THIS IS A LEGACY SPECIFICATION

OCR
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Wednesday 1 February 2012 – Afternoon

GCSE TWENTY FIRST CENTURY SCIENCE SCIENCE A

A213/02 Unit 3: Modules B3 C3 P3 (Higher Tier)

Candidates answer on the Question Paper.
A calculator may be used for this paper.

OCR supplied materials:
None

Other materials required:
- Pencil
- Ruler (cm/mm)

Duration: 40 minutes

A213/02

5006236153

Candidate forename		Candidate surname	

Centre number						Candidate number				

MODIFIED LANGUAGE

INSTRUCTIONS TO CANDIDATES

- 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 **42**.
- This document consists of **16** pages. Any blank pages are indicated.

Answer **all** the questions.

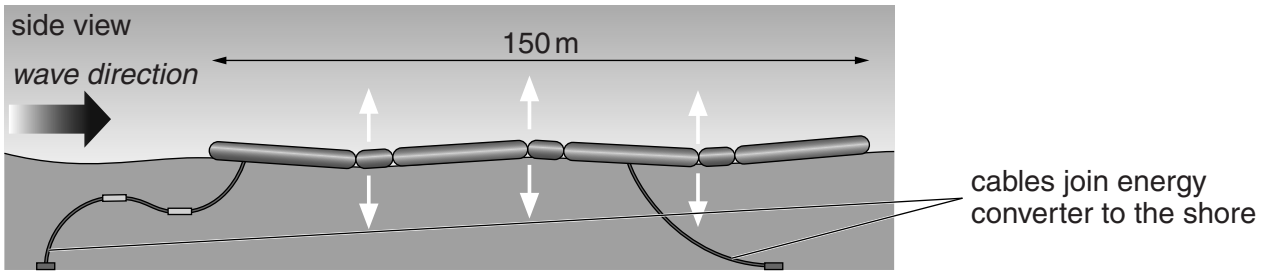
1 Read this newspaper article.

Power from the waves

The Portuguese Government has set up a wave farm in the Atlantic Ocean.

It has been testing wave energy converters built in Scotland.

These have successfully generated energy for the Portuguese National Grid.



As the wave passes, the wave energy converter bends at its three joints. This pumps oil through hydraulic motors, which then drive generators. The electricity they produce passes along cables to the shore.

The complete wave farm will occupy a square kilometre of ocean about 10 kilometres from the shore. Its power output will be much less than a power station burning fossil fuels.

(a) Complete the block diagram below to show how the energy converter generates electricity.

Choose the correct statements from **A**, **B**, **C**, **D**, **E** and **F** and put them in the correct order.

One statement is incorrect.

One has been done for you.

A oil is pumped through motors

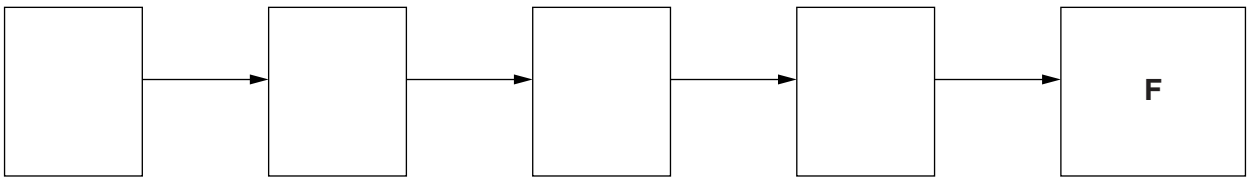
B the converter bends at each joint

C generators turn

D waves move under the converter

E turbines turn generators

F electricity passes to the National Grid

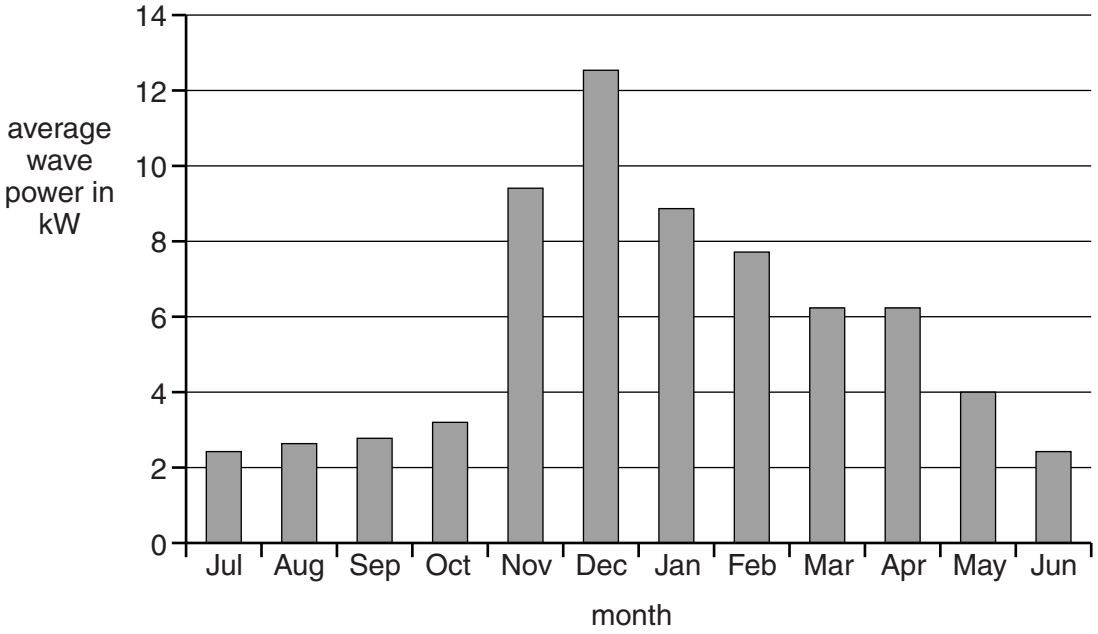


[1]

(b) The bar chart shows how the power carried by the waves varies throughout the year.

Suggest advantages **and** disadvantages of this type of wave farm compared with fossil fuel burning power stations.

Include information from the bar chart in your answer.



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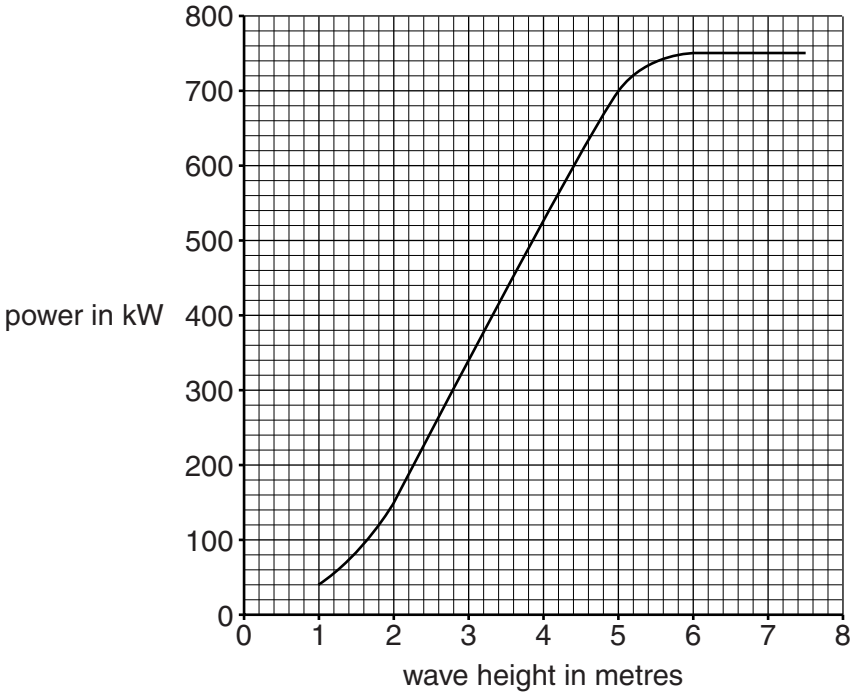
..... **[3]**

(c) The graph shows how the power produced by one energy converter depends on the height of the waves.



Use the graph to find the wave height which produces a power of 120 kW.

height = ... metres **[1]**

(d) Describe how the power output from the energy converter varies as wave height increases from 1 metre to 7 metres.

.....

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

[Total: 7]

2 The used fuel rods from nuclear power stations contain nuclear waste.

The used fuel rods give off gamma radiation.

(a) At first, used fuel rods are stored in pools of water approximately 12 metres deep.

The water keeps the fuel rods cool.

Which two statements, when taken together, provide another reason for using very deep pools of water?

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

Gamma radiation is ionising radiation.	☐
Gamma radiation is very penetrating.	☐
The activity is less under water.	☐
The radiation dissolves in the water.	☐

[1]

(b) Intermediate level nuclear waste should be disposed of safely as it may be dangerous for many thousands of years.

Here are some suggestions for the disposal of intermediate level nuclear waste.

1 Bury the waste deep underground.

2 Seal the waste up securely and drop it into the deepest parts of the ocean.

3 Send the waste into space in rockets so that it goes into the Sun.

The UK Government has decided to adopt method **1**.

Suggest reasons why methods **2** and **3** have been rejected.

Include ideas of feasibility and risk of each method in your answer.

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

[Total: 3]

3 Tritium is radioactive with a half-life of 12 years.

A sample of tritium has an activity of 800 counts per second.

Calculate the activity after 48 years.

Show your working.

activity = ... counts per second **[2]**

[Total: 2]

4 **(a)** Name **three** sources of background radiation.

1 .....

2 .....

3 ..... **[1]**

(b) Explain why it is not possible to avoid all risk from background radiation.

.....

.....

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

[Total: 2]

5 Scientists are not sure how life on Earth started.

They do agree about when it started and what the earliest living things evolved from.

(a) Complete the sentences about life on Earth.

(i) Scientists have evidence that life on Earth began approximately ..... million years ago. **[1]**

(ii) Scientists think that the first living cells developed from ..... that could copy themselves. **[1]**

(b) Charles Darwin suggested that evolution happens due to **natural selection**.

Darwin got some of his ideas by studying **selective breeding**.

Describe how selective breeding is

- **similar** to natural selection
- **different** from natural selection.

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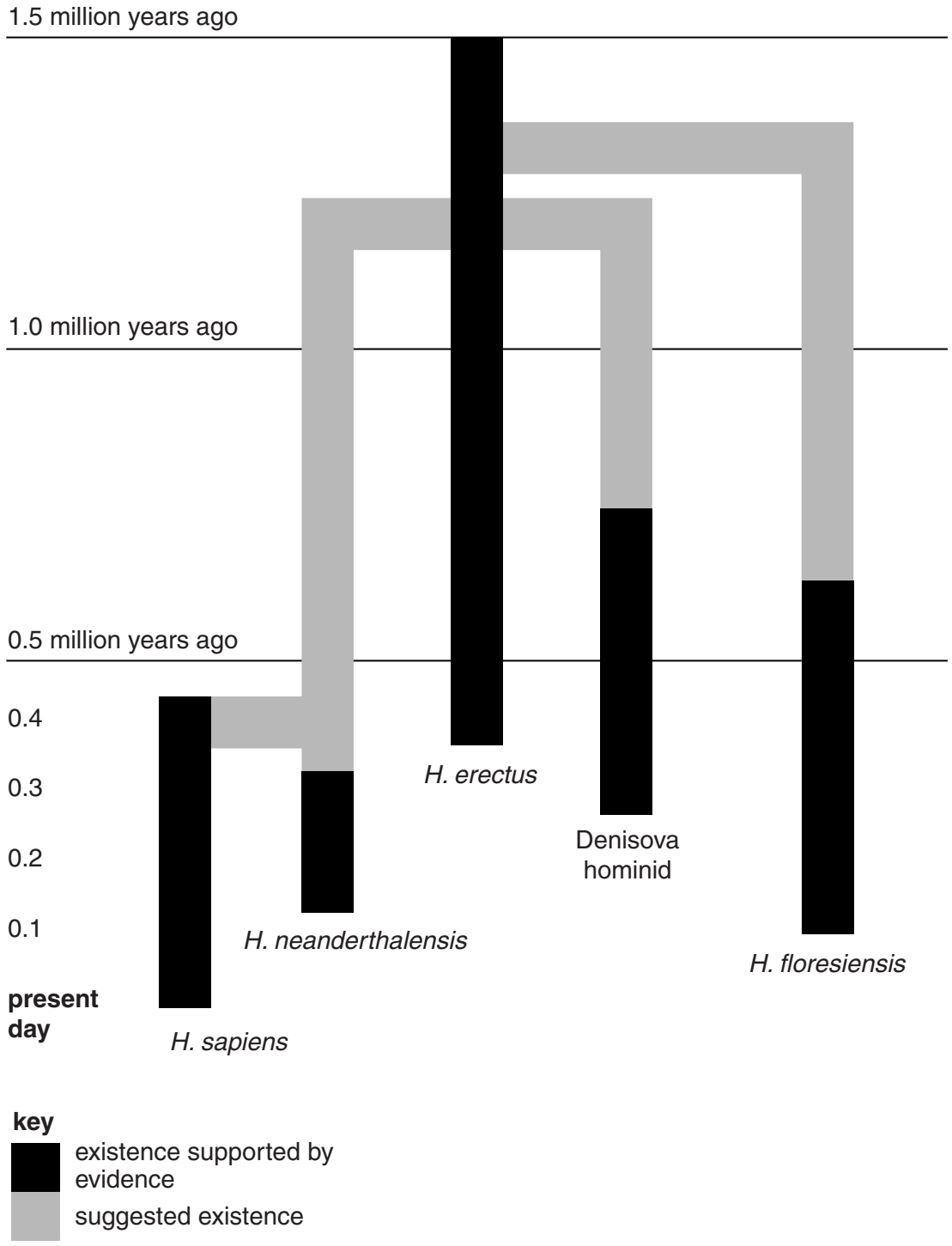
..... **[4]**

[Total: 6]

6 In the last 10 years evidence for two new species of hominid has been found.

These are called *H. floresiensis* and the Denisova hominid.

The diagram shows the likely evolution of hominids using the new evidence.



(a) Look at the diagram.

Put a (ring) around the correct word to complete each sentence.

Scientists have evidence that the number of hominid species alive 1.0 million years ago was **one** / **two** / **three** / **four** / **five**.

Scientists think that the number of hominid species alive 0.5 million years ago was **one** / **two** / **three** / **four** / **five**.

[2]

(b) Most scientists think that the common ancestor of hominids lived in Africa.

They think that hominids migrated out of Africa 1.5 million years ago.

Many scientists also think that there was a second migration about 60 000 years ago.

Some scientists think that there may have been several further migrations.

Scientists cannot agree about the further migrations.

Suggest **two** reasons why scientists may not agree about the migrations.

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.....

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

(c) The suggestion that hominids migrated out of Africa on more than two occasions is a new scientific explanation.

Put ticks (✓) in the boxes next to the **two** correct statements about a new scientific explanation.

A new explanation should…

… account for the data already known.	☐
… be easier to understand than existing explanations.	☐
… make use of modern technology.	☐
… allow testable predictions to be made.	☐
… test the predictions of earlier explanations.	☐

[2]

[Total: 6]

7 The sight of food and the smell of food are stimuli.

Read this information about how the body responds to these stimuli.

> When we see or smell food our salivary glands quickly produce saliva.
>
> At the same time the glands in the stomach rapidly produce gastric juices.
>
> Food that we have eaten stays in the stomach for four hours.
>
> Gastric juice is produced throughout the four hours.
>
> Saliva is produced in large quantities for only a short time.
>
> These processes are controlled by the nervous and hormonal communication systems.

Use the information to complete the table.

Put a tick (✓) in the correct box in each row.

	nervous system only	**hormonal system only**	**both nervous and hormonal systems**
secretion of saliva is controlled by…			
secretion of gastric juice is controlled by…			

[2]

[Total: 2]

8 This question is about chemicals added to food.

(a) The table shows E numbers for food additives.

E number	type of additive
E100 – E199	colourings
E200 – E299	preservatives
E300 – E399	antioxidants
E400 and above	emulsifiers and stabilisers

Draw a straight line from each **E number** to the **type** of additive and then to **how it works**.

E number	type	how it works
E211	antioxidant	stops food reacting with oxygen
E324	colouring	stops the growth of microbes
E401	emulsifier	allows oil and water to mix
	preservative	

[3]

(b) Scientific advisory committees carry out risk assessments on foods.

Why do they carry out these risk assessments?

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

To reduce the amount of additives in foods. ☐

To make sure the food tastes good. ☐

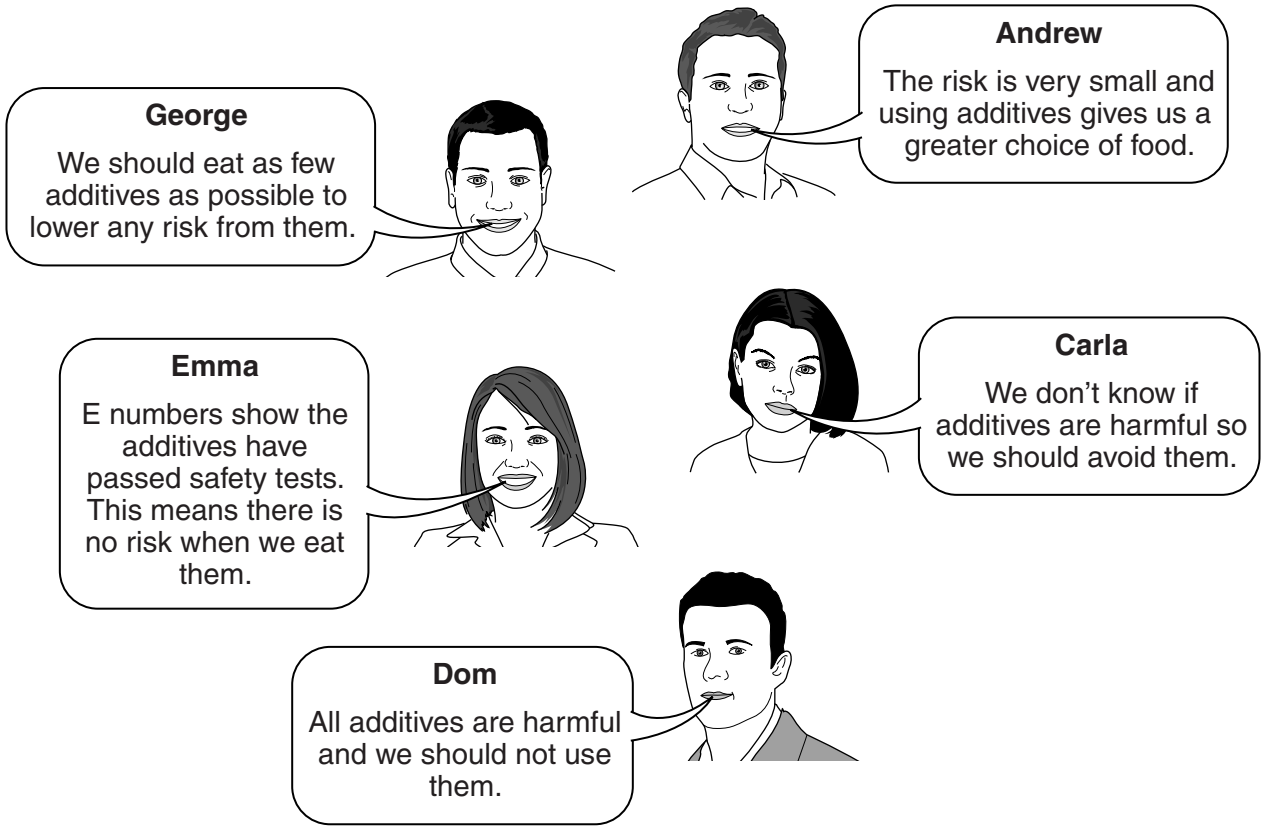
To check the foods are labelled correctly. ☐

To determine the safe levels of chemicals in food. ☐

[1]

(c) Some people worry that it may be risky to eat food that contains additives.

Five students talk about the benefits and risks of additives.



(i) Who is suggesting that the benefits of additives outweigh their risks?

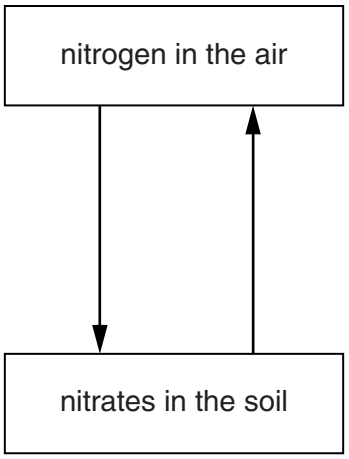
..... **[1]**

(ii) Which student is following the **precautionary principle**?

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

[Total: 6]

9 The diagram shows two stages of the nitrogen cycle.



(a) The diagram shows that

- nitrogen is changed to nitrates
- nitrates are changed to nitrogen.

For **each** change explain **one** way that this may happen.

.....

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

(b) Len is a farmer. He uses organic farming methods to grow wheat in his fields.

He uses manure to fertilise these fields.

Which **two** statements, when taken together, explain why Len needs to put manure on his soil?

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

Bacteria break down the protein in wheat when it dies. ☐

Plants take soluble nitrates from the soil to build proteins. ☐

Decay splits protein molecules into amino acids. ☐

Protein is taken away when wheat is harvested. ☐

Manure damages the structure of the soil. ☐

[2]

(c) Here are some statements about the environmental effects of different farming methods.

Which statement describes a **difference** between organic farming and intensive farming that shows why organic farming may be better for the environment than intensive farming?

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

Nitrogen is replaced in the soil.	☐
The number of wildlife habitats decreases.	☐
Non-renewable resources are used.	☐
Only fertilisers from recycled waste are used.	☐

[1]

(d) Kate always buys organic vegetables.

She thinks that they are safer to eat because they never contain harmful substances.

Explain to Kate why organically grown food could contain harmful substances.

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

[Total: 8]

END OF QUESTION PAPER

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