Twenty First Century Science

PILOT
Examination Questions

GCSE Science Jan 2005

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

Please note:

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

Answer **all** the questions.

1 Just over nine hundred 15-year olds replied to a survey about what they ate for breakfast.

(a) Some of the information collected is shown in this table.

how often do you eat breakfast cereals?	males		females	
	number	%	number	%
more than once a day	59	13.8	24	5.0
once a day	235	55.2	194	40.5
most days	51	12.0	76	15.9
once or twice weekly	43		66	13.8
less than once a week	26	6.1	68	14.2
never	12	2.8	51	10.6
total	426	100.0	479	100.0

(i) What percentage (%) of males eat breakfast cereals **once or twice weekly**? You must show how you work out your answer.

.....% [2]

(ii) The table shows differences in eating habits between males and females. Describe these differences.

.....

.....

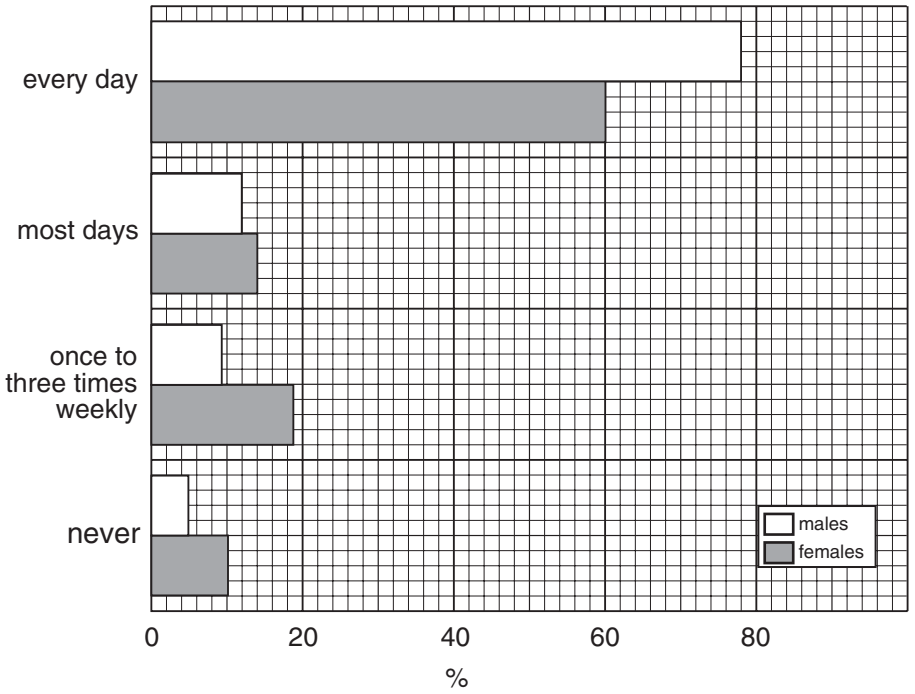
.....[2]

(iii) Finish this sentence by putting a (ring) around the correct word in the list.

Breakfast cereals are made from ..... .

animals **microbes** **plants** [1]

(b) This graph shows how often 15-year olds eat breakfast.



(i) What percentage (%) of males eat breakfast **every day**?

.....% [1]

(ii) Suggest why some people never eat breakfast.

.....

.....[1]

(iii) Explain why we **should** eat breakfast.

.....

.....

.....

.....[2]

(c) Breakfast cereals contain starch.
Describe the changes to starch as it is digested.

One mark is available for correct spelling, punctuation and grammar.

.....

.....

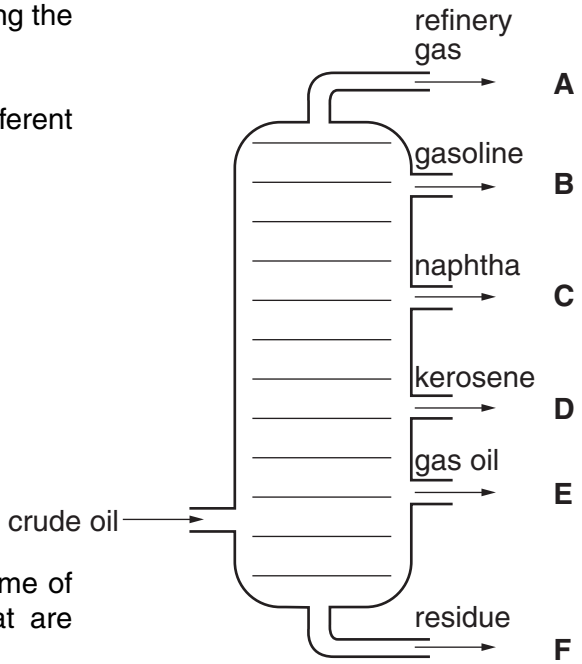
.....

.....[2 + 1]

[Total: 12]

2 The diagram shows the first stage in separating the different chemicals in crude oil.

Oil is heated and passed into a column. Different chemicals are collected at different levels.



(a) These boxes show information about some of the fractions **A**, **B**, **C**, **D**, **E** and **F** that are collected.

Beside each box, write the letter of the fraction that it relates to.

This fraction contains the smallest molecules.	

[1]

This fraction is used as a source of chemicals for making plastics, dyes, medicines, etc.	

[1]

This fraction can be used for tarring roads.	

[1]

(b) Most of the molecules in crude oil are hydrocarbons.

Which **two** elements are present in hydrocarbons?

.....[1]

(c) Explain why hydrocarbons with heavier molecules have higher boiling points.

Use ideas about chemical bonding in your answer.

.....

.....

.....[2]

(d) Every year, millions of tonnes of crude oil are used. Explain why it is important to keep the amount of oil used as small as possible.

.....

.....

.....[2]

[Total: 8]

BLANK PAGE

3 There has been discussion in the media about whether mobile phones are safe or not.

(a) Mobile phones use microwaves to transmit information. Microwaves are part of the family of radiations called the electromagnetic spectrum.
Fill in the gaps in this diagram of the electromagnetic spectrum.
Choose words from this list.

radio **sound** **transverse** **ultraviolet** **X-ray**

	microwave	infrared	light			gamma

[3]

(b) Read this article, then answer the questions which follow.

People protest about phone masts. But there are few complaints about phones themselves. Is this because people *choose* to use their phones: they don't often choose to have a mast at the end of the garden radiating energy all the time.

What about phones themselves: harmful or not?

The energy in sunlight striking your head is higher than that from a mobile phone.

Most physicists say, the only effect that phone radiation should have on the body is to warm it slightly. A mobile phone warms the closest part of the brain by only one tenth of a degree celsius. That's less than the natural variation in brain temperature throughout the day.

What is unknown is whether there are other effects at the same time, and whether they could cause long-term problems.

Research around the world

Researchers in Finland reported that low-level phone radiation can cause 'stress' reactions in cells isolated from human blood vessels. This might allow toxic substances to enter the brain.

It *might* even cause cancer. But it's a big leap from the test tube to the hospital bed. In 1990, there were 500,000 mobile phone users in Britain: now there are 40 million. Yet there has been no detectable overall rise in brain cancers.

Suggest **two** reasons why people in Britain are more concerned about the construction of the phone masts than they are about the risk of using a mobile phone.

1 .....

.....

2 .....

.....[2]

(c) The article discusses the heating effect of radiation from mobile phones.

(i) It is possible to reduce the heating effect your brain receives from your mobile phone.

Suggest how.

.....

.....[1]

(ii) What evidence in the article shows that the heating effects are small?

.....

.....[1]

(d) Researchers in Finland have shown that phone radiation can cause signs of stress to some human cells.

Why does the **Research around the world** section of the article say that, "it's a big leap from the test tube to the hospital bed"?

.....

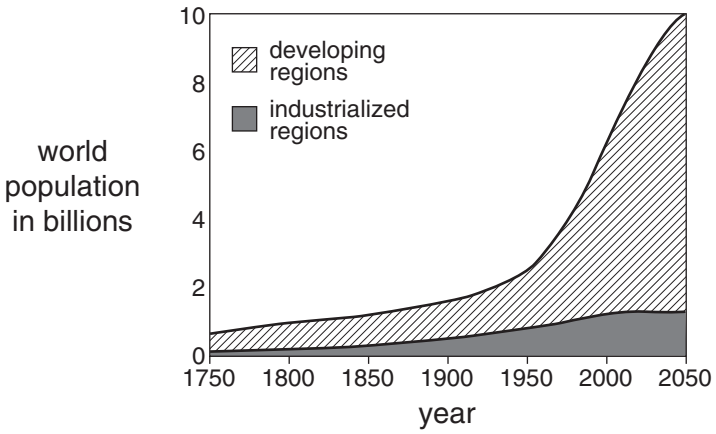
.....

.....

.....[2]

[Total: 9]

4 The graph shows how the number of people in the world has changed since 1750 and is expected to change by 2050.



(a) Describe the changes in world population growth as shown in this graph.

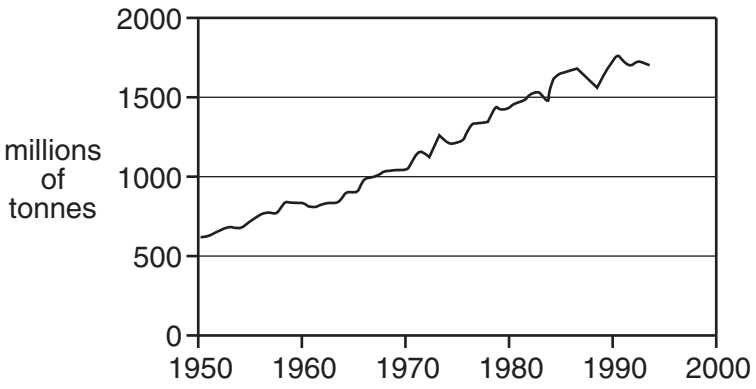
.....

.....

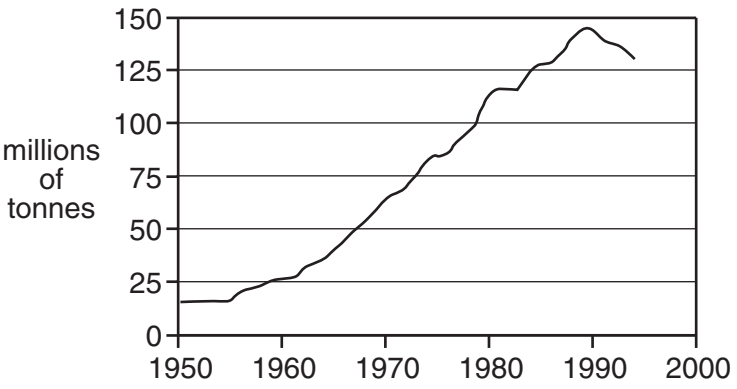
.....

.....[2]

(b) These graphs show world grain production and world fertilizer use, from 1950 until 1993.



world grain production, 1950-93



world fertilizer use, 1950-93

Suggest why there has been an increase in the **world fertilizer use**.

.....

.....

.....

.....[2]

(c) Most of the fertilizer used is synthetic (artificial).

(i) Describe **one advantage** and **one disadvantage** of using synthetic fertilizer compared to natural fertilizer.

advantage .....

.....

disadvantage .....

.....[2]

(ii) Describe **one** factor, other than fertilizer, that affects grain production.

.....

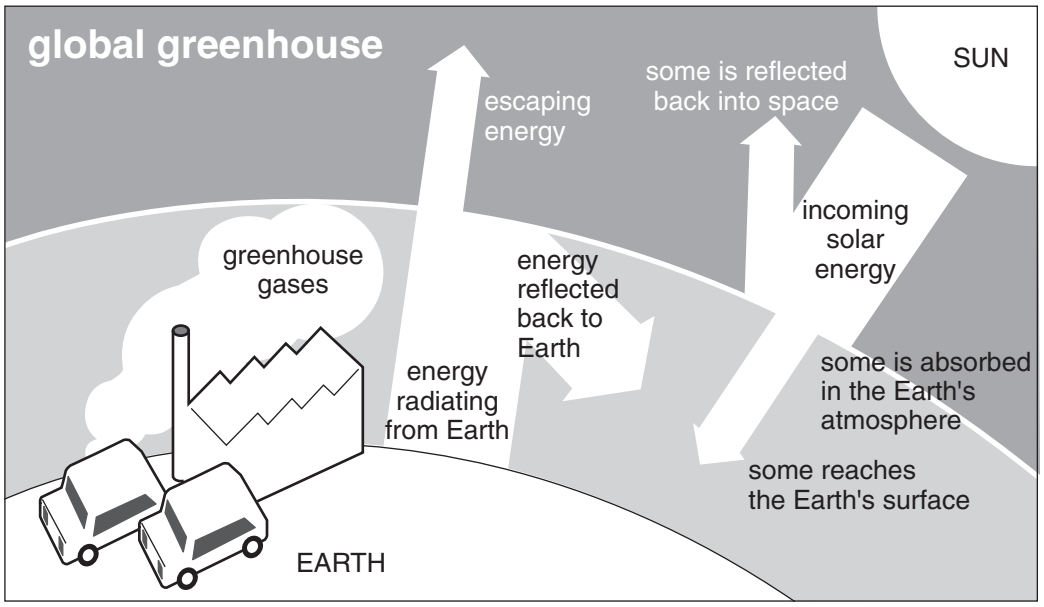
.....

.....

.....[2]

[Total: 8]

5 The diagram illustrates the greenhouse effect.



(a) Use words from the list to complete the sentences.

Words may be used once, more than once or not at all.

atmosphere

carbon dioxide

colder

glucose

ozone

radiation

warmer

water

The Earth is surrounded by a thin layer of atmosphere, which protects us from some of the Sun's ..... .

Some ultraviolet is absorbed by ..... in the upper atmosphere.

Some of the energy from the Sun is used by plants to make glucose from ..... and ..... in photosynthesis.

Some of the energy from the Sun is absorbed by the Earth and then re-radiated.

..... in the Earth's atmosphere absorbs some of this radiated energy, so the Earth and atmosphere become ..... .

This is called the greenhouse effect. [6]

(b) The greenhouse effect may result in climate change. Describe and explain **two different** ways in which living organisms could be affected by climate change.

One mark is available for a clear, ordered answer.

1 .....

.....

.....

.....

2 .....

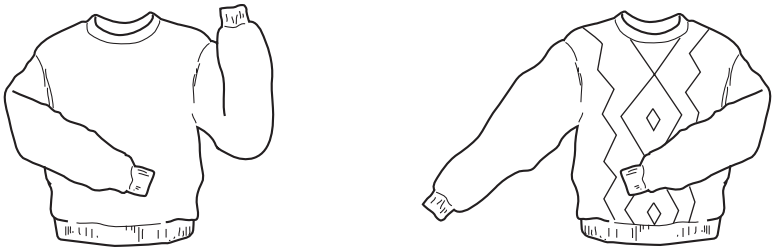
.....

.....

.....[4 + 1]

[Total: 11]

6 A clothing import company has been offered a new type of sweater.



The label says the sweaters are made from 70% wool; 20% polyester; 10% acrylic fibre.

(a) (i) Which one of these three types of fibre is a natural material?

.....[1]

(ii) Suggest why the sweaters were made from a **mixture** of materials, rather than just a single type of fibre.

.....

.....

.....[2]

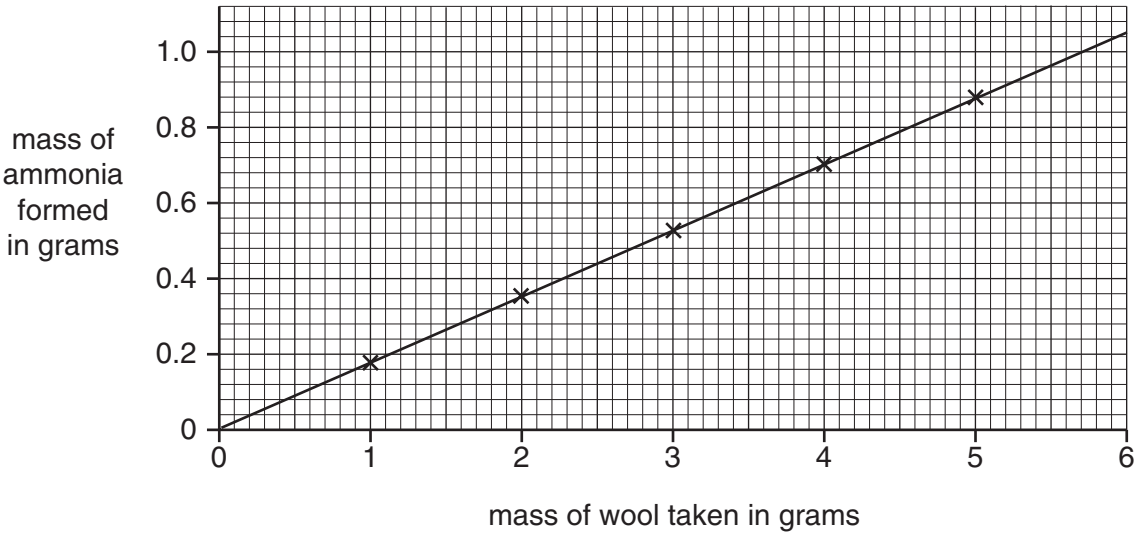
(b) The molecules of wool are made of many smaller molecules linked together.

Wool is a protein. What type of small molecules are linked together to form proteins?

.....[1]

(c) The company use a standard test to see how much wool the sweaters actually contain.

The graph shows how much ammonia is formed from different amounts of wool in the test.



(i) 0.4 g of ammonia was formed when a sample of material from a sweater was tested.

(I) Use the graph to help you find out what mass of wool was in the sample.

.....[1]

(II) The sample of sweater material was 5 g. What is the percentage of wool in the sweater material?

Answer: .....% [2]

(ii) Four more samples were taken from different sweaters in the batch, and each was tested.

The results for the percentage of wool in the samples were

43% 46% 48% 47%

(I) Explain how the evidence is improved by testing more than one sample.

.....

.....

.....[2]

(II) What is the range of values for the percentage of wool from these four samples?

.....[1]

(III) What do these results show about the information on the label on the sweaters?

.....

.....

.....[2]

[Total: 12]

END OF QUESTION PAPER