

**GENERAL CERTIFICATE OF SECONDARY EDUCATION
TWENTY FIRST CENTURY SCIENCE
SCIENCE A**

A213/02

Unit 3: Modules B3 C3 P3 (Higher Tier)

Candidates answer on the question paper.
A calculator may be used for this paper.

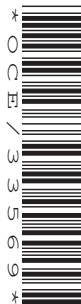
OCR supplied materials:
None

Other materials required:

- Pencil
- Ruler (cm/mm)

**Friday 17 June 2011
Afternoon**

Duration: 40 minutes



Candidate forename		Candidate surname	
Centre number		Candidate number	

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Answer **all** the questions.
- Do **not** write in the bar codes.

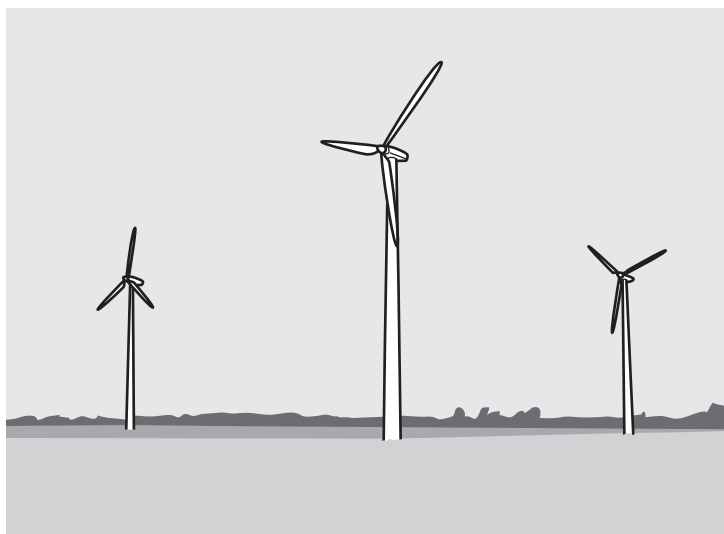
INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **42**.
- This document consists of **20** pages. Any blank pages are indicated.

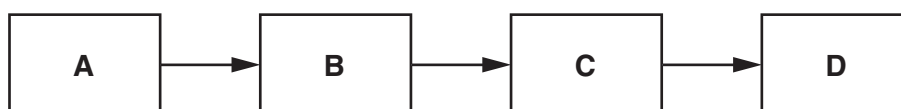
2

Answer **all** the questions.

- 1 Wind turbines can be used to generate electricity in wind farms.



- (a) The block diagram below shows the stages by which a wind turbine generates electricity.



The letters **A**, **B**, **C** and **D** stand for the statements below.

Put the correct letter next to each statement.

Electricity is generated.

☐

Electricity is passed on to the National Grid.

☐

The generator spins.

☐

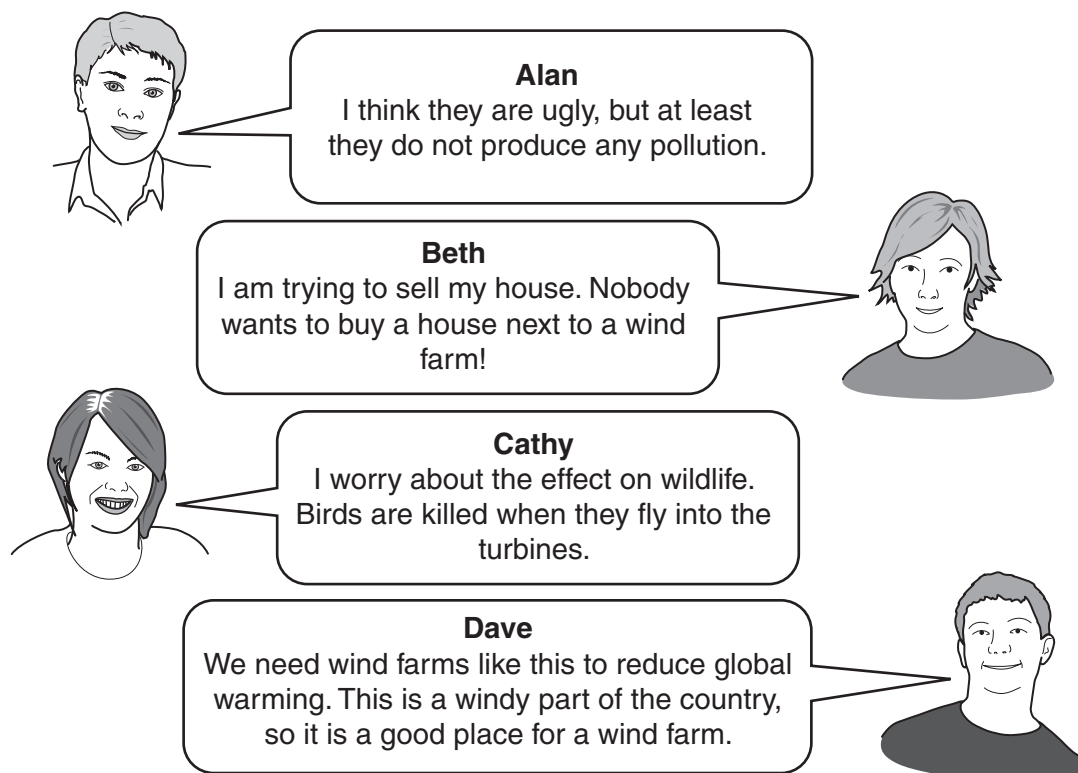
The blades of the turbine rotate.

☐

[1]

3

(b) These people have different ideas about the wind farm next to their village.



Alan
I think they are ugly, but at least they do not produce any pollution.

Beth
I am trying to sell my house. Nobody wants to buy a house next to a wind farm!

Cathy
I worry about the effect on wildlife. Birds are killed when they fly into the turbines.

Dave
We need wind farms like this to reduce global warming. This is a windy part of the country, so it is a good place for a wind farm.

(i) Who mentions an advantage of having the wind farm?

Put ticks (✓) in the boxes next to the **two** correct names.

Alan	☐
Beth	☐
Cathy	☐
Dave	☐

[1]

(ii) Who mentions both an advantage and a disadvantage of having the wind farm?

Put a tick (✓) in the box next to the correct name.

Alan	☐
Beth	☐
Cathy	☐
Dave	☐

[1]

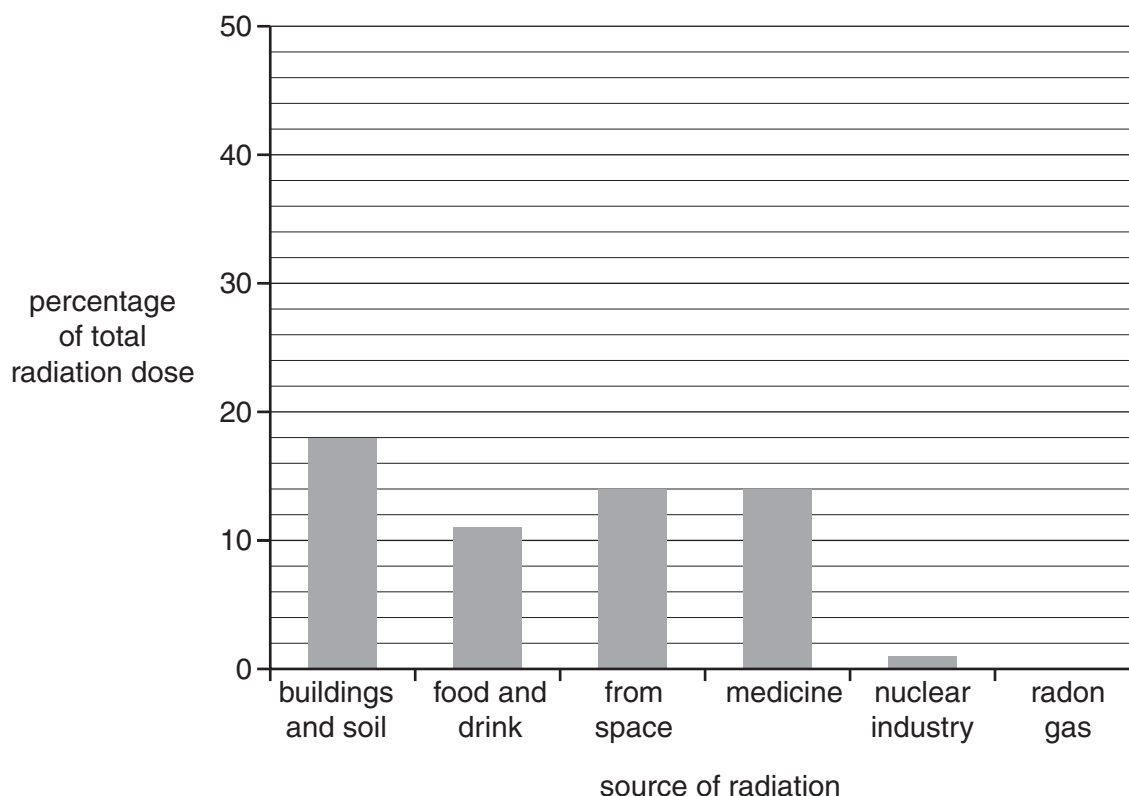
[Total: 3]

Turn over

4

- 2 The average radiation dose of people living in Europe can be measured.
The radiation comes from different sources.
The bar chart shows the percentage of the total dose that is received from different sources.

The percentage for one source of radiation has **not** yet been plotted on the chart.



- (a) Assume that no other sources give any radiation dose.

Draw a bar on the chart to show the percentage of the total radiation dose from radon gas. [1]

- (b) The radioactive materials used in medicine and in the nuclear industry are artificial ones, not natural ones.

- (i) What is the percentage of the total radiation dose given by these two artificial sources of radiation?

answer = % [1]

- (ii) Which of the natural sources of radiation gives the smallest percentage of the total radiation dose?

answer [1]

5

- (c) Explain how risk to workers in the nuclear industry is controlled by the Government and the nuclear industry employers.

In your answer you should consider

- the **risks** and **benefits**
- the **official regulations**.

.....

.....

.....

.....

.....

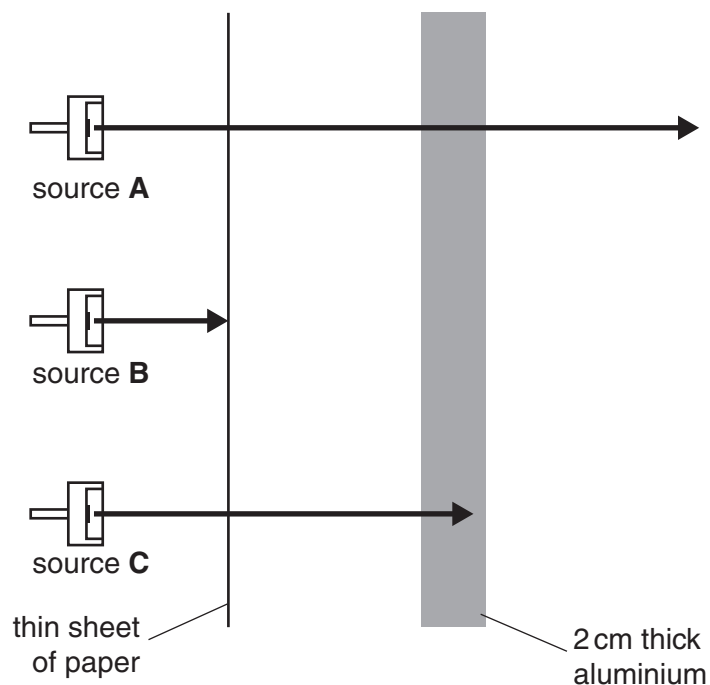
..... [3]

[Total: 6]

- 3 (a) The diagram shows three different types of radiation being given out by radioactive sources **A**, **B** and **C**.

Sheets of thin paper and thick aluminium are put in front of the sources.

The arrows show how far each type of radiation can travel through these materials.



Write down the name of the type of radiation given out by each source.

Source **A** gives out radiation.

Source **B** gives out radiation.

Source **C** gives out radiation. [1]

- (b) The different sorts of radiation come from the centre of the atom.

(i) What is this part of the atom called?

answer [1]

(ii) What particles are found in this part of the atom?

answer and [1]

7

- (c) A sample of a radioactive material has a half-life of 3 minutes.

At the beginning of an experiment the sample has an activity of 400 counts/second.

Calculate the activity of the sample 12 minutes after the start of the experiment.

You should show your working clearly.

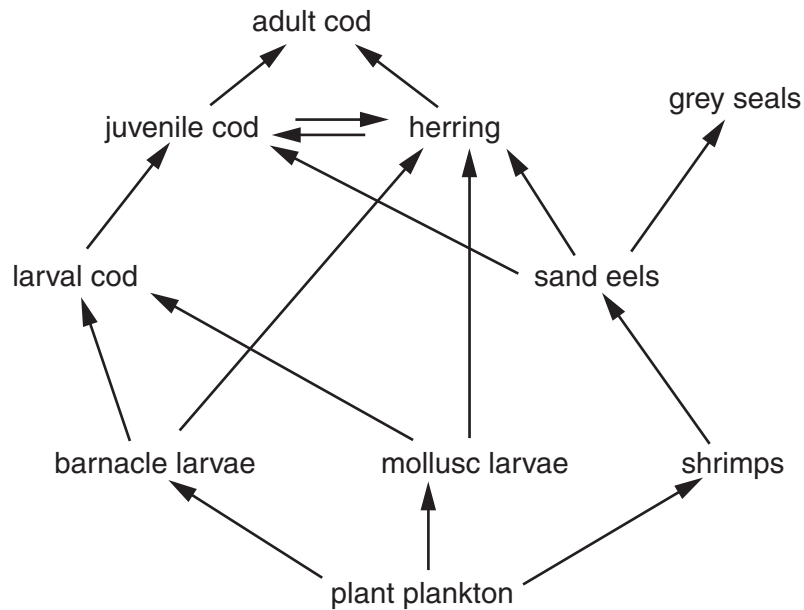
activity = counts/second

[2]

[Total: 5]

4 This question is about food webs.

(a) The diagram shows part of a food web for the North Sea.



(i) Use information from the food web to complete the sentence.

The species with the most varied diet is [1]

(ii) Barnacle larvae, mollusc larvae and shrimps all feed on plant plankton.

All three are using the same food resource.

Scientists call this interaction [1]

(b) Grey seals eat sand eels.

Overfishing has reduced the numbers of cod and herring.

What effect will overfishing have on the seal population for this food web?

Draw **one** straight line to link the correct **effect on grey seal population** to its **explanation**.

Draw **one** straight line only.

effect on grey seal population

explanation

it increases

cod do not eat sand eels

it decreases

fewer sand eels are eaten by other predators

it stays the same

more sand eels are eaten by other predators

grey seals do not eat herring or cod

[1]

[Total: 3]

5 This question is about evolution.

Darwin suggested that evolution happened due to natural selection.

Read the information about peacocks.



Males have very large colourful tails with eyespots.

Females do not have large colourful tails.

Research shows that females prefer to mate with males with the most eyespots on their tails.

Explain why male peacocks have evolved such large tails.

In your answer write about

- variation of peacocks
- competition between peacocks
- reproduction.

.....

.....

.....

..... [3]

[Total: 3]

- 6 This is a question about extinctions.

Read the information about passenger pigeons.

- 1 When European settlers arrived in North America in the 1600s, there were millions of passenger pigeons.
- 2 The female passenger pigeons only laid one egg a year.
- 3 The passenger pigeons had few natural predators.
- 4 The birds fed mainly on acorns, chestnuts and beech nuts in the extensive woodlands of North America.
- 5 Settlers cut down woods for fuel and to build houses.
- 6 The settlers hunted the birds for food and feathers.
- 7 In 1914 the last passenger pigeon died in captivity.

- (a) Four of the sentences explain the rapid extinction of the passenger pigeon.

Which four?

sentence number,, and [1]

- (b) Extinctions reduce the number of species in a habitat.

What is the word that scientists use for the number of species in a habitat?

answer [1]

[Total: 2]

7 Read the article.



Artists reconstruction of
A. ramidus

Missing link – the scientific breakthrough of 2009

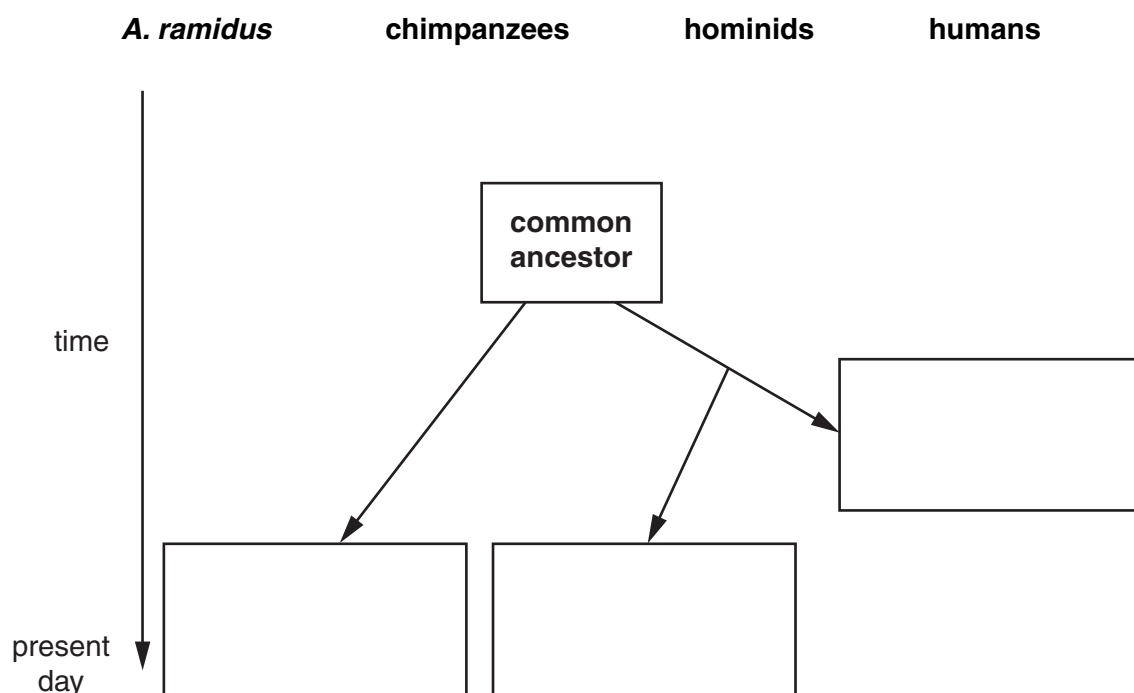
Parts of an ancient skeleton of an ape-type animal, *Ardipithecus ramidus*, were discovered in 1994. The skeleton had grasping feet like modern chimpanzees.

Scientists spent years piecing together fragments of the badly crushed pelvis bones. In 2009 they decided that *A. ramidus* could walk upright. They said this means *A. ramidus* was, like humans, a hominid and not an ancestor of modern chimpanzees or a common ancestor of chimpanzees and humans.

These scientists also think that the grasping feet mean that *A. ramidus* had lived in woodland. This would show that hominids may have evolved in woodland.

Other scientists think that hominids evolved in open grassland.

- (a) Use information from the article to complete the labels in the simplified diagram of human evolution.



[2]

- (b) Some scientists think the *A. ramidus* skeleton is evidence that hominids evolved in woodland.

Other scientists think hominids evolved on the grassland of Africa rather than in woodland.

Put ticks (✓) in the boxes next to the **two** sentences that explain why the evidence is not conclusive.

- | | |
|---|--------------------------|
| <i>A. ramidus</i> was not the common ancestor of chimpanzees and humans. | ☐ |
| Only one example of <i>A. ramidus</i> has been found. | ☐ |
| The skeleton had grasping feet. | ☐ |
| <i>A. ramidus</i> probably walked upright. | ☐ |
| Analysis of other hominid teeth supports the idea that hominids lived in grassland. | ☐ |

[1]

[Total: 3]

8 Multicellular organisms like humans have developed systems for communication between cells.

(a) Name the two communication systems in humans.

..... and [1]

(b) The two communication systems work in different ways.

One communication system uses electrical impulses. The other uses chemicals transported in the blood.

Each way of working has different features.

Draw **two** straight lines from **each** way of working to its **two** correct features.

You should draw **four** lines.

way of working	features
uses electrical impulses uses chemicals transported in blood	short-lived responses slow responses rapid responses long-lasting responses

[2]

[Total: 3]

15

9 Read these sentences from a newspaper article.

Supermarkets have been told to remove packets of dried fruit from their shelves.

They contain the preservative sulfur dioxide, but this is not mentioned on the food label.

(a) Suggest an argument the authorities might use to justify taking packets of dried fruit off supermarket shelves.

.....

.....

.....

..... [2]

(b) Why does the dried fruit contain sulfur dioxide?

Put a tick (✓) in the box next to the best answer.

Sulfur dioxide reacts with oils, so the oils do not react with oxygen.

☐

Sulfur dioxide stops harmful chemicals forming during cooking.

☐

Sulfur dioxide neutralises pesticides sprayed on food crops.

☐

Sulfur dioxide stops the growth of fungi and bacteria.

☐

[1]

[Total: 3]

10 Martha reads a healthy eating leaflet written by the Food Standards Agency.

(a) What are the jobs of the Food Standards Agency?

Put ticks (✓) in the boxes next to the **two** correct answers.

to find out the safe levels of chemicals in food

☐

to tell you if food is organic

☐

to stop people having diabetes because they are overweight

☐

to advise people on what they should eat

☐

to pass laws about healthy eating

☐

[2]

(b) The leaflet has a table that tells Martha the levels of fat, sugar and salt in a food.

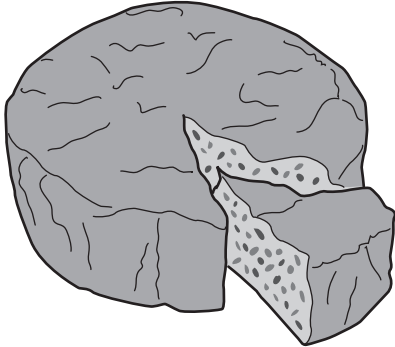
The levels are classified as **high** and **low**.

Each amount is given as grams in every 100 g of food.

levels of fat, sugar and salt in food in g / 100 g food			
	fat	sugar	salt
food that is high has more than	20	15	1.5
food that is low has less than	3	5	0.3

Martha buys a cake at the supermarket.

She looks at the label.

 FRUIT CAKE	Per 100g	
	Energy Carbohydrate Protein	1460 kJ 49.0 g 2.8 g
	FAT HIGH SUGAR HIGH SALT LOW	

17

- (i) Here are some statements about a 100g slice of cake.

Only **one** of them is true.

Put a tick(✓) in the box next to the **true** statement.

A 100g slice contains ...

... 20g fat and 0.5g salt.

☐

... 10g fat and 1g salt.

☐

... 45g fat, and 1g salt

☐

... 25g fat and no salt.

☐

[1]

- (ii) Martha knows there is a health risk in eating too much fat and sugar.

What information will Martha need in order to assess this risk?

.....

.....

.....

..... [2]

- (c) The cake label also shows the amounts of carbohydrate and protein in the cake.

What are the **four** main elements in proteins?

1

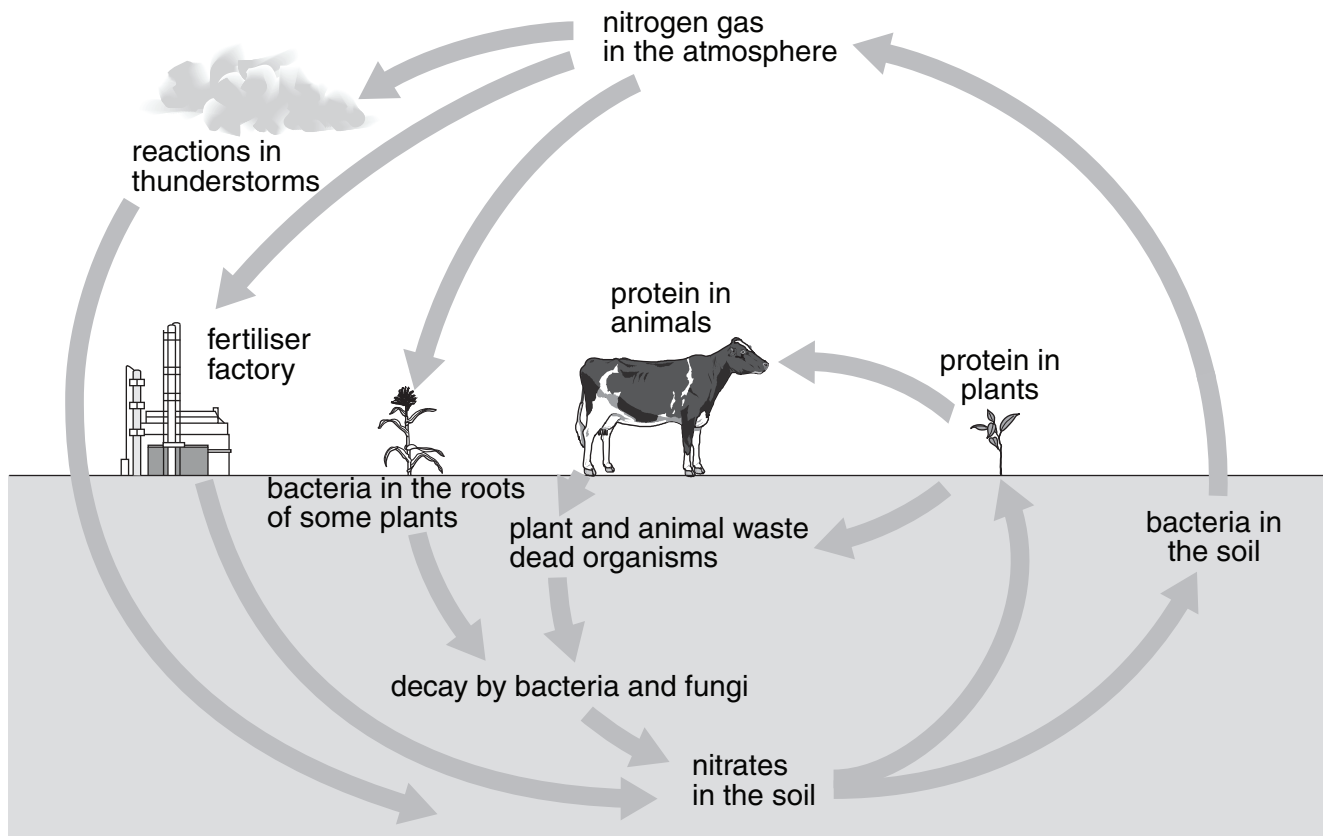
2

3

4 [2]

[Total: 7]

11 This is a diagram of the main stages in the nitrogen cycle.



19

Here are five chemical reactions involving nitrogen.

A	Amino acids break down to make nitrates.
B	Amino acids build up to make proteins.
C	Nitrates are used to make proteins.
D	Nitrates break down to make nitrogen gas.
E	Nitrogen gas from the air is changed to nitrates.

Which chemical reactions are involved in each of the following stages of the nitrogen cycle?

Complete the table by writing the correct letter, **A**, **B**, **C**, **D** or **E**, next to each statement.

You may use each letter once, more than once or not at all.

stage of the nitrogen cycle	chemical reaction
in the fertiliser factory	
when dead animals and plants decay	
in thunderstorms	
in the bodies of living animals	

[4]

[Total: 4]

END OF QUESTION PAPER

PLEASE DO NOT WRITE ON THIS PAGE



Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR 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.