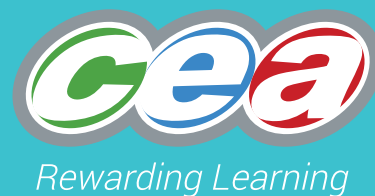


GCSE



Chief Examiner's Report
Single Award
Science

March Series 2024



Foreword

This booklet outlines the performance of candidates in all aspects of this specification for the March 2024 series.

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

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

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GCSE SINGLE AWARD SCIENCE

Chief Examiner's Report

Assessment Unit 1: Biology

Foundation Tier

Unit Overview

- Candidates must use comparative language when asked to compare two pieces of data etc. For example, Question 2(a)(i) – food B contains more fat than food A – not just that food B contains a lot of fat. This is a skill that can be practised through past paper questions.
- Candidates should avoid using the word 'it' at the beginning of an answer unless they are very clear what 'it' is referring to. For example, in Question 5(a)(ii) 'It produces sperm' is a correct response to the question 'what is the function of a testis?' as 'it' refers to the testis but in Question 7(b)(ii) 'It goes up' is an incorrect answer as the question is asking about fishing quotas and so 'it' refers to the fishing quotas rather than the population of herring. This distinction between when 'it' is acceptable in an answer is subtle and difficult for the majority of candidates so avoiding use of the word is the best advice.
- Candidates should be encouraged to learn definitions as they are written on the specification, e.g. the definition of stem cells and mutation.
- As always, candidates should practise the skill of reading questions carefully so that they provide creditworthy answers.

Q1 This question was testing candidates' knowledge of Section 1.1 of the specification (cells). A familiar style of question which allowed most candidates to settle into the paper. In Part (a) the majority of candidates were familiar with the functions of the different parts of the cell and so attained both marks with very few receiving no marks. Part (b) was also accessible and candidates of all abilities could identify structures found only in plant cells. However, in Part (c), stem cells were less well known with many candidates achieving only one of the two available marks.

Q2 This question was testing candidates' knowledge of Section 1.2 of the specification (food and diet). In Part (a) the role of vitamin C and calcium were generally well known, though vitamin D was a popular wrong answer. Part (b) required a comparison to be made between food A and food B; candidates who failed to use a comparative term in Part (i) and Part (ii) were penalised, as were those who simply listed all the contents of food B rather than identifying the relevant component. In Part (b)(iii), the majority of candidates were able to recognise this as a simple subtraction but occasionally transcribed the answer incorrectly. This is where showing working out comes into play; candidates who correctly laid out the calculation but incorrectly transcribed the answer were able to gain one mark. Some candidates failed to read the question correctly in Part (c) and gave the end colour of the Benedict's reagent rather than the starting colour, though those who correctly gave both starting and end colour were not penalised. The majority of candidates correctly identified Benedict's as a test for sugar.

- Q3** This question was testing candidates' knowledge of Section 1.8.6 of the specification (food chains and food webs). In Part (a), a secondary consumer was often correctly identified from the food web though a number of candidates named a primary rather than a secondary consumer. A significant number of candidates gave the original source of energy in Part (b) as reeds or grass, which was incorrect. However, they then went on to correctly complete the food chain in Part (d). In Part (c), those candidates who did not read the question or who did not understand the term 'food chain' often gave eight as the number of food chains. In Part (d), it was pleasing to note how many candidates were able to achieve full marks for the food chain but a minority of candidates did not start with a producer and some gave four organisms in a five-organism food chain, despite the question asking for a complete food chain. The majority of candidates were able to describe the effect removing the grass would have on the number of grasshoppers in Part (e) though vague reference to them dying was not rewarded without reference to the effect on their **numbers** which was what the question was about.
- Q4** This question was testing candidates' knowledge of Section 1.4.1/2 of the specification (central nervous system and voluntary & reflex actions). Again, it was pleasing to note how well candidates knew the nervous system, with many obtaining full marks. However, candidates should be careful to refer to **spinal cord** in Part (a). 'Spine' was an incorrect answer.
- Q5** This question was testing candidates' knowledge of Section 1.5.1/5 of the specification (male reproductive system and contraception). In contrast to Question 4, answers to this question were disappointing. The scrotum was frequently mis-identified. Colloquial terms for the scrotum were not accepted. In Part (a)(ii), the function of the testes was often given as storing sperm rather than producing sperm. Candidates who stated that the testes produced and stored sperm were not penalised but storing sperm as an answer was not creditworthy. In Part (b) many recognised that the sperm ducts had been cut but some candidates lost this mark if they said that the sperm duct was no longer connected to the testis as the diagram shows part of the sperm duct still attached. In Part (b)(ii) vague references to the couple changing their minds about wanting children rather than describing the permanency of a vasectomy were not rewarded. Candidates performed better in Part (c); many were able to name the condom as a mechanical method of contraception used by males and the contraceptive pill or hormone implant as a chemical method used by females. However, in Part (ii) there was a requirement for candidates to allude to the contraceptive pill – examiners accepted 'the pill' as this term is in common use but 'a pill'/'pills' were not accepted as this could have referred to any type of pill.
- Q6** This question was testing candidates' knowledge of Section 1.6 of the specification (variation) In Part (a)(i), only a minority of candidates were able to adequately define the term continuous variation. As noted in the summary, candidates should be encouraged to rote learn definitions in order to forgo the need to try and find the correct vocabulary in the exam.

Candidates should also be encouraged to use a ruler when drawing graphs, be they bar charts, histograms or line graphs. In Part (ii), many candidates failed to label the x axis or omitted the units from their label. This was not a difficult mark to attain as it simply required candidates to transcribe the heading in the first column of the table. In Part (iii) only the best candidates were able to identify this graph as a histogram – most described it as a bar chart. In Part (b)(i), again, candidates would benefit from learning the definition of the term 'mutation'.

In Part (ii), candidates had to reference **UV** light in order to gain credit. Incorrect answers here included cancer, extra chromosomes, chemicals, sunlight and sunburn.

- Q7** This question was testing candidates' knowledge of Section 1.8.9 of the specification (human activity on earth). This was the first of the overlap questions between the Foundation and Higher Tier papers and it proved to be challenging for the majority of Foundation Tier candidates.

In Part (a), many candidates struggled to correctly describe the trend, often just giving the answer 'it is positive', or 'it goes up'. Describing a trend from a graph (or table) is an essential skill which candidates should be encouraged to practise. They should learn that 'As (whatever happens on the x-axis) increases' and then go on to describe what effect this has on the y-axis. It should be noted that the cause and effect should be the correct way around. In this question, it was incorrect to state the increasing number of bird species caused the hedgerow to get longer. In Part (ii), most candidates correctly described the increase in biodiversity but few explained this in terms of increased habitats, food or shelter. One or two candidates missed out on the first mark because they did not state the effect on the biodiversity but just stated the explanation. In Part (b), candidates were expected to interrogate the graph and recognise that the mass of herring was at its lowest point (in Part (i)) but started to increase after the introduction of quotas Part (ii). Some candidates lost marks in this question part for referring to the mass of herring caught rather than the mass of herring in the North Sea.

- Q8** This question was testing candidates' knowledge of Section 1.4.7 of the specification (diabetes). A common mistake in Part (a) was to give long term effects of diabetes rather than symptoms. Candidates should be encouraged to learn the symptoms as described in the specification to avoid giving answers that are too vague. In Part (b) (i), candidates were required to compare two lines on a graph. Many candidates were able to recognise that person A had a higher blood glucose level than person B but fewer candidates were able to state that person A's blood glucose level fluctuated more. When answering questions linked to graphs or tables, candidates should be encouraged to take the time to use the exact wording from the axes in their answer as some lost marks by not referring to blood glucose levels (e.g. referring simply to blood levels which was not creditworthy). In Part (iii) only a minority of students were able to correctly calculate the percentage increase though many were able to gain one mark for taking the correct readings from the graph. In Part (iv) most candidates were able to describe that the snack contained glucose or carbohydrate but candidates who listed a number of food types were penalised and the name of a specific snack was not given credit as the question asked for a food type.

- Q9** This question was testing candidates' knowledge of Section 1.7.1/6 of the specification (communicable diseases and development of medicines). Part (a) required students to apply their knowledge of the transmission of colds and flu to the transmission of Covid 19. Unfortunately, a significant number of candidates contradicted themselves and described the transmission route as direct contact and droplet infection which meant they lost this mark. For the second mark, candidates needed to focus on the idea that, by keeping a distance from an infected person, the droplets could not reach and therefore infect another person. In Part (b), it was pleasing to note that nearly all candidates attempted the QWC question. The mark scheme allowed for candidates of all abilities to access at least one or two marks whilst crediting those candidates who knew and understood more about the process.

Higher Tier

Unit Overview

- Q1, Q2 & Q3** These first three questions were overlap questions with the Foundation Tier and were well answered by the majority of the higher tier candidates. This would 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 (Question 3) were generally of a higher standard with more candidates able to achieve higher marks.
- Q4** This question was testing candidates' knowledge of Section 1.2.5 of the specification (nutrition and food tests).
- (a)**
- (i)** This was very well answered by most candidates.
 - (ii)** Colour changes of food test reagents must be accurately described, as given on the specification. Consequently, blue-black was the only acceptable answer. Candidates were penalised for listing several colours, however, those who gave both the correct starting and end colours were awarded the mark.
- (b)**
- (i)** A mixed response. Only about 50% of candidates appreciated that the white chocolate would allow the colour change of the Benedict's reagent to be seen more clearly. The other 50% thought that white chocolate was used instead of dark chocolate because it contained more sugar. This was irrelevant in the context of this question.
 - (ii)** This question asked the candidates to state how the student would know which food contained more sugar. To answer this question a comparative term was required with regards to the speed at which the reagent would change colour. More careful reading of the information in the question would have guided the candidates to the correct answer.
- Q5** This question was testing candidates' knowledge of Section 1.4.4 of the specification (plant hormones).
- (a)**
- (i)** Well answered, although, as you would expect some candidates had mixed up phototropism and photosynthesis. Phototropic was also an acceptable answer to this question.
 - (ii)** Well answered.
 - (iii)** This was a free response extended writing question on plant hormones. Most candidates were able to describe the bending of the shoot towards the light. Some candidates understood that the auxin moved to the shaded side but only the more able candidates could explain that auxin caused more cell elongation on the shaded side.
 - (iv)** To gain both marks for this question the candidate had to imply that there was more of one of the components, i.e. light, photosynthesis or growth. This, however, could take a variety of forms such as closer to the light, grows taller/bigger/faster. This is a common question on higher tier single award biology papers and candidates are encouraged to learn the answer as, more light for more photosynthesis for more growth.
- (b)** Most candidates achieved the mark for this question part.

- Q6** This question was testing candidates' knowledge of Section 1.3.6 of the specification (genetic diagrams and terminology).
- (a)**
- (i)** Examiners, mindful not to penalise descriptions of dominant and recessive based on a candidate's limited vocabulary, allowed several alternative ways of describing these terms. However, answers referring to, or implying that the dominant allele was stronger than the recessive allele were not credited.
 - (ii)** This was reasonably well answered, and most candidates were able to get at least one of the two marks on offer. Candidates are encouraged to make sure that their formation of upper and lowercase letters are clear and leave no room for misinterpretation by the examiner. There was no error carried forward for this genetic cross as there was only one combination of gametes which could give the correct genotypes of the offspring.
 - (iii)** Generally well answered. Error carried forward was applied to this question.
 - (iv)** A significant number of candidates were unable to name the type of genetic diagram.
 - (v)** Generally well answered. Error carried forward was applied to this question.
- (b)** Well answered.
- (c)**
- (i)** Many candidates were not able to name the amniocentesis test and those who did name it, frequently spelt it incorrectly.
 - (ii)** Well answered. The most common answer was cystic fibrosis.
- Q7** This question was testing candidates' knowledge of Section 1.2.12 and 1.2.13 of the specification (respiration). It was also testing the candidates' ability to plot and draw a line graph and state a trend from information displayed in a line graph.
- (a)**
- (i) & (ii)** The term exothermic and the balanced symbol equation for respiration, both straightforward factual recall, were not well known. Many candidates lost marks for placing oxygen and carbon dioxide on the wrong side of the equation or for incorrect balancing.
- (b)**
- (i)** Despite being directed to draw a line graph some candidates chose to draw a bar chart or histogram. Candidates should be encouraged to use a ruler to join the points in a line graph, being careful to ensure the line goes through all the points. Lines drawn freehand tend to miss points and therefore lose the line mark.
 - (ii)** The general trend was often correctly described but the wrong turning point was given in some cases (50°C instead of 40°C) so these candidates lost one mark.

- Q8** This question was testing candidates' knowledge of Section 1.6.3 of the specification (natural selection).
- (a)** This proved to be a challenging question for all but the more able candidates. Candidates should be encouraged to learn off the set bullet points for natural selection and then practice applying these to different situations. When natural selection is taught in this way it is straight forward for candidates to put this into practice if they come across a similar question in an exam paper. The candidates 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.
 - (b)** Well answered.
 - (c)** Well answered.
 - (d)** Descriptions of fossils were often correct but their role in providing evidence for evolution was less well known. Very few candidates appreciated the importance of dating fossils and many simply restated the information given in the question stem.

Assessment Unit 2: Chemistry

Foundation Tier

Unit Overview

The paper included a good range of topics, covering a large amount of the specification and was a good assessment of candidates' knowledge of Unit 2. The paper allowed for candidates of differing abilities to respond positively with most candidates attempting all questions. There was no evidence that candidates had insufficient time to complete the paper. There were a wide range of responses and a wide range of marks achieved. The standard of answers was possibly not as high as previous years - there still seems to be a lack of consolidated knowledge and skills which has become increasingly evident over the last few years. It was also noted that some candidates did not read a number of the questions fully, resulting in questions not being properly answered.

Knowledge of key terms and definitions needed consolidation for many candidates.

- Q1**
- (a)** The majority of candidates were able to complete the diagram to show the particle arrangement in a gas and to name the changes of state that were taking place at the different parts in the diagram.
 - (b)** This was one of the questions where knowledge of key terms and definitions needs consolidation for many candidates.
- Q2**
- (a)** The matching of mixtures to diagrams of apparatus was very well answered by the majority of candidates. A few candidates joined the heading "mixture" to the bottom diagram, this was ignored by examiners.
 - (b)** Very few candidates recognised the definition of the term 'pure'.

- Q3**
- (a)**
 - (i)** The majority of candidates correctly identified the hazard symbol for corrosive.
 - (ii)** Most candidates knew that the general name for these symbols was “hazard” – the most common incorrect answer was ‘warning’ symbols.
 - (iii)** This was another well-answered question with candidates recognising that pH1/sulfuric acid would turn universal indicator red. A few candidates answered red/orange and unfortunately could not be awarded the mark due to a conflict in their answer.
 - (b)**
 - (i)** Candidates were provided with a choice of words and asked to complete sentences about the use of toothpaste after eating food. The sentences were reasonably well completed, although some candidates incorrectly answered ‘strong’ and ‘clean’.
 - (ii)** The completion of the general word equation of a reaction between an acid and alkali – most candidates were able to achieve one mark for ‘water’. Fewer achieved the full two marks. ‘Carbon dioxide’ was the most common incorrect answer.
- Q4**
- (a)** Most candidates understood the meaning of the term ‘synthetic’.
 - (b)** Candidates were provided with information about five different types of plastic and then asked to choose the best plastic for two different uses. This was reasonably well answered by most candidates.
 - (c)** Candidates were asked to give one advantage and one disadvantage of using Kevlar to make gloves for firefighters. The advantage was relatively well answered, however the question asked for one advantage and some candidates gave multiple answers which caused a conflict in their answer. Most candidates successfully gave the correct disadvantage, referring to high cost.
 - (d)**
 - (i)** Candidates were given a pie chart showing plastic disposal by different methods and asked to calculate the missing percentage. The calculation was very well worked out by many candidates. Some candidates were perhaps put off by the pie chart and thought they had to work out an angle rather than the percentage.
 - (ii)** Very few candidates successfully identified that sending plastic to landfill would result in less toxic gases being released by burning – and whilst candidates hinted at the disadvantage they were unable to successfully express their answer in words.
- Q5** This question assessed candidate’s knowledge of the Periodic Table and the work of Dmitri Mendeleev. Whilst candidates seemed to understand how the modern Periodic Table is arranged, as tested in Part (a) and Part (b), they were not as confident in answering the questions regarding Mendeleev’s version of the periodic table.
- (c)**
 - (i)** Fewer candidates than expected were able to answer this question correctly – common incorrect answers as to how Mendeleev ordered his elements included ‘alphabetical order’ and ‘metals and non-metals’.
 - (ii)** Candidates were asked to give a reason as to why Mendeleev had left gaps in his periodic table – many answers were too vague e.g. ‘some missing’.

- Q6 (a)** There was a noted improvement in the standard of answering this question, on the formation of crude oil, compared to previous years. Some candidates misunderstood the question and provided a description of fractional distillation and the separation of crude oil. Some candidates are still referring to crude oil being formed over hundreds of years rather than millions of years.
- (b) (i)** Very well answered – most candidates responded with carbon dioxide.
- (ii)** Candidates were asked to give two environmental problems caused by the greenhouse effect. This resulted in very mixed responses with many candidates considering climate issues they had potentially seen on the news e.g. forest fires which were not accepted.
- (c) (i)** Very few candidates identified ‘methane’ as the first member of the family of alkanes – butane was a common incorrect answer.
- (ii)** The two elements making up hydrocarbons were well answered by many candidates – unfortunately a number of candidates wrote ‘carbon dioxide’ instead of carbon.
- (d)** The structural formula for butane was well drawn by the majority – candidates need to take care to include the bonds between the carbon atoms as well as the hydrogen atoms.
- Q7 (a) (i)** Candidates either knew covalent bonding or they did not. Many guessed ‘ionic’ unsuccessfully.
- (ii)** Not well answered with many candidates circling the wrong formula.
- (b) (i) & (ii)** There was a notable improvement in the standard of answers compared to previous years in identifying the number of elements and then atoms.
- Q8 (a) (i)** Using the information provided most candidates were able to place the three metals into the correct order of reactivity. Some candidates introduced their own named elements into the order of reactivity – showing they had not read the question correctly.
- (ii)** Identifying the metal ion from the flame colour was not well answered. Many candidates incorrectly answered lithium, zinc or copper – possibly making a connection to the previous question.
- (b) (i)** Most candidates were able to get at least one of the available three marks for the graph. Care is needed when plotting the points – some ‘dots’ were so big that they covered two values. The scale provided was generous so accuracy in plotting was needed. Some candidates are still using a ruler to join the plotted points and some candidates going over the line of best fit and unfortunately producing double lines rather than a smooth curve.
- Some candidates failed to draw the graph having not read the question carefully.
- (ii)** Most candidates were successfully able to identify the first part of the trend. The second part of the trend proved more difficult. Terms such as ‘flatlines’ were not accepted.
- (iii)** Many candidates had difficulty expressing their answer successfully for this question. It was sometimes obvious candidates knew what they were talking about but poor wording/ expressions limited their ability to gain marks.
- (iv)** The naming of the salt was generally well done by candidates.

(v) Many candidates answered the question as if oxygen gas was being produced rather than hydrogen.

(vi) The term 'exothermic' was well known.

Q9 This question assessed the quality of written communication on the topic of atomic structure and the formation of a lithium ion. Many candidates were able to gain at least two marks in the QWC. Fewer candidates left the question unanswered compared to previous years. Some candidates appeared not to recognise the term 'sub-atomic particles'. A few candidates understood how ions are formed but referred to the losing of 'atoms' rather than electrons and thus could not be credited with the relevant mark.

A few candidates answered the question incorrectly by describing the reactivity of lithium. Again, careful reading of the question and using the bullet points to structure answer is recommended.

There is a marked decline in the standard of written communication including legibility of handwriting. Very few foundation candidates fell into band A to achieve six marks.

Higher Tier

Unit Overview

The paper included a good range of topics, covering a large amount of the specification and was a good assessment of candidates' knowledge of Unit 2. The paper allowed for candidates of differing abilities to respond positively with most candidates attempting all questions. There was no evidence that candidates had insufficient time to complete the paper. There were a wide range of responses and a wide range of marks achieved. Looking at the marks achieved it was evident that those at the lower end of the marks achieved would have been better suited to sitting the examination at foundation level. Standard of answers was possibly not as high as previous years – there still seems to be a lack of consolidated knowledge and skills which has become increasingly evident over the last few years. It was also noted that some candidates did not read some of the questions fully, resulting in some questions not being properly answered.

The overlap Questions (1, 2 and 3) were generally completed to a higher standard than the same questions on the Foundation Tier.

As with the Foundation Tier, knowledge of key terms and definitions were at times weak and in need of consolidation.

- Q1**
- (c)**
 - (i)** Candidates either knew covalent bonding or they did not. Many answered 'ionic' unsuccessfully.
 - (ii)** Not well answered with many candidates circling the wrong formula.
 - (d)** **(i) & (ii)** There was a notable improvement in standard of answers compared to previous years in identifying the number of elements and then atoms.
- Q2**
- (c)**
 - (i)** Using the information provided most candidates were able to place the three metals into the correct order of reactivity. Some candidates introduced their own named elements into the order of reactivity, showing that they had not read the question correctly.
 - (ii)** Identifying the metal ion from the flame colour was not well answered – many candidates incorrectly answered lithium, zinc or copper – possibly making a connection to the previous question.
 - (d)**
 - (i)** Most candidates were able to get at least one of the available three marks for the graph. Care is needed when plotting the points – some 'dots' were so big that they covered two values. The scale provided was generous so accuracy in plotting was needed. Some candidates are still using a ruler to join the plotted points and some candidates going over the line of best fit and unfortunately producing double lines rather than a smooth curve.
Some candidates failed to draw the graph having not read the question carefully.
 - (ii)** Most candidates were successfully able to identify the first part of the trend. The second part of the trend proved more difficult. Terms such as 'flatlines' were not accepted.
 - (iii)** Many candidates had difficulty expressing their answer successfully for this question. It was sometimes obvious candidates knew what they were talking about but poor wording/expressions limited their ability to gain marks.
 - (iv)** The naming of the salt was generally well done by many candidates.

- (v) Many candidates answered the question as if oxygen gas was being produced rather than hydrogen.
- (vi) The term 'exothermic' was well known.

Q3 This question assessed the quality of written communication on the topic of atomic structure and the formation of a lithium ion. Many candidates were able to gain at least two marks in the QWC. Fewer candidates left the question unanswered compared to previous years. Some candidates appeared not to recognise the term 'sub-atomic particles'. A few candidates understood how ions are formed but referred to the losing of 'atoms' rather than electrons and thus could not be credited with the relevant mark.

A few candidates answered the question incorrectly by describing the reactivity of lithium. Again, careful reading of the question and using the bullet points to structure answer is recommended.

Examiners noted a decline in the standard of written communication including legibility of handwriting. Only the most able candidates fell into band A to achieve six marks, with the majority of Higher Tier candidates scoring four marks.

- Q4**
- (a) Candidates were asked to give one example of a piece of digital evidence – this was poorly answered by the majority of candidates. In some cases, answers were too vague, e.g. phone or laptop, candidates needed to refer to phone logs or e-mail records to gain credit.
 - (b) Candidates were provided with information regarding nanomaterials.
 - (i) Very few candidates were able to successfully give the definition of a trace material.
 - (ii) Naming an example of trace evidence from the passage provided was well done by most candidates.
 - (iii) Many candidates incorrectly provided the size of a nanometer.
 - (iv) Many candidates were able to give an answer from the information provided in the passage.
 - (v) As above, candidates were able to give an answer from the information provided. Care is needed when providing numerical values to include the correct units.
 - (c)
 - (i) Some candidates described the pattern they saw in the visual stimulus provided rather than structure of graphene.
 - (ii) Many candidates correctly named the examples given in the specification whilst others took examples from recent past papers.

- Q5** (a) Many candidates understood the process of chromatography and were able to achieve at least one of the three available marks. Some candidates were too vague in their answers, lacking in the specific details needed e.g. use a pencil to draw the baseline, place a dot of the black ink on the baseline (rather than just on the chromatography paper). Many candidates incorrectly said to place the paper into the solvent to touch the baseline.
- (b) Stationary phase was well answered by most candidates.
- (c) (i) Very well answered by most candidates.
- (ii) This was an accessible question for candidates of different abilities – candidates showing incorrect working out could achieve one mark for correctly rounding to 1dp.
- Q6** (a) Candidates were provided with the melting and boiling points of some alkanes and then asked a number of questions relating to the information provided.
- (i) Well answered by many candidates.
- (ii) A number of candidates found this difficult, incorrectly giving butane as their answer.
- (iii) As above, this question caused difficulty with a number of candidates incorrectly answering ‘decreases’.
- (iv) Many candidates were able to predict a value for the boiling point of pentane within the accepted range.
- (b) Nearly all candidates were able to achieve one of the available marks for C_2H_4 . Fewer went on to achieve full marks.
- (c) Very few candidates were able to successfully balance the equation for the combustion of propene.
- (d) (i) Well answered but care should be taken with the spelling of polymerisation.
- (ii) Not well answered – very few achieved the mark for the double bond breaking, and whilst many candidates hinted at the idea of small molecules joining together, some had difficulty in expressing their answer.
- Q7** This question was a good discriminator. Most candidates were able to achieve some marks and only the most able achieved full marks.
- (a) (i) Some candidates referred to ‘positive’ and ‘negative’ electrodes rather than properly naming the electrodes.
- (ii) Most candidates achieved one mark here for ‘good conductor’ – fewer achieved full marks for a second property ‘inert’.
- (b) Not as many candidates as expected were able to answer ‘electrolyte’.
- (c) (i) Only the very able candidates were able to answer this question successfully – most candidates found this one of the most challenging questions on the paper.
- (ii) Many candidates went down the route of aluminium running out or causing pollution. It was difficult to award marks for these answers as they were too vague.
- (iii) Not well answered – Some candidates gave the half equation for the cathode reaction rather than the anode.
- (iv) Generally not well answered – the idea of the oxygen reacting with the anode and causing it to wear away was needed to gain full credit.

Assessment Unit 3: Physics

Foundation Tier

Unit Overview

The Foundation Tier paper was well received by candidates across the ability spectrum. It was pleasing to see very few blank spaces across the majority of papers. The six-mark QWC question was also attempted by the vast majority of candidates.

- Q1** This question about electrical symbols and circuits proved to be a good discriminator. Most candidates knew the symbol for a voltmeter, in Part (a) and knew which bulbs would be lit if switch one was closed and switch two open, in Part (c). Some candidates also recognised the symbols for a fuse and a variable resistor. However, in Part (b) only a few candidates were able to correctly identify the polarity of cells which gave 1.5V.
- Q2** Most candidates responded well to this question. Most knew that headphones produced sound energy. However, many candidates incorrectly stated that the energy contained in the match was light energy instead of chemical energy.
- Q3** This question on space was well received by most candidates. Most correctly named mercury as the closest planet to the Sun, in Part (a)(i). Most realised that the furthest planet would take the longest time to orbit the Sun. Part (b) proved more challenging, although, some candidates recognised that Uranus and Neptune did not follow the trend and a few correctly stated that Uranus was bigger than Neptune but had less gravity. Most candidates identified the correct diagram of the relative movement of the Earth, Sun and moon, in Part (c). In Part (d) most candidates correctly named asteroids or meteors as the cause of craters on the moon.
- Q4** Most candidates responded well to this question on heat transfer. Most candidates correctly calculated the temperature rise, in Part (a)(i) and correctly identified the best insulator as Y, in Part (a)(ii). However, in Part (a)(iii), few candidates knew that the reliability of the investigation could be improved by repeating the investigation and averaging the results. In Part (b)(i), most candidates correctly concluded that draught excluders took the shortest time to recover the set-up cost and correctly calculated that it would take 20 years to recover the set-up cost for double glazing. In Part (c)(i), only a few candidates correctly identified convection as the heat transfer mechanism and the lowest point C, would be the coldest in the room.
- Q5** Most candidates responded well to this question. In Part (a), most candidates correctly read the newton meter and correctly drew a bar chart, in Part (b). Most candidates knew that concrete surface produced most friction, in Part (b)(ii) and that friction could be reduced by lubrication with oil or water, in Part (c). Most candidates knew that a brick being pulled across a floor surface would generate sound and/or heat energy, in Part (d).
- Q6** This question was well answered by most candidates. Most knew that the fuse protected the fridge from high currents and that the cable grip held the wires securely in place, in Part (a). In Part (b) most candidates correctly calculated the cost of electricity.

- Q7** This proved to be a good discriminating question. In Part (a)(i) most candidates were able to place at least one of the types of electromagnetic radiation – infrared, microwaves, ultraviolet in their correct position in the electromagnetic spectrum but few were able to give one property that was different for each of these types of electromagnetic radiation, in Part (a)(ii). In Part (b) few candidates knew that the area around a phone mast is called a cell. Most candidates correctly worked out that the safest phone had the lowest SAR rating, in Part (c)(i). In Part (c)(ii) while most candidates knew children should not be given the phone with the highest SAR rating, few were able to correctly work out that its SAR rating would be doubled for children.
- Q8** This question was poorly answered by most candidates. Most found it difficult to explain how a generator produced electricity in Part (a)(ii), nor were they able to give one disadvantage of using wave chambers to generate electricity in Part (a)(iii). In Part (a)(i), most stated that renewable energy meant, the source would not run out, while only a few could project the graph to suggest the percentage of electricity generated from renewable sources in 2019 in Part (b)(i). Few candidates were able to give one reason why the percentage of electricity produced by renewable sources had increased, in Part (b)(ii).
- Q9** This proved to be a good discriminating question. The more able candidates correctly stated that the Atlantic spotted dolphin had the smallest frequency range, in Part (a) and correctly substituted the numbers into the equation in Part (c). Few candidates correctly stated 20000Hz as the highest frequency that humans could hear, in Part (b) and fewer realised that the time had to be halved to correctly calculate the distance in Part (c).
- Q10** The QWC question was a good discriminator. Most candidates had either some knowledge of the effect alcohol had on the brain or on its effect on driving distances or could find trends in the table of information and gained two marks. Those who gained four marks correctly interpreted information and commonly referred to, older drivers had less accidents and higher blood alcohol levels were associated with increased accidents. Candidates who gained all six marks were very aware that alcohol consumption increased both the thinking and stopping distance but had no effect on braking distance.
- Q11** This question also proved to be a good discriminator. In Part (a), the more able candidates correctly suggested that isotope B would be the best for a food producer but few were able to explain that a long half-life meant the source would not have to be replaced as often or that Cobalt 60 emits gamma radiation which means that it can penetrate plastic packaging. In Part (b), while most candidates realised that irradiating food would either kill the bacteria on the fruit or give it a longer shelf life few were able to give both reasons for a full.

Higher Tier

Unit Overview

The Higher Tier paper was well received by candidates across the ability spectrum. It was pleasing to see very few blank spaces across the majority of papers. The six-mark QWC question was also attempted by most of candidates.

Q1, Q2, Q3 & Q4 These were overlap questions and the comments below are still appropriate for the Higher Tier paper, although Higher Tier candidates' responses tended to be better than for Foundation Tier.

- Q1** This question was poorly answered by most candidates. Most found it difficult to explain how a generator produced electricity in Part (a)(ii). Nor were they able to give one disadvantage of using wave chambers to generate electricity in Part (a)(iii). In Part (a)(i), most candidates stated that renewable energy meant, the source would not run out, while only a few could project the graph to suggest the percentage of electricity generated from renewable sources in 2019 in Part (b)(i). Few candidates were able to give one reason why the percentage of electricity produced by renewable sources had increased, in Part (b)(ii).
- Q2** A few candidates correctly stated that the Atlantic spotted dolphin had the smallest frequency range, in Part (a) and correctly substituted the numbers into the equation in Part (c). Few candidates correctly stated 20000Hz as the highest frequency that humans could hear, in Part (b) and fewer realised that the time had to be halved to correctly calculate the distance in Part (c).
- Q3** The QWC question was a good discriminator. Most candidates had either some knowledge of the effect alcohol had on the brain or on its effect on driving distances or could find trends in the table of information and gained two marks. Those who gained four marks correctly interpreted information and commonly referred to, older drivers having less accidents and higher blood alcohol levels were associated with increased accidents. Candidates who gained all six marks were very aware that alcohol consumption increased both the thinking and stopping distance but had no effect on braking distance.
- Q4** This question also proved to be a good discriminator. In Part (a), the more able candidates correctly suggested that isotope B would be the best for use by a food producer but few were able to explain that a long half-life meant the source would not have to be replaced as often or that Cobalt 60 emitted gamma radiation which meant that it can penetrate plastic packaging. In Part (b), while most candidates realised that irradiating food would either kill the bacteria on the fruit or give it a longer shelf life few were able to give both reasons for a full explanation.
- Q5** Most candidates were able to show that the activity needed to be halved to find the half-life but many candidates had difficulty correctly reading the time from the x-axis and only gained one mark, in Part (a). In Part (b) most candidates were unable to give a mark worth response to the question, *what is background radiation?*

- Q6** There was a mixed response to this question about heat transfer. In Part (a), while most candidates gained one mark by referring to metals conducting heat through the movement of free electrons, or that conduction caused atoms to vibrate faster or that conduction caused atoms to collide with each other, very few candidates gave a full explanation. In Part (b), most candidates knew that convection caused the water particles to move down at position A but very few candidates were aware that at point B the particles would move to the left. In Part (c) very few realised that position X would be the warmest as it got heat through both convection and radiation.
- Q7** This proved to be a good discriminating question. Only a few candidates correctly identified the first part of the power station diagram as the boiler or furnace, in Part (a). In Part (b), while most candidates knew that a step-up transformer increased the voltage or reduced the current to prevent heat energy losses in distribution, very few were able to give a full explanation. In Part (c)(i), while most candidates correctly worked out the correct ratio of turns on the transformer core, only a few correctly worked out the voltage output, in Part (ii). In Part (d), most candidates gained one mark by substituting the correct numbers into the equation or carrying out one of the conversions from watts to kilowatts, or from minutes to hours. Very few candidates correctly completed both conversions and calculated the cost of electricity.
- Q8** In Part (a), while most candidates correctly gave one advantage of using non-edible seeds to make biodiesel, as producing more biodiesel, few realised a second advantage was that the use of non-edible seeds removed the need to use edible seeds, which were a food source. In Part (b)(i), most candidates correctly stated that a fuel substitute was a fuel replacement. However, very few candidates named alcohol as a fuel extender in Part (b)(ii).
- Q9** This proved to be a good discriminating question. Most candidates correctly gave the direction of the gravitational force acting on the satellite, as horizontally towards the Earth in Part (a). In Part (b)(i), while most candidates correctly plotted points on the grid, few drew a straight line of best fit and did not gain full marks. In Part (b)(ii), most candidates correctly stated the trend shown by the data. Part (c) was poorly answered. Very few were able to adequately describe the formation of the universe for full marks. In Part (d) most candidates gave galaxy A as being furthest from Earth but did not associate this with having the greatest red shift. In Part (e), most candidates correctly identified at least one element shown by their wavelengths in the diagram.
- Q10** Most candidates correctly stated the trend shown by the graph of cross-sectional area versus resistance in Part (a)(i) and correctly read the resistance for the area given in Part (ii). In Part (a)(iii), most candidates knew that a lower resistance metal would have the same shape of graph as the one given, or the resistance line on the graph would be lower at all points compared to the one given. However, only a few candidates were able to correctly draw a line on the graph for Helium for the full two marks. In Part (b), many candidates were aware that length or temperature were other factors that affected resistance.

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