OCR
RECOGNISING ACHIEVEMENT

Tuesday 14 May 2013 – Morning

LEVEL 1 CAMBRIDGE NATIONAL IN SCIENCE

R072/01 How scientific ideas have developed

R038160613

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

R072O1

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- The Insert will be found in the centre of 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 **16** pages. Any blank pages are indicated.

Answer **all** the questions.

This question is based on the case study 'Cancer in children around Sutro Tower, San Francisco'.

1 **(a)** Look at the data in Table 1.

'A higher percentage of children living within 500 m of the mast developed cancer compared to the children in the control group.'

Use calculations to show that this statement is true.

[2]

(b) The original hypothesis for the study was that 'Exposure to radio and microwave radiation causes cancer in children living near the tower.'

Give **two** pieces of information in the case study that do **not** support the hypothesis.

.....

.....

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

(c) People who live near the tower do not all get the same exposure to FM and UHF radio waves.

Look at Graph 1 in the article.

Describe how the exposure to UHF and FM radio waves change as you move away from the tower.

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.....

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

(d) Look at Graph 2 in the article.

Which statements about Graph 2 are true and which are false?

Put a tick (✓) in one box in each row.

	True (✓)	False (✓)
The nearer to the tower, the lower the risk of developing cancer.		
There is a correlation between developing cancer and exposure to radiation.		
The graph proves that radiation causes cancer.		

[2]

(e) The case study says that some types of radiation are **genotoxic**.

What do you think the case study means by the word 'genotoxic'?

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

(f) Look at the information about the study around a similar tower in the UK.

The scientists who did the original study around Sutro Tower were very interested in the UK study.

Explain why.

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

(g) Radio masts have been used for over a hundred years.

Data about cancer and radiation exposure has only been available for about 30 years.

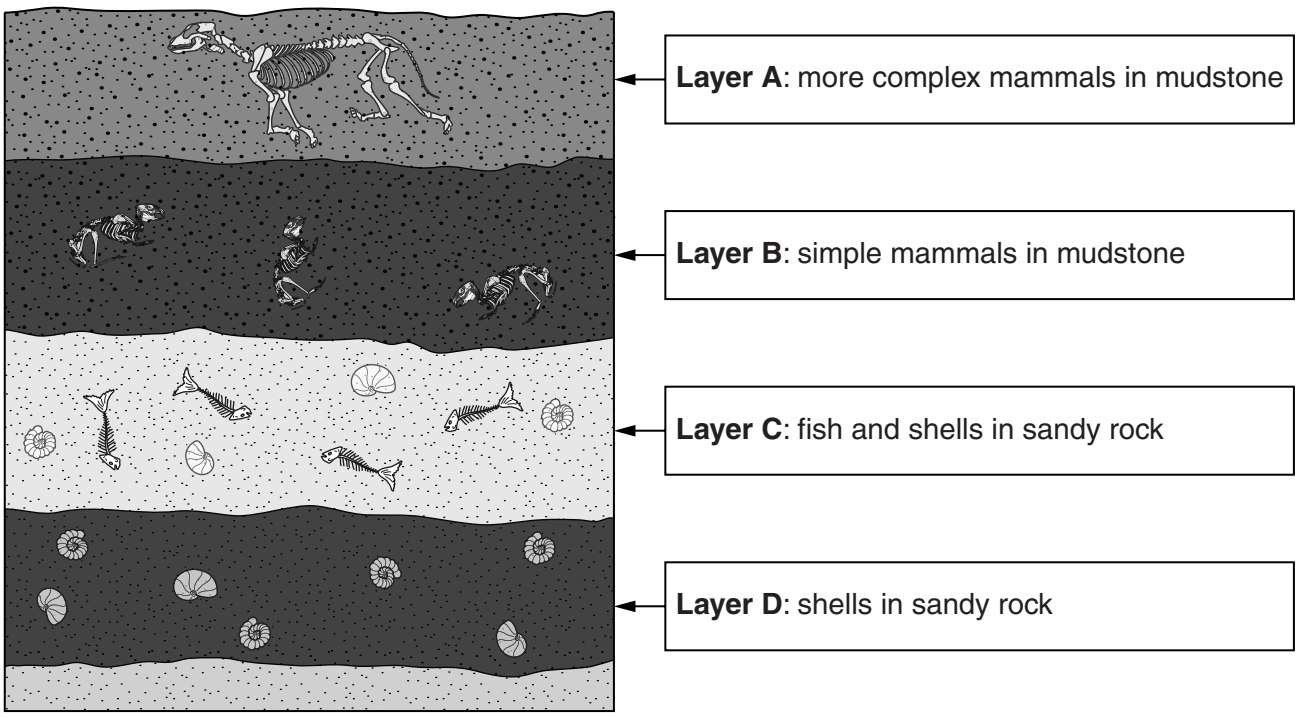
Which statements best explain why?

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

The equipment to measure exposure was not available a hundred years ago.	☐
Scientists did not understand how radio masts worked until recently.	☐
It takes longer than 30 years to collect data in any reliable scientific study.	☐
Scientists are not allowed to publish recent data.	☐
New techniques to diagnose cancer have been developed.	☐ **[2]**

[Total: 15]

2 Scientists collect evidence from rock layers to show that the Earth's climate has changed over time.



(a) Which layer of rock **A**, **B**, **C** or **D** is the oldest?

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

(b) Conditions have changed over time in the area where these layers of rock formed.

(i) What do the types of fossils in **layer C** tell you about the conditions when this rock formed? Explain your answer.

.....

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

(ii) How do the other rock layers show that the conditions have changed over time?

.....

.....

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

(c) Different scientists have put forward ideas about changes to the Earth.

Draw lines to connect each **scientist** with the **evidence** he collected and the **change to the Earth** he investigated.

Scientist	Evidence	Change to the Earth
Wegener	sudden changes in fossils in rock layers and marks of big stones being moved	Continental Drift
Lyell	carbon dioxide concentrations change over time	Ice Ages
Fourier	fossils in South America match fossils in Africa	changes to the Greenhouse Effect

[2]

(d) Darwin also used evidence from fossils in the rocks.

What theories did Darwin use this evidence to support?

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

- selective breeding ☐
- natural selection ☐
- evolution ☐
- classification by genus and species ☐
- dominant and recessive characteristics ☐

[2]

[Total: 9]

3 Alex goes on holiday to a very hot place. Ben goes on holiday to somewhere very cold.

Alex

outside temperature	40°C
skin temperature	39°C
core temperature	37°C

Ben

outside temperature	2°C
skin temperature	31°C
core temperature	37°C

(a) Use ideas about temperature control to explain what is happening to Alex and Ben.

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

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

(b) Another control system in the body is involved in the control of glucose concentration in the blood.

Amir is a doctor. He uses a glucose monitor to test the glucose concentration in blood.

He tests the blood of a patient every half hour after the patient has eaten.

He repeats his test several times.

The table shows his results.

Time after eating in hours		**0.0**	**0.5**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**	**3.5**	**4.0**
Glucose concentration in blood in mmol/l	**Test 1**	5.1	5.6	6.1	6.6	7.1	6.7	6.3	5.9	5.4
	Test 2	4.5	4.9	5.3	5.7	6.1	5.8	5.4	4.9	4.6
	Test 3	4.8	5.2	5.6	6.0	6.4	5.9	5.6	5.3	4.9

(i) Describe the change in glucose concentration during **Test 1**.

.....

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

(ii) Amir thinks that the data from the tests is of good quality because it is reliable.

Why does he think this?

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

The results for all of the tests show a similar pattern. ☐

All of the measurements are to one decimal place. ☐

He took all of the measurements carefully. ☐

The values do not change very much over time. ☐ **[1]**

(c) Amir does another test (**Test 4**).

He finds that the change in glucose concentration in **Test 4** is different from Tests 1 to 3.

Time after eating in hours		**0.0**	**0.5**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**	**3.5**	**4.0**
Glucose concentration in blood in mmol/l	**Test 4**	5.0	5.4	5.9	6.3	6.8	6.3	5.8	5.5	6.4

(i) How is the change in glucose concentration in **Test 4** different from Tests 1 to 3?

.....

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

(ii) Which of the following statements about **Test 4** might explain this difference?

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

The patient ate a snack during the test.	☐
Amir should have taken readings more often.	☐
The patient did not eat a meal at the start.	☐
Amir took the last reading much later than he should.	☐
Amir read the glucose monitor wrongly.	☐

[2]

(d) Glucose concentration in the blood and body temperature are controlled by different systems in the body.

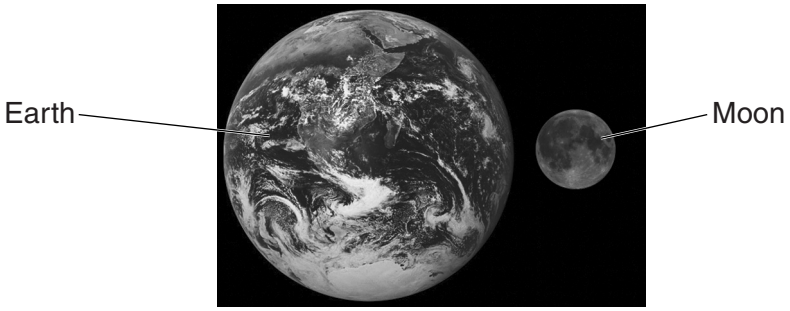
Draw straight lines to link the correct **control system** for glucose concentration in the blood and body temperature.

	Control System
	reproductive system
glucose concentration in blood	endocrine system
body temperature	binomial system
	nervous system

[2]

[Total: 14]

4 Some scientists study the movement of moons, planets and stars.



(a) The Earth and the Moon both move in orbits.

(i) How is the orbit of the Earth **similar** to the orbit of the Moon?

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

(ii) How is the orbit of the Earth **different** to the orbit of the Moon?

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

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

(b) Scientists have observed that stars are moving away from the Earth.

How do scientists explain why the stars are moving away from the Earth?

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

Stars move on invisible spheres.	☐
The Universe started with the Big Bang.	☐
The gravity of the Earth attracts stars.	☐
The Universe is expanding.	☐
Our Sun is at the centre of the Universe.	☐

[2]

(c) Scientists use light to take measurements of very distant stars and galaxies.

Why is light useful for taking these measurements?

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

Scientists can vary the speed of light to take readings.	☐
Light carries a lot of data because it travels very slowly.	☐
Stars and galaxies give out light that can be seen from Earth.	☐
Light always travels at the same speed.	☐
Scientists can shine light on distant stars from Earth.	☐

[2]

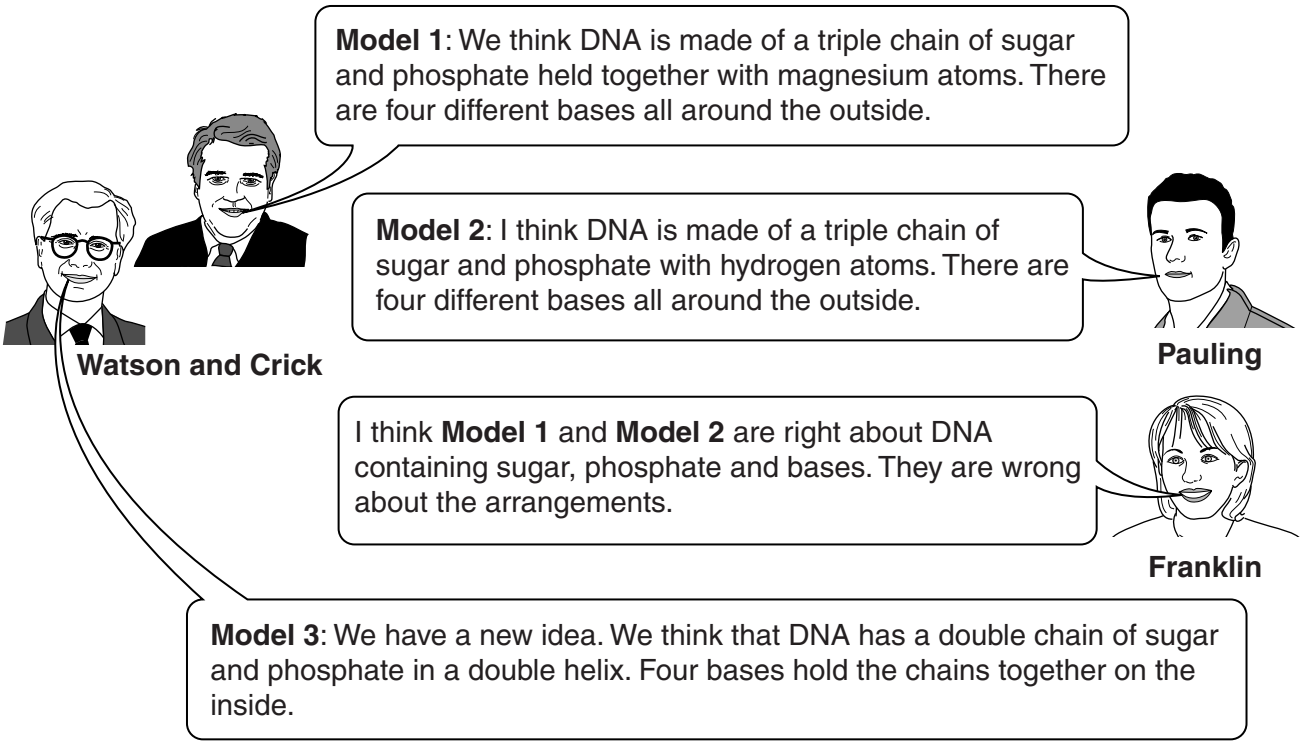
[Total: 8]

Question 5 begins on page 12

5 At the start of the 1950s, scientists were interested in working out the structure of DNA.

They looked at X-ray crystallography photographs.

The diagram shows scientists talking about three different models for the structure of DNA.



Watson and Crick's new idea (**Model 3**) was accepted by scientists as the best model.

(a) Describe the similarities and differences between **Model 1**, **Model 2** and **Model 3**.

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

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

(b) Watson and Crick's first idea (**Model 1**) was a **provisional** model.

What does this mean?

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

The model explained the evidence available at the time.	☐
The model did not fit any of the evidence available.	☐
Other scientists did not agree.	☐
They published their ideas too quickly.	☐
New evidence caused them to change their ideas.	☐

[2]

(c) William Bragg developed the technique of X-ray crystallography in 1912.

Explain why this was important to the development of ideas about DNA.

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

(d) Franklin also worked out the structure of DNA.

She took a long time to publish her ideas.

Why does it take some scientists a long time to publish their ideas?

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

They recheck data. ☐

They find out if other scientists on the same team agree with them. ☐

They work on too many other projects. ☐

Scientists do not want to share information with each other. ☐

Publishing ideas is not important to scientists. ☐ **[2]**

(e) **Model 3** for the structure of DNA is still accepted today.

Which of the statements about the structure of DNA are true and which are false?

Put a tick (✓) in one box in each row.

	True (✓)	**False (✓)**
The bases form rings in groups of three.		
Base A joins to base T and base C joins to base G.		
Genes are made from DNA.		
The bases cannot join to each other.		

[2]

[Total: 14]

END OF QUESTION PAPER

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