

# **Report on the Units**

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**June 2009**

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It is also responsible for developing new syllabuses to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support which keep pace with the changing needs of today's society.

This report on the Examination provides information on the performance of candidates which it is hoped will be useful to teachers in their preparation of candidates for future examinations. It is intended to be constructive and informative and to promote better understanding of the syllabus content, of the operation of the scheme of assessment and of the application of assessment criteria.

Reports should be read in conjunction with the published question papers and mark schemes for the Examination.

OCR will not enter into any discussion or correspondence in connection with this Report.

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## Chief Examiner's Report

This was the first opportunity for candidates to receive the award of a certificate for this new AS course. It is interesting to report that there has been a significant change in the type of candidate now entered. With the old AS, candidates were often entered because the centres considered the candidates unable to cope with separate sciences at AS level. Now, many of the candidates are able candidates doing this course possibly as a prelude to taking separate sciences. As a result there were some high scoring candidates in all of the components.

It is pleasing to report that there is evidence with almost all of the candidates of progression from GCSE.

Throughout the report the following points are relevant and might be useful in preparing candidates for the future.

- 1 Candidates often were unable to give clear definitions of basic terms eg *biodiversity* or *isotope*. Often these were terms that they should have met at GCSE.
- 2 Many of the questions give information for candidates to use. Often this information was not used but merely repeated.
- 3 Where calculations were correct, incorrect units were often given.
- 4 Candidates did not understand the terms *reliability* and *validity*. This was clear both in G642, *Science and Human Activity*, and G643, *Practical Skills in Science*.
- 5 In both G641, *Remote Sensing and the Natural Environment*, and G642, *Science and Human Activity*, candidates were asked to describe the shapes of graphs. Many tried to explain the graphs.

G643, *Practical Skills in Science*, assesses skills via practical tasks taken under controlled conditions. The use of OCR's secure Interchange portal for distribution of the Tasks and support materials worked well. An e-mail updates service is available to alert centres to changes on the Interchange pages. To be notified by e-mail when changes are made to **GCE Science** pages please e-mail [GCEsciencetasks@ocr.org.uk](mailto:GCEsciencetasks@ocr.org.uk) including your centre number, centre name, a contact name and the subject line **GCE Science**. **It is strongly recommended that all centres register for this service.**

Another on-line initiative introduced this session has been the automatic generation of a moderation sample, with e-mail notification of the sample to the Examinations Officer at the centre. Teachers are advised to check with their Examinations Officer that the e-mail address supplied to OCR is correct. If the e-mailed sample request does not reach the centre then a delay is inevitable. For authentication purposes any change to the e-mail address must be sent by fax to Centre Services on 01223 552646 on centre-headed paper.

A final initiative has been the facility to submit practical marks electronically via Interchange (more details are in the Exams Officer Update, April 2009, Issue 14, p. 4; see [www.ocr.org.uk/Data/exams\\_officers/Exams\\_Officer\\_Update\\_Issue14.pdf](http://www.ocr.org.uk/Data/exams_officers/Exams_Officer_Update_Issue14.pdf)). There is no requirement to complete the old paper-based MS1 forms as an electronic iMS1 form is automatically produced; this can be printed out. Considerable time is saved in the generation of the moderation sample as the automated e-mail sample request is produced from the electronic data. Centres are advised to consider this option as an alternative to the old paper based MS1s. Details of the arrangements have been sent to Examinations Officers.

## Upcoming INSET events in 2009/2010

### OCR AS Level Science (H178): *Get ahead – raising standards through exam feedback*

This **full day** course will:

- Allow you to share good practice and ideas on new approaches
- Demonstrate standards for the internal assessment of coursework, and externally assessed components
- Consider post-summer results documentation, such as question papers, reports and mark schemes
- Discuss helpful approaches for preparing candidates for the external examination
- Review the support and resources available from OCR.

**Course dates and codes** – Tuesday 29 September 2009 (London, course code OSCG8, event code 01), Monday 9 November 2009 (Birmingham, course code OSCG8, event code 02).

**Fee** – £173 including refreshments, lunch and course materials. £205 if you book within 7 days of the course date.

#### To book a course

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**By e-mail:** use the booking form on [www.ocr.org.uk](http://www.ocr.org.uk) and e-mail it to: [training@ocr.org.uk](mailto:training@ocr.org.uk)

**By fax:** please complete and return the booking form to: 024 7649 6399

**By post:** please complete and return the booking form to: OCR Training, Progress House, Westwood Way, Coventry CV4 8JQ

*Please note: we cannot take telephone or provisional bookings.*

Please note: training programmes are correct at time of going to print. Please visit EventBooker at [www.ocr.org.uk/eventbooker](http://www.ocr.org.uk/eventbooker) to search for the most up-to-date event details.

# G641 Remote Sensing and the Natural Environment

This was the second opportunity for candidates to take this paper; most were re-sit candidates. There was some evidence that they were better prepared than in January.

## Specific questions

- Q1 Candidates assumed that this question was easy and their answers tended to be far too superficial.
- (a) Few had learned the definitions of biomass and biodiversity and their attempts were vague.
  - (b) Understanding of the reasons why one ecosystem is more productive than another was patchy. Most failed to understand that it involved speed of growth. The majority fell back on claiming that coral reefs are more productive because they have a higher biodiversity.
  - (c) Most candidates thought carefully about this question and there were some interesting answers. Vague answers like 'driving cars' were not acceptable.
  - (d) This question proved to be a good discriminator, with weaker candidates resorting to vague generalisations about productivity.
  - (e) Only a few candidates scored full marks. They tended to repeat the information 'healthy vegetation reflects VNIR strongly, whilst water absorbs VNIR strongly' which was given in the question without going on to explain how this related to monitoring changes in the appropriate ecosystems.
- Q2(a)&(b) Candidates had a good understanding of diffraction. The commonest error was to make the emerging wavelength much smaller.
- (c) The difference between the waves of red and violet light was well known.
  - (d) The detection of light in the eye was well understood. The commonest errors were to get the rods and cones the wrong way round, and there was quite a lot of uncertainty about the colours that are picked up.
- Q3 Weaker candidates found this question difficult, yet most of the answers were in the question itself.
- (a)(i) This question merely asked the candidates to describe what happens to nitrate production throughout the year. Many tried to explain it, which was not necessary. Many believed that autumn ploughing caused the dip in August.
  - (a)(ii) The reason for the increase in nitrate production in spring was well understood.
  - (b) Few candidates could describe a use of nitrogen in plants. Most resorted to 'growth' which is not an adequate response at AS level.

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- (c) Weaker candidates found this difficult. A lot of confusion was evident. A considerable number thought the plants were producing the nitrates and many thought it would not be necessary to apply fertiliser in June.
  - (d) Most realised that excess fertiliser would be washed away and the detrimental effect this would have in watercourses.
- Q4
- (a) Candidates understood the difference between the use of radar and visible light, but the calculation was a problem for many.
  - (b) Practically everyone could define a pixel, although few related it to representing a fixed area of land.
  - (iii) There was an interesting range of answers here. Some were excellent. However, some candidates had not made the connection that digital means numbers. Some thought that different colours were assigned different numbers. Others were confused with the binary system.
- Q5
- This question was probably the most poorly answered on the paper. There were two main problems: firstly, candidates did not relate their answer to climate change, but simply slipped into some other example of evolution they had met in the course eg Darwin's finches, the length of giraffes' necks etc. This would then expand into how new species evolve which is unlikely to happen in 40 years. Secondly, there is a fundamental misunderstanding of how natural selection works. There was a lot of talk about species 'learning to adapt' as though they give it conscious thought. The important point is that the advantageous characteristic already exists in the population and that it comes to the fore when conditions change.
- Some candidates seemed to think that to string together phrases such as 'survival of the fittest', 'natural selection' and 'adaptation' in an incoherent way would be enough to earn marks.
- Q6
- (a) A surprisingly large number of candidates were unable to write a fully correct word equation for respiration.
  - (b) The fact that soil would contain microbes that are also respiring was well understood.
  - (c) Candidates had obviously thought carefully about their answers here. The commonest misconception was that the water would be cold, but credit was given for understanding that the water could absorb the heat. Some went into detail about its high specific heat capacity.

## G642 Science and Human activity

The majority of scripts were legible although there were a minority of poorly presented responses. Many students need to be directed to the number of marks awarded for the question part and take it as an indicator of the detail required.

### Specific questions

- 1 Reading values off the graph proved to be an accessible start to the question but possibly less than 50% of candidates realised that temperature needed to be in Kelvin for Charles' law to hold. Those who realised this tended to give better answers to the explanatory parts of the question. In(b)(iii) it was essential that particles/ molecules were mentioned in the answer. Most realised that as it was hotter over the equator the gas would expand but failed to go on to consider density.
- 2 The diagram for the water molecule was attempted by most but many failed to address the "dot and cross" requirement. The most common error was to omit the two sets of lone pairs on the oxygen. A correct diagram almost invariably got all 4 marks for this question.

The high boiling point of water needed to refer to the relatively strong **intermolecular** forces between water molecules. Writing that the forces were very strong obtained no credit. Very few candidates scored 5 for part (e) in which water's ability to retain heat energy (due to its high specific heat capacity) had an impact on both the sea temperature and the air temperature (and humidity) above the Gulf Stream. This then needed to be related to the UK climate.

- 3 A balanced symbol equation was generally provided but less than half of students correctly allocated an oxidation state of +4 (4) to sulfur in  $\text{SO}_2$ . The correct full ionisation of  $\text{H}_2\text{SO}_4$  was very poorly answered. Often the products of ionisation were not ions at all with  $\text{SO}_3$  and  $\text{H}_2\text{O}$  a common answer. Answers to part (c) were often vague.
- 4 This question was generally poorly addressed for the following reasons: Part (a) required a **description** of the curves in the figures and many students immediately attempted to explain a link between the two sets of data. This left little to address for the second part of the question. Very few students addressed the **reliability** and **validity** issues in the question. It was apparent that the weaker students took the results at face value and thus went on to describe the correlation between the two sets of data. Better answers addressed issues such as "who recorded the data?" (reliability) and "where was the data recorded?" etc and the need to eliminate/identify other variables that may not have been considered (validity of conclusion). Too many students just trotted out the current mantra "more carbon dioxide = more global warming."
- 5 Surprisingly few students were able to give 3 roles of proteins in organisms. Primary structure of protein needed to highlight the **sequence** or **order** of amino acids. Secondary structure was generally well identified but the role of bonds in the tertiary structure was less well addressed. A large number of students used DNA and base pairing to explain hydrogen bonding and although credit was given for identifying the H bond the follow up mark was not awarded. This proved to be a highly discriminating part question with C grade candidates identifying the 3 bond types (hydrogen, ionic and covalent) 3 marks but A grade candidates using diagrams, as requested, to elaborate on specific examples eg Sulfur-Sulfur bonds between Cys residues, ionised residues of particular amino acid residues etc.



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- 6 Surprisingly few students were able to give a succinct definition of isotopes. Part (b) was answered correctly by the majority of candidates but the half life definition and calculation proved difficult for many. Carbon neutral needed to specify no **NET** (overall) generation of carbon dioxide.
- 7 This question was generally well answered with the simple calculations generating marks for many although weaker students still struggle with the correct units.
- 8 The final question was generally well addressed and the better students regularly scored 13 or better in this question. Part (b) especially, proved to be a good grade discriminator with strong students giving details of how genetic manipulation can be carried out and highlight specific benefits rather than “better crops”, which was not credited.

## G643 Practical Skills in Science

This was the first year of the new method of assessment involving a Practical Task and a Case Study. These were supplied by OCR on the secure Interchange website for teachers to download and use at a suitable time. Candidates could do more than one of each but would be required to submit only the highest scoring Practical Task and Case Study for moderation.

For 2009 there were 292 candidates entered from 23 centres.

Because of the small number of centres involved in AS Science it was never possible to get a suitable number together for a training event. Teachers therefore relied on the specification, the Support Booklet and information within the tasks to illustrate what was expected. It is pleasing to report that most centres did it very well and this unit was a worthwhile part of the assessment.

It is pleasing to report that all of the tasks were attempted by a number of candidates but Practical Task 1 and Case Study 3 were probably the most popular.

### Update on the assessment model

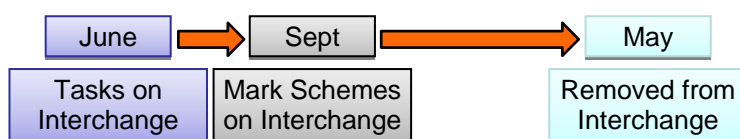
Note that completed Tasks remain confidential and assessment material should not be returned to candidates.

Only OCR Tasks from Interchange clearly marked with the current assessment year, eg 1 June 2009 to 14 May 2010, can be used for Practical assessment during that period. However, if a candidate wishes to improve their mark they could re-submit, for example, their best 1 June 2008 to 14 May 2009 Practical Skills Task along with a new Case Study (from the 1 June 2009 to 14 May 2010 selection on Interchange). However, the marks confirmed by the Moderator when the Task was first submitted cannot be 'carried forward'. Teachers will be able to re-mark the Task in light of any comments made by the original Moderator and it will be re-moderated when it is re-submitted. Only ONE Task per student may be re-submitted (for example, a student may have performed well in their Case Study in June 2009 and re-submit it for Moderation with a new Practical Skills Task in June 2010 – chosen from the Practical Skills Tasks available for assessment in the June 2010 session).

Thus, centres should retain Tasks securely until such time as they are clear that candidates will not wish to re-submit work to OCR in future sessions. At this point the work should be securely destroyed.

### Availability of files on Interchange

Each year, Tasks (and Instructions for Teachers and Technicians) are available from 1 June, Mark Schemes are available from 1 September and all Tasks, Instructions and Mark Schemes are removed by 15 May in the following year.



An e-mail alerts service is available. To be notified by e-mail when changes are made to **GCE Science** pages please e-mail [GCESciencetasks@ocr.org.uk](mailto:GCESciencetasks@ocr.org.uk) including your centre number, centre name, a contact name and the subject line **GCE Science**.

**It is strongly recommended that all centres register for this service.**

## Submission of marks

Centres should note that it is possible to submit candidate marks for this unit to OCR using Interchange (more details are in the Exams Officer Update, April 2009, Issue 14, p. 4; see [www.ocr.org.uk/Data/exams\\_officers/Exams\\_Officer\\_Update\\_Issue14.pdf](http://www.ocr.org.uk/Data/exams_officers/Exams_Officer_Update_Issue14.pdf)). This greatly accelerates the whole moderation process, allowing centres to receive details of the moderation sample much more quickly than by use of handwritten MS1 forms. Teachers may need to consult with the Examinations Officer to gain the relevant access rights.

During the moderation process, it was apparent that many e-mail addresses supplied by centres to OCR were incorrect. All sample requests are automated and it is vital that the supplied e-mail address for the Examinations Officer is correct. Your Examinations Officer can check their details on Interchange by selecting 'Admin' and then 'View your centre details'. For authentication purposes any change to the e-mail address must be sent by fax to Centre Services on 01223 552646 on centre-headed paper.

## Administration of the Practical Task

It is important that the teacher carries out the task at the same time as the candidates. This is a check to make sure the task has worked correctly. All of the Practical Tasks were tested in school conditions but having the teacher's results helps the moderator to ensure the candidates are treated fairly. There were some centres that did not submit their teacher's results. The Centre Authentication Form (CCS160) and details of any correspondence with OCR should also be included.

The Practical Tasks were devised to be simple tasks that candidates could do individually and that required limited apparatus. They should give reasonable results but also give opportunities for evaluation.

The Practical Task requires the candidate to

- |  |          |
|--|----------|
| (a) demonstrate skillful and safe practical techniques                   | 5 marks  |
| (b) make and record observations with appropriate precision and accuracy | 10 marks |
| (c) analyse and interpret results to reach valid conclusions             | 5 marks  |
| (d) evaluate the methodology used in experimental results.               | 5 marks  |

Obviously the teacher who is present in the classroom is the best person to assess Quality (a). It was usual for the teacher to show by annotation which points were awarded for Quality (a). At least one centre produced a cover sheet but ✓✓x✓x on the script is sufficient to show that the first two and the fourth marks were awarded but not the third and fifth. Since the points chosen were practical and showed safe working, candidates scored well here and it was easy for the moderator to support the marks.

In Quality (b) most candidates recorded results in suitable tables that they had devised. It should be stressed that correct units are important and if the candidate is expected to record temperatures to 0.5°C that includes all of them.

Quality (c) was more demanding and even where an indication was given in the task about the processing of the results, candidates did not always do it well.

Very few candidates did Quality (d) well and often centres over-marked what was written. Comments about reliability were often no better at all than GCSE. Credit was given by one centre for the statement by a candidate that the results were reliable because he had done them and would be better if he had done them more carefully and had better equipment. Comments like this do not deserve credit. Stating that the results were not reliable because they were done once but would be reliable if they were done five times requires a rider from the candidate that

this is true only if the results obtained were in close agreement. Candidates need to be critical about the method used. Centres need to spend some time before the Practical Task looking at suitable responses that should be made but not, of course, using the Practical Task chosen for assessment. Differences in marks between the centre and the moderator usually came in Quality (d).

### Administration of the Case Study

The Case Study gives candidates the opportunity to study some aspect of the specification in greater depth. It is expected that they will produce a report which, in many cases, will go beyond the content of the specification. The Support Booklet explains clearly in pages 23-25 how this should be done.

Centres are reminded that the candidates should carry out individual research and not be given references to use. Research can be done inside or outside lessons and candidates should only bring in research material on paper. If the report is processed under the controlled conditions the candidates must not have access to electronic materials or the Internet and should not be able to take away an electronic copy of the report. Photos, graphs etc should be physically pasted into the report and not pasted in electronically. The Support Booklet suggests about 1 hour for the writing up session. It can be longer providing the reports are collected in between sessions so nothing can be added outside the controlled session.

In the Case Study the candidate is assessed on

<b>Quality A</b>	Quality of selection and use of material	5 marks
<b>Quality B</b>	Quality of understanding of ethical, safe and skilful techniques processes of other scientists	5 marks
<b>Quality C</b>	Explain and evaluate the results and impact of the work of other scientists.	5 marks

Unfortunately when given a task like this to do candidates rush to sources such as Wikipedia and paste in whole sections of relevant and irrelevant material and sometimes may not even have read it. Alternatively they turn to a text book and just copy it out. Either approach will not lead to high marks in Quality A. A candidate who does no more than use the stimulus material from OCR is limited to 1 mark and using sources such as Wikipedia alone and textbooks will suggest 3 marks providing everything is fully referenced and it is clear what has been taken from the source and what the candidate has written. To secure 5 marks it is expected that candidates will find sources that were written by the scientists mentioned in the task or their contemporaries. It is helpful for Quality C if there is original data in the source. One good way of finding these is to look at the references listed at the end of Wikipedia and similar sources. Teachers should resist the temptation of identifying sources for the candidates.

In Quality B we are assessing the candidate's understanding of the Science. For 1 mark the understanding of the science would be at about grade E - perhaps some relevant correct science has been copied in but not really commented upon. For 5 marks the Science must be correct and appropriate. For example, in the Ammonia task there certainly would be an understanding, in the candidate's own words of how the chosen principle explains some of the data given. Also at 3 or 5 marks the candidate must also consider ethical issues and/or the safe and skilful techniques used by the scientists. This will depend upon the task but 5 marks cannot just be for the science alone.

Quality C was the one that caused most problems because it requires candidates to carry out processing and identify trends. Too many have just written an essay on the topic and have not been directed to consider anything else. For 1 mark the candidate may identify a trend but the mark must not be given for simple giving a fact. For three marks there may be more trends but there must also be some processing from the stimulus material. For 5 marks we must rely on the

information they have found about the work of the listed scientists. Unfortunately, they will not score here now if research in Quality A is poor. They must identify trends and process some of this data and also consider the reliability and validity of this data. Evidence suggests candidates do not understand these two terms. Comments such as 'It was reliable because it was listed early on the search engine' are wrong. Perhaps reliability can be established by finding similar information from different sources and validity when there is sufficient evidence to be certain of the results.

## **Summary**

The work produced for moderation was pleasing. It was certainly better that we have been used to for the previous AS specification. Teachers used the points based system for the Practical Task better than the previous criteria-based system for the investigation. Certainly with the best candidates it was obvious that they had got a great deal out of the Case Study in particular.

It is the intention to change a number of Case Studies and Practical Tasks annually so that new ones are available each year together with some of the existing ones. However, until moderation in 2009, we had very little idea how candidates would perform in any of these tasks and comments from centres were very few. Therefore, it was decided that the same tasks will be used for 2010 and then refreshment of tasks would start in June 2010 ready for 2011. Doing this would give teachers a period of stability.

Centres are advised that OCR would be interested in ideas for Practical Tasks and Case Studies which would then be developed for the future. Also any centre wanting advice about the tasks, the marking of the tasks or any other aspect of the course should email the GCE Science Tasks mailbox at OCR. Two training sessions have been planned for the autumn providing we can generate sufficient interest.

The whole process has been very pleasing and teachers and candidates are to be congratulated for tackling this new Assessment so well.

# Grade Thresholds

Advanced GCE Science H178  
June 2009 Examination Series

## Unit Threshold Marks

Unit		Maximum Mark	A	B	C	D	E	U
G641	Raw	60	45	40	35	30	26	0
	UMS	90	72	63	54	45	36	0
G642	Raw	100	79	70	61	52	43	0
	UMS	150	120	105	90	75	60	0
G643	Raw	40	33	30	27	24	22	0
	UMS	60	48	42	36	30	24	0

## Specification Aggregation Results

Overall threshold marks in UMS (ie after conversion of raw marks to uniform marks)

	Maximum Mark	A	B	C	D	E	U
H178	300	240	210	180	150	120	0

The cumulative percentage of candidates awarded each grade was as follows:

	A	B	C	D	E	U	Total Number of Candidates
H178	11.0	24.5	43.1	59.0	80.0	100.0	292

For a description of how UMS marks are calculated see:  
[http://www.ocr.org.uk/learners/ums\\_results.html](http://www.ocr.org.uk/learners/ums_results.html)

Statistics are correct at the time of publication.

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