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

BIOLOGY **9700/13**

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)

4295094601

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, 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 **14** printed pages and **2** blank pages.

1 For which process is the large surface area of the cristae in the mitochondria important?

A energy radiation

B enzyme reaction

C gaseous exchange

D protein synthesis

2 What is **not** a limitation of an electron microscope?

A Electrons do not travel far in air so the whole system must be in a vacuum.

B The electron beam cannot penetrate far into biological material.

C The typical specimen viewed in a vacuum must be dehydrated.

D There is an increase in resolution and magnification compared with the light microscope.

3 What explains why cells with no nucleoli die?

A They do not have centrioles and cannot divide.

B They do not have mitochondria and cannot release energy.

C They do not have mRNA and cannot transcribe DNA.

D They do not have ribosomes and cannot synthesise protein.

4 Which statements about a typical prokaryotic cell are correct?

1 It is smaller than 2 μm.

2 It has a nucleus.

3 Its has circular DNA.

4 It has small (70S) ribosomes.

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

5 When mitochondria are extracted from cells for biochemical study, they are usually kept in a $0.25\,mol\,dm^{-3}$ sucrose solution.

Why is the sucrose solution used?

A to act as a solvent

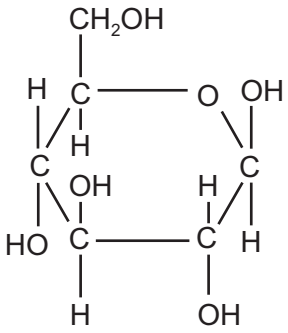
B to enable the rate of reaction of the mitochondria to be determined

C to prevent the mitochondria from changing in structure

D to provide a source of energy

6 Which shows the basic unit of cellulose?

A



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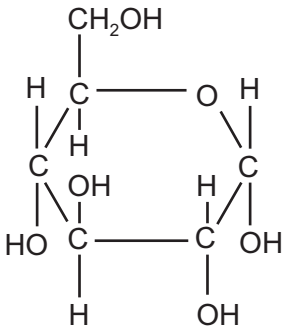

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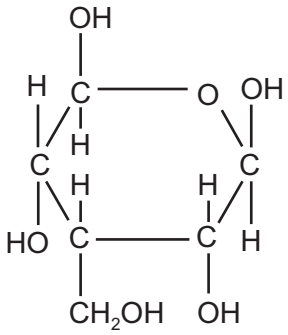

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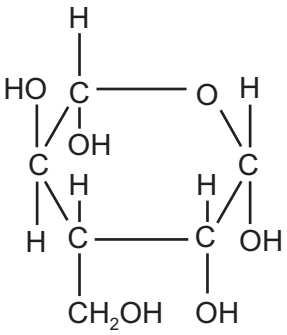


7 Which explains why haemoglobin is suitable as an oxygen carrier?

1 The haem group combines with oxygen.

2 The iron combines with oxygen reversibly.

3 Haemoglobin changes shape as oxygen loads.

A 1 only

B 1 and 2 only

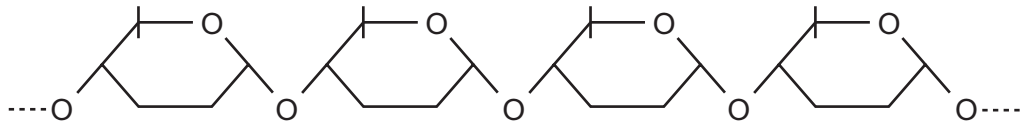
C 2 and 3 only

D 1, 2 and 3

[Turn over

8 Which diagram shows part of a structural polysaccharide?

A



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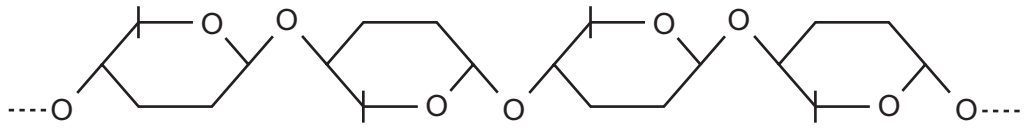

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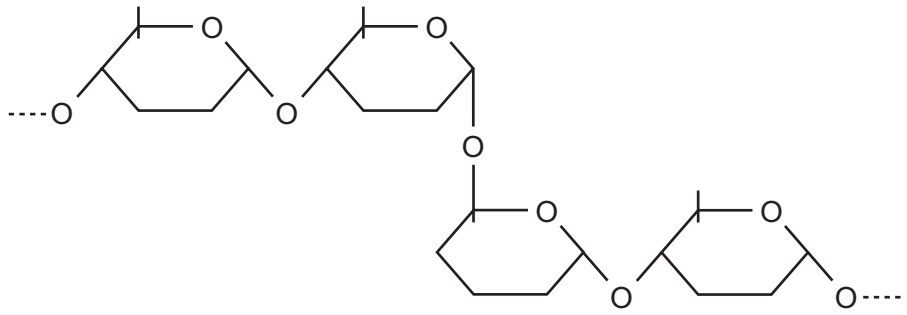

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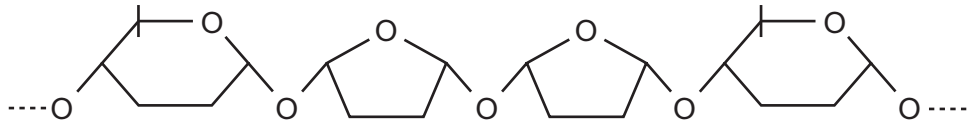
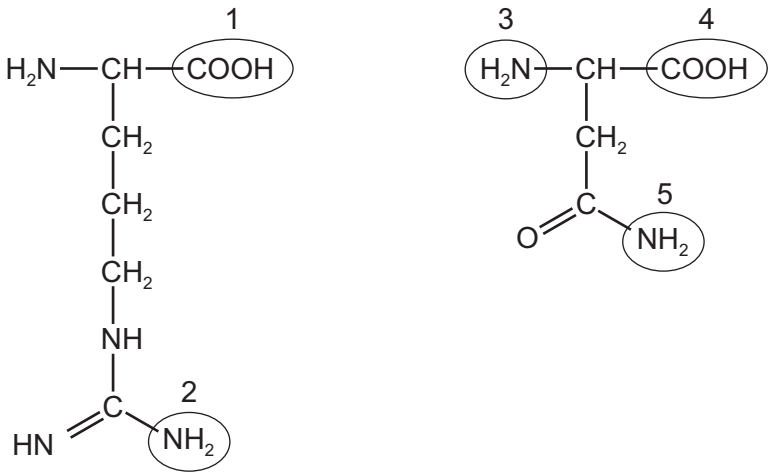


9 The diagrams show the structures of two amino acids, each of which has more than one amine ($-NH_2$) group.



A peptide bond is formed between the two amino acids.

Which groups form the peptide bond?

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

10 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

11 Which is correct for competitive inhibitors of enzymes?

1 They occupy the active site of an enzyme.

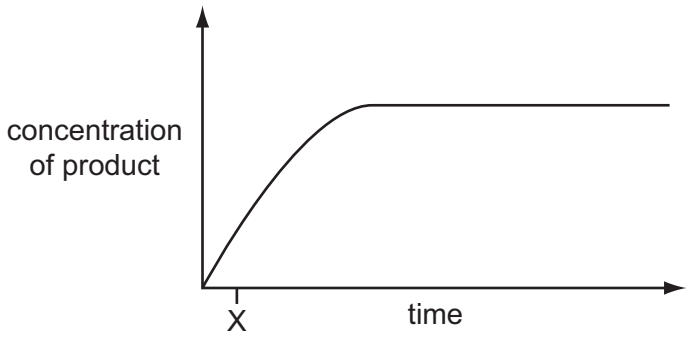
2 They have exactly the same shape as the substrate.

3 They can be used to control the rate of enzyme activity.

4 They can bind to a site on an enzyme other than the active site.

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

12 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.

13 Which statement concerning the role of cholesterol in the cell surface membrane is correct?

A It can act as a barrier to the entry into the cell of non-polar molecules.

B It helps the entry and exit of ions through the fatty acids.

C It maintains the fluidity of the membrane at low temperatures.

D It makes the membrane more permeable to very small water-soluble substances.

14 Which processes that contribute to transport across cell surface membranes are active or passive?

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

key
✓ = active
✗ = passive

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

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

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

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

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

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

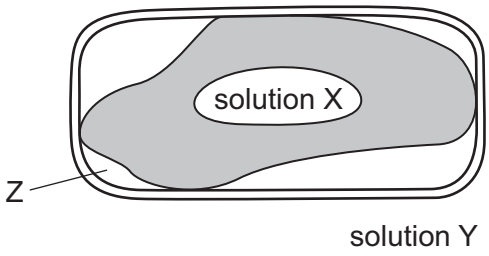
A from 1 and 2 to 3 and 4

B from 2, 3 and 4 to 1

C from 1 to 3 to 2 and 4

D from 1, 2 and 3 to 4

16 The diagram shows a partially plasmolysed plant cell.



What is found at Z?

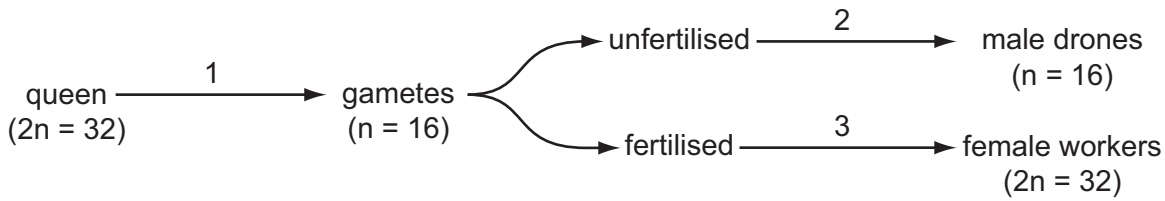
A air

B solution X

C solution Y

D water

17 The diagram shows part of the life cycle of the honey bee, *Apis mellifera*.



Where does mitosis occur?

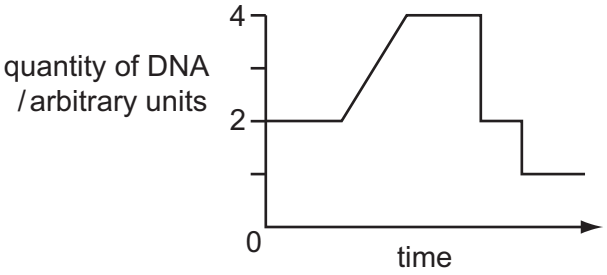
A 1 only

B 1 and 2 only

C 1 and 3 only

D 2 and 3 only

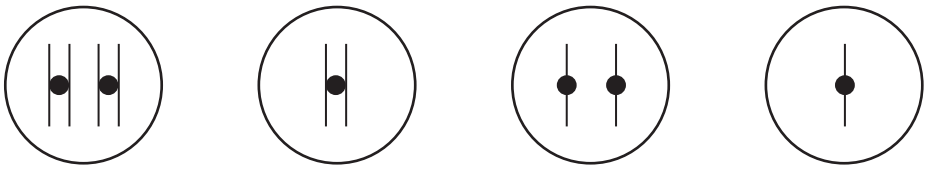
18 The graph shows the change in the quantity of DNA in a cell during a reduction division (meiosis).



A cell with one pair of chromosomes (2n = 2) undergoes meiosis.

Which nucleus is formed as a result of this division?

A **B** **C** **D**



19 What is the minimum number of hydrogen bonds in a length of DNA containing 700 base pairs?

A 350 **B** 700 **C** 1400 **D** 2100

20 Which term best describes the length of DNA that codes for the synthesis of a polypeptide?

A anticodon

B codon

C gene

D nucleotide

21 Which statements about complementary base pairing are correct?

1 It occurs during translation.

2 Purines and pyrimidines are the same size.

3 The base pairs are of equal length.

4 Uracil forms three hydrogen bonds with adenine.

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

22 What is transpiration and which advantage does it give to a plant?

	transpiration	advantage to a plant
A	evaporation of water from leaf surfaces	maintains the water potential
B	evaporation of water from leaf surfaces	stomata are open for gas exchange
C	loss of water vapour from leaves	maintains the water potential
D	loss of water vapour from leaves	stomata are open for gas exchange

23 Which feature of xylem vessel elements allows them to stay open as transpiration increases?

A new vessel elements carry extra water as a plant grows

B there are no cross walls between vessel elements

C vessel elements form narrow tubes

D walls of vessel elements contain lignin

24 What occurs in the sieve tube elements of a photosynthesising leaf and an actively growing root?

	sieve tube elements in leaf	sieve tube elements in root
A	water potential decreases	sugars are moved in
B	water potential decreases	sugars are moved out
C	water potential increases	sugars are moved in
D	water potential increases	sugars are moved out

25 What occurs in the apoplast and symplast pathways?

	water enters cytoplasm through cell surface membrane	water enters vacuoles	water moves from cell to cell through intercellular spaces
A	apoplast	apoplast	symplast
B	apoplast	symplast	symplast
C	symplast	apoplast	apoplast
D	symplast	symplast	apoplast

26 Some fungi cause wilting in crop plants by growing within the xylem vessels.

Which process will be directly affected by these fungi?

A cohesion between water molecules

B development of root pressure

C mass flow during translocation

D uptake of water by root hair cells

27 Which statement correctly identifies a similarity between blood plasma and tissue fluid?

A Protein is found in equal concentration in both blood plasma and tissue fluid.

B The blood plasma is under the same pressure as the tissue fluid.

C The water potential of the blood plasma and tissue fluid are equal.

D White blood cells are found in both blood plasma and tissue fluid.

28 Which reactions are **not** likely to occur in blood that is passing through active tissues?

1 $Hb + 4O_2 \rightarrow HbO_8$

2 $HbO_8 + H^+ \rightarrow HHb + 4O_2$

3 $HCO_3^- + H^+ \rightarrow H_2CO_3$

4 $H_2O + CO_2 \rightarrow H_2CO_3$

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

29 The pressure of blood entering capillaries is about seven times higher than that of blood leaving the capillaries.

What correctly explains this observation?

1 Blood pressure decreases with distance from the heart.

2 Tissue fluid formation is due to a net loss of plasma from capillaries.

3 Veins have fewer elastic and muscle fibres in their walls than arteries.

A 1, 2 and 3

B 1 and 2 only

C 1 and 3 only

D 2 and 3 only

30 The red blood cell count of humans increases when they remain at high altitudes.

Why does this occur?

1 to increase the Bohr effect

2 to increase the diffusion gradient for oxygen in the lungs

3 to maintain transport of oxygen

A 3 only

B 1 and 2 only

C 2 and 3 only

D 1, 2 and 3

31 Goblet cells are found in the trachea.

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

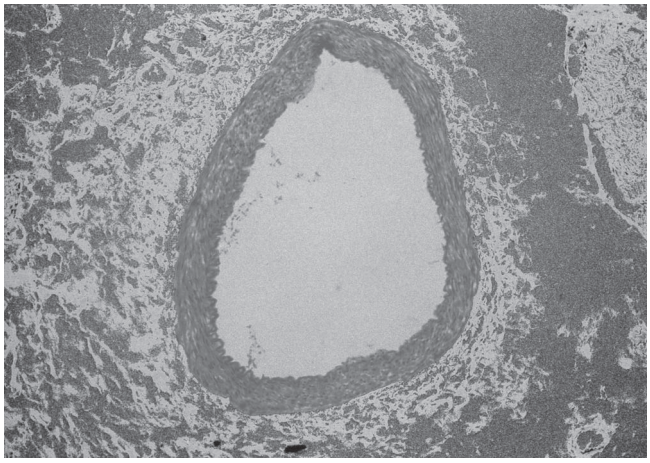
	Golgi apparatus	mitochondria	ribosomes
A	✓	✓	✓
B	✓	✓	✗
C	✓	✗	✓
D	✗	✓	✓

key

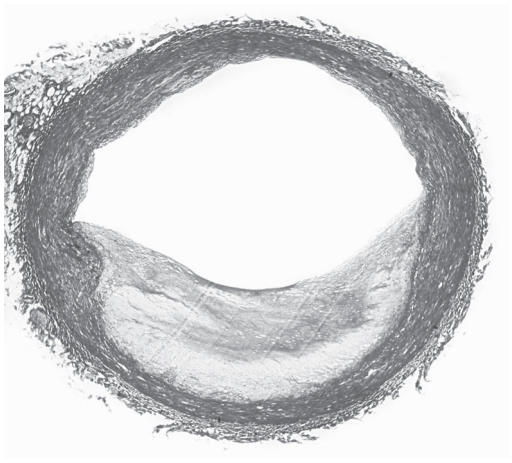
✓ = present in large numbers

✗ = not present in large numbers

32 The photomicrographs show a TS of an artery from a non-smoker and a TS of an artery from a smoker.



non-smoker



smoker

What is the reason for the appearance of smoker's artery?

A A cancerous tumour has formed and is blocking the lumen.

B Nicotine has damaged the artery endothelium causing a plaque.

C Tar has stuck to the artery wall forming a blockage.

D The artery has become constricted due to carbon monoxide.

33 Which row describes emphysema?

	lung tissue	total surface area of the alveoli
A	less elastic	decreased
B	less elastic	increased
C	more elastic	decreased
D	more elastic	increased

34 Which row is correct?

	disease	causative agent	method of transmission	method of control
A	AIDS	HIV	intimate contact	antibiotics
B	cholera	virus	waterborne	oral rehydration therapy (ORT)
C	malaria	bacterium	insect vector	antimalarial drugs
D	tuberculosis (TB)	bacterium	airborne	vaccination

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

What could help prevent humans from spreading the disease?

1 killing all poultry

2 reducing the number of 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 the function(s) of plasma cells during an immune response?

1 destroy cancer cells

2 differentiate into memory cells

3 secrete antibodies

A 2 only

B 3 only

C 2 and 3 only

D 1, 2 and 3

37 Some of the facts about a pathogen, P, are that:

1 it is transmitted in food and water

2 it lives in human intestines

3 it has many genes coding for surface proteins

4 it changes its surface antigens

5 it may or may not trigger an immune response.

Which explains why it is difficult to develop an effective vaccine for P?

A P can mutate to produce different antigens.

B P is a eukaryotic cell with many genes.

C P is found in contaminated food and water and affects the gut.

D People can be infected with P and may not show symptoms.

38 Which description is correct for B-lymphocytes?

	processed in the thymus	release antibodies immediately after formation	act in the cell mediated response	can act as antigen presenting cells
A	✓	✓	✓	✗
B	✓	✗	✓	✗
C	✗	✓	✗	✓
D	✗	✗	✗	✓

key
✓ = correct
✗ = incorrect

39 In a mangrove ecosystem, leaves from the grey mangrove plants fall into the water and sink to the mud below. They are then broken down by bacteria and fungi.

Invertebrates such as crabs, prawns, and molluscs live in the mud and feed on the dead leaves. The bullseye fish feeds on the invertebrates. Humans eat prawns, crabs and fish.

Herons and other wading birds live and breed in the mangroves. These birds feed on invertebrates and fish.

What is correct about this ecosystem?

A Bacteria, fungi, crabs, prawns and molluscs form the community in the mud.

B Bullseye fish are at the second trophic level in the food web.

C Fungi in the water are the main producers in the ecosystem.

D Grey mangroves are the ecological niche of herons.

40 Two species of birds feed on different insects living on the same tree and so do not compete for food.

Which statement describes these two species of birds?

A They occupy different habitats in the same ecosystem.

B They occupy the same habitat in the same ecosystem.

C They occupy different niches in the same habitat.

D They occupy the same niche in the same habitat.

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