

**Additional Science A  
Twenty First Century**

General Certificate of Secondary Education **GCSE J631**

**Report on the Units**

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**June 2007**

**J631//MS/R/07**

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This report on the Examination provides information on the performance of candidates which it is hoped will be useful to teachers in their preparation of candidates for future examinations. It is intended to be constructive and informative and to promote better understanding of the syllabus content, of the operation of the scheme of assessment and of the application of assessment criteria.

Reports should be read in conjunction with the published question papers and mark schemes for the Examination.

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### General Certificate of Secondary Education

### GCSE Additional Science A (21<sup>st</sup> Century) J631

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## A215/01: Additional Science A, Foundation Tier

### General Comments

The paper was well attempted and produced a high mean mark.

Candidates should be aware that the marking is done from scanned images of their scripts. If candidates alter their answers those alterations must be made clearly and unambiguously.

### Comments on Individual Questions

1 This question was well attempted. Almost all candidates were able to link at least one of the symbols to its meaning, and many could also choose at least one correct safety precaution. Weaker candidates had more difficulty in deciding the precaution for lithium and often suggested both the lower boxes instead of making a single choice. Many candidates struggled with the word equation, though the most able scored well.

2 Most of the candidates could correctly state the colour of chlorine gas, though blue and green/brown were often seen. Many also went on to give the colour of bromine, and the most able were able to complete all three sections. Weaker candidates often suggested that the formula of iodine was either  $\text{IO}_2$  or  $\text{I}$ .

While many candidates could correctly ring one of the statements about halogens in part b], the most able could not only complete all three, they could also give the electron configuration of a fluorine atom.

3 This question overlaps with the upper tier paper. All candidates had difficulty deciding on the indicator colours for water before and after the addition of lithium, but able candidates were much more likely to identify the gas as hydrogen.

Very few knew that the product of the reaction was lithium hydroxide. Answers such as 'lithium oxide' could not be credited, even though they clearly showed a higher level of thinking than most of the responses. Most candidates could complete the table about group 1 elements, but spellings such as  $\text{NA}$  were penalised.

4 The more able candidates scored well across the whole of this question and were able to choose the correct words to describe how the brakes slow a car down.

Many weaker candidates could see that the speed of the car was 17 metres per second, but often gave the time as 0.8 seconds.

5 The task of applying concepts of force and speed to a parachute jump stretched most candidates. The mark for part a] and one of the marks for part b] proved to be the most accessible.

6 This question overlaps with the upper tier paper. The sentence completion for force, momentum and change in speed was remarkably well attempted, with many scoring two of the three marks. The more able could also correctly decide which graph showed the space shuttle getting faster.

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- 7 Identifying the receptor and effector stages was a difficult task for the candidates to complete, though most were able to score a mark in part c for linking speed of reaction to cell activity. Even more able candidates had difficulty in completing the rest of the table successfully, with many not realising that the number of molecules in the cell stays the same when the rate increases.

A sizeable minority were able to score full marks in part d. Candidates who change their answers are again reminded that any corrections must be unambiguous. If this is difficult, candidates should cross out the answer and add a note stating where the new answer can be found.

- 8 This question overlaps with the upper tier paper. Most candidates were able to state where urine is stored in the human body, and could also identify at least one of the symbols from the diagram. The more able could identify all three.
- 9 Most of this question overlaps with the upper tier paper. The question was designed to be more stretching, but a surprisingly large number did not realise that the membrane used in osmosis must be partially permeable. Many candidates did not appear to show any familiarity with the concept of osmosis.

Able candidates could tell which sugar solution was the more concentrated, and the very able candidates realised that more sugar must be added to solution A to restore the levels. The other candidates gave answers which were randomly distributed across the three other options.

## A215/02: Additional Science A, Higher Tier

### General Comments

This is the first year that candidates have completed this type of short response paper. The overwhelming impression of examiners is that they coped very well. It was unusual to see any gaps. Candidates used their time well and completed the paper fully. There was evidence that many candidates revisited their answers and revised their responses.

A common error was not to make enough choices in the questions. For example, in Q3 b ii, candidates were asked to tick boxes. Many only ticked a single box. On the higher tier paper, when candidates are asked to tick boxes (plural) they will always need to tick at least two boxes, sometimes more. Candidates need to practice a new technique of working through each choice and deciding if it is worthy of a tick or not.

#### Teacher's tip

Use this paper to practice the 'tick boxes' type questions so that candidates are ready to tick more than one box where appropriate. Look at questions 3 b ii and 8a.

Concerning crossed out answers: although these papers are marked electronically, examiners can see the whole page and if an answer is crossed out, the examiner will look at the rest of the page to see if a revised answer has been written in the margin.

### Comments on Individual Questions

- 1 This question was intended as a straightforward 'starter'. Most candidates gained all three marks.
  - (a) Most gained a mark for recognising that B has six electrons in the outer shell so is most likely to be in Group 6.
  - (b) Most recognised chlorine as having seven electrons in the outer shell.
  - (c) Most spotted that A would form an ion by losing an electron.
- 2 This question is an overlap question, designed to test achievement at CD grades. It also appeared on the foundation tier paper.
  - (a) Most correctly gave the colour change, but some included 'red' or reversed the order of green and blue. This would be a good question to use for practice when reactions of Group 1 with water is taught.
  - (b) Most knew that hydrogen is formed, but all gases were seen, implying some confusion. Fewer could give the name of the other product. 'Lithium oxide' was a common wrong answer. 'Lithium chloride' was also seen.

#### Teacher's tip

The colour changes when using indicator and the products of the reaction between Group 1 metals and water are common topics for examination questions. It is worth practising these regularly so that students know them very thoroughly.

- (c) The symbols of the elements and their relative reactivity were very well known by higher tier candidates, gaining an easy two marks. Common errors were to use all capitals in symbols, for example NA, or to use a very obviously lower case for potassium (k). Rubidium and radium were sometimes confused. The order of reactivity was jumbled or reversed by a few candidates.
- 3 (a) Most correctly gave the product 'lithium chloride'. Spelling was not penalised, but 'lithium chlorine' was marked as incorrect. Most candidates balanced the equation correctly.
- (b) Of the few questions that were sometimes left blank, this was one of the commonest. All possible incorrect ions were seen including  $\text{Cl}^+$ ,  $\text{Cl}_2^-$  and variations that included oxygen. Some candidates put the charge to the left of the ion ' $\text{Cl}^-$ ' – such an answer was not given credit. An important error in (ii) was that many candidates only ticked a single box. It is very important that higher tier candidates realise that if a question is given 2 marks there is probably a need to tick at least two boxes.

**Teacher's tip**

Use this question as practice for the tick box technique. Ask students to notice that the question asks for boxes to be ticked and that there are two marks available. Remember, however, that in some questions, more than two boxes need to be ticked.

- (c) Most knew that a flame test is the best choice, but all distracters were chosen by candidates across the whole cohort.
- 4 This question is another 'overlap' question which also appears on the foundation tier. Such questions are designed to discriminate between grades C and D, and so this question proved straightforward for most higher tier candidates.
- (a) No problems here for higher tier candidates. All gained an easy three marks.
- (b) Most correctly chose A but B was a popular wrong choice.
- 5 (a) This question was poorly answered by some candidates who did not read the instructions properly. The question asked candidates to put a tick in a box if a statement is true and a cross if it is false. Many candidates left boxes blank, which had to be treated as an unattempted part. Among those who obeyed the rubric, many did not sort the statements correctly into true and false, so one mark was the common score.

**Teacher's tip**

Examiners will ask 'novel' type questions to break up the sameness of tick boxes on these papers. It is important that students practise digesting the instructions – this is a good question to use to illustrate how not reading the question properly can lose marks.

- The numerical questions (ii) and (iii) proved very challenging for candidates and part (iii) was sometimes left unattempted. They differentiated well between candidates of higher ability.
- (b) Most knew the effect of the hill on kinetic energy.
- 6 (a) An interesting question. More able candidates who chose A scored (2) but those showing partial understanding (the majority) who chose B were awarded a single mark. Fewer were able to give a numerical value to the kinetic energy in (ii).

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- (b) This was the third of the questions that was sometimes left blank. Many could not correctly calculate the change in GPE.
  - (c) Only the most able got this answer correct.
- 7 This question was another overlap, shared in common with the foundation tier.
- (a) Most higher tier candidates interpreted the diagram correctly to identify sugar, water and urea. Sugar and water were sometimes reversed.
  - (b) All knew that urine is stored in the bladder.
  - (c) This part question was for higher tier only. It proved challenging. Most knew that ADH production either reduced or increased, but many got this the wrong way around for ecstasy and alcohol. All distracters were chosen for the organ which secretes ADH. The hypothalamus was the commonest wrong answer.
- 8 (a) Another question where the number of responses was not made clear to candidates. However, this time most did choose two boxes. A common error was to choose the first box (that amylase works best at 60 °C).
- (b) Many gave the correct answer, but a confusion with optimum temperatures was common, so 40, 37 and 37.5 °C were common wrong answers.
- 9 Candidates seem to like 'fill in the gaps' questions. Most gained at least two marks. Common confusion was between the pituitary gland and the hypothalamus and between vasodilation and vasoconstriction.
- 10 The last question was also an overlap in common with the foundation tier.
- (a) All knew that there was a difference in concentration between A and B, but many got the answer the wrong way round.
  - (b) Guesswork seemed to often operate here. Adding more sugar (correct) and adding more water (incorrect) were the most popular choices.

## **A216/01: Additional Science A, Foundation Tier**

### **General Comments**

This paper was aimed at candidates operating at grade C or below. None of the small entry appear to have been entered for the wrong tier, with no candidate earning much more than 80% of the marks. It was good to find that no candidate earned less than 20 %, although the objective style of questions in the paper make it difficult to earn much less than this through random guesswork. There was no indication that any candidates ran out of time.

The variety of question styles meant that candidates had to read the instructions carefully each time. Centres are to be congratulated that there was little indication that their candidates misinterpreted what they had to do for any of the questions. For example, where candidates were required to tick two correct boxes, it was rare to find anything other than two ticks.

Candidates stood more chance of picking up marks on questions which required them to process information supplied in the question, or to select one of a range of answers. Where they were being tested on their ability to recall scientific facts, they fared much worse. This lack of familiarity with the meaning of basic terms suggest that many candidates would have benefited from more study of the units being tested before being entered for this paper.

### **Comments on Individual Questions**

- 1 Only the stronger candidates earned a mark in (a) for mitosis, with fertilisation a very popular incorrect response for weak candidates. The majority of candidates worked out the correct sequence for (b). For part (c), candidates were required to complete sentences by ringing one word in a pair. Most candidates had no difficulty with the first and third choices, but often confused genes with bases in the second choice. Only the strongest candidates knew that proteins are made in the cytoplasm.
- 2 The first two parts of this question also appeared on the Higher Tier paper, so were intended to be harder. This was certainly the case for (a), with most candidates only earning one mark or none. Part (b) proved to be much easier, with the majority of candidates knowing that root growth is promoted by hormones. Part (c) was about cloning embryos. Only a minority of candidates knew that it was not possible to produce embryos from sixteen-cell embryos, but most knew that this was because the cells have become specialised.
- 3 This question proved to be harder than anticipated. Only the strongest candidates knew how many chromosomes there were in an egg compared to a parent cell for part (a). Weaker candidates appeared to ring words at random for part (b), suggesting that they didn't understand the sentences at all. The most common error was the assumption that most of the genes in a baby's cells are active.
- 4 This was the first of the chemistry questions. It was aimed at candidates operating at grade C, so also appeared on the Higher Tier paper. For part (a), candidates were required to write the formula for nitrogen gas in the table. It was disappointing to find that only a few of the stronger candidates could write N<sub>2</sub>, with most weak candidates writing just N or not bothering at all. As expected, part (b) proved to be difficult for weak candidates, but even the most able frequently failed to earn more than one mark. Similarly, in part (c), only the strongest candidates were able to correctly identify the picture representing a monatomic gas, but even so, many of them did not.

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- 5 This question was about sea water. Few candidates earned both marks for part (a). Most candidates linked water to (l) and salt to (s), but then didn't know what to do with water vapour and salt solution. They clearly are not familiar with state symbols in chemical equations. Part (b) proved to be straightforward for able candidates, with weaker candidates possibly picking up one mark by chance.
- 6 This question gave candidates lots of information about lead and then tested their understanding of the extraction of metals from their ores. Many candidates earned lots of marks on this question. In part (a), the heaviness of lead proved to be a strong distractor for weak candidates and only the most able could earn both marks for (b). However, part (c) proved to be the easiest section of the whole paper, with most candidates correctly selecting 350 °C and malleable as their responses.
- 7 This was the first of the three physics questions. The majority of candidates earned both marks for (a), indicating that they had a good understanding of the operation of a.c. generators. Surprisingly, for part (b) only half the candidates knew that the domestic mains supply voltage is 230 V. Similarly, for part (c) very few candidates chose kilowatt-hours as the units of energy transfer measured by an electricity meter. This display of ignorance was quite surprising.
- 8 This question was about static electricity. Most strong candidates could earn both marks for part (a), with the type of charge acquired by the hair being the commonest mistake (despite a series of helpful minus signs on the diagram!). Candidates of all abilities appeared to select their response to (b) at random, suggesting that they didn't really know the meaning of the words generator, insulator or transformer. Similarly, few candidates, regardless of their ability, selected the correct response for part (c), with the most popular response being the statement 'metals do not contain free electrons'. It was surprising that so many candidates were opting for something which is completely contrary to what they should have been taught.
- 9 This final question also appeared on the Higher Tier paper, so it was expected that weak candidates would struggle to earn the marks. However, only a small minority of strong candidates were able to draw a voltmeter in the correct place on the circuit diagram. Part (b) was the hardest question of the paper, with very few candidates able to identify both correct statements. The calculation of part (c) proved to be easier, despite the mysterious disappearance of the equal sign in the third choice, with many candidates able to select the correct answer.

## **A216/02: Additional Science A, Higher Tier**

### **General Comments**

Candidates generally coped well with the challenging aspects of this new paper. Some of the themes were novel and thought-provoking and required the candidates to apply their knowledge to a range of scenarios.

Candidates had been well prepared to cope with the rubric of the paper and almost all attempted all questions.

### **Comments on Individual Questions**

- 1 This question was generally well answered. Almost all candidates were aware of the use of hormone powder in plant cuttings.
- 2 Phototropism was clearly identified as a link to improved competition for light. The distribution of auxin provided challenge and stretch for all, including the most able candidates. Although the movement of auxin was known by the majority, only the most able were aware of the direction of the movement.
- 3 (a) was answered well although there was some confusion between base-pairing and triplet codes. (b) presented few problems.
- 4 Surprisingly few candidates knew the formula for nitrogen .
- 5 The liquid and gas symbols (states) were well understood but only the most able appreciated the state symbols 'aq' and 's'. The formulae for  $MgCl_2$  and  $SO_4^{2-}$  were not well understood but most showed knowledge of  $K^+$ .
- 6 Electrolysis continues to be challenging for most, but able candidates identified the correct two statements. Very few could identify  $3e^-$  in the equation.
- 7 Only the most able completed the graph correctly but many were successful with the voltage output item. There was a tendency to repeat 24V for both parts (c) and (d).
- 8 Some uncertainty was shown for the voltmeter yet many understood the features of the circuit. The calculation presented few problems.
- 9 (a) demonstrated the candidates' ability to interpret the charges on the diagram and (b) was well answered.

**General Certificate of Secondary Education  
Twenty First Century Science (Specification Code J631)  
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**Unit Threshold Marks**

| Unit           |     | Maximum Mark | a*        | a         | b         | c         | d         | e         | f         | g         | u   |
|----------------|-----|--------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----|
| <b>A215/01</b> | Raw | 42           | n/a       | n/a       | n/a       | <b>28</b> | <b>24</b> | <b>20</b> | <b>17</b> | <b>14</b> | 0   |
|                | UMS | 34           | n/a       | n/a       | n/a       | 30        | 25        | 20        | 15        | 10        | 0   |
| <b>A215/02</b> | Raw | 42           | <b>35</b> | <b>30</b> | <b>25</b> | <b>20</b> | <b>15</b> | <b>12</b> | n/a       | n/a       | n/a |
|                | UMS | 50           | 45        | 40        | 35        | 30        | 25        | 23        | n/a       | n/a       | n/a |
| <b>A216/01</b> | Raw | 42           | n/a       | n/a       | n/a       | <b>24</b> | <b>20</b> | <b>16</b> | <b>13</b> | <b>10</b> | 0   |
|                | UMS | 34           | n/a       | n/a       | n/a       | 30        | 25        | 20        | 15        | 10        | 0   |
| <b>A216/02</b> | Raw | 42           | <b>29</b> | <b>24</b> | <b>19</b> | <b>15</b> | <b>11</b> | <b>9</b>  | n/a       | n/a       | n/a |
|                | UMS | 50           | 45        | 40        | 35        | 30        | 25        | 23        | n/a       | n/a       | n/a |

For a description of how UMS marks are calculated see;  
[http://www.ocr.org.uk/exam\\_system/understand\\_ums.html](http://www.ocr.org.uk/exam_system/understand_ums.html)

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