

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

Unit 4 Ideas in Context

HIGHER TIER

THURSDAY 7 JUNE 2007

H A214/02

Morning
Time: 45 minutes

Calculators may be used.
Additional materials: Insert
Pencil
Ruler (cm/mm)



*
C
O
P
Y
T
4
0
2
1
5
*

Candidate
Name

Centre
Number

--	--	--	--	--

Candidate
Number

--	--	--	--

INSTRUCTIONS TO CANDIDATES

- Write your name, Centre Number and Candidate Number in the boxes above.
- Answer **all** the questions.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- Do **not** write in the bar code.
- Do **not** write outside the box bordering each page.
- **WRITE YOUR ANSWER TO EACH QUESTION IN THE SPACE PROVIDED. ANSWERS WRITTEN ELSEWHERE WILL NOT BE MARKED.**

INFORMATION FOR CANDIDATES

- The number of marks for each question is given in brackets [] at the end of each question or part question.
- The marks allocated and the spaces provided for your answers are a good indication of the length of answers required.

FOR EXAMINER'S USE		
Qu.	Max.	Mark
1	14	
2	13	
3	13	
TOTAL	40	

This document consists of **8** printed pages and an Insert.

Answer **all** the questions.

This question is based on the article ‘Nuclear waste: bury it and forget?’.

- 1 (a) The alarm at Sellafield makes a continuous beeping sound.
A reporter asks if the alarm is an example of use of the ALARA (as low as reasonably achievable) principle at Sellafield.

Write an answer for the reporter.

Your answer should describe what is meant by the ALARA principle and explain whether or not the alarm is an example of the principle.

.....

.....

.....

..... [2]

- (b) The article says, ‘This hell’s brew still emits 40 times a lethal dose of radiation.’
This statement is **not** very scientific.

- (i) Imagine you are a worker at Sellafield.

Write down **two** factors that would affect the dose you would receive from the radioactive sludge in the pipe.

1

.....

2

..... [2]

- (ii) Choose **one** of these factors and explain how it affects the dose.

factor

explanation

..... [1]

- (iii) At Sellafield, one safety feature is the alarm.
Write down **two** other safety features described in the article, that reduce the dose received by workers.

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

- (c) The waste contains plutonium.
The half-life of plutonium is 24 000 years.
The article says that after 250 000 years (about 10 half-lives) the plutonium will have degraded completely.

Use a calculation to help you explain why this statement is incorrect.

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

- (d) Explain why different levels of nuclear waste (high, intermediate and low) can be treated in different ways.

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

- (e) Choose **one** method of disposal for high-level waste suggested in the passage.

Give reasons for **and** against using the method.

Your answer should make clear the difference between what **can** be done (i.e. is technically feasible) and what **should** be done.

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

[Total: 14]

This question is based on the article 'Leading Scientist Fakes His Results'.

2 (a) (i) How were scientists around the world able to show that the data published by Professor Hwang had been made up?

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

(ii) Name **two** ways in which scientists report their findings to other scientists.

1

2 [2]

(iii) Professor Murdoch said 'When we come to publish anything, the validation will have to be more than 100 percent tight'.

Explain what Professor Murdoch means.

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

(iv) In Professor Hwang's research some of the eggs were donated by his junior research workers.

Why does the article state that this is unethical?

..... [1]

(v) If therapeutic cloning was legalised, the availability of human eggs could be a problem.

Suggest why.

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

- (b) (i) Human cloning has been banned by the Human Fertilisation and Embryology Authority (HFEA).

Suggest possible reasons for its decision.

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

- (ii) Some members of the HFEA are **not** scientists.

Suggest why members of the HFEA are not all scientists.

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

- (c) Look at the diagram of therapeutic cloning.

- (i) The nucleus comes from one of the patient's cells.

Explain why it is important to use the patient's **own** cell nucleus.

..... [1]

- (ii) The stem cells are removed at the eight cell stage in the growth of the embryo.

Why can they not be used **after** this stage?

..... [1]

[Total: 13]

This question is based on the article 'Food Additives and Obesity'.

3 (a) (i) Look at the graph showing **relative risk for Type 2 diabetes**.

Why can this graph not be used to draw conclusions about the general population?

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

(ii) Explain why it may be difficult to obtain a reliable estimate of obesity data in a population.

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

(b) This question is about possible links between fructose and obesity.

(i) The article describes a study of rats carried out by one group of researchers. The conclusion was 'fructose may make you think you are hungry even when you do not need to eat'.

This statement is not a valid conclusion from the experiment carried out by the researchers.

Give a reason why it is **not** valid.

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

(ii) The article suggests that there may be **another** link between fructose and obesity.

What is the suggested link, and what evidence supports the link?

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

- (c) The Food Standards Agency has set an Acceptable Daily Intake (ADI) for aspartame. Many people drink sugar-free drinks containing aspartame. How can they use the ADI to decide how many drinks they might have each day?

One mark will be for a clear ordered answer.

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

- (d) Each of the three sweeteners, sucrose, fructose and aspartame, may cause a risk to health.

Which of these sweeteners would you choose to be used in food that you eat?

answer

How would you convince a friend that this is the healthiest choice?

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

[Total: 13]

END OF QUESTION PAPER

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (OCR) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

OCR is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.