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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

BIOLOGY **9700/11**

Paper 1 Multiple Choice **October/November 2009**
1 hour

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

6488376821

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International Examinations

1 Which cell structure can be seen only with an electron microscope?

A cell surface membrane

B chromosome

C nucleolus

D vacuole

2 A lymphocyte has a diameter of 1×10^{-2} millimetres (mm).

What is the diameter in nanometres (nm)?

A 1×10^{1} **B** 1×10^{2} **C** 1×10^{3} **D** 1×10^{4}

3 What is a function of the smooth endoplasmic reticulum?

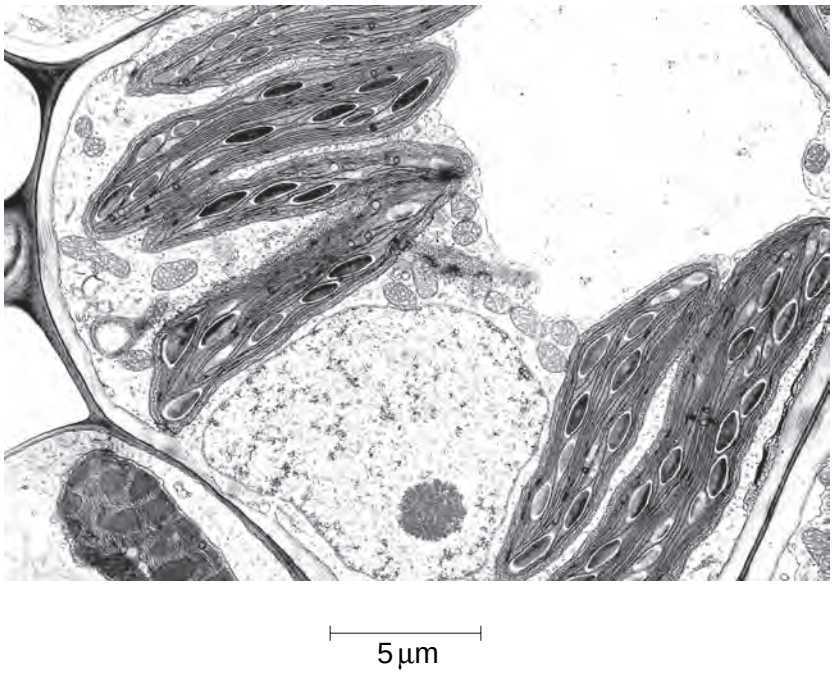
A protein synthesis

B protein transport

C steroid synthesis

D steroid transport

4 The photomicrograph of a cell has a 2 cm scale line labelled 5 μm.



What is the magnification of the photomicrograph?

A 1×10^{3} **B** 2×10^{3} **C** 4×10^{3} **D** 5×10^{3}

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5 Which is a feature of all prokaryotic cells?

A absence of cell surface membrane

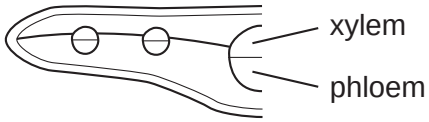
B division by mitosis

C presence of cellulose cell wall

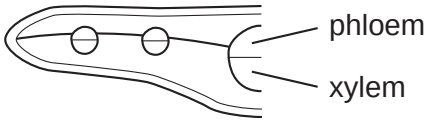
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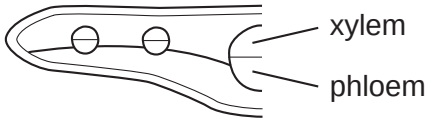
A



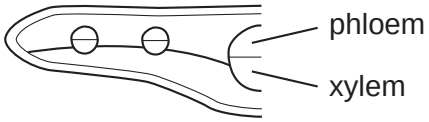
B



C



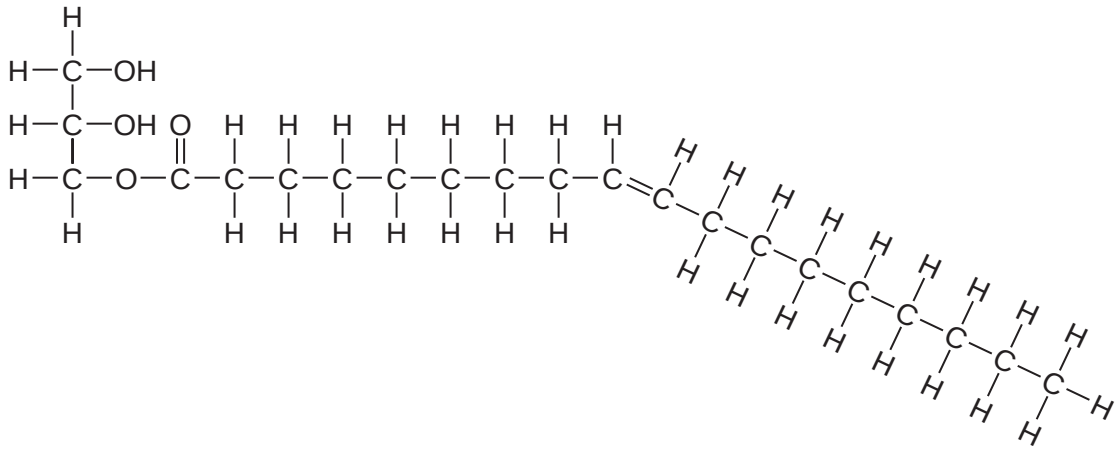
D



7 Which combination of procedures would **not** be used in a food test?

	use heat	use biuret reagent	use Benedict's reagent	boil with dilute acid
A	✓		✓	
B	✓	✓		
C	✓		✓	✓
D		✓		

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What will be the products of the total hydrolysis of the molecule shown?

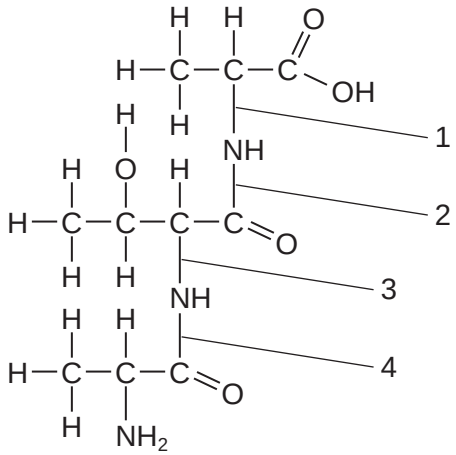
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9 The diagram shows a tripeptide molecule.



At which two points will hydrolysis occur to release three amino acids?

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

10 Which statement is true for cellulose, but **not** true for protein?

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11 Which combination of bond types correctly shows the weak and strong bonds that hold a molecule of protein in shape?

	types of bond		
	hydrogen	disulfide	ionic
A	strong	strong	weak
B	strong	weak	strong
C	weak	strong	strong
D	weak	strong	weak

12 Which features of collagen result in it having high tensile strength?

1 covalent bonds form between adjacent molecules

2 each three-stranded molecule is held together by hydrogen bonds

3 every third amino acid in the polypeptide is small

4 the primary structure is held together by peptide bonds

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

13 HIV-1 protease is an enzyme produced by the HIV virus.

Two identical chains of 99 amino acids form the enzyme. In each chain, amino acids 25, 26 and 27 in the sequence form part of the active site.

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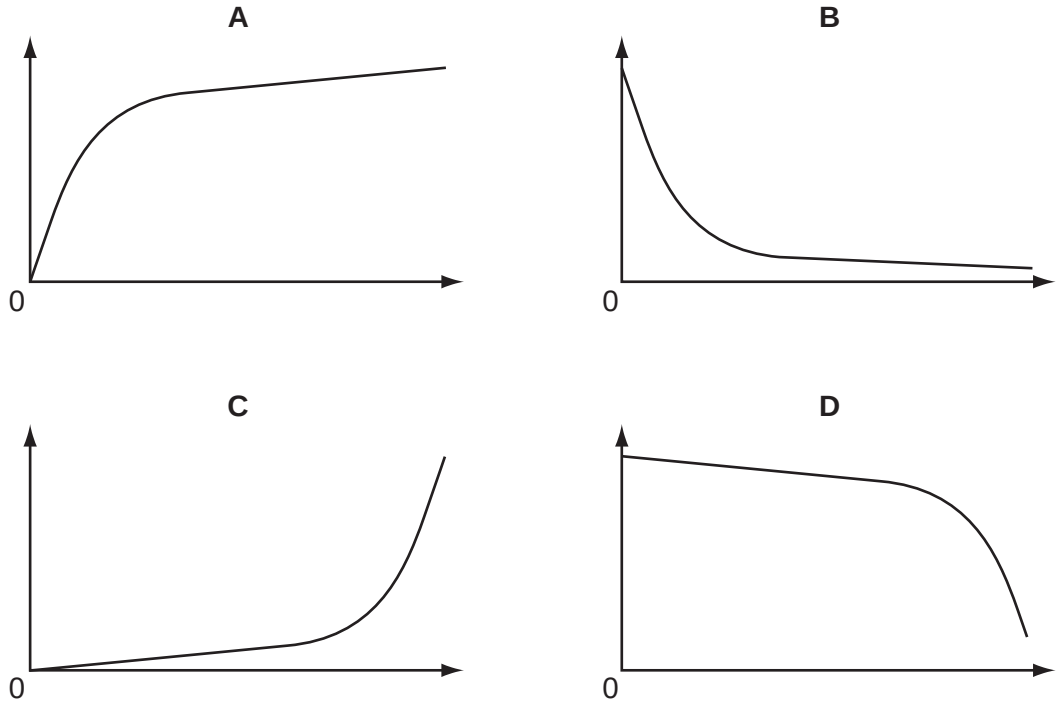
C primary and quaternary only

D quaternary only

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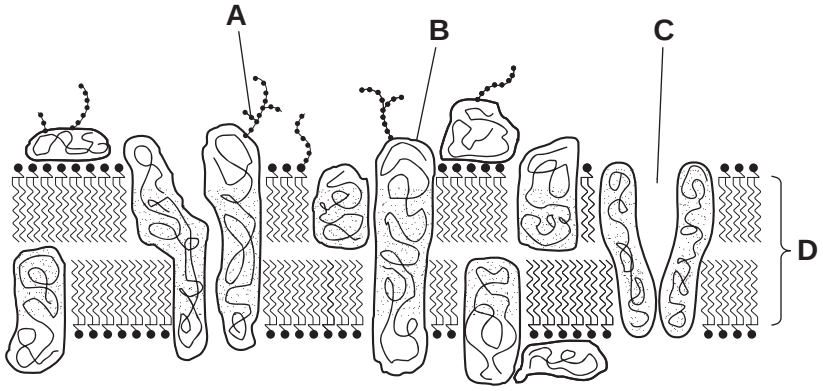
14 In an experiment, 5 cm^3 of 1 % salivary amylase are added to 100 cm^3 of different concentrations of starch.

Which graph shows the results of plotting the initial rate of reaction (y-axis) against the concentration of substrate (x-axis)?



15 Cystic fibrosis is a disease where Cl^- ions are unable to be transported into cells.

Which structure in the cell surface membrane is faulty?



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16 Diagrams 1 and 2 show how the transverse section through a leaf changes when moved from one solution W to a different solution Y.

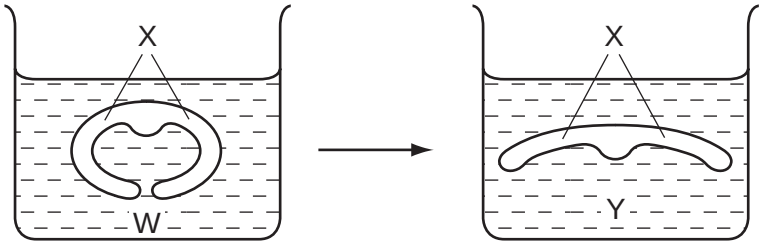
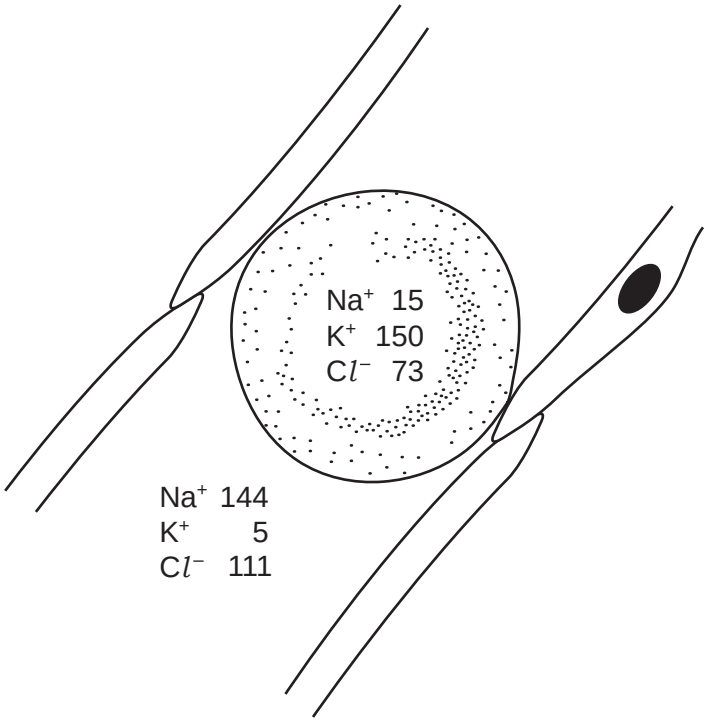


diagram 1 diagram 2

How has the water potential changed in diagram 2?

	difference in cells at X in solution Y compared to the same cells in solution W	difference in solution Y compared to solution W
A	less negative	less negative
B	less negative	more negative
C	more negative	less negative
D	more negative	more negative

17 The diagram shows a red blood cell and the concentrations of ions, in mmol dm^{-3}, in the plasma and in the cell.



Which ions are actively transported into and out of the cell?

	into cell	out of cell
A	Cl^-	K^+
B	K^+	Na^+
C	Na^+	Cl^-
D	Na^+	K^+

18 Which statement describes a cell that is capable of reproduction and belonging to a haploid organism?

A It has chromosomes that contain one polynucleotide chain.

B It is capable of carrying out a reduction division to form gametes.

C It possesses two copies of each gene as a result of fertilisation.

D It will undergo cell division by mitosis during asexual reproduction.

19 During which stage of the mitotic cell cycle is DNA replicated?

A anaphase

B interphase

C prophase

D telophase

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20 Cancer cells divide out of control, forming tumours.

Which statement describes the difference between a cancer cell and a normal cell?

A Cancer cells do not undergo cytokinesis.

B Cancer cells have a shorter interphase.

C Cancer cells do not have metaphase.

D Only cancer cells have mutated DNA.

21 The following statements describe events that take place during DNA replication and transcription.

Which statement is **not** correct?

		DNA replication	transcription
A	adenine pairs with thymine	yes	no
B	both DNA polynucleotide chains act as templates	yes	no
C	the original DNA molecule is changed after the process	no	yes
D	uracil pairs with adenine	no	yes

22 A peptide consists of ten amino acids of four different kinds.

What is the theoretical minimum number of tRNA molecules required to translate the mRNA for this peptide?

A 4 **B** 10 **C** 12 **D** 30

23 What does the enzyme DNA polymerase synthesise in a cell?

A a polypeptide using DNA as a template

B a strand of DNA using a polypeptide as a template

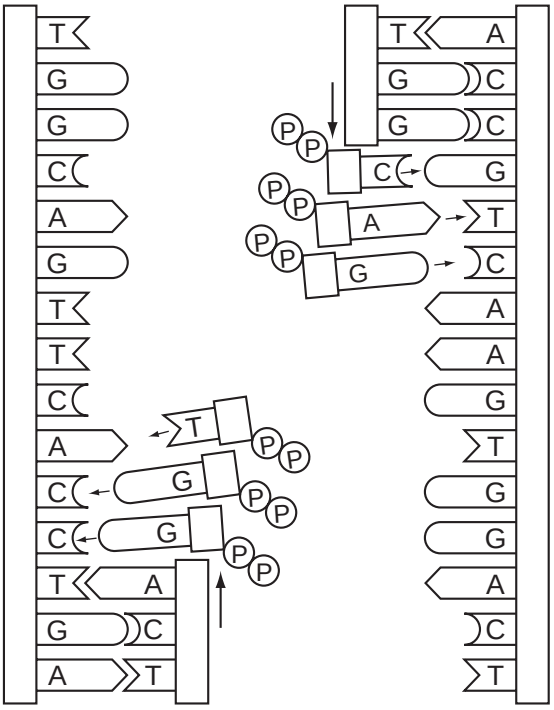
C a strand of DNA using DNA as a template

D a strand of mRNA using DNA as a template

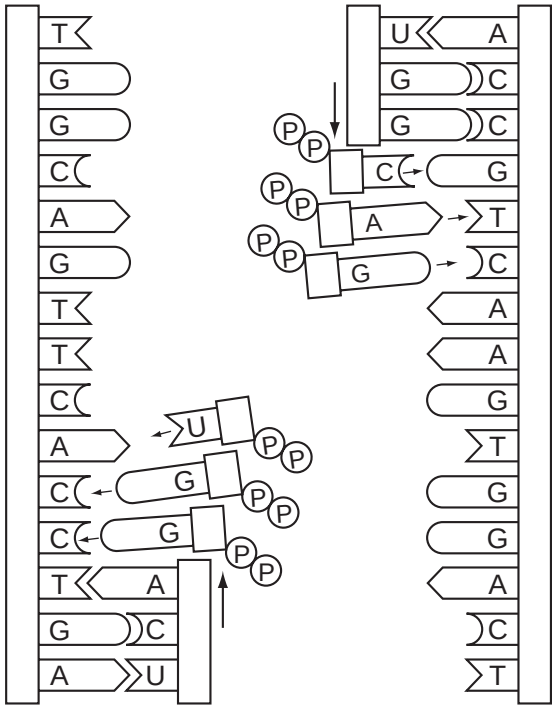
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24 Which diagram shows the semi-conservative replication of a section of a molecule of DNA?

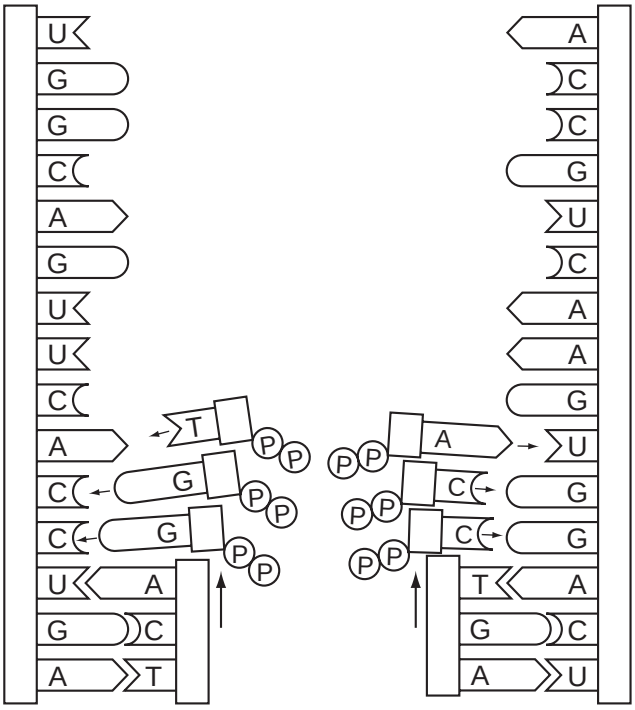
A



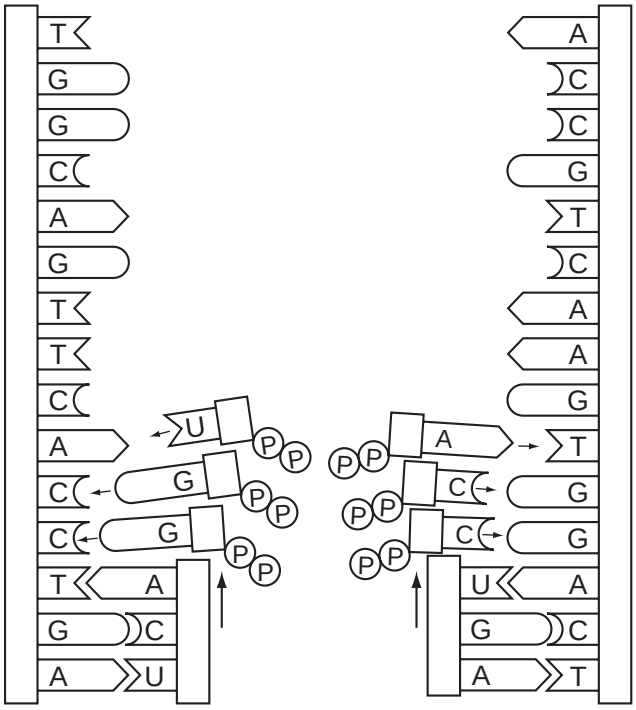
B



C



D



25 Which description states some of the features of xylem vessels?

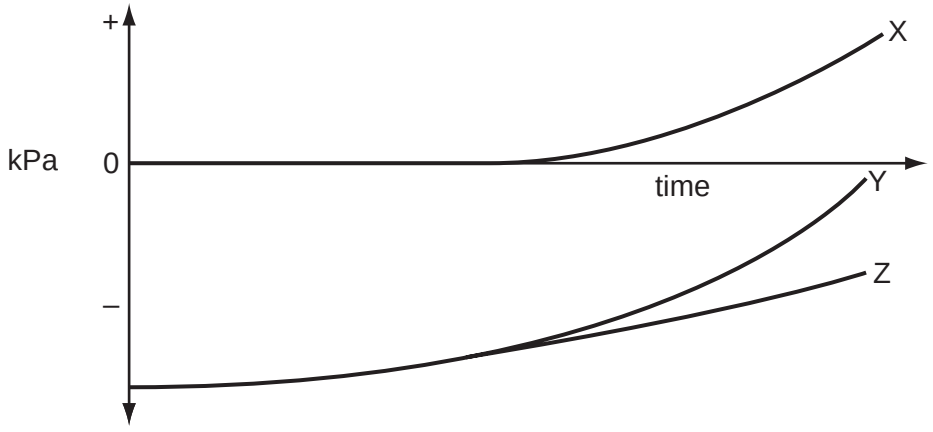
A cells joined to form a tube, pits at intervals, sieve plates between cells, surrounded by the endodermis in roots

B contains cells joined end to end, containing peripheral cytoplasm, cell walls with secondary thickening of lignin, located to the outside of phloem in vascular bundles

C contains elongated cells with end walls broken down, located in vascular bundles in the stem and centrally in the roots

D dead elongated cells, lignified cell walls with pits at intervals, associated with companion cells in the roots only

26 The diagram shows the changes in pressure potential (Ψ_P), solute potential (Ψ_S) and water potential (Ψ) when a plasmolysed plant cell is placed in pure water.



Which shows the correct curves for each potential?

	X	Y	Z
A	Ψ	Ψ_P	Ψ_S
B	Ψ_P	Ψ_S	Ψ
C	Ψ_S	Ψ	Ψ_P
D	Ψ_P	Ψ	Ψ_S

27 What is the sequence of events in the translocation of assimilates?

A active loading of sucrose into sieve elements via companion cells at the source, increased hydrostatic pressure, mass flow, unloading at the sink

B hydrolysis of storage compounds in sinks, lowered water potential in sink, unloading of sucrose from sieve elements down the water potential gradient, mass flow from the source

C lowered pressure in sieve elements at the source, movement of sucrose down the pressure gradient from companion cells, mass flow down a diffusion gradient to the sink

D mass flow of dissolved sucrose via companion cells into the sieve element at the source, lowered hydrostatic pressure, diffusion of sucrose down concentration gradient to sink, active unloading

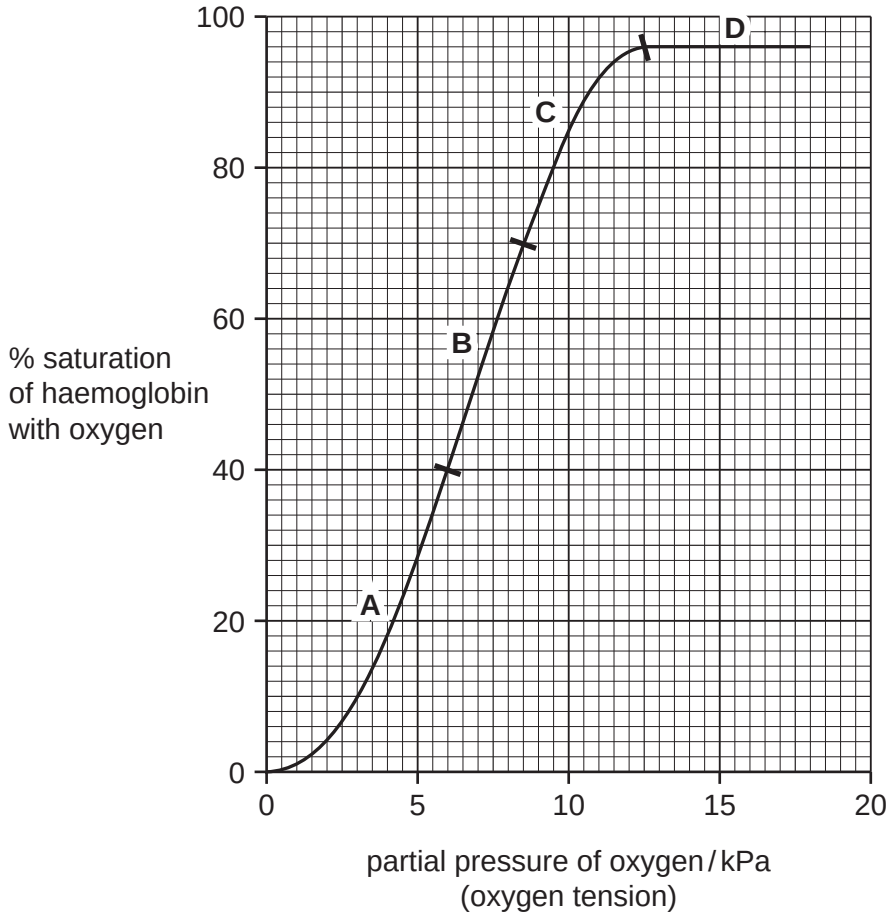
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28 When stained, which features, visible under the light microscope, are part of the cells of the plant tissues listed in the table?

	xylem elements	sieve tube elements	companion cells
A	cytoplasm	lignin	nuclei
B	lignin	cytoplasm	nuclei
C	lignin	nuclei	cytoplasm
D	nuclei	cytoplasm	lignin

29 The graph shows the percentage saturation of haemoglobin with oxygen at different partial pressures of oxygen.

Which range of partial pressures of oxygen produces the greatest change of percentage saturation of haemoglobin per unit oxygen tension?



30 Below are correct statements comparing blood, tissue fluid and lymph in a capillary bed.

- W lacks large plasma proteins and red blood cells and has a higher water potential than Z.
- X is at a lower pressure than Y and contains red blood cells and large plasma proteins.
- Y is at a higher pressure than W and contains red blood cells and large plasma proteins.
- Z is at a lower pressure than Y and lacks red blood cells.

Which correctly identifies W, X, Y and Z?

	W	X	Y	Z
A	blood entering capillary	lymph	blood leaving capillary	tissue fluid
B	blood leaving capillary	lymph	tissue fluid	blood entering capillary
C	lymph	blood entering capillary	tissue fluid	blood leaving capillary
D	tissue fluid	blood leaving capillary	blood entering capillary	lymph

31 What would be seen in an electron micrograph of a bronchus wall?

1 cartilage cells

2 ciliated cells

3 exocytotic vesicles

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

32 An oxygen molecule diffuses directly from the air in an alveolus to haemoglobin in a red blood cell.

What is the minimum number of cell surface membranes through which this molecule must pass?

A 2 **B** 3 **C** 4 **D** 5

33 A disease damages alveoli.

Which effect does this have on the gas exchange surface area and volume of the lungs?

	surface area	volume
A	decreased	decreased
B	decreased	no change
C	increased	increased
D	increased	no change

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34 A country has fewer than 2.5 deaths per 100 000 people from TB in one year and the next year this rose to 25 deaths per 100 000.

What may have contributed to this change?

1 decrease in contact tracing

2 increase in refugee camps

3 water supply contaminated by sewage

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

35 Scientists are concerned that avian (bird) flu caused by the H5N1 virus, could infect humans and cause a pandemic.

If this occurs, which factors could help prevent humans spreading the disease?

1 killing all poultry

2 reducing all air flights

3 taking a course of antibiotics

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

36 What are produced by B-lymphocytes?

	killer lymphocyte clones	memory cells	plasma cell clones
A	✓	✓	✗
B	✓	✗	✓
C	✓	✓	✓
D	✗	✓	✓

37 After an immune response, memory cells remain in the blood for a long time.

What is the function of memory cells?

A They can ingest invading bacteria.

B They contain lots of antibodies.

C They divide to make plasma cells.

D They kill cells infected with virus.

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38 A tree carries out photosynthesis and provides organic compounds for other organisms in a forest. It takes carbon dioxide from and returns oxygen to the atmosphere. It takes water from the soil into its roots and its leaves lose water to the atmosphere. Many other organisms live in the tree.

Which term applies to the description of the tree?

A ecosystem

B habitat

C niche

D trophic level

39 In an investigation, discs of 2.5 cm diameter were cut from leaves. Fifty discs were put into three identical bags with different net sizes and buried in newly dug soil at a depth of 3 cm.

At 60 day intervals the bags were dug up and the leaf discs measured to see how much of the leaf area had disappeared.

The table shows the percentage of leaf discs remaining in each bag.

	percentage of leaf disks remaining		
time / days	net size 7 mm	net size 0.5 mm	net size 0.03 mm
0	100	100	100
60	80	94	100
120	30	81	100
180	14	67	100
240	9	63	100
300	6	61	100

Which organisms are most important for breaking down the leaves?

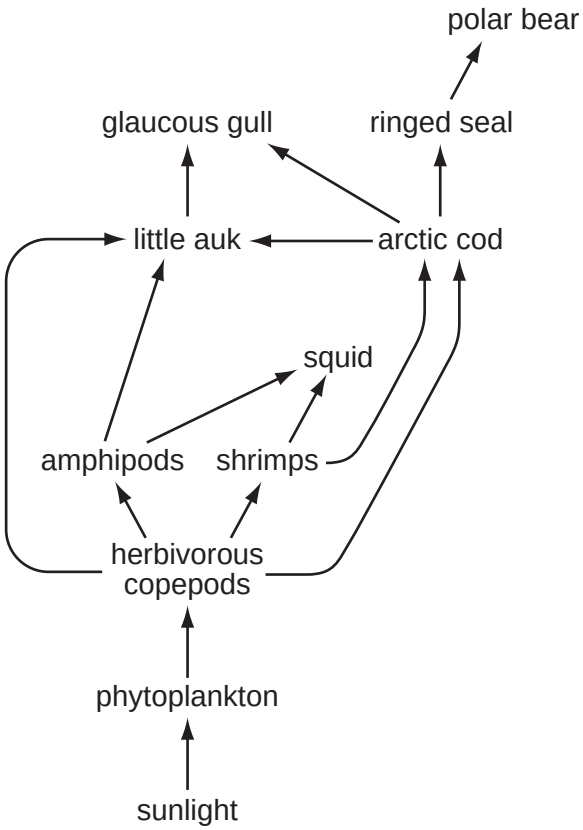
A earthworms and beetles

B microorganisms only

C small invertebrates only

D small invertebrates and microorganisms

40 The diagram shows an arctic ecosystem.



How many trophic levels are represented?

A 3 **B** 4 **C** 5 **D** 6

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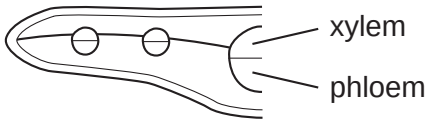
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What is the diameter in nanometres (nm)?

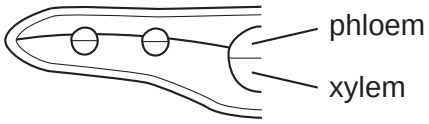
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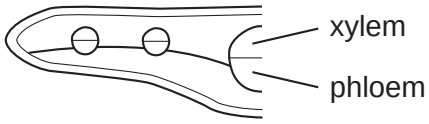
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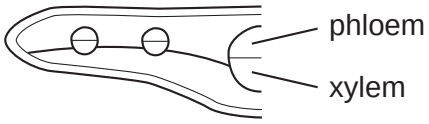
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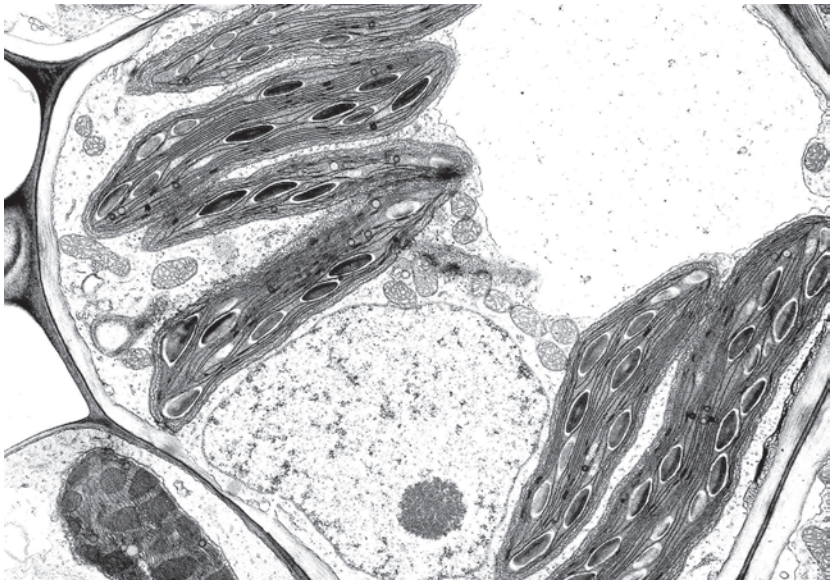


D



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5 The photomicrograph of a cell has a 2 cm scale line labelled 5 μm.



What is the magnification of the photomicrograph?

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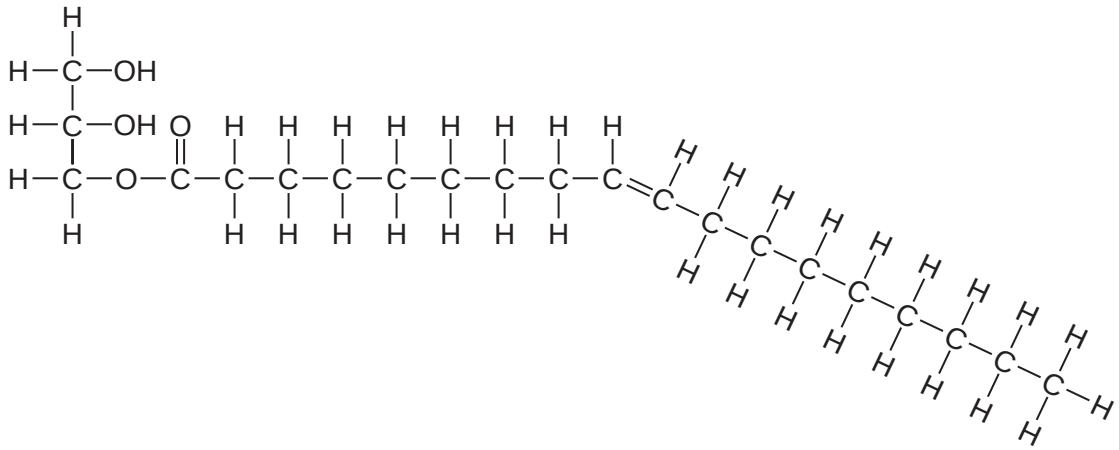
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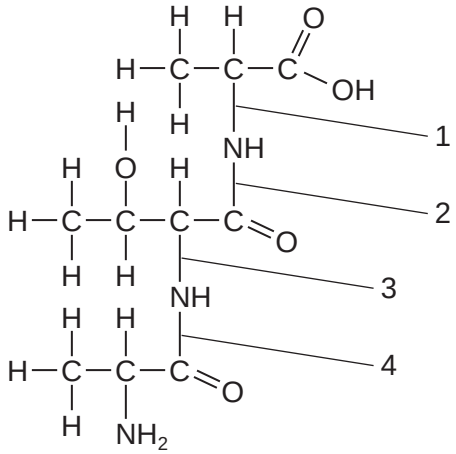
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1 covalent bonds form between adjacent molecules

2 each three-stranded molecule is held together by hydrogen bonds

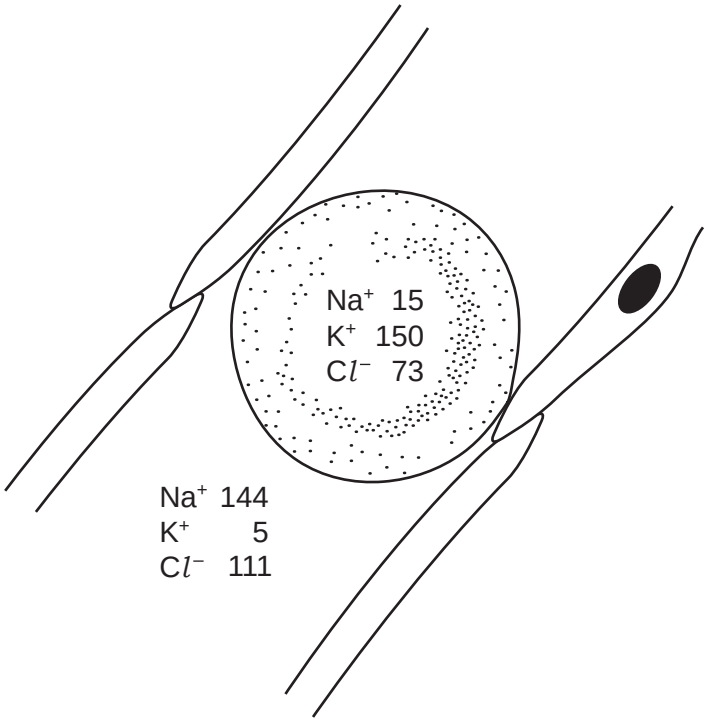
3 every third amino acid in the polypeptide is small

4 the primary structure is held together by peptide bonds

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

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14 The diagram shows a red blood cell and the concentrations of ions, in mmol dm^{-3}, in the plasma and in the cell.



Which ions are actively transported into and out of the cell?

	into cell	out of cell
A	Cl^-	K^+
B	K^+	Na^+
C	Na^+	Cl^-
D	Na^+	K^+

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15 Diagrams 1 and 2 show how the transverse section through a leaf changes when moved from one solution W to a different solution Y.

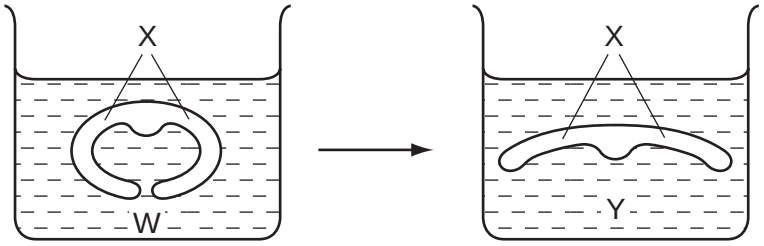


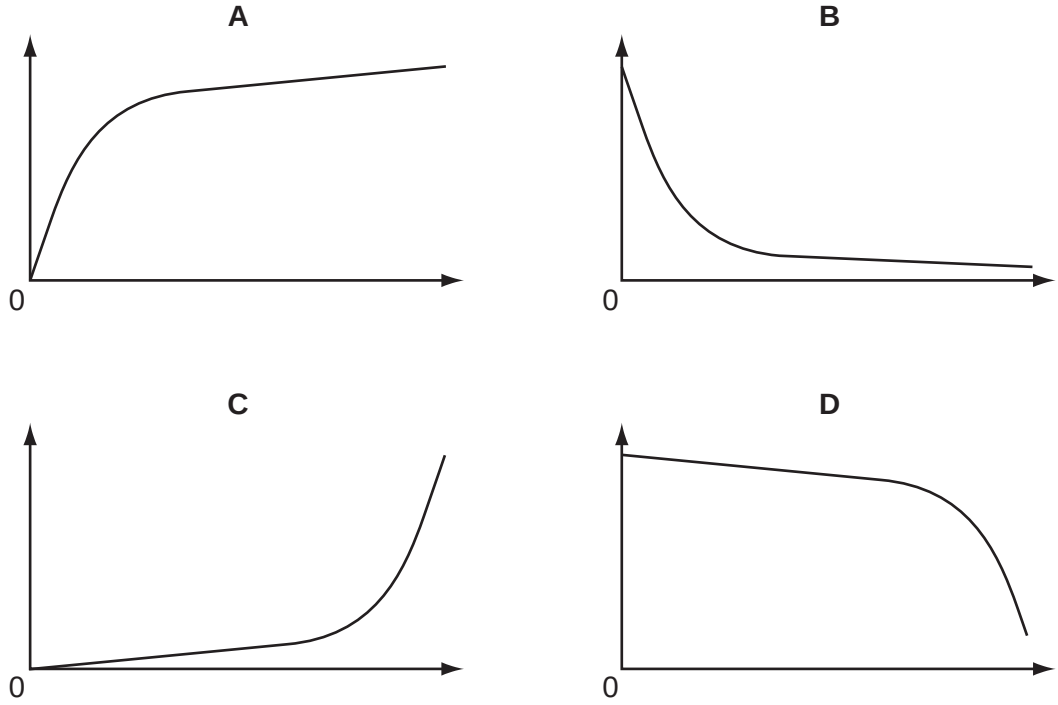
diagram 1 diagram 2

How has the water potential changed in diagram 2?

	difference in cells at X in solution Y compared to the same cells in solution W	difference in solution Y compared to solution W
A	less negative	less negative
B	less negative	more negative
C	more negative	less negative
D	more negative	more negative

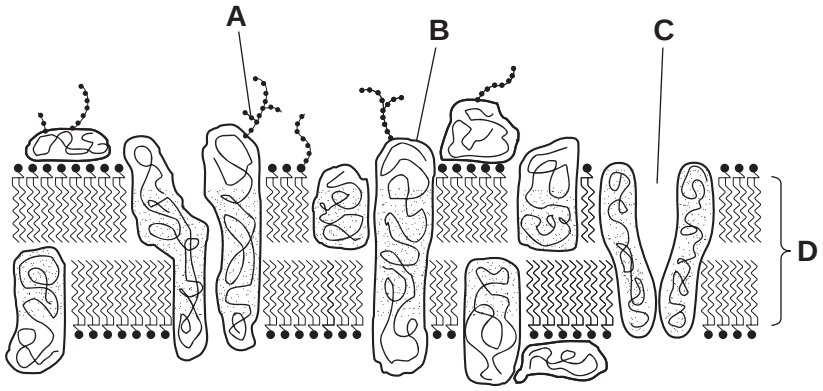
16 In an experiment, 5 cm^3 of 1 % salivary amylase are added to 100 cm^3 of different concentrations of starch.

Which graph shows the results of plotting the initial rate of reaction (y-axis) against the concentration of substrate (x-axis)?



17 Cystic fibrosis is a disease where Cl^- ions are unable to be transported into cells.

Which structure in the cell surface membrane is faulty?



18 Cancer cells divide out of control, forming tumours.

Which statement describes the difference between a cancer cell and a normal cell?

A Cancer cells do not undergo cytokinesis.

B Cancer cells have a shorter interphase.

C Cancer cells do not have metaphase.

D Only cancer cells have mutated DNA.

19 Which statement describes a cell that is capable of reproduction and belonging to a haploid organism?

A It has chromosomes that contain one polynucleotide chain.

B It is capable of carrying out a reduction division to form gametes.

C It possesses two copies of each gene as a result of fertilisation.

D It will undergo cell division by mitosis during asexual reproduction.

20 During which stage of the mitotic cell cycle is DNA replicated?

A anaphase

B interphase

C prophase

D telophase

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21 What does the enzyme DNA polymerase synthesise in a cell?

A a polypeptide using DNA as a template

B a strand of DNA using a polypeptide as a template

C a strand of DNA using DNA as a template

D a strand of mRNA using DNA as a template

22 The following statements describe events that take place during DNA replication and transcription.

Which statement is **not** correct?

		DNA replication	transcription
A	adenine pairs with thymine	yes	no
B	both DNA polynucleotide chains act as templates	yes	no
C	the original DNA molecule is changed after the process	no	yes
D	uracil pairs with adenine	no	yes

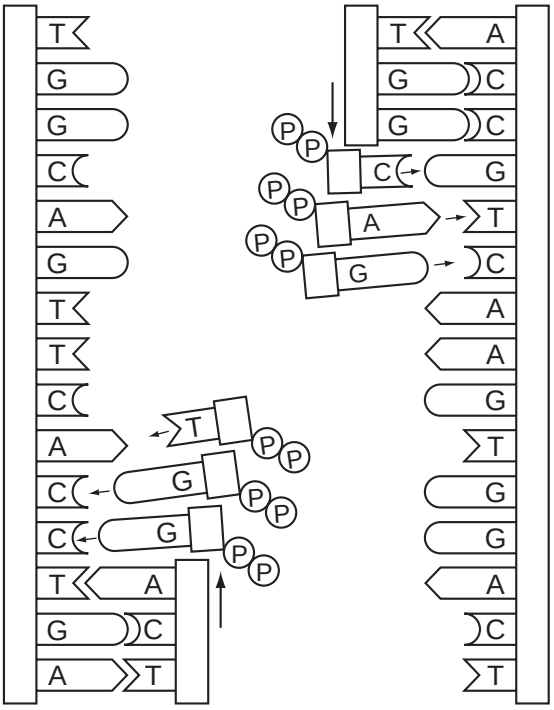
23 A peptide consists of ten amino acids of four different kinds.

What is the theoretical minimum number of tRNA molecules required to translate the mRNA for this peptide?

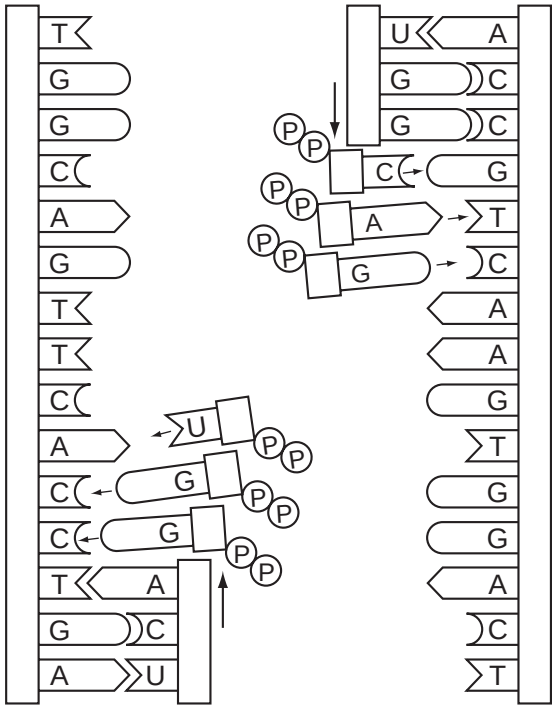
A 4 **B** 10 **C** 12 **D** 30

24 Which diagram shows the semi-conservative replication of a section of a molecule of DNA?

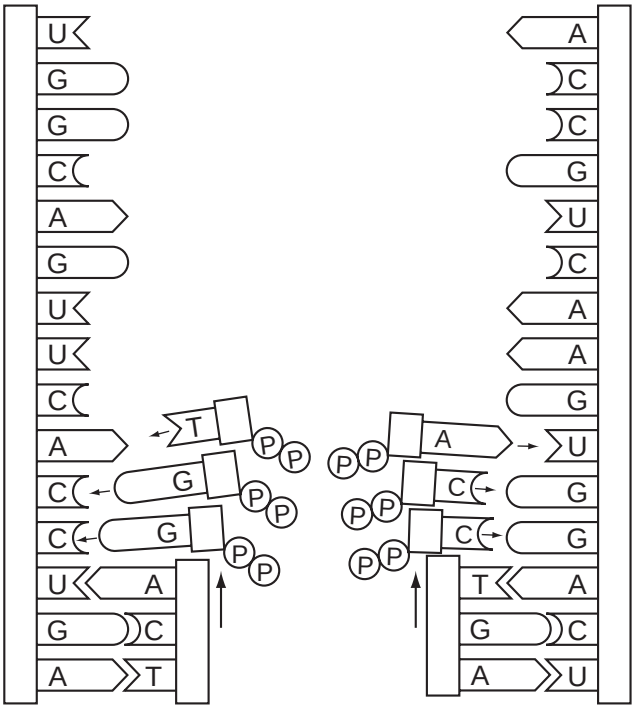
A



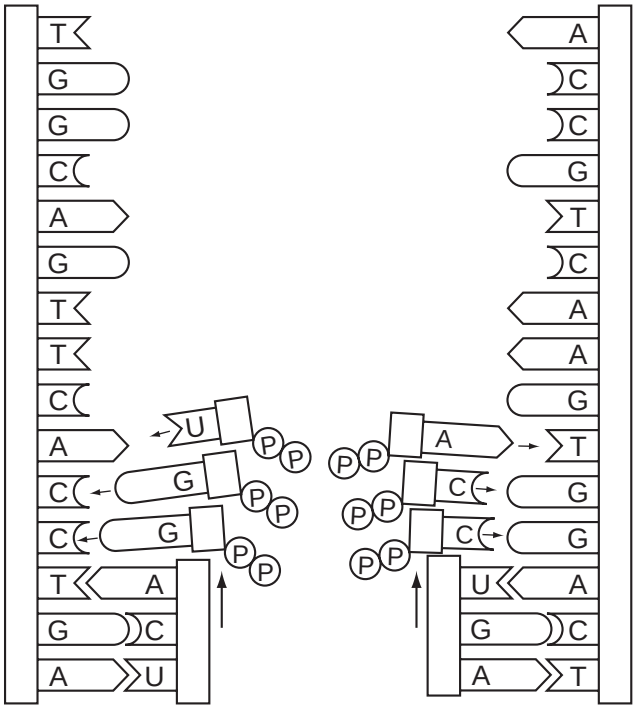
B



C



D



25 What is the sequence of events in the translocation of assimilates?

A active loading of sucrose into sieve elements via companion cells at the source, increased hydrostatic pressure, mass flow, unloading at the sink

B hydrolysis of storage compounds in sinks, lowered water potential in sink, unloading of sucrose from sieve elements down the water potential gradient, mass flow from the source

C lowered pressure in sieve elements at the source, movement of sucrose down the pressure gradient from companion cells, mass flow down a diffusion gradient to the sink

D mass flow of dissolved sucrose via companion cells into the sieve element at the source, lowered hydrostatic pressure, diffusion of sucrose down concentration gradient to sink, active unloading

26 Which description states some of the features of xylem vessels?

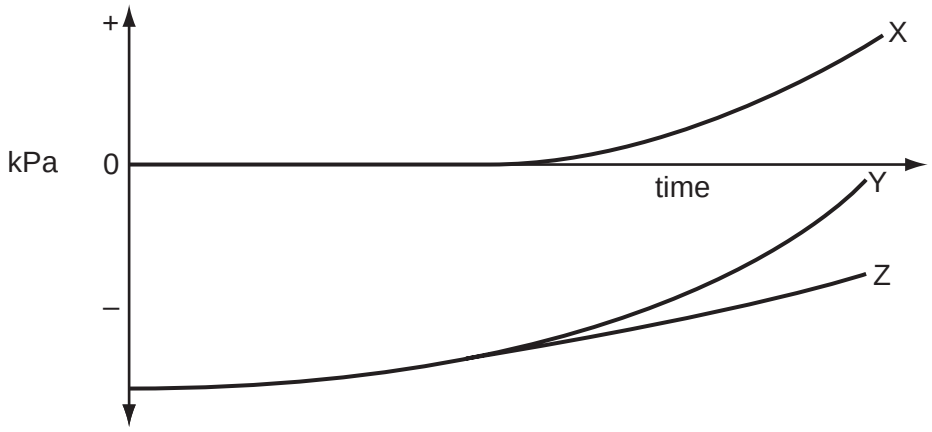
A cells joined to form a tube, pits at intervals, sieve plates between cells, surrounded by the endodermis in roots

B contains cells joined end to end, containing peripheral cytoplasm, cell walls with secondary thickening of lignin, located to the outside of phloem in vascular bundles

C contains elongated cells with end walls broken down, located in vascular bundles in the stem and centrally in the roots

D dead elongated cells, lignified cell walls with pits at intervals, associated with companion cells in the roots only

27 The diagram shows the changes in pressure potential (Ψ_P), solute potential (Ψ_S) and water potential (Ψ) when a plasmolysed plant cell is placed in pure water.

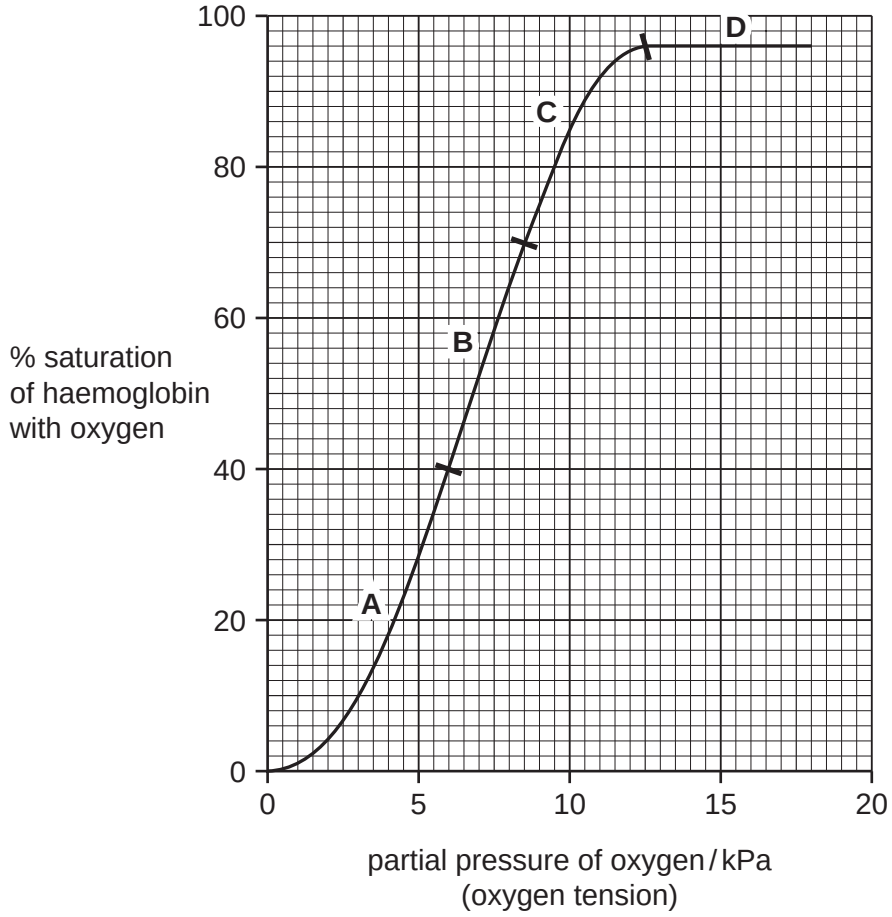


Which shows the correct curves for each potential?

	X	Y	Z
A	Ψ	Ψ_P	Ψ_S
B	Ψ_P	Ψ_S	Ψ
C	Ψ_S	Ψ	Ψ_P
D	Ψ_P	Ψ	Ψ_S

28 The graph shows the percentage saturation of haemoglobin with oxygen at different partial pressures of oxygen.

Which range of partial pressures of oxygen produces the greatest change of percentage saturation of haemoglobin per unit oxygen tension?



29 When stained, which features, visible under the light microscope, are part of the cells of the plant tissues listed in the table?

	xylem elements	sieve tube elements	companion cells
A	cytoplasm	lignin	nuclei
B	lignin	cytoplasm	nuclei
C	lignin	nuclei	cytoplasm
D	nuclei	cytoplasm	lignin

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30 A disease damages alveoli.

Which effect does this have on the gas exchange surface area and volume of the lungs?

	surface area	volume
A	decreased	decreased
B	decreased	no change
C	increased	increased
D	increased	no change

31 An oxygen molecule diffuses directly from the air in an alveolus to haemoglobin in a red blood cell.

What is the minimum number of cell surface membranes through which this molecule must pass?

A 2 **B** 3 **C** 4 **D** 5

32 What would be seen in an electron micrograph of a bronchus wall?

1 cartilage cells

2 ciliated cells

3 exocytotic vesicles

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

33 Below are correct statements comparing blood, tissue fluid and lymph in a capillary bed.

- W lacks large plasma proteins and red blood cells and has a higher water potential than Z.
- X is at a lower pressure than Y and contains red blood cells and large plasma proteins.
- Y is at a higher pressure than W and contains red blood cells and large plasma proteins.
- Z is at a lower pressure than Y and lacks red blood cells.

Which correctly identifies W, X, Y and Z?

	W	X	Y	Z
A	blood entering capillary	lymph	blood leaving capillary	tissue fluid
B	blood leaving capillary	lymph	tissue fluid	blood entering capillary
C	lymph	blood entering capillary	tissue fluid	blood leaving capillary
D	tissue fluid	blood leaving capillary	blood entering capillary	lymph

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34 After an immune response, memory cells remain in the blood for a long time.

What is the function of memory cells?

A They can ingest invading bacteria.

B They contain lots of antibodies.

C They divide to make plasma cells.

D They kill cells infected with virus.

35 What are produced by B-lymphocytes?

	killer lymphocyte clones	memory cells	plasma cell clones
A	✓	✓	✗
B	✓	✗	✓
C	✓	✓	✓
D	✗	✓	✓

36 Scientists are concerned that avian (bird) flu caused by the H5N1 virus, could infect humans and cause a pandemic.

If this occurs, which factors could help prevent humans spreading the disease?

1 killing all poultry

2 reducing all air flights

3 taking a course of antibiotics

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

37 A country has fewer than 2.5 deaths per 100 000 people from TB in one year and the next year this rose to 25 deaths per 100 000.

What may have contributed to this change?

1 decrease in contact tracing

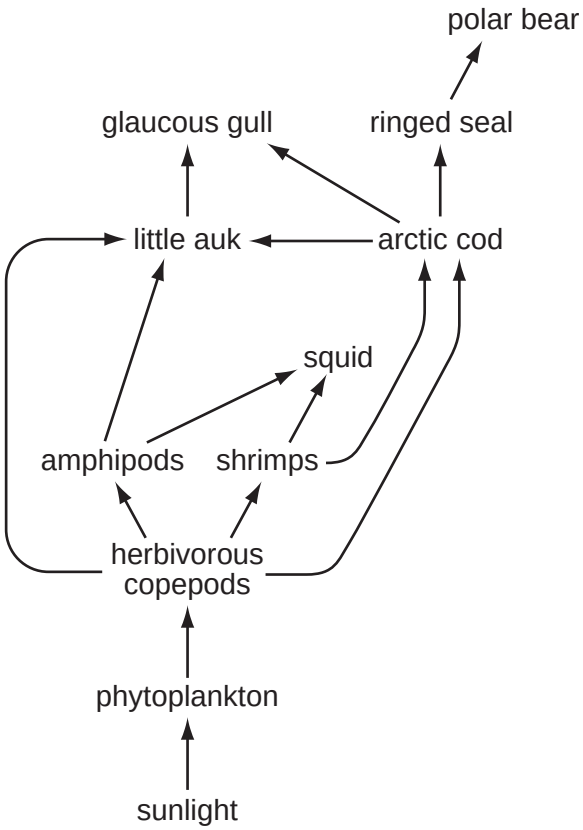
2 increase in refugee camps

3 water supply contaminated by sewage

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

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38 The diagram shows an arctic ecosystem.



How many trophic levels are represented?

A 3 **B** 4 **C** 5 **D** 6

39 A tree carries out photosynthesis and provides organic compounds for other organisms in a forest. It takes carbon dioxide from and returns oxygen to the atmosphere. It takes water from the soil into its roots and its leaves lose water to the atmosphere. Many other organisms live in the tree.

Which term applies to the description of the tree?

A ecosystem

B habitat

C niche

D trophic level

40 In an investigation, discs of 2.5 cm diameter were cut from leaves. Fifty discs were put into three identical bags with different net sizes and buried in newly dug soil at a depth of 3 cm.

At 60 day intervals the bags were dug up and the leaf discs measured to see how much of the leaf area had disappeared.

The table shows the percentage of leaf discs remaining in each bag.

	percentage of leaf disks remaining		
time / days	net size 7 mm	net size 0.5 mm	net size 0.03 mm
0	100	100	100
60	80	94	100
120	30	81	100
180	14	67	100
240	9	63	100
300	6	61	100

Which organisms are most important for breaking down the leaves?

A earthworms and beetles

B microorganisms only

C small invertebrates only

D small invertebrates and microorganisms

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