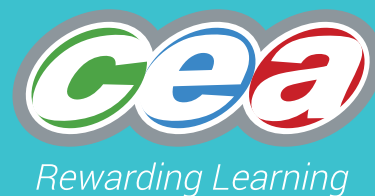


GCSE



Chief Examiner's Report Single Award Science

March Series 2023



Foreword

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

Subject Overview

Examiners reported that the papers across this series were fair and covered a wide range of topics from the specification. The questions tested recall, application of knowledge, reasoned judgements, and mathematical content. The papers allowed candidates the opportunity to demonstrate their knowledge and understanding of the subject. However, examiners were concerned that some candidates seemed to be entered for the incorrect tier. It was noted that skills such as graph drawing and completing calculations were not as strong as in other past module series.

As with all online marked units, candidates should be encouraged not to work in pencil. The erased indentations on the paper can be picked up during the scanning process. This can make it difficult for the examiner to interpret their answer. Candidates should also try to limit their answer to the space provided. If candidates write elsewhere on the paper they should indicate this clearly in the main answer space. If candidates use a supplementary answer booklet, candidates should ensure that the question number and part are clearly and correctly indicated.

Assessment Unit 1: Biology

Foundation Tier

Unit Overview

There was no indication that foundation tier candidates ran out of time and the language seemed appropriate for this level. Most candidates attempted all questions and there was a range of marks.

- Q1** This question was testing knowledge of how to reduce the risk of heart disease and substances contained in cigarette smoke.
- (a)** Very well answered.
 - (b)**
 - (i)** Very well answered.
 - (ii)** Generally well answered - these were dependent marks. The candidate could not be awarded the mark for the explanation if they had incorrectly identified the name of the substance in cigarette smoke that makes it difficult to give up smoking. The most common wrong answer was nitrogen.

- Q2** This question was testing knowledge of methods of contraception, the female reproductive system and the effect of alcohol on a developing foetus.
- (a)**
 - (i)** This was very well answered, and most candidates secured both marks.
 - (ii)** Generally well answered.
 - (b)**
 - (i)** This is a very common question on Single Award Biology foundation tier papers so, as expected, it was well answered.
 - (ii)** A mixed response. Womb was also credited as an acceptable answer. Spelling of scientific terms must be phonetically correct to be awarded the mark.
 - (iii)** This was generally well answered, with the most common right answer that 'the alcohol can cause harm to the developing foetus'. Candidates had to be very clear when answering this question that the harm was being caused to the developing foetus and not the mother.
- Q3** This question was testing candidate's knowledge of Section 1.7 of the specification on disease and body defenses.
- (a)** Well answered.
 - (b)** Most candidates were able to achieve one of the two marks available for this question by placing two letters in the correct order. Very few candidates achieved both marks for this question.
 - (c)**
 - (i)** Well answered.
Most candidates were able to correctly identify paper disc C as the disc that contained the most effective form of the antibiotic. However, the explanation part was less well answered. To be awarded this mark the candidate had to correctly state that paper disc C had the largest clear area around it, but they also had to recognise that this meant that the most bacteria had been killed.
- Q4** This question was testing knowledge of Section 1.2 of the specification - food and diet. This question was also testing the candidate's ability to correctly identify a trend from a table of information.
- (a)**
 - (i)** Mixed response. A good number of candidates correctly identified that more calcium, protein or fat were present when the cereal was taken with milk. However, many candidates could not go on and give the explanation, or the explanation was linked to the wrong food type.
 - (ii)** Well answered.
 - (iii)** Well answered.
 - (b)**
 - (i)** Very poorly answered. Candidates find this the most difficult food test to remember so it is worth reinforcing this with them prior to the modular exam, as it is a frequently asked question.
 - (ii)** Again, very poorly answered. The candidates are required to state the end colour for a positive result as it appears in their specification, so the expected answer was white emulsion. White or emulsion on their own were not acceptable answers.

- (c) (i) This was very poorly answered. Very few candidates achieved this mark. When answering a trend question candidates need to refer to both axis on the graph or in this case both columns of the table. If it is a trend from a table, they must refer to the information in the first column, i.e., the years increasing and then the effect this is having on the information in the second column, i.e., that the mass of herring caught is decreasing.
- (ii) Candidates found this difficult and as such many did not achieve this mark.
- Q5** This question was testing knowledge of section 1.4.4 on the specification –plant hormones and Section 1.8.7 – monitoring environmental changes.
- (a) (i) Well answered. Most candidates correctly identified B as the way the plant shoot would look after 48 hours in the light.
- (ii) Reasonably well answered. It is worth noting that this is a common question on the Single Award Biology papers and the answer that is expected is always the same. The candidates are expected to recognise that there is more light available for more photosynthesis and so for more growth. No further explanation is required.
- (b) A mixed response.
- Q6** This question was testing the candidate’s knowledge of the nervous system and hormones.
- (a) (i) This was poorly answered. Candidates were not credited if they simply picked out the correct statement from the boxes, John’s muscle contracts. To be awarded the mark they had to know that the effector was the muscle - this could be stated as ‘muscle’ or ‘John’s muscle’ on the answer line.
- (ii) Very few candidates achieved all three marks. A lot of candidates found this very difficult and especially as they had no words to choose from.
- (b) Overall, this was well answered.
- (c) Well answered.
- Q7** This question was testing candidate’s knowledge of chromosomes and genes. This question was also testing the candidate’s ability to carry out a mathematical calculation.
- (a) (i) A mixed response. This calculation was only worth one mark so therefore the candidates should have expected this to be a simple calculation. However, some candidates carried out very detailed calculations which were incorrect and meant they had used up valuable time. It is worth pointing out to candidates when you are preparing them for modular exams that the mark allocation in calculations is an indicator of the difficulty level.
- (ii) Overall, this was well answered, considering that this is an interpreting question and involves analysis of the information provided.
- (b) (i)(ii)(iii) These were all poorly answered by all but the more able candidates.
- (c) (i) The graph was well plotted by many candidates.
- (ii) This was a question which proved very challenging for most candidates. Candidates must treat this type of question like one asking about a trend and refer to both axis of the graph.
- (d) Poorly answered.
- (e) Reasonably well answered.

- Q8 (a)** This question was assessing written communication skills including the use of specialist scientific terms. The knowledge being tested was the effect of exercise on pulse rate.

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 foundation tier 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.

Candidates should be encouraged to answer the bullet points in order and use the stimulus material provided.

- (b)** **(i)** Reasonably well answered.
(ii) Poorly answered.

Assessment Unit 1: Biology

Higher Tier

Unit Overview

The quality of answers on the paper 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 2 (a)) were generally of a higher standard with more higher tier candidates able to achieve higher marks.

- Q1 Q2** These first two questions were overlap questions with the foundation tier and were well answered by the majority of the higher tier candidates.

- Q3** This question was testing candidate's knowledge of insulin and the menstrual cycle.

- (a)** **(i)** Well answered.
(ii) Very few candidates achieved both marks for this question. The most common answer given for one mark was that the glucose was converted to glycogen. However, very few candidates could go on to state the additional responses of the body, i.e., that there is an increased uptake of glucose into the cells or increased respiration. This is a very common question on the higher tier paper and the same standard answer is always acceptable, glucose converted to glycogen, increased respiration and increased uptake of glucose into the cells. When preparing candidates for their modular exam it would be worth getting them to learn these three answers and practise answering this type of question from past papers.
- (b)** **(i)(ii)** Candidates find the information relating to the menstrual cycle difficult, so it is not surprising that these two parts were poorly answered. There are only two hormones linked to the menstrual cycle that candidates must know, so it was imperative that they learn their functions. Part (ii) was a good discriminator as it required the candidates to use the stimulus material and their knowledge to formulate an answer. To be awarded both marks candidates had to refer to both the egg and the sperm and correctly identify that the egg is released on day 14 or at ovulation and the sperm is there to fertilise the egg as it survives for three days. Pregnancy cannot occur without fertilisation and fertilisation cannot occur without an egg and sperm so these were key parts of the answer.

- Q4** This question was testing knowledge of specialisation in cells and stem cells.
- (a)** Reasonably well answered.
 - (b)**
 - (i)** This proved challenging for all but the more able candidates. Most candidates were able to identify the bone marrow as the source of the stem cells. However, very few could go on and give a correct explanation. When teaching the specification, it is important to go into a little bit of detail about the conditions mentioned to give candidates the opportunity to answer these interpreting type questions.
 - (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 learn these answers directly from the specification. This is a common question on Single Award Biology higher tier papers.
 - (c)** This was very poorly answered. Candidates were required to know the definition of biodiversity to be able to answer this question.
- Q5** This question was testing candidate's knowledge of natural selection and photosynthesis.
- (a)**
 - (i)** This was a question which differentiated between the more and less able candidates. There was a full range of marks achieved with only the more able candidates achieving all three marks.

Candidates should be encouraged to learn the set bullet points for natural selection and apply these to different situations. The candidates should 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.
 - (b)** Mixed response. Most candidates could identify the source of energy as the sun. However, very few candidates referenced the chloroplasts or chlorophyll for the second mark.
- Q6** This question was testing candidate's knowledge of MRSA and antibiotics. This question was also testing candidate's mathematical capabilities.
- (a)**
 - (i)(ii)** Generally well answered.
 - (iii)** 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 white blood cells up which resulted in them losing both marks.
 - (b)**
 - (i)** This was well answered.
 - (ii)** Well answered. The most common right answer was 'to isolate the patients with the superbug'.

- Q7** This question was testing the candidate's knowledge of genetic diagrams, genetic screening and genetic conditions.
- (a) (i)** Due to the way this question was asked no 'error carried forward' was allowed. However, it was still reasonably well answered. Candidates were required to understand the genetic terminology to be able to assign the correct genotype to the gametes. Once they had correctly worked out the genotype of the gametes, they were able to complete the cross to get the offspring mark as well.
 - (ii)** This was poorly answered. It was apparent that the candidates did not know what the term phenotype meant.
 - (b) (i)** This proved to be a challenging question for all but the more able candidates.
 - (ii)** Well answered. This has been on previous Single Award Biology papers and the answers which are acceptable are on previous mark schemes.
 - (iii)** Very well answered. Candidates are encouraged to stick to the genetic conditions given on their specification when answering this type of question.
- Q8** This question was testing the candidate's knowledge of phototropism.
- Overall, this question was a good differentiator, proving challenging for all but the most able candidates.
- (a) (i)** Poorly answered.
 - (ii)** Well answered.
 - (iii)** For this type of question candidates are encouraged to use the stimulus material and to look closely at what it is showing them. Careful examination of the diagram would have allowed more candidates to achieve at least one of the two marks for this question.
 - (b) (i)** Reasonably well answered by the more able candidates.
 - (ii)** Poorly answered. This proved to be a very challenging question, as would be expected for the final question on a higher tier paper.

Assessment Unit 2: Chemistry

Foundation Tier

Unit Overview

This paper was well received by most candidates who attempted all questions indicating they had adequate time to do so. Candidates should be encouraged to form symbols for elements using the format given in the Periodic Table as errors are often made in formulae and equations. They should also take care when drawing graphs and complete these in pen to aid the scanning process.

- Q1** This question on hazard symbols was answered well by nearly all candidates. Candidates coped well in Part (a) with matching the symbols and risks. In Part (b) only a small number of candidates were unable to draw the correct symbol for caution.

- Q2** This question on separation techniques was answered well by nearly all candidates. Candidates were mostly able to match the diagrams and methods in Part (a). In Part (b) a reasonable number of candidates were able to correctly name chromatography to separate colours in ink – although the spellings of chromatography were on occasions dubious.
- Q3** Candidates answered Part (a) of this question, which involved identifying acids and alkalis from the table of information given, relatively easily. Part (b) proved more challenging to some and again the spelling of neutralisation on occasions was unclear. It is important to note that neutral was not an acceptable answer as this does not describe the process/reaction.
- Q4** This question was based on properties of materials and the interpretation skills of candidates. In Part (a) most candidates were able to select ‘cheap’ and ‘strong’ as the properties required by iron, but in Part (b) a large number of candidates did not choose aluminium as the suitable material to make airplanes from and were unable to select the property of ‘low density’ as being important for this use. It should be noted that listing all properties meant students could not be given credit for the answer.
- Q5** This question was based on an investigation to test the strength of a material. Candidates were asked, in Part (a), to identify the controlled variable – the most common incorrect answer was to add the same amount of weight. Overall, the bar chart was well drawn, for scanning purposes it is important that any graphs are drawn in pen. Part (c) proved the most challenging aspect of this question, it asked about the advantage and disadvantage of landfill. Most candidates when describing the disadvantage simply gave a definition of non-biodegradable, which was not accepted.
- Q6** This question was based on forensics, Parts (a) and (b) were generally well answered by all candidates. It is important to note when asked for a way to make fingerprints visible ‘blue light’ is not an acceptable alternative to UV light and when asked for a use of fingerprints, vague answers such as ‘for security’ are not accepted. Part (c) proved to be a discriminatory question, whilst many candidates were able to put the method for carrying out a flame test in the correct order, very few gave the correct symbol for a lithium ion or the correct flame colour for potassium, it should be noted that purple is not an acceptable alternative to lilac. There are only a limited number of colours required to be known and candidates should be encouraged to learn these carefully.
- Q7** This question was based on the Periodic Table, Part (a) asked for the name of the Russian scientist who developed the first periodic table – this was well known. Part (b) asked for the name of the Group not included in Mendeleev’s table, many incorrect answers were seen for this question, including Group 0. Part (c) received a mixed response, the symbols of elements were given for candidates to choose from, but many used other elements to answer the questions and so did not receive any credit. The symbol for a halogen was quite commonly given as ‘H’ instead of choosing ‘Cl’.
- Q8** This question mainly tested knowledge on symbols and formula. Part (a) asked to name the most common metal listed in the table of information about elements in the Earth’s crust, the most common incorrect answer was to quote the percentage of oxygen. Candidates coped well with the calculation in Part (b) and in Part (c) candidates were still not confident in counting the number of atoms represented by a formula – this is a skill that can easily be practised.

- Q9** This question was based on information given about Group 1 elements. In Part (a) candidates seemed well rehearsed in identifying the trend shown by the information. Part (b) asked for an explanation as to why a student's conclusion was incorrect, candidates found this difficult to express in words. Part (c)(i) asked for the electronic configuration for sodium, this was well answered, but Part (ii) was challenging for some students who were unable to describe the formation of a sodium ion, Part (iii) was the most difficult, with only a small number of Foundation Tier candidates able to say that Group 1 elements all have one electron in their outer shell. In Part (iv) there were a variety of answers as to how to store the alkali metals, vague answers such as 'in a safe place' were not acceptable.
- Q10** Part (a) of this question assessed QWC. Candidates were asked to compare and contrast the reaction of sodium and calcium with water. It was pleasing to see that most candidates attempted the question, but there were varying degrees of success. Many candidates seemed to compare reactions of sodium and potassium rather than calcium. The most common mark awarded was the similarity of producing bubbles. Many candidates scored two marks of the possible six, with fewer scoring four and only a very small number of foundation candidates scoring full marks. In Part (b) many candidates wrote about using a safety screen which did not gain credit as the question focused on the adding of the sodium into water.
- Q11** Part (a) of this question asked for the definition of a hydrocarbon – most candidates scored at least one mark out of two. Part (b)(i), asking for the fractions of crude oil, was not well known by most foundation candidates. Part (ii) was better answered. Part (c) proved challenging for many foundation candidates, especially when asked to name the alkane in Part (i), significantly more candidates were able to successfully draw the structure of propane.

Assessment Unit 2: Chemistry

Higher Tier

Unit Overview

This paper was well received by most candidates who attempted all questions indicating they had adequate time to do so. There were still some candidates who may have been better suited to sitting the foundation paper. Candidates should be encouraged to form symbols for elements using the format given in the Periodic Table as errors are often made in formulae and equations.

- Q1-3** These questions were overlap questions, and as expected, there was a higher quality of answers given from most higher tier candidates compared to foundation candidates. In Question 3 (c)(ii) higher tier candidates were asked to draw the structure of propene, this was not well done, and is an easily practised skill.
- Q4** This question was based on graphene. Most candidates had good knowledge of this topic, but candidates should have more easily gained the two marks for the definition of the structure of graphene.
- Q5** These questions proved to be a discriminator. There were only a small number of candidates who scored well in this question overall. The most challenging part seemed to be the calculation of the R_f value, most candidates did not realise measurements needed to be taken from the baseline. In Part (c)(i) very few candidates were able to identify that ink A contained both C and D, they simply stated there were two dyes present.

- Q6** This question was based on electrolysis, Part (a) was well answered by most candidates. Part(b)(i) was well answered but it should be noted that simply listing all properties does not gain credit. Not surprisingly writing the balanced equation in part (c) was only answered successfully by a small number of candidates.
- Q7** The focus of this question was on bonding. In Part (a) was well answered by the majority of candidates scoring at least one mark. In Part (b) most candidates were able to identify the type of bonding correctly as covalent but in Part (c) many candidates incorrectly named a covalent compound rather than an element. Part (d) asked for the charge and mass of an electron which was surprisingly not well answered. Part (e) was also a discriminatory question with candidates still finding the concept of state symbols challenging. Part (f)(i) asked for the test for oxygen, while most candidates coped well with this question, many struggled with the concept of a glowing splint describing it as a 'recently lit' splint or a 'blown out' splint. It is important that candidates use correct scientific terms. Part (ii) was well answered with most candidates able to describe the bonding in magnesium oxide, only a small number of candidates were able to go on to give the correct formula of a magnesium ion in Part (iii).
- Q8** The topic covered by this question was rates of reaction, Part (a) seemed challenging to candidates but Part (b) which involved interpretation of data was well answered. Part (c) asked for the effect of changing temperature on rate and an explanation in terms of particles, candidates struggled to achieve full marks in this question. In order to gain full marks, it is important that candidates understand the idea of particles colliding 'successfully'. Part (d) focused on catalysis; most candidates successfully gave the definition of a catalyst in Part (a) but found describing the trend shown in the graph for Part (b). If there is a change in trend in a graph it is important that candidates acknowledge this point, in this graph there was an increasing trend up until 150g of catalyst was added then the percentage rise in rate remained constant. It is only by quoting the figure from the graph that full marks can be achieved.

Assessment Unit 3: Physics

Foundation Tier

Unit Overview

The paper included questions that allowed candidates of all abilities to respond and demonstrate their knowledge and understanding. However, there was evidence of candidates failing to read the questions accurately which resulted in a loss of marks. The mathematical questions were generally well answered where the formula was provided in the correct format with numbers which did not require processing before substitution. Answers which required explanations were not well answered. This suggested that many candidates lacked knowledge and understanding about core concepts.

- Q1 (a)** Most candidates answered this question well. Many candidates identified the position of gamma radiation. A significant number of candidates chose B which was an incorrect response.
- (b)** Most candidates answered this question well with only a small number either drawing two lines from a statement or allocating radio to broken bone detection.
- (c)** This was a more discriminating question. Only the better candidates selected speed as the correct answer.

- Q2** (a) While most candidates answered this question well a minority failed to read the question and included the wasted energy heat.
- (b) This was a challenging question. Very few candidates were able to identify the correct word to complete the sentence.
- (c) (i) Most candidates answered this question well. Frequent incorrect responses involved division of the energies stated.
- (ii) Most candidates correctly calculated efficiency.
- (iii) Many candidates failed to identify the live wire.
- Q3** (a) (i) Most candidates drew the correct symbol for an ammeter. Only a small number of candidates failed to include a circle or drew the symbol for a different component.
- (ii) Only the better candidates stated the name of the correct unit.
- (b) Many candidates correctly identified the trend, although some used terms such as amount of wire rather than length.
- (c) (i) While many candidates identified the correct type of circuit, a large number of candidates showed a lack of understanding.
- (ii) Most candidates achieved at least 1 mark for both switches closed, with only the better candidates gained the 2nd mark for switch 2 closed.
- Q4** (a) (i) Most candidates answered this question well, which indicated a good understanding and knowledge about the order of the planets.
- (ii) A small but significant number of candidates did not know the rocky planets.
- (iii) Most candidates answered this question well. Many candidates answered, Mercury and gave a reasoned response.
- (iv) While this should have been a familiar question it was poorly answered. A minority of candidates correctly gave gravity as the force.
- (v) Most candidates scored at least one mark. Many incorrect responses included planets and stars.
- (b) Most candidates answered this question well. Incorrect responses included vague references to weather, TV, or mobile phones without the necessary detail.
- Q5** (a) Candidates found this a challenging question. Many answers stated oil as the non-renewable source and ignored nuclear. Geothermal was more frequently stated for award of the mark.
- (b) Most candidates offered adequate definitions with some incorrect responses stating that the source could not be reused.
- (c) A familiar question that frequently causes difficulty – only the more able candidates were awarded both marks.
- (d) (i) Again candidates showed skill at stating the trend in data, with many candidates awarded the mark. Some lack of accuracy in the name – quantity/number of discs - and some candidates simply quoted figures in their response.
- (ii) This was a challenging question. Very few candidates gave an adequate response.

- Q6** (a) (i) Many candidates correctly stated amplitude.
(ii) Very few candidates were able to determine the correct wavelength.
- (b) Many candidates found this difficult. Incorrect answers suggested sound, ultrasound or transverse.
- (c) (i) Although this was a challenging question it was well answered by many candidates.
(ii) This question was less well answered. Many candidates divided the speed by two, which indicated a lack of understanding and problem-solving skills.
- (d) Most candidates made a good attempt at this calculation. Those who failed to access full marks gained 1 mark for substitutions. Candidates should be reminded to show their working out.
- Q7** (a) (i) Most candidates answered this question well.
(ii) Candidates found this question challenging because they had difficulty in de-coding the question.
(iii) Many candidates were accurate in their response to the worn tyre's condition but not for the tired driver condition. Many candidates were awarded 1 mark.
- (b) (i) While this should have been a familiar question many found it challenging and reflected by the significant number of incorrect responses.
(ii) Most candidates answered this question well.
(iii) Many candidates made incorrect substitutions for this question.
- Q8** (a) (i) This question was poorly answered by most candidates. Some recognised that alpha was the source but failed to use the count rates to justify their choice and instead relied on paper as the explanation. Some candidates stated an absorber rather than a source.
(ii) This was also a challenging question for many candidates.
- (b) Many candidates were awarded a mark for unstable, but many failed to state the protons and neutrons condition.
- (c) This question was reasonably well answered. Frequent incorrect answers included x-rays or chemotherapy.
- Q9** This question was not answered well. Many candidates failed to focus on a physics explanation and brought in information from other sources such as mental health, eyesight issues etc. Many failed to state that microwaves were used. Many failed to adequately describe the relaying of the signal. The most common marking point awarded was for cancer as a risk.
- Q10** (a) Heat transfer was poorly addressed. Candidates' responses showed confusion in their understanding between conduction, convection and radiation. Most candidates failed to state that white is a very poor emitter of radiation.
- (b) (i) Most candidates recognised that the lesser amount of water lost heat faster. Fewer candidates stated the direct relationship between time and temperature.
(ii) Many candidates correctly deduced room temperature.

Assessment Unit 3: Physics

Higher Tier

Unit Overview

The paper included questions that allowed candidates of all abilities to respond and demonstrate their knowledge and understanding. However, there was evidence of candidates failing to read the questions accurately which resulted in a loss of marks. The mathematical questions were generally well answered where the formula was provided in the correct format with numbers which did not require processing before substitution. Answers which required explanations were not well answered. This suggested they had a less than secure knowledge base of the core concepts.

Q1-4 These were carry over questions from the Foundation Tier paper. The questions were better answered on most occasions by the Higher Tier candidature.

- Q5**
- (a)**
 - (i)** Most candidates drew the correct symbol for the ammeter in a correct place but only the very able were able to place the voltmeter in the correct place.
 - (ii)** Only around half of the candidates correctly indicated the direction of electron flow.
 - (b)**
 - (i)** Many candidates correctly calculated the resistance. Common mistakes were often due to incorrect substitutions.
 - (ii)** This was poorly answered. Candidates thought that a thicker wire had a higher resistance.
 - (iii)** While most candidates correctly plotted the graph, best fit lines were poorly drawn by many. This indicated that many candidates did not have a ruler in the examination. Points were rarely marked as a cross or a circle containing a dot.
- Q6**
- (a)**
 - (i)** While many candidates made accurate substitutions, they often went on to make incorrect calculations. But overall, a sound knowledge of potential energy.
 - (iii)** Candidates found this question challenging. Many recognised the need to quote the principle but many failed to apply it to this situation.
 - (b)** This question was poorly answered by most candidates. Only a few gained marks. Occasionally a mark could be awarded for stating the acceleration of the rock.
- Q7**
- (a)** Many candidates failed to use only the fossil fuels in the calculation, but when they did the calculation was well done.
 - (b)** Most candidates recognised the reliance of renewable sources on the weather but many failed to address both sun and wind.
 - (c)** Only the better candidates recognised biomass as a burned source.
 - (d)** This question was poorly answered. Many candidates confused fusion and fission and many were not able to name a nuclear fuel.

- Q8 (a)** Well answered – most candidates stated hybrid correctly.
- (b) (i)** Many candidates failed to include all quantities in the table.
- (ii)** Some candidates stated the need to preserve fossil fuels rather than give the carbon dioxide argument.
- (iii)** Most candidates answered this question well. Many candidates recognised the longer charging time.
- Q9 (a) (i)** This question was poorly answered. Many candidates were challenged by the use of standard form.
- (ii)** This was a challenging question.
- (iii)** This was a recall question which was not well answered. Candidates frequently equated the unit with time rather than distance.
- (iv)** A challenging question due to the standard form numbers. Only some candidates achieved full marks. Some gained partial credit for substitutions again this highlighted that candidates should clearly show their working out.
- (b) (i)** Many candidates correctly stated the answer as redshift.
- (ii)** Definitions varied and indicated that most candidates had a poor understanding of galaxies being a group of stars not planets.
- (c) (i)** Most candidates answered this question well.
- (ii)** Most candidates answered this question well.

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