OCR
Oxford Cambridge and RSA

Friday 5 June 2015 – Afternoon

LEVEL 1 CAMBRIDGE NATIONAL IN SCIENCE

R072/01 How scientific ideas have developed

4439397090

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

R072/01

Candidate forename		Candidate surname	

Centre number						Candidate number				

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. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- 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 is based on the case study 'Communicating with waves'.

(a) When a sound wave travels through the air what happens to the **molecules**?

Put a tick (✓) next to the correct answer.

They get hotter.	☐
They move closer together and further apart.	☐
They get bigger and then smaller.	☐
They get used up.	☐

[1]

(b) In **Experiment 1**, Les measures the time taken for the sound to travel to the wall and bounce back.

(i) How can Les use all the results in **Table 1** to work out a mean?

.....

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

(ii) Suggest why the recording on the mobile phone will give a more accurate measurement than when Les uses the stopwatch.

.....

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

(c) Using the mobile phone, Les measures the time as 0.29 seconds. He works out the speed of sound using the formula:

$$\text{Speed of sound} = \frac{\text{total distance travelled}}{\text{time taken}}$$

Which of these is used to calculate the speed of sound?

Put a (ring) around the correct answer.

$\frac{\mathbf{50}}{\mathbf{0.29}}$ $\frac{\mathbf{2 \times 50}}{\mathbf{0.29}}$ $\frac{\mathbf{0.29}}{\mathbf{2 \times 50}}$ $\frac{\mathbf{0.29}}{\mathbf{50}}$

[1]

(d) (i) Michael Faraday did many experiments. He published his results. This allowed other scientists to check his work.

What is the name for this checking by other scientists?

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

(ii) James Clerk Maxwell showed that Faraday's electromagnetic waves would travel through space at 300,000 km/s.

Why did this suggest that visible light was also an electromagnetic wave?

.....

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

(e) Use **Table 2** in the case study to work out which type of wave carries the most energy.

Put a (ring) around the correct answer.

radio waves **microwaves** **infra-red** **visible light**

[1]

(f) Which part of the atmosphere reflects some radio waves?

Put a tick (✓) next to the correct answer.

clouds ☐

greenhouse gases ☐

ionosphere ☐

ozone layer ☐

[1]

(g) Maxwell predicted that radio waves existed but he did not detect them.

Why was Heinrich Hertz able to detect radio waves?

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

(h) Two students are using their mobile phones to call different friends. They use the same network in the same place, at the same time.

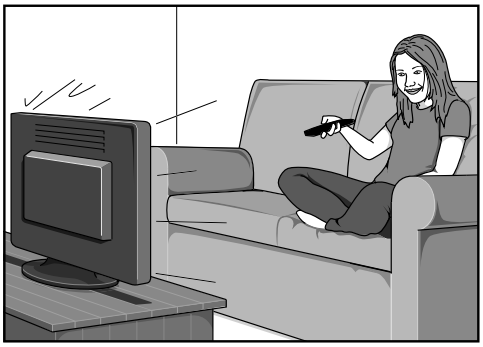
Explain how each of them can make a separate phone call.

.....

.....

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

(i) Freda uses a remote control to change the channel on her TV.



The remote control does not work when she is in the next room.

What does this tell you about infra-red waves?

.....

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

(j) Freda's computer receives data from all over the world along optical fibres.
The strength of the signal in the fibre is not lost when it travels long distances.

Which **two** statements explain why?

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

The signal does not spread out.	☐
Weak signals do not reach the computer.	☐
Fibres do not allow the signal to escape.	☐
Other signals can enter the fibres.	☐

[2]

[Total: 15]

2 Aimee and her friends use thermometers to measure their body temperatures.

Name	**Aimee**	**Ben**	**Mike**	**Raj**	**Sameeya**
Temperature in °C	37.1	36.8	37.0	36.7	36.9

Mean body temperature = 36.9 °C

(a) Which statements about the data are **true** and which are **false**?

Put a tick (✓) in a box in each row.

	True	**False**
Two people have body temperatures below the mean body temperature.		
Aimee's body temperature is 0.2 °C above the mean.		
Ben has the lowest body temperature.		

[2]

(b) Another friend, Kuda, finds that his body temperature is 2.0 °C higher than the mean body temperature.

Explain why the friends are worried about Kuda's temperature.

.....

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

(c) Temperature control is an example of a negative feedback system.

A **receptor** senses that Kuda's temperature is high.
An **effector** makes a change to reduce the temperature.

Choose from these words to complete the sentences below.

arteries **brain** **hormones** **nerves** **sweat**

When Kuda's temperature is too high the receptor is in his .....

Kuda's temperature goes down because the effector produces ..... .

[2]

(d) The next day, the friends have a mean temperature of 37.0 °C.
Kuda's temperature is 37.2 °C.

Kuda says that God has made his temperature lower.

Explain why scientists **cannot** find out if he is right.

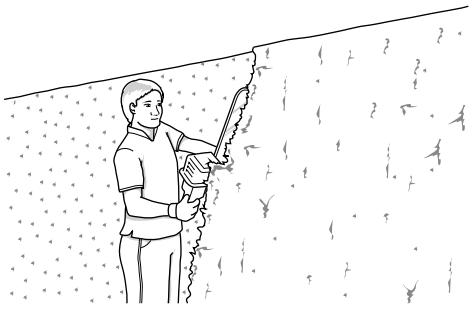
.....

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

[Total: 8]

3 Yew trees grow in many churchyards. They can grow for hundreds of years.
If yew trees are left to grow naturally they can become large trees. However, they can be cut regularly to make a shaped hedge.

A large yew tree



A shaped yew tree hedge

(a) (i) The scientific name for a yew tree is *Taxus baccata*.
What does each part of the scientific name tell us?

Draw **one** straight line from each **name** to the correct **meaning**.

name	**meaning**
	common name
Taxus	genus
	kingdom
baccata	species

[2]

(ii) What is the usual name for the system of giving organisms scientific names?

Put a tick (✓) next to the correct answer.

the binomial system	☐
the biological system	☐
the descriptive system	☐

[1]

(iii) What is the name of the scientist who created this naming system?

Put a (ring) around the correct answer.

Darwin **Lamarck** **Linnaeus** **Mendel**

[1]

(b) Every year, yew trees can produce seeds.

Alex has collected seeds from a yew tree hedge.
The seeds grow into seedlings.

(i) Alex notices that all the seedlings have leaves of the same shape as the leaves in the hedge.

Explain why they all have the same shaped leaves.

.....

.....

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

(ii) The seedlings do not grow naturally into a hedge shape. They grow into large trees.

Which **two** statements explain why?

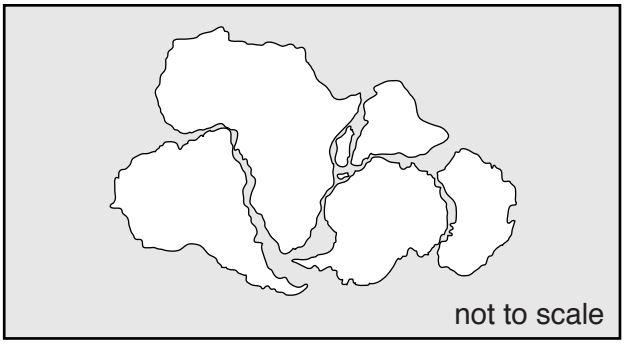
Put a tick (✓) in the boxes next to the **two** correct answers.

The hedge shape is not passed on.	☐
Natural selection causes the next generation to be bigger.	☐
The hedge has the same genes as the large trees.	☐
Large trees show a recessive characteristic.	☐

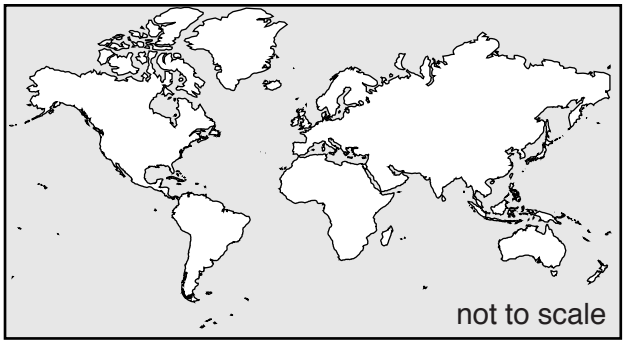
[2]

[Total: 8]

4 In 1915, Alfred Wegener proposed a new idea that the continents used to be arranged differently.



Wegener's idea of how the continents were arranged 200 million years ago



The arrangement of the continents now

Alfred Wegener

(a) What did Wegener mean by **continental drift** and what evidence did he use to support his ideas?

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

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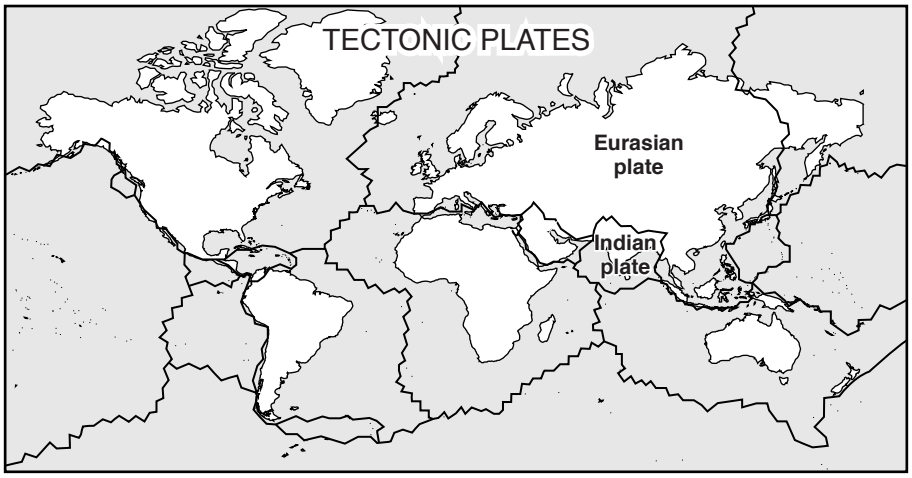
..... **[6]**

(b) Scientists now believe that the surface of the Earth is made of tectonic plates which can move.



Modern measurements show that:

- Many tectonic plates move at about 2 cm/year.
- The Indian plate moved at about 20 cm/year until it collided with the Eurasian plate.
- The Indian plate is now moving at about 5 cm/year.
- The Indian plate is about half as thick as the other tectonic plates.

Using this data decide whether each statement is **True**, **False** or you **Cannot tell**.

Put a tick (✓) in **one** box for each statement.

Statement	**True**	**False**	**Cannot tell**
Before the Indian plate collided it travelled ten times faster than most other plates.			
The Indian plate moved faster as a result of its collision with the Eurasian plate.			
The Indian plate is thicker than other plates.			
The Eurasian plate was not moving when hit by the Indian plate.			
All the plates now move more slowly than in the past.			

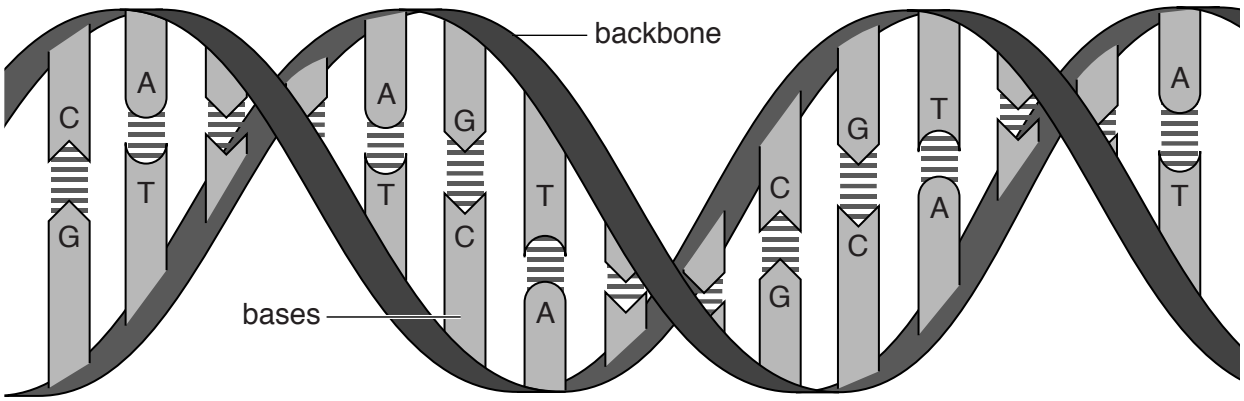
[4]

(c) If a tectonic plate moves at 2 cm a year, how far will it move in 100 years?

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

[Total: 12]

5 **(a)** Watson and Crick used research by Franklin to suggest a model of the structure of DNA.



Describe the structure of DNA that Watson and Crick suggested **and** the evidence that Franklin provided. Use the diagram to help you.

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

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..... **[6]**

(b) The police arrest a suspect after a crime.

Explain how the police can use DNA to show that the suspect had been at the scene of the crime.

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..... **[3]**

[Total: 9]

6 About 1000 years ago, Avicenna knew that some of his patients produced urine which contained more sugar than usual.
He tried treating his patients by adding various types of seeds to their diet.

He gave some of his patients a special diet which included fenugreek seeds. Their urine contained noticeably less sugar for the next few hours. However, the next day, their urine was exactly the same as before.

(a) What could Avicenna conclude from his experiment?

.....

.....

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

(b) Dan is overweight and thinks that he may have developed Type 2 diabetes.

Give **two** other symptoms that Dan should be looking out for.

.....

.....

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

(c) Dan's father has diabetes.

His blood sugar level an hour after a meal is usually between 15 and 20 mmol/L.
He eats fenugreek seeds in a meal and an hour later his blood sugar level is 10 mmol/L.

He concludes that the fenugreek seeds have reduced his blood sugar level.

Suggest what Dan's father needs to do to check his conclusion.

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

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

[Total: 8]

END OF QUESTION PAPER