Cambridge National

Science

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

OCR Report to Centres January 2015

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 R071 is a mandatory unit with evidence coming from the OCR model assignment. The model assignment has been written to give centres the flexibility to make the tasks relevant to their learners.

Most centre marking was consistent if over generous, with a number of the learning outcomes being leniently marked, this was more noticeable of centres that had entered candidates for the first time.

To support their judgements, teachers commented and explained their assessment judgements on the unit recording sheet. This is important to support marks given for candidates' independence when carrying out tasks especially for practical learning outcomes 3, 6 and 9. Teachers can also use witness statements and competency recording sheets to indicate the level of a candidate's practical skills in greater detail.

It would be helpful if teachers annotated candidates' work when moderating, this then would allow teachers to justify why they are awarding the mark they do.

Candidates that supported their judgements with quantitative data rather than just qualitative data attained higher marks.

Scaffolding worksheets or templates **must not** be used when candidates are undertaking the model assignment and will trigger a referral for malpractice if used.

However, teachers may use them as well as guidance comments during prior learning but this material should not be included in the candidate's assessment evidence.

Comments on Individual Questions:

LO1: Candidates gave a range of energy sources that could be converted into an electrical supply in some detail. The better descriptions included the technical detail of the source as well as the environmental and social impact. The technical detail allowed candidates to evaluate their choice of energy source in realistic terms.

Candidates achieved higher marks if the geographical, environmental and climate for a specified location for the energy supply was fully identified and researched so that they could make an informed choice of energy source for the specified location.

When considering the transfer of energy into electricity candidates should quantitatively analyse the efficiency of one source when compared with another rather than just quote values.

If candidates considered questions that are addressed in a public enquiry by a particular concern group, this would allow them to extend their evidence when making a choice of energy source.

LO2: To meet the model assignment requirements candidates needed to include a wide range of applications from industrial, healthcare and power. It is expected candidates will explain at least three uses from each of two applications. At MB3 candidates should also refer to a third application. Candidates should also include the character of the radiation and if possible an example of the isotope used in the application.

Candidates gave a range of uses with their benefits but tended not to explain how the risk of using nuclear ionising radiation could be reduced so that it can be used safely.

Candidates should note 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. Candidates can refer to X-ray dosage when considering the reduction of risk when X-rays are involved in nuclear medicine.

LO3: Candidates carried out the practical task well. To achieve higher marks they need to explain why they have selected the pieces of equipment they use; this would especially help when candidates evaluate the accuracy of their results. It should be remembered that the unit of time is in seconds, as measuring in minutes would produce measurements with less accuracy.

To enhance the accuracy of the practical data, repeated values should be collected.

The exam-board expects that no more than two candidates would be working in a group, consequently it is expected that a wide range of results will be produced.

Teacher comments or a detailed witness statement of practical competences, if provided would support the marks awarded.

LO4: Nearly all candidates stated a chosen client group. The best responses linked the health education programme to the group rather than one aimed at the general public.

Some candidates were able to adapt their health programme to the work location of the group.

When describing the factors affecting health the better responses included a combination of both qualitative and quantitative data.

LO5: A wide range of medical treatments were seen and presented in a large number of different ways. For evidence only one treatment is required as stated in the model assignment. The specifications are helpful in giving guidance as to what evidence is required. Candidates realised that there was a second part to the task that was to explain the need for clinical testing.

Candidates were able to describe each stage but did not always explain the reason for the stage.

LO6: Centres used a wide range of locations to collect evidence of pollution, and a range of techniques were used to collect samples. To aid candidates in producing worthwhile measurements, centres should choose locations that provide candidates the opportunity to collect both abiotic and biotic data,

The specifications give the expected range of tests that should be used on the collected samples. Better responses were made by those candidates who were clear to why they were sampling and what was the problem was, which resulted in a more in-depth evaluation. When evaluating potential environmental problems it would help candidates if they were aware of what the different plants and invertebrates they collected actually indicated.

LO7: The model assignment is focused on the construction materials used in a house. The better candidates were able to identify a wide range of eight to nine of materials.

To achieve higher marks candidates need to explain the chemical processes used to produce the material (balanced equations and calculations of theoretical yields) and the impact of the chemical processes on the environment. They also need to explain alternative production methods that can reduce environmental impact.

LO8: Centres used the model assignment for this task and the mark awarded was generally fair and consistent. The evidence provided was supported with a more detailed explanation of how the properties of materials depend upon their structure and bonding. The better candidates used diagrams to explain the molecular structure of a number of materials, and hence their properties. They also included quantitative data related to the properties of the materials.LO9: Candidates displayed a range of practical skills, and when integrated into the model assignment candidates produced more in-depth conclusions. The task) requires candidates to carry out at least two tests on at least two materials for an appropriate use. Those candidates that understood what the purpose of the tests, achieved a higher grade as they could evaluate their results for a purpose.

R072/01 How scientific ideas have developed

General Comments

This unit gives candidates the opportunity to study the processes by which scientific ideas have been developed. This is achieved by considering a number of important steps in the development of our modern understanding.

The first question relates to the pre–release material and provides 25% of the marks for the whole paper. Candidates who did well on the whole paper had usually worked on this document with their teachers in class before the examination. Very few marks were obtained by simply copying from the document, but many marks were accessible to those who had considered and discussed the pre-release material.

The language of the examination was inclusive and there was no evidence that any candidate were disadvantaged by this or cultural issues. There was little or no evidence of time pressures or other constraints for most candidates.

Where multiple choice questions ask for a specific number of responses (e.g. question1a), candidates cannot gain full marks by giving fewer or more responses. The level one paper will usually state how many responses are required, although this may not always be the same as the number of marks awarded.

Candidates are allowed to use a calculator in this examination but a number of candidates did not do so.

Comments on Individual Questions

Question No.1

This question related to the pre-release material.

Part (a) was well answered and most candidates gained both marks. More able candidates also answered (b) and (c) correctly. In (d) some candidates gained a mark by mentioning the idea of a jigsaw fit, but many did not give evidence for Wegener's ideas, instead they explained what those ideas were e.g. drifting continents. Many candidates correctly worked out the answer in part (e), however few showed their working out. Part (f)(i) was answered correctly by most candidates but some simply stated that ‘he was not a proper scientist’ which did not gain a mark. There was a great variation in the responses to (f)(ii) with the most able candidates gaining full marks. This was also true for parts (g) and (h).

Question No.2

In part (a) it was rare for candidates to gain a mark for stating that it was to ensure comparability, and many candidates incorrectly referred instead for the need to have enough energy in his system to fulfil his needs. In (b)(i) many candidates could work out the answer from the data given but it was very rare to see the correct unit given. It was also very rare to see the correct percentage given as answer to (b)(ii). In (c)(i) many candidates gave a vague comment without addressing what the question asked, which was for a comparison of the data. Some seemed to confuse 'energy' and 'glucose levels', talking about 'more energy' being available from one of the breakfasts which was incorrect. In part (c)(ii) many candidates did not identify a similarity and a difference clearly. Some identified differences and quoted them as similarities and vice versa. A common error was to identify individual results that were different rather than discussing the overall patterns in the data.

Part (c)(iii) was well answered by the majority of candidates and the idea of experiment design was clearly understood. In (c)(iv) many candidates also recognised that peer review must be done by another scientist. For part (d) it was rare for 6 marks to be awarded for clearly stating how glucose is used and how it is controlled by insulin. Many candidates only answered one aspect of the question rather than both. It is important that candidates read the longer answer questions fully to make sure they engage with all aspects of the task. Many earned at least some credit for stating that glucose is needed for energy. Some gave some correct points about insulin, for example that is made in the pancreas. Some confused the function of the liver and the pancreas. Many thought that insulin could increase glucose levels when necessary.

Question No.3

In part (a) many candidates drew 4 lines to connect responses rather than the 1 line which was asked for and therefore did not gain a mark. Many candidates chose the correct responses for parts (b), (c) and (d) (i). In (d)(ii) most candidates incorrectly discussed making longer calls on the phone or using a range of phones.

Question No.4

In part (a) almost all candidates knew some information about Copernicus' model of the Solar System. Many gained 4 marks at level 2 by comparing this with the Greek model, most frequently by comparing the relative centres of the Sun and the Earth. Fewer gave further correct details to gain full marks. These could have included the motion of the moon, the relative speeds of the planets or the rotation of the Earth. In part (b)(i) most candidates knew that Galileo had a telescope. There was some confusion between telescope and microscope, and some vague answers about ’better equipment‘ and ’better technology‘ which were not credited. In part (b)(ii) most candidates knew that Newton developed the theory of gravity, but far fewer knew that he also developed the theory of the laws of motion.

Question No.5

In part (a) candidates seldom gained two marks for this question, a mark was most commonly awarded for the idea that acquired characteristics (long hair) are not passed on. In part (b) it was very rare for candidates to gain full marks for this question as Darwin's theory of evolution was not well understood. Some candidates discussed the roles DNA and genes, which were not ideas that Darwin used himself. Some confused natural selection with selective breeding. In part(c) it was rare for full marks to be awarded here as many candidates expressed the idea that humans hunted the mammoths to extinction. In (d), candidates who did not gain a mark here merely repeated the idea from the question that there is no evidence available to prove Fitzroy's belief.

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/pre-release) provides 25% of the marks for the whole paper. Most candidates were familiar with this document and it seemed that they had spent time preparing in advance of the examination. It was, however, very clear that many candidates were unable to address the questions which related specifically to the **bold print** statements in the specification. These can only be examined on the level two paper so they must appear here.

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.1Responses indicated that many candidates were familiar with the Case Study which was the basis for this question. In part (a), most candidates were aware that South America and Africa were once linked. The fossil record in table one suggests that Africa and India were once linked too. Part (b) was also well understood with many candidates scoring full marks. Some candidates were able to identify two aspects of the advantages of scientific teamwork in part (c) but weaker candidates offered only one idea. Parts (d) and (e) could be answered using ideas from the Case Study. Some good candidates identified two responses which argued from evidence in part (f). In part (g)(i), candidates often identified the idea that the core heats the rocks in the mantle, but rarely gave enough detail of the processes involved to score the other marks. Some candidates mixed up Holmes with Wegener in part (g)(ii).

Question No.2

It was clear in part (a)(i) that the concept of a percentage increase was not well understood. A small number of candidates worked with the correct numbers, but most attempted to do more familiar manipulations like identifying outliers or calculating means. Part (a)(ii) required candidates to describe patterns of change in the data and many good responses were received. Some candidates described instead how to process the results by drawing a graph or bar chart and a few assumed that the question was about a healthy diet instead of blood glucose levels. Part (a) (iii) was poorly understood with many candidates selecting the same mass of breakfast as the key control.

Responses to part (b) indicated that many candidates have not really grasped the problems caused by diabetes. Most were aware that the blood glucose levels could be too high or two low – and that this was hazardous. Better candidates were able to identify why blood glucose should be checked in the three situations given. A few good responses also identified the actions which would be required to counter high or low figures.

Most candidates answering part (c)(i) were unconvinced that anyone would want to use the taste of the urine in diabetic diagnosis. Those who accepted the idea often assumed that the amount of sugar in urine was more affected by what had been eaten recently rather than hormone levels. The idea that measuring blood glucose requires relatively modern technology was not commonly identified in part (c)(ii).

Question No.3

Decoding the Morse code in part (a)(i) was generally done well, although some candidates clearly just took a guess.

Answers to part (a)(ii) were usually vague, but often identified the risk of a random result (usually expressed as cheating or lying). Although explicit in the specification, very few candidates identified infra-red radiation as being used in part (b)(i). The idea that the radiation is not able to spread out and dissipate in part (b)(ii) was not often well explained. Attempts to describe the process of total internal reflection were sometimes undermined as the candidates were usually thinking of the optical fibre as a *tube* with glass only at the edges.

Even though the relationship of bits to bytes and megabytes is unique to the Level two paper, very few candidates had any idea how to handle the calculation in part (b)(iii). It should be noted that the specification statements in **bold print** must feature in the level two examination. Candidates for this examination will be disadvantaged if they are not familiar with the content of these statements.

Question No.4

The idea that Hubble was studying distant galaxies was often appreciated in part (a) but the graph in part (b)(i) was less often interpreted correctly. Candidates at this level should be able to read from a graph. In part (b)(ii), the ability to describe the graph allowed most candidates to score some marks. Good candidates described the relationship shown in the graph but relatively few linked this quantitatively to the ideas of the big bang or expanding universe. In part (c) many candidates identified new generations of telescopes as the key to better observations, but did not develop their answers sufficiently to get all three marks. Although galaxies are moving away from our solar system, this does not of itself invalidate Hubble's data. The final part (d) of his question showed that few candidates appreciated that red shift was the evidence for the movement of the galaxies and that background radiation for the cooling universe. Once again, these are **bold print** statements in the specification which must be taught to candidates who are sitting the level 2 paper.

Question No.5

The difference between the ideas of Lamarck and Darwin were investigated in this question. Although there was some evidence that students had considered this, the differences were still not well known. Responses to part (a) should have considered that growing long hair is an acquired characteristic and so cannot be passed on to the next generation. In part (b) the common Darwinian summary "survival of the fittest" was often quoted but rarely well explained. Although set in the context of Darwin's refusal to publish for a long time, the final part (c) was more general and many candidates were able to show their understanding here.

R073 How scientists test their ideas

General Comments:

Learners are able to choose from three practical investigations: Burning fuels, Antimicrobials and Electrolysis.

There was a tendency for teachers to use the grading criteria in isolation. Before undertaking a model assignment, teachers must refer to the 'Information for Teachers' within OCR's model assignment which gives:

- Guidance on using the model assignment – the preparation and completion of the assignment;
- Evidence summary - the evidence the learner is expected to produce for the model assignment;
- Apparatus and materials which centre staff will need to provide.

If teachers do this they will then be aware of the scenario the tasks are set in which will impact on their assessment of learner's evidence.

Scaffolding worksheets or templates must not be used when candidates are undertaking the model assignments and will trigger a referral for malpractice if used.

However, teachers may use them as well as guidance comments during prior learning but this material should not be included in the candidate's assessment evidence.

Before learners undertake a model assignment they should have access to both to the 'Information for Learners' within the model assignment and the making criteria so that they are aware of the expected evidence for the research undertaken, the planning process and the recording of measurements.

The exam-board expects that no more than two candidates would be working in a group together, consequently it is expected that a wide range of results will be produced. It is not expected that each script within a centre's submission would have the same results. Centres are reminded that supplying results to candidates constitutes malpractice.

Comments on Individual Questions:

LO1: The range and detail of research differed from centre to centre and investigation to investigation. The level of research was reflected in the detail of planning.

In some cases, where candidates have scored well, they have based their investigation on a range of relevant sources of secondary information which were also referenced.

Candidates produced methods that could be followed but there was a tendency that they for them not to explain why they had selected the equipment that they had.They also made no reference to the accuracy of the measurement technique, and consequently this was not referred to when evaluating the accuracy of their results. This was also seen in the number of significant figures used in some recorded measurements, as these were not consistent with the accuracy of the measuring instrument. Candidates need to explain why they are taking repeat results, and it would be helpful if some indication of the expected range is known.

LO2: All candidates 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 must record the full range of the measurements they have taken. Candidates should refer to the measurements that need to be taken in their plan. The use of minutes to record time will reduce the accuracy of their measurement.

Candidates should make sure their recording table is correctly formatted with headings and units for all columns.

Witness statements or a competence record sheet would support the teachers' judgements in greater detail and would aid moderation.

LO3: Where candidates plotted line graphs they were able to give a greater degree of analysis than those candidates who produced bar charts. Candidates are more likely to produce detailed quantitative analysis if they have acquired the necessary mathematical skills prior to the investigation.

LO4: Those candidates who recorded a good range of measurements and displayed error bars on their graphs produced a more in depth analysis. If candidates had not fully understood the task and produced very limited research then their evaluations were brief. Better candidates used quantitative statements to back their judgements rather than qualitative data based on their results and secondary data and linked their evaluation to the underlying science.

LO5: The most able candidates tended to use scientific terminology and language within their initial research and in their evaluations. Most candidates were able to use standard formats to logically organise their evidence.

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