

## Monday 8 January 2018 – 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.

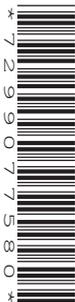
**OCR supplied materials:**

- 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. 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 barcodes.

#### 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.

1 This question refers to the case study **Optical Fibres** in the insert.

(a) Give **two** advantages of using endoscopes during operations.

1 .....

.....

2 .....

..... [2]

(b) Put the types of electromagnetic radiation in order of wavelength.

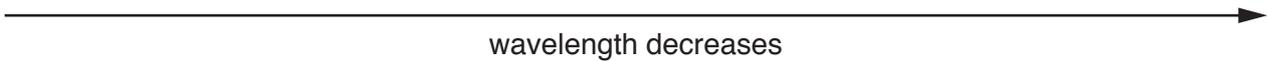
Use these words.

**microwaves**

**radio waves**

**visible light**

		infra-red	
--	--	-----------	--



[1]

(c) The case study says sending signals through the air directly from a transmitter to a receiver is not used to send signals between Britain and America.

Which statements explain why?

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

- Signals only travel in straight lines.
- Signals cannot travel over water.
- Air changes the speed of the signal.
- The Earth is curved.

[2]

(d) Explain how the cladding around optical fibres helps make sure that the quality of the signal is not lost.

.....

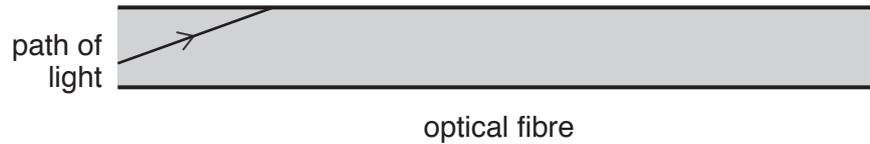
.....

.....

..... [3]

- (e) The line shows the path of light as it enters a glass fibre.

Complete the diagram by drawing lines to show the path of light through the optical fibre.



[2]

- (f) What is the difference in speed between the speed of light in air and the speed of light in glass?

Show your working.

difference in speed = ..... m/s [2]

- (g) The time taken for a signal to travel from Britain to America through an optical fibre can be calculated using this formula.

$$\text{time taken (s)} = \frac{\text{distance between Britain and America (m)}}{\text{speed of light in glass (m/s)}}$$

- (i) What is the distance between Britain and America?

Give your answer in **metres**.

distance = ..... m [1]

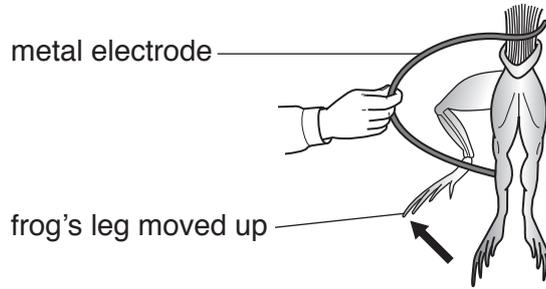
- (ii) Use your answer in part (g)(i) to calculate the time taken for a signal to travel from Britain to America through an optical fibre.

time taken = ..... s [2]

[Total: 15]

Turn over

2 Galvani and Volta were scientists who both investigated electricity during the eighteenth century. Galvani made static electricity by rubbing the skin of a frog's leg. He then used a metal electrode to pass the electricity through the frog's leg. The leg moved up.



Volta saw Galvani's work.

He rubbed a frog's skin and touched it with a metal electrode. He also saw that the frog's leg moved up.

(a) Explain why this is an example of scientific peer review.

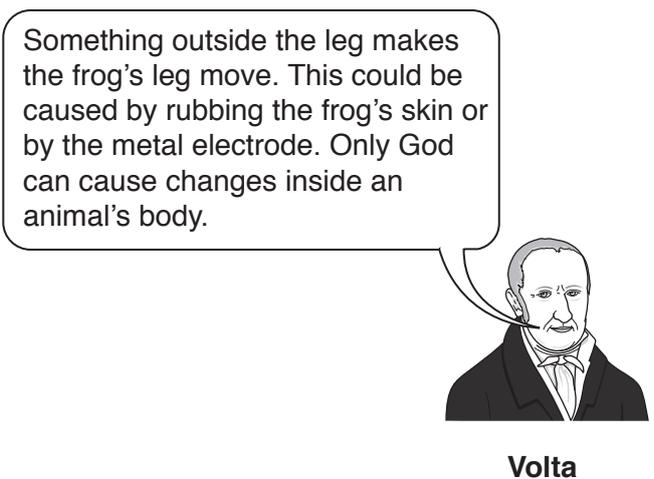
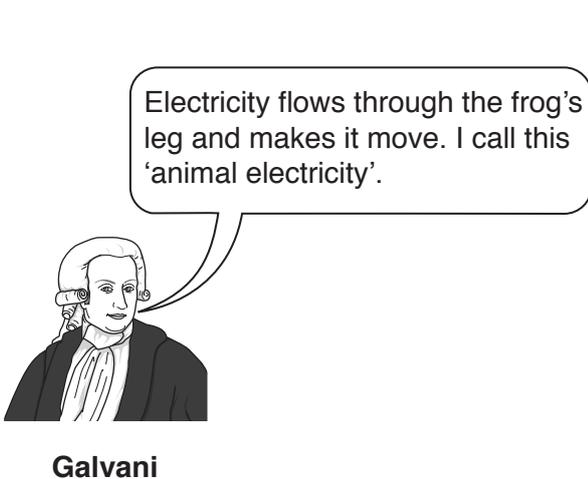
.....

.....

.....

..... [2]

(b) Galvani and Volta talked about their ideas.



(i) How does the work of Volta support the work of Galvani?

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

(ii) In what ways do the explanations given by Galvani and Volta differ?

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

(c) Give **two** reasons why it was difficult for Volta to collect evidence to prove his idea at that time.

1 .....  
.....  
2 .....  
..... [2]

(d) Volta had the idea that electricity could only be produced by living things. He later invented the first battery, which produced electricity without living things.

Which statement shows that Volta's idea was a provisional explanation?

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

He did not publish his idea.

He needed to change his idea after he invented the battery.

His idea did not say how much electricity living things produce.

His battery did not work as well as modern batteries.

[1]

[Total: 9]

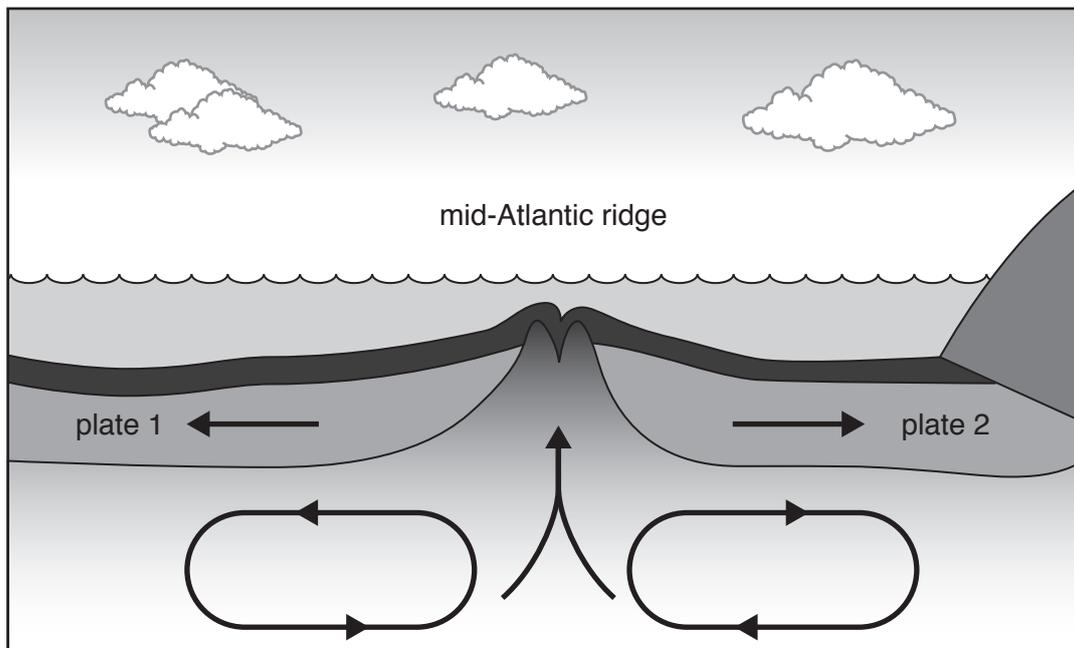
3 The mid-Atlantic ridge is a deep valley with ridges at either side.

It runs down the middle of the Atlantic Ocean between Britain and America.

The ridge was first discovered in 1872.

In 1929 Holmes had an idea to explain how the ridge formed.

The diagram shows Holmes' idea.



(a) Complete the sentences to explain Holmes' idea.

Choose from these words.

apart

conduction

convection

crust

mantle

molten

together

There are ..... currents in the part of the Earth called the .....

Very hot ..... rock rises to the surface.

The plates move .....

A deep valley and ridges form.

[3]

(b) Which other features of the Earth's surface can be explained using Holmes' ideas?

Put a **ring** around the **two** correct features.

**beaches**

**deserts**

**mountains**

**oceans**

**volcanoes**

[2]

(c) Holmes' ideas supported the work of Wegener.

In 1912, Wegener published a paper containing the idea of 'Continental Drift'.

(i) What did he mean by 'continental drift'?

..... [1]

(ii) What evidence did Wegener use to support his idea?

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

Fossils on different continents are the same.

Sea level is the same all over the Earth.

The continents appear to fit together like a jigsaw.

The climate of the Earth is different on different continents.

[2]

(d) When Wegener published his idea, it was rejected by other scientists.

Why did other scientists reject his idea?

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

He was not qualified to study rocks.

He could not explain why continental drift happened.

He copied the idea from an earlier scientist.

He did not include information about smaller countries in his idea.

[2]

[Total: 10]

8  
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4 Reaction time is used to measure the rapid response of a person to a sudden change.  
Reaction time depends on how quickly signals travel through the central nervous system.

(a) Which statements about the central nervous system are true and which are false?

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

	True	False
Signals travel to and from the spinal cord along the same neurone.		
Signals travel to the spinal cord through sensory neurones.		
Signals travel to muscles through motor neurones.		
Motor neurones sense changes in the environment.		

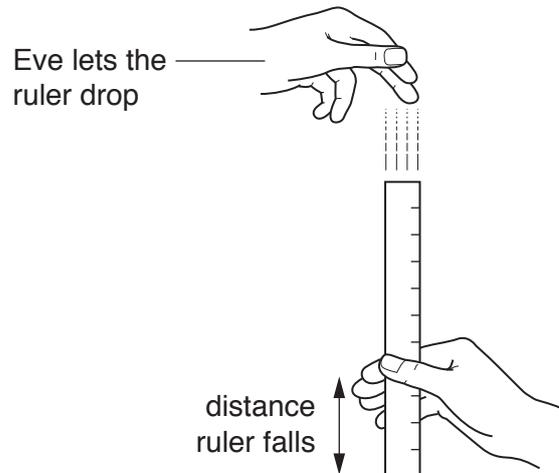
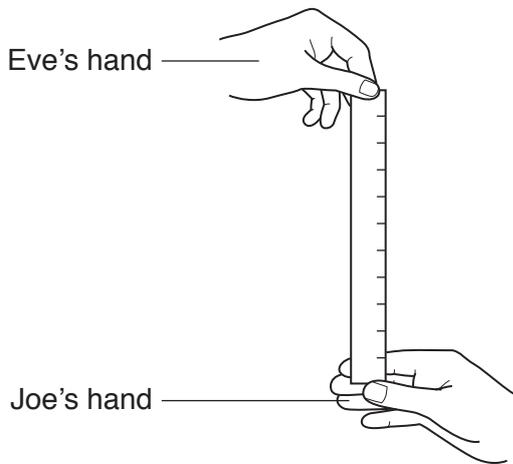
[2]

(b) Eve and Joe do an experiment to test their reaction times.

Eve holds a ruler at the top of Joe's hand.

She lets the ruler drop.

Joe catches the ruler and notes the distance the ruler falls before being caught.



He repeats the test three times.

They change places and do the same experiment again.

Eve and Joe want to compare their reaction times.

Suggest **one** factor in the experiment that they will need to control when they change places.

.....

..... [1]

(c) **Table 4.1** shows their results.

Test	Distance ruler falls (cm)	
	Joe	Eve
1	20	30
2	10	15
3	10	20

**Table 4.1**

**Table 4.2** shows how the distance the ruler falls is related to the reaction time.

Distance ruler falls (cm)	Reaction time (s)
5	0.10
10	0.14
15	0.17
20	0.20
25	0.23
30	0.25
35	0.27

**Table 4.2**



5 Scientists have studied the effects of fasting on mice.

Fasting means eating much less food than normal over a limited amount of time.

Some of the mice in the study had diabetes.

These mice cannot make insulin.

One scientist talks about what the study found out.



(a) Explain why scientists think that this unexpected result is important.

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

(b) Avicenna was the first scientist to suggest that people could make lifestyle changes to control diabetes.

What changes did he suggest that people should do to control diabetes?

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

(c) Banting and Best found that people with diabetes do not produce enough insulin.

(i) Which organ in the body makes insulin?

..... [1]

(ii) Which system in the body makes insulin?

Put a ring around the correct answer.

- binomial**                      **DNA**                      **endocrine**                      **genetic**                      **nervous**

[1]

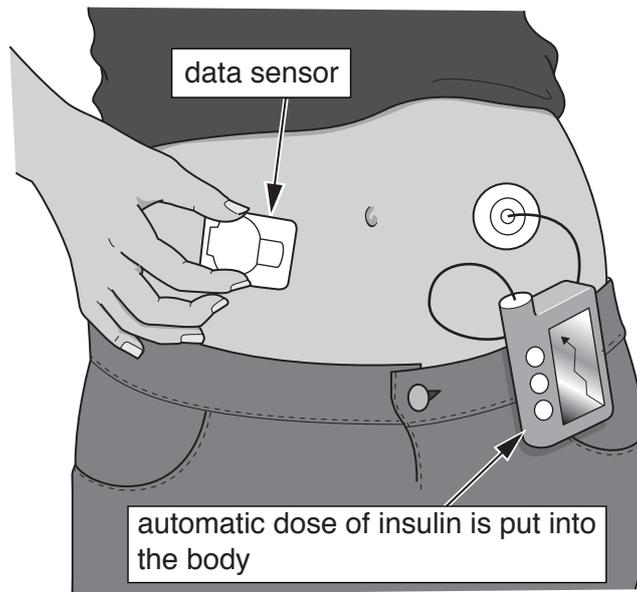
(d) People who have diabetes need to test their blood regularly.

Since the 1970s, home testing kits for diabetes have been available for people to use.

The person takes a blood sample and the kits analyse the sample of blood.

A new type of monitor uses a data sensor to test blood regularly all day.

The monitor works out the dose of insulin needed and provides this dose automatically.



What are the **advantages** of using the new monitor compared to the older test kits?

.....

.....

.....

.....

[3]

[Total: 9]

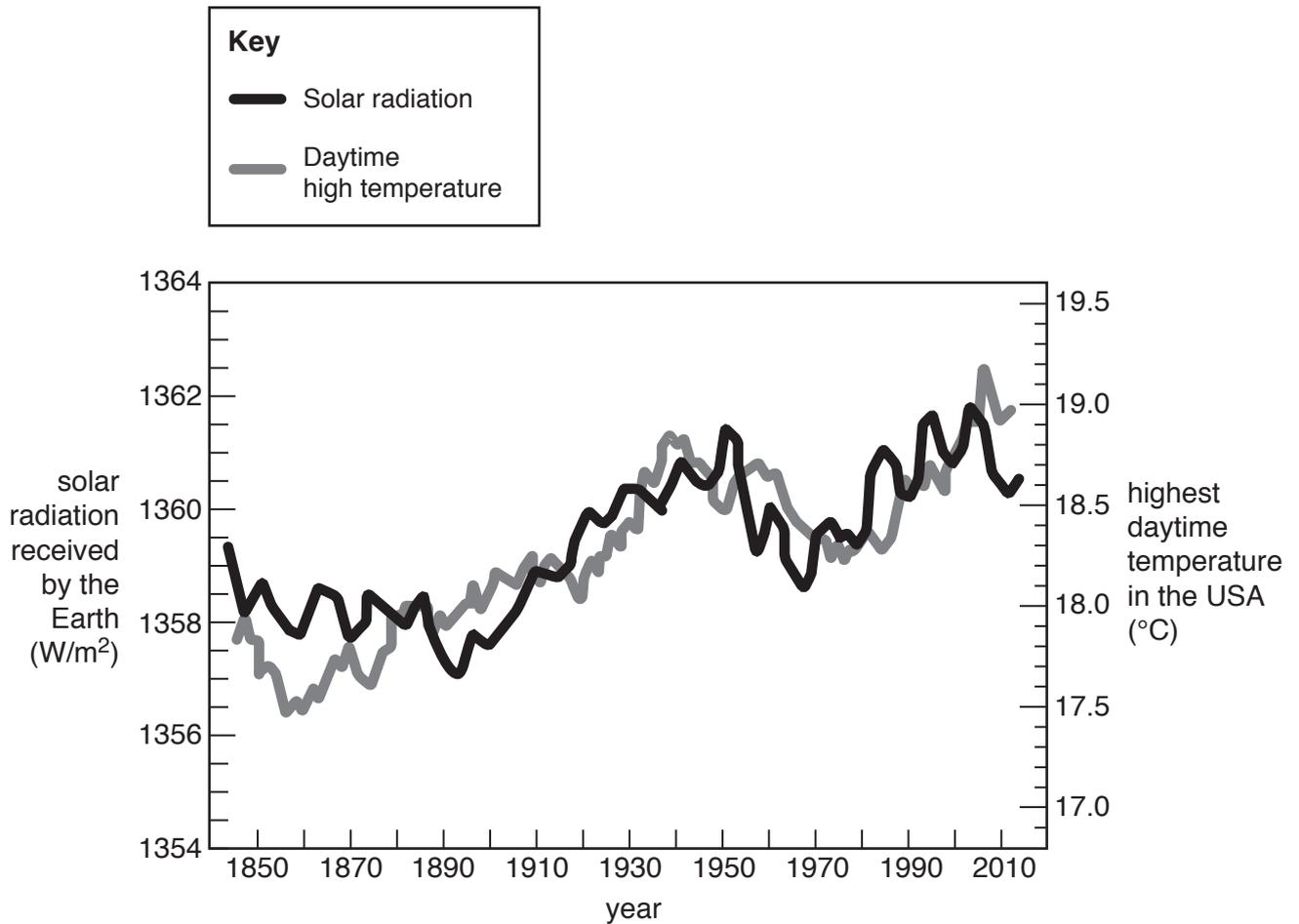
- 6 The amount of radiation received from the Sun (called solar radiation) by the Earth changes over time.

Some scientists think that the amount of solar radiation received by the Earth affects the average temperature of the whole Earth.

Scientists in the USA collected data about the highest daytime temperatures in the USA.

They compared their data with the amount of solar radiation received by the Earth.

**Graph 6.1** shows their results.



**Graph 6.1**



- (b) Scientists also think that some of the gases in the atmosphere change the temperature of the whole Earth.

These gases are called greenhouse gases.

- (i) Which gas is a greenhouse gas?

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

carbon dioxide

oxygen

nitrogen

[1]

- (ii) Which statement correctly describes how greenhouse gases change the temperature of the whole Earth?

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

The gases stop radiation entering and leaving the Earth.

The gases allow more radiation from the Sun to reach Earth.

The gases react with each other and give out heat.

The gases stop radiation escaping into space.

[1]

[Total: 8]

**END OF QUESTION PAPER**

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