

Additional Science A

Twenty First Century Science Suite

General Certificate of Secondary Education J631

Examiners' Reports

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J631/R/11J

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

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Chief Examiners' Report

As always in any system which exposes candidates' shortcomings as well as their strengths, it is a pleasure to see just how much candidates are capable of doing. There were many answers which demonstrated clarity of understanding and originality of thought, and these candidates are to be congratulated.

Many examiners also noted an improvement in the clarity with which intentions were communicated. Answers were written in pen dark enough to be picked up unambiguously by the electronic scanning process, and in cases where candidates changed their answers the updated version was clearly marked.

This is the third examination session since the introduction of free-response questions into the papers, and examiners were pleased that the drop in mean marks over the past two seasons appears to have been halted. However, they are worried that this drop has not yet been reversed. A disturbing number of candidates are still leaving all the free response questions blank. This trend was by no means limited to the least able candidates – examiners comment on it as a major concern on the higher tier papers as well. This is even more important as the revised specification will be examined for the first time next year, and these new papers will all have some six mark free response questions.

It was noticeable that even very weak candidates who did attempt the free response questions, however badly, were often able to gain some credit. Those candidates who had been given practice in ordering their thoughts and then communicating them in writing were able to score very well.

There was no evidence that shortage of time was an issue. Almost all candidates completed each question paper, and items located at the end of the papers were seemingly answered to the same level of success as those towards the start.

Having said all this, it is important to repeat the message of the first paragraph. There were examples of lucid, well thought out answers that were a real pleasure to read.

A215/01 – Twenty First Century Additional Science A (B4, C4, P4) Foundation Tier

General Comments

Overall performance on this paper was unchanged from last year. As ever, candidates let themselves down in many ways, but the free response questions continue to be major source of lost marks for many. Many of them would benefit from much more practice at deciding what the question wants them to do and marshalling their arguments before attempting to write anything.

The paper addressed a number of subject areas across the module. The exam suggests that many candidates have a good understanding of osmosis, homeostasis, group one elements, speed and displacement, kinetic energy and momentum. However, there are some topic areas which are almost universally poorly understood: enzymes, atomic structure, interaction pairs and representing forces.

Comments on Individual Questions:

Question No.

- 1 The vast majority of candidates identified homeostasis as the correct answer to the first part of the question. However, about half of the candidates thought that blood temperature is sensed by the skin and that the brain contains effectors to control it, instead of the other way round. Only a minority of candidates kept their answers to the last part strictly to the question, so the majority failed to earn full marks. Too many weak candidates thought that increased blood flow would be enough on its own to raise the skin temperature, and often failed to develop the logically linked argument required of an explanation.
- 2 This question presented candidates with data from an experiment. Most were able to correctly match at least some of the observations of potato stretching to concentration, most knew that the membrane had to be partially permeable and nearly all knew that the process was called osmosis.
- 3 The first part of this question about enzymes was very poorly answered. Very few candidates realised that the shapes of enzyme and molecule have to match for break down to occur. The majority suggested that starch was too big or strong for peroxidase to have any effect. Most candidates erroneously opted for the first graph showing a rise to a constant value, probably because they didn't understand or notice the word **rate** on the vertical axis. Although the final part of this question was the most successful for the candidates, the majority still thought that denaturing was the reason for the increasing efficiency of the enzyme as temperature was raised.
- 4 The first chemistry question was about group one of the periodic table. The vast majority of candidates were able to copy symbols for elements from the periodic table, with only a few forgetting that correct capitalisation is important. Less than half of the candidates could match all three elements with the description of their reaction with water, and very few knew that hydrogen gas was produced as well as sodium hydroxide when sodium reacted with water. Surprisingly, only half of the candidates could write down the symbol formula for sodium chloride - many wrote down a word equation instead. However, many candidates knew that sodium affects the colour of a street lamp and were able to identify francium as the most reactive element in group one.
- 5 This question about atomic structure was poorly answered by the majority of candidates. Too many candidates assumed that the shells were filled with protons instead of electrons,

so were unable to correctly explain why the element shown had to be in group one. Only a minority of candidates knew that the atom became an ion by losing an electron and about half were able to correctly calculate the number of neutrons from the atomic mass and proton numbers.

- 6 This was the first of the physics questions, about speed, velocity and displacement. It was good to find that the vast majority of candidates could correctly identify the graph for constant speed and calculate the displacement. However, very few earned any marks at all for their free response answer. Most assumed that the driver would automatically have gone faster on the motorway instead of realising the difficulty of keeping a constant high speed on small roads. Too many assumed that if the average speed was 90 kph then it could not be steady, invented reasons why the driver needed to arrive in a hurry or did spurious calculations with the data provided. Many candidates suggested that velocity contained information about mass, probably confusing it with momentum.
- 7 This question was well answered by many candidates, although less than half were able to correctly identify the second half of the interaction pair. Many candidates knew that the oar did work on the water, with increasing its mass being a very popular wrong answer. Many candidates could name kinetic energy and some were able to express themselves clearly enough to indicate that they knew that it increased with increasing speed.
- 8 Very few candidates earned the mark for the first question. They needed to get the correct direction (horizontal) as well as the scale (three squares). Their responses suggested that many candidates had never exercised this skill. As expected, many weak candidates ignored the instructions for the second part and drew more than one line. Only a small minority could correctly calculate the size and direction of the resultant horizontal force. It was good to find that the majority of candidates could correctly relate the size of a resultant force to a change of momentum and were able to calculate a value for momentum.

A215/02 – Twenty First Century Additional Science A (B4, C4, P4) Higher Tier

General Comments:

As in recent sessions this paper contained a number of questions which required candidates to write out a response. With some notable exceptions the responses to these were often poorly structured. In future series, candidates might benefit from practice in thinking through their answer before starting to write. On this occasion there was no evidence that any significant number of candidates had any problem with completing the paper in good time, so the opportunity to pause and think first would seem to be there.

Almost all of the written responses except the truck tachograph question showed a disappointing number of candidates offering no response at all. This supports the suggestion that candidates would benefit from more preparation for this increasingly significant style of question.

In general the instructions to complete the other questions were fairly well followed, although there was one issue with part of Question 1 as detailed below. Candidates and Centres are to be congratulated on this good work.

Comments on Individual Questions:

Q1a asked candidates to describe why peroxidase could not break down starch. Many scored at least one mark through reference to the lock and key model or to the shape of the molecules, but a few hinted at the right answer by stating that each enzyme is specific. In the context of this question such responses were too vague to credit. In future candidates should keep in mind the need for sufficiently detailed answers. 1bi required candidates to select graph C, but a substantial minority went for option A instead. 1bii was well answered, but a significant minority spoiled their response to 1c by linking all of the boxes instead of the **one** straight line on each side as asked for.

Some responses to 2a were spoiled by giving a general response in terms of plasma concentration being either too high or too low. What the markscheme calls for is how Brad's body responds to the scenario given in the question. In 2b the great majority of candidates failed to realise that respiring would produce some water, but many did realise that blood temperature sensors are in the hypothalamus in 2c.

3a required a calculation of percentage increase in length of a potato cylinder of 4%, which was not done as well as anticipated. 3b was much more successfully answered, with Jenny and Ann on the left and Margaret and Sylvia on the right. There was a slight tendency for some to place Margaret on the left side among those who scored a mark for getting three in the right places.

4a and 4c were extremely well answered but correctly balancing the equation for the reaction of sodium and water was a real weakness. It was disappointing to see so many responses where the candidate was unable to give the correct species let alone balance the equation correctly. The ideal answer to 4d would have linked looking with a spectroscope to the unique patterns of spectral lines of each element, but the majority who did gain some credit for this part of the question did so through the perhaps less sophisticated approach of a flame test. This was a clear example of a written response which would have benefited from a little more thought before starting to write the answer.

Q5 was generally well answered, especially ai. On 5b the most common error was to give the answer of 19 rather than 20, suggesting that some were unclear as to how to determine the number of neutrons in a nucleus.

The marks for 6a were awarded as one for getting both colours correct and one for getting both states correct. While some did gain both marks it was more common to see one mark for the colours awarded, and the states seemed a particular weakness. 6b required an explanation of why sodium and chlorine react in different ways. A significant minority offered no response at all to this section, and it was a rare pleasure to award all three marks. The idea that sodium loses an electron and chlorine gains one was the most common way one mark was scored, but perhaps candidates will for future sessions need more confidence in approaching this type of question.

Q7a was poorly done, often not because the direction of the arrow drawn was wrong but because no care had been taken to draw it to scale – three boxes of the grid was the required length. 7b required the size and direction of the resultant force to be given, and while most realised it was forwards, many got the magnitude wrong. 7c was much better answered by nearly all candidates, and it was pleasing to see so many get the calculation for 7d correct as well.

8a required a description of a truck journey, with the key to a good response being to give plenty of detail from the graph. Many candidates showed themselves to be capable of accurately extracting data, although few were then able to go on and correctly complete the calculation of the speed in part b. 8c needed a clear understanding of the concept of negative distance and negative velocity which any candidates were unable to display by choosing graph A.

Q9 tested the key concept of an interaction pair of forces in part a, but the great majority of candidates were unable to identify this from the context of the question and either gave a bald 60N as their response, or else said the force was backwards but was slightly less than the push of Marco. As with other areas where a written answer was required, there was a number of candidates from whom there was no response at all. 9b required the selection of the correct equation and then calculation of how long the force acted. A reasonable number of candidates did this successfully, but perhaps some others would have benefited from more practice in solving this type of problem. 9ci was particularly poorly answered, with very few candidates indeed recognising that the work done increases the kinetic energy of the water. Part cii was a little better answered, and the point that friction dissipates energy through heating is one which it is important for candidates to recognise in any setting. As might be expected with 9d only the most able were successful in rearranging the equation for kinetic energy to work out the speed, although a significant number did opt for the correct fraction but only took the square root on the top line, so perhaps confidence and practice in taking the correct square root might help future candidates.

A216/01 – Twenty First Century Additional Science A (B5, C5, P5) Foundation Tier

General Comments:

Overall performance on this paper slightly better than this time last year.

As ever, candidates let themselves down in many ways, but the free response questions continue to be major source of lost mark for many. Perhaps they don't meet enough questions of this type in lessons? Many of them would benefit from much more practice at deciding what the question wants them to do and marshalling their arguments before attempting to write anything.

The paper addressed a number of subject areas across the module. The exam suggests that many candidates have a good understanding of molecular structure, static electricity, current in simple circuits, cuttings, phototropism and DNA structure. However, there are some topic areas which are almost universally poorly understood : metals from ores, the carbon cycle, generating electricity and how phenotype follows genotype.

Comments on Individual Questions:

Question no.

- 1 The majority of candidates earned most of the marks on this question. Weak candidates usually lost marks for the free response element of the question by discussing the behaviour of particles in gases instead of stating their masses and the forces between them.
- 2 Too many candidates earned no marks at all for this question. Some lost marks by attempting a symbol equation instead of a word one, others by not knowing that reduction is the opposite of oxidation. Only a minority of candidates knew that iron oxide and carbon gave iron and carbon dioxide.
- 3 Candidates fared much better on this question about the carbon cycle. Nearly all of them knew that carbon dioxide enters the atmosphere from burning fossil fuels, but very few realised that to calculate the net annual increase you had to use information from all the arrows in the diagram. Too many candidates ignored the question of the last part and wrote in general terms about the exchange of carbon between land and atmosphere instead of quoting evidence from the diagram. Lack of detail, such as numbers from the diagram, lost many candidates a mark.
- 4 Many candidates earned the majority of the marks for this free response question about static electricity. Weak candidates often confused static electricity with magnetism, and assumed that electrons could have both positive and negative charges.
- 5 At least half of the candidates earned all of the marks for this question about current in circuits. Where candidates did lose marks it was either because they didn't know why a lamp filament glows or they didn't know how to make it glow more brightly.
- 6 Most candidates did well on this question. Most could at least partially identify the correct explanation for the conservation of current in a series circuit. More than half could identify the correct way of connecting a voltmeter in a circuit and could use the idea of voltages across components adding up to the supply voltage in a series circuit.

- 7 Very few candidates were able to describe a generator as a magnet spinning inside a coil of wire and almost none could name the process as induction - electrolysis was a popular incorrect name. Large numbers of candidates thought that the magnet had to be rubbed against the coil to generate electricity, and some thought that the magnet was pulled in and out of the coil (probably remembering their own experience of generating electricity in the laboratory). Some candidates did a bit better on the second part of the question, but too many lost a mark through not being precise enough about their proposed changes to the coil. "More turns of wire in the coil" earned a mark, but "more coils" did not. Many weak candidates resorted to running two generators together, putting in more coal, turning up the heat, getting a stronger generator ...
- 8 The majority of candidates correctly named mitosis as the type of cell division, with meiosis as a very popular incorrect answer. Although most candidates could correctly identify the location of genes and the type of molecule they contained instructions for, very few were able to make any sense of the final part about the switching on and off of genes as an insect matured. The vast majority of candidates completely failed to mention the word "gene" in their answer, so could not even earn one mark. Most answers discussed the need for the insect to grow gills or wings to adapt to its environment, ignoring the question altogether.
- 9 Candidates fared much better with this question about cuttings and phototropism. Although the majority could identify the stem as the part to use, only a small minority could state that the rooting powder contained hormones. Most candidates earned at least one mark for identifying part of the reason why cuttings develop into new plants, but only a few earned both. Although only half the candidates identified the correct name for the process, nearly all of them could say what effect it had on the plant. As always, they are much better at questions which are about process instead of recall.
- 10 Many candidates earned full marks for this question about the structure of DNA.

A216/02 – Twenty First Century Additional Science A (B5, C5, P5) Higher Tier

General Comments:

The paper was well attempted by most candidates and produced a similar range of marks to the previous two series. Most candidates obeyed the rubric, answering the questions in the way requested, but there were quite a few who omitted the free-responses questions. It was also pleasing that there were few candidates who wrote in pen or pencil that could not scanned electronically, and where changes were made to answers, these changes were clear.

It may be that many who omitted questions would have been better entered for the foundation tier examination. However, there is another point here that centres will want to note: about one-third of all questions on the examinations are currently free-response, with about two-thirds being objective style – this will be different in the new specifications (for all awarding bodies) as the proportion of free-response questions will increase. It is therefore essential to prepare students to meet the challenge that these questions pose.

All candidates seemed to have made good use of their time. There was no evidence of candidates running out of time.

Comments on Individual Questions:

Question No.

- 1 (Oxygen gas) In (a), relatively few candidates recognised that the question was asking for the gas with the lowest boiling point: oxygen was by far the commonest answer, and water vapour was also popular. In the free-response part (b), most candidates were able to comment on the weak inter-molecular forces, although many were distracted into discussion of the interatomic bonds.
- 2 (Extracting metals) This question was generally well done. Some candidates did not answer (a)(i) correctly, attempting to write a symbol equation. (a)(iii) was frequently very well done. In part (b), as in 1(a), some candidates used the wrong column of the table to identify the three elements with lowest melting points, and others chose the least reactive three.
- 3 (Carbon cycle) This question was by far the most difficult of the chemistry questions: the quantitative parts (a) and (b) were rarely correctly answered, while (c)(i) showed that the majority of candidates did not know what 'state symbols' are, with many inserting numbers or chemical formulae into the answer boxes. Only a very tiny fraction of the candidature had (c)(i) correct. The free-response part (c)(ii) divided candidates into those who recognised that ionic solutions conducted electricity and those who did not.
- 4 (Electromagnetic induction) This question was entirely free-response. In (a), some candidates did not read the question clearly and did not describe how the magnet/coil move in a generator: 'turn' or a similar verb was needed. Very few knew the term 'induction'. In (b), many recognised that more coils/ faster rotation/ stronger magnet (NOT 'bigger magnet!') were the factors required.
- 5 (Power in a simple circuit) This question was well answered.

- 6 (Series circuit) This more difficult circuitry question was correctly answered by much fewer candidates. In the free-response part (a) many recognised that the current was the same because 'it had nowhere else to go', while many candidates are now able to draw a voltmeter correctly in place, even if they do not always read the question ('across the resistor').
- 7 (Electrostatics) Only the best candidates recognised that the movement of electrons from the balloon left it with a positive charge: most had 'negative' here, even though the other three terms were usually correctly chosen.
- 8 (Cell division and growth) Many candidates recognised that the chromosome number have in meiosis but remain the same in mitosis, but they frequently did not correctly identify them with P and Q, and gained no marks in (a)(i). In (a)(ii), very few candidates realised that only statement B ('copies of the chromosomes separate') occurred in cell division rather than cell growth. In (b), all five talking heads featured in different candidates' answers, rather than just Vick and Andrew.
- 9 (Cuttings) This question was generally well answered, with many recognising that the hormone stimulating root growth was auxin: 'hormone' was enough for the mark.
- 10 (DNA and protein synthesis) 'Double helix' was generally known as the correct response to (a), while there were some good answers to the free-response part (b), with the roles of messenger RNA and the location of protein synthesis as ribosomes known by many – 'a copy' and 'in the cytoplasm' would have sufficed for the marks. The nucleotide bases and their pairing were often well explained.

A217/01 – Twenty First Century Additional Science A (B6, C6, P6) Foundation Tier

The examination discriminated well, all candidates appeared to have time to complete the paper, and candidates were entered appropriately for this tier.

Most candidates attempted all the objective style questions but still showed lack of confidence when faced with the longer response questions that are now a feature of these papers, and a significant proportion left these sections completely blank. Candidates lost marks needlessly by this strategy. This trend was not limited to the weakest candidates, there were many examples of candidates scoring well on the objective questions but attempting none of the longer answers. It was also noticeable that even the weakest candidates who did attempt these longer response questions were able to gain some credit from their attempts.

Question 1

- 1a Most candidates were able to draw a sinusoidal waveform, but only a minority attempted to draw a wavelength. The majority of these attempts were, pleasingly, horizontal lines, showing the candidates had an intuitive idea of wavelength. Unfortunately most of them were not accurate enough to gain credit even when judged by eye.
- 1b A few candidates had a clear understanding of the effect of refraction on speed and frequency of light. It was clear that most candidates had engaged sensibly with the question, even if they scored little credit. A common mistake being the suggestion that the speed of light stayed the same.. The second part, about photons of different colours, was also found to be difficult though again examiners were encouraged that very few candidates went for red photons having the same energy as blue photons.

Question 2

- 2a Many candidates realised that the diagram showed an analogue signal, though digital was the most common incorrect choice.
- 2b In general the effect of an amplifier on a noisy signal was well understood by many candidates, with “only the amplitude of the radio wave increases” as the most common mistake. However, some of the most able candidates found this question unexpectedly difficult.
- 2c This was the first of the questions which required a longer response and some candidates left it blank. Many able candidates appreciated that a digital microphone would produce a cleaner sound, and so gained partial credit. A few of the most able candidates went on to get the second mark for realising that the noise could be cleaned from the signal. Weaker candidates repeated ideas from the stem of the question and discussed “pulses” without adding any further insight.

Question 3

This question is common with the higher tier paper, and so was designed to stretch the most able candidates on this paper. Part ai demanded that candidates not only know the term “diffraction”, but recall that term without any prompting from the question stem. A considerable minority of candidates made no attempt whatsoever and left this part blank. The term was known

by some of the target population, but few could explain what it showed about light or predict the interference pattern which would be created. For part aii all the statements were correct, but only two of them made up an explanation of why light is diffracted. Many candidates chose "light is a longitudinal wave" and "photons carry the energy to the screen" as their explanation. Most candidates incorrectly chose option B for their interference pattern.

Question 4

The whole of this question discriminated well, with able candidates scoring almost full marks and weaker candidates still able to gain some credit.

Most candidates correctly realised that reflexes are rapid and involuntary, with weaker responses tending towards rapid and voluntary. More able candidates then went on to choose the correct definition of a stimulus and could also sequence the events in a reflex arc. Many of those who were less certain were still able to gain credit for putting B directly before A.

Part 4d required a longer response and again some candidates left this section blank. Those that did answer it often scored well, with many interesting and imaginative answers. Some candidates with very poor communication skills found it difficult to express their thoughts in a meaningful way, though examiners gave credit where possible.

Question 5

The role of neural pathways in learning was well understood by most candidates. Many also recognised the correct two functions of the cerebral cortex, though temperature control was a common alternative response. The last part, which dealt with techniques for mapping the cerebral cortex, gave rise to considerable concern. This is a question which has been answered well in previous years when asked in its objective form, but in this case a very large minority of candidates made no attempt and left it blank. Candidates clearly had great difficulty in organising their ideas, and many answers were too vaguely worded to be awarded credit. The most common credit worthy answers involved different forms of scan, with "dissection" and unqualified "X-rays" as popular alternatives which did not gain credit.

Question 6

- 6a This part was intended to give weaker candidates an opportunity to show what they could do, but surprisingly few candidates across the whole ability spectrum realised which two readings could be used to calculate the mass of alkali.
- 6b This question is common with the higher tier paper, and so was designed to stretch the most able candidates on this paper. It was another question which required a longer answer and many candidates did not attempt it – though more did attempt it than for question 5bii. Some candidates appeared to be unfamiliar with the titration as a technique and instead gave descriptions of crystallisation or rate of reaction investigations. Candidates who did gain credit usually did so for a reference to the colour change of the indicator and for adding the acid slowly/drop by drop.
- 6c Candidates were much more confident at the word equation and able candidates answered this well. Weaker candidates found it much harder to translate the information from the format of the question stem to the format of a formal word equation, and examiners had suspicions that these candidates did not realise that the information had actually been given to them.
- 6d Most candidates could successfully identify the two alkalis in the list.

Question 7

While very few candidates knew which acid from the list is a solid acid, the rest of this question tended to be answered well. However, weaker candidates often suggested that the reaction between an acid and sodium hydrogen carbonate was an oxidation reaction.

Question 8

This question was designed to allow weaker candidates to show their understanding of pH and it worked well, with many candidates recognising that pH gives an indication of how acid or alkaline a solution is, and large numbers also realising that a neutral solution has a pH of 7. The weakest candidates often suggested 6 instead.

That relative formula mass is calculated by adding up the relative atomic masses, proved more difficult than might be expected, with 1/35.5 being a common response even amongst more able candidates.

A217/02 – Twenty First Century Additional Science A (B6, C6, P6) Higher Tier

General Comments:

The paper was well attempted with few blank spaces. The candidates seem to have made good use of their time. There was no evidence of candidates running out of time.

The mark range was 1 – 40 out of 42 and the mean mark was lower than both January and June 2010.

There are still some candidates who do not follow instructions as to how to answer the questions (Q 1a and 4b)

Comments on Individual Questions:

Question No.

- 1 (a) This was a good start for most candidates. Nearly all managed to score one mark for knowing that the wavelength is the distance from crest to crest. Few scored both marks. The distance from the crest to the next trough was often connected wrongly to one of the sentence starts. Some candidates drew more than three lines.
- (b) The knowledge about white light shining at a prism was well known. A significant proportion scored all three marks here. The amount of refraction depends on the amplitude was a common error.
- (c) Only 25% of candidates knew the equation for calculating the intensity of light arriving at a point on a screen.
- 2 (a) This question was looking for a wave of fixed amplitude whose frequency changes. As this was freehand some allowance was made for the drawing. Fewer than 20% scored the mark here. Many left it blank.
- (b) Candidates who knew that digital has two values scored one mark however they expressed it. The idea of noise being picked up during transmission and then got rid of enabled some candidates to score more than one mark. 50% of candidates did not score any marks. Another question many left blank.
- 3 (a) (i) Diffraction was a term known to about 60% of the candidates. A common wrong answer was refraction.
- (ii) About half of the candidates scored one or two marks. There was no pattern to the wrong answers..
- (b) Answer A is the only plausible answer, even though it is drawn in an unusual direction. Only 15% gave the correct answer.
- 4 (a) This was one of the worst sections for scoring marks. Diffusion of the chemical transmitter (not the electrical impulse) would have scored the first mark. The second was for binding to the receptors. If the candidate gave the membrane of B, they would have scored the third mark.

- (b) This is an example of a question where candidates do not follow instructions. Many drew more than one line. One mark was for knowing that Ecstasy reduces serotonin removal from neuron A and the second was for knowing it increases serotonin concentration in the synapse.
- 5 (a) Candidates linguistic skills were as important as their knowledge. Some described reflexes as generic rather than specific ideas, some were senses rather than reflexes. However over 70% scored both marks.
- (b) Involuntary for last response was the usual mistake in this question. Some candidates got sensory and motor the wrong way round. Overall many scored one mark for getting at least one answer correct.
- (c) The candidates had to get both answers correct to score the mark and many of them managed it. There was no pattern of mistakes seen in the wrong answers.
- (d) Primary and secondary were often transposed, and modified for the last response the usual mistakes. Less than 20% failed to score at all.
- 6 Many scored both marks. Ideas about learning were known. Those who did not score often only ticked one box.
- 7 (a) About a third of candidates seemed to have no idea what a titration was. Generally well answered by those who had done the experiment, and poorly done by those who hadn't. Usually two marks were given for drip/mix and measuring acid. Four marks was given fairly often. Common mistakes included talking about time/rate and not giving clear colour change or saying "neutral colour".
- (b) Candidates did this section quite well. They were able to work out that the sodium hydroxide solution reacted with less acid than she expected because it contained impurities.
- (c) (i) This was the worst section for scoring marks. Only 9% managed to score a mark. Candidates did not know the formula for sulfuric acid or sodium hydroxide, two common laboratory chemicals. This meant their score was 0. The few who did know the formulas were not always successful at balancing the equation.
- (ii) Another poor scoring question. Slightly better answered than balancing equation. A common mistake was missing the charges off. Some wrote acid and alkali in the boxes.
- 8 (a) About 50% of the candidates knew that citric acid was the acid most likely to be in the powder.
- (b) This type of sequencing question did not score as well as they usually do. There was no pattern to the incorrect answers.
- (c) Many candidates got the name right (magnesium chloride) , but **MANY** Mg_2Cl responses for the formula.
- (d) Few candidates knew that magnesium oxide was the other compound that reacts with acids.

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