Cambridge
O Level

Cambridge Assessment International Education
Cambridge Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

9973360422

SCIENCE FOR ALL **5031/02**

Paper 2 **October/November 2019**

1 hour 30 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Write your answers in the spaces provided on the Question Paper.

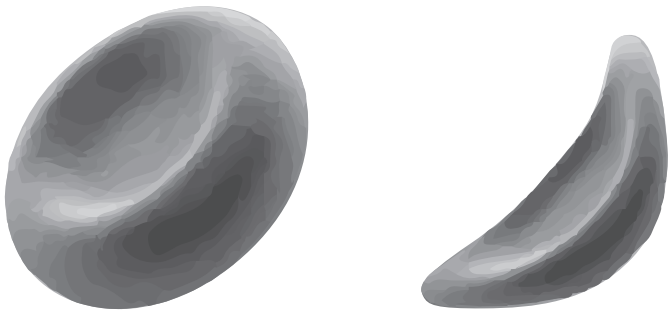
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **17** printed pages and **3** blank pages.

Cambridge Assessment International Education

1 People with sickle cell anaemia have red blood cells which curve into 'sickles'.



normal red blood cell sickle cell

Sickle cell anaemia is caused by one gene with faulty alleles.

(a) State **two** symptoms of sickle cell anaemia.

.....

.....

..... [2]

(b) In 2017, the following information was published in a scientific magazine.

> A teenage boy with sickle cell anaemia has been treated with gene therapy. His faulty alleles were replaced with normal alleles. Tests show that he appears to have been cured.
>
> This could help millions of people worldwide.

Not everyone agrees with using gene therapy.

Suggest **one** reason why people might **not** want to have their child treated with gene therapy.

.....

.....

..... [1]

(c) Cystic fibrosis is another genetic disorder. Emily has cystic fibrosis, but neither of her parents have the condition.
The genetic diagram shows how cystic fibrosis is inherited in Emily's family.
The normal allele is labelled **A**, and the faulty allele is labelled **a**.

		Emily's mother	
		A	**a**
Emily's father	**A**	**AA**	**Aa**
	a	**Aa**	**aa**

(i) Emily has cystic fibrosis.

Which of the allele combinations in the shaded squares does Emily have?

..... [1]

(ii) Explain, in terms of the alleles **A** and **a**, why this diagram shows that Emily's mother and father are both *carriers* of cystic fibrosis. You should make it clear what 'carrier' means.

.....

.....

.....

..... [3]

(iii) Emily's parents are expecting another baby. What is the percentage chance of this baby having cystic fibrosis?

Use the genetic diagram to help you.

..... % [1]

[Total: 8]

[Turn over

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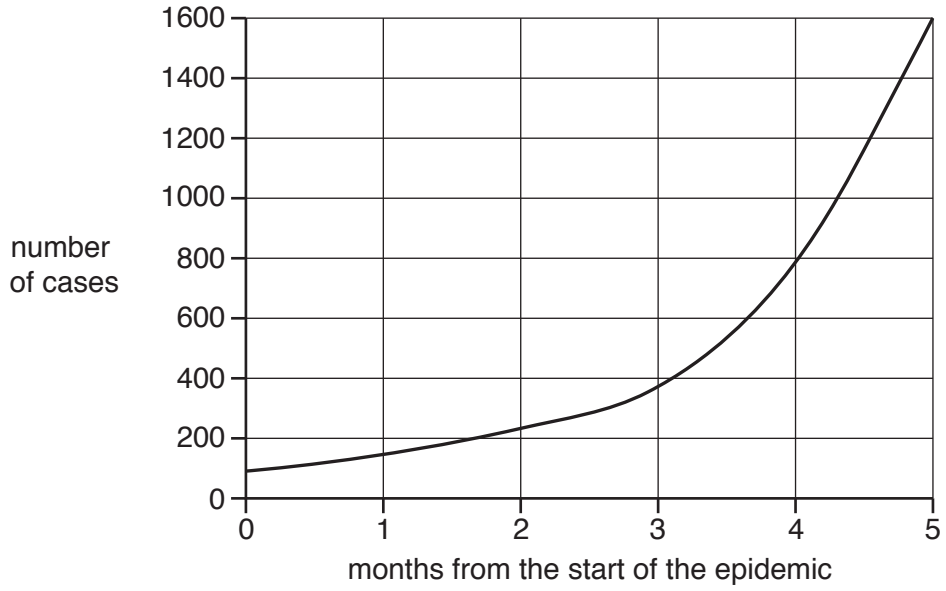
2 The graph shows the number of cases of Ebola in an epidemic which started in Africa in 2014.

Ebola is passed on by contact with someone who is already infected.



(a) Describe what the graph shows about the number of cases of Ebola in the first five months of the epidemic.

.....

.....

..... [2]

(b) Explain why the number of cases changes in this way.

.....

.....

..... [2]

(c) Ebola is caused by a virus, not a bacterium.

Explain why a bacterial disease is easier to treat than Ebola.

.....

.....

..... [2]

[Total: 6]

[Turn over

3 Charles Darwin published his theory of evolution in 1859.

(a) Darwin observed birds in the Galapagos Islands. He found that the different islands had similar birds with very different beaks.

The diagram shows three finches from different islands in the Galapagos.

A **B** **C**

One of these finches eats small insects which it needs to pick up out of mud and leaves.

One cracks small seeds for food.

One cracks large seeds and nuts for food.

Use the diagram to decide which type of food each finch eats. Explain your answers.

Finch **A** eats .....

I can tell this because .....

.....

Finch **B** eats .....

I can tell this because .....

.....

Finch **C** eats .....

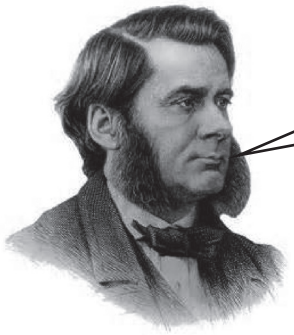
I can tell this because .....

.....

[3]

(b) Darwin suggested that all animals and plants on Earth have evolved from simpler living things, and that this includes human beings.

Many scientists thought that Darwin's theory was right, but not everyone agreed.

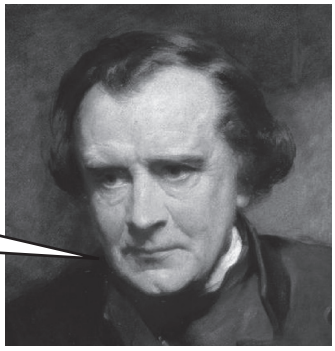


Thomas Huxley

This theory explains so much in the natural world. Darwin must be right.

Samuel Wilberforce

This contradicts everything I have learned. The theory is crazy. Darwin must be wrong.



Suggest and explain reasons to support Thomas Huxley and reasons to support Samuel Wilberforce.

For Huxley:

.....

.....

.....

For Wilberforce:

.....

.....

.....

[3]

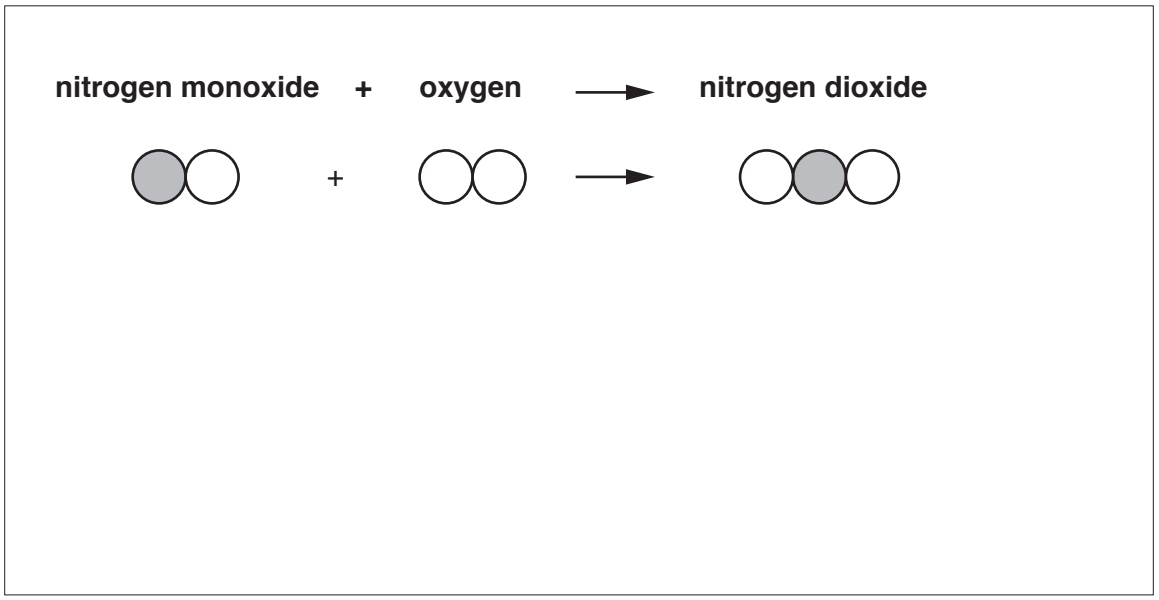
[Total: 6]

4 Nitrogen monoxide is made in car engines.
It oxidises in the air to form nitrogen dioxide.

(a) The diagram shows one nitrogen monoxide molecule reacting with one oxygen molecule to make one nitrogen dioxide molecule.

(i) The molecules do not show a balanced equation.

Draw more molecules on each side to balance the equation.



[2]

(ii) Explain why this is an oxidation reaction.

.....

..... [1]

(b) Nitrogen dioxide causes problems in the environment.

Complete the sentences about nitrogen dioxide.

Choose from these words.

acid rain **carbon monoxide** **climate change**

incomplete combustion **oxygen** **sulfur dioxide** **water**

Nitrogen dioxide reacts with ..... and ..... .

This causes ..... .

Another pollutant gas that causes the same problem is ..... .
[3]

[Total: 6]

5 Metal alloys contain one main metal with small amounts of other metals added.

Alloys have different properties from pure metals.

The table shows information about some pure metals and their alloys.

metal or alloy	tensile strength / MPa	melting point / °C
iron	185–285	1500
steels (iron alloys)	1700–1800	1370–1650
aluminium	90	660
aluminium alloys	90–600	463–671
copper	220	1084
copper alloys	140–1310	871–904

(a) How are the properties of an alloy different from the properties of a pure metal?

Use data from the table to support your answer.

.....

.....

.....

..... [3]

(b) Yess and Kavi discuss the data.

Use data from the table to explain each person's point of view.

.....

.....

.....

..... [2]

(c) Pure copper and pure aluminium are both used to make electricity cables.

Cables made from different metals have different life cycle assessments.

Which **two** statements explain why the life cycle assessments are different?

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

Copper is brown but aluminium is grey.	☐
Aluminium is also used to make drink cans.	☐
The Earth's supplies of copper are running out.	☐
Large amounts of electricity are used to extract aluminium.	☐
Copper is also used for water pipes and tanks.	☐

[2]

[Total: 7]

[Turn over

6 Coastal areas and the sea are used to extract resources for people and industry.

(a) Coastal sand is considered to be a 'slowly renewable resource', but mining sand has been banned in Mauritius since 2001.

(i) Explain why coastal sand is considered to be a 'renewable resource'.

.....

.....

..... [2]

(ii) Why do some governments ban mining sand, even though sand is a renewable resource?

.....

.....

..... [2]

(b) Seawater is used as a supply of drinking water.

Which process is **not** involved in making drinking water from seawater?

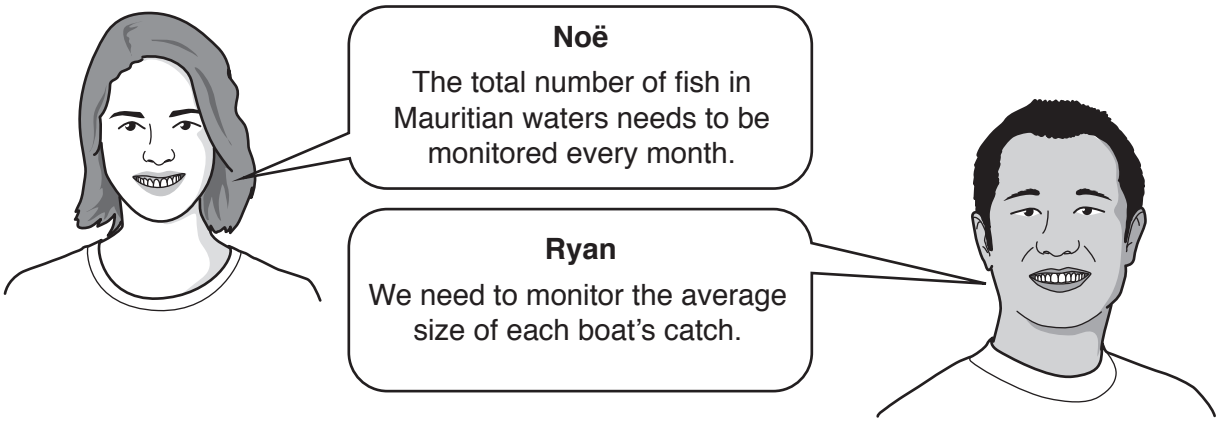
Put a (ring) around the correct answer.

chlorination **desalination** **filtration** **polymerisation**

[1]

(c) Some people are concerned that the number of fish in the sea around Mauritius is decreasing.

Noë and Ryan are discussing ways to increase the number of fish in the sea around Mauritius.



Which person's idea is *technically feasible* and which is not?

Explain why.

.....

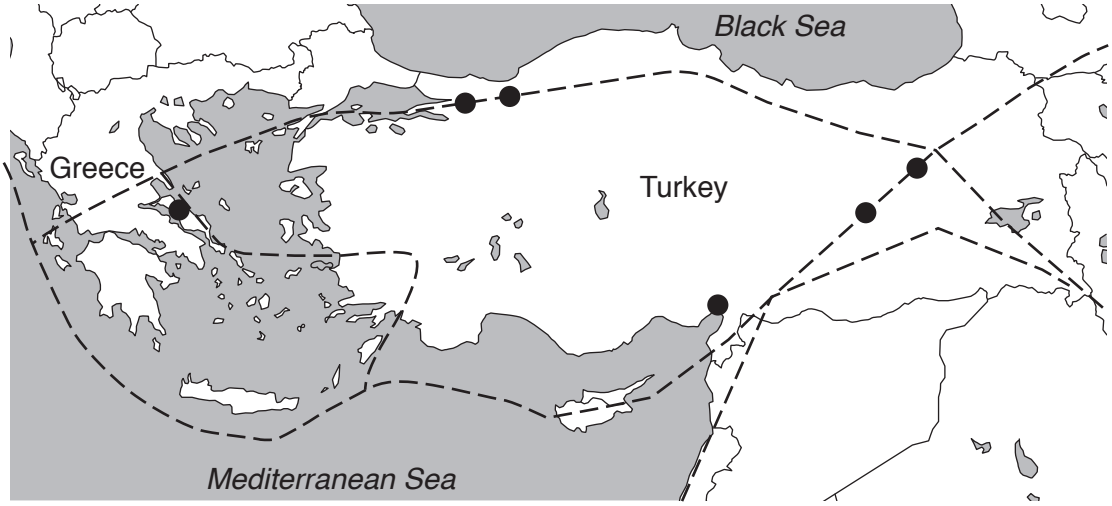
.....

..... [2]

[Total: 7]

7 The map shows the sites of large earthquakes in Greece and Turkey.

Tectonic plate boundaries are shown as dashed lines.



Key:
tectonic plate boundary – – –
site of a large earthquake ●

(a) Use information from the map to suggest why earthquakes happened at the sites marked.

.....

..... [1]

(b) Explain the processes in the Earth's crust which cause earthquakes.

.....

.....

.....

.....

..... [3]

(c) Suggest **three** actions that could be taken by governments in Greece and Turkey to reduce the damage caused by earthquakes.

1. .....

.....

2. .....

.....

3. .....

.....

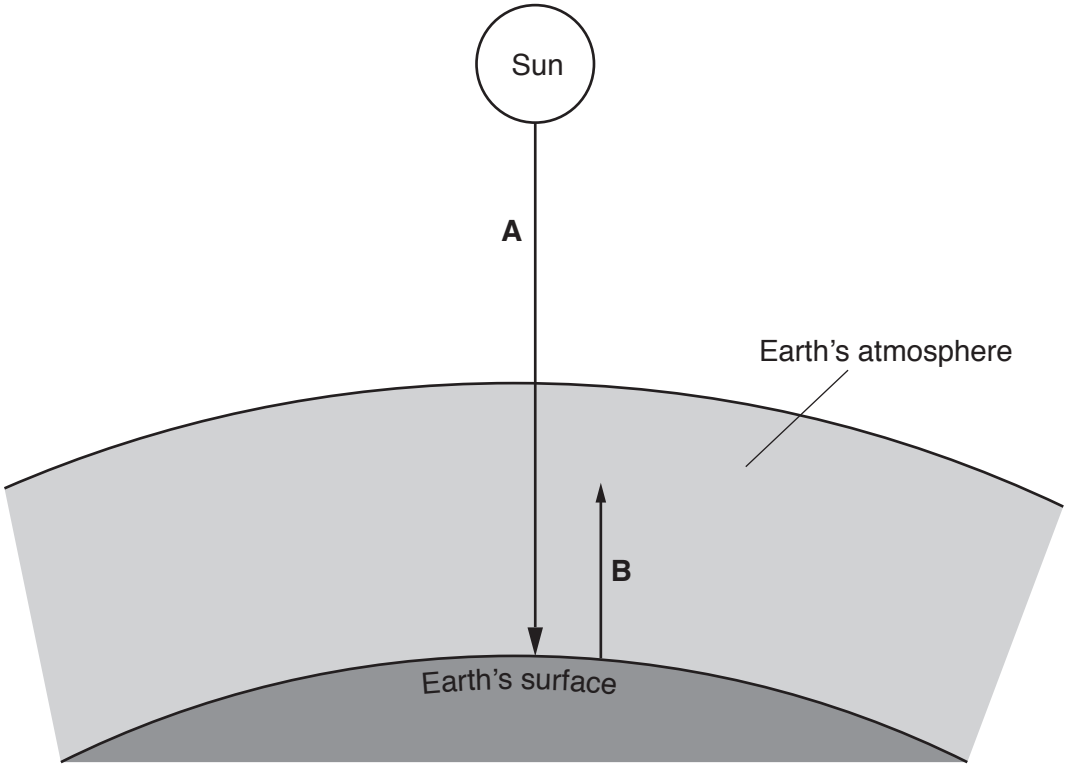
[3]

[Total: 7]

8 The diagram shows radiation from the Sun, labelled **A**, reaching the Earth's surface. It also shows radiation emitted by the Earth, labelled **B**.

Radiation **A** is visible and ultraviolet light, emitted by the surface of the Sun.

Radiation **B** is infrared radiation, emitted by the surface of the Earth.



(a) Radiation **A** emitted by the Sun is necessary for life on Earth.
Give **two** reasons why radiation **A** is necessary for life.

1 .....

.....

2 .....

.....
[2]

(b) All hot or warm objects emit electromagnetic radiation.

Suggest why the Sun and the Earth emit different radiation.

.....

..... [1]

(c) Some gases in the atmosphere, such as carbon dioxide, allow through visible light but absorb infrared radiation. These are called greenhouse gases.

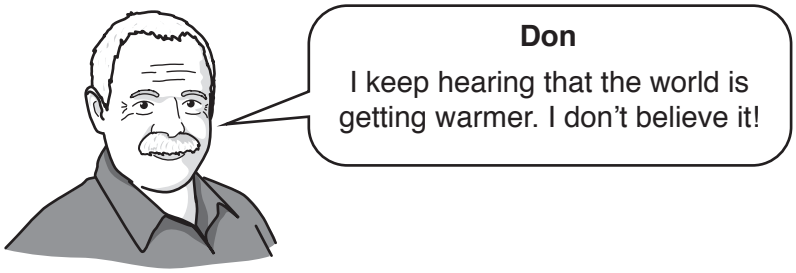
Explain how these gases make the Earth warmer.

.....

.....

..... [2]

(d) Some people do not believe that the Earth is actually getting warmer.



(i) Suggest **one** reason why people may hold the same opinion as Don.

.....

..... [1]

(ii) Give **one** reason why scientists now agree that the Earth is getting warmer.

.....

..... [1]

[Total: 7]

9 The diagram shows the electromagnetic spectrum.

The average photon energy of each region of the spectrum is given in units called 'electron-volts' (eV).

region of the spectrum	**C**	microwave	infrared	visible light	ultra-violet	**D**	gamma
average photon energy in eV	less than 0.01 millionths	less than 1 millionth	0.02	2.5	120	10 000	1 000 000

(a) Two of the regions of the spectrum are not named.
Write their names in the spaces below.

C is ..... **D** is .....

[2]

(b) Artificial light in buildings comes from light bulbs which emit only visible light and infrared. Sunlight is very damaging to skin, but artificial light is not.

Use information from the table to explain why sunlight can damage skin, but artificial light cannot.

.....

.....

..... [2]

(c) Transmitter masts for mobile phones emit microwaves. Many people think that these microwaves are dangerous.

Use information from the table to help you to explain why most scientists do **not** think that the radiation given out by transmitter masts is a health risk.

.....

.....

..... [2]

[Total: 6]

END OF QUESTION PAPER

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