Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

BIOLOGY **9700/12**

Paper 1 Multiple Choice **May/June 2014**

1 hour

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

5159671053

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.

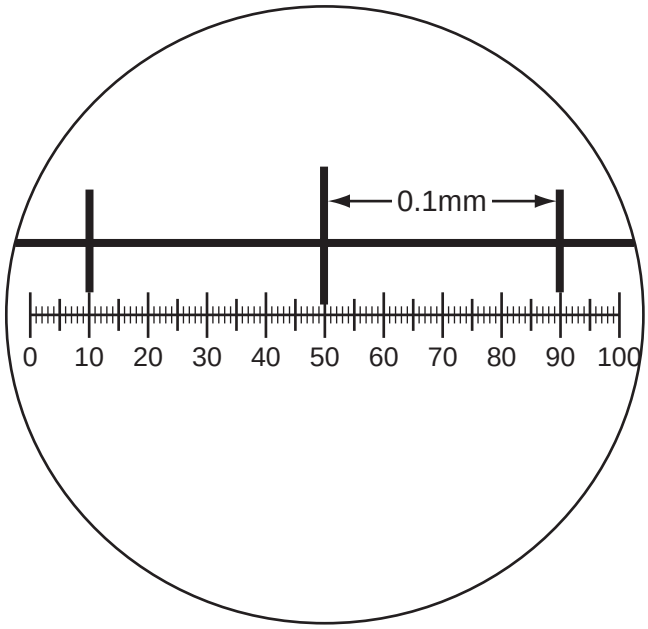
This document consists of **16** printed pages.

© UCLES 2014

1 At approximately which magnification is light microscopy not suitable because the resolution becomes too low?

A ×100 **B** ×200 **C** ×400 **D** ×1500

2 The diagram shows a stage micrometer viewed with an eyepiece graticule scale, using a magnification of ×400.



Using the same magnification, a chloroplast is measured and found to be 4 eyepiece graticule divisions long.

How long is the chloroplast?

A 1.0×10^{1} μm

B 4.0×10^{2} μm

C 2.5×10^{-1} μm

D 2.5×10^{-2} μm

3 Which organelle does **not** contain a partially permeable membrane?

A Golgi apparatus

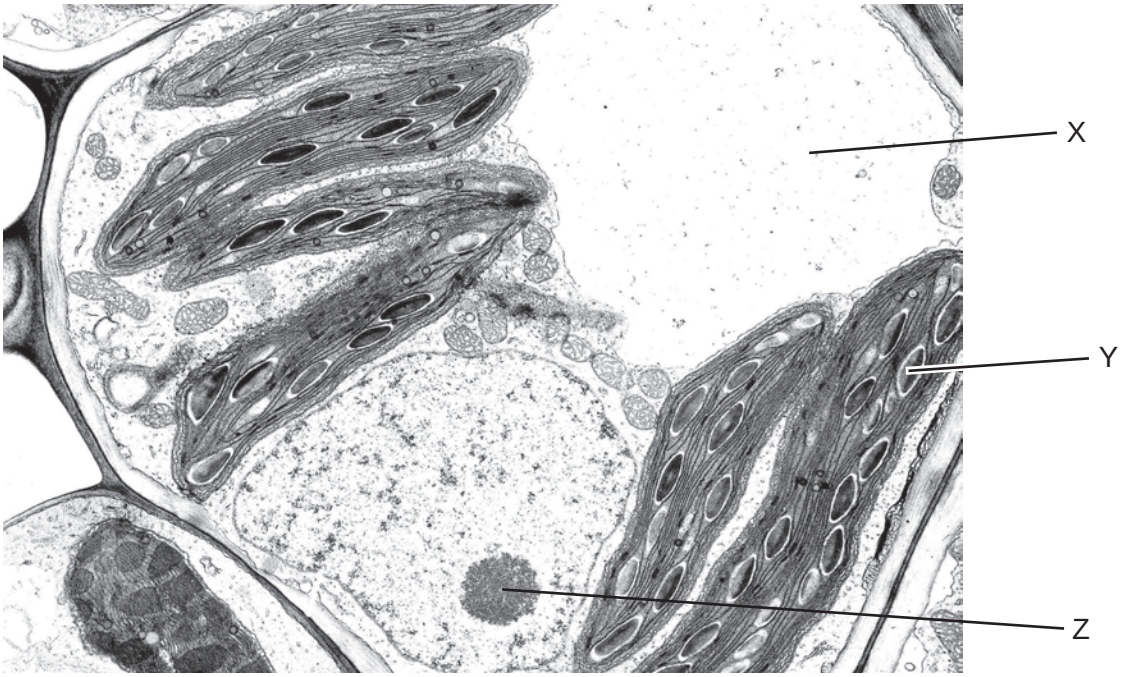
B lysosome

C mitochondrion

D ribosome

© UCLES 2014

4 The diagram shows an electron micrograph of a plant cell.



What do structures X, Y and Z contain?

	X	Y	Z
A	air	starch	DNA and RNA
B	cell sap	chlorophyll	protein
C	mineral ions	starch	DNA and RNA
D	water	mineral ions	starch

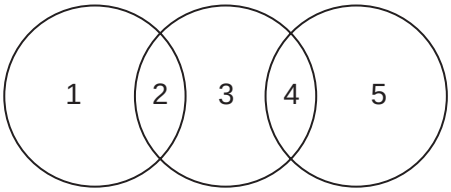
5 An amino acid enters a cell and is then used to synthesise an enzyme secreted by the cell.

What is the sequence of cell structures involved in the synthesis of the enzyme?

	first →			last
A	endoplasmic reticulum	Golgi apparatus	ribosome	exocytotic vesicle
B	endoplasmic reticulum	ribosome	Golgi apparatus	cell surface membrane
C	ribosome	endoplasmic reticulum	Golgi apparatus	exocytotic vesicle
D	ribosome	Golgi apparatus	endoplasmic reticulum	cell surface membrane

© UCLES 2014

6 The diagram shows some similarities between chloroplasts, mitochondria and typical prokaryotes.

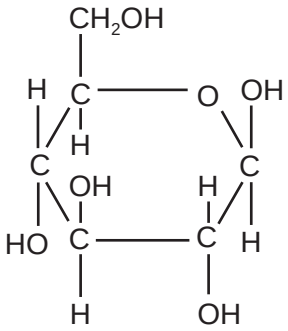


Which row is correct?

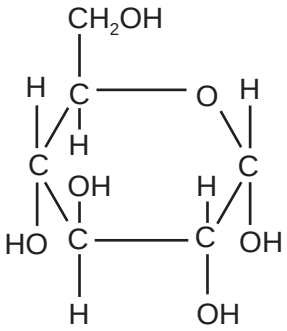
	1	2	3	4	5
A	chloroplasts	70S ribosomes	prokaryotes	70S ribosomes	mitochondria
B	chloroplasts	70S ribosomes	prokaryotes	80S ribosomes	mitochondria
C	mitochondria	70S ribosomes	chloroplasts	80S ribosomes	prokaryotes
D	mitochondria	80S ribosomes	chloroplasts	80S ribosomes	prokaryotes

7 Which shows the basic unit of glycogen?

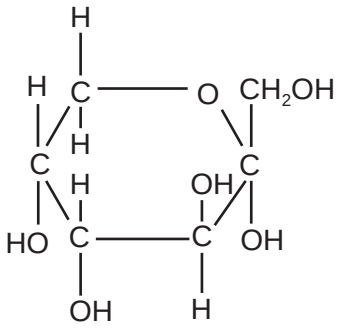
A



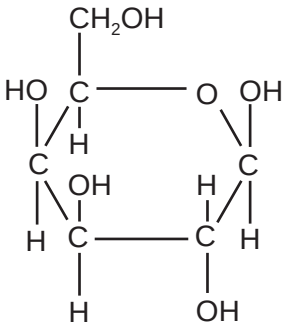
B



C



D



8 Four sugar solutions were tested with Benedict's solution. The table shows the colour of the solutions after testing.

solution	colour
1	green
2	blue
3	brick red
4	yellow

What is the best interpretation of the results?

	solution 1	solution 2	solution 3	solution 4
A	0.05% reducing sugar	0.5% non-reducing sugar	1.0% reducing sugar	0.1% reducing sugar
B	0.5% reducing sugar	0.0% reducing sugar	1.0% reducing sugar	0.1% reducing sugar
C	1.0% reducing sugar	1.0% non-reducing sugar	1.5% reducing sugar	0.5% reducing sugar
D	0.05% non-reducing sugar	0.5% reducing sugar	1.0% non-reducing sugar	0.1% non-reducing sugar

9 Which features adapt a cellulose molecule for its function?

1 Long chains of glucose molecules coil into a helix.

2 Many hydrogen bonds form between adjacent chains.

3 It is insoluble in water.

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

10 The structure of phospholipids and triglycerides include the following.

1 glycerol linked to fatty acids

2 hydrophobic fatty acid chains

3 saturated fatty acid chains

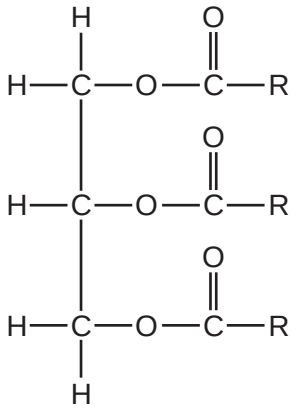
Which structures enable the formation of a lipid bilayer in cell surface membranes?

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

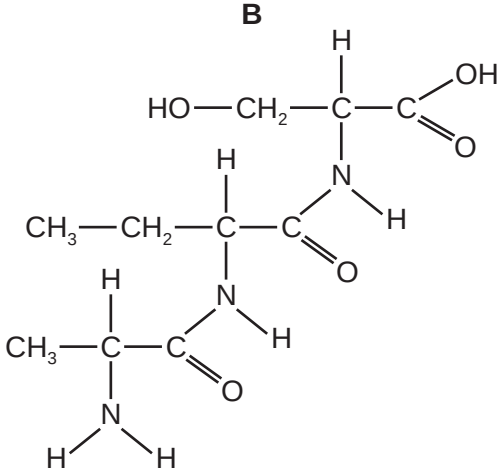
© UCLES 2014

11 Which molecule contains a glycosidic bond?

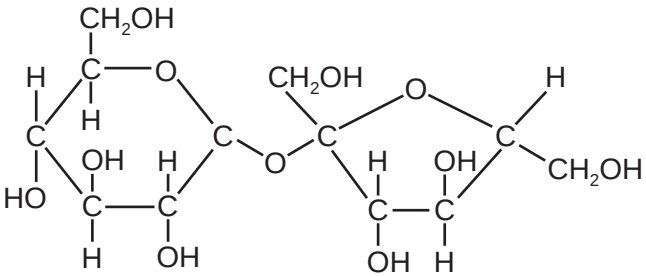
A



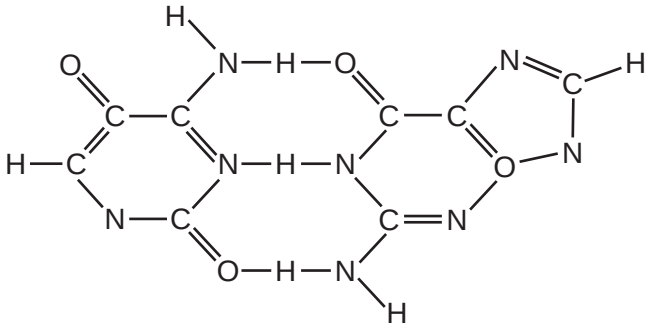
B



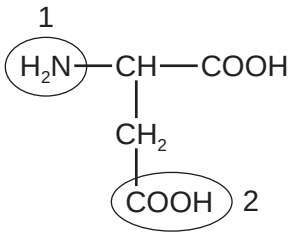
C

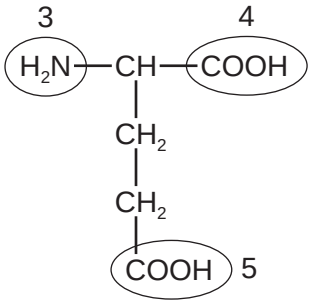


D



12 The diagrams show the structures of two amino acids, each of which has two carboxylic acid (–COOH) groups.





A peptide bond is formed between the two amino acids.

Which groups form the peptide bond?

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

© UCLES 2014

13 The drug ritonavir is sometimes used in the treatment of HIV / AIDS.

Ritonavir consists of three amino acids and is a competitive inhibitor of HIV protease. HIV causes this protease to be made inside human cells.

Ritonavir produces many side effects as it interferes with many metabolic processes in human cells.

Which statements about ritonavir are correct?

1 Ritonavir has a shape complementary to the active site of HIV protease.

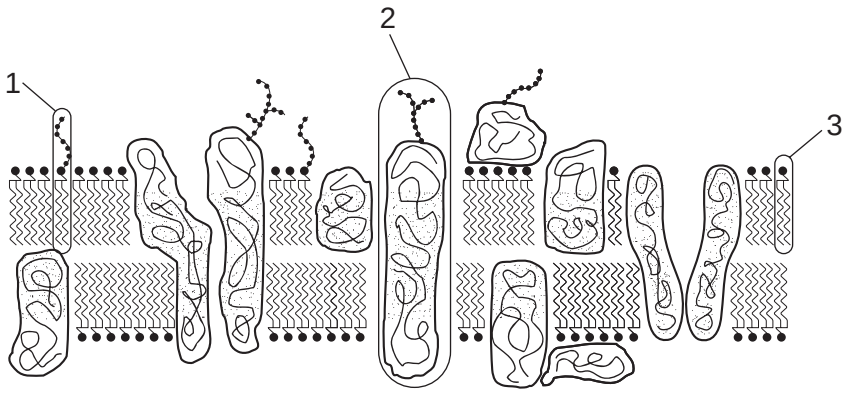
2 Ritonavir will enter human cells directly through the lipid bilayer and not require any transport proteins.

3 Ritonavir is likely to inhibit many of the enzymes of human cells.

4 Complete hydrolysis of ritonavir would require the addition of three water molecules.

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

14 The diagram shows the fluid mosaic model of a section of a cell surface membrane.



What is the role of each of the components labelled 1 to 3?

	1	2	3
A	antigen	chemical receptor	allow lipid soluble molecules to pass through
B	barrier to polar molecules	stabilise the membrane	antigen
C	chemical receptor	allow lipid soluble molecules to pass through	regulate the fluidity of the membrane
D	stabilise the membrane	control the fluidity of the membrane	barrier to polar molecules

15 Proteins in the cell surface membranes of human cells and mouse cells were labelled with red and green fluorescent dyes respectively.

When a human cell and a mouse cell were fused together the red and green fluorescent labels were at first found in different regions of the cell surface membrane of the hybrid cell, but after 40 minutes they were evenly distributed in the entire cell surface membrane.

What explains this observation?

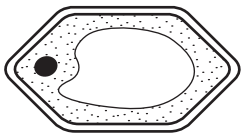
A All protein molecules in the cell surface membrane are fixed to structures within the cell, but phospholipid molecules move freely between them.

B Groups of protein and phospholipid molecules in the cell surface membrane are attached to each another and move together.

C Only protein molecules in the outer layer of the cell surface membrane can move freely between phospholipid molecules.

D Protein molecules in the outer layer of the cell surface membrane and those which span the bilayer can move freely between phospholipid molecules.

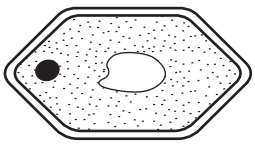
16 The diagram shows a plant cell.



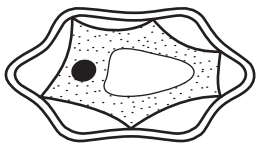
The plant cell is put into a solution with a water potential less negative than the cell contents.

What will happen to the appearance of the cell?

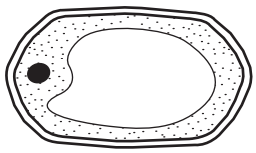
A



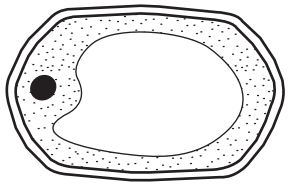
B



C



D



17 The cell cycle includes mitosis.

Which are features of **nuclear** division?

1 forms cells of equal size to the parent cell

2 forms genetically identical cells

3 semi-conservative replication of DNA

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

© UCLES 2014

18 Which is the correct statement concerning cell and nuclear division?

A Haploid eukaryotes can reproduce by mitosis whereas diploid eukaryotes can reproduce by mitosis or meiosis.

B Just before prophase, the mass of DNA is double the normal mass. Following anaphase, this mass is reduced by half and following cytokinesis this mass halves again.

C Mutagens can cause mutations whereas carcinogens can cause cancer. This means that all mutagens are carcinogenic.

D Some of the roles of mitosis are growth, asexual reproduction, cell repair following tissue damage and cell replacement.

19 Diploid (2n) organisms that reproduce sexually produce haploid (n) gametes.

Some plants, such as wheat, can produce diploid or haploid gametes. These gametes can fertilise other diploid or haploid gametes.

Which statements are correct for plants like these?

1 Diploid gametes may be produced by a fault in the reduction division (meiosis).

2 The offspring will always show an increased chromosome number.

3 The offspring could be either 2n, 3n or 4n.

4 The chromosome number could, in theory, increase with each generation.

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

20 Which nucleic acid bases are pyrimidines?

A adenine and guanine

B adenine, cytosine and thymine

C cytosine, thymine and uracil

D guanine, cytosine and uracil

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

© UCLES 2014

22 A short piece of DNA fifteen base pairs long was analysed to find the number of nucleotide bases in each of the polynucleotide strands. Some of the results are shown below.

	number of nucleotide bases			
	A	C	G	T
strand 1	6		3	
strand 2			4	

How many nucleotides containing adenine (A) were present in strand 2?

A 2 **B** 3 **C** 4 **D** 6

23 Which feature of xylem vessel elements helps adhesion during transpiration?

A lignin forms an incomplete secondary wall

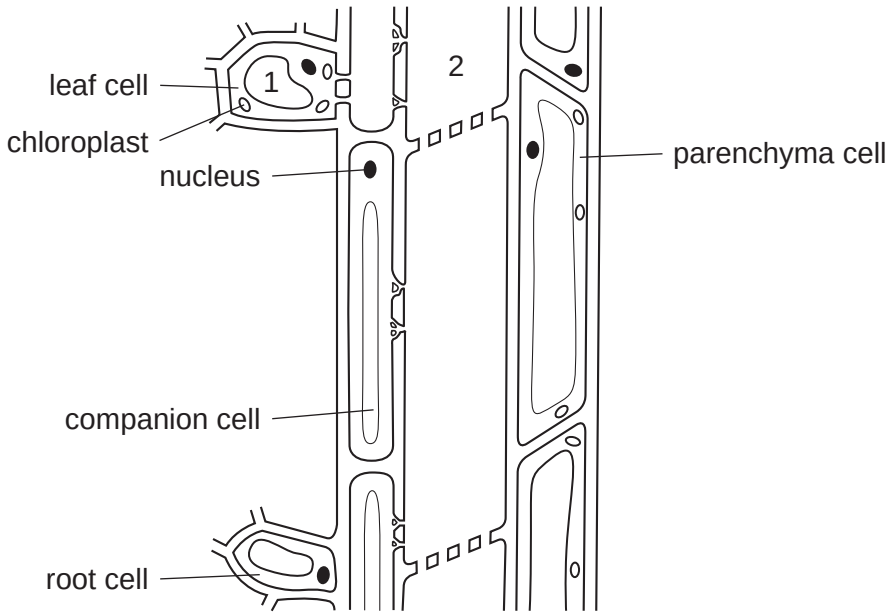
B new vessels carry extra water as the plants grow

C there are no cross walls between vessel elements

D the vessel elements form a narrow tube

© UCLES 2014

24 The diagram represents part of the phloem pathway, with adjacent cells, from leaf to root in a plant.



Which process is occurring between 1 to 2 and what is the effect on the water potential at 2?

	process from 1 to 2	water potential at 2
A	active transport of sucrose	becomes less negative
B	active transport of sucrose	becomes more negative
C	diffusion of sucrose	becomes less negative
D	diffusion of sucrose	becomes more negative

25 Which xerophytic adaptations reduce the water potential gradient?

1 rolled leaves

2 hairy leaves

3 sunken stomata

4 fewer stomata

5 fleshy leaves

A 1, 2, 3, 4 and 5

B 1, 2 and 3 only

C 1, 3 and 4 only

D 2 and 5 only

© UCLES 2014

26 What is **not** a factor influencing blood pressure?

A the diameter of the blood vessels

B the number of red blood cells in circulation

C the systolic pressure of the heart ventricles

D the volume of blood returning to the heart each heart beat

27 Which of the following are found in blood and lymph and tissue fluid?

1 carbon dioxide

2 fatty acids

3 white blood cells

4 proteins

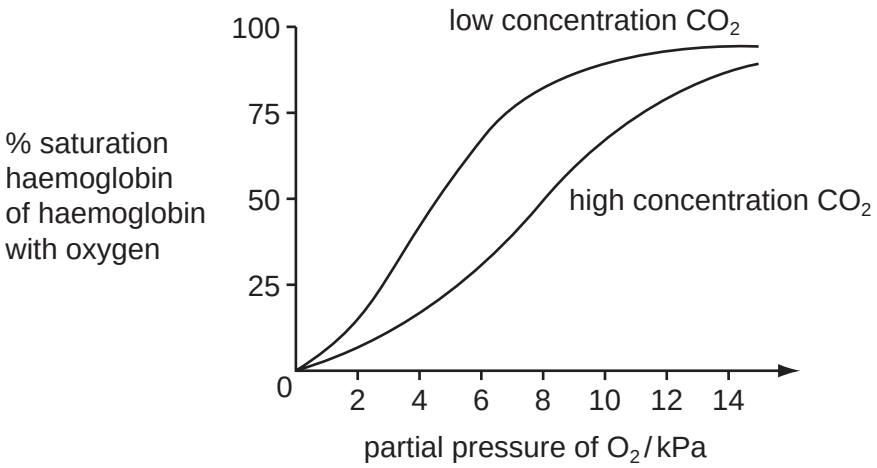
A 1, 2, 3 and 4

B 1, 2 and 3 only

C 1, 2 and 4 only

D 3 and 4 only

28 The graph shows the percentage saturation of haemoglobin with oxygen at different partial pressures of oxygen and two different concentrations of carbon dioxide.



What is the effect of increasing the concentration of carbon dioxide?

A It increases the affinity of haemoglobin for oxygen at respiring tissues.

B It increases the dissociation of haemoglobinic acid inside red blood cells.

C It increases the dissociation of oxygen from haemoglobin at respiring tissues.

D It increases the inhibition of carbonic anhydrase enzyme in red blood cells.

© UCLES 2014

29 Some babies are born with a hole between the right and left atria. These babies are found to have an increased number of red blood cells.

What is the reason for this increase?

A More blood is needed because it is pumped faster.

B More blood is needed because the pressure is lower.

C Their haemoglobin has a higher affinity for oxygen.

D There is less oxygen available to the newly born baby.

30 In the lungs, oxygen and carbon dioxide pass through cell membranes by diffusion.

Which row is correct?

	number of cell membranes diffused through by	
	oxygen from air	carbon dioxide to air
A	3	2
B	3	2 or 3
C	5	4
D	5	4 or 5

31 Which describes how substances in cigarette smoke increase the risk of developing atherosclerosis?

1 Carbon monoxide damages the endothelium of the arteries.

2 Nicotine makes platelets sticky.

3 Nicotine stimulates the release of adrenaline.

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

© UCLES 2014

32 Which flow diagram correctly describes the effect of tar entering the lungs?

A carcinogens come into contact with DNA → mutation occurs → uncontrolled cell division

B goblet cells secrete more mucus → mucus accumulates causing infection → phagocytes attracted by inflammation

C mucus accumulates causing infection → phagocytes attracted by inflammation → elastase destroys the alveolar walls

D mutation occurs → phagocytes attracted by inflammation → causes irritation and coughing

33 Which could **directly** reduce the surface area available for gas exchange in human lungs?

1 emphysema

2 lung cancer

3 smoking

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

34 The malarial parasite, *Plasmodium,* infects red blood cells and breaks down haemoglobin. Free haem groups are toxic to *Plasmodium* and the parasite converts them into non-toxic, crystalline haematozoin, using an enzyme, HDP, which is found in all species of *Plasmodium.*

What will be the long term result of giving patients with malaria a drug which inhibits HDP?

A a decreased concentration of free haem groups in infected red blood cells

B a decreased concentration of haemoglobin in infected red blood cells

C more rapid reproduction of some species of *Plasmodium* in infected red blood cells

D slower reproduction of all species of *Plasmodium* in infected red blood cells

© UCLES 2014

35 During a primary immune response, the following events occur.

1 Some B-lymphocytes form plasma cells.

2 B-lymphocytes with the specific cell surface receptors divide repeatedly by mitosis.

3 Specific antibody is produced.

4 T-helper cells secrete cytokines.

5 T-helper cells identify a specific antigen.

In which order will the events occur?

A $2 \rightarrow 1 \rightarrow 4 \rightarrow 3 \rightarrow 5$

B $2 \rightarrow 4 \rightarrow 3 \rightarrow 1 \rightarrow 5$

C $5 \rightarrow 4 \rightarrow 2 \rightarrow 1 \rightarrow 3$

D $5 \rightarrow 4 \rightarrow 3 \rightarrow 1 \rightarrow 2$

36 Which statement concerning the defence in the body against infectious disease is **not** correct?

A Antibodies against specific antigens are produced by plasma cells in passive immunity, but the protection is short-lived as no memory cells are produced.

B A specific immune response involves activation of B-lymphocytes and T-lymphocytes following recognition of, and binding to, a specific antigen.

C Following invasion by microorganisms, natural active immunity can be gained by initiating an immune response.

D Lysosomes fuse with vacuoles that have been formed by phagocytes and which contain invading microorganisms.

37 An antiserum to a snake toxin can be obtained by injecting the toxin into a horse. The antiserum is made from blood plasma taken from the horse a few weeks later. The antiserum is injected into a person who has been bitten by the same species of snake.

Which type of immunity occurs as a result of using this antiserum?

A artificial active

B artificial passive

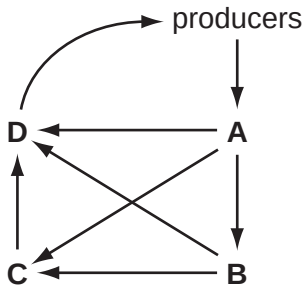
C natural active

D natural passive

© UCLES 2014

38 The flow of nutrients in an ecosystem is shown in the diagram.

Which letter represents decomposers?



39 An insect eats only the leaves of grass. This insect is eaten by carnivorous beetles.

Which ecological terms are described in this information about the insect?

1 habitat

2 niche

3 trophic level

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

40 A gardener has a waterlogged garden showing poor growth. He decides to drain it in an attempt to reduce the numbers of some harmful bacteria.

Which type of bacteria would he be attempting to reduce in number?

A decomposing

B denitrifying

C nitrifying

D nitrogen fixing

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

© UCLES 2014