GCSE EXAMINERS' REPORTS

CHEMISTRY
GCSE

SUMMER 2023

Introduction

Our Principal Examiners' reports offer valuable feedback on the recent assessment series. They are written by our Principal Examiners and Principal Moderators after the completion of marking and moderation, and detail how candidates have performed.

This report offers an overall summary of candidates' performance, including the assessment objectives/skills/topics/themes being tested, and highlights the characteristics of successful performance and where performance could be improved. It goes on to look in detail at each question/section of each unit, pinpointing aspects that proved challenging to some candidates and suggesting some reasons as to why that might be.[i]

The information found in this report can provide invaluable insight for practitioners to support their teaching and learning activity. We would also encourage practitioners to share this document – in its entirety or in part – with their learners to help with exam preparation, to understand how to avoid pitfalls and to add to their revision toolbox.

Further support

Document	Description	Link
Professional Learning / CPD	WJEC offers an extensive annual programme of online and face-to-face Professional Learning events. Access interactive feedback, review example candidate responses, gain practical ideas for the classroom and put questions to our dedicated team by registering for one of our events here.	https://www.wjec.co.uk/home/professional-learning/
Past papers	Access the bank of past papers for this qualification, including the most recent assessments. Please note that we do not make past papers available on the public website until 6 months after the examination.	www.wjecservices.co.uk or on the WJEC subject page
Grade boundary information	Grade boundaries are the minimum number of marks needed to achieve each grade. For unitised specifications grade boundaries are expressed on a Uniform Mark Scale (UMS). UMS grade boundaries remain the same every year as the range of UMS mark percentages allocated to a particular grade does not change. UMS grade boundaries are published at overall subject and unit level. For linear specifications, a single grade is awarded for the overall subject, rather than for each unit that contributes towards the overall grade. Grade boundaries are published on results day.	For unitised specifications click here: Results, Grade Boundaries and PRS (wjec.co.uk)

Exam Results Analysis	WJEC provides information to examination centres via the WJEC secure website. This is restricted to centre staff only. Access is granted to centre staff by the Examinations Officer at the centre.	www.wjecservices.co.uk
Classroom Resources	Access our extensive range of FREE classroom resources, including blended learning materials, exam walk-throughs and knowledge organisers to support teaching and learning.	https://resources.wjec.co.uk/
Bank of Professional Learning materials	Access our bank of Professional Learning materials from previous events from our secure website and additional pre-recorded materials available in the public domain.	www.wjecservices.co.uk or on the WJEC subject page.
Become an examiner with WJEC.	We are always looking to recruit new examiners or moderators. These opportunities can provide you with invaluable insight into the assessment process, enhance your skill set, increase your understanding of your subject and inform your teaching.	Become an Examiner | WJEC

Subject Officer's Executive Summary

Advance information was provided for units 1 and 2. The topic areas were listed in rank order based on the number of marks allocated. This had little effect on performance.

There has been a shift in entries from Foundation Tier to Higher Tier over recent years and it is evident that some candidates were incorrectly entered for the Higher Tier paper for units 1 and 2.

Recall of knowledge was a problem for many as is the case every year. It is particularly disappointing when candidates are unable to describe simple tests such as those for hydrogen and carbon dioxide gas which they will have been familiar with since KS3. Flame tests for metal ions and the silver nitrate test for halide ions are assessed every year and all candidates should be able to recall the relevant observations. These are included in Unit 1 of the specification but are required for Unit 2 also. This should be emphasised to candidates.

Calculations involving masses and moles of substance are also specified in Unit 1 but needed for both units. Questions on percentage yield and reacting masses were very poorly answered on the Unit 2 paper, again suggesting that this content was not effectively revised.

As always, each of the papers included multiple questions testing candidates' skills in relation to chemical formulae and equations. All would benefit from practising these skills regularly throughout the two-year course. Many candidates did not appear to be familiar with using the table of ions at the back of the paper to help them write formulae.

Questions were often not read carefully enough. For example, some questions requiring a chemical equation to be written gave the names/formulae of some of the reactants or products in the stem. Many candidates did not notice this information and made things more difficult than they needed to be. QER questions often give some information in photographs or tables of results and candidates should consider this information as they plan their answer. Finally, many questions were answered quite generally because candidates had read the question quickly and missed key details.

There was some evidence that candidates had less practical experience than in previous years. This is understandable as both year groups missed a lot of laboratory time during their KS3 years. It was nevertheless disappointing that questions on familiar salt preparations and rate experiments were so poorly answered.

Areas for improvement	Classroom resources	Brief description of resource
Recall of knowledge	Resource WJEC Educational Resources Website	**Knowledge organisers** include key facts for all specification topics summarised in one/two page presentation
Chemical formulae and equations	Resource WJEC Educational Resources Website	A step-by-step guide to developing the skills needed to write chemical equations with confidence

Calculations	2.1.4 Chemical Calculations.pptx (live.com)	This **Tanio** revision resource produced by GwE is from of an excellent website covering all topics for DA Science
Bonding, structure and properties	Resource WJEC Educational Resources Website	Interactive self-study **Blended Learning** package designed to complement face-to-face teaching; ideal for revision or flipped learning

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CHEMISTRY 1 – FOUNDATION TIER

Overview of the Unit

Candidates coped well with the foundation tier only section of the paper mainly due to the increased number of multiple-choice questions. Apart from the QER question, all other questions were well attempted. The common section differentiated well. The atomic structure question in the common section was much better done than the Group 1 chemistry question.

Candidates demonstrated good knowledge and understanding of the following areas:
- Atomic Structure
- Methods of separating mixtures
- Plate tectonics
- Disadvantages of hard water.

Candidates demonstrated a lack of knowledge and understanding of the following areas:
- Practical skills
- Advantages and disadvantages of limestone quarrying
- Interpretation of solubility curves
- Group 1 metals

Comments on individual questions/sections

Q.4 (a) Most candidates were unable to identify the correct chemical equation for the reaction between magnesium and hydrochloric acid. The question was simply testing a candidate's ability to recognise the fact that hydrogen gas is a diatomic molecule.

Q.5 (a) (i) Few candidates gained both marks in this question. More able candidates gained a mark for 'CO_2'. Some candidates gave a word equation and most could not give the formula CaO from 'calcium oxide'.

(ii) Very few candidates were able to give the chemical formula for calcium hydroxide. The most common error was the omission of the brackets around the OH^- ion.

(b) Unfortunately, this QER question on the economic benefits and environmental drawbacks of limestone quarrying was not well answered. This topic was well within the grasp of foundation tier candidates. However, as in previous years, the standard of handwriting, spelling and grammar were often poor. There was very little evidence that candidates planned their answers. Many failed to use the photograph provided to help them answer the question. There was little attempt to develop simple points to gain more credit e.g. to link dust or noise to blasting or lorry traffic. Vague reference to global warming was also commonly seen.

Q.6 (a) (iv) Although the formula for the carbonate ion was given to help, most candidates failed to give the correct answer.

Q.8 (b) Most candidates understood that the disadvantages of living in a hard water area were related to 'scum' and 'limescale'. However, few candidates gained both mark for this question. Reference to soap was needed for credit relating to 'scum' and limescale formation had to be linked to an appliance e.g. forms limescale in a kettle.

(c) (i) Only the most able foundation tier candidates gained this mark. Many simply described the shape of the graph or described the relationship between solubility and temperature. This is an example where candidates showed a heavy reliance on questions from previous examination papers. They saw a graph and immediately thought that a relationship between variables was required. Questions must be read carefully.

(c) (ii) This was disappointingly answered. Candidates were instructed to read off the solubility at 50°C and then subtract 53 from their value. Some failed to read the correct solubility from the graph. Candidates were given the solubility at 20°C but some read this incorrectly from the graph. Errors were carried forward so that the second mark could be awarded when the correct method was used.

Q.10 (a) (i) Candidates demonstrated poor examine technique in this question. They were given a table showing properties of Group 1 elements. They were instructed to use the information in the table. Many simply re-wrote the heading of the relevant column rather than stating that the elements have *the same number of electrons in the outer shell*.

(ii) Weaker candidates didn't know the meaning of the term 'property'. These simply gave either sodium or potassium and gained no credit.

(b) (i)-(iii) These questions were poorly answered. Candidates showed very little knowledge and understanding of the chemistry of Group 1 metals.

(iv) Very few foundation tier candidates gained this mark for writing a very simple chemical formula. This is a skill in which time should be invested because every chemistry paper at both tiers will include a number of marks on formula and equations.

(c) (i) Very few foundation tier candidates gained two marks for this calculation. The first mark relies on an understanding of formulae (as described above) and the second mark is a simple percentage calculation. The most common error was not to include the mass of six fluorine atoms.

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CHEMISTRY 1 – HIGHER TIER

Overview of the Unit

As in previous years there were a significant number of candidates who would have benefitted in sitting the foundation tier paper. Apart from the calculation questions, most other questions were well attempted. The majority of candidates coped well with the common section questions.

Candidates once again failed to understand the meaning of the command word 'explain'. An 'explain' question must have a 'because' in the answer.

Candidates demonstrated good knowledge and understanding of the following areas:
- Atomic structure
- Group 1 chemistry
- Group 7 reactivity
- Plotting graphs
- Particle theory.

Candidates demonstrated a lack of knowledge and understanding of the following areas:
- Chromatography
- Chemistry calculations
- Using solubility curves
- Limestone chemistry
- Chemical analysis.

Comments on individual questions/sections

Q.3 (a) (ii) Candidates were asked to explain the process of chromatography. Many only achieved one of the two possible marks by either stating that water is absorbed by the paper but then not stating why the dyes separate or by simply describing why the dyes separate making no reference to the movement of the solvent front.

(b) (ii) This three-mark question contained no structure. This resulted in many candidates reading the solubility of potassium nitrate at 55°C and doing nothing else, so only gaining the first marking point. The style of this question was very different compared to previous questions. A mean mark of 1.8 out of 4 for part (b) suggests that understanding of solubility graphs is not always good. Some candidates were unable to read the vertical scale correctly but the application of 'error carried forward' helped them gain some credit.

Q.4 (a) (iii) About a half of candidates gained this mark. This is a good example of a question where the majority of the information needed is given in the question. The name of the missing reactant is given in the stem and its formula appears in the diagram, where the name of the product is also given. All that is needed is to use the ion table to write the formula for calcium hydroxide. Improved exam technique would help most candidates.

(b) (ii) The most common incorrect answer referred to calcium hydroxide as a fertiliser. Many of those who knew that it neutralises acidic soil failed to address the 'explain' part of the question by stating that it is an alkali or a base.

Q.5 (a) Candidates were given the name of the missing reactant in the table. Only one in three were able to complete the equation by adding Na_2CO_3. Once again, the ion table should be the starting point for most candidates.

Q.6 (a) Most candidates attempted this QER question. Top band answers discussed formation of the oceans, photosynthesis and the 'locking up' of carbon dioxide in fossil fuels or limestone. Only the most able addressed all three points fully in their answer. Examiners were looking for the use of correct scientific terms e.g. water vapour *condensed*, green plants *evolved*, plants *absorbed* carbon dioxide during *photosynthesis*. Many candidates included irrelevant statements e.g. reference to human activity, burning fossil fuels and global warming. Only a minority structured their answers logically and clearly and used good spelling, punctuation and grammar.

Q.7 (a) The question is set in the context of a common rate of reaction experiment. Most candidates failed to use the information in the given equation i.e. that carbon dioxide *gas* is formed resulting in effervescence. This could lead to some loss of mass due to acid spray. Only around one in six candidates gained this mark. Most candidates showed no understanding of the method and stated that the cotton wool acts as a bung preventing carbon dioxide from escaping. This suggests that they have not seen this experiment.

(c) Candidates were guided through this question but many failed to gain any marks. Candidates were given a triangle drawn on the tangent and the equation used to find the rate but many failed to read the scales on the graph correctly. Another common error was to not calculate a change in mass or time but to simply divide the mass 0.38 by 23. This gained no credit.

(d) (ii) Many candidates gained two out of the three available marks. The question explicitly stated the answer required reference to particle theory. Marks were often lost for lack of precision of language rather than poor understanding e.g. 'less acid' rather than 'fewer acid *particles*' and reference to a 'different concentration' rather than a '*lower* concentration'.

(e) This question was surprisingly poorly answered. The question clearly stated that the acid was in excess so using twice the mass of chalk would result in twice the volume of carbon dioxide being formed. This type of question has been asked in several previous papers. Most candidates failed to draw their graph up to 0.88g.

Q.8 (a) (ii) Most candidates gained one of the two available marks. Some candidates referred to the need to lose electrons rather than gaining them. Weaker candidates showed a lack of clear understanding of key terms such as atoms, electrons, shells and nucleus.

(b) Only able candidates scored full marks for this question. Many candidates gained 1 mark for the formula of sodium chloride but failed to give the correct formula for chlorine, although the formula for bromine was given in the equation. The balancing mark was only awarded when both formulae were correct.

(c) (ii) Only the most able candidates were able to calculate the simplest formula of copper bromide. The first common error was dividing the mass of one element by the A_r of the other one, resulting in a ratio of 1:3. This gained no credit but the second mark was awarded for $CuBr_3$ using the 'error carried forward' rule. The other common error was dividing A_r by the mass giving the inverse ratio and the formula Cu_2Br. This answer was again awarded 1 mark.

Q.9 (a) (i) Questions on chemical analysis are always challenging for Year 10 candidates but this was better done than in previous years and the mean mark was almost 2 out of 3. Candidates only have to know the tests for the following ions for Unit 1.

Positive ions (metals)	Li^+, Na^+, K^+, Ca^{2+} and Ba^{2+}
Negative ions (non-metals)	Cl^- ,Br^- and I^-

Those who had not learnt the relevant tests and observation guessed ions such as zinc and nitrate.

Some candidates lost a mark carelessly by giving bromine and iodine instead of bromide and iodide. The example in the first table should have helped remind them that the name of the ion rather than the element was needed.

(b) Ionic equations are not well understood but almost half of candidates selected the correct option here. In the case of a precipitation reaction, an ionic equation should have two aqueous ions on the left-hand side and one solid product on the right-hand side.

(c) This calculation could have been worked out using either moles, reacting masses or percentages. Candidates who used the moles method were most successful. The main error was not using the 2:4 ratio shown in the equation but this did not stop many from gaining 2 out of the 3 marks using the 'error carried forward' rule.

Candidates should be reminded to set their calculation out as clearly as possible as marks can be awarded for correct steps in the method even if the final answer is incorrect.

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CHEMISTRY 2 – FOUNDATION TIER

Overview of the Unit

All Unit 2 topics were assessed in this paper.

2.1 Bonding, structure and properties
2.2 Acids, bases and salts
2.3 Metals and their extraction
2.4 Chemical reactions and energy
2.5 Crude oil, fuels and organic chemistry
2.6 Reversible reactions, industrial processes and important chemicals

Foundation Tier candidates responded well to an increase in the number of questions where a choice of answers was given or where a short answer was required and these were well attempted. Many could correctly plot graph points and read data from a graph. In line with previous years, candidates struggled more on questions requiring an extended response and especially on the QER question. Performance on the common questions was very poor indeed.

Overall, candidates demonstrated a good knowledge and understanding of:
- pH and reactions of acids
- Fire triangle
- Fermentation.

A lack of knowledge and understanding was shown in these areas of the specification:
- Symbol and ionic equations
- Ionic bonding
- Salt preparation
- Energy profile diagrams
- Fractional distillation of crude oil and cracking.

Comments on individual questions/sections

Q.1 (a) Well attempted. Most candidates knew universal indicator colours and could select the correct formula for sodium hydroxide.

(b) Well attempted. Most could select the correct answers from the table. However, fewer could give the correct test and observation for hydrogen gas.

Q.2 (a) Most candidates could give the missing side of the fire triangle. Fewer could identify the side of the fire triangle removed by cutting down trees during a forest fire.

(d) Many candidates could not correctly calculate the M_r value. The total of the three A_r values was often given.

Q.3 (a) Most candidates could correctly identify the conical flask. Very few gained both marks for the test for carbon dioxide gas.

(b) The graph was well plotted in general, although many candidates lost the mark for drawing a straight line through the points. Many correctly read a value from the graph but few could engage with the data to estimate a value in part (iii).

Q.4 (a) Parts (i) and (iii) were reasonably well answered but fewer than one in five gave the correct formula for aluminium oxide.

(b) The mean mark for the QER was 2. Many candidates were unable to correctly link uses and properties of copper, often listing a few properties only. Higher band answers linking all three uses to relevant properties, with some reasoning, were not often seen.

Q.5 (b) Only around one in four used the ion table to give the name of ammonium sulfate in part (i). The most common error was 'ammonia sulfate'.

(c) Fewer than half of candidates could balance the equation but slightly more knew the meaning of the symbol for a reversible reaction. Some knew why a catalyst is used but very few recalled that iron is the catalyst used in the Haber process.

Q.6 (a) Candidates showed reasonable knowledge of the properties associated with different structures scoring a mean mark of 1.5 out of 3.

(b) More than half of candidates could correctly show a single covalent bond, but fewer showed eight electrons around both chlorine atoms.

(c) Parts (i) and (ii) were slightly different in style to previous questions and candidates found them challenging. The mean mark was 1 out of 3. Part (iii) also caused problems for many with answers based on one atom of potassium rather than two commonly seen.

Q.7 (a) (ii) Barely any candidates scored a mark here suggesting that few had experience of this practical. Reference to there being no effervescence was the expected answer.

(a) (iii) Copper(II) sulfate was named as one of the products. One mark was awarded for giving its formula. The second mark was for the formula of water as the second product. Many did not manage to give either and the mean mark was 0.6 out of 2.

(b) This was poorly answered with very many candidates showing a lack of knowledge of energy profiles. Some gave a general definition of an exothermic reaction in part (iii) rather than referring to the diagram.

Q.8 (a) Parts (i) and (ii) were very poorly answered with barely any candidates able to name the changes of state as boiling/evaporation and condensing. In part (iii) the calculation was well attempted but many candidates lost a mark by not calculating a temperature rise or by not giving their answer to two significant figures.

(b) A good number of candidates could balance the cracking equation in part (i) but barely any could recall the knowledge needed to answer parts (ii)-(iv). These parts were not attempted by around two out of every five candidates.

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CHEMISTRY 2 – HIGHER TIER

Overview of the Unit

All Unit 2 topics were assessed in this paper.

2.1 Bonding, structure and properties
2.2 Acids, bases and salts
2.3 Metals and their extraction
2.4 Chemical reactions and energy
2.5 Crude oil, fuels and organic chemistry
2.6 Reversible reactions, industrial processes and important chemicals

Higher Tier candidates could, in general, give a better quality of extended response, although few gave a higher band answer to the QER question. They found reacting mass, percentage yield and titration calculations difficult.

Overall, candidates demonstrated a good knowledge and understanding of:
- Energy profile diagrams
- Reactivity series
- Bond energy calculations.

A lack of knowledge and understanding was shown in these areas of the specification:
- Symbol and ionic equations
- Ionic and covalent bonding and structures
- Percentage yield calculations
- Reacting masses calculations
- Titration calculations.

Comments on individual questions/sections

Q.1 (a) Parts (i) and (iii) were well answered but very few candidates could describe a difference in the observations made when copper(II) oxide rather than copper(II) carbonate is added to sulfuric acid. This again suggests that few had practical experience of these reactions.

(b) Well answered overall, although again many candidates gave a general definition of an exothermic reaction in part (iii) rather than referring to the diagram.

Q.2 (a) (i) Only one in three gained the mark for naming the changes of state.

(ii) Many gave a general explanation for 1 mark, but few linked boiling point to hydrocarbon chain length to gain both marks.

(b) The vast majority correctly completed the equation in part (i) and around half of candidates recalled the information needed for parts (ii) and (iv). On the other hand only one in six gave an acceptable answer for the meaning of the term unsaturated.

Q.3 Overall this question was disappointingly answered. Although most candidates could draw the structure of ethanol from the formula, few could identify ethanoic acid as a carboxylic acid or give the correct name for propene. The repeat unit was reasonably drawn but only one in three could give the product of the reaction of an alkene with bromine.

Q.4 Fewer than half of candidates were able to give a correct order of reactivity from the information given in part (a). The graph was well done by almost all candidates but few gained all 3 marks for the analysis in (b)(ii). Most did not mention zinc in their answer.

Q.5 (a) Diagrams of the bonding in carbon dioxide were disappointing. Many failed to show double bonds and therefore gained no credit. Explanations of carbon dioxide's low boiling point were often unclear. A lack of understanding of intermolecular forces was evident with many referring incorrectly to covalent bonds or bonds between *atoms*.

(b) Although slightly better than those in part (a), bonding diagrams here were also disappointing. Few gained full credit. Some were ambiguous in that electrons appeared in the two places at the same time and others had incorrect charges on the ions. Some attempted to show covalent bonding. Few candidates could explain the difference between melting points of MgO and NaCl. The percentage yield calculation in part (iii) was incredibly poorly answered with few gaining even 1 mark. This calculation is specified in Unit 1 but required in Unit 2 also. It appears that this fact has been overlooked by many in their revision plans.

Q.6 (a) Many candidates correctly identified Y as sodium chloride due to a reactivity comparison and were able to access the lower band on this QER question. A good number identified the gas produced as hydrogen. Fewer, however, showed understanding of the difference in reactions of strong and weak acids to correctly identify X and Z. The mean mark was 2.4 out of 6.

(b) Many candidates identified the correct colours but some made no reference to a precipitate and were unable to gain full credit.

Q.7 (a) Pleasingly well answered with a mean of 2 out of the 3 marks available. Certainly the most successful calculation on the paper.

(b) Knowledge of the Haber process was well demonstrated by some, but many gave vague answers and gained no credit.

(c) This equation was poorly done. Most candidates did not appear to have used the table at the back of the paper to look up the formulae of the ions needed.

(d) A clear sequence of events was needed here for full credit. Many scored 1 mark only for any relevant point.

Q.8 (a) Part (i) was well done by almost all candidates but part (ii) was poorly done with only one in ten getting the mark. This is a scientific literacy question where candidates needed to recognise the significance of the different units for both acids.

(b) (i) The ionic equation for neutralisation was not well known. This is straightforward recall from the specification.

(ii)&(iii) Both the titration and moles calculations were very poorly done.

Q.9 (a) Answers here often gave a general definition of oxidation and reduction with no reference to the reaction. This gained no credit. Of those candidates who did address the question correctly, some lost a mark for referring to the oxide ion as 'oxygen'.

(b) Most candidates gained the mark in part (i) but again the vast majority struggled with the calculation in part (ii).

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CHEMISTRY 3 – PRACTICAL ASSESSMENT

Overview of the Unit

In this unit candidates are assessed on their practical skills including, forming hypotheses, recognising and preventing hazards and risks, recording and presenting data, understanding the variables that are involved in experiments, evaluating the success of the experiment and planning improvements.

Both tasks proved to be accessible for most candidates who usually attempted all sections.

Comments on individual questions/sections

Section A – Hypotheses and risk assessments

Most candidates were able to make a sensible hypothesis in both tasks, which linked the independent and dependent variables. In producing risk assessments, the most successful candidates linked the risk with a particular action in the method, such as spilling chemicals onto skin whilst pouring, and were able to suggest a sensible control measure for that risk. Less successful candidates often did not link the risk to an action or referred to chemicals splashing into eyes which could not be credited.

Section A – Tables of results

Most candidates produced well organised tables of results and recorded all their data. It was pleasing to see that most candidates included units in the table headings and not in the body of the table. In some cases, headings lacked detail and could not be credited. In the sodium thiosulfate task, many candidates simply had the heading concentration and did not refer to sodium thiosulfate. This was required to distinguish between this and hydrochloric acid.

Section B – Variables

Both tasks included a section on variables. Candidates were able to identify the independent and dependent variables and most were able to state the range of these variables. Less successful candidates simply listed all the values of the variable when asked for a range, but this was seen less often than in previous series. One area for development that was noted was the resolution of the apparatus used. Where this was asked it was common to see incorrect values given. The tasks explored either how or why certain variables were controlled, and this was less well answered than other areas of the section on variables. For example, in the sodium thiosulfate task, candidates were required to explain how the volume of the sodium thiosulfate was controlled but most candidates didn’t refer to the volume of the of the solution used or the apparatus used to measure this volume.

Section B – Graphs

Graphs continue to produce a mixture of results with the same errors consistently appearing:

- Axis labels missing or without units or with incorrect units
- Less than half the graph paper area being used for scales, the origin left blank, using scales with multiples of 3 or 7
- Line of best fit with thick or wispy lines.

The subsequent description of the graphs was generally well answered when a basic description of the relationship between independent and dependent variables was required. However, when a second mark was sought for a more detailed description, many candidates failed to gain additional credit.

Section B – Calculations

Calculations were answered well by most candidates.

Section B – Analysis and evaluation of results

Compared to previous series, it was far more common to see candidates describing their data in detail. In the sodium thiosulfate task, many candidates were able to select and use appropriate data to evaluate a claim about reaction time halving as concentration doubles. Weaker candidates tended to be vague in their responses and needed to consider the specific factor by which variables change in relation to each other to draw valid conclusions.

Section B – Improvements

Many candidates were able to suggest suitable improvements, for example using a thermostatically controlled water bath to control temperature in the sodium thiosulfate task. Where candidates were less successful, they suggested invalid improvements such as controlling the temperature of the entire room in the rates of reaction task.

Section B – Use of practical terms

Most candidates demonstrated clear understanding of practical terms such as repeatability, reproducibility and accuracy. Similarly, candidates were confident in identifying anomalous results. Other terms, such as systematic error, were not well understood and most candidates had difficulty in clearly explaining the effect of a systematic error. The glossary of practical terms is a good reference that candidates should use when revising for these tasks.

Section B – Planning

The most effective responses to questions that asked candidates to plan another experiment included investigating the effect of a different variable, a list of apparatus, controlled variables and a clear and valid method that could be followed. Less successful attempts at this type of question provided more of a narrative response and frequently did not identify how the independent variable was to be changed, did not state the variables to be controlled and would not have produced valid data. Simply stating ‘repeat the experiment from Section A’ with one change is not detailed enough to be credited. Candidates should be encouraged to include a chronological list of steps, including stated values of the independent variable, along with reference to what measurements are required.

Section B – Science theory

Theory based questions, such as those involving collision theory in the rates of reaction task were often not well answered. Although candidates had a broad understanding, they often didn't use sufficient detail and correct terminology to gain credit. For example, the distinction between collisions and *successful* collisions was not clearly understood.

Supporting you

Useful contacts and links

Our friendly subject team are on hand to support you between 8.30am and 5.30pm, Monday to Friday.
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[i] ***Please note that where overall performance on a question/question part was considered good, with no particular areas to highlight, these questions have not been included in the report.***