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

BIOLOGY **9700/12**

Paper 1 Multiple Choice **October/November 2013**

1 hour

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

* 1 4 3 6 9 1 3 7 8 6 *

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.
DO **NOT** WRITE IN ANY BARCODES.

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.
Electronic calculators may be used.

This document consists of **15** printed pages and **1** blank page.

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1 Which structure is measured in the units shown using a light microscope?

	structure	unit
A	cell surface membrane	nm
B	cell wall	nm
C	chloroplast	μm
D	ribosome	μm

2 A student studied two photographs, at the same magnification, of a palisade mesophyll cell, one using a light microscope and the other using an electron microscope.

The student observed:

1 the cisternae of the Golgi apparatus

2 the grana in the chloroplasts

3 the two membranes of the nuclear envelope

4 the vacuole enclosed by a tonoplast.

Which features can only be seen because of the higher resolution of the electron microscope?

A 1, 2 and 3 only

B 1, 2 and 4 only

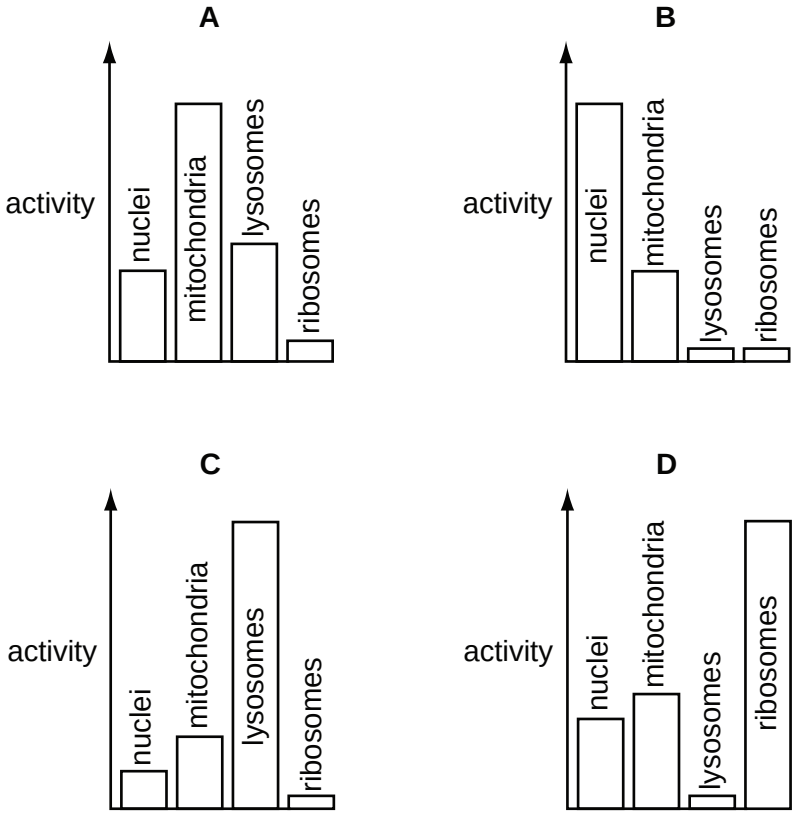
C 1, 3 and 4 only

D 2, 3 and 4 only

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3 A piece of mammalian tissue was homogenised and centrifuged. The biochemical activity of four subcellular fractions was investigated.

Which diagram indicates the fraction with maximum synthesis of messenger RNA?



4 Which row shows features of a typical eukaryotic cell?

	cell size	nucleus	DNA	ribosome size
A	< 2μm	absent	linear	large 80S
B	< 2μm	present	circular	small 70S
C	> 2μm	present	circular	small 70S
D	> 2μm	present	linear	large 80S

5 Many single-celled animals, living in fresh water, possess vacuoles which contract regularly, expelling excess water.

Why do the cells of plants living in fresh water **not** require such vacuoles?

A Plant cells have a higher concentration of dissolved solutes than animal cells.

B Plant cell walls are impermeable to water.

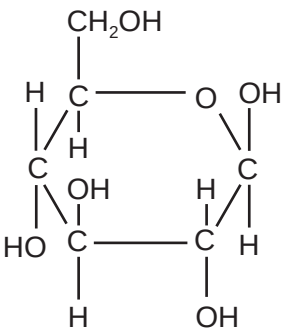
C Plant cell walls limit cell size.

D Water movement into plants is controlled by their roots.

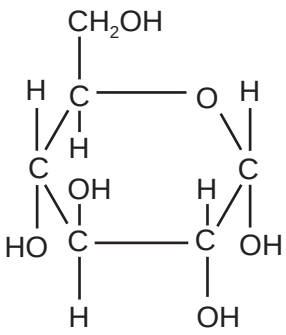
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6 Which shows β-glucose?

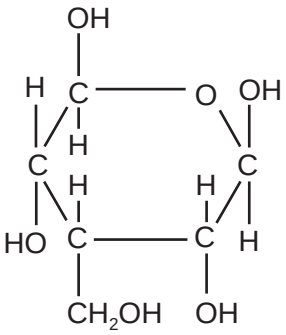
A



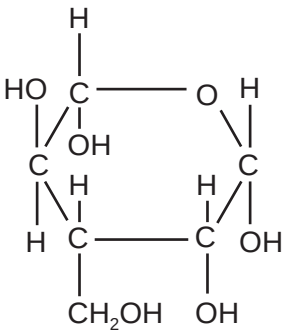
B



C



D



7 Which row is correct when one molecule of sucrose is hydrolysed?

	molecules of reducing sugar	molecules of water
A	1	1
B	1	2
C	2	1
D	2	2

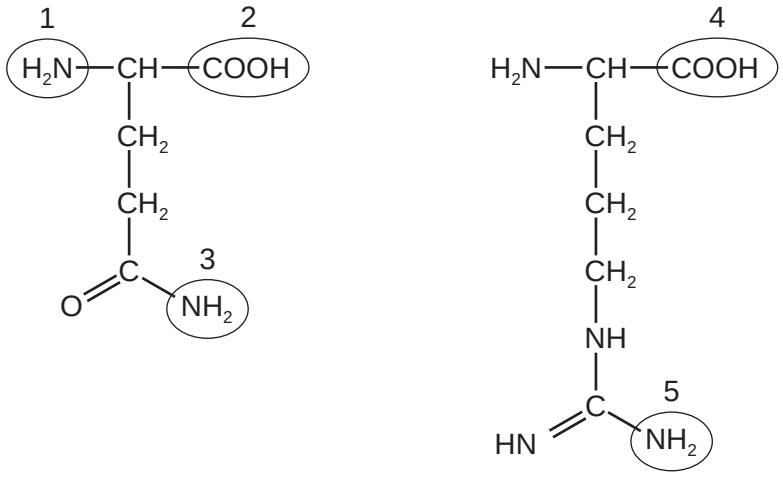
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8 The formation of glycosidic and peptide bonds is responsible for polymerisation in some biological molecules.

Which bonds are found in which molecules?

	glycosidic	peptide
A	glycerol	glycoprotein
B	glycogen	glycerol
C	glycogen	glycoprotein
D	glycoprotein	glycolipid

9 The diagrams show the structures of two amino acids, each of which has more than one amine ($–NH_2$) group.



A peptide bond is formed between the two amino acids.

Which groups form the peptide bond?

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

10 Which explains why haemoglobin is able to carry oxygen?

A It consists of four polypeptides.

B It contains iron.

C It has a quaternary structure.

D It is a globular protein.

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11 Which is correct for a non-competitive inhibitor of enzyme action?

1 Increasing the concentration of the enzyme's substrate will reduce its effect.

2 It reduces the activation energy required for a reaction to take place.

3 It reduces the maximum rate of reaction.

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

12 The enzyme lysozyme secreted from tear glands forms deposits on contact lenses.

Which ingredient would be effective in a contact lens cleaner for removing these deposits?

A ethanol

B lysosomes

C pH buffers

D proteases

13 Which is correct for components of a cell surface membrane?

	increases membrane fluidity	allows recognition of cell
A	cholesterol	glycoproteins
B	glycolipids	phospholipids
C	glycoproteins	glycolipids
D	phospholipids	cholesterol

14 A method called freeze-fracture can be used to study the structure of cell membranes. The membrane is frozen and then split down the middle, separating the two layers of phospholipids from each other. Any proteins contained within one layer remain in that layer. Proteins which span the membrane can be found in either layer after freeze-fracture, depending on the protein's properties.

Which statement(s) about the results of freeze-fracture studies are correct?

1 It provides evidence for the bilayer nature of membranes.

2 It provides evidence for the arrangement of proteins.

3 It shows that the proteins in the membrane do not contribute to its strength.

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

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15 Which statements are descriptions of **both** facilitated diffusion and active transport?

1 moves substances against a concentration gradient

2 requires ATP

3 transports charged ions across the cell surface membrane

4 uses proteins

A 1, 2, 3 and 4

B 1, 2 and 4 only

C 2 and 3 only

D 3 and 4 only

16 Which statement about the fluid mosaic model of membrane structure is correct?

A The less unsaturated the fatty acid chains of the phospholipids, the more fluid the membrane.

B The more unsaturated the fatty acid chains of the phospholipids, the more fluid the membrane.

C The higher the temperature, the less fluid the membrane.

D The lower the temperature, the more fluid the membrane.

17 Which statements about cancer are correct?

1 Exposure to UV light from the sun always causes skin cancer.

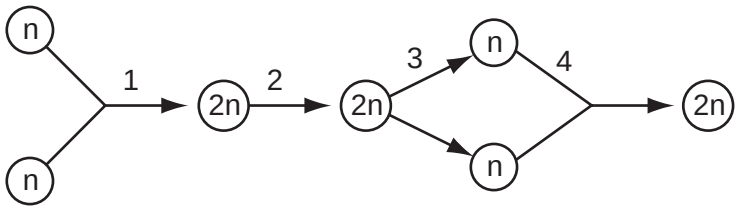
2 Some viruses can cause cancer.

3 The mutation of genes controlling the cell cycle may cause cancer.

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

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18 The diagram represents the life cycle of a sexually reproducing animal.



Which row correctly identifies meiosis and mitosis?

	meiosis	mitosis
A	1	4
B	2	1
C	3	2
D	4	3

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

Which row 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

20 Which statements about complementary base pairing are correct?

1 Purines and pyrimidines are different sizes.

2 It occurs during translation.

3 The base pairs are of different length.

4 Uracil forms two hydrogen bonds with adenine.

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

21 What is the minimum number of base substitutions required to change the nucleotide sequence of the HbA (normal) allele to the HbS (sickle cell) allele?

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

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22 Which feature of a plant cell is an adaptation for water uptake from the soil solution?

A waxy cuticle

B large numbers of mitochondria

C long, thin extension to the cell

D thick cellulose cell wall

23 A student used a potometer to measure the rate of water loss from a plant by transpiration.

The internal diameter of the capillary tube and the distance moved by the bubble in 30 seconds were recorded.

The results are shown in the table.

internal diameter of capillary tube / mm	distance bubble moved in 30 s / mm
1.8	40.0

The volume of water moved = πr^2 x distance moved by the bubble.

Which calculation correctly shows how to determine the rate of transpiration in $mm^3 s^{-1}$?

A $\frac{\pi(1.8^2 \times 40.0)}{30}$

B $\pi(1.8^2 \times 40.0) \times 30$

C $\frac{30}{\pi(0.9^2 \times 40.0)}$

D $\frac{\pi(0.9^2 \times 40.0)}{30}$

24 Which feature of xylem vessel elements helps the cohesion of water?

A lignin forms an incomplete secondary wall

B new vessels carry extra water as a plant grows

C there are no cross walls between the vessel elements

D the vessel elements form narrow tubes

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

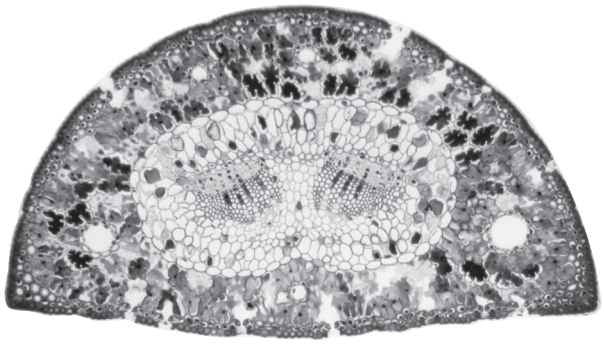
A absorption of water through the root hair cells

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

26 The photomicrograph shows a transverse section through a leaf.



×50

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

1 sunken stomata

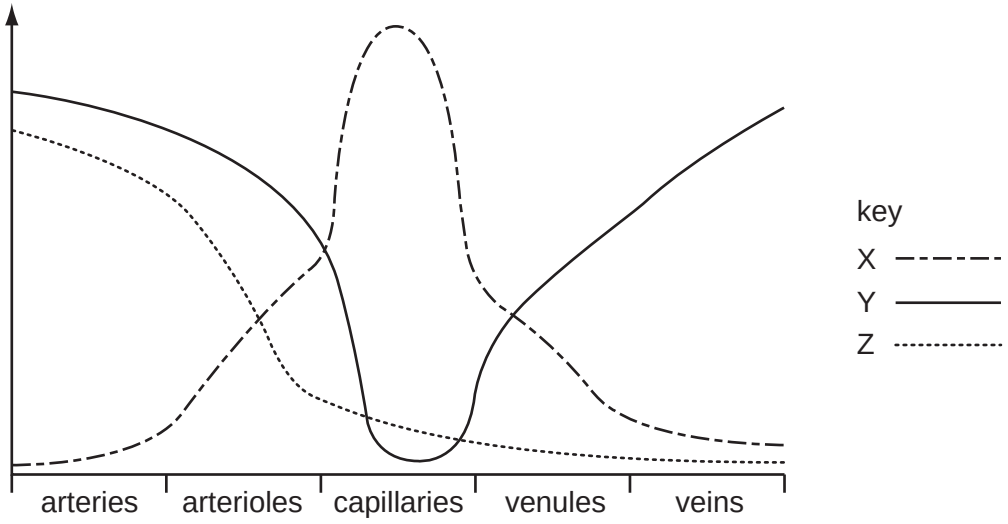
2 two layers of epithelium

3 thick cuticle

4 small surface area to volume

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

27 The graph represents data on blood vessels and blood flow.



Which row correctly identifies the curves?

	velocity of blood flow	pressure of blood	total cross-sectional area
A	X	Y	Z
B	X	Z	Y
C	Y	Z	X
D	Z	X	Y

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28 What occurs during ventricular systole in a mammalian heart?

1 aortic pressure increases

2 atrial pressure does not change

3 ventricular pressure increases

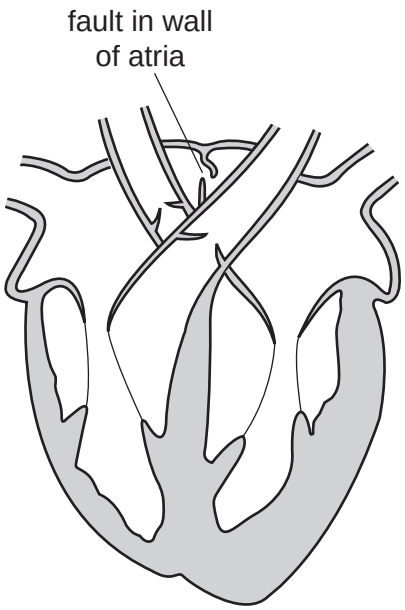
A 1 and 2

B 1 and 3

C 2 and 3

D 3 only

29 The diagram shows a defect in the walls between the atria.



What effect would this defect have on the blood circulatory system?

A increased pressure in the pulmonary artery

B irregular heart beat

C reduced oxygen saturation of haemoglobin

D ventricular systole is delayed

30 Which will **not** be formed in the plasma in capillaries surrounding active tissue?

A carbaminohaemoglobin

B carbonic acid

C hydrogen carbonate

D hydrogen ions

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[Turn over

31 Goblet cells are found in the trachea.

Which organelles would be found in large numbers in a goblet cell?

1 lysosomes

2 mitochondria

3 rough endoplasmic reticulum

4 secretory vesicles

A 1, 2 and 3 only

B 2, 3 and 4 only

C 1 and 3 only

D 2 and 4 only

32 Which tissues are present in a bronchus?

	cartilage	ciliated epithelium	smooth muscle
A	✓	✓	✓
B	✓	✓	✗
C	✓	✗	✓
D	✗	✓	✓

key

✓ present

✗ absent

33 Which statements are correct effects of tar in tobacco smoke on the human gas exchange system?

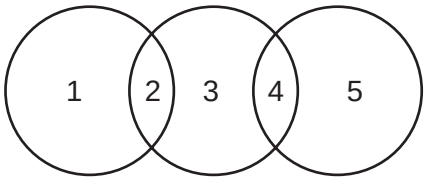
	goblet cells are stimulated to secrete more mucus	mucus glands in the trachea are enlarged	mutations may occur in epithelial cells forming tumours	the activity of cilia in the airways is inhibited
A	✓	✓	✗	✗
B	✗	✓	✓	✓
C	✓	✓	✓	✓
D	✓	✗	✓	✓

key

✓ correct

✗ not correct

34 The diagram shows the relationship between cholera, measles and TB.



Which is correct?

	1	2	3	4	5
A	cholera	bacteria	TB	airborne	measles
B	cholera	virus	measles	waterborne	TB
C	measles	airborne	cholera	bacteria	TB
D	measles	waterborne	TB	virus	cholera

35 New-born babies have natural passive immunity.

What is the correct explanation for this?

	immunity is not inherited	antibodies are broken down
A	✗	✓
B	✗	✗
C	✓	✓
D	✓	✗

key

✓ = correct

✗ = not correct

36 Which is a correct description of different types of immunity?

	natural active	natural passive	artificial active	artificial passive
A	antibodies cross the placenta	injection of antigens	injection of antibodies	no memory cells form
B	memory cells form	antibodies cross the placenta	injection of antigens	injection of antibodies
C	injection of antibodies	memory cells form	antibodies cross the placenta	injection of antigens
D	injection of antigens	injection of antibodies	no memory cells form	antibodies cross the placenta

37 The World Health Organization (WHO) set a target to eradicate polio, using vaccination, by the year 2000. However, cases are still being reported in some parts of the world after this date.

What explains these new cases of polio?

1 Some parts of countries are difficult to reach because of poor transport or wars.

2 There is not enough research to develop more effective vaccines.

3 Records of vaccinated and unvaccinated people are incomplete.

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

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

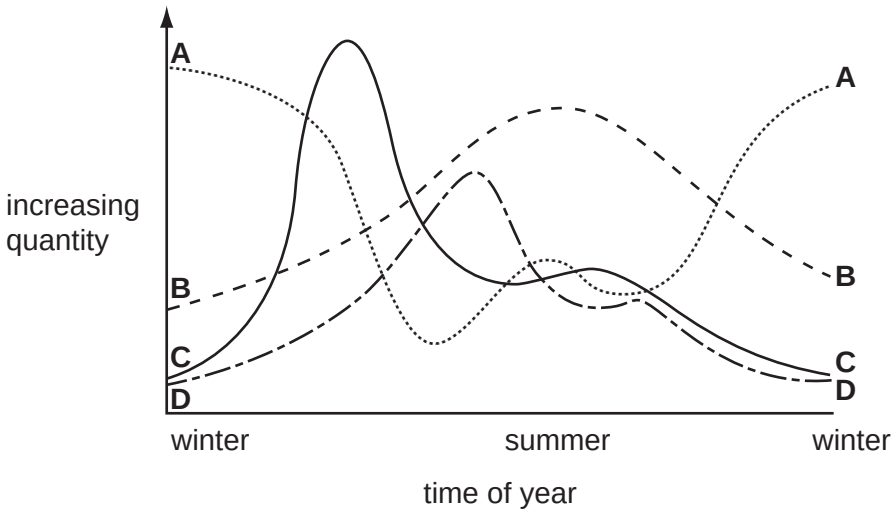
intensity of light per day

numbers of producers

numbers of primary consumers

quantity of nutrients

Which curve represents the numbers of producers?



39 Which events can occur in the nitrogen cycle?

1 Inorganic nitrogen in the atmosphere undergoes denitrification by specific prokaryotes.

2 Nitrate concentrations in the soil are increased by nitrifying bacteria in waterlogged soil.

3 Organic nitrogen in legumes passes into the soil where deamination and ammonification occurs.

4 Saprotrophic fungi living in the soil decompose organic nitrogen in faeces.

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

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40 Two different ecosystems of the same size, X and Y, were compared. Both ecosystems have the same climate.
The results of the comparison are shown.

ecosystem X	ecosystem Y
greater number of trophic levels	fewer number of trophic levels
lower proportion of decomposers	higher proportion of decomposers
dominant producer is smaller and non-woody	dominant producer is larger and woody
has smaller fluctuation in environmental temperature	has larger fluctuation in environmental temperature
has less oxygen	has more oxygen

Using the information in the table, which statement is **not** a valid suggestion concerning X and Y?

A A greater percentage of primary producers are likely to be consumed by primary consumers in X than in Y.

B X could be a marine aquatic ecosystem and Y could be a terrestrial ecosystem.

C Energy losses between trophic levels are likely to be lower for X than for Y.

D There is likely to be a higher rate of photosynthesis and production of organic matter in X than in Y.

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