GCSE EXAMINERS' REPORTS

GCSE
APPLIED SCIENCE (DOUBLE AWARD)

SUMMER 2022

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APPLIED SCIENCE (DOUBLE AWARD)

GCSE

Summer 2022

UNIT 1: FOUNDATION TIER

General Comments

This is the first examination of unit 1 since the pandemic. It is evident that candidates found the examination very challenging with many candidates struggling with the demands made by the paper.

Q 1, 2 and 4 solicited the best responses on the paper. The candidates generally found the questions increasingly difficult as the demand increased through the paper. This was also reflected in the increasing proportion of candidates not attempting parts of a question as the level of demand increased.

Question 7 was common to the Higher Tier paper.

Comments on individual questions/sections

Q.1 (a) Part (i): Many seemed to have missed the time frame that this question was set over and gave answers that related to recent changes e.g. burning fossil fuels, pollution from factories etc. Part (ii) was much better attempted with most candidates giving at least two changes shown between the pie charts.

(b) Most candidates could give 2 of the 3 correct statements.

Q.2 (a) Part (iii) was often the most poorly answered of the three parts; the term ‘ions’ being frequently given. Perhaps candidates were uneasy about giving the same answer for two consecutive parts?

(b) Part (i) was frequently incorrect with ‘8’ and ‘16’ given as answers. Part (ii) and (iii) were generally better known but some candidates inverted their answers to the two parts, possibly showing they confused the idea of a period and a group.

(c) Most could give the relative atomic mass of the elements however relatively few could give the relative formula mass of water; the frequent incorrect answer given as ‘17’.

Q.3 It appeared that these two circuits and the differences between then them was relatively unknown to candidates. The answers to this question were disappointing and only a few answers were worthy of marks in band 2 or 3. Many candidates just referred to either the number of, or the location of, the ammeters and voltmeters in each circuit. Others seemed to think the reading on the meters was ‘A1’, ‘A2’ etc. Only a relatively few candidates made sensible observations about the current and voltage in the circuits. Where descriptions were given, they tended to be better for the series circuit than the parallel circuit.

Q.4 (a) Part (i) was the best answered part of 4(a). Although most attempted part (ii), relatively few realised that they needed to multiply 66 by 23/100. The answers given to this part (iii) were quite mixed.

(b) Both part (i) and (ii) were relatively well done. Part (iii) presented more of a challenge, but a welcome number of candidates obtained at least 2 marks.

Q.5 (a) Part (i): Although most candidates said gas use decreased from 2006 to 2018, less said that consumption increased to 2010 before falling until 2018. Part (ii): Many gave the correct answer of '51'. Some candidates tried to use 33% and 30% (for renewables) to calculate an answer.

(b) Most candidates found this part quite challenging, but a number did manage to get all three marks. Some candidates could convert 950 MW to watts to gain one mark.

Q.6 (a) Part (i). Although many candidates recognised that the answer involved carbon dioxide and oxygen, a number failed to get a mark because they placed them in the wrong order. Part (ii) Many wrong answers were seen including 'cell membrane, 'red blood cell', 'blood vessel'.

(b) Part (i) Most candidates could give correct answers in the table. Most candidates gained a mark for part (ii) but some candidates lacked precision in their answers e.g. by stating 'breathing increased' rather than saying (e.g.) 'breathing rate increased'.

Part (iii). Only a few candidates worked through to show 'yes, she had achieved her target'. Most did not know realise the difference in % composition of oxygen was 5%. Even less realised they needed to find 5% of 40 000 cm^3.

(c) A disappointing number of candidates were able to state what is meant by 'anaerobic respiration'. Part (ii). Disadvantages tended to be a little better known than advantages.

Q.7 This question was common to the HT paper. Most foundation candidates found this a very challenging question.

(a) Although many candidates wrote something, very few understood that glucose would diffuse out of the VT and starch would not. Part (ii): A number of candidates knew the two tests that could be used. Most of these however incorrectly assumed a colour change for the starch solution.

(b) Part (i): Very few seemed to know that carbohydrase would digest starch. Part (ii): Some realised the diffusion would be faster but relatively few of those could give an explanation. Part(ii) was very rarely understood.

(c) This was poorly answered.

(d) Very few candidates gave responses worthy of marks.

Summary of key points

Candidates need to:

- read questions carefully looking out for key words such as ‘state’, ‘describe’ and ‘explain’.
- learn how to examine information contained in pie charts and make comparisons.
- practice extracting information from the Periodic Table and using it to find the atomic mass of elements and the electronic configuration of lighter elements (e.g. O) from the atomic number. Candidates should also practice finding relative formula mass of simple compounds from relative atomic mass.
- practice calculations particularly those involving ‘percentages of’ a value.
- understand the differences in terms of current and voltage between series and parallel circuits. This was particularly poorly understood this year.
- strengthen understanding of core concepts in applied science

APPLIED SCIENCE (DOUBLE AWARD)

GCSE

Summer 2022

UNIT 1: HIGHER TIER

General Comments

This is the first examination of unit 1 since the pandemic. It is evident that candidates found the examination challenging with many candidates struggling with the demands made by the paper. The majority of candidates sat this paper through the medium of English.

A much higher proportion of candidates attempted each part of the paper than on the foundation tier, but this did not always transpose into good marks.

Question 1 was common to the foundation tier.

Probably a significant number of the candidates would be better suited to the foundation tier.

Comments on individual questions/sections

Q.1 (a) Part (i): A few candidates were able to give an account of diffusion with reference to the relative sizes of the molecules to the holes in the VT. Part (ii): A reasonable number of candidates were able to give the names of the tests that needed to be carried out. Less were able to describe the observations that would be made with starch giving most problems (no change).

(b) A few recognised that carbohydrase would break down starch. Less were able to explain how diffusion would be affected. Part (iii) Only a few candidates recognised that there was no longer a concentration gradient.

(c) Only a few candidates recognised the model did not have a blood supply and it was unable to maintain a concentration gradient.

(d) There were attempts at this part which were worthy of a proportion of the marks. ‘Surface area’, ‘thin walls’ and ‘good blood supply’ were seen most often. Suitable explanations were also provided in some of these cases.

Q.2 (a) This is a less structured version of Q2(a) on the foundation tier. The removal of the structure made the question very much more challenging for candidates. Terminology was poorly used by many candidates showing a lack of basic knowledge, e.g. statements were made such as ‘oxygen is a structure made of 8 atoms’. Still, a number of candidates were able to get three marks for describing the structure.

(b) Part (i): Very few candidates were able to give the electronic structure of the ions. A few gave the electronic structure of the atoms, but most wrote numbers selected from the Periodic Table.

(c) A few candidates were able to give the correct answer, but many had no idea how to calculate the relative formula mass.

Q.3 Most candidates tried to respond to this question, but most responses could only be awarded marks from the lower band. Where marks were earned, it was generally for candidates recognising that elements were placed in order of atomic number, that groups were columns of elements and periods were rows of elements. A few candidates could also state that electrons in groups had the same number of electrons in the outer shell. Very few could clearly say that groups of elements had similar chemical properties. A number of candidates recognised that elements were either metals or non-metals and made some reference to where the two types of elements may be found. A number of candidates tried to use group 1 to illustrate their answer.

Q.4 (a) Part (i). A significant number of candidates were able to earn at least 2 of the 3 available marks. There was more than one way that candidates could arrive at the final answer and credit was awarded for which ever approach the candidate used. Part (ii): This was more challenging than expected. Perhaps the most common answer given credit was 'there may be less sunshine than expected' or 'it was cloudier than expected'. Other reasons were less well known. A few suggested 'energy prices may increase' but this will not lengthen payback time.

(b) A few candidates did read the information given and recognise that the number of hours of sunshine per year was 1500 hours. A number of candidates used this figure to correctly calculate 21 000 kWh but did not realise that they needed to find 23% of this figure.

(c) A number of candidates were able to carry out both calculations for (i) and (ii). Where mistakes were made, it often related to using wrong information from the question or errors in using the indices. In a few cases, candidates gave incorrect answers with no workings.

Q.5 (a) A number of candidates were able to describe enzymes as biological catalysts or state they 'speed up the rate of reaction'.

(b) Very few candidates were able to suggest a reason why the enzyme should be given as a liquid.

(c) Only relatively few candidates were able to explain that Y was the most suitable catalyst. Most did not realise that the enzyme would be active in the alkaline environment of the small intestine.

(d) Part (i): A few candidates were able to suggest that all three enzymes were necessary to break-up stains caused by different types of foods. Part (ii). Very few obtained more than 2 marks. Of the responses worthy of marks, the most common were that enzymes will 'denature at this temperature' and 'so food stain will not be broken down'.

Q.6 (a) This was disappointing. A few candidates were able to state ‘voltage’ for (i) and even less state ‘current’ for part (ii). Answers for part (ii) included ‘the lamp’ and ‘voltmeter’. Part (iii): A surprising number of candidates were unable to give a suitable scale. In a number of cases the ‘scale’ was simply the voltage/current readings written against each major gridline. In other cases, the scale was poorly chosen so that it was difficult for the candidate to determine where to plot the data points. Where a sensible scale was chosen most candidates were then able to plot the data points. The line drawn at the end was often a straight line even though a smooth curve was the obvious choice. Part (iv): A few candidates were able to use their graph to find the current at 7.2 V and then divide the voltage by their current to find the resistance. A few candidates obtained a suitable current but did not know how to find the resistance. Part (v): Where resistance was commented on, the candidates often thought it remained constant.

(b) Many candidates made no reference to resistance in their answer but simply made statements such as, ‘current increasing as the voltage increases’ (or similar). If candidates earned marks, it was generally for saying that the resistance was constant in the resistor. Very few could accurately comment on the resistance in a diode.

Summary of key points

Candidates need to

- read questions carefully looking out for key words such as ‘state’, ‘describe’ and ‘explain’.
- practice extracting relevant data from information given in the stem of questions and from the Periodic Table.
- practice constructing graphs with suitable and useable scales. In particular, candidates need to practice constructing suitable scales from non-linear data. Candidates also need to consider the kind of line that best fits the data given (straight or smooth curve).
- practice working through multistage calculations.
- strengthen understanding of core concepts in applied science.

APPLIED SCIENCE (DOUBLE AWARD)

GCSE

Summer 2022

UNIT 2: FOUNDATION TIER

General Comments

There were approximately 1 520 entries for this tier paper. About 1 446 of these entries were through the medium of English and 74 through Welsh. On the English scripts, not a single question had a 100% attempt rate. On the Welsh scripts there were 2 question parts with 100% attempt rate. It is disheartening to see the lack of motivation that results in some candidates not even attempting questions that require the ticking of boxes (q2b) or underlining words in brackets to complete a sentence (q5b).

Questions involving data analysis or application of knowledge (q1a, q4ai, q8ci) were often answered better than those requiring recall (q2c, q3aii, q4c).

Some candidates often seemed not to have read the question fully and did not consider diagrams given in questions, which often provide substantial clues to the answer. As a result, their ability to analyse data, make inferences or draw conclusions was severely hampered. This was evident in q1b, q3b and q8e.

Poor basic literacy severely limited the quality of responses of some candidates. Some answers or part answers were partly or wholly illegible, making it very challenging for examiners to interpret.

Comments on individual questions/sections

Q.1 (a) This was well answered. Most candidates gained at least 2 marks. However it was surprising that just over 2% of candidates did not attempt the question.

(b) It was decided at the exam conference to add between sites 3 & 4 to the marking scheme. Even so, less than half of candidates stated an appropriate pair to gain the mark. Some answers stated between sites 1 and 8.

Q.2 (a) The attempt rate was just below 82%. Just over half of candidates earned this mark.

(b) It is always a surprise when the attempt rate for a tick box question is below 100%, in this case 98.7%. However, this was a well answered question. Some candidates thought fishing or photography were methods of maintaining biodiversity. There are always those candidates who ignore the instruction to tick two boxes and select three instead immediately attracting a penalty.

(c) This question relied on candidates' recall of knowledge. It was not answered well. Candidates did not appear to understand the term 'wildlife corridors'. Many thought they were indoor corridors. The non-attempt rate was just over 25%.

Q.3 (a) (i) Most candidates were able to label at least one part correctly, usually the synovial fluid. Muscle was confused with ligament and the cartilage was sometimes labelled ligament.

(ii) This question required recall of knowledge and was not answered well. Answers in both parts usually referred to sports injuries of ligaments and muscles.

(b) This question tested application of knowledge of antagonistic muscles to movement of the foot. About 25% of candidates earned credit and usually for recognising one muscle moves the foot up and the other moves it down. Few candidates worked out which muscle produced up or down movement. The word 'tenses' was accepted for 'contract' in this instance. Some candidates believe muscles act by pushing rather than pulling.

Q.4 (a) (i) If the introductory passage to part (a) was read carefully then the answer was easily obtained from the graph. Most candidates did this well to obtain the mark.

(ii) Less than 40% of candidates earned this mark. There were vague references to using injections and balanced diets without specifically referring to insulin and low carbohydrate diets. Some candidates spoke of monitoring. There were a few references to the use of EpiPens and penicillin.

(b) Just over half of candidates earned at least two marks for completing the table. These marks were usually gained in row B for recognising ultrasound scans and their use in monitoring unborn babies. Despite the question specifying imaging technique and the table including a column with the same heading, some candidates gave treatment to kill tumours as a use in row C.

(c) (i) Knowledge of base pairs was poor. About 25% of candidates earned the mark. The attempt rate of 61% was one of the lowest on the paper.

(ii) This depended on recall and was very poorly answered. The ionising nature of X-rays was not known. It was very rare to award a mark.

Q.5 (a) Both parts required recall and both parts were not well answered. This was particularly true in part (ii) where candidates must have misread the question because answers included disadvantages of Earth-based telescopes.

(b) Just over half of candidates selected the correct option.

(c) (i)&(ii) This question assessed recall of the order of the specified parts of the electromagnetic spectrum. Correct answers were seen in just under half of scripts in both parts. Some candidates named parts of the em spectrum not included in the question.

(iii) The attempt rate for this part was only 72.4%. Over half of candidates who attempted the question gained at least 1 mark. Others stated parts that had already been given in the question. They ignored the instruction to 'Name two other types….'. Ultra, infra, violet and red were not accepted. Magma rays was an unusual answer.

(d) Just over 20% of candidates did not attempt this calculation. About a third of candidates gained some credit, usually for selection of 2m. Candidates who selected 10m and then worked out an answer of 30 000 000 earned 1 mark only. There were examples of numbers between 2 and 10m being used. Some candidates thought that they should use both 2m and 10m in their calculation, so the following substitutions were seen: $3\times10^8/2\times10$ and $(3\times10^8/2)\times10$.

(e) The attempt rate for this question was just under 70%. Most of the candidates who attempted the question stated the correct theory. Incorrect names of the theory included galaxy, Benedict's, Wegener's and Stephen Hawking.

Q.6 The attempt rate for this QER question was just below 90%. Candidates made quite good attempts at the question and the mean mark was just in the middle band. The question asked for a comparison between two diets and how the actual diet would affect health. Most candidates could make comparisons between the diets, but less included comments about health. The number of points placed the answer in a band. However, there were additional hurdles to gain a top band mark of 5 or 6. These were at least 6 points from the indicative content should be present, with at least two from each area, and at least one link between diet and a named health effect. It was very pleasing to see candidates overcoming these hurdles with answers gaining top band marks.

Q.7 (a) (i) Most candidates gave the correct answer.

(ii) Lots of incomplete calculations seen. Some candidates calculated a drop of 11 but went no further, others calculated the pulse rate had to drop 55 from 133 and went no further, others deduced the pulse rate had a further 44 to drop and some worked out it would take 5 minutes to drop from 133. Few went on to calculate 4 minutes which is what the question asked.

(iii) It was expected that candidates would perform the following division, $\frac{400}{58}$. However there were variations of different distances divided by different times all taken from the table. One method involved adding all the distances which totalled 1000m, then doing the same for times, total 141s, then performing the division.

(iv) The majority of candidates completed the first required row correctly but usually the next two rows were in reverse. Other errors included writing 0→200, 0→300 and 0→400. Also some sections were not even within the range of the race, e.g. 400→500.

(b) This was not answered well. Some candidates realised that the pulse rate would be below 132 during exercise but didn't think the resting pulse rate would be reduced also. Some answers included a pulse of zero before the race started.

Q.8 This question is based on the pre-release. It was evident that candidates had been introduced to the document before the exam as is the intention.

(a) (i) Most candidates completed the Kingdom and Phylum correctly in the classification table. There was less success in completing the Genus and Species because some copied *Vanessa atalanta* from the resource folder.

(ii) About half of candidates earned at least 1 mark here.

(b) (i) The term migration was not well known with only a minority gaining a mark. Some called it Natural Selection or hibernation. More candidates were able to give a reason for the seasonal movement though.

(ii) The completion rate here was less than 70%. Most candidates described the changes between April and October rather than compare the curves. However some recognised the peak in 2019 is greater than the mean count. Few noticed the peak in 2019 is earlier.

(iii) The completion rate here was similar to part (ii). Over half of those who completed the question drew a curve of smaller amplitude but fewer showed a shift to the right.

(c) (i) This was well answered. Candidates used the information in table 2 of the resource folder to complete the food web correctly with many earning full marks.

(ii) Some candidates could describe how the numbers of mice and rabbits would decrease due to lack of food and how this affects foxes. Others forgot to state the effect on foxes. The rest of answers did not make it clear which consumer was affected so it was difficult to award any marks.

(iii) This was not answered well. At the bottom of page 3 of the resource folder there is information about trophic levels including the statement 'In a food web some organisms can appear in more than one trophic level.' This obviously had not been explored further when the pre-release was made available. It was disappointing that some candidates did not appear to understand the term 'trophic level'.

(d) The attempt rate was just over 75%. However candidates who attempted the question usually earned some credit with a minority gaining full marks. Some candidates ignored the instructions in the question for the pyramid to contain **five** trophic levels starting with berries and ending with buzzards. Pyramids containing a range of 3 to 7 levels were seen which attracted a penalty. Some didn't start with berries or end with buzzards which was penalised. Others did not draw a pyramid but gave a food chain.

(e) The attempt rate of under 60% was the lowest on the paper. The question was not answered well. Candidates obviously didn't realise that producers occupy the bottom level of the pyramid. Either that or they did not read the question carefully. Lots of examples where 20 810 appeared in the calculations. The wording of the efficiency equation was amended to make it candidate friendly but few correct calculations were seen.

Summary of key points

Candidates must be encouraged to:

- read questions carefully.
- follow the instructions given in questions.
- attempt all questions.
- show substitutions into formulae in the spaces allocated for workings.
- develop strategies to retain information since 40% of the marks are allocated to recall.
- write legibly and succinctly.

APPLIED SCIENCE (DOUBLE AWARD

GCSE

Summer 2022

UNIT 2: HIGHER TIER

General Comments

There were 145 entries for this tier paper, 140 through the medium of English and 5 through Welsh.
Performance on questions involving application or analysis of data was much better than questions relying on recall.
Candidates' knowledge was poor as demonstrated by the low facility factors on questions that depended on recall e.g. q5.
Not all candidates showed their working or substitution into equations which resulted in them gaining zero marks if the answer was incorrect.
Candidates had problems handling indices.

Comments on individual questions/sections

Q.1 This question is based on the pre-release. It was evident that candidates had been introduced to the document before the exam as is the intention. As expected, the attempt rates and performance were better on the common questions than on the foundation paper.

(a) (i) Most candidates completed the classification table correctly to earn full marks. However, some candidates had less success in completing the Genus and Species because some copied *Vanessa atalanta* from the resource folder.

(ii) Over half of candidates earned at least 1 mark here.

(b) (i) The term migration was known by less than half of candidates. Most candidates were able to give a reason for the seasonal movement though

(ii) Most candidates described the changes between April and October rather than compare the curves. However, some recognised the peak in 2019 is greater than the mean count. Few noticed the peak in 2019 is earlier.

(iii) Over half of those who completed the question drew a curve of smaller amplitude but fewer showed a shift to the right.

(iv) This was not answered well. Where credit was earned it was usually for stating that as the Red Admiral population increased so did the population of frogs. There was no mention of the lag between the population growths.

(c) (i) This was generally well answered. Candidates used the information in table 2 of the resource folder to construct the food web correctly with some earning full marks. Some single food chains were seen which earned 1 mark. Some included arrows that pointed in the wrong direction. However, some ignored the instruction to construct the web that depends on berries and even though only berries were shown in the space they added plantain also. This resulted in the complete food web being drawn. On this occasion it was decided not to penalise candidates if this was done. Candidates penalised themselves by spending more time than required answering this question.

(ii) About 40% of candidates earned credit here mainly for stating that frogs occupied more than one food chain. At the bottom of page 3 of the resource folder there is information about trophic levels including the statement 'In a food web some organisms can appear in more than one trophic level.' This obviously had not been explored further when the pre-release was made available.

(d) The question was well answered. However, some candidates ignored the instructions in the question for the pyramid to contain **five** trophic levels starting with berries and ending with buzzards. Pyramids containing a range of 3 to 7 levels were seen which attracted a penalty. Some didn't start with berries or end with buzzards which was penalised. Others did not draw a pyramid but gave a food chain.

(e) The question was not answered well. Candidates obviously didn't realise that producers occupy the bottom level of the pyramid. Either that or they did not read the question carefully. Lots of examples where 20 810 appeared in the calculations. The wording of the efficiency equation was amended to make it candidate friendly but few correct calculations were seen.

Q.2 (a) (i) The attempt rate of just over 77% was one of the lowest on the paper. The question relied on recall and generally the question was poorly answered. However, some excellent answers were seen including some stating what A, T, C and G stand for.

(ii) This was not answered well. Many answers about different imaging techniques using radiation to alpha and beta. Some thought MRI scans were ionising, and others did not know that X-rays and CAT scans were ionising. No knowledge of ultrasound was apparent.

(b) This question required recall and the knowledge was not well known. Statements about 'it uses X-rays' or radio waves were seen. Most answers referred to images of a baby and not how they are formed.

Q.3 (a) If the question was read carefully then it would have been apparent it was about antagonistic muscles and the function of each muscle could have been deduced. However, a minority of candidates worked this out to give good explanations. Most of the answers were poorly expressed so it wasn't clear which muscle was performing what function. Candidates often used terms such as 'tense', 'retract' or 'stretch' instead of contract and relax.

(b) This question was testing recall and it was not answered well. Few candidates earned credit and usually for referring to bones rubbing together. Many answers referred to muscles and tendons which were irrelevant to this question.

(c) (i) Not answered well. Few correct answers seen. Some candidates misread the question and answered about Tom not Dafydd. Other errors included incorrect subtraction e.g. 56.55-40.95=16, comparing the last 100m with the first 50m, and adding the times not realising they were cumulative.

(ii) The majority of candidates earned credit including references for graph work, but it was rare to award any credit for the conclusion. Most scales were appropriate, and plots correct but often no lines were drawn. Some basic errors were evident, such as not adding a scale on the x-axis, adding a non-linear scale and using intervals of 6s/2cm so the x-axis only extended to 48s. Most conclusions stated that Dafydd was faster but with no reasoning why. Candidates did not appear to relate steepness of the line to size of speed.

Q.4 (a) (i) The difficulty of the question was reduced at the exam conference by removing the requirement for an explanation for each controlled variable. Even so a minority of candidates earned credit. Some candidates thought using same pieces of apparatus were controlled variables. Others used the term 'same amount' instead of mass or volume when referring to food and water which didn't earn credit.

(ii) This was the least well answered question on the paper. Most of the answers referred to manufacturers having better equipment or using more accurate methods.

(iii) This was very poorly answered also. Candidates could not explain how the additional labelled parts of the apparatus, (including oxygen, copper coil, air filled jacket and stirrer) improved the quality of the results.

(b) Candidates had more success in completing the calculation than they did in the rest of the question. However, few correct answers were seen since candidates overlooked the requirement to calculate the energy content of food in J/g. Therefore, most of the calculations ended with an answer of 1 293.6 J or 1 293 600 J if there was no conversion from g to kg. This earned 2 marks.
Some candidates failed in their attempted conversion because instead of 20×10^{-3} they used 20^{-3}.

Q.5 This entire question was assessing recall. It was very poorly answered.

(a) Clearly, candidates did not understand the purpose of nature reserves. Many believe it's a space that is put aside and then animals are moved to it rather than a specified area which is to be protected. It was rare to award a mark. Some of the more unusual answers referred to animals not knowing where they are, not all animals getting along and animals dying when they cross the road.

(b) The completion rate was about 80%. This QER was based on a topical issue of relevance to young people. The indicative content was wide ranging and included all the current issues related to sustainability. There were few hurdles to overcome to move up through the bands. Despite this most answers were limited to the bottom band. Some candidates wrote at length without referring to any issues at all.

Q.6 (a) (i) The question required recall and was poorly answered. Some argued that Earth-based telescopes produced better images than space-based ones.

(ii) This question also required recall and was also poorly answered. The question referred to visible light, so answers based around CMBR automatically earned zero. There was little knowledge of red shift. Some answers referred to sound waves left over from the Big Bang.

(b) (i) The attempt rate was just over 72%. The facility factor was under 2% meaning it was very rare to award a mark. The most common answer was 5 billion light years. However, answers ranging from 9 minutes upwards were seen.

(ii) This tested whether candidates knew that all em waves travel at the same speed through space. Less than 20% of candidates ticked the correct box. The most common answer was a tick in the top box.

(iii) The attempt rate here was just over 76% and most answers were poor. Candidates experienced problems in manipulating the equation and in handling indices. Most did not realise that they had to select the lower frequency and some, somehow, included both in their calculations.

Summary of key points

Candidates must be encouraged to:

- read questions carefully and follow the instructions given.
- develop the skills required to add linear scales to axes when the tabulated data is not increasing in equal intervals and to ensure it covers the range of values.
- show substitutions into formulae in the spaces allocated for workings.
- develop strategies to retain information since 40% of the marks are allocated to recall.
- improve their ability in handling indices, such as when multiplying, dividing, using negative powers and when converting from one unit to another.

APPLIED SCIENCE(DOUBLE AWARD)

GCSE

Summer 2022

UNIT 3: FOUNDATION TIER

General Comments

There were approximately 2 570 entries for this tier paper. About 2 170 of these entries were through the medium of English and 400 through Welsh. On the English scripts, not a single question had a 100% attempt rate. On the Welsh scripts there was 1 question part with 100% attempt rate. It is disheartening to see the lack of motivation that results in some candidates not even attempting questions that require the ticking of boxes (5b) or underlining words to complete a sentence (1bii, 6aii).

Questions involving calculations and data analysis (2b, 3c, 4, 6ai) were often answered better than those requiring recall (2ai&ii, 3b, 5c).

Some candidates experienced difficulty interpreting scales on the graph.

Poor basic literacy severely limited the quality of responses of some candidates. Some answers or part answers were partly or wholly illegible, making it very challenging for examiners to interpret.

Comments on individual questions/sections

Q.1 (a) (i) Almost all candidates attempted the question and most earned full marks.

(ii) Most candidates underlined the correct option. About 1.5% did not attempt it.

(iii) This part was answered well by many candidates. Answers which did not earn credit include: ‘to prevent illness’, ‘to clean the equipment’ and ‘to kill germs’.

(iv) Not answered as well as the previous part but still about half of candidates gained the mark. Some candidates referred to thickening the milk, to make yoghurt, to remove lumps and to clean it.

(b) (i) The attempt rate dropped to around 87% here. About half of candidates earned at least 1 mark. There wasn’t one gap that was filled correctly more often than the other. Common incorrect answers were: Semi-skimmed milk is made by skimming (milk/cheese/yoghurt) from (the/cows/semi-skimmed/skimmed) milk.

(ii) Considering this required underlining a word in each bracket it is surprising that over 3% did not attempt the question. Most of those that did, gained at least 1 mark. Some candidates underlined more than 1 word in a bracket so lost the mark.

Q.2 (a) (i) This was not answered well. Just about anything involved in the experiment was included here. It was not obvious that candidates understood the term independent variable. Less than 30% gained the mark.

(ii) Similar comments as the previous part. Some answers included single words such as ‘pin’ or ‘Vaseline’. These were not credited and a property such as ‘same type of pin’ or ‘same mass of Vaseline’ were expected.

(iii) The attempt rate here dropped to just below 70%. Answers were very poor with only about 10% of candidates earning a mark. It was doubtful whether most candidates understood ‘related to the dependent variable’.

(b) (i) The attempt rate went back up here to almost 99%. About half of candidates could arrange the metals into the correct order. However the remainder thought the best conductor was the one with the biggest time.

(ii) Many candidates earned at least 1 mark here. This was because they sorted the metals in order using the data in the table. Sometimes this was all that was done with no further explanation. Less than half of candidates justified their answer by comparing the position of a named metal (ideally copper or aluminium) in both lists.

(c) Not well answered. Less than 10% of candidates earned a mark. Few recognised it was already in the liquid state so stated it would melt in the flame.

Q.3 (a) This was not answered well with about only a fifth of candidates earning a mark, which was usually for identifying A. candidates could not give an acceptable answer for their choice.

(b) This was very poorly answered and the attempt rate was just under 78%. Very few credit worthy responses seen. Answers often referred incorrectly to electrons. Some answers were just a rewording of the question. Other responses included statements like sodium chloride can’t move in a solid but it can in a liquid.

(c) (i) This was well answered by many who used the data to compare carbon fibre and aluminium. Some used phrases such as carbon fibre is light but a comparative term was needed. A significant number thought that having a much higher melting point was an advantage.

(ii) This was a straightforward calculation requiring candidates to select the correct density from the table. Many did this and obtained the correct answer for 2 marks. However, some used a value for another property of lead earning no credit. Even though the equation was given in the correct form some performed the calculation $\frac{700}{11.3}$. Some candidates believe that 700 cm^3 = 700^3.

Q.4 This was the QER question. It was not reliant on recall of knowledge. It required a description of each graph separately from the others. Almost 90% of candidates attempted it. The mean was equivalent to a middle band mark. It was pleasing to see some excellent answers including a full description of each graph including data which earned a top band mark. Good descriptions without data still earned middle band marks. Some candidates described the increase in graph 1 and 3 but then thought the horizontal line meant that photosynthesis had stopped. Most candidates had better success in describing how the rate changed with temperature in graph 2. Some candidates described the process of photosynthesis which was not required so earned zero unless there was some reference to one or more of the graphs. Other candidates thought the numbers on the x-axis were rate of photosynthesis values.

Q.5 (a) (i) Many candidates identified the correct field but some then went on to say it has the highest values of nutrients which was not true.

(ii) More candidates identified the correct field here than in the previous part but again reasoning was not always creditable.

(iii) This part was reliant on recall, and it was not well done. Almost 23% of candidates did not attempt it. All that was required was a statement to add fertiliser or manure. Instead, candidates referred to adding water, increasing light intensity and taking samples to check mineral content.

(b) This was well answered with most candidates earning both marks. However it is always surprising when the attempt rate for this type of question is not 100%, in this case 97%.

(c) This question relied on recall and it was not well answered. Candidates did not know about selective breeding. Most answers referred to genetic modification.

Q.6 (a) (i) Questions involving bond energies are often perceived to be difficult. However, this question was structured in a way to make it accessible to foundation candidates. It was very well answered with many candidates gaining 4 or 5 marks. Quite often the last mark was lost for errors in addition or omitting it altogether.

(ii) This question relied on recall, but candidates only had to underline a selected word in each bracket. Most of the candidates who attempted it scored at least 2 marks. It is always advisable for candidates to re-read the sentences again once they underline a word to see if it makes sense. Again, very surprising to see only 81% of candidates attempted it.

(iii) This question also relied on recall, but the answer was a free response type. Over 25% of candidates failed to attempt it. Those who did attempt it did not score very well. Marks were awarded very infrequently. Most answers referred to the reaction causing valves to blow.

(b) (i) Candidates were unsure what to do here. Some showed calculations of 8 200 $\times$ 8.

(ii) This was the most common mark achieved by candidates in part (b). Even so, there were still calculations of 96 $\times$ 8.

(iii) It was very rare to see a sequence of halving and even less to see a correct answer. Some had a sequence of 12 numbers but this only represents 11 half-lives. Many answers showed divisions of $\frac{96}{12}$ and $\frac{8200}{12}$.

Q.7 This is the common question that appears on both FT and HT.

(a) (i) Less than 30% of candidates knew the answer here. Popular answers included blood, hair and skin.

(ii) This was answered well with many earning both marks for interpreting the information in the diagram. Some forgot to make a judgement so lost the second mark.

(iii) About half of candidates gave an acceptable use. Others gave examples of obtaining DNA, for example, from hair, saliva or blood. Others thought fingerprinting or urine samples were another use.

(b) (i) Most candidates earned their marks for part (b) in this section. Many plotted the points correctly and added an acceptable line. However, others misread the scales to lose plotting marks.

(ii) It didn't appear that candidates knew where neutral was on the pH scale since most answers were 35, just where the graph levels off.

(iii) Generally, values were substituted in an incorrect place. Some candidates attempted to rearrange the equation which was unnecessary. Very few answers received any credit.

(iv) This equation comes from a required practical. Very few candidates completed it correctly and the mark was most frequently awarded for water.

(v) Few candidates mentioned the purpose of repeat readings is to identify anomalies. Most stated that it reduces the number of anomalies. They usually added that this improves the accuracy but this was included in the question.

(c) Candidates had to interpret the information and recall results of qualitative chemical tests to identify the powders. This was not done well. Marks were credited on very rare occasions.

Summary of key points

Candidates must be encouraged to:

- read questions carefully.
- follow the instructions given in questions.
- attempt all questions.
- practice calculations involving half-life.
- develop their skills in interpreting graph scales, especially where each small square is worth 0.2.
- develop strategies to retain information since 40% of the marks are allocated to recall.
- write legibly and succinctly.

APPLIED SCIENCE (DOUBLE AWARD)

GCSE

Summer 2022

UNIT 3: HIGHER TIER

General Comments

There were 273 entries for this tier paper, 247 through the medium of English and 26 through Welsh.

Performance on questions involving calculations or analysis of data (1aii, 3b, 4bi) was much better than questions relying on recall (2ai, 3c, 4c, 6a).

Candidates' graph work was generally good.

Not all candidates showed their working or substitution into equations which resulted in them gaining zero marks if the answer was incorrect.

Candidates had problems handling indices.

Comments on individual questions/sections

Q.1 This is the common question that appears on both FT and HT. As expected, performance and attempt rates are better on this tier.

(a) (i) Most candidates knew the answer here to gain the mark.

(ii) This was answered well with many earning both marks for interpreting the information in the diagram.

(iii) Most candidates gave an acceptable use.

(b) (i) Most candidates earned their marks for part (b) in this section. Many plotted the points correctly and added an acceptable line. However, some misread the scales to lose plotting marks.

(ii) Most candidates gave the correct answer, but it didn't appear that some candidates knew where neutral was on the pH scale since their answers were 35, just where the graph levels off.

(iii) Generally, values were substituted in an incorrect place. Some candidates attempted to rearrange the equation which was unnecessary. Few answers received any credit.

(iv) This equation comes from a specified practical. Few candidates completed it correctly and the mark was most frequently awarded for water.

(v) Some candidates mentioned the purpose of repeat readings is to identify anomalies. Others stated that it reduces the number of anomalies. They usually added that this improves the accuracy but this was included in the question.

(c) Candidates had to interpret the information and recall results of qualitative chemical tests to identify the powders. This was not done well. Marks were credited on rare occasions.

Q.2 (a) Both questions (i) and (ii) relied on recall of knowledge. These parts were not answered well.

(b) This was answered well by about half of candidates. Some omitted information from the graph which was required to earn both marks.

Q.3 (a) About half of candidates were able to state at least 1 controlled variable. Taking repeats was acceptable here because of the different wording used compared with the similar FT question 2.

(b) Most candidates interpreted the data to compare whether the 2 columns of data matched. However not all included a named metal in this comparison. A conclusion was expected for full marks.

(c) This was very poorly answered. Very few creditworthy responses seen. Answers often referred incorrectly to delocalised electrons. There was confusion about the type of bonding, ionic or covalent. Also candidates were unsure about in which state sodium chloride became a conductor. Some answers were just a rewording of the question.

Q.4 (a) Most candidates were able to achieve some marks for their recall about fertilisers and pesticides. The positive impact of using fertilisers was much better known than the negative. In the case of pesticides, the negative impact was better known than the positive. Answers had to be clear about which of fertilisers or pesticides were linked with the negative and positive impacts. Some answers began ”Fertilisers and pesticides ……..’ and the rest of the sentence didn’t always read consecutively.

(b) (i) Many candidates achieved 2 marks for their calculations here. Some lost the third mark because they did not divide by 5. Other candidates did not select the appropriate data from the table.

(ii) The question asked candidates to use data from the table to explain their answer. Candidates were expected to identify where the suggestion was true and where it was not. Less than half of candidates gained 3 marks for doing so. A conclusion was expected for full marks. Some candidates explained half of the account to confirm or disprove the suggestion. If this was accompanied by an appropriate conclusion then 2 marks were awarded. Other candidates failed to use data so they scored zero.

(c) This question assessed recall of knowledge. It was very poorly answered. There was some recognition that individuals with favourable traits should be selected. There was no mention of seeds being collected from these individuals. There were very few references to cross breeding over generations. Some answers were just a rewording of the question. Others mentioned genetic modification and intensive farming techniques.

(d) This question also relied on recall and was answered slightly better than the previous part. A minority of candidates could describe the difference between hydroponics and traditional methods of growing plants and gave very good answers. Others confused hydroponics with growing plants under controlled environments such as when artificial lighting is used.

Q.5 (a) A minority of candidates gained full marks for calculating the M_r correctly. Others gained partial credit for working through some parts of the method correctly. So if candidates extracted the correct values of A_r for C, H, N and O from the Periodic Table they gained 1 mark. If they identified that there were 2C (24) and 3H (3) then another 2 marks were awarded. The fourth mark was given for the correct addition. However some candidates, referring to the equation, counted 2C + C so losing that mark. Other candidates must have included 2H and another O from the water formula. There were instances where the complete equation was considered in the calculation. A final error was sometimes selecting values of *Z* from the Periodic Table.

(b) This was not answered well and just over 20% of candidates did not attempt it. There were a few hurdles to overcome. Firstly, a conversion from kg to g was required. This was rarely done. Then candidates had to realise the answer depended on a division of mass by M_r. This was rarely done. There were instances where the two values were multiplied together.

(c) This question was not answered well with the mean being equivalent to a bottom band mark. The question was structured into three sections. The first section was about reaction pathway. Few candidates recognised that the reaction pathway diagram represented an exothermic reaction so there was no realisation that the difference in energy was released as heat. This made the next section difficult since candidates could talk about bonds being broken and made but they were unaware that more energy is released when bonds are formed than when broken. The final section on thermal runway could have been answered independently of what had been written previously but accounts were poor. Some candidates used the terms reaction pathway, bond energies and thermal runway without any explanation of what they meant. There was also confusion with a nuclear reactor so references to fission, control rods, moderators and neutrons were seen.

Q.6 (a) This was not answered well. It was another question that relied upon recall. Very rare to award a mark. The term ‘composite material’ was not well known.

(b) Some good answers seen on a minority of occasions. There was recognition that the introduction of copper atoms upset the regular structure with the consequence being layers of atoms could not slide over each other easily. Few references to the different sizes of the atoms were made. Some candidates based their explanation around free electrons and the fact the copper atoms block their movement.

(c) This was a two-stage calculation so an ecf was allowed within the question. The first stage involved calculation of the cross-sectional area. This was a simple calculation of 5×6. However, another dimension of 22 cm was also included, and some candidates decided they must use it. They did not appear to be aware that they had now calculated the volume. However, if it was clear an incorrect csa had been calculated then an ecf was allowed when substituting into the equation given in the question. Some candidates had difficulty in manipulating the equation and ended up with another division instead of a multiplication. The use of indices was usually incorrect. Candidates did not appear to know how to convert from cm^2 to m^2 using the given conversion factor. The most common mark was 2 for a correct calculation of csa. Very rare for a full correct calculation to be seen.

Summary of key points

Candidates must be encouraged to:

- read questions carefully and follow the instructions given.
- develop the skills required to interpret graph scales especially when each small square is equivalent to 0.2.
- show substitutions into formulae in the spaces allocated for workings.
- develop strategies to retain information since 40% of the marks are allocated to recall.
- improve their ability in handling indices, such as when multiplying, dividing, using negative powers and when converting from one unit to another.
- develop their skills in manipulating equations.

APPLIED SCIENCE (DOUBLE AWARD)

GCSE

Summer 2022

UNIT 4: FOUNDATION TIER

General Comments

Unit 4 is the task-based assessment for this qualification. Unlike previous series only one pack was available to centres this year. The content of the task had been modified to reflect the problems that were encountered whilst carrying out practical work over the last two years. This resulted in task 1 being shorter than usual and the weighting for the unit being higher than previous series.

- Some candidates are still confused by the terms: independent; dependent and controlled variables.
- The quality of candidates spelling, punctuation and grammar is improving but there is still some work to be done here.
- Candidates find producing accurate graphs/charts challenging, in particular the determination of drawing the most suitable line of best fit.
- The evaluation was a particularly low scoring section on the Activity 2 paper.
- Candidates were good at drawing and correctly labelling setup apparatus.
- Candidates continue to have difficulty identifying the actions that create the risk in a Risk Assessment.

Comments on individual questions/sections

Activity 1

Planning task
Many candidates were able to state the independent variable as the ‘release distance of the marble/ drop height of marble or the release point of the marble’. Unfortunately, some candidates did not express themselves fully and gave vague answers which were not credit worthy.

Again, many candidates were able to state the dependent variable as ‘the distance the block moved’. The majority of candidates were able to state at least one controlled variable for the investigation.

The correctly labelled diagram of the apparatus was done well by most candidates. Candidates are not marked on the quality of their drawing and providing they have included all relevant apparatus and labelled these diagrams, they scored well. Errors made by candidates included not including/labelling the two sets of rulers on the diagram (both the metre rule and the rulers on the ramp were needed) or they included irrelevant apparatus which should be discouraged when centres practise these tasks.

Most candidates produced a method, however, not all succeeded in including the changing of the independent variable and measuring of the dependent variable. They, therefore, failed to produce a method that would work. Many of those that did include these details included the need for repeat readings and a correct range of values for the independent variable which gained extra credit.

Candidates were expected to use appropriate scientific language that included the words ‘repeat’ and ‘distance’. This was no problem to those that had produced a good method. However, those that had not, often failed to include these words and this would affect their mark for the section.

The quality of spelling, punctuation and grammar varied. Candidates were only marked on the accurate spelling of scientific words and were allowed one mistake. They were also expected to include a capital letter and full stop for each point in their method (again one mistake was allowed). It was disappointing to see candidates again this year made basic mistakes in this section, and many key terms that had already been used on the paper previously were spelt incorrectly.

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Activity 2 Task A (Analysis)

Candidates were expected to use the resource folder when answering the questions for this activity.

(a) Many had no trouble in listing the dwarf planets in order of mass, starting with the lowest.

(b) When stating why Pluto is no longer a major planet, many confused themselves and failed to state that 'it did **not** have enough mass'. Again, candidates did not express themselves clearly here.

(c) (i) Many candidates struggled with the graph this year. The scales had been provided but candidates were unable to plot the values correctly which resulted in little or no credit. There is a tolerance of less than a small square with plotting, but some candidates used crosses or dots that were so large they were out of this tolerance. The line/curve of best fit was poor at best and the majority failed to gain any credit for their efforts here. Centres are reminded to practise drawing graphs with candidates prior to the assessments.

(ii) Some candidates were able to give basic descriptions of trends from the graph e.g. 'as distance increases, year length increases' but could not go further and describe the 'increasing rate'.

(d) Many candidates could suggest why it was difficult for amateur astronomy groups to observe Haumea, Makemake and Eris.

(e) (i) Calculating the mean proved difficult for many candidates. Many failed to round their values to the correct number of decimal places.

(ii) Calculating the constant error was also weak for the majority of candidates.

Activity 2 Task B (Evaluation)

Many candidates were able to make a judgement on the suitability of the method. They also gave, in many cases, basic but correct statements about the suitability such as that data was collected so the method was suitable.

A good number of candidates were able to suggest why it is difficult to get a complete months' worth of observations in Wales due to the weather/ cloud cover/ rain etc.

Fewer candidates made the link with the moons being on the other side of Jupiter so not always visible from Earth.

The majority of candidates could suggest a suitable improvement to the method with many different answers being credited, these included; measuring over an extended period of time, getting more people to do the measurements and using higher resolution binoculars/ better telescopes.

When asked about reproducibility candidates struggled, many gave a judgement but then failed to qualify this by stating that one of the student's was not within 0.1 of the other three.

Activity 3 (Risk Assessment)

The Risk Assessment was again, the least successful part of the examination, although the standard of candidates' responses is improving.

Many candidates failed to identify the actions causing the risk. For example, many candidates would state that the sodium hydroxide solution would irritate the eyes/skin, but not the action that creates the risk i.e whilst pipetting/pouring the solution.

Candidates did have more success with identifying suitable control measures for hazards, however this control measure must be linked to the risk, for example; if the risk stated solution could irritate the eyes, a suitable control would be to wear goggles.

Summary of key points

Centres should give candidates opportunities to:

- regularly identify independent, dependent, and controlled variables.
- write methods using a good level of spelling, punctuation and grammar.
- calculate mean values and note to the correct number of decimal places in a table.
- frequently plot a range of accurate graphs and charts.
- evaluate methods.
- construct Risk Assessments and use Student Safety Sheets regularly.

APPLIED SCIENCE (DOUBLE AWARD)

GCSE

Summer 2022

UNIT 4: HIGHER TEIR

General Comments

Unit 4 is the task-based assessment for this qualification. Unlike previous series only one pack was available to centres this year. The content of the task had been modified to reflect the problems that were encountered whilst carrying out practical work over the last two years. This resulted in task 1 being shorter than usual and the weighting for the unit being higher than previous series.

- It is clear most Higher Tier candidates have been well trained to include most items needed in a plan.
- The quality of candidates spelling, punctuation and grammar is good in the Higher Tier.
- Higher tier candidates can generally produce good graphs/charts.
- The evaluation was a particularly low scoring section on the Activity 2 paper.
- Candidates still find constructing a comprehensive Risk Assessment difficult.

Comments on individual questions/sections

Activity 1 Planning task

Candidates were able to state the independent, dependent and controlled variables on the higher tier paper with ease. Centres are reminded to tell candidates that they must state them clearly within the planning section when practising so that it is obvious which variable is which. Examiners will not give credit here if it is not explicitly stated.

The majority of candidates had no trouble producing well drawn, labelled diagrams that included all of the key apparatus and no irrelevant apparatus.

Many candidates were able to produce methods that worked, including the independent and dependent variables and also stating the correct range and repeats.

Spelling, punctuation and grammar was generally very good for the higher tier scripts with candidates using appropriate scientific language, correct spelling (allowing for one mistake) and the correct use of capital letters and full stops.

Activity 2 Task A (Analysis)

Candidates were expected to use the resource folder when answering the questions for this activity.

(a) (i) Many candidates struggled with the first question and could not state that Ceres was an asteroid because it lies within the asteroid belt / between Mars and Jupiter.

(ii) Here candidates did not connect the information from the resource pack and failed to state that ‘it **did not** have enough mass’ to be a full planet.

(b) (i) Candidates were required to label the axes on the graph. Many failed to give a full label and then did not give the units, both of these were included in the stem of the question and should not have proved problematic to candidates.

As the scale was given this year, candidates were asked to plot the points and connect with a suitable line. Again, even with a tolerance of one small square very few were able to plot the points correctly and the line/curve of best was very poor.

(ii) Candidates struggled to describe the pattern from the graph with answers that were not complete. This is higher tier and candidates are expected to develop their answers from the basic statement of trend seen (As distance from Sun increases, year length increases). Very few could expand on their answers and state the 'increasing rate' that was seen in the data.

(c) (i) Very few could name the type of error as 'systematic'.

(ii) Calculation of the error however, was correctly identified by many candidates.

(iii) Calculation of the relative distance of Themisto from Jupiter was done well by some candidates but it was clear that many did not have access to a calculator. In this instance examiners accepted a correct equation that was given by candidates so as not to disadvantage them. Centres are reminded to tell candidates to bring appropriate equipment to the assessments or to provide a calculator for those candidates to borrow during the assessment.

(d) Candidates were asked whether they agreed with Dafydd and to give an explanation. A number of candidates gave a good explanation but did not state whether they agreed with Dafydd so would not gain credit. Many did not explain why they agreed/ didn't agree with Dafydd.

Activity 2 Task B (Evaluation)

Evaluation

Many candidates were able to make a judgement on the suitability of the method. They also gave, in many cases, basic but correct statements about the suitability such as that data was collected so the method was suitable.

Most candidates were able to suggest why it is difficult to get a complete months' worth of observations in Wales due to the weather/ cloud cover/ rain etc.

Few candidates made the link with the moons being on the other side of Jupiter so not always visible from Earth.

The majority of candidates could suggest a suitable improvement to the method with many different answers being credited, these included; measuring over an extended period of time, getting more people to do the measurements and using higher resolution binoculars/ better telescopes.

When asked about reproducibility many candidates failed to identify that 3 out of the 4 are similar with the exception of Bryn's values.

Activity 3 (Risk Assessment)

The Risk Assessment was again, the least successful part of the examination, although the standard of candidates' responses is improving.

Many candidates failed to identify the actions causing the risk. For example, many candidates would state that the sodium hydroxide solution would irritate the eyes/skin, but not the action that creates the risk i.e whilst pipetting/pouring the solution.

Candidates did have more success with identifying suitable control measures for hazards, however this control measure must be linked to the risk, for example; if the risk stated solution could irritate the eyes, a suitable control would be to wear goggles.

Summary of key points

Centres should give candidates opportunities to:

- regularly identify independent, dependent, and controlled variables. Ensuring each is clearly identifiable within their plan.
- write methods using a good level of spelling, punctuation and grammar.
- evaluate methods – candidates need to give sufficient reasoning in support of their judgement.
- construct Risk Assessments and use Student Safety Sheets regularly.

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