UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

TWENTY FIRST CENTURY SCIENCE

0608/04

Paper 4

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.

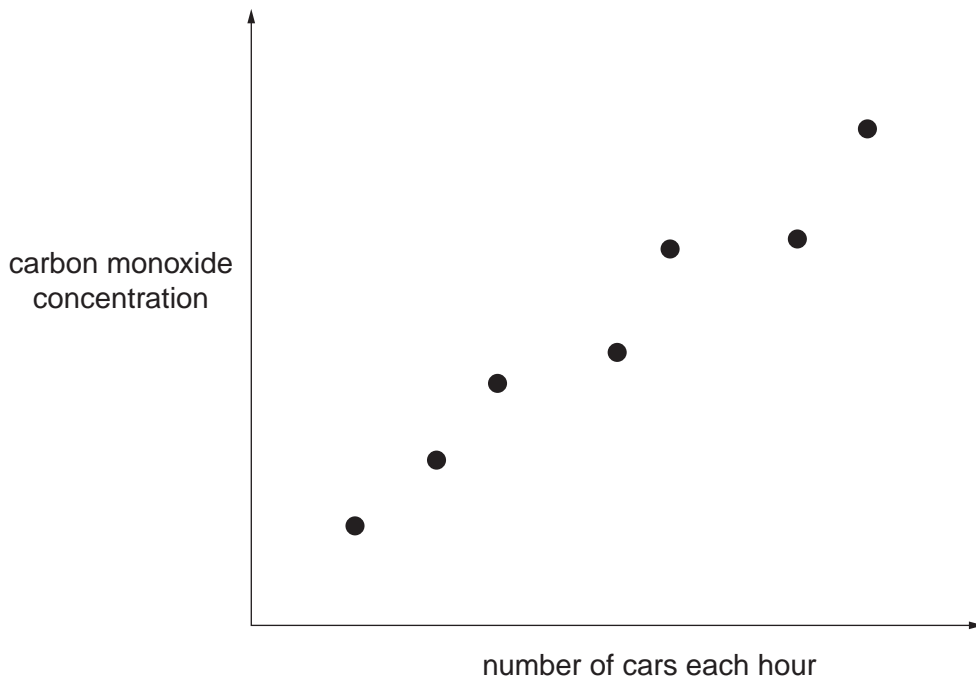| For Examiner's Use	
1	
2	
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5	
6	
7	
8	
9	
Total	

This document consists of **13** printed pages and **3** blank pages.

UNIVERSITY *of* **CAMBRIDGE**
International Examinations

[Turn over

1 **(a)** 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) What does this graph show?

....

....[1]

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

What further evidence would support this suggestion?

....

....

....[1]

(b) (i) In a catalytic converter nitrogen monoxide and carbon monoxide are conve... nitrogen and carbon dioxide.

Complete the diagram to show this reaction.

carbon monoxide   nitrogen monoxide   nitrogen
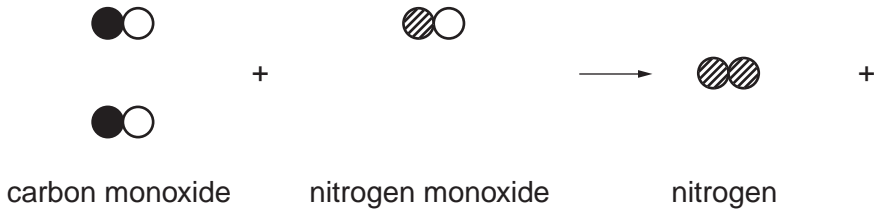
[2]

(ii) Write a balanced symbol equation for this reaction.

....[1]

(iii) Both nitrogen monoxide and carbon monoxide cause harm to people **directly**.

Explain how nitrogen monoxide also causes harm to people **indirectly**.

....

....

....

....[2]

[Total: 7]

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	22
without plasticiser	77	76	87	73	74	75	

(a) (i) What is the range of the results for the polymer without plasticiser that the scientists should use?

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

(ii) Use the results in this range to find a best estimate of the hardness of the polymer without plasticiser.

Show your working.

best estimate = ...[2]

(b) There is a real difference between the hardness of the two polymers.

How do the results in the table show this?

....

....[1]

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

Suggest another modification which would make the polymer harder.

....

....[1]

(ii) Explain how this modification makes the polymer harder.

....

....

....[2]

[Total: 7]
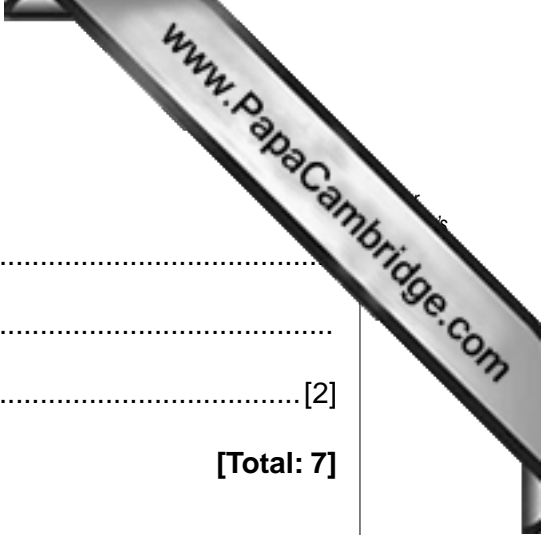
3 Processed food often contains additives.

Some people think that these additives may be harmful.

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

Explain how.

....

....

....

....[2]

(b) Synthetic pesticides sprayed onto crops may leave harmful residues.

Farmers using organic methods do not use pesticides.

However, organically grown food cannot be guaranteed to be completely safe from pesticide residues.

Suggest why.

....

....

....

....[2]

(c) Even food that has no additives or pesticide residue may contain harmful chemicals.

Describe **two** ways in which these harmful chemicals can be formed in food.

....

....

....

....

....

....[2]

[Total: 6]

4 This question is about planets of distant stars.

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

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

....

....

....[2]

(b) 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) Our Moon is about **one light-second** away from the Earth.

What is the distance from the Earth to the Moon in kilometres?

distance = ... km [1]

(c) 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.

(i) Explain why a space telescope will be better at finding planets of distant stars than a telescope of the same size on Earth.

....

....

....[2]

(ii) Some scientists support building and launching the Gaia telescope, but other scientists think the money would be better spent in other ways.

Suggest one argument **for** building and launching the Gaia telescope, and one argument **against**.

argument for ....

....

....

argument against ....

....

....[2]

[Total: 8]

5 The ozone layer, high in the Earth's atmosphere, protects us from the effects of ultraviolet radiation from the Sun.

(a) (i) Ultraviolet radiation is dangerous because it is an ionising radiation.

Name **two** other types of ionising radiation in the electromagnetic spectrum.

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

(ii) Explain why ionising radiation is harmful to living things.

....

....

....

....[2]

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

Suggest reasons why they sunbathe, even though they know that the ultraviolet radiation in sunlight can be dangerous.

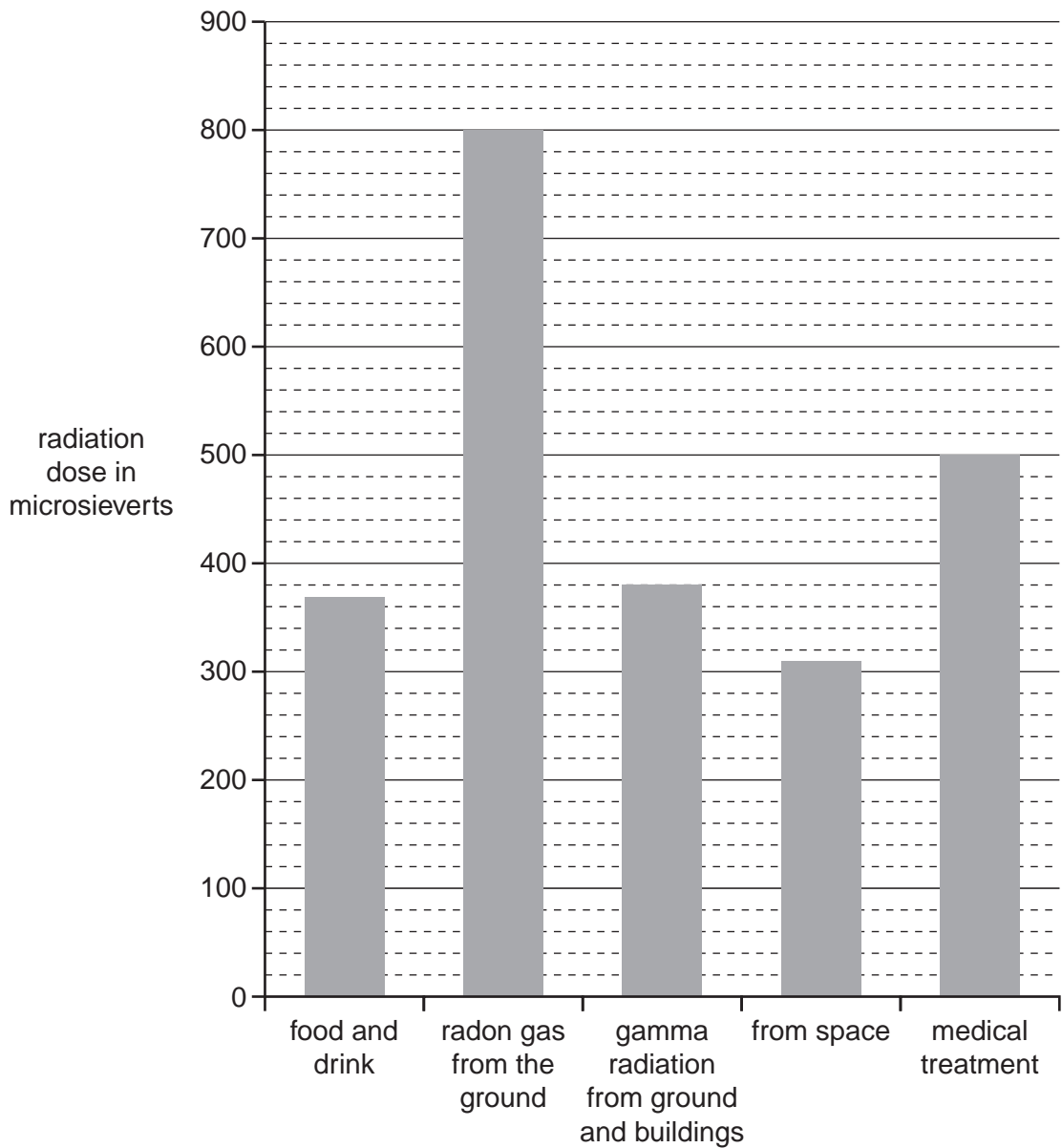Use ideas of **risk** and **benefit** in your answer.

....

....

....

....[2]

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

....

....

....[1]

[Total: 6]

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Please turn over for Question 6.

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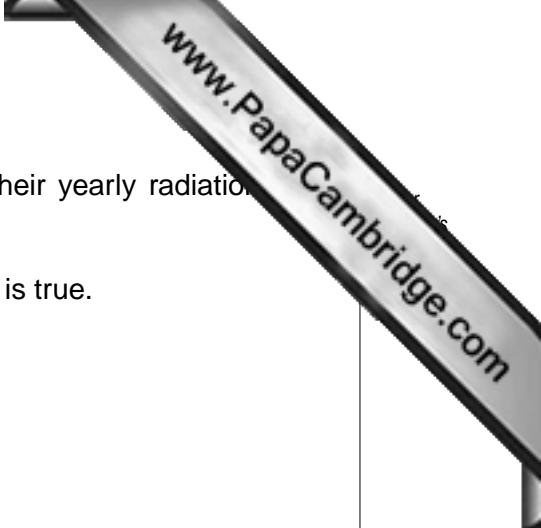

(a) Use the bar chart to answer these questions:

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

Show your working.

total radiation dose = ... microsieverts [1]

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

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

[2]

(iii) Crew on aircraft fly frequently at high altitude, and each receives 1600 microsieverts more per year than someone on the ground.

Calculate the percentage of their total dose that they receive from flying.

Show your working.

percentage of dose due to flying = ... % [1]

(b) The radiation received from radon gas from the ground is due to alpha radiation. This is given out by heavy radon gas which is breathed in.
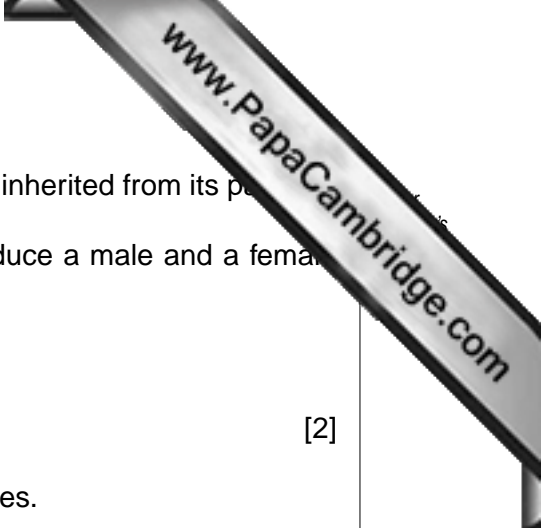
The risk to the average European from radon gas from the ground is much more than that from gamma radiation from the ground and buildings.

Use the properties of alpha and gamma radiation to explain why.

....

....

....

....[2]

[Total: 6]

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

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

    male embryo ....

    female embryo ....   [2]

(b) Gender is controlled by a gene on one of the sex chromosomes.

    Describe the specific role of that gene.

    ....

    ....

    ....[2]

(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 asked to complete a medical questionnaire by his
    employer.

    Give **two** reasons why George may not want his employer to know about the genetic
    condition in his family.

    ....

    ....

    ....[2]

(d) George is trying to decide whether he should be screened to see if he has the gene for
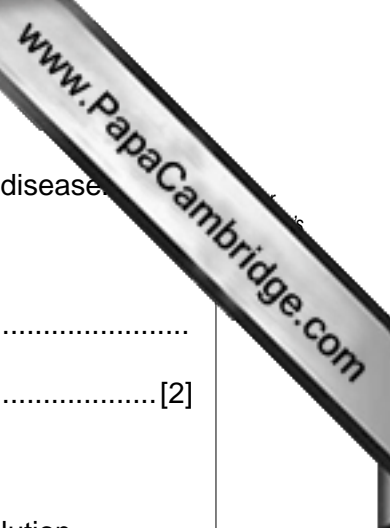   this inherited condition.

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

         ....

         ....

         ....[2]

    (ii) One reason why George might **not** want to be screened for the condition is that he
         does not want his employers to know the result.

         Suggest **another** reason why George might **not** want to be screened for the
         condition.

         ....

         ....[1]

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) Read these sentences.

    A   Scientists have found a link between heart disease and air pollution.

    B   The scientists studied 66 000 women over a period of nine years.

    C   1816 of the women suffered from heart disease during this time.

    D   These 1816 women lived in areas where the level of air pollution was high.

    E   The small pollution particles can enter the blood and affect the blood vessels.

    F   The risk of heart disease increases in places where there is more air pollution.

Choose from sentences **A**, **B**, **C**, **D**, **E** and **F** to answer the following questions

(i) Which sentence describes the correlation between air pollution and heart disease?

....[1]

(ii) Which two other sentences, when put together, describe the same correlation?

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

(iii) Which sentence suggests a causal link between air pollution and heart disease?

....[1]

(c) The study was carried out over a period of nine years.

Suggest why such a long period was used.

....

....[1]
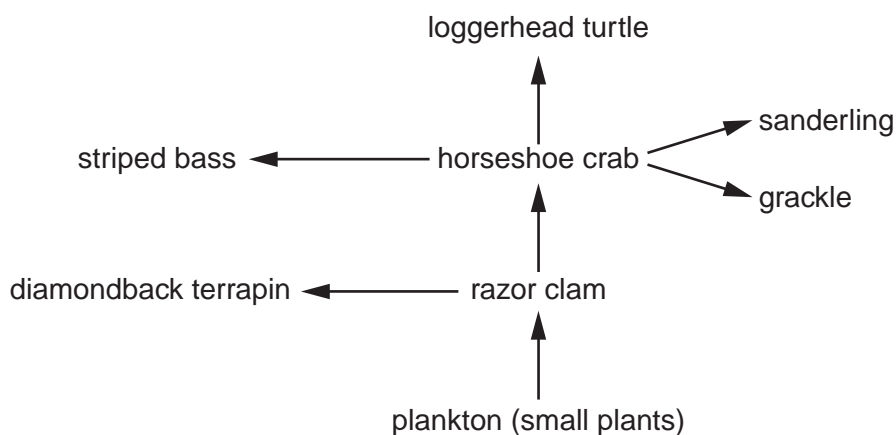
(d) Calculate the percentage of women in the study that suffered from heart disease.

Show your working.

percentage of women that suffered from heart disease = ... % [1]

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

loggerhead turtle

striped bass ← horseshoe crab → sanderling

horseshoe crab → grackle

diamondback terrapin ← razor clam

plankton (small plants)

(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.

Suggest and explain what would happen to the number of striped bass if the loggerhead turtle became extinct.

....

....

....[2]

[Total: 4]

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