

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

A214/02

Unit 4: Ideas in Context (Higher Tier)

**Friday 28 May 2010
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	
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Centre Number						Candidate Number				
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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.
- 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).

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.

This question is based on the article ‘To cull or not to cull?’

1 (a) In the UK, it is common for herds of cattle without TB to become infected with the disease.

Use information from the article to explain how they may become infected.

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

(b) A vaccine is being developed to protect cattle against TB.

This vaccine may not completely get rid of TB in cattle.

Suggest two reasons why.

1
2 [2]

(c) Explain why, when a vaccine does become available, it will be necessary to vaccinate most of the cattle population.

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

(d) It is likely that a vaccine for badgers will be developed before a vaccine for cattle. Scientists do not think that vaccination will be very effective in controlling TB in the badger population.

Suggest **two** reasons why.

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

(e) Scientists wanted to find out if TB present in the badger population was being spread to cattle. They decided to collect some data.

In each high-infection area, the data was collected the same way.

However, the percentage of cattle infected with TB varied from area to area.

Suggest **one** reason why.

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

(f) In the article, different opinions are expressed about culling badgers.

Write down the correlation suggested by Stella's argument.

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

(g) Peter talks about a 20% increase in TB in cattle on neighbouring land when more badgers were culled.

This is an **average** value.

Suggest and explain why an average value was calculated.

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

(h) The article suggests that, following a cull, the surviving badgers roam over larger areas, and there is an increase of TB in cattle in those areas.

If this were the case, would it prove that badgers spread TB to cattle?

Explain your answer.

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

[Total: 13]

2 This question is based on the article ‘Cleaning up the Marshall Islands’.

(a) Radioactive waste emits **ionising** radiation.

Write down two things that may happen to living cells when ionising radiation strikes them.

- 1
- 2 [2]

(b) The United States government decided to clean up the Marshall Islands.

They removed soil from some of the most contaminated places, and replaced it with crushed coral.

(i) Suggest and explain one reason, apart from cost, why they did not remove **all** the soil from Rongelap and replace it with crushed coral.

-
-
-
- [2]

(ii) When a nuclear accident occurred in England in 1957, the clean-up that took place afterwards removed a much greater fraction of the spilt radioactive chemicals than happened in Rongelap.

Suggest **two** reasons why a more thorough clean-up was done in England compared with the Marshall Islands.

-
-
-
- [2]

- (c) Scientists used crushed coral to cover the ground that still contained some radioactive chemicals. They found that for every 6 cm of coral they added, the amount of gamma radiation went down by half.

Calculate the percentage of gamma radiation that would get through 18 cm of crushed coral. Show your working clearly.

answer % [2]

- (d) The main radioactive chemical risk to the Rongelap Islanders was caesium-137, which has a half-life of 30 years.

- (i) Explain why the amount of caesium-137 left in the ground in Rongelap goes down to half its value in about 9 years.

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

- (ii) Caesium-137 is chemically very similar to potassium.

Explain why this makes caesium-137 a high risk to Rongelap islanders.

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

- (e) Even though Rongelap Island was still radioactive until quite recently, many tourists go diving in the sea there.

Suggest why these people dive there even though there may be a risk from radiation.

One mark is for a clear explanation that considers both risks and benefits.



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

[Total: 14]

Turn over

3 This question is based on the article ‘Call to ban food colourings’.

Scientists at Southampton University carried out research on the effects of some food colourings on hyperactivity in children.

- (a) The scientists used two drinks containing different mixtures of food colourings and a preservative.

They also used a third drink, with no additives at all.

Explain why these different drinks were used.

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

- (b) Scientists have advised caution in applying results from this study to the whole UK population.

Use the article to state two reasons why.

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

- (c) The statement from the British Soft Drink Association suggests that some drinks manufacturers prefer to continue using the six food colourings.

Suggest why drinks manufacturers may want to continue using these food colourings.

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

(d) Some people say that food colourings should not be added to drinks.

Discuss whether this is a sensible idea.

In your answer, distinguish between what **could** be done and what **should** be done.

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

(e) There is evidence that some food colourings may cause hyperactivity in children. Some parents give their children drinks containing these additives.

Other parents do not allow their children to have drinks containing these food colourings.

(i) Explain how parents who do not allow their children to have drinks containing these food colourings are applying the **precautionary principle**.

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

(ii) It is impossible for any soft drink to be completely safe to drink.

Give **two** reasons why.

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

[Total: 13]

END OF QUESTION PAPER

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