

**GENERAL CERTIFICATE OF SECONDARY EDUCATION  
TWENTY FIRST CENTURY SCIENCE  
SCIENCE A**

**A214/02**

Unit 4: Ideas in Context  
(Higher Tier)

Candidates answer on the question paper  
A calculator may be used for this paper

**OCR Supplied Materials:**

- Insert (inserted)

**Other Materials Required:**

- Pencil
- Ruler (cm/mm)

**Wednesday 10 June 2009  
Afternoon**

**Duration: 45 minutes**



Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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**MODIFIED LANGUAGE**

**INSTRUCTIONS TO CANDIDATES**

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.

**INFORMATION FOR CANDIDATES**

- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **40**.
-  Where you see this icon you will be awarded a mark for the quality of written communication in your answer.
- This document consists of **12** pages. Any blank pages are indicated.

Answer **all** the questions.

**This question is based on the article ‘Does homeopathy really work?’**

1 (a) Homeopathic doctors claim that their treatments will help people to get better.

Read the statements from Jane, Ranjit, Peter and Stella.

(i) Which **one** person makes a statement which does **not** support homeopathic doctors’ claims?

..... [1]

(ii) Which **one** person makes a statement which clearly supports homeopathic doctors’ claims?

..... [1]

(b) What has happened to Jane, Ranjit, Peter and Stella does not provide sufficient evidence to show whether or not homeopathy works.

Explain why, and suggest how better evidence could be obtained.

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

(c) Look at the dilution table.

If the original number of molecules was doubled from 1 000 000 000 to 2 000 000 000 molecules, how many molecules of the original substance are likely to be in the final dose of medicine?

Explain your answer.

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

- (d) (i) A new conventional medicine is tested before doctors are allowed to use it.

The table shows **what happens** at each **stage** of testing, and **why it is carried out**.

Complete the table.

stage	what happens	why it is carried out
1	medicine is tested on human cells	to check that it is suitable for further investigation
2	medicine is tested on live animals	to check how well the treatment works in whole animals
3	trials on healthy volunteers	
4	trials on a small group of people with the disease	

[2]

- (ii) Each stage of testing must show reliable data before scientists can move on to the next stage.

Explain what is meant by **reliable data**.

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

- (iii) The findings from the tests are published in a peer-reviewed journal.

How can the wider scientific community gain confidence in the published results?

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

- (iv) A conventional medicine may still cause unpleasant side-effects even after it has been trialled and approved.

Use ideas about risk to suggest why a patient may still take this medicine.

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

- (e) Placebos are sometimes used in trials, but doctors do not normally give placebos to their patients.

Explain why.

.....

.....

..... [2]

[Total: 13]

This question is based on the article ‘Carbon monoxide – the invisible killer’.

2 (a) Explain the mechanism by which carbon monoxide damages health.

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

(b) A politician says, ‘If we all use electrically powered cars, this will drastically reduce the risk to our health from carbon monoxide’.

Outline an argument to support this view. Use information from the article to help you.

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

(c) Information in the article shows that there is a correlation between the number of cars fitted with a catalytic converter and carbon monoxide concentrations.

(i) Describe the mechanism which gives a causal link between these two observations.

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

(ii) Look at the graph ‘Carbon monoxide emissions by source: 1970 to 2005 – United Kingdom’.

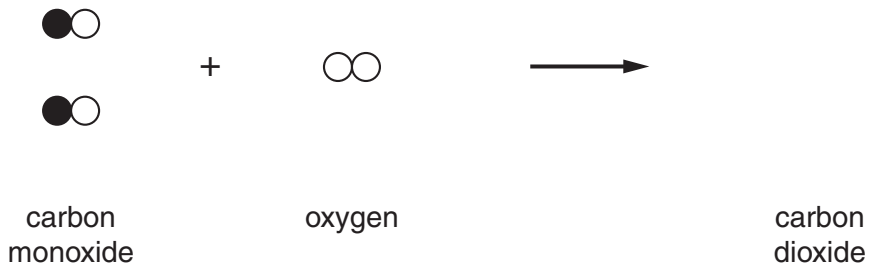
It shows that the carbon monoxide emission from houses has decreased.

Explain why.

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

(d) When carbon monoxide is released into the air it reacts with oxygen to produce carbon dioxide.

Complete the diagram to show this change.



[2]

(e) (i) Carbon monoxide released from cars is a health risk for people in cities.

Despite this, the number of cars used in most cities increases each year.

Use ideas of **risk** and **benefit** to explain why.

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

(ii) When making a risk assessment, you must take account of the probability of an event occurring and the consequences if it did.

Use this idea to discuss why people should have gas fires serviced regularly.

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

[Total: 13]

This question is based on the article ‘The risk from microwave radiation’.

3 (a) Michael has been reading these two extracts.

This is what he said:



**Michael**

If people feel ill near a wireless network, there must be a reason for it. They wouldn't be making it up! There has to be a correlation between their illness and the microwave radiation.

(i) Look at **Extract 1**. This extract does **not** give convincing evidence of a correlation between illness and microwave radiation.

Explain why.

.....

..... [1]

(ii) Describe a method scientists would use to investigate the health effects of microwave radiation.

.....

..... [1]

(iii) Give **one** example from everyday life of a correlation between a factor and an outcome.

Describe this correlation.

factor ..... outcome .....

correlation .....

..... [2]

(b) Debbie has also been reading these two extracts.

This is what she said:

**Debbie**  
You can't say that there's a correlation between illness and the microwave radiation unless you can find some reason for it.



Debbie is confusing the meaning of the term 'correlation' with the term 'cause'.

Explain the correct meanings of the terms **correlation** and **cause**.

You may give an example to help your explanation.

One mark is for correct spelling, punctuation and grammar.



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

(c) For most people, the dose received from a mobile phone handset is greater than the dose from the mobile phone transmitter mast.

Explain why.

You will need to use the data given in the first seven lines of the article, '**The risk from microwave radiation**'.

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



(d) **Extract 2** states the results of a study into radiosensitivity.

type of individual	number judging all the tests correctly	number in sample
radiosensitive	2	44
not radiosensitive	5	114

The extract states that, 'The percentage judging correctly was very similar in each case'.

Was the extract correct?

Support your answer with calculations.

Show your working clearly.

.....

.....

.....

.....

.....

.....

.....

..... [2]

(e) Salim is talking about the Essex University Study.



**Salim**

Money for the Essex University study was provided by the mobile phone industry.

They were biased! You would expect them to say that mobile phones are safe!

Use information from **Extract 2** to write a statement to persuade Salim that this study was well designed and not biased.

.....

.....

.....

.....

.....

.....

[3]

[Total: 14]

**END OF QUESTION PAPER**

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