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

BIOLOGY **9700/13**

Paper 1 Multiple Choice **October/November 2010**

1 hour

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

3821339057

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.

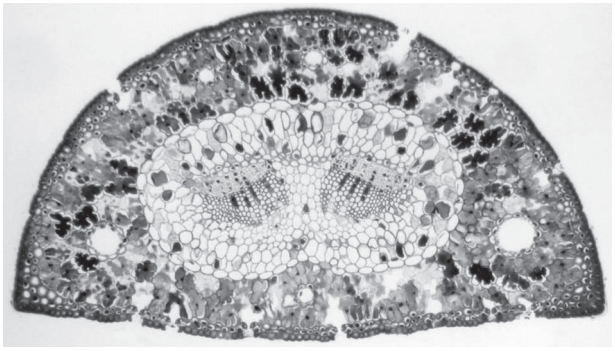
Read the instructions on the Answer Sheet very carefully.

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.

This document consists of **17** printed pages and **3** blank pages.

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1 The photomicrograph shows a transverse section through a leaf.



×50

1 sunken stomata

2 two layers of epithelium

3 thick cuticle

4 small surface area to volume

Which features of a xerophytic leaf are visible in this section?

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

2 What determines the rate of water movement from the roots to the leaves?

A absorption of water through the root hair cells

B development of a less negative water potential in the leaves

C diffusion of water through the stomata

D evaporation of water from the mesophyll cell walls

3 Which shows the correct structure of mature xylem vessel elements and phloem sieve tube elements?

		cytoplasm	nucleus	end wall
A	phloem	✓	✓	✓
	xylem	✓	✗	✗
B	phloem	✓	✗	✓
	xylem	✗	✓	✓
C	phloem	✓	✗	✓
	xylem	✗	✗	✗
D	phloem	✗	✓	✓
	xylem	✗	✗	✓

key

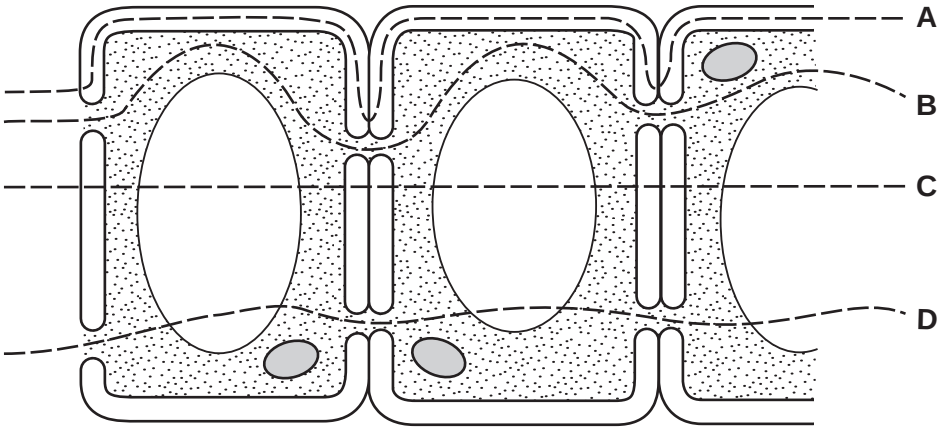
✓ = present

✗ = absent

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4 The diagram shows some adjacent cells from the root of a plant.

Which is the apoplastic pathway of water movement?



5 Water is important to living organisms because it

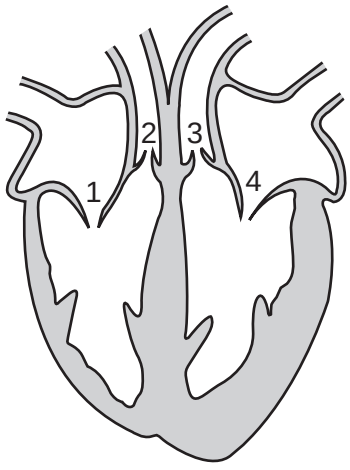
A acts as an excellent solvent for transport of dissolved glucose and urea.

B becomes more dense in its solid form, ice, than its liquid state.

C is used in condensation reactions to synthesise macromolecules.

D requires a small increase in heat energy to raise its temperature.

6 The diagram shows the valves inside the heart.



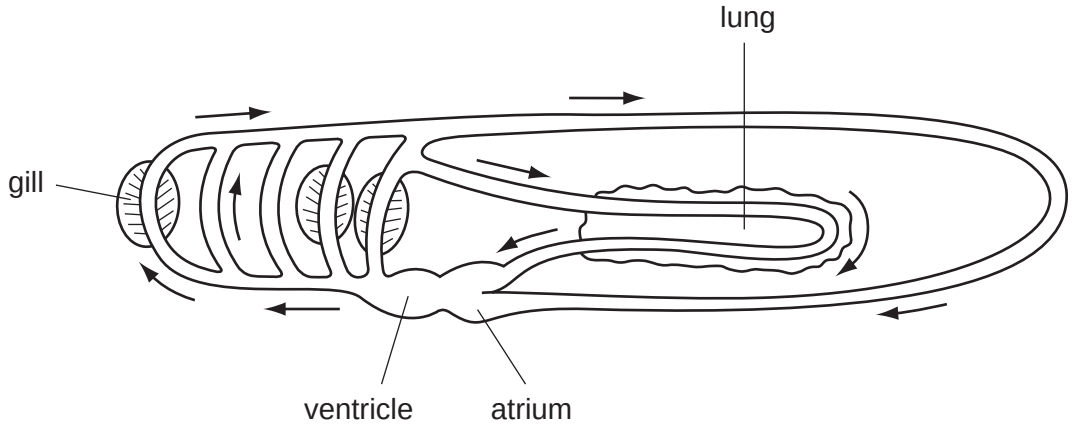
Which valves are open or closed when the atria are relaxed and the ventricles contracted?

	valves open	valves closed
A	3 and 4	1 and 2
B	2 and 4	1 and 3
C	2 and 3	1 and 4
D	1 and 4	2 and 3

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7 The mammalian circulatory system is described as a closed double circulation.

The diagram shows the circulatory system in a different organism. The arrows show the direction of blood flow in the vessels.



How is the circulatory system in this organism described?

A closed double

B closed single

C open double

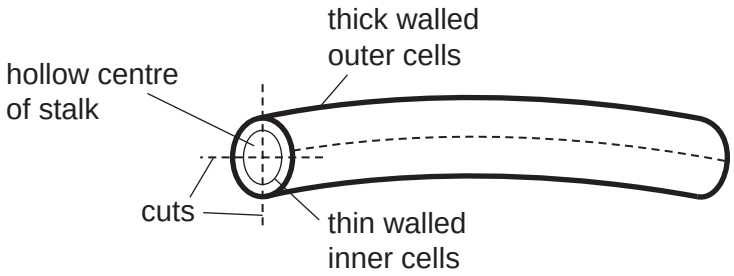
D open single

8 Which molecules, found in the cell surface membrane, have the properties listed?

	act as receptor sites for hormones	form hydrogen bonds with water	recognise antibodies
A	cholesterol and proteins	phospholipids and cholesterol	proteins and glycolipids
B	glycolipids and glycoproteins	glycolipids and glycoproteins	glycolipids and glycoproteins
C	phospholipids and cholesterol	proteins and glycolipids	cholesterol and proteins
D	proteins and glycolipids	cholesterol and proteins	phospholipids and cholesterol

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9 The stalk of a dandelion is a hollow tube. Pieces of the stalk are cut as shown and placed in sucrose solutions of different water potentials.



Which diagram shows the piece that is placed in the sucrose solution with the highest water potential?

A



B



C



D



10 In an investigation, four sucrose solutions were separated from each other by partially permeable membranes.

1 $1.1\,mol\,dm^{-3}$

2 $0.8\,mol\,dm^{-3}$

3 $0.5\,mol\,dm^{-3}$

4 $0.1\,mol\,dm^{-3}$

Which shows the direction in which water will move between the solutions?

A from 1 and 2 to 3 and 4

B from 2 and 3 to 1

C from 1 to 3

D from 2 to 4

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11 The equation shows a reversible reaction.

$$\text{sucrose} + \text{water} \underset{\textbf{2}}{\overset{\text{sucrase}\ \textbf{1}}{\rightleftharpoons}} \text{glucose} + \text{fructose}$$

In this reaction, on which molecule does an active site occur and what types of reaction occur at **1** and **2**?

	active site present on	reaction at **1**	reaction at **2**
A	sucrase	condensation	hydrolysis
B	sucrase	hydrolysis	condensation
C	sucrose	condensation	hydrolysis
D	sucrose	hydrolysis	condensation

12 Tests on a liquid give these results.

test	observation
Benedict's	red
biuret	lilac
iodine in potassium iodide solution	orange

What are present in the liquid?

A reducing sugar and protein

B reducing sugar and starch

C starch and protein

D starch only

13 Which linkages are found between the glucose units in cellulose?

A α 1–4 only

B α 1–4 and α 1–6

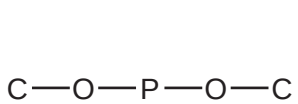
C β 1–4 and α 1–6

D β 1–4 only

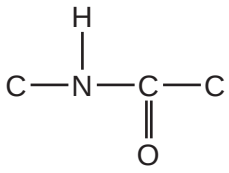
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14 Which diagram shows the bond linking the individual units of both cellulose and amylose?

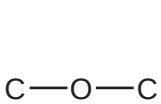
A



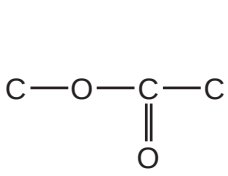
B



C



D



15 Which statements about amylopectin and glycogen are correct?

1 both contain 1-4 glycosidic bonds

2 amylopectin contains β-glucose

3 glycogen contains more 1-6 branches than amylopectin

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

16 What are the features of triglycerides?

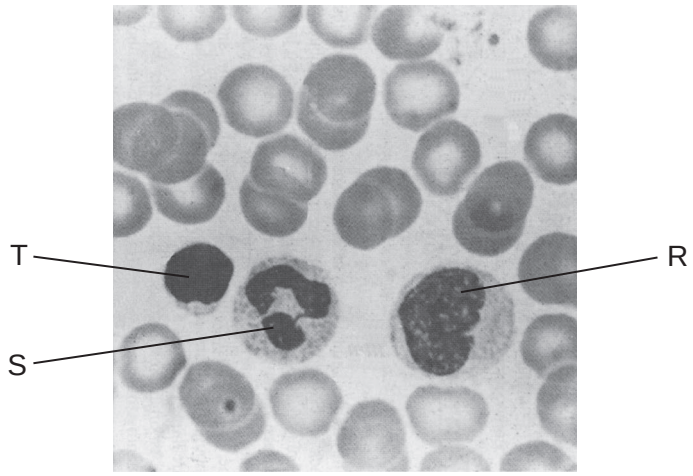
	polar	less dense than water	higher energy value than carbohydrates	lower proportion of hydrogen than in carbohydrates
A	✓	✓	✗	✗
B	✓	✗	✓	✓
C	✗	✓	✓	✗
D	✗	✗	✗	✓

key

✓ = yes

✗ = no

17 The photomicrograph shows human blood, with three types of white cell labelled.

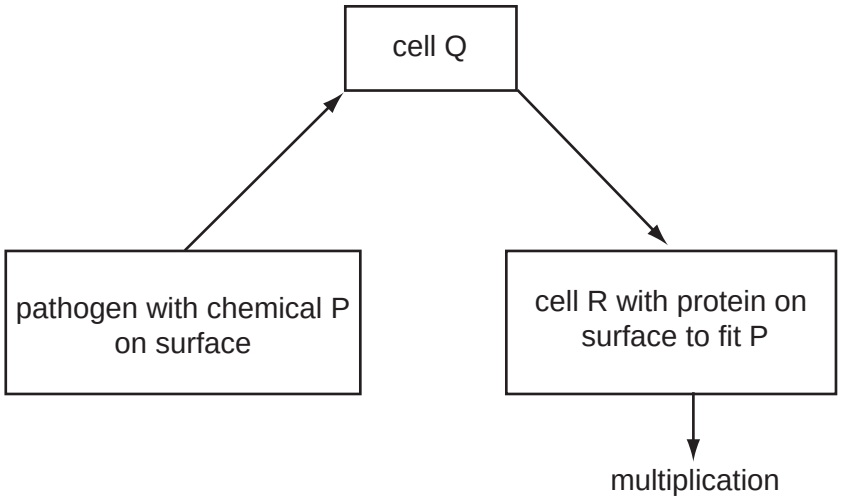


Which row correctly identifies these white cells?

	cell R	cell S	cell T
A	lymphocyte	lymphocyte	phagocyte
B	lymphocyte	phagocyte	lymphocyte
C	phagocyte	lymphocyte	phagocyte
D	phagocyte	phagocyte	lymphocyte

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18 The diagram shows part of the immune response.



What are P, Q and R?

	P	Q	R
A	antibody	B-lymphocyte	T helper cell
B	antibody	T helper cell	B-lymphocyte
C	antigen	B-lymphocyte	T helper cell
D	antigen	T helper cell	B-lymphocyte

19 Which diseases can be cured by the use of antibiotics?

A cholera and tuberculosis

B measles and smallpox

C measles and tuberculosis

D smallpox and cholera

20 What could cause an outbreak of malaria in a country where it had been eliminated?

1 mosquitoes became resistant to insecticides

2 migration of population due to war

3 malarial parasites became resistant to quinine

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

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21 When a body cell is infected by a pathogen, which describes a correct immune response?

A Killer T cells punch holes in infected cells, releasing antibodies.

B Killer T cells release cytokines, infected body cells release antibodies.

C Memory cells release antibodies, killer T cells secrete cytokines.

D T helper cells release cytokines, plasma cells release antibodies.

22 Which of the cell organelles, when appropriately stained, will be clearly visible under the high power (×400) of the light microscope?

	lysosomes	endoplasmic reticulum	mitochondria	chloroplasts
A	✓	✓	✗	✗
B	✓	✗	✓	✗
C	✗	✓	✓	✓
D	✗	✗	✗	✓

key

✓ = visible

✗ = not visible

23 The graticule and stage micrometer are used to measure cells.

Which is the correct reason why the graticule calibrated?

A The graticule can be used to make measurements.

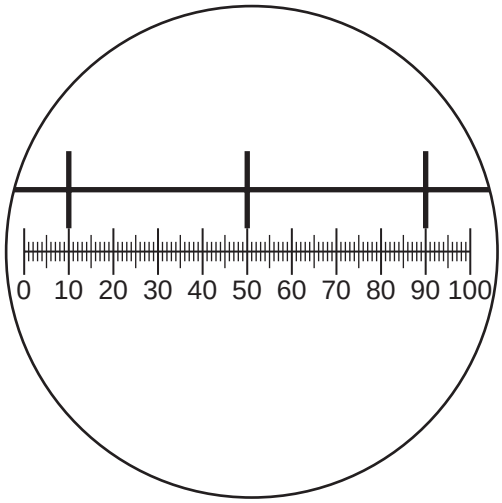
B The graticule is magnified by the objective lens.

C The graticule magnifies the specimen.

D The graticule makes comparisons.

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24 The diagram shows a stage micrometer, with divisions 0.1 mm apart, viewed through an eyepiece containing a graticule.



The same eyepiece is now used to examine a blood smear.

How many graticule divisions will cover the diameter of a white cell of 10 μm?

A 1 **B** 4 **C** 10 **D** 20

25 What are the characteristics of a prokaryotic cell?

	DNA structure	endoplasmic reticulum	plasmids	ribosomal size
A	circular	absent	present	small
B	circular	present	absent	large
C	linear	absent	present	small
D	linear	present	absent	large

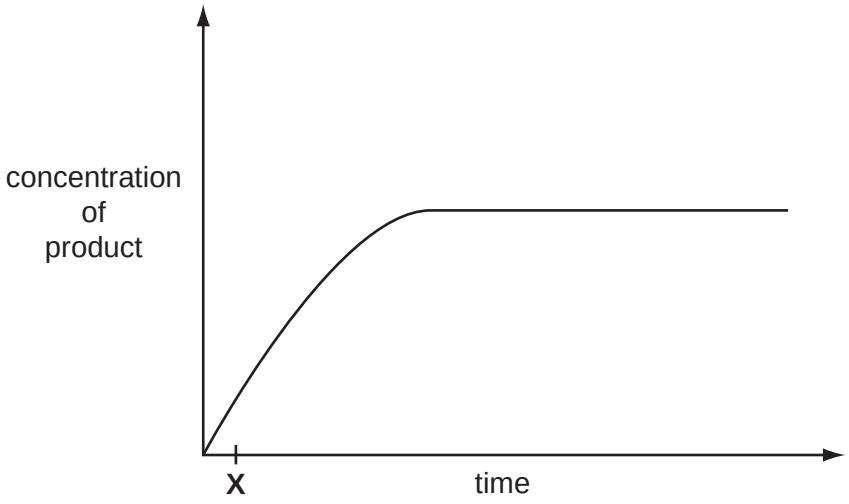
26 Which is correct about the organelles listed in the table?

		carries out transcription	contains enzymes	contains ribosomes
1	lysosomes	no	yes	no
2	mitochondria	yes	no	yes
3	rough endoplasmic reticulum	yes	yes	yes
4	vacuoles	no	yes	no

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

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27 The graph shows the course of an enzyme-catalysed reaction at 30 °C.



What is true at time **X**?

A Most enzyme molecules will have free active sites.

B The number of available substrate molecules is high.

C The number of enzyme-substrate complexes is low.

D The rate remains the same if more enzyme is added.

28 The rate of enzyme-catalysed reactions in human cells is regulated.

Which may be involved in such regulation?

1 a change in enzyme concentration

2 a change in substrate concentration

3 inhibition by the final product of the reaction

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

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29 The table shows the role of four different proteins involved in DNA replication.

protein	helicase	topoisomerase	single-strand binding protein	DNA polymerase
role	unwinds the parental DNA double helix	breaks and rejoins the DNA strands	binds to separated DNA strands to stabilise them	synthesises strand of DNA

Which shows the function of these proteins?

	helicase	topoisomerase	single-strand binding protein	DNA polymerase
A	adds DNA nucleotides to the 3' end of a growing polynucleotide strand	prevents original strands reforming complementary base pairs	enables tension caused by unwinding to be released	makes strands available as templates
B	enables tension caused by unwinding to be released	prevents original strands reforming complementary base pairs	makes strands available as templates	adds DNA nucleotides to the 3' end of a growing polynucleotide strand
C	enables tension caused by unwinding to be released	makes strands available as templates	adds DNA nucleotides to the 3' end of a growing polynucleotide strand	prevents original strands reforming complementary base pairs
D	makes strands available as templates	enables tension caused by unwinding to be released	prevents original strands reforming complementary base pairs	adds DNA nucleotides to the 3' end of a growing polynucleotide strand

30 Male bees are haploid. They develop from unfertilised eggs. Female bees are diploid.

Which statements are correct?

1 All male bees are genetically identical.

2 Male bee sperm cells are produced by mitosis.

3 New combinations of genes only occur in female bees.

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

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31 Which statement describes the semi-conservative replication of DNA?

A Parental DNA is broken down into nucleotides and reassembled with new nucleotides.

B Parental DNA is split into triplets and new triplets are added.

C Parental DNA is split into two strands, each of which is replicated.

D Parental DNA remains intact and a new daughter DNA copy is built from new nucleotides.

32 What describes the behaviour of the nuclear envelope and the cell membrane during mitosis?

	nuclear envelope	cell membrane
A	breaks down	breaks down
B	breaks down	remains intact
C	remains intact	breaks down
D	remains intact	remains intact

33 DNA was extracted from the salivary glands of a fruit fly and a human cheek cell.

In which way did the DNA molecules differ?

A in the ratio of adenine to thymine

B in the sequence of the nucleotides

C in the type of pentose sugar

D in the types of nucleotide

34 The table shows the percentages of nitrogenous bases in four samples of nucleic acids.

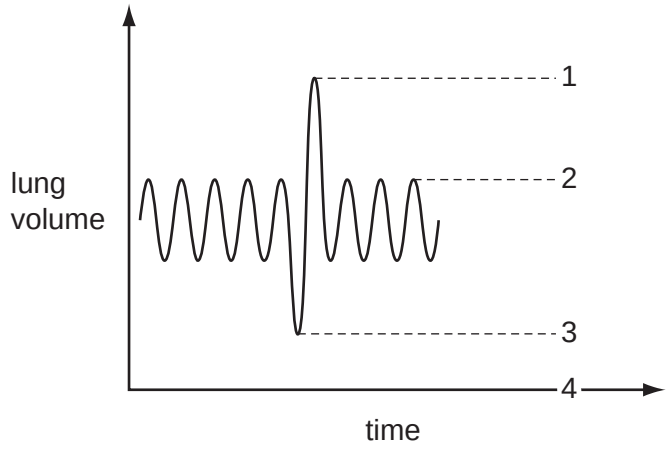
Which base is adenine?

sample	percentage of nitrogenous bases				
	A	**B**	**C**	**D**	uracil
1	19	31	30	19	nil
2	27	23	24	26	nil
3	25	25	nil	25	25
4	17	32	33	18	nil

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35 The diagram shows the volume of air breathed in and out while a person is breathing normally when at rest.

They breathe out the deepest breath they can and then breathe in as much as they can before breathing normally again.



Which points would you use to calculate the vital capacity?

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

36 Which tissues are present in the walls of a trachea and an alveolus?

		tissue		
		cartilage	epithelium with goblet cells	smooth muscle
A	trachea	✓	✓	✓
	alveolus	✓	✓	✗
B	trachea	✓	✓	✓
	alveolus	✗	✗	✗
C	trachea	✓	✓	✗
	alveolus	✗	✓	✓
D	trachea	✓	✓	✓
	alveolus	✗	✗	✓

key
✓ = present
✗ = absent

37 How does nicotine in cigarette smoke increase the risk of cardiac disease?

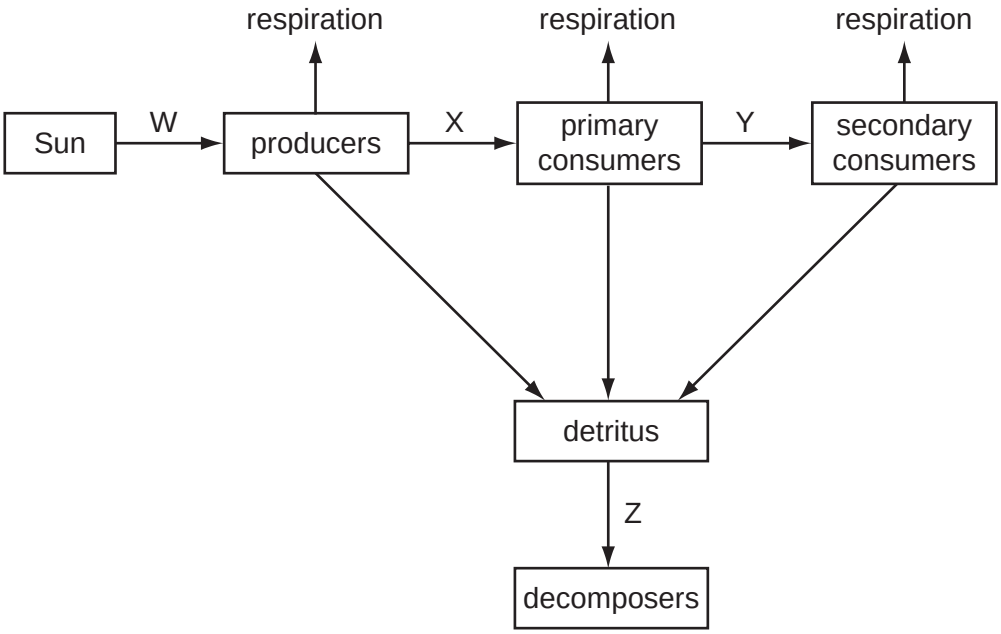
A by binding with haemoglobin

B by constricting blood vessels

C by inhibiting nerve transmission

D by stimulating the pacemaker

38 The diagram represents the flow of energy through a tropical rainforest ecosystem.



Which set of figures identifies the percentage transfer of energy between the Sun, producers, consumers and decomposers?

	W	X	Y	Z
A	1	10	20	80
B	1	20	10	80
C	10	20	1	10
D	10	10	1	20

39 A farmer grows a different crop in a field each year for three years.

In the fourth year the farmer plants a leguminous crop and then ploughs this into the soil. The next year the rotation starts again.

Which microorganisms will increase by the time the rotation starts again?

1 denitrifying bacteria

2 nitrifying bacteria

3 nitrogen-fixing bacteria

4 decomposing bacteria

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

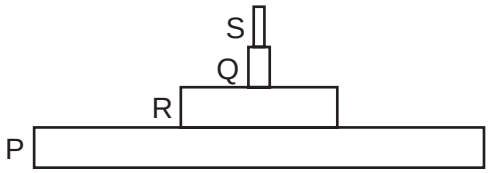
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40 The table shows the results of a field study of four species in a food chain in an area of woodland.

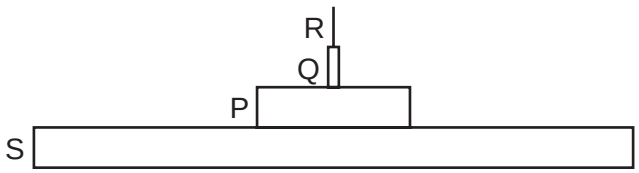
species	number of individuals	biomass of one individual / arbitrary units	energy value per unit mass / arbitrary units
P	10 000	0.100	1.0
Q	5	10.000	2.0
R	500	0.002	1.8
S	3	300 000.000	0.5

Which is the correct pyramid of energy from these data?

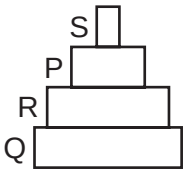
A



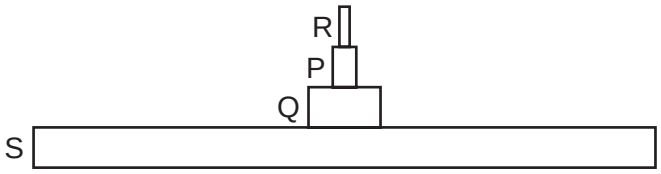
B



C



D



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