Cambridge Assessment International Education

Cambridge International AS & A Level

BIOLOGY **9700/12**

Paper 1 Multiple Choice **October/November 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 The size of the measles virus, *Morbillivirus*, is approximately 150 nm.

The *Mimivirus* is approximately 4.5 times larger than *Morbillivirus*, whilst the *Pandoravirus* is approximately 1.5 times larger than the *Mimivirus*.

Which viruses can be seen using a light microscope with a maximum resolution of 0.25 μm **and** using an electron microscope?

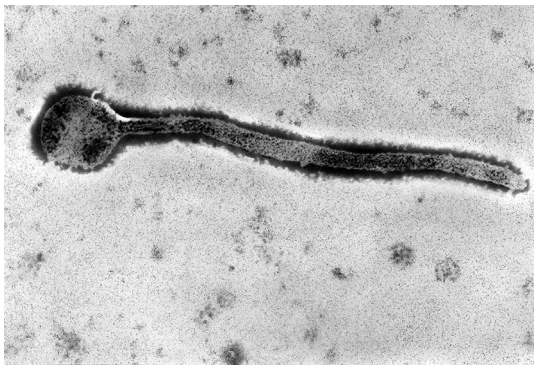
	Morbillivirus	*Mimivirus*	*Pandoravirus*
A	✓	✓	✓
B	✗	✓	✓
C	✗	✗	✓
D	✗	✗	✗

key

✓ = can be seen

✗ = cannot be seen

2 The electron micrograph shows a type of virus at a magnification of ×60 000.

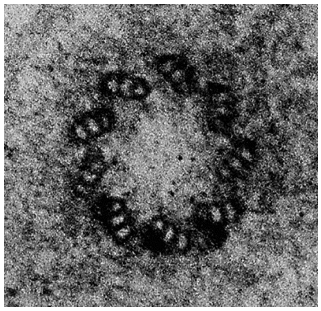


What is the actual length of the virus?

A 1.1 nm **B** 11 nm **C** 110 nm **D** 1100 nm

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



Which biological molecules are found in this structure?

1 nucleic acid

2 protein

3 phospholipid

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

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 number.

1 mRNA passes through to the ribosome

2 synthesis of lipids

3 packaging of hydrolytic enzymes that will remain in the cell

The appearances were listed by letter.

V membranes which surround an enclosed inner cavity

W non-membrane-bound, spherical structures

X a double membrane interspersed with 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	V	W	Z
B	V	Z	Y
C	X	V	W
D	X	V	Z

5 Which are found in typical prokaryotic cells **and** in typical plant cells?

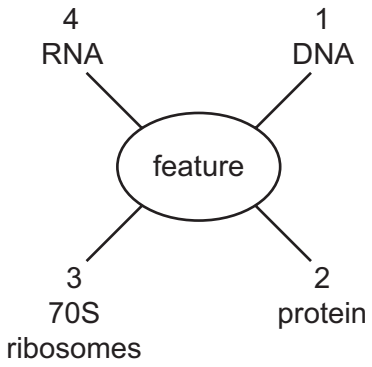
1 cell wall

2 circular DNA

3 cytoplasm

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

6 The diagram shows some features that occur in organisms.



Which features can be present in viruses?

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

7 Diastase is an enzyme that breaks down starch into maltose. Maltose is a reducing sugar.

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 reagent.

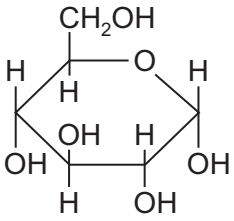
What are the results?

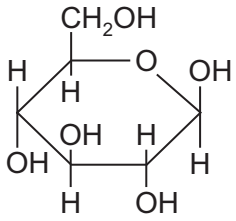
	iodine solution	Benedict's reagent
A	blue-black	blue
B	blue-black	red
C	brown	blue
D	brown	red

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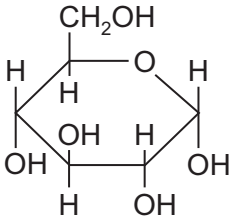
8 Which pair of monosaccharides forms sucrose?

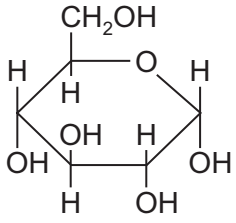
A



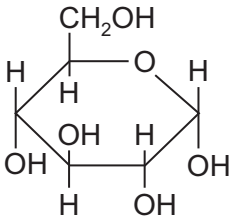


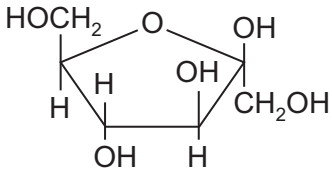
B



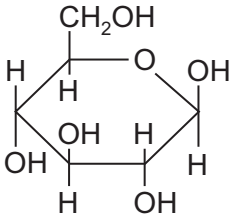


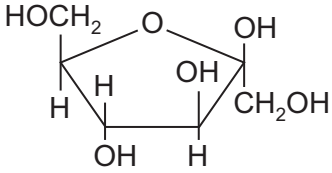
C



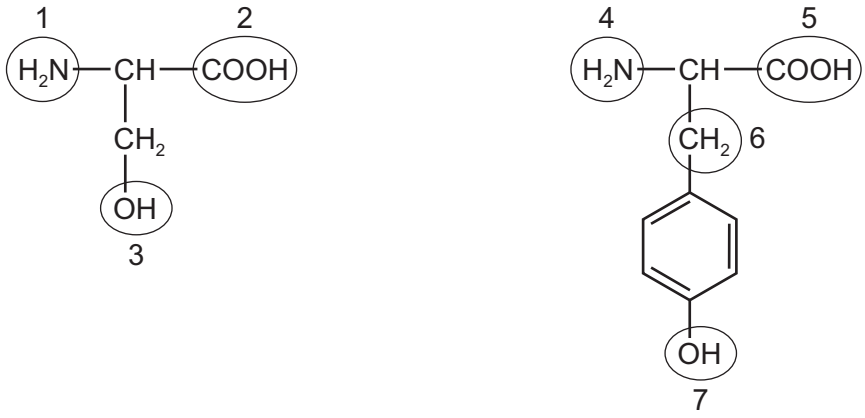


D





9 The diagram shows the structures of two amino acids.



These amino acids will form part of a protein that has a tertiary structure.

Which numbered groups could form hydrogen bonds to maintain the tertiary structure of the protein?

A 1 and 6 **B** 2 and 4 **C** 3 and 5 **D** 3 and 7

10 Which row about the structure of proteins is correct?

	primary structure	tertiary structure	quaternary structure
A	is the number of amino acids present in a protein	is the result of cross bonding between all the amino acids in the primary structure	is the polypeptides that link together to form a protein
B	is the order of amino acids present in a protein encoded by DNA	is the shape formed by folding of a polypeptide and held together by hydrogen bonds	contains two types of polypeptide that interact forming the shape of a protein
C	is the result of translation of an mRNA molecule by a ribosome into a chain of amino acids	is the result of ionic and hydrogen bonds, disulfide bridges and hydrophobic interactions between amino acids	is formed by four polypeptides and an additional reactive group attached to the protein
D	is the sequence of amino acids in a protein coded by an mRNA molecule	is formed as a result of interaction of the side chains of amino acids in the primary structure	is formed by the linking together of more than one polypeptide to form a protein

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11 Which row correctly identifies structural features of a collagen molecule and a haemoglobin molecule?

	molecule consists of more than one polypeptide	globular protein
A	collagen and haemoglobin	collagen and haemoglobin
B	collagen and haemoglobin	haemoglobin only
C	haemoglobin only	collagen and haemoglobin
D	haemoglobin only	haemoglobin only

12 Which statements describe some enzyme actions?

1 Enzymes hold reacting molecules so that their reactive groups are close together.

2 In an enzyme-catalysed reaction, more molecules have sufficient energy to react than in the absence of the enzyme.

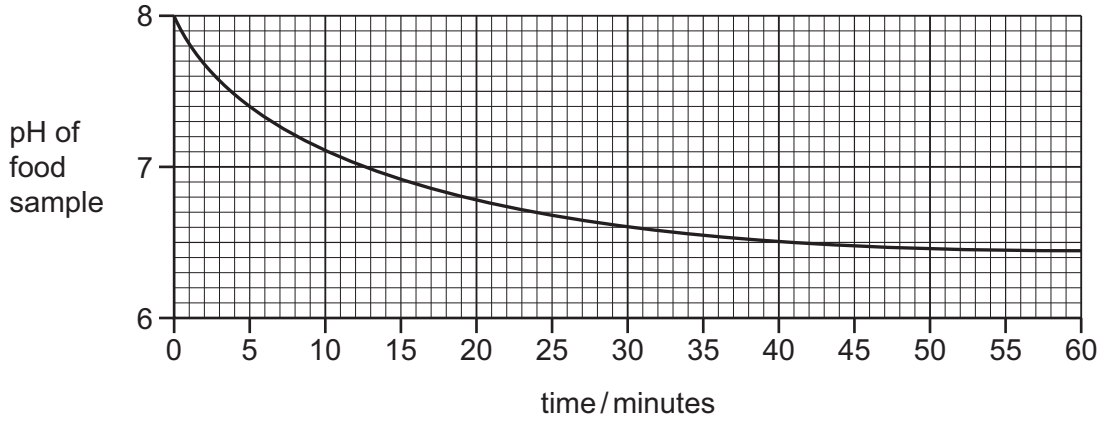
3 Reactions catalysed by enzymes take place at a lower temperature than they would without the enzyme.

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 Lipase is an enzyme that catalyses the hydrolysis of lipids. An experiment was carried out to investigate changes in pH when lipase is added to a food sample containing a high proportion of lipids.

The results are shown in the graph.



Which statements are possible explanations of the results of the experiment between 50 minutes and 60 minutes?

1 Enzyme concentration becomes the limiting factor.

2 Substrate concentration becomes the limiting factor.

3 All the enzyme active sites are occupied.

4 Denaturation of the enzyme by the products takes place.

5 Products are acting as competitive inhibitors.

A 1, 2 and 3 **B** 1, 4 and 5 **C** 2, 3 and 4 **D** 2, 4 and 5

14 The painkiller ibuprofen reduces the activity of an enzyme involved in the production of prostaglandin.

Ibuprofen binds reversibly to the active site of the enzyme.

Which type of enzyme inhibition describes this example and why?

A competitive inhibition because ibuprofen alters the shape of the enzyme

B competitive inhibition because ibuprofen and the substrate cannot bind at the same time

C non-competitive inhibition because ibuprofen blocks the active site

D non-competitive inhibition because ibuprofen has the same shape as the substrate

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15 Equal-sized potato pieces were placed into test-tubes containing equal volumes of different concentrations of sucrose solution and left for 30 minutes. All other variables were controlled.

After 30 minutes, the potato piece in one of the concentrations of sucrose solution had **not** changed in size.

What can be concluded from the result for this potato piece?

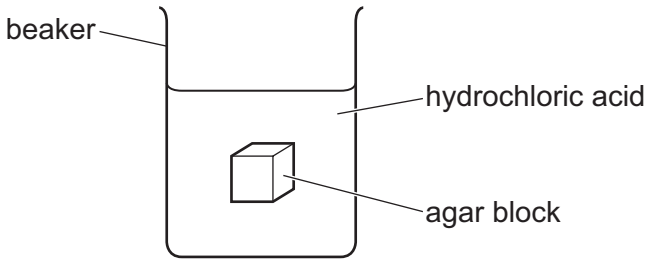
1 The concentration of sucrose in the potato is the same as the concentration of the sucrose solution.

2 The water potential of the potato is the same as the water potential of the sucrose solution.

3 There is no more movement of water into or out of the potato.

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

16 Four agar blocks are stained green using universal indicator and suspended in $1\,mol\,dm^{-3}$ hydrochloric acid.



The time taken for the agar blocks to change from green to red was recorded.

Which agar block would be the first to become completely red?

A $2\,cm \times 2\,cm \times 2\,cm$

B $2\,cm \times 1\,cm \times 4\,cm$

C $2\,cm \times 3\,cm \times 2\,cm$

D $5\,cm \times 2\,cm \times 3\,cm$

17 During the cell cycle, the mass of DNA in a cell is doubled.

At which stage in the cell cycle is the mass of DNA in a cell reduced?

A anaphase

B cytokinesis

C interphase

D prophase

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18 How many of the listed structures typically contain genetic material that has telomeres?

- bacterial cell
- chloroplast
- mitochondrion
- nucleus

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

19 In eukaryotes, the chromosomes become shorter and thicker during mitosis. The thickening may be increased by molecules called protamines. The protamines replace part of the structure of the chromosome.

Which part of the chromosome is replaced by protamines?

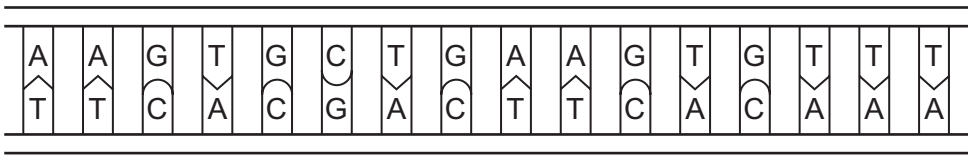
A centromeres

B chromatids

C histones

D telomeres

20 How many hydrogen bonds are holding the two strands of this section of a DNA molecule together?



A 16 **B** 32 **C** 38 **D** 48

21 Which description of a eukaryotic gene is correct?

A a sequence of bases that forms part of a DNA molecule and codes for a protein

B a sequence of nucleotides that forms part of a DNA molecule and codes for a polypeptide

C a sequence of bases that forms part of an RNA molecule and codes for a protein

D a sequence of nucleotides that forms part of an RNA molecule and codes for a polypeptide

22 The DNA sequence CCAAGAAGTCGACAAACA is translated to synthesise the amino acid chain gly-ser-ser-ala-val-cys.

As a result of a mutation, the sequence length of the amino acid chain is shortened from six to two amino acids. A stop codon in mRNA is UGA.

Which base in the DNA sequence was changed by the mutation?

A A **B** C **C** G **D** T

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23 Which combination of features is correct for a phloem sieve tube element as it unloads into a sink?

	water potential	lignified cell wall
A	higher than sink	absent
B	higher than sink	present
C	lower than sink	absent
D	lower than sink	present

24 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

3 vein

4 xylem vessel

A 1, 2, 3 and 4

B 1, 2 and 3 only

C 1 and 3 only

D 2 and 4 only

25 Which two rows are correct for the movement of water from the soil into a root?

	soil	root
1	lower solute concentration	higher solute concentration
2	higher water potential	lower water potential
3	higher solute concentration	lower solute concentration
4	lower water potential	higher water potential

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

26 ATP is used in companion cells to provide the energy for loading a sieve tube element with sucrose.

How does the co-transporter mechanism use this energy?

A to pump hydrogen ions into the sieve tube element

B to pump hydrogen ions out of the companion cell

C to pump sucrose into the sieve tube element

D to pump sucrose out of the companion cell

27 Why is the mammalian circulatory system described as a double circulation?

A Blood flows twice through the heart in one complete cardiac cycle.

B Blood flows twice through the heart in one complete circuit of the body.

C Blood remains within arteries, capillaries and veins.

D Blood transports both oxygen and carbon dioxide.

28 Which sequence of letters correctly identifies the order of events during the cardiac cycle?

T atrial walls contract

U impulse is delayed a fraction of a second

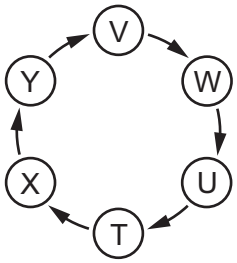
V wave of excitation enters the atrioventricular node

W wave of excitation passes down the Purkyne tissue

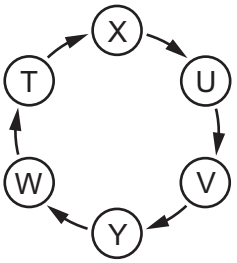
X wave of excitation spreads from the sinoatrial node

Y ventricles contract

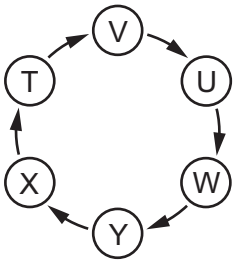
A



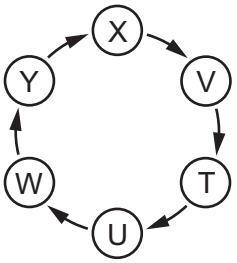
B



C



D



29 Which factors affect blood pressure?

1 the diameter of the blood vessels

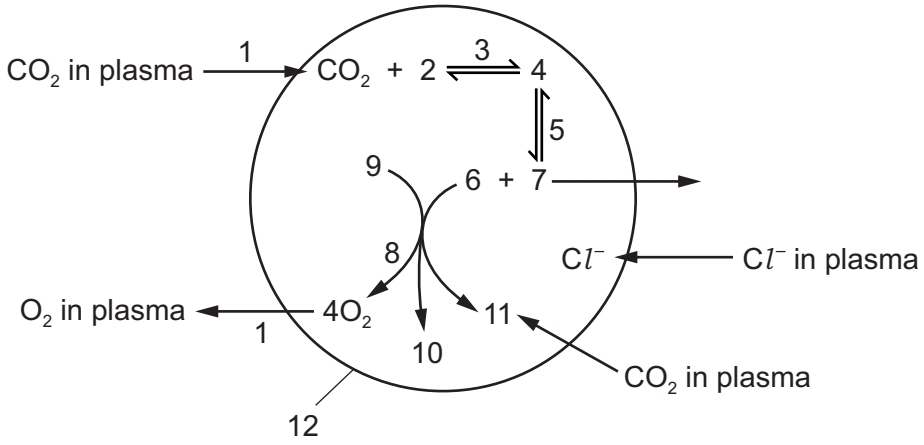
2 the systolic pressure of the heart ventricles

3 the volume of blood returning to the heart in each cardiac cycle

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

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30 The diagram is a summary of the role of haemoglobin in the transport of carbon dioxide.



Which set of labels is correct?

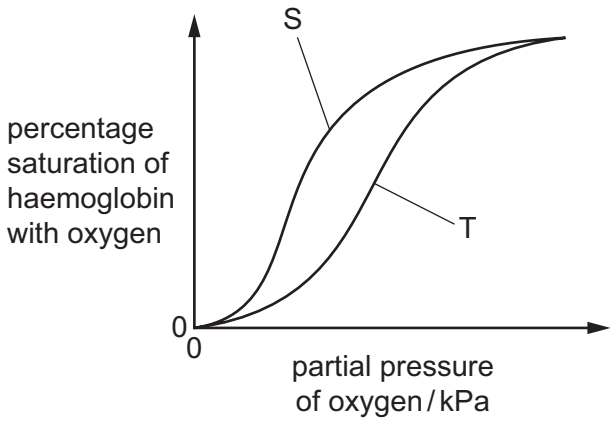
A 1 = facilitated diffusion, 4 = carbonic acid, 7 = hydrogencarbonate ions

B 2 = water, 8 = dissociation, 10 = carbaminohaemoglobin

C 3 = carbonic anhydrase, 9 = oxyhaemoglobin, 11 = carbaminohaemoglobin

D 5 = carbonic anhydrase, 6 = hydrogen ions, 12 = red blood cell

31 The graph shows the oxygen dissociation curves of haemoglobin from two species of mammal, S and T.



Which statements could explain the difference in the oxygen dissociation curves of species S and species T?

1 Species T has a lower haemoglobin concentration in its red blood cells than species S.

2 The haemoglobin in species T has a lower affinity for oxygen than the haemoglobin in species S.

3 Species T lives at higher altitudes than species S.

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

32 Which are present in bronchioles?

1 endothelium

2 ciliated cells

3 smooth muscle tissue

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

33 The partial pressure of oxygen in air inside alveoli is 14 kPa.

The partial pressure of oxygen in pulmonary capillaries is 6 kPa.

What will be the effect of these partial pressures on diffusion?

A Carbon dioxide will not diffuse in any direction.

B Oxygen will diffuse from alveoli into capillaries.

C Oxygen will diffuse from capillaries into alveoli.

D Oxygen will diffuse equally in both directions.

34 Which can be **directly** linked to a reduction in the surface area available for gas exchange in human lungs?

1 emphysema

2 lung cancer

3 smoking tobacco

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

35 Which row is correct about the affinity between haemoglobin and the gases carbon dioxide, carbon monoxide and oxygen?

	highest affinity	⟶	lowest affinity
A	carbon monoxide	carbon dioxide	oxygen
B	carbon monoxide	oxygen	carbon dioxide
C	oxygen	carbon dioxide	carbon monoxide
D	oxygen	carbon monoxide	carbon dioxide

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36 An earthquake caused damage to sanitation systems in a large tropical village.

Drinking water became contaminated with sewage. Heavy rain then caused flooding and left large pools of water in the village. Housing was destroyed and people in the village had to live in very overcrowded conditions.

Which infectious diseases could increase in the village population as a result of the earthquake and heavy rain?

1 cholera

2 malaria

3 tuberculosis

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

37 Which statements about the use of antibiotics could cause an increase in antibiotic-resistant bacteria?

1 Patients do not always complete the course of antibiotics.

2 Patients keep unused antibiotics from previous prescriptions and take them at a later date in smaller doses than prescribed.

3 Antibiotics are used in farming to prevent infections.

4 Doctors prescribe narrow spectrum antibiotics that only kill a few types of bacteria.

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

38 Which row is correct for neutrophils and B-lymphocytes?

	neutrophil	B-lymphocyte
A	can change shape	activated by contact with antigens
B	found in organs rather than in blood	kill virus-infected cells
C	may be long-lived cells	always short-lived cells
D	their lysosomal enzymes digest bacteria	secrete cytokines

39 Rabies is usually a fatal disease. Rabies is transmitted to people in the saliva of infected animals.

A person who has been bitten by an infected animal needs immediate treatment.

The treatment is a vaccination against rabies **and** an injection containing antibodies to the rabies antigen.

What type of immunity is given by the injection of antibodies?

A artificial active

B artificial passive

C natural active

D natural passive

40 A graft of tissue, such as skin, from a different person is usually rejected by the body.

Which statement about graft rejection is correct?

A The graft is rejected by B-lymphocytes because they make and release antibodies which react with the surface antigens on the graft cells.

B The graft is rejected by B-lymphocytes because T-lymphocytes are not stimulated to produce antibodies.

C The graft is rejected by T-lymphocytes because the graft tissue causes T-lymphocytes to release antibodies.

D The graft is rejected by T-lymphocytes because they circulate in the blood and can gather at the graft site.

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