



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
International General Certificate of Secondary Education

CANDIDATE  
NAME

CENTRE  
NUMBER

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**TWENTY FIRST CENTURY SCIENCE**

**0608/03**

Paper 3

**May/June 2011**

**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 a pencil for any diagrams or graphs.

Do not use staples, paper clips, highlighters, glue or correction fluid.

**DO NOT WRITE IN ANY BARCODES.**

Answer **all** questions.

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.

**For Examiner's Use**

|              |  |
|--------------|--|
| <b>1</b>     |  |
| <b>2</b>     |  |
| <b>3</b>     |  |
| <b>4</b>     |  |
| <b>5</b>     |  |
| <b>6</b>     |  |
| <b>7</b>     |  |
| <b>8</b>     |  |
| <b>9</b>     |  |
| <b>Total</b> |  |

This document consists of **14** printed pages and **2** blank pages.



- 1 (a) The table shows some of the gases contained in a sample of air from a city centre.

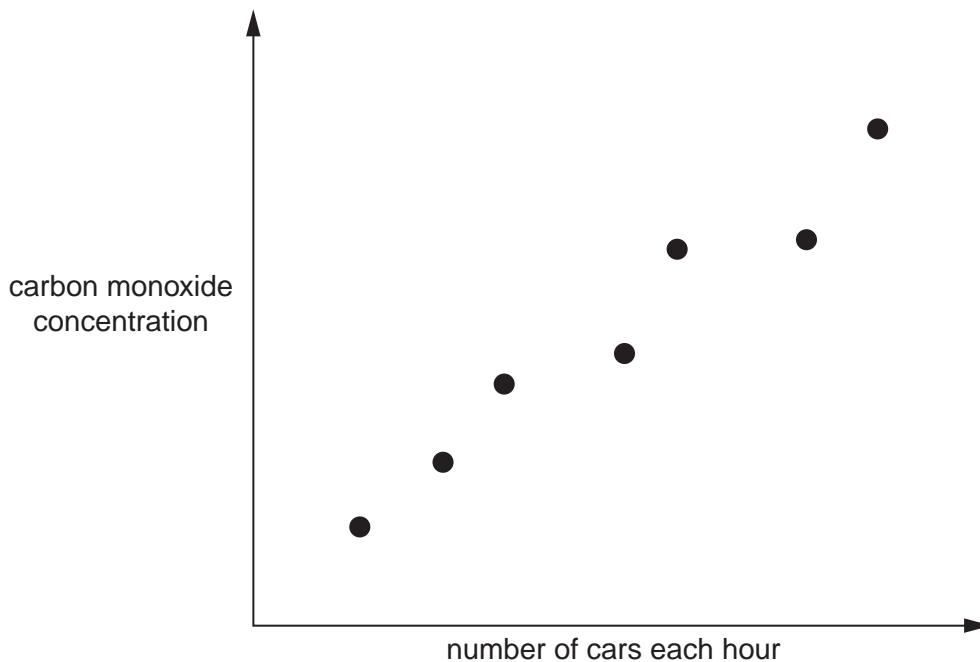
Put **two** ticks in the column to show which two of these gases are pollutants and give the main source of each pollutant gas.

| name of gas      | tick (✓) if a pollutant gas | main source of pollutant gas |
|------------------|-----------------------------|------------------------------|
| argon            |                             |                              |
| nitrogen         |                             |                              |
| nitrogen dioxide |                             |                              |
| oxygen           |                             |                              |
| sulfur dioxide   |                             |                              |

[4]

- (b) Carbon monoxide is a pollutant gas.

Scientists measure the number of cars passing along a city street each hour and the carbon monoxide concentration in the air. Their results are shown in the graph.



- (i) The graph shows a correlation.

Finish this sentence to describe this correlation.

As the number of cars ..... the carbon monoxide concentration .....

[1]

- (ii) The scientists suggest that the carbon monoxide in the air is caused by the cars passing along the street.

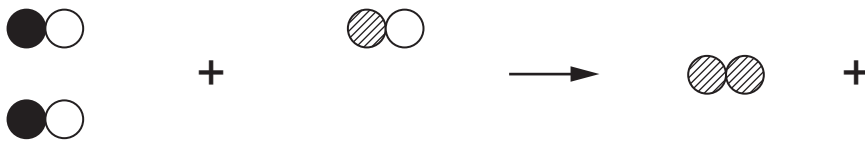
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What further evidence would support this suggestion?

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

- (c) In a catalytic converter carbon monoxide and nitrogen monoxide are converted to nitrogen and carbon dioxide.

Complete the diagram to show this reaction.



carbon monoxide

nitrogen monoxide

nitrogen

[2]

**[Total: 8]**

2 Scientists develop a new plasticiser.

Scientists test the hardness of samples of a polymer with and without the new plasticiser.

They measure the hardness of the polymer on a scale of 1 (very soft) to 100 (very hard).

Their results are shown in the table.

|                     | hardness |          |          |          |          |          |      |
|---------------------|----------|----------|----------|----------|----------|----------|------|
|                     | sample 1 | sample 2 | sample 3 | sample 4 | sample 5 | sample 6 | mean |
| with plasticiser    | 22       | 21       | 20       | 22       | 24       | 23       |      |
| without plasticiser | 77       | 76       | 87       | 73       | 74       | 75       | 75   |

(a) To get a best estimate of the hardness of each polymer the scientists work out the mean (average) of each set of results.

(i) When working out the mean for the polymer without plasticiser they miss out the value for sample 3.

Explain why.

.....

.....

..... [2]

(ii) Work out the mean of the results for the polymer with plasticiser.

mean for polymer with plasticiser = ..... [2]

(iii) What is the range of the results for the polymer with plasticiser?

range = ..... to ..... [1]

(b) Adding plasticiser to the polymer makes it less hard.

Suggest another modification which would make the polymer harder.

.....

..... [1]

[Total: 6]

3 Mary is shopping in a supermarket.

She wants to make sure that she does not eat any harmful chemicals.

(a) Describe how the food she buys could contain harmful chemicals from each of the following:

(i) pesticides,

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

(ii) additives,

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

(iii) moulds.

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

(b) The chance that additives in food could cause harm to the public is reduced by the action of scientific advisory committees.

Explain how.

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

(c) What can Mary do to avoid buying food that contains harmful chemicals?

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

**[Total: 6]**

4 This question is about planets of distant stars.

(a) A new space telescope called **Gaia** is due to be launched late in 2011. It will be used to look for planets of distant stars.

This telescope will be much better at finding these planets than a telescope on Earth.

This is because it is outside the Earth's atmosphere.

Suggest reasons why a telescope on the Earth's surface does **not** have such a clear view of the sky as a telescope in space.

1. ....  
.....

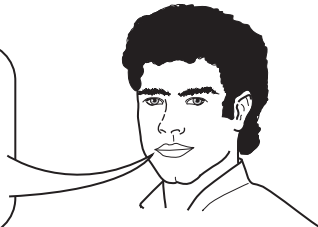
2. ....  
..... [2]

(b) Two scientists have different views about building and launching the Gaia telescope.



**Dr Chen**  
If we can see planets with atmospheres like our Earth, there may be life on them.

**Dr Hamid**  
We have many problems here on Earth. The money spent on the telescope could be better used solving these problems.



Use what these scientists have said to suggest one argument **for** building and launching the Gaia telescope, and one argument **against**.

argument for .....  
.....  
.....

argument against (include what the money should be used for)  
.....  
.....  
..... [2]

(c) Astronomers believe that stars with planets are common in the Universe.

Describe how planetary systems, like our solar system, were formed.

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

(d) Planets of distant stars that have been discovered so far are at least 50 light-years from Earth.

(i) What is meant by the term *light-year*?

..... [1]

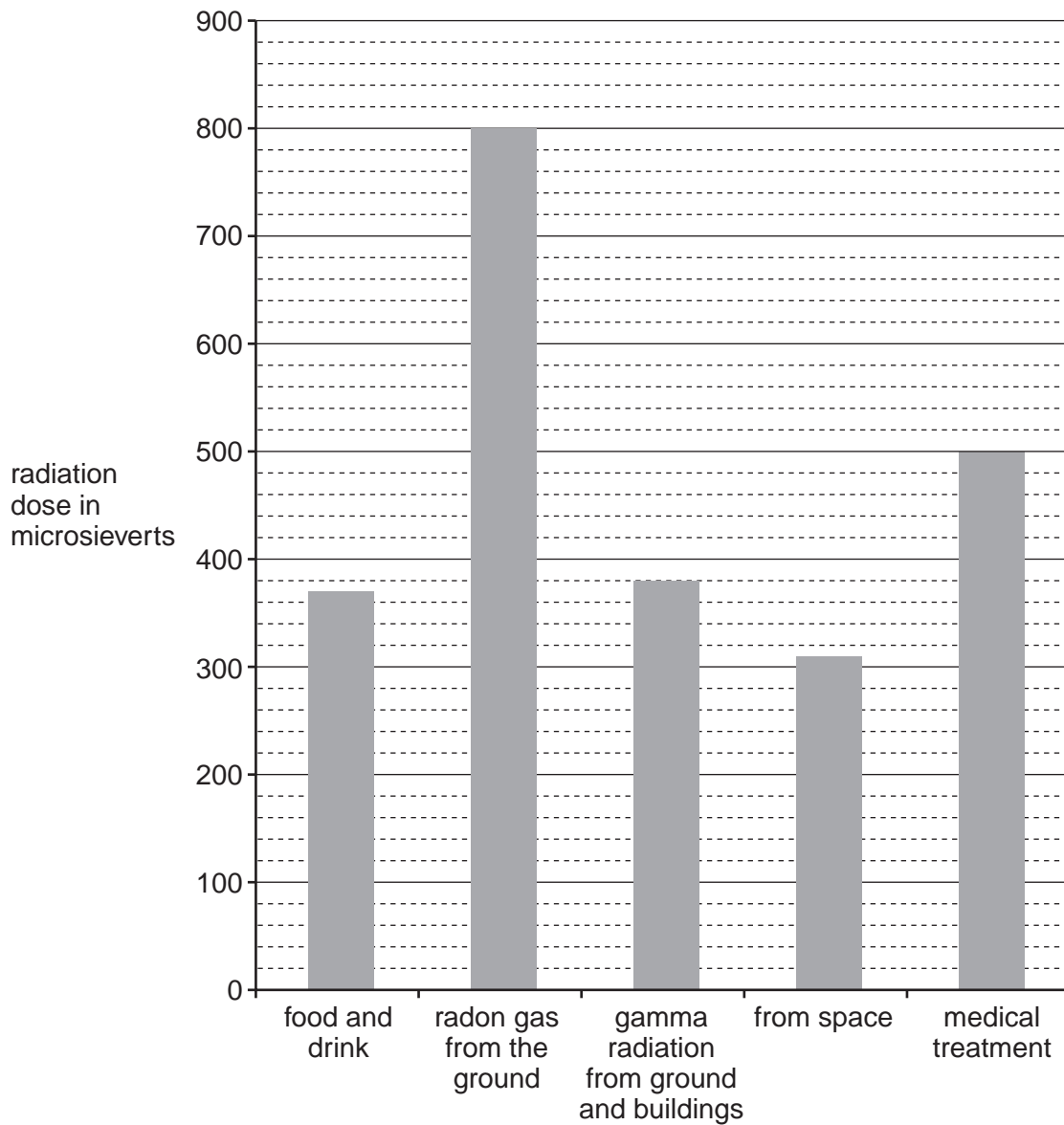
(ii) Why are distances to stars measured in light-years instead of kilometres?

..... [1]

**[Total: 8]**

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- 5 The bar chart shows the typical nuclear radiation dose received each year by someone living in Europe.



Use the bar chart to answer these questions:

- (a) Write down the gamma radiation dose received from the ground and buildings.

dose = ..... microsieverts [1]



(b) Calculate the total radiation dose received in a year by someone living in Europe.

Show your working.

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total radiation dose = ..... microsieverts [1]

(c) It has been said, 'The average person gets over half their yearly radiation dose from radon gas from the ground'.

Use the data in the bar chart to show whether or not this is true.

[2]

(d) One source of radiation gives out gamma radiation. Another source gives out alpha radiation.

Describe how you could find out which source is giving out alpha radiation.

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

[Total: 6]

6 This question is about ultraviolet radiation in sunlight.

(a) (i) Complete the following sentences choosing the correct words from the list.

**neutrons      photons      protons      radio waves      ultrasound      X-rays**

Ultraviolet radiation is ionising because it consists of large 'packets' of radiation.

These 'packets' of radiation are called .....

Another type of ionising radiation in the electromagnetic spectrum is

..... [2]

(ii) A layer of a chemical in the upper atmosphere absorbs ultraviolet radiation.

Write down the name of this chemical.

..... [1]

(b) On hot sunny days, many people like to sunbathe.

(i) Explain why ultraviolet radiation from sunlight can be dangerous.

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

(ii) Suggest one reason why people sunbathe, even though the ultraviolet radiation from sunlight can be dangerous.

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

(iii) Suggest **and** explain one way of protecting yourself from ultraviolet radiation when you are outdoors on a sunny day.

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

**[Total: 6]**

7 The gender of an embryo is determined by the sex chromosomes inherited from its parents.

(a) State the combination of sex chromosomes inherited to produce a male and a female embryo.

Male embryo: .....

Female embryo: .....

[2]

(b) Draw a straight line from each description to its correct term.

**description**

**term**

contains only one copy of each chromosome from each pair

allele

instructions for a cell that describe how to make proteins

chromosome

there are 23 pairs of these in each human body cell

gene

a different version of the same gene

nucleus

sex cell

[4]

- (c) George's grandfather and father both suffer from an inherited genetic condition that develops after the age of 40 years.

George is 26 years old.

He is trying to decide whether he should be screened to see if he has the gene for this inherited condition.

- (i) Suggest **two** reasons why George might want to be screened for the condition.

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

|  |                          |
|--|--------------------------|
| to see if his wife has the condition                     | <input type="checkbox"/> |
| to stop him getting the condition                        | <input type="checkbox"/> |
| to see if he will develop the condition in later life    | <input type="checkbox"/> |
| to see if he could pass the condition on to his children | <input type="checkbox"/> |
| so that doctors can cure the condition                   | <input type="checkbox"/> |

[2]

- (ii) Suggest **one** reason why George might **not** want to be screened for the condition.

.....

..... [1]

[Total: 9]

8 There are many different factors that increase the risk of suffering from heart disease.

(a) State two lifestyle factors that increase this risk.

1. ....

2. .... [2]

(b) Scientists studied the link between heart disease and air pollution. They found that the risk of heart disease increased in places where there was more air pollution.

(i) In their study, the scientists found a correlation.

State the factor and the outcome in this correlation.

factor .....

outcome ..... [2]

(ii) Describe another example of a correlation.

.....

..... [1]

(iii) The scientists want to publish an article about this study. Before the article is published, it is sent to other scientists.

What is the name given to this process?

..... [1]

(iv) Suggest **one** reason why the article is sent to other scientists.

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

|  |
|--|
| because all scientists are interested in the study   |
| because other scientists need to evaluate the study  |
| because the study is definitely correct              |
| because scientists like to show others their results |

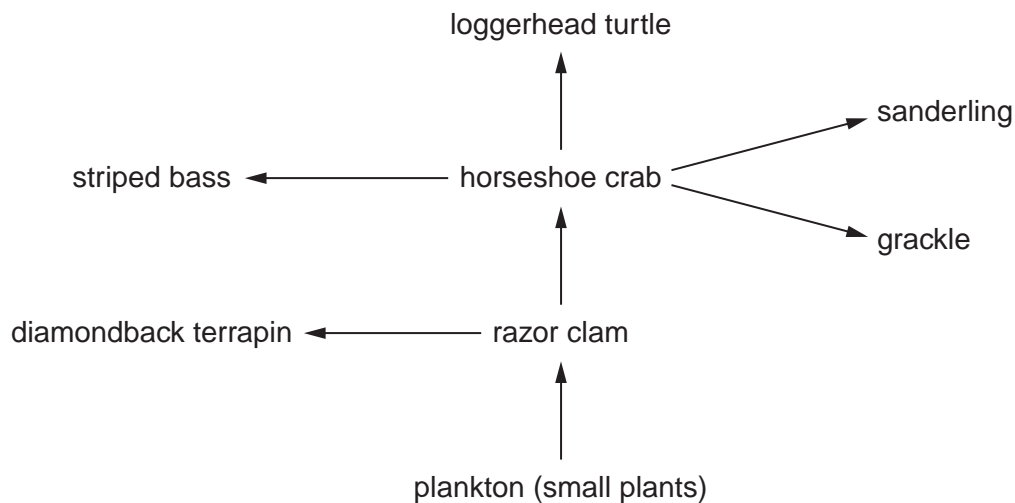
|  |
|--|
|  |
|  |
|  |
|  |

[1]

[Total: 7]

- 9 Look at the food web showing the feeding relationships between different animal and plant species living in the sea.

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- (a) All living organisms are dependent on the environment and other species for their survival.

Name the source of energy for all species in a food web.

..... [1]

- (b) Competition for food occurs between different species.

Name **two** species from the food web that compete with each other for razor clams.

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

- (c) The loggerhead turtle is an endangered species. This means it is in danger of becoming extinct.

- (i) What is meant by the term *extinct*?

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

- (ii) The number of horseshoe crabs increased. How will this affect the food web?

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

The number of striped bass would **(increase / decrease)**.

This is because there would be **(more / less)** food for the striped bass. [1]

**[Total: 4]**



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