

Additional Applied Science A

Twenty First Century Science Suite

General Certificate of Secondary Education J632

OCR Report to Centres

January 2012

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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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Overview

Most candidates taking the Additional Applied papers in this session performed extremely well, found the papers accessible and were able to demonstrate satisfactory knowledge and understanding of the specification.

As is usually the case, the free response questions proved to be the most challenging, but the papers were constructed in such a way as 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 all candidates should feel that they had a positive experience in taking the examinations.

Most candidates were well prepared by their centres, which was supported by 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, or that any group had been disadvantaged by the language or by any cultural issues. Apart from the Materials and Performance, and Agriculture and Food higher tier papers, most centres had also entered their candidates for the correct tier of examination. Foundation tier candidates who are entered for a higher tier paper generally do not have a pleasant experience taking the examination.

As was to be expected, the entry for each of the papers was considerably less than previous sessions, as centres are now preparing and entering candidates for the new style examination papers, however the overall general performance was similar to that in previous examination sessions.

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

As in previous reports, an important message that centres must make clear to candidates is to emphasise the importance of clear handwriting and following the guidance about writing within the framework of the paper as scripts are scanned and marked on-line. Candidates who write out of designated areas are at risk of their answers not being fully marked. There was continuing evidence of candidates not following this advice. Should candidates require more space they should use additional pages, as these are 'flagged up' to the examiner.

Candidates should also read each question carefully. Every year a number of candidates lose marks unnecessarily because they fail to carry out this simple action. 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 that has been asked on the examination paper. It is all too easy for candidates to get carried away and end up attempting to answer a completely different question. This is referred to in more detail for example on the higher tier report of the Food and Agriculture paper.

Candidates should also be encouraged to make some attempt at every question as a blank space cannot gain any marks. At least attempting the question opens up the opportunity of scoring some of the available marks. Candidates should also be encouraged to look at the number of marks available for each question section and check that their answers contain at least that number of separate points.

As in the past, calculations still prove to be a problem for some candidates. Not all papers (eg Harnessing Chemicals – Foundation Tier) had mathematical calculations, but where candidates did encounter them (eg Food and Agriculture – Foundation paper and Communications – Higher

paper) too many errors still occur. When answering questions that include numerical calculations, candidates are always asked to show their working and it is essential that they do. 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 candidates 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.

Many of the questions are set in context. Candidates should always take notice of the context as it can affect the way the questions should be answered.

As in previous sessions, questions which required candidates to have memorised a piece of knowledge proved to be much harder than those which required candidates to process information supplied in the question. Vocabulary is still a problem for many candidates. Several modules require candidates to use many specialist terms which do not appear elsewhere in GCSE Science; centres might usefully consider more testing of these specialist words as part of their teaching.

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 members of staff are encouraged to read these reports. They are available on line at www.ocr.org.uk

A324/01 Additional Applied Science A – Life Care (Foundation Tier)

General Comments

The paper performed well with most candidates able to gain marks for the tick boxes and calculation, whilst the more able could demonstrate their understanding in the longer answer questions. There was no evidence of any candidates having insufficient time to complete the paper and the wide spread of marks suggests there was sufficient scope for differentiation.

Comments on Individual questions:

- 1a** Most candidates ticked three responses and seemed to fare well with this question, but all of the distracter statements attracted some use. The higher scoring candidates who dropped a mark on this question usually selected the 'expensive' option, whereas weaker candidates usually selected the first statement claiming that 'all treatments make you better'.
- 1b** The majority of candidates scored one of the two available marks, either by offering the idea that the most serious injury got priority, or by providing examples such as heart attack before a broken finger. The concept of assessment did not really appear very often and most of the individuals who scored both marks on this question referred to the process of 'triage' in their response. Some candidates were let down by their command of English – suggestions that priority was given to the 'worst person' or the 'worst accident', were not credited.
- 2a** This question is an overlap with the higher paper and the answers were usually too general and vague for much credit. Candidates often scored one mark by referring to Saskia recording or logging something, possibly on a computer. Alternatively, many scored one mark by measuring a parameter such as the time taken for some exercise to be completed, or pulse rate. Credit was not given for measuring BMI and although it was sometimes possible to deduce repeated measurements or the idea of comparison, many simply repeated parts of the stem ('to monitor progress') in the hope that this would get the final mark.
- 2b** Once again, this question elicited a lot of very vague answers. The better candidates suggested that the programme needed to be modified due to injury or illness, but the majority scored just one mark for the suggestion that it was too easy, too hard or not working.
- 3a** This question was well done with few candidates giving other than three responses. The commonest correct answers concerned stimulating the temperature receptors and sweating.
- 3b** Candidates generally took this question to relate to why Ralph needed to know about health issues and not the reason for the general public to be informed, but a good number referred to raising awareness and scored a mark. In addition, a pleasing number of the better candidates then went on to refer to the benefits to the NHS of saving money as fewer people were ill.

- 4a** The labels atrium and ventricle were encouragingly common – although sometimes reversed. A number of candidates actually gave the correct words preceded by the word ‘right’ so losing a mark, but only a minority left it blank or produced random words, such as valve or capillary.
- 4b** The ECG was almost universally known for studying the heart.
- 4c** Conversely, quite a few candidates seemed to have no idea what was required with this question. A number of the more able ones appreciated the context and gave salt and saturated fat as their choices. However, carbohydrates and proteins were the commonest answers, with water a close third.
- 4d** This question has appeared in a similar format in several previous papers, but it still caught a number of candidates unawares. A minority randomly allocated various food groups to the spaces within the table, presumably selecting them from the list above, associated with part (c). As usual, a number of candidates offered ‘dietician’ as one of the team even though it was excluded by the emboldened ‘other’ in the question stem. In addition, a number of fitness coaches and trainers appeared despite the requirement for the individuals to be health practitioners. The role descriptions of doctors and nurses were vague and a choice of optician, dentist or midwife (however disconnected from the context) usually produced a clearer idea of the role and were rewarded with full marks.
- 5a** The majority of candidates compared women with men, and although a small number ignored the mention of obesity and assumed that the graph was in some way just a measure of BMI, they still scored a mark.
- 5bi** The numbers in this question made the calculation of a correct answer even without a calculator quite accessible. This gave a much better outcome than many previous similar calculations. A good number managed to get the working mark despite not being able to do the sums. The most common incorrect answer was 62 where the need to square the height was ignored.
- 5bii** The majority of candidates scored this mark regardless of whether they calculated Tracy’s BMI to be 31 or 62.
- 5c** Candidates often seemed unclear as to what constitutes a lifestyle choice, answering in terms of medical conditions, injuries and the like. The issue of smoking was almost universally addressed to give a minimum of one mark for most. A sizeable number appreciated the need to inquire about the amount of exercise Tracy normally did and although alcohol consumption was obviously an issue, a number lost the mark by asking ‘do you drink?’ without mentioning alcohol.
- 6a** A number of candidates seem very well informed about the body changes during pregnancy. Good answers described the mother ceasing to have periods, her womb growing larger and her breasts increasing in size. However, some were keen to describe more vague changes such as irritability, moodiness and cravings which were not deemed sufficient to award the mark. A worrying number who did tackle the issue of changes to the body felt that the mother would get fat or grow a larger stomach or else dealt only with the process of giving birth and not pregnancy.
- 6bi** The majority of candidates were able to read the mass successfully and score the available mark.
- 6bii** Despite the linked question numbers, many candidates missed the intended link with the data given in the graph. A number of poor answers related to the baby being unhealthy, born disabled or somehow breathing the smoke whilst it was still in the womb. Amongst the better candidates, there was an appreciation that the baby was likely to be premature or have a smaller mass at birth.

A324/02 Additional Applied Science A – Life Care (Higher Tier)

General Comments

The candidates had generally been well prepared for this examination and were able to demonstrate a good understanding of health care provision. There is now a significant bank of past papers for this specification and many centres appear to be using these to good effect to familiarise candidates with the style and demands of the questions set.

As in previous reports, an important message that centres must pass back to their students is to emphasise the importance of clear handwriting and following the guidance about writing within the framework of the paper as scripts are scanned and marked on-line. There was continuing evidence of candidates not following this advice. Should candidates require more space they should use additional pages. All candidates should be encouraged to make some attempt at every question as a blank space cannot gain any marks. Candidates should also be encouraged to look at the number of marks available for each question section and check that their answers contain at least that number of separate points.

There were no signs that any group had been disadvantaged by the language or by any cultural issues and there was no evidence of any candidates having insufficient time to complete the paper.

Comments on Individual Questions

- Q1a** Examiners were looking for a description of a fitness test which was repeated over a period of time and a record kept of the patient's performance in the test over this period of time. Many candidates gained marks for regular testing, but a common error was to repeat the stem of the question and few correctly identified a fitness test that could be used.
- Q1b** This was well answered but simply stating for 1 and 2 the programme was too easy or too hard only gained a maximum of 1 mark as the programme will have been designed to suit the fitness level of the client.
- Q1c** Many candidates scored at least 2 of the 3 available marks though some missed the key point of the question, which was asking for the personal qualities that the health practitioner should have.
- Q2a(i)** Well answered with virtually all candidates correctly identifying the correct trend for obese women.
- Q2a(ii)** This was not well answered with very few candidates able to calculate 12% of 3.5 million.
- Q2b(i)** Candidates were, however, able to substitute figures into a given formula and calculate the BMI value and this question was well answered across all ability ranges.
- Q2b(ii)** All then went on to correctly identify the calculated figure to be in the obese category.
- Q2c** A common error with answers to this question related to the candidates not reading the stem carefully. Although emboldened, they failed to recognise that the question was asking about queries that should be posed to the client about her lifestyle and not her

medical history or her family's medical history. Consequently many answers related to her health and her sports injuries. Candidates also failed to gain a mark when they did not qualify the term 'drinking' with alcohol, as drinking on its own could relate to any liquid. Good answers included reference to smoking, alcohol intake and participation in regular exercise.

- Q3a** Most candidates were able to correctly identify sweating as a body response to increased temperature, but few went on to gain further marks. Candidates should be encouraged to look at the number of marks available for an answer and try to include the relevant number of points in their response. The strongest candidates included references to vasodilation linked to increased blood flow to the skin surface and a reddening of the skin. There are still candidates that think blood vessels rise to the skin surface.
- Q3b** Examiners were looking for a reference to a risk assessment being carried out to see if the benefits of the procedure would outweigh the risks that are inherent in the diagnostic test. The patient also needs to know the risks in order to give his informed consent.
- Q3c** Many candidates were able to correctly identify a drug therapy, but then they failed to gain the second mark by not describing how this therapy worked, eg cancer cells being destroyed by chemotherapy, bacteria/fungi being targeted by antibiotics or statins reducing cholesterol levels.
- Q4a** Few candidates were able to correctly identify photograph B as a normal blood smear and that C was anaemic with fewer red blood cells. It is hoped that candidates are given the opportunity to look at prepared blood smear slides to be able to identify the component blood cells.
- Q4b** Most candidates were able to correctly identify at least 2 other samples that could be sent to a pathology lab.
- Q4c** Few candidates gained both marks available in this question. The majority correctly identified the role of the kidney in removing waste but few were able to also identify its role in water control. It was disappointing in a higher tier paper to see so few references to the removal of urea by the kidney.
- Q5a** A pleasing number of candidates correctly identified hCG as the hormone present in a pregnant women's urine.
- Q5b(i)** Most candidates gained one mark in this answer by correctly identifying the difference in birth mass of smokers and non-smokers babies. Few, however, went on to identify any similarities or other differences in the data sets to gain any more marks.
- Q5b(ii)** It would appear that many candidates failed to read the stem of this question carefully as there were few references to the impact of not smoking on the baby and then the subsequent reduction in money needing to be spent as there would be fewer premature/underweight babies being born and needing treatment. A number of candidates suggested that the money saved by the mother not smoking could then be spent on the baby.

A325/01 Additional Applied Science A – Scientific Detection (Foundation Tier)

General Comments

Most candidates seemed to be well prepared and made a very good attempt at answering the questions. Candidates would be well advised however, to ensure that their writing is legible and contained within the space provided. Due to the fact that these scripts are marked electronically, examiners do not see the whole page by default and unless there is some indication that the candidate has written outside the allocated window, it is possible that the examiner will fail to spot additional text and the candidate could lose marks.

The paper was suitably challenging and discriminated well between candidates. Very few sections were unanswered suggesting that the paper was accessible to most candidates. There was no evidence that any of the candidates ran out of time.

Comments on Individual Questions

Question 1

Part (1ai) was only answered well by those candidates who read the question carefully. The question clearly asked for an example of someone working in consumer protection, but a large proportion of candidates gave any example that involved the work of a scientist. Examples such as NASA were common, but were not credited. Vague answers such as consumer protection were also not credited.

In part (1aii) the tight restriction that was imposed on part (ai) was relaxed and if the description involved a scientist and related to their answer for part (ai) their answer was credited.

Part (1b) required specific answers such as greater magnification or gives more detail. Vague answers such as sharper or can zoom in more, were not credited. Those candidates, and there were quite a few, who gave answers such as greater resolution were also credited even though they were not expected to be able to answer questions on resolution on the foundation tier paper.

Many candidates answered part (1ci) well and scored both marks. Those candidates who did demonstrate a correct method, but the wrong result, were credited with one mark. Most candidates performed well on question (1cii). Identifying D as the correct answer proved relatively easy, although this was not true for all candidates. To score the next two marks candidates had to clearly identify two similarities. Vague answers such as they looked the same did not score, but answers that said they had the same shape were credited. Good answers involved commenting on the holes and sharp edges shown in the diagrams.

Question 2

It was clear from the answers to part (2a) that some students had actually carried out this procedure and others had merely been taught the method. Good answers included all the steps in the correct order and involved adding dust to the microscope slide, adding mounting fluid and then using the needle to carefully lower a cover slip onto the slide avoiding air bubbles. Only the most able candidates who had clearly performed the technique scored all three of the marks. Most candidates however managed to score at least two marks.

Although just over half the candidates managed to score the (2bi) it evidently was not an easy question. Candidates would be well advised to use the skill of estimation when answering these types of questions. All too often answers such as 3cm were given when a simple estimation check would make the candidates realise that human hair could never be 3 cm thick.

Most candidates scored well on (2bii) and gained both marks. The most common error was to state dust mites instead of dust mite droppings.

Part (2biii) should have been an easy one mark and indeed it was for most candidates. However, a significant number either miscounted or simply gave a list of the types of things that could be seen in the image. This was not answering the question and failed to score.

Part (2c) was well answered with most candidates scoring both marks. Candidates were asked to choose words from the diagram and most did, but credit was also given for correct words that were substituted, such as light for lamp. Three correct answers were required to score just a single mark.

Question 3

Part (3a) required the selection of four correct statements. Approximately 60% of candidates chose each statement correctly although less managed to score all four marks for four correct statements. It was pleasing to see that the vast majority of candidates followed instructions and chose statements from the list provided. In the past this has not always been the case and candidates have put themselves at risk by designing their own answers.

Most candidates were able to match the clinistix in part (3bi) and gained the mark. In (3bii) good answers included universal indicator, but all too often an incorrect answer such as pregnancy testing or litmus paper was given. Far too many candidates do not understand the meaning of semi-quantitative.

The key to part (3c) was medical diagnosis. In this section pregnancy testing was allowed or indeed any other medical test that involved the use of colour for diagnosis. Vague answers such as blood testing were not credited.

Question 4

In part (4a) most of the candidates managed to match the two dyes and identify C as the correct answer.

Part (4b) however gave the additional challenge to candidates of noticing that one of the component dyes had an R_f value of 0 and was still on the start line. This resulted in D being the only correct answer and candidates who gave both C and D did not score.

Part (4c) was surprisingly well answered. Approximately two thirds of all candidates realised that the dyes would move different distances and any answers which gave this idea such as “were at a different scale on the chromatogram” were credited.

There were very few good answers to part (4d). All too often candidates thought that reference samples were concerned with fair testing or that government regulations insisted on their use. Good answers that included comparison and identification were rare.

Part (4e) also proved to be a difficult question with almost half of the candidates failing to score. Only the most able candidates selected all four words and used them correctly.

Question 5

This section assessed graph plotting skills. To score both marks in part (5a) candidates had to make four correct plots and then draw a line of best fit that went through the origin and the first four given plots. Only one third of candidates were able to score both marks, even though a tolerance of 0.5 of a square was allowed by examiners.

Part (5b) was quite well answered and an error carried forward was allowed so that candidates who failed to score on part (a) were not penalised on this question. Any circle around a plot furthest from the line of best fit was credited.

Part (5c) required a reading taken from the candidate's graph. Once again an error carried forward was allowed even if the line of best fit had been drawn in the wrong place. The most common error was for candidates to draw horizontal and vertical lines to help with their reading but actually draw one of the lines in the wrong place, usually the nearest grid line. Candidates were required to make an accurate reading in order to gain this mark. Only about one third of all candidates managed to score this mark.

Part (5d) was an easy end to the paper and most candidates gave intensity as the correct answer.

A325/02 Additional Applied Science A – Scientific Detection (Higher Tier)

General Comments

Although this examination was relatively short, there was no evidence that candidates were short of time. Most candidates were able to make some response to all questions.

Candidates showed a good knowledge of the basic techniques of chromatography and microscopy, but struggled to explain their answers.

Comments on Individual Questions

Question No.

- Q1(a)** Most candidates were able to correctly identify the drink which could contain the banned food dye as C.
- Q1(b)** About half the candidates were able to correctly calculate the Rf value as 0.3. Wrong answers included 0.4 and $3/9$ or $1/3 = 0.33$.
- Q1(c)** Most candidates were able to identify D as the drink from which the greatest number of dyes have been separated, but some did not understand that there was a dye which had remained on the start line and chose drink C.
- Q1(d)** The idea that the dyes are different because they moved different distances was well understood. Some incorrectly stated that it was the solvent that moved up to different levels or just referred to separation without discussing distance or Rf values.
- Q1(e)** The meaning of a standard reference material was not well understood. Most marks were gained from the idea of its use for comparison, but few understood its role in identification of the unknown substance.
- Q1(f)** Most candidates were able to identify most of the relevant terms involved in chromatography. Terms commonly confused were solution/solvent and qualitative/quantitative. Some got the mobile and stationary phases the wrong way around.
- Q2(a)** There were some well plotted and drawn graphs but marks were commonly lost by omitting some points, misuse of scale and poorly drawn lines of best fit, including multiple lines, hand drawn lines and lines that did not go through the origin.
- Q2(b)** Very few candidates were unable to identify the outlier on the graph.
- Q2(c)** Most candidates could successfully use the graph to find the concentration corresponding to the absorbance given. Common incorrect answers were 0.22 due to misreading the scale or 0.38 from using the wrong axis to read off the result.
- Q2(d)** Only a minority of candidates did not understand that a colorimeter measures the intensity of the colour. A small number thought that it measured the shade of the colour.

- Q3(a)** Only the better candidates understood the purpose of a standard procedure. Many thought it was used to produce more accurate results rather than more reliable ones while others just referred to ease of following instructions.
- Q3(b)** Most candidates realised that the sample should be sealed to prevent contamination although some thought it was to avoid spillage.
- Q3(c)** Answers referring to the need to check the colour of the stick before use to ensure it had not deteriorated were rare. Most thought that it was to check whether the stick had been used, in spite of it being stated that the sticks were new.
- Q3(d)** Better candidates identified the need to check the final colour so that it could be matched to a chart or that the colour change was needed to identify the presence of glucose.
- Q4(a)(i)** Most candidates identified D as the most magnified image but many were unable to give a suitable reason. Incorrect answers included a more magnified or closer image.
- Q4(a)(ii)** Most candidates incorrectly identified A as the image showing the greatest resolution although more realised that greater resolution meant a more detailed or sharper image.
- Q4(a)(iii)** Few candidates understood that depth of field meant that the image should be sharp from front to back with most choosing image C instead of image A.
- Q4(b)** About half the candidates understood that a light microscope has lower resolution than a scanning electron microscope.
- Q4(c)** Candidates showed that they knew the limitations of a scanning electron microscope and most scored at least 1 mark, routinely referring to the cost and portability of the machine, followed by the use of dead/non-living samples and difficulty of use. Candidates failing to score only stated one of the acceptable alternatives and discussed resolution or magnification from the questions above instead.
- Q4(d)(i)** Although many candidates showed that they understood how to work out an area they struggled to apply the scale correctly to obtain the answer of 250,000. Very few were able to state the correct units with many omitting them altogether and others giving just km rather than km². There were a significant number of answers which used the 20,000 ft height in their calculation rather than measuring the sides of the marked no fly zone.
- Q4(d)(ii)** The reason for the uncertainty in the value of the calculated area was not well understood with most candidates discussing the validity of the marked zone rather than the uncertainty of its measurement. Few recognised that the edges drawn were not straight but there were some good answers referring to multiplication of uncertain values leading to greater uncertainty.
- Q5(a)(i)** Most candidates realised that the retention time scale was incomplete but some were unclear about which side was incomplete and others thought it should start at 1 minute rather than 0.
- Q5(a)(ii)** Very few candidates were unable to identify C as carbon monoxide from the given retention time.

- Q5(a)(iii)** Most candidates could correctly identify D as the most abundant component but often struggled to explain the reason for their choice in terms of area or width of peak. The most frequently seen incorrect answer was C because it is the highest peak.
- Q5(b)(i)** Most candidates were able to identify at least one use of DNA profiling with paternity testing as the most popular choice. The next most common answer related to crime scenes although they did not always refer to identifying the victim or suspect. Some gave confused answers referring to the use of fingerprints, hair, blood or skin cells and not DNA.
- Q5(b)(ii)** Electrophoresis was not well understood with many answers showing a confusion with electrolysis. Of the correct answers given most referred to the size or mass of the particle, with a smaller proportion discussing the charge.

A326/01 Additional Applied Science A – Communications (Foundation Tier)

General Comments

In every series, candidates are required to perform simple calculations for this exam paper. There are few opportunities for calculations in the specification for this module, so the calculation questions in this paper were inevitably variations on ones which had appeared in previous seasons. The performance of candidates suggests that they have had little practice at this skill.

Five of the marks for this paper were allocated to testing the ability of candidates to provide their own examples of systems, occupations or devices in the field of communications. Only a minority of candidates were able to earn those marks, suggesting that centres might find it to their advantage to ensure that candidates have prepared their examples in advance of the exam.

Comments on Individual Questions

Question No.

- 1 This question was about the use of mobile phones for communication. The majority of candidates had no difficulty in clearly explaining two important features to look for when selecting a mobile phone. Very few candidates failed to correctly match the named property of microwaves with their explanation, whereas only a minority could correctly select the type of aerial used in a hand-held device.
- 2 It was good to find that the majority of candidates were able to earn the majority of the marks on this question about storing analogue signals in digital media. In the first part, many candidates seem to be unfamiliar with the term **binary word**, preferring to use **long word** instead. Just over half of the candidates were able to correctly calculate the time to fill the memory, although they all had a go. The most common error was to multiply the two numbers together, instead of dividing, suggesting a poor understanding of the storage process. Too many candidates offered USB as a device to store information, not realising that this is the name of a type of connection, not a memory stick. Many candidates were able to identify both disadvantages of storing analogue information.
- 3 This question was about a fax transmission system. Although the majority knew that the scanner came first and the printer came last, many put the encoder and decoder in the wrong order, suggesting that they did not understand the function of these blocks. However, few candidates failed to earn both marks for describing the encoding process. Too many candidates failed to describe a communication system that used copper wire as the link and explain its advantages. The specification contains a number of requirements that candidates be able to describe their own examples of communication systems; these are easy marks to earn and come up in most exam seasons. The final parts of the question required candidates to perform calculations. Although the vast majority had a go, few obtained the correct answer.
- 4 Only about half of the candidates understood the meaning of the term encryption, often confusing it with compression. As with the previous question, a substantial minority were unable to provide their own example of an encrypted communication system. However, few candidates had any difficulty in identifying a device which has increased the quantity of communication between people – the mobile phone was a popular correct answer.

- 5** This was the first of two questions which also featured in the Higher Tier paper. Understandably, candidates found these questions harder than the preceding ones. Although the majority of candidates knew that the link in the circuit was wire, many incorrectly thought that the battery was the input instead of the switch. Less than half of the candidates were able to provide a satisfactory account of the differences between block and circuit diagrams, very few could explain why Morse code was digital and most only knew one advantage of sending information in a digital code (usually less loss of information). Most still assume that information is transferred faster by digital than with analogue transmission.
- 6** Candidates found this question the hardest of all. Less than half could describe the job of someone in the communications industry with technical expertise, too often describing a device (such as a computer repair shop or a mobile phone shop) rather than a person. Very few candidates could correctly identify the capacitor and only the best candidates were able to say anything sensible about the function of an amplifier, often talking about sound instead of electrical signals.

A326/02 Additional Applied Science A – Communications (Higher Tier)

General Comments

Only one of the handful of candidates who sat this paper should have done the Foundation Tier paper instead. There is no advantage for a weak candidate to sit the Higher Tier paper and being faced with so many questions that they can't answer is unlikely to lead to a positive exam experience.

The comments that follow only apply to the performance of those candidates who were entered for a paper appropriate to their abilities.

Comments on Individual Questions

Question No.

- 1 This was the first of two questions which also appeared on the Foundation Tier paper. As intended, it allowed most candidates to score high marks. The block and circuit diagram posed no real difficulty, but only about half of the candidates could explain why Morse is a digital code, although they knew the advantages of transmitting information digitally.
- 2 This question also appeared on the Foundation Tier paper. Good candidates could describe a job in communications which needed technical expertise, but weak ones briefly described a workplace instead, earning no marks. Although only the better candidates could identify the capacitor in the circuit, more could describe the function of the amplifier. The final calculation posed little difficulty for the majority of candidates.
- 3 This question was about mobile phones. The majority of candidates were able to correctly identify a microwave frequency, but only a minority could correctly match each type of aerial to a possible receiver. Only the ablest candidates were able to sensibly use the properties of radio waves to explain the variation of signal strength.
- 4 This question was about the conversion of information from analogue to digital form and then storing it. None of the candidates earned all of the marks for their description of the analogue-to-digital conversion process, but all were able to calculate the rate of memory use from the information provided. Although most candidates were able to give a sensible reason why the information was compressed, few could explain what was meant by compression, sometimes confusing it with encryption. Although most candidates were able to suggest one advantage of storing information in digital form, none could suggest three.
- 5 This question was about fax systems. Most candidates found it hard. Few could correctly label all the spaces in the block diagram, complete the sentences to explain image construction from lines of pixels or give three advantages of using copper wire (faster was a very popular incorrect answer). However, most good candidates could do the final calculation of transfer time.

A334/01 Additional Applied Science A – Agriculture & Food (Foundation Tier)

General Comments

The entry numbers were lower than in previous sessions; however, the general performance was similar. Marks ranged from 5 to 31 out of a possible 36.

The main problems were due to:

- not reading the question. For example, Q3bii asked the candidate for “two other advantages” yet many answers referred to a larger crop which had been stated earlier in the question. Q4b required candidates to use information in the article about biofuels to suggest improvements and only a handful of candidates did so; a common response was to simply copy out a sentence from the article
- lack of knowledge, especially in questions about plants. For example, Q1c required knowledge about the conditions needed for germination. Few candidates correctly named two conditions
- lack of mathematical skill. The simple calculation in Q1b produced a 45% success rate, while the more difficult calculation in Q4a produced only a 15% success rate. The calculation of total pear crop in Q3b produced a better result of 75%. It was interesting to note the many varied methods of calculation used by candidates.

Candidates produced good performances in:

- connecting information on growing media (Q1d)
- knowing why some people object to intensive farming (Q2b)
- knowing the importance of a “quality mark” (Q3d).

Comments on Individual Questions

Question 1

This question was based on growing tomato plants and involved ticking boxes, joining information in boxes, calculating germination figures and explaining about tomato plant growth in a glasshouse. It was quite well answered by the majority of candidates.

- a) There was some confusion with plant processes. Candidates were required to identify two reasons why plant seeds are in sealed packets and what this prevented. Most candidates correctly identified “germination”, but few identified “rotting” as well.
- b) The simple calculation involving germination rate met with a mixed response. A common response was 998 instead of 980.
- c) Very few candidates correctly named two conditions needed for germination. Many candidates knew that water was needed, but few candidates knew that oxygen was also required.
- d) This question on advantages and disadvantages of growing media was answered correctly by the majority of candidates.
- e) This question involved explaining why light and carbon dioxide were important to produce a good crop of tomatoes. Many candidates linked the two factors to growth, but only a few referred to photosynthesis.

Question 2

This question was based on intensive farming of salmon. It showed a good spread of marks.

- a) Most candidates correctly identified salmon farming as an example of intensive farming.
- b) Most candidates wrote an acceptable reason for objecting to intensive farming.
- c) An encouraging number of candidates wrote down two factors that affect growth. Incorrect answers tended to refer to food despite the question stating “apart from food”.
- d) There was some confusion concerning the main stages in selective breeding. A common error was not writing about repeating the selection and breeding process over many generations. Some candidates concentrated on artificial insemination and wrote detailed answers that were not relevant. Very few candidates scored the maximum 3 marks, although similar questions have been set in previous examinations.

Question 3

This question was based on growing pear trees and producing pear cider. Parts were targeted at Grades D/C and were also on the Higher Tier examination paper.

- a) This question on identifying the type of harvest was answered very well.
- b)i) Despite the question having a worked example, many candidates were unable to calculate the total crop (3200). Multiplying 40 by 80 proved to be rather difficult.
- b)ii) Since this question on the advantages of growing dwarf trees was considered very straight forward, two correct answers were required. However, many candidates wrote vague answers or referred to “a larger crop”, despite being asked for “other advantages”.
- c) This sentence completion question produced many combinations of answers. However, the process (fermentation) was better known than the products (alcohol and carbon dioxide). Nitrogen was a common incorrect answer.
- d) Most candidates correctly identified the meaning of a quality mark.
- e)i)ii) The majority of candidates were able to identify a type of microorganism that could damage pears and describe part of the process.

Question 4

This question was based on using *Jatropha* crops as a biofuel. Parts were targeted at Grades D/C and were also on the Higher Tier examination paper.

- a) Few candidates were able to calculate the crop yield. A common wrong answer was 3 instead of 0.5.
- b) Candidates were expected to read the article and suggest two ways to improve the wild plants, which had a varied crop yield and flowering time. Answers such as having a reliable/regular crop yield and a fixed flowering time were rare. Most candidates simply copied out sentences from the article. Very few candidates scored 2 marks.

- c)** There was some confusion between artificial insemination and selective breeding when identifying the technique used to improve the plants.

- d)i)ii)iii)** Most candidates were able to identify the method of plant reproduction using pollination, but few realised that two methods (cuttings and tissue culture) would produce identical plants. Few candidates realised the significance of “method(s)”, meaning that there could be more than one answer.

- e)** As in previous examinations, there was much confusion over “growing conditions”, such as light intensity, temperature, watering etc. Many candidates wrote irrelevant or vague answers. Few candidates scored 2 marks.

A334/02 Additional Applied Science A – Agriculture & Food (Higher Tier)

General Comments

The entry numbers were lower than in previous sessions; however, the general performance was similar with marks ranging from 3 to 28.

The main problems were due to:

- not reading the question. For example, Q.1(aii) asked the candidate for “two other advantages” yet many answers referred to a larger crop which had been stated earlier in the question. Also Q.2 (b) required candidates to use information in the article about biofuels to suggest improvements. Only a handful of candidates did so; a common response was to simply copy out a sentence from the article
- lack of knowledge especially in questions identified in the specification for Higher Tier. Many candidates were unprepared for these questions and should not have been entered for Higher Tier
- lack of mathematical skill. The very simple calculation in Q.(1a) was well done (90% correct), but the more difficult calculation in Q.(2a) produced only 35% correct answers.

Few candidates knew about:

- a word equation for anaerobic respiration
- tissue culture
- the process of genetic modification
- the use of hormones in cattle.

Comments on Individual Questions

Question 1

This question was based on growing pear trees and producing pear cider. Parts were also on the Foundation Tier paper.

- a)i)** Most candidates were able to do the very simple calculation about the total crop. A common incorrect response was 998 instead of 980.
- a)ii)** Many candidates failed to read the question which asked for “two other advantages”. Their answers referred to larger crop, which was already identified.
- b)** The majority of candidates did not seem to understand the phrase “ word equation” and wrote a vague sentence or collection of words.
- c)i)ii)** Some candidates correctly identified the process of tissue culture/cloning, but few knew that growth hormones were added to the agar.

Question 2

This question was based on using *Jatropha* crops as a biofuel. Parts were targeted at Grades D/C and were also on the Foundation Tier examination paper.

- a)** Few candidates were able to calculate the crop yield. A common incorrect answer was 3 instead of 0.5.

- b)** Candidates were expected to read the article and suggest two ways to improve the wild plants which had a varied crop yield and flowering time. Answers such as having a reliable/regular crop yield and a fixed flowering time were rare. Most candidates simply copied out sentences from the article.
- c)** There was some confusion between artificial insemination and selective breeding when identifying the techniques used to improve the plants.
- d)i)ii)iii)** Most candidates were able to identify the method of plant reproduction using pollination, but few realised that two methods (cuttings and tissue culture) would produce identical plants. Many candidates did not realise the significance of the word “method(s)”.
- e)** As in previous examinations, there was some confusion over “growing conditions”, such as light intensity, temperature, watering etc. Many candidates wrote irrelevant or vague answers.

Question 3

This question was based on intensive farming of salmon.

- a)i)** Most candidates correctly identified two ways in which the GM salmon would be better than wild salmon.
- a)ii)** Despite being asked for “one other characteristic”, many candidates described one already identified.
- b)** As in a)ii), many candidates ignored the important “one other reason” and described reasons dependant on not escaping.
- c)** This question asked for a description of the process of producing a genetically modified organism. Few answers contained relevant information.
- d)** Many candidates wrote a low level answer such as “growth”.
- e)** Despite the word “subsidy” being in the specification, almost all candidates failed to understand the question. Virtually all candidates wrote a negative response, referring to the Government closing down the industry, taking the profit, stopping GM production or losing jobs. Most candidates scored zero marks.
- f)** Some candidates were able to identify a GM microorganism but few were able to state its product.

Question 4

This question was based on the use of hormones in controlling reproduction in cattle. Few candidates displayed a good knowledge and understanding of the topic.

- a)i)ii)** Some candidates realised that a disease causing organism is called a pathogen, but few wrote a complete answer to the value of using antibiotics.
- b)i)ii)iii)iv)** These questions required knowledge of which body organ was targeted by hormones (ovary), which female body cycle was being controlled (oestrus), the effect of the hormone (release egg) and the advantages of using the hormone (timing of birth, all cattle calving at same time, convenience of booking vet etc). The majority of answers showed a lack of knowledge; vague answers such as “reproduction” were common.

- c)** This question asked for a description of the main stages in artificial insemination. Although similar questions have been set in previous examinations, few candidates scored the maximum 3 marks. There was some confusion about where the sperm were inserted. It was interesting to note the connection between this question and the confusion between selective breeding and artificial insemination in Q.2c about a plant.

- d)** The majority of candidates were able to write down an acceptable advantage of using artificial insemination in cattle.

A335/01 Additional Applied Science A – Harnessing Chemicals (Foundation Tier)

General Comments

The paper performed well and the standard of answers given by the candidates was comparable to previous sessions. It was pleasing to see some areas answered well, but there are still some areas where work needs to be done to improve the quality and to show better understanding. The level of written English in the longer answer questions was much better than has often been seen in the past and this enabled candidates to explain their answers well. There were no questions that involved calculations with a formula on this paper.

Comments on Individual Questions

Question No.

- 1 (a) The line drawing was generally clear and unambiguous and many candidates were able to link the hazard with the correct description.
- (b) This question showed that although many candidates knew the definitions for the various hazards they did not really understand their meanings. This might be an area which could be addressed during normal teaching by reinforcing the hazard type and its meaning every time the chemical is used. Most, but not all, candidates understood that milk was not really much of a hazard.
- (c) The (highly) flammable sign was known to most candidates and most were able to describe, for the code shown, the action necessary by the emergency services. It should be emphasised that simply listing all of the possibilities from the table is not good enough to score marks as some of the actions will conflict with the correct actions of evacuation, breathing apparatus, foam and not washing the spill down the drains. Most candidates knew that it was the HSE that is responsible for enforcement of the safety regulations.
- 2 (a) Many candidates managed the subtraction correctly to get the proportion of iron(II)sulphate in the mix correct. Fewer were able to work out the numbers of atoms of sulphur in iron(II)sulphate or the number of elements present in ammonium sulphate despite having the formulae written in the table at the head of the question.
- (b) Apparatus and substance identification was not as good as expected, perhaps because the terms are assumed during teaching rather than emphasised. The wet sand (heavier) was not explained well and few were able to state that the water needed to be removed (any sensible method) to get to the actual mass of the sand.
- (c) The word equation was poorly completed. Some work needs to be done to improve this.
- 3 (a) The problem with apparatus identification continued into this question with few candidates able to correctly identify the condenser or name the process going on inside. The ideas about heat being necessary to speed up the reaction and the dangers of flammable substances were often missed. These could have been explained in many different ways to score the marks. Separating the ester by distillation was also often missed.

- 4 (a) Plotting of points onto the graph paper was generally done well and many candidates scored full marks but the drawing of a best fit line was not done well. Common errors included joining up the dots with straight lines, poor drawing through the points, drawing several lines and not having a sharp enough pencil to produce a line of suitable quality. The subtraction to reach a figure for the mass lost during the experiment was not always done well and few seemed to know the general equation for the addition of an acid to a carbonate to liberate carbon dioxide gas. If a formula was given instead of the words it needed to be correct (CO_2). The deduction boxes were used correctly and many candidates identified the completion time and the fact that the acid had been used up. The more difficult questions at the end proved tricky for the candidates to explain why increased surface area increases the rate of reaction and why the loss in mass is the same in each experiment.

A335/02 Additional Applied Science A – Harnessing Chemicals (Higher Tier)

General Comments

The paper was challenging but no candidates appear to have been disadvantaged by language or cultural issues. A number of candidates found the examination difficult and a few of these failed to respond to most of the questions. These candidates might have been better served if they had been entered for the Foundation tier. Apart from these, most candidates attempted all of the questions, so there was no indication of time pressure or other constraints.

Comments on Individual Questions

- 1 Most candidates found part (a) to be an accessible question with most scoring full marks. However, some weaker candidates continued this theme into part (b), considering still the emergency services and not the legislative position.
- 2 The early parts of this question indicate that only the best candidates understand the way chemical formulae work in representing atoms and elements. The practical aspects of salt preparation suggest that many candidates have carried out this sort of experiment, but their understanding of why they do particular things was less certain. Although all the data for the calculation was provided, it proved to be much more challenging than similar questions and very few candidates were successful. Converting a word equation into formulae should have been straightforward as all the formulae needed are listed in the specification as ones that candidates should be able to recall, but remarkably few were even confident about the symbol for zinc.
- 3 Although it was shown in the question, many candidates were not familiar with the experimental technique of heating under reflux. The purpose of the condenser in the diagram produced some quite speculative answers, but few that related to preventing reactants escaping from the system.

The choice of the correct acid and alcohol to make a specific ester again indicated the shortcomings of the candidates in interpreting the structures shown.

Despite the hint that the catalyst in part (b)(ii) was “an inorganic acid”, only a few candidates could name sulfuric acid. Others seem to have returned to this question after completing the paper and offered catalysts named in the final question.

- 4 Part (a) was well answered with most candidates correctly plotting the data points on the graph, although the idea that a “best fit” line must be a straight line persists, even where the points clearly lie on a smooth curve.

In part (b), good candidates were able to link the loss of mass with the loss of a gas from the system, but it was not uncommon to see this attributed to dissolving of the marble chips. Unfortunately, many of those candidates who understood that gas was being lost from the flask joined the large majority in suggesting that the cotton wool in the neck of the flask was there to stop gas escaping.

The remainder of the question was answered reasonably well as good candidates showed a sound appreciation of collision theory and the factors which limit the amount of reaction, although some assumed that the marble chips were used up despite the statement in the question that some remained after the experiment.

- 5** This question provided an unfamiliar context to examine the understanding of catalysis. Most good candidates could define a catalyst well, although the understanding of how a catalyst would save money was less certain. A significant number of candidates attempted the question as if it was comparing an expensive metal with a cheap one and not using information from the table.

A336/01 Additional Applied Science A – Materials and Performance (Foundation Tier)

General Comments

The paper was appropriate for all candidates and the overall performance of candidates was pleasing. There was a definite improvement in the number of candidates scoring above 25 marks, while at the other end there were very few scripts with less than 10 marks. The number of no responses was relatively small. This shows that the vast majority of candidates were entered for correct tier. There were a variety of different styles of questions allowing candidates of all abilities access to questions. Most candidates attempted all questions and they showed a good use of time. As expected, most did better on the objective type question than written questions and describing an experiment remains a difficulty. Poor handwriting and very scribbled lines joining boxes made some papers difficult to mark

Comments on Individual Questions

Question No.

- 1a)** This was a well answered question with the majority of candidates knowing the common mechanical properties of materials.
- 1b)** The majority of candidates scored the mark for substitution into the formula, but many got no further and some inverted the figures so as to get an answer greater than 1.
- 2a)** Although relatively well answered there were a considerable number of candidates who did not know the difference between compression and tension.
- 2b)** Well answered.
- 2c)** Many candidates failed to describe clearly what they wanted to do; more use of diagrams from weaker candidates would have raised their marks. Very few scored the marking point for actually recording the force required to break the wire and the majority were more concerned with measuring the extension as the weights were added, in other words they were answering a question about an experiment they had carried out – not the one in the question. Similarly there were a considerable number of bridges and even a few tennis rackets (from a question a few years ago).
- 3a)** Well answered.
- 3b)** Whilst the majority of candidates understood reflective and transparent, there appeared to be much confusion over opaque and translucent.
- 3c)** A significant number of students failed to correctly identify convergent and divergent lenses, with many circling one of each in each part of the question.
- 4a)** This was pleasingly well answered with many candidates explaining how good conductors, like metals, get very hot or poor conductors can remain cool to the touch.
- 4b)** These two questions were fairly well answered, with the majority of candidates understanding the technical words in the question.

- 5a)** The graph was not well drawn, with the vast majority of candidates attempting to draw a straight line of best fit as opposed to a curve. A minority joined dot to dot.
- 5b)** The responses to these three questions were disappointing. Candidates very often did not respond to the differences in decibel levels in (i) and (ii) and few appeared to know that 130dB is above the threshold of pain. Tinnitus was known by the more able candidates.
- 5c)** Many candidates chose correct materials for insulation, but did not always explain how the material either absorbed or reflected the sound. Foam, without any further qualification, was regularly referred to and was awarded no credit.
- 6a) & 6b)** These questions were reasonably well answered, with the other distracters being randomly chosen.
- 6c)** The majority of answers were rather vague, with few giving clear answers about crumple zones increasing the length of time over which a crash occurs and therefore reducing the force of impact.

A336/02 Additional Applied Science A – Materials and Performance (Higher Tier)

General Comments

Candidates were able to access the majority of questions, and there were very few blank spaces. There continues to be a substantial number of candidates who are entered for this tier, but who would be better advised to enter the Foundation tier paper.

Comments on Individual Questions

Question No.

Q1 Candidates demonstrated a good familiarity with the properties of sound, but were often disadvantaged by an inability to express their understanding.

In part (a) many candidates drew what they thought was the best 'straight line' through the given points and while this is a worthwhile skill, the points were designed to demonstrate a clear, smooth curve. Other candidates omitted the (clear) data point at the origin. Parts b(i) and b(ii) were taken together, with a progression of effects expected between the two which most candidates appreciated. The majority of candidates could define tinnitus, but in part (c) they were often unable to describe clearly what they wanted to say.

Q2 Parts (a), (b) and (c) were relatively well tackled. Many candidates did, eventually, manage to describe the fall in force and rise in collision time. However, there were still many who discussed a fall in momentum rather than the 'change'. Many responses talked about collisions in very non-technical ways.

Q3 The viewfinder of the camera was usually identified, but the focal plane was often erroneously positioned. Most candidates still believe that the lens is coated to prevent damage from scratches. In part (b) there were a number of good responses, showing recall and understanding of definitions. However, many candidates applied the terms given to the digital cameras that they are familiar with. This elicited descriptions of 'zooming' and the operation of the 'power' switch.

Q4 The majority of candidates simply gave 20N as their answer for (a)(i), rather than using the formula as required. Parts (ii) and (iii) were much better done, with many candidates realising that the sample could have broken or become plastic in the latter stages of the extension. Part (b) caused the familiar difficulties of candidates giving responses referring to thermal or electrical properties rather than mechanical and so scoring no marks. Many of the 'mechanical' answers did not refer to 'similar' behaviour, but contrasting ones, again unlikely to score marks.

Q5 Very few responses referred to the expansion and contraction of the metal disc.

Q6 It was gratifying to note that the majority of candidates had learnt how a basic circuit should be constructed and there were a number of excellent responses. Unfortunately there were also many candidates who, having recalled the outline of the circuit, could not progress as far as identifying the components correctly.

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