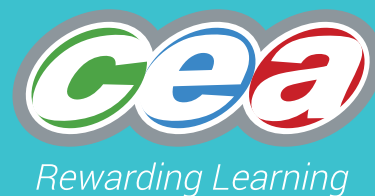


GCSE



Chief Examiner's Report
Single 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 SINGLE AWARD SCIENCE

Chief Examiner's Report

Subject Overview

This is the first award for the new GCSE Single Award Science specification. There have been pleasing outcomes in all units which are in line with previous years' results. There was a range of academic performance observed, on occasion it was evident that some candidates should have been entered for Foundation Tier rather than Higher Tier units. It was pleasing to see that candidates, on the most part, were attempting all questions in some way and, as has been the trend over several years, the extended writing (quality of written communication) question was attempted by the vast majority of candidates.

It is important that candidates continue to work on their examination technique, this includes reading questions carefully and taking care with the presentation of their work. Some candidates when asked to 'explain fully' did not give sufficient detail in their answer. When asked to plot and draw a line graph, some candidates failed to draw the line to complete the graph and so did not gain this mark.

This series was the first sitting of the practical assessments and the approaches taken to these by most centres was good. For Booklet A it is important that centres trial the practical tasks in advance to insure the validity of results. Centres are informed that they must contact the Subject Officer in advance if there are any concerns regarding results obtained during this trial. In the marking process it was evident that some centre's had not followed this procedure.

It is important that candidates are familiar with terms such as reliable, variable and anomalous as outlined in the specification as these will continue to be assessed in Booklet B.

It is also important to emphasise that candidates should learn key definitions that appear throughout the specification as these are examined on a regular basis in all units, it has been observed that many candidates are not familiar with these and are losing valuable marks.

Assessment Unit 1 Biology

Foundation Tier

Q1 This question was about food and energy.

- (a) (i) A simple calculation correctly answered by all but a few candidates.
- (ii) Many candidates got 1 or 2 marks in this question. Those that got 1 mark often said the same point twice – e.g. teenagers are more active and do more exercise. The second mark was for growing/developing and this was the more common mark to be omitted.
- (b) Surprisingly a significant number of candidates got this wrong, failing to identify sugar.
- (c) (i) Most bar graphs were correctly drawn however it would be of great benefit to examiners if bars could be shaded or if candidates made the outline of each bar darker. Once scanned the bars were extremely faint and were difficult to see. It would be beneficial for teachers and candidates to be aware of this when completing future scanned papers, and shade or use a dark pencil.
- (c) (ii) Was answered well.
- (iii) Use of fat was poorly answered with many stating “to keep warm” which did not gain credit.

Q2 This question tested understanding of the gene and chromosome.

- (a) Gene; not well answered. Many appeared to guess the answer incorrectly as ‘genome’
- (b) (i) Was well answered.
- (ii) Was well answered showing that chromosome number is understood by majority of candidates. Many candidates who lost 1 mark did so because they did not complete the comparison required.

Q3 This question about variation required candidates to interpret a table of results and carry out a simple calculation of average. Both Parts (a) and (b) were well answered but some candidates did not realise the total had been given and they did not need to calculate this. The majority answered Part (c) incorrectly, failing to identify continuous variation.

Q4 This question tested candidates’ knowledge of the effect of smoking and alcohol on the body and required interpretation of a graph.

- (a) (i)&(ii) Lungs and nicotine were correctly identified by the majority of candidates
- (b) Candidates failed to state the conclusion correctly that as the time after stopping smoking increased, the deaths from cancer decreased. Teachers must encourage candidates to state a trend from a graph by stating the x axis and then the y axis using the full labels. Many candidates wrote about the risk of cancer, or the likelihood of getting cancer even though these were not shown on the graph.
- (c) (i) ‘liver’ correctly identified by almost all candidates.
- (ii) It was pleasing to see that the definition of ‘binge drinking’ has been memorised by the vast majority of candidates.

Q5 This question tested knowledge of heart disease, its causes and effects.

- (a) (i) Too many candidates stated another dietary change, clearly not understanding the difference between dietary and lifestyle factors.
- (ii) Those who failed to get the mark did not refer to treating heart disease specifically, instead they spoke about training doctors and specialists.
- (b) Similar to Question 4(b) candidates found it difficult to state the information exactly. They referred to the likelihood/risk of getting heart disease rather than deaths from heart disease which is what is shown on the graph.
- (c) (i) Cholesterol was correctly identified by the vast majority of candidates, however, taking more care with the spelling would be of benefit to the candidates and to the examiners marking who often struggled to decipher the word presented.
- (ii) Many candidates explained the effect of the blockage using the word 'blockage/block' thus it was not clear that they understood the effect on the blood flow i.e. that it slowed or stopped.
- (d) Those that correctly shaded the blood vessels below the point of the blockage were in the minority. Many shaded all the vessels on the right side, mirroring the left and a significant number left this out, suggesting they didn't understand what was being asked.
- Q6** This question tested understanding of the female reproductive system and pregnancy.
- (a) (i) Most pupils managed to remember at least one part of the female reproductive system that was required.
- (ii) Few were able to correctly place the 'x' in the uterus for implanting the fertilised egg, a significant number left it blank perhaps indicating that they missed the question.
- (iii) This was a discriminatory question and very few candidates answered zygote.
- (b) (i) the placenta was correctly identified by the vast number of candidates.
- (ii)& Transfer of substances between mother and baby and vice versa was very
- (iii) poorly answered, for example ; many candidates answered 'urine' rather than urea, or used vague terms such as waste.
- (c) (i) The correct answer of the contraceptive pill was not given by many. A number described it vaguely as a pill/pill and so lost this mark. A number tried to describe the hormone implant but many used only the word implant and so lost their mark for a vague answer. It must be noted that text books make no mention of hormone implant and this may have contributed to the vague answers given.
- Q7** (a) (i) Food web was well answered.
- (ii) Transfer of energy not well answered. Too many candidates fail to refer to the movement of energy through the food chain and instead give a vague answer about consuming- what eats what/who eats who which is not given credit.
- (iii) Most candidates did recognise a reduction in water beetles however they were not specific in mentioning that was their only food source.
- (b) (i)& It seems that the terms biotic and abiotic are not clearly understood,
- (ii) although the definition for biotic was answered better than abiotic factors.
- (iii) The link required was accessed correctly by most candidates.

- (iv) Most candidates accessed one of the two available marks, candidates that did not accurately describe or state the range of concentrations lost the second mark.
- Q8** This question assessed quality of written communication. It proved to be a good discriminator with most candidates scoring at least 2 marks but very few candidates scored six marks on the Foundation Tier. It appeared that the majority did not understand that the average mass of the seedlings was needed.
- Q9** (a) Most candidates correctly identified D however, the majority described it as having the biggest area of no bacteria for the second mark which was not given credit. Very few candidates described the bacteria as having been destroyed or killed.
- (b) Was answered well. Of those that were incorrect, the answers focused on viruses rather than genes. It seemed the unfamiliar context of the question caused some confusion.
- (c) (i) Was not answered well at all with the majority of candidates linking it to not getting sick in general.
- (ii) Very few candidates scored full marks, the majority failed to gain any marks as antibodies were not referenced to in the answer.

Higher Tier

- Q1, 2 & 3** These first three questions were overlap questions with the Foundation Tier paper and were well answered by the vast majority of the Higher Tier candidates. This seems to indicate that candidates were generally entered for the correct tier. There was no indication that candidates ran out of time and the language seemed appropriate for this level. The QWC answers were more in-depth than on the Foundation Tier and many candidates were able to achieve all six marks.
- Q4** This question was testing knowledge of competition between species and the effects of introducing a competitive invasive species into an area.
- (a) (i) Well answered – the vast majority of candidates were able to give one piece of evidence from the graph to support the suggestion that grey squirrels are responsible for the change in red squirrel numbers. Most candidates were able to identify that they needed to compare what happened to the number of both types of squirrel.
- (ii) Very well answered – most candidates understood that if the number of pine martens increase then the numbers of grey squirrel decrease and the numbers of red squirrel increase. Those candidates who lost the mark for this question often failed to refer to what happened to the numbers of both types of squirrel when the pine martens were introduced.
- (c) Very poorly answered – the response to this question was disappointing as the effects of introducing a competitive invasive species to an area has been asked many times before. Candidates are advised to complete as many past paper questions as possible in order for them to become familiar with the type of questions asked on each area of the specification. It is worth noting that credit for the competition mark will only be given if the candidate clearly states that the competitive invasive species ‘out-competes’ the native species. Vague answers such as the fact that they are better competitors, better adapted or that they make other species extinct are not accepted and therefore no marks are awarded. The second feature which is most often asked for is that they ‘spread

rapidly or reproduce rapidly' – growing rapidly or taking over are not acceptable answers for this marking point.

- Q5** This question was testing knowledge of protecting fish stocks by quotas, fishing bans and restrictions on net size.
- (a)** Very well answered. Very few candidates failed to achieve this mark.
 - (b)** Mixed response. Most candidates did attempt the calculation and were referring to the correct type of fish. However, a significant number of candidates did not subtract 32 from 44 to get 12, instead opting to divide 32 by 44 to get 72.7% which was incorrect. Partial credit was given to those candidates who had the number 12 anywhere in their working out. It would be worth stressing to candidates that these questions on percentage increase are quite common so practicing them would be worthwhile for future papers.
 - (c)** This was well answered by the vast majority of candidates with most recognising that having a larger mesh size allowed the smaller fish to escape and grow. These were independent marks so the second marking point could be awarded as long as the candidate had not disqualified themselves by talking about adult fish escaping for marking point one. Other acceptable answers for making point two were to allow the fish time to breed or reproduce. An unacceptable answer was so they could live longer. This was too vague and not worthy of a mark.
- Q6** This question was testing knowledge of hormones in plants and animals.
- (a)** This proved to be a very challenging question for a significant number of candidates. This question part was a good discriminator. It is worth noting that an unacceptable answer for the function of oestrogen is that it repairs the uterine wall – there had to be a reference to 'builds-up' to be credited with the first marking point and then as its additional role that it stimulates ovulation or alternatively they can say that it causes the release of an egg.
 - (b)** **(i)** Those candidates who found this question straightforward were the ones who had obviously prepared thoroughly for the examination by completing previous past paper questions, where this type of question on phototropism has come up many times previously. Most candidates were able to get the name of the hormone but only the more able candidates could go on and explain how this caused phototropism to occur in the plant. Part (ii) was well answered.
 - (c)** **(i)** This was a new style of graph for the candidates to interpret and all but a small number were able to correctly identify indigo as the colour of light which is most effective in causing a phototropic response. Candidates were looking for the colour of light which gave the greatest amount of bending.
 - (ii)** Once they had worked out that indigo gave the greatest amount of bending then the answer to this question was fairly straightforward and careful reading of the graph allowed the vast majority of candidates to work out that there was no bending or the plant grew straight up with red light.
- Q7** This question was testing knowledge of photosynthesis and respiration in plants including the balanced symbol equation for photosynthesis.
- (a)** Poorly answered – only the more able candidates achieved both marks for this question. Careful analysis of the stimulus material and all the information provided was required to work out what colour you would expect the hydrogen carbonate to be in each test tube after 6 hours.

- (b)** Again, poorly answered. This was disappointing as this is straight forward recall and it is higher tier only material, so it is inevitable it is going to be tested quite often. It would benefit candidates to learn this balanced symbol equation and that of respiration off so they can be re-written accurately if asked for on a paper again.
- Q8** This question was testing the candidate's knowledge of pedigree diagrams and Punnett squares.
- (a)(i) & (ii)** Were well answered – the majority of candidates achieved this mark.
- (iii)** Mixed response – some candidates clearly did not know what the word genotype meant so they did not know what they were required to do to get the mark. Careful learning of genetic definitions is essential for higher tier candidates.
- (b) (i)** Overall this was well answered. However, when completing Punnett squares it is important that candidates clearly distinguish between the lower and uppercase letters so that the examiner is left in no doubt that the candidate has understood the question.
- (ii)** Well answered – Error carried forward was awarded if the percentage probability was correct for the candidates own Punnett square, provided the Punnett square had two letters for each genotype, one letter for each parental gamete and all offspring squares were completed.
- (c)** Very well answered.
- Q9** This question was testing knowledge of natural selection, evolution, what a fossil is and how fossils can be used to provide evidence for evolution.
- (a)** Considering that this was the first part of the last question on the examination paper it was reasonably well answered. Candidates should be encouraged to learn off the set bullet points for natural selection and then practice applying these to different situations. When this is taught in this way it is then straight forward for candidates to put this into practice if they come across a similar question in an exam paper. The candidate should always be encouraged to look for the adaptation that means the species is better adapted to the environment they are living in and then work from there. In this instance a converse answer was not credited as it did not answer the question which was being asked.
- (b)** Candidates find this concept hard to explain so it is best to stick to the wording used in the specification when it is being taught as this is exactly what is required when giving an answer to this question– ‘Darwin’s theory of evolution as a continuing process of natural selection, which leads to gradual changes in organisms over time and which may result in the formation of a new species’.
- (c) (i)** Reasonably well answered. This is a definition which is not well learnt so going over recent mark schemes and learning it would benefit the candidates greatly.
- (ii)** Poorly answered. Very few candidates were able to formulate an answer worthy of any credit. Again, learning this answer off from mark schemes would be beneficial as it is not going to change should this question arise in the same format again.

Assessment Unit 2 Chemistry

Foundation Tier

- Q1** This question was based on mixtures and separating techniques. The most common error was to match the distillation apparatus with the mixture of colours in ink.
- Q2** This question was based on materials and their properties. Part (a) was well answered as was Part (b). In Part (c), many candidates could not recall correctly the definition of 'synthetic' as being man-made or manufactured.
- Q3** This question was testing knowledge of fingerprints and forensic science. Surprisingly many candidates did not correctly identify the fingerprint in Part (a) as a loop. Part (b) asked for an explanation of the term 'unique' which most candidates answered with ease. Part (c) proved more challenging, many candidates correctly named carbon or aluminium powder for Part (i) whilst the most common error in Part (ii) was to name another powder – this was not given credit. Part (d) was well answered.
- Q4** This question was based on waste. In Part (a), the candidates had to complete a pie chart, this was well done. Part (b) proved to be discriminatory with candidates finding it difficult to describe an advantage of landfill sites. Part (c) was well answered but the definition of 'non-biodegradable' was not well known and many candidates failed to score any marks for this part.
- Q5** This question was testing understanding and application of knowledge about chemical substances. Information was presented in a key and candidates were asked to interpret this. The majority were unable to identify the two elements in Part (a) and give a reason for their choice. Parts (b) and (c) were more successfully answered.
- Q6** This question was based on the topic of smart materials. Part (a) was fairly well attempted, but candidates had to mention both colour and light to gain credit. Part (b) proved to be discriminatory, many candidates were unable to express their ideas clearly as to which packaging should be chosen.
- Q7** The topic for this question was acids and alkalis. In Part (a), candidates were presented with different parts of the body and their pH. They then had to apply their knowledge to answer questions about pH; this proved challenging for some candidates. In the majority of cases 'pH meter' was correctly identified as the answer for Part (b). Part (c) was based on indigestion remedies, candidates found it difficult to complete the word equation for neutralisation in Part (ii) and also to identify the number of elements and atoms represented by the formula for magnesium hydroxide.
- Q8** This question centred on the topic of the Periodic Table. On the whole, it was a well-received question. Candidates should take care when completing particle diagrams to insure particles are of uniform size.
- Q9** This question was testing the candidate's knowledge of Organic Chemistry, as expected this proved to be a challenging question. In Part (a), the description of formation of crude oil was not well known by Foundation Tier candidates, many only scoring one out of a possible three marks. In Part (b)(i), many candidates did not give the correct answer of 'fractional distillation'. Part (b)(ii) asked for the names of the missing fractions from the diagram and this was very poorly answered. In Part (c), candidates were presented with information about the different fractions and asked to use this to answer questions and on the whole, these were well attempted.

Q10 This was the question where Quality of Written Communication was assessed. Candidates were asked to describe the structure of an aluminium atom. The vast majority of Foundation Tier candidates attempted the question, many scoring four out of a possible six marks. However, many candidates did not use the bullet points provided to help structure their answer and so omitted some of the required information.

Higher Tier

Q1, 2 & 3 These questions were an overlap from the Foundation Tier paper, as expected there was a higher level of response from the Higher Tier candidates. It was very pleasing to see some well structured answers for the QWC question, with a number of candidates scoring full marks.

Q4 This question was testing knowledge of new materials. Despite being asked on many previous past papers the size of a nanoparticle like in part (a), the correct answer was not widely known. Part (b) that was based on interpreting the information given was received well. Part (c), about graphene, was not well answered. Perhaps this was because it is a new material to the specification.

Q5 This question was well answered. In part (a), candidates were asked to complete a line graph for a set of results. The most common error was that the points were not joined with a smooth curve; candidates who used a ruler to join 'point-to-point' were not given full marks. Parts (b) and (c) were fairly well answered, but very few candidates scored full marks when using particle theory to describe how concentration affects rate in part (d). Part (e) examined the use of state symbols, this proved challenging for many Higher Tier candidates.

Q6 This question mostly examined the topic of chemical bonding. Part (a)(i), which asked for the completion of dot-and-cross diagrams was well done. Parts (ii) and (iii) proved more challenging, with many candidates unable to give the formula of a magnesium ion correctly or be able to name magnesium sulfide. Part (b) focused on covalent bonding and was reasonably well known. Parts (c) and (d), based on carbon dioxide were also well known.

Q7 This question, as expected, proved to be differentiating. Candidates find the concept of electrolysis demanding. Part (a) asked for the definition of electrolysis and it was evident that some candidates had not learnt the definition in enough detail. Part (b) was well answered with most candidates identifying that electrodes must be good conductors and so scored at least one mark out of a possible two marks. In Part (c), only the most able candidates scored any marks. Surprisingly in Part (d), which asked for the test for hydrogen, a large number of candidates only scored one of the two marks as many described the splint as 'glowing'. The symbol equation in Part (ii) also proved challenging.

Assessment Unit 3 Physics

Foundation Tier

- Q1** This question was on energy changes and was very well answered by all the candidates.
- Q2** This question on the Solar System was well answered by most of the candidates. In Part (a)(i) most of the candidates knew the name Solar System. Part (ii) was also well answered but many candidates still think that Pluto is the last planet in our Solar System. Parts (a)(iii), (b)(i) and (ii) were also very well answered. Part (c) was also well answered although the spelling of asteroid needs to be learnt more carefully, those who got the wrong answer just referred to an asteroid as a large rock.
- Q3** Part (a) was about electrical symbols, most candidates knew the symbol for the variable resistor but it was surprising a lot of candidates wrote that the cell was a lamp. Part (b) was very well answered.
- Parts (c)(i) and (ii) proved to be good discriminators; few candidates were able to interpret the voltmeter and ammeter readings. Parts (d)(i) and (ii) were interpreting data on light bulbs, this was very well answered. Those who did not achieve the marks failed to elaborate on their answer, they simply wrote cheaper, rather than cheaper to buy or cheaper to run.
- Q4** This question was on heat transfer which is one of the topics which is new to the Single Award Science specification. In Part (a) on conduction most candidates achieved one of the two marks. They knew which spoon was the warmest but lost a mark for writing it was a good conductor rather than the best conductor. Part (b) on convection was very well answered by the majority of candidates.
- Q5** Part (a) was very well answered. Part (b)(i) was very poorly answered most candidates gave the answer for the most money saved per year rather than the best value for money. Part (ii) was a calculation which was very well answered although many candidates rounded up the answer at the end. Part (c) was very badly answered very few candidates knew that air was a poor conductor. Part (d) proved to be a very good discriminator; many candidates incorrectly thought that certain colours attract the sun.
- Q6** This question was on thinking, braking and stopping distances and all parts were very well answered by the majority of candidates.
- Q7** This question was on distance-time graphs. Part (a) was very badly answered, many candidates wrote that the runner was 'resting' between 30 and 40 minutes which does not mean they are necessarily stationary. Part (b) was very well answered. Generally, Part (c) was well answered those who did not achieve the mark calculated $60/10$ rather than $10/60$.
- Q8** This question was the first question which was common to both the foundation and the higher tiers. In Part (a) (i) candidates had to explain how electricity is produced by a generator, similar questions have been asked in the past but still this part was very badly answered. Part (ii) was a definition for renewable energy, this was very well answered, and it was good to see that very few candidates gave the answer reused which is incorrect. In Part (b)(i) the majority of candidates were able to interpret the graph, in Part (ii) very few candidates gave an economic reason. Part (c) was a calculation on efficiency those who did not attain the marks either wrote $300/120$ instead of $120/300$ or gave the answer a unit of MJ.

- Q9** This question was a 6 mark QWC question. This question was accessible to the majority of candidates. Those achieving 2 marks correctly identified the colours of the wires. Those who achieved 4 marks knew the colours and the position of the wires. Those who achieved maximum marks also knew a safety feature of the plug. It was disappointing to see some candidates using a red wire for live and a black wire for neutral.
- Q10** In Part (a)(i) most candidates knew the direction of energy flow. In Part (ii) very few candidates knew the motion of a particle in a longitudinal wave. Parts (b), (c) and (d) required the candidates to interpret data from a table, these were very well answered. Parts (e)(i) and (ii) were poorly answered and were very good discriminators. Very few candidates could find out the amplitude most candidates either did $3m \times 1.5m$ or $3m + 1.5m$ instead of halving 1.5m. In Part (ii) very few candidates converted the wavelength from centimetres into metres.

Higher Tier

- Q1, 2 & 3** These questions were an overlap from the Foundation Tier paper, as expected there was a higher level of response from the Higher Tier candidates.
- Q4** This question proved to be a good discriminator. In Part (a) most candidates recognised that all three types of radiation are found at point A and only gamma would be found at point C. Only a few realised that ionisation charges air molecules. In Part (b)(i) most knew that radiating fruit would keep it fresh for longer but few could explain this was because the bacteria were killed or that the shopkeeper would then make more profit. In Part (b)(ii) Many candidates were able to find the half-life from the graph but very few realised that three half-lives were required to reduce the activity by the amount stated in the question.
- Q5** This also proved to be a good discriminator. In Part (a) most candidates realised that the helicopter would gain height but few could state that this was caused by unbalanced forces and that these also cause the helicopter to accelerate. In Part (b) most candidates could work out the direction of the forces between the car and the caravan. In Part (c) most were able to state one of the trends shown in the table but few could state both. In Part (d) most candidates recognised that not all children were wearing seat belts. In Part (d) most could describe a substitute correctly but thought that an extender stretches something. There were also many candidates who thought substitutes and extenders were electric and hybrid vehicles.
- Q6** This question was well answered, with most candidates able to deduce that the “highest probability of impact” was the most concerning factor in the table in part (a), and were able to state the correct trend shown in the graph in Part (b) and recognising that the diagrams showed Red-shift. Very few recognised that the opposite of Red-shift meant that the galaxy was moving closer to ours.
- Q7** This question based on heat transfer, which is new to the Single Award specification was poorly received. Most candidates demonstrated very little knowledge of heat transfer through poor conductors by vibrating the atoms faster and transferring energy as kinetic from one atom to another in Part (a), although a lot of candidates knew that free electrons were responsible for the conduction through metals in Part (b).
- Q8** This question on microwave heating was poorly received with most candidates only aware that microwaves act upon the water molecules found inside food. Few could state that these molecules were made to vibrate faster and even fewer realised that the microwaves have to penetrate or travel through the food to act on these water molecules.

- Q9** This question also proved to be a good discriminator. In Part (a) most candidates stated the conservation of energy correctly with those who got it wrong leaving out either of the create, destroy or transfer parts. In Part (b) very few realised that all the energy in the first part of the diagram was potential with more candidates recognizing that $\frac{3}{4}$ of the way down the fall the energy was 75% kinetic and 25% potential. Part (c) was very well done with most candidates able to rearrange the equation to calculate mass but a lot of mistakes were made when stating the unit of mass as anything other than the kilogram.

Assessment Unit 4 Practical Skills

This paper (Booklet A) was carried out in the classroom under a high level of control over a continuous session of 2 hours. Candidates were allowed to carry out the experiments in groups of up to three or individually to collect raw results but were then required to work alone for the rest of the paper.

Examiners reported that in general Question 1 (Chemistry) was answered better than Question 2 (Physics).

It appeared that some schools may not have trialled the physics investigation and so there were issues with the voltages recorded. A number of centres recorded results in the range 0V – 2V despite instructions given in the paper. Other centres recorded the power pack readings rather than those from the Voltmeter. In the cases where very small voltages were obtained, the scale on the V/I graphs was not always adjusted.

Further emphasis is required by teachers across centres on what is meant by the terms risk, reliability, anomalous and variable.

It was suggested by examiners that candidates must be encouraged more to use a ruler and calculator.

Examiners reported that the language in questions was appropriate and there was no evidence that candidates ran out of time.

Booklet A: Foundation Tier

- Q1** This chemistry investigation required candidates to react metals with acid and record the temperature change. Since the reaction is exothermic, the initial temperature was expected to be lower than the final temperature. Examiners noted that this question was successfully completed and the vast majority of candidates were able to follow the procedure and obtain accurate results. Parts (d), (e) and (f) required the candidates to interpret what they were doing in the practical and give answers where they had to apply their knowledge and make judgments – it was these parts of the question that provided differentiation.

In Part (a), the majority of candidates were able to access full marks, recording the temperatures and differences. A few had the initial temperature higher than the final temperature and consequently lost the first mark, but they could still access the second mark for temperature change as the sign was not penalised. In Part (b), a number of candidates lost their first mark as they did not make reference to acid being corrosive or burning. Vague answers such as ‘acid can get in your eyes’ were often given rather than explaining why this was a risk or hazard. Part (b)(ii) was well answered with ‘wear safety goggles’ being the most common answer. Part (c) was answered well. In Part (d)(i), the majority of candidates produced well drawn bar graphs. In Part (ii), approximately half of the candidates were able to answer ‘repeat’ in order to improve reliability. In Part (d)(ii), most candidates were able to describe ‘heat being kept in’. In Part (e)(i), a significant number of examiners noted

that candidates answered this question very poorly. They linked stirring to speeding up the reaction or ensuring that the reaction was fully completed rather than to spreading out the heat evenly. Parts (e)(ii) and (f) and (g) were all answered well.

- Q2** This physics investigation required candidates to record the current and voltage in a circuit using as the voltage on the power pack was increased.

Examiners generally felt that this question proved more challenging than question one, in that the results should have been recorded to 1 decimal place, yet a number of centres recorded them to 2 decimal places and lost a mark for doing so. In addition, many of the candidates were unable to plot their results accurately and used the scale given without adjusting it to their own results; this should not have been the case if the practical was trialed as instructed. However, getting results and drawing the graph provided an avenue for discrimination between candidates of differing abilities.

In Part (a) around half of candidates did not give their results to 1 decimal place and so lost this mark. Few candidates appear to have noted step 2 of the method and most had small voltage readings. Part (b) Most candidates answered this part correctly apart from Part (iii) where they were unable to describe how to minimise the risk of a hot wire. Part (c) Most candidates scored well on the graph although the line of best fit was carelessly drawn by some. Part (iii) was a good discriminator. Part (d) Part (i) was well answered but the answers to Part (ii) were often too vague to obtain the mark.

Booklet A: Higher Tier

- Q1** In Part (a), most of the candidates were able to record the highest temperature and calculate the change in temperature. In Part (b), the common answer for the risk was getting acid into the eyes. Very few candidates wrote that acid was corrosive. The vast majority of candidates were able to suggest how to minimise the risk. In Part (c)(i), the bar charts were well drawn and the axes were suitably scaled. It would be beneficial to the candidates if they all used a ruler to draw the lines. Part (ii) was well done; those who did not achieve a mark had the order in decreasing activity. Part (iii) was very well answered. Part (d)(i) was very well answered. Part (d)(ii) was very badly answered with scales being the most common incorrect answer. In Part (e), the candidates were able to name two controlled variables. Part (f) proved to be a good discriminator; very few candidates realised that a more concentrated acid would not increase the overall temperature rise but would just make the rise happen quicker. Part (g) was very well answered.

Supervising Examiner Comment

- Q2** This question was on Ohm's law. In Part (a) many candidates did not record their results to one decimal place. This would make drawing the graph more difficult. Part (b)(i) was very badly answered, those who did achieve a mark knew the meters were a voltmeter and an ammeter, very few knew how they were correctly connected in a circuit. In Part (ii) most candidates were able to suggest two things to make sure the experiment was a fair test. The graph in Part (c)(i) was very badly answered. Candidates found it very difficult to scale the y-axis, very few candidates drew a line of best fit, most just joined the points. Those who did draw a line of best fit rarely went through the origin. Part (ii) was very well answered with most candidates able to spot a trend. Part (ii) was also badly answered most candidates just gave the trend again and many candidates wrote that the current was proportional to the voltage rather than directly proportional. Part (d) was not well answered; most candidates assumed the power pack was turned off to let the wire cool down rather than to stop it heating up and very few knew that a change in temperature would affect resistance. Part (e) was very well answered.

Booklet B

This is the first occasion that this format of practical Booklet B has been assessed in the new specification. Taking this into consideration the candidates performed well on the paper, and candidates of all abilities were able to respond positively to the questions.

There was no indication that candidates ran out of time. The language appeared to be appropriate for all candidates and there was no evidence that any candidate misinterpreted any of the questions. It was pleasing to see that very few candidates left questions unanswered and the quality of written communication was of a good standard.

Booklet B: Foundation Tier

- Q1** This question was based on the microscope and preparation of microscope slides.
- (a) (i)** Was well answered with the majority of candidates knowing that the part required was the stage. A few candidates answered 'platform', this was not given credit. Part (ii) Well answered by the vast majority of candidates. Part (iii) Overall this was well answered with most candidates scoring at least one of the two marks available.
 - (b) (i)** Proved challenging to foundation tier candidates. Part (ii) well answered – most candidates knew that X was the nucleus and Y was the cytoplasm.
- Q2** This question was based on food tests and energy in a food sample experiments.
- (a) (i)** Generally well answered – although some candidates were unable to identify that Benedict's was the reagent to test for sugar. Part (ii) Very well answered – most candidates understood that if the sample did not contain sugar the Benedict's reagent would stay blue or would not change colour. Part (b)(i) Very well answered – most candidates were able to name a thermometer as the piece of apparatus to measure temperature. In Part (b) (ii) most candidates were able to clearly show their working out and get the correct answer for the temperature rise. Part (iii) Most candidates managed very well with this question and were able to link a higher temperature rise with the food having more energy.
- Q3** This question was testing knowledge of how the 'testing a leaf for starch' experiment is carried out and factors that affect the rate of photosynthesis.

In the first part of this Question (a)(i) candidates were assessed on their written communication skills including the use of specialist scientific terms, it was reasonably well answered, however, only the more able candidates achieved full marks. Candidates should be encouraged to answer the question using the bullet points provided and present their answer in a logical order of progression of the steps. Too many candidates started off giving a description of how and why the plant was de-starched and this was not required so was not worthy of any marks. It was pleasing to see only a very small number of candidates did not attempt this question. In Part (a)(ii) candidates were asked to shade the part of the leaf that would contain starch; this was well answered. Part (b) Was well answered with most candidates being able to select the most appropriate hypothesis. Part (c)(i) This was well answered by the vast majority of candidates with most recognising that the best temperature for photosynthesis was between 20 and 30°C as this was the maximum point of the graph. Part (ii) proved to be a very challenging question for candidates – only some were able to select the correct answer.

Q4 This question was based on the reactivity series and the test for hydrogen.

(a) (i) This question was worth two marks – candidates were easily able to score one of the two marks. Some candidates described a safety screen incorrectly as a safety guard; this did not gain credit. Part (ii) was well answered, candidates seem very familiar with the idea of fair testing. Part (b)(i) was well answered by many candidates who were able to correctly identify the trend shown in the graph. Part (ii) proved to be a very challenging question for all but the most able candidates. This was a good discriminator. As the candidates had been asked to use the results in the bar chart, and the y-axis of the graph clearly states, ‘time taken to disappear’. Time and speed were often confused here by the candidates and meant that they were not awarded this mark. Part (c) There was a variety of responses in selecting the name of the gas produced in the reaction.

Q5 This question was based on the neutralisation experiments and also tested a mathematical concept from Page 58 of the new specification ‘Understand that $y = mx$ represents a linear relationship, where m is the gradient, and that the graph of y against x is a straight line through the origin.’

All candidates need to be familiar with and competent in all areas of mathematics set out clearly on Page 58 of the new specification in order to develop their skills, knowledge and understanding in Single Award Science. This mathematical content will be assessed within the lifetime of the specification.

Part (a) was poorly answered. A substantial number of candidates could not identify Z as the most suitable measuring cylinder. Part (b)(i) asked candidates for the range of volume shown in the graph; this was well answered. Parts (ii) and (iii) proved to be very challenging for the vast majority of candidates, at best most only scored one of the available two marks. Part (iv) was well answered. The most common wrong answer was ‘people may see colours differently’ – it had to be clearly linked to the colour ‘green’ to be awarded the mark. Part (v) was accessible to most candidates who were able to identify a pH probe as being the piece of equipment that would accurately measure the pH. Part (vi) proved to be another challenging question for candidates – with most giving the reverse order and starting with the least effective indigestion tablet which meant that no marks could be awarded. Partial marks were awarded if the candidate got any two of the indigestion tablets in the correct order, e.g. BA, AD or DC together. The more able candidates did get the correct order of BADC and achieved both marks. Part (c) Asked candidates to complete a paragraph about the test for carbon dioxide, it was clear that a lot of candidates had not learned this well. Part (d)(i) The points on the graph were plotted accurately by the vast majority of candidates, those who did lose a mark for plotting it was often for the plot at mass 3.5g – with candidates plotting this as 74 instead of 72. Candidates should be encouraged to place a small x or dot exactly where the plot should be as large marks will cover too wide an area and will not be credited. The line should have been a straight line of best fit through the origin – the points should not be joined dot to dot in a graph displaying data from a Chemistry or Physics experiment.

(ii) Very well answered – candidates are familiar with trend questions from the written modular papers, so this helped them achieve this mark.

(iii) Very poorly answered – it was obvious that a large number of candidates were unfamiliar with this equation and so did not know how to work out the value for c despite being given choices. Part (v) Poorly answered – most candidates could identify that there were no anomalous results. However, they were not able to explain their answer.

There was no separate mark for saying that there were no anomalous results – it was the explanation which was being credited.

Q6 This question was based on the conductive properties of materials.

Part (a) was well received by most candidates who knew that a stopwatch could measure time accurately in Part (i) and could state a controlled variable in Part (ii) but few realised that time was the dependent variable in Part (iii). In Part (b)(i) few recognised that the investigation was carried out three times to improve reliability with most incorrectly thinking it was to improve accuracy. In Part (b)(ii) most candidates knew how to calculate the average of three numbers even if they didn't follow through correctly; candidates should be encouraged to use a calculator when appropriate. In Part (b)(iii) most recognised 20.1s as the anomalous result but few could state clearly how to deal with an anomaly when finding an average in part (iv). In Part (v) most recognised that the shortest time was for the best conductor of heat and that these results should be displayed in a bar graph for Part (iv). In Part (c) most candidate could express the shown number to one decimal place while in Part (d) few realised that an insulator would take a longer time. In Part (e) most knew that the apparatus should be left to allow it to cool down.

Q7 This question was based around the measurement of the speed of sound using the echo method.

It was well received with the majority of candidates gaining 3 out of the 6 marks available. In Part (a) most knew to start the timer when the sound was made and stop it when the echo was heard although some candidates struggled to communicate this clearly. Part (b) proved difficult for candidates to figure out that the time between the wall and the people was half the return time. In Part (c) very few worked out that standing too close would make timing inaccurate nor could they figure that slow reactions would lead to a shorter time being recorded in Part (d). Most candidates recognised the correct equation for calculating speed in Part (e).

Q8 This question was testing the candidate's knowledge on measuring reaction times.

It was well received with most candidates gaining 3 out of the 4 marks available by recognising that Y's reactions are being tested as they are ready to catch the meter stick in Part (a), working out that X's reactions are faster in Part (b)(i) and realising that it is not possible to draw conclusions on one set of results from a boy and a girl in Part (b)(ii). Very few worked out that X's reactions were 0.05s faster in Part (b)(i) to gain full marks.

Booklet B: Higher Tier

Q1 This question was based on the microscope and preparation of microscope slides.

Part (a)(i) was not well answered – this question required the candidates to explain what the x meant so they had to clearly include 'times' in their answer not just repeat the question, e.g. magnified ten times not just magnified 10x. In addition to this a lot of candidates lost their mark for stating that the cells were ten times closer or zoomed in ten times. These were incorrect answers but very often the ones candidates opted for, so they lost this mark. Part (ii) Well answered by the vast majority of candidates. Part (b)(i) Overall this was well answered with most candidates scoring at least one of the two marks available. The most common wrong answer was that 'it is easier to see cells'. Part (ii) Well answered – most candidates knew that X was pointing to the nucleus and Y was pointing to the cytoplasm. When candidates did lose a mark, it was often for saying vacuole instead of cytoplasm.

Q2 This question was based on food tests and energy in a food sample experiments.

- (a) (i)** Generally well answered – some candidates mixed biuret up with iodine and often the spelling of biuret was not very clear, however, most candidates were able to get the final colour correct. Part (ii) Very well answered – most candidates understood that if the sample did not contain sugar the Benedict's reagent would stay blue / not change colour to brick red. Part (b)(i) Very well answered – most candidates were able to clearly show their working out and get the correct answer for the temperature rise.
- (ii)** Most candidates coped very well with this question and achieved the mark on offer. However, some candidates failed to make a comparison between the two samples, and this was not credited with a mark. The most common wrong answer was 'it only had an increase of 5°C' – there was no comparison to the rise in temperature for Jane's food which was 8°C, so a mark was not awarded.

Q3 This question was testing knowledge of how the 'testing a leaf for starch' experiment is carried out and factors that affect the rate of photosynthesis. In the first part of this Question (a)(i) candidates were assessed on their written communication skills including the use of specialist scientific terms.

- (a) (i)** Reasonably well answered, however, only the more able candidates achieved full marks. More careful reading of the stem of the question to see what was required in the answer would have benefitted candidates greatly. Too many candidates started off giving a description of how and why the plant was de-starched and this was not required so was not worthy of any marks. Where this was the case then those candidates often just tagged a few lines of relevant detail onto the end which was not detailed enough to include enough marking points to be awarded full marks. It was pleasing to see that very few candidates left this question blank. Part (ii) was well answered. Part (b) was also well answered – if more than one box had a tick in it then this was conflict, so no mark was awarded, even if one of the ticks was in the correct box. Candidates should be encouraged to read the instructions for a question very carefully and only do what they have been asked to do – in this case place 'a' tick beside the most suitable hypothesis to test this idea. Part (c)(i) This was well answered by the vast majority of candidates with most recognising that the best temperature for photosynthesis was between 20 and 30°C as this was the maximum point of the graph. Alternative answers also worthy of credit were that this was the peak of the graph, the highest rate of photosynthesis was between these two temperatures or that between these two temperatures the plant photosynthesised the most. The most common wrong answers were, that photosynthesis stops here, or the rate of photosynthesis is steady between 20 and 30°C. Part (ii) This proved to be a very challenging question for candidates – very few were able to formulate an answer worthy of credit. The answer we required to be awarded the mark was that the gardener should carry out the investigation for more temperatures between 20 and 30°C. This would then allow the gardener to get a more accurate value for the best temperature for photosynthesis.

Q4 This question was based on the reactivity series and the test for hydrogen.

- (a) (i)** This question was worth two marks – candidates should be encouraged to look at the mark allocation for questions, in addition to the stem of the question, and this will then help them decide on the level of detail required in an answer. With this in mind most candidates did not go on to suggest how to reduce the danger and lost one mark, or if they did they did not give the correct scientific term for the apparatus used – for example saying ‘a guard’ instead of a ‘safety screen’. Part (ii) Very well answered. Part (b) This proved to be a very challenging question for all but the most able candidates. This was a good discriminator. As the candidates had been asked to use the results in the bar chart, any reference to quicker to disappear was not accepted as the y-axis of the graph clearly states, ‘time taken to disappear’. Time and speed were often confused here by the candidates and meant that they were not awarded the mark. Part (c) Mixed response. It was often the case that if the candidate could identify the gas then they were able to describe the test for it and achieved all three marks. Each marking point was independent in this question so if they identified the wrong gas but went on to describe the test for hydrogen as using a ‘lit splint’ and a ‘squeaky pop’ then they could be awarded these marks. However, many candidates identified the gas as carbon dioxide and then went on to describe the test for carbon dioxide which meant they lost all three marks.

Q5 This question was based on the neutralisation experiments and also tested a mathematical concept from page 58 of the new specification ‘Understand that $y = mx$ represents a linear relationship, where m is the gradient, and that the graph of y against x is a straight line through the origin.’

All candidates need to be familiar with and competent in all areas of mathematics set out clearly on page 58 of the new specification in order to develop their skills, knowledge and understanding in Single Award Science. This mathematical content will be assessed within the lifetime of the specification.

- (a)** Poorly answered. A substantial number of candidates could not identify Z as the most suitable measuring cylinder and for those who did achieve this mark, they were then not able to go on and correctly explain why they chose this particular measuring cylinder. The stem of the question clearly states that ‘the student used the measuring cylinder to measure the volume of acid’ - which was only 5cm^3 . Therefore, the measuring cylinder which will allow them to do this more accurately is the 10cm^3 measuring cylinder (Z). Often candidates missed this vital information and started to add up all the numbers and then chose the largest measuring cylinder as their answer. Part (b)(i) Well answered – the most common answer, which was correct, was 20cm^3 . Part (ii) This proved to be a very challenging question for the vast majority of candidates, at best most only scored one of the available two marks. To be awarded the first of the two marks candidates had to clearly state that by adding 1cm^3 at a time this would be ‘more accurate’ and then relate that to the ‘end point’/neutralisation/when it turns green/when to stop. The second mark was awarded for correctly stating that this would allow a difference to be seen in the volume of hydrochloric acid required to neutralise indigestion tablets C and D. Part (iii) Well answered. The most common wrong answer was ‘people may see colours differently’ – it had to be clearly linked to the colour ‘green’ to be awarded the mark. Part (iv) This proved to be another challenging question for candidates – with most giving the reverse order and starting with the least effective indigestion tablet which meant that no marks could be awarded. Partial marks were awarded if the candidate

got any two of the indigestion tablets in the correct order, e.g. BA, AD or DC together. Part (d)(i) Well answered – most candidates correctly labelled the y-axis, although some candidates forgot to put in the units, so they were not able to achieve this mark. Part (ii) The points on the graph were plotted accurately by the vast majority of candidates, those who did lose a mark for plotting it was often for the plot at mass 3.5g – with candidates plotting this as 74 instead of 72, or the plot at mass 3.0g - with candidates plotting this as 62 instead of 61. Candidates should be encouraged to place a small x or dot exactly where the plot should be as large marks will cover too wide an area and will not be credited. The line should have been a straight line of best fit through the origin – the points should not be joined dot to dot in a graph displaying data from a Chemistry or Physics experiment. Part (iii) Very well answered – candidates are familiar with trend questions from the written modular papers, so this helped them achieve this mark. Part (iv) Very poorly answered – it was obvious that a large number of candidates were unfamiliar with this equation and so did not know how to work out the value for c. As explained at the start of the comments on this question it is very important to make sure that all candidates are familiar with and competent in all areas of mathematics set out clearly on page 58 of the new specification. Part (v) Poorly answered – most candidates could identify that there were no anomalous results. However, they were not able to explain their answer. There was no separate mark for saying that there were no anomalous results – it was the explanation which was being credited.

Q6 This question was testing the candidate's ability to interpret questions based on conduction and radiation.

- (a) (i)** Well answered – the majority of candidates achieved this mark. Part (ii) Again, well answered – it was clear that candidates had been taught the difference between these variables and therefore they were able to correctly identify that time was the dependent variable in the investigation. Part (b)(i) Overall this was well answered. However, it was clear that some candidates still do not know the difference between accuracy and reliability. If the investigation has been repeated then this is to ensure reliability, it has nothing to do with ensuring accuracy or maintaining a fair test. The alternative answer which was acceptable was that the investigation was carried out three times to check for anomalous results. To calculate an average was not credited as this was in the stem of the question. Part (ii) Well answered – a substantial number of candidates achieved all three marks for this question – with many setting out their working out in a very logical way which was pleasing to see. Partial marks were awarded for adding the three numbers for metal B up correctly and then getting 24.5, dividing 24.5 by 3. Part (iii) Very well answered – most candidates correctly identified 20.1s as the anomalous result. Part (iv) Well answered – however, some candidates just said that the anomalous result was ignored but to be awarded the mark they needed to go on and say that it was not used to calculate the average. This meant that some candidates lost this mark. Part (v) Well answered. Part (vi) Well answered. Part (c)(i) This was one of the most difficult questions on the paper and as such very few candidates achieved the mark. Careful examination of the stimulus material would have helped candidates to formulate an answer worthy of credit. Part (ii) Again, this was another very challenging question – as is to be expected at the end of a higher tier paper. However, it was answered much better than Part (i) with some candidates able to achieve at least one of the two marks on offer.

- Q7** This question was testing knowledge of the echo method used to find the speed of sound and the equation used to calculate the speed of sound.
- (a) (i)** Well answered – most candidates could correctly identify that Student B started the stopwatch when student A hit the blocks together. However, a significant number of candidates thought that student A was throwing the bricks at the wall and it was on impact with the wall that student B started his stopwatch. This was not the correct answer, so no mark was awarded. Part (ii) Well answered. Part (b) Mixed response – many candidates found this question very difficult. Part (c) Very well answered – most candidates achieved this mark.
- Q8** This question was testing the candidate's ability to interpret questions based on the ruler experiment for testing reaction times.
- (a)** Well answered. The explanation of why it was student Y who was having their reactions tested was being credited with the mark and not just naming the student.
- (b) (i)** Considering that this was the last question on the paper, it was generally well answered. The question was asking candidates to compare the reaction times of student X and Y so the answer had to have a comparative term – such as faster, quicker to be credited. The second mark was being given for clearly stating that there was a 0.05s difference between the reaction times of student X and Y. If no unit was included with this figure, then the mark was not awarded. It is good practice for all candidates to learn to always include the units in any mathematical answer.
- (ii)** Overall this was well answered. Part (iii) There were two marks for this question – the first mark for stating that the experiment should be repeated with more boys and girls and then the second mark for knowing that an average was then able to be calculated. Overall it was well answered, and a significant number of candidates did achieve both marks.

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