GCSE

Rewarding Learning

Chief Examiner's Report

Double Award Science

Summer Series 2019

Foreword

This booklet outlines the performance of candidates in all aspects of this specification for the Summer 2019 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 section on our website at www.ccea.org.uk.

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GCSE SCIENCE (DOUBLE AWARD)

Chief Examiner's Report

General comments on all papers

Summer 2019 saw the first time that CCEA made awards in the new revised Double Award Science specification at qualification level. Earlier awards were at unit level only.

In general, the senior exam team was very pleased indeed with the way in which the entire examination process was conducted. The newest element of this specification was the replacement of Controlled Assessment by an assessment of practical skills in Unit 7.

Candidate performance was very much as expected. Specific details on performance is given in the reports on individual units. The purpose of these reports is to support centres, to show where candidate performance was good and to provide guidance as to how it might be improved.

Biology

Subject Overview

The papers were accessible to candidates of all abilities shown by a broad range of marks achieved on all the papers. Most candidates did not leave any blank answers on any of the papers. There was no evidence of candidates not having time to complete the papers.

The standard of candidates hand writing continues to deteriorate. Candidates lose marks if examiners cannot decipher their responses.

Candidates need to pay more attention to diagrams. Sometimes they need to observe something on a diagram and incorporate this observation into their answer. If candidates are asked to draw a diagram, the marks on this type of question are as valuable as other marks on other types of questions, but some candidates are often careless with drawing or labelling diagrams. When linking boxes of two categories in a question, candidates should use a ruler to join the boxes.

For graphs in Biology candidates should join point to point on the graph with a ruler. QWC questions should have some sentences or bullet points starting with a capital letter and ending in full stop. Some candidates wrote a page without a capital letter or a full stop.

Some candidate responses suggest that some centres have not done fieldwork or certain practicals, including the prescribed practicals. In addition, candidates from some centres scored poorly in topics that are new on this specification.

Booklet B. Practical papers. There were no questions on either tier that were inaccessible to candidates but some questions proved discriminatory. The lack of experience of practicals of some candidates became obvious from their responses.

Assessment Unit 1 Cells, Living Processes and Biodiversity

Foundation Tier

Overview

Candidates attempted all the questions on the paper but there were some poorly answered papers as well as some good ones.

Many candidates had difficulty with parts of Question 4 on decomposition. Few inserted arrows into the food web to show the transfer of energy in Question 6(a). Some had difficulty with parts of Question 7 where they had to apply their knowledge to an unfamiliar context. Most candidates obtained at least two marks in the QWC question.

Q1 **(a)** Many candidates correctly identified the two parts of the cell.

(b) Many candidates did not read the question and incorrectly answered nucleus.

(c) Most candidates gave at least two correct answers.

(d) Many candidates could not give a correct structure.

Q2 **(a)** Most candidates could give one correct response but few gave two.

(b) The majority of candidates circled the correct responses.

(c) More able candidates correctly gave the brain as their answer.

Q3 **(a)** The first and last answers were quite often incorrect. Endothermic is a new and more difficult term for candidates and many stated incorrectly that carbon dioxide gas was produced in photosynthesis.

(b) **(i)** The plotting of the graph was generally correct but some candidates added in a plot at 0,0.

(ii) Most candidates correctly read the figure for 50cm from their graph.

(iii) Many candidates linked the change in distance with the number of gas bubbles but few went on to explain the relationship between the distance of the light and photosynthesis.

(iv) The extension of the graph line was generally well done.

(v) Most candidates did continue the line with the same gradient until it met the x-axis to obtain a correct reading.

Q4 **(a)** Many candidates could name one saprophytic organism but few could give both bacteria and fungi.

(b) Most candidates choose the correct response from those in the box.

(c) Excretion was given by only a few candidates.

(d) **(i)** Few candidates knew nitrates.

(ii) Only better candidates named the root hair cell.

Q5 Most candidates obtained some marks for this question about the adaptations of the leaf. Spongy and palisade mesophyll were often confused as were intercellular air spaces and waxy cuticle.

As stated in the general comments, candidates should draw using a ruler to join the boxes to make it easier for examiners to follow their lines. If they make a mistake in their response they should clearly indicate this on their script.

Q6 **(a)** Many candidates completed the boxes correctly but fewer inserted lines with arrows to show the direction of energy transfer. A food chain or food web is not complete without theses arrows.

(b) Many candidates still confuse biotic and abiotic factors and find it difficult to identify these in a particular context.

(c) Quite a few candidates answered correctly but the explanation needed to match the description.

(d) Many candidates correctly calculated the world population of the Brent geese.

Q7 **(a)** Many candidates obtained 1 mark here for realising that the starch was broken down. This experimental context was unfamiliar for candidates and only a few realised that that enzyme involved was amylase.

(b) Many candidates did identify the fact that the starch had not been broken down but few explained why.

(c) More able candidates were able to link what had happened with the boiled saliva to their knowledge of enzyme theory. Many candidates did give at least one correct explanation.

(d) **(i)** This was an unfamiliar context but some candidates did realise that it was the enzyme/amylase that had caused the change.

(ii) More candidates did realise that the starch had been broken down to glucose.

Q8 Most candidates were able to give at least one way that water is gained and one way that water is lost from the body. Fewer were able to give the term osmoregulation. The most common error was that candidates stated that water was lost in cell respiration.

Higher Tier

Overview

Few candidates inserted arrows into the food web to show the transfer of energy. Some had difficulty with parts of Question 3 where they had to apply their knowledge to an unfamiliar context. Most candidates obtained at least four marks in the QWC question.

Careless drawing in Question 5(c) cost some candidates marks. In Question 8(b) some candidates did not read the question carefully and therefore did not give answers about bacteria. Question 9 - this question asked about oxygen in Part (a) and then the rest of the answers were linked to carbon dioxide which caused some confusion in less able candidates.

Q1 Many candidates obtained two marks for this question about the adaptations of the leaf. Spongy and palisade mesophyll were often confused. As stated in the general comments, candidates should use a ruler to join the boxes to make it easier for examiners to follow their lines. If they make a mistake in their response they should clearly indicate this on their script.

Q2 **(a)** Most candidates completed the boxes but fewer inserted lines with arrows to show the direction of energy transfer. A food chain or food web is not complete without theses arrows.

(b) Some candidates still confuse biotic and abiotic factors and find it difficult to identify these in a particular context.

(c) Quite a few candidates answered correctly here but the explanation needed to match the description.

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(b) Many candidates did identify the fact that the starch had not been broken down but fewer explained why.

(c) Most able candidates were able to link what had happened with the boiled saliva to their knowledge of enzyme theory.

(d) **(i)** This was an unfamiliar context but some candidates did realise that it was the enzyme/amylase that had caused the change.

(ii) More candidates did realise that the starch had been broken down to glucose.

Q4 **(a)** Most candidates were able to give at least one way that water is gained and two ways that water is lost from the body. Fewer were able to give the term osmoregulation. A few candidates stated that water was lost in cell respiration.

(b) Many candidates are confused about the action of ADH, where the water is absorbed from and the effect on urine production.

Q5 **(a)** Most candidates correctly answered, 'in the tip'.

(b) Both parts were correctly answered by most candidates.

(c) Examiners were looking for the fact that the cell was longer than the original one and that it has all the same features. As stated in the general comments, candidates are sometimes careless when drawing diagrams and yet there were two marks available here.

(d) **(i)** Generally well answered.

(ii) Examiners were looking for the fact that the cells were elongated on the shaded side but many candidates just gave the description of the plant shoot.

Q6 **(a)** Many candidates incorrectly stated pancreas.

(b) Candidates gave vague answers to this question.

(c) Most candidates were able to work out this calculation.

(d) **(i)** This question was in an unfamiliar context and candidates had to use the graph to explain their answer. Many candidates did correctly link the fact that the blood glucose had fallen below the normal and link this to the graph.

(ii) Candidates had to apply their knowledge and the more able candidates were able to give correct answers.

Q7 **(a)** **(i)** Many candidates did link the presence of more root nodules with increasing nitrogen fixation and more nitrates.

(ii) The most common incorrect answer given was oxygen.

(b) **(i)** Most candidates correctly linked the weeds with the fact that the crops were competing with them for a named resource.

(ii) Quite a few candidates did not name saprophytes.

(iii) Some candidates still confuse the actions of the different types of nitrogen bacteria.

Q8 **(a)** Most candidates correctly linked the increase in nitrates with the increase in then numbers of algae.

(b) More able candidates had no problem with this question but some others did not read the question which was about bacteria, not algae.

(c) Some candidates did not describe the effect on animal biodiversity and others did not explain what happened to the animals in the lake.

(d) Many candidates did correctly state eutrophication.

Q9 **(a)** Many candidates correctly linked the fact that there were only plants present in the flask, to the oxygen produced during photosynthesis.

(b) Candidates had to link the fact that flask A had the highest levels of carbon dioxide to the fact that it contained the most fish and therefore there would be more respiration here than in flask C.

(c) Some candidates gave the wrong colour for hydrogen carbonate indicator and also some gave incorrect explanations about oxygen here rather than carbon dioxide.

The various parts of Question 9 discriminated between candidates because they had to use the information in the diagrams to identify and explain the processes of photosynthesis and respiration in the different flasks.

Assessment Unit 2 Body Systems, Genetics, Microorganisms and Health

Foundation Tier

Overview

Many candidates had difficulty with questions on the new parts of the specification e.g. knowledge of angioplasty and how statins and aspirin work were often vague. General answers such as 'prevents coronary heart disease' are not worthy of credit. Knowledge of some forms of contraception was confused. If candidates are comparing three pulse rates as in Question 10 they need to be giving answers comparing all three results, not just two of the results. Answers therefore need to be framed in terms of least or most e.g. boy 3 had the lowest pulse before exercise. In the QWC Question 11 answers need to be specific.

Q1 Many candidates incorrectly answered B but most gave at least one correct adaptation.

Q2 **(a)** Quite a few candidates read the figures from the bar chart correctly but then incorrectly divided by 27.

(b) Most candidates did correctly circle ability to roll the tongue.

Q3 **(a)** **(i)** Most candidates gave a correct description of what had happened to the walls.

(ii) Few candidates linked the change in the structure to the need to receive extra oxygen.

(b) **(i)** Many candidates gave a correct description.

(ii) Few candidates were able to explain the effect of carbon monoxide.

Q4 **(a)** Most candidates choose some correct responses from the list given. The most difficult answer was identifying the mesophyll cells as the correct answer for the 2nd gap.

(b) Many candidates correctly gave a tick to show that when surface area is increased the rate of transpiration increased, but few then gave correct answers for increase in wind and humidity.

Q5 **(a)** **(i)** Few candidates could give a definition for cancer. Many answers were vague.

(ii) Only a few candidates could give characteristics of a benign tumour.

(b) **(i)** Many candidates calculated the correct number of people diagnosed with all types of cancer.

(ii) Most candidates correctly stated ultra violet light.

Q6 **(a)** There were many vague answers here.

(b) **(i) & (ii)** Most candidates used the information in the table to answer these questions correctly.

(iii) Generally well answered.

Q7 **(a)** Most candidates correctly linked at least one of the genetic definitions.

(b) **(i)** Surprisingly some candidates did not know the human sex chromosomes.

(ii) Candidates could draw a Punnett square but a few still were confused and had two chromosomes in each gamete.

(iii) Many candidates still do not understand that there are equal chances of having a boy or a girl.

(iv) A large number of candidates do not realise that the chances of having a boy or a girl are always 50/50.

Q8 (a) (i) Most candidates answered this part of the question correctly.

(ii) Many candidates did give a suitable explanation e.g. that 'the woman had forgotten to take a tablet'.

(b) Candidates lack of knowledge of how different forms of contraceptive work was evident in this question part. Many answered the question by explaining how the morning after pill worked and others explained how an intrauterine device worked.

(c) (i) Examiners were looking here for the fact that there was a lack of barrier to prevent the transmission of sexually transmitted infections.

(ii) Generally well answered.

(d) Most candidates made the link with the fact the ovulation takes place, and some went on to explain that this was on day 14, but fewer then made the link that fertilisation would not take place in this case.

Q9 (a) (i) & (ii) Many candidates did not know the term 'stent'. There were all sorts of descriptions here including chicken wire.

(b) (i) Many candidates did not know how statins work.

(ii) Answers on the action of aspirin were even vaguer than those on statins.

Q10 (a) (i) & (ii) Most candidates were able to continue the graph line and give a correct value for boys 1's pulse. There were a few candidates however who just added a horizontal line to continue the line given.

(b) Most candidates gave some correct answers here but, as stated in the general comments, they need to be careful to compare all of the results and say that boy 3 had the lowest pulse rate before exercise, or that his pulse rate was lower than both boy 1 and boy 2's before exercise.

(c) Candidates either knew the correct answers or gave vague responses.

Q11 Most candidates gave some correct answers but many did not focus on the differences in structure. Many included correct statements about arteries and veins such as 'arteries carry blood away from the heart' and 'veins carry blood towards the heart' but these did not answer the question asked. Candidates need to take a little time to think about their answer on this type of question before they start writing their response.

Higher Tier

Overview

Many candidates had difficulty with questions on the new parts of the specification e.g. knowledge of angioplasty and how statins and aspirin work were often vague. General answers such as 'prevents coronary heart disease' are not worthy of credit. Knowledge of some forms of contraception was confused. If candidates are comparing three pulse rates, as in Question 3, they need to be giving answers comparing all three results, not just two of the results. Therefore their answers need to be framed in terms of 'least' or 'most' e.g. 'boy 3 had the lowest pulse before exercise'. In the QWC Question 4, answers needed to be

specific. Inheritance of sex-linked diseases is new on the specification and some candidates did not understand this type of inheritance, however there were also some excellent answers. As commented in the overall comments at the start of these reports, candidates need to take care when answering questions on diagrams. In Part 8(b)(i) many lost marks because they did not start the arrow on a spongy mesophyll cell or they did not continue their line out through the guard cells. Question 9 proved to be discriminatory since able candidates had few problems with the different parts of the question but others struggled with various aspect of DNA and genetic engineering.

Q1 **(a)** **(i)** Most candidates answered this part of the question correctly.

(ii) Many candidates did give a suitable explanation e.g. that 'the woman had forgotten to take a tablet'.

(b) Candidates lack of knowledge of how different forms of contraceptive work is concerning. Many answered the question by explaining how the morning after pill worked and others explained how an intrauterine device worked.

(c) **(i)** Examiners were looking for the fact that there was a lack of barrier to prevent the transmission of sexually transmitted infections.

(ii) Generally well answered.

(d) Most candidates made the link with the fact the ovulation takes place, and some went on to explain that this was on day 14, but fewer then made the link that fertilisation would not take place.

Q2 **(a)** **(i) & (ii)** Many candidates did not know the term stent. There were all sorts of descriptions here including chicken wire.

(b) **(i)** Many candidates did not know how statins operate.

(ii) Answers on the action of aspirin were even vaguer than those on statins

Q3 **(a)** **(i) & (ii)** Most candidates were able to continue the line and give a correct value for boys 1's pulse. There were a few candidates however who just added a horizontal line to continue the line given.

(b) Most candidates gave some correct answers here but, as stated in the general comments, they need to be careful to compare all of the results and say that boy 3 had the lowest pulse rate before exercise, or that his pulse rate was lower than both boy 1 and boy 2's before exercise.

(c) Candidates either knew the correct answers here or gave vague responses.

Q4 Some candidates gave some correct answers here, but some did not focus on the differences in structure. Quite a few think that the lumen is bigger in arteries than veins. Many included correct statements about arteries and veins such as 'arteries carry blood away from the heart' and 'veins carry blood towards the heart' but these did not answer the question asked.

Q5 **(a)** There were some excellent answers here, but also some candidates were confused e.g. they started with phagocytosis as the first response shown by the immune system.

(b) Many candidates did understand the process here but some forgot to add the original person to the total at the end.

(c) **(i)** Antibodies was the most common incorrect answer here.

(ii) Not many candidates knew that fungi produce antibiotics.

(iii) Most candidates were able to work out this calculation but some did not give their answer to the correct number of decimal places.

(iv) This part of the question was answered well by many candidates.

Q6 **(a)** Many candidates drew three correct bars here. However, examiners saw every possible variation. The most common incorrect answer was to draw a bar at 2 for 'after meiosis'.

(b) Doubling of DNA was only given by a small proportion of candidates.

(c) Most candidates circled the correct response.

(d) & (e) Many correct responses given, but also some mixed up the locations of the two types of cell divisions.

Q7 **(a)** **(i)** Many candidates completed the 1st graph correctly but the 2nd graph on humidity proved more challenging.

(ii) Candidates needed to specify where the sex chromosomes had come from and then also give the alleles on these chromosomes. Quite a few candidates failed to do this.

(iii) In this question candidates, as well as giving Mark's genotype, had to give the origins of the chromosomes. There were many confused answers here.

(b) **(i)** The Punnett square needed to incorporate the sex chromosomes. Some candidates incorrectly gave answers with just H and h.

(ii) Answered well by those candidates who understood the overall process of sex-linked inheritance.

Q8 **(a)** **(i)** Most candidates completed the graphs correctly.

(ii) Many candidates gave good answers for this question. Examiners accepted answers incorporating different ways that light intensity was affected, but candidates needed to qualify their answer by linking it with factors or processes.

(b) **(i)** As mentioned in the introduction to this paper, carelessness with drawing of the arrow on the diagram meant that some candidates lost marks here. There were also some answers where arrows showing water loss were drawn coming out of the sides of the diagram or from the cells out through the cuticle and top leaf surface.

(ii) There were some excellent answers here.

Q9 **(a)** **(i)** There were many correct answers here.

(ii) This question was very badly answered.

(b) **(i)** More candidates could name the correct type of enzyme.

(ii) Many candidates could follow the example given on the diagram and showed one correct cut, but fewer showed two correct cuts.

(iii) Only better candidates gave the correct answer '3'.

(c) **(i)** Many correct answers.

(ii) Many candidates did not state that the 1st step was to insert the modified plasmid back into the bacterium.

(iii) Downstreaming is new to the specification. Examiners were looking for the processes as given in the specification. Some candidates had obviously no knowledge of downstreaming.

Chemistry

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

Foundation Tier

Overview

This was the fifth sitting of the new DAS Specification Chemistry Unit 1 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. It is evident that, with each passing examination series, a higher proportion of candidates have been able to demonstrate their understanding in respect of topics that are new to this specification. Hopefully, the availability of several past papers now, coupled with other support materials available on the CCEA website, is helping teachers plan their delivery of this unit.

General note: Use of the Glossary of Terms

In addition to the wording in the DAS Specification, CCEA has produced a Glossary of Terms for DAS: Chemistry which is available on the CCEA website. The Mark Schemes now reflect the actual wording provided in these two documents when questions relating to definitions or understanding of a 'term' are examined.

Q1 Few candidates gained all 4 marks in this question, which required them to identify which separation technique would be most suitable for separating a named mixture. Filtration and evaporation were invariably correctly identified but two of the five given diagrams showed distillation. Many candidates did not know that simple distillation can be used to separate pure water from salty water and that, when separating ethanol from water (two miscible liquids), fractional distillation is required.

Q2 A high percentage of candidates gained full marks in this question, demonstrating their understanding of the terms used in describing atomic structure and electronic configuration. Some candidates lost marks by confusing the neutron, electron and proton definitions.

Q3 The first part of this question was a cloze question about the development of the Periodic Table. Many candidates gained all 6 marks. Some candidates mixed up atomic mass and atomic number when describing the arrangement of elements. Others called the 'rows' Groups and the 'columns' Periods. In Part (b), most candidates knew that boron is the element with the symbol B; a majority knew that sulfur has six electrons in it outer shell, although it was common to see '16' as the answer; many gave the wrong symbol for the most reactive element in 'column 1'. It was very common to see 'francium' rather than 'rubidium'. The errors in Parts (b)(ii) and (b)(iii) illustrated the importance of reading questions carefully. These were not the only questions where candidates lost marks through lack of careful reading. Part (b)(ii) did not say 'How many electrons would you expect to find in a sulfur atom?' The sentence included the words 'the outer shell of'. Part (b)(iii) did not say 'Write down the symbol for the most reactive element in Group 1'; the last two words were 'column 1' and the stem of the question instructed candidates to **only** use elements shown (in the diagram) when answering the question.

Q4 In Part (a)(i), nearly everyone gave the correct pH - 14. In Part (a)(ii), the correct volume was 25 cm^3. It was relatively common to see answers where the mark was lost because no units were given. The other incorrect answer which was quite commonly seen was 23 cm^3. Yet again this indicated inaccurate reading of the question which asked for the volume of acid needed to make the pH drop sharply. In Part (a)(iii), many candidates knew that the indicator colour would be purple. Parts (b) and (c) of this question were extremely poorly answered. In Part (b)(i), it was surprising how few candidates could name both products from the reaction of hydrochloric acid with sodium hydroxide. Many did give water, although hydrogen was frequently seen; only a minority gave sodium chloride. It was disappointing to see so many wrong answers, particularly those such as 'carbon dioxide', which included elements not even present in the reactants. In Part (b)(ii), nearly every candidate gave two answers but virtually none gained 2 marks. A tiny proportion knew that H^+ is present in hydrochloric acid; hardly anyone knew that OH^- is present in the alkali. Many candidates gave formulae which were not ions and/or formulae containing random elements, despite the fact that the word 'ions' was written in bold in the question. In Part (c), it was surprising to see how many candidates could not use the information in a given formula equation to name either or both of the products – zinc nitrate and hydrogen. The failure to identify even hydrogen from the formula H_2 suggested that the question had not been read properly and it meant that many candidates did not gain either of the 2 low demand marks by giving the test for hydrogen.

Q5 This question was about nanoparticles. Part (b) in particular was very well answered. The size of a nanoparticle, although given in the specification, was not known by many. In Part (b), candidates had to analyse and interpret data given in a table and a passage. Many gained all 5 marks available. Common errors were to name titanium oxide, rather than titanium as a transition metal or, through misreading the question, to give 'socks' instead of 'silver' as the nanoparticle that is used to reduce the smell of sweaty feet. In Part (c), very few candidates could recall that cell damage, which is stated in the specification, is a potential risk arising from the use of nanoparticles in sun cream.

Q6 This question was a good discriminator. In Part (a)(i), better candidates wrote MgF_2 but MgF and occasionally Mg_2F were also seen. Equations were not acceptable as the question asked for the chemical formula of magnesium fluoride. In Parts (a)(ii) and (a)(iii), many candidates had not read the question carefully and, as a result, failed to mention the electronic configuration in either answer. Often the loss of two electrons to give magnesium a full outer shell was given but without fully describing how the electronic configuration changed i.e. from 2,8,2 to 2,8. Similarly, in Part (a)(iii), candidates often failed to describe the electronic configuration change for the fluorine atom when it became a fluoride ion. Often the gain of one electron to give fluorine a full outer shell was given as the answer but without fully describing how the electronic configuration changed i.e. from 2,7 to 2,8. Some candidates thought that magnesium gained electrons and fluorine lost electrons. Answers to Part (b) demonstrated a gap in knowledge. It consisted of three multiple choice questions about ionic bonds, ionic structures and diatomic molecules. Very few candidates gained 3 marks. Many scored zero and, of those who gained 1 mark, Part (b)(i) was more commonly the only answer which was correct. Part (c) was worth 5 marks for drawing the electronic structures of a hydrogen atom, a chlorine atom, a hydrogen chloride molecule and for labelling a lone pair in the molecule. Top candidates gained all 5 marks. Some lost marks by not reading the question carefully e.g. by not showing all the electrons in a chlorine atom or by not labelling a lone pair. The tasks had been set out in bullet points with 'lone pair' and 'all' electrons being written in bold type.

Q7 A very high proportion of Foundation Tier candidates were able to work out the relative formula mass of sulfuric acid but the brackets present in the second formula meant that fewer calculated the RFM of ammonium carbonate correctly. Part (b) came from a topic new to this specification – the calculation of percentage by mass of an element in a compound. It should be noted that the question asked for the answer to be calculated to 1 decimal place. The question, which appeared on the Higher Tier paper also, proved to be too difficult for Foundation Tier candidates, many of whom left the working out and answer blank. Candidates should also be reminded to show their working out in calculations where there is more than one mark available as this allows Error Carried Forward (ECF) mark(s) to be awarded. The mass to moles question, Part (c)(i), was also quite often left blank. The most common error was an answer of 4 moles (180/45).

Q8 This question assessed Quality of Communication (QWC) and involved demonstrating understanding of two structures, one of which (structure B) may have been much more familiar to Foundation Tier candidates than the other. Most Foundation Tier candidates struggled to answer this question. For structure A, the most common error was thinking that the structure represented diamond and then basing properties on diamond. Some did recognise structure B as that of graphite but others described it as graphene. Even for those who answered on the basis of 'graphite', it was not uncommon to see wrong physical properties such as low melting point or soluble in water. Please note that 'giant' covalent and 'simple/molecular' covalent are incorrect descriptions for a type of bonding and were not credited. In QWC questions such as this one, specific guidance is often provided to help candidates know what needs to be covered in their answers. This further serves to emphasise the importance of candidates carefully reading through all the information provided in the question before they answer.

Higher Tier

Overview

This was the fifth sitting of the new DAS specification Chemistry Unit 1 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. It is evident that, with each passing examination series, a higher proportion of candidates have been able to demonstrate their understanding in respect of topics that are new to this specification. Hopefully, the availability of several past papers now, coupled with other support materials available from the CCEA website, is helping teachers plan their delivery of this unit.

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Q1 Overall this question about fractional distillation was not well answered. It was however, a good discriminator. In Part (a)(i), although a majority recognised the diagram as depicting fractional distillation, many candidates gave distillation or simple distillation as their answer. The question had asked for the **full** name of the process. In Part (a)(ii), most candidates recognised the condenser. In Part (a)(iii), answers given as to why water flows through the condenser were varied. A minority understood that the water helps provide a cold surface (to assist condensation). Unfortunately, many candidates displayed their lack of understanding of the process indicating that

the water was running down the inside of the condenser and/or that it was the same water that was being separated. In Part (b)(i), a majority of candidates recognised that, since the ethanol had been separated from the water, i.e. it was not mixed with anything else, then it was pure. Some said that it was not mixed with any other element; this was not credited. Only a minority chose the thermometer in Part (b)(ii) as the piece of apparatus used to prove purity. Most selected the fractionating column.

Q2 Overall this question was really well answered. In Part (a)(i), most candidates were able to complete the atomic structure correctly and gain all 4 marks. However, some of these candidates did not recognise that since A and C had the same atomic number, they had to be the isotopes. Calculation of the relative atomic mass of an element given the relative abundance of its isotopes has now been asked a number of times. More candidates are now demonstrating a really good ability to calculate the relative atomic mass and a high proportion gained both marks. A common error, from those who did not understand how to use the information provided, was to add the three mass numbers together and divide by either 3 or 100. The question specifically asked for the answer to be given to 2 decimal places and nearly everyone produced an answer to the correct degree of accuracy.

Q3 This question was about nanoparticles and was very well answered. Most candidates knew the size of a nanoparticle. In Part (b), candidates had to analyse and interpret data given in a table and a passage. A high proportion gained all 5 marks available. An error was to name titanium oxide, rather than titanium, as a transition metal or, less frequently, through misreading the question, to give 'socks' instead of 'silver' as the nanoparticle which is used to reduce the smell of sweaty feet. In Part (c), a minority recalled that cell damage, which is stated in the specification, is a potential risk arising from the use of the nanoparticles in sun cream.

Q4 This question was well answered by many candidates. In Part (a)(i), most candidates wrote MgF_2 but MgF was also seen. Equations were not acceptable as the question asked for the chemical formula of magnesium fluoride. In Parts (a)(ii) and (a)(iii), some candidates had not read the question carefully and, as a result failed to mention the electronic configuration in either answer. Often the loss of two electrons to give magnesium a full outer shell was given but without fully describing how the electronic configuration changed i.e. from 2,8,2 to 2,8. Similarly, in Part (a)(iii), candidates often failed to describe the electronic configuration change for the fluorine atom when it became a fluoride ion. Often the gain of one electron to give fluorine a full outer shell was given as the answer but without fully describing how the electronic configuration changed i.e. from 2,7 to 2,8. Some thought that magnesium gained electrons and fluorine lost electrons. Answers to Part (b) demonstrated a real weakness in knowledge. It consisted of three multiple choice questions about ionic bonds, ionic structures and diatomic molecules. Only a minority of candidates gained all 3 marks. Most candidates gained at least 1 mark, with Part (b)(i) producing the most correct answers. Part (c) was worth 5 marks for drawing the electronic structures of a hydrogen atom, a nitrogen atom, an ammonia molecule and for labelling a lone pair in the molecule. Many candidates gained all 5 marks. Some lost marks by not reading the question carefully e.g. by not showing all the electrons in a nitrogen atom or by not labelling a lone pair. The tasks had been set out in bullet points with 'lone pair' and 'all' electrons being written in bold type. In Part (d), better candidates drew correct diagrams worth 2 marks but, as with Part (c), some had failed to read the question carefully and did not label any multiple bonds.

Q5 In Part (a), a very high proportion of candidates were able to work out the relative formula masses of both sulfuric acid and ammonium carbonate correctly. Part (b) came from a topic new to this specification – the calculation of percentage by mass of an element in a compound. It should be noted that the question asked for the answer to be calculated to 1 decimal place. The question, was a good discriminator. Most of the higher achieving candidates gained all 3 marks. Candidates should also be reminded to show their working out in calculations where there is more than one mark available as this allows ECF mark(s) to be awarded. The mass to moles question, Part (c)(i), was also well answered although some candidates gave the answer as 4 moles (180/45). In Part (c)(ii), although many candidates chose 40% as the percentage composition by mass of carbon in a glucose molecule, 25% was frequently given in this multiple choice question. The latter answer is arrived at by computing the proportion of the atoms in a glucose molecule which are carbon, but takes no account of mass.

Q6 This QWC question involved demonstrating understanding of two structures, one of which (structure B) may have been much more familiar to Higher Tier candidates than the other. Most candidates struggled with structure A. The most common error was thinking that the structure represented diamond and then basing properties on diamond. Only a small minority recognised the structure as that of an ionically bonded compound. However, many Higher Tier candidates identified structure B as that of graphite and were able to gain at least 5 of the 6 indicative points available + 1 for recognising that a substance with structure A would have a high melting point. Overall this meant that many candidates who had got structure A 'wrong' were still able to gain a middle band 4 marks through their answers for structure B. A minority gained all 6 marks by recognising that structure A represented an ionically bonded molecule. Some thought that structure B was graphene, although 2 layers were shown in the diagram. Even for those who answered on the basis of 'graphite', it was not uncommon to see wrong physical properties such as low melting point or soluble in water. Please note that 'giant' covalent and 'simple/molecular' covalent are incorrect descriptions for a type of bonding and were not credited. In QWC questions such as this one, specific guidance is often provided to help candidates know what needs to be covered in their answers. This further serves to emphasise the importance of candidates carefully reading through all the information provided in the question before they answer.

Q7 This was the most poorly answered question on the entire paper. It was a good discriminator for better candidates. In Part (a), most could not name either the alkali which reacts with nitric acid to give potassium nitrate or a base which reacts with sulfuric acid to give copper sulfate. It was clear that many candidates did not know the common reactions that occur between acids and bases/alkalis. This question required candidates to work back from the products, i.e. water produced means a metal oxide or hydroxide must have been required. The metal could then be identified from the beginning part of the salt produced. Some candidates got the names correct but not the formulae. Quite often just the two metals were given as the answers. In Part (b), only a minority wrote that an alkali is a soluble base. With the benefit of hindsight, the question could have been more clearly worded. An increasing proportion of better candidates are now able to write correct ionic equations for neutralisation, including the use of state symbols, and many gained all 3 marks. A common error was to omit state symbols or incorrectly write these. Part (d)(i) was extremely poorly answered. Higher Tier candidates are expected to be able to demonstrate understanding that strong acids are completely dissociated in water i.e. that H^+ ions are produced and therefore, consequently, in this equation, the NO_3^- ion is also produced. It was more common to see answers with equations showing

substances containing elements other than H, N or O than it was to see H^+ given as part of the answer and only a handful of candidates gained both marks. Answers to Part (d)(ii) were mixed; some recognised 100% ionisation but 50% or 1% were also frequently seen. There were some very good, totally correct answers to Part (d)(iii) but these were in a minority. Many were able to calculate that 0.2 moles of zinc nitrate were produced. But some could not use this information to compute the mass of zinc needed. Error carried forward (ECF) is used when marking questions like this. This means that even with a wrong answer, if the candidate's work is clearly set out, it can be possible to gain 2 of the 2 available marks.

Q8 Although Part (a) was often well answered, two points are worth noting: firstly, the boiling points are becoming less negative (i.e. they are rising, not falling) and, secondly, in order to describe the trend in boiling points, candidates also needed to state 'As you move down the group …' or 'As the relative atomic mass increases…'. In Part (b), the expected answer was, 'They all have a full outer shell of electrons'. Some candidates described the number of electrons as being 'the same in the outer shell' or 'having 8 electrons in the outer shell', which did not score credit because this is not correct for helium. Being 'unreactive' was also often given as an answer but this has nothing to do with the number of electrons in the outer shell. In Part (c), many candidates gave 'colourless', but the colour was sometimes given as yellow. Invisible was not accepted. Part (d) was a good discriminator. There were two ways to arrive at the correct answer. One, less commonly used was to find the difference between -269 and -108 and then divide by 4 to get 40.25 (40 was accepted). The other was to compute each of the 4 differences, add them together and then divide by 4. Common errors included: adding up all the boiling points and dividing by 5; calculating the change between boiling points (161) and dividing by 5 or 6 instead of 4; giving the answer as a negative number. For Part (d)(ii), ECF was allowed for this question, however, the temperature predicted should have been a higher temperature than -108 ^{0}C. Candidates should have been able to deduce by following the general trend of the boiling points given in the table. In Part (e), the most common incorrect answer was 'unreactive' which describes a chemical property, however, the question asked for a physical property of the noble gases.

Assessment Unit 2 Further Chemical Reactions, Rates and Equilibrium, Calculations and Organic Chemistry

Foundation Tier

Overview

This was the first sitting of the new DAS specification Chemistry Unit 2 exam. As such, this provided a particular challenge for candidates and their teachers. The unit includes a significant amount of material that had not been in the previous specification and the assessment objective weightings are different to those in the C1 Unit, particularly in respect of AO3 – Analyse and evaluate evidence, make reasoned judgements and draw conclusions based on evidence. In the C1 Foundation Tier paper, AO3 accounts for around 6 of the 60 marks available whereas in a C2 Foundation Tier paper, it accounts for around 15 of the 70 marks available.

As is typical with Foundation Tier papers, a wide range of marks was seen with few candidates achieving very high marks. 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.

General note: Use of the Glossary of Terms

In addition to the wording in the DAS Specification, CCEA has produced a Glossary of Terms for DAS: Chemistry which is available on the CCEA website. The Mark Schemes now reflect the actual wording provided in these two documents when questions relating to definition or understanding of a 'term' are examined.

Q1 Although the examining team had thought that candidates would find this a very straightforward question with many scoring 6 or all 7 marks, this proved not to be the case. A majority of candidates circled the correct answer for the percentage of nitrogen in air in Part (a)(i) but it was not uncommon to see answers of 21% or 1%. In Part (a)(ii), most could circle one of the physical properties of nitrogen but many did not make two correct choices – 'pungent smell' was, for example, frequently circled. Although the specification sets out uses of gases which should be recalled, it was clear that many candidates had simply no idea about which gas linked to which use in Part (b). It was rare to see 'disinfectant' being given as a use for any of the gases but most other combinations cropped up regularly – for example, hydrogen in fizzy drinks or in welding; oxygen in fizzy drinks or as a coolant. Overall the question was poorly answered; many candidates scored 4 marks or less.

Q2 This question also produced answers of variable quality and was a good discriminator. In Parts (a)(i) and (a)(ii), most knew that copper will not react with cold water or steam and that magnesium produces a bright white light when it burns in air. However, when asked to choose between four gases to identify the one that is produced when a metal reacts with steam it was as common to see carbon dioxide or oxygen circled as the answer as it was to see hydrogen. In Part (a)(iv), a minority of candidates were able to put six metals in the correct order of reactivity. In Part (a)(v), the majority of candidates recognised that iron is extracted by chemical reduction but were unable to link this method to the reactivity series; aluminium was the most common second metal given. In Part (b), most candidates could give the correct right hand side for a given word equation. It was pleasing to note that

in Part (c), a high proportion of candidates were able to deduce the correct order of reactivity from the information provided.

Q3 This question was really all about oxides. In Part (a)(i), only a minority could identify, from a list of five elements, the two which would form acidic oxides i.e. the only two non-metals in the list. Nearly everyone did know, however, that magnesium was the element which forms a white oxide. Part (a)(iii) was very poorly answered. The question asked candidates to identify which elements, from the list, formed solid oxides. The number of elements required was not stated but the examiners had hoped that candidates would work out that metals form solid oxides and hence deduce the three elements which needed to be listed to get credit. It was an AO3 question and virtually no Foundation Tier candidates gained the mark available. In Part (b)(i), nearly everyone knew that carbon dioxide turns limewater milky but the question had also asked about what happens when the carbon dioxide is in excess. Very few went on to say that the precipitate disappears (or equivalent). In Part (b)(ii), identification of a compound formed when carbon dioxide is bubbled through calcium hydroxide solution (limewater) was a mystery to most candidates, even though a list of four possible compounds was given.

Q4 This question was a good discriminator. In Part (a), candidates had to tick three correct observations, from a list of six, for the reaction of calcium with water. It was expected that candidates would have had opportunities to see this reaction happening and that they would eliminate the wrong observations easily. This proved not to be the case; most candidates made one error, a few made two and a few got all 3 marks. It was common to see candidates who thought that calcium burns with a lilac flame, or that it forms a ball, or that the reaction is very slow. Part (b)(i) was incredibly poorly answered by all but the top candidates. They were told that iron is produced in the blast furnace by reacting iron(lll) oxide with carbon monoxide and asked to write a word equation for the reaction. In effect, the stem of the question provided candidates with three of the four substances needed for the word equation. Only a minority of candidates even named iron as one of the products; only a minority had a left hand side which showed iron(lll) oxide + carbon monoxide →; and many candidates included products derived from elements other than iron, carbon and oxygen. Nearly everyone knew that strength was the most important property which accounts for the use of iron as a building material for bridges.

Q5 This question focused on organic chemistry and was constructed to help make it as accessible as possible to Foundation Tier candidates. Many scored well. Instead of asking for three features of a homologous series, candidates were ask to choose from five possible answers. Nearly everyone ticked two correct boxes but many thought that members differed by a CH_3 group. In Part (b), nearly everyone identified two fuels used in cars from a list of five crude oil fractions but, although a majority knew that naptha is used to manufacture chemicals, fuel oils was a popular but wrong answer. Some knew that bitumen/tar is used to surface roads. A similar proportion identified fractional distillation as the technique used to separate the fractions in crude oil.

Q6 Part (a) was an organic question type which has been a feature of many past DAS chemistry papers. Candidates are given some information relating to molecular and or structural formulae and are then asked to complete a table which includes writing a molecular formula and/or drawing a structural formula. This time nearly everyone identified methane as a gas with the molecular formula CH_4 but many struggled with C_2H_4. It was very common to see structural formulae which did not have a double C=C bond and a variety of suggested names. The vast majority of candidates did not know both products formed on complete combustion of methane. Many gave carbon dioxide or water but few named both; hydrogen and sulfur dioxide were

popular but wrong answers. Part (c) was a good discriminator. Better candidates knew that carbon monoxide combines with haemoglobin in the blood, reducing its capacity to carry oxygen. In Part (c)(ii), although this was simply a recall question about the effects of acid rain, taken from section 2.5.26 of the specification, relatively few candidates used the examples given in the specification; common errors were to mention global warming or to refer to an effect on ocean life.

Q7 In this question, Part (a), worth 3 marks, was poorly answered. Candidates were given a formula equation showing the dehydration of hydrated copper(ll) sulfate and were asked to give the formula of the substance in the equation which contained water of crystallisation. Although the answer was $CuSO_4.5H_2O$, the most common answer, by some distance, was '$5H_2O$'. A slight majority were able to give the formula ($CuSO_4$) of the anhydrous substance. Most identified that statement B described how a dehydration reaction can be carried out. In Part (b), nearly everyone correctly worked out the relative formula mass for Na_2CO_3 but when asked to do the same for $Na_2CO_3.10H_2O$, common answers were 124 or 134 rather than 286.

Q8 Parts (a)(i) and (a)(ii) of this question covered the extraction of aluminium. It was extremely poorly answered by the vast majority of candidates, nearly all of whom demonstrated no knowledge or understanding relating to the extraction of aluminium. Many thought that iron ore was purified to give alumina, or left Part (a)(i) blank. Most candidates attempted at least three of the four structured sections of the QWC question on aluminium manufacture and, although there were 10 indicative points credited in the mark scheme, most Foundation Tier candidates did not gain even 2 indicative content points which was the minimum needed for credit. Some candidates picked up 1 of the 3 marks available for explaining why it is better to recycle aluminium than to extract it from its ore but it was very rare to see 3 mark answers. In Part (b), candidates had to show the cathode and anode products from the electrolysis of sodium bromide. Some gave bromide as a product; some described the appearance of 'products'; some gave the correct products but ascribed them to the wrong electrodes; others left the answer blank. A minority identified that sodium was formed at the cathode and a few of these also identified bromine as the anode product.

Q9 Part (a) of the final question was about exothermic and endothermic reactions. In Part (a)(i), candidates were given a list of five examples and asked to select the three which were exothermic. Nearly everyone identified 'burning wood' and most picked a second correct example but it was common to see thermal decomposition or photosythesis given as the third example. Part (a)(ii) was an example of an AO3 type question. The stem provided a context from which candidates needed to evaluate all the evidence and arrive at a judgement. Very few worked out that if a candidate was holding a boiling tube in which an endothermic reaction was taking place, the candidate would know that it was endothermic because his/her hand felt colder. Most thought that the boiling tube would heat up. In Part (b), better candidates could articulate what is meant by the term 'reversible reaction', without using 'reversible' in their answers. In the final 4 mark question, candidates were asked to write a balanced symbol equation for the reversible reaction between hydrogen and bromine to give hydrogen bromide. Despite the fact that the stem named all three substances needed in the equation, hardly anyone gained any credit. A few gave the reversible sign; many left the answer blank; it was really rare to see attempts in which the candidate was attempting to provide formulae for the three named substances.

Higher Tier

Overview

This was the first sitting of the new DAS specification Chemistry Unit 2 exam. As such, this provided a particular challenge for candidates and their teachers. The unit includes a significant amount of material that had not been in the previous specification and the assessment objective weightings are different to those in the C1 Unit, particularly in respect of AO3 – Analyse and evaluate evidence, make reasoned judgements and draw conclusions based on evidence. In the C1 Higher Tier paper, AO3 accounts for around 7 of the 70 marks available whereas in a C2 Higher Tier paper, it accounts for around 17 of the 80 marks available.

There was little evidence of Higher Tier candidates being entered at the wrong tier along with a wide range of marks being achieved across the full range. The paper was successful in providing candidates of differing abilities the opportunity to respond positively.

General note: Use of the Glossary of Terms

In addition to the wording in the DAS Specification, CCEA has produced a Glossary of Terms for DAS: Chemistry which is available on the CCEA website. The Mark Schemes now reflect the actual wording provided in these two documents when questions relating to definition or understanding of a 'term' are examined.

Q1 This question, which focused on gas chemistry, was worth 11 marks. There were few very weak answers but the question proved to be a good discriminator. In Part (a), most knew that only about 1% of air is not made up of nitrogen or oxygen but there were some answers where high percentages were quoted. Part (a)(ii) illustrated the importance of reading the question carefully. Despite the fact that candidates were asked to identify the element which was the third most abundant gas in the atmosphere, many candidates gave carbon dioxide as their answer; hydrogen was also quite popular; a minority identified argon. Part (b) included two questions on a topic area which is new to this specification and answers reflected candidates' familiarity, or otherwise, with the importance of the triple bond in explaining the lack of reactivity of nitrogen and with the test for ammonia. The specification clarifies that a glass rod and concentrated hydrochloric acid are needed and the mark scheme reflected this. There was credit for 'rod/wire' or for 'hydrochloric acid'. Part (c)(i) was also taken from a topic new to the specification; the catalytic decomposition of hydrogen peroxide to give oxygen. Only a minority gave the correct products for this reaction. It was common to see $H_2 + O_2$. Although many knew that sulfur burns with a blue flame in oxygen, yellow or orange were also chosen as the answer by many. Judging from the answers to Parts (c)(iii) and (c)(iv), it would appear that only a minority understand that non-metal oxides are acidic and that metal oxides are basic.

Q2 This question, about metals and the reactivity series was very well answered. Although some resorted to observations from the reaction of sodium with water (e.g. moving on the surface, melting, etc.) it was pleasing to note that most candidates achieved 3 or all 4 marks. Many went on to give a correct symbol equation for the displacement reaction and a high proportion deduced in Part (c), the correct order of reactivity of four unknown metals, from information provided in the question.

Q3 Part (a) of this question was based on the extraction of iron. Many candidates could not balance the formula equation for the reduction of iron(lll) oxide with carbon monoxide. Part (a)(ii) required a clear understanding of the process of redox and the ability to apply that to the reaction of carbon monoxide with carbon. It was a good discriminator, being well answered by higher ability candidates. It was disappointing to note how many candidates did not know the main acidic impurity

from the extraction of iron. Parts (b) and (c) covered areas new to the specification. In Part (b), many candidates could give one condition, usually temperature, which could be changed to alter the direction of a reversible reaction; in Part (c), there were few accurate explanations as to what is meant by a dynamic equilibrium. The mark scheme reflected the exact wording in the specification but many answers lacked the key words 'rates' and 'amounts'.

Q4 Common features of a homologous series were well identified by a high proportion of candidates; many gained all 3 marks. In Part (b), better candidates knew that carbon monoxide combines with haemoglobin in the blood, reducing its capacity to carry oxygen but many answers were too general. Although, in Part (c)(i), nearly every candidate knew that carbon dioxide turns limewater milky, only a minority correctly described what happens when the carbon dioxide is in excess. In Part (c)(ii), better candidates knew or worked out that calcium carbonate is formed from the reaction in Part (c)(i) but it was quite common to see each of the three distractor answers being circled. The final part was simply a recall question about the effects of acid rain, taken from section 2.5.26 of the specification; significant numbers did not use the examples given in the specification; common errors were to mention global warming or to refer to an effect on ocean life.

Q5 This question was a good discriminator. Part (a) was an organic question type which has been a feature of many past DAS chemistry examination papers. Candidates are given some information relating to molecular and or structural formulae and are then asked to complete a table which includes writing a molecular formula and/or drawing a structural formula. This time nearly everyone gave the molecular formula for but-1-ene and most knew that it is a gas but many really struggled with propan-1-ol. It was rare to see a correct molecular formula and very rare to see a correct structural formula. In Part (b), most knew that ethane is formed from ethene and hydrogen but fewer knew that ethene and steam produce ethanol and very few gave 'addition' as the type of reaction in Part (b)(iii). Better candidates were able to work out the repeating structure for polytetrafluoroethene, having been given the monomer structure. It is important to make sure that the double bond is not present and that the brackets and 'n' are correctly positioned.

Q6 Part (a) involved calculation of empirical formulae. It discriminated between those who had a clear understanding of this topic, most of whom gained 3 marks, and those for whom the topic was a complete mystery. Candidates should be reminded not to include '1' in a formula e.g. one answer was HO and not H_1O_1. In Part (b)(i), nearly everyone could work out the relative formula mass of $MgSO_4$. Parts (b)(ii) and (b)(iii) required candidates to use information provided to calculate the relative formula mass for $MgSO_4.xH_2O$. Very few used the 48.8% figure given in the question stem and in Part b(ii), the most common answer was 138 (i.e. 18 was added to the Part (b)(i) answer). Very few gave 286 as the answer. In Part (b)(iii), error carried forward (ecf) was applied and, although this allowed candidates full credit to work through the 138 answer from Part (b)(ii), others used the 48.8% correctly here and worked out the correct answer; i.e. that x was 7.

Q7 Parts (a)(i) and (a)(ii) of this question covered the extraction of aluminium. It was a very good discriminator. A minority of candidates demonstrated little knowledge or understanding relating to the extraction of aluminium. Some of these thought that iron ore was purified to give alumina. Most candidates attempted all the four structured sections of the QWC question on aluminium manufacture. There were 10 indicative points credited in the mark scheme, and this enabled many candidates to achieve middle band 4 mark answers, even if they displayed only partial knowledge and understanding of the topic. Many top candidates achieved the full 6 marks. Many picked up 2 of the 3 marks available for explaining why it is better to recycle

aluminium than to extract it from its ore and better candidates provided 3 mark answers. In Part (b), candidates had to show the cathode and anode products from the electrolysis of sodium bromide. Many gained both marks available but some gave bromide as a product; some described the appearance of 'products'; some gave the correct products but ascribed them to the wrong electrodes. A minority identified that sodium was formed at the cathode and a few of these also identified bromine as the anode product.

Q8 The final question covered a topic new to this specification, dealing with activation energy and reaction profiles. Many candidates scored well in this 8 mark question, reflecting their clear understanding and the quality of their teaching. Others seemed to be 'guessing'. In Part (a), it was necessary to refer to 'minimum' energy required for one of the two marks. In Part (b)(i), labelling the reaction profile diagram proved very straightforward to those who were familiar with these diagrams, others struggled. Most worked out in Part (b)(ii) that the reaction profile diagram represented an exothermic reaction and went on to choose the correct energy change from six possible answers. A high proportion worked out in the final question part that use of a catalyst would lead to the activation energy being smaller.

Physics

Assessment Unit 1 Motion, Force, Moments, Energy, Density, Kinetic theory, Radioactivity, Nuclear Fission and Fusion

Foundation Tier

Q1 This type of question is always well answered by candidates and most responded well.

Q2 **(a)** This was a straightforward question on the conservation of energy where candidates had to compare energy inputs with energy outputs and make simple calculations. However, some candidates clearly did not know the answer given their responses.

(b) It was good to see candidates quote and use the fully correct equation for efficiency (i.e. efficiency = ***useful*** energy output/total input energy).

Q3 This was generally well done but many candidates did not appreciate that the answer to Part (a)(iii) should be equal but in the opposite direction to that in Part (ii).

Q4 Many candidates struggled with the concept of the 'rate of change of speed'. Equations quoted were often confused with other equations in this section; e.g. the equation 'rate of change of speed' was given as initial speed + final speed/2. In this section candidates need to be careful to use the correct subscripts (e.g. initial, final) or to use word equations as given in the specification.

Q5 This was well answered but those candidates who wrote moment = mass x distance would have been penalised.

Q6 This question tested an experiment which should have been familiar to the majority of candidates. The second part was badly completed by some candidates, namely the two readings which must be taken to allow the mass of the milk to be found. Candidates need to be aware that repeating the experiment will increase the reliability of the result but not the accuracy. Four marks out of six was common.

Q7 **(a)** The challenge in this question was to use the correct distance in the equation work = force x distance. Those candidates who were unsure and offered two solutions (one based on a distance of 8 m and one using 5.5 m) were penalised. Nevertheless, it was pleasing to see many candidates get the correct answer.

Q8 Both parts were well answered.

Q9 **(a)** The idea of half-life was examined in a new and challenging way and many candidates struggled to understand. In Part (a)(ii) many scored 2 marks out of 3. They were able to calculate correctly from 512 to 32 (or from 32 to 512) but could not convert their calculations into time.

(b) Nuclear reactions were being described but some candidates answered in terms of alpha, beta etc.

Higher Tier

Q1 It was common to see 4 marks out of 6 awarded often because the two readings needed to obtain the mass of the milk were not carefully given, e.g. some candidates thought the two readings were mass and volume (showing careless reading of the question), others wrote about weight and volume.

Q2 **(a)** It was important to select the correct distance; many candidates scored well.

(b) The formula needed to be re-arranged and this skill is improving.

Q3 This was well answered.

Q4 **(a)** **(i)** This tested the concept of half-life in a novel way and the more able candidates showed good understanding here.

(ii) It was common to see 2 out of 3 awarded. Candidates were able to go from 32 to 512 (or from 512 to 32) but many failed to convert this process into a time interval.

(b) There was some clear confusion of fission and fusion.

Q5 This question tested material which is new but well described in the new specification. Candidates appeared to have been ill-prepared in many cases. It was a discriminating question and some candidates scored well. Part (b) was well answered.

Q6 The equation for pressure is well known but still instances of mass rather than weight being used.

Q7 The first three marks (kinetic energy) were scored by most but too many subtracted (rather than added) the 500 J.

When no energy is lost it is quite acceptable to write Ep at the top = Ek at the bottom. However, in this example energy was lost due to friction and so the equation did not apply.

Part (b) was well answered but in Part (c) it seems that many guessed the answer.

Q8 **(i)** Some used displacement = velocity x time, not realising that the velocity was not constant and so average velocity had to be used.

(ii) In this part the resultant force was given; the acceleration could be obtained from the velocity – time graph and the mass calculated from F = ma. The more able candidates were successful in doing this.

Assessment Unit 2 Waves, Light, Electricity, Magnetism, Electromagnetism and Space Physics

Subject Overview

Summer 2019 saw the first time that CCEA made awards in the new revised specification at qualification level. Earlier awards were at unit level only.

In general, the examinations team was very pleased indeed with the way in which the entire examination process was conducted. What was new in 2019 was the replacement of Controlled Assessment by a practical skills assessment in Unit 7. With a total candidature of around 8000 learners, the marking and checking of candidates' scripts in this unit alone was a huge undertaking.

Candidate performance was very much as expected. Specific details on performance are given in the reports on individual units. The purpose of these reports is to support centres, to show where candidate performance was good and to provide guidance as to how it might be improved. I would encourage all teachers of Double Award Science to apply this guidance to inform their teaching practice.

Foundation Tier

Q1 **(a)** **(i)** Almost all candidates knew that all electromagnetic waves travel at the same speed in a vacuum.

(ii) Most candidates knew the names of the electromagnetic spectrum in order of wavelength.

(b) **(i)** The most common incorrect answer here was cancer. Examiners were looking for eye damage.

(ii) Almost everyone could associate overexposure to gamma rays with cancer.

Q2 **(a)** **(i)** Most knew that waves transfer energy.

(ii) & (iii) The majority of candidates could extract from the graph the wavelength and amplitude of the wave.

(b) **(i)** While most could give another example of a transverse wave, many were unable to describe how the particles moved. It was essential for candidates to indicate that the movement was an oscillation or vibration before they could access the mark for the direction of the vibration relative to the direction of motion of the wave itself.

(ii) Most candidates knew that sound/ultrasound waves are longitudinal.

Q3 **(a)** **(i) & (ii)** All but the least able candidates gained the marks for the normal and the reflected ray.

(iii) While many candidates obtained the mark for the angle of incidence, a large minority confused this with the glancing angle and lost the mark.

(b) **(i)** This was well done by the more able candidates. Less able candidates showed the ray on the correct side of the normal, but lost the mark for the direction of the bending.

(iii) This was well done by almost all candidates.

Q4 This question was on lenses and was one of the two questions assessing the new parts of the specification.

(a) **(i) & (ii)** Examiners were surprised that so many candidates were unable to distinguish between converging and diverging lenses from their shape.

(b) More able candidates picked up three marks here by drawing rays to show the action of a converging lens. Some candidates showed the action of a diverging lens. It was surprising that these marks were more easily obtained than the marks for the names of the lenses in Part (a).

(c) Candidates who had done the experiment realised the need for a metre stick and a screen. Often less able candidates would write pen and paper as the apparatus required. They gained no credit for this response.

Q5 **(a)** **(i)** Most obtained the correct answer of 30 ohms.

(ii) This question required candidates to know how to calculate the effective resistance of two equal resistors in parallel. A surprisingly large number of candidates did not know where to begin. Others tried to use the 'product over sum' method and made an error in the mathematics. Examiners were simply looking for dividing 10 by 2.

(b) These were six straightforward marks. However many confused the colours and names of the wires inside the plug. Particularly common was a live-neutral and brown-blue confusion.

Q6 **(a)** **(i)** Only a small number of candidates could state that an electric current is a flow of electrons (or electric charge).

(ii) Some candidates lost a mark by identifying X as a battery. Examiners were looking for the word cell. The other parts of this question were usually well done.

(b) Less able candidates often sored zero marks in this question. Examiners were looking for application of Q = It and a recognition that the 't' had first to be converted from minutes to seconds. There was a stand-alone mark for the unit (coulombs).

Q7 **(a)** Many candidates appreciated that the main energy form produced is heat. However, it was very rare to see a satisfactory explanation as to how this energy is produced. Examiners were looking for a statement that electrons and atoms were involved in a collision process in the wire.

(b) **(i)** This was an application of P = IV to find I. Many candidates gained the mark for the formula but could get no further. Some confused power and voltage.

(ii) Most gained the mark for the correct fuse.

(c) This caused many candidates some difficulty. The common error was a failure to convert 1.2 kW to watts. Candidates who made this error generally gained two marks out of the four available, one for the formula and one for correct substitution. This question, like Part (b)(i), demonstrated the importance of candidates showing the development of their answers beginning with the formula they intend to use.

Q8 This QWC question was generally very well answered. However, centres should be advised that candidates were penalised for stating other heavenly bodies in their list of planets. For example, those who identified Pluto as a planet lost two marks, one for the names of the planets and one for the order.

Q9 This question was on electromagnetism and was second of the two questions on the new parts of the specification.

(a) **(i)** This part required candidates to state three ways to increase the strength of the electromagnet. Many recalled the idea of increasing the current, some knew about increasing the number of turns, but very few appreciated the effect of using an iron core.

(ii) It was a surprise that so many candidates believed that reversing the direction of the current in the coil made the magnetic field weaker.

(b) Many candidates found this question, the last on the paper, to be very challenging. They first had to use an appropriate rule (such as the right hand grip rule) to identify the north and south poles. They then had to recall that outside the coil, the field is always in a direction away from north. Finally, they had to understand that, for consistency, the field direction inside the coil had to be from right to left.

Higher Tier

Q1 **(a)** **(i)** Surprisingly, the majority of candidates failed to state that an electric current is a flow of electrons (or electric charge).

(ii) Candidates lost a mark by identifying X as a battery. Examiners were looking for the word cell. The other parts of this question were usually well done.

(b) Weak candidates often sored zero marks in this question. Examiners were looking for application of Q = It and a recognition that the 't' had first to be converted from minutes to seconds. There was a stand-alone mark for the unit (coulombs).

Q2 **(a)** Many appreciated that the main energy form produced is heat. However, it was very rare to see a satisfactory explanation as to how this energy is produced. Examiners were looking for a statement that electrons and atoms were involved in a collision process in the wire.

(b) **(i)** This was an application of P = IV to find I. Many gained the mark for the formula but could get no further. Some confused power and voltage.

(ii) Most gained the mark for the correct fuse.

(c) This caused many candidates some difficulty. The common error was a failure to convert 1.2 kW to watts. Candidates who made this error generally gained two marks out of the four available, one for the formula and one for correct substitution. This question, like Part (b)(i), demonstrated the importance of candidates showing the development of their answers beginning with the formula they intend to use.

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Q5 **(a)** This question was well answered.

(b) This was a good test of this part of the specification and more able candidates scored well. It was unfortunate to see some candidates connecting the resistors in the correct way only to spoil their answer by including an extra wire which 'shorted' their network.

Q6 **(a)** This was adequately answered but examiners expected it to be well answered since it addressed basic wave concepts such as wavelength and amplitude, e.g. many thought that 90 cm represented two wavelengths.

(b) **(i) & (ii)** This was generally well answered.

(c) Echo calculations often appear on this paper and those who had prepared well scored well.

Q7 **(a)** **(i) to (iii)** It was pleasing to see this so well answered by many.

(b) **(i)** A new topic – the magnifying glass. Lens diagrams must be practised and some well-prepared candidates were able to do well here and scored five marks. Most were able to score some marks with a few scoring zero.

(ii) to (iv) Generally, those candidates who drew good ray diagrams also did well here. This was a good discriminating question overall.

Q8 **(a) & (b)** **(i)** This was generally well done.

(b) **(ii)** This is new material. Candidates are advised, especially with descriptive material, to use the terminology used in the specification. For example, examiners were looking for the term 'thermal expansion' acting outwards to balance the 'gravitational force' acting inwards. There were few instances where all five marks were gained by candidates.

Q9 **(i) to (iv)** Again, this is new material and the question tested recall of material in this part of the specification. The response was mixed with almost all candidates gaining some marks with a few gaining all.

Assessment Unit 7 Practical Skills

Foundation Tier

Booklet A

Overview

This was the first year of this assessment. CCEA is grateful for the cooperation of centres in making the assessment so successful. However, there are some issues that have been identified and implementation of the advice below would make for an even smoother conduct of the assessment in future years.

Centres are advised to pay very close attention to the Apparatus and Materials List and, where necessary, to order consumables well in advance of the test planned by the centre. They should also be very careful that solutions required by candidates are prepared as instructed and to the correct concentration. In addition, conducting trial experiments just prior to the assessment is essential if problems on the day of the assessment are to be avoided.

Biology Paper

Q1, 2 & 3 These were all well answered by almost all candidates. This was as expected since they would have carried out a similar prescribed practical in class as part of their course.

Q4 **(a)** Candidates were asked for a safety precaution – some referred to safety glasses. Since this was given in the preamble to the experiment it was not accepted as a creditworthy response. Examiners were looking for a response citing care with the knife or cork-borer or the need to take care when working with glassware.

(b) Most candidates realised that time (or temperature) was one of the possible controlled variables.

Q5 Parts (a) and (b) of this question were well answered. However, some candidates omitted the minus sign to indicate the reduction in mass with 20% sucrose solution. In Part (c) some candidates had difficulty in determining a percentage change in mass.

Q6 This question presented most difficulty for candidates, many of whom thought it had to do with improving accuracy.

Q7 Parts (a)(i) and (b)(i) required candidates to inspect and comment on their results. Most obtained full marks in these questions. Part (a)(ii) required recall of the term turgid. Most were able to gain the mark here also. Part (b)(ii) related to an explanation of the mass reduction when the potato cylinder was placed in 20% sucrose solution. Most realised that this was due to loss of water by the potato. Only more able candidates went on to say that in osmosis, water would travel from a region of low sugar concentration to one of high concentration. A small number of candidates confused the process occurring with plasmolysis.

Chemistry Paper

Q1 **(a)** Some candidates lost marks because their temperature changes fell outside the allowed range – most commonly this was the error in experiment 3.

(b) The majority of candidates correctly identified the hazard symbol.

(c) Most candidates named the correct alternative apparatus.

Q2 **(a)** Most candidates correctly stated the appearance of compound A and the sulfuric acid. For sulfuric acid, examiners were looking for colourless liquid. Clear was not credited. Liquid was accepted for solution but fluid was not.

(b) **(i)** Most candidates identified gas being released/bubbles/fizzing. Those who wrote 'a blue solution was formed' or 'sulfuric acid turned blue' were awarded credit. Candidates were not awarded the mark for simply stating 'went from green to blue'. Reference to the solution turning blue had to be made. The third marking point was for the solid disappearing (dissolving was allowed). Many candidates failed to identify this observation and therefore only scored 2 out of the 3 marks available.

(b) **(ii)** Most candidates recognised that there was fizzing, a gas was evolved and the magnesium ribbon disappeared. A few added that heat was produced, but this was not credited as this information was given in the question.

Physics Paper

Q1 **(a)** Nearly all candidates measured this correctly. A small number lost the mark for an answer which was ten times too large (around 200 mm).

(b) **(i)** Almost all candidates gained full credit of 2 marks for correct column headings.

(ii) An increasing length for increasing force for both sets of readings 1 and 2 were needed. A few measured lengths in cm and this caused them problems in Part (iii).

Problems also arose when candidates did not give their readings to the nearest mm as required by the question.

(iii) The majority of candidates calculated the correct average lengths of the spring although some did not record their values to the nearest mm.

(iv) Most candidates correctly calculated values for the extension of the spring by deducting the original length of the spring from their recorded averages. ECF was allowed here if incorrect answers had been given for the calculated average length.

(c) **(i)** This was generally answered well. The majority of candidates were able to label the axis correctly and provide a suitable scale (scale needed to be at least ½ way across the grid provided). If a non-linear scale was used no credit was given.

(ii) Nearly all candidates gained 2 marks for plotting the data at 1, 2, 3, 4 & 5 N.

(iii) It should be noted that a curve, a point-to-point line or a negative slope was not awarded credit. Candidates were asked specifically to draw the straight line of best fit.

(iv) The majority of candidates obtained a straight line through the origin and correctly interpreted this to mean direct proportion. For some candidates the graph did not pass close enough to the origin and they were credited with interpreting this to mean not directly proportional.

Booklet B

Biology Paper

Overview

These papers were new to the specification and it was suggested by the quality of some candidate responses that some centres had not carried out all of the prescribed practicals. This was especially true of fieldwork as shown by the responses to the QWC question. There was a wide range of marks obtained on the paper.

Q1 **(a)** **(i)** Quite a few candidates did not know that the black rings were air bubbles.

(ii) This question was well answered.

(iii) Many candidates did not know that it was the lowest power lens that is used first to view that cells.

(b) **(i)** Most candidates did recognise the nucleus.

(ii) Many candidates answered the question correctly.

(iii) Few candidates made the connection with the fact that the onion cells are underground and therefore that the chloroplasts are not needed for photosynthesis because there is no light underground.

Q2 **(a)** **(i)** There were some good answers here.

(ii) Many candidates correctly identified sugar but fewer also identified fat.

(b) **(i)** Most candidates did give thermometer as their answer.

(ii) The majority of candidates did say to set it alight.

(iii) Many candidates did give a correct answer here.

(iv) Quite a few candidates answered this question correctly.

(c) Quite a few candidates made the link here with the presence of more sugar or more fat but few gave both.

Q3 As stated in the general comments for this paper, some candidates did not know how to carry out fieldwork to investigate the distribution of plant species. Quite a few candidates did not know the name quadrat and described it as a square, whilst other accounts included throwing Punnett squares in the woodland. Many candidates did not include using a key to identify plants.

Q4 **(a)** Many candidates did give time as the independent variable but others gave the number of earthworms or the depth of the soil.

(b) Most candidates did know how to obtain the average temperature.

(c) **(i)** Many candidates did correctly read the graph to give the highest average air temperature.

(ii) Most candidates did correctly plot the points and join them up with straight ruled lines. However, there were a few candidates who plotted the first point between the first two sets of months, or did this for the last set of months. They seemed to think that they should not be plotting points on the y-axis.

(iii) Many candidates gave a correct statement about rainfall and backed this up with correct data, but few also gave a correct statement about temperature. Also, some candidates were confused and gave incorrect statements about rainfall e.g. stating that 'earthworms liked little rainfall'.

(d) Candidates have some difficulty with identifying factors from a particular context.

Chemistry Paper

Overview

This was the first sitting of the new DAS Chemistry Unit 7 Booklet B practical theory exam. As such, this provided a particular challenge for candidates and their teachers. The unit is synoptic and there had been no synoptic element in the previous specification; it includes a significant amount of material that had not been in the previous specification and the assessment objective weightings are different to those in the C1 Unit and C2 units, particularly in respect of AO3 – Analyse and evaluate evidence, make reasoned judgements and draw conclusions based on evidence. This assessment objective would typically add demand to an examination paper. In a C1 Foundation Tier paper, AO3 accounts for around 6 of the 60 marks available; in a C2 Foundation Tier paper, it accounts for 15 of the 70 marks available. In Unit 7, around 16 of the 50 marks (including those in Booklet A) assess AO3, but since Booklet A is very largely AO2, this means that Booklet B has to be comprised of high proportions of AO1 and AO3 material. Also, there were no past papers available for comparison purposes in this first series.

Having said all the above, there was little evidence of Foundation Tier candidates being entered at the wrong tier. A wide range of marks was achieved across the full range of marks and the paper was successful in providing candidates of differing abilities the opportunity to respond positively.

General note: Use of the Glossary of Terms

In addition to the wording in the DAS Specification, CCEA has produced a Glossary of Terms for DAS: Chemistry which is available on the CCEA General Science website. The Mark Schemes now reflect the actual wording provided in these two documents when questions relating to definition or understanding of a 'term' are examined.

Q1 This question was about rusting and, in general, it was not well answered. The specification expects candidates to have investigated experimentally rusting as a reaction of iron with water and air (Section 2.2.2) but many candidates did not seem to understand why the experiments being carried out in the question were set up as they were. In Part (a)(i), many thought that the bung was to stop air leaving the test tube. In Part (a)(ii), some thought that the water had been boiled to test the effect of having a nail in hot water; only a minority realised that the purpose of boiling was to remove air/oxygen. Most candidates knew that the nail in test tube C would rust most quickly but only a minority explained that this was because air/oxygen and water are both needed for iron to rust. In Part (b), a high proportion suggested a reasonable method to prevent rusting of an iron bridge but 'oiling' was sometimes given as an answer.

Q2 Answers to this question were also variable in quality. Part (a) asked candidates to draw a labelled diagram of the assembled apparatus used to carry out filtration. Only a minority drew assembled apparatus which included a filter funnel, filter paper and a conical flask or other suitable collection vessel. It was quite common to see filter paper (in a V shape) above a flask or beaker, but without any means of supporting the filter paper. It was quite common to see diagrams for evaporation. A minority drew tiny diagrams; some did not label their diagrams. It is disappointing to have to record a low standard of answering for this question part. In Part (b), a majority correctly chose, from four options, the mixture (aluminium powder & water) which

can be separated by filtration. In Part (c)(i), only a minority knew that liquids which do not mix can be described as immiscible. Part (c)(ii) was a good discriminator; many candidates knew that evaporation was needed to remove the water but only a small proportion recognised that the water needed to be condensed i.e. that distillation was needed and that the question was about obtaining pure sodium chloride and pure water.

Q3 This question, covering the rates of reaction topic area, was well answered by many candidates. For most Foundation Tier candidates this was their best question. Nearly everyone gained the full 5 marks available for plotting and labelling a graph and reading information from the graph. The most common error was carelessness when labelling the x-axis. In Part (c), again a high proportion of candidates knew that the reaction was fastest during the initial time (0-20 seconds). Calculation of the average rate was also well answered by better candidates.

Q4 Part (a) covered the preparation and collection of hydrogen gas and was a QWC question. Only a minority of candidates scored well. Many seemed very unfamiliar with this preparation; some seemed to gain some 'inspiration' from the diagram in Question 2 which showed an acid + carbonate reaction and collection of a gas in a gas syringe. It may be more challenging for many to describe a procedure in words, rather than through a diagram. Very few Foundation Tier candidates produced good answers, although the mark scheme was generously interpreted by the examination team. Many were able to get 2 marks by giving the two correct indicative points for the test for hydrogen. There were seven other indicative points available for the preparation and collection of hydrogen gas. Assuming that the test for hydrogen was correct, candidates needed to gain at least a further three of the seven, preparation and collection indicative points to achieve a middle band mark. Very few did so. Some attempted to put the zinc and hydrochloric acid in a beaker under water; many carried out the reaction in an open container. Common errors, from those who were familiar with the procedure for making hydrogen, were to simply collect in a gas syringe, to not seal the reaction vessel or to not describe how the gas was able to move from the reaction vessel to the collection vessel, which in turn needed to be in water and filled with water. In Part (b), a common error, when identifying a precaution, was to give a 'generic' answer such as 'tying hair back' or 'standing when carrying out the reaction' rather than a precaution linked to the actual reaction being carried out. In Part (c), nearly everyone knew that a catalyst speeds up a reaction but only a minority went on to state that a catalyst is not used up and in Part (d), most did not apply understanding regarding the reactivity series of metals to help them identify a metal, other than zinc, which can be reacted with hydrochloric acid to safely prepare hydrogen.

Physics Paper

Q1 **(a)** When candidates observed a person running up a flight of stairs many assumed that a question on personal power was going to be asked. This led to the wrong apparatus being identified; e.g. stopwatch to measure time rather than the apparatus needed to measure potential energy i.e. scales and metre rule.

(b) **(i) & (ii)** This question was well answered.

(iii) Many candidates used Ep = m x h - neglecting the 'g' and so were out by a factor of 10. A free-standing unit mark was awarded for kg.

Q2 Overall the answers to this question were disappointing given that the Principle of Moments is one of the Prescribed Practicals. Incorrect distances were identified and the equation for anticlockwise moment was poorly answered. The Principle itself was rarely quoted correctly.

Q3 **(a)** Ohm's law was another Prescribed Practical but was not well answered in general at the Foundation Level. Although the symbols for the ammeter and voltmeter are generally well know the connection of the voltmeter was poorly answered. Careless drawing (e.g. arrow inside the rectangle) of the rheostat cost a mark.

(b) **(i) to (iii)** These Parts were well answered with most candidates picking up most of the marks. It was surprising to see, in Part (iv), so many examples of R = I/V.

Higher Tier

Booklet A

Overview

This was the first year of this assessment. CCEA is grateful for the cooperation of centres in making the assessment so successful. However, there are some issues that have been identified and attention to the advice below would make for an even smoother conduct of the assessment in future years.

Centres are advised to pay very close attention to the Apparatus and Materials List and, where necessary, to order consumables well in advance of the test planned by the centre. They should also be very careful that solutions required by candidates are prepared as instructed to the correct concentration. In addition, conducting trial experiments just prior to the assessment is essential if problems on the day of the assessment are to be avoided.

Biology Paper

Q1, 2 & 3 These questions were all well answered by almost all candidates. This was as expected since they would have carried out a similar prescribed practical in class as part of their course.

Q4 Candidates were asked to determine a percentage change in mass correct to 1 decimal place. Although most tackled the question well, some omitted the minus sign where there was a reduction in mass. Others did not follow the instruction concerning the number of decimal places to be quoted in their answers. A few gave answers which were clearly wrong due to incorrect use of the calculator.

Q5 Better candidates knew the reason for use of percentage change in mass. The common incorrect answers were to improve reliability or accuracy.

Q6 Parts (a)(i) and (b)(i) required candidates to inspect and comment on their results. Most obtained full marks in these questions. Part (a)(ii) required recall of the term 'turgid'. Most were able to gain the mark here also. Part (b)(ii) related to an explanation of the mass reduction when the potato cylinder was placed in 20% sucrose solution. Most realised that this was due to loss of water by the potato, but only better candidates went on to say that in osmosis, water would travel from a region of low sugar concentration to one of high concentration. A small number of candidates confused the process occurring with plasmolysis.

Chemistry Paper

Q1 In Part (a), some candidates lost marks because their temperature changes fell outside the allowed range; this was most commonly the error in experiment 3. Almost all candidates recognised that a gas was produced in experiments 1 and 2, but not in experiment 3. In Part (b), the majority of candidates correctly identified experiment 1 as the exothermic reaction.

Q2 In Part (a), most candidates correctly stated the appearance of compound A and the sulfuric acid. For sulfuric acid, examiners were looking for colourless liquid. Clear was not credited. Liquid was accepted for solution but fluid was not. In Part (b), most candidates identified gas being released/bubbles/fizzing. Those who wrote 'a blue solution was formed' or 'sulfuric acid turned blue' were credited. Candidates were not awarded the mark for simply stating 'went from green to blue'. Reference to the solution turning blue had to be made. The third marking point was for the solid disappearing (dissolving was allowed). Many failed to identify this observation and therefore only scored 2 out of the 3 marks available. In Part (b)(ii), most candidates recognised that there was fizzing, a gas was evolved and the magnesium ribbon disappeared. A few added that heat was produced, but this was not credited as this information was given in the question. In Part (c)(i), incorrect answers identified were copper(II) chloride, calcium sulfate and calcium carbonate. Candidates were expected to know that the only coloured compound out of the 6 given would be copper. Copper(II) chloride was incorrect as this would not react with an acid. In Part (c)(ii), credit was given for the idea of copper compounds being coloured (or stating the copper compound used was green). The majority of candidates identified the colour part but not the carbon dioxide, which would lead to identification of a carbonate. Very few identified the idea of a vigorous reaction happening.

Physics Paper

Q1 In Part (a), nearly all candidates measured this correctly. A small number lost the mark for an answer which was ten times too large (around 200 mm). In Part (b) (i), an increasing length for increasing force for both sets of readings 1 and 2 were needed. A few measured lengths in cm and this caused them problems in Part (ii). Problems also arose when candidates did not give their readings to the nearest mm as required by the question. In Part (b)(ii), the majority of candidates calculated the correct average lengths of the spring although some did not record their values to the nearest mm. In Part (b)(iii) most candidates correctly calculated values for the extension of the spring by deducting the original length of the spring from their recorded averages. Error Carried Forward (ECF) was allowed here if incorrect answers had been given for the calculated average length. Part (c)(i) was generally answered well. The majority of candidates were able to provide a suitable scale (scale needed to be at least ½ way across the grid provided). A non-linear scale was not credited. In Part (c)(ii), nearly all candidates gained 2 marks for plotting the data at 1, 2, 3, 4 & 5 N. In Part (c)(iii), it should be noted that a curve, a point-to-point line or a negative slope was not credited. Candidates were asked specifically to draw the straight line of best fit. Marks were lost in Part (c)(iv) for not giving the correct units (N/mm) and incorrect calculation of the gradient. A method mark could be gained if the candidate demonstrated their understanding of calculating the gradient by writing gradient = rise/run even if the rise/run values were incorrect. In Part (c)(v), candidates were expected to the use their graph to determine the extension value for 4.5 N and add it to the original length of the spring. The majority of candidates gained two marks. If a mark was lost this was usually due to the candidate not adding on the original length of the spring.

Booklet B

Biology Paper

Overview

These papers were new to the specification and it was obvious that candidates from some centres had not had experience of some of these practicals. This was especially true of fieldwork, as shown by the responses to the QWC question. Also some candidates had difficulty answering the questions on aseptic techniques and in interpreting the questions on practicals with antibiotic discs. In the last question some candidates did not make links with the process of respiration in the yeast.

Q1 As stated in the general comments for these practical papers a few candidates did not know how to carry out fieldwork to investigate the distribution of plant species. Some did not know the name quadrat and described it as a square, whilst other accounts included throwing Punnett squares in the woodland; there were less of these on the higher paper and there were also some really comprehensive answers.

Q2 **(a)** Many candidates did give time as the independent variable, but others gave the number of earthworms or the depth of the soil.

(b) Most candidates did know how to obtain the average temperature.

(c) **(i)** Most candidates did correctly read the graph to give the highest average air temperature.

(ii) Most candidates did correctly plot the points and join them up with straight ruled lines. However, there were a few candidates who plotted the first point between the first two sets of months or did this for the last set of months. They seemed to think that they should not be plotting points on the y-axis.

(iii) Many candidates gave a correct statement about rainfall and backed this up with correct data but few also gave a correct statement about temperature.

(d) Candidates have some difficulty with identifying factors from a particular context.

Q3 **(a)** **(i)** There were some surprising solutions and processes given here.

(ii) Candidates need to say bacteria are killed, not removed.

(iii) Some good answers here.

(iv) A wide variety of temperatures were given, from 0 to 100°C, and everything in between although 37°C was the most popular incorrect response.

(v) Many candidates did not know autoclave.

(b) **(i)** Some good answers, but a few candidates incorrectly gave answers for the most effective antibiotic.

(ii) Only more able candidates were able to make the link with the results for antibiotics E and C.

Q4 **(a)** **(i)** Many candidates did correctly state respiration.

(ii) Most candidates did correctly identify the gas as carbon dioxide.

(iii) Candidates needed to make the link with more respiration or more gas/ carbon dioxide.

(iv) Few candidates answered this question correctly.

(b) Candidates needed to explain why the volume was less at the lower temperature in terms of enzyme theory. Many candidates gave answers about what happens at higher temperatures.

Chemistry Paper

Overview

This was the first sitting of the new DAS Chemistry Unit 7 Booklet B practical theory exam. As such, this provided a particular challenge for candidates and their teachers. The unit is synoptic and there had been no synoptic element in the previous specification; it includes a significant amount of material that had not been in the previous specification and the assessment objective weightings are different to those in the C1 Unit and C2 units, particularly in respect of AO3 – Analyse and evaluate evidence, make reasoned judgements and draw conclusions based on evidence. This assessment objective would typically add demand to an examination paper. In a C1 Higher Tier paper, AO3 accounts for around 7 of the 70 marks available; in a C2 Higher Tier paper, it accounts for 17 of the 80 marks available. In Unit 7, around 16 of the 50 marks (including those in Booklet A) assess AO3, but since Booklet A is very largely AO2, this means that Booklet B has to be comprised of high proportions of AO1 and AO3 material. Also, there were no past papers available for comparison purposes in this first series.

Having said all the above, there was little evidence of Higher Tier candidates being entered at the wrong tier. A wide range of marks was achieved across the full range of marks and the paper was successful in providing candidates of differing abilities the opportunity to respond positively.

General note: Use of the Glossary of Terms

In addition to the wording in the DAS Specification, CCEA has produced a Glossary of Terms for DAS: Chemistry which is available on the CCEA General Science website. The Mark Schemes now reflect the actual wording provided in these two documents when questions relating to definition or understanding of a 'term' are examined.

Q1 Part (a) was the 'bromine water test' which had been on the previous specification and should have been familiar to all candidates. Many did answer well but some had absolutely no idea which test to use. Common errors were to use 'bromine', to describe the colour change as 'from orange to colourless' and/or to state that there was no colour change with the alkene but there was one with the alkane. In Part (b), better candidates worked out that D (the carboxylic acid) would react with sodium carbonate.

Q2 This question, covering the rates of reaction topic area, was well answered by many candidates. Nearly everyone gained the full 5 marks available for plotting and labelling a graph and reading information from the graph. The most common error was carelessness when labelling the x-axis. In Part (c), again a very high proportion of candidates knew that the reaction was fastest during the initial time (0-20 seconds). Calculation of the average rate was also well answered. Part (e), which was aimed at top candidates, proved to be a good discriminator. Top candidates gave clear, accurate answers gaining all 3 marks. Many candidates gained at least 1 mark.

Q3 Part (a) covered the preparation and collection of hydrogen gas and was a QWC question. Only a minority of candidates scored well. Some seemed very unfamiliar with this preparation; many seemed to gain some 'inspiration' from the diagram in Question 2 which showed an acid + carbonate reaction and collection of a gas in a gas syringe. It may be more challenging for many to describe a procedure in words, rather than through a diagram. Top candidates produced excellent, well worded

answers and the mark scheme was generously interpreted by the examination team. This allowed many candidates to achieve middle band marks. The most common errors, from those who were familiar with the procedure for making hydrogen, were to simply collect in a gas syringe; to not seal the reaction vessel; or to not describe how the gas was able to move from the reaction vessel to the collection vessel, which in turn needed to be in water and filled with water. In Part (b), a common error, when identifying a precaution, was to give a 'generic' answer such as 'tying hair back' or 'standing when carrying out the reaction' rather than a precaution linked to the actual reaction being carried out. In Part (c), nearly everyone knew that a catalyst speeds up a reaction but only a minority went on to state that a catalyst is not used up and in Part (d), many did not apply understanding regarding the reactivity series of metals to help them identify a metal, other than zinc, which can be reacted with hydrochloric acid to safely prepare hydrogen.

Q4 This was, essentially, an AO3 question which required candidates to evaluate all the information provided. Many candidates did not seem to realise that the four parts to Part (a) were in some way linked. A similar problem arose with Part (b). Many candidates gained 2 or less of the full 8 available marks. A tiny minority gained 6 or more marks. It was common in Part (a) to see answers where the formula for 'U' in Part (a)(ii) was not linked to the metal ion which it contained or where the identification of 'T' was based solely on it being a white, slightly soluble solid. The 'brick-red flame' should have led candidates to realise that they were dealing with a calcium compound but this was usually not the case. In Part (a)(iv), very few recognised that the key difference with nitric acid would have been that a solution, rather than a solid, would be produced. The most common answer was to suggest that a gas would be given off. Part (b) was equally poorly answered, for reasons which were fairly similar to Part (a). Candidates have a tendency to read information in parts, rather than as a whole. In Part (b), reference to blue solution or blue solid should have alerted candidates to the fact that they were being asked questions based on copper compounds but Part (b)(i) was often answered by guessing a name for a black solid. Part (b)(i) answers weren't arrived at by reasoning that if V could be reduced to give a metal, V might be an oxide. In Part (b)(iii), few could name hydrated copper(ll) sulfate but some did arrive at the correct formula.

Physics Paper

Q1 Question 1 was set in the context of an experiment on moments. While most candidates could identify P as the pivot, some were unable to identify the relevant distances as d2 and d3. The calculation of the anticlockwise moment was often poorly done. Examiners simply wanted to see that the candidate knew that W1 had to be multiplied by d2. Many were unable to identify the unit for moment as the Nm or Ncm. Surprisingly, the last part where the Principle had to be stated was not as well answered as expected.

Q2 Based on Ohm's law this is a Prescribed Practical but was not always well answered at the Higher level. Although the symbols for the ammeter and voltmeter were generally well known their electrical connection was often careless or in the wrong place. There were also careless examples of the variable resistor symbol which cost a mark. In Part (vi) the examiners were looking for temperature as the quantity which should be kept constant.

The graphical question, Part (b), allowed most candidates to score well. It was disappointing to see, though, instances of R = I/V in Part (vi). More able candidates, however, scored well in this question overall.

Q3 Part (a) was well done. Part (b) was well done though some candidates didn't heed the request for 'one decimal place'. Part (c) was well answered. Part (d) proved to be a discriminating question where the idea of using ratios to confirm or negate proportionality was not widely known. Examiners were looking for 1.9 and 1.4 as the ratios.

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