OXFORD CAMBRIDGE AND RSA EXAMINATIONS

LEVEL 1

R072/01

CAMBRIDGE NATIONAL IN SCIENCE

How scientific ideas have developed

MONDAY 11 JUNE 2018:
Morning
DURATION: 1 hour
plus your additional time allowance
MODIFIED ENLARGED 24pt

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

OTHER MATERIALS REQUIRED:

Pencil
Ruler (cm/mm)

READ INSTRUCTIONS OVERLEAF

DC (NH/CB) 170976/1
© OCR 2018 [R/503/6262]

INSTRUCTIONS TO CANDIDATES

The Insert will be found with this document.

Write your name, centre number and candidate number in the boxes on the front 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. If additional space is required, you should use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.

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 (✎).

Answer ALL the questions.

1 This question refers to the case study THE POLAR BEAR PLUNGE in the insert.

(a) The case study says that warm-blooded animals have some control over their body temperature.

What process in the body controls body temperature? [1]

Put a (ring) around the correct answer.

adaptation **diffraction**

homeostasis **protein synthesis**

(b) Look at Fig. 1 in the case study.

(i) What happens to the body temperature of the SNAKE when the outside temperature changes?

_____

_____ **[1]**

(ii) What happens to the body temperature of the CAT when the outside temperature changes?

_____

_____

_____ **[2]**

(iii) At what outside temperature will both animals have the same body temperature?

Outside temperature = _____ **°C [1]**

(c) Look at Fig. 3.

(i) The case study says that respiration increases the body temperature of cold-blooded animals.

Explain how the graph supports this statement.

_____

_____ [1]

(ii) At what time of the day would you expect the lizards to be at their most active?

_____ [1]

(iii) The scientist who collected the data for Fig. 3 wants to do some more experiments.

The scientist wants to improve his experiment to increase the quality of the data.

Suggest ONE improvement the scientist could make to the experiment.

_____

_____ [1]

(d) Look at the graph in Fig. 4.

Which statements about the graph in Fig. 4 are TRUE and which are FALSE?

Put a tick (✓) in one box in each row. [2]

	True	False
The metabolic rate rises when the outside temperature falls from 25 °C to 0 °C.		
Warm-blooded animals cannot survive below 0 °C.		
Normal body temperature is 37 °C.		
Warm-blooded animals are only comfortable at temperatures above 35 °C.		

(e) The case study says that when the body temperature of warm-blooded animals is too high or too low, the body reacts to return body temperature to normal.

How does the body react when it is too hot or too cold?

_____

_____

_____ [2]

(f) (i) **Explain why the 'Polar Bear Plunge' is safe for people, but only if they 'get out fast'.**

_____

_____

_____ **[2]**

(ii) **Why would the 'Polar Bear Plunge' not be safe for a snake?**

_____

_____ **[1]**

[TOTAL: 15]

2 **Scientists predict the surface temperature of a planet by considering its distance from the Sun. They use the idea that planets closer to the Sun are hotter than planets that are further away.**

FOURIER'S IDEA
The surface temperature of the Earth is higher than predicted because the atmosphere acts as an insulator and keeps the Earth warm.

(a) Fourier worked in the 1820s.

(i) What is Fourier likely to have used to measure temperature? [1]

digital thermometer	mercury thermometer
spectroscope	temperature probe

(ii) Give ONE reason why Fourier could not measure the temperature of other planets.

_____

_____ **[1]**

(b) In 1890, Samuel Langley measured infra-red radiation from the Moon.

A telescope fitted with a spectroscope can be set up on Earth to measure this radiation.

The measurements can be used to work out the temperature and the composition of the atmosphere of the Moon.

Table 2.1 shows information about the Earth and the Moon.

Table 2.1

	Distance from the Sun (millions of km)	Average surface temperature (°C)	Atmosphere present
Earth	150	16	yes
Moon	150	–33	almost no atmosphere

Does the data about the Moon and Earth increase confidence in FOURIER'S idea?

Explain your answer.

_____

_____

_____

_____ [3]

BLANK PAGE

(c) Data collected by telescopes can be used to find out about the temperature and atmosphere of other planets.

Table 2.2 shows some data about the Earth and some other planets.

Table 2.2

Planet	Predicted surface temperature (°C)	Actual surface temperature (°C)	Atmosphere present
Mercury	167	167	almost no atmosphere
Venus	7	467	atmosphere
Earth	–33	17	atmosphere
Mars	–68	–63	almost no atmosphere
Jupiter	–183	–103	atmosphere

(i) Fourier said that an atmosphere keeps the Earth warmer than its predicted temperature.

Which other planets in Table 2.2 also show this effect? [1]

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

Jupiter ☐

Mars ☐

Mercury ☐

Venus ☐

(ii) How does the actual surface temperature compare to the predicted surface temperature for planets which have almost no atmosphere?

_____

_____ [1]

(d) Since the 1950s, space probe robots have been sent to other planets. Space probe robots are designed to collect data and send it back to Earth.

Which statements are LIMITATIONS of space probe robots? [2]

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

Robots use temperature probes to take measurements of surface temperature. ☐

The journey of the robot to other planets takes many months. ☐

Robots take samples of the planet atmosphere for analysis. ☐

Reception of radio signals from the probes is strongest when they are near Earth. ☐

(e) **The native American Indians believed that the Earth was made thousands of years ago by an Earth Maker God who made everything about the Earth, including its temperature, perfect for humans to live.**

Give ONE reason why it is difficult to collect data to test this idea.

_____

_____ **[1]**

[TOTAL: 10]

BLANK PAGE

3 Some types of elephants live in Africa.

Fossils of an extinct elephant called PRIMELEPHAS have been found in Africa.

Scientists think that the modern AFRICAN ELEPHANT evolved from primelephas.

Primelephas has different features to a modern African elephant.

Elephant	Features
Primelephas	weight approximately 2 tonnes very small ears very long tusks sloping back
African elephant	weight approximately 6 tonnes very large ears short tusks hollow back

Describe the differences between the features of the elephants and explain how evolution caused the features to be different.

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

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[6]**

[TOTAL: 6]

4 **In 1809 Jean Baptiste Lamarck published his theory of evolution.**

His theory said that characteristics acquired during the life of an organism are passed on.

One example of an acquired characteristic is muscle size in humans.

Table 4.1 shows two of the main ideas in his theory.

Table 4.1

Idea 1	**Body parts that are used more become bigger and stronger.**
Idea 2	**Body parts that are not used waste away and become smaller.**

(a) **Joe and Adam are identical twins.**

They decide to collect evidence to show that Idea 1 and Idea 2 are true.

They make a plan to test these ideas, using equipment at their local gym.

(i) Joe does arm exercises every day for a month.

Adam does leg exercises every day for a month.

Both boys measure the diameter of their arms and legs at the start of the month.

What other measurements should Joe and Adam take to test Idea 1 and Idea 2?

_____

_____

_____ [1]

(ii) Joe and Adam try to control anything affecting their results during the month.

One way they do this is by keeping their other activities as similar as possible during the month.

Suggest one OTHER way that they need to keep their lives the same.

_____

_____

_____ [1]

(iii) What changes should Joe and Adam expect at the end of the month?

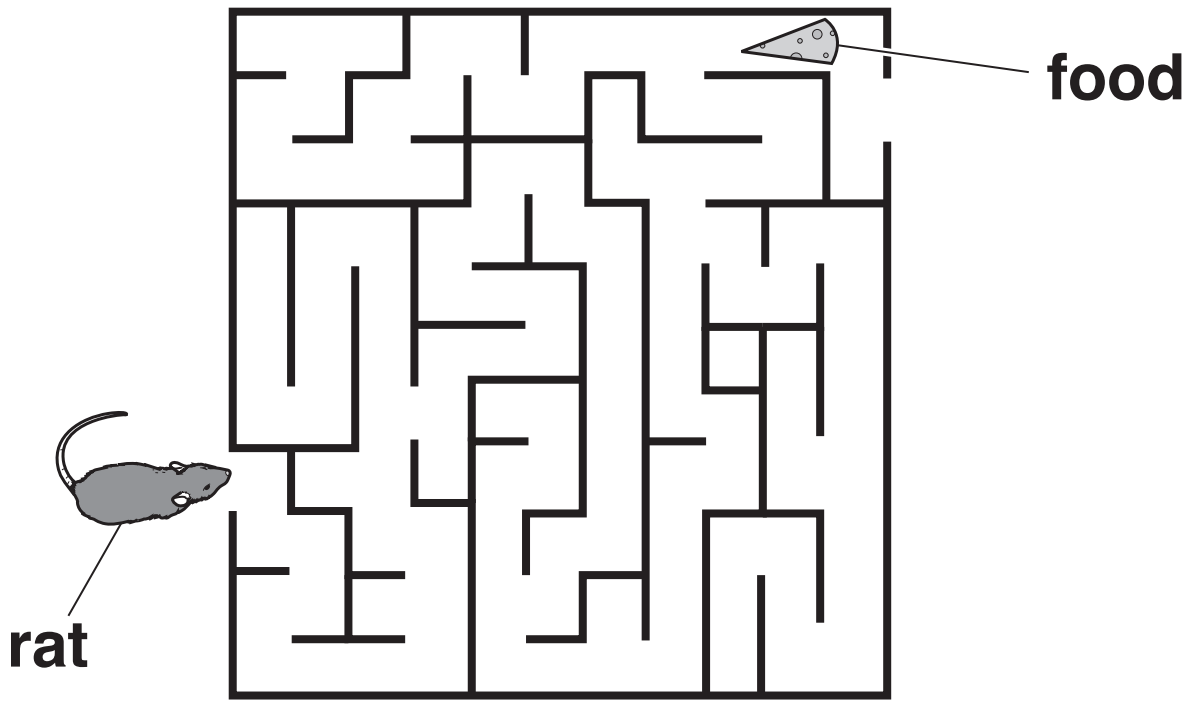
_____

_____

_____ [2]

(b) In the 1920s, William McDougall did some research to find out whether rats could pass learned behaviour on to their offspring.

He put the same rats many times into the same maze to find food.



He counted how many wrong turns they made.

When they learned their way through the maze he bred offspring from the rats.

He put the offspring into the maze and then bred offspring from them after they learned their way through.

His reports included the results shown in Table 4.2.

Table 4.2

	Number of wrong turns taken during first time in the maze
First generation rats	165
Rats born after several generations	20

(i) Lamarck's third idea is that acquired characteristics are passed on to offspring.

Does the data in Table 4.2 support this idea?

Explain your answer.

_____

_____

_____ [2]

(ii) Other scientists have done the same experiments as McDougall. None of the scientists have got similar results.

Their results did not show that the rats made any improvement through the generations.

What is the process of checking results called?

Put a tick (✓) in the box next to the correct answer. [1]

conflicting evidence ☐

correlation and cause ☐

quantitative approach ☐

peer review ☐

(iii) Why do scientists check each other's results?

_____

_____ [1]

(c) In 1859, Charles Darwin published his theory of natural selection to explain why evolution happens.

Explain how ‘natural selection’ results in evolution.

_____

_____

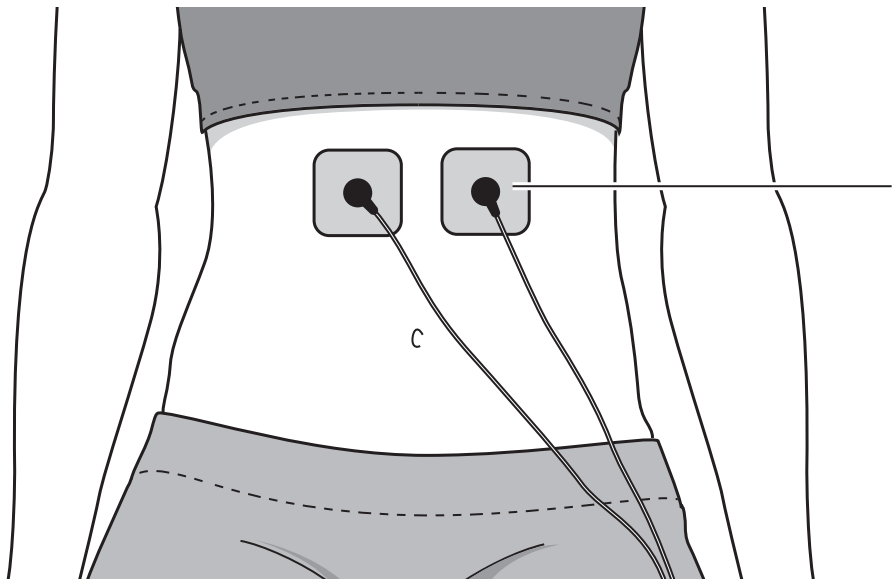
_____ [2]

[TOTAL: 10]

BLANK PAGE

5 Some people use an electrical machine as a way of exercising their body.

The machine has pads which send electrical signals through the skin into the body.



(a) Complete the sentences by putting a (ring) around ONE word in each line. [2]

Electrical signals travel QUICKLY / SLOWLY

through the body.

Electrical signals travel through NEURONES / BLOOD.

The signals cause muscles to RELAX / CONTRACT.

(b) In the 1780s, a scientist did some research into 'animal electricity'.

He used static electricity in very dry weather, and also used electricity directly from lightning.

He did experiments to show what happened when electricity was passed through the leg of a frog.

(i) What was the name of this scientist? [1]

Put a ring around the correct answer.

Galvani Mendel

Newton Wegener

(ii) What did he see happen when he passed electricity through the leg of a frog?

_____

_____ [1]

(iii) In 1800, Volta invented the first battery.

What effect would this invention have on 'animal electricity' research?

Explain your answer.

_____

_____

_____ [2]

(c) When animals feel pain, an electrical signal is sent to the brain.

Explain how feeling pain affects the chances of survival for an animal.

_____

_____

_____ [2]

[TOTAL: 8]

6 In 1735, Linnaeus published a new system of classifying living things based on their external characteristics.

(a) At the time, scientists travelled all over the world to find new species of living things.

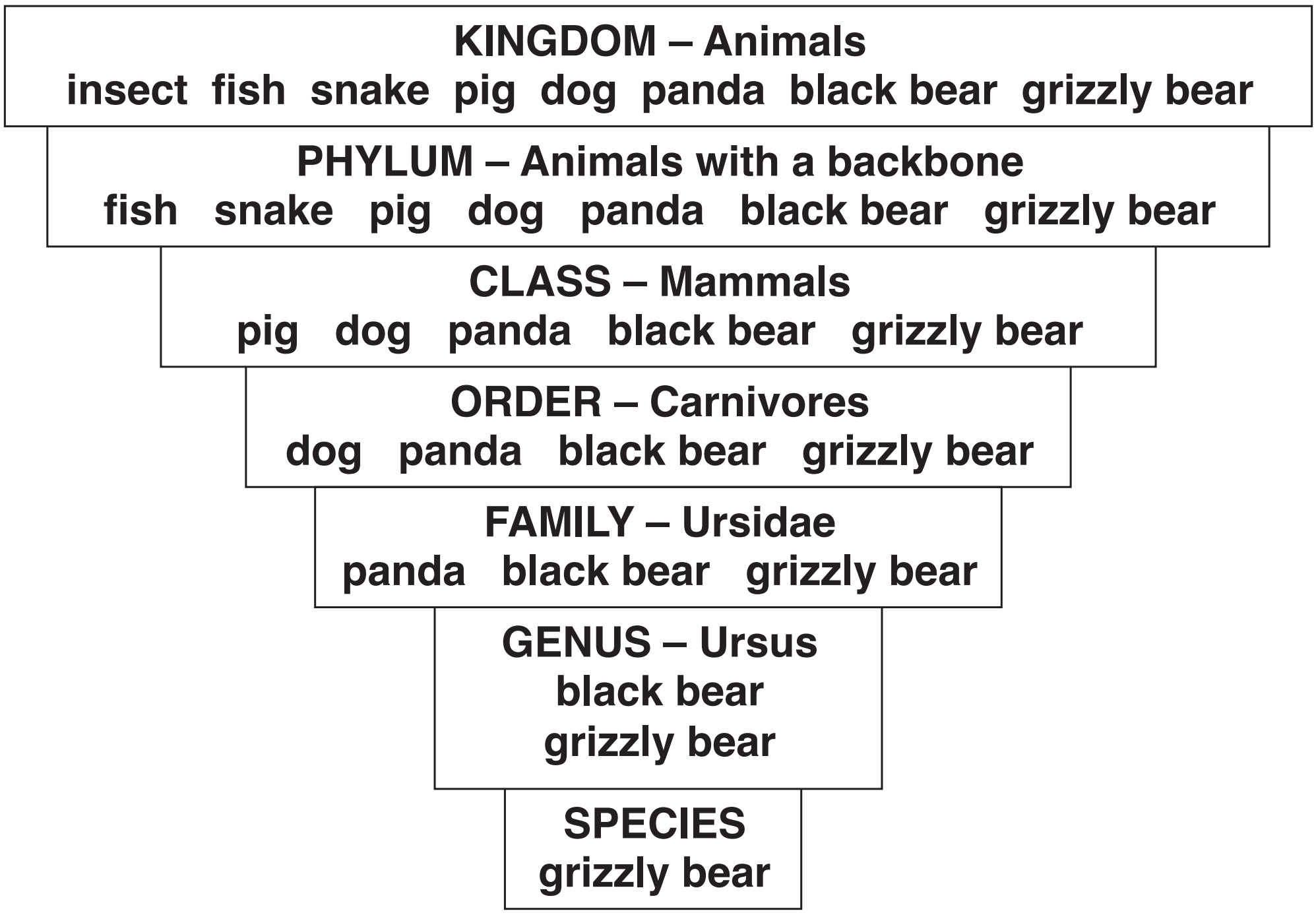
They found that classifying living things by external characteristics was a very easy system to use.

Explain why a system based on external characteristics is very easy to use.

_____

_____ **[1]**

(b) The diagram shows how his system can be used to classify some living things.



Use the diagram to answer the following questions.

(i) Which TWO living things in the diagram have the most similar characteristics?

Explain your answer.

Living things _____

and _____

Explanation _____

_____ [2]

(ii) Give ONE reason why snakes and fish are NOT placed in the same class as the other animals.

_____

_____ [1]

(iii) In what way, shown in the diagram, are insects different to fish and snakes?

_____

_____ [1]

[TOTAL: 5]

7 The first radio transmissions sent signals directly from a transmitter to a receiver, as shown in Fig. 7.1.

Fig. 7.1

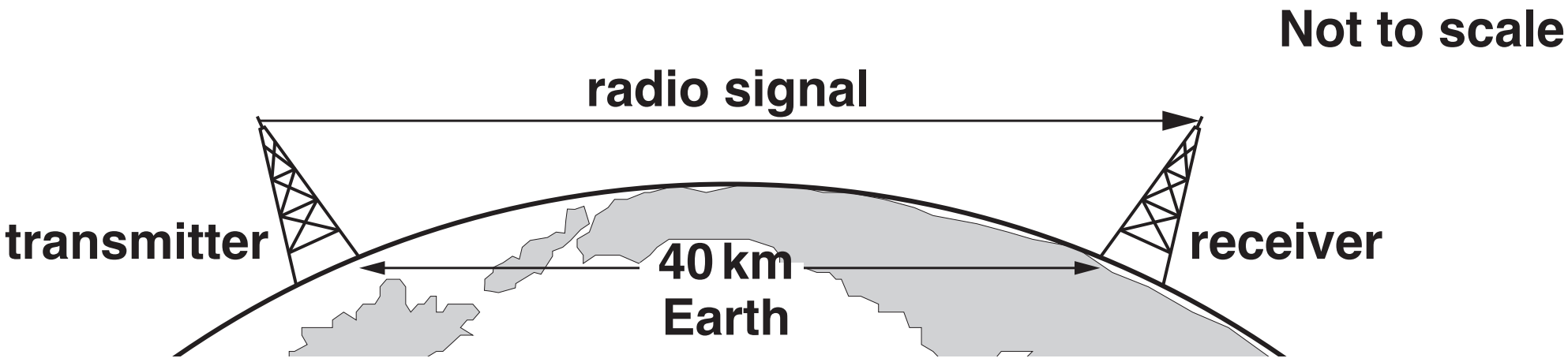
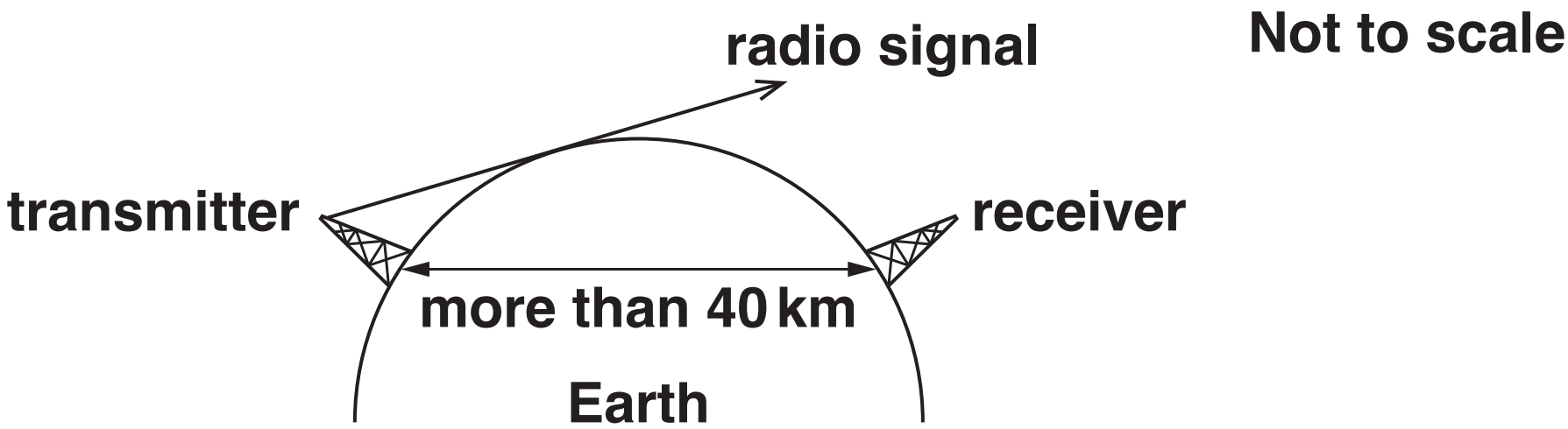


Fig. 7.2 shows a path of a radio signal from the transmitter when the receiver is more than 40 km away.

Fig. 7.2



This method of sending radio signals had limited uses.

A few years later, Marconi invented a new method to send radio signals from Britain to America.

Use Fig. 7.1 and Fig. 7.2 to help you to describe how radio signals travel from a transmitter to a receiver and explain why this method had limited uses.

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

_____ **[6]**

[TOTAL: 6]

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).

OCR
Oxford Cambridge and RSA

Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB21GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.