



Surname _____

Other Names _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

I declare this is my own work.

GCSE

COMBINED SCIENCE: TRILOGY

Foundation Tier

Biology Paper 2F

8464/B/2F

F

Time allowed: 1 hour 15 minutes

At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.

[Turn over]



For this paper you must have:

- **a ruler**
- **a scientific calculator.**

INSTRUCTIONS

- **Use black ink or black ball-point pen.**
- **Pencil should only be used for drawing.**
- **Answer ALL questions in the spaces provided.**
- **If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).**
- **Do all rough work in this book. Cross through any work you do not want to be marked.**
- **In all calculations, show clearly how you work out your answer.**



INFORMATION

- **The maximum mark for this paper is 70.**
- **The marks for questions are shown in brackets.**
- **You are expected to use a calculator where appropriate.**
- **You are reminded of the need for good English and clear presentation in your answers.**

DO NOT TURN OVER UNTIL TOLD TO DO SO



0	1
---	---

**A human body cell contains
46 chromosomes.**

0	1	.	1
---	---	---	---

**How many chromosomes does a human
sperm cell contain? [1 mark]**

Tick (✓) ONE box.

☐

22

☐

23

☐

46



BLANK PAGE

[Turn over]



0	1	.	2
---	---	---	---

**On the opposite page, draw ONE line from each word to the meaning of that word.
[3 marks]**



WORD**MEANING****Gene**

**A small ring of
DNA in the
cytoplasm**

Genome

**All the genetic
material of an
organism**

Nucleus

**A small section
of DNA which
codes for a
protein**

**A structure
which contains
chromosomes**

[Turn over]

Some plants contain a harmful chemical called PTC.

Some people can taste PTC.

0 1 . 3

Suggest ONE advantage of being able to taste PTC. [1 mark]

Only people with a dominant allele T can taste PTC.

People with ONLY the allele t cannot taste PTC.

0 1 . 4

A person has the genotype Tt.

What word describes the person's genotype? [1 mark]

Tick (✓) ONE box.

☐

Heterozygous

☐

Phenotype

☐

Recessive

[Turn over]



0	1	.	5
---	---	---	---

Give the genotype of a person who CANNOT taste PTC. [1 mark]



BLANK PAGE

[Turn over]



01.6

A woman and a man plan to have a child.

The woman and the man both have the genotype Tt.

Complete FIGURE 1 to show the possible genotypes of the child. [2 marks]

FIGURE 1

		WOMAN	
		T	t
MAN	T	TT	
	t		

0	1	.	7
---	---	---	---

What is the chance of the child being able to taste PTC?

Use FIGURE 1. [1 mark]

Tick (✓) ONE box.

☐

25%

☐

50%

☐

75%

☐

100%

[Turn over]

<hr/>
10



0	2
---	---

Caffeine is a drug that affects reaction time.

Coffee is a drink that contains caffeine.

Five students investigated the effect of drinking coffee on their reaction time.

Each student sat in front of a computer screen showing a reaction timer.

This is the method used.

- 1. Press any key on the keyboard when the colour of the screen changes to green.**
- 2. Record the reaction time shown on the computer screen.**
- 3. Drink coffee containing caffeine.**
- 4. Wait 15 minutes then repeat steps 1 and 2.**



0	2	.	1
---	---	---	---

What is the dependent variable in the investigation? [1 mark]

Tick (✓) ONE box.

☐

The coffee containing caffeine

☐

The number of students

☐

The reaction time

[Turn over]



0	2	.	2
---	---	---	---

Give TWO control variables the students should have used. [2 marks]

1 _____

2 _____

0	2	.	3
---	---	---	---

Why did the students wait 15 minutes after drinking the coffee before repeating the test? [1 mark]



0	2	.	4
---	---	---	---

Responding to the colour change of the screen involves a receptor in the student.

Where is the receptor in the student?
[1 mark]

Tick (✓) ONE box.

☐

Ear

☐

Eye

☐

Skin

[Turn over]



0	2	.	5
---	---	---	---

Responding to the colour change of the screen involves an effector in the student.

What is the effector in the student?
[1 mark]

Tick (✓) ONE box.

☐

Brain

☐

Gland

☐

Muscle

☐

Spinal cord



BLANK PAGE

[Turn over]



TABLE 1 shows the results.

TABLE 1

Student	Reaction time in milliseconds	
	Before drinking coffee	After drinking coffee
1	385	255
2	420	291
3	285	265
4	871	259
5	463	247



0	2	.	6
---	---	---	---

What is the effect of drinking coffee on reaction time?

Use TABLE 1. [1 mark]

[Turn over]



0	2	.	7
---	---	---	---

Which student had the smallest change in reaction time after drinking coffee?
[1 mark]

Tick (✓) ONE box.

☐

Student 1

☐

Student 2

☐

Student 3

☐

Student 4

☐

Student 5



0	2	.	8
---	---	---	---

The students decided that one of the results was anomalous.

What should the students do with the anomalous result when calculating the mean change in reaction time? [1 mark]

[Turn over]

9



0	3
---	---

FIGURE 2 shows one species of bird on a bird feeder.

FIGURE 2



The birds use their beaks to reach nuts inside the bird feeder.

Cats sometimes eat the birds.



0	3	.	1
---	---	---	---

Give the food chain for the birds, cats and nuts. [2 marks]

0	3	.	2
---	---	---	---

Which organism in the food chain you gave in Question 03.1 is the primary consumer? [1 mark]

[Turn over]



0	3	.	3
---	---	---	---

Cats are one biotic factor that affects the size of the bird population.

Which TWO of the following are BIOTIC factors? [2 marks]

Tick (✓) TWO boxes.

☐

Food

☐

Pathogens

☐

Sunlight

☐

Temperature

☐

Water



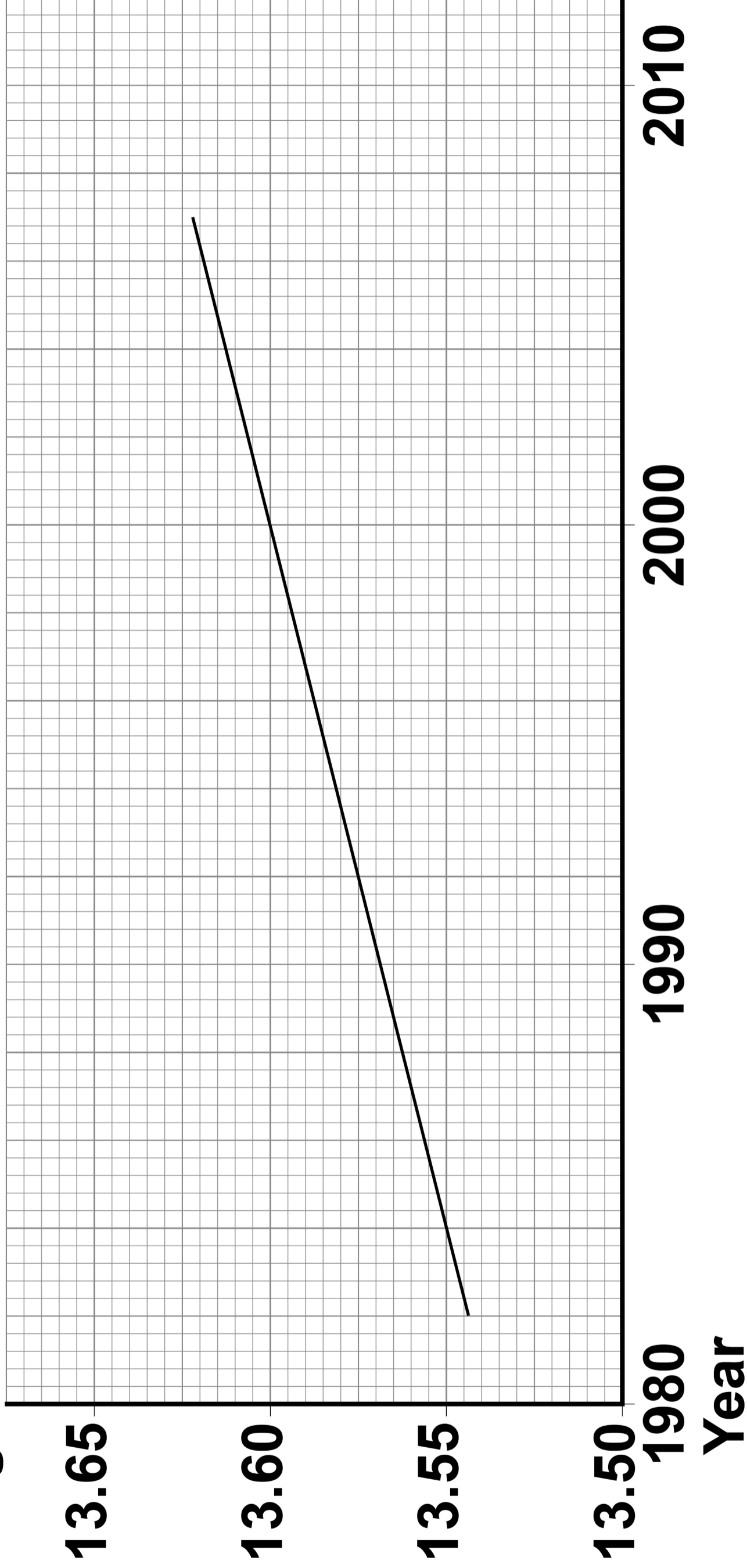
FIGURE 3, on page 28, shows the mean beak length of this species of bird from 1982 to 2007.

[Turn over]



FIGURE 3

**Mean beak
length in mm**



03.4

What was the mean beak length in 2000? [1 mark]

Mean beak length = _____ mm

03.5

What type of adaptation is beak length? [1 mark]

Tick (✓) ONE box.

☐

Behavioural

☐

Chemical

☐

Structural



FIGURE 3, on page 28, shows evidence of evolution in this species of bird.

03.6

Scientists have concluded that beak length in this species of bird is increasing.

Complete the sentences, on the opposite page, about the evolution of this species of bird.

Choose answers from the list. [4 marks]

- **excretion**
- **generation**
- **mutation**
- **reproduction**
- **respiration**
- **variation**



The difference in beak length in the bird population is called _____ .

A change in a gene affects the beak length. Change in a gene is called _____ .

The birds with the longest beaks get more food. Getting more food improves a bird's chances of survival and _____ .

This process of evolution takes place over more than one _____ .

[Turn over]



0	3	.	7
---	---	---	---

Birds of this species:

- **live for about 3 years**
- **produce up to 24 eggs every year.**

Why is evolution easier to study in birds than in humans? [1 mark]

Tick (✓) ONE box.

☐

Birds breed less frequently than humans.

☐

Birds have a shorter life cycle than humans.

☐

Birds have fewer offspring than humans.



0	3	.	8
---	---	---	---

Bacteria also provide evidence for evolution.

Which statement describes evidence for evolution? [1 mark]

Tick (✓) ONE box.

☐

Bacteria can become resistant to antibiotics.

☐

Decomposition can be caused by bacteria.

☐

Some bacteria are pathogens.

[Turn over]

13



0	4
---	---

A fossil was found in rocks. The rocks were formed from mud.

The fossil is of the fungus ‘Ourasphaira giraldae’.

0	4	.	1
---	---	---	---

What is the genus of the fungus? [1 mark]

Tick (✓) ONE box.

☐

Giraldae

☐

Ourasphaira

☐

Ourasphaira giraldae



0	4	.	2
---	---	---	---

The mud around the fungus did NOT contain oxygen.

Which process did the mud around the fungus prevent? [1 mark]

Tick (✓) ONE box.

☐

Decay

☐

Geological activity

☐

Photosynthesis

[Turn over]



0	4	.	3
---	---	---	---

The fossilised fungus is estimated to be 890 000 000 years old.

**What is 890 000 000 in standard form?
[1 mark]**

Tick (✓) ONE box.

☐

$$8.9 \times 10^6$$

☐

$$8.9 \times 10^7$$

☐

$$8.9 \times 10^8$$

☐

$$8.9 \times 10^9$$



0	4	.	4
---	---	---	---

Traditional classification divided organisms into kingdoms.

Who developed the traditional system of classification? [1 mark]

Tick (✓) ONE box.

☐

Carl Linnaeus

☐

Carl Woese

☐

Charles Darwin

[Turn over]



0	4	.	5
---	---	---	---

More recent classification methods use a three-domain system.

What is the name of the domain the fungus ‘*Ourasphaira giraldae*’ is classified in? [1 mark]

Tick (✓) ONE box.

☐

Bacteria

☐

Eukaryota

☐

Plants



0	4	.	6
---	---	---	---

Why has classification changed over time? [1 mark]

Tick (✓) ONE box.

☐

Electron microscopes allow more detail to be seen inside cells.

☐

Many more types of organisms have become extinct.

☐

Some fossils are buried so deep that they may never be discovered.

[Turn over]



04.7

The fungus ‘*Ourasphaira giralda*’ is now extinct.

Give TWO possible causes of extinction.
[2 marks]

1 _____

2 _____

8



0	5
---	---

Increased carbon dioxide levels in the atmosphere contribute to climate change.

0	5	.	1
---	---	---	---

**Give ONE way deforestation can increase carbon dioxide levels in the atmosphere.
[1 mark]**

[Turn over]



0	5	.	2
---	---	---	---

Name ONE other gas that contributes to climate change.

Do NOT refer to carbon dioxide in your answer. [1 mark]

0	5	.	3
---	---	---	---

Meat is produced for humans to eat.

Give TWO ways the production of meat releases carbon dioxide. [2 marks]

1



2

0	5	.	4
---	---	---	---

The mass of carbon dioxide released during the production of food varies depending on the type of food.

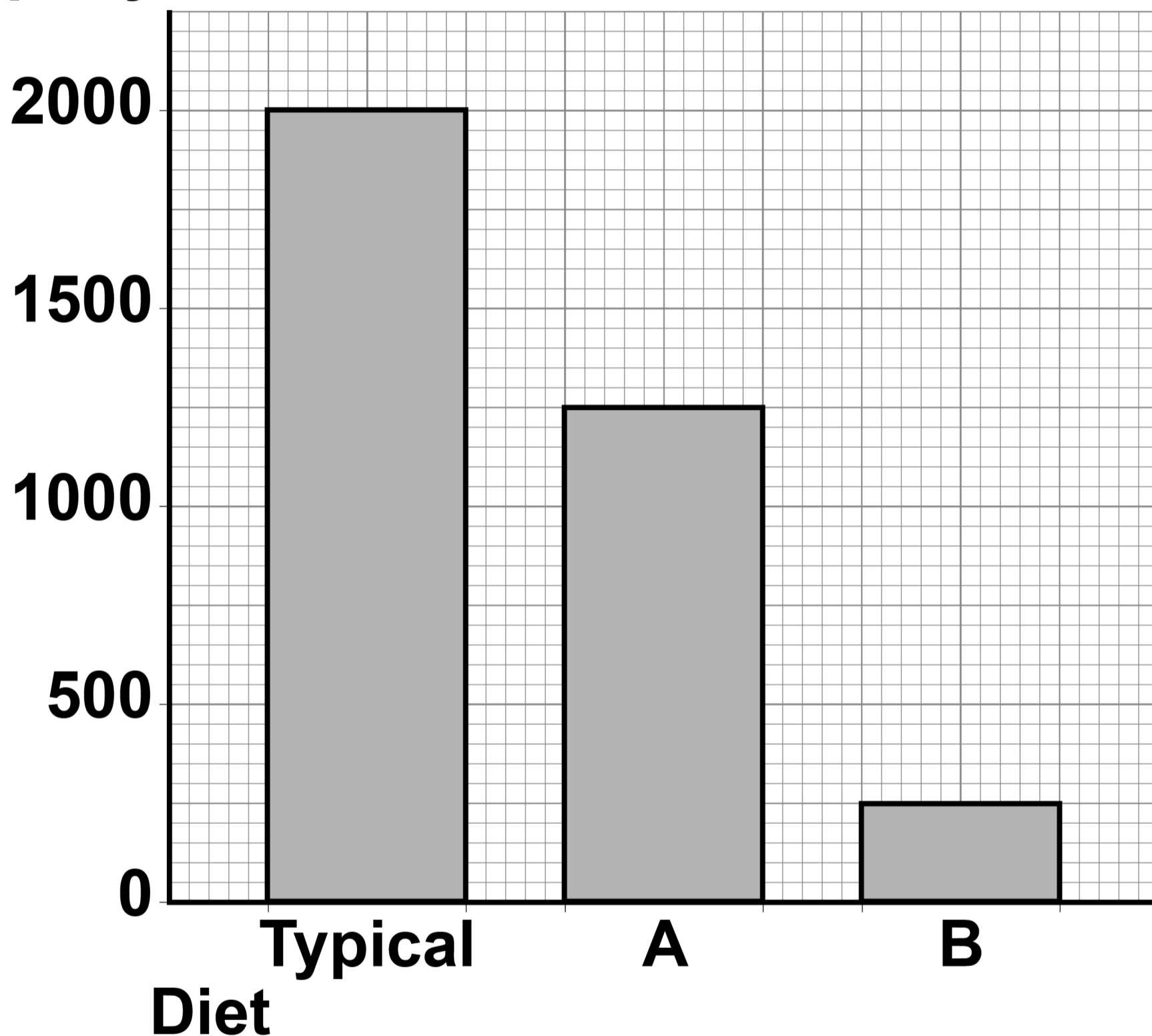
FIGURE 4, on page 44, shows the mass of carbon dioxide released as a result of three different diets.

[Turn over]



FIGURE 4

**Mass of carbon dioxide
released in kg per person
per year**



**Compare the mass of carbon dioxide
released as a result of the three diets
shown in FIGURE 4.**



**Use data from FIGURE 4 in your answer.
[4 marks]**

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

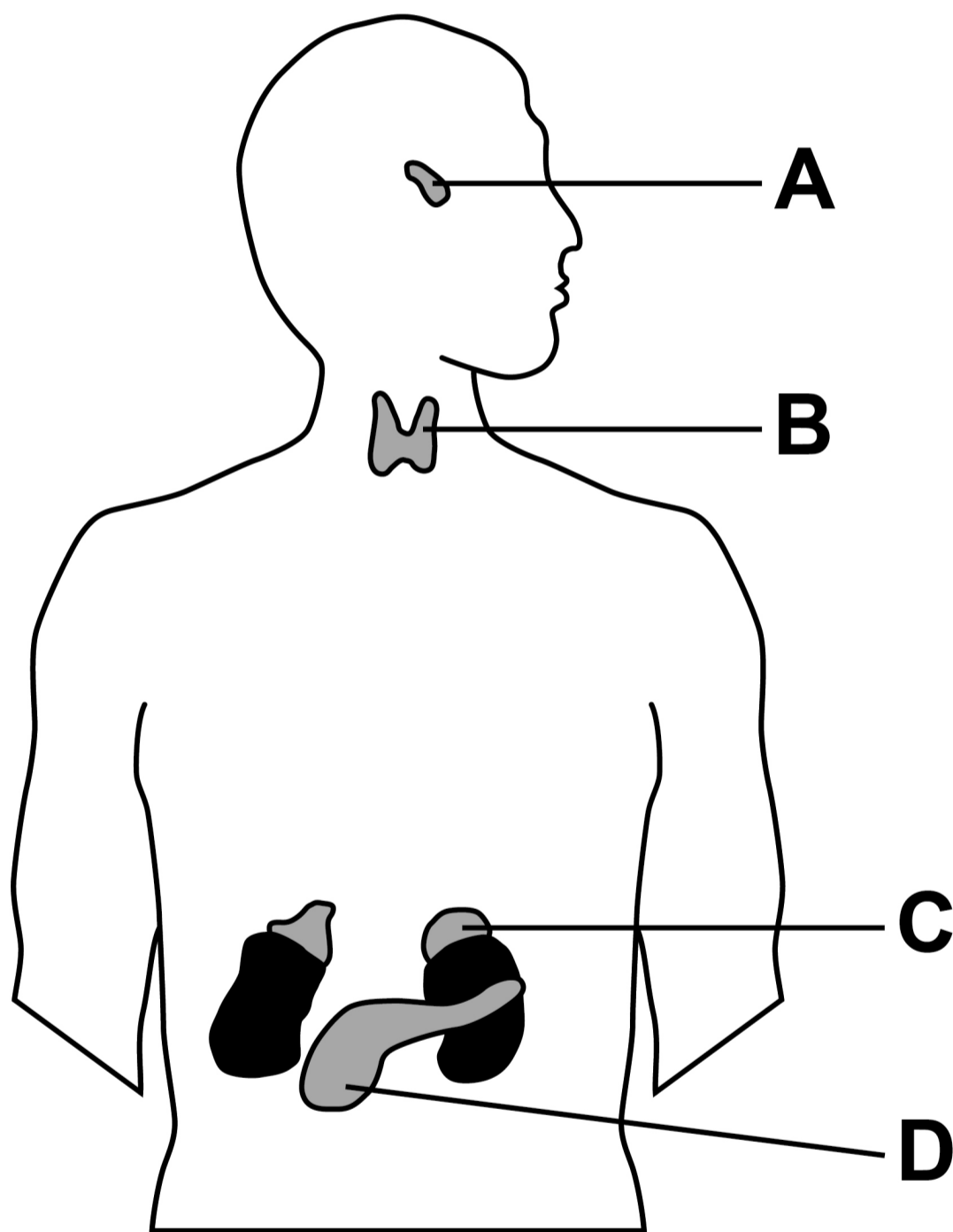
[Turn over]



0	6
---	---

FIGURE 5 shows glands in the human body.

FIGURE 5



0	6	.	1
---	---	---	---

Which organ system includes the glands shown in FIGURE 5? [1 mark]

0	6	.	2
---	---	---	---

Which gland produces insulin? [1 mark]

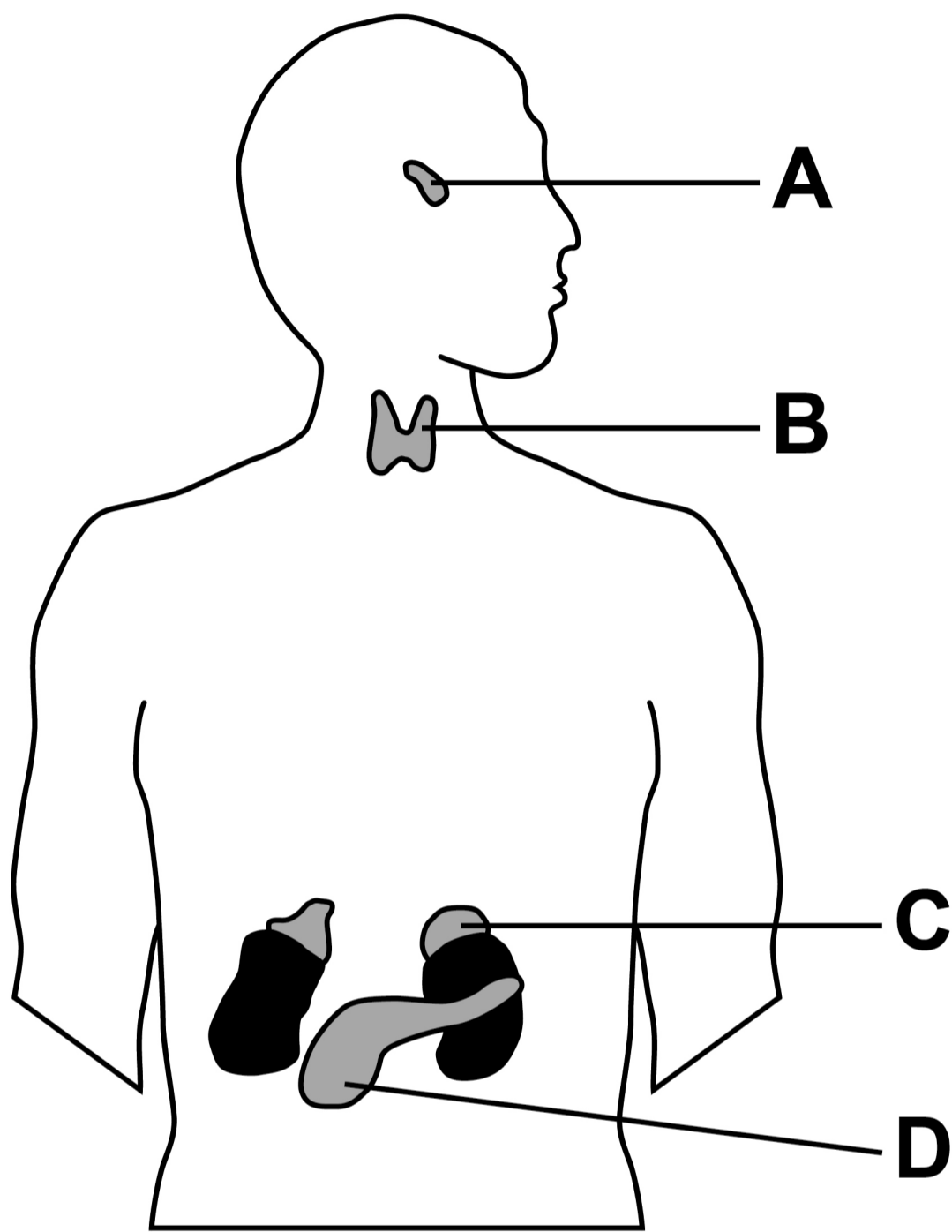
Tick (✓) ONE box.

☐**A**☐**B**☐**C**☐**D**

[Turn over]



REPEAT OF FIGURE 5



0	6	.	3
---	---	---	---

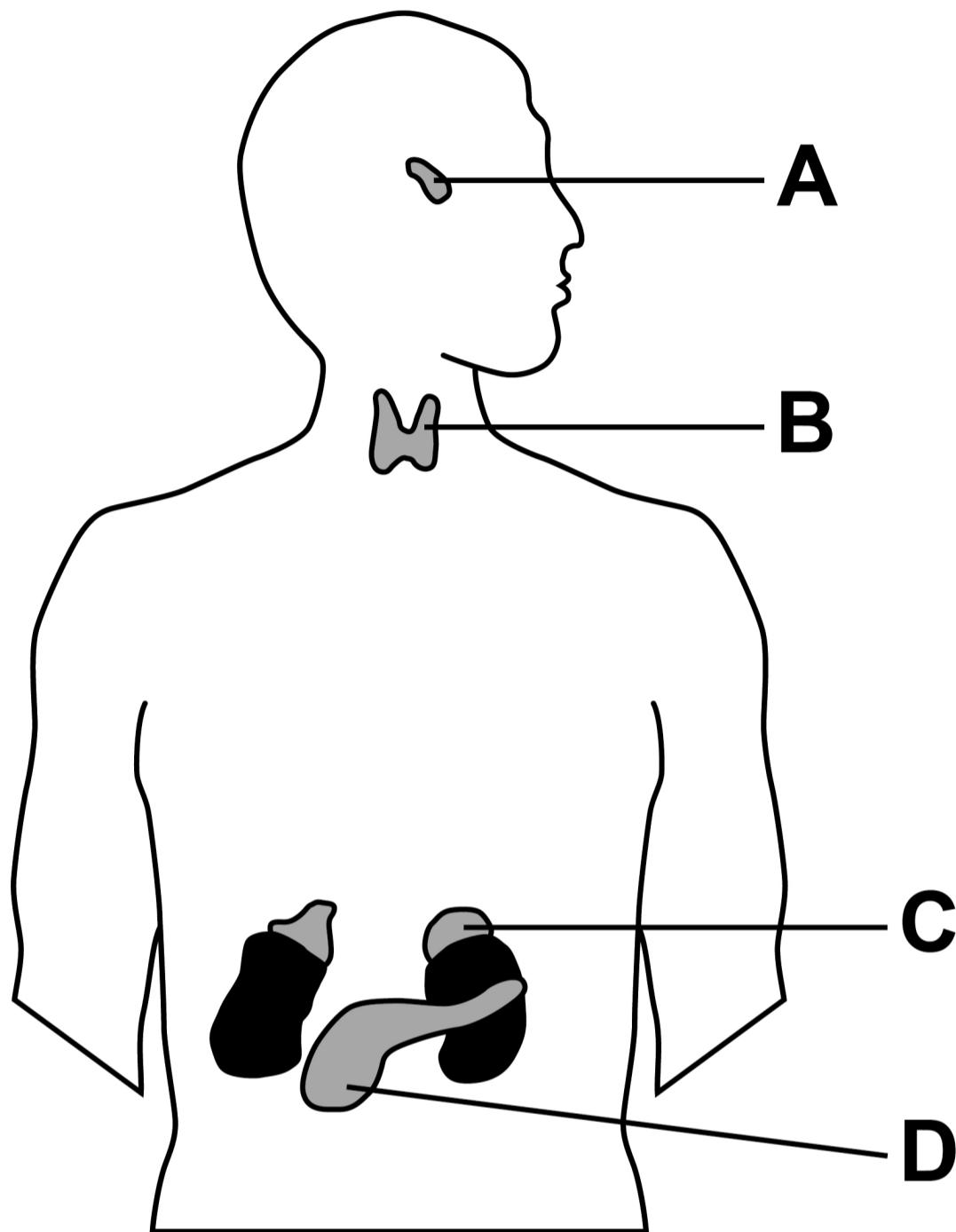
Which gland produces hormones that stimulate the other glands to produce hormones? [1 mark]

Tick (✓) ONE box.

☐**A**☐**B**☐**C**☐**D**

[Turn over]



REPEAT OF FIGURE 5

0	6	.	4
---	---	---	---

How do hormones travel from one gland to another gland? [1 mark]

0	6	.	5
---	---	---	---

Name TWO glands involved in human reproduction.

Do NOT refer to glands shown on FIGURE 5 in your answer. [2 marks]

1 _____

2 _____

[Turn over]



0	6	.	6
---	---	---	---

Ovulation test kits can help women know when they are most fertile.

Ovulation test kits detect the increase in the hormone that stimulates ovulation.

Which hormone is detected by ovulation test kits? [1 mark]

Tick (✓) ONE box.

☐

Follicle stimulating hormone (FSH)

☐

Luteinising hormone (LH)

☐

Oestrogen

☐

Progesterone



BLANK PAGE

[Turn over]



0	6	.	7
---	---	---	---

A new contraceptive drug for men is being tested.

The drug:

- **is given in one injection**
- **stops sperm being able to fertilise eggs**
- **is effective for up to 13 years.**

Evaluate the use of the new drug compared with existing contraceptive methods. [6 marks]



07

FIGURE 6, on the opposite page, shows the money spent on conserving biodiversity in the UK by the government.

07.1

Describe the trends in the money spent on conserving biodiversity from 2005 to 2011.

Use data from FIGURE 6 in your answer. [2 marks]

56

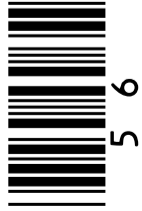
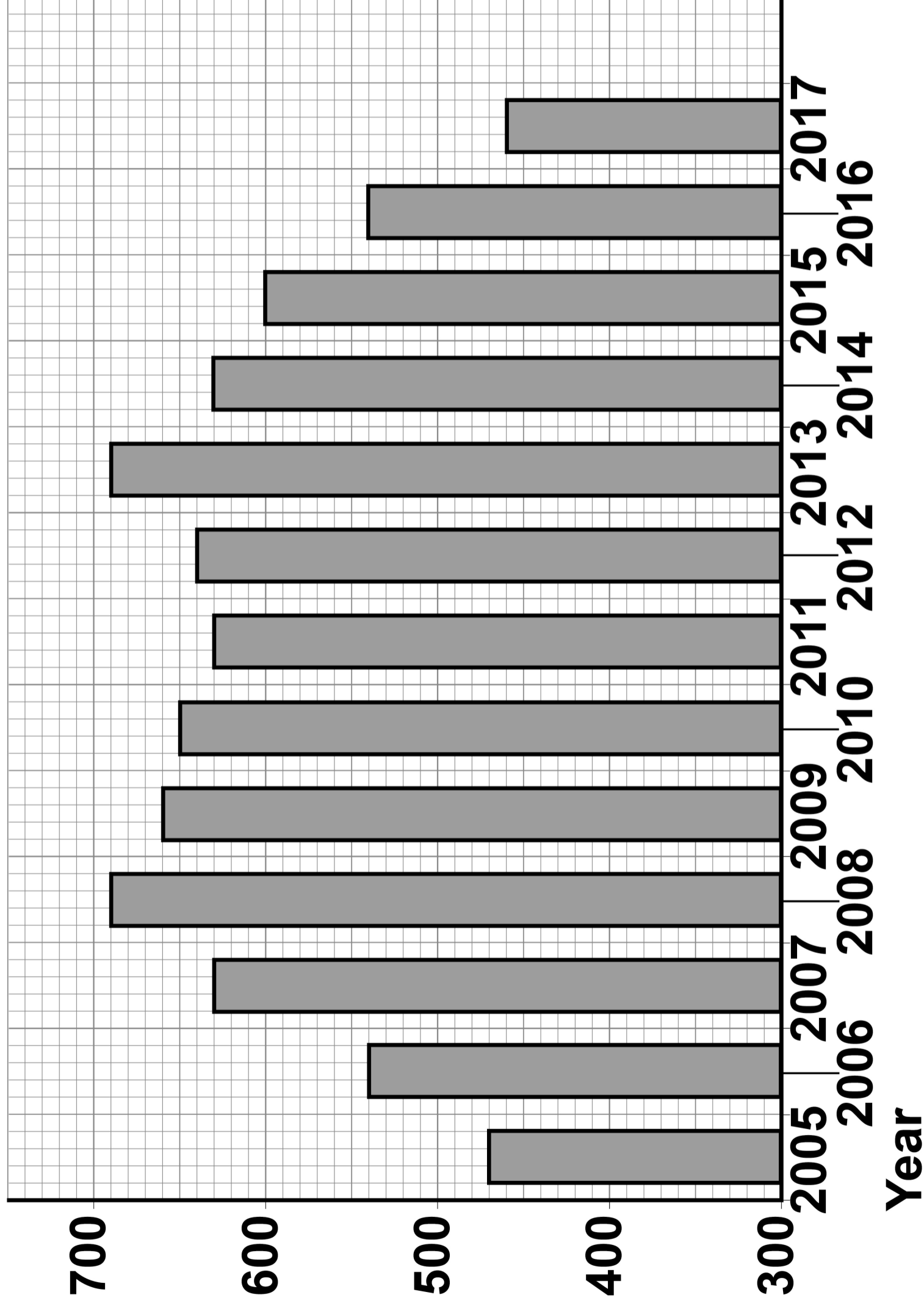
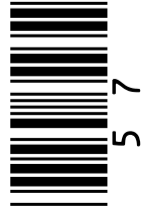


FIGURE 6

Money spent
in millions of pounds



[Turn over]



07.2

Calculate the percentage decrease in the money spent on conserving biodiversity from 2013 to 2017.

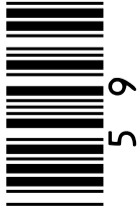
Use the equation:

percentage decrease =
$$\frac{\text{change in money spent from 2013 to 2017}}{\text{money spent in 2013}} \times 100$$
 58

Give your answer to 2 significant figures. [3 marks]

Percentage decrease (2 significant figures) =
%

[Turn over]



0	7	.	3
---	---	---	---

Conservation of peat bogs can help maintain biodiversity.

Give TWO uses of peat taken from peat bogs. [2 marks]

1 _____

2 _____



0	7	.	4
---	---	---	---

Describe TWO ways to INCREASE biodiversity in the UK.

Do NOT refer to money spent or to peat in your answer. [2 marks]

1 _____

2 _____

END OF QUESTIONS

9



Additional page, if required.
Write the question numbers in the left-hand margin.

This image shows a blank sheet of white paper with horizontal ruling lines. A single vertical line runs down the left side, creating a narrow margin. There are 20 horizontal lines in total, evenly spaced across the page. The lines are thin and black.

Additional page, if required.
Write the question numbers in the left-hand margin.

This image shows a blank sheet of white paper with horizontal ruling lines. A single vertical line runs down the left side, creating a narrow margin. There are 20 horizontal lines in total, evenly spaced across the page. The lines are thin and black.

BLANK PAGE

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	

Copyright information

For confidentiality purposes, all acknowledgements of third-party copyright material are published in a separate booklet. This booklet is published after each live examination series and is available for free download from www.aqa.org.uk.

Permission to reproduce all copyright material has been applied for. In some cases, efforts to contact copyright-holders may have been unsuccessful and AQA will be happy to rectify any omissions of acknowledgements. If you have any queries please contact the Copyright Team.

Copyright © 2021 AQA and its licensors. All rights reserved.

IB/M/CH/Jun21/8464/B/2F/E1

