GCE

Science

Advanced Subsidiary GCE AS **H178**

OCR Report to Centres June 2014

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications 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 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.

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

CONTENTS

Advanced Subsidiary GCE Science (H178)

OCR REPORT TO CENTRES

G641 Remote Sensing and the Natural Environment

General Comments

The overall standard was higher this year. Candidates were well prepared and seemed comfortable with the paper.

Comments on Individual Questions

Question No.

Question 1

(a) and (b). Candidates had no problems interpreting the data, but few were able to gain many marks for explanation for the population variations. This was interesting with regards to the trout, since, in the past, when the question was asked in a slightly different form, they found it easy to correlate the growth of algae with the death of fish.

(c) possible pollutants were well known.

(d) The role of the plasma membrane is well understood. The commonest error was to state that glucose needed to be actively transported across.

Question 2

(a) The majority of the candidates found the calculation straightforward and could give at least one creditable reason why not all the sunlight would be absorbed.

(b) A wide range of marks here, but many candidates scored at least 3. The answer to D (Respiration), proved the most difficult.

(c) There were no problems with the calculation.

(d) Whilst the majority could define *steady state* correctly, only the best candidates could explain the role of producers in its maintenance in the carbon cycle. Answers, on the whole, were superficial and vague.

Question 3

(a) A straightforward question, usually well answered. The stumbling block, most usually, was achieving the right dimensions.

(b) The colours of the spectrum are well known, but a sizeable proportion got them back to front.

(c) and (d) Weaker candidates found it more difficult to interpret the graph. In (d), some missed the reference to the human eye and simply stated that gamma and radio waves cannot be detected because there are none.

(e) The function of the different photoreceptors in the eye is now very well understood.

Question 4

(a) The mechanism of cellular respiration is better known than it used to be, and better candidates were referring to glycolysis, but there was considerable confusion with anaerobic respiration with the consequent production of lactic acid.

(b)(i) The answers tended to be too vague at this level. e.g. 'To see what happens when nothing's there'. In (iii), there was a good distribution of marks. Most candidates could select at least one of the correct tubes and make an attempt at the reason (if not necessarily correct)

Question 5

(a) Candidates have a much better understanding of how information is processed in a satellite. However, confusion still exists around how the number (between 0 - 255) is assigned. Some were stating that it depended on the shade of grey of the reflected radiation (rather than its intensity) and others on its wavelength.

(b) a straightforward question, straight from the syllabus. Well prepared candidates scored the marks.

G642 Science and Human Activity

General Comments

This year saw a noticeable fall in the total number of entries for this paper. The overall standard of candidates responses was, however, considerably improved on previous sessions and the number of very poor scripts seen was extremely low. The highest raw mark was 89 and the lowest was 15.

Many candidates seemed to have heeded advice to use language carefully in their responses and the general scientific accuracy of the responses seen was much better than in some previous sessions.

Candidates, however, found the more open nature of some of the questions more challenging and it was rare to find even the best candidates scoring full marks on these questions.

Many of the calculations were completed confidently and accurately, showing competence in handling both powers of ten and the rearrangement of selected formulae.

Comments on Individual Questions

Question No.

1 Most candidates found this an accessible opening question. Some responses lost marks in (b) because they failed to explain that boiling involves breaking bonds between molecules. A common error in (c) (i) was not realising that the wavenumber scale increases from right to left.

Only the best candidates in part (d) were able to describe how the different bond strengths of the bonds in carbon dioxide and water molecules means that they will absorb infrared radiation of different wavelengths.

2 Some good answers were seen in parts (a)(ii) and (more rarely) in part (a) (iii), displaying a clear understanding of the kinetic theory. A common problem was not referring to the behaviour of molecules (or particles) in the explanation. In part (b) (ii), candidates spent much of their answer simply describing the behaviour of air shown in the diagram without attempting an explanation of the behaviour in terms of temperature and pressure differences.

Good answers seen in (b) (iii) made use of the diagram at the very start of the question to link the variation in solar intensity at the equator during the year to the tilt of the Earth's axis.

3 The equation in part (a) was balanced correctly by a pleasing number of candidates. However even the best candidates struggled to score full marks on the extended writing task in (b) (i), even though this is an experiment referred to explicitly in the specification. Candidates were expected to realise that one of the biggest issues in the experiment is the need to ensure that temperature measurements are measured using a thermometer able to measure to a precision of better than $1^{o}C$. Although many students stated that reliability is improved by repeating and taking averages of the temperature change data, it was necessary to state that all relevant conditions and quantities needed to be kept the same.

4 Candidates displayed a good level of knowledge and understanding about the structure of enzymes and proteins, although very few knew that the hydrogen bonds that maintain the secondary structure are between atoms in the peptide groups. Many candidates lost a mark in part (c) by failing to state that the substrate, as well as the active site, has a **specific and unique** shape. The term "lock and key" alone did not attract credit without an explanation of the ability of the substrate to fit into **and** bond to the active site. Descriptions and explanations of the variation of enzyme activity with temperature were generally very good, with many candidates correctly explaining the more difficult idea that the lower activity below the optimum temperature is related to the frequency of (successful) collisions between enzyme and substrate.

5 This straightforward question was done well by the vast majority of candidates. A common error was to forget that U rather than T will be present in mRNA molecules.

6 Most candidates correctly deduced the missing numbers in the plutonium nuclide. The half-life question was quite demanding for many candidates. Even those who correctly deduced that 4 half-lives had elapsed could not then complete the calculation, often simply dividing 0.8g by 4.

The discussion of the containment of the plutonium isotope proved a good discriminator. Many candidates thought only of the need to absorb the alpha radiation without considering the need to avoid the source itself leaking out of the container and increasing the risk of ingestion by organisms.

7 The discussion of the relative merits of alternative energy sources provided many candidates with a lot of scope for making a wide range of interesting points. However many candidates failed to pick up more than a handful of marks because they simply listed the relevant factors rather than discussing how these factors applied to specific energy sources. Although no credit was given for choosing a specific energy source as the best option, candidates should perhaps be reminded that in this type of question a good approach is to make a reasoned case for such an energy source by considering the strength of arguments for and against the use of a variety of sources.

8 Candidates were generally successful with the two calculations in this question.

9 Most candidates coped well with the oxidation number question, correctly calculating the oxidation number change in both equations. Almost all candidates explained the word acid in terms of H+ ions rather than simply referring to pH values as has sometimes been case in previous years. However, despite giving the correct definition of an acid as an H+ donor, many candidates were not then able to deduce the ions present in nitric acid.

Some excellent, detailed answers to the ion-exchange question were seen, although some candidates made life difficult for themselves by not referring to ions in describing the process. A significant number believed that the ions bonded to soil were negative.

G643 Practical Skills in Science

General Comments

This component gives centres the opportunity for candidates to show their competence and ability in skills not assessed in the written papers. Staff are thanked for their preparation and marking of both the case studies and the practical tasks. Work seen this session was well annotated and the centres had in the main enclosed the supervisor's results with the candidates' practical work. This is a requirement necessary to support the moderation process. Generally where centres are now familiar with the marking schemes of both the case study and practical tasks the marking was supported. There was a little over assessment in the case study mainly where the higher marks were awarded and candidates had not fully explained or supported their arguments or processing. Centres are to be congratulated for the promptness of sending the samples for moderation following electronic requests from OCR. The work again was suitably collated and cover sheets clearly completed and attached to candidate's work.

Comments on each component

Case studies

The case studies offered this session were:

- Controlling Malaria
- Carbon Capture
- Structure of the Atom.

'The Structure of the Atom' and 'Controlling Malaria' were the most popular. Centres are advised to use the additional guidance 'Instructions for teachers and technicians' which accompanies the criteria when marking.

For Quality A some generous assessment was seen on candidates' reports as again many centres were awarding full marks where candidates had listed a number of references, many of which were just websites. Work seemed particularly structured this year with candidates tending to focus much of their reports on the work of the scientists. Where five marks are awarded it is essential that teacher's refer to the guidance for Quality A: for 5 marks … 'the second source should be from work of the original scientists or contemporary reports. It is useful if this source contains some real data. All sources should be fully referenced.' This was not clearly shown in many of the candidates' work gaining full marks. Referencing using superscripts throughout the report is a good way of indicating the 'effective' use of the sources used. Candidates scoring high marks should also be selecting suitably relevant and accurate information. The inclusion of excessive research in reports which is not directly relevant to the tasks is not worthy of top marks.

For Quality B most candidates did show some understanding of the topic chosen. This was particularly evident in the malaria study, where interesting and relevant scientific information was endorsed. For the higher marks candidates need to use their research and structure it within the report. For 3 marks and above it is a requirement of the criteria to show an understanding both of the science involved and the ethical issues and/or safe and skilful techniques used. Many candidates had just made brief statements e.g. this is an ethical issue and had been awarded overall 4 marks. Candidates need to discuss such issues rather than identify them where the higher marks are being awarded. In addition the tasks require the candidates to describe and explain the relevant science and any practical techniques used by the scientists. Candidates do need to adapt their research to support both the task requirements and demonstrate their understanding for the assessment criteria.

In Quality C candidates did not seem to draw main conclusions from their research. Even for 1 mark a conclusion or a pattern or trend needs to be identified and for 3 marks candidates need to carry out basic processing of data. In the Malaria work processing of the data was written on the task sheet and not introduced into the report. Some basic graph plotting was seen for Case study 3 but the processing of additional data was rarely seen. Please note for the future to award 4 or 5 marks candidates need to show evidence of further higher level processing to reveal further information. For 5 marks work should also show that candidates have considered the reliability and validity of the data used; simply stating that a particular source is reliable is insufficient. Conclusions also need to have depth of scientific understanding for the higher mark bands.

Practical Tasks

The tasks available this session were:

- Changes in intermolecular bonding with concentration
- Studying Reaction Rates
- Effect of concentration on action of urease on urea solutions.

Changes in intermolecular bonding with concentration and studying reaction rates were the most popular. The evidence seen through moderation indicated that the practical tasks were achievable by the candidates and results collected were suitably processed. The centres should be congratulated this year on their careful assessment and correct application the mark scheme. It was, in the majority of cases, possible to support the centre's decisions on the practical task.

For most candidates assessment of Skill A2 Demonstrating safe and skilful techniques was supported, as this was assessed by the staff supervising the practical task. For Task 1, however, candidates were not describing both hazards of glycerol, and assessment was often generous for this section.

Assessment of Skill B1 & B2 making reliable and valid observations and measurements and recording them was also generally supported. It was good practice to see detailed annotation from teachers to show coverage of these criteria and this should be endorsed. Although most centres included staff results, it is important that these are sent with candidates' work. Moderators are required to check candidates' results against those completed by the staff. Generally candidates designed their own table for their results, but should ensure correct units are included as a heading to the columns and not as an addition in the body of the table. For skill C2 analysing and interpreting results candidates need to understand the meaning of concordance and to omit the inappropriate value. Similarly several candidates acknowledged outliers but continued to use them in calculations. Graph plotting was variable although graphs were usually plotted correctly; scales were often poor and triangles for gradients were not always at least half of the length occupied by the plotted points. Scales were often chosen where the graph plotted covered only less than a quarter of the graph paper. In task 2 candidates were not always using values from their graph to calculate the average rate of reaction.

Evaluation assessment skill C3 seemed much better this session. More candidates were being more specific in their evaluative comments on repeatability: scatter/range bars were small, points were on a straight line, and all 3 values were considered and were within +/- stated value. Care also needs to be taken that candidates describe the reliability of the experiment carried out and not how the reliability would be improved if it were carried out again. Sources of error were generally stated, and more specific statements were seen e.g. incorrect timing, concentration measured incorrectly and vertical set up of burette not correct. Improvements, however, were not as focused.

To access the higher marks candidates need to provide a detailed explanation of the nature of the procedural errors with improvements clearly linked. Both experimental design and procedural methodology should be considered.

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

Education and Learning
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored