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CAMBRIDGE
International Education

Cambridge International AS & A Level

BIOLOGY **9700/12**

Paper 1 Multiple Choice **February/March 2026**

1 hour 15 minutes

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 or tape.
- 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.

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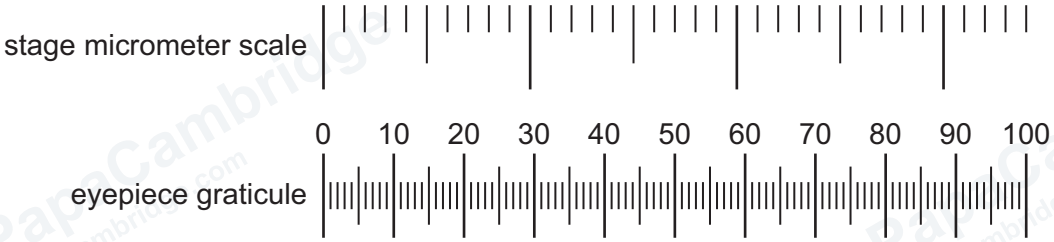
1 The eyepiece graticule for a light microscope at ×100 magnification was calibrated using a stage micrometer scale, as shown in the diagram.

Each small division on the stage micrometer scale measured exactly 0.01 mm.



A single-celled organism was viewed with the light microscope at ×100 magnification. The length of the organism measured 47 units on the eyepiece graticule.

What is the actual length of the organism?

A 1.6×10^{-1} µm

B 2.9×10^{-1} µm

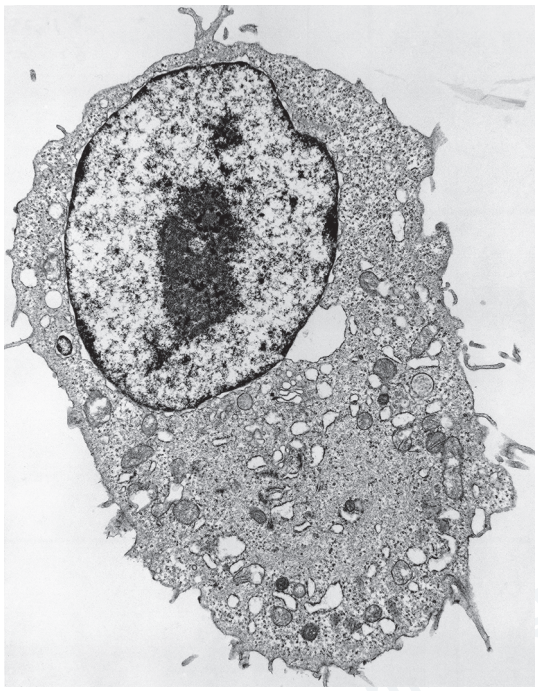
C 1.6×10^{2} µm

D 2.9×10^{2} µm

2 One of the electron micrographs shows a eukaryotic cell. The other shows a prokaryotic cell.



×91 000



×4000

What is the approximate distance across the eukaryotic cell at its widest point?

A 0.7 µm **B** 2.1 µm **C** 7 µm **D** 21 µm

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3 Which polymer is a major component of the cell walls of typical prokaryotes?

A cellulose

B peptidoglycan

C glycogen

D suberin

4 Which features are shown by prokaryotic cells and also by eukaryotic cells?

1 cell surface membrane

2 lysosomes

3 cytoplasm

4 70S ribosomes

A 1, 2, 3 and 4

B 1, 3 and 4 only

C 1 and 3 only

D 2 and 4 only

5 Some proteins synthesised in plant cells are modified before they are secreted.

Which cell structure in plants is responsible for modifying proteins before they are secreted?

A plasmodesmata

B tonoplast

C Golgi body

D lysosomes

6 Which row shows the types of membrane that surround the mitochondria and the nuclei?

	mitochondria	**nuclei**
A	single	double
B	double	double
C	double	single
D	single	single

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7 It is suggested that primitive prokaryotic cells may be ancestors of certain organelles in eukaryotic cells.

Which organelle is most similar to a typical prokaryote?

A Golgi body

B lysosome

C mitochondrion

D nucleolus

8 Which of the sugars fructose, glucose and maltose are reducing sugars?

A fructose and glucose only

B fructose and maltose only

C fructose, glucose and maltose

D glucose and maltose only

9 Which molecule in a muscle cell is rapidly hydrolysed to produce glucose?

A amylopectin

B amylose

C cellulose

D glycogen

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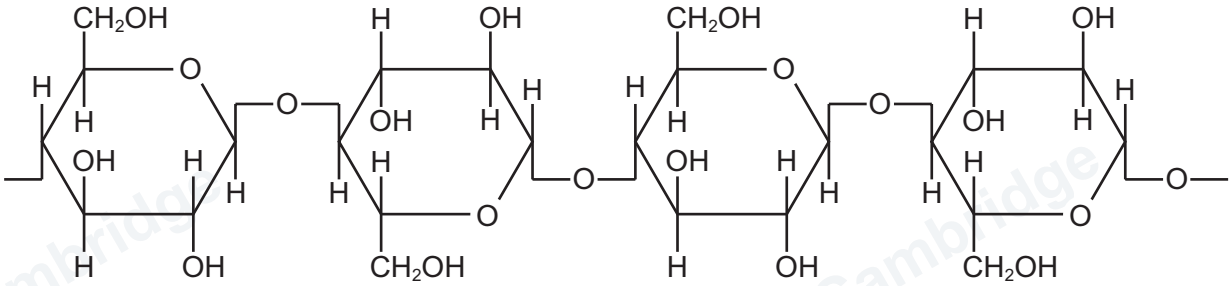
10 The diagram shows how the β-glucose monomers of cellulose are linked to each other.



The –OH groups on carbon 2 of adjacent glucose monomers are on opposite sides of the cellulose molecule.

What is the main way in which this arrangement of –OH groups on carbon 2 contributes to the strength of structures made of cellulose?

A The –OH groups on both sides of a cellulose molecule can form cross-links within the same cellulose molecule through the formation of glycosidic bonds between adjacent –OH and $–CH_2OH$ groups.

B The –OH groups on each side of a cellulose molecule can form cross-links with different cellulose molecules through the formation of glycosidic bonds between nearby –OH groups.

C The –OH groups on both sides of a cellulose molecule can form cross-links within the same cellulose molecule through the formation of hydrogen bonds between adjacent –OH and $–CH_2OH$ groups.

D The –OH groups on each side of a cellulose molecule can form cross-links with different cellulose molecules through the formation of hydrogen bonds between nearby –OH groups.

11 Which statement relates the structure of triglyceride molecules to their function?

A Triglyceride molecules can function as energy stores because they have a large number of C–H bonds in their fatty acid tails.

B Triglyceride molecules can function as energy stores because large amounts of energy are required to hydrolyse ester bonds.

C Triglyceride molecules can provide energy to all the cells of the body because they are non-polar molecules that easily dissolve in water for transport in the blood plasma.

D Triglyceride molecules can provide energy to all the cells of the body because they are polar molecules that easily diffuse through the phospholipid bilayer of cell surface membranes.

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12 Membrane fluidity is affected by temperature and by the percentage of fatty acid tails in the phospholipid molecules that are saturated.

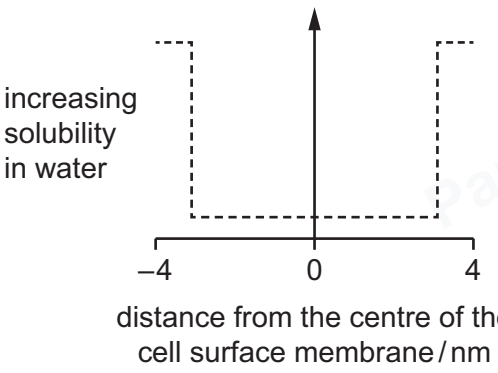
Which combination of these two factors would result in the greatest membrane fluidity?

	temperature / °C	**percentage of the fatty acid tails in the phospholipids that are saturated**
A	10	80
B	40	20
C	10	20
D	40	80

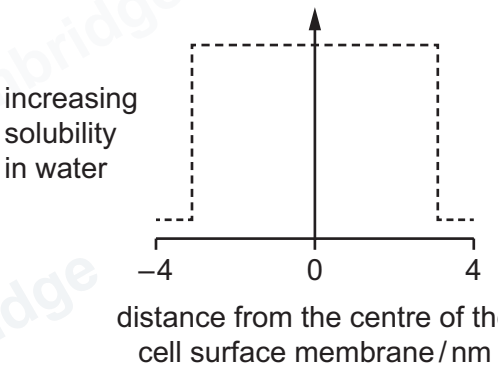
13 The solubility in water of different regions of the cell surface membrane changes with the distance of each region from the centre of the membrane.

Which graph shows the approximate relationship between the distance of each region from the centre of the cell surface membrane and its solubility in water?

A



B



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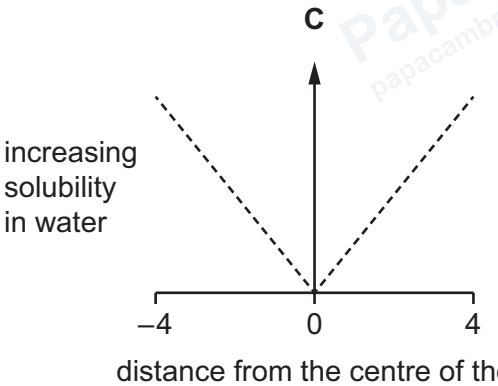
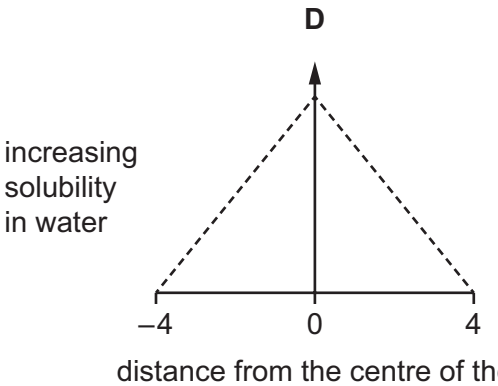


D



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14 Which row about the primary structure, secondary structure and quaternary structure of proteins is correct?

	primary structure	secondary structure	quaternary structure
A	the sequence of amino acids in a protein coded by a DNA molecule	the result of attraction between hydrogen and oxygen atoms associated with the peptide bonds	formed by the linking together of more than one polypeptide to form a protein
B	the sequence of amino acids that is determined by the codon sequence of an mRNA molecule	the coiling of a chain of amino acids to form a β-pleated sheet or α-helix	always contains at least two different types of polypeptide that interact to form the shape of a protein
C	the result of translation of an mRNA molecule by a ribosome into a chain of amino acids	formed by hydrogen bonding between the R-groups of the amino acids that form the primary structure	formed by four polypeptides and an additional reactive group attached to the protein
D	the number of amino acids present in a protein	the left-handed spiral formed by the primary structure	formed by two or more subunit polypeptides that link together to form a protein

15 Some RNA molecules, called ribozymes, can catalyse reactions in a similar way to enzymes.

Many of these ribozymes have other RNA molecules as their substrates and catalyse reactions that break specific phosphodiester bonds. Another important group of ribozymes form the functional part of ribosomes.

Which statements about ribozymes and enzymes are correct?

1 Binding of the substrate to the active site depends on complementary pairing of bases for ribozymes and on complementary pairing of R-groups for enzymes.

2 Ribozymes and enzymes can catalyse hydrolytic reactions and condensation reactions.

3 For molecules made up of the same number of monomers, the number of possible types of enzyme is greater than the number of possible types of ribozyme.

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

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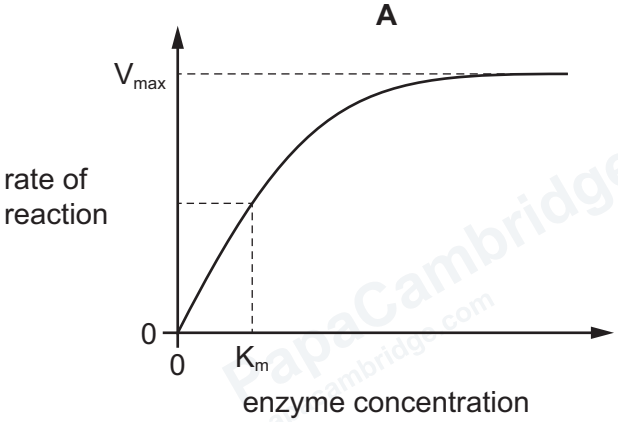
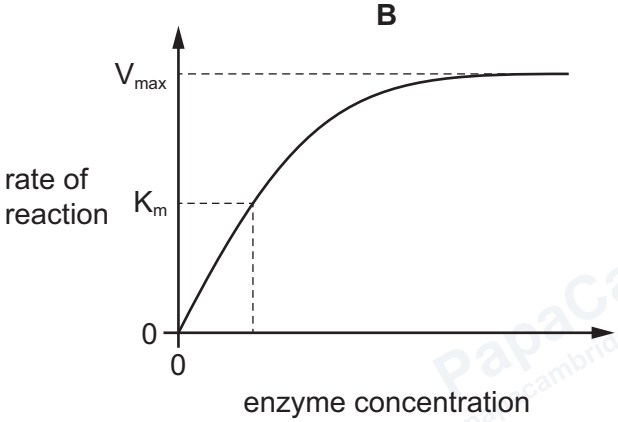
16 Some students sketched graphs to show V_{max} and K_m.

Which graph is correct?

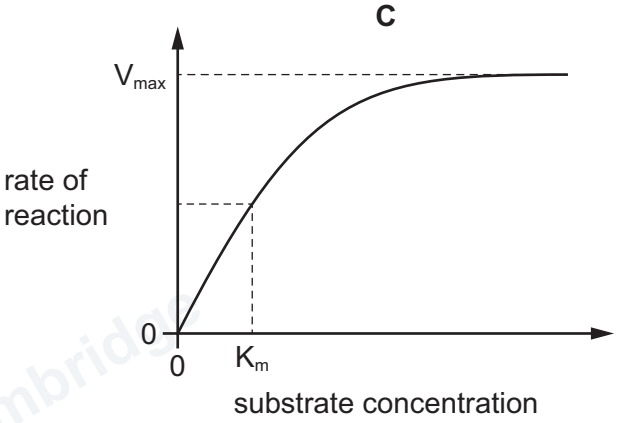
A



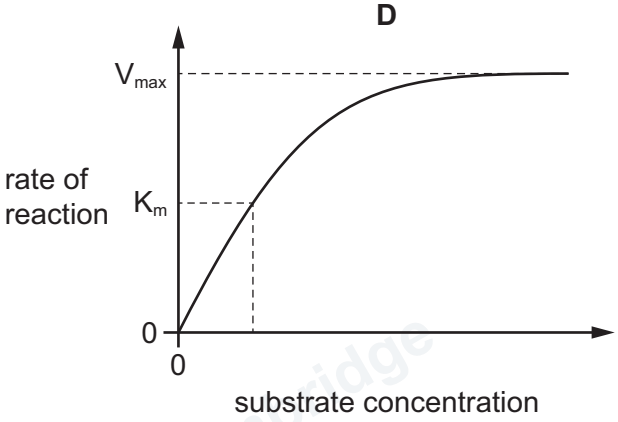
B



C



D



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17 Enzymes can be immobilised in alginate beads.

Which row identifies advantages of using enzymes immobilised in alginate beads compared with using enzymes that are free in solution?

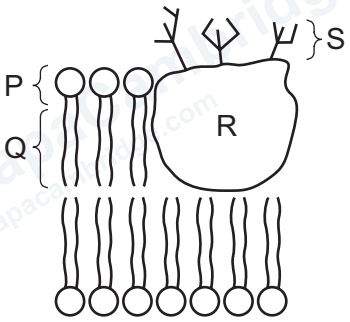
	enzymes are less likely to denature when heated	**it is easier to re-use the enzymes when making new batches of product**	**the product is easier to purify**
A	✓	✓	✓
B	✓	✗	✓
C	✗	✓	✓
D	✓	✓	✗

key

✓ = an advantage of using immobilised enzymes

✗ = **not** an advantage of using immobilised enzymes

18 The diagram represents the arrangement of some of the molecules in a cell surface membrane. Labels P and Q identify two regions of one of the molecules, and labels R and S identify two regions of another molecule.



Which labelled regions always contain oxygen atoms and which labelled regions always contain phosphorus atoms?

	always contain oxygen atoms	**always contain phosphorus atoms**
A	P, Q, R and S	P and S
B	P, Q, R and S	P only
C	P, R and S only	P only
D	P, R and S only	P and S

19 Adrenaline is a hormone that prepares the body for rapid responses by increasing the blood flow to muscles and increasing blood sugar concentrations. Adrenaline is secreted from the adrenal glands and acts on nearly all body tissues by binding to adrenergic receptors on the surface of the cells.

Different tissues respond to adrenaline in different ways. For example, adrenaline causes smooth muscle in the airways to relax but causes contraction of smooth muscle in arterioles.

What could explain the different responses of smooth muscle to adrenaline?

A Smooth muscle cells in the airways and in the arterioles have different types of adrenergic receptors, which initiate different responses after binding to adrenaline.

B The adrenergic receptors on smooth muscle cells in the airways bind to different ligands from the adrenergic receptors on smooth muscle cells in arterioles.

C The concentration of adrenaline reaching target cells is dependent on the distance from the adrenal glands and determines whether smooth muscle relaxes or contracts.

D The binding sites of adrenergic receptors on smooth muscle cells have different tertiary structures depending on the location of the smooth muscle cells.

20 What explains the effect on a red blood cell of being placed into pure water?

A Less water leaves the cell than enters it, so the cell swells and bursts.

B More water enters the cell than leaves it, so the cell becomes turgid.

C Water can enter the cell but water is unable to leave the cell, so the cell swells and bursts.

D Water enters the cell at the same rate as water leaves the cell, so the cell does **not** change.

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21 A scientist used a sharp knife to cut a cube from a potato.

The cube had a mass of 3.10 g.

The scientist placed the cube in sucrose solution and measured the mass of the cube every 30 minutes for 120 minutes. The results are shown in the table.

time / minutes	mass of cube / g
0	3.10
30	3.31
60	3.40
90	3.43
120	3.43

After 120 minutes, the scientist measured:

- the turgor pressure of the potato cells
- the water potential of the potato cells
- the water potential of the sucrose solution.

Turgor pressure is the hydrostatic pressure within a cell that pushes the cell surface membrane against the cell wall.

Which values of potato cell turgor pressure, potato cell water potential and sucrose solution water potential after 120 minutes are consistent with the results?

	potato cell turgor pressure / MPa	potato cell water potential / MPa	sucrose solution water potential / MPa
A	0.0	–1.7	–1.2
B	1.2	–0.6	–0.6
C	0.7	–0.5	–1.2
D	0.7	–1.2	–0.5

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22 Keratinocyte stem cells are found in the skin, where they are important for the repair of damaged skin.

Which row shows how keratinocyte stem cells respond when skin is damaged?

	repair damaged cells	divide by mitosis
A	no	no
B	no	yes
C	yes	no
D	yes	yes

23 Four days after fertilisation, a human embryo was found to contain 32 cells.

How many cells will there be in the human embryo after completion of four more mitotic cell cycles, assuming that no cells die?

A 256 **B** 512 **C** 1024 **D** 8192

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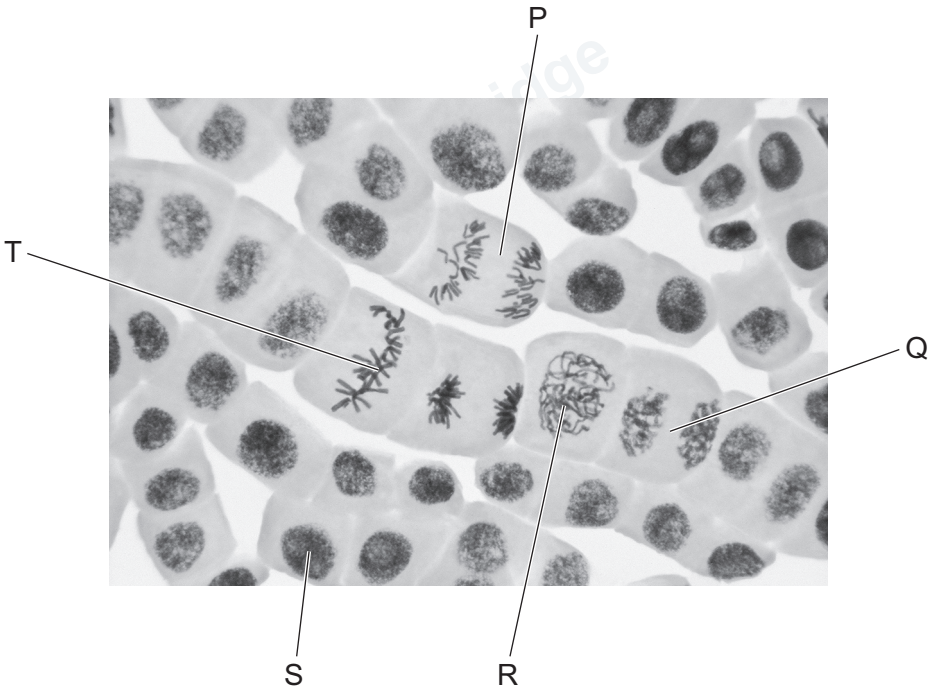
24 The photomicrograph shows cells in different stages of the mitotic cell cycle.



Which statements are correct?

1 Cell T shows metaphase.

2 DNA replication is occurring in cell R.

3 The amount of DNA in cell P is the same as the amount of DNA in cell T.

4 The correct order of stages in the mitotic cell cycle is shown by the labelled cells in the sequence S → R → T → P → Q.

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

25 Which statement about nucleotides is correct?

A Adenine and guanine are pyrimidines.

B ATP is a phosphorylated nucleotide.

C Purines have a single ring structure.

D Uracil replaces cytosine in RNA.

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26 The scientist Erwin Chargaff analysed the base composition of the DNA of several species. The table shows some of Chargaff's data.

species	percentage of base in DNA			
	adenine	guanine	cytosine	thymine
E.coli	24.7	26.0	25.7	23.6
maize	26.8	22.8	23.2	27.2
grasshopper	29.3	20.5	20.7	29.3
sea urchin	32.8	17.7	17.3	32.1
octopus	33.2	17.6	17.6	31.6
rat	28.6	21.4	20.5	28.4

Which statements can be concluded using **only** the data in the table?

1 Cytosine binds to guanine using three hydrogen bonds.

2 Approximately 50% of the bases in any of the species are either adenine or thymine.

3 The base composition of DNA varies between different species.

4 The number of cytosine bases in any of the species is approximately the same as the number of guanine bases.

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

27 A gene from a eukaryote is inserted into the DNA of a bacterium. The bacterium is **not** able to synthesise the polypeptide coded for by the eukaryotic gene.

Which statements explain why the bacterium is **not** able to synthesise the polypeptide?

1 The mRNA produced by the bacterium is different from the mRNA produced by the eukaryote.

2 Eukaryote genes contain non-coding sequences that are absent from bacterial genes.

3 There are differences in the genetic code between bacteria and eukaryotes.

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

28 Why do some gene mutations result in the synthesis of the same polypeptides as the original genes?

A Ribosomes correct mutations before translation occurs.

B The mutated bases will **not** be transcribed.

C Mutated exons will be removed before translation.

D Most amino acids have more than one DNA triplet code.

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29 What determines the rate of water movement from the roots to the leaves of a plant on a hot, sunny day?

A transport of water through the apoplast of the endodermis

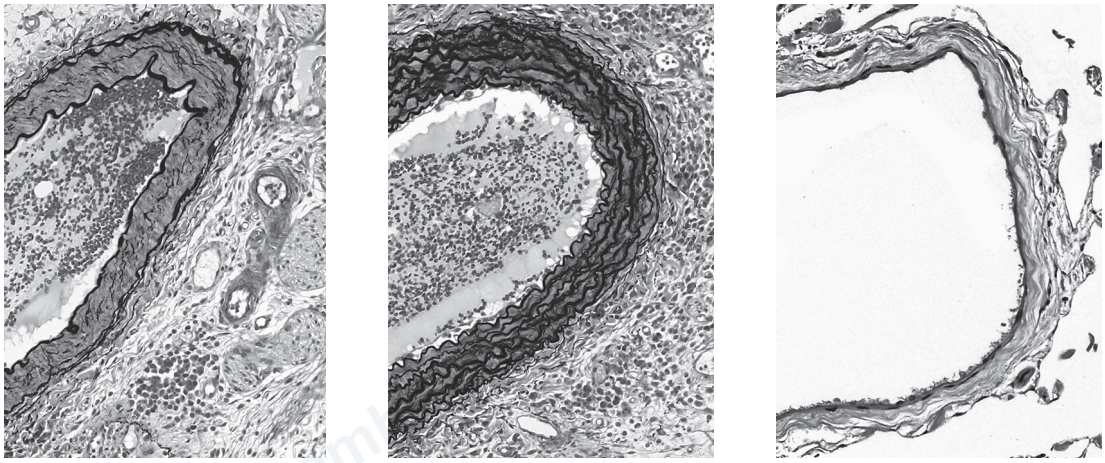
B development of a less negative water potential in the leaves

C changes in the specific heat capacity of water in the leaves

D evaporation of water from the mesophyll cell walls

30 The photomicrographs show transverse sections through three different types of blood vessel. All are shown at approximately the same magnification.

type 1 type 2 type 3



Which row correctly identifies the three different types of blood vessels?

	type 1	type 2	type 3
A	elastic artery	muscular artery	vein
B	muscular artery	elastic artery	vein
C	muscular artery	vein	elastic artery
D	vein	muscular artery	elastic artery

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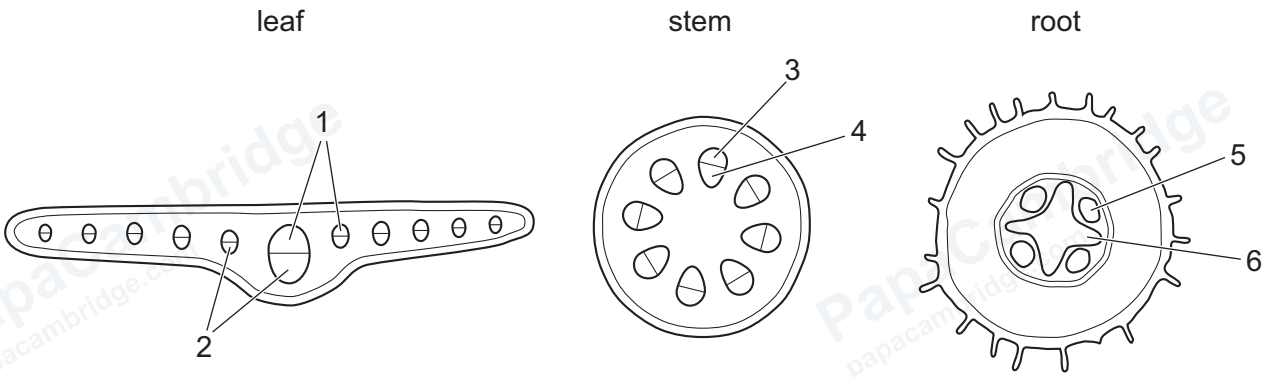
31 The diagrams show transverse sections of parts of a plant. Transport tissues are labelled 1 to 6.



Which row shows two tissues that mainly transport water and two tissues that mainly transport sucrose?

	mainly transport water	**mainly transport sucrose**
A	1 and 3	4 and 6
B	2 and 3	4 and 5
C	3 and 5	2 and 6
D	4 and 6	2 and 3

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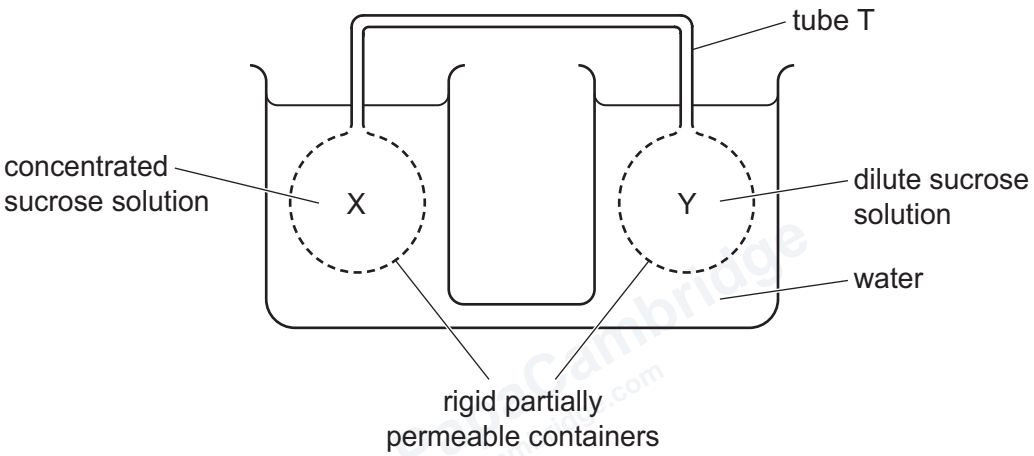
32 The diagram shows a model that can be used to demonstrate mass flow in phloem. Tube T represents the phloem.



Water moves in or out of X and Y either as a result of osmosis or as a result of hydrostatic pressure. Sucrose solution then moves through tube T that joins X and Y.

Which description is correct?

	water potential in X compared with Y	**direction of movement of sucrose solution in tube T**
A	less negative	from X to Y
B	less negative	from Y to X
C	more negative	from X to Y
D	more negative	from Y to X

33 Which statement about the transport of sucrose in plants is correct?

A The hydrogen ion (proton) concentration gradient, on which the transport of sucrose into companion cells depends, is maintained by active transport.

B Sucrose moves through plasmodesmata by passive diffusion from mesophyll cells into companion cells down the concentration gradient.

C ATP synthesised by the mitochondria in companion cells provides the energy for the active transport of sucrose from companion cells into phloem sieve tube elements.

D Water enters companion cells by active transport causing hydrostatic pressure to build up and push sucrose into phloem sieve tube elements by mass flow.

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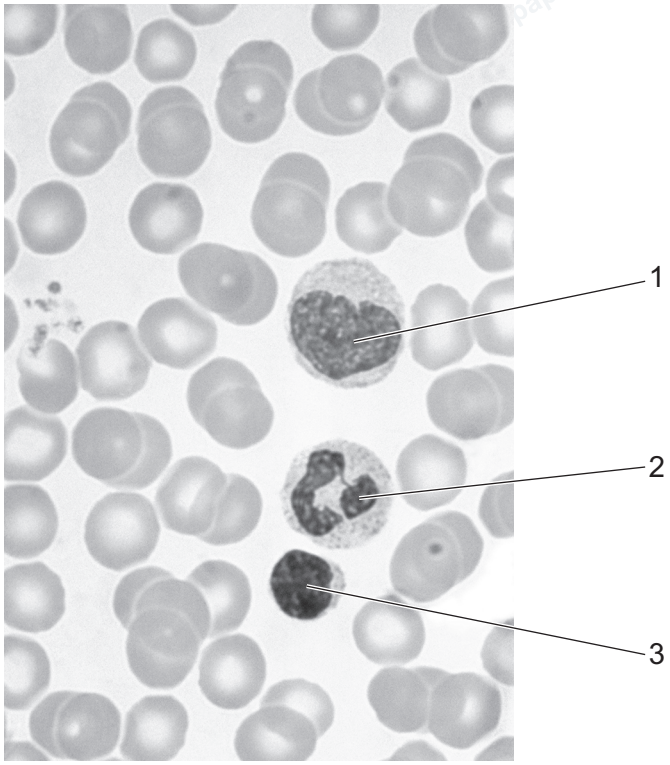
34 The photomicrograph shows a human blood smear.



Which row identifies the labelled cells?

	1	2	3
A	monocyte	neutrophil	lymphocyte
B	lymphocyte	neutrophil	monocyte
C	monocyte	lymphocyte	neutrophil
D	lymphocyte	monocyte	neutrophil

35 Which row correctly identifies properties of water that are important for its role in the transport of glucose and ions in mammals?

	high specific heat capacity	high latent heat of vaporisation	solvent action
A	✓	✓	✗
B	✓	✗	✓
C	✗	✓	✓
D	✗	✗	✓

key

✓ = important property for its role in the transport of glucose and ions in mammals

✗ = **not** an important property for its role in the transport of glucose and ions in mammals

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36 Which substances will increase in concentration in the plasma in capillaries surrounding active muscle tissue?

1 carbaminohaemoglobin

2 hydrogencarbonate ions

3 hydrogen ions

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

37 Which statement correctly describes a structure of the human gas exchange system?

A The wall of an alveolus is only one cell thick and contains smooth muscle to allow contraction and expansion.

B The wall of a bronchiole consists of a thin layer of cartilage and a thin layer of smooth muscle.

C The wall of a bronchus has a folded inner layer of ciliated epithelium, which contains many goblet cells.

D The wall of the trachea contains many ciliated epithelial cells and is supported with complete rings of cartilage.

38 Three statements about the pathogen that causes tuberculosis (TB) are listed.

1 The pathogen can inhibit some immune responses, such as phagocytosis.

2 The pathogen reproduces slowly.

3 The pathogen is able to become dormant within infected tissues.

Which statements explain why antibiotic treatment for TB takes a long time?

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

39 During an outbreak of a severe infectious disease, vulnerable people need immediate protection.

Which type of immunity could provide immediate protection?

	artificial	**natural**
active	**A**	**B**
passive	**C**	**D**

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40 Which statement describes a response of T-lymphocytes when body cells are infected by viruses?

A T-helper cells destroy the infected body cells by phagocytosis.

B T-killer cells bind to antigens on the surface of infected body cells.

C T-helper cells release cytotoxins that enter infected cells, resulting in cell death.

D T-killer cells secrete antibodies that destroy the infected body cells.

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