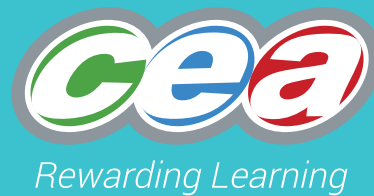


GCSE



Chief Examiner's Report
Single Award
Science

November Series 2023



Foreword

This booklet outlines the performance of candidates in all aspects of this specification for the November 2023 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

Overview

This paper was well suited to the cohort and allowed candidates of all abilities to respond positively to the questions. There was no evidence that candidates did not have enough time to complete the paper and candidates attempted most of the questions. The paper rewarded candidates who had revised thoroughly for the exam, while being a good overall discriminator for those candidates who were able to apply their knowledge to more challenging questions.

- Q1** This question was testing candidates' knowledge of animal and plant cells.
- The cued question for Part (a) allowed the candidates to settle into the paper. However, the role of the cytoplasm was commonly mistaken as forming a boundary around the cell.
- (b)** Generally well answered, however, some candidates confused the cell membrane for the cell wall.
- Q2** This question was testing candidates' knowledge of the female reproductive system, the journey of a sperm cell from leaving the penis to reaching the egg cell and methods of contraception.
- (a)** Well answered.
- (b)** This is a familiar style of question for this paper. The topic being tested seemed to be well understood with most candidates able to give two structures in the correct sequence and therefore obtain one of the two marks on offer.
- (c)** Well answered. Most candidates were able to correctly state that the method which was the least effective at preventing pregnancy was the rhythm method and the method which prevents the spread of sexually transmitted diseases was the condom.
- (d)** Vague reference to 'too young' or 'he might change his mind' were not rewarded in this question part without qualification that he may want to have children later in life or that a vasectomy is difficult to reverse. This led to some candidates losing the mark for this question part.
- Q3** This question was testing candidates' knowledge of disease-causing microorganisms and antibiotics.
- (a)** A mixed response. A significant number of candidates gave the flu as a disease caused by bacteria so lost one of the two marks on offer.
- (b)** In this question part only the more able candidates were able to identify the antibiotic as penicillin and correctly name bacteria as the microorganisms targeted by antibiotics.

- Q4** This question was testing the candidates' ability to describe a trend, extrapolate a graph and carry out a simple mathematical calculation.
- (a) (i) Some candidates lost marks in this question for not referring to both the snail numbers and time when describing the trend. When describing a trend candidates must refer to both the x and y axis in their answer.
 - (ii) Some candidates did not accurately extrapolate their graph to give an estimation of the number of water snails in the river in 2020. This mistake could have been avoided if candidates had used a ruler.
 - (b) This was well answered by most candidates. To achieve both marks for this question, candidates were required to accurately read the values from the graph and then carry out the correct subtraction. Some leeway was given for the number of snails at 2015, due to the fact that this value was not on a major gridline, and then a correct subtraction from 3500 (the number of water snails present in 1990).
- Q5** This question was testing candidates' knowledge of the parts of the specification on effects of exercise (1.2.10) and food and energy (1.2.3).
- (a) Well answered by most candidates.
 - (b) This was a question which proved very challenging for most candidates on the basis that it was only asking for the differences during the period of exercise. Very few candidates achieved both marks. More careful reading of the question could have allowed more candidates to achieve full marks.
 - (c) Generally well answered, however, it is worth noting that answers of 1.3 and 1.30 were not credited.
 - (d) (i) Very well answered.
 - (ii) Well answered, although it is worth noting that a vague reference to teenagers developing rather than growing was not credited.
- Q6** This question was testing candidates' knowledge of content on 1.3 (chromosomes and genes) and 1.6.1 (types of variation) of the specification.
- This proved to be a challenging question overall for many candidates.
- (a) (i) Only the more able candidates were able to name the nucleus as the organelle housing chromosomes.
 - (ii) The most common wrong answer given was chromosomes. This was disappointing because more careful interrogation of the stimulus material would have eliminated this as a possible answer for candidates.
 - (b) The term double helix was not well known by candidates, so this proved to be a question which discriminated well between differing abilities.
 - (c) Only the more able candidates knew the term genome. Definitions are asked frequently on the Unit 1 papers, so it is important that candidates learn these and are able to recall them when required.
 - (d) (i) Very poorly answered. A significant number of candidates appeared to mis-read the question and gave two examples of discontinuous variation.
 - (ii) Generally well answered. Candidates should be encouraged to check over their calculations before the end of the examination to ensure they have entered numbers correctly into their calculator. Some candidates had shown the correct working out but then missed out on the second mark due to an error in their final calculation.

- Q7** This question was testing candidates' knowledge of content on 1.2.8 (food and health) and 1.4.7 (diabetes) of the specification.
- (a)** Candidate's answers had to be specifically confined to dietary changes to be given credit. No marks were awarded for descriptions of lifestyle changes.
 - (b)** Well answered. Incorrect answers included reference to liver damage and high blood pressure while vague descriptions of bad eyesight or kidney problems were also not awarded any marks.
 - (c)** The economic impact of diabetes in the population was well known.
 - (d)** Most candidates were able to correctly interpret the evidence and identify the type of diabetes described. However, giving the type of diabetes on its own did not get the mark. The candidate had to go on and use the correct data from the table to explain their answer and some candidates failed to do this resulting in them losing the mark for this question.
- Q8** This question was testing candidates' knowledge of the need for chlorophyll in photosynthesis by testing a leaf for starch (1.8.4) and the production of oxygen (1.8.3).
- (a)** A disappointing number of candidates thought starch would be present in the white area of the leaf and absent in the green area.
 - (b)**
 - (i)** Most candidates were able to use the evidence provided to identify green as the least useful colour of light for photosynthesis.
 - (ii)** A step taken to ensure validity in the experimental design was well described by candidates.
- Q9** This question was testing candidates' knowledge of food chains and food webs (1.8.6), biodiversity (1.8.9) and the meaning of the terms biotic and abiotic (1.8.7). It was also testing the candidates' ability to interpret graphs.
- (a)**
 - (i)** Most candidates were able to complete the food chain from the food web to gain one mark.
 - (ii)** There was some confusion over the impact caused by a decline in the number of Kestrels. A significant number of candidates suggested that the voles were eating the stoats, despite having completed the food chain correctly.
 - (b)** This question proved very challenging. Very few candidates were able to appreciate how the hedge increased biodiversity. The question was asking why the hedgerow helps 'increase' biodiversity. Therefore, candidates had to reference 'more' in their answers to gain marks, i.e. more food, more habitats, more shelter. Candidates should always be encouraged to read questions carefully to ensure they know exactly what they are being asked.
 - (c)** Most candidates demonstrated good understanding of the term 'biotic'.
 - (d)** Well answered. However, reference to generalisations such as weather, pollution or greenhouse gases were not credited.
 - (e)** To gain the mark for this question the candidate needed to have a link between cause and effect in their answer. Some candidates simply described the increase in lichens and the decrease in acid rain and made no attempt to explain the increase in lichens as a consequential effect of the decrease in acid rain.
 - (f)**
 - (i)** The compound bar chart was generally well interpreted; most candidates correctly identified spruce as the type of tree least affected by acid rain.

- (ii) Most candidates gave the correct percentage of fir trees suffering severe damage. However, a small number of candidates failed to correctly subtract the value of 80, which they had read from the graph, from 100 so lost the mark for this question.

Q10 This question was testing candidates' knowledge of the body's defence mechanisms (1.7.2).

- (a) (i) The concept of active immunity is not well understood and very often the diagram was not correctly completed. This is an area of the specification that candidates could focus more on when revising and completing past papers.
- (ii) & (iii) On most occasions the terms antigen and lymphocytes were not well known.
- (b) (i) & (ii) Only a minority of candidates could correctly identify active immunity as the type of immunity and very few candidates could recall an advantage of this type of immunity.

Q11 This question was testing candidates' knowledge of biological molecules (1.2.4) and food tests (1.2.5). It was also testing the candidate's ability to write in continuous prose using specialist scientific terms and good written communication skills.

In this extended writing question, many candidates were able to name a protein-rich food and give the function of proteins. However, the reagent used to test for protein was often incorrectly identified (often as Benedict's). Most candidates were able to obtain one indicative content mark for describing the colour of the reagent at the start or end of the test for protein. Unfortunately, many candidates made no attempt to describe how the test would actually be carried out.

Higher Tier

Overview

The first three questions in this paper were overlap questions with the Foundation Tier (GSA11) 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 the candidates' knowledge of competitive invasive species (1.8.8) and consumers (1.8.5).

- (a) Well answered by most candidates. 'Spreads rapidly' was the most common correct answer given by candidates. Alternative ways of saying this, for instance that the competitive invasive species reproduce or grow rapidly, were also worthy of credit. It is worth noting that 'spreads easily' is not an acceptable answer.
- (b) Candidates had to be specific and state that the animals that feed on producers were 'primary' consumers or herbivores to be awarded this mark. Simply stating that the animals were consumers was not credited.
- (c) Very well answered by many candidates.

- Q5** This question was testing candidates' knowledge of content from 1.7.7 on the specification. It was also testing the candidates' ability to draw conclusions from data.
- (a)** This was well answered by many candidates. For those candidates who did lose marks, it was generally for their poor use of language. When teaching this skill of drawing conclusions from data it is worth stressing to the candidates the importance of using the exact wording given in the headings of the columns in the table or if it is a graph, the labels on the x and y axes. For this question if a candidate gave an answer stating that 'males are more likely to drink alcohol than females' then this was not credited. It is the statement 'more likely' that makes this answer incorrect and not worthy of credit.
 - (b)**
 - (i)** This is a question which is asked frequently on Single Award Biology higher tier papers and was answered well by many candidates.
 - (ii)** Well answered.
- Q6** This question was testing candidates' knowledge of antibiotic resistant bacteria (1.7.4).
- (a)** Very well answered. The most common answer given by candidates, which was worthy of credit, was that patients in hospitals have open wounds. If candidates wish to refer to the immune system of the patients in hospitals, it is worth noting that this will only be given a mark if they make reference to the fact that the immune system is weakened, or the patients have a low immune system. Simply stating that the patients are more ill or more vulnerable to infections is not worthy of a mark.
 - (b)** Very well answered. Most candidates achieved both marks for this question.
- Q7** This question was testing candidates' knowledge of content on 1.4.2 (voluntary and reflex actions) and 1.4.3 (reflex arc) of the specification.
- (a)**
 - (i)** A good number of candidates were able to correctly identify the neurone, labelled A, as the sensory neurone.
 - (ii)** This was poorly answered. This is a frequently asked question on the Single Award Biology papers so candidates should be encouraged to learn the definition of a synapse.
 - (b)** Well answered. Most candidates were able to achieve this mark.
- Q8** This question was testing candidates' knowledge of section 1.4.4 (plant hormones) on the specification.
- (a)** Well answered although, as you would expect, some candidates had mixed up phototropism and photosynthesis. Phototropic was also an acceptable answer to this question.
 - (b)** There was a mixed response to this question. Those candidates who were secure in their knowledge of this topic achieved this mark. However, many candidates forgot to say 'more' light, 'more' photosynthesis or 'more' growth. 'More' needed to be in the answer for candidates to achieve the mark for this question. An alternative to the word more in relation to growth was 'faster'.
 - (c)** Well answered.

- Q9** This question was testing candidates' knowledge of genetic engineering (1.3.11). It was also testing the candidates' ability to state a trend from information displayed in a table.
- (a)** Generally well answered. This was a more complex table of data than in recent papers, however, most candidates were able to pick out one of the three trends shown by the information.
 - (b)**
 - (i)** This was a question which differentiated between the more and less able candidates. The definition of genetic engineering is clearly stated on the specification and candidates should be encouraged to learn definitions to secure more marks on their paper.
 - (ii)** Well answered. As expected, 'insulin' was the most common answer given by candidates.
 - (c)** A high proportion of candidates were able to identify Jersey as the breed of cattle which would increase the risk of developing heart disease. However, only the more able candidates were able to achieve both marks. To get the second mark candidates had to recognise that the milk from the Jersey cow had the 'highest' amount of fat present. A comparative term was required and a link to fat. Alternatives to 'highest' were 'most', 'biggest' or 'more'.
- Q10** This question was testing candidates' knowledge of genetic diagrams (1.3.6).
- (a)** Poorly answered by all but the more able candidates.
 - (b)** Generally well answered.
 - (c)** The correct answer to this question was 'brother'. An alternative answer that was credited was 'brother and sister'. Sibling, which was the most common answer was not awarded a mark as it did not consider the gender of the people involved (persons 4 and 5).
 - (d)** 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. While candidates are not penalised for using alternative letters, they should be encouraged to use the letters given in the question (in this case A and a).
 - (e)** Reasonably well answered. ECF was applied in this question.
- Q11** This question was testing candidates' knowledge of the menstrual cycle (1.5.3).
- (a)**
 - (i)** Well answered.
 - (ii)** Well answered.
 - (iii)** Poorly answered - only the more able candidates were able to achieve both marks for this question. The names of both hormones, oestrogen and progesterone, were needed for the first mark and then a reference to the fall or drop of these hormones to cause menstruation to occur was required for the second mark.
 - (b)** This was well answered. If candidates are going to refer to an implant as the method of chemical contraception, they need to clearly state that it is a 'hormone' implant. The word 'implant' on its own will not be credited.
 - (c)**
 - (i)** Reasonably well answered.
 - (ii)** Poorly answered. Very few candidates achieved this mark.
 - (iii)** Only the more able candidates were able to secure this mark.

Assessment Unit 2 Chemistry

Foundation Tier

Overview

The paper allowed candidates of all abilities to respond positively to at least parts of each of the questions. Most candidates attempted all questions and there was no evidence that candidates had insufficient time to complete the paper. The importance of good handwriting should be emphasised to candidates as this allows examiners to clearly read responses.

Q1 Hazard Symbols

This question on hazard symbols was answered well by nearly all candidates. It was surprising to see the number of candidates who were unable to clearly draw the hazard symbol for explosive. In Part (c) it should be noted that vague answers such as 'easier to see' were not credited as a reason why symbols are used rather than words.

Q2 Dissolving and Separating

Most candidates struggled to correctly match the key terms, solute, solvent and solution, to the substance. Part (b) proved more straightforward with a range of correct responses allowed. Part (c) had a mixed response, with only some candidates correctly identifying evaporation as the correct separating method.

Q3 Acids and Alkalis

In Part (a) candidates were asked to identify the most alkaline soil – this was well answered. In Part (b) most candidates identified the correct number of plants but found it more challenging to explain why potatoes would not grow in the alkaline soil, it was not enough to simply quote the two pH values. Part (c)(i) should be a familiar style of question where candidates were required to complete a table about household substances and the colour of universal indicator – this was well answered by nearly all candidates. In Part (ii) the most common incorrect answer was 'neutral'. Part (d) was well answered.

Q4 Materials and the Environment

In Part (a) only a small number of candidates were able to correctly define the term non-biodegradable, the most common omission was a reference to microorganisms. The bar chart in Part (b) was well drawn by most. Part (c) gave information about the disposal of plastics and this was well received by the majority of candidates. The main reason candidates did not gain full marks was because they did not follow the instruction to use only the information provided.

Q5 Metals and their Reactivity

This type of question has been asked in previous series'. It involved interpreting data on metal reactions. In Part (a) most candidates were at least able to gain one of the two marks available for sorting the metals into the correct order of reactivity. In Part (b) only around half of the candidates were able to use the observations to identify metal A as potassium. Part (c) asked candidates to identify the type of reaction that gives out heat and a large number of candidates gained this mark. In Part (d) only some candidates were able to complete the word equation.

Q6 Periodic Table

In Part (a)(i) candidates were asked to name the Russian scientist who developed the first periodic table. This was well known but some of the spellings were questionable. Around half of the candidates knew that Mendeleev had left gaps for undiscovered elements. In Part (b) candidates were provided with an outline of the Periodic Table with only some elements shown, they were then asked to use these elements to answer a series of questions. Overall, this question was well answered with the exception of Part (ii) in which candidates struggled to identify an element in the same period as argon. Most candidates mistakenly chose an element in the same group. Part (c)(i) was well answered by most candidates but the formula of a sodium ion in Part (ii) was not well known. Part (d) was well received, the main error was in part Part (ii) in which candidates identified the correct element's atomic number rather than giving the element's name.

Q7 Elements and Compounds

On Part (a) the calculation was completed well by most candidates. Part (b) proved to be more challenging, candidates who did identify the hydrogen molecules correctly found it difficult to explain their choice.

Q8 Reactions of Metal Carbonates and Formulae

This question gave the candidates information about a series of reactions. In Part (a) most candidates were able to name the Bunsen burner as the correct piece of apparatus. In Part (b) only some candidates were able to associate the production of a gas with a loss of mass. Parts (c) and (d) were well received – the main error that candidates made was in Part (d) if they also used 'no colour change' as one of the pieces of evidence this was not given credit because there were two metal carbonates that did not change colour. Part (e), although a standard type of question, proved to be differentiating.

Q9 Crude Oil

In Part (a) QWC was examined in the candidate's response. Most Foundation Tier candidates scored at least two of the six marks. Candidates seemed more comfortable in describing the formation of crude oil rather than its separation. In Part (b) candidates were provided with a table of information about the fractions of crude oil and asked to identify a trend in Part (a). This was well answered by many but Part (ii) seemed more challenging with many candidates not scoring any marks. Part (c), as expected, was also a differentiating question with very few Foundation Tier candidates scoring all three marks.

Higher Tier**Overview**

The paper allowed candidates of differing abilities to respond positively to the questions. There was a good range in marks from very high to very low with a good spread between. 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. Most candidates attempted all questions and there was no evidence that candidates had insufficient time to complete the paper. The overlap questions (1 and 2) were generally completed to a higher standard than the same questions on the Foundation Tier.

Q1 Reactions of Metal Carbonates and Formulae

This question gave the candidates information about a series of reactions. In Part (a) nearly all candidates were able to name the Bunsen burner as the correct piece of apparatus. In Part (b) more candidates at Higher Tier were able to associate the production of a gas with a loss of mass compared to Foundation Tier. Parts (c) and (d) were well received – the main error that candidates made was in Part (d) if they also used ‘no colour change’ as one of the pieces of evidence this was not given credit because there were two metal carbonates that did not change colour. Part (e), although a standard type of question, proved to be differentiating, but again more successfully answered than at Foundation Tier.

Q2 Crude Oil

In Part (a) QWC was examined in the candidate’s response. Most Higher Tier candidates scored at least four of the six marks. Candidates seemed more comfortable in describing the formation of crude oil rather than its separation. In Part (b) candidates were provided with a table of information about the fractions of crude oil and asked to identify a trend in Part (a). This was well answered by many but Part (ii) seemed more challenging with many candidates not scoring any marks. Part (c), as expected, was a more differentiating question with the most challenging part being Part (ii) – naming the type of bonding.

Q3 Calcium Fluoride - Bonding and Atomic Structure

In Part (a)(i) candidates were asked to calculate the number of electrons and neutrons in calcium fluoride. A lot of candidates were able to calculate the number of electrons but found it more difficult to calculate the number of neutrons. In Part (ii) most candidates were able to score one of the three marks for describing the correct electron transfer but only some clearly identified that two electrons are transferred and only the most able candidates were able to state that two atoms of fluorine were required. In Part (iii) only a few candidates correctly identified the flame colour for calcium as brick red; ‘red’ on its own was not accepted as an answer. Overall Part (b) was well answered.

Q4 Indicators

In Part (a) candidates were given a table of data relating to colour changes of different indicators. Parts (i) and (ii) were well answered, but in Part (iii) candidates found it difficult to express their explanation and so only gained one of the two marks available. In Part (b), most candidates were able to order the methods correctly but found it more challenging to gain the two marks for explaining their chosen order.

Q5 Properties of Materials and Polymers

The first parts of this question provided information about five plastics. Parts (a) and (b) were both well answered. Part (c), as expected, proved more challenging. In Part (i) many candidates struggled to name the type of reaction as polymerization. Many thought it was exothermic or chemical. In Part (ii), very few candidates managed to construct the correct balanced equation – this is a skill that could be easily practiced. In Part (iii) candidates had to describe non-biodegradable as the lack of ability to rot due to the action of microorganisms; this was not well known and most candidates did not mention the need for microorganisms.

Q6 Rates of Reaction

This question, in general, was very well answered by the majority of the candidates. Just a couple of points to note here. In Part (a)(ii) when the graph levels out, the response of the 'reaction finishes' is not accepted as a response. In Part (b) very few candidates gained full marks for using particle theory to explain the effect of an increase in concentration of acid on a reaction. Many described what happens to particles at a higher temperature. It is also important to note that, in order to gain full marks, candidates need to mention 'successful' collisions.

Q7 Electrolysis and the Extraction of Aluminium

In Part (a) large number of candidates identified bauxite as the ore.

In Part (b) candidates were asked to explain how electrolytes conduct electricity – very few answered this question correctly and many candidates did not attempt an answer.

In Part (c)(i) the majority of candidates identified the anode as the positive electrode but in Part (c)(ii) explaining the need to replace the anode, as expected, proved challenging to many candidates.

Assessment Unit 3 Physics

Foundation Tier

Overview

This foundation tier paper was well answered by most candidates. There were few blank spaces across the majority of papers. The QWC question was also well attempted by the majority of candidates.

Q1 Astronomy

This question was about space. It was well answered by most candidates. In Part (a)(i) most candidates completed the table and identified the trend which linked the diameter of a planet with gravity. In Part (ii) most candidates recognised the astronaut would weigh most on the planet with the greatest gravity. In Part (iii) most candidates knew that the planet furthest from the Sun would be the coldest. Part (b)(i) was well answered by most candidates. Most knew that our central star was called the Sun and gravity provided the orbital force for the planets. In Part (iii) most candidates knew there were eight planets in our solar system. In Part (iii) most correctly named a gas planet.

Q2 Electrical Conductors

The question about electrical conductors proved to be a good discriminating question. While most candidates knew the bulb would light or current would flow, if a conductor was placed between the crocodile clips, few gave both for the full two marks in Part (a)(i). In Part (ii) most candidates worked out that two cells provided three volts to the circuit. In Part (b) most candidates knew that either copper or iron were conductors. Many candidates identified both for two marks.

Q3 Energy Types and Conservation

In Part (a)(i) just over half the candidates understood that the builder used either kinetic or chemical energy when he climbed the ladder and had gained potential energy when he stood at the top of the ladder in Part (ii). In Part (iii) most candidates knew that the builder wasted energy, as either heat or sound, as he climbed the ladder. In Part (b) most knew that energy could not be created or destroyed, or that it could only be changed. However, only half of the candidates correctly completed the conservation of energy statement. In Part (c) very few correctly gave the joule or kilojoule as the unit of energy.

Q4 Heat Transfer and Energy Sources

Question 4 was also a good discriminating question. Just over half of the candidates recognised that shiny surfaces reflected heat in Part (a)(i) while in Part (ii) just under half understood that convection caused hot air to rise. In Part (b) most candidates correctly interpreted the table of information, relating cross-sectional area, temperature and the current needed to heat a wire and gave one appropriate conclusion. Few candidates gave both conclusions. Part (c)(i) about was well answered by most candidates. Most knew that coal, oil and gas were fossil fuels. In Part (ii) just over half of the candidates knew that wood was a renewable source that could be burned in homes.

Q5 Wind Turbines Producing Electricity

Most candidates found this question challenging. Most correctly gave the maximum power produced in the wind turbine in Part (a). In Part (b) while many recognised that as wind speed increased the power produced by the wind turbine also increased, none realised that, if the if the wind speed was less than 3m/s, no power was generated and gained one of the two marks. In Part (c) just over half of the candidates correctly gave the range of speed that produced the maximum power. In Part (d)(i) most knew that a magnet must move inside a coil of wire for a generator to produce electricity. In Part (ii) few stated that a stronger magnet or more turns on the coil were required to produce more electricity.

Q6 3-Pin Plug

This question was well answered by most candidates. They knew the position of the neutral wire inside the plug, in Part (a)(i), the colour of the live wire in Part (ii) and another safety feature of the plug, in Part (iii). In Part (b)(i) most candidates correctly calculated the current flowing to an appliance and selected the correct fuse in Part (ii). In Part (c)(i) while most candidates knew that the plug of a doubly insulated appliance did not require an Earth wire, few recognised that a doubly insulated appliance had its outer cover made of plastic.

Q7 Waves

This question was poorly answered by most candidates. While most candidates correctly gave the amplitude of the wave shown in Part (a)(i), very few gave its correct wavelength in Part (ii). In Part (b) just under half of the candidates correctly gave the time for one complete vibration for the wave shown. In Part (c)(i) very few candidates were able to give another example of a transverse wave and fewer correctly chose the diagram representing the movement of particles in a transverse wave.

Q8 Distance-Time Graph

Most candidates responded well to this question. Most correctly stated that the bicycle was moving at constant speed from A to B, or that it was stationary from B to C. However, few correctly answered both question Parts (a)(i). In Part (a)(ii) most candidates knew that a steeper diagonal line on this type of graph represented a faster speed and in Part (b) most correctly calculated the average speed.

Q9 Radiation

This was a good discriminating question. Few candidates were able to fully complete the line graph for the values in the table in Part (a). Most correctly plotted four points and gained one mark and some candidates plotted all five points for two marks. However, few candidates were able to plot all five points and draw a smooth curve through the points to gain full marks. In Part (b), most candidates were aware that the count rate decreased as the distance from the source increased or that the count rate stayed the same after 1.2m. However, few candidates gave both parts for full marks. In Part (c) more than half the candidates recognised the level of background radiation on the graph was 16cpm.

Q10 Ohm's Law

This was the QWC question. Most candidates' responses suggested that they had not conducted this prescribed practical (P1) and seemed to mix it up with prescribed practical P2 (resistance v length). Most candidates recognised that the meters shown in the circuit diagram were an ammeter and a voltmeter and gained two marks. Some candidates knew that an ammeter should be connected in series or a voltmeter in parallel and gained four marks but very few were able to provide any detail on how this experiment should be carried out or how the results could prove Ohm's law.

Higher Tier

Overview

This higher tier paper was well answered by most candidates across the ability spectrum. It was pleasing to see very few blank spaces across most papers. Even the six-mark QWC question was attempted by the vast majority of candidates.

Q1–4 These were the overlap questions with the Foundation Tier paper.

Q1 Astronomy

This question was about space and was well answered by most candidates. In Part (a) (i) most candidates completed the table and identified the trend linking the diameter of a planet and gravity. In Part (ii) most candidates recognised the astronaut would weigh most on the planet with the greatest gravity. In Part (iii) most candidates knew that the planet furthest from the Sun would be the coldest. Part (b)(i) was well answered by most candidates. Most knew that our central star was called the Sun and that gravity provided the orbital force for the planets. In Part (iii) most candidates knew there were eight planets in our solar system. In Part (iii) most correctly named a gas planet.

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The question about electrical conductors proved to be a good discriminating question. While most candidates knew, the bulb would light or current would flow, if a conductor was placed between the crocodile clips. However, few gave both for the full two marks in Part (a)(i). In Part (ii) most candidates worked out that two cells provided three volts to the circuit. In Part (b) most candidates knew that either copper or iron were conductors. Many candidates identified both for 2 marks.

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In Part (a)(i) just over half the candidates understood that the builder used either kinetic or chemical energy when he climbed the ladder and gained potential energy when standing at the top of the ladder in Part (ii). In Part (iii) most candidates knew that the builder wasted either heat or sound energy as he climbed the ladder. In Part (b) most knew that energy could not be created or destroyed, or it could only be changed. However, only half of the candidates completed the conservation of energy statement correctly. In Part (c) very few correctly gave the joule or kilojoule as the unit of energy.

Q4 Heat Transfer and Energy Sources

Question 4 was also a good discriminating question. Just over half of the candidates recognised that shiny surfaces reflect heat in Part (a)(i) while in Part (ii) just under half understood that convection caused hot air to rise. In Part (b) most candidates correctly interpreted the table of information, relating cross-sectional area, temperature and the current needed to heat a wire and gave one appropriate conclusion. Few candidates gave both conclusions. Part (c)(i) about was well answered by most candidates. Most knew that coal, oil and gas were fossil fuels. In Part (ii) just over half of the candidates knew that wood was a renewable source that could be burned in homes.

Q5 Heat Transfer

The question on heat transfer was well answered. Most candidates correctly named convection as the heat transfer method in Part (a)(i) and correctly indicated the direction of water flow around the home hot water system in Part (ii). In Part (b)(i) most candidates correctly calculated the time interval between the first and last pins to fall off the rods from and recognised that it took longer for the pin to fall from a glass rod, in Part (ii). Candidates found Part (b)(iii) more challenging. Around half of the candidates recognised that a fair test required the length or width of the metal rods to be the same. In Part (c) most candidates recognised that conduction was the heat transfer method through metals or that metals had free electrons or heat made the atoms of the metal vibrate but few candidates gave a full response.

Q6 Road Transport

This was a good discriminating question. In Part (a) most candidates gave one part of the trend shown in the graph of distance travelled by an electric car compared to speed. However, few were able to give the complete trend; up to a speed of 18mph the distance travelled increased with speed, at higher speeds the distance travelled decreased.

In Part (b) most candidates knew that regenerative braking used energy created when braking or that this energy was used to recharge the battery. Few candidates were able to give both parts for two marks. Many candidates thought regenerative braking was an automatic stopping system. In Part (c) most candidates knew that governments have been encouraging car manufacturers to reduce reliance on fossil fuels because they are non-renewable or because they produced carbon dioxide.

Q7 Electromagnetic Spectrum

This question proved to be a good discriminator. The more able candidates stated that ultraviolet was the missing wave from the table in Part (a)(i) and correctly stated, that as wavelength increased, frequency decreased, in Part (ii). In Part (b) most candidates were able to calculate the speed of light using standard form. Part (c) (i) was poorly answered. Few candidates showed any knowledge of the microwave heating effect. Some knew that microwaves affected the water molecules in the food but very few were aware that microwaves were absorbed by the water molecules. This made the water molecules vibrate faster. Most candidates gained 1 or no marks for this part of the question. In Part (c)(ii) about half of the candidates knew that microwaves were also used for mobile phone signals.

Q8 Astronomy

In Part (a)(i) most candidates correctly stated that the graph showed, as time increased, the distance between galaxies increased or that the universe was constantly expanding. Few candidates knew the universe started from a singularity. In Part (ii) less than half of the candidates were aware that the red-shift or CMBR was another piece of evidence for the Big Bang theory. A few knew that the Steady State theory was another scientific theory for the formation of the universe. In Part (b) most candidates correctly stated the Milky Way. In Part (c) about half the candidates knew that light years were used to measure distance in space because the distance between galaxies is huge.

Q9 Energy Conservation

This question also proved to be a good discriminator. Few candidates correctly calculated the kinetic energy of the ball. They typically failed to convert mass into kilograms in Part (a). In Part (b)(i) few candidates knew that as the ball travelled upwards, its kinetic energy was being transferred to potential energy and the potential energy was maximum at the highest point reached. In Part (ii) only about half of the candidates correctly completed the sentence with the principle of conservation of energy.

Q10 Balanced Forces

Few candidates recognised that the moving car would continue to move with constant speed because the forces applied were balanced in Part (a). In Part (b)(i) few candidates could work out that the largest resultant force shown in the diagrams was 12N to the right although, more than half realised that a resultant force would cause the speed of a car to change, to accelerate or decelerate in Part (ii).

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