

GCSE (9–1) Biology A (Gateway Science)

F

J247/02 Paper 2 (Foundation Tier)

Sample Question Paper

Date – Morning/Afternoon

Time allowed: 1 hour 45 minutes

You may use:

- a scientific or graphical calculator
- a ruler



First name

Last name

Centre
number

Candidate
number

INSTRUCTIONS

- Use black ink. You may use an HB pencil for graphs and diagrams.
- Complete the boxes above with your name, centre number and candidate number.
- Answer **all** the questions.
- Write your answer to each question in the space provided.
- Additional paper may be used if required but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

INFORMATION

- The total mark for this paper is **90**.
- The marks for each question are shown in brackets [].
- Quality of extended response will be assessed in questions marked with an asterisk (*).
- This document consists of **32** pages.

SECTION A

Answer **all** the questions.

You should spend a maximum of 30 minutes on this section.

1 Which of these statements is an example of sustainability?

- A** Harvesting selected trees from a forest and replanting.
- B** Replacing forests with food crops.
- C** Taking fish from the sea faster than they can reproduce.
- D** Using crude oil to make plastics.

Your answer

[1]

2 Many habitats are being destroyed.

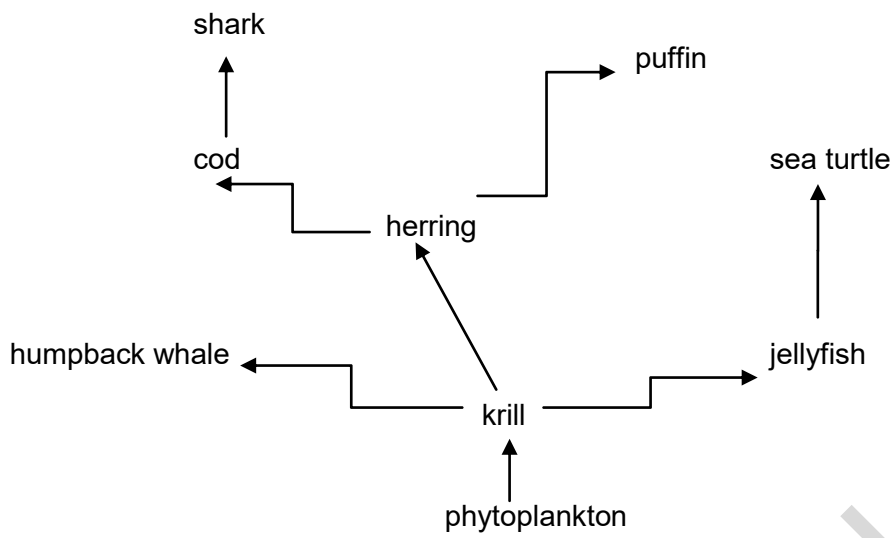
Why is it important that we stop habitats from being destroyed?

- A** to maintain biodiversity
- B** to maintain homeostasis
- C** to maintain active transport
- D** to maintain differentiation

Your answer

[1]

3 The diagram shows a food web.



What is the most likely effect on the food web, if the number of cod decreased?

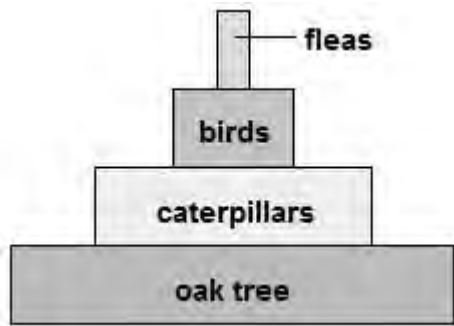
- A an increase in the number of herrings
- B an increase in the number of krill
- C no effect on the population of puffins
- D an increase in the number of sharks

Your answer

[1]

4 Look at the pyramid of biomass.

What can you tell from this pyramid of biomass?



- A Fleas are producers.
- B The trophic level with oak trees has the lowest biomass.
- C There are fewer birds than caterpillars.
- D All four trophic levels contain consumers.

Your answer

[1]

5 Organisms in an ecosystem are affected by **biotic** factors.

Which of these is a biotic factor?

- A disease
- B light intensity
- C rainfall
- D wind speed

Your answer

[1]

6 What are the names of the two scientists who first suggested the theory of natural selection?

- A Darwin and Mendel
- B Mendel and Wallace
- C Wallace and Darwin
- D Watson and Crick

Your answer

[1]

7 A sperm cell of a mouse has 20 chromosomes.

Which row in the table shows the correct number of chromosomes in each cell?

	Number of chromosomes in	
	a mouse egg cell	a mouse eye cell
A	40	40
B	20	20
C	20	40
D	40	20

Your answer

[1]

8 The DNA of the unborn baby can be found in the blood sample of the mother.

This DNA is tested to see which chromosomes are present.

Which conclusion is correct?

- A If a Y chromosome is present then it must be a boy.
- B If a Y chromosome is present then it must be a girl.
- C If an X chromosome is present then it must be a boy.
- D If an X chromosome is present then it must be a girl.

Your answer

[1]

9 Different diseases are caused by different pathogens.

Which type of pathogen causes tobacco mosaic disease?

- A** a bacterium
- B** a fungus
- C** a virus
- D** a protist

Your answer

[1]

10 What may a vaccine contain?

- A** small numbers of live harmful microbes
- B** dead microbes
- C** antibiotics specific to the microbe
- D** memory cells

Your answer

[1]

11 Scientists want to make human stem cells from body cells rather than getting stem cells from embryos.

Why is this?

- A** Stem cells cannot be found in human embryos.
- B** Some people object to destroying human embryos.
- C** The cells in human embryos are all differentiated.
- D** Human embryos are single-celled.

Your answer

[1]

- 12** New drugs are tested on humans, animals and tissues.
In which order are they tested?
- A** tissues – humans – animals
 - B** humans – animals – tissues
 - C** animals – tissues – humans
 - D** tissues – animals – humans

Your answer

[1]

- 13** Why is it difficult to kill cancer cells in the body?
- A** They are foreign cells that are not destroyed by antibiotics.
 - B** They are body cells and so the body's defence system does not attack them.
 - C** They hide inside other body cells away from the body's defences.
 - D** They divide very slowly.

Your answer

[1]

- 14** Heart disease affects a large number of people.
Which of these factors contributes to heart disease?
- A** lack of exercise
 - B** low fat diet
 - C** being a non-smoker
 - D** not drinking alcohol

Your answer

[1]

15 Look at the table.

It shows the death rates from coronary heart disease (CHD) in the UK in 2008.

Death rates from CHD per 100,000 population			
Age 55-64		Age 65-74	
men	women	men	women
175	47	443	179

In 2008 the total number of deaths per 100 000 in both age ranges was 844.

What percentage of these deaths were women?

- A 5.6%
- B 21.2%
- C 22.6%
- D 26.8%

Your answer

[1]

SECTION B

Answer **all** the questions.

16 Different parts of the body have natural defence mechanisms to stop pathogens infecting the body.

These defences include:

- skin
- tears
- secretions from the stomach.

(a) Describe how each defence stops pathogens infecting the body.

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..... **[4]**

(b) Sometimes the defence mechanisms do **not** work and pathogens enter the body. They may then be treated with antibiotics.

What is an antibiotic?

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..... **[2]**

(c) Probash is ill and is having tests in hospital.

His doctors monitor Probash's body temperature frequently.

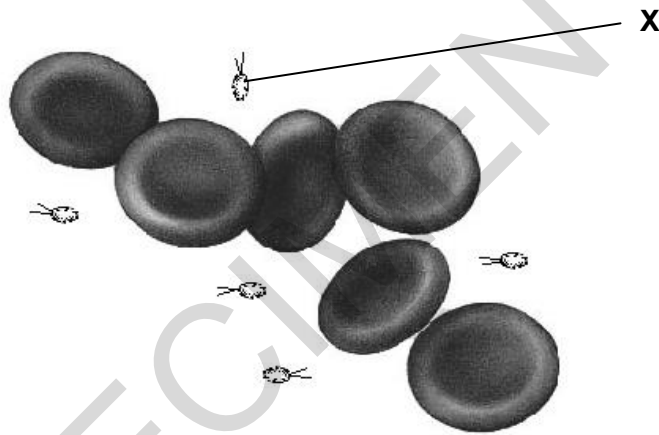
Explain why it is important to monitor Probash's body temperature frequently.

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..... [2]

(d) The doctors took a sample of blood from Probash.

They looked at the specimen under a light microscope.

This is a picture of what they saw.



From this picture, the doctors decide that Probash's illness is caused by bacteria (labelled X).

(i) Why do the doctors **not** think that the structures labelled **X** are viruses?

..... [1]

(ii) What equipment could the doctors use to get a clearer image to confirm their ideas?

..... [1]

- (e) Probash's doctors want to check that the bacteria causing his illness are not resistant to the antibiotic erythromycin.

They set up an experiment to test this.

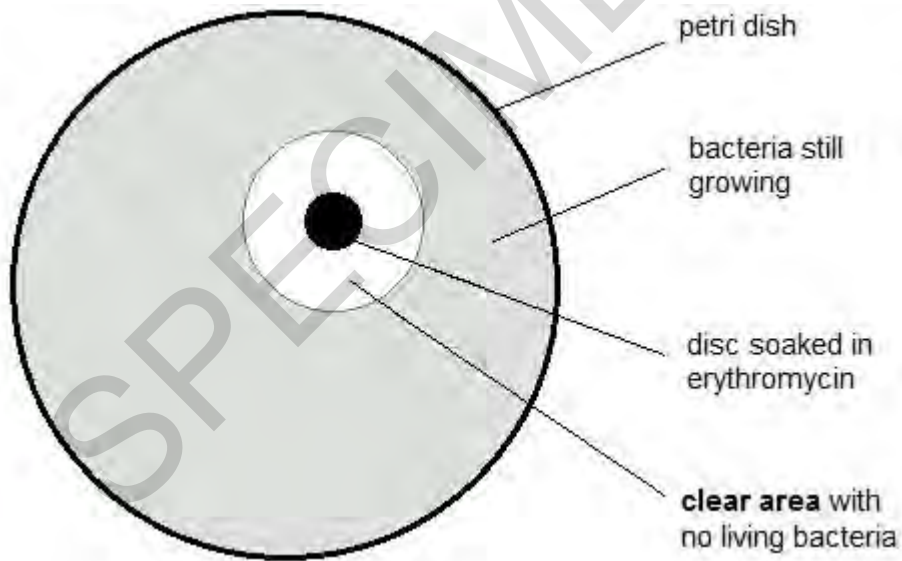
This is the method they use:

- a petri dish is made that has the bacteria growing evenly over the surface
- a disc of filter paper is soaked in erythromycin
- the disc is placed on the agar in the centre of the petri dish
- the lid of the dish is fixed on with a piece of tape
- the dish is then incubated.

- (i) Why did the doctors tape the lid on the petri dish?

..... [1]

- (ii) The diagram shows the doctor's results.



Use a ruler to measure the diameter of the **clear area** in mm.

Use this diameter to calculate the area of the circle where there are no living bacteria.

(the area of a circle = πr^2 and $\pi = 3.14$)

area = mm² [3]

(iii) This table is used to analyse the results of the experiment.

Area clear of bacteria including the area of the disc (mm ²)	Level of resistance
less than 133	resistant
133 to 416	intermediate resistance
more than 416	not resistant

Use your result from part (ii) to judge the level of resistance in the microbe.

..... [1]

17 Rheumatic fever is a rare disease in the UK.

Look at this information.

<u>Rheumatic fever information leaflet</u>
Bacteria can enter the mouth and cause sore throats.
This may develop into rheumatic fever.
Rheumatic fever is much more likely if a person does not get enough food or lives in overcrowded conditions.
White blood cells in the body make protein molecules to kill these bacteria.
However, sometimes these molecules attack heart valves making them leaky.

(a) (i) Put ticks (✓) in the **two** boxes that best describe rheumatic fever.

a communicable disease	
a disease that is caused by defective alleles	
a non-communicable disease	
a disease that is affected by lifestyle	

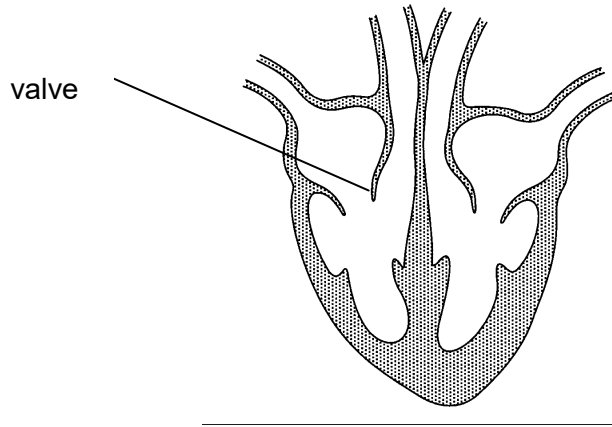
[1]

(ii) White blood cells make protein molecules to kill the bacteria.

What is the name of these protein molecules?

..... [1]

(iii) The diagram shows one of the valves that can be made leaky by rheumatic fever.



People who have this leaky valve often have these symptoms:

- they get out of breath easily
- they do not seem to have much energy and feel tired.

Write about the job of this valve and how damage to it may cause these symptoms.

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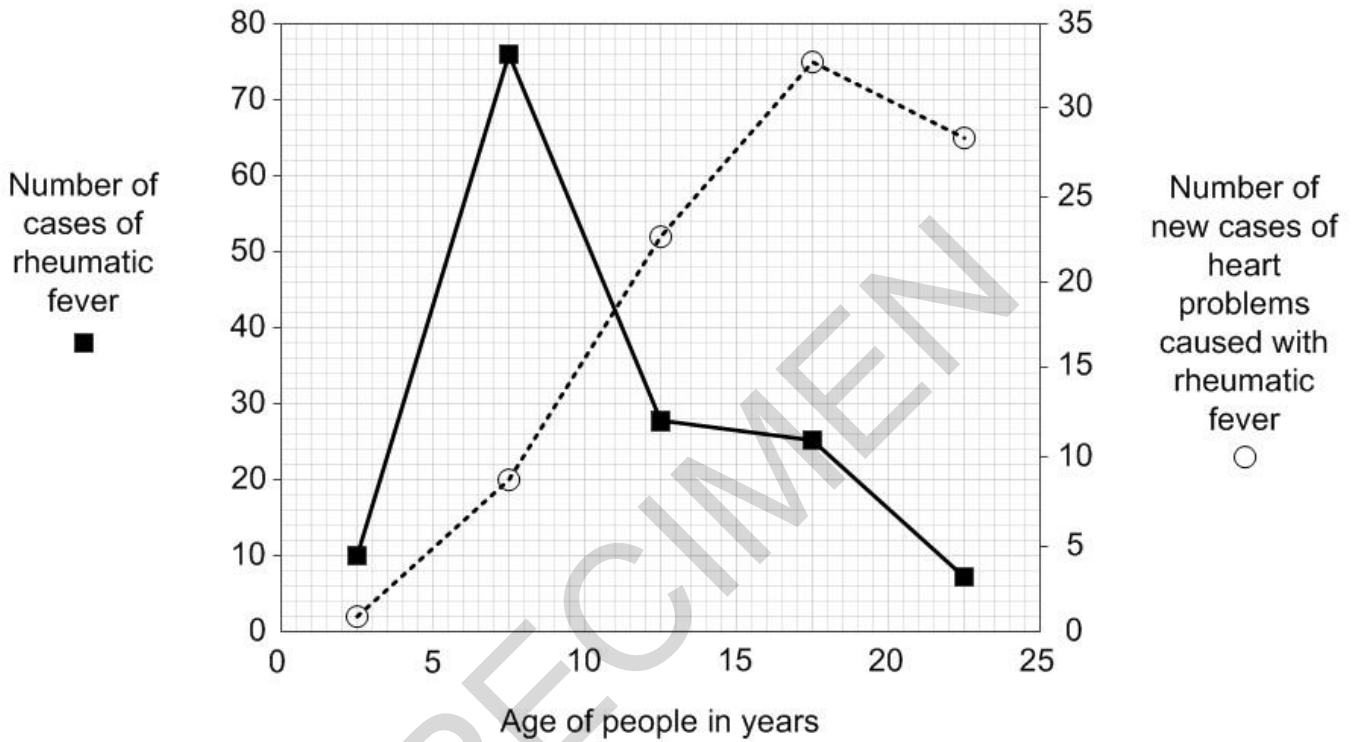
[4]

(b) Look at the graph.

It gives data about people of different ages in one area.

It shows the number of cases of rheumatic fever.

It also shows the number of new cases of heart problems caused by rheumatic fever.



(i) At what age do you most commonly find people with rheumatic fever?

answer = years

[1]

(ii) How many years after getting rheumatic fever is it most common to get heart problems?

How can you tell this from the graph?

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[2]

(c) One treatment for the heart valve problem is to lower the patient's blood pressure.

To lower the blood pressure, a drug can be taken to **increase** the amount of water excreted by the body.

Which organ would be targeted by the drug and what effect would it have on the urine?

organ.....

effect on urine.....

..... [2]

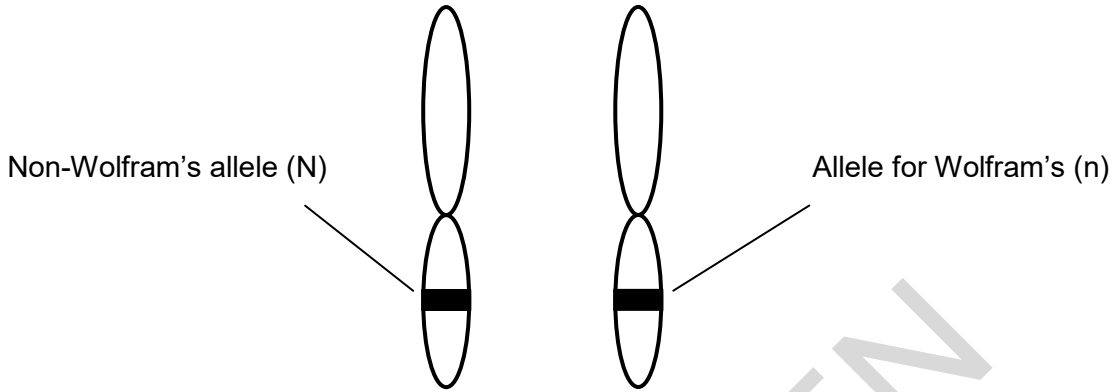
SPECIMEN

18 Wolfram's Syndrome is a genetic disorder.

It is caused by a recessive allele (n).

In people with Wolfram's syndrome, a protein does not function correctly.

The diagram shows a pair of chromosomes from a person called Tim.



(a) Complete these sentences.

Tim does not have Wolfram's syndrome.

This is because his genotype is

This means the probability of any one of his sperm having the Wolfram's allele is

.....

[2]

(b) (i) Meena is expecting a baby.

Tim is the father.

Complete this genetic diagram.

		Tim	
Meena	N		
	n		

[2]

- (ii) Wolfram's syndrome can affect the production of hormones from the pancreas.

Meena and Tim's doctor tells them that there is a chance that their baby will have problems controlling its blood glucose level.

Explain why the doctor thinks this.

Use information from part (b) (i) and your biological knowledge.

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[4]

SPECIMEN

19 In many countries people rely on bananas for food.

Black sigatoka is a disease of banana plants.

It is caused by a fungus.

(a) Banana plants grown by farmers are usually produced asexually.

This process uses mitosis.

This means that if one banana plant can die of black sigatoka then they all can.

Write down why.

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..... **[1]**

(b) The food security of bananas could be improved using different methods.

Draw a straight line to join each **method** to a step that it **involves**.

method	involves
biological control	putting a gene for resistance into banana plants
	growing bananas in a greenhouse
genetic engineering	choosing resistant banana plants to use for reproduction
	using hydroponics
selective breeding	introducing a virus that kills black sigatoka fungus

[3]

- (c) A type of pesticide called fungicide can be used to kill the fungus.

Scientists are investigating how well the fungicide works.

They also want to see if it works better if they add a chemical called a sticking agent.

This helps the fungicide stick to the banana leaves.

The scientists grow banana plants in four blocks.

The table shows the treatments each block is given.

block	treatment	
	fungicide	sticking agent
A	✓	✓
B	✓	X
C	X	✓
D	X	X

- (i) Why did the scientists include the treatments given to block C and block D?

Block C was used so the scientists could.....

.....

Block D was used so the scientists could.....

..... [2]

- (ii) After a few months the scientists gave the plants in each area a disease rating. The higher the rating the more disease present.

block	disease rating
A	20
B	35
C	45
D	60

What conclusions could the scientists make from this study?

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..... [3]

SPECIMEN

20 The rock pocket mouse is a small grey coloured mouse that lives in Mexico.



These mice are the main food for owls.

Rattlesnakes also feed on these mice.

The mice get most of their food from grass plants.

(a) Complete the sentences about this food web.

The grass plants are producers in the food web.

Mice are primary in this food web.

The group of mice living in this habitat is called a population.

All the organisms living in this habitat is called the

[2]

(b) Scientists want to construct a pyramid of biomass for this food web.

They first need to estimate how many organisms there are in the area.

They decide to do this using sampling.

(i) Describe how the scientists would sample an area and ensure that the sample was not biased

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..... **[2]**

(c) In most areas of Mexico the ground is covered in grey rocks.

In one area the ground is covered with black rocks.

The black rocks were formed about 1000 years ago when a volcano erupted.

The scientists make two observations:

- very occasionally a black mouse is born to grey parents due to a mutation
- black mice are well camouflaged.

Use these observations to explain why most of the mice in this area are black and not the usual grey.

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[4]

SPECIMEN

21 Some students are investigating lichens.

Lichens are often studied because they are sensitive to pollution.

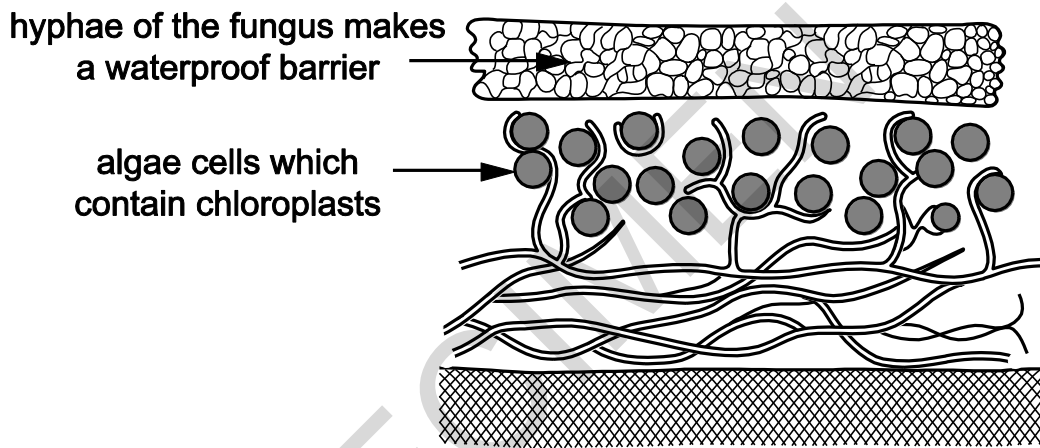
(a) Lichens are made up of two different organisms: fungi and algae.

Both the fungus and the algae gain from living together.

What biological name is given to a relationship where both organisms gain?

..... [1]

(b) The students find a diagram of a lichen.



Using the information from the diagram suggest what the algae and fungi each gain from their relationship.

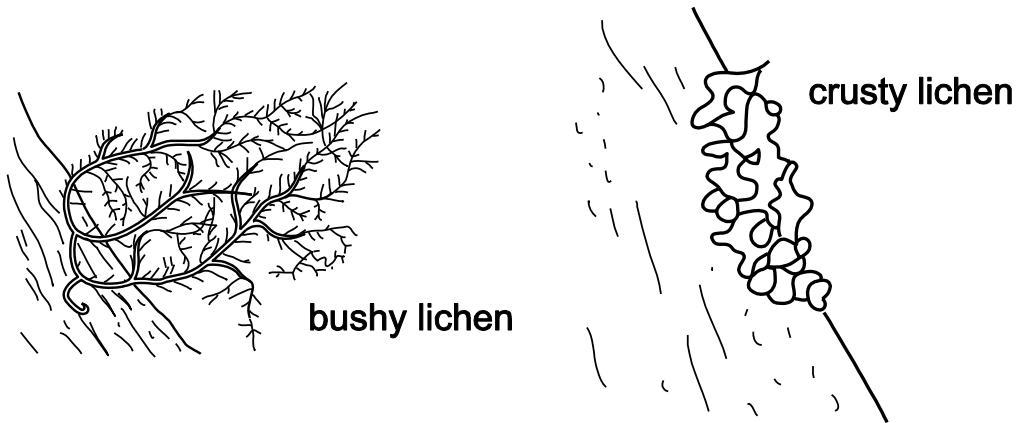
algae.....

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fungus.....

..... [2]

- (c) Lichens are sensitive to pollution because they take up chemicals from the air.
The diagram shows a 'bushy' species of lichen and a 'crusty' species of lichen.



Bushy lichens are usually more sensitive to pollution than crusty lichens.

Use the diagrams to suggest why.

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[1]

- (d) The students decide to use lichens to try and work out how polluted their school grounds are.

They read about a scale called the Lichen Diversity Value (LDV).

It is worked out in this way:

- choose four trees in the area
- hold a quadrat on the north side of the trunk of one tree
- count the total number of all the lichens in the quadrat
- then do this on the east, south and west side of the tree
- repeat this for each tree.

- (i) Suggest how the students could choose four trees.

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[1]

- (ii) The students put their results into a table.

Number of individual lichens found in each quadrat				
Tree number	North	East	South	West
1	3	11	18	7
2	4	12	17	8
3	5	10	15	12
4	4	15	12	9
mean	4.0	12.0	15.5	

The LDV is found by adding together the four mean values.

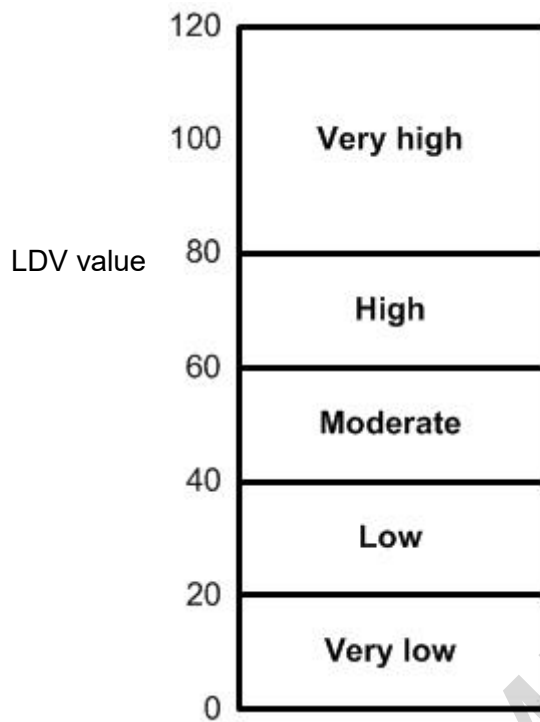
The students calculate the mean number of lichens on the north, east and south sides of the trees.

Calculate the mean for the west side and use this to calculate the LDV.

LDV =

[2]

(iii) This scale shows the type of diversity shown by the LDV.



What does the LDV show about the amount of diversity in the school grounds?

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..... [2]

(iv) LDV is calculated by counting all the lichens present.

What else about the lichens could the students look for to make a better assessment of pollution?

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..... [3]

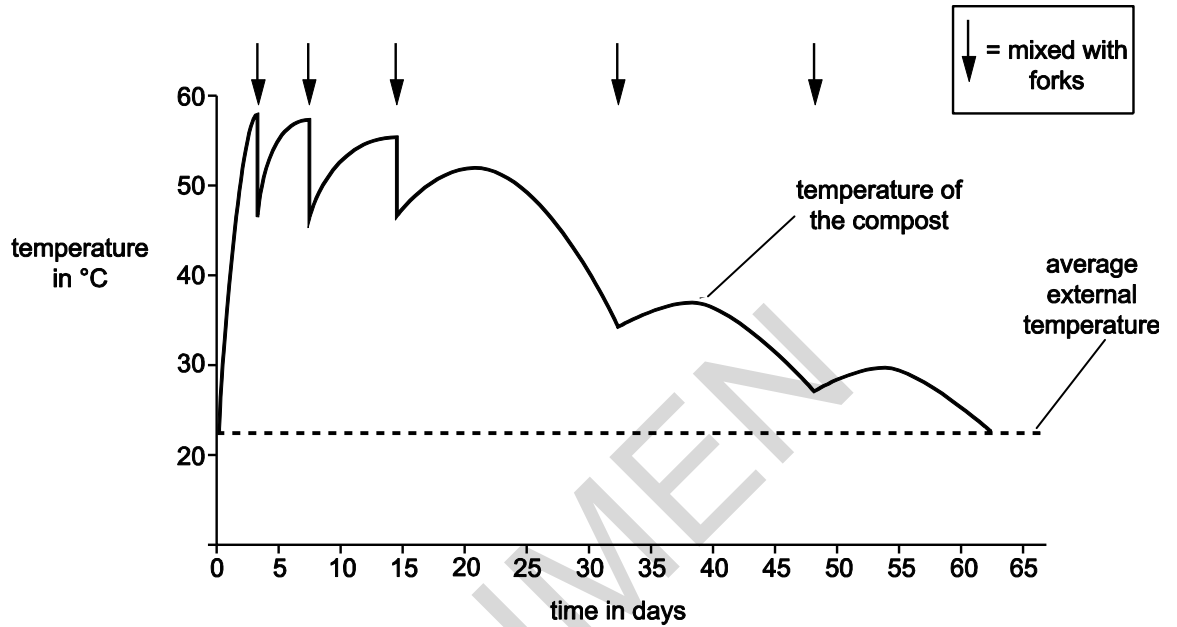
22

Some students measured the temperature inside a compost heap.

They also measured the external temperature.

On five occasions they mixed up the compost heap with garden forks.

The graph shows their results.



(a) (i) The compost took 63 days to completely decompose.

Explain how the students could tell this from their graph.

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..... [1]

(ii) The rate of temperature increase is greatest before the compost is mixed for the first time.

Explain how the rate of temperature change can be calculated.

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..... [1]

- (b) Compost decomposes more slowly above 60°C or below 30°C.

Use ideas about enzymes and decomposition to explain why this is.

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..... [2]

- (c) Use the graph to describe how the forking helps to provide the best temperature for decomposition.

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..... [2]

END OF QUESTION PAPER

SPECIMEN