GCSE EXAMINERS' REPORTS

CHEMISTRY
GCSE

SUMMER 2019

Grade boundary information for this subject is available on the WJEC public website at: https://www.wjecservices.co.uk/MarkToUMS/default.aspx?l=en

Online 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.

Annual Statistical Report

The annual Statistical Report (issued in the second half of the Autumn Term) gives overall outcomes of all examinations administered by WJEC.

CHEMISTRY

GCSE

Summer 2019

COMPONENT 1 - CONCEPTS IN CHEMISTRY - FOUNDATION TIER

General Comments

Only a very small number of candidates sat this paper. Overall performance was pleasing with a mean mark of 65 out of 120 and a range from 41 to 88. Candidates showed generally good mathematical skills but often lost marks through poor use of language in their explanations.

Candidates generally struggled with writing chemical formulae and symbol equations as is often the case at the foundation tier. Some showed a surprising lack of knowledge of Group 1 reactions and simple organic chemistry. A lack of familiarity with specified practical tasks was also common.

Comments on individual questions/sections

Q.1 Generally well done.

(a) Weaker candidates labelled the filter paper as a 'filter funnel'.

(b) Hydrogen was often given as the gas that turns limewater milky.

(c) Well answered.

(d) Zn_2Cl was the most common incorrect formula chosen for zinc chloride.

Q.2 This question was poorly answered by many candidates.

(a) Weaker candidates simply guessed words from the list with barely any thought e.g. a colour was sometimes seen in place of the name of gas **C**.

(b) The most common formulae for given for lithium oxide were 'LiO' and 'LiO_2'.

Q.3 Atomic structure was well understood by most candidates.

Q.4 Most candidates were able to extract numerical information from the table and from the graph. In part (b) most understood that a different thermometer would be needed but did not recognise that a liquid with a higher boiling point than water must be used.

Q.5 **(a)** **(i)** Most candidates gained the symbol mark for the iron(III) ion but were unable to use it to give the formula for iron(III) oxide.

(ii) Weaker candidates did not cope with this question. Many failed to calculate the difference in volumes after 1 week. These weaker candidates simply used the two values in the stem i.e. $\frac{7.6}{9.2} \times 100$.

(iii) Well answered.

(b) **(i)** Well answered.

(ii) Surprisingly poorly answered. The most common answer was zinc. This indicated that candidates had not read the information given carefully enough.

Q.6 Well answered. Line graphs were well plotted and correctly interpreted by most candidates.

Q.7 Parts (a)-(c) were well answered. Many failed to gain the mark for part (d) after giving vague answers. Reference to water pollution was required and responses such as 'detergents kill wildlife' and 'detergents are dangerous' gained no credit.

Q.8 Generally poorly answered.

(a) **(i)** Surprisingly poorly answered. Weaker candidates often gave a property and a use which relies on a different property e.g. diamond is transparent and used in drill bits.

(b) Candidates were able to connect the structure to its correct bonding but failed to connect the substance to its correct structure.

Q.9 **(a)** The quality of extended response (QER) question was poorly answered. Candidates showed a general lack of knowledge of what should be a familiar method and consequently failed to mention the variables that should be controlled in order to ensure a fair test. Several candidates suggested burning both fuels and measuring the fall of the liquid level in each burner.

(b) Generally well answered.

Q.10 **(a)** **(i)** Very few candidates named the homologous series correctly. The most common incorrect answers were 'hydrocarbons' and 'fuels'.

(ii) Generally well done.

(b) Able candidates gained one mark for correctly drawing a carbon dioxide molecule. Very few gained the second mark for drawing two water molecules. Most candidates combined the hydrogen and oxygen atoms into one large molecule!

(c) Generally well answered.

Q.11 This line graph interpretation question was poorly answered.

(a) Able candidates obtained the 'support' mark but not the 'oppose' mark. These candidates could not explain that as carbon dioxide concentration increases, mean atmospheric temperature fluctuates.

(b) Most candidates gave a qualitative answer and gained one mark. A second mark was awarded when a quantitative comparison was included.

(c) Well answered.

Q.12 Candidates were required to use information from several sources, including a graph, a diagram and a table, in order to answer this question. Only the more able ones were able to do so.

(a) **(i)** Some weak candidates used the wrong graph. Some decided to read values from random points on the line and needless errors were seen.

(ii) The most common error was to draw a line from (0,0) to (10,7.9) rather than to (10,79).

(iii) Weaker candidates did not realise the significance of the two diagrams. They used the values 5.0 cm^3 and 12.5 g and noted that this point on the graph was close to the line for aluminium.

(b) **(i)** Well answered.

(ii) and (iii)

Most candidates failed to compare the relevant property of each metal in both parts, e.g. copper is a <u>better</u> electrical conductor than aluminium. No credit was awarded for 'copper is a good electrical conductor'.

Q.13 Poorly answered by most candidates but differentiated well. Only the stronger candidates scored three marks or more.

(a) **(i)** This was the only mark obtained by most candidates.

(ii) Poorly answered. The most common incorrect answers included 'iron', 'copper oxide' and 'rust'.

(iii) Many candidates failed to give the formula for iron(III) chloride so lost both marks.

(b) Most candidates could not write the formulae for the two products.

Q.14 This was the only question in the common section where foundation tier candidates gained significant numbers of marks. Atomic structure and the Periodic Table are usually well known by most candidates.

(a) **(i)** Generally well answered.

(ii) Well answered.

(b) Generally well answered.

Q.15 Poorly answered. There was little evidence that candidates had carried out this specified practical [SP11].

(a) and (b)

Most candidates gained these mathematical marks.

(c) Poorly answered. Some candidates obtained the first mark but then went on to state that the experiment should be carried out three more times before calculating a mean value. Only very rarely were both marks awarded.

(d) Poorly answered. Some candidates gained the first mark for reference to adding water but very few stated that the reaction is reversible.

Q.16 Poorly answered. Once again there was little evidence that candidates had carried out this specified practical [SP7B].

(a) **(i)** Most candidates stated that the white tile was used to 'see the indicator'. This was not credited. The mark scheme required the candidate to state that it allows the colour change of the indicator to be seen more easily.

(ii) Surprisingly poorly answered. The most common incorrect answers were 27.8, 26.1 and 26.4.

(iii) Generally well answered.

(iv) Most foundation tier candidates struggled to answer this question showing a lack of understanding of this very common method. This is a good example of where experience of carrying out the practical work is essential.

(v) Very few foundation tier candidates obtained any marks for this question. The most common incorrect answers included 'carry out the experiment again more carefully', 'filter off the crystals' and 'evaporate the neutral solution to dryness'.

(b) This question was beyond almost all foundation tier candidates.

Summary of key points

- Candidates need to understand what is meant by the command words 'state', 'describe' and 'explain' used in the stem of questions.
- Candidates must read questions carefully as additional information is often given to help construct the answer.
- They should spend a little time organising their thoughts before beginning to answer questions requiring extended writing. This will help ensure that points are made in the correct order and that the appropriate scientific terminology is used.

CHEMISTRY

GCSE

Summer 2019

COMPONENT 1 - CONCEPTS IN CHEMISTRY - HIGHER TIER

General Comments

The vast majority of candidates in this qualification sat the higher tier paper. There was a total of 249 candidates compared with 28 at foundation tier. Overall performance was pleasing with a mean mark of 72 out of 120 and a range from 21 to 109. Those who scored marks of 40 or less would have benefitted from entering at foundation tier.

Candidates showed generally good mathematical skills but often lost marks through poor use of language in their explanations. Those who had carried out a broad range of practical work during their two-year course answered practical-based questions much better than those who had not.

Significant numbers of candidates demonstrated a lack of knowledge and understanding of the extraction of aluminium, phytoextraction and organic chemistry.

Comments on individual questions/sections

Q.1 This question was not generally well done. Weaker candidates struggled to cope with writing chemical formulae.

(a) **(i)** Well answered.

(ii) Well answered.

(iii) The most common error was to give the formula for iron(III) chloride as $FeCl_2$. Unfortunately, this resulted in the loss of the second mark also.

(b) Many candidates were unable to write the formulae of the two products. Common errors included $NaSO_4$ for sodium sulfate and $FeOH_2$ for iron(II) hydroxide.

Q.2 This was well answered by the vast majority of candidates.

Q.3 **(a)** Generally well answered.

(b) Generally well answered.

(c) Most candidates gained the first mark for stating that not all the water has been removed but many showed a lack of understanding of the practical method by quoting generic methods for improvement e.g. repeating three times or using more precise apparatus.

(d) Again most candidates gained the first mark but not all recognised it as a reversible reaction.

Q.4 **(a)** **Parts (i)-(iii)**

These were generally well answered.

(iv) Surprisingly poorly answered. Candidates who had carried out this specified practical [SP7B] were at an advantage. Weaker candidates often said that the mixture contains hydrochloric acid and indicator or that it has not been neutralised.

(v) Poorly answered. Only more able candidates described repeating the method without the indicator. Methods such as filtration and distillation were given.

(b) Only answered well by able candidates. Some tried to answer using extended calculations.

Q.5 Generally well answered.

(a) Well answered. Errors in the formula for nitric acid were common e.g. HNO, HNO_2 and HNO_4.

(b) Most candidates gained two of the possible three marks. Some lost a mark as they made no mention of heating.

(c) Those candidates who calculated the distance travelled by the red dye tended to obtain both available marks. The most common errors were in the positioning of the yellow dye spot.

Q.6 A well answered question.

Q.7 Most candidates gained at least half the available marks for this question.

(a) **(i)** Some candidates lost the first mark because they did not read the x-axis scale correctly. The effect of burning fossil fuels was well known.

(ii) Generally well answered.

(b) **(i)** The most common error was to state that the acidity decreases when it is in fact the pH that decreases.

(ii) Most candidates gained one of the marks by stating that calcium oxide is a base or an alkali. The most common reason for not gaining the second mark was to state that the pH decreases.

Q.8 This was one of the worst answered questions on the paper. The question relied on the recall of knowledge relating to the extraction of aluminium from its ore.

(a) Compound **A** was usually known but few candidates were able to clearly state why it is added to the electrolyte. A number said that it lowers the melting point of aluminium.

(b) Most candidates gained the mark for the cathode half-equation but not for the anode half-equation.

(c) This was very poorly answered. Although no explicit reference to the siting of aluminium plants is made in the specification there is a generic statement which candidates should consider in the context of all industrial processes [11(i)].

Q.9 Poorly answered. This question relied on the recall of knowledge and understanding relating to phytoextraction.

(a) Most candidates did not demonstrate a thorough understanding of the process of phytoextraction. Poor writing skills sometimes contributed to a lack of credit being awarded. The main misconception was that the process uses up a lot of land which could be used to grow crops (candidates possibly mixing up phytoextraction with the growing of biofuels.)

(b) **(i)** Most candidates gained the first mark. Many candidates failed to gain the second mark by not giving a sufficient explanation for their chosen method.

Many candidates who chose electrolysis did not state that Cu^{2+} ions are attracted to the cathode. Those who chose displacement failed to state that adding a more reactive metal results in copper (the less reactive metal) being displaced.

(ii) Most candidates gained the first marking point by correctly stating the meaning of reduction in terms of gain of electrons. Only a small proportion related this to their method in part (i).

Q.10 Generally well answered with most candidates gaining half the available marks.

(a) Generally well done.

(b) Most candidates gained the first mark by reading off the rate at 1.0 mol/dm^3 from their graph. However only the most able realised this was not the final answer and converted the rate to a time as required.

(c) Most candidates gained one mark for stating the qualitative answer 'as the number of particles increase the chance of collision increases'. Some candidates didn't refer to particles as asked for in the stem of the question. Only the most able candidates stated that doubling the number of particles doubles the chance of collision.

(d) Experience of a broad range of practical work on rates would have been of benefit in answering this question. Only able candidates realised that a different method involved measuring the volume of gas formed or the loss of mass over time.

(e) Parts (i) and (ii) were both generally well answered.

Q.11 Answers here were generally very disappointing. Candidates failed to demonstrate knowledge and understanding of organic chemistry.

(a) Fewer than half the candidates gained the first mark for stating that the C=C bond is broken. Only a very small number gained the second mark for reference to one bromine atom bonding to each carbon atom. Many candidates discussed addition polymerisation which gained no credit.

(b) **(i)** Common errors included structures containing five carbon atoms or a carbon atom having five bonds.

(ii) Only the most able candidates gained this mark.

(c) Only the most able candidate knew the functional group found in carboxylic acids.

Q.12 **(a)** The calculations in parts (i) and (ii) were well done.

(b) Parts (i) and (ii) were well done.

Q.13 **(a)** Able candidates coped well with this question. Weaker candidates failed to clearly express their thoughts and often gave contradictory statements e.g. 'the system will try to oppose the low temperature so equilibrium will move to the right and the yield of ammonia decreases'.

(b) Generally well answered.

(c) Parts (i) and (ii) were well answered by able candidates. Weaker candidates fell down by using O rather than O_2 for oxygen gas in their equation in part (ii).

Q.14 **(a)** This was well answered by most candidates.

(i) Weaker candidates gave incorrect colours for the calcium and/or sodium ion flames.

(ii) Most gave the silver nitrate test but some mixed up the colours for chloride and iodide precipitates.

(iii) Some chose the incorrect test here and unfortunately lost all three marks.

(b) Generally well answered although a number chose the equation including all eight ions.

Q.15 This QER question discriminated well. More able candidates used correct chemical terminology in concise and well organised answers. These candidates addressed all parts of the question. Weaker candidates failed to describe any limitations of the bonding models.

Top band answers included dot and cross diagrams for both compounds and made appropriate references to bonding type, structure and forces of attraction between particles. They discussed the limited use of the model in predicting 3D shape and the relative strength of attractive forces.

Q.16 It was pleasing to see that the more able candidate coped well with this question.

(a) Common errors included not converting 30 milliseconds into seconds and not giving the answer in standard form.

(b) Some candidates used volumes with different units in the calculation resulting in an answer out by a factor of 1000.

(c) Common errors included calculating the relative molecular mass of two NaN_3 units and using a ratio of 3:2 rather than 2:3.

(d) Most candidates attempted the formula for the missing reactant and the three products. Most gave the correct formula for potassium nitrate gaining one mark. Many also gave the correct formula for potassium oxide and for sodium oxide but failed to give N_2 for nitrogen gas. The balancing mark was therefore also lost.

(e) This was a difficult final question and only answered correctly by the most able candidates.

Summary of key points

- Candidates need to understand what is meant by the command words 'state', 'describe' and 'explain' used in the stem of questions.
- Candidates must read questions carefully to ensure that their answer is focused on its specific requirements rather than a generic response on the content area.
- Candidates should practise writing chemical formulae and equations throughout their two-year course. A minimum of around 10% of the available marks will be awarded for these skills.
- They should spend a little time organising their thoughts before beginning to answer questions requiring extended writing. This will help ensure that points are made in the correct order and that the appropriate scientific terminology is used.

CHEMISTRY

GCSE

Summer 2019

COMPONENT 2 - APPLICATIONS IN CHEMISTRY - FOUNDATION TIER

General Comments

Only 28 candidates sat this paper. The mean mark was 25 out of 60 which was 3 marks lower than last year's. All candidates scored marks between 17 and 36. **Section A** proved to be challenging with questions 3 and 5 inaccessible for most candidates.

Some candidates appeared to lack first-hand experience of some very basic experiments and practical methods.

Numeracy skills showed an improvement from 2018 although not all candidates showed a good understanding of significant figures.

Comments on individual questions/sections

Section A

Q.1 **(a)** Most candidates correctly completed the column for tube 5 but some did not appreciate that boiling the water in tube 4 removes air.

(b) Many talked about excluding oxygen here rather than preventing any water from reaching the nail.

(c) Tube 1 was frequently chosen.

(d) Some candidates could identify the nail as being the same but did not give a suitable controlled variable. Simply stating that 'identical' nails should be used gained no credit. Many candidates said that the test tubes needed to be the same size or that you would add the same amount of liquid. Again, these gained no credit.

(e) This question was poorly answered and not attempted by some candidates.

Q.2 **(a)** **(i)** The majority of candidates gained credit here.

(ii) Nearly all candidates scored this mark.

(iii) This question saw a wide variety of answers and less than half the cohort gained the mark.

(b) Candidates usually scored two or no marks here.

Q.3 **(a)** Most candidates recognised that the potassium flame should not be blue and many knew that the silver chloride precipitate should not be orange. The final circle was quite randomly distributed suggesting guesswork on the part of many.

(b) **(i)** Less than half of candidates stated that a flame test should be carried out. Some stated that the tablets should be 'burned'. Many different colours were seen and only the odd few candidates gained both marks.

(ii) Hydrogen was the most frequent incorrect answer. The correct test for hydrogen gained no credit.

(iii) This question was surprisingly poorly answered with very few candidates stating that the tablet should be filtered and dried.

Q.4 **(a)** **(i)** **I** Most candidates correctly identified the burette.

II Approximately a third of candidates chose the funnel here but most gave the correct answer.

(ii) Few candidates could state the purpose of the trial run.

(iii) Most candidates showed a good understanding of repeatability.

(iv) This question was answered well with only a few including the rough result in the calculation.

(v) Many candidates did not attempt this question. Some failed to give an appropriate volume but gained one mark for their reasoning.

(b) **(i)** The graph was well drawn. A few point-to-point lines were seen and these lost the third mark.

(ii) Most candidates gained the marks for parts I and II.

(iii) Most candidates could suggest an improvement and some could state why the polystyrene cup was used.

(iv) Many answers here suggested using a metal cup or a beaker instead of the polystyrene cup. These were not accepted.

Q.5 Responses here were disappointing as it would be expected that all candidates had seen this very familiar demonstration first hand. Most scored lower band marks. Descriptions of the method and observations were poor but safety precautions were well known. Those who described the trend in reactivity usually did so correctly.

Section B

Q.6 **(a)** Almost all candidates gained some credit here. The main reason for loss of marks was directly quoting from the text with no 'reason' given e.g. 'each megatonne of recycled steel is worth £138 million' gained no credit.

(b) **(i)** Most candidates gained this mark.

(ii) The calculation presented little difficulty for most candidates but some could not round their answer to three significant figures as required.

(c) **(i)** Most candidates were awarded this mark.

(ii) This mark was gained by the majority of candidates. Some tried to use their answer from part (i) to calculate this value.

(d) **(i)** Almost all candidates answered correctly here.

(ii) Some candidates referred to a property of tungsten rather than a property conferred on the steel by the addition of tungsten. Depending on the way this was expressed, it sometimes resulted in the mark not being awarded.

(iii) The mark was awarded to the vast majority of candidates.

(e) The most common mark here was one for recognising an increase in production. A few candidates described the increase in more detail and gained the second mark.

(f) Many foundation tier candidates struggled with this calculation even though an example was provided.

Summary of key points

- Candidates must have first hand experience of common experiments and practical methods to be well-prepared for this examination paper.

- Candidates made good use of the resource booklet to answer **Section B** and some achieved high marks here. Some practise may be required in using given information as evidence to support their answers.

CHEMISTRY

GCSE

Summer 2019

COMPONENT 2 - APPLICATIONS IN CHEMISTRY - HIGHER TIER

General Comments

The mean mark for this paper was 32 out of 60 which was 5 marks higher than last year's. Most candidates scored between 15 and 45 marks but a small number would have benefitted from being entered at foundation tier. All questions were accessible and facility factors ranged from 38 to 64.

Some candidates appeared to lack first-hand experience of some very common GCSE experiments and practical methods.

Numeracy skills showed improvement from 2018 although not all candidates showed a good understanding of decimal places and significant figures.

Comments on individual questions/sections

Section A

Q.1 **(a)** All candidates gained credit here. Some lost a mark for directly quoting from the text with no 'reason' given e.g. 'each megatonne of recycled steel is worth £138 million'.

(b) **(i)** Almost all candidates gained this mark.

(ii) The calculation presented little difficulty but a few could not round their answer to three significant figures.

(c) **(i)** Most candidates were awarded this mark.

(ii) This mark was gained by the majority of candidates. Some tried to use their answer from part (i) to calculate this value.

(d) **(i)** Almost all candidates answered correctly here.

(ii) Some candidates referred to a property of tungsten rather than a property conferred on the steel by the addition of tungsten. Depending on the way this was expressed, it sometimes resulted in the mark not being awarded.

(iii) The mark was awarded to the vast majority of candidates.

(e) The most common mark here was one for recognising an increase in production. A number of higher tier candidates described the increase in more detail and gained the second mark.

(f) Most higher tier candidates managed to use the example given to carry out an appropriate calculation. Error carried forward (ECF) marking was applied and candidates were able to access the final mark for sensible reasoning even when their calculation was incorrect.

Section B

Q.2 **(a)** **(i)** Most candidates could calculate this mass or gain one mark for 0.2 mol of aluminium. The most common incorrect answer was 12.7g.

(ii) Candidates struggled with this question. Few understood that residual water would increase the mass and some referred to aluminium sulfate being left on the copper and said it could be washed off. This suggests a lack of familiarity with the practical method of drying to constant mass.

(iii) This question again was poorly answered. Candidates were clearly unfamiliar with the idea of quantitatively removing a solid from a flask.

(b) **(i)** The graph presented few difficulties with an occasional mark lost for a poor line of best fit.

(ii) Most candidates scored one mark here with the more able getting the second mark for describing 'direct proportionality'.

(iii) The majority of candidates scored two marks here. Those that did not had usually failed to extrapolate the graph.

(c) The modal mark here was one mark. Most candidates either stated that repeating would allow anomalies to be identified or that repeating would not in itself improve accuracy. Few mentioned both of these creditworthy points.

(d) This question was well answered and most candidates gained both marks.

Q.3 **(a)** **(i)** Around half of the candidates chose the carbonates and explained the observation. Marks were often lost for the inclusion of additional compounds.

(ii) This question was well answered. It was pleasing to see that the correct colours of the precipitates were often given as well.

(iii) Candidates frequently lost marks here. The most common incorrect answers were carbon dioxide and hydrogen. When ammonia was identified, some candidates did not state that the litmus paper needed to be damp.

(b) **(i)** Most candidates could state the colours of iron(II) hydroxide and iron(III) hydroxide precipitates but not all knew that sodium hydroxide is the reagent required. Silver nitrate and hydrochloric acid were frequently suggested.

(ii) The reagent had to be correct here for the observation to be credited. Any soluble barium compound was allowed however. Approximately half of candidates gained these marks.

Q.4 **(a)** **(i)** **I** Reasons were often imprecise here, talking about not being over the burner flame or not measuring the temperature of the liquid rather than specifically stating that the thermometer would measure the temperature of the vapours.

II The word 'condense' was expected here though descriptions of condensation were allowed. Frequently candidates talked about 'catching the gas' which gained no credit.

(ii) Most candidates gained this mark for a statement directly linking boiling point range and appearance.

(b) This question proved a good discriminator with a great variety of answers seen. Candidates were not awarded the mark for pentane as the compound with no positive results unless two chemical tests had been given. The 'test' boxes were regularly left blank. There were some references to flammability of the compounds but this did not gain credit.

Marks were most frequently awarded for the correct use of bromine water to identify pentene.

(c) This question was marked quite generously. It would ordinarily be expected that candidates refer to the presence of a particular peak in the spectrum of one of the compounds and its absence in those of the others. It would also be advisable to use the relevant wavenumber range in a complete response.

Q.5 **(a)** Full marks were frequently awarded here but on the other hand some candidates made no attempt. These would have benefitted from being entered at the foundation tier. ECF marking allowed candidates to gain up to two marks if one error was made during the calculation. Only two marks were awarded if the final answer was not given to two decimal places.

(b) Some candidates attempted this question having not attempted part (a)! Some candidates did not appreciate that 500 cm^3 is 0.5 dm^3 and this was a frequent reason for losing marks.

Q.6 A full range of marks was seen here. Some candidates knew nothing about the two reactions whereas others presented carefully structured, detailed descriptions and explanations including balanced half-equations.

Common weaknesses that limited candidates' marks included:

- giving incorrect products
- confusing the anode and the cathode
- neglecting to mention oxidation or reduction
- confusing oxidation and reduction in terms of electrons
- lack of precision in the use of 'ions' and 'atoms'
- getting half-equations the wrong way around e.g. showing the production of chloride ions even when the description was correct

Many candidates explained why copper metal is produced in one case whereas hydrogen gas rather than sodium is produced in the other.

Summary of key points

- Candidates made good use of the resource booklet to answer **Section A** and some achieved high marks here. Some practise may be required in using given information as evidence to support their answers.

- Candidates must have first-hand experience of common experiments and practical methods to be well-prepared for this examination paper.

- Candidates who had thoroughly revised chemical tests for various ions, gases and organic functional groups would have had the opportunity to gain more than 20% of the marks available for this paper.

WJEC
245 Western Avenue
Cardiff CF5 2YX
Tel No 029 2026 5000
Fax 029 2057 5994
E-mail: exams@wjec.co.uk
website: www.wjec.co.uk