



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
International General Certificate of Secondary Education

CANDIDATE  
NAME

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**TWENTY FIRST CENTURY SCIENCE**

**0608/03**

Paper 3

**May/June 2013**

**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.

Electronic calculators may be used.

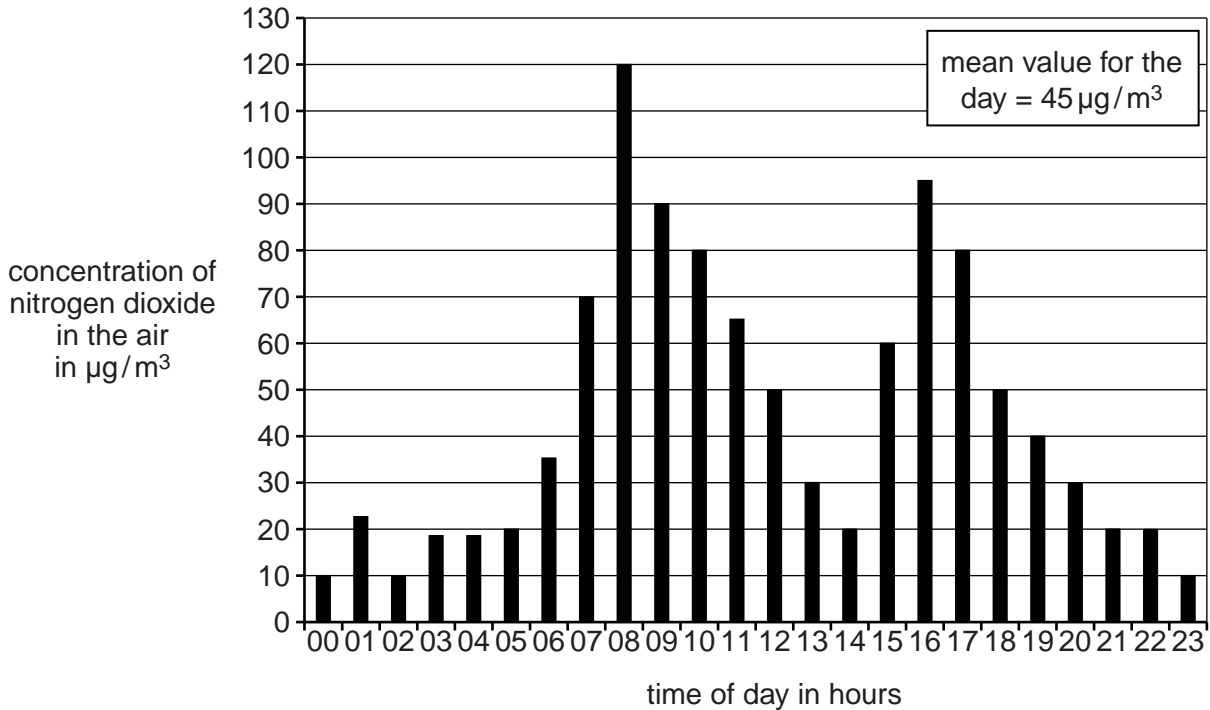
At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **16** printed pages.



1 Scientists measure the nitrogen dioxide concentration in the air in a city centre.  
They take their measurements over a period of 24 hours.  
Their results are shown in the bar chart.



(a) (i) What is the range of the measurements taken by the scientists on this day?  
range = from ..... to ..... µg/m<sup>3</sup> [1]

(ii) The nitrogen dioxide concentration reaches two peak levels during the day.  
At what times does it reach these peak levels?  
1 ..... hours  
2 ..... hours [1]

(iii) The main source of nitrogen dioxide is from cars driving in the town.  
Suggest why the concentration reaches two peak levels each day.  
.....  
.....  
..... [2]

(b) In a car engine, nitrogen and oxygen react to form nitrogen monoxide.  
What is the source of the nitrogen and oxygen that react in a car engine?  
..... [1]

(c) Cars release other pollutant gases into the air.

Name **one** of these gases.

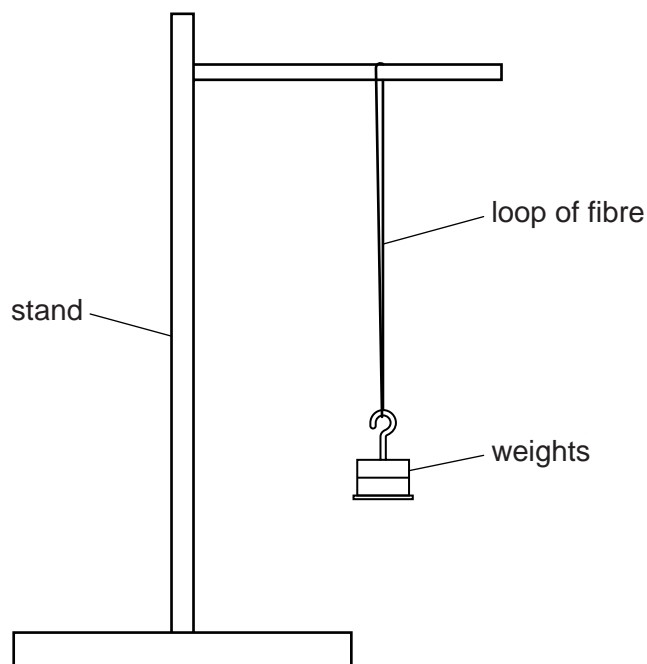
..... [1]

[Total: 6]

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- 2 Fibres made from a new polymer are tested using the apparatus shown below.

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Weights are added until the fibre breaks. The length of the loop of fibre just before it breaks is measured and the amount that the fibre has stretched is recorded. The test is then repeated with five more samples.

Results of these tests are shown in Table 1.

**Table 1**

sample number	1	2	3	4	5	6
stretch in mm	13	11	12	13	14	12

- (a) Calculate a best estimate for the stretch.

Show your working.

best estimate = ..... mm [2]

(b) A plasticiser is added to the new polymer.

Fibres of the plasticised polymer are then tested in the same way as the unplasticised polymer.

Results of these tests are shown in Table 2.

**Table 2**

sample number	1	2	3	4	5	6	mean
stretch in mm	21	20	22	21	23	22	21.5

(i) Describe how adding a plasticiser has changed the properties of the polymer.

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

(ii) Explain how the plasticiser caused this change in properties.

Use ideas about forces between molecules in your answer.

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

(c) A company wants to use the fibres of the new polymer to make jogging trousers.

Which of the two polymers, plasticised or unplasticised, should they choose?

Explain your answer.

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

[Total: 7]

3 (a) Complete these sentences about the digestion of food.

Use words from the list.

**amino acids      fatty acids      glucose      minerals      cellulose      vitamins**

During digestion large food molecules are broken down into small molecules.

Starch is broken down into .....

Protein is broken down into ..... [2]

(b) Eating too much of some food types can lead to health problems. For example, eating too much sugar can lead to diabetes.

Choose one **other** food type, and describe a health problem that it may cause if too much of this food type is eaten.

food type .....

health problem .....

..... [2]

(c) (i) The labels on many food packets give details of what is in the food.

A person could use this information to avoid the health problems that may be caused by eating too much of some food types.

Explain how.

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

(ii) Some people do not bother to read food labels and make no effort to control how much of each food type they eat.

Suggest why these people do not control what they eat.

Use ideas about risk in your answer.

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

[Total: 7]

4 (a) Asteroids, comets and planets are all part of our solar system.

(i) Write down one difference between asteroids and planets.

..... [1]

(ii) Write down one difference between asteroids and comets.

..... [1]

(b) (i) The dinosaurs died out about 65 million years ago. In 1980, scientists suggested that this happened when an asteroid crashed into the Earth. This idea was supported by asteroid dust found in rocks of that age.

Explain how an asteroid crashing in one place could affect dinosaurs in another part of the world.

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

(ii) In 1990, the remains of a large crater was discovered near Chicxulub, in Mexico. Evidence in the rocks suggested that this crater was about 65 million years old.



Explain why the discovery of this crater was important to the scientists developing the theory of extinction of dinosaurs.

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

[Total: 6]

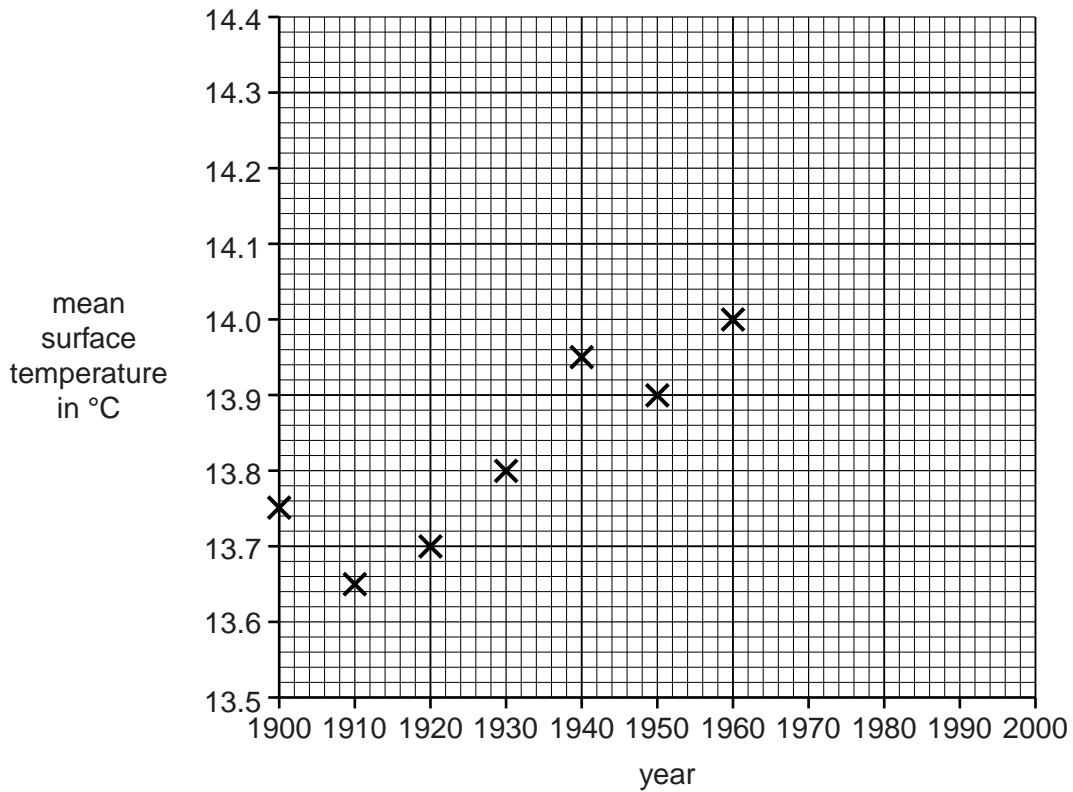
- 5 (a) The table below shows how the mean surface temperature of the Earth changed between 1900 and 2000.

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year	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000
mean surface temperature in °C	13.75	13.65	13.70	13.80	13.95	13.90	14.00	13.95	14.05	14.20	14.40

- (i) Seven points from the data in the table have been plotted on the grid below.

Plot the remaining points.



[2]

- (ii) Describe the trend shown by the data in the graph.

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



(b) Scientists are very concerned about the changes shown in the graph.

(i) What gas in the atmosphere do scientists think is causing these changes?

..... [1]

(ii) Give **two** causes of the increase in this gas in the atmosphere.

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

(iii) Bangladesh is a country with large areas of land which are not far above sea level.

Farmers in Bangladesh need rain in September so that their crops will grow.

Explain why changes in the world's climate could be a serious problem in Bangladesh.

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

[Total: 8]

6 Nuclear power stations produce radioactive waste.

(a) Radioactive waste gives off three different types of radiation.

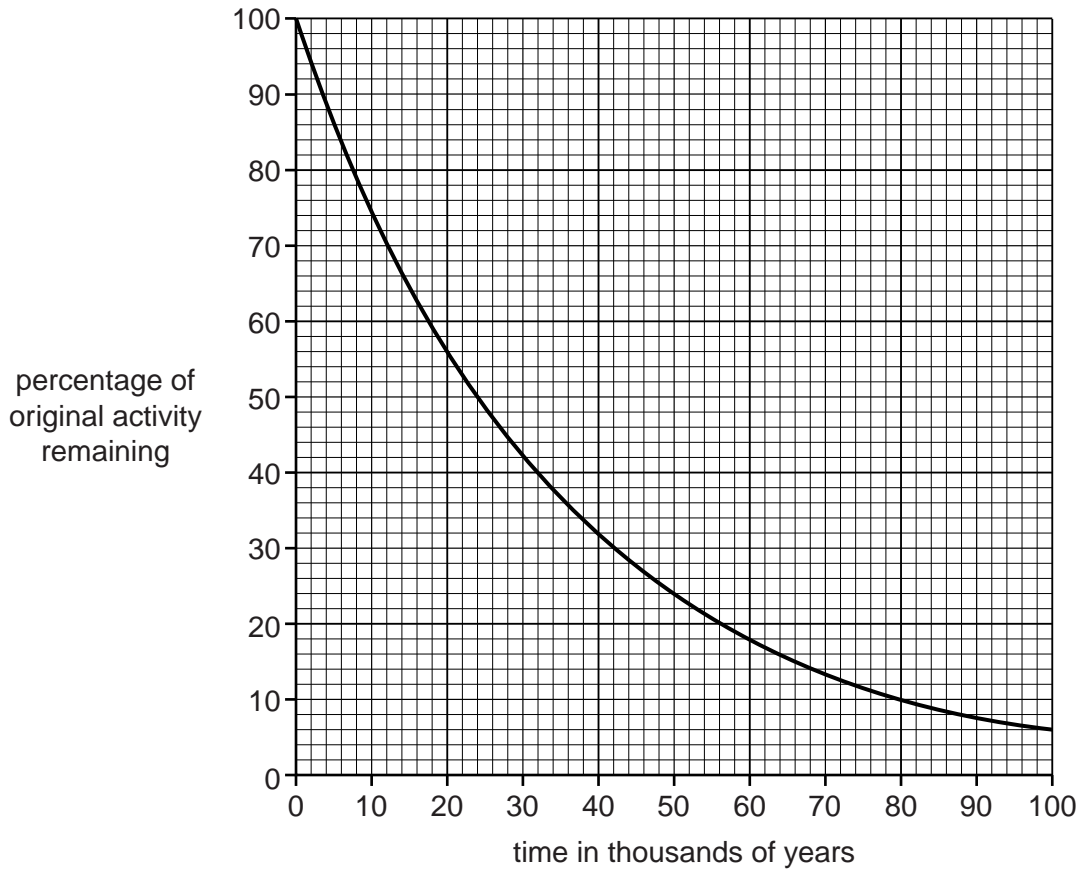
List these radiations below, in order of their penetrating power.

(least penetrating) ..... (most penetrating)

[2]

(b) Radioactive waste becomes less active with time.

The graph shows what happens to one radioactive material found in waste from power stations.



(i) After 80 thousand years, what percentage of the original activity remains?

percentage remaining = .....%

[1]

(ii) How long does it take for the activity to fall to half the original level?

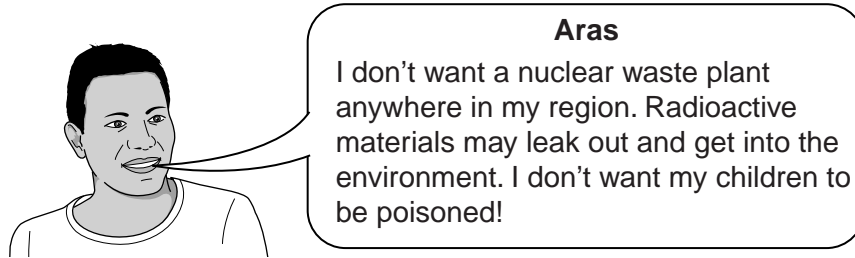
time = ..... thousand years

[1]

(c) Radioactive waste must be processed before disposal.

There are plans to build a new waste processing plant.

Some people who live nearby are very worried about the possible risks.



(i) Give one benefit of having the processing plant built in the region.

..... [1]

(ii) Give one way in which the risk could be kept as small as possible.

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

[Total: 6]

7 A newborn baby cannot produce antibodies.

(a) Write down the type of cell that produces antibodies.

..... [1]

(b) Antibodies are passed to the baby from its mother before the baby is born.

Suggest why this is important.

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

(c) The baby receives many different types of antibody from its mother.

Explain why.

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

(d) The baby begins to make its own antibodies when it is about 12 weeks old.

Many babies are vaccinated at this age.

(i) What is a vaccination?

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

(ii) Suggest why a baby is not usually vaccinated before 12 weeks.

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

(iii) Vaccinating babies is of great benefit to society as a whole.

Explain why.

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

(iv) Some parents still choose **not** to get their babies vaccinated.

Suggest one reason why.

.....

.....[1]

[Total: 8]

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8 Our bodies have communication systems that allow us to respond to changes in our environment.

Look at the list of responses.

- A reducing blood sugar levels after a meal
- B jumping out of the way of a moving car
- C blinking in bright sunshine
- D pulling a hand away from a hot object
- E developing sexual characteristics at puberty

(a) Some of these responses are nervous and some are hormonal.

Complete the table by writing each of the letters **A** to **E** in the correct column.

nervous	hormonal

[2]

(b) Write down **two** differences between nervous and hormonal communication systems.

.....

.....

.....

.....

.....

..... [2]

(c) In humans and other vertebrates, the nervous system is coordinated by the central nervous system.

(i) Write down the names of the two parts of the central nervous system.

1 .....

2 .....

[2]

(ii) The speed of nerve impulses is different in different animals.

Look at the table of data.

animal	speed of impulse in m/s	vertebrate or invertebrate
human	30.4	vertebrate
crab	6.4	invertebrate
frog	12.2	vertebrate
horse	18.3	vertebrate
lugworm	3.1	invertebrate

Write down a conclusion that can be made about the speed of impulses in vertebrate and invertebrate animals.

Use data in your answer to support your conclusion.

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

[Total: 8]

9 Read the article about stem cells.

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**First stem cell trial in stroke patient**

A British man has had stem cells injected into his brain to replace the cells damaged by a stroke. A stroke is a serious medical condition that occurs when the blood supply to part of the brain is cut off.

The stem cells used in this clinical trial were taken from embryos.

Many people support this step forward in the treatment of stroke patients. Others are worried about the ethical issues it raises.

(a) Explain why stem cells can be used to replace damaged cells.

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

(b) Stem cell therapy has the potential to save many lives. It may help to treat or cure some serious illnesses.

Despite this potential benefit of stem cell therapy, some people believe it should never be carried out.

Suggest two reasons why.

1 .....  
2 ..... [2]

[Total: 4]

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