

Friday 10 June 2016 – Morning

LEVEL 1 CAMBRIDGE NATIONAL IN SCIENCE

R072/01 How scientific ideas have developed

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

OCR supplied materials:

- Insert (R072/01/I – inserted)

Other materials required:

- Pencil
- Ruler (cm/mm)

Duration: 1 hour



Candidate forename		Candidate surname	
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Centre number						Candidate number				
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INSTRUCTIONS TO CANDIDATES

- The Insert will be found inside this document.
- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- 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. If additional space is required, you should use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.
- 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 **60**.
- Your quality of written communication is assessed in questions marked with a pencil (✎).
- This document consists of **12** pages. Any blank pages are indicated.

Answer **all** the questions.

1 This question refers to the case study ‘Natural Selection’.

(a) (i) Why do the Galápagos Islands have many unusual species of plants and animals?

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

- The islands are both hot and cold.
- The islands used to be volcanoes.
- The islands are a long way from other land.
- The islands are very small.

[1]

(ii) Darwin published *On the Origin of Species* more than 20 years after he returned to England.

Suggest why Darwin waited so long to publish *On the Origin of Species*.

.....
 [2]

(iii) Why was it important that Darwin published his ideas about natural selection?

Put a tick (✓) in one box for **each** statement to show whether it is **true** or **false**.

	True	False
so that other scientists could check his work		
to prove that he was right		
to get the credit for his discoveries		

[1]

(b) (i) What feature of the different types of finch did Darwin use to distinguish them from each other?

..... [1]

(ii) How can modern scientists be sure that all the finches have come from a common ancestor?

..... [1]

(c) The scientific name for the medium ground finch is *Geospiza fortis*.

The scientific name for the common cactus finch is *Geospiza scandens*.

What do the scientific names tell us about the genus and species of these finches?

.....

 [2]

(d) Look at **Fig. 2**.

Describe the distribution of the size of beaks in 1976.

.....

 [2]

(e) Look at **Fig. 3**.

Put a tick (✓) in one box for each statement to show if it is **true**, **false** or you **cannot tell**.

	True	False	Cannot tell
Offspring always have the same-sized beaks as their parents.			
Both parent finches have same-sized beaks.			
There is a correlation between the size of beaks of parents and offspring.			

[2]

(f) Look at **Fig. 2** and **Fig. 5**.

(i) Describe what happened to the population of finches following the drought of 1977.

..... [1]

(ii) Using **Fig. 4**, explain your answer to part (i).

..... [1]

(g) Peter and Rosemary Grant visited the island regularly for the next 40 years to study the finches.

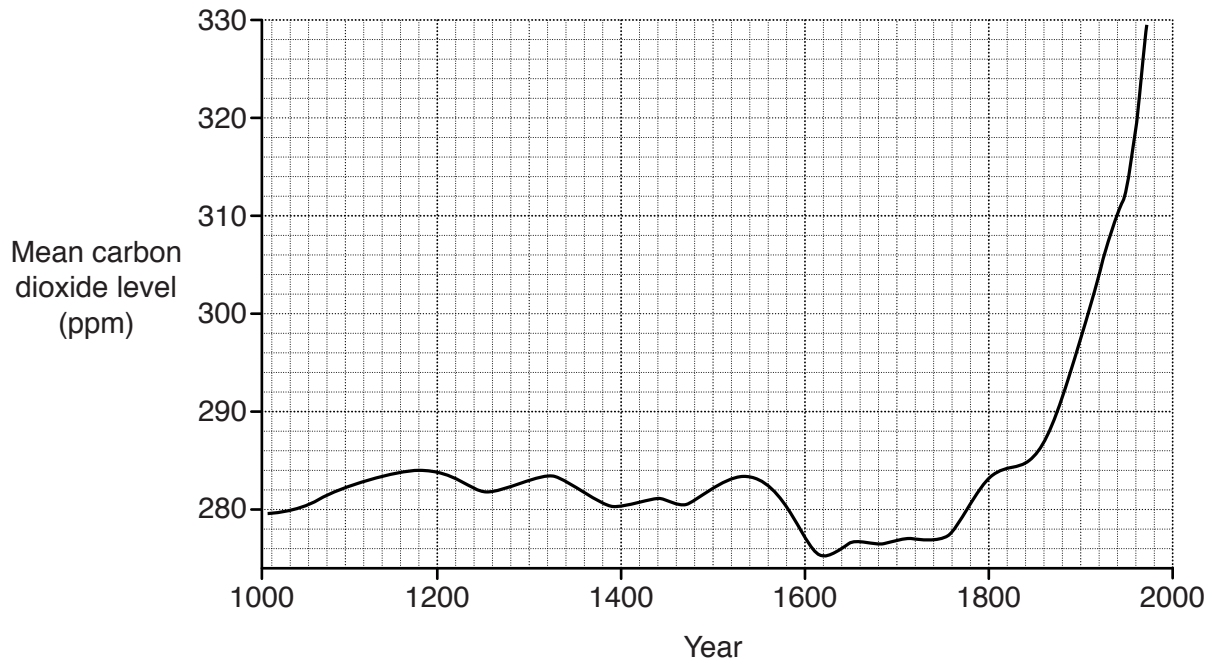
Suggest why it was important that they continued their study for a long time.

.....
 [1]

[Total: 15]

Turn over

- 2 The graph shows how the mean carbon dioxide level in the Earth's atmosphere has changed over time.



- (a) Look at the graph.

In which of these years is the carbon dioxide level below 280 ppm?

Put a **ring** around the correct answer.

1200

1400

1600

1800

[1]

(b) In 2015, the carbon dioxide level reached 400 parts per million (ppm).

Describe how the carbon dioxide level has changed from the year 1000 to 2015, and explain what changes this could cause on Earth.



The quality of written communication will be assessed in your answer.

..... [6]

(c) Explain how the amount of carbon dioxide can change the temperature of the Earth's atmosphere.

..... [3]

[Total: 10]

3 (a) These types of electromagnetic wave can be used for communication.

Complete the sentences below.
Use the best words from the list.

- infra-red microwaves radio waves light**

The electromagnetic waves with the longest wavelength are

Mobile phones communicate using

Optical fibres carry pulses of

[3]

(b) Who first made the following developments?

Put one tick (✓) in the correct column for each development.

Development	Galileo	Hertz	Marconi	Maxwell
apparatus for making and detecting radio waves				
'over-the-horizon' radio communication				
modelling visible light as an electromagnetic wave				

[3]

(c) Explain how several people can use mobile phones on the same network in a city.

.....

 [2]

[Total: 8]

- 4 Diabetes affects the ability of the body to store excess glucose.

Helen and Ian are concerned about the level of glucose in their blood. They eat breakfast at 08:00 and measure their blood glucose level in mmol/L for the next two hours.

Time	08:00	08:30	09:00	09:30	10:00
Helen's blood glucose level (mmol/L)	10.0	17.0	19.0	15.0	12.5
Ian's blood glucose level (mmol/L)	4.5	7.0	6.0	5.0	5.0

- (a) Suggest a factor that must be controlled if they are to compare their results.

.....
 [1]

- (b) Helen's blood glucose level increased during the morning.

- (i) How much did her blood glucose level increase from 08:00 to 09:00?

..... mmol/L [1]

- (ii) What is the **percentage** increase in Helen's blood glucose level from 08:00 to 09:00?

Show your working.

..... % [2]

- (iii) Helen thinks that the change in her blood glucose level happens because she has diabetes.

Which of these are typical symptoms of diabetes?

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

- | | |
|-----------------|--------------------------|
| hunger | <input type="checkbox"/> |
| thirst | <input type="checkbox"/> |
| urinating a lot | <input type="checkbox"/> |
| unconsciousness | <input type="checkbox"/> |
| weight gain | <input type="checkbox"/> |

[2]

Turn over

(c) (i) Suggest what additional data they should collect to find out whether she has diabetes.

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

(ii) How would the data indicate that Helen has diabetes?

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

(d) Sometimes diabetes can be treated by injecting insulin.
Banting and Best extracted insulin from the pancreas of animals and used it to treat diabetes in humans.

Suggest why they did not extract insulin from human beings.

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

(e) Over 1000 years ago, Avicenna noticed that people with diabetes had a lot of sugar in their urine.

(i) Suggest why he did not mention insulin to explain what caused there to be a lot of sugar in the urine.

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

(ii) Avicenna suggested changes to the lifestyle of his patients with diabetes.
What changes did he suggest?

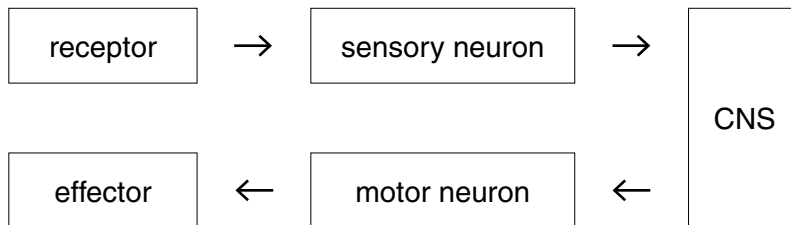
.....
.....
..... [2]

[Total: 12]

5 A doctor does a test on Emily's knee. Her leg jerks very quickly. This is a reflex reaction.



Emily does some research and finds this diagram of her reflex reaction:



Use this diagram to explain why her leg jerks when her knee is tapped and why this reaction is much faster than when she reacts to a signal to start a race.



The quality of written communication will be assessed in your answer.

.....

.....

.....

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.....

.....

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.....

.....

[6]

[Total: 6]

- 6 In the 1950s, many scientists in the USA and Britain were trying to work out the structure of DNA, which had been discovered about 80 years earlier.

Watson and Crick published one of the first models of the structure of DNA but the model was incorrect.

- (a) Why did Watson and Crick publish an incorrect model?

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

The model explained the evidence they had at the time.

They wanted to publish before anyone else.

Their idea had been peer-reviewed.

They had just discovered DNA.

They wanted to see what was wrong with the model.

[2]

- (b) Give **two advantages** of a scientist publishing their work.

.....

.....

..... [2]

- (c) Watson and Crick’s final model of the structure of DNA used evidence from other people’s experiments.

Put a tick (✓) in one box in each row to show whether the statement is **true** or **false**.

	True	False
Using evidence from other people’s experiments always prevents mistakes.		
Scientific work must be checked.		
Sometimes scientific discoveries need ideas from other scientists.		
Individual scientists cannot make scientific discoveries.		

[2]

- (d) The correct structure for DNA involves four bases.
In a sample of human DNA, 30% of the bases are Adenine (A).

Adenine is always joined to Thymine.
Cytosine is always joined to Guanine.

Complete the table to show the percentage of each of the bases.

Adenine (A)	Thymine (T)	Cytosine (C)	Guanine (G)
30%			

[3]

[Total: 9]

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).

A large rectangular area with a solid vertical line on the left side and horizontal dotted lines across the rest of the page, providing space for writing answers.



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