

Biology A

Twenty First Century Science Suite

General Certificate of Secondary Education J633

Reports on the Units

January 2010

J633/R/10J

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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 specification 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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Introduction from the Chief Examiner

Most candidates taking the Biology papers in this session performed extremely well. The papers were constructed to allow candidates to feel that they had every opportunity to demonstrate their knowledge and understanding while at the same time discriminating between candidates of differing abilities. It was intended that candidates should feel that they had a positive experience in taking the examinations.

The format of the paper has changed from previous years in that approximately fourteen marks were allocated to extended response type questions. This provided the paper with more stretch and challenge, enabling more able candidates to show the full extent of their capabilities. The questions performed as expected and provided increased discrimination in all of the papers.

Most candidates found the papers accessible and demonstrated sound knowledge and understanding of the course content. Most candidates had been well prepared by their centres and due to the fact that questions towards the end of the papers were answered equally as well as questions at the beginning of the paper, there was no evidence that candidates ran out of time.

As always, there are lessons to be learned and specific points relating to each paper are picked up in the individual reports from each Principle Examiner. Some issues, however, occurred across the suit of papers and these are detailed below.

Candidates are well advised to read questions carefully. Each year a number of candidates lose marks unnecessarily because in their haste to complete the paper before they run out of time, they fail to read the question carefully. It cannot be stressed too strongly that reading and re-reading the question is time well spent. Candidates would also be advised to pay similar attention to their answers. Answers should always be re-read to ensure that they do indeed answer the question.

When answering questions that include numerical calculations, candidates are always asked to show their working. It is vital that they do this. Candidates are very good at answering calculation questions intuitively or performing simple mental arithmetic and then writing down the answer. Providing the answer is correct, this is not a problem as they will gain full marks. However it is a very risky strategy. A simple mistake in their mental calculations will lose all of the marks. If they had written down their working, the chances are that they would have salvaged at least one of the marks available for the question.

Using chemical equations is another area when candidates can lose marks. When candidates are asked for a word equation, it is surprising the number of candidates who write down the chemical equation. This is a risky strategy as to score the marks, the chemical equation must be given correctly. Candidates would be well advised to give word equations when they are asked for them in a question.

Centres will be well aware that many of the questions in these papers consist of "Put ticks (✓) in the boxes next to the correct answers." In order to increase the degree of difficulty with these questions, on higher tier papers, candidates are not always told how many correct responses are required. The more astute candidate may well look to see how many marks the question is worth and then assume that the number of marks available for the question, must match the number of correct responses required. This is not necessarily the case. Some questions will award one mark for two correct responses. Some may award two marks for three correct responses. Candidates must be advised to answer each of these questions on their merit and place ticks next to those answers that they think are correct.

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Finally, although module B7 is not assessed in the January series, I would still take this opportunity to remind centres module B7 is not just another unit of equal comparability with B1 to B6. It is in fact three times larger than the earlier units. Centres are well advised to regard it notionally as B7, B8 and B9, rather than just B7. This does of course mean that it requires three times the amount of teaching time given to each of the other six units.

The following reports provide more detail on how candidates performed on specific questions, highlighting areas of concern and applauding improvements from previous years.

Please ensure that your staff are encouraged to read these reports.

A221/01 – Twenty First Century Science

Biology A

(B1, B2, B3) Foundation Tier

General Comments

This paper contained questions which required extended writing or “free response” answers from candidates for the first time in this specification. While it seems clear that candidates on the whole found these questions harder to score marks on than the more objective style questions, it was pleasing to see so many candidates perform well.

It is likely that future candidates could be better prepared for the more open questions, as there were some common features in the responses of those who did not score high marks in these parts. It was often the case that weaker candidates did not offer creditworthy answers because they had not read the question properly, and so wrote about the wrong thing. For example for 10b many restated the arguments given by the scientists in the question rather than addressing the question which was asked, or on 7c many seemed not to read that the question was about **who** drugs are tested on and so wrote about tests on cells and animals.

Most candidates attempted all of the questions. Future candidates should still be encouraged to attempt some response to all questions as this clearly helped towards an encouraging overall performance.

Comments on Individual Questions

- 1 Part(a) required the choice of a correct word from a list of three, and was well done by most candidates.

Part(b) was even better answered than 1a, although there were still a number of candidates who did not realise that the body responding more quickly to subsequent infection was the correct answer.

- 2 Part (a) was not especially well answered. While many candidates had the idea that one segment should be shaded to represent an allele, many could not place it in the same place as Steve's to score the mark.

Part (b) was generally well answered, with most gaining one if not two marks.

Part (c) was particularly well answered, and here it was pleasing to note that candidates were not spoiling correct choices by ticking too many boxes as has sometimes happened in the past.

- 3 This question was well answered, with many candidates gaining both marks, and again showing evidence of good preparation by centres by giving the two ticks which were asked for.

- 4 Part (a) tended to be better answered than part (b). In 4b the candidates were expected to offer more than a simple recitation of the risk of miscarriage as stated in the earlier part of the question, and more thorough preparation on this aspect of question answering skills may assist future candidates. There were some clearly expressed correct answers, but a failure to provide specific points, and perhaps start writing before the thoughts were clearly formed, did hinder some of the candidates.

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- 5 Part (a) was fairly well answered, although a surprisingly high proportion of candidates were unclear on the basic definition of what a stem cell is.

Part (b) was not well answered. Again the most common source of error was to simply restate the question. Disappointingly, few candidates actually carried out the task they were asked to do, which was to apply a general idea about science to this particular case. Candidates perhaps need to be better versed in seeking out the command words in questions, and in thinking through what is being asked for, rather than rushing straight in to getting any sort of answer down on paper.

- 6 Part (a) was fairly well answered, although perhaps not quite as well as might be expected for a question about a basic definition of a vaccine.

Part (bi) was slightly better answered, with most candidates choosing the correct option of Stella. There was no clear pattern among the incorrect choices, suggesting that candidates were correctly guessing when they were unsure of the correct response rather than being consistently drawn to one of the wrong choices.

Part (bii) was much less well answered, for two reasons. Some candidates were unable to express themselves clearly or briefly enough to score the mark. Others failed to perform the synthesis called for in the question, and simply restated parts of the question. It would be helpful to future candidates to stress the importance of not merely restating the question, as this has been something of a theme in the free response questions which have proved a little more challenging than the completely objective style questions found in previous sessions.

- 7 Part (a) was about the type of microorganisms which antibiotics cannot treat, and following a winter with swine flu so much in the news it was a little surprising this was not better answered.

Part (b) was fairly well answered, but many candidates did drop one of the marks by getting one of the three lines wrong. The basic uses of antibiotics would seem to be a good area to target for future revision.

Part (c) was not as well answered as the other parts of question 7, where again many candidates failed to follow the instruction in the question. That significant numbers did score one or two marks here suggests that better reading of the question would benefit the remainder. The most common failing was to waste time writing about cell, tissue and animal studies when the question was clearly about who would be studied. Some candidates offered slightly confused accounts of double blind trials, and so had clearly studied the topic of drug trials, but were unable to distinguish between trials on healthy volunteers and trials on ill people.

- 8 Part (a) was not always well done. A majority of candidates simply indicated a narrowing of the lumen of the artery, rather than making it clear in their diagram that the artery wall remains the same thickness while the lumen is partially occluded with deposits. This lack of distinction by the candidates indicates that this is another area of the specification that would benefit from a more considered approach.

Part (b) was in contrast very well answered. It was rare that candidates did not score at least one mark.

- 9 Part (a) was on the whole well answered, although it is a little surprising that more candidates did not score all three marks. Very often the mark dropped was in not choosing one of the two correct "millions" so an understanding of time scales in evolution might be an area of study for future improvement.

Reports on the Units taken in January 2010

Part (b) was surprisingly slightly less well answered than 9a, so a number of candidates were able to gain marks from a question about evolution without correctly naming natural selection.

- 10 Part (a) was generally well answered; candidates were able to gain marks by extracting information from the question.

Part (b) was very poorly answered and again the most common fault was in restating the terms of the question rather than developing the process begun in part a and using ideas about science to explain how two scientists could hold differing views. Candidates should realise that not all of the questions presented are going to be of a simple factual nature, but will involve some thinking skills as well.

- 11 Part (a) was fairly well answered, although a significant number of candidates scored no marks on this part of the question. Candidates need to learn basic definitions, and this is an area to focus on with future candidates.

Part (b) was not so well answered. Those candidates who were confident that the hormonal system differs from the nervous system by being slower, chemically mediated and longer lasting in effect, had no difficulty in answering the question. The mark-scheme was constructed so that any of these three points would score. As in previous series this seems to be an area of the specification where the candidates were not quite as prepared as they needed to be.

A221/02 – Twenty First Century Science Biology A (B1, B2, B3) Higher Tier

General Comments

The format of the paper has changed from previous years in that fourteen marks were allocated to extended response type questions. This provided the paper with more stretch and challenge, enabling more able candidates to show the full extent of their capabilities.

Candidates performed well on this paper and were well prepared for the examination. There was no evidence that any of the candidates ran out of time.

Candidates should be aware that this is mainly a multiple choice style of question paper and with any questions that they cannot answer, they should at least try to eliminate incorrect responses and then take a guess at the correct answer.

The paper is marked on screen after first being scanned and then passed electronically to examiners. It is now more important than ever that candidates restrict their responses to the boxes, spaces and lines that have been provided rather than writing in margins. Additional sheets of paper may be requested if necessary.

Candidates should also be aware that some multiple choice responses require more than one response and the number of responses required does not always match the number of marks available. This was demonstrated in question 11c that required four correct responses for two marks.

Comments on Individual Questions

- 1 Part (a) proved to be an easy introduction to the paper. Most candidates scored the mark by correctly giving Mary an X chromosome, and Steve a Y chromosome.

Part (b) was also well answered and very few candidates failed to score the mark.

Part (c) proved to be a good discriminator. Many candidates attempted to answer the question by explaining why identical twins might have different DNA. Only the more able realised that any differences between the twins was due to environmental differences experienced by the two twins.

- 2 This question was answered well by the majority of candidates who scored both correct responses. Any incorrect responses were scattered over the remaining distracters.
- 3 Part (a) was also answered well. 'Having an anaesthetic' proved to be a popular distracter, but most candidates scored at least one, if not both of the marks.

Part 3 (b) proved to be a more testing question and required extended writing by the candidates. Good responses included specifying a risk other than miscarriage, such as introducing an infection, deciding whether to terminate the pregnancy if the test was positive, referring to the ethics of having the test, questioning the reliability of the test, or saying that family history may play a part in the decision making process. Only the most able candidates were able to score full marks on this question.

Reports on the Units taken in January 2010

- 4 Part (a) was not an easy question as it was targeted at more able candidates. Three correct responses were required for two marks and only the most able candidates scored both marks. The question was made more difficult due to the candidates not being told how many correct responses were required and the number of correct responses not matching the number of marks available.

Part (b) was more straightforward in that the number of correct responses did match the number of marks available but many candidates only scored one of the two marks. A popular incorrect response was 'each clone cell has different DNA'.

- 5 Part (a) discriminated well with a range of marks from one to three being awarded. Only the more able candidates scored all three marks.

Part (b) also discriminated well. Some candidates lost one of the two marks by giving more than two answers. Others managed to score the easier of the two marks by ticking the first box, but were unable to correctly identify the second correct response.

- 6 Part (a) was answered correctly by most candidates, but a popular incorrect response was that vaccines contain an infectious form of the disease.

Part (b) was also well answered but 'Rafi' proved to be the most popular of the incorrect answers.

Part (c) was well answered by those candidates who realised that they must give both sides of the argument to score. Generic answers such as 'the benefits outweigh the risk' did not score. Good answers referred to possible side effects from the vaccine but stated that they were effective in preventing epidemics.

- 7 This question was extremely well answered. So much so that it failed to discriminate, and most of the weaker candidates were able to score both the two marks.

- 8 This proved to be quite a difficult question, which was not surprising as it was mainly aimed at A* to B grade candidates. Very few candidates scored full marks on this question.

Part (a) required candidates to explain changes in the two graphs. Good answers included reference to the second graph showing fewer finches, a higher proportion or average having bigger beaks (birds have bigger beaks was not allowed), or fewer finches with beaks at the extremes of the range. Many answers just gave vague responses that did not score.

Part (b) was more straightforward and any answer that included survival of the fittest or natural selection, scored the mark.

Part (c) proved to be the hardest of the questions in this section. Good answers included that there were fewer finches to start with and that this made the population vulnerable to predation or poor breeding. Many candidates simply gave vague answers about finch's beaks and seed size, and did not score.

- 9 Part (a) proved to be less straight forward than first thought. Although most candidates correctly identified scientists A and B, many gave a different scientist and thus did not score.

Part (b) also proved to be difficult. Examiners were looking for reference to loss of face, loss of professional credibility, stubbornness, or worry about loss of funding. Many candidates gave vague answers about collecting data concerning the dinosaurs.

Reports on the Units taken in January 2010

- 10 Part (a) discriminated well. Most candidates scored the first easier mark by ticking the second box. However only the most able went on to score the second mark by ticking the fifth box. A variety of alternative non scoring answers were provided by candidates with the first, third and fifth be the most popular. Clearly candidates knew that receptors and effectors must figure in the answer but were not quite sure how.

Part (b) also discriminated well. The most common error was to refer to hormone impulses. Any reference to hormone impulses such as 'slow impulses' failed to score. However use of the word 'slow' a second time was not penalised twice. Most candidates scored one of the two marks with only the most able scoring all three. Candidates that simply said hormones are slower, longer lasting and chemical scored all three marks.

- 11 Part (a) was correctly answered by most candidates but blue tits and shrews was a popular incorrect answer.

Part (b) was generally well answered with most candidates scoring one of the two marks. The most common incorrect response was found in the first and last line of the table.

Part (c) proved to be a tricky end to the paper. Four correct responses were required for two marks and only the most able were confident enough to do this. Many only gave two or three responses and this limited them to one of the marks available. However the way the question was marked, most candidates scored one of the two marks.

A222/01 – Twenty First Century Science Biology A (B4, B5, B6) Foundation Tier

General Comments

Many candidates performed well on this paper and were well prepared for the examination, but with the addition of questions that required extended answers, many candidates found the paper much more difficult. There was no evidence that any of the candidates ran out of time.

The paper is marked on screen after first being scanned and then passed electronically to examiners. It is now more important than ever that candidates restrict their responses to the boxes, spaces and lines that have been provided rather than writing in margins. Additional sheets of paper may be requested if necessary.

Comments on Individual Questions

- 1 Part (a) was well answered with most candidates being awarded the mark. The few incorrect answers that did occur were usually when the response “hypothermia” was selected.

Part (b) was also well answered with most candidates scoring both of the available marks.

Part (c) was not so well answered. This required a structured answer and this type of question was new to the paper this session. Credit was given for any idea that the receptors sent information to the brain, that the brain responded and acted upon this information, and the effectors responded in an appropriate way to ensure that the body temperature was maintained at the correct level.

- 2 Part (a) was generally well done. Errors that did occur usually stated that the membrane was fully permeable to all molecules. Fortunately most candidates managed to obtain the mark on this question.

Part (b) was not well answered and only the most able candidates scored both of the marks. It appeared that in most cases, candidates simply guessed at the correct responses.

Part (c) was also not well answered. The answers appeared to be scattered across the three possible responses, with no one response appearing to be more popular than either of the others.

- 3 Part (a) was not answered at all well. Respiring proved to be a very powerful incorrect distracter. As three correct responses were required for 1 mark, it proved to be quite a difficult question.

Most candidates scored one of the two marks in part (b), in particular scoring the mark for the right hand column. The left hand column proved to be more difficult and only the more able candidates scored this second mark.

Part (c) was a difficult question. Candidates were required to state that both conditions produced a more concentrated urine and go on to explain why. Only the most able candidates scored one or both of these marks. Credit was given for stating that water was

Reports on the Units taken in January 2010

lost as sweat and that the body was trying to conserve water for the first example, and that salt increased water retention in the body for the second example.

- 4 In part (a) most candidates correctly stated that DNA was a double helix. However fewer candidates correctly stated that four different bases were used to produce DNA.

In part (b) Frank and Helen were popular correct choices although Seb, Emily and Alex were regularly incorrectly chosen.

Most candidates found part (c) quite difficult. This was often because they had failed to read the question in sufficient detail and explained what was happening to cells rather than what was happening to the chromosomes. Good answers included the idea that the chromosomes were copied and that they then split and went into different cells.

- 5 Part (a) proved to be a straightforward question and most candidates were awarded the mark.

In part (b) hormones proved to be the most popular and in fact the correct response. Chlorophyll and enzymes however were often selected as incorrect responses.

Part (ci) should have been an easy mark. However although most candidates did correctly identify B as the answer, far too many were unable to identify in which way the plant would bend in response to directional light.

Part (cii) proved to be easier and almost all candidates correctly identified chlorophyll as the correct answer.

- 6 Part (a) was well answered by almost all candidates with few selecting any other answer than 30.

In part (b) although most candidates correctly identified that this was meiosis, very few realised that the zygote would contain a full complement of chromosomes.

Part (c) was well answered with most candidates realising that the cells would become specialised.

Part (d) required an extended answer and was not well answered. Very few candidates referred to genes being switched on or off or that these genes coded for the protein that was found in the milk. Most candidates failed to act upon the instruction to use ideas about genes and proteins and instead gave vague answers about cells or that bulls do not have cells that produce milk.

- 7 In part (a) only the most able candidates scored both marks and correctly identified consciousness, intelligence and language development as being controlled by the cerebral cortex.

Part (b) was better answered with most candidates identifying the two correct responses required for the single mark.

Most candidates correctly stated in (ci) that James needed both long and short term memory.

However in part (cii) few failed to realise that during learning, some neurons are more likely to transmit impulse than other neurons. Far too many candidates thought that impulses would be transmitted in both directions or that impulses would be transmitted more quickly.

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- 8 Part (a) produced some very surprising answers. Candidates were required to select a pair of responses from a list of possible responses. All too often the candidates gave answers, which had they thought about, could not have been correct. For example both voluntary and involuntary, or simple and complex. This simple lack of thought resulted in many candidates losing an easy mark.

Part (b) was very well done and most candidates scored this mark.

Part (c) was also well done with brain and spinal cord being required to score the mark. Occasionally other choices were made but these were few and far between.

- 9 Part (a) should have been an easy question but not all candidates gave B as the correct response. Credit was given for any other indication that the candidate had chosen B, for example drawing a circle around B in the diagram.

In part (b) most candidates only scored one of the three marks. Good answers included that the fatty sheath was found around the axon and that it insulated and speeded up the impulse.

A222/02 – Twenty First Century Science Biology A (B4, B5, B6) Higher Tier

General Comments

The paper was accessible to the majority of candidates. The introduction of free-response items was challenging to some candidates but many responded well to this format and presented clear and concise answers. Occasionally, some candidates used spaces below the dotted lines provided for answers. This is not encouraged and, for many, did not yield more marks. In general, candidates showed a sound knowledge and understanding of enzyme activity, protein synthesis, the genetic code and phototropism. Candidates did, however, show the least confidence in the areas of kidney function and neuron pathways and learning.

With the exception of one or two questions, the majority of items did not appear to generate errors due to the misinterpretation of instructions or rubric. The candidate scores ranged from 4 to 40 out of a maximum of 42 marks, demonstrating a wide range of performance. Many candidates appear to have been well-prepared for this paper and completed all items. Few candidates appeared to run out of time.

Comments on Individual Questions

- 1 Part (a) - most candidates achieved the mark for this question but some confused breathing with respiring in relation to water loss.

Part (b) - many candidates coped well with this question but some were unsure about the total reabsorption of glucose in the kidney.

Part (c) - not all candidates appreciated that concentrated urine would be produced under both conditions. Most realised that water reabsorption was linked to water loss via sweating but relatively few understood that water retention was needed to offset the high salt concentration. Many confused this point with salt excretion in the urine.
- 2 Part (a) - many candidates were fully aware of the critical temperature for hypothermia.

Part (b) - the concept of heat balance confused some candidates. They did not appreciate the critical feature that heat gain does not counteract heat loss under the conditions outlined in the question.

Part (c) (i) - a number of candidates did very well with this question. Some were unsure of the involvement of the hypothalamus in thermoregulation.

Part (c) (ii) - this was a well answered question. Relatively few candidates gave incorrect responses.
- 3 Part (a) (i) and (ii) - many candidates obtained both marks but some incorrectly identified Gordon for part (ii).

Part (b) - many candidates did not fully answer this question. They were often able to link the boxes for A and B, but failed to correctly identify the activities at C and D. The reason may be due to a misunderstanding about high collision rates for denatured enzymes in the D region of the curve.

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In parts (c) and (d), most candidates answered these questions correctly. No alternative patterns emerged.

- 4 Part (a) - although almost all candidates realised that meiosis was involved, many did not appreciate that all of the chromosomes in the cow's egg would appear in the zygote.

Part (b) - a very well answered question. Very few candidates gave other incorrect responses.

- 5 Parts (a) and (b) - the two items were often answered correctly. No other clear pattern emerged for those with incorrect responses.

Part (c) - many candidates calculated the answer to this question without any difficulty, but some were confused by the stages involved in determining the answer. Only the first triplet code would be unaffected by the insertion.

- 6 Part (a) (i) - this question did not present a problem for many candidates. For those who were unable to obtain the mark, they tended to confuse A with C.

Part (a) (ii) - many candidates were able to cope well with this question and were not challenged by the alternative responses. However, some correctly identified Chris but added the wrong response for the second person in this 'talking heads' item. For example, some chose Joan instead of Laani.

Part (b) - unfortunately, some candidates described plants 'bending' towards the light, without any reference to growth. Most appreciated that plants need light for photosynthesis but very few realised that plants can compete better for light if they demonstrate this feature and that this gives them a competitive advantage.

- 7 Part (a) - this question did not present a problem for most candidates.

Part (b) - although most candidates could correctly identify the location of the fatty sheath as C or around the axon or fibre, some were unable to gain this mark because they gave a general reference to 'wrapped around the neuron'. Many understood that the sheath speeds up the rate of nerve impulse transmission but only a smaller number of candidates gained the third mark for insulation.

- 8 Part (a) (i) - many candidates successfully stated that memory is the storage of information, but only some candidates stated that the information must also be retrieved.

Part (a) (ii) - it was encouraging to note that many candidates realised that memory is a function of the cerebral cortex. One or two candidates incorrectly chose cerebellum or hypothalamus.

Part (b) - some candidates gave a full and succinct answer. They referred to repetition in some form, creating patterns for knowledge, concepts and reinforcement or association with another stimulus such as colour and taste. It was unfortunate that some candidates described the use of neuron pathways in the brain for this particular item. This confused their overall response.

Part (c) - this question was not answered well. Many candidates failed to adhere to the rubric of the item and gave only one response but the question referred to students (plural). Many were tempted to give 'Sarah' as the single response. This was a strong distracter for this item but was incorrect. Chris and Edward gave the best, combined ideas about neuron pathways and learning.

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- 9 Part (a) - almost all candidates realised that the speed of a nerve impulse is slowed down at a synapse.

Part (b) - many of the candidates responses were often general without a clear reference to neuron A and neuron B. Some candidates also failed to mention synapse chemicals in their answers.

Part (c) - a generally well answered question. Most candidates appreciated that the serotonin level will increase.

Grade Thresholds

General Certificate of Secondary Education
GCSE Twenty First Century Biology A (J633)
January 2010 Examination Series

Unit Threshold Marks

Unit		Maximum Mark	A*	A	B	C	D	E	F	G	U
A221/01	Raw	42				25	20	16	12	8	0
	UMS	34				30	25	20	15	10	0
A221/02	Raw	42	32	29	24	19	12	8			0
	UMS	50	45	40	35	30	25	20			0
A222/01	Raw	42				21	17	13	9	5	0
	UMS	34				30	25	20	15	10	0
A222/02	Raw	42	32	26	19	13	10	8			0
	UMS	50	45	40	35	30	25	20			0

Specification Aggregation Results

Overall threshold marks in UMS (ie after conversion of raw marks to uniform marks)

	Maximum Mark	A*	A	B	C	D	E	F	G	U
J633	300	270	240	210	180	150	120	90	60	0

The cumulative percentage of candidates awarded each grade was as follows:

	A*	A	B	C	D	E	F	G	U	Total No. of Cands
J633	13.2	41.2	83.3	99.1	99.1	99.1	100.0	100.0	100.0	114

275 candidates were entered for aggregation this series.

For a description of how UMS marks are calculated see:

<http://www.ocr.org.uk/learners/ums/index.html>

Statistics are correct at the time of publication.

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