Twenty First Century Science

PILOT
Examination Questions

GCSE Science June 2004

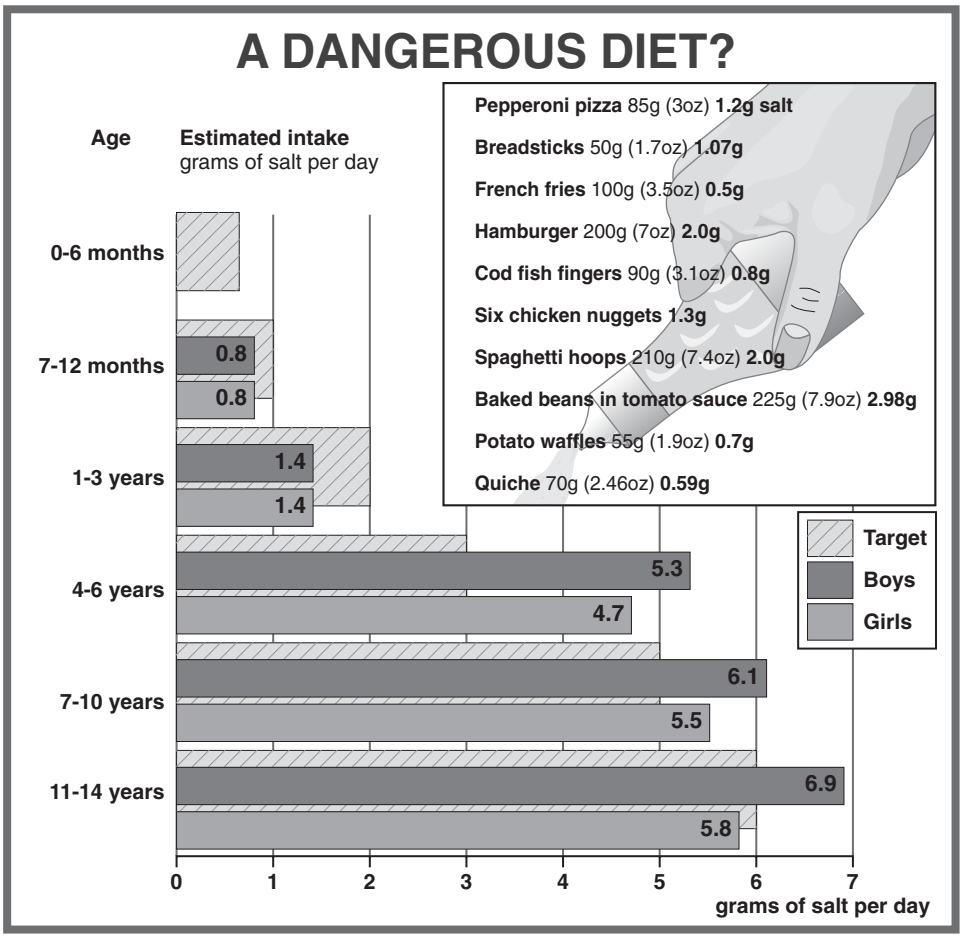
Food matters, Material choices, Radiation and life
(Higher Tier)

Please note:

- **These questions are not Sample Assessment Materials (SAMs) for the new OCR specification (for Sept 2006).**
- **The style of question varies from that used for the new specifications.**
- **For up to date SAMs see the OCR website: www.gcse-science.com**
- **These questions are provided for classroom use by teachers, to develop students' understanding of Ideas about Science.**
- **Some of the material covered in these questions is no longer part of the GCSE Science specification. Please check the specification document before using these questions.**

Answer **all** the questions.

1 A Public Health warning about the levels of salt in our diet was given in May 2003.



Use the information in the diagram to answer the following questions.

(a) John is 5 years old.

For his tea, he eats:

one 200g hamburger

225g baked beans.

In his tea, has he eaten more than the target (recommended) amount of salt for one day?

Work out the following amounts to help you find the answer.

total intake of salt in John's tea ..... g

recommended intake of salt for one day ..... grams per day

answer ..... [2]

(b) Most food companies add salt to improve the taste of food. It also acts as a preservative.

Too much salt in food increases the risk of heart disease, high blood pressure and strokes.

Explain why food companies,

- **may not want** to reduce the amount of salt in their foods

.....

.....

- **should be made** to reduce the amount of salt in their foods.

(One mark is for giving a clear, ordered answer.)

.....

.....

.....[4+1]

[Total: 7]

2 This question is about the risks associated with having a dental X-ray examination.

Read the information below and answer the questions.

The National Radiological Protection Board provides data about the risk of cancer being caused by ionising radiation.

> The risk of getting cancer at some time in your life is 1 in 3. Some of this risk is due to the background radiation we all receive.
>
> On a flight to Spain, a passenger is exposed to as much radiation as from 4 days' background radiation.
>
> A single dental X-ray is equivalent to two days' background radiation.
>
> A single dental X-ray increases the risk of getting cancer by less than 1 in one million.

A professor of public health has carried out research into the work of dentists. He has reported that dentists are carrying out unnecessary treatment to get more money.

Patients do not need a check up every six months and X-ray examinations are only required every five years.

Tooth decay happens so slowly that frequent X-rays are unnecessary.

The dentists' organisations disagree.

X-rays are only carried out when necessary. All patients are different. People at high risk of tooth decay should have X-rays every six months; those with a moderate risk every year and those in the low risk group every two years.

(a) What do X-rays do, in the body, that may cause cancer?

.....

.....[1]

(b) Compare the risk of having a dental X-ray with flying to Spain.

.....

.....[1]

(c) Why does the professor say that X-rays are only required every five years?

.....

.....[2]

(d) Suggest the **benefit** of giving an X-ray examination to a patient when the dentist thinks it is necessary.

.....

.....[1]

(e) Use your ideas about risk to explain why a patient should not have more X-rays than is necessary.

.....

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.....[2]

(f) The NRPB provided the information opposite for people concerned about having a dental X-ray examination.

Use your ideas about risk to suggest why the information included the risk of exposure to radiation from flying to Spain.

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.....[2]

[Total: 9]

3 Tom works as a scientist with a company that makes rubber products.

He carries out tests on two samples of rubber.

Sample **A** has been heated with chemicals. This is called vulcanised rubber.

Sample **B** has not been treated. This is unvulcanised rubber.

He tests the samples for the following

- the resistance to breaking when it is stretched (tensile strength)

  The higher the value, the less likely it is to break.

- hardness.

  The higher the value, the harder the rubber is.

Tom does each test five times.

The table shows Tom's results.

	tensile strength in MPa	hardness
sample **A** (vulcanised rubber)	33 34 33 34 36	43 38 45 65 40
sample **B** (unvulcanised rubber)	3 4 2 5 3	22 29 24 28 25

(a) (i) Work out the best estimate for the tensile strength of sample **A** by calculating an average value.

You **must** show how you work out your answer.

..... MPa [2]

(ii) Explain why Tom repeated each test and took an average.

.....

.....[2]

(iii) There are small differences in the repeat measurements.

Suggest **one** reason why.

.....[1]

(b) Look at Tom's results for the hardness of sample **A**.

Tom thinks that the best estimate for the hardness of sample A lies in the range 38 to 45.

Explain why.

.....

.....[2]

(c) The discovery of the process for vulcanising rubber was important in the manufacture of car tyres.

How do Tom's results confirm this?

.....

.....

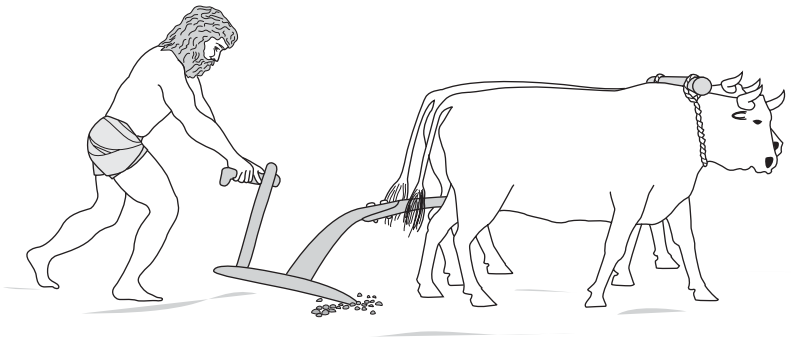
.....[2]

[Total: 9]

[Turn over

4 Thousands of years ago, farmers used a “slash and burn” method to grow crops.

Small areas of forest were burned and crops planted.



(a) Some farmers ploughed the ashes from the burned forest back into the soil. Some did not.

Crop yield was higher when ashes were ploughed back into the soil.

Suggest why.

.....

.....[1]

(b) After a few years of growing the same crops, the yield (amount harvested) fell.

The farmers then moved on to another area of forest.

Modern farmers are able to grow crops with high yields without moving to a new area.

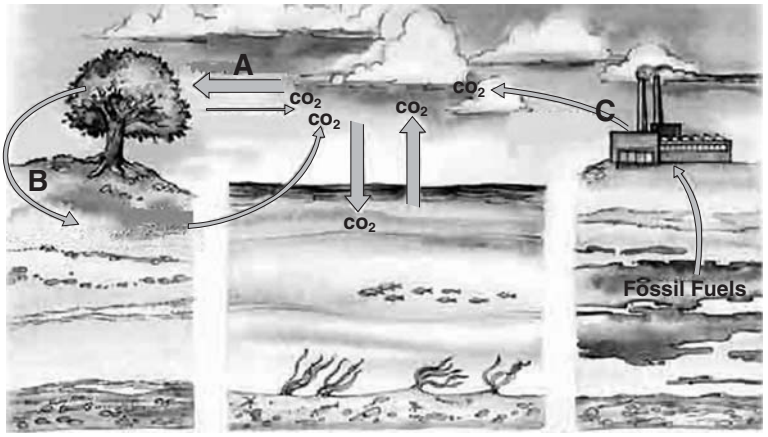
Suggest **two** reasons for this.

1 .....

2 .....[2]

[Total: 3]

5 The diagram shows part of the carbon cycle.



(a) The labels **A**, **B** and **C** on the diagram show three of the processes in the carbon cycle.

Describe the **three** processes shown **and** explain whether each process leads to an increase or decrease in the level of carbon dioxide in the atmosphere.

A .....

.....

.....

B .....

.....

.....

C .....

.....

.....[6]

(b) The level of carbon dioxide in the atmosphere has increased over the past 200 years. Explain why.

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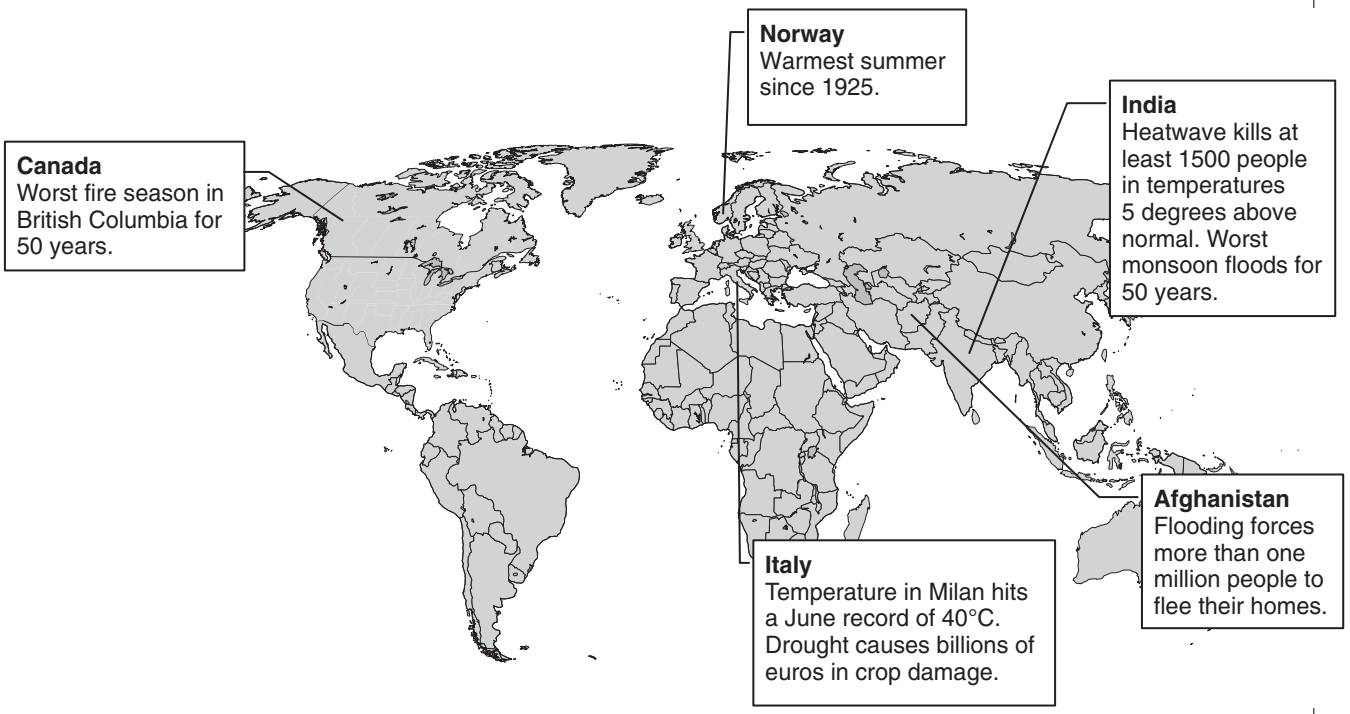
.....[2]

(c) The increase in carbon dioxide in the atmosphere has been blamed for global warming. In August 2003, temperatures across the World reached record levels. The map shows some of the effects.



(i) Choose **three** pieces of evidence from this map. Explain how each might convince a scientist that something unusual was happening.

1 .....

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.....

2 .....

.....

.....

3 .....

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.....[3]

(ii) Read this newspaper report.

Global warming may be speeding up, fears scientist

A climate scientist said that the high temperatures could be evidence of global warming.
He warned that several months' research would be needed to analyse data from around the world before scientists could say why the heatwaves are so intense this year.
"What we are seeing is absolutely unusual," said the scientist. "We know that global warming is happening, but most of us thought that we would be seeing hot spells like this in 20-30 years time. But it's happening now. Clearly extreme weather events will increase."

based on *The Guardian 6th August 2003*

The scientist says that the heatwave **could be** evidence of global warming.

Suggest **two** reasons why the scientist cannot be certain.

(One mark is for spelling, punctuation and grammar.)

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.....[2+1]

[Total: 14]

6 An American company has applied for permission to sell genetically modified (GM) bent grass.

Bent grass is very good in lawns but it cannot compete with fast growing weeds and is damaged by many weed killers.

The company's bent grass has been modified to make it resistant to their own brand of weed killer.

(a) (i) Suggest why many people are concerned about **this** use of genetic modification of plants.

.....

.....[1]

(ii) GM plants have been modified for different reasons.

Write down **two other** reasons for genetically modifying plants.

1 .....

2 .....[2]

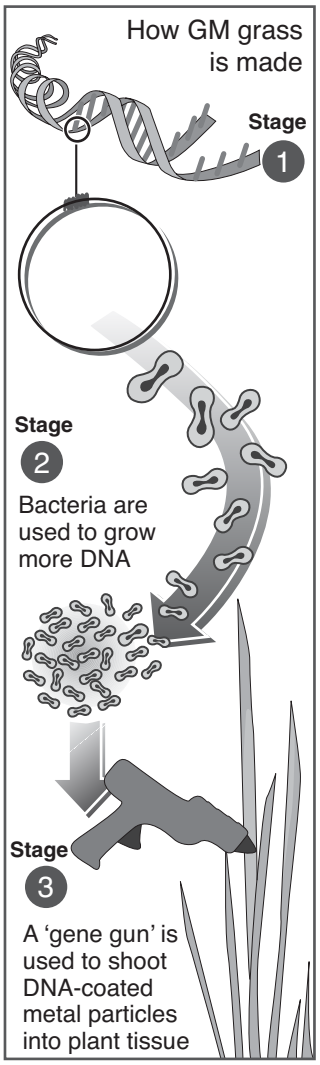
(b) The American company would need to apply for permission to sell the GM bent grass in Britain.

Suggest **one** reason for having such controls.

.....

.....[1]

(c) The main stages in producing GM grass are shown in the diagram.



(i) Describe what is happening at **Stage 1**.

.....

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.....

.....

.....[3]

(ii) Explain why this GM grass will be different from the natural bent grass.

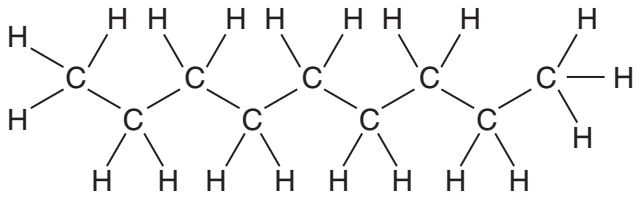
.....

.....[1]

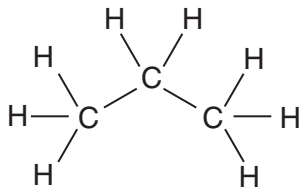
[Total: 8]

7 The following diagrams show the structures of three chemicals found in crude oil.

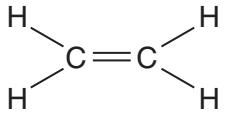
A



B



C



(a) What name is given to chemicals such as these that contain carbon and hydrogen atoms only?

.....[1]

(b) Chemical **C** can be *polymerised*.

Explain what this means.

.....

.....

.....[2]

(c) It is profitable for the petrochemical industry to refine crude oil.

Briefly explain why.

.....

.....

.....[2]

(d) Chemical **A** has a higher boiling point than chemical **B**.

Suggest why.

.....

.....

.....

.....[3]

(e) Life Cycle Assessments for the extraction of crude oil and its products include the energy inputs for oil extraction and refining.

Write down **two** other features of a Life Cycle Assessment for a product obtained from crude oil.

1 .....

.....

2 .....

.....[2]

[Total: 10]

END OF QUESTION PAPER