CAMBRIDGE INTERNATIONAL EXAMINATIONS

General Certificate of Education Advanced Subsidiary Level and Advanced Level

BIOLOGY 9700/1

PAPER 1 Multiple Choice

OCTOBER/NOVEMBER SESSION 2002

1 hour

Additional materials:
Multiple Choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Do not open this booklet until you are told to do so.

Write your name, Centre number and candidate number on the answer sheet in the spaces provided unless this has already been done for you.

There are **forty** questions in 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 very carefully the instructions on the answer sheet.

INFORMATION FOR CANDIDATES

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 question paper consists of 15 printed pages and 1 blank page.

SP (NF/JG) S33354/3

UNIVERSITY of CAMBRIDGE
Local Examinations Syndicate

[Turn over

1 Which feature is a characteristic of prokaryotic organisms?

A a cell wall

B circular DNA

C mitochondria

D rough endoplasmic reticulum

2 What is meant by *resolution* in light microscopy?

A the product of the magnifications of the eyepiece and the objective lenses

B the shortest distance between two objects that can be seen as separate

C the size of the smallest object that can be seen

D twice the wavelength of the light used to illuminate the specimen

3 From which cell organelle are nucleic acids absent?

A chloroplast

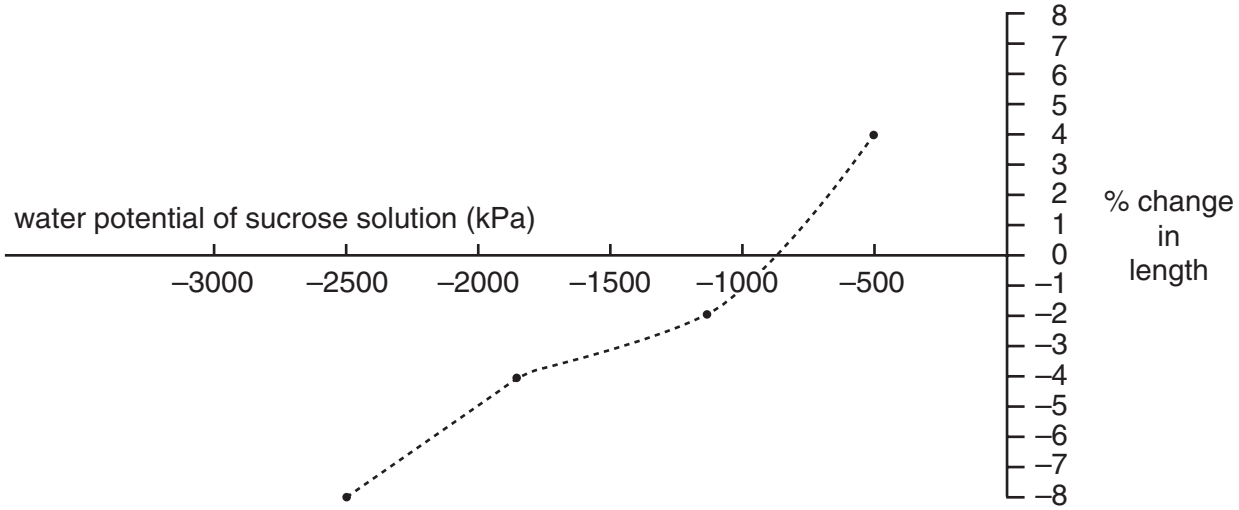
B Golgi body

C mitochondrion

D ribosome

4 Freshly cut potato chips are immersed for 30 minutes in four sucrose solutions of varying water potentials.

The graph shows the percentage change in their length.



What is the water potential of the potato cells in the freshly cut chips?

A 0 kPa

B – 525 kPa

C – 875 kPa

D – 2500 kPa

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

A energy radiation

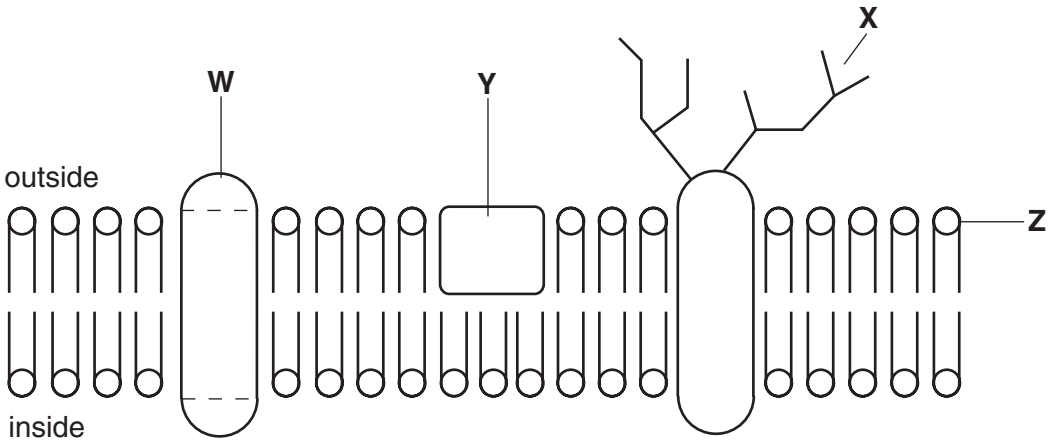
B enzyme reactions

C gaseous exchange

D protein synthesis

[Turn over

6 The diagram shows part of a cell surface membrane.



Four functions of the membrane are listed:

1 allows fat-soluble molecules through membrane

2 allows cell recognition

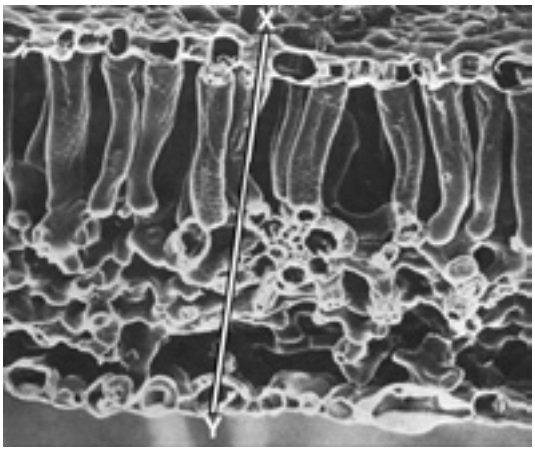
3 maintains constant shape of membrane

4 pumps ions through membrane

Which part is correctly paired with its function?

A W and 1 **B** X and 2 **C** Y and 3 **D** Z and 4

7 This electron micrograph of a section of a leaf has a magnification of × 210.



What is the actual width of the leaf along the line X – Y?

A 2.43 µm **B** 24.3 µm **C** 243.0 µm **D** 2430 µm

8 What is the general formula for starch?

A $(C_5H_{10}O_5)_n$

B $(C_5H_{10}O_6)_n$

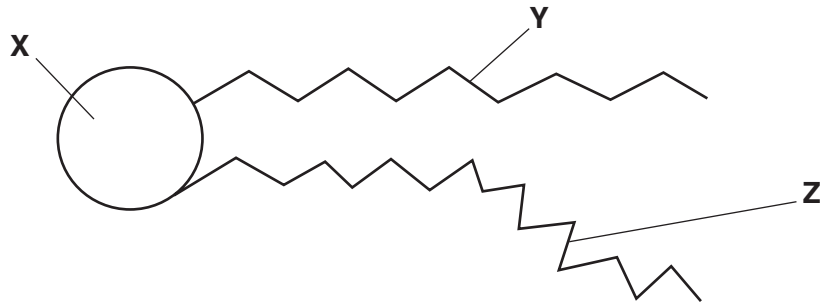
C $(C_6H_{10}O_5)_n$

D $(C_6H_{12}O_6)_n$

9 Which molecular bonds will be broken by hydrolysis when a molecule of glycogen is converted to glucose?

	bonds		
	1,2	1,4	1,6
A	✓	✗	✗
B	✗	✓	✓
C	✓	✗	✓
D	✗	✓	✗

10 The diagram shows a molecule that is found in cell surface membranes.

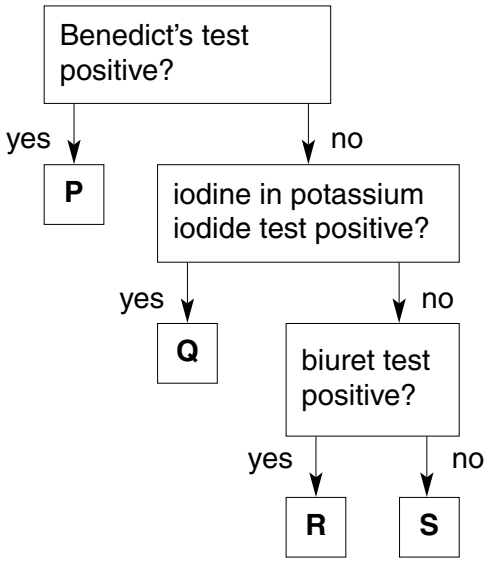


What is present at **X**, **Y**, and **Z**?

	X	**Y**	**Z**
A	phosphate	double-bond carbon chain	protein
B	phosphate	single-bond carbon chain	double-bond carbon chain
C	protein	glucose	single-bond carbon chain
D	protein	phosphate	glucose

[Turn over

11 Various substances are identified using the following procedure.



What could the four substances be?

	P	Q	R	S
A	glucose	starch	protein	lipid
B	glucose	sucrose	starch	protein
C	sucrose	protein	lipid	starch
D	sucrose	starch	lipid	protein

12 Which level of protein structure maintains the globular shapes of enzymes?

A primary

B secondary

C tertiary

D quaternary

13 What will break an ionic bond between amino acids?

A condensation

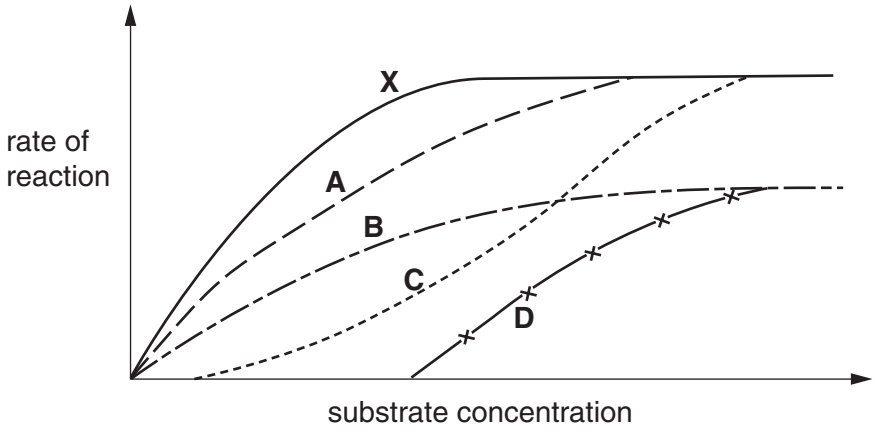
B high temperature

C hydrolysis

D pH change

14 In the graph, **X** represents the relationship between the initial rate of reaction of an enzyme and the concentration of its substrate under optimal conditions and without an inhibitor.

Which curve represents the result when the same experiment is carried out in the presence of a fixed, low concentration of a non-competitive inhibitor?



15 Which bonds hold substrate molecules to the active site of an enzyme?

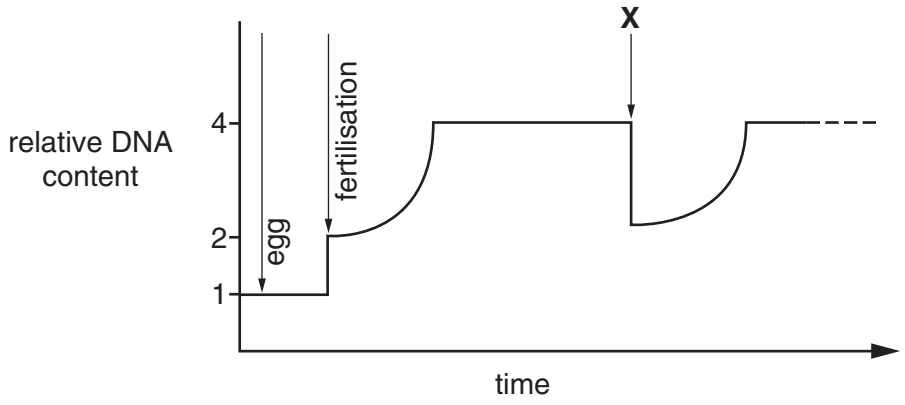
A disulphide

B glycosidic

C hydrogen

D peptide

16 The graph represents the changes in the quantity of DNA present in one nucleus at different stages in the life cycle.



Which stage takes place at **X**?

A interphase

B metaphase

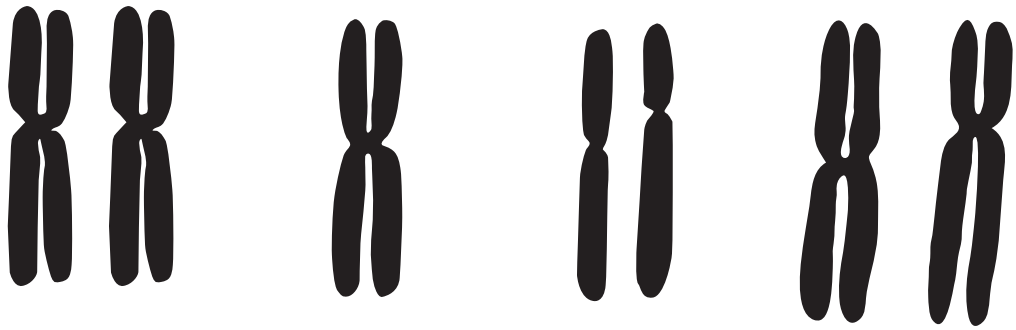
C prophase

D telophase

[Turn over

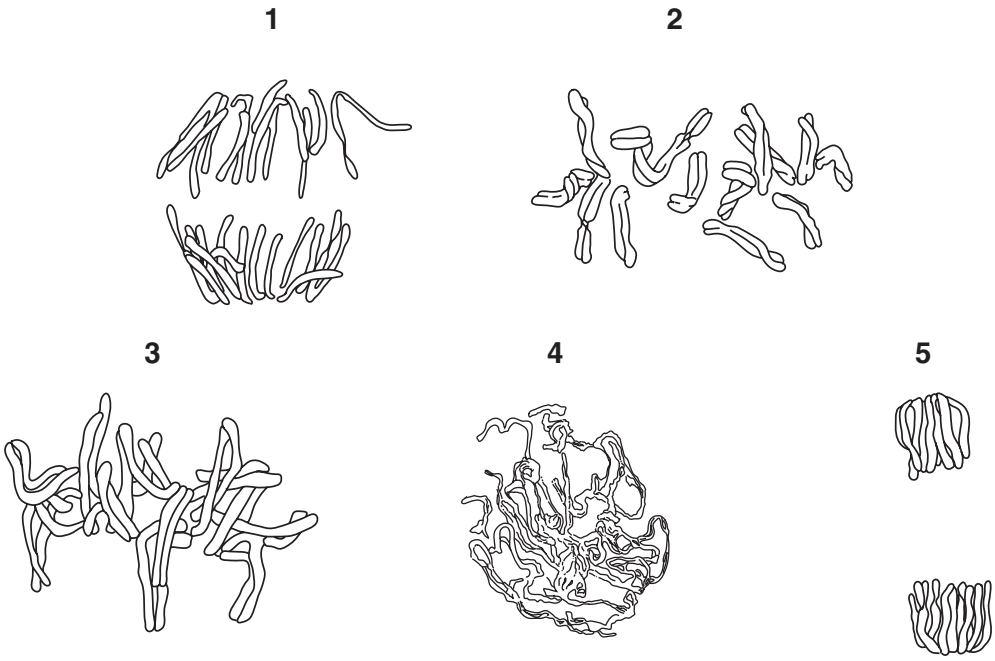
17 The diagram shows chromosomes taken from the nucleus of a cell.

Which diagram represents a pair of homologous chromosomes?



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

18 The drawings show stages of the mitotic cell cycle.



In which order do the stages occur?

	first →				last
A	2	1	3	5	4
B	2	4	1	5	3
C	4	2	1	3	5
D	4	2	3	1	5

19 What is the function of the enzyme DNA polymerase?

A to synthesise a polypeptide using mRNA as a template

B to synthesise a strand of DNA using a polypeptide as a template

C to synthesise a strand of DNA using DNA as a template

D to synthesise a strand of mRNA using DNA as a template

20 The following events occur in the replication of DNA.

1. bonds between complementary bases break
2. bonds between complementary bases form
3. opposite strands separate
4. sugar-phosphate bonds form
5. free nucleotides pair with complementary nucleotides on each strand

In which order do these events take place?

	first → last				
A	1	3	5	2	4
B	1	5	3	2	4
C	3	1	5	4	2
D	5	1	3	4	2

21 The sequence of bases on part of a molecule of DNA is shown.

TACAAATGACCA sense strand
ATGTTTACTGGT antisense strand

What is the sequence of bases in mRNA transcribed from this sequence?

A ATGTTTACTGGT

B AUGUUUACUGGU

C TACAAATGACCA

D UACAAAUGACCA

[Turn over

22 The table gives the tRNA anticodons for four amino acids.

amino acid	anticodon (tRNA)
asparagine	UUA
glutamic acid	CUU
proline	GGA
threonine	UGG

A cell makes a polypeptide with the amino acid sequence:

glutamic acid – asparagine – threonine – proline

What was the sequence of bases on the mRNA from which this was formed?

A GAAAATACCCCT

B AGGGGUGUUUUC

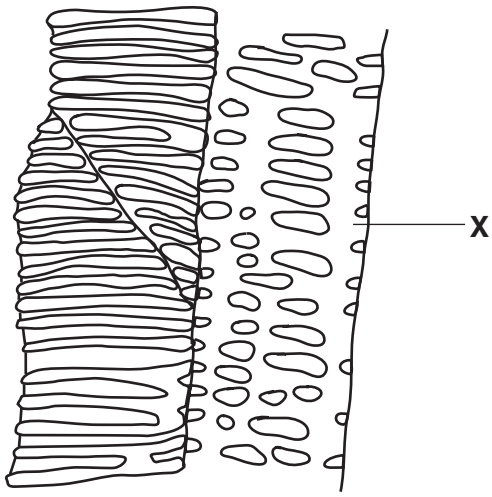
C TCCCCGCAAAAG

D GAAAAUACCCCU

23 In which combination of environmental conditions are the stomata of a plant most likely to close?

	atmospheric humidity	soil water potential	wind speed
A	high	high	high
B	high	low	low
C	low	high	low
D	low	low	high

24 The diagram shows a longitudinal section through transport tissue in a plant stem.



What are the names of the structure labelled **X** and the tissue in which it is found?

	structure **X**	tissue
A	sieve tube	phloem
B	sieve tube	xylem
C	vessel	phloem
D	vessel	xylem

25 In the mammalian heart, which structure is the pacemaker?

A atrioventricular node

B bundle of His

C Purkyne (Purkinje) fibres

D sinoatrial node

26 The table shows changes occurring in the body.

Which combination would cause the greatest rise in cardiac output?

	aortic blood pressure	blood pressure in the vena cava	carbon dioxide concentration of the blood	frequency of impulses in the vagus nerve
A	decrease	no change	increase	no change
B	decrease	no change	no change	increase
C	no change	decrease	increase	no change
D	no change	decrease	no change	increase

[Turn over

27 To maintain health, infants should receive about 1.50 g of protein per kg body mass per day whilst adults only require 0.55 g of protein per kg body mass per day.

What is the reason for the difference in protein requirement?

A Adults have sufficient protein reserves for oxidation.

B Growth has ceased in adults.

C Infants have a smaller body mass.

D Protein digestion is inefficient in infants.

28 What causes the swelling of the body tissues of a child with the protein deficiency disease kwashiorkor?

A Fat stores in the abdomen are used up and converted to tissue fluid which makes the liver swell.

B Few plasma proteins form, raising the blood water potential and causing fluid to accumulate in the tissues.

C Proteins in the gut wall are used up and replaced by body tissue fluid.

D The glycogen stores in the liver are used up and replaced by body tissue fluid.

29 Which component of tobacco smoke causes an increased risk of lung cancer?

A carbon dioxide

B carbon monoxide

C nicotine

D tar

30 During an investigation on gas exchange, measurements were made on four people. The efficiency of gas exchange was the same in all four people.

Which person absorbed most oxygen during four minutes of normal breathing?

person	breathing rate / breaths per minute	tidal volume / dm^3	total lung volume / dm^3
A	14	0.6	6.4
B	15	0.6	6.0
C	16	0.5	6.4
D	17	0.4	5.8

31 Which chamber of the heart shows the greatest pressure changes during one cardiac cycle?

A left atrium

B left ventricle

C right atrium

D right ventricle

32 Four people of the same age, sex and mass had their pulse rate taken before and immediately after taking a standard strenuous exercise.

Which person had the most well developed heart muscle?

	pulse rate / beats per minute	
person	resting	after exercise
A	55	160
B	72	190
C	75	180
D	81	175

33 In what way are caffeine and nicotine similar in their effects on the human body?

A They both increase heart rate.

B They both increase urine output.

C They both reduce blood pressure.

D They both reduce heat loss through the skin.

34 Which disease is least likely to be passed directly from parent to child?

A cholera

B HIV/AIDS

C malaria

D sickle cell anaemia

35 What do the causative agents of HIV/AIDS, malaria and TB have in common?

	cell surface membrane	genes	ribosomes	respiration
A	✓	✓	✓	✓
B	✓	✗	✗	✓
C	✗	✓	✗	✓
D	✗	✓	✗	✗

36 The first breast milk produced by the mother for a new-born baby contains antibodies.

What do these antibodies provide?

A artificial active immunity

B artificial passive immunity

C natural active immunity

D natural passive immunity

37 Where are antibodies and antigens found?

	on surface of pathogen	on surface of macrophage	in blood plasma
A	antibody	antibody	antigen
B	antibody	antigen	antibody
C	antigen	antibody	antigen
D	antigen	antigen	antibody

38 The rate of absorption of light energy measured in a field is 6300 kJ m^{-2} day^{-1}. Only 1% of this energy is converted into new plant production. 10% of the net production at one trophic level is transferred to the next trophic level.

How much energy is entering the primary consumers?

A 0.063 kJ m^{-2} day^{-1}

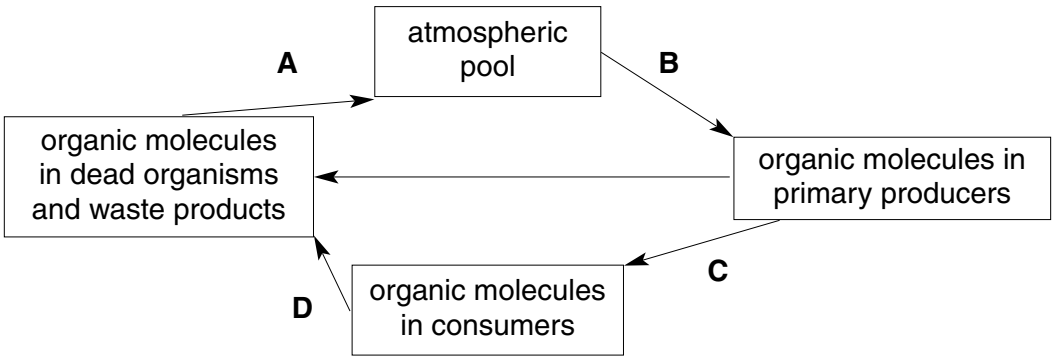
B 0.63 kJ m^{-2} day^{-1}

C 6.3 kJ m^{-2} day^{-1}

D 63 kJ m^{-2} day^{-1}

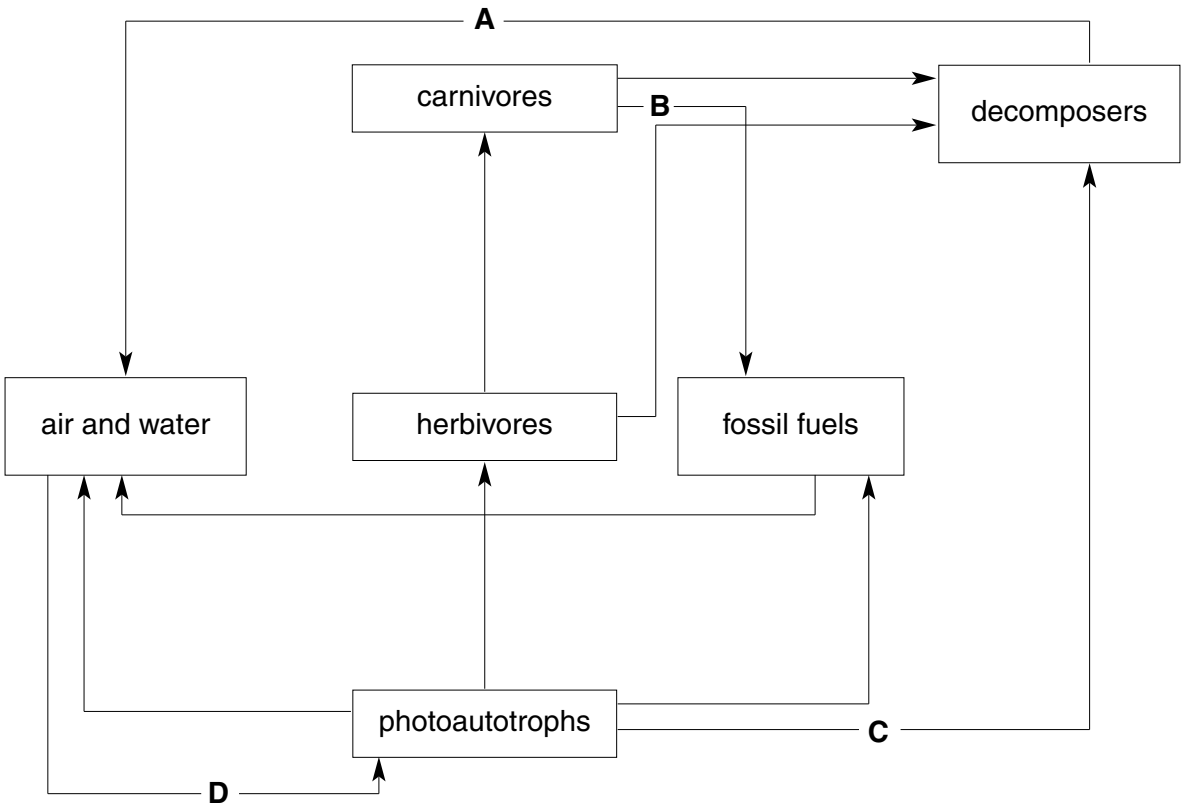
39 The diagram shows the general pattern of a nutrient cycle, such as the nitrogen cycle.

During which stage in the nitrogen cycle are denitrifying bacteria involved?



40 The diagram shows part of the carbon cycle.

Which arrow represents the release of carbon dioxide in respiration?



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