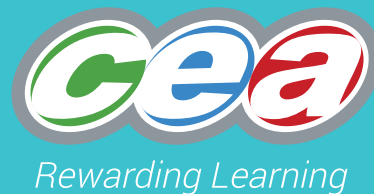


GCSE



**Chief Examiner's Report**  
**Single Award**  
**Science**

Summer Series 2022





## Foreword

This booklet outlines the performance of candidates in all aspects of this specification for the Summer 2022 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](http://www.ccea.org.uk).



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# GCSE SINGLE AWARD SCIENCE

## Chief Examiner's Report

### Subject Overview

The papers in this suite contained questions that allowed candidates of differing abilities to respond positively. Candidates' responses ranged from excellent to poor. For all papers there was a good range in marks, from very high to very low, with a good distribution in between. Most candidates attempted all questions and there was no evidence that candidates had insufficient time to complete the paper. There was, however, evidence of gaps in knowledge that has not been previously seen in other series – on occasion, a small number of candidates left whole questions unanswered. It was also evident that candidates had not practiced past papers as part of their preparation for the examination.

## Assessment Unit 1      Biology

### Foundation Tier

- Q1** This question was testing knowledge of animal and plant cells and the definition of a stem cell.
- (a) (i) & (ii)** Well answered. These were cued questions and provided a positive start to the paper for all candidates, with most achieving at least 3 of the 4 marks available.
  - (b)** Poorly answered. This was also a cued question but many students did not have sufficient knowledge of the definition of a stem cell, preventing them from completing the sentence accurately and achieving both marks available.
- Q2** This question was testing knowledge of Sections 1.8.5 and 1.8.6 of the specification on food chains and the role of the sun as an energy source.
- (a)** This question part involved candidates completing the food web using the information given. This was very well answered, and most candidates secured the mark available.
  - (b)** Generally well answered.
  - (c)** This is a very common question on Single Award Biology foundation tier papers so, as expected, it was well answered. It is worth noting that the word 'light' on its own is not an acceptable answer. The only acceptable answers are 'sun/sunlight'.
  - (d) (i)** This is also a very common question on Single Award Biology foundation tier papers. To increase the chances of the candidate achieving full marks for this type of question, the candidate must read the information in the question carefully and answer the question which is asked, and not the question they would like to have been asked.
  - (d) (ii)** Poorly answered. To gain this mark candidates were required to refer to one of the following words or phrases 'reproduction, breed, produce offspring' or an alternative word or phrase with the same meaning. Vague answers, such as, 'so they can make more together' or 'so the numbers would increase again' were not credited.

- Q3** This question was testing candidates' knowledge of the parts of the specification on alcohol (1.7.7) and the development of medicines (1.7.5). This question was also testing the candidate's mathematical skills and ability to extract information from a graph.
- (a)** Poorly answered and very few candidates achieved both marks. The first mark was awarded for correctly reading the two times from the graph (4.5 and 1) and some candidates were able to secure this mark. However, to be awarded the second mark the candidates had to go on and do the subtraction  $4.5 - 1$  to give the answer 3.5. More careful reading of the question would have helped some candidates to score both marks in this question.
  - (b)** Well answered.
  - (c)**
    - (i)** Most candidates were able to achieve one of the two marks available for this question by correctly placing 'clinical trials' in the second box. Other acceptable answers were 'testing on humans', 'testing on volunteers' and 'human testing'. Very few candidates however were able to secure the first of the two marks by correctly placing 'in-vitro testing' in the first box. 'Testing on cells' was also an acceptable answer for the first mark. The most common wrong answer for the first stage was 'testing in a laboratory' this was viewed as being too vague.
    - (ii)** There were a wide range of answers for this question and often poor literacy skills prevented candidates from securing these marks. When preparing candidates for this type of question it is worth using the mark scheme as a reference point, to illustrate the level of scientific language required. Some of the most frequently given wrong answers were, 'in case the human died', 'to see if it is effective' and 'to see the side effects of the drugs'.
- Q4** This question was testing knowledge of antibiotics and the body's defense mechanisms. This question was also testing the candidate's ability to extract information from a graph and correctly identify a trend from a graph.
- (a)**
    - (i)** Well answered by most candidates.
    - (ii)** Often when candidates are asked for a trend it is a free response question. However, on this occasion the candidates were given the first part of the trend and asked to complete it using the information given in the graph. Unfortunately, some candidates missed the fact that there were two parts to the trend- an increase in the number of cases of TB up to 2010 and then a decrease. To be awarded both marks for this question candidates were required to have both parts of the answer. There were alternative ways that candidates could indicate the year when the number of cases peaked – for example, by saying there was an increase in the number of cases of TB over the first 15 years, or the number of cases of TB peaked at 9000. 'They' or 'it' are not acceptable terms for indicating the number of cases of TB. Candidates must refer to the Y-axis in full.
  - (b)** Reasonably well answered.
  - (c)** This is a topic which candidates find difficult at the best of times. However, the disruption to some candidates learning was very evident in this question as the marks were even lower than the examiners would normally expect for this type of question. It was obvious that candidates had not completed as many past papers as usual to allow them to consolidate their learning of this topic.



- (i) Many candidates circled the antigen-antibody complex, and this was not credited with a mark.
- (ii) A substantial number of candidates mixed up the role of the two types of white blood cell.
- (iii) Candidates found this difficult and as such many did not achieve this mark.

**Q5** This question was testing knowledge of specification Sections 1.5.2: The Female Reproductive System, 1.5.4: Pregnancy and 1.5.5: Contraception.

- (a) (i) This question has not been asked before on a Single Award Biology foundation tier paper and bearing this in mind it was quite well answered overall. Some candidates, however, lost the mark by failing to draw in both ovaries in the correct place on the diagram.
- (ii) Very poorly answered. Candidates were placing Xs on various parts of the female reproductive system and not on the uterus wall/lining. To be awarded the mark candidates had to have made an effort to place the centre of their X close to the Uterus lining/wall.
- (b) (i) Well answered.
- (ii) Well answered.
- (c) (i) When drawing bar charts, it is important to stress to candidates the need for an accurate top line drawn using a ruler. Shading is not required but it can assist the examiner in identifying the placing of the top line on scripts marked online. In bar charts each bar should be an equal width and there should be equal spacing between bars. The graph paper on the question paper already had the spacing designated for each bar, however, if candidates had drawn bars that were not of equal width, then one mark was deducted.  
Generally, most bar charts were drawn accurately.
- (ii) Well answered. If candidates added up the numbers incorrectly but then went on to take this number away from 100 correctly, then they were awarded one mark.
- (iii) Well answered. It is worth noting that 'ethical reasons' is not an acceptable answer to this question.
- (iv) Well answered.
- (v) Well answered.

**Q6** This question was testing the candidate's knowledge of food and energy and biological molecules.

- (a) (i) This was well answered and most candidates were able to get 15 as an answer and secure their mark.
- (ii) Generally well answered. Unacceptable answers were 'same sized biscuit' or 'same weight/mass' on its own. To be awarded the mark candidates had to refer to both the same mass/weight and to the biscuit.
- (iii) This was very well answered by the vast majority of candidates.
- (b) (i) Overall, this was well answered. However, some candidates lost one of the two marks by not referring to 'heating' the boiling tube or 'putting it in a water bath'.
- (ii) Well answered by most candidates.

**Q7** Supervising Examiner Comments

This question was testing knowledge of the effect of exercise on heart rate, respiration and harmful substances contained in cigarette smoke.

This question was also testing the candidate's ability to carry out a mathematical calculation.

- (a) (i)** Well answered.
- (ii)** Overall, this was well answered and most candidates were able to secure at least one mark. It is important to stress to candidates that in a question like this their answers should be comparative terms as they are comparing one person with two other people, i.e., lower/quicker.
- (b) (i)** Poorly answered by all but the more able candidates. Exothermic was the only acceptable answer.
- (ii)** This was a question which proved very challenging for most candidates. Very few candidates scored more than one out of three marks for this question. Most candidates scored one mark for correctly identifying that smokers will have lower energy levels. However, candidates failed to recognise the fact that carbon monoxide combines with the red blood cells more readily for the second mark and therefore less oxygen is transported in the blood to the cells to be awarded the third mark.
- (iii)** Well answered. Nicotine and addictive were the most common answers given to be credited with two marks.

**Q8** This question was assessing written communication skills including the use of specialist scientific terms. The knowledge being tested was the effect of insulin on blood glucose levels in the body.

There were seven indicative content points available to candidates. To achieve full marks, the candidates had to include at least five of these indicative content points in their answer. Unfortunately, very few candidates secured full marks, with most candidates scoring 2 or 4 marks. It was pleasing to see that very few candidates left this question blank.

When referring to the effect of insulin on blood glucose levels candidates must indicate that the insulin is lowering, reducing or bringing the blood glucose levels back down to normal. It is not sufficient to just state that the insulin controls or regulates blood glucose levels. Similarly, when referring to the effect of insulin on respiration within the body, the candidate must state that it causes increased respiration. A reference to respiration on its own is too vague and will not lead to the awarding of this indicative content point.

**Higher Tier**

**Q1, 2 & 3** These first three questions were overlap questions with the Foundation Tier and were well answered by most 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 than those seen in Foundation Tier scripts, with more candidates able to achieve higher marks.

- Q4** This question was testing candidate's knowledge of Sections 1.8.8: Competition and 1.4.4: Plant Hormones on the specification. It was also testing the candidate's ability to carry out a mathematical calculation, plot and draw a line graph and describe a trend.
- (a)** Overall, most candidates were able to calculate the number of seedlings that survived in dish D. To assist candidates in answering this type of calculation it is worth telling them to look at how the number of seedlings that survived had been worked out for other dishes in the investigation. This should guide them to what they are required to do to get the correct answer.
  - (b)** Very well answered – most candidates were able to plot and draw the line graph accurately and secure both marks for this question. When plotting line graphs candidates should be encouraged to use a small 'x' to mark the point and then join the points with a ruler to form straight lines between all points. The line must go through the centre of all the points plotted. In Biology a line or curve of best fit is not credited.
  - (c)** Generally well answered. As previous examiners reports have stated – the only way candidates will be credited for their answer to a trend is by referring to both axes. In this case it was number of seeds sown and then number of seedlings that survived. Candidates had to make sure they were referencing seeds and seedlings correctly to be awarded the mark.
  - (d)**
    - (i)** This was a free response extended writing question on plant hormones. This is asked frequently on Single Award Biology Higher Tier papers and therefore in normal circumstances it would be expected that this question would be answered well. However, it was obvious that many candidates had been impacted by lost teaching and learning time, with perhaps less of an opportunity to focus on the completion of past paper questions. Candidates found this question challenging and only the more able candidates were able to secure all three marks.
    - (ii)** Well answered, although, as you would expect some candidates had mixed up phototropism and photosynthesis. Phototropic was also an acceptable answer to this question.
- Q5** This question was testing knowledge of genetic terminology and genetic diagrams.
- (a)**
    - (i)** This was well answered, and most candidates secured this mark.
    - (ii)** Reasonably well answered by most candidates.
  - (b)** 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 uppercase and lowercase letters are clear and leave no room for misinterpretation by the examiner. There was no error carried forward for this cross as there was only one combination of gametes which could give the correct genotypes of the offspring for individuals 6 and 7.
  - (c)**
    - (i)** This was reasonably well answered – a good number of candidates secured this mark.
    - (ii)** Reasonably well answered. It is important that candidates are taught correctly the type of graph used to display particular sets of data as this is a common question on Single Award Biology papers.
  - (d)** Well answered.
  - (e)**
    - (i)** Well answered.
    - (ii)** Well answered.

- Q6** This question was testing knowledge of Section 1.4 on the specification – co-ordination and control.
- (a) (i) This was a question which differentiated between the more and less able candidates entered for the Higher Tier. There was a full range of marks achieved with only the more able candidates achieving all three marks. This question was scaffolded to assist the candidates in their processing of the information and hopefully achieving all three marks. However, some candidates simply did not have the knowledge of the topic to be able to formulate a response. Candidates had the chance of scoring one mark if all the names of the neurons were correct but in the wrong order, or any two neurons were in the correct order, for example, motor following association. Relay or connector were also acceptable terms for the association neurone.
- (ii) Poorly answered - candidates found this question challenging.
- (iii) Again, this was poorly answered.
- (b) Well answered. Although this question did not have any choose from options, candidates benefited from the scaffolding of the question to help them secure their marks.
- Q7** This question was testing knowledge of the menstrual cycle and contraception.
- (a) Generally well answered.
- (b) There was a mixed response to this question. Those candidates who were secure in their knowledge of this topic achieved both marks. However, with many candidates it was clear they were guessing and often mixed the two hormones up or chose a hormone not linked to the menstrual cycle, for example, testosterone.
- (c) This was well answered. If candidates are going to refer to in implant as the method of contraception that can alter a woman's hormone level, then they need to clearly state that it is a 'hormone' implant. The word 'implant' on its own will not be credited.
- (d) Well answered.
- (e) Mixed response. To be awarded the mark for this question candidates had to clearly state that both the egg and the sperm cannot meet/fertilisation cannot take place. Referencing the egg or sperm on their own was not worthy of a mark.
- Q8** This question was testing the candidate's knowledge of food chains and natural selection
- (a) (i) Well answered.
- (ii) This was well answered by the majority of candidates.
- (b) (i) 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 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 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.
- (ii) Well answered.

## Assessment Unit 2      Chemistry

### Foundation Tier

- Q1** This question, was on hazard symbols. It asked candidates to give the benefits of hazard symbols and to identify the toxic symbol and draw the flammable symbol. Overall, this question was well answered with many candidates scoring all four marks available. It is important to note that vague answers such as 'symbols are easier to see than words' were not accepted for Part (a).
- Q2** This question tested candidates' knowledge of separating techniques. Part (a) was well answered. The majority of candidates were able to select the correct separating technique for the stated mixture. Part (b) focused on chromatography, while most candidates were able to name the technique many were unable to interpret the chromatogram correctly. The most common incorrect response was that there were 3 colours in the sample – candidates counted in the mark for the original sample.
- Q3** In Part (a) candidates were asked to identify the synthetic material from the list. This was well answered with many candidates correctly selecting nylon. A small number of candidates incorrectly chose silk. In Part (b) most candidates were able to apply their knowledge to select the correct properties.
- Q4** This question proved challenging for many candidates. This was most evident in Part (a)(ii) as many candidates did not know that Group 2 elements were the Alkaline Earth metals. It is important to emphasise that all three words were essential in the response to this question and that 'Alkali' was not an acceptable alternative to 'Alkaline'. In Part (b)(ii) many candidates did not know that all Group 2 elements have 2 electrons in the outer shell. The reference to 'outer' shell was important. In Part (c)(iii) many candidates were unsure of how to calculate the number of atoms in magnesium sulfate (6) and the most common error was to give the number of elements (3).
- Q5** This question examined candidates' ability to recall and apply their knowledge. In Part (a)(ii) it was pleasing to see most candidates attempted to draw the line graph although, it was also evident that many candidates had not practiced this skill. There were many candidates who did not accurately plot the points or did not draw the line as a smooth curve. Using a ruler to join the points was not given credit. In Part (a)(iii) candidates were asked to describe the trend shown in the results, most candidates scored one of the two available marks for stating as the time increased so did the volume of gas. Fewer candidates were able to complete the trend by stating that there was no more gas produced after 40 seconds. It should be noted, it was important to quote a figure from the graph to gain the second mark. In Part (a)(iv) the test for hydrogen was well known, although on some occasions candidates did not state that the splint had to be burning and lost one of the two marks. A simple statement of 'the pop test' only gained one mark. Part (b) proved difficult for most foundation tier candidates and many candidates scored one of the two marks for adding a line above that already plotted. Candidates seemed unaware that the total volume of gas would be the same at the end of the experiment, in this case 25cm<sup>3</sup> of gas.
- Q6** In Part (a) candidates were asked to define the term hydrocarbon and describe how crude oil is formed. There was a varying level of success amongst candidates in providing the detail required for these answers. There was also several candidates who described the separation rather than the formation of crude oil. Overall, Parts (b) and (c) were answered well.

- Q7** This was the first of the carry over questions to the higher tier and viewed as medium demand.
- (a)** This question asked candidates to define the term “thermochromic”. Most candidates gave an indication that a temperature change was involved. Only the higher level candidates were able to identify that a colour change took place with a change in temperature.
  - (b)** Candidates were asked to calculate how much larger the measuring range of the digital thermometer was compared to the forehead strip thermometer. Many candidates successfully calculated this accurately. Most candidates were able to achieve at least one of the two marks for calculating the range of the digital thermometer.
  - (c)** Candidates were asked to identify one advantage and one disadvantage of using the digital thermometer. This question was generally well answered with most candidates achieving at least one mark. Candidates needed to clearly identify an advantage of the digital thermometer over the forehead strip thermometer.
- Q8**
- (a)** Candidates were asked to complete a table of information relating to some common laboratory acids and alkalis. This was well answered by the majority of candidates.
  - (b)**
    - (i)** Candidates were asked to identify a piece of apparatus that could be used to measure volume. This question was poorly answered by many candidates. Some candidates misinterpreted the question completely, giving a pH probe as their answer while others incorrectly answered measuring jug/measuring tube rather than measuring cylinder.
    - (ii)** The majority of candidates were able to give a reason why it was better to use a pH meter rather than universal indicator to measure pH.
    - (iii) & (iv)** Candidates were provided with a graph which showed the results of adding acid to a volume of alkali during a neutralization reaction. Nearly all the candidates were able to use the graph to identify the pH of the alkali at the start of the investigation. Higher level candidates used the graph to work out the volume of acid needed to neutralize the alkali. Those candidates answering Part (iv) incorrectly gave either  $10\text{cm}^3$  or  $16\text{cm}^3$  as their answer which related to horizontal sections of the graph.
    - (v)** Candidates were asked to use the information in the graph and previous table to identify the acid and alkali used in this investigation. Although, several candidates identified which acid and alkali were used, they wrote the answers the wrong way around. This was a good question which differentiated between candidates of different abilities.
  - (c)** Candidates were asked to complete the general word equation for a neutralisation reaction. Very few candidates achieved full marks. Most candidates achieved one mark for giving “water”.
- Q9** This question assessed candidates’ quality of written communication with reference to a banded mark scheme. The question was on conducting a flame test and comparing copper chloride with potassium chloride. Many candidates’ responses were in band B and achieved 4 marks. Only a few top candidates gained the full 6 marks on this higher tier question. Many candidates were unable to give the correct flame colours for copper and potassium ions. The QWC answers were generally of a higher standard than the foundation tier answers with more candidates able to achieve four marks or full marks.

## Higher Tier

**Q1–3** See foundation tier comments (Q7 – 9)

**Q4** Candidates were provided with information regarding an instant cold pack.

- (a) Most candidates were able to achieve at least one of the two marks available for this question.
- (b) Candidates were asked to suggest a reason why the bag was shaken. Many candidates repeated the information already provided in the question stem. Higher level candidates were able to reason that shaking the bag speeded up the process of dissolving the chemicals which was the required answer.
- (c) (i) & (ii) Candidates were asked to name the elements in ammonium nitrate and give the number of atoms present in the formula. While many candidates were able to give the element names fewer correctly identified the number of atoms present.

**Q5** Candidates were provided with information relating to 6 different experiments investigating rates of reaction between acids and metals.

Most candidates answered Parts (a) and (b) reasonably well.

- (c) While the majority of candidates identified that experiment C was at a higher temperature and achieved one mark, fewer candidates went on to explain that a higher temperature would provide the particles with more energy to move faster and therefore leading to more successful collisions. This was another good question which differentiated candidates' responses.
- (d) Many candidates failed to recognise that copper would be unreactive.
- (e) Candidates were asked to explain the meaning of the term "catalyst". Most candidates recognised that a catalyst affected the rate of a reaction and gained one mark. Higher level candidates achieved full marks they also recognised that a catalyst does not get used up during the reaction.

**Q6** Candidates were provided with information on the use of nanoparticles in developing reusable facemasks.

- (a) This was a familiar question from previous papers however, many candidates did not know the definition of non-biodegradable and referred to littering/waste.
- (b) (i) It was pleasing to note that more candidates answered this question correctly than in previous years.
- (ii) Most candidates identified correct answers from the information given.
- (iii) This question was not well answered. Many candidates referred to the dangers of inhaling nanoparticles but few answered correctly by citing the dangers outlined in the specification regarding potential cell damage.
- (c) Many candidates correctly identified the example of suncreams, as given in the specification. Some candidates went on to discuss disadvantages again, misreading the question.
- (d) (i) Candidates were provided with a diagram of zinc as represented on the periodic table and asked to calculate the number of protons, electrons and neutrons. Most candidates gained one mark, few gained full marks.
- (ii) This question was poorly answered by most candidates.

- Q7** (a) Candidates were asked to complete and balance a symbol question for the reaction between calcium carbonate and hydrochloric acid. This question was poorly answered by the majority of candidates. Many candidates stated “H<sub>2</sub>O” and achieved one mark. Few candidates achieved full marks. Candidates need to take care and use subscript numbers when writing symbol equations.
- (b) This question was reasonably well answered.
- (c) Candidates were asked to fully describe the trend shown by the results given. While most candidates recognised the initial part of the trend, few went on to describe the trend shown towards the end of the reaction.
- (d) Most candidates achieved one mark in this question for “limewater”. Several candidates mixed up the test for carbon dioxide with the test for hydrogen gas.
- (e) (i) Higher level candidates correctly labelled a “lone pair”. Many candidates left this question blank.
- (ii) While most candidates correctly stated “covalent” bonding, the second part of the sentence completion proved more challenging for a number of candidates.
- Q8** In general, this question was not well answered by most candidates. While most candidates attempted all parts of the question, only a few higher level candidates achieved some marks.
- (a) Most candidates achieved one mark in this question for correctly writing the formula for ethene. Higher level candidates achieved full marks. The structure of propene proved to be very challenging for most candidates.
- (b) (i) Only a few candidates answered this question correctly to achieve full marks. Most candidates incorrectly included a double bond and attached hydrogen at either end of their diagram.
- (ii) Very few candidates were able to complete the sentence to correctly identify “addition” polymerization.

## Assessment Unit 3      Physics

### Foundation Tier

- Q1** This question on space was well received by most candidates. In Part (a) most could name a rocky planet and realized that gravity was the force that keeps planets in orbit. In Part (b) most could use the equation to calculate the astronaut’s weight on the moon and realized that gravity on space is zero. In Part (c) most could deduce the years that had the biggest increase in the number of artificial satellites and could give one use of these.
- Q2** This question on radiation was also well received. In Part (a) most candidates knew that beta was the missing radiation type and gamma travels the furthest in air. In Part (b) most could read the graph to complete the conclusion and find the correct amount of lead to reduce count rate to 400cpm. In Part (c) most knew that background radiation was radiation that is all around us and could name one source.



- Q3** This question on the use of electricity proved to be a good discriminator. In Part (a) (i) most candidates recognized that the amount of electricity used increased between 8am and 4pm, some seen that it increased and then decreased but very few could state that the amount of electricity used increased until 8am and then decreased. In Part (ii) most knew that it would be warmer and brighter in summer but couldn't go on to state that the consequence would be that less electric lighting or heating would be required in summer. In Part (b)(i) most could calculate the current flowing to the toaster, but few knew in Part (ii) that the correct fuse would be the next highest value i.e., 13A. In Part (c) very few knew that a 13A fuse would allow too much current to flow to the lamp.
- Q4** This question on electric circuits also proved to be a discriminator. In Part (a) most candidates knew the correct symbol for a bulb but didn't know the symbol for a cell but many candidates incorrectly drew the bulbs in series. In Part (b) few knew that in a parallel circuit the bulbs get the total voltage although most were aware that the current is split. Part (c) was well received with most able to state that the bulbs were connected in parallel and if one bulb went out the other would stay lit.
- Q5** This question was on waves and in Part (a)(i) few candidates recognized that the water waves were transverse, but most could state that the wavelength decreased, and the frequency increased as the voltage was increased in Part (ii). In Part (iii) most could correctly calculate the velocity of the wave using the equation given and the values in the table. In Part (b) most recognized that either the frequency or wavelength of the waves shown was different, but few could state that the amplitude was the same.
- Q6** This question about energy and motion was well received with most candidates able to use the principle of conservation of energy to complete the table in Part (a) and then go on, in Part (b) to describe that the potential energy decreased and kinetic increased as the object moved down the slope. Part (c) proved more difficult with few realizing that the object would move at the same speed across a flat surface if there was no friction. In Part (d) most knew that if a surface was rough, the speed would be slower, and some realized that the rough surface had more friction.
- Q7** This question about heat transfer proved to be a good discriminator. In Part (a) few candidates knew that a shiny surface would reduce heat loss through radiation, but most knew that the tea would be hottest at the top of the flask as it rises due to convection. In Part (b) most knew the wax would melt allowing the drawing pins to fall and could attempt the calculation of time difference between the first and last pin falling. Any mistakes in the calculation were due to an incorrect reading from the graph for the time of the last pin to fall. Most were also aware that a glass rod would take a far longer time.
- Q8** This question about thinking and stopping distances proved to be a good discriminator. In Part (a)(i) most candidates could see that the graph showed increasing speed made stopping distance longer. In Part (ii) most were aware that a wet road would lead to a longer stopping distance but then had trouble showing this on a graph with many drawing straight lines from (0,0) rather than a curve that was similar in shape to that given for a dry road. Part (iii) was poorly received with very few able to correctly read the 60km/hr stopping distance from the graph and then substitute this value into the calculation.
- In Part (b) many vague answers were given for the effect alcohol has on stopping distance with most candidates focusing on the effects of alcohol on the brain rather than thinking and stopping distance.
- In Part (c) most candidates could name a safety feature found in a vehicle, but some had difficulty describing how this feature reduced the risk of serious injury. Again, a lot of vague responses were given.

- Q9** Part (a) was the six-mark QWC question on how electricity is made in a fossil fuel power station, and it was pleasing to see so few blank spaces. This part proved to be a very good discriminator with most candidates able to name two fossil fuels and gain two marks. Those candidates who achieved four marks were able to give descriptions of what happened in each part of the power station while those who gained full marks could also state the energy change occurring in each part of the power station. In Part (b) most candidates could name a renewable source of energy and explain why there is an increased emphasis on the use of renewables.

## Higher Tier

### Unit Overview

This Higher tier paper was well received by candidates across the ability spectrum. It was very pleasing to see very few blank spaces across most papers.

- Q1, 2 & 3** These first three questions were overlapping 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 on electrical circuits. In Part (a)(i) the majority of candidates knew the direction of conventional current flow. In Part (a)(ii) it was good to see candidates achieving two out of the three marks, knowing the particle involved and its charge. In Part (b)(i) the candidates had to draw a graph, this was very well answered most achieving full marks. Those who did not joined the points with a ruler rather than a smooth curve. Part (b)(ii) was very well answered.
- Q5** This question was on transformer and was not well answered. In Part (a)(i) most candidates gave an overall effect rather than fully describing the effect of changing the frequency. In Part (a)(ii) most candidates were able to give a difference in efficiencies.
- Part (b) was very badly answered this type of question has been asked in many series before hand, very few knew about preventing energy being lost as heat.
- Q6** In Part (a)(i) candidates had to calculate the potential energy of a ball at the top of some stairs. This question was very badly answered by the majority of candidates. Candidates did not convert the mass of the ball from grams to kilograms, they also forgot to convert centimetres to metres. In Part (a)(ii) few candidates knew the joule was the unit of energy.
- Part (b) was on the Principle of Conservation of Energy the majority of candidates achieved a full mark of three for this question.
- Part (c) of this question was on balanced forces. In Part (c)(i) most candidates were able to work out the size and the direction of the force. In Part(c)(ii) most candidates knew the resultant force provided an acceleration. In Part (c)(iii) most candidates thought the car was stationary rather than moving at a steady speed.
- Q7** This question was on astronomy and was very well answered Part (a) was on Red-shift. In Part (a)(i) candidates knew the name of the effect. In Part (a)(ii) and (iii) they knew the order of galaxies from the Sun and which galaxy was moving fastest.
- Part (b)(i) was a calculation involving standard form many candidates are still finding it difficult to work with calculations involving this standard form, centres maybe need to practice more with these types of calculation. Very few candidates were able to work out how many light years Proxima Centauri was from Earth.

In Part (c) candidates were able to achieve two out of the three marks for this question on the Big Bang theory. They achieved a mark for knowing of a singularity and a cosmic expansion, few knew that gravity pulled the particles together.

- Q8** This question was on radioactivity. In Part (a) the majority of candidate's were able to use the graph to find the half-life of the radioactive source. In Part (b) most candidates achieved two of the three marks. They lost the third mark by not fully explaining the need for a short half-life. In Part (c) most of the candidates knew the process of ionisation.

## **Assessment Unit 4      Practical Skills**

In this academic year, the practical unit was available for optional omission. Most centres chose to omit this unit for all or some of their candidates. Therefore, no valid comparisons can be made about performance of this small and atypical candidature.

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