

**Advanced Subsidiary GCE
SCIENCE**

G643

Case Study for Unit G643

Specimen Task

For use from September 2008 to June 2009.

All items required by teachers and candidates for this task are included in this pack.

INFORMATION FOR CANDIDATES

- Case Study: Ozone depletion.

INFORMATION FOR TEACHERS

- Mark scheme.
- Instructions for Teachers and Technicians.

SPECIMEN

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Candidates answer on separate writing paper

Additional Materials: Loose leaf writing paper

INSTRUCTIONS TO CANDIDATES

- Answer **all** parts of the task.

INFORMATION FOR CANDIDATES

- The total number of marks for this task is **15**.

ADVICE TO CANDIDATES

- Read each part carefully and make sure you know what you have to do before starting your answer.

FOR TEACHER'S USE

Part	Max.	Mark
A	5	
B	5	
C	5	
TOTAL	15	

This task consists of **5** printed pages and **1** blank page

Case Study

Ozone Depletion

The problem of the depletion of ozone layer in the upper atmosphere has only been realised in the past 40 years.

James Lovelock first noticed in Summer 1968 that there was a haziness in the distance as he looked across the beautiful Bantry Bay in Southern Ireland. He used an electron capture detector (ECD) that can detect minute amounts of pollutants to test his suspicions by detecting the amount of chlorofluorocarbons (CFCs) in the air. CFCs do not occur naturally but are made by industry. He found appreciable concentrations of CFCs in the atmosphere. At this time these compounds were believed to be harmless.

A few years later two US scientists – Rowland and Molina – discovered that CFCs are not as innocent as people believed. At ground level where the air is warm, CFCs have little or no effect on the surrounding atmosphere. However, at low temperatures, for example in the upper atmosphere, this is not the case.

Ten years later, near the South Pole, where temperatures can reach -35°C , a group of scientists from the British Antarctic Survey had been monitoring ozone levels in the upper atmosphere. The news was not good. The results that they published in the scientific journal *Nature* in 1985 showed there was a huge reduction in ozone around both Poles – this had resulted in an ozone hole – and it was growing bigger.

The photograph Fig. 1 shows an ozone hole in the upper atmosphere above the Antarctic.

Scientists have discovered that different compounds have different effects on the ozone layer. The table gives some data about these compounds.

name	formula	ozone depletion potential (relative to CFC11)	lifetime in years	uses
CFC11	CFCl_3	1.0	45	Refrigeration, air-conditioning, foams, dry cleaning
CFC12	CF_2Cl_2	1.0	100	
Halon 1301	CF_3Br	10	65	Firefighting
tetrachloromethane	CCl_4	35		Solvents
1,1,1-trichloroethane	$\text{C}_2\text{H}_3\text{Cl}_3$	0.1	4.8	

Scientists have developed safer alternatives to CFCs but not every country is currently using them.

Your task

To research:

- the work of James Lovelock, Mario J. Molina, F. Sherwood Rowland and other scientists in establishing the role of CFCs in the destruction of the ozone layer;
- the steps that must be taken to reverse this effect throughout the world.

In the report of your research you should:

- describe and explain the science which is relevant in this study;
- describe and explain any practical techniques used by scientists in obtaining relevant results or data for this research;
- process, analyse and explain the scientists' results and data, so that you can identify the main conclusions, patterns or trends in their research;
- consider any ethical issues relevant in the research;
- consider the reliability and validity of the results or data;
- list clearly the sources you have used in your research.

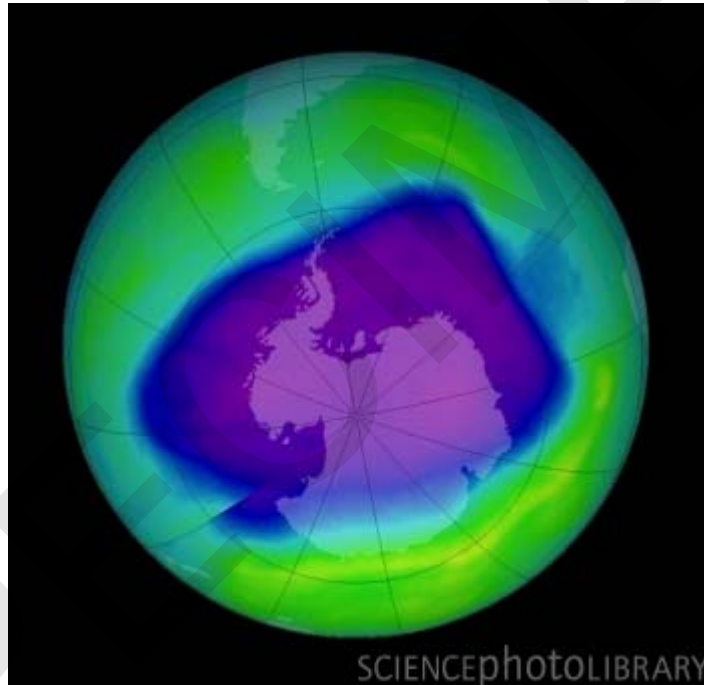


Fig. 1: © NASA/Science Photo Library, 2006, Antarctic ozone hole, (E100/238)

END OF TASK

Total [15]

Copyright Acknowledgements:

Sources

Fig. 1 © NASA/Science Photo Library, 2006, Antarctic ozone hole (E100/238)

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The maximum mark for this task is **15**.

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Quality A**Quality of selection and use of material****5 marks**

Mark	1	2	3	4	5
	Candidate only uses the data supplied in the stimulus material .		Candidate finds at least one suitable source of material and uses it in their report. The source is correctly referenced.		Candidate finds at least two suitable sources and uses them effectively in their report. The source is correctly referenced

Quality B**Quality of understanding of ethical, safe and skilful techniques processes of other scientists****5 marks**

Mark	1	2	3	4	5
	Candidate shows some understanding of the science underlying the study.		Candidate shows more understanding of the science of the study including ethical issues and/or the safe and skilful techniques used.		Candidate shows high level understanding of the science of the study including ethical issues and the safe and skilful techniques used.

Quality C**Explain and evaluate the results and impact of the work of other scientists.****5 marks**

Mark	1	2	3	4	5
	Candidate identifies a conclusion, pattern or trend from the research of other scientists		Candidate carries out some processing of data and identifies the main conclusions, patterns or trends in the research of other scientists.		Candidate carries out some advanced processing of data and identifies the main conclusions, patterns or trends in the research of other scientists. Consider reliability and validity of the data.

Total 15 marks

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This task relates to Module 2, Unit G642.

It is assumed that you will have completed the teaching of the above module before setting your students this task. This module has links to other modules which contain related learning experiences – please refer to your specification.

Candidates may attempt more than one Case Study task with the best mark from this type of task being used to make up the overall mark for Unit G643.

Preparing for the assessment

It is expected that before candidates attempt Case Study (Unit G643) they will have had some general preparation in their lessons. They will be assessed on a number of qualities such as: demonstration of the understanding of the science underlying the study; demonstration of the understanding of the practical techniques used by the scientists involved in the research, including any ethical issues and also consideration of the reliability and validity of the data. They should also demonstrate that they have used a variety of sources.

Preparing candidates

At the start of the task the candidates should be given the task sheet.

Candidates must work on the task individually. Candidates will produce the written report on the case study under controlled conditions, using secondary or primary sources to investigate further. The completed task will be submitted to the teacher at the end of the lesson. Completed tasks should be kept under secure conditions until results are issued by OCR.

Candidates should not be given the opportunity to redraft their work, as this is likely to require an input of specific advice. If a teacher feels that a candidate has under-performed, the candidate may be given an alternative task. In such cases it is essential that the candidate be given detailed feedback on the completed assessment before undertaking another Case Study Task. Candidates are permitted to take each task **once** only.

Assessing the candidate's work

The mark scheme supplied with this pack should be used to determine a candidate's mark out of a total of 15 marks. The cover sheet for the task contains a grid for ease of recording marks. To aid moderators it is preferable that teachers mark work using red ink, including any appropriate annotations to support the award of marks.

Notes to assist teachers with this task

Teachers must trial the task before candidates are given it, to ensure that the apparatus, materials, chemicals etc provided by the centre are appropriate. The teacher carrying out the trial must complete a candidate's task sheet showing the results attained, and retain this, clearly labelled, so that it can be provided to the moderator when requested.

Health and Safety

Attention is drawn to Appendix D of the specification.