

Please write clearly in block capitals.

Centre number

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Candidate number

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Candidate signature

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# GCSE COMBINED SCIENCE: TRILOGY

# H

Higher Tier

Biology Paper 2H

Specimen 2018 (set 2)

Time allowed: 1 hour 15 minutes

## Materials

For this paper you must have:

- a ruler
- a scientific calculator.

## Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- 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

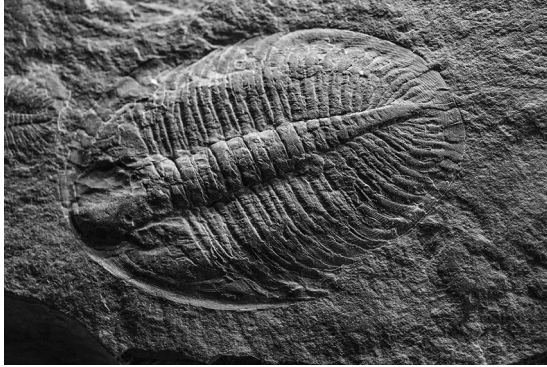
For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
<b>TOTAL</b>	

0	1
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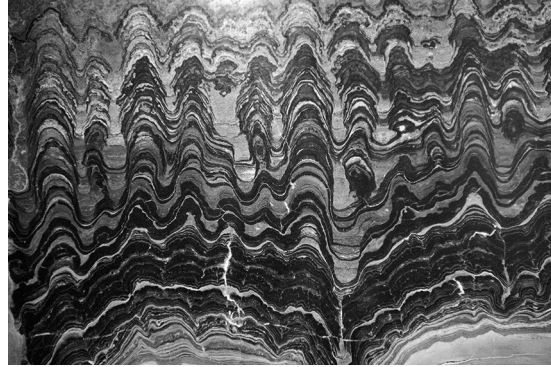
Figure 1 shows photographs of fossils of extinct organisms.

Figure 1

Fossil A



Fossil B



0	1	.	1
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What is a fossil?

[2 marks]

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0	1	.	2
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What does extinct mean?

[1 mark]

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0 1 . 3

**Fossil A** is a trilobite which had a shell, eyes and limbs.

**Fossil B** is a stromatolite formed by layers of microorganisms.

Which **two** statements suggest that the microorganisms lived at an earlier time than the trilobites?

[2 marks]

Tick **two** boxes.

Microorganisms have a more simple structure than a trilobite.

Stromatolites are found in older rock than trilobites.

Stromatolites are layers of minerals left behind by millions of microorganisms.

Stromatolites structures are larger than trilobite fossils.

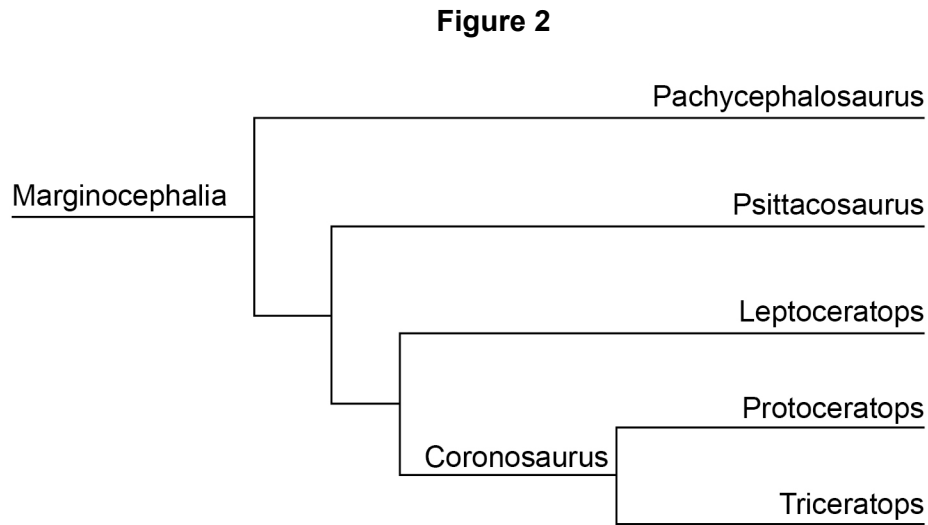
Trilobites lived in the sediment on the sea floor.

**Question 1 continues on the next page**

**Turn over ►**

**Figure 2** shows an evolutionary tree drawn from the fossil record in the 1970s.

The evolutionary tree is for a group of dinosaurs.



**0 1 . 4** Scientists in the 1970s did radiocarbon dating on all the fossils.

Which fossil gave the earliest radiocarbon date?

[1 mark]

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**0 1 . 5** Suggest which **two** types of dinosaur fossils showed the most similar features.

[1 mark]

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**0 1 . 6** Give **one** reason why this evolutionary tree might **not** be correct.

[1 mark]

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0 2

This question is about the human nervous system.

0 2 . 1

A ball is thrown towards a boy.

As the ball is thrown, information passes along a pathway to allow the boy to catch the ball.

Draw **one** line from each action to the correct part of the pathway.

**[3 marks]****Action****Part of the pathway**

Retina cells in the eye detect the light from the ball

Coordinator

The impulse reaches the brain which 'sees' the ball and sends an impulse to the arm muscle

Effector

The muscle in the arm

Response

The arm stretches to catch the ball

Receptor

Stimulus

**Question 2 continues on the next page****Turn over ►**

Students in a college made this hypothesis:

‘reaction time will increase as the time you have been awake increases.’

The students set up an investigation to test their hypothesis.

This is the method used.

1. Find 5 volunteers willing to stay awake for 24 hours.
2. Keep the volunteers in a room where they can study, use an exercise bike or watch TV as they wish.
3. Provide food, water, coffee and tea as requested.
4. Measure the volunteers’ reaction time every 4 hours using a computer program.

0 2 . 2

What was the independent variable in this investigation?

[1 mark]

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The students used a computer program to test reaction time.

0 2 . 3

Describe one **other** method that can be used to measure reaction time.

[3 marks]

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**0 2 . 4** Which method would you choose to use at your school?

Tick **one** box.

Computer program

Method described in Question **02.3**

Give **one** reason for your choice.

**[1 mark]**

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**Question 2 continues on the next page**

**Turn over ►**

**Table 1** shows the students' results.

**Table 1**

Time awake in hours	Reaction time in seconds					
	Volunteer					Mean
	A	B	C	D	E	
0	0.25	0.33	0.35	0.21	0.27	0.28
4	0.20	0.30	0.31	0.19	0.26	0.25
8	0.21	0.28	0.33	0.20	0.27	0.26
12	0.26	0.40	0.58	0.22	0.30	0.35
16	0.44	0.49	0.83	0.27	0.75	<b>X</b>
20	0.64	0.55	1.11	0.39	1.40	0.82
24	0.92	0.61	1.15	0.45	1.35	0.90

**0 2 . 5** Calculate value **X** in **Table 1**.

Give your answer to 2 significant figures

**[2 marks]**

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**X** = \_\_\_\_\_ seconds

**0 2 . 6** Describe the pattern of results for mean reaction time as the time awake increases.

**[2 marks]**

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0 2 . 7

Do these results support the students' hypothesis: 'reaction time will increase as the time you have been awake increases.'?

Give **one** reason for your answer.

[1 mark]

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0 2 . 8

Give **two** ways the students could improve their investigation to make it more valid.

[2 marks]

1 \_\_\_\_\_

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2 \_\_\_\_\_

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15

**Turn over for the next question**

**Turn over ►**

0	3
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Some animals are adapted to survive in very cold conditions such as the Arctic.

Explain how the adaptations of Arctic animals help them to survive in cold conditions.

**[6 marks]**

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0	4
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This question is about reproduction.

0	4	.	1
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Describe the difference between the way hormonal and non-hormonal methods of contraception work.

Give **one** example of each method of contraception.

**[3 marks]**

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**Question 4 continues on the next page**

**Turn over ►**

The urine of women using hormonal methods of contraception contains high levels of progesterone.

Concentrations of 1–3 ng/dm<sup>3</sup> of progesterone are found in the water of rivers near sewage outflow points.

Scientists investigated the effect of different concentrations of progesterone in water on fish reproduction.

This is the method used.

1. Prepare tanks of water containing different concentrations of progesterone.
2. Put a breeding pair of fish into each tank.
3. Record the number of eggs produced per day by the female in each tank for 14 days.

**Table 2** shows the results.

**Table 2**

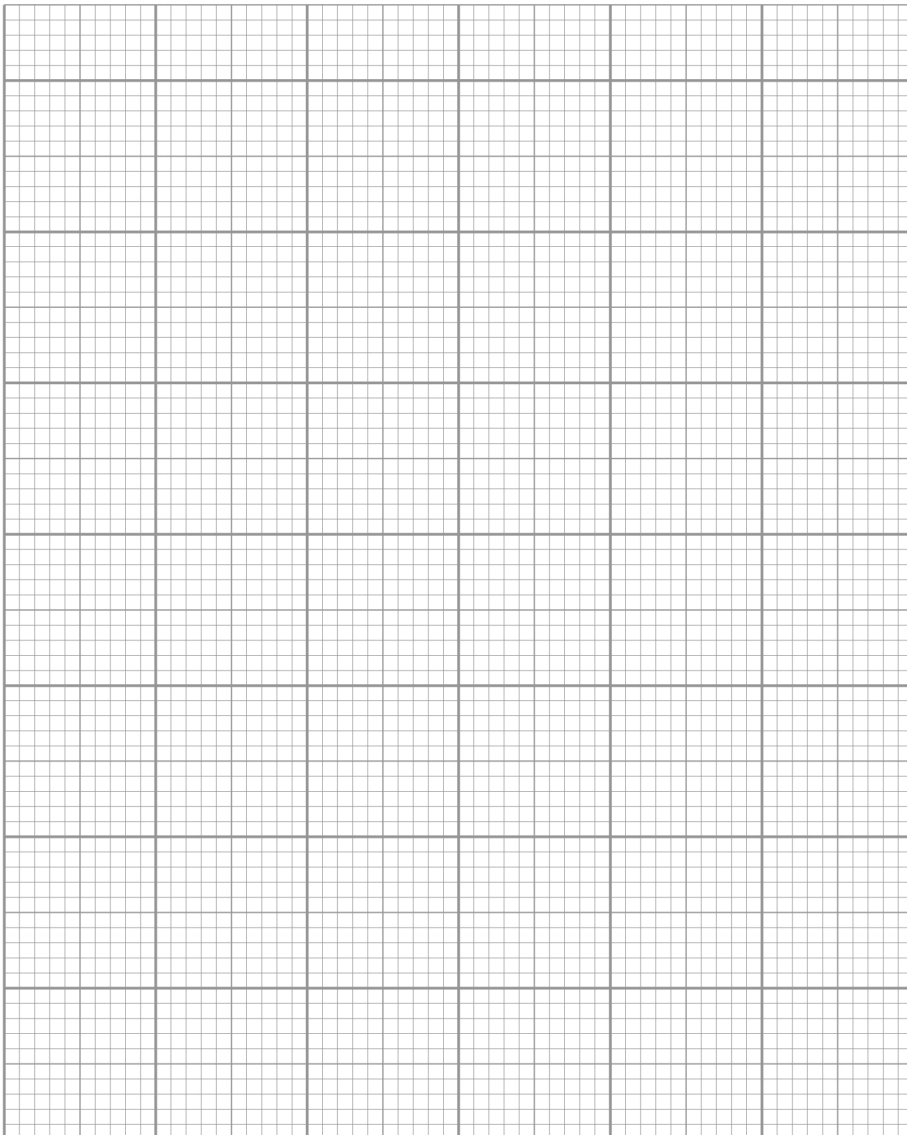
Concentration of progesterone in water in ng/dm <sup>3</sup>	Mean number of eggs produced per day
0.0	28.6
0.8	4.5
1.5	3.2
3.0	2.8
10.0	1.1
20.0	0.2

**0 4 . 2** Plot the data from **Table 2** on **Figure 3**.

You should:

- label each axis
- use a suitable scale
- draw a line of best fit.

**[4 marks]**

**Figure 3****0 4 . 3**

Describe the effect on fish reproduction of the concentrations of progesterone found in rivers near sewage outflows.

Use data from your graph.

**[2 marks]**

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**9****Turn over ►**

**0 5**

Control of blood glucose concentration is an important aspect of homeostasis.

When the blood glucose concentration is too high the hormone insulin is released.

**0 5 . 1**

Name the hormone released when the blood glucose concentration is too low.

**[1 mark]**

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**0 5 . 2**

Explain how the **two** hormones keep the blood glucose concentration at the correct level in a healthy human body.

**[5 marks]**

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The two hormones which control blood glucose concentration are proteins.

Proteins are made according to information stored in the DNA structure of genes.

**0 5 . 3** Describe the structure of DNA.

**[2 marks]**

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**0 5 . 4** Describe how DNA controls the structure of a protein.

**[2 marks]**

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**Question 5 continues on the next page**

**Turn over ►**

0 5 . 5

Polydactyly and cystic fibrosis are both inherited disorders caused by faulty DNA.

- Polydactyly is caused by a dominant allele.
- Cystic fibrosis is caused by a recessive allele.

Mother **A** has polydactyly.

Mother **B** has cystic fibrosis.

Mother **A** is more likely to have a child with polydactyly than Mother **B** having a child with cystic fibrosis.

Explain why.

Assume the fathers of the children have no alleles for polydactyly or cystic fibrosis.

You may use genetic diagrams in your answer.

[3 marks]

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**Turn over for the next question**

**DO NOT WRITE ON THIS PAGE  
ANSWER IN THE SPACES PROVIDED**

**Turn over ►**

0 6

Fall armyworms are native to America.

Fall armyworms eat corn plants.

0 6

. 1

The binomial name for fall armyworms is *Spodoptera frugiperda*.

Fall armyworms belong to an order of insects called Lepidoptera.

**Table 3** shows a classification table for the fall armyworm.

Complete **Table 3**.

[2 marks]

**Table 3**

Classification group	Name
Kingdom	
	Arthropoda
	Insecta
Order	Lepidoptera
Family	Noctuidae
	<i>frugiperda</i>

Fall armyworms have been found in Africa.

By 2016 they had spread rapidly destroying corn crops.

0 6 . 2

Suggest **one** reason why the fall armyworms are spreading so rapidly in Africa.

[1 mark]

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0 6 . 3

Fall armyworms:

- are **not** worms (annelids)
- are the caterpillars of moths (arthropods).

Describe **one** way scientists could tell if a new 'worm' they found should be classified as an annelid or as an arthropod.

[1 mark]

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0 6 . 4

In parts of Africa, aeroplanes have been used to spray insecticide on crops, to kill the worms.

Explain the advantages and disadvantages of spraying insecticide on the corn crops.

[4 marks]

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8

Turn over ►

**0 7**

In 2017, the city of Manchester began a 'City of Trees' project.

The project plans to plant 3 million trees over the next 25 years.

The trees will be used to:

- make existing woodlands larger
- link existing woodlands
- create new woodlands
- plant in parks, public gardens and along streets
- give to people to plant in private gardens.

**0 7 . 1**

It was suggested that the council plant  $3.6 \times 10^5$  trees in the first year.

The rest of the trees would be planted in equal numbers over the remaining years.

Calculate how many trees would need to be planted in each of the remaining years.

Give your answer in standard form.

**[3 marks]**

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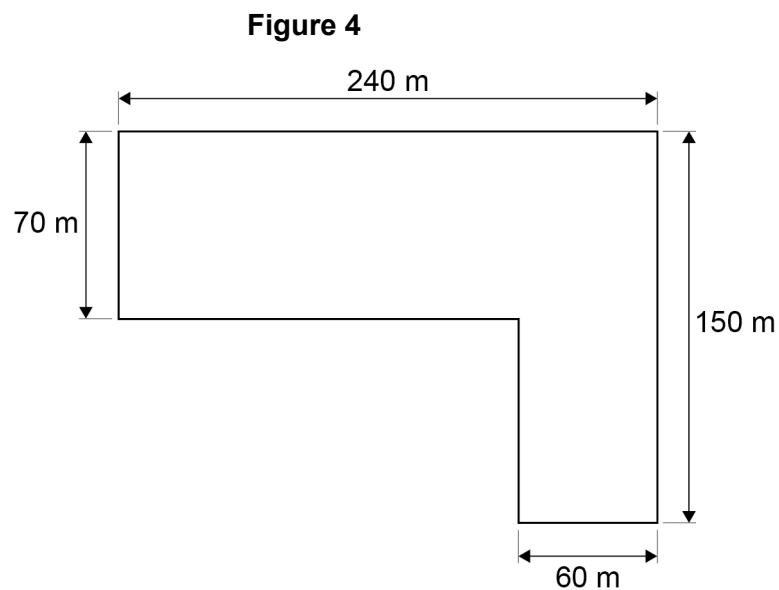
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Number of trees = \_\_\_\_\_ per year

**0 7 . 2** Students investigated the number of bluebells in one of the existing woodlands.

**Figure 4** shows the dimensions of the woodland.



The students used a  $0.25 \text{ m}^2$  quadrat to sample the bluebell population.

The mean number of bluebells per quadrat was 6

Estimate the population of bluebells in the woodland.

**[2 marks]**

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Population = \_\_\_\_\_ bluebells

**Question 7 continues on the next page**

**Turn over ►**

**0 7 . 3**

A Manchester resident says that this project will 'fight pollution' and 'increase biodiversity' in their city.

Explain how the 'City of Trees' project will:

- reduce pollution
- increase biodiversity.

**[6 marks]**

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**END OF QUESTIONS**

**11**

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