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Oxford Cambridge and RSA

Cambridge Nationals

Science

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

OCR Report to Centres January 2014

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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.

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

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R071 How scientific ideas have developed

Unit R071 is a mandatory unit where learners have to complete the OCR Model Assignment. The model assignments have 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.

To support their judgements, teachers commented and explained their assessment judgements on the unit recording sheet. Teachers can also use witness statements and competency recording sheets to indicate the level of a candidate's practical skills.

It was noticeable in a small number of portfolios that scaffolding worksheets/frameworks had been used to give guidance when candidates were completing the tasks. It is expected that candidates will initially be taught the knowledge and skills required, as specified by the specification, before independently undertaking the set assessment tasks in the Model Assignment. The use of guidance within portfolios resulted in a restricted moderated mark.

It is noticeable that some centres have not familiarised themselves with the specification, exam board guidance and Model Assignment.

Across the assessment task it is worth noting that those candidates that supported their judgements, where appropriate, with quantitative data rather than just qualitative data achieved higher marks.

Comments on portfolio evidence

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 their environmental and social impact.

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

When considering the transfer of energy into electrical candidates should quantitatively analysis the efficiency of one source when compared to another.

If candidates considered questions that are addressed in a public enquiry 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 both industrial and healthcare applications. It is expected candidates will explain four examples from each of these two applications.

Please note that X-rays and CT scans do not use nuclear ionising radiation. Therefore, candidate descriptions do 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.

To complete the task candidates do not need to refer to the electromagnetic spectrum as the task is concerned with ionising nuclear radiation.

LO3: Candidates carried out the practical task well. In order to achieve higher marks they need to explain why they have selected the pieces of equipment they use.

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

The exam board expects that no more than three candidates would be working in a group together. Consequently, it is expected that a wide range of results will be produced from each cohort entered.

Teacher comments or a detailed witness statement of practical competences would support the candidate's assessment mark.

LO4: Nearly all candidates stated a chosen client group. The best pieces of work linked the health education programme to their chosen group rather than being a programme aimed at the general public. When describing the factors affecting health the best responses included a combination of both qualitative and quantitative data.

LO5: A wide range of medical treatments were seen, and were presented in a large number of different ways. For evidence only one treatment is required as stated in the Model Assignment. The specification is helpful in giving guidance as to what evidence is required.

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 most competent responses were made by those candidates who were clear as to why they were sampling and what the problem was. This resulted in these candidates producing more in-depth evaluations. When evaluating potential environmental problems it would help candidates if they had a better awareness of what the different plants and invertebrates they collected actually indicated.

LO7: The Model Assignment is focused on the constructional materials used in a house. The more able candidates were able to identify a wide range of materials.

To achieve higher marks candidates need to explain the chemical processes used to produce the material (to include 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 the environmental impact the processes explored.

LO8: The mark awarded by centres was generally fair and consistent for this task. The evidence provided a detailed explanation of how the properties of the materials are dependent upon the structure and bonding involved. More able candidates used diagrams to explain the molecular structure of a number of materials and hence their properties. They also included quantitative data on the properties of the materials.

LO9: Candidates displayed a range of practical skills. The task requires candidates to carry out a range of tests on materials for an appropriate use. Those candidates that understood the purpose of the tests achieved a higher mark.

R072 How scientific ideas have developed

R072 Level 1 January 2014

This unit gives candidates the opportunity to study the processes by which scientific ideas have been developed. 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. 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. 1ei) candidates cannot gain full marks by giving fewer or more responses. The Level 1 paper will usually state how many responses are required.

Questions

1. This question related to the pre-release material and responses demonstrated that candidates had used the information given to answer the question.

   In part (a) most candidates correctly read the graph.

   In part (b) many candidates gained at least one mark for identifying at least 3 correct true or false statements. Some were confused by those statements directly relating to the information shown in the graph.

   In (c) most candidates restricted their answer to one point, where 2 marks were available. Many had the idea that individual variations in data would be eliminated when using averages. When candidates did not achieve marks it was usually because they stated that the data would be more accurate, rather than the correct response of more reliable.

   Part (d) discriminated well; this was because in order to achieve marks the candidates had to understand the concept of pancreatic extract and its effect on the dogs. Stating that the dogs would get better was the most common scoring point. When candidates did not gain marks it was often because they simply quoted that the dogs would “stay healthy” from the text.

   In part (e)(i) most candidates gained a mark, the most common incorrect response being that “They needed to make sure it was a fair test”.

   In part (e)(ii) most candidates gained a mark.

   In part (f) most candidates gave Ayo as a correct response. The most common errors were to choose Joanna and Barbara.

   In part (g) some candidates identified the correct base pairs.

   In part (h) most candidates gave a single response that “Bovine insulin was almost identical to human insulin”. The second mark was rarely awarded.

2. In part (a)(i) only a few candidates correctly identified both countries.

   In part (a)(ii) most candidates gained a mark for "jigsaw fit" idea. The mark for continents moving away from each other was sometimes given. There was little reference to fossil evidence. Some candidates wrote about tectonic plates which was not relevant. Most candidates who gained one mark were awarded another QWC mark as their responses were well written.

   In part (a)(iii) many candidates were confused by the term "suggest an argument" in the question, and responded by asking questions such as "How do you know?" as if to start an argument.

   Many candidates gained a mark when responding to part (b).

3. Most candidates were able to use the key and correctly identify the grasshopper in part (a).

   Part (b) discriminated well. The most successful answers used a lot of information from the key. Those who did not score well used some features of ants and beetles not listed on the key.

   In part (c) most candidates identified at least one correct answer.

4. A few candidates gained a mark for the correct calculation in part (a). Those who did not usually stated the sum of the response times.

   Part (b) discriminated well. A few candidates scored high marks by giving advice and relating that to information given in the table. Those who did not score well presented vague, non-specific ideas rather than advice.

   In part (c) most candidates identified at least one of the two correct answers.

   When answering part (d) a few candidates gained at least one mark, two marks were rarely awarded. Candidates simply stated that this was a matter of belief and therefore were not awarded a mark.

5. Question (a)(i) was very challenging for the majority of candidates. They needed to identify the wavelength on a diagram and most were unable to.

   In part (a)(ii) some candidates were able to identify the correct response. Those who did not often chose infra-red.

   Part (b) was a challenging question with few candidates scoring 2 marks.

   In part (c)(i) only a few candidates were able to answer the question and subsequently gained a mark.

   In part (c)(ii) some candidates correctly identified the speed of light.

   In part (d) many candidates gained a mark.

6. Many candidates correctly answered part (a).

   In part (b)(i) Some candidates gained a mark. The ones who did not often said that other scientists would read the information .

   In part (b)(ii) Most candidates gained a mark. Those who did not often suggested that other scientists would not waste their time doing similar research.

   Most candidates gained a mark in part (c).

7. In part (a)(i) some candidates gained two marks. Those who did not had not identified both a similarity and a difference.

   Most candidates identified the correct answer in part (a)(ii).

   Most candidates gained at least one mark in part (b).

R072 Level 2 January 2014

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 pre-release Case Study) 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.

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 most questions. They would have been better advised to attempt the level one paper.

Many candidates were familiar with all the themes followed in the specification, but some did not attempt question five which related to “Using Waves to communicate”. This might suggest that the entry was premature and the candidates would be better served by attempting this component in the summer.

Questions

1. Figure 1 in the insert was understood by many candidates and the changes in glucose levels were often clearly described and linked to the mealtimes.

   In part (b) answers which addressed *why* the blood glucose concentration drops before a meal were rare. Although glucose is used up by respiration or excreted (but not stored) many candidates simply asserted that the people were hungry or needed more glucose.

   Part (c) was also based on the experiment in figure 1 and expected answers in terms of the increase in reliability as a sample size is increased. The most common mark was scored for noting that individuals were likely all to be different, but the idea of reducing the effect of outliers was rarely seen. Some candidates linked the question to the groups in figure 2.

   Part (d) was quite well answered with most candidates identifying at least one valid conclusion from the data in the table. Joanna and Barbara were the most common wrong responses.

   Part (e)(i) and (ii) credited those who understood the idea of pairs of bases and the triplet code for each amino acid in the resulting protein. Very few candidates appreciated that 51 amino acids (given in the pre-release document) required a minimum of 3 pairs of bases

for each amino acid. Although the Level 2 pre-release gave an outline of the way in which bacteria can be used to provide "human" insulin, most candidates did not seem to have realised that modifying one cell (and then allowing it to multiply) was a less challenging task than modifying many cells in a multicellular organism.

Some good answers to part (f) which focused on the ethical issues of extracting insulin from human donors.

2. A few candidates continued to answer in terms of diabetes from question 1, but most were familiar with Wegener's theories and many could also explain how he used the fossil evidence. A much smaller number of candidates appreciated that Wegener did not propose a viable mechanism to explain how continents might be moved and so many could not explain the significance of Holmes' work.

3. In part (a) many candidates appreciated that evolution often proceeds from simple to complex, although a significant number thought that the human being must have evolved first. The justification for this was generally that the extra features must have taken a long time, so the *process* must have started earlier.

The first 'Level of Response' question (6 marks) was attempted by most candidates, and most scored some marks, at least linking a number of ticks in the table with a position in the cladistics diagram. It should be noted that the diagram does not imply that the mouse is a direct ancestor of a human being but that they may share a common ancestor.

The final part (c) of this question was generally well done – although some candidates chose the wrong number of responses. The last two statements were quite common even with candidates who had already identified the two correct answers.

4. In part (a) candidates without calculators sometimes struggled and made arithmetic errors on the right calculation. The most common wrong answer was 30.

The Level of Response question in part (b) required candidates to use the evidence in the table to support two ideas. A few candidates did this very well. However, some assumed that a fast reaction time was indicated by a large number in the table. Others explained the ideas without using the data or without making clear which data they intended to use.

Responses to part (c) were not intended to explain why or how the result was obtained, but how the unexpected result might provide the stimulus for other investigations in the future.

The diagram in part (d) gave candidates a chance to show that they understood the processes of the reflex arc. Responses in terms of hormones and the endocrine system were rare. Additionally, some candidates did not appreciate the difference between sensory and motor neurones.

Part (e) tackled the idea that some questions cannot currently be answered, or even addressed, by the scientific method. Although some candidates simply described the idea as being "religion not science" or "just his belief", many tackled the question appropriately, referring to the lack of data or suitable apparatus.

5. A significant minority of candidates did not attempt to answer much of this question. It is important that candidates are familiar with all sections of the specification.

In part (a)(i), the meaning of the wavelength was not well known. Those who had some idea of the answer often failed to mark the wavelength accurately enough to score a mark, and many responses were clearly random.

Part (a)(ii) assessed an item explicitly mentioned in the specification, but over 25% of candidates failed to give an answer. Common amongst examples of electromagnetic radiation was "*micro*wave".

Again part (b) concerned a value that candidates should have learned as it is stated in the specification. Measuring the speed of light is difficult because of instrumental limitations in view of the immense speed – but many candidates did not seem to realise this. The actual value of the speed of light was not well known either.

In part (c) the idea that the ionosphere could make a radio signal go "over the horizon" in 1902 was less commonly given than the suggestion that satellites or optical fibres were used. The description of Morse code was recognised by a few candidates.

6. The work of the astronomer Hubble was better understood when compared to question 5. Although some candidates did not realise the difference between looking at planets and moons in our own solar system and considering the shape of galaxies outside the Milky Way in part (a).

The idea of publication of results is becoming well known and many valid answers were received to part (b).

In part (c), almost half of candidates recognised red shift as the evidence for the expanding universe which was very pleasing.

7. The first part (a) of this question investigated the differences between the theories of Lamarck and Darwin. It was common for candidates to get one or both of the first two lines of the table correct – but rare for all four to be known.

Part (b) asked for a description of the process of selective breeding. Many candidates were able to score the first two marks, but the third (for the idea of repeating the selection of many generations) was rarely seen.

R073 How scientists test their ideas

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

It was noticeable in a small number of portfolios that scaffolding worksheets/frameworks had been used to give guidance to candidates when carrying out tasks. It is expected that candidates will initially be taught the knowledge and skills required, as specified by the specification, before independently undertaking the set assessment tasks in the Model Assignment. The use of guidance within portfolios resulted in a restricted moderated mark.

The exam board expects that no more than three candidates would be working in a group together consequently it is expected that a wide range of results will be produced from each cohort entered. 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 portfolio evidence

LO1: The range and detail of research differed from centre to centre, and was obviously different dependent on the investigation chosen.

Where candidates performed well in this Learning Outcome they have based their investigation on a range of relevant secondary sources of information, and referenced their sources clearly.

Although candidates produced methods that could be followed there was a tendency that they did not explain why they had selected the equipment that they used. There was also little reference made to the accuracy of the measurement technique, and consequently this was not referred to when evaluating the accuracy of their results.

A number of candidates produced good quality drawn diagrams but a high proportion of students produced lower quality diagrams.

LO2: All candidates completed risk assessments as part of their plan. However, a few referred to standard laboratory rules rather than to the specific chemicals and processes that they were using. Those candidates that referenced to CLEAPSS hazard cards were more likely to score higher marks as consideration was given to the chemicals they were working were. Witness statements or a competence sheet would aid moderation.

LO3: Where candidates plotted line graphs they were able to give a greater degree of analysis than those candidates were drew bar charts.

LO4: Those candidates who recorded a good range of measurements and displayed error bars on their graphs were able to carry out a more in depth analysis of their results. If candidates had not fully understood the task and produced very limited research then their evaluations were brief. More able candidates used quantitative statements to support their judgements in addition to qualitative and secondary data.

LO5: More able candidates tended to use scientific terminology within their initial research and in their evaluations. Most candidates were able to logically organise their reports.

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