

Wednesday 9 January 2013 – 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 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 **20** pages. Any blank pages are indicated.

Answer **all** the questions.

1 This question is based on the article ‘**Collecting data and making predictions about climate**’.

(a) What was the average global temperature during the last Ice Age?

Use information from the article to help you.

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

0°C 5°C 10°C 15°C [1]

(b) Scientists want to make sure that their testing of global temperature is fair and that it gives a reliable value.

The article discusses why it is difficult for scientists to agree on how to collect data about average global temperature.

Explain why it is important that data about temperature is collected ‘at regular intervals’ from a ‘wide range of locations’.



One mark will be for a clear, ordered answer.

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

(c) The article says that cities give unreliable data because they are ‘hot-spots’.

Suggest reasons why the temperature in cities is higher than in the surrounding land area.

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

(d) Two scientists working independently collect and analyse data.

They calculate different values for average global temperature.

(i) Suggest reasons why the scientists reach different values.

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

(ii) The two scientists each publish their work in a scientific journal.

What would you expect to happen after the work has been published?

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

(e) We do **not** have reliable data about the composition of the atmosphere from hundreds of years ago.

Give reasons why there is no reliable data.

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

(f) If the average temperature of the Earth increased by $0.6^{\circ}\text{C} \pm 0.2^{\circ}\text{C}$, what is the **range** of this increase in temperature?

Between $^{\circ}\text{C}$ and $^{\circ}\text{C}$ [1]

(g) The article shows a graph of predictions for the number of people who could be flooded each year in the 2080s.

Which of the following statements **about the graph** are correct?

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

- The graph shows a correlation between the amount of carbon dioxide in the air and the number of people who could be flooded.
- The graph predicts that fewer people in East Africa are likely to be flooded than in West Africa.
- The graph shows a correlation between the number of people who could be flooded and the height above sea level.
- The graph predicts that no people will be flooded if there is no increase in carbon dioxide levels.
- The graph predicts that at least 8 million people will be flooded in South Asia.

[2]

[Total: 15]

2 Mendel is famous for his genetic experiments on pea plants.

In many experiments, he used pure breeding tall plants.

(a) What does 'pure breeding tall plants' mean?

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

When the plants are crossed, all the seeds grow into tall plants.

The plants have been grown in a sterile environment.

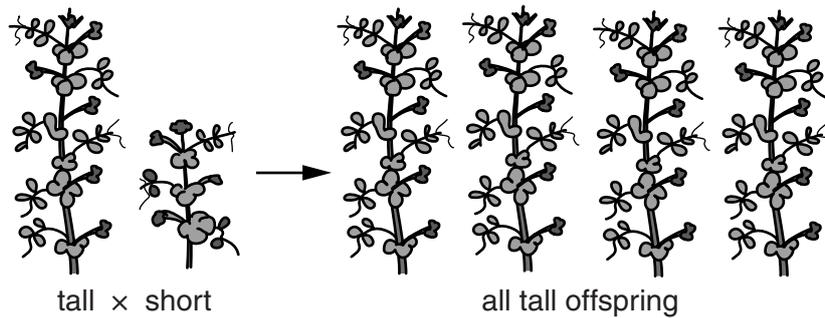
All of the plants are grown from seeds from the same two parents.

None of the plants have been used for breeding before.

[1]

(b) In one experiment, he crossed pure breeding tall plants with pure breeding short plants.

All of the seeds from the plants grew into tall offspring.



Is tall or short the dominant characteristic?

Explain your reasoning.

.....

..... [1]

(c) Mendel did two more experiments on the plants.

Here are his results.

Table 1: Results from crossing tall parent with tall offspring

Total number of seeds planted	Number of tall pea plants	Number of short pea plants	Simplest ratio of tall to short pea plants
110	50	50	1:1

Table 2: Results from crossing offspring from first experiment with each other

Total number of seeds planted	Number of tall pea plants	Number of short pea plants	Simplest ratio of tall to short pea plants
105	75	25	

(i) Some of the seeds did not grow after they were planted.

What is the total number of seeds from both experiments that did not grow?

answer [1]

(ii) What is the **simplest** ratio of tall to short pea plants in **table 2**?

answer [1]

(d) Mendel thought that he knew how plant height was inherited.

He wanted to be more confident that his ideas were correct.

What did he do to increase confidence in his ideas about plant height?

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

He collected data about thousands more plants.

He looked at many characteristics rather than just height.

He repeated the same experiments and compared the results.

He repeated the experiments at different times of the year.

[1]

(e) Mendel thought that height was inherited in factors passed from one generation to the next.

What word do we use for these factors today?

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

base

gene

helix

mRNA

[1]

[Total: 6]

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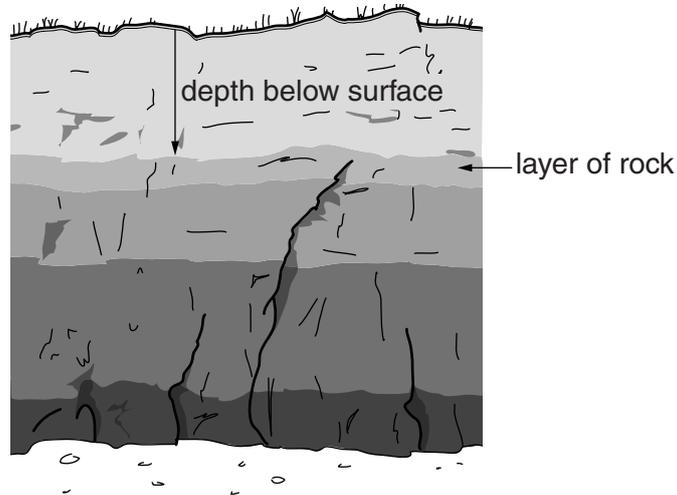
Question 3 begins on page 8

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3 Rose is a scientist who studies rocks. She is interested in studying the layers of rock in a cliff.

She takes samples of rocks from different layers in the cliff face and tests them to find out their ages.

She measures how deep the bottom of each layer is from the top of the cliff.



This table shows her results.

	Type of rock in layer	Depth below surface in m	Age of rock in millions of years
Cliff 1	limestone	5	70
	chalk	7	75
	red sandstone	10	82
	red mudstone	16	91
	grey mudstone	18	96

(a) What **correlation** does the data suggest?

.....
 [1]

(b) Rose notices that the rock layers in another cliff look similar.

This table shows the results for **cliff 2**.

	Type of rock in layer	Depth below surface in m	Age of rock in millions of years
Cliff 2	limestone	5	70
	chalk	8	75
	red sandstone	11	82
	red mudstone	15	91
	grey mudstone	19	96

Cliff 2 is a few miles away from **cliff 1**, the first cliff she tested.

Rose thinks that **cliff 1** and **cliff 2** formed close together but have moved apart.

How do the results provide evidence to support Rose’s idea that the cliffs were formed close together?

.....

.....

.....

..... [2]

(c) Wegener was the first scientist to suggest that large areas of land moved.

What evidence did he use to support his ideas?

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

- Different continents have similar climates.
- The continents appeared to fit together.
- Similar fossils can be found in countries on different sides of large oceans.
- Rocks can be eroded by oceans and rivers.
- Beach sand can be washed along the shore.

[2]

(d) Plate tectonics is the theory that explains how land moves.

There are other changes to the Earth's surface caused by plate tectonics.

Give two **other** examples.

1

2

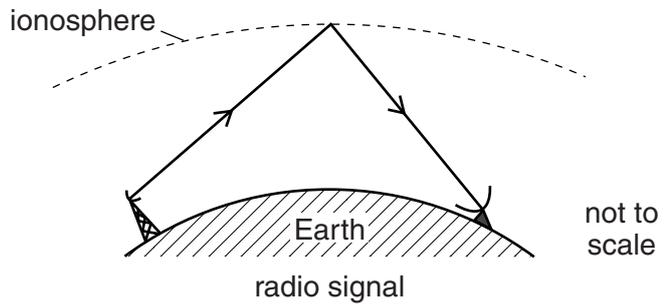
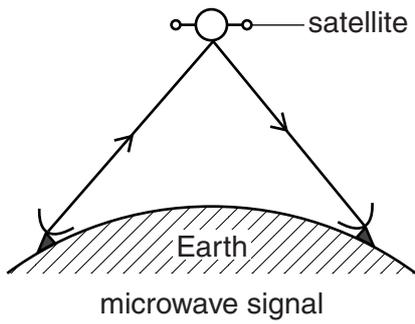
[2]

[Total: 7]

11
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Question 4 begins on page 12
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4 The diagrams show how microwave and radio signals are used to transmit messages across long distances.



(a) Give one **similarity** and one **difference** in the way that microwave and radio signals travel long distances.

Similarity

.....

Difference

..... [2]

(b) Microwave signals spread out as they travel.

Why is this a **disadvantage**?

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

The signal loses quality with distance.

They can only be used for short periods.

Other people can receive your mobile signal.

They interfere with radio signals.

[1]

(c) Infra-red radiation can be used to transmit large amounts of data over long distances.

How does the infra-red radiation travel over a long distance?

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

through insulated pipes

through wires

through optical fibres

via satellite

[1]

[Total: 4]

5 Conditions inside the body need to be kept within narrow limits.

This is called homeostasis.

One example of homeostasis is temperature control.



When we feel cold, nerves in the skin detect the temperature.
The nerves send messages to the brain.
The brain sends messages to the muscles to cause shivering.

(a) What is the receptor and what is the effector in this example?

Draw straight lines to show your answer.

	temperature
	nerves in the skin
receptor	homeostasis
	brain
effector	muscles
	shivering

[2]

(b) When we are cold, the body shivers.

How does the body control temperature when it is too **hot**?

..... [1]

(c) In the 18th century, Galvani did some experiments to investigate how nerves work.

He passed an electric current through a frog's leg.

(i) What did he see happen?

..... [1]

(ii) What does this experiment tell us about how nerves work?

..... [1]

[Total: 5]

(b) Wild foxes have evolved characteristics such as long legs and aggressive behaviour.

Explain why these characteristics help the foxes to survive.

long legs

.....

aggressive behaviour

..... [2]

(c) Complete the sentences about how the wild foxes evolved by putting a **ring** around the correct words in bold.

The wild foxes have evolved long legs and aggressive behaviour through a mechanism called

the genetic code. / **natural selection.** / **the binomial system.** / **the fossil record.**

This mechanism was described by a scientist called

Darwin. / **Lamarck.** / **Lyell.** / **Watson.** [2]

(d) Eve is a scientist who studies wild foxes.
She used to study the foxes by watching them or trapping them.

Now she collects samples of faeces and fur from around where the foxes live.
She finds out information about the foxes by testing DNA in the samples.

Why does Eve think the new method is a better way of studying foxes?

.....

.....

.....

..... [3]

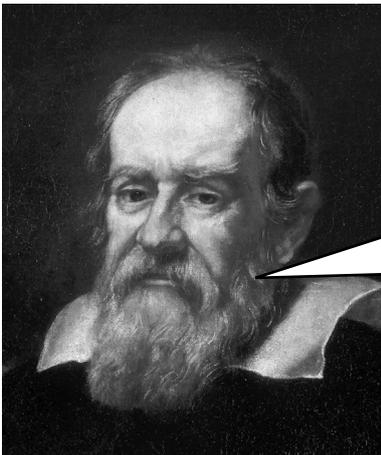
[Total: 13]

7 **Ptolemy** was an astronomer in ancient Greece. These are his ideas about the Solar System.



I have spent many years watching the sky.
I think that the Earth is at the centre of the Universe. The Moon, Sun and stars are all fixed to invisible spheres that spin around the Earth. There are wanderers in the sky that are not attached to any spheres.

Galileo lived in the 16th century (about 2000 years later than Ptolemy). He had different ideas.



I have a telescope. It is one of the first telescopes in the world.
The wanderers are planets. It isn't only Earth that has a moon. Some of the other planets have moons going around them.
I don't think that Ptolemy's ideas are right.

(a) Galileo lived about 2000 years later than Ptolemy.

Suggest reasons why ideas about the Solar System did not develop very much during that time.

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

(c) Some friends are talking about the Universe.



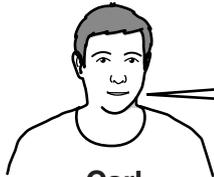
Ali

I believe that God created the Universe.



Bea

I think there may be life on other very distant planets.



Carl

We need many more computers to process all the data we have about the Universe.



Di

New telescopes are collecting new data and we might not be able to explain it with the ideas we have at the moment.

(i) Who is making a statement that cannot be explained using science?

..... [1]

(ii) Who is saying that scientific ideas may change in the future?

..... [1]

[Total: 10]

END OF QUESTION PAPER

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