



**Cambridge International Examinations**  
Cambridge International General Certificate of Secondary Education (9–1)

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**BIOLOGY**

**0970/02**

Paper 2 Multiple Choice (Extended)

**For Examination from 2018**

SPECIMEN PAPER

**45 minutes**

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

**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.**

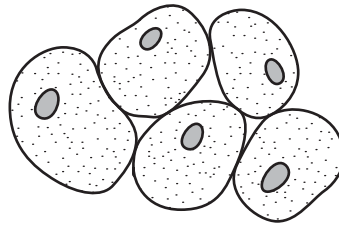
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

Electronic calculators may be used.

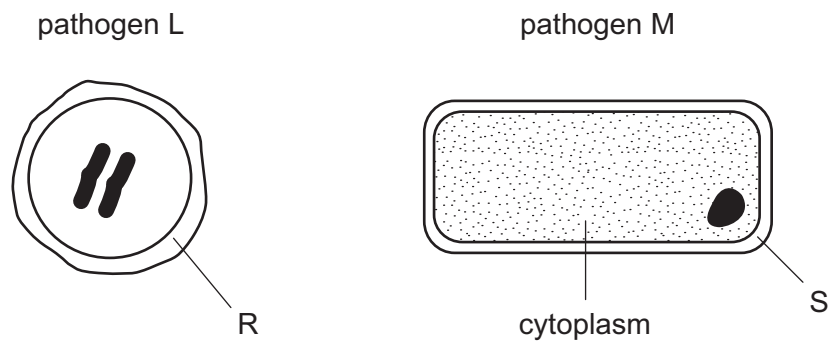
This document consists of **18** printed pages.

- 1 The diagram shows some liver cells as they appear under a microscope.



How many cell walls can be seen?

- A 0                      B 2                      C 5                      D 10
- 2 The diagram shows two pathogens, not drawn to the same scale.



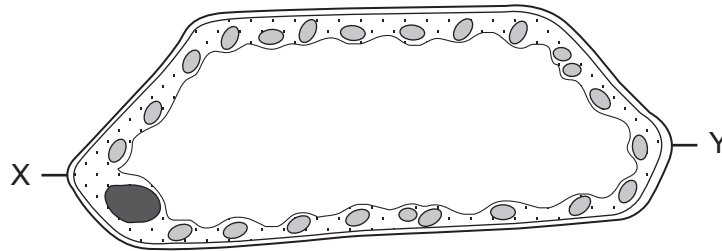
What identifies pathogens L and M and structures R and S?

	L	M	R	S
<b>A</b>	prokaryote	virus	cell wall	protein coat
<b>B</b>	prokaryote	virus	protein coat	cell wall
<b>C</b>	virus	prokaryote	cell wall	protein coat
<b>D</b>	virus	prokaryote	protein coat	cell wall

3 The diagram shows a high-power drawing of a plant cell.

The distance between X and Y on the diagram below is 80 mm.

The actual length of the cell between X and Y was  $160\ \mu\text{m}$ .



What is the magnification of the cell?

A  $\times 50$

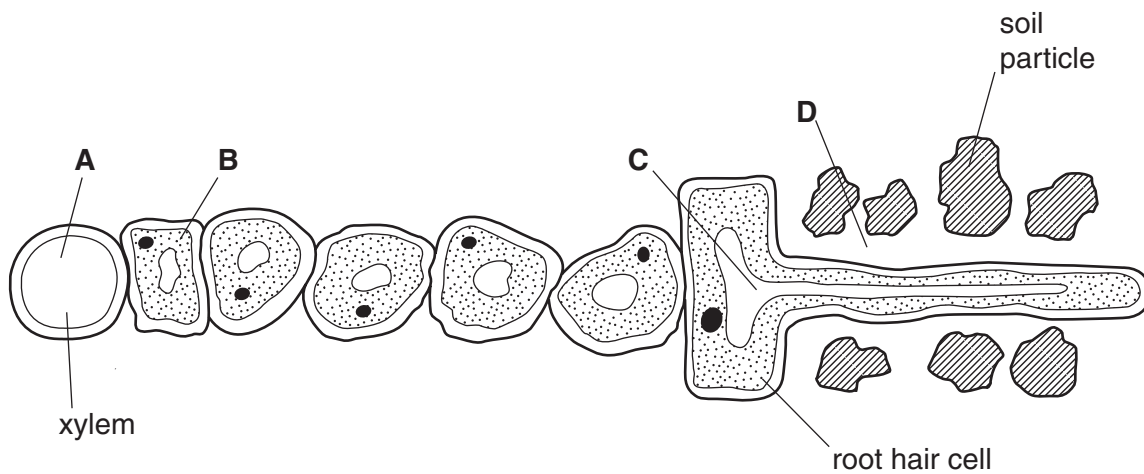
B  $\times 100$

C  $\times 500$

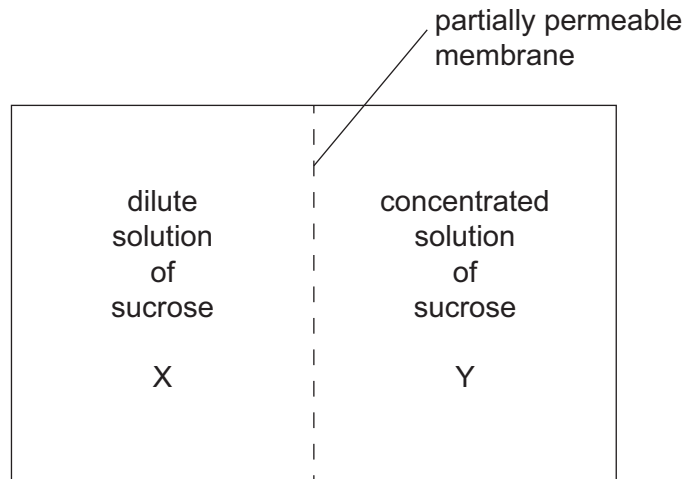
D  $\times 1000$

4 The diagram shows part of a plant root in the soil. The root is absorbing water.

At which labelled point is the water potential highest?

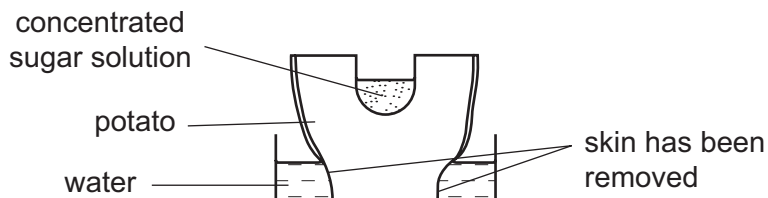


- 5 The diagram shows two solutions that are separated by a partially permeable membrane.

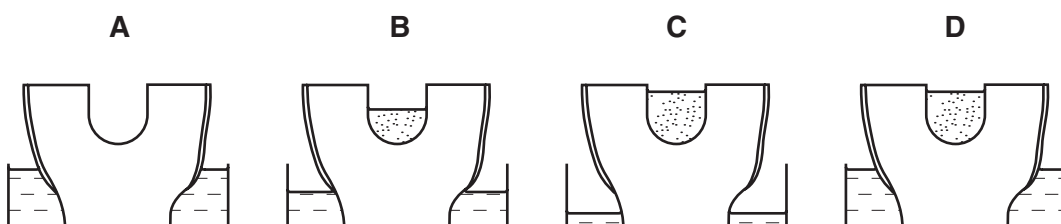


In which direction will most water molecules move in relation to their concentration gradient?

- A** from X to Y against their concentration gradient  
**B** from X to Y down their concentration gradient  
**C** from Y to X against their concentration gradient  
**D** from Y to X down their concentration gradient
- 6 Which statement describes active transport?
- A** the movement of ions through proteins in a cell membrane, releasing energy  
**B** the movement of ions through proteins in a cell membrane, using energy  
**C** the movement of water through lipids in a cell membrane, releasing energy  
**D** the movement of water through lipids in a cell membrane, using energy
- 7 The diagram shows an experiment using an uncooked potato. The skin of the potato was removed as shown.



Which diagram shows the result of the experiment after 24 hours?



8 One strand of a DNA molecule contains the base sequence AGT.

What is the base sequence on the other strand of the DNA molecule?

- A AGT
- B GAT
- C TAC
- D TCA

9 The following can be used to write a word equation for photosynthesis.

- 1 carbon dioxide and water
- 2 light and chlorophyll
- 3 glucose and oxygen

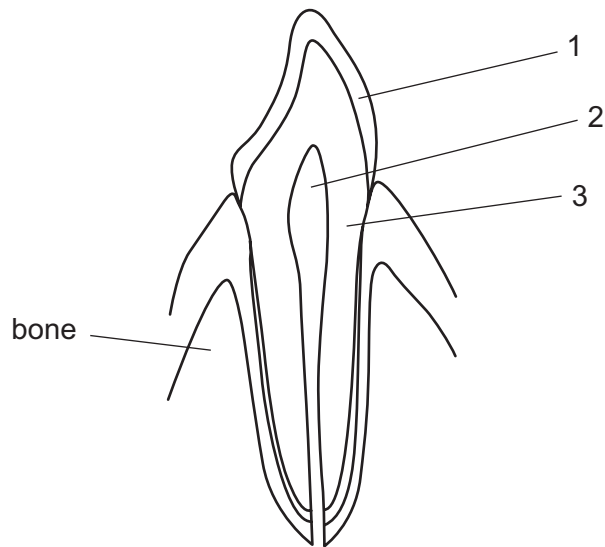
Which shows a correct word equation for photosynthesis?

- A 1 → 2 in the presence of 3
- B 1 → 3 in the presence of 2
- C 2 → 3 in the presence of 1
- D 3 → 1 in the presence of 2

10 Which row shows the most likely number of chloroplasts in three types of cell in a leaf?

	epidermis	mesophyll	vascular bundle cell
<b>A</b>	0	6	17
<b>B</b>	0	17	0
<b>C</b>	17	6	0
<b>D</b>	17	0	6

11 The diagram shows a tooth.



What are the parts labelled 1, 2 and 3?

	1	2	3
<b>A</b>	dentine	enamel	pulp
<b>B</b>	enamel	dentine	pulp
<b>C</b>	enamel	pulp	dentine
<b>D</b>	pulp	dentine	enamel

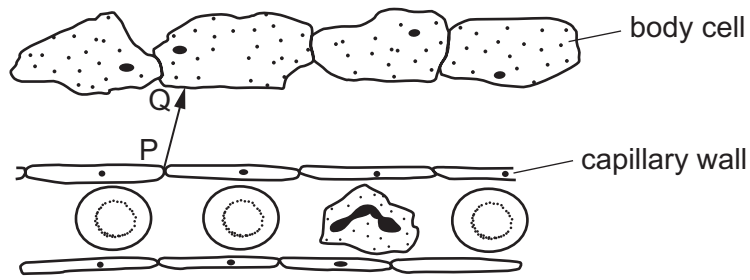
12 What is the function of the lacteal in a villus?

- A** absorbs the fatty acids
- B** allows substances to pass from the lumen of the intestine into the villus
- C** takes oxygen to the villus
- D** absorbs the glucose and amino acids

13 On a dry, sunny day, how does water vapour move through the stomata of a leaf?

- A** into the leaf by diffusion
- B** into the leaf by respiration
- C** out of the leaf by diffusion
- D** out of the leaf by respiration

14 The diagram shows a capillary and some body cells.



How do ions pass from P to Q?

- A by diffusion in blood
- B by diffusion in tissue fluid
- C by osmosis in blood
- D by osmosis in tissue fluid

15 These actions may be important in controlling the spread of disease.

- 1 washing hands after going to the toilet
- 2 disposing of waste frequently
- 3 using separate cutting boards for meat and salad
- 4 disposing of raw sewage into a river

Which would help control the spread of disease?

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

16 New-born babies have passive immunity.

Why is this only temporary?

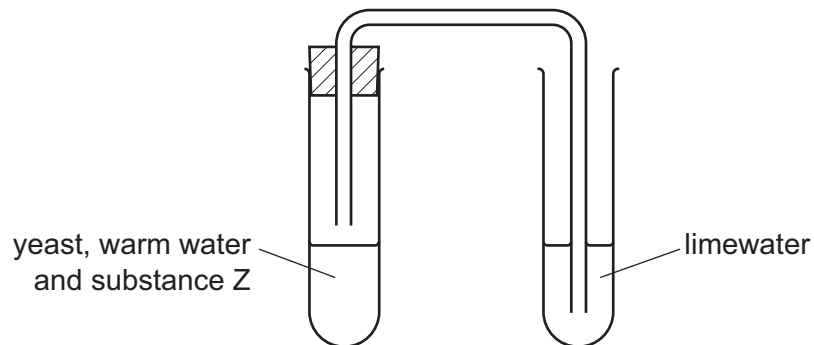
- A No memory cells are produced in the baby.
- B The antibodies are insufficient in number.
- C The antibodies only act in the mother.
- D The immunity is not inherited.

17 The table shows some of the features of respiration.

Which row is correct for anaerobic respiration?

	amount of energy released per glucose molecule	chemical reaction	releases carbon dioxide
<b>A</b>	high	always the same	sometimes
<b>B</b>	low	different in different organisms	sometimes
<b>C</b>	high	different in different organisms	always
<b>D</b>	low	always the same	always

18 The diagram shows some apparatus used to investigate respiration. Yeast, warm water and substance Z were put into a test-tube. After a while, the limewater began to go cloudy.



What is substance Z?

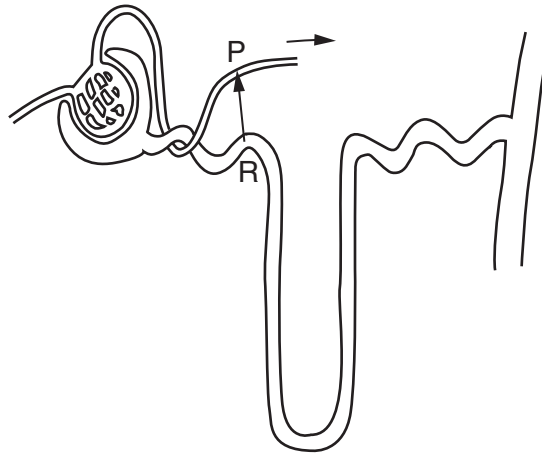
- A** alcohol
- B** glucose
- C** nitrogen
- D** oxygen

19 What happens during the process of breathing out?

	external intercostal muscles contract	pressure in the lungs increases	diaphragm contracts	volume of thorax increases
<b>A</b>	yes	yes	no	yes
<b>B</b>	yes	no	yes	yes
<b>C</b>	no	yes	no	no
<b>D</b>	no	no	yes	no



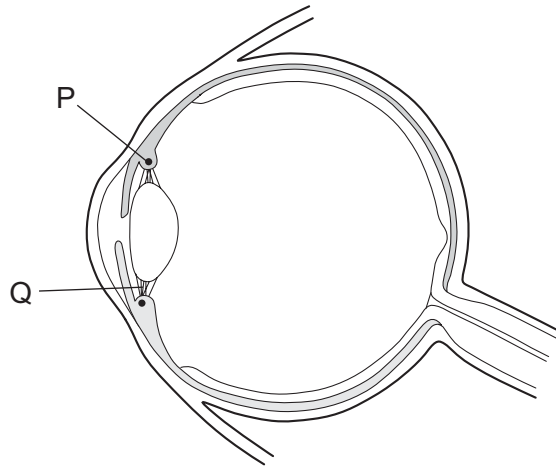
20 The diagram shows a kidney tubule and some of its associated blood vessels.



Which substance is entirely reabsorbed from the fluid at R to the blood at P?

- A glucose
  - B salts
  - C urea
  - D water
- 21 Which of the following can be an effector in a reflex arc?
- A a gland
  - B a light receptor
  - C the brain
  - D the spinal cord

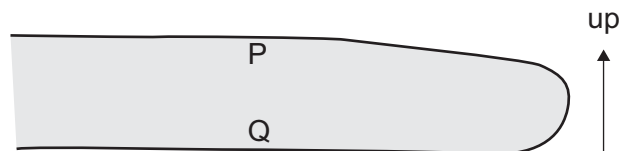
22 The diagram shows a section through a human eye.



When focusing on a close object at night, what is the state of structures P and Q?

	P	Q
<b>A</b>	contracted	tight
<b>B</b>	contracted	slack
<b>C</b>	relaxed	tight
<b>D</b>	relaxed	slack

23 The diagram shows a shoot that has been placed on its side. The shoot begins to grow upwards.

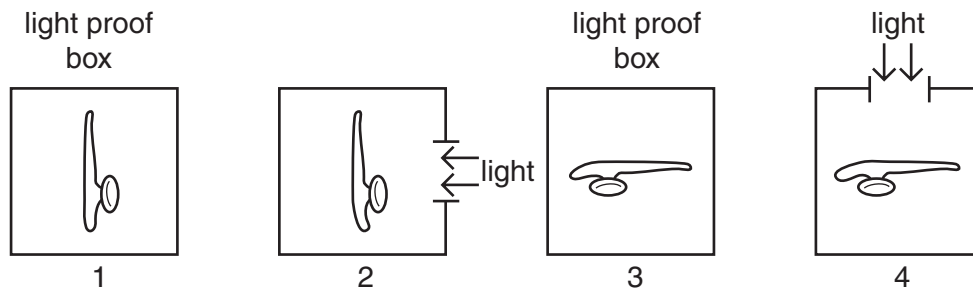


What causes the shoot to grow upwards?

- A** increased cell division by meiosis at P
- B** increased cell division by mitosis at P
- C** more cell elongation at P than Q
- D** more cell elongation at Q than P

24 Some roots are known to be gravitropic.

Which pair of diagrams show a controlled experiment to find out if these roots are also phototropic?

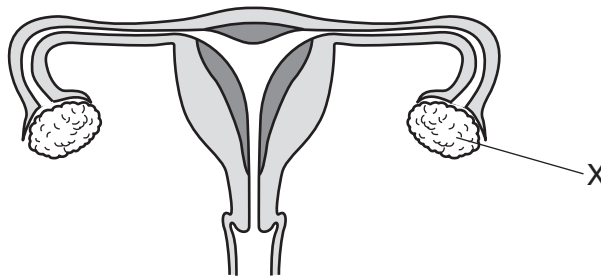


- A 1 and 2
- B 1 and 3
- C 2 and 3
- D 2 and 4

25 Which feature of sexual reproduction helps a species to evolve?

- A Fewer offspring are produced than in asexual reproduction.
- B Offspring are the result of the fusion of the nuclei of dissimilar gametes.
- C Offspring always inherit advantageous characteristics.
- D Offspring produced will always be in a suitable environment.

26 The diagram shows the female reproductive system.





What is the function of the part labelled X?

- A gamete production and hormone secretion
- B gamete production only
- C hormone secretion only
- D zygote production and hormone secretion

27 The diagram shows the menstrual cycle of a woman during the month of September.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

key

	= ovulation
	= menstruation

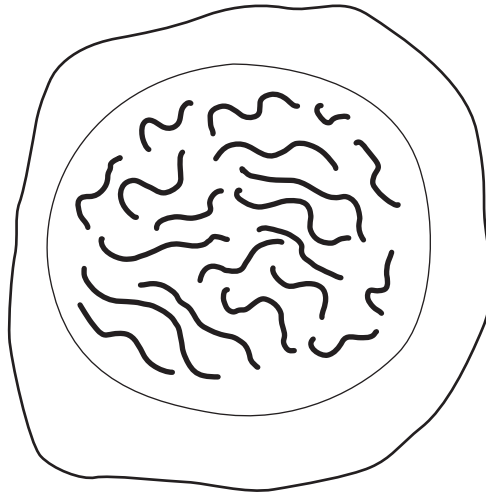
Why can fertilisation not take place if sperms are released into the vagina on 8th September?

- A Sperms are washed out of the female uterus by the menstrual flow.
- B Sperms can survive in the female reproductive system for only 3 or 4 days.
- C Sperms must be released after ovulation for fertilisation to take place.
- D The uterus lining is washed out of the female body during menstruation.

28 Which states a function of the four hormones FSH, LH, progesterone and oestrogen in controlling the menstrual cycle?

	FSH	LH	progesterone	oestrogen
<b>A</b>	stimulates the pituitary gland to release LH	maintains the lining of the uterus during the middle part of the menstrual cycle	causes an egg to mature in an ovary	causes the mature egg to be released from the ovary
<b>B</b>	causes an egg to mature in an ovary	causes the mature egg to be released from the ovary	prepares the uterus to receive a fertilised ovum	stimulates the pituitary gland to release LH
<b>C</b>	prepares the uterus to receive a fertilised ovum	stimulates the ovaries to release oestrogen	stops FSH being produced	maintains the lining of the uterus during the middle part of the menstrual cycle
<b>D</b>	maintains the lining of the uterus during the middle part of the menstrual cycle	stops FSH being produced	causes the mature egg to be released from the ovary	prepares the uterus to receive a fertilised ovum

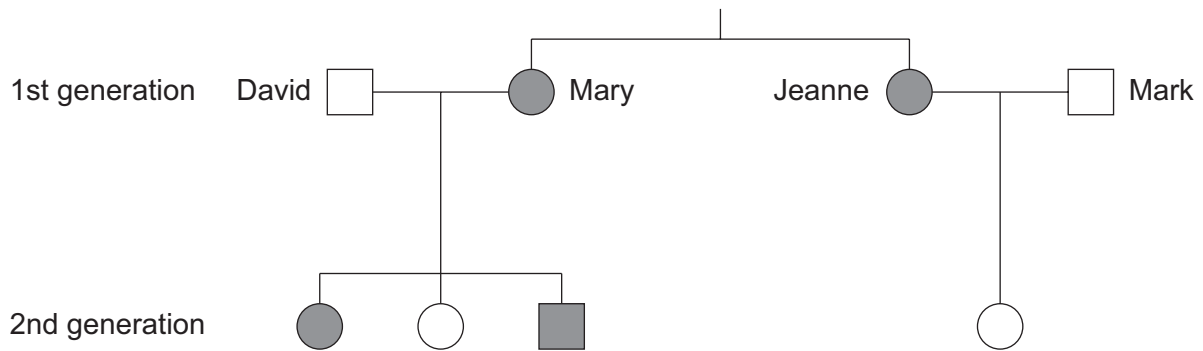
- 29 The diagram shows a cell of an organism formed by reduction division. The nucleus contains 20 chromosomes.



What is the diploid number for this organism?

- A** 10                      **B** 20                      **C** 40                      **D** 46
- 30 What are the possible blood groups of the offspring of parents who have blood group A and B?
- A** AB only  
**B** A and B  
**C** A, B and AB  
**D** A, B, AB and O

- 31 The diagram shows a family tree and the inheritance of the ability to taste a certain substance. The allele for the ability to taste this substance is dominant.



key

■ male 'taster'

□ male 'non-taster'

● female 'taster'

○ female 'non-taster'

Which statement about the genotypes of the sisters Mary and Jeanne is correct?

- A** Mary is heterozygous and Jeanne is homozygous.  
**B** Mary is homozygous and Jeanne is heterozygous.  
**C** They are both heterozygous.  
**D** They are both homozygous.
- 32 Haemophilia is a sex-linked recessive condition. A haemophiliac man has one son who has inherited haemophilia and two more sons who have not.

The man's wife is pregnant again. If this baby is a girl, what is the chance that she will have haemophilia?

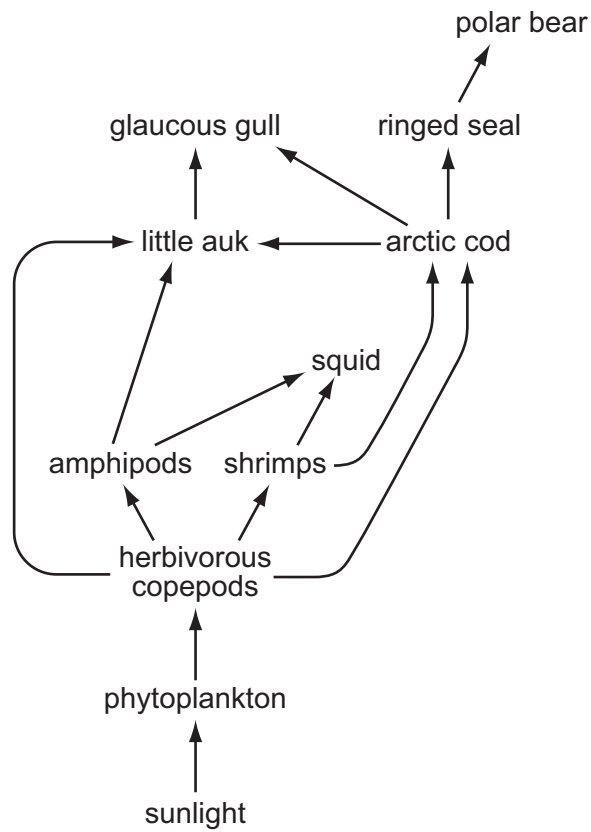
- A** 0%                      **B** 25%                      **C** 50%                      **D** 75%

- 33 Antibiotics often do not work as effectively against bacterial infections as they used to.

What change has taken place in the bacteria, and what type of selection has brought this about?

	change in the bacteria	type of selection
<b>A</b>	have become immune to the antibiotic	artificial
<b>B</b>	have become immune to the antibiotic	natural
<b>C</b>	have become resistant to the antibiotic	artificial
<b>D</b>	have become resistant to the antibiotic	natural

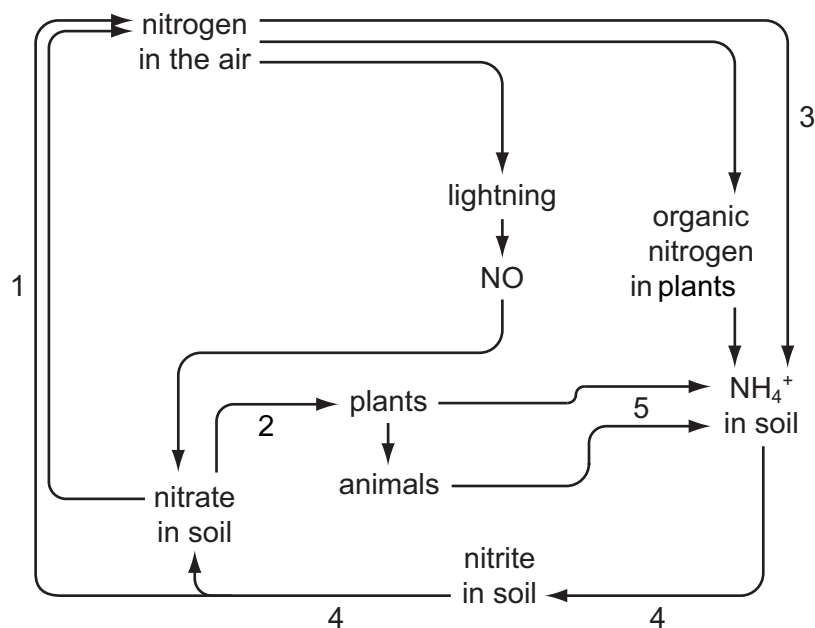
34 The diagram shows an Arctic ecosystem.



How many organisms can act as tertiary consumers in this food web?

- A** 3                      **B** 4                      **C** 5                      **D** 6

35 The diagram shows the circulation of nitrogen in nature.



What is correct?

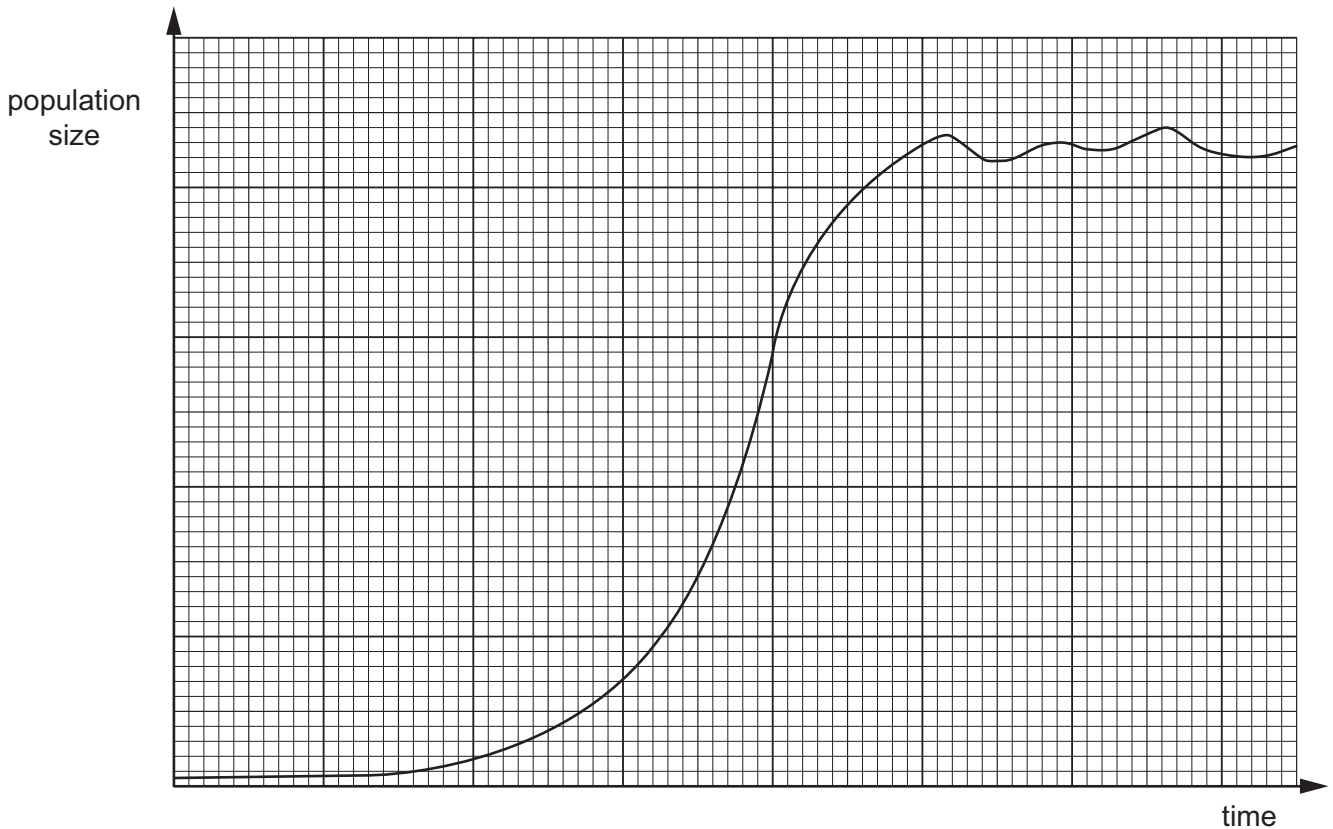
	denitrification	nitrification	nitrogen fixation
<b>A</b>	1	5	3
<b>B</b>	2	5	4
<b>C</b>	3	2	1
<b>D</b>	1	4	3

36 What is the correct match of example to ecological term?

	community	ecosystem	population	trophic level
<b>A</b>	all lake organisms	freshwater lake	freshwater shrimps	pond weed as primary producer
<b>B</b>	freshwater shrimps	all lake organisms	pond weed as primary producer	freshwater lake
<b>C</b>	freshwater lake	pond weed as primary producer	freshwater shrimps	all lake organisms
<b>D</b>	freshwater shrimps	freshwater lake	all lake organisms	pond weed as primary producer



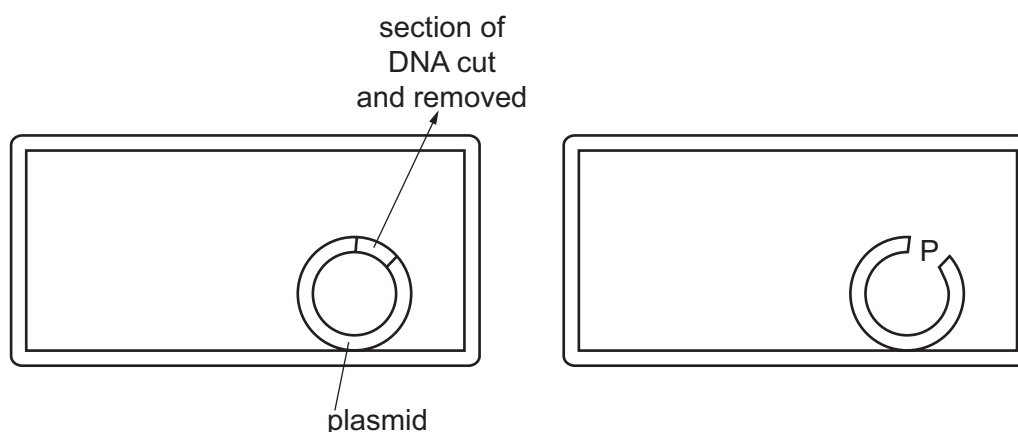
- 37 Some rabbits colonised an island for the first time. The graph shows how their population size changed over the next few years.



What explains the way the size of the rabbit population changed during the exponential (log) phase?

- A birth rate and death rate in equilibrium
- B increasing number of rabbits able to reproduce
- C increase in the number of predators
- D limiting factors begin to take effect

- 38 The diagram shows a bacterium whose plasmid is being used during genetic engineering to produce human insulin.



What is inserted at P so that the bacterium can produce human insulin, and which enzyme is used to catalyse the insertion?

- A a section of human DNA, using DNA ligase
  - B a section of human DNA, using restriction enzymes
  - C a section of human mRNA, using DNA ligase
  - D a section of human mRNA, using restriction enzymes
- 39 Modern technology has resulted in the production and use of insecticides.
- Which statement is a **false** description of insecticides?
- A Insecticides can affect food chains.
  - B Insecticides can cause pollution.
  - C Insecticides improve yields.
  - D Insecticides target weeds.
- 40 Which of these measures will help to prevent acid rain?
- A avoiding the use of non-recyclable plastics
  - B filtering sulfur dioxide in power station chimneys
  - C reducing methane emissions in industry and agriculture
  - D using alkaline fertilisers on fields

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