Cambridge National

Science

Level 1/2 Cambridge National Certificate in Science **J815**

OCR Report to Centres June 2016

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.

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OCR REPORT TO CENTRES

R071 How scientific ideas have an impact on our lives

General Comments:

Unit RO71 is a mandatory unit with evidence coming from an OCR model assignment. The model assignment may not be used for practice and it is assumed candidates will have been taught the necessary knowledge and skills prior to undertaking the tasks set out in the model assignment.

OCR model assignments which centres must use, link logically to the grading criteria. It is expected that the learners have access to both the tasks set in the model assignment and to the grading criteria. The model assignments have been written to give centres the flexibility to make the tasks relevant to their learners.

Marking by centres that have entered a number of cohorts over the years was consistent and reflected the level of achievement by their candidates. However, some centres were over generous, with most of the learning outcomes being leniently marked. These centres seem to be interpreting the MB descriptors too leniently.

Where there is more than one assessor within a centre then internal moderation of portfolios is essential to ensure that all assessors are marking to the same standard to avoid rank-order problems.

Assessors should support their marking with comments on the unit recording sheet. If assessors annotate evidence then their marking will more likely match the grade criteria. It is advisable, where relevant, to support their assessment judgements by the use of witness statement and or competency recording sheets. If a witness statement is used then it should be made clear exactly what the candidate has undertaken.

Scaffolding work-sheets or templates must not be used when candidates are undertaking the model assignment tasks and will trigger referral for malpractice. However, assessors may use them as well as guidance comments during prior learning. If guidance is given while candidates are undertaking the tasks, it will severally restrict the mark the candidate is able to obtain.

It may be beneficial for staff involved with the course to look again at the exemplar material provided by OCR, to see again what is required within each mark band.

It should be remembered that centres should send copies of the MS1 and CCS160 to the designated moderator as well as making sure the candidate's number and full name is entered onto the Unit Recording Sheets. OCR's Unit Recoding Sheets must be used, centres cannot construct their own.

Comments on Individual Learning Outcomes:

LO1: Candidates tended to give a limited range of energy sources that could be converted into an electrical supply. It is expected that candidates will give a wide range of up to nine sources with a limited description, then select those energy sources that might be used in the specified location and describe those sources in detail. Candidates need to refer to the technical detail of the source as well as their environmental and social impact. Higher grade candidates would be expected to quantitatively analyse the pertinent requirements of a chosen energy source.

Some centres did not identify the geographical, environmental and climate for a specified location. Without a detailed description of the location learners cannot make an informed choice of energy source. Without choosing a location (as indicated in the model assignment) learners could not evaluate what would be the appropriate energy source. If centres change the location as specified in the model assignment to make the scenario more relevant to their learners then the location should be real.

When considering the transfer of energy into electricity, learners should analyse the efficiency both of generation and transmission quantitatively against energy sources, if possible, so they can be awarded the higher mark.

LO2: To meet the model assignment requirements candidates needed to include a wide range of industrial and healthcare as well as power applications It is expected that candidates will give 3 to 4 uses per application.

In the application “healthcare,” uses might include:- radiography; radiotherapy; nuclear medicine; sterilisation.

In the application “industry”, uses might include:- quality control of materials; measuring the level in containers; monitoring the thickness or consistency of paper; modification and preparation of polymeric materials and composites; irradiation of foods.

In power generation the uses of ionising radiation might include:- secure the UK’s energy supplies; help the UK decarbonise and meet legal low-carbon obligations; benefit the economy more widely; produce large quantities of low carbon electricity over an extended period; small power plants, as in submarines, produce large amounts of power for a small amount of material allowing submarines to submerge of months at a time.

It should be remembered that X-rays and CT scans do not use nuclear ionising radiation and their descriptions would not support the evidence required for the model assignment. However, when the risk of radiation exposure is calculated, they may be included as part of a radiation treatment.

Also candidates are required to suggest how risks could be reduced, this could be linked to the type (and its properties) of radiation involved. Where possible the source material of the nuclear ionising radiation used in the application should be named to support a high mark.

LO3: To show independence, candidates should be encouraged to explain why they are using the pieces of. The accuracy of collected practical data is enhanced when repeated values are collected. It is expected that the results collected by the candidates are appropriately displayed and units are included.

Assessor comments or a detailed witness statement of practical competences would support the marks given.

LO4: Few candidates decided upon a client group, what the ‘problem’ was and then linked this with a health education programme.

Evidence was often just "evidence" - there was no idea that relevant materials produced should have a specific client group in mind. Those candidates who produce leaflets etc targeting a client group achieved higher marks.

A lot of candidates relied mainly on qualitative data in the analysis of the general factors affecting health; there should be a combination of both qualitative and quantitative data in the evidence provided. The full range of factors would include diet, exercise, smoking, drug use,

pollution, noise, and agrochemicals and it is expected at least four factors would be evaluated in detail supported with quantitative data.

LO5: The specification indicates the range of medical treatments that should be understood by the candidate. Only one treatment needs to be considered, but in some depth and with some quantitative analysis.

Evidence for testing and clinical trials of medical treatments should have reasons for each stage of the testing.

LO6: Centres used a wide range of locations to collect evidence of pollution, from trips out to wildlife trust centre to their own school grounds. Consequently a range of techniques were used to collect samples. However, a number of centres used a location that provided a very limited range of samples restricting the candidates testing techniques.

Candidates should have the opportunity to collect both biotic and abiotic data, to include, depending on survey: indicating vegetation count, vertebrate count or invertebrate count and pH values, chemical tests (such as for sulfates, chlorides, carbonates) and particulates counts.

Too many investigations did not have sufficient depth of numerical processing to achieve a higher mark.

Some learners were unclear as to why they were sampling which meant they were unable to evaluate their findings.

The grading criteria, asks for visualisation of data, this could be in the form of a chart.

LO7: The model assignment was focused on the constructional materials in a house. It is expected that up to nine materials are listed and explained to achieve a higher mark.

There were limited explanations of the chemical processes used to produce materials (balanced equations and calculations of theoretical yields), the impact of the chemical processes on the environment, and little evidence of alternative production methods that can reduce environmental impact.

There is an opportunity, in prior learning, to carry out a number of chemical processes so learners can focus on the environmental effect of a process. This would lead onto alternative processes and candidates could be introduced to electrolysis.

LO8: A number of candidates used diagrams to explain the molecular structure of a number of materials, and hence their properties. It is expected at least five materials would be explained to achieve a higher mark. Quantitative data should refer to property of the material and then explain why this data makes it appropriate to use.

LO9: The task requires candidates to carry out a range of tests on materials for an appropriate use. At least two materials should be tested, each for two properties and then a comparison between the two materials made. The purpose of the tests was not always evident.

R072-01 How scientific ideas have developed

General Comments:

This unit gives candidates the chance to show their understanding of the processes by which scientific ideas have developed. It was clear that Centres had entered candidates who were suited to the structured approach of this Level 1 paper so that they were often able to demonstrate their knowledge and understanding. The language used in questions was appropriate, relatively few questions were unanswered and there was no evidence that candidates did not have sufficient time to complete the examination.

Question 1 is based on the Case Study and provides 25% of the marks for the whole paper. In answering this question candidates usually made good use of the pre-release material where straightforward answers from the text were required (1bi, 1bii) although many were unclear when required to interpret the material (e.g. 1ai, 1d, 1f).

Candidates do need to ensure that they spend sufficient time reading questions carefully so that their answers address the question asked. For example, many only addressed one aspect of the two aspects required in the extended writing tasks (2, 5). Similarly where a written answer requires 2 marks candidates need to realise that two aspects need to be addressed to gain full credit (e.g. 1aii, 3c, 6b).

Comments on Individual Questions:

Question no.1

Many candidates used the insert to identify how Darwin differentiated the types of finch in part (b)(i) and the population trend in part (f)(i). .

In part (d) candidates had difficulty in interpreting the distribution charts both in fig. 2 where they just described the shape or how beak size changed over time.

When comparing fig.2 and fig.4 in part (f)(i) many compared the shapes, not realising that the y axis scale had changed and consequently thought that only the population of birds with smaller beaks had declined.

In part (g) most candidates appreciated that a lengthy study of birds was needed to ensure sufficient evidence was collected

Question no.2

In part (a) candidates were confident in identifying the low CO_2 level .

Unfortunately many did not make sufficient use of the graph in part (b) where answers often just stated that the CO_2 level had risen. They need to be aware that where 6 marks are available detailed answers are required. The best answers gave the detail required and commented on the change beyond the year 2000. Few candidates addressed the aspect relating to environmental changes, many who did, referred to greenhouse gases or global warming rather than describing a likely effect. The mechanism by which CO_2 causes global warming was not known, credit usually only gained for mentioning warming or the greenhouse effect. A misconception was that the ozone layer is connected to the global warming process.

Question no.3

In part (a) many knew that infra-red is used in optical fibres which was the most correct 1 mark answer but few had a good concept of how mobile phones connect to a network in part (c).

Question no.4

Many candidates could interpret data in part (b)(i) but most struggled to convert this to a percentage in part (b)(ii), and symptoms of diabetes were fairly well known in part (b)(iii).

Several candidates mentioned the use of a blood test in part (c)(i) but did not specify to measure glucose levels.

Most candidates were unaware of Avicenna in part (e)(ii) and ignored the information that he lived over 1000 years ago, as answers related to current advice to reduce sugar intake and exercise more; a few good answers mentioned fenugreek seeds.

Question no.5

There were only a few clear answers identifying that the receptor is in the knee and muscles being the effector. Many candidates just described the steps in the diagram and consequently did not gain credit. There was little concept of the difference between a reflex reaction and a conscious response.

Question no.6

This question was answered quite well with candidates understanding why scientists publish findings (parts a, b, c). The best answers in part (d) indicated a good understanding of DNA base pairing.

R072-02 How scientific ideas have developed

General Comments:

This unit gives candidates the chance to show their understanding of the processes by which scientific ideas have developed. The first question (relating to the Case Study) provides 25% of the marks for the whole paper. Most candidates were familiar with this document. It is intended that teachers spend some time with candidates before the examination, considering the evidence given in the Case Study. The data relating to a real-life study of Darwin's finches provided considerable opportunity to review ideas of variation and selection under environmental pressures – but most candidates did not seem to have considered how this data might illustrate topics they had studied.

It was, very clear that few candidates were prepared to address the questions which related specifically to the **bold print** statements in the specification. These have to be examined on the Level Two paper. Candidates who are entered for this examination should have been given specific additional teaching about this content or they are be seriously disadvantaged.

The language of the examination was inclusive and there was no evidence that any were disadvantaged by this or cultural issues. There was little or no indication of time pressure or other constraints for most candidates although some very weak candidates did not attempt a number of questions. They would have been better advised to attempt the level one paper.

Comments on Individual Questions:

Question no.1

Some candidates understood the idea of geographical separation in part (a) while others speculated that adaptation to the local environment was the key to the uniqueness of the finches on the island.

The differences which allowed two species to co-exist were well understood in part (b)(ii).

Despite the emphasis in previous reports, the binomial system of nomenclature was barely recognised in part (c) which was disappointing.

Candidates sometimes recognised that the graph in Fig. 3 showed a correlation between the data for each generation, but few appreciated the variability in the data.

Although most candidates noted that the population of ground finches had dropped significantly as a result of the drought, the explanations in part (e) were often sketchy and made little reference to the data provided.

The final part of the question tested the concepts of experimental design and showed that a pleasing number of students were able to identify the key variables in an unfamiliar experimental situation.

Question no. 2

A few candidates were able to explain how "Greenhouse" gases can affect the temperature but many chose to describe possible outcomes instead. Like the action of water vapour and methane as greenhouse gases, this is in **bold print** in the specification and so can only be examined on this paper. A worryingly large number of candidates mixed up the greenhouse

effect with damage to atmospheric ozone levels which is a completely different effect of atmospheric pollution.

A pleasing number were able to recognise possible outcomes of climate change in part (b) – although relatively few were able to give any arguments as to why people might reject the anthropogenic view in part (c).

Question no. 3

As has happened in previous years, it seemed as though a limited number of candidates had studied the topic relating to communicating with waves in any detail. Parts (a) and (b) were a direct assessment of facts detailed in the specification but few candidates were sure of the answers except perhaps those who study ICT. The final section of this question was much better answered with many candidates offering explanations of how to design a fair comparison of two phones and sometimes a sensible understanding of how scientific work is peer reviewed.

Question no. 4

The topic of diabetes is generally far more familiar to candidates than most other topics. Part (a) required candidates to explain how the blood glucose levels varied, but the bulk of candidates chose to describe the changes without any attempt to explain how the presence or absence of insulin might affect these changes.

The symptoms of diabetes were quite well known in part (b) and the idea of further measurements to add resilience to the data was usually appreciated.

Part (d) indicated that most candidates realised the limitations of monitoring blood glucose levels a century ago – and many appreciated that the pancreas was the organ that produces insulin – although a significant number believed that insulin was collected from the liver.

Question no. 5

This question was about the process of scientific publication in the context of the structure of DNA. In part (a) the ambition to be first to publish was investigated and generally well understood by good candidates. The advantages of publication and the reasons for delay were also quite commonly understood.

When asked a direct question on previous papers, many candidates have correctly stated that Adenine matches Thymine, with Cytosine bonding to Guanine. Part (d) allowed candidates who understood this to obtain some marks for a fairly straightforward calculation. A pleasing number got this right – and those who didn't recognise the idea sometimes picked up a consolation mark for making the four numbers add up to 100%.

The final part of this question was focused on the way in which the sequence of bases in DNA provided a code for the amino acids in proteins – but there was little or no sign that candidates had ever been introduced to this concept.

R073 How scientists test their ideas

General Comments:

Candidates are able to choose from three practical investigations: Burning fuels, Antimicrobials and Electrolysis. Centres should not attempt to carry out any other experiment without prior consultation with OCR.

Scaffolding work-sheets or templates must not be used when candidates are undertaking the model assignment tasks and will trigger referral for malpractice. However, teachers may use them, as well as, guidance comments, during prior learning.

It is expected that candidates will initially be taught the knowledge and skills required before undertaking the model assignment independently.

If guidance is given whilst candidates are undertaking the model assignment, it will severally restrict the mark the candidate is able to obtain.

Candidates may use the comments on the grading sheets as guidance when undertaking the model assignment so it is important that they have access to them.

Comments on the Unit Recording Sheet should be detailed as possible and show how marks have been awarded linked to the criteria.

Witness statements with details of the candidate's practical competencies would be helpful in supporting the awarded marks.

Please ensure that you annotate all candidates' work to show where the evidence has been met as annotation is always useful in confirming the judgements made by the teachers.

Overall, marking was consistent although it tended to be generous.

It should be remembered that centres should send copies of the MS1 and CCS160 to the designated moderator as well as making sure the candidate's number and full name is entered onto the Unit Recording Sheets

Comments on Individual Learning Outcomes:
LO1: The range and detail of research differed from centre to centre, and investigation to investigation. Candidates should refer to the model assignment which lists the expected research to be carried out.

In cases where candidates scored well, they have based their investigation on a range of relevant sources of secondary information. Not all candidates referenced the information gathered when undertaking their research. After initial research learners will identify the "problem" that needs to "solved".

From their research and prior learning candidates will be able to plan their investigation. The plan should be written so that another person could follow it.

Candidates should explain why they have chosen the equipment and why they have chosen the measurements, and to what accuracy measurements can be taken using the equipment selected.

Candidates have also to been able to explain how errors will be minimised and linked this to the discussion of their results when they have completed the practical work in their evaluation.

LO2: All learners completed risk assessments as part of their plan. However, a few referred to standard laboratory rules rather than the chemicals and processes that were to be used. Candidates are expected to have access to CLEAPSS information. Candidates need to explain the risk of the individual chemicals used or biological materials, they should also explain how waste material is dealt with. Assessor comments were also included on how candidates managed risk.

Candidates could refer to how equipment is set up in the plan – in terms of taking readings and ease of carrying out the practical. Diagrams and photographs could be used to indicate the equipment set up.

Candidates must demonstrate the ability to take and record appropriate measurements.
It is expected candidates will take repeat measurements – candidates should be aware of the accuracy of their measurements when taking them as they may decide to collect a number of results in a certain range (if initially 3 measurements are taken, candidates may decide to take more whilst actually carrying out the practical till 3 measurements are taken that are “close” to each other).

Candidates should consider to what significant figure they are recording to – precision of final result will depend on the sensitivity of all readings taken. When measurements are taken the appropriate format should be used, including use of correct units. It is expected that candidates select the appropriate recording format; they should not be given a pre-prepared template.

LO3: A graph with a range of collected results (at least 5) will reveal trends/patterns. When drawing graphs appropriate scales and axes should be used and data plotted accurately, including where appropriate, use of lines of best fit.

To achieve the higher mark a complex mathematical technique is required. This may mean candidates calculating areas, gradients etc. rather than just calculating mean values.

LO4: If candidates have clearly recorded a good range of measurements and displayed range bars on their graphs then further analysis will be easier. They will be able to produce supported discussions about the limitations and reliability of the procedures, and identify suggestions for improvements. They should consider the accuracy and precision of their data against the equipment that they have used.

Candidates should be able to produce comments linked to their initial research in their evaluation and try to justify their conclusion.

LO5: Candidates tended to use scientific terminology within their initial research and in their evaluations. Most learners were able to use standard formats to logically organise their evidence.

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