the percentage decrease in blood pressure between the arteriole and the arterial end of a capillary?

A 42% **B** 58% **C** 142% **D** 240%

34 Which reaction is catalysed by carbonic anhydrase?

A the dissociation of carbonic acid

B the formation of carbaminohaemoglobin

C the formation of hydrogencarbonate ions and hydrogen ions

D the association of carbon dioxide and water

35 What **directly** causes the percentage oxygen saturation of haemoglobin to decrease in actively respiring muscles?

A hydrogencarbonate ions

B carbon dioxide

C carbonic acid

D hydrogen ions

36 Which row shows the tissues that are present in the wall of the trachea **and** also the wall of the bronchus?

	ciliated epithelium	squamous epithelium	smooth muscle
A	✓	✓	✓
B	✓	✓	✗
C	✓	✗	✓
D	✗	✓	✓

key

✓ = present in trachea and bronchus

✗ = **not** present in trachea or bronchus

37 Outbreaks of cholera commonly occur in camps that are set up after a major natural disaster.

The list shows some control measures that can be taken to limit the spread of cholera in the camps.

1 treating all drinking water supplies with a high concentration of chlorine

2 setting up an emergency treatment centre to isolate cases of cholera and treat them with antibiotics

3 using concentrated disinfectant to clean sewage disposal areas and infected bedding

4 health workers visiting regularly to detect cases

5 keeping good records of the number of cases and deaths at treatment centres

Which features of these control measures involve an economic factor?

A 1, 2, 3, 4 and 5

B 1, 3 and 5 only

C 2, 3, 4 and 5 only

D 2 and 4 only

38 Antibiotics are used to treat many infections. Each antibiotic has one or more biochemical targets.

Tetracycline inhibits 70S ribosomes.

Rifamycin inhibits prokaryotic RNA polymerase.

Which antibiotics can be used to treat an infection caused by the influenza virus?

	penicillin	tetracycline	rifamycin
A	✓	✓	✓
B	✓	✗	✓
C	✗	✗	✓
D	✗	✗	✗

key

✓ = can be used

✗ = **cannot** be used

39 Which cells involved in the primary immune response are phagocytes?

A monocytes

B plasma cells

C T-helper cells

D T-killer cells

40 Some ways in which different types of monoclonal antibodies can work are described.

1 binding to proteins on cell surfaces and triggering the immune system

2 blocking molecules on cell surfaces that inhibit T-cells

3 blocking cell signalling receptors that trigger cell division

4 blocking cell signalling receptors that trigger the immune response

Which types of monoclonal antibody could be used to treat cancer?

A 1, 2, 3 and 4

B 1, 2 and 3 only

C 1 and 4 only

D 2, 3 and 4 only

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