OXFORD CAMBRIDGE AND RSA EXAMINATIONS
LEVEL 2

R072/02

CAMBRIDGE NATIONAL IN SCIENCE

How scientific ideas have developed

FRIDAY 5 JUNE 2015: Afternoon
DURATION: 1 hour
plus your additional time allowance

MODIFIED ENLARGED

Candidate forename		Candidate surname	

Centre number						Candidate number				

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

OCR SUPPLIED MATERIALS:

Insert (R072/02/I – inserted)

OTHER MATERIALS REQUIRED:

Pencil
Ruler (cm/mm)

READ INSTRUCTIONS OVERLEAF

DC (ST/JG) 6064856869 112746/1

INSTRUCTIONS TO CANDIDATES

The Insert will be found inside this document.

Write your name, centre number and candidate number in the boxes on the first page. 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).

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 (✎).

Any blank pages are indicated.

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Answer ALL the questions.

1 This question is based on the case study 'Communicating with waves'.

(a) Describe what happens to air molecules when a sound wave moves through the air.

_____

_____ **[1]**

(b) (i) What is the mean time measured during EXPERIMENT 1?

Show your working.

_____ **seconds [2]**

(ii) Sachin suggests that the results might be closer together if he stood further from the wall.

Explain why Sachin is correct.

_____

_____ **[1]**

(iii) The recording made in EXPERIMENT 2 shows that the sound of the echo was recorded 0.29 seconds after the sound of the clap.

Use the formula below to work out the speed of sound in air.

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

Show your working.

_____ **m/s [1]**

(c) (i) In 1831 Faraday made observations about electricity and magnetism. He published his observations for other scientists.

Why was this important?

_____

_____

_____ **[2]**

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

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

_____

_____ **[1]**

(d) Suggest why it was useful to discover that radio waves could be reflected by part of the atmosphere.

_____

_____ **[1]**

(e) Ultraviolet is another type of electromagnetic wave. It has more energy than visible light.

What can you deduce about the wavelength of ultraviolet compared to visible light?

_____ **[1]**

(f) 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]**

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

Suggest how the remote control can work when she points it at the ceiling instead of at the TV.

_____

_____ **[1]**

(h) Freda's computer can receive data from all over the world through her internet connection. The data travels along optical fibres.

Explain why the strength of the signal is not lost when it travels long distances along an optical fibre.

_____

_____ **[2]**

[TOTAL: 15]

2 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) Suggest why Avicenna only gave SOME of his patients the fenugreek seeds in their diet.

_____

_____

_____ **[2]**

(b) Avicenna tested the urine for sugar by tasting it. Nowadays we use a dipstick which changes colour depending on the amount of sugar present in the urine.

Explain why using a dipstick improves the quality of the data.

_____

_____

_____ **[2]**

(c) We now know that too much sugar in the urine is a symptom of diabetes.

Dan has diabetes. His blood sugar level an hour after a meal is usually between 15 and 20 mmol/L. An hour after eating fenugreek seeds in a meal his blood sugar level is 15 mmol/L.

Dan is not sure if the seeds have made a difference to his blood sugar level.

Why is Dan not sure and what further evidence would he need to make a conclusion?

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

_____

_____

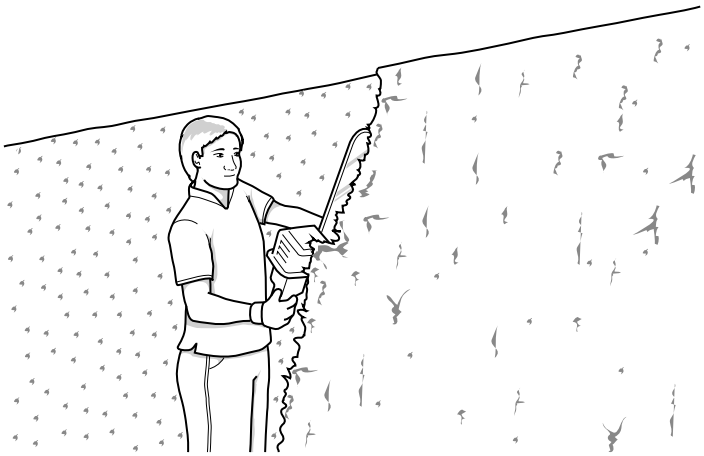
_____

_____

_____ **[4]**

[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) The scientific name for a yew tree is *Taxus baccata*.

Complete these sentences:

This system of having two-part scientific names is

called the _____ system.

The genus of the yew tree is _____

_____ .

The species of the yew tree is _____

_____ .

[3]

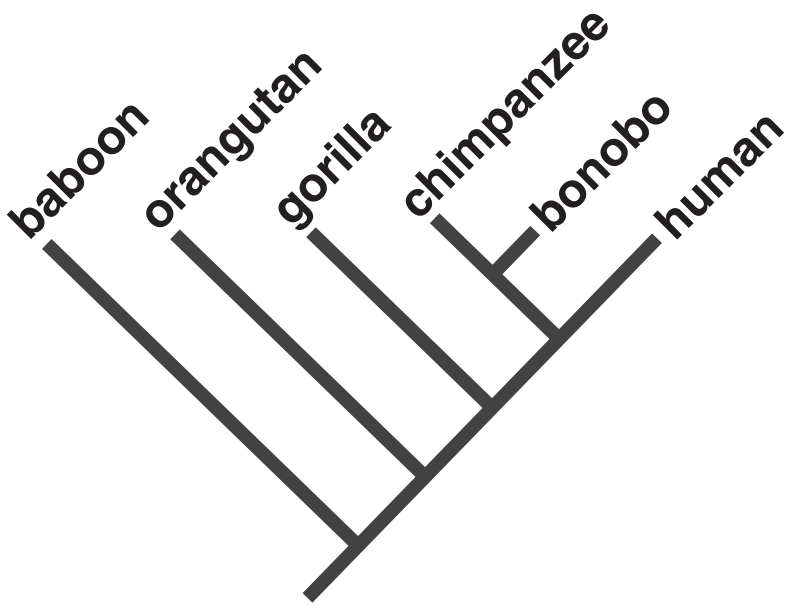
(b) Alex wants to grow a shaped yew tree HEDGE from seeds.

Explain why he can use seeds from a large yew tree to make a shaped yew tree hedge.

_____

_____ **[1]**

(c) Modern classification systems use Cladistics diagrams (cladograms).
This diagram shows how different types of animal may be related.



(i) Which animal shares the most characteristics with the BONOBO in this diagram?

_____ **[1]**

(ii) The Cladistics diagram shows the stages in development of physical features in the evolution of some animals.

How does the diagram show that humans and gorillas have some physical features that are the same and some that are different?

_____

_____

_____ **[2]**

(iii) Since it has been possible to analyse DNA, some cladograms have had to be redesigned.

Suggest why.

_____

_____

_____ **[2]**

[TOTAL: 9]

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4 (a) In 1915, Alfred Wegener proposed new ideas about how the arrangement of the continents had changed over time.

Wegener said 'I have collected lots of evidence to suggest that the continents used to be arranged differently. I think this is because of CONTINENTAL DRIFT'.

What evidence did Wegener use to support his ideas and explain why his ideas were rejected by other scientists at the time.

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

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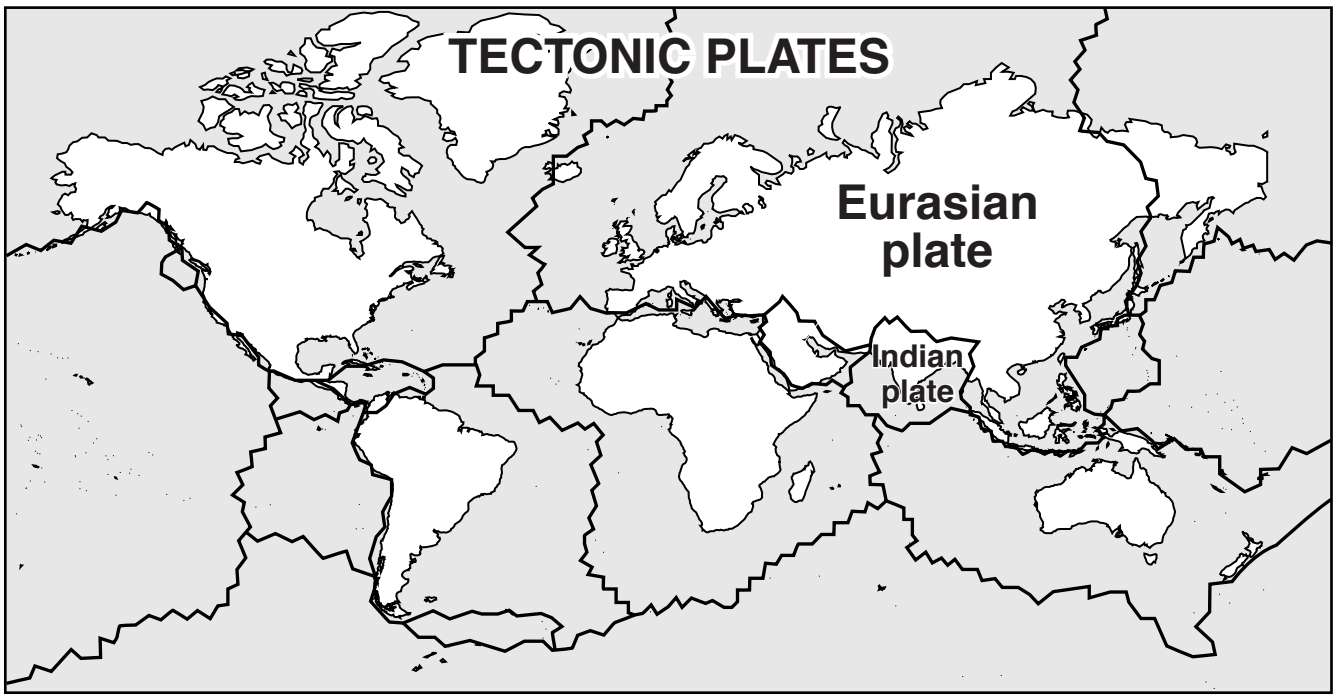
_____ **[6]**

(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.

(i) **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]

(ii) **Suggest why Wegener did not use these measurements to support his theory.**

_____

_____ **[1]**

[TOTAL: 11]

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5 (a) The diagrams below show two different ways of showing the structure of a DNA molecule.

DIAGRAM 1

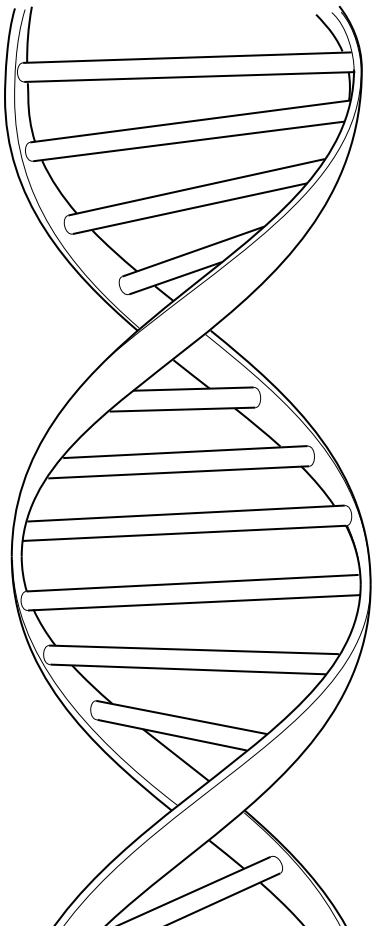
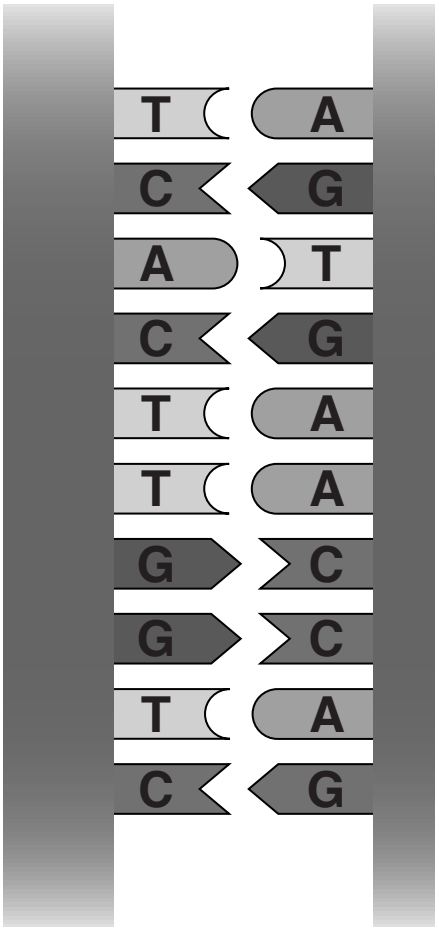


DIAGRAM 2



Explain why BOTH diagrams are needed to describe the structure of DNA.

_____

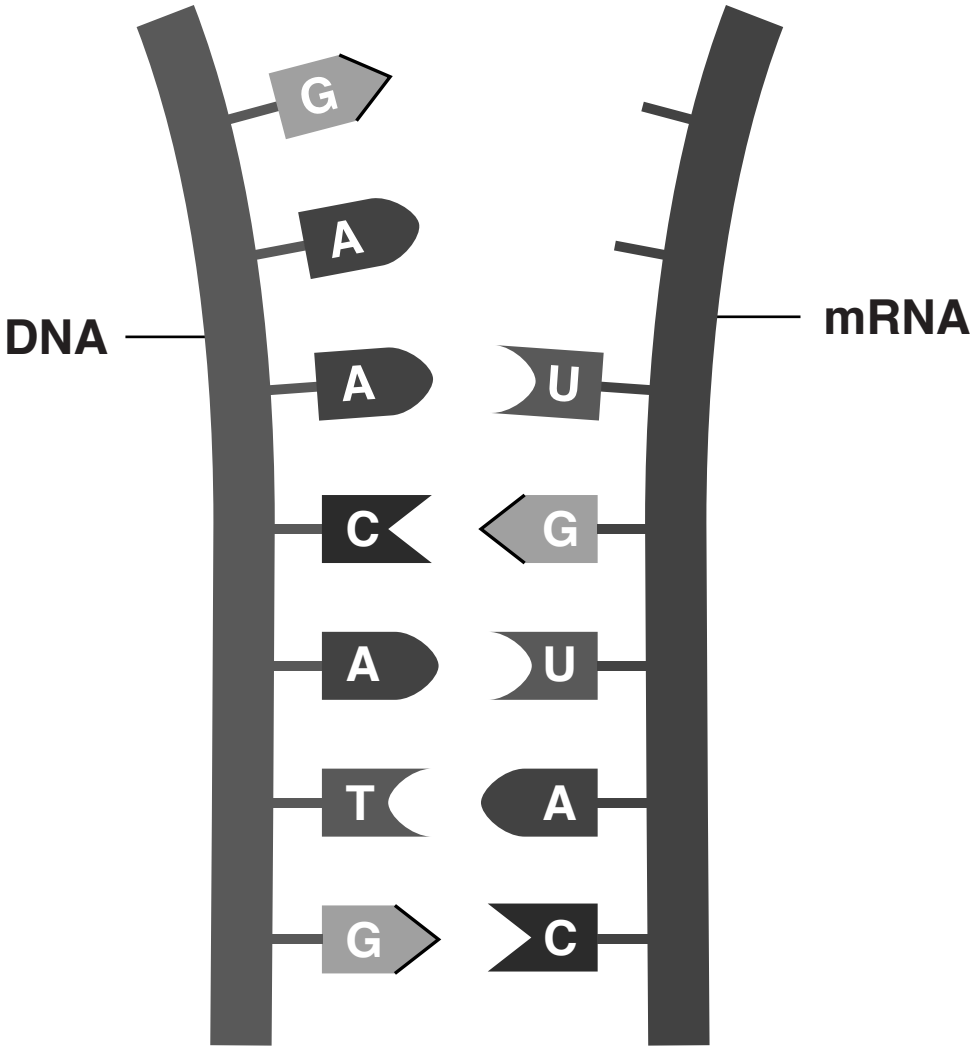
_____

_____

_____

_____ **[4]**

(b) Living things make proteins in their cells by protein synthesis.
The first stage in protein synthesis happens in the nucleus of the cell.
Messenger RNA (mRNA) forms along a DNA molecule.



Describe what happens when mRNA forms along a DNA molecule, and what happens next in protein synthesis.

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

_____

_____

_____

_____

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_____ **[6]**

[TOTAL: 10]

6 Kuda measures his body temperature and finds that it is almost 2 °C higher than normal body temperature.

His brain sends impulses to his skin to reduce his temperature.

(a) Explain how changes to the blood supply in his skin can reduce his temperature.

_____

_____

_____

_____ **[3]**

(b) Explain why this process is called a NEGATIVE FEEDBACK SYSTEM.

_____

_____

_____ **[2]**

(c) The next day, Kuda's temperature is normal.

Kuda says that God has made his temperature lower.

Explain why scientists CANNOT find out if he is right.

_____

_____

_____ **[2]**

[TOTAL: 7]

END OF QUESTION PAPER