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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 2011**

1 hour

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

7213346851

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, highlighters, glue or correction fluid.
Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.

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 separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.

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UNIVERSITY of CAMBRIDGE International Examinations

1 What is the diameter of a typical prokaryote, such as *Streptococcus*?

A 7.5×10^{1} nm

B 7.5×10^{2} nm

C 7.5×10^{0} μm

D 7.5×10^{1} μm

2 Which cell components contain ribosomes?

1 chloroplast

2 mitochondrion

3 nucleus

4 cytoplasm

A 1, 2, 3 and 4

B 1, 2 and 3 only

C 1 and 2 only

D 3 and 4 only

3 Where would cristae be found in a cell?

1 endoplasmic reticulum

2 Golgi apparatus

3 mitochondrion

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

4 Which cell components are present in **all** prokaryotic cells?

	cell surface membrane	cell wall	endoplasmic reticulum	flagellum
A	✓	✓	✗	✓
B	✓	✗	✓	✗
C	✓	✓	✗	✗
D	✗	✓	✓	✓

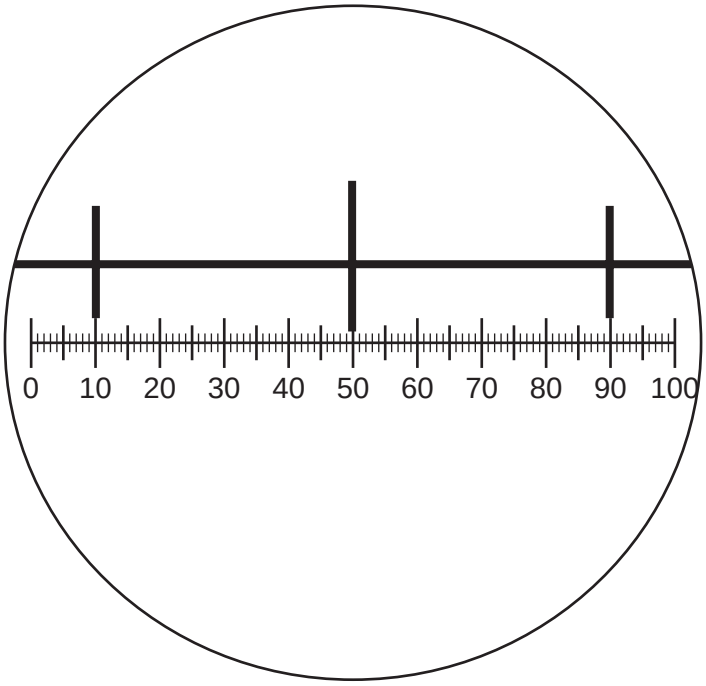
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✓ = present

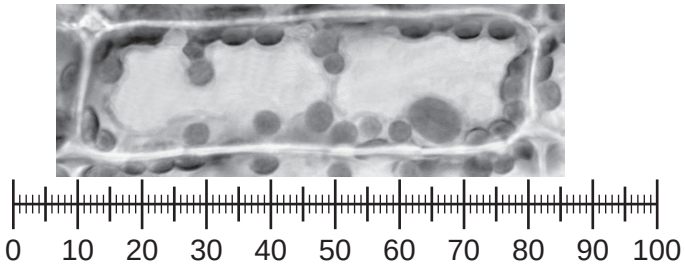
✗ = not present

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5 The diagram shows a stage micrometer on which the small divisions are 0.1 mm. It is viewed through an eyepiece containing a graticule.



The stage micrometer is replaced by a slide of a plant cell.



What is the length of the nucleus?

A 0.8 mm **B** 8 μm **C** 25 μm **D** 200 μm

6 In general, eukaryotic cells undergo division much slower than prokaryotic cells.

What is the reason for this?

A Eukaryotes break down the nuclear membrane during mitosis.

B Eukaryotes have many more mitochondria than prokaryotes.

C Prokaryotes do not contain any centrioles.

D Prokaryotic cells are a lot smaller than eukaryotic cells.

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7 Which is the strongest type of bonding found in proteins?

A disulfide bonds

B hydrogen bonds

C hydrophobic interactions

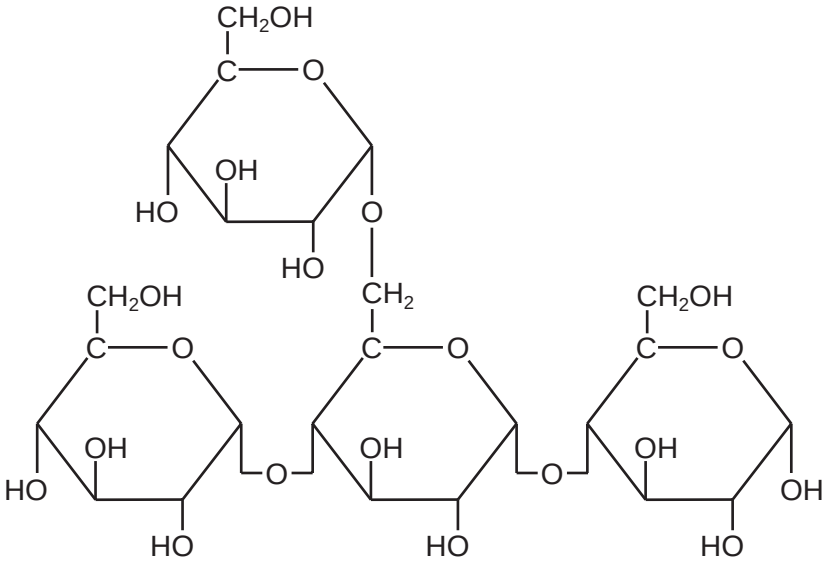
D ionic bonds

8 Two disaccharides are maltose and sucrose. Maltose is formed from two molecules of glucose, whilst sucrose is formed from fructose and glucose.

Which row shows the molecular formulae of the two disaccharides?

	maltose	sucrose
A	$C_{12}H_{22}O_{11}$	$C_{12}H_{22}O_{11}$
B	$C_{12}H_{22}O_{11}$	$C_{12}H_{24}O_{12}$
C	$C_{12}H_{24}O_{12}$	$C_{12}H_{22}O_{11}$
D	$C_{12}H_{24}O_{12}$	$C_{12}H_{24}O_{12}$

9 The diagram shows a carbohydrate molecule.



Of which polymers could this be a part?

A amylopectin and cellulose

B amylose and starch

C glycogen and amylose

D starch and glycogen

10 Solutions of biological molecules are tested for sugars. The table shows the colours of the solutions after testing.

Which may contain reducing sugars?

solution	heated with Benedict's solution	boiled with hydrochloric acid, neutralised, then heated with Benedict's solution
1	blue	yellow
2	green	orange
3	orange	red

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

11 Which property of water makes it most suitable for transport in eukaryotic organisms?

A density

B ionisation

C latent heat of vaporisation

D solvent properties

12 Which statements about the effect of **all** enzyme inhibitors are correct?

1 alter the shape of the active site

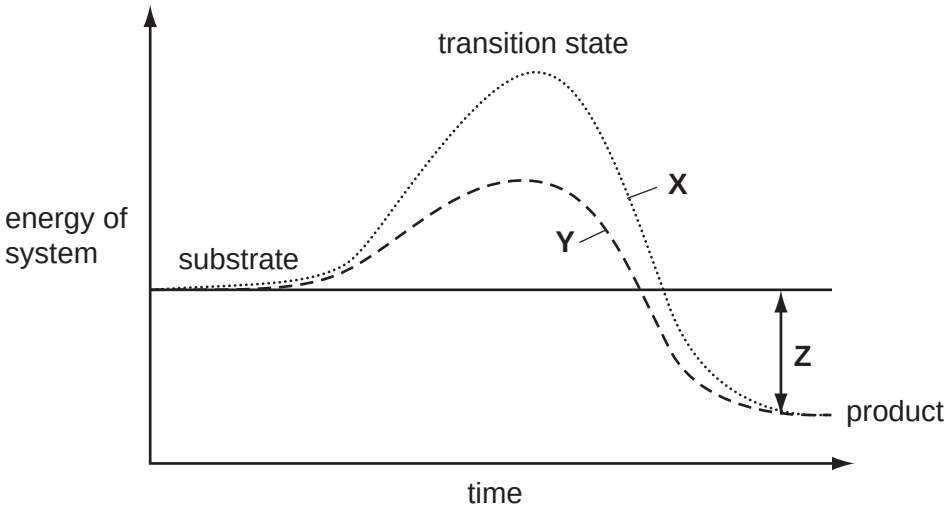
2 denature the enzyme

3 reduce the rate of the enzyme catalysed reaction

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

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13 The graph shows the effect of an enzyme on a reaction.



Which combination identifies **X**, **Y** and **Z**?

	X	Y	Z
A	catalysed reaction	uncatalysed reaction	energy lost by product
B	catalysed reaction	uncatalysed reaction	total energy lost during reaction
C	uncatalysed reaction	catalysed reaction	energy gained by product
D	uncatalysed reaction	catalysed reaction	total energy change during reaction

14 Single-celled animals that live in fresh water have a vacuole that contracts regularly to remove excess water. Single-celled plants that live in fresh water do not have a similar vacuole.

Which statement explains why only these animals need this vacuole?

A Plant cell cytoplasm and animal cell cytoplasm both have a lower water potential than fresh water.

B Plant cell sap has the same water potential as fresh water, animal cytoplasm has a lower water potential than fresh water.

C Plant cell walls are impermeable to water, animal cell surface membranes are permeable to water.

D Plant cell walls restrict the entry of water, animal cell membranes allow the free entry of water.

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15 Which statement defines active transport?

A movement of large molecules through the cell surface membrane into the cytoplasm of a cell

B movement of molecules or ions from where they are in a low concentration to where they are in a higher concentration

C movement of molecules or ions from where they are in a high concentration to where they are in a lower concentration

D net movement of water molecules across a partially permeable membrane from a region of higher water potential to one of lower water potential

16 Which statements about the components of the cell surface membrane are correct?

1 Diffusion can take place through lipids and protein pores.

2 Endocytosis only involves lipids.

3 Facilitated diffusion only involves proteins.

4 Osmosis only involves proteins.

A 1, 2, 3 and 4

B 1, 3 and 4 only

C 1 and 3 only

D 2 and 4 only

17 Which statement about a diploid cell is **not** correct?

A It can undergo a mitotic division to allow growth to occur.

B It can undergo a mitotic division to repair a cell.

C It can undergo a reduction division to form haploid cells.

D It is one that possesses two complete sets of chromosomes.

18 Meiosis and mitosis are two types of cell division.

A cell has 10 chromosomes before it divides.

How many chromosomes will it have after dividing by meiosis or mitosis?

	meiosis	mitosis
A	5	10
B	5	20
C	10	5
D	20	5

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19 A gene codes for the production of a protein, p53, that binds to damaged DNA during interphase and prevents its replication. A carcinogen in cigarette smoke mutates this gene.

Which statement explains why this mutation may cause cancer?

A Lack of p53 allows cells to undergo mitosis.

B Lack of p53 allows cells with damaged DNA to replicate.

C The carcinogen in cigarette smoke increases the rate of cell division.

D The p53 causes uncontrolled cell division.

20 In a genetic engineering experiment a piece of double-stranded DNA containing 6000 nucleotides coding for a specific polypeptide is transcribed and translated.

What is the total number of amino acids in this polypeptide?

A 500 **B** 1000 **C** 2000 **D** 3000

21 What makes the exact copying of DNA molecules possible?

A base pairing

B hydrogen bonding between nucleotides

C sugar-phosphate backbone

D the double helix shape

22 Which molecule has its synthesis directly controlled by DNA?

A amylase

B cholesterol

C glycogen

D phospholipid

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23 Bacteria were grown in a medium containing ^{15}N. After several generations, all of the DNA contained ^{15}N. Some of these bacteria were transferred to a medium containing the common isotope of nitrogen, ^{14}N. The bacteria were allowed to divide once. The DNA of some of these bacteria was extracted and analysed. This DNA was all hybrid DNA containing equal amounts of ^{14}N and ^{15}N.

The remaining bacteria were left in the medium with ^{14}N and allowed to divide one more time. The DNA of some of these bacteria was extracted and analysed.

What is the composition of this DNA?

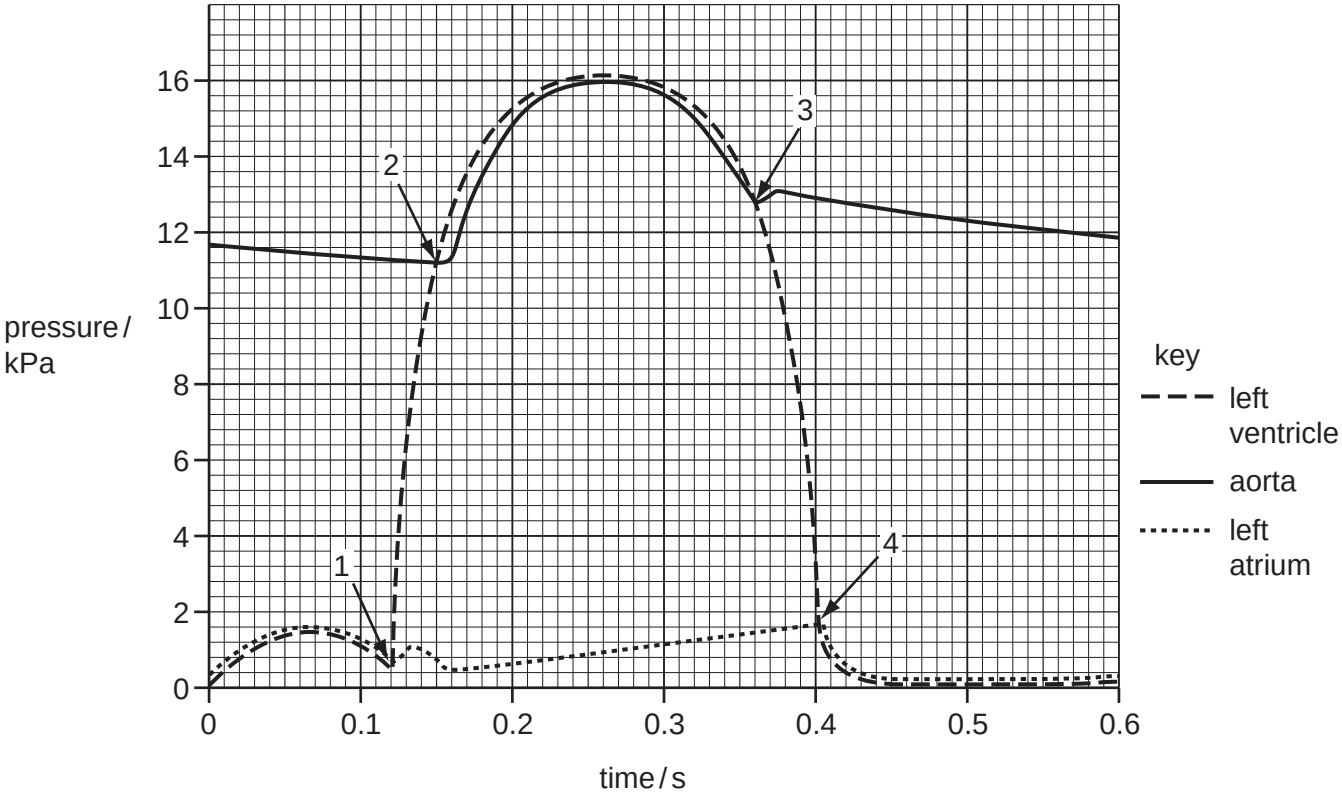
A 25 % hybrid DNA

B 50 % hybrid DNA

C 75 % hybrid DNA

D 100 % hybrid DNA

24 The diagram shows pressure changes in the left side of the heart and aorta over time. The length of this cardiac cycle is 0.6 s. Points 1, 2, 3 and 4 indicate when atrio-ventricular valves and semi-lunar valves either open or close.



What is the total time during one cardiac cycle that the atrio-ventricular valves and the semi-lunar valves are both closed at the same time?

A 0.03 s **B** 0.04 s **C** 0.07 s **D** 0.21 s

25 The large arteries close to the heart have a thick elastic layer in their walls.

Which statements about this layer are correct?

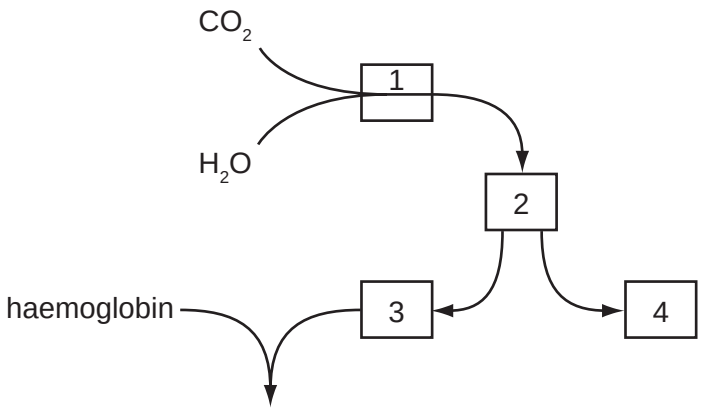
1 evens out the blood flow from the heart

2 reduces friction within these blood vessels

3 prevents too much pressure bursting the artery wall

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

26 The diagram shows part played by red blood cells in the transport of carbon dioxide.



Which row is correct?

	1	2	3	4
A	carbaminohaemoglobin	haemoglobinic acid	hydrogen ions	hydrogen carbonate ions
B	carbonic anhydrase	carbonic acid	hydrogen ions	hydrogen carbonate ions
C	carboxyhaemoglobin	carbonic anhydrase	carbonic acid	carbon dioxide
D	haemoglobinic acid	carbonic acid	hydrogen carbonate ions	hydrogen ions

27 Which components of blood are also present in lymph?

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

key

✓ = present

✗ = absent

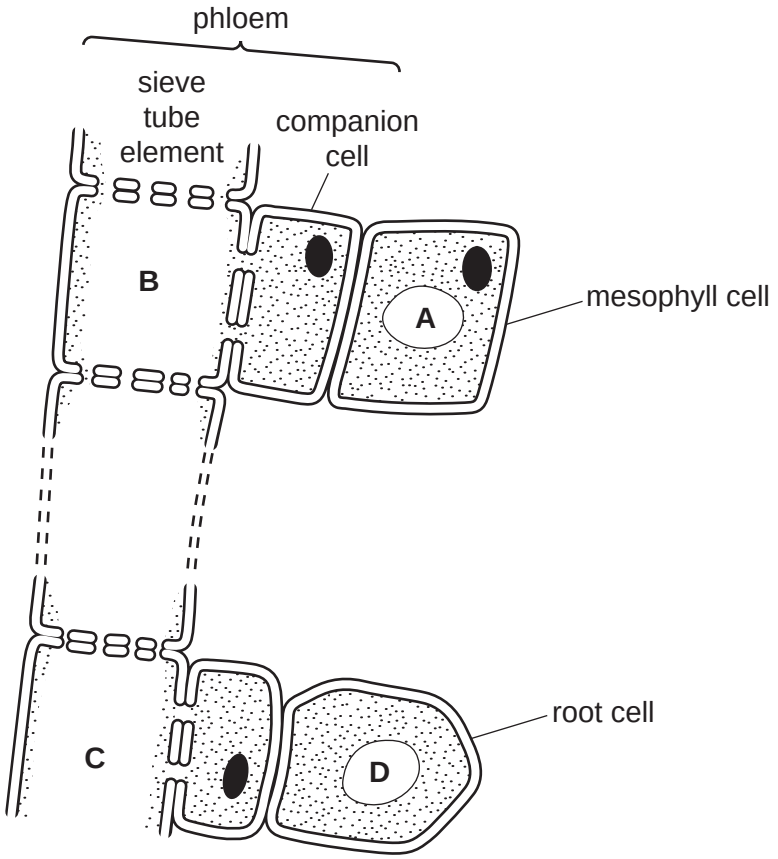
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28 In which combination of environmental conditions are the stomata of a plant most likely to close?

	atmospheric humidity	soil water potential	wind speed
A	high	low	high
B	high	low	low
C	low	high	high
D	low	low	high

29 The diagram shows the tissues involved in the transport of sucrose in a plant.

Where is the highest concentration of sucrose?



30 Which evidence supports the cohesion-tension theory for the movement of water in flowering plants?

1 When the rate of transpiration of a tree is maximum, the diameter of the trunk is minimum.

2 When a plant shoot is removed close to the base of the stem, sap leaks out from the cut.

3 Evaporation of water from a porous pot can exert a force that draws water up a glass tube attached underneath the pot.

4 Droplets of water form at the edge of leaves of plants growing in conditions of soil with high water content and air with high humidity.

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

31 What describes how smoking contributes to cardiovascular disease?

1 Both nicotine and carbon monoxide speed up the development of plaques in arteries.

2 Nicotine increases blood pressure and heart rate and so increases the body's demand for oxygen.

3 Smoking interacts with other risk factors and increases the blood cholesterol level.

4 Tar is deposited in the lining of artery walls and increases the development of atherosclerosis.

A 4 only

B 2 and 4 only

C 1, 2 and 3 only

D 1, 2, 3 and 4

32 Where in the respiratory system are both goblet cells and ciliated epithelium found?

	trachea	bronchi	bronchioles
A	✓	✓	✗
B	✓	✗	✗
C	✗	✓	✓
D	✗	✗	✓

key

✓ = found

✗ = not found

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33 What is an effect of inhaling tobacco smoke?

A decreased mucus production

B increased movement of cilia

C less oxygen transport by blood

D narrowing of the bronchioles

34 Which does **not** increase the efficiency of gaseous exchange in the alveoli?

A The blood capillaries and alveoli have a large total surface area.

B The blood flow is slowed as it passes through the pulmonary capillaries.

C The walls of the alveoli and capillaries are moist.

D The walls of the alveoli and capillaries are very thin.

35 Which details are correct?

	disease	method of controlling spread	treatment	causative agent
A	AIDS	use condoms during sexual intercourse	antibiotics	virus
B	cholera	water treatment	oral rehydration	bacterium
C	malaria	quinine	vaccination	protoctist
D	TB	isolate patients	antibiotics	virus

36 Where are antibodies and antigens found?

	on surface of pathogens	on surface of phagocytes	in blood plasma
A	antibodies	antibodies	antigens
B	antibodies	antigens	antibodies
C	antigens	antibodies	antigens
D	antigens	antigens	antibodies

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37 Breast milk produced by the mother for a new-born baby contains antibodies.

What do these antibodies provide?

A artificial active immunity

B artificial passive immunity

C natural active immunity

D natural passive immunity

38 Which group could be a population?

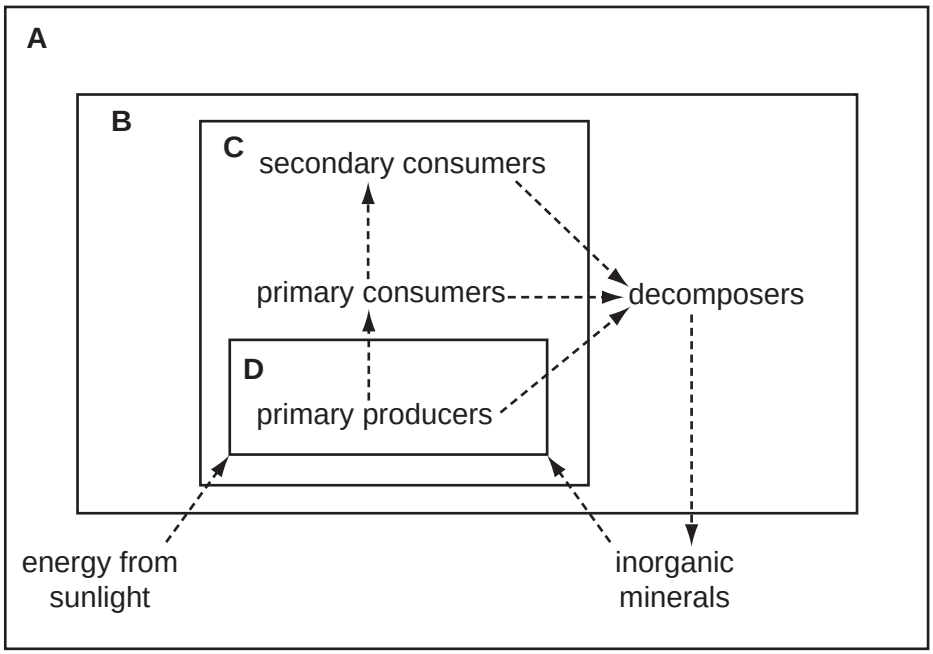
A all the animals and plants on an isolated island

B all the birds counted in one day in a garden

C all the bacteria in a colony of *Bacillus subtilis*

D all the insects occupying three hectares of farmland

39 Which box contains only the parts of an ecosystem which are classed as a food web?



40 The graph shows the annual changes of the following factors in a lake.

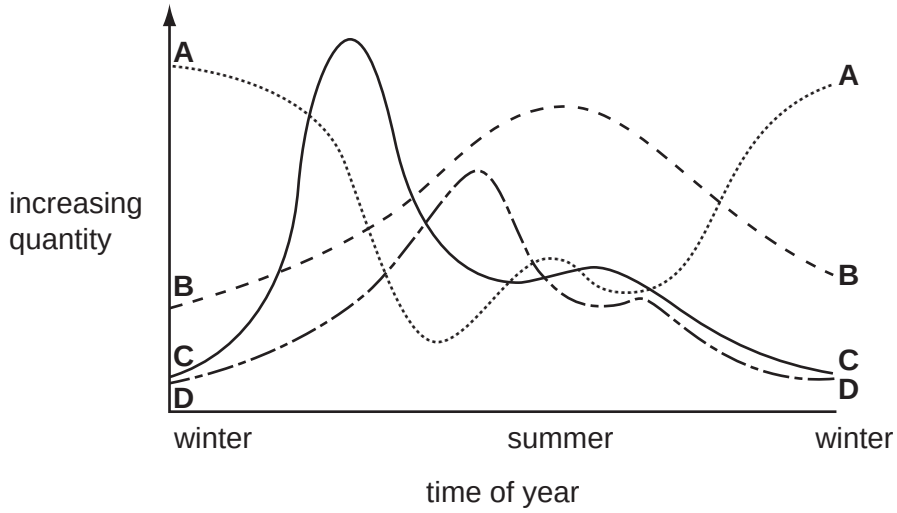
intensity of light per day

numbers of producers

numbers of primary consumers

quantity of nutrients

Which curve represents the numbers of primary consumers?



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BIOLOGY **9700/12**

Paper 1 Multiple Choice **October/November 2011**

1 hour

Additional Materials: Multiple Choice Answer Sheet
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Any rough working should be done in this booklet.

This document consists of **18** printed pages and **2** blank pages.

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1 What is the diameter of a typical plant cell?

A 1.0×10^2 nm

B 4.0×10^2 nm

C 4.0×10^0 μm

D 4.0×10^1 μm

2 Where would cisternae be found in a cell?

1 endoplasmic reticulum

2 Golgi apparatus

3 mitochondrion

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

3 Ribosomes exist as separate subunits that bind together during protein synthesis.

What do these subunits consist of?

A mRNA and protein

B mRNA and tRNA

C rRNA and protein

D rRNA and tRNA

4 Which cell components contain mRNA?

1 chloroplast

2 mitochondrion

3 nucleus

4 rough endoplasmic reticulum

A 1, 2, 3 and 4

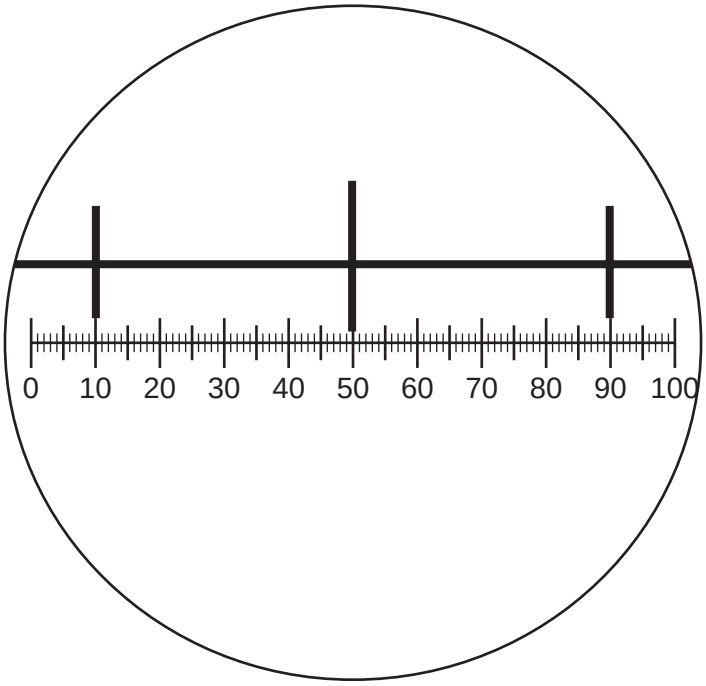
B 1, 2 and 3 only

C 2, 3 and 4 only

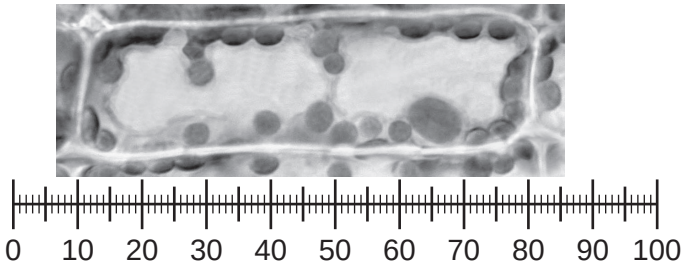
D 3 and 4 only

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5 The diagram shows a stage micrometer on which the small divisions are 0.1 mm. It is viewed through an eyepiece containing a graticule.



The stage micrometer is replaced by a slide of a plant cell.



What is the width of a chloroplast?

A 0.5 mm **B** 10 μm **C** 50 μm **D** 100 μm

6 Which processes occur in eukaryotes and prokaryotes?

1 hydrolysis
2 mitosis
3 transcription
4 translation

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

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7 High concentrations of urea break all bonds, except covalent bonds, in protein molecules.

Which level of protein structure would remain unchanged when a protein is treated with urea?

A primary

B secondary

C tertiary

D quaternary

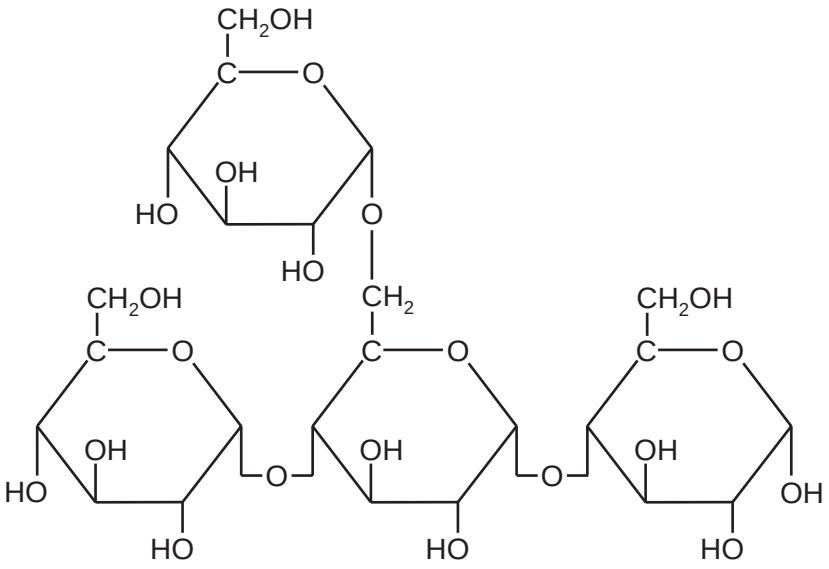
8 Two disaccharides are cellobiose and sucrose. Cellobiose is formed from two molecules of glucose, whilst sucrose is formed from fructose and glucose.

Which row shows the molecular formulae of the two disaccharides?

	cellobiose	sucrose
A	$C_{12}H_{22}O_{11}$	$C_{12}H_{22}O_{11}$
B	$C_{12}H_{22}O_{11}$	$C_{12}H_{24}O_{12}$
C	$C_{12}H_{24}O_{12}$	$C_{12}H_{22}O_{11}$
D	$C_{12}H_{24}O_{12}$	$C_{12}H_{24}O_{12}$

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9 The diagram shows part of a carbohydrate molecule.



Which polymers could this be part of?

1 amylopectin

2 amylose

3 glycogen

4 starch

A 1, 2 and 3

B 1, 3 and 4

C 2 and 4 only

D 3 and 4 only

10 Solutions of biological molecules are tested for sugars. The table shows the colours of the solutions after testing.

solution	heated with Benedict's solution	boiled with hydrochloric acid, neutralised, then heated with Benedict's solution
1	blue	orange
2	orange	green
3	yellow	red

Which may contain non-reducing sugars?

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

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11 When a lake begins to freeze, which properties of water are needed for fish to survive?

1 Water has a high surface tension.

2 Water has a high latent heat of vaporisation.

3 Water has a high thermal capacity.

4 Water has its maximum density at 4 °C.

	1	2	3	4
A	✓	✓	✓	✗
B	✓	✗	✓	✗
C	✗	✓	✗	✓
D	✗	✗	✓	✓

key

✓ = needed

✗ = not needed

12 In an enzyme-catalysed reaction, which combination of inhibitor and substrate would result in the highest rate of reaction?

	inhibitor	substrate concentration
A	competitive	high
B	competitive	low
C	non-competitive	high
D	non-competitive	low

13 Following a heart attack, the enzyme lactate dehydrogenase leaks into the blood plasma from damaged heart muscle.

Which steps are required to obtain the best estimate of lactate dehydrogenase activity in a sample of blood plasma?

	sterilise blood plasma by heating	incubate with substrate for lactate dehydrogenase	incubate with lactate dehydrogenase inhibitor
A	✓	✓	✓
B	✗	✓	✓
C	✗	✓	✗
D	✗	✗	✓

key

✓ = step required

✗ = step not required

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14 Red blood cells were placed in a solution of sodium chloride with a less negative water potential than the cell contents. Haemoglobin was released from the cells.

By what process was the haemoglobin released?

A active transport

B exocytosis

C facilitated diffusion

D lysis of cell

15 The table shows three processes that contribute to transport across cell surface membranes.

Which processes are the result of random movement of molecules?

	diffusion	facilitated diffusion	osmosis
A	✓	✓	✗
B	✓	✓	✓
C	✗	✓	✓
D	✗	✗	✗

key

✓ = random

✗ = non-random

16 The cell surface membranes of plants adapted to cold conditions change as the weather gets colder, allowing the plants to carry out exocytosis.

Which change occurs?

A a decrease in the ratio of proteins to saturated phospholipids

B a decrease in the ratio of unsaturated phospholipids to saturated phospholipids

C an increase in the ratio of proteins to unsaturated phospholipids

D an increase in the ratio of unsaturated phospholipids to saturated phospholipids

17 Which statements about a diploid cell are correct?

1 can divide by mitosis to repair itself

2 possesses two complete sets of chromosomes

3 undergoes a reduction division to form haploid cells

4 undergoes mitotic division to allow growth to occur

A 1, 2, 3 and 4

B 1, 2 and 3 only

C 1, 2 and 4 only

D 2, 3 and 4 only

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18 Meiosis and mitosis are two types of cell division.

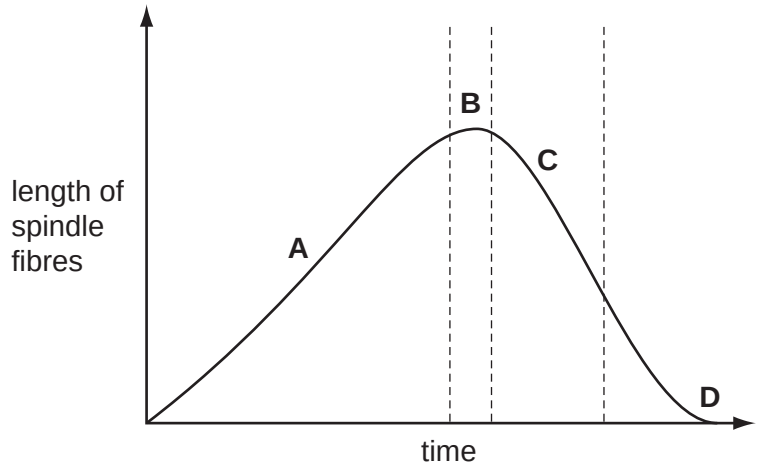
A cell has 20 chromosomes before it divides.

How many chromosomes will it have after dividing by meiosis or mitosis?

	meiosis	mitosis
A	5	20
B	10	20
C	20	10
D	40	10

19 The graph shows the length of the spindle fibres during mitosis.

Which region of the graph shows when the centromeres detach from the spindle fibres?



20 In a genetic engineering experiment, a piece of double-stranded DNA containing 12×10^3 nucleotides coding for specific polypeptide is transcribed and translated.

What is the total number of amino acids in this polypeptide?

A 6×10^3 **B** 4×10^3 **C** 2×10^3 **D** 1×10^3

21 What is the correct sequence for the processes involved in the formation of an enzyme in a cell?

A transcription → condensation → translation → ionic bonding

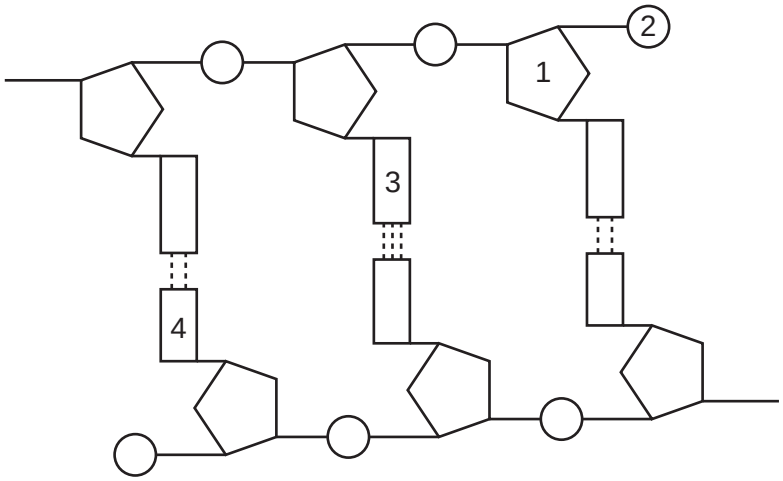
B translation → hydrogen bonding → transcription → condensation

C transcription → translation → condensation → ionic bonding

D translation → transcription → ionic bonding → hydrogen bonding

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22 The diagram shows part of a DNA molecule.



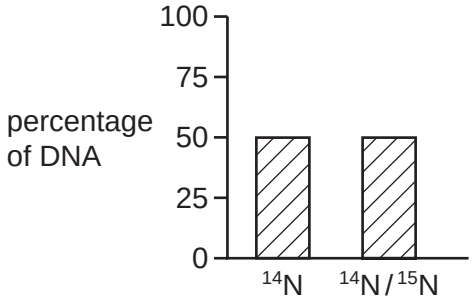
Which row correctly identifies the structures labelled 1, 2, 3 and 4?

	1	2	3	4
A	cytosine	phosphate	guanine	deoxyribose sugar
B	deoxyribose sugar	phosphate	adenine	cytosine
C	deoxyribose sugar	phosphate	cytosine	thymine
D	phosphate	deoxyribose sugar	cytosine	adenine

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23 Bacteria were grown in a medium containing ^{15}N. After several generations, all of the DNA contained ^{15}N. Some of these bacteria were transferred to a medium containing the common isotope of nitrogen, ^{14}N. The bacteria were allowed to divide once. The DNA of some of these bacteria was extracted and analysed. This DNA was all hybrid DNA containing equal amounts of ^{14}N and ^{15}N.

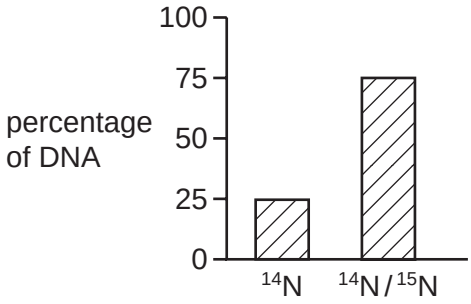
Some bacteria from the medium with ^{15}N were transferred into a medium of ^{14}N. The bacteria were allowed to divide twice. The graph shows the percentages of ^{14}N and ^{15}N in the DNA of these bacteria.



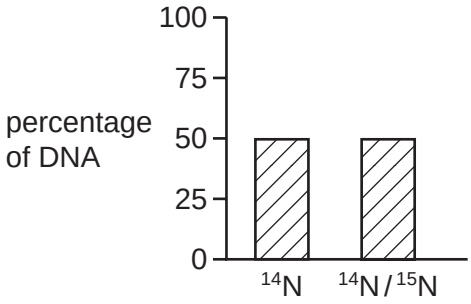
Some bacteria from the medium with ^{15}N were transferred into a medium of ^{14}N. The bacteria were allowed to divide three times.

What would be the percentages of ^{14}N and ^{15}N in the DNA extracted from these bacteria?

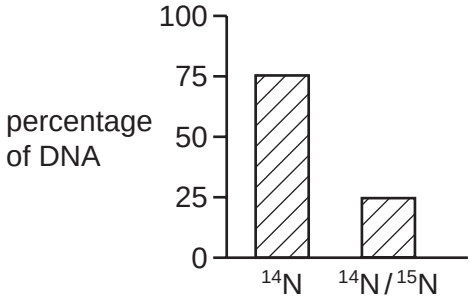
A



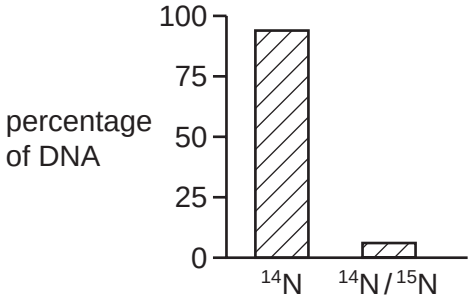
B



C

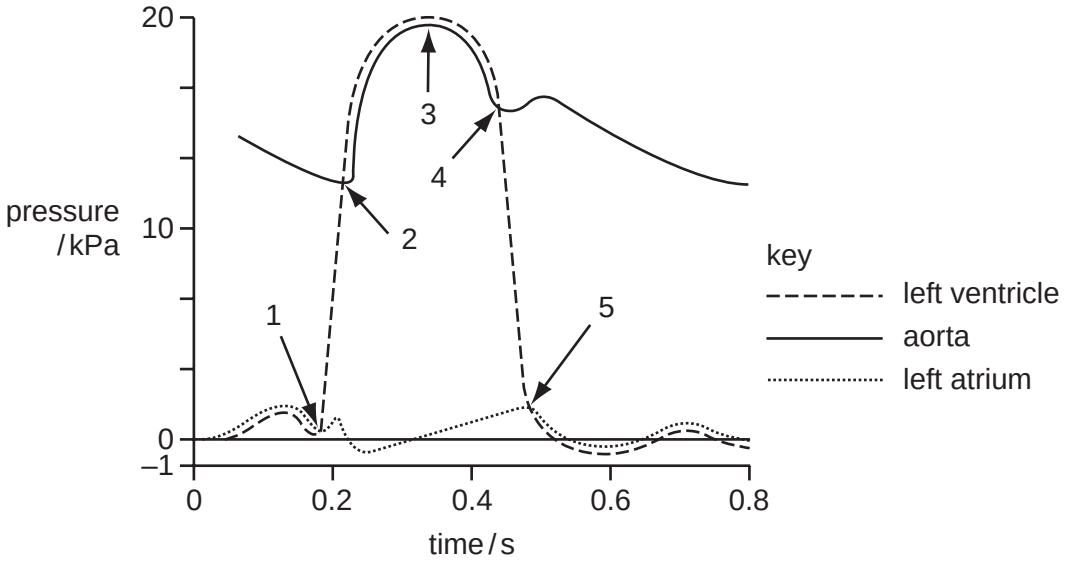


D



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24 The diagram shows pressure changes in the aorta, left atrium and left ventricle during the cardiac cycle.



Which row explains the changes in the left ventricle at different times on the graph?

	region of graph	muscles of ventricle wall	volume of left ventricle
A	between 1 and 2	contract	remains constant
B	between 2 and 3	relax	increases
C	between 3 and 4	contract	remains constant
D	between 4 and 5	relax	decreases

25 Which row shows the changes in concentration in the red blood cells when carbon dioxide diffuses from respiring cells?

	carbonic anhydrase	hydrogencarbonate ions	hydrogen ions
A	decreases	no change	no change
B	increases	increases	increases
C	no change	decrease	increase
D	no change	increase	increase

26 The following are all structural components of blood vessels.

1 collagen fibres

2 elastic fibres

3 endothelial cells

4 smooth muscle cells

Which row shows the distribution of these components in different blood vessels?

	artery	vein
A	1, 2 and 4	1, 3 and 4
B	2, 3 and 4	1, 3 and 4
C	1, 2, 3 and 4	1, 2, 3 and 4
D	1, 2, 3 and 4	2, 3 and 4

27 Which components of blood are also present in tissue fluid?

	phagocytes	proteins	sodium ions
A	✗	✓	✗
B	✓	✓	✓
C	✓	✗	✓
D	✗	✓	✓

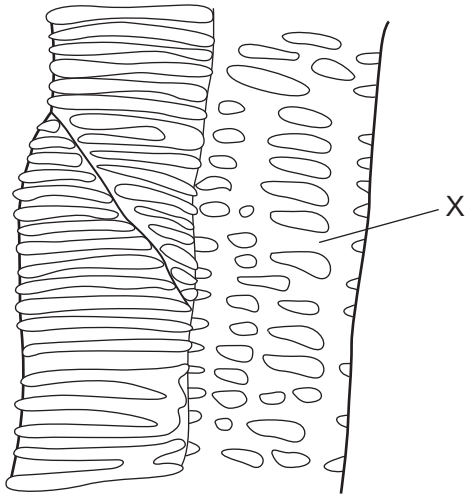
key

✓ = present

✗ = absent

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28 The diagram shows a longitudinal section through transport tissue in a plant stem.

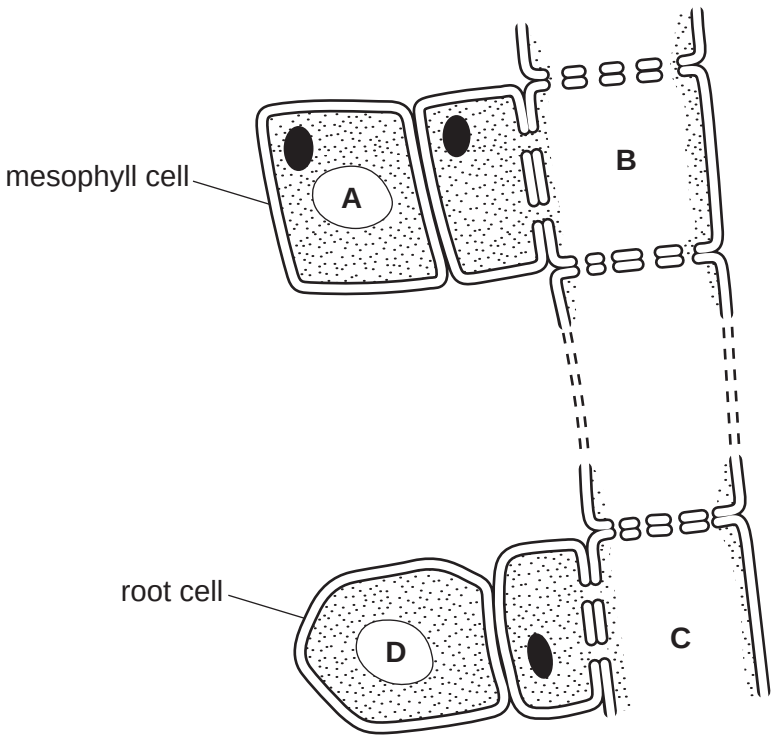


What are the names of the element labelled X and the tissue in which it is found?

	element X	tissue
A	sieve tube	phloem
B	sieve tube	xylem
C	vessel	phloem
D	vessel	xylem

29 The diagram shows the tissues of the transport system of flowering plants.

Where is the water potential **most** negative?



30 Which evidence supports the theory of water movement by root pressure in flowering plants?

1 When the rate of transpiration of a tree is maximum, the diameter of the trunk is minimum.

2 When a plant shoot is removed close to the base of the stem, sap leaks out from the cut.

3 Evaporation of water from a porous pot can exert a force that draws water up a glass tube attached underneath the pot.

4 Droplets of water form at the edge of leaves of plants growing in conditions of soil with high water content and air with high humidity.

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

31 Cardiovascular disease is said to be multifactorial.

What does this mean?

A You can get the disease, if you are exposed to one or more risk factors.

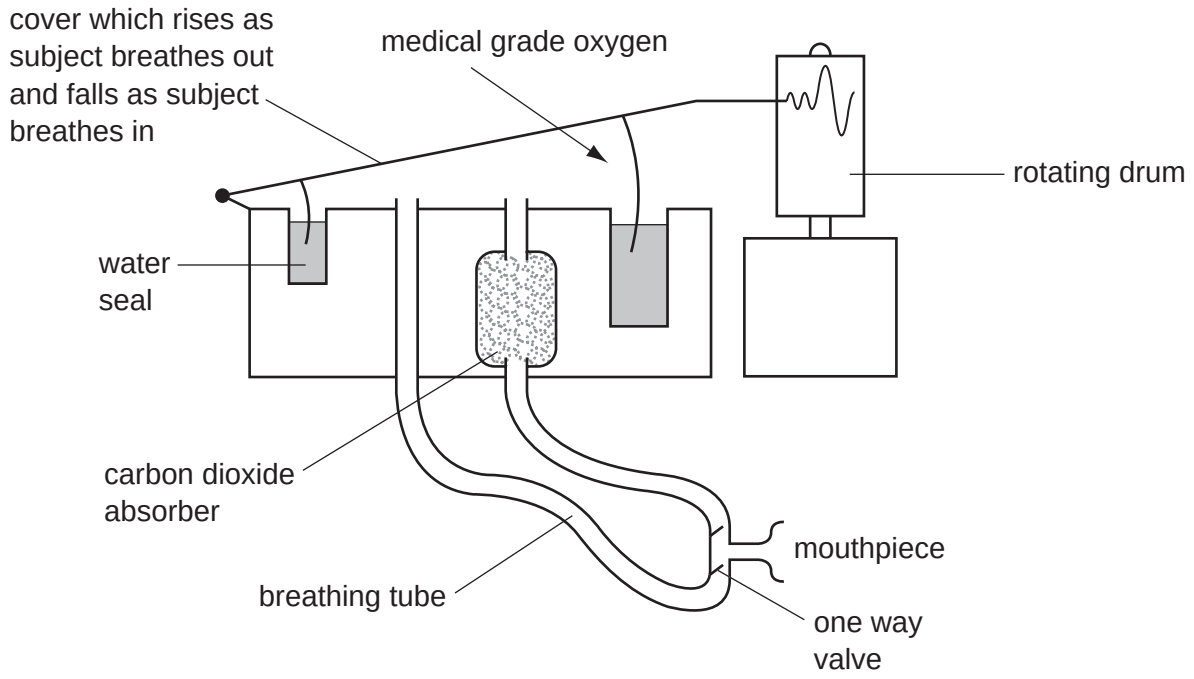
B You can never get the disease, if you are exposed to only one risk factor.

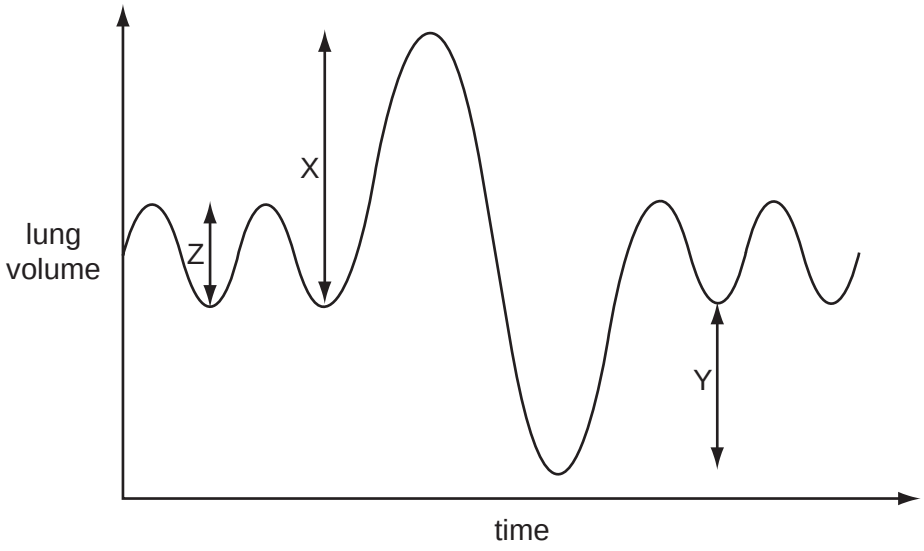
C You only get the disease, if you are exposed to all the risk factors.

D You will always get the disease, if you are exposed to all the risk factors.

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32 The first diagram shows a spirometer, which is an apparatus used to measure changes in lung volume. The cover rises during exhalation and falls during inhalation, producing a trace on the rotating drum. The second diagram shows a typical trace from a spirometer.





Which would give the vital capacity?

A X + Y **B** X – Y **C** X + Y + Z **D** X – Y + Z

33 Which row shows a correct location of cartilage and smooth muscle in the human gas exchange system?

	cartilage	smooth muscle
A	respiratory bronchioles	terminal bronchioles
B	respiratory bronchioles	trachea
C	trachea	bronchi
D	trachea	respiratory bronchioles

34 Which observation would indicate a difference between the structure of the gas exchange system of a cigarette smoker and a non-smoker?

A the absence of ciliated epithelium in the bronchioles

B the decrease in elastic fibres in the bronchioles

C the enlargement of goblet cells in the bronchi

D the increase in smooth muscle

35 Which row is correct?

	disease	causative agent	method of infection
A	cholera	bacterium	ingestion
B	HIV / AIDS	virus	water-borne
C	malaria	protoctist	blood transfusion
D	tuberculosis (TB)	virus	inhalation

36 Why is passive immunity effective for only a short time?

A antibodies are rapidly broken down

B antigens are rapidly broken down

C memory cells soon die

D phagocytes soon die

37 What is the first response by the immune system to a pathogen?

A ingestion of the pathogen by B-lymphocytes

B ingestion of the pathogen by phagocytes

C production of antibodies

D production of antigens

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38 Within an ecosystem, the top consumers in a food chain are few in number.

Which statement explains this?

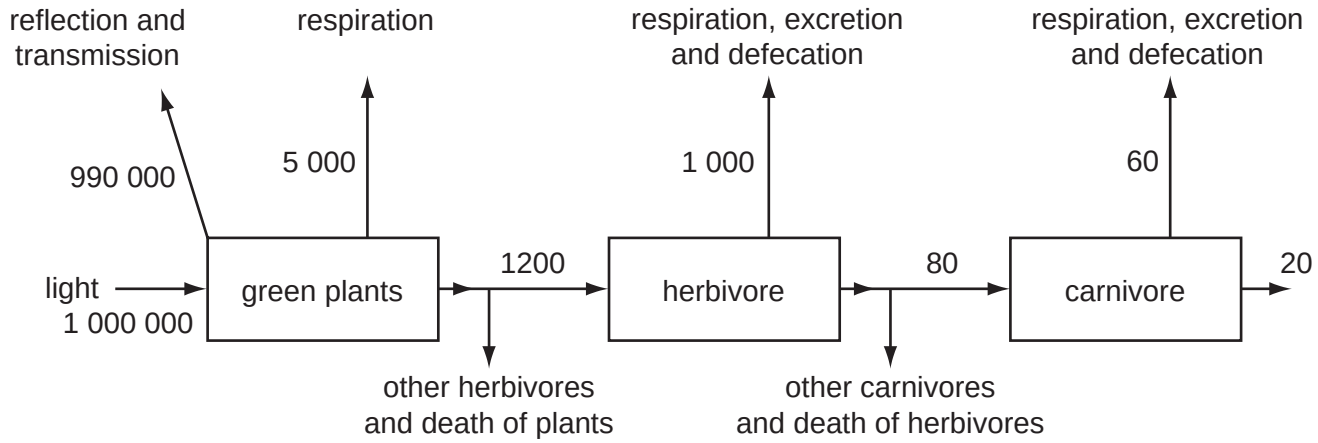
A Energy losses in the consumers' digestive systems.

B Energy losses occur at each trophic level.

C Top consumers have a low reproductive rate.

D Top consumers are large in size.

39 The diagram shows the flow of energy through a food chain. Figures are in $kJ\,m^{-2}\,year^{-1}$.

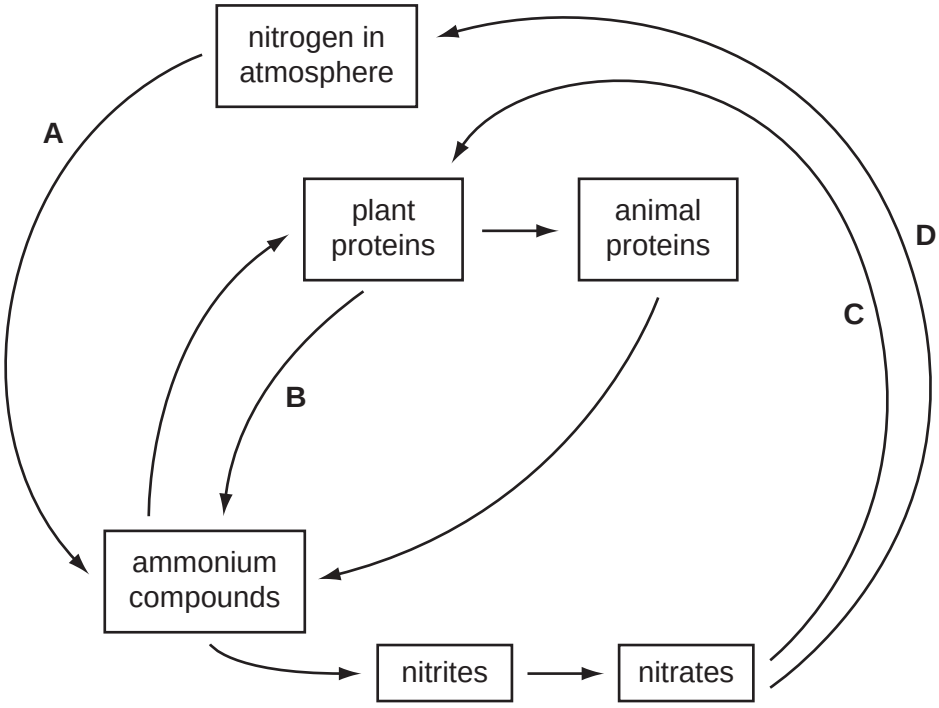


What percentage of light energy is converted to net primary productivity?

A 0.1 % **B** 0.5 % **C** 1.0 % **D** 5.0 %

40 The diagram shows part of the nitrogen cycle.

Which process is increased in poorly drained soil?



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BIOLOGY **9700/13**

Paper 1 Multiple Choice **October/November 2011**

1 hour

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

0527153262

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, highlighters, glue or correction fluid.
Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.

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 separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.

IB11 11_9700_13/FP
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1 Which group could be a population?

A all the animals and plants on an isolated island

B all the birds counted in one day in a garden

C all the bacteria in a colony of *Bacillus subtilis*

D all the insects occupying three hectares of farmland

2 The graph shows the annual changes of the following factors in a lake.

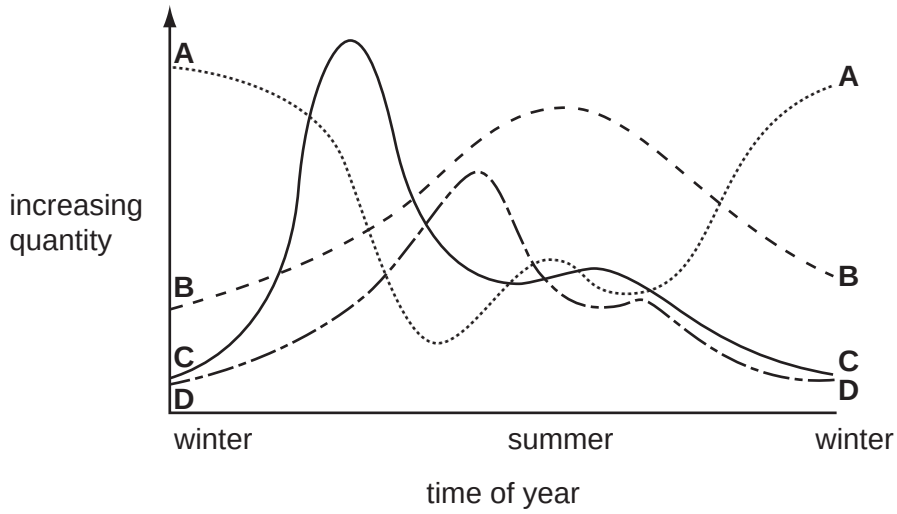
intensity of light per day

numbers of producers

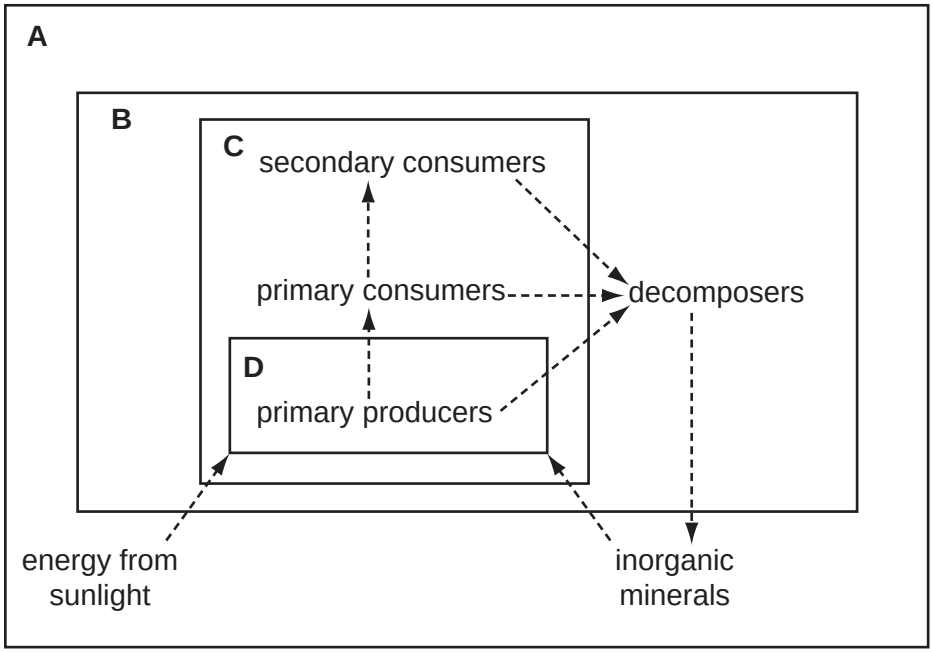
numbers of primary consumers

quantity of nutrients

Which curve represents the numbers of primary consumers?



3 Which box contains only the parts of an ecosystem which are classed as a food web?



4 In general, eukaryotic cells undergo division much slower than prokaryotic cells.

What is the reason for this?

A Eukaryotes break down the nuclear membrane during mitosis.

B Eukaryotes have many more mitochondria than prokaryotes.

C Prokaryotes do not contain any centrioles.

D Prokaryotic cells are a lot smaller than eukaryotic cells.

5 What is the diameter of a typical prokaryote, such as *Streptococcus*?

A 7.5×10^{1} nm

B 7.5×10^{2} nm

C 7.5×10^{0} μm

D 7.5×10^{1} μm

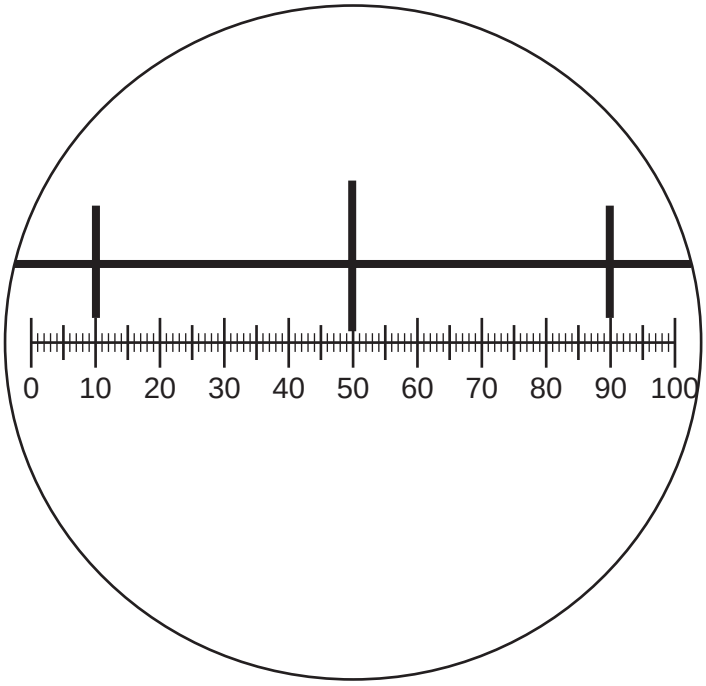
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6 Which cell components are present in **all** prokaryotic cells?

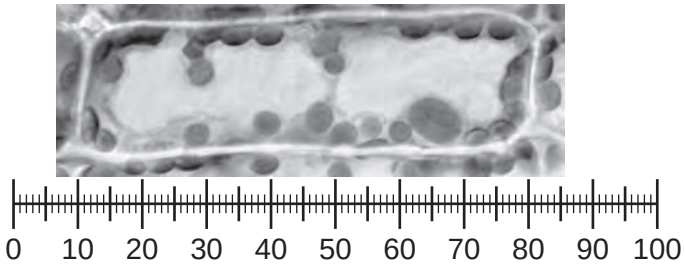
	cell surface membrane	cell wall	endoplasmic reticulum	flagellum
A	✓	✓	✗	✓
B	✓	✗	✓	✗
C	✓	✓	✗	✗
D	✗	✓	✓	✓

key
✓ = present
✗ = not present

7 The diagram shows a stage micrometer on which the small divisions are 0.1 mm. It is viewed through an eyepiece containing a graticule.



The stage micrometer is replaced by a slide of a plant cell.



What is the length of the nucleus?

A 0.8 mm **B** 8 μm **C** 25 μm **D** 200 μm

8 Where would cristae be found in a cell?

1 endoplasmic reticulum

2 Golgi apparatus

3 mitochondrion

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

9 Which cell components contain ribosomes?

1 chloroplast

2 mitochondrion

3 nucleus

4 cytoplasm

A 1, 2, 3 and 4

B 1, 2 and 3 only

C 1 and 2 only

D 3 and 4 only

10 Where in the respiratory system are both goblet cells and ciliated epithelium found?

	trachea	bronchi	bronchioles
A	✓	✓	✗
B	✓	✗	✗
C	✗	✓	✓
D	✗	✗	✓

key

✓ = found

✗ = not found

11 Which does **not** increase the efficiency of gaseous exchange in the alveoli?

A The blood capillaries and alveoli have a large total surface area.

B The blood flow is slowed as it passes through the pulmonary capillaries.

C The walls of the alveoli and capillaries are moist.

D The walls of the alveoli and capillaries are very thin.

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12 What is an effect of inhaling tobacco smoke?

A decreased mucus production

B increased movement of cilia

C less oxygen transport by blood

D narrowing of the bronchioles

13 What describes how smoking contributes to cardiovascular disease?

1 Both nicotine and carbon monoxide speed up the development of plaques in arteries.

2 Nicotine increases blood pressure and heart rate and so increases the body's demand for oxygen.

3 Smoking interacts with other risk factors and increases the blood cholesterol level.

4 Tar is deposited in the lining of artery walls and increases the development of atherosclerosis.

A 4 only

B 2 and 4 only

C 1, 2 and 3 only

D 1, 2, 3 and 4

14 Which details are correct?

	disease	method of controlling spread	treatment	causative agent
A	AIDS	use condoms during sexual intercourse	antibiotics	virus
B	cholera	water treatment	oral rehydration	bacterium
C	malaria	quinine	vaccination	protoctist
D	TB	isolate patients	antibiotics	virus

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15 Where are antibodies and antigens found?

	on surface of pathogens	on surface of phagocytes	in blood plasma
A	antibodies	antibodies	antigens
B	antibodies	antigens	antibodies
C	antigens	antibodies	antigens
D	antigens	antigens	antibodies

16 Breast milk produced by the mother for a new-born baby contains antibodies.

What do these antibodies provide?

A artificial active immunity

B artificial passive immunity

C natural active immunity

D natural passive immunity

17 Which property of water makes it most suitable for transport in eukaryotic organisms?

A density

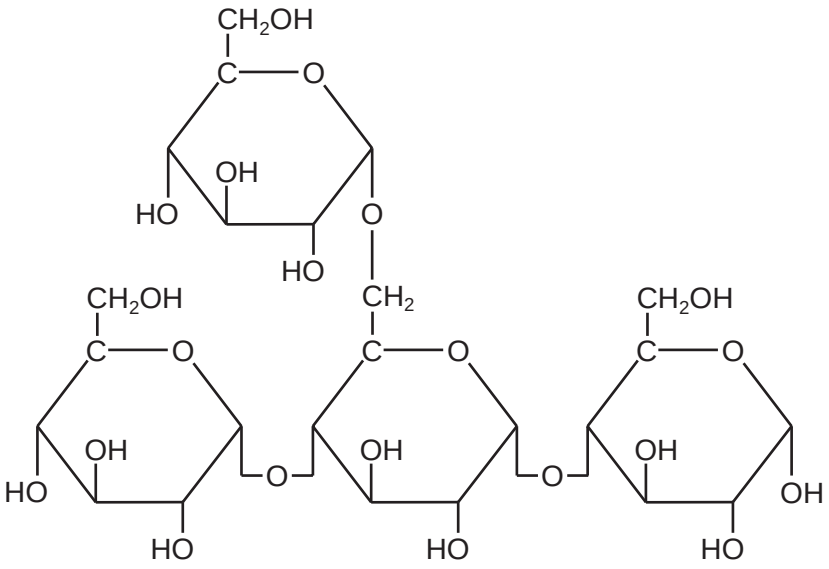
B ionisation

C latent heat of vaporisation

D solvent properties

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18 The diagram shows a carbohydrate molecule.



Of which polymers could this be a part?

A amylopectin and cellulose

B amylose and starch

C glycogen and amylose

D starch and glycogen

19 Two disaccharides are maltose and sucrose. Maltose is formed from two molecules of glucose, whilst sucrose is formed from fructose and glucose.

Which row shows the molecular formulae of the two disaccharides?

	maltose	sucrose
A	$C_{12}H_{22}O_{11}$	$C_{12}H_{22}O_{11}$
B	$C_{12}H_{22}O_{11}$	$C_{12}H_{24}O_{12}$
C	$C_{12}H_{24}O_{12}$	$C_{12}H_{22}O_{11}$
D	$C_{12}H_{24}O_{12}$	$C_{12}H_{24}O_{12}$

20 Which is the strongest type of bonding found in proteins?

A disulfide bonds

B hydrogen bonds

C hydrophobic interactions

D ionic bonds

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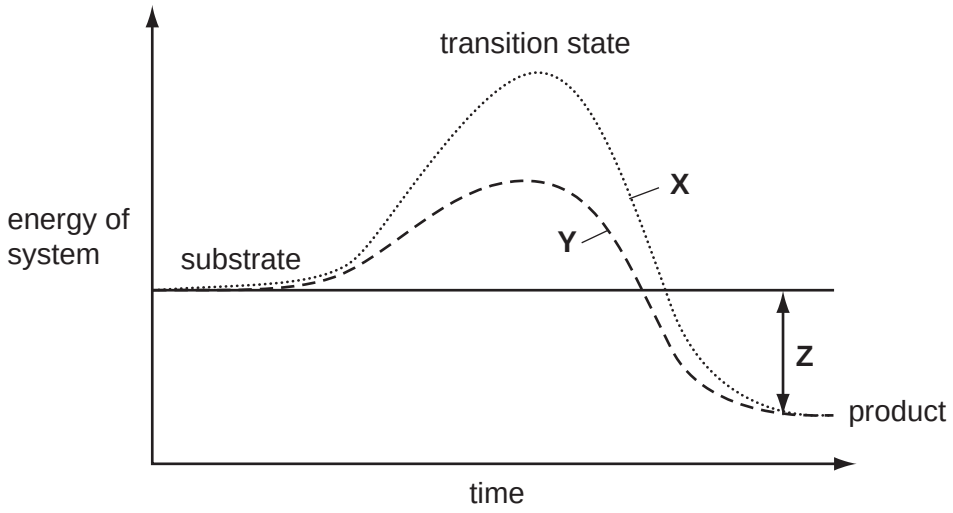
21 Solutions of biological molecules are tested for sugars. The table shows the colours of the solutions after testing.

Which may contain reducing sugars?

solution	heated with Benedict's solution	boiled with hydrochloric acid, neutralised, then heated with Benedict's solution
1	blue	yellow
2	green	orange
3	orange	red

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

22 The graph shows the effect of an enzyme on a reaction.



Which combination identifies **X**, **Y** and **Z**?

	X	**Y**	**Z**
A	catalysed reaction	uncatalysed reaction	energy lost by product
B	catalysed reaction	uncatalysed reaction	total energy lost during reaction
C	uncatalysed reaction	catalysed reaction	energy gained by product
D	uncatalysed reaction	catalysed reaction	total energy change during reaction

23 Which statements about the effect of **all** enzyme inhibitors are correct?

1 alter the shape of the active site

2 denature the enzyme

3 reduce the rate of the enzyme catalysed reaction

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

24 Which statement defines active transport?

A movement of large molecules through the cell surface membrane into the cytoplasm of a cell

B movement of molecules or ions from where they are in a low concentration to where they are in a higher concentration

C movement of molecules or ions from where they are in a high concentration to where they are in a lower concentration

D net movement of water molecules across a partially permeable membrane from a region of higher water potential to one of lower water potential

25 Single-celled animals that live in fresh water have a vacuole that contracts regularly to remove excess water. Single-celled plants that live in fresh water do not have a similar vacuole.

Which statement explains why only these animals need this vacuole?

A Plant cell cytoplasm and animal cell cytoplasm both have a lower water potential than fresh water.

B Plant cell sap has the same water potential as fresh water, animal cytoplasm has a lower water potential than fresh water.

C Plant cell walls are impermeable to water, animal cell surface membranes are permeable to water.

D Plant cell walls restrict the entry of water, animal cell membranes allow the free entry of water.

26 Which statements about the components of the cell surface membrane are correct?

1 Diffusion can take place through lipids and protein pores.

2 Endocytosis only involves lipids.

3 Facilitated diffusion only involves proteins.

4 Osmosis only involves proteins.

A 1, 2, 3 and 4

B 1, 3 and 4 only

C 1 and 3 only

D 2 and 4 only

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27 Which statement about a diploid cell is **not** correct?

A It can undergo a mitotic division to allow growth to occur.

B It can undergo a mitotic division to repair a cell.

C It can undergo a reduction division to form haploid cells.

D It is one that possesses two complete sets of chromosomes.

28 Meiosis and mitosis are two types of cell division.

A cell has 10 chromosomes before it divides.

How many chromosomes will it have after dividing by meiosis or mitosis?

	meiosis	mitosis
A	5	10
B	5	20
C	10	5
D	20	5

29 What makes the exact copying of DNA molecules possible?

A base pairing

B hydrogen bonding between nucleotides

C sugar-phosphate backbone

D the double helix shape

30 Which molecule has its synthesis directly controlled by DNA?

A amylase

B cholesterol

C glycogen

D phospholipid

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[Turn over

31 A gene codes for the production of a protein, p53, that binds to damaged DNA during interphase and prevents its replication. A carcinogen in cigarette smoke mutates this gene.

Which statement explains why this mutation may cause cancer?

A Lack of p53 allows cells to undergo mitosis.

B Lack of p53 allows cells with damaged DNA to replicate.

C The carcinogen in cigarette smoke increases the rate of cell division.

D The p53 causes uncontrolled cell division.

32 In a genetic engineering experiment a piece of double-stranded DNA containing 6000 nucleotides coding for a specific polypeptide is transcribed and translated.

What is the total number of amino acids in this polypeptide?

A 500 **B** 1000 **C** 2000 **D** 3000

33 Bacteria were grown in a medium containing ^{15}N. After several generations, all of the DNA contained ^{15}N. Some of these bacteria were transferred to a medium containing the common isotope of nitrogen, ^{14}N. The bacteria were allowed to divide once. The DNA of some of these bacteria was extracted and analysed. This DNA was all hybrid DNA containing equal amounts of ^{14}N and ^{15}N.

The remaining bacteria were left in the medium with ^{14}N and allowed to divide one more time. The DNA of some of these bacteria was extracted and analysed.

What is the composition of this DNA?

A 25 % hybrid DNA

B 50 % hybrid DNA

C 75 % hybrid DNA

D 100 % hybrid DNA

34 The large arteries close to the heart have a thick elastic layer in their walls.

Which statements about this layer are correct?

1 evens out the blood flow from the heart

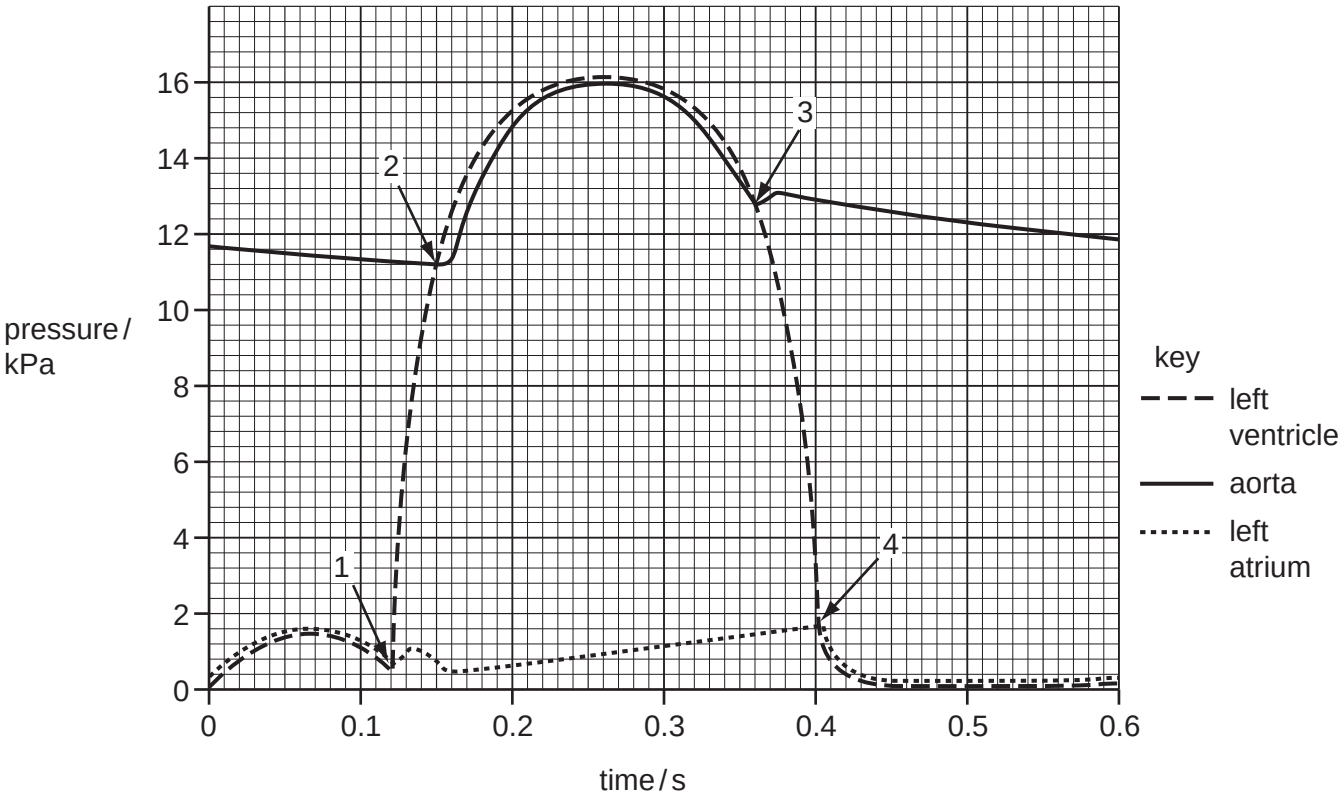
2 reduces friction within these blood vessels

3 prevents too much pressure bursting the artery wall

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

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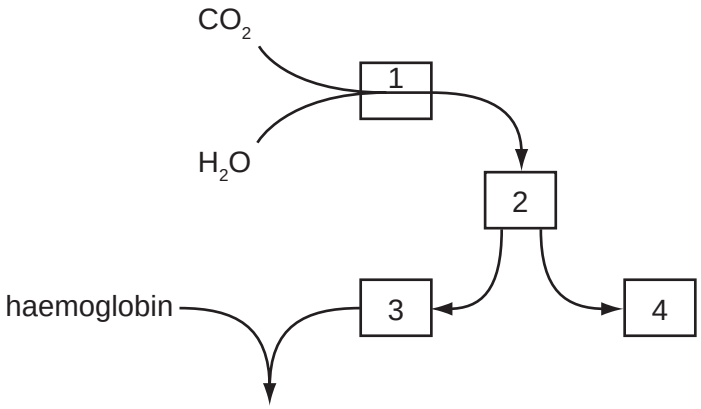
35 The diagram shows pressure changes in the left side of the heart and aorta over time. The length of this cardiac cycle is 0.6 s. Points 1, 2, 3 and 4 indicate when atrio-ventricular valves and semi-lunar valves either open or close.



What is the total time during one cardiac cycle that the atrio-ventricular valves and the semi-lunar valves are both closed at the same time?

A 0.03 s **B** 0.04 s **C** 0.07 s **D** 0.21 s

36 The diagram shows part played by red blood cells in the transport of carbon dioxide.



Which row is correct?

	1	2	3	4
A	carbaminohaemoglobin	haemoglobinic acid	hydrogen ions	hydrogen carbonate ions
B	carbonic anhydrase	carbonic acid	hydrogen ions	hydrogen carbonate ions
C	carboxyhaemoglobin	carbonic anhydrase	carbonic acid	carbon dioxide
D	haemoglobinic acid	carbonic acid	hydrogen carbonate ions	hydrogen ions

37 Which components of blood are also present in lymph?

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

key
✓ = present
✗ = absent

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38 Which evidence supports the cohesion-tension theory for the movement of water in flowering plants?

1 When the rate of transpiration of a tree is maximum, the diameter of the trunk is minimum.

2 When a plant shoot is removed close to the base of the stem, sap leaks out from the cut.

3 Evaporation of water from a porous pot can exert a force that draws water up a glass tube attached underneath the pot.

4 Droplets of water form at the edge of leaves of plants growing in conditions of soil with high water content and air with high humidity.

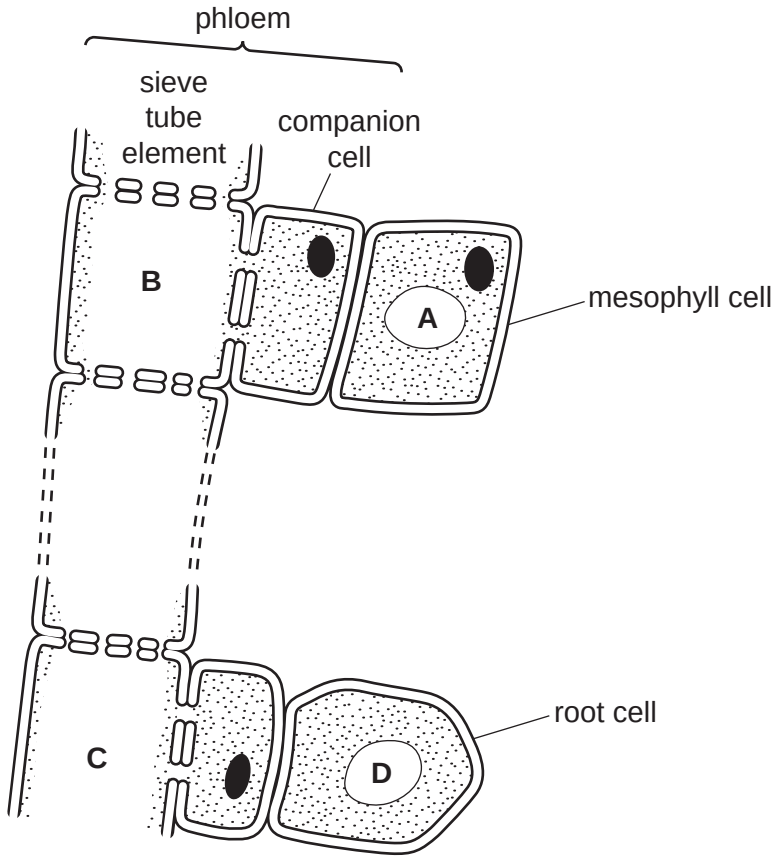
A 1 and 2 **B** 1 and 3 **C** 2 and 3 **D** 2 and 4

39 In which combination of environmental conditions are the stomata of a plant most likely to close?

	atmospheric humidity	soil water potential	wind speed
A	high	low	high
B	high	low	low
C	low	high	high
D	low	low	high

40 The diagram shows the tissues involved in the transport of sucrose in a plant.

Where is the highest concentration of sucrose?



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