GCSE

Rewarding Learning

Chief Examiner's Report

Double Award Science

Summer Series 2018

Foreword

This booklet outlines the performance of candidates in all aspects of CCEA's General Certificate of Secondary Education (GCSE) in Double Award Science for this series.

CCEA hopes that the Chief Examiner's and/or Principal Moderator's report(s) will be viewed as a helpful and constructive medium to further support teachers and the learning process.

This booklet forms part of the suite of support materials for the specification. Further materials are available from the specification's microsite on our website at www.ccea.org.uk.

Contents

GCSE DOUBLE AWARD SCIENCE

Chief Examiner's Report

Paper 1 Biology

Assessment Unit 1 Cells, Living Processes and Biodiversity

General comments on all papers

Hand writing is still an issue with some candidates making it very difficult for examiners to read their responses. If candidates make a mistake they should clearly stroke out their incorrect response on their script. If they leave an incorrect response that is not stroked out with a correct response they will not be awarded the mark. It is not up to examiners to guess which response the candidate intended.

In future when candidates are asked to shade something on the exam paper they need to ensure that shading is quite dark so that it can be clearly picked up when scripts are scanned.

If candidates are asked to give data then they need to state figures from the information they are given.

When candidates are asked for differences between two examples they need to reference both in their answers.

New specification GDW11 & GDW12

There was a broad range of marks awarded on both these two papers. All questions were accessible to the candidates but there were also questions that provided differentiation. It was clear that candidates from some centres were not familiar with the new topics on this specification.

Foundation Tier

Q1 In Part (a), all questions were well answered by most candidates. However, in Part (b), some candidates were not familiar with the parts of a bacteria which is new to this specification.

Q2 In Part (a), most candidates correctly answered about the starch test. However, in Part (b), many candidates could not name two simple carbohydrates.

Q3 In Part (a), some candidates confused the positions of oxygen and carbon dioxide in the respiration equation. In Part (b), the calculation in Part (i) and Part (ii) were well answered by most candidates but fewer could give correct reasons in Part (iii).

Q4 Parts (a) & (b) were generally correctly answered, but in the calculation in Part (c), quite a number of candidates forgot to take into account the fact that the information given to them was for breeding pairs of house sparrows. In Part (d), many candidates got the first two parts of this question correct but not the last part.

Q5 The cross section of a leaf is a new topic on this specification. This question was either answered well by candidates who were familiar with the topic or very badly. The difference was centre specific. Candidates found Part (c) the most difficult part of the question.

Q6 The question on diabetes did not pose any problems for the majority of candidates.

Q7 In Part (a), some candidates did not read the question properly and incorrectly gave the amount of orange peel remaining rather than the amount decomposed. In Part (b), many candidates correctly described the effect of temperature on the rate of decomposition but then did not give data to support their answer.
Part (c)(i) was correctly answered by most candidates, but in Part (ii), the detail about decomposition is a new part of the specification and was not known by many candidates.

Q8 The question on the effect of temperature on controlled reactions was well answered by many but some candidates incorrectly thought that enzymes were also denatured at low temperatures.

Higher Tier

Q1 The cross section of a leaf is a new topic on this specification. This question was either answered well by candidates who were familiar with the topic or very badly. The difference was centre specific. Candidates found Part c the most difficult part of the question.

Q2 The question on diabetes did not pose any problems for the majority of candidates.

Q3 In Part (a), some candidates did not read the question properly and incorrectly gave the amount of orange peel remaining rather than the amount decomposed. In Part (b), many candidates correctly described the effect of temperature on the rate of decomposition but then did not give data to support their answer.
Part (c)(i) was correctly answered by most candidates, but in Part (ii), the detail about decomposition is a new part of the specification and was not known by some candidates.

Q4 In Part (a), the effect of temperature on controlled reactions was well answered by many but some candidates incorrectly thought that enzymes were also denatured at low temperatures. In Part (b), many candidates could explain that inhibitors slowed the rate of an enzyme reaction but some gave incorrect explanations when they talked about inhibitors fitting into the substrate.

Q5 In Part (a), when candidates are asked to give differences between two examples they need to reference both examples in their answer. Quite a large number of candidates did not do this for this question. In Part (b)(i), some candidates incorrectly identified neurone A as a motor neurone. Parts (ii) & (iii) were generally well answered.

Q6 Many candidates gave the correct balanced equation for photosynthesis. However, the formula for glucose was not correct in some cases. In Part (b)(i), a large number of candidates still find the concept of limiting factors difficult. The most common incorrect response was light. In Part (ii), there were also many incorrect answers.

Q7 Most candidates coped well with this question.

Q8 In Part (a), many candidates only described the increase in algae but did not go on to give the decrease. Most gave a correct explanation for the increase but fewer also explained the reason for the decrease in the numbers of algae. In Part (b)(i), most candidates correctly answered this question and in Part (ii), many candidates gave comprehensive answers.

Q9 Part (a) was well answered by many candidates. However, in Part (b), some candidates incorrectly gave the type of animals as A. In Part (c)(i) and (ii), although there were a large number of correct responses here, some candidates struggled with understanding the processes involved. In Part (iii), only more able candidates were able to answer the question correctly.

Q10 In Part (a), there were correct answers from many candidates. In Part (b), there were some good answers but some candidates incorrectly identified the soil. In Part (c), only the most able candidates answered this question well.

Paper 2 Chemistry

Assessment Unit 1 Structures, Trends, Chemical Reactions, Quantitative Chemistry and Analysis

Foundation Tier

This was the second sitting of the new DAS Unit C1 exam. A wide range of marks with few very low marks was evident. There was little, if any evidence of Foundation Tier candidates being entered at the wrong tier. The paper was successful in providing candidates of differing abilities the opportunity to respond positively. Some candidates provided excellent responses throughout the paper. There was evidence of variability in responses from centre to centre, particularly in respect of topics or types of question which were being examined for the first time in this paper. This specification has many new areas that need to be examined and each paper needs to cover some of these. Additionally the Foundation Tier paper now has 60 marks, compared with 70 in the last specification.

Q1 The first question listed five substances and students were asked to match the statements to the substances. Although a significant number of candidates were aware that chlorine bleaches damp universal indicator paper many mixed up the tests for hydrogen and oxygen and many did not work out, even by process of elimination, that magnesium oxide was the substance which reacts with an acid to form a salt and water. Few candidates gained all 5 marks.

Q2 The first part of this question was about subatomic particles and was very well answered. Most candidates gained all 3 marks. Part (b) required candidates to apply their understanding of atomic structure in order to work out the number of protons, neutrons and electrons in a fluorine atom, given the atomic number and mass number. Better candidates gained all 3 marks. Most candidates knew the chemical symbol for fluorine but very few knew that an atom has no electrical charge because the number of protons/positively charged particles is equal to the number of electrons/negatively charged particles.

Q3 The first part of this question was about the Periodic Table and differences between Mendeleev's Periodic Table and the modern version. The question was well answered but candidates needed to be careful that they made clear which version of the Periodic Table they were referring to. In Part (b) most knew that elements in the same Group have the same number of outer electrons.

Q4 This question was designed to find out students' understanding of a given balanced formula equation. The first three parts, in particular, were poorly answered. Although the equation had products many candidates thought there were five –

presumably by finding the total number of reactants and products. Although there were five compounds and no elements in the equation most candidates could not work out that there were five compounds. In Part (c) many did name all five elements whose symbols appeared in the equation but some simply read the question as "Name five elements".

In Part (d) understanding of the "aq" symbol was variable. Examiners were generous in accepting phonetic spelling for "aqueous" but many candidates did not know the answer. In Part (e), most did gain the mark by naming a substance whose formula was given.

Q5 This question was about chromatography, a topic which is new to this specification. There were many very good or excellent answers and it was common to see 4 or all 5 marks being gained. Candidates knew the name of the separation technique and why the line is drawn in pencil and not ink. They were able to analyse a simple chromatogram and they understood that the least soluble dye was the one which moved the shortest distance up the paper.

Q6 This question was also about a topic area which is new to this specification, nanoparticles. Part (a) asks students to recall how many atoms are in a typical nanoparticle, from four given alternatives. Only a minority knew that "a few hundred" is the correct answer. Part (b) asked student to evaluate information contained in a short article in order to identify three advantages of using sun creams which contain nanoparticles. This was really well answered. Most candidates gained all 3 marks.

The final part was slightly more challenging than Part (b). It also required students to evaluate information contained in the article and many candidates provided answers which omitted a key point. An example would be referring to nanoparticles as possibly being toxic without going on to say "to some types of cells …"

Q7 This question, about electronic structures and the properties of an ionic salt, was well answered by many candidates. Nearly everyone gained both marks in Part (a) and in the QWC question many were able to access sufficient indicative points to take them into the middle, 3-4 mark band.

Q8 Understanding of covalent bonding was tested in this question. Only a handful knew, in Part (a) that a covalent bond is a shared pair of electrons but, in Part (b) there were many well drawn dot and cross diagrams for a hydrogen chloride molecule. The final part of the question required three sentences about covalently bonded molecules to be completed. The first two sentences, which were about covalent bonding were worth 3 marks and candidates scored well. The final sentence was about forces between covalent molecules, a new topic for DAS students. Answers were generally incorrect and reflected that this topic area is not yet well understood by foundation tier candidates.

Q9 This was a calculation question. Previously, mole calculations had been examined in the C2 module. Now they are on the C1 module along with new topics such as percentage of an element by mass. The appearance of these topics set alongside a requirement for a 20% mathematical content across the DAS examination papers as a whole means that candidates and teachers should expect calculations of some type in every C1 paper.

As with the February 2018 GDW21 paper, some parts of this question were very well answered by a high proportion of candidates, which is very pleasing. For the topic areas which are new to the DAS specification there was a more variable, often centre specific, quality of response.

Part (a) was not well answered. Candidates could not recall the definition for relative atomic mass. However, in Part (b) a high proportion worked out both the relative formula masses correctly. Part (c)(i) was also well answered showing that candidates could use a given mass and a given RFM to work out the number of moles. Some did use 30/150 instead of the other way round. Part (c)(ii) demonstrated that, at the moment, few foundation tier candidates can tackle percentage by mass calculations.

Higher Tier

This was the second sitting of the new DAS Unit C1 exam. A wide range of marks with few very low marks was evident. There was little, if any evidence of Higher Tier candidates being entered at the wrong tier. The paper was successful in providing candidates of differing abilities the opportunity to respond positively. Some candidates provided excellent responses throughout the paper. There was evidence of variability in responses from centre to centre, particularly in respect of topics or types of question which were being examined for the first time in this paper. This specification has many new areas that need to be examined and each paper needs to cover some of these.

Q1 This question was about transition metals and about flame tests, both of which are topics which are new to this DAS specification. Although Part (a) should have been straightforward, the majority of candidates did not appear to be aware that transition metals form coloured compounds. Part (b)(i) asked candidates to describe how they would carry out a flame test. Examiners suspected that answers tended to be centre specific. A small number of candidates produced excellent, step by step answers. Another group of candidates were aware that the chemical had to be placed on something and put into a Bunsen flame, but their answers lacked correct detail. The third group appeared never to have witnessed a flame test being carried out as their answers bore no resemblance to the actual experiment. A minority knew that copper ions produce a blue-green (or green-blue) flame. The only acceptable colours are those given in the specification.

Q2 This question was about chromatography, a topic which is new to this specification. There were many very good or excellent answers and it was common to see 4-6 marks being gained. Only a minority of candidates knew what the stationary phase is in paper chromatography but near everyone could explain why none of the food colourings being tested could be pure substances and they understood that the least soluble dye was the one which moved the shortest distance up the paper. Pleasingly, the majority of candidates showed their understanding of the term "R_f value" by carrying out the calculation correctly from information given in the diagram.

Q3 This question was also about a topic area which is new to this specification, nanoparticles. Part (a) asked students to recall how many atoms are in a typical nanoparticle, from four given alternatives. Many knew that "a few hundred" is the correct answer but a sizeable proportion of candidates did not. Part (b) asked student to evaluate information contained in a short article in order to identify three advantages of using sun creams which contain nanoparticles. This was really well answered. Most candidates gained all 3 marks.

The final part was slightly more challenging than Part (b). It also required students to evaluate information contained in the article and some candidates provided answers which omitted a key point. An example would be referring to nanoparticles as possibly being toxic without going on to say "to some types of cells …"

Q4 This question, about electronic structures and the properties of an ionic salt, was very well answered by many candidates. Nearly everyone gained both marks in Part (a) and in the QWC question most were able to access sufficient indicative points to at least take them into the middle, 3-4 mark band and many gained all 6 available marks.

Q5 Understanding of covalent bonding was tested in this question. The first part of the question required three sentences about covalently bonded molecules to be completed. The first two sentences, which were about covalent bonding were worth 3 marks and most candidates gained all 3 marks. The final sentence was about forces between covalent molecules, a new topic for DAS students. Answers were sometimes correct but reflected that this topic area is not yet well understood. In Part (b) there were many well drawn dot and cross diagrams for a carbon dioxide molecule. It is important, in these questions, to check that the bonded electrons are actually shared and that the correct number of outer electrons is shown.

Q6 This was a calculation question. Previously, mole calculations had been examined in the C2 module. Now they are on the C1 module along with new topics such as percentage of an element by mass. The appearance of these topics set alongside a requirement for a 20% mathematical content across the DAS examination papers as a whole means that candidates and teachers should expect calculations of some type in every C1 paper.

As with the February 2018 GDW22 paper, many parts of this question were very well answered by a high proportion of candidates, which is very pleasing. Part (a) was less well answered. Many candidates could not recall the definition for relative atomic mass. However, in Part (b) a high proportion worked out both the relative formula masses correctly. Part (c)(i) was also well answered showing that candidates could use a given mass and a given RFM to work out the number of moles. Part (c)(ii) demonstrated that, a significant proportion of higher tier candidates tier candidates can tackle percentage by mass calculations. A common error was to forget to multiple by 2 (12 x 2) because there are two carbon atoms in an ethane molecule.

Q7 This question was about acids, bases and salts. In Part (a) candidates had to complete a table about acids, bases, salts and the formulae of ions. Many gained both of the available marks.

Part (b) asked for an ionic equation to show the formation of sodium chloride in an acid base reaction. Candidate responses were so poor that it became evident that the fault lay not with the candidates but rather with the wording of the question. On the other hand, better candidates are now so familiar with writing an ionic equation for neutralisation that, in Part (c) it was common to see perfect, 3 mark, answers. The final part of the question also tested a new topic, namely understanding that strong acids are completely ionised in water and what this means. Very few candidates could link “completely ionised” to the very high concentration of hydrogen ions which is results from complete ionisation of a strong acid i.e. candidates could not put into words or an equation $HNO_3 \rightarrow H^+ + NO_3^-$.

Q8 This question linked properties to structure and it was a good discriminator. Parts (a) and (b) were relatively straightforward and most of the better candidates gained all 4 marks. Part (c) was slightly more challenging because, in the explanation, candidates needed to identify high melting point and conductivity to explain why substance B could be graphite. Part (d) was the most challenging. Some correctly identified the metal as C but just restated the term “relatively low melting point” which was given in the question.

Q9 Part (a) of this question tested another new topic on this specification, namely calculating relative atomic masses from mass numbers and relative abundances. It was pleasing to see how many candidates had been taught a clear method to use and had applied this to arrive at the correct answer. The second part of the question built on Part (a) to ask why some atoms of gallium are heavier than others. A high proportion of candidates knew that the atoms had a different number of neutrons but few used the information provided to explain that the heavier atoms of gallium have two extra neutrons.

Q10 It had been common, in the previous specification to have a question, near the end of the higher tier paper which focusses on halogen chemistry and displacement reactions. Balanced symbol equations for displacement reacts have been asked so frequently in DAS chemistry papers that it would be good to be able to report that, at last, candidates can correctly give the formula for a halogen and for a halide in an equation. Unfortunately Part (a) of this question was as poorly answered as in the previous specification questions. It remains common to see a group 1 halide written as MX_2 and a halogen as 2X. The colour change on displacement was usually not known. Yet again very few candidates recognised that the original colour of the halide solution was colourless. Most did get credit in Part (a)(iii) for understanding that, in the given reaction, chlorine was displacing iodine. In Part (b) the examiners were looking for answers linked to the fact that the halogens need to gain one electron to become stable but many of the answers were limited to the fact that the halogens are in the same Group. There was no credit for stating this.

Paper 3 Physics

Assessment Unit 1 Motion, Force, Moments, Energy, Denisty, Kinetic Theory, Radioactivity, Nuclear Fission and Fusion

Foundation Tier

This Paper proved to be successful in allowing candidates of differing abilities to display their knowledge and understanding of Physics. The Paper contained some new material e.g. pressure. It also contained some revised material e.g. new ways of calculating average speed and the concept of rate of change of speed.

Q1 Part (a)(iii): this was the only part of Question 1 which proved troublesome for some candidates - we were looking for strain (energy).

Q2 Part (a): many candidates still think that a renewable energy is one that 'can be re-used' or 'can be used over and over again'. Since the specification now defines both Renewable and Non-renewable energy this is an unnecessary loss of marks.

Part 2 (a)(ii): It was strange to see the correct equation chosen for Part (c)(i) and then an incorrect equation used for Part (c)(ii).

Q3 Part (a): A very common question on the Foundation Paper and disappointing that such a basic calculation is still not well answered by too many. Mass should be converted to kg before multiplying by 10.

Part (b) is new material. When an object falls freely its speed increases by 10 m/s each second.

In this revised part of the specification, candidates need to be careful in their speed designations e.g. average speed, initial speed, final speed. This was important in Parts (c) and (d). The unit in Part (d) was often guessed and it was rare to see the correct equation for 'rate of change of speed'.

Q4 Some used the diameter instead of radius for their 'distance from pivot'.

A number quoted the Principle of Moments equation. Simply a 'moment' calculation was asked.

Q5 Well answered in general.

Q6 Part (a) was well answered but there is still some confusion between the two terms.

The specification states clearly that a nucleus decays because it is unstable. Answers stating that it decayed because it was radioactive did not receive credit because the word radioactive was included in the question stem.

In Part (c) confusion occurred if candidates did not distinguish between decayed and undecayed particles. Many good answers were seen though.

Q7 Well answered.

Q8 Part (a) was well answered. In Part (b) most knew the equation for power but some failed to convert minutes to seconds.

Q9 In Part (i) candidates were asked for an explanation in 'terms of pressure'.

The first mark was awarded for 'pressure is reduced'. In the second part the mark was awarded for a correct reference to area. Loose or imprecise terms like 'wide base' were not credited.

In Part (ii) the weight of the mountaineer was asked for. Not surprisingly, many wrote W = mg which in this context would not have been credited. This question involved a rearrangement of equation which is new for the Foundation Paper. It was pleasing to see that a number of candidates succeeded in getting the correct answer.

Higher Tier

Candidates sitting this paper had many and varied opportunities to demonstrate their knowledge of Physics. Examiners have reported that it was a very fair assessment.

Q1 Part (a) was well answered but there remains some confusion between the two terms.

The specification states clearly that a nucleus decays because it is unstable. Answers stating that it decayed because it was radioactive did not receive credit because the word radioactive was included in the question stem.

In Part (c) confusion occurred if candidates did not distinguish between decayed and undecayed particles. Many scored well.

Q2 Well answered.

Q3 Part (a) was well answered. In Part (b) most knew the equation for power but disappointing to see so few Higher Tier candidates failing to convert minutes to seconds.

Q4 In Part (i) candidates were asked for an explanation in 'terms of pressure'.

The first mark was awarded for 'pressure is reduced'. In the second part, the mark was awarded for a correct reference to area. Loose or imprecise terms like 'wide base' were not credited.

In Part (ii) the weight of the mountaineer was asked for. Not surprisingly, many wrote W = mg which in this context would not have been credited. Many, though, got full marks.

Q5 This question covered revised specification material. In content like this (Parts (a) and (b)), it is important to designate velocities correctly e.g. initial velocity, final velocity, average velocity.

In Part (b)(i) there was some initial/final velocity confusion (which was penalised) but many got the correct numerical answer. The negative sign was often omitted.

Q6 Part (i) was well answered. In Part (ii) the effect on distance between molecules was asked. The answer, 'distance is less' was all that was expected; not answers in terms of density or molecular arrangement, neither of which were asked or credited.

Q7 In Part (i), candidates answered this application of F=ma well.

In Part (ii) reference to 'resultant force' (or similar) was necessary.

Q8 This was new content. Part (a) asked for Hooke's Law definition and it was well known. Candidates should note, however, that where definitions are given in the specification, it is best to reproduce these on exam papers. 'Elastic limit' was not allowed as an alternative to 'limit of proportionality'.

Part (b) was a straightforward test of F=ke and many scored well. Part (c) proved to be testing and it was rare to see all three parts answered correctly.

Q9 This question carried 6 marks for descriptive work. Examiners reported that the question structure allowed candidates to match their answers with the bullet points and so scoring was good.

Q10 This was a discriminating question and aimed at top students. Even then the incline of difficulty within the question allowed most students to score 3 out of 6 marks.

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