

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

A214/02

Unit 4: Ideas in Context (Higher Tier)

**Friday 27 May 2011
Morning**

Duration: 45 minutes

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)



Candidate
forename

Candidate
surname

Centre number

Candidate number

INSTRUCTIONS TO CANDIDATES

- The insert will be found in the centre of this document.
- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- 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 **8** pages. Any blank pages are indicated.

Answer **all** the questions.

1 This question is based on the article ‘Are organic foods better for us?’.

(a) The article describes a study carried out for the Food Standards Agency (FSA).

(i) In 2009 the FSA made a study of the nutritional value of organically grown food.

What was the conclusion of this study?

.....
 [1]

(ii) There is more phosphorus in organic food. Phosphorus is a mineral needed in the diet.

How does the FSA explain that this extra phosphorus does not make organic food more nutritious?

.....
 [1]

(b) Farmers using intensive farming methods spray crops with pesticides to control insect pests.

(i) The FSA says it is safe to eat food from crops sprayed with pesticides.

Give two reasons to explain why.

1

 2

 [2]

(ii) Some people still prefer to buy organically grown vegetables because they are not sprayed with pesticides.

Use the **precautionary principle** to suggest why.

.....

 [2]

3

- (c) People bought more organic food each year up to 2007, but sales fell in 2008 and 2009.

Suggest an explanation for this fall.

.....

.....

.....

..... [2]

- (d) It has been suggested that all farmers in the UK should use organic methods.

Suggest why this may **not** be a practical idea.

.....

.....

.....

..... [2]

- (e) Look at the table of results showing vitamin C content in tomatoes.

- (i) The best estimate for the vitamin C content of the intensively grown tomatoes is 19.9mg/100g.

Show how this best estimate is calculated.

[2]

- (ii) The scientists concluded that there was not a real difference in the vitamin C content of tomatoes grown using the two farming methods.

Explain how the data shows that there is not a **real difference**.

.....

..... [1]

[Total: 13]

2 This question is based on the article 'Methane from the Arctic'.

- (a)**
- The article states that the carbon dioxide level changed from 280 ppm to 387 ppm.

This is an increase of 107 ppm, which is nearly 40%.

Calculate the actual percentage increase.

percentage increase = % **[2]**

- (b)**
- The article states that '...the consequences of continued global warming will be severe.'

Write down one consequence of continued global warming, and explain why it will have a severe effect.

consequence

why it will be severe

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

- (c) (i)**
- Explain how carbon dioxide and methane cause global warming.

Your answer should refer to

- the effect of greenhouse gases on radiation
- the source of the radiation.

.....

.....

.....

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

- (ii)**
- If global warming continues, the warmer atmosphere will hold more water vapour.

Predict the consequences of this.

.....

.....

.....

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

5

- (d) Professor Walter's work in Alaska has been replicated in northern Russia.

Suggest and explain a reason for replicating her experiments in another part of the Arctic.

.....

.....

..... [2]

- (e) The article suggests that methane from the lakes can be collected and used as a fuel.

Discuss the advantages and disadvantages of using Arctic methane as a fuel.



One mark is for considering both sides of the argument.

.....

.....

.....

.....

.....

..... [2+1]

- (f) Suggestions to keep the permafrost frozen involve reducing the snow cover.

Explain how reduced snow cover helps the permafrost to freeze harder in the winter.

.....

..... [1]

[Total: 14]

3 This question is based on the article “‘Pump head’ syndrome”.

Heart-lung machines are regularly used when heart surgery is carried out.

- (a) The scientists involved in the study in **Part A**, thought there was a **correlation** between heart-lung machines and ‘pump head’ syndrome.

Suggest **two** possible causal links between being on a heart-lung machine and having reduced brain function.

.....

.....

.....

..... [2]

- (b) At the end of **Part A**, the article states, ‘This was true even when the figures were adjusted for age.’

Why should the figures be adjusted for age?

.....

.....

..... [1]

- (c) Some scientists think that the data in **Part A** is flawed.

Use the information from **Part B** to suggest two reasons why the data is flawed.

1

2

[2]

- (d) **Part C** describes the study carried out by Ola Selnes.

152 patients had surgery using a heart-lung machine.

In the previous study 42% of patients developed ‘pump head’ syndrome.

If this result was repeated in Professor Selnes’ study, how many of the 152 patients would develop ‘pump head’ syndrome?

Show your working.

answer = [2]

(e) Different control groups were used in Professor Selnes' study.

(i) Describe one control group and state the number of people involved.

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

(ii) Explain why this control group was needed.

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

(f) Double-blind trials were not appropriate for the study in **Part C**.

Explain why.

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

(g) In Ola Selnes' study in **Part C**, the number of people in each group was quite different.

Suggest why the group sizes were different.

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

(h) Some people will experience reduced brain function even though they do not have heart disease.

Suggest one reason why.

..... [1]

[Total: 13]

END OF QUESTION PAPER

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