GCSE EXAMINERS' REPORTS

GCSE (NEW)
APPLIED SCIENCE (SINGLE AWARD)

SUMMER 2022

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APPLIED SCIENCE (SINGLE AWARD)

GCSE (NEW)

Summer 2022

UNIT 1: FOUNDATION TIER

General Comments

There were approximately 1 035 entries for this tier paper. About 910 of these entries were through the medium of English and 125 through Welsh. On the English scripts, not a single question had a 100% attempt rate. On the Welsh scripts there were 3 question parts with 100% attempt rate. What is alarming is the not attempted rates throughout the paper, regularly exceeding 20% and rising up to almost 50% on one occasion. It is disheartening to see the lack of motivation that results in some candidates not even attempting questions that require the ticking of boxes or underlining words in brackets to complete a sentence.

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 q5 and q6b. Poor basic literacy severely limited the quality of responses of many candidates. Some answers or part answers were partly or wholly illegible, making it very challenging for examiners to interpret.

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

Comments on individual questions/sections

Q.1 (a)(b)(c) These tick box questions were attempted by between 96.5% and 98.5% of candidates. The completion rate declined from (a) to (c). It is surprising that these figures are not 100%. Some candidates ignored the instruction in each part to tick **the** box and ticked two instead. The success rate increased from (a) to (c).

(a) Less than half of candidates selected the correct option in (a). Selecting the option 24 was a common error.

(b) About half of candidates earned the mark in part (b). A common error was selecting 20. Data for parts (a) and (b) suggest that at least half of candidates are not secure in their knowledge and understanding of the information that can be gathered from relative atomic mass and atomic numbers.

(c) There was a massive clue in the question in part (c), namely electronic configuration begins with 2,8. There was only one option that followed this pattern. Over 65% of candidates gained the mark here. However, a common error was selecting 2,2,8,8.

(d) Just over half of candidates attempted this part and they had little success in earning credit. Few realised that if they were isotopes, they would have the same atomic number. Common answers include: Yes, because they are both group 2; No because they have different top numbers. Some answers just agreed or disagreed without any explanation.

Q.2 (a) Almost all candidates attempted this part with the majority gaining at least 2 marks. The crust and solid iron inner core were most often labelled correctly. Lava appeared as a label on a few occasions.

(b) (i) About 20% of candidates did not attempt this question. This may be due to the absence of dotted lines so candidates moved on to part (ii). Candidates need to be trained to spot this type of question. Most candidates selected the correct option.

(ii) About 24% of candidates did not attempt this part. A minority gained more than 1 mark. Credit was usually only awarded for statements about the 'jigsaw effect' of continents which can be deduced from the diagrams. Knowledge of similar rocks and fossils found on different continents was not well known.

(iii) Over 40% of candidates failed to attempt this question. Some of the remainder referred to movement of plates without knowing the cause of this movement. It was unusual to award more than 1 mark. Unusual descriptions were seen including references to the Big Bang.

(iv) Just under 20% of candidates did not attempt this part of the question. Many of the other candidates could name 2 of the disasters occurring at tectonic plate boundaries. Others could only name 1. Common incorrect answers included asteroids, thunderstorms, tornados, hurricanes and global warming.

(c) (i) This was the best answered question on the paper in terms of facility factor. The attempt rate was about 92%. Many candidates compared the two atmospheres to score 2 or 3 marks. Where candidates missed out on credit it was because they had not made it clear about which atmosphere they were referring to.

(ii) The attempt rate dropped to just over 72% here. The question required candidates to "Name the process" but despite this some tried to describe the process of photosynthesis without actually using the term. These descriptions usually included errors. About half of those who answered the question obtained the mark for stating photosynthesis.

Q.3 (a) (i) This question assessed whether candidates could rearrange the given parts of the electromagnetic spectrum into the correct order in terms of energy. About 11% of candidates did not attempt to do this. About half of those who answered the question obtained at least 1 mark for positioning one part correctly. Less than half earned 2 marks and few gained 3 marks. Most commonly, gamma rays were placed correctly at the top of the list but it was disappointing that the remaining parts could not be listed in order underneath gamma.

Q.3 (a) (ii) It was surprising that less than 60% of candidates answered this question. It required recall of knowledge of the parts of the em spectrum and then naming two parts not included in the table in part (i). Some candidates did not read the question carefully since they gave names of parts from the table. About half of candidates earned 1 mark and about a quarter earned both marks. Terms such as ultra, infra, violet or red did not earn credit. Sound appeared on a few occasions. Some of the stranger answers included Sun, wind, lava, water and moonlight.

(b) This is a straightforward calculation. The equation is given in the correct form and there are only two numbers in the rubric. A mark is available for substitution into the equation. Despite this, only two thirds of candidates attempted the question. About 40% of candidates earned at least 1 mark for substitution with less earning the answer mark. One reason for failing to gain an answer mark was copying an incorrect number of zeroes on the answer line. In some instances, no substitution was shown so when an incorrect answer was written on the answer line so no credit could be given. There were instances of incorrect substitution, so wavelength appeared as the numerator and wave speed as the denominator. The unit of frequency was not well known and it was usually stated as m/s.

(c) (i) Usually candidates can readily state effects of global warming, so it was surprising that the attempt rate was only about 87%. About half of these could state acceptable effects to earn at least 1 mark.

(ii) Again candidates are usually knowledgeable of methods of reducing human contributions to the greenhouse effect so it was surprising that less than 80% attempted this question. However most of these candidates earned at least 1 mark. The marking scheme was substantially extended to include additional methods.

(d) In terms of facility factor, this was the least well answered question on the paper. It was attempted by about 80% of candidates and roughly about 10% earned any credit. Candidates were unable to state reasons for the energy loss at each stage of the food chain.

Q.4 (a) This is another straightforward calculation with both values clearly shown in the rubric. So it was another surprise that the non-attempt rate was about 16%. Mostly correct answers were seen. Working was not always shown so if the answer was incorrect then the substitution mark was also lost. It remains a mystery how, in the absence of workings, some answers were arrived at.

(b) The attempt rate was just under 83%. Few candidates earned more than 2 marks out of the 4 available.

(i) The input energy of 100 J was deliberately used to make the question more straightforward. However some answers for light and heat energy did not add up to 100 J, some gave a total greater than 100 J. The arrows were also intended to represent the lower value of light compared to heat. Despite this lots of 50/50 or 70/30 answers were seen instead of 30/70.

Q.4 (b) (ii) Candidates only had to decide how to substitute the two values into the given equation. They should also be aware that the efficiency cannot be greater than 100%. However examples of $\frac{44}{2.2} \times 100 =$ 2000% were seen. Even when substituted correctly, some omitted to multiply by 100 so lost the answer mark. Also, despite the equation showing the two power values should be divided, some calculated 44×2.2.

(c) The attempt rate for this question was about 71%. A minority of candidates earned any credit here.

(i) The answer line included the unit so there is a clue as to which of the numbers in the rubric are relevant. The wording also includes 'uses' repeatedly to direct candidates to these values. However correct answers were seen in only a minority of cases.

(ii) This required multiplying the answer in part (i) by 0.35. An ecf was allowed. Again only a minority gave a correct answer.

(iii) This answer is exactly the same as the answer in part (ii), however this was rarely seen. It is another mystery how some of the answers were derived.

Q5 (a) There are two aspects to this question. The first relies on knowledge of heat transfer which historically is not answered well, and the second relies on data interpretation, which is usually answered well. In this case the attempt rate was about 74%. The mean mark of 0.7 demonstrates that most candidates were limited to the bottom band range of marks. Knowledge of heat transfer and applying it to double-glazed windows was very poor. Comments about thicker glass were seen. The function of the gap between panes of glass was not known. Where credit was given, it was usually for use of data. Credit was earned just for comparing cost or heat loss data even without a conclusion.

(b) (i) Attempt rate was about 72%. The mean mark was less than 1.

I. Candidates needed to read the question carefully and the relevant types of insulation were emboldened to alert candidates. Candidates were required to subtract before and after energy loss values to determine the reductions achieved by each type of insulation. However there was little evidence that these subtraction were done. The final mark was achieved for adding the two values that resulted from the subtractions allowing for ecf. It was rarely awarded.

II. This assessed whether candidates realised the equivalence of J/s and W. It was rare to see the answer from the previous part being given here.

(ii) The attempt rate was similar to and the mean mark was over double that of part (i). Even if candidates arrived at an incorrect cost an ecf was applied in the calculation of payback time.

Q.6 This is the common question that appears on both tiers.

(a) The attempt rate was about 70%. The mean mark is very low and it was rare for any candidate to gain more than 1 mark. Knowledge of identifying ions from the results of chemical tests was very poor.

(b) The attempt rate was slightly better than for part (a) and the mean mark was over double. Candidates could generally make some comparison between the test strip and the key and some gave an appropriate conclusion. Some candidates earned full marks.

(c) The attempt rate for the final part of Q6 increased to just less than 80%. It was surprising that just over 20% of candidates did not even attempt the graph. The mean mark for this part was less than 2 out of 12.

(i) Candidates experienced problems in adding the scales. Despite the axes being labelled, the absorbance scale was added to the x-axis and concentration to the y-axis. Some scales such as 1→2→3→ etc or 10→20→30→ etc were produced. In these instances the scale mark was lost. Non-linear scales, no scales and bar charts were also produced. These examples earned zero marks. The scales were required to produce plotted points that occupied at least half of the grid and where linear scales were produced this was usually the case. Points were not always plotted correctly and the line joining them did not always extend back to 0,0.

(ii) A minority of candidates stated that as concentration increases so does absorbance. Very few recognised this rate of increase was constant. A few spotted that absorbance = 11 × concentration or every 0.01 increase in concentration the absorbance increases by 0.11. These statements earned both marks.

(iii) Even when the graph was plotted correctly most candidates interpreted the graph incorrectly.

(iv) Both parts I & II proved too difficult for foundation tier candidates and it was rare to award any marks.

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.
- 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 (SINGLE AWARD)

GCSE (NEW)

Summer 2022

UNIT 1: HIGHER TIER

General Comments

There were 21 entries for this tier paper and all through the medium of English.

Performance on questions involving calculations 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. q4.

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

Q1. This is the common question that appears on both tiers. As expected, performance was better than in the foundation tier.

(a) The attempt rate was about just over 95%. The mean mark was low and it was rare for any candidate to gain more than 1 or 2 marks. Knowledge of identifying ions from the results of chemical tests was poor.

(b) The attempt rate was the same as in part (a) and the mean mark was over double. Candidates could generally make a comparison between the test strip and the key but not all gave an appropriate conclusion. However some candidates earned full marks.

(c) The attempt rate for the final part of Q1 increased to 100%. The mean for this part was just under half marks.

(i) The scales were required to produce plotted points that occupied at least half of the grid and where linear scales were produced this was usually the case. Some candidates used an absorbance scale with intervals of 0.11 every 2 cm. This worked very well in this instance. Points were usually plotted correctly and the line joining them extended back to 0,0. Some candidates made errors. Despite the axes being labelled, the absorbance scale was added to the x-axis and concentration to the y-axis. Some scales such as 1→2→3→ etc or 10→20→30→ etc were produced. In these instances the scale mark was lost. Non-linear scales earned zero marks.

(ii) Most candidates stated that as concentration increases so does absorbance. Some recognised this rate of increase was constant. Others spotted that absorbance = 11 × concentration or every 0.01 increase in concentration the absorbance increases by 0.11. These statements earned both marks.

(iii) Most candidates interpreted the graph correctly to arrive at the expected answer.

(iv) Both parts I & II proved difficult for candidates.
I. A minority of candidates recognised that the filter needed to be changed and some of these identified the new colour.
II. It was rare to give any credit here. A few candidates realised that the solution would be colourless for all concentrations.

Q.2 The attempt rate for this question was 100%. The mean was over half marks.

(a) Candidates were able to substitute correctly into the equation and some calculated the correct answer. However many did not convert mA into A. This was despite the conversion factor being given in the form $1mA = 10^{-3}A$. In these instances, answers of 5 060 earned 2 marks.

(b) Here is an example where it makes sense to substitute into the given equation to earn the first mark. Only then attempt the rearrangement of the equation. Most did this but only a minority arrived at the correct answer. Some manipulated incorrectly. Others forgot to include the 100 in the rearranged equation so obtained an answer of 210 W which resulted in 2 marks being awarded.

Q.3 Just over 90% of candidates attempted this question. The mean was about half marks.

(a) (i) This required candidates to compare heat loss from the home and how the loss compares at different internal temperatures. It did not matter whether data for temperatures of 21˚C and 22˚C were compared or for 20˚C and 21˚C. It also did not matter which part of the house was considered. Most candidates were able to do this and realised that reducing the inside temperature by 1˚C resulted in less heat loss. However, few went on to explain why this saved homeowners money or how it helped the environment.

(ii) Firstly, candidates had to use data from the correct column and not all did this. Secondly, they were required to find the difference between the energy loss before and after installing each type of insulation and find their total. Again not all did this. Finally, the total should have been divided by 60 and only a few did this.

(iii) This tested whether candidates realised the equivalence of J/s and W and how to convert to kW. The previous answer should have been divided by 1000. An ecf was allowed. Few candidates arrived at a correct answer. Most divided their previous answer by 10 or 100.

(b) The mean for this part is higher than in (a). This is often true when comparing parts requiring calculations only with parts requiring explanation also.

(i) Most candidates recognised there was a saving of half an hour a day so calculated the savings per day in units and cost. However, few completed the next step to calculate savings per week.

(ii) An ecf was allowed from part (i). As a result some obtained both marks here. Others forgot to convert their previous answer in pence into £.

Q.4 This entire question required recall of knowledge. It was the least well answered question on the paper. The facility factor of the different parts varied from 0.0 to 14.1. The attempt rate varied from 38.1% to 85.7%.

(a) (i) Poor recall limited most marks to the bottom band. The causes of hardness in water were not known. The action of soap with hard and soft water was usually confused. Comments about heating systems were vague and often included comments about 'scum' in kettles.

(ii) Few candidates could identify a health benefit and even less linked this with the correct mineral.

(iii) Most candidates had no knowledge of ion exchange and its use to soften water.

(b) Most candidates had no knowledge of the purpose of adding ozone during water treatment.

(c) Candidates had no knowledge of the role of microbes in sewage treatment. No marks were awarded for this question part.

Q.5 Three quarters of the marks for this question depended on recall of knowledge. This depressed the facility factors which ranged from 22.9% to 38.2% for the different question parts. Attempt rates varied from 76.2% to 85.7%.

(a) Marks were earned by a minority of candidates. It was rare to award a mark for balancing since the symbols and formulae were often incorrect. Where a mark was awarded, it was usually for the formula of carbon monoxide. Candidates probably copied the format of the formula for iron(III) oxide because the symbol for iron was usually Fe_2 and the formula for carbon dioxide was CO_3.

(b) This part was poorly answered. Where a mark was awarded, it was usually for a statement about rust. One of the more unusual answers referred to limited iron because blast furnaces were stopping.

(c) This was the best answered part of the question but the facility factor is still low. Candidates could usually state a factor to earn 1 mark.

Q.6 (a) Few candidates earned credit here. It is doubtful they knew that 2×10^{-14} is greater than 2×10^{-24}.

(b) (i) Most candidates identified the correct option, UV1.

(ii) There was a conversion mark to convert nm to m. However it was clear that candidates did not know how to use the information $1nm = 10^{-9}m$. The correct answer was rarely seen and instead it was common to see answers of 9.87×10^{n} where n was not 15. Some candidates failed to manipulate the equation correctly. However a substitution mark could have been obtained if workings were shown.

(c) (i) Mostly correct answers seen.

(ii) Few candidates earned credit since recall of photosynthesis and energy loss in food chains was not well known.

(iii) Knowledge of how plants use nitrates was poor. Few earned a credit.

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.
- 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 (SINGLE AWARD)

GCSE (NEW)

Summer 2022

UNIT 2: FOUNDATION TIER

General Comments

The majority of candidates attempted every question but there were sections within each of the questions that were left blank. The majority of candidates appeared to be appropriately entered for this tier. It was noted that knowledge-based questions such as labelling the heart and practical procedures seemed to be answered particularly weakly. The graph question was also answered poorly, where many candidates tried to manipulate the data to produce a straight-line graph.

Generally, candidates had difficulty with the following:

- reading questions carefully so as not to miss information, and to be aware of the different command words used. This was particularly noticeable in the QER question.
- interpreting some of the data and being able to apply it in to draw conclusions.
- understanding what a controlled variable is.

Comments on individual questions/sections

Q.1 This question was well attempted.

(a) It was common for candidates to select 'infra-red' in place of the correct answer of 'ionising', and 'Cystic Fibrosis' instead of 'Downs Syndrome'.

Q.2

(b) A well attempted question, but significant numbers of candidates thought that insulin was needed to raise glucose levels, or answered too generally e.g., 'eat food', 'eat healthy food'.

(c) (i) Many candidates gave the treatment instead of the cause, so it was quite common to see 'type 1 injects insulin' stated as an answer. It was also common to see the incorrect answer 'type 1 was caused by a lack of glucose'.

(ii) This part was answered better, but a small number of candidates suggested that 'eating more sugar' was a way of controlling diabetes. There were many general comments such as eating a 'balanced diet'.

(d) (i) Only a minority selected Benedicts reagent as an answer. The incorrect answer of iodine was generally seen.

(ii) This was well attempted but only a minority selected all three letters needed for the mark.

Q.3 (a) Generally well attempted but only a minority scored all four marks. It was relatively common to see the labels on the opposite sides to the correct answers.

(b) This part was not so well attempted with many gaps left in the table.

Q.4 (a) (i) & (ii) were generally well answered with the majority scoring at least 1 mark.

(ii) Very few candidates noted that the man was near 70 years of age, and therefore at a greater risk than a 60-year-old woman.

(iv) Only a few candidates stated that smaller age intervals would lead to a better conclusion.

(b) This part was generally well answered.

Q.5 (a) Very few candidates knew the symbol for a beta particle. Some candidates spotted that the atomic number for technetium could be obtained from the Periodic Table at the back of the exam paper.

(b) (i) this part was generally well answered.

(ii) A surprisingly large number of candidates used the numbers in the table as the x-axis scale to produce a straight-line graph and thus scored zero. Candidates who did draw an appropriate scale tended not to put a zero at the origin and lose the scale mark, however these candidates almost always scored for their plotting.

(iii) A sizable number of candidates that attempted this part scored well, but many did not attempt this part of the question.

(c) Many general safety answers were given that were not specific to the use of a gamma source, e.g., ‘don’t eat’ ‘wear gloves/goggles’ – these did not gain credit.

Q.6 (a) This part was very poorly answered with many candidates using the stock answers e.g., ‘can cause cancer’ ‘heart disease’.

(b) (i) This part was generally well answered. Candidates who attempted the question were able to calculate speeds from the equation.

(ii) Many candidates found linking the data from the table and their answer to b(i) to b(ii) challenging.

Q.7 (a) This part was well answered.

(b) Many candidates did not write about changes in lung function, this meant that they limited themselves to a maximum of 2 marks. A significant number of candidates wrote about general symptoms of smoking without any interaction with the graph.

Q.8 (common question with higher tier)

(a) Very few candidates could identify what was needed stop contamination by bacteria.

(b) This part was generally well answered apart from b(iii) where candidates did not use the answer from b(ii) and b(iv). Candidates did not realise that area depended on diameter squared, and therefore quadruples when diameter doubles.

Q.9 (common question with higher tier)

(a) It was very common to see the independent and dependent variables listed rather than the ones that needed to be controlled. It was also common to see 'sodium thiosulfate' as an answer without reference to volume or concentration.

(b) & (c) Many candidates could state how the speed of the reactions changed but could not explain in terms of particle theory.

Summary of key points

- Encourage candidates to read each question part carefully and underline key words.
- Candidates should practice labelling common diagrams, such as the heart.
- Graph plotting, in particular producing linear scales, needs to be reinforced with candidates.
- On QER questions where data is provided, candidates need to interpret that data rather than just using their own knowledge.
- Develop candidates' skills in extracting information.
- Emphasize the importance of understanding the specified practicals.

APPLIED SCIENCE (SINGLE AWARD)

GCSE (NEW)

Summer 2022

UNIT 2: HIGHER TIER

General Comments

Most candidates attempted every question and appeared to be appropriately entered for this tier.

Candidates had difficulty with the following:

- applying graphical data, including estimating numbers from graphs and using data to make conclusions
- knowledge of standard methods when using agar plates in specified practicals
- writing a decay equation from given data
- calculating distance from a velocity:time graph.
- Identifying controlled variables.

Comments on individual questions/sections

Q.1 (a) Very few candidates could identify what was needed stop contamination by bacteria.

(b) (i) This part was generally well answered.

(ii) It was pleasing to see candidates rounding to 3 dp correctly.

(iii) Many candidates did not realise they needed to use the answer from part (ii) to answer this part.

(iv) This part was quite poorly answered. Candidates did not realise that area depended on diameter squared and therefore quadruples when diameter doubles.

Q.2 (a) It was very common to see the independent and dependent variables listed rather than the ones that needed to be controlled. It was also common to see ‘sodium thiosulfate’ given as an answer without reference to volume or concentration.

(b) & (c) Most candidates could state how the rate of the reactions changed but many could not explain in terms of particle theory.

Q.3 (a) This part was generally well answered.

(b) (i) The majority could not relate the structure of capillaries to their function.

(ii) Most candidates scored some marks here, although it was relatively common for the roles of arteries and veins to be mixed up.

(c) This part was generally well answered with most candidates knowing about production of antibodies and engulfing of bacteria, but only a few mentioned production of antitoxins.

Q.4 (QER)

(a) This question was very well attempted with the strongest candidates correctly explaining the roles of glucagon and glycogen. The weaker candidates could relate diabetes to a failure of the body to produce insulin.

(b) Most candidates mentioned double helix structure and AT and CG pairs. No candidate obtained the mark for weak hydrogen bonds.

Q.5 (a) This part was generally well answered, with candidates successfully taking information from the graph.

(b) This part was generally well answered.

(c) Many failed to state that Llinos' gran was an anomaly and failed to link a reason to their judgement.

Q.6 (a) This part was generally well answered. The majority of candidates could do the calculation in (ii).

(b) (i) Very few candidates scored full marks. Many did not use numbers/data from the graph and did not identify trends.

(ii) This calculation was split into two parts - estimating the mean number of females between the two age groups, and then using that to work out the number that this corresponds too. Only a very small minority scored all four marks. Many marks were awarded as errors carried forward from use of an incorrect mean into the second part of the calculation.

(c) This part was well answered.

Q.7 (a) (i) Most candidates knew that the particle was an electron but did not score the second mark.

(ii) This part was done very poorly.

(b) (i) Most candidates showed a good understanding of how the number of nuclei halved with every half-life. The most often seen mistake was halving by an incorrect number of times. Some stronger candidates used $1/2^x$ which was pleasing to see.

(ii) Most candidates attempted this question, with the stronger candidates being able to accurately carry out the necessary calculations.

(c) This part was very well attempted, with a large number realising that the half-life was long. However, they often failed to gain the mark by not explaining that this resulted in the isotope remaining in and damaging the patient for a long time.

Q.8 A complete range of marks seen for this part, ranging from not attempted to a significant number scoring the full 6 marks.

Many candidates could calculate the distance from the first graph and many of those could convert the units to Km/h therefore scoring half marks. The distance calculations from the area below the second graph were not so well attempted.

Summary of key points

- Encourage candidates to read each question part carefully and underline key words.
- Develop candidates' skills in extracting information.
- Emphasise the importance of understanding the specified practicals.
- Candidates should be able to write balanced decay equations and know the nuclear symbol for alpha and beta radiations.
- The working out of distance from velocity:time graphs using area of a triangle formula should be practiced.

APPLIED SCIENCE (SINGLE AWARD)

GCSE (NEW)

Summer 2022

UNIT 3: FOUNDATION TIER

General Comments

Unit 3 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 still find constructing a Risk Assessment difficult.
- Candidates find producing accurate graphs/charts challenging in particular with selecting the correct labels and units for axes (higher tier) and the line of best fit (both higher and foundation tiers).
- Evaluations are still low scoring sections on all papers, at all levels.
- Candidates are quite good at drawing and labelling the apparatus set up correctly.

Comments on individual questions/sections

Activity 1 Task A

Planning

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 diagram of the apparatus was done well on the whole. 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.

The majority of 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 incorrect.

Risk Assessment

The Risk Assessment was still the least successful part of the examination across both the Higher and Foundation tiers. Very few candidates at foundation level identified any suitable hazards, those that stated there were no hazards were credited but leaving the grid blank was not accepted by examiners. Many candidates could identify injuries caused by the hazards, but fewer could state the actions that might bring them about. This still needs emphasising as it ensures parity with the Risk Assessment elements of the other GCSE Sciences. Candidates did have slightly more success with identifying suitable control measures. Centres are again, strongly recommended to revisit this with their candidates.

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 on the foundation tier 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 students was not within 0.1 of the other three.

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.
- construct Risk Assessments and use Student Safety Sheets regularly.
- 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.

APPLIED SCIENCE (SINGLE AWARD)

GCSE (NEW)

Summer 2022

UNIT 3: HIGHER TIER

General Comments

Unit 3 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.

- Most candidates could state the independent, dependent and controlled variables with no problem.
- The quality of candidates' spelling, punctuation and grammar is good for the majority of scripts.
- Candidates still find constructing a Risk Assessment difficult.
- Candidates find producing accurate graphs/charts challenging in particular with selecting the correct labels and units for axes (higher tier) and the line of best fit (both higher and foundation tiers).
- Evaluations are still low scoring sections on all papers, at all levels.
- Candidates are good at drawing and labelling the apparatus set up correctly and producing methods.

Comments on individual questions/sections

Task 1 Activity A

Planning
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.

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.

Risk Assessment
The Risk Assessment was again, the least successful part of the examination across the Higher and Foundation tiers.

Most candidates at higher level can identify the specific nature of a hazard but then struggle to identify the risks with the actions causing the risk. This ensures parity with the Risk Assessment elements of the other GCSE Sciences. Candidates did have more success with identifying suitable control measures. Centres are strongly recommended to revisit this with their candidates frequently.

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 correct by the majority of candidates.

(iii) Calculation of the relative distance of Themisto from Jupiter was done well by a good number of candidates but it was clear that some 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/ did not agree with Dafydd.

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.

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.

A good number of 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 performed better here, many gave a qualified judgement which gained them credit.

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.
- construct Risk Assessments and use Student Safety Sheets regularly.
- 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.

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