Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

BIOLOGY **9700/12**

Paper 1 Multiple Choice **October/November 2014**

1 hour

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

6946056967

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 **15** printed pages and **1** blank page.

© UCLES 2014

1 Which combination of lenses for a light microscope will give the greatest magnification?

	eyepiece lens	objective lens
A	×5	×100
B	×10	×40
C	×15	×40
D	×15	×100

2 Which steps are needed to find the actual width of a xylem vessel viewed in transverse section using a ×10 objective lens?

1 Convert from mm to μm by multiplying by 10^{-3}.

2 Calibrate the eyepiece graticule using a stage micrometer on ×4 objective lens.

3 Measure the width of the xylem vessel using an eyepiece graticule.

4 Multiply the number of eyepiece graticule units by the calibration of the eyepiece graticule.

A 1, 2, 3 and 4

B 2, 3 and 4 only

C 1 and 2 only

D 3 and 4 only

3 The statements are all descriptions of cell structures.

1 surrounded by a single membrane and enclosing a large fluid-filled space

2 surrounded by a single membrane and enclosing inactivated enzymes

3 formed by two membranes enclosing a matrix, the inner membrane is folded

4 formed by a membrane that has flattened sacs and tubular structures inter-connected throughout the cell

5 formed of nucleic acid and protein attached to membranes or free in the cytoplasm

Which row shows the typical cell in which these cell structures are found?

	plant cell	animal cell
A	1, 2, 3 and 4	1, 2, 3 and 5
B	1, 3, 4 and 5	2, 3, 4 and 5
C	2, 4 and 5	1, 4 and 5
D	3, 4 and 5 only	2, 3 and 5 only

© UCLES 2014

4 Which structures are found in **both** typical eukaryotic cells **and** typical prokaryotic cells?

1 70S ribsomes

2 80S ribosomes

3 circular DNA

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

5 Which sequence shows some of the stages in the production and secretion of an enzyme?

A Golgi apparatus → ribosome → rough endoplasmic reticulum → mRNA

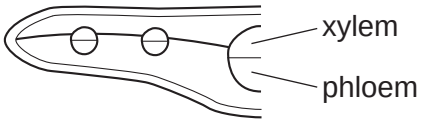
B mRNA → smooth endoplasmic reticulum → Golgi apparatus → vesicle

C ribosome → rough endoplasmic reticulum → vesicle → Golgi apparatus

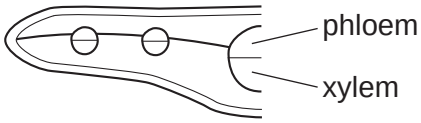
D smooth endoplasmic reticulum → mRNA → vesicle → ribosome

6 Which plan diagram of a transverse section of a dicotyledonous leaf correctly shows the position of xylem and phloem in a palisade mesophyll layer that is twice as thick as the spongy mesophyll layer?

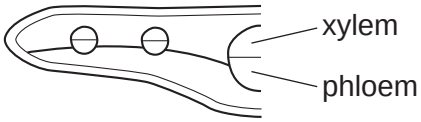
A



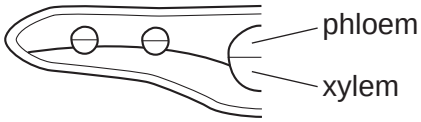
B



C



D



7 Proteases are a group of enzymes that digest proteins.

Which statement about proteases is correct?

A A bacterial protease that is secreted from a disease-causing bacterium could act as an antigen and cause the production of an antibody.

B Bacterial proteases are important in the nitrogen cycle as they are able to catalyse the breakdown of the organic nitrogen molecules nucleotides and urea.

C Non-competitive inhibition of a protease that has an optimum pH of pH2 can be overcome by increasing the substrate concentration and increasing the pH.

D Water molecules are required when peptide bonds that link the monomers together are broken by the action of proteases in condensation reactions.

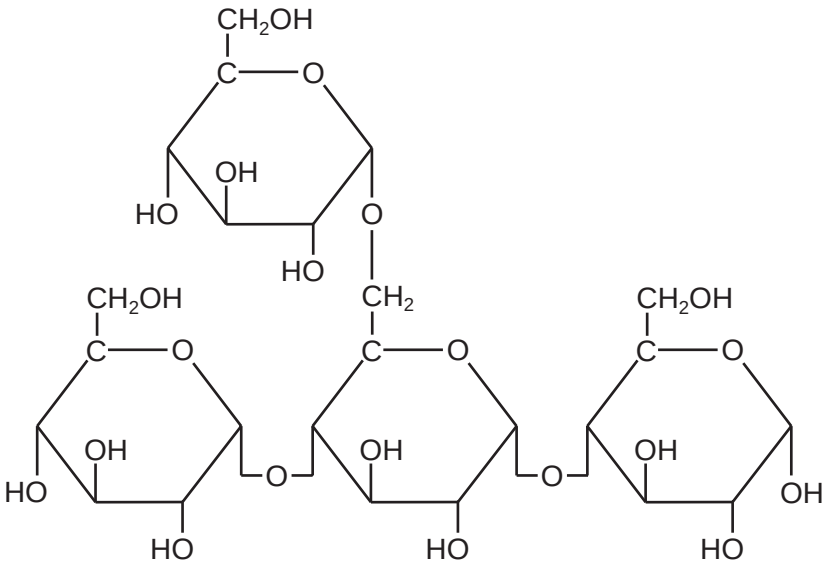
© UCLES 2014

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 Which of the bonds stabilising the tertiary structure of a protein would be **least** likely to break when the temperature is increased above the optimum for the protein?

A disulfide

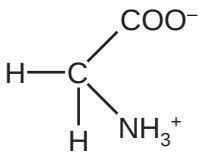
B hydrogen

C hydrophobic

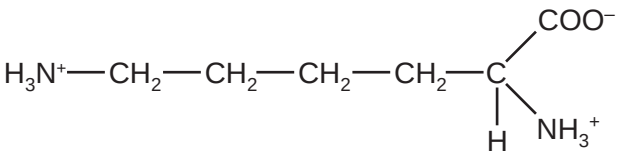
D ionic

© UCLES 2014

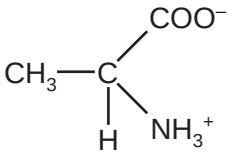
11 The diagram shows the structure of four amino acids in solution.



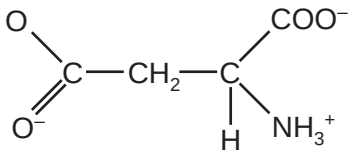
glycine



lysine



alanine



aspartate

Which amino acids have **no** overall charge?

A alanine and aspartate

B alanine and glycine

C aspartate and lysine

D glycine and lysine

12 The statements are about the properties of water.

1 It requires a lot of heat to evaporate.

2 It retains a lot of heat.

3 It is able to form hydrogen bonds with other water molecules.

4 It is able to form hydrogen bonds with other polar and non-polar molecules.

Which properties are important in transpiring plants to prevent enzymes in leaves from being denatured?

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

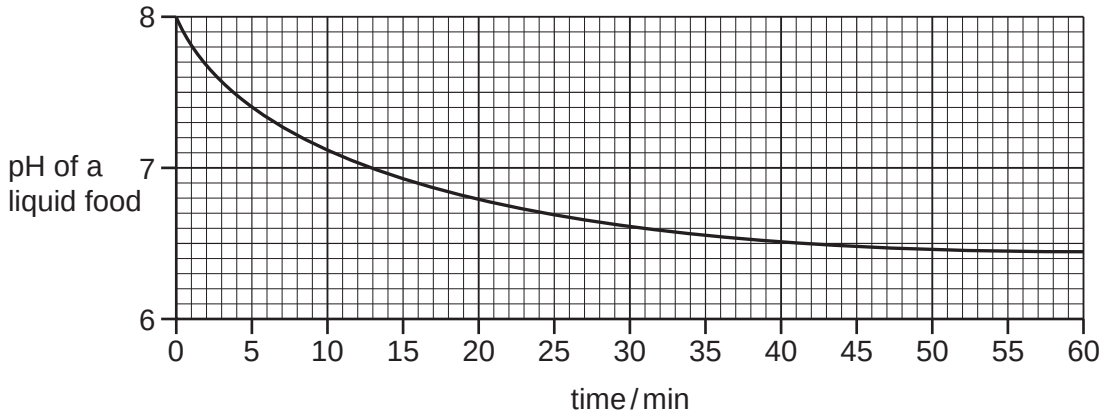
© UCLES 2014

13 Which words from the table correctly complete the paragraph about enzymes?

When the pH of an environment is decreased below an enzyme's optimum pH, ……1…… bonds between adjacent ……2…… groups, holding the ……3…… structure, are disrupted.

	1	2	3
A	hydrogen and ionic	R	tertiary
B	hydrogen	hydroxyl	secondary
C	ionic and peptide	R	primary and tertiary
D	peptide	amine	primary

14 Lipase is a digestive enzyme produced by the pancreas that catalyses the hydrolysis of dietary lipids. The table shows how the pH of a liquid food containing a high proportion of lipids decreases over time.



Which statements are possible explanations of the results of the experiment between 50 and 60 minutes?

1 Enzyme concentration becomes the limiting factor.

2 Substrate concentration becomes the limiting factor.

3 All the enzyme active sites are saturated.

4 Denaturation of the enzyme by the products.

5 Products are acting as competitive inhibitors.

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

© UCLES 2014

15 The AIDS virus produces a long polypeptide that is hydrolysed by a protease enzyme, producing several smaller peptides. This viral protease is the target of anti-AIDS drugs.

Which feature is essential for the success of these drugs?

A a complex structure that inhibits many types of viral enzyme

B a molecule containing a heavy metal atom that is a non-competitive inhibitor of enzymes

C a protein that can act as a competitive inhibitor of protease enzymes

D a specific structure that inhibits only viral protease

16 What is the width of the cell surface membrane?

A 0.5 – 1.0 nm **B** 5 – 10 nm **C** 50 – 100 nm **D** 0.5 – 1 μm

17 Some functions of molecules found in cell surface membranes are listed.

1 cell recognition

2 ion transport

3 maintaining fluidity

4 mechanical stability

Which are functions of cholesterol?

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

18 The enzyme lactase is found in the membranes of epithelial cells lining the small intestine.

The enzyme is formed by a single polypeptide that folds to give three regions.

- an active site with the free amino group outside the cell
- a short section inside the membrane
- a short section inside the cell

What type of amino acid would be found in each of the three regions?

	outside cell	inside the membrane	inside the cell
A	hydrophilic	hydrophobic	hydrophilic
B	hydrophilic	hydrophobic	hydrophobic
C	hydrophobic	hydrophilic	hydrophobic
D	hydrophobic	hydrophobic	hydrophilic

19 A student examined the cells in the growing region (meristem) of an onion root and obtained the data below.

stage	number of cells
interphase	886
prophase	73
metaphase	16
anaphase	14
telophase	11

What percentage of cells contain chromosomes that appear as two chromatids?

A 97.5% **B** 95.9% **C** 8.9% **D** 7.3%

20 Which definitions of *diploid* and *haploid* are true for typical eukaryotic cells?

1 *diploid* – any cell with an even number of homologous chromosomes

2 *diploid* – any cell with two copies of each homologous chromosome

3 *haploid* – any cell with half the diploid number of homologous chromosomes

4 *haploid* – any cell with one copy of each homologous chromosome

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

21 Which type of sugar and types of bonds are found in a DNA molecule?

	type of sugar	types of bonds
A	non-reducing	hydrogen and ionic
B	non-reducing	hydrogen and peptide
C	reducing	covalent and hydrogen
D	reducing	hydrogen and peptide

22 Which nucleic acid bases are purines?

A adenine and cytosine

B cytosine and thymine

C guanine and adenine

D uracil and cytosine

© UCLES 2014

23 A short piece of DNA 15 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.

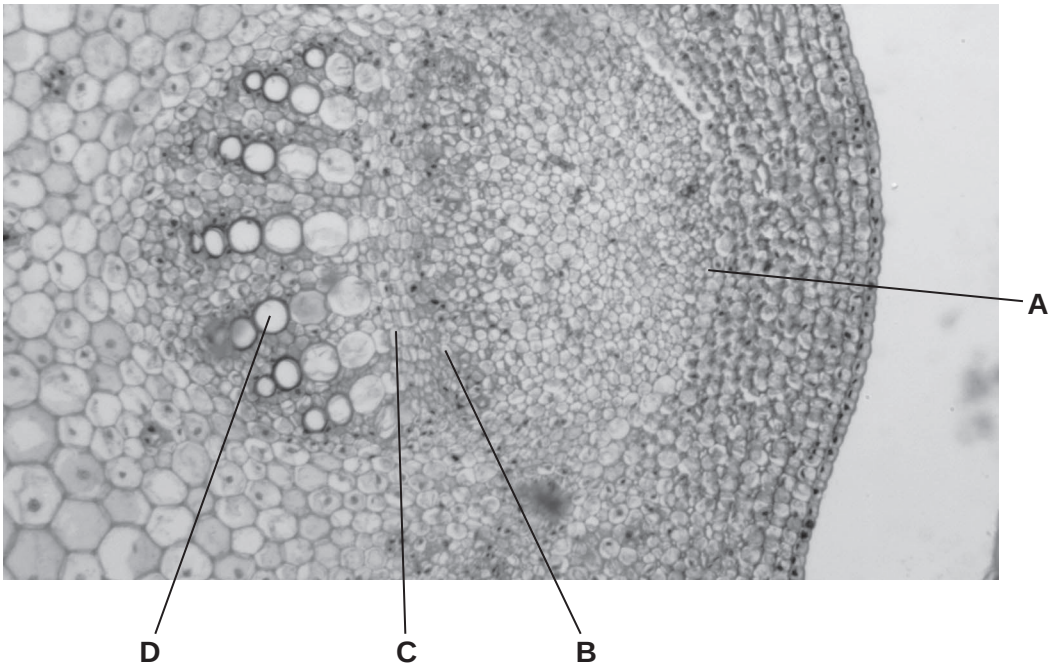
	number of nucleotide bases			
	A	C	G	T
strand 1		6		3
strand 2				4

How many nucleotides containing guanine were present in strand 1?

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

24 The diagram shows a transverse section of a stem.

Which area is the phloem?



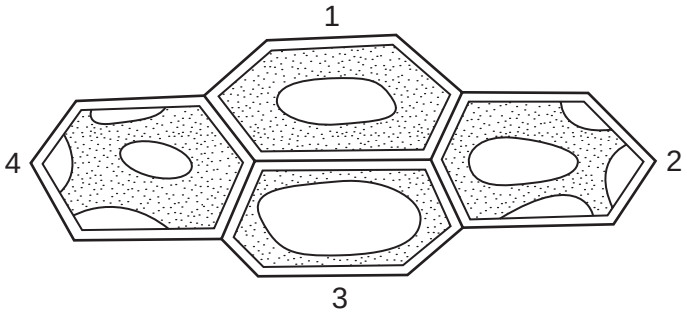
25 A leafy shoot was attached to a potometer and exposed to a variety of conditions. The time taken for the meniscus to move 50 mm along the capillary tubing was recorded for each set of conditions.

temperature / °C	humidity	air movement	time taken to move 50 mm / s
20	dry	still	125
20	dry	moving	71
30	dry	still	40
20	humid	still	166
20	humid	moving	83
30	humid	still	55

Which shows the slowest and fastest rates of water uptake?

	slowest / mm s^{-1}	fastest / mm s^{-1}
A	0.3	1.3
B	0.3	3.3
C	3.3	0.3
D	1.3	0.8

26 The diagram shows four plant cells.



In which direction could there be net movement of water by osmosis?

A 1 to 2 and 1 to 4

B 1 to 3 and 1 to 2

C 2 to 1 and 1 to 4

D 4 to 1 and 2 to 3

© UCLES 2014

27 How will the root pressure in a plant be affected by waterlogged soil?

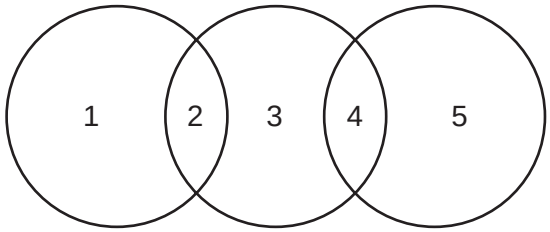
A It will not be affected.

B It will decrease due to a lack of oxygen in the soil.

C It will increase due to a lower water potential in the soil.

D It will increase due to a higher rate of transpiration.

28 The diagram shows the relationship between phloem sieve tube elements, xylem vessel elements and companion cells.



Which is correct?

	1	2	3	4	5
A	companion cells	endoplasmic reticulum	phloem sieve tube elements	nucleus absent	xylem vessel elements
B	companion cells	nucleus	phloem sieve tube elements	cytoplasm	xylem vessel elements
C	phloem sieve tube elements	mitochondria	companion cells	nucleus	xylem vessel elements
D	xylem vessel elements	cytoplasm absent	phloem sieve tube elements	vacuole	companion cells

29 Small arteries (arterioles) are found near tissues. One function of an arteriole is to increase or decrease the flow of blood to the tissues.

Which tissues would be present in an arteriole wall to allow this function?

1 collagen

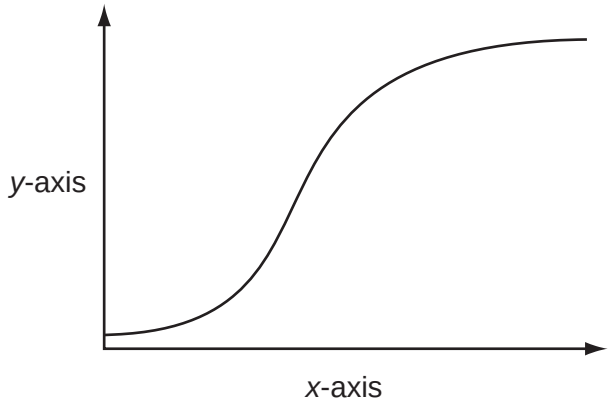
2 elastic

3 muscle

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

© UCLES 2014

30 The graph shows a dissociation curve for haemoglobin.



Which are suitable labels for the *x*-axis and the *y*-axis?

	x-axis	*y*-axis
A	partial pressure of carbon dioxide	percentage of haemoglobin
B	partial pressure of oxygen	percentage saturation of haemoglobin with oxygen
C	percentage of haemoglobin	partial pressure of oxygen
D	percentage saturation of haemoglobin with oxygen	partial pressure of carbon dioxide

31 One type of congenital heart defect is called atrial septal defect (ASD) where the left and right atria are not completely separated.

ASD usually results in blood moving from the left atrium into the right atrium. This will cause increased blood pressure in the right atrium and decreased blood pressure in the left atrium.

Which row describes the other effects of ASD on blood pressure and oxygenation?

	blood pressure in pulmonary artery	blood pressure in aorta	% oxygenation of blood in pulmonary artery
A	decreased	increased	decreased
B	decreased	increased	increased
C	increased	decreased	decreased
D	increased	decreased	increased

© UCLES 2014

32 Which are effects on the body of carbon monoxide in tobacco smoke?

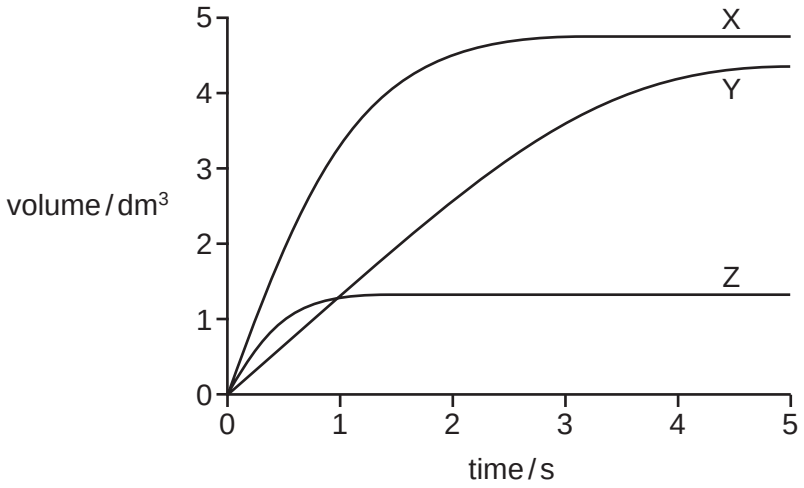
1 It reduces the amount of haemoglobin available to transport oxygen.

2 It reduces the rate of diffusion of oxygen from the alveoli into the blood.

3 It inhibits the release of oxygen from haemoglobin.

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

33 The graph shows the volume of air breathed out quickly and with force, following a deep breath in, for three different people, X, Y and Z.



What is a possible explanation for the differences in the volume of air breathed out by these people shown?

	chronic bronchitis	emphysema	normal lung function
A	X	Z	Y
B	Y	X	Z
C	Y	Z	X
D	Z	Y	X

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

A carcinogens come into contact with DNA → mutation occurs → uncontrolled cell division → mass of cells produced

B goblet cells secrete more mucus → mucus accumulates causing infection → phagocytes attracted by inflammation → causes irritation and coughing

C goblet cells secrete more mucus → mutation occurs → phagocytes attracted by inflammation → mass of cells produced

D phagocytes attracted by inflammation → mutation occurs → uncontrolled cell division → elastase destroys the alveolar walls

35 Which statements about people infected with HIV / AIDS are correct?

1 They can be treated and completely cured.

2 They may live for many years after infection.

3 They will have symptoms.

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

36 The statements refer to polio and tuberculosis (TB).

1 Macrophages present antigens in vaccines to stimulate an immune response.

2 The TB antigens necessary to produce an immune response are proteins which would be digested in the stomach and small intestine.

3 There are no B-lymphocytes and T-lymphocytes in the stomach.

Which explains why polio vaccine can be taken by mouth but TB vaccine has to be injected?

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

37 Which explains why sickle cell anaemia has not been eradicated?

A Identification of carriers is too difficult as they show no symptoms.

B Sickle cell anaemia gives the individual some resistance against malaria.

C Sickle cell anaemia is an inherited disease, so vaccination is not possible.

D The gene responsible for sickle cell anaemia has a high rate of mutation.

© UCLES 2014

38 Which method of gaining immunity can be described as natural active immunity?

A feeding on colostrum

B inhaling the chicken pox virus

C injection with antibodies

D through the placenta

39 Which stage of energy transfer has the lowest efficiency?

A sunlight → producer

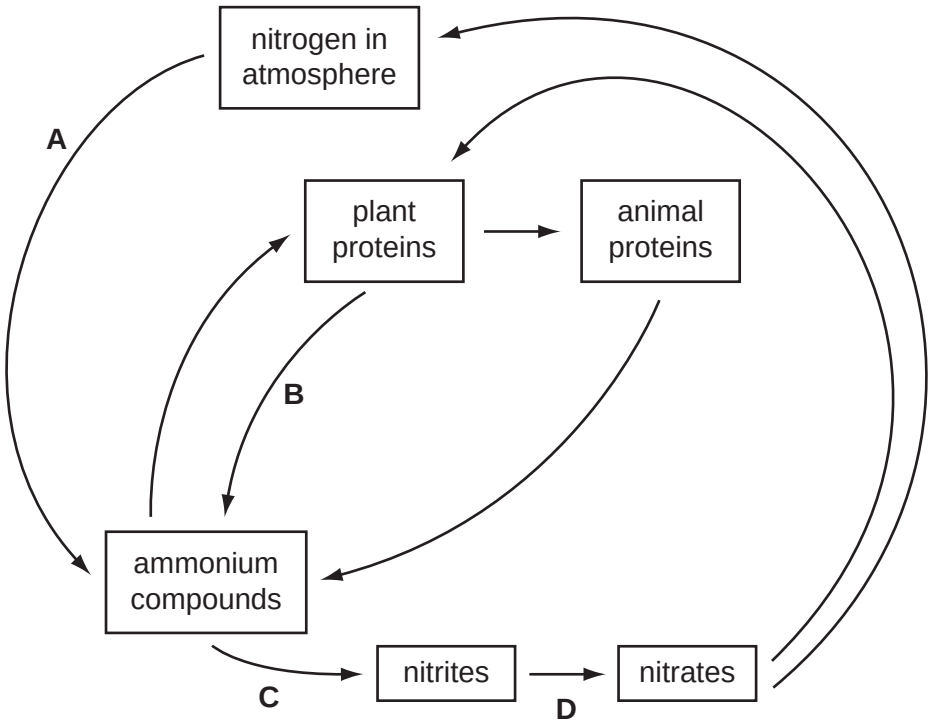
B producer → primary consumer

C primary consumer → secondary consumer

D secondary consumer → tertiary consumer

40 The diagram shows a simplified nitrogen cycle.

During which stage does decomposition take place?



BLANK PAGE

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.