OCR
RECOGNISING ACHIEVEMENT

GCE

Science

Advanced Subsidiary GCE **AS H178**

Report on the Units

June 2010

HX78/R/10

Oxford Cambridge and RSA Examinations

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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 specification 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.

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Advanced Subsidiary GCE Science (H178)

REPORTS ON THE UNITS

Chief Examiner's Report

There was a significant increase in the number of candidates entering for this specification this year. Many of these candidates were Year 11 students on accelerated courses. The majority of the candidates showed progression from GCSE and, I am sure, found this course the ideal preparation for AS and A2 courses in Science subjects.

Because, it is suggested that centres enter candidates for G641 in January, the candidates for G641 in June were largely re-sit candidates. The whole cohort entered for G642 in June. This accounts for the difference in quality and quantity between the two units.

G641: Remote Sensing and the Natural Environment

General Comments

There were 145 candidates entered for this unit in June. Most of the candidates had previously taken this unit in January and were entered again to improve grades. As a result, there were fewer high scoring candidates and many candidates showed fundamental weaknesses.

Comments on Individual Questions

Q1 Candidates found this the most difficult question to score well on. Most could name sunlight as the source of energy, but a significant number were unable to suggest what detritus might represent. The nature and function of decomposers was poorly understood, with vague references to them 'decomposing dead things'. Part **(b)** was generally poorly answered. Despite the candidates having been asked to define productivity of an ecosystem on previous papers, few could do so. Many confused it with biodiversity. In part **(b) (iii)**, answers rarely referred to the ecosystems in the question, despite being asked to. They were often vague, e.g. talking about 'climate differences' or just irrelevant e.g. rainfall or soil type. In part **(c)**, few candidates realised this was a question about geographical isolation and, ignoring the context, launched into a description of evolution, even quoting Darwin's finches. A significant few also talked about the wren changing by 'breeding with other species'.

Q2 This proved to be a better discriminator. Most candidates could name chlorophyll as the green pigment, but few could locate it in a chloroplast. The light-dependent stage of photosynthesis was poorly known. However, most could take a figure from the graph correctly and were aware of the meaning of the abbreviation, nm. The responses to the calculation were heartening - much better than in previous papers. Most managed to rearrange the equation correctly and made some attempt at changing nm into m. The greatest loss of marks was in the choice of units.

Q3 (b) (i) The cause of scattering in the atmosphere was not generally well known and was frequently confused with absorption. In part **(b) (ii)**, most could work out that the light with the shortest wavelength would scatter the most, however, fewer realised that this was at the blue end of the spectrum. Part **(c)** was poorly answered. A lot of misunderstanding was evident, with references to the ozone layer and other gases in the atmosphere. Others mistook this for a question about food chains and talked at length about heat being dissipated between trophic levels. Numerate candidates coped well with part **(d)** and most scored at least 2 marks in **(e)**.

Q4 This question was surprisingly poorly answered. Few could locate the mitochondria in the cytoplasm, and the routes of molecules through the membrane were not at all well known. However, it was astounding that at AS level, so few were able to write a word equation for aerobic respiration. Better candidates were able to suggest how the energy might be used in the cell. Anaerobic respiration was similarly misunderstood, with a worrying number of candidates suggesting that its disadvantage is that it USES energy.

Q5 This question was generally well answered. Most candidates had a working knowledge of diffraction, and could draw the waves as they passed through the harbour entrance correctly. The commonest error was to make the emerging waves closer together than the originals. In part **(b)** the laws of reflection were well understood, but some candidates were unsure of the nature of the waves involved.

G642: Science and Human Activity

General Comments

There were a total of 459 candidates entered for this paper and the general standard was slightly improved compared to last June's cohort with the full grade range represented in the scripts marked. A small but significant number of candidates did not attempt parts of questions. The vast majority of scripts were legible but there are still a number of scripts with many corrections and crossings out.

Comments on Individual Questions

Q1 Most candidates labelled the secondary structures correctly but less than half scored 3 marks for a correct peptide bond **and** a water molecule. The points were plotted well on the axes but marks were lost for not labelling the Y axis or connecting the points with a ruler rather than a smooth curve. The final six mark question was well answered by candidates who explained the data whereas a description of the data could only score two of the six marks available.

Q2 This question was generally well answered. Part **(a) (ii)** proved to be a good discriminator as only the better candidates got both the value **and** the unit correct. Part **(b)** was less well answered with weaker candidates describing the Hadley cell rather than answering the question as set.

Q3 Generally well answered by the majority of candidates. Part **(c)** gave a chance to recall issues relating to acid rain but poorer answers were badly structured and confused issues such as carbon dioxide being responsible for acid rain and issues relating to CFCs.

Q4 This question was less well answered with a significant minority not knowing what a photochemical reaction was. The calculation was a good discriminator with the strongest candidates securing all 4 marks. The concept of a radical was not well understood.

Q5 This was a question of two distinct halves. The first word selection part frequently scored 7 but part b) was frequently misunderstood. Too many candidates did not answer the question as set and discussed the preliminary context of the question. It would appear that few centres consider the issues of epidemiological studies in terms of how these studies can be carried out: requirement for statistically significant numbers, placebos, etc. although ethical issues were well identified.

Q6 A surprisingly large number of candidates stumbled on the isotope definition with too many using the term molecule in their answer. Many also think 'isotopes are radioactive'. The half life calculation proved to be a good grade discriminator. Part **(b) (iv)** was disappointingly answered with too many generalities such as wearing goggles and a lab coat.

Q7 Parts **(a)** and **(b)** provided a reasonably accessible start to the final question but there was a preponderance of waffle in the weaker answers such as, 'advantage - Wind produces lots of energy'. Some candidates pursued cost issues despite then being ruled out by the question. Part **(c)** saw some candidates get the two terms confused and, again, a well learned definition in preparation for the exam would have secured a certain four marks. For part **(c) (iv)**, the ozone layer was the 'knee jerk response' with the better candidates realizing that cosmic rays are not UV rays.

G643: Practical Skills in Science

In this, the second year of the new specification, candidates had to complete a Practical Task and a Case Study. A choice of three of each was supplied by OCR on the secure Interchange website for teachers to download and use at a suitable time. As there are few candidates, the tasks remained unchanged from 2009 but they will be changing on a rolling programme from 2011. Candidates could do more than one of each type of Task but would be required to have only the best Practical Task and best Case Study moderated.

For 2010 there were 461 candidates entered from 23 centres. This represents an increase in candidates of 33%.

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. Centres needing any additional help or support with the specification should contact the Qualifications Leader at OCR.

Many candidates had moderated marks lower that the centre marks and in the case of a difference outside of tolerance, the marks for the centre would have been adjusted to bring them in line with national standards. The main difference was usually seen in the Evaluation section of the Practical Task or in the Case Study.

The tasks offered for 2010 were

Practical tasks

1. Enthalpy of vaporisation of water
2. Using density measurements to find the concentration of sodium chloride in sea water.
3. Using gas volume measurements to estimate different temperatures.

Case Studies

a) Radioactivity

b) Ammonia from the air

c) DNA.

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

Administration of the Practical task

It is important that the teacher trials the task in advance to ensure that all materials and apparatus provided by the centre are appropriate and 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 fairly treated. There were some centres that did not submit them. The decision was made that there was no point going back and asking for them as they probably would not exist.

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

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 ^{o}C that means all of them. The marking point should not be recorded for less.

Quality **(c)** was more demanding and even where indication was given in the task about the processing of the results, candidates did not always do it well. For example, in Practical Task 1, calculations of the energy produced by the Bunsen burner per minute and the enthalpy of vaporisation of water were often badly done even with the mathematical relationship given. In Practical Task 2, candidates needed to dilute the stock solution five times (once by direction and four times using their own method). They needed to use the calculation to get the concentration of sodium chloride solution in each case. In Practical task 3, depending upon the results, the graph drawn could be a curve or a straight line. If candidates drew a straight line they must not do it by taking -273 ^{o}C as a point. If they drew a curve, somewhere they should make the point that they had disproved Charles Law!

Almost all candidates did not do Quality **(d)** very well and often centres over-marked what was written. Comments about reliability were often no better than at GCSE level. Credit was given by one centre for the statement by a candidate that the results were reliable 'because he did them and would be better if he did them more carefully and had better equipment'. Comments like this do not deserve credit. Writing that the results were not reliable because they were done once but would be reliable if they were done five times requires a rider that the results should be in close agreement to secure reliability. The limitations and improvements a candidate identifies needs to be restricted to the **method** they followed and not what went wrong with their particular experiment. In Practical Task 1, candidates suggested there should be a more accurate way of measuring the volume of the water – a burette or pipette rather than a measuring cylinder. They have failed to realise that the exact volume does not matter because it is the mass that is going to be taken and used. Centres need to spend some time before the Practical Task looking at a Task, other than the one that is being used, and discussing responses which are acceptable and those which are not.

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.

Centres are reminded that the candidates should carry out individual research and not be given references to use by teachers. Research can be done inside or outside lessons and **candidates should only bring in research material in on paper**. There should be no pasting into the report from websites without some candidate additions. If the report is word 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 one 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

Quality A	Quality of selection and use of material	5 marks
Quality B and **Quality C**	Quality of understanding of ethical, safe and skilful techniques processes of other scientists 5 marks 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. Neither approach will lead to high marks.

A candidate who does no more than use the stimulus material from OCR is limited to 1 mark in Quality **A** 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.

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 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 Le Chatelier's Principle explains some of the data given. Also at 3 or 5 marks the candidate must 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 identifies a trend e.g. increasing temperature decreases the yield of ammonia, providing other conditions are the same. It must not be given for a fact e.g. an ammonia factory operates at 450 ^{o}C. For three marks there may be more trends but there must be some processing from the stimulus material. For example, a graph of data in ammonia, a graph showing how radioactive count of a listed isotope would change over several half-lives or using Fig. 2 in DNA to give examples of the coupling of amino acids. Now, 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**. This is different from what many candidates would do at GCSE, where just a comparison of the likely reliability and validity of different **sources** is enough. Evidence suggests candidates do not understand the terms reliability and validity. 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 by most candidates was an improvement on work produced at GCSE. Teachers, on the whole, used the points based system for the Practical Task confidently. Certainly with the best candidates it was obvious that they had got a great deal out of the Case Study in particular. To some it appeared a chore from which they derived little. 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 contact the Qualifications Manager at OCR (Cambridge). 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.

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