



GENERAL CERTIFICATE OF SECONDARY EDUCATION  
TYSTYSGRIF GYFFREDINOL ADDYSG UWCHRADD

# EXAMINERS' REPORTS

## SCIENCE/ADDITIONAL SCIENCE/ CHEMISTRY

SUMMER 2008

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## **Statistical Information**

### **GCSE**

The Examiners' Report may refer in general terms to statistical outcomes. Statistical information on candidates' performances in all examination components (whether internally or externally assessed) is provided when results are issued. As well as the marks achieved by individual candidates, the following information can be obtained from these printouts:

*For each component:* the maximum mark, aggregation factor, mean mark and standard deviation of marks obtained by *all* candidates entered for the examination.

*For the subject or option:* the total entry and the lowest mark needed for the award of each grade.

### **Annual Statistical Report**

Other information on a centre basis is provided when results are issued. The annual *Statistical Report* (issued in the second half of the Autumn Term) gives overall outcomes of all examinations administered by WJEC.

## CHEMISTRY 1

### General Certificate of Secondary Education 2008

#### Foundation Tier

Team Leader: Dr Brian Jones

This paper produced the lowest mean mark, 25.1, of any Chemistry 1 Foundation paper having a significant entry so far. There was evidence that some questions on the earlier part of the paper produced some confusion for candidates and did not operate as intended by the examining team. Questions 1(iii), 2(i) and (iii), 3(a), 5(a)(iii) and (b) (ii), 6(i)(ii) and (iv) proved largely inaccessible to most candidates.

- Q.1 Parts (i) and (ii) were generally well answered. It was pleasing to see that most candidates did write the *names* and those who attempted to use formulae instead inevitably failed to correctly write H, O, and Cl. 'Chloride' was a common error in (ii), but less frequent than predicted. Candidates failed to score in (iii) because they omitted '*types of atoms*' or '*more than one element*'. This part was poorly answered by most candidates.
- Q.2 This was not as well answered as expected. The majority did select the correct size range in (i). However, in (ii), '*jewellery*' was the common incorrect answer given and in (iii), very few were able to associate the size of the nano-particles with skin absorption and/or inhalation.
- Q.3 In (a), candidates' had difficulty in distinguishing between '*raw materials*' and '*useful products*'. Candidates were not meant to match a raw material with its product or to fill all the spaces in the table. The fact that some raw materials did happen to match some products and the presence of an apparent "extra" box did appear to produce some confusion on the day of the examination. Part (b) was generally well answered, but common unacceptable answers were '*change of colour*' or '*the disappearance of the sodium carbonate*'. In (b)II, the majority wrote carbon dioxide and not the formula.
- Q.4 An extremely well answered question. A very large majority of candidates achieved maximum marks, which showed they were able to comprehend all the information given in the text. A common error in part (iii) was to use '*same*' instead of '*similar*'.
- Q.5 In (a)(i), many candidates incorrectly included magnesium *ribbon* and hydrogen *gas* in the word equation. Not many answers offered formulae as an alternative – where they were invariably wrong. In (ii), changes that were not accepted included Mg dissolving, colour change, gas produced, (hydrogen), exothermic. Many candidates were able to correctly select the letter corresponding to the apparatus, but fewer could name it as '*gas syringe*'.
- In (b), almost all had (i)I. correct, with 5.6 and 7 being the most common errors in (i)II. In (b)(ii), many candidates quite literally *sketched* the graph – using a broad shaded arc instead of the required thin line. Common errors included the line not going through the origin and not finishing at the same end point.

- Q.6 (i) Surprisingly, many candidates ticked 'halogens' instead of hydrocarbons, and then whilst naming the colourless liquid correctly in (ii)I., incorrectly offered oxygen and carbon dioxide as their respective answers to (ii)II. and (iii). Part (iv) was not answered well, with carbon monoxide and sulphur oxide in I. and greenhouse effect/global warming in II. being the common incorrect answers.
- Q.7 On the whole, parts (a)(i) and (b) were very well answered.
- Q.8 In part (i), very many failed to *compare*, simply stating an increase. Again in (ii), candidates failed to appreciate the need for *increased* combustion or *more* cars/industry. Deforestation / more trees cut down was very rarely offered for the second mark. In (iii), whilst I. was correctly answered, in II. 'greenhouse effect' was given instead of global warming. Part III. was generally well answered, with rising sea levels, ice caps melting and flooding being the common answers.

## Higher Tier

*Principal Examiner: David Reeves*

Overall, this was a very well answered paper with the highest mean mark of any Chemistry 1 Higher paper so far and with the majority of candidates scoring 30+. It was pleasing to see so many marks above 40. There were very few candidates who scored below 20, suggesting that most were correctly entered at this tier.

- Q.1 (a) (i) This was very well answered. In part (ii), the better candidates scored well. However, there was a clear communication problem with candidates often being too vague or using incorrect terms. Marks were lost for referring to the number of atoms rather than electrons. Common responses which were generously credited on this occasion included:
- I. The last number
  - II. The amount of numbers
  - III. Add up all the numbers.
- Part (b) was well answered.
- Q.2 (i) The majority of candidates scored 1 here, with most losing a mark for comparison of the rate of increase before and after 1900.
- (ii) Most of the candidates knew that increased burning of fossil fuels was the major cause. Only the better candidates referred to deforestation.
- (iii) The majority of candidates were able to state that there had been an increase in temperature and gave a correct consequence of this. However, weaker candidates were unable to name the effect as global warming, often giving the greenhouse effect.
- Q.3 Most candidates gained all 5 marks here. The most common error was to give the formula of potassium sulphide as  $\text{KSO}_4$  and magnesium chloride as  $\text{MgCl}$ . Weaker candidates clearly ignored the table of common ions and gave  $\text{Ca}^+$  and  $\text{O}^-$ .

Q.4 There were very mixed responses here, although it was pleasing to see a significant number scoring all 4 marks available. In (i), candidates often referred to small particles without qualification. Another common error was to give 0 -100 nm or even omit the units altogether, thus losing the mark. Part (ii) was generally well answered but a significant number of candidates believed that nano-silver helped keep the fridge cold by reflecting heat back out or was keeping bacteria out / stopping them growing. The most disappointing responses came in (iii), with candidates incorrectly concentrating on the effect on the atmosphere rather than health. A surprising number of candidates referred to the particles multiplying or developing a mind of their own!

Q.5 (a) The majority of candidates knew the purpose of a catalyst. However, fewer knew that it wasn't used up. Another common error was to state that the catalyst did not take part in the reaction.

(b) The majority of candidates were able to plot the points. However, weaker candidates were unable to give the correct curve of best fit through the points. Some candidates lost a mark for incorrect or unsuitable axes but plotting marks could still be gained. In (ii), only the better candidates were able to identify that the minimum time was 2 minutes or that an optimum rate was reached after addition of  $2.5 \text{ cm}^3$ .

Part (iii) was generally well answered.

Q.6 (a) Part I. was well answered, although weaker candidates were unable to choose the correct reason and merely copied out all the information in the table. Part II. was a good differentiator, with only the stronger candidates scoring all 3 marks. Common errors included reference to burning or cracking, rather than heating. Many candidates were unable to associate boiling point with size of molecule. As in part I., some candidates merely restated the information in the table, with some stating that separation was according to the different colours of fractions.

(b) The majority of candidates gained full marks for part (i). However, some candidates still lost marks by performing all calculations in one section rather than breaking it into two parts. Some even calculated the overall energy change in II.

In part (ii), there is still some confusion between what constitutes an exothermic or endothermic reaction, with only a minority of candidates correctly giving  $-818$  as the overall energy change and then correctly stating that it is exothermic due to it being a negative value.

Q.7 Most candidates correctly identified sodium in part (i). However in (ii), only a minority of candidates gave a correct equation using M or Na as the symbol for the metal. Some failed to give the product even though it was in the stem of the question. It was particularly disappointing to see candidates who believed that hydrogen or water were products in the reaction.

Part (iii) caused most problems, with a significant number of candidates giving correct observations but being unable to name silver nitrate\* as the correct reagent. The term 'precipitate' was not well known, with some candidates merely referring to the solution turning white or yellow. The most disappointing aspect was to see so many candidates stating that a flame test was used to identify halide ions.

\* Credit was given to candidates who used chlorine or bromine water as reagent together with correct observations.

## CHEMISTRY 2

### General Certificate of Secondary Education 2008

#### Foundation Tier

Team Leader: *Dr Carl Bartholomew*

This paper was generally well answered, the mean mark of 32.3 being of a similar order to the mean marks of the past two Chemistry 2 papers.

- Q.1 (a) (i) & (ii) Well answered in general but many candidates had the answers in the reverse order in each case.
- (b) Poorly answered. Few candidates gave the correct answer, 16 being a common response.
- Q.2 (i) Well answered. Relatively few candidates failed to gain full marks here.
- (ii) Well answered.
- Q.3 (a) (i) The bar chart was well drawn.
- (ii) I. & II. Many candidates thought **A** the hardest and **C** the softest water.
- (iii) Well answered.
- (b) Well answered.
- Q.4 (a) (i) Generally well answered.
- (ii) Well answered.
- (iii) The structural formula for butane was generally well drawn, the commonest error being the omission of the bonds between the carbon atoms.
- (b) Most candidates failed to identify ethene.
- Q.5 (i) I. Well answered.
- II. Generally well done but hydrogen or nitrogen was often given.
- (ii) I. The choice of acid seemed almost random at times. Candidates did not generally recognise the relationship between sulphate and sulphuric acid.
- II. Poorly answered. Candidates do not understand the term "eutrophication" and attempts to explain it usually involved plants using up the oxygen and suffocating fish.

- Q.6 (i) I. & II. Generally well answered.
- (ii) Poorly answered in general. Candidates frequently confused the behaviour of steel with that of nitinol and *vice versa*.
- Q.7 (i) Well answered.
- (ii) Very poorly answered. The vast majority of candidates gave aluminium ore as their response.
- (iii) Very well answered.
- Q.8 (i) I. The graph was usually well drawn but very few candidates used a ruler to draw a line of best fit.
- II. Most candidates succeeded in interpreting the graph correctly here.
- III. Generally well done but a significant number of candidates failed to gain the mark.
- (iii) Very few candidates gained credit here.
- Q.9 (i) I. Correct responses were very few.
- II. Poorly answered in general. Many candidates gained no credit even though the reactant was given in the question.
- III. Many candidates gained credit here.
- (ii) Few candidates gained credit here.
- (iii) A large number of candidates failed to gain credit here. For property a use was frequently given and *vice versa*. Many candidates ignored the instruction to “give a **different** property...”
- Q.10 Poorly answered in general though there were many good answers. Candidates tended to focus on the **colour** and **size** of the atoms rather than the **structures** of the two materials.

## Higher Tier

Chief Examiner: Mrs Rebecca Ennion

This paper was generally well answered, with a mean mark of 31.0.

- Q.1
- (i) I. Most candidates gained the plotting marks but failed to obtain the 'line' mark by not using a ruler to draw the 'line of best fit'.
  - II-III. Generally well answered by all candidates.
  - (ii) Only the most able candidates gained this mark. Most candidates stated simply that 'the boiling point of water is 100°C', which gained no credit, and failed to include reference to the fact that water freezes at 0°C. Both pieces of information were necessary for the one mark.
- Q.2
- (i) I. Only weaker candidates failed to gain this mark. Reference to the 'stability of aluminium oxide' and the 'melting point' of aluminium oxide gained no credit.
  - II. Generally well answered.
  - III. Surprisingly,  $O^{2-}$  was often given, even by more able candidates.
  - (ii) Common incorrect answers included reference to 'proximity to bauxite' and 'the effect to habitats'. Many candidates lost the mark due to the inability to express themselves clearly, e.g., 'near water' instead of 'coastal position'.
  - (iii) This traditional question was poorly answered. Weaker candidates mixed up the terms 'property' and 'use'. Many candidates made reference to aluminium 'rusting', which gained no credit. Some candidates failed to give a sensible 'use' to a specific property, e.g., aluminium has a low density, therefore it is used to make 'cans'.
- Q.3
- Most candidates gained one of the two marks available for this question. Common incorrect answers included reference to 'size' of atoms rather than 'different' atoms, 'larger gaps' and 'metallic gas'. Some candidates failed to specify whether their difference referred to the metal or the metallic glass. Weaker candidates gave one difference as 'metallic structures are ordered' and the second difference as 'metallic glasses having a random structure' - this gained only one mark.

- Q.4 (i) I. Well answered. Weaker candidates often gave the answer 'calcium chloride', which gained no credit.
- II. Many candidates lost the mark due to the inability to express themselves clearly. Many candidates referred only to the 'calcium chloride' tube or by stating the solutions reacted 'differently'.
- (ii) I & II. Well answered.
- (iii) The most common correct answer referred to 'reducing heart disease'. Answers such as 'good for teeth' and 'healthy teeth' gained no credit. Only a few candidates made reference to teeth being 'strengthened'.
- Q.5 Generally well answered.
- (i) Weaker candidates failed to gain marks in parts II and III.
- (ii) This mark was lost by candidates being sloppy as to where they placed the '4' after the hydrogen atom. A superscript '4' or the '4' being placed along side the hydrogen atom failed to gain credit.
- Q.6 This was the least successfully answered question on the paper. There was evidence that many candidates were unprepared for this traditional type of question. Some candidates gave an ionic answer, others gave both a covalent and ionic answer, for hydrogen sulphide. Two discrete sets of diagrams are expected to show the formation of an ionic compound. Many candidates showed the transfer of electrons and the ions on the same diagram. This gained no credit.
- Q.7 (i) This symbol question was poorly attempted. The formula for ammonia was not well known.
- (ii) I - III. Well answered.
- (iii) Some candidates mixed up the chemical formula with the empirical formula.  $N_2H_4O_3$  gained no credit.
- Q.8 (a) (i) Common incorrect answers included 'ethane' and '2CH<sub>3</sub>'.
- (ii) Part I was well answered but many candidates lost the mark for part II due to the inability to express themselves clearly.
- (iii) Poorly answered. The responses 'any number' and 'the number of hydrocarbons' gained no credit.
- (b) (i) A few candidates gave the structural formula for 'polythene' and not PTFE as an answer. Many candidates demonstrated total non-recognition of PTFE.
- (ii) Generally well answered. However, few candidates actually used the term 'non-stick'. Some candidates did make reference to PTFE being a 'good heat conductor', which gained no credit.
- Q.9 (a) Part (ii) better answered than part (i). Common incorrect answers for (i) included answers such as 'changes state' and 'regains state'.
- (b) (i) More able candidates gained full marks for this question, weaker ones gained 0.
- (ii) Well answered by more able candidates. Many candidates derived the correct ratio but then failed to give the actual formula. The most common error was 'Ti<sub>2</sub>Cl'.

## CHEMISTRY 3

### General Certificate of Secondary Education 2008

#### Foundation Tier

Chief Examiner: Mrs Rebecca Ennion

This paper was generally very well answered, the strength of this small, able cohort being reflected in the high mean mark of 34.8.

- Q.1 Parts (a) and (b) were well answered by all candidates.
- Q.2 Only the very weak candidates failed to achieve three marks for this question.
- Q.3 Surprisingly, this question was poorly answered.
- (i) Weaker candidates confused the colours for 'calcium' and 'potassium', therefore failing to gain any marks.
  - (ii) Reference to a 'suitable implement' and the sample being put into a flame were needed to gain the mark. Many candidates who failed to mention that the sample needs to be placed into a flame therefore failed to be awarded the mark. Common incorrect implements included 'tongs' and 'tweezers'.
- Q.4 This was generally well answered by most candidates.
- Q.5 Parts (i) and (iii) were well answered. However, part (ii) was not known by most candidates.
- Q.6
- (i) This was generally well answered. Some candidates attempted a symbol equation which, in some cases, resulted in the loss of marks due to incorrect formulae being given, e.g., O instead of O<sub>2</sub> and SO<sub>3</sub> instead of SO<sub>2</sub>. A few candidates gave 'air' instead of oxygen as one of the products.
  - (ii) This was well answered.
  - (iii) Weaker candidates gave 'sulphuric acid' as the answer instead of 'water'.
- Q.7 Parts (i) and (ii) were generally well answered. Part (iii) was surprisingly poorly answered. Most candidates could not select the correct substance contained in ethanol or ethanoic acid. Most common incorrect responses were 'petrol' for ethanol and 'car battery acid' for ethanoic acid.
- Q.8 This was a poorly answered question.
- (i) Weaker candidates failed to use the formula for calcium carbonate, which was given in the stem of the question, and did not know the formula for carbon dioxide.

- (ii) Most candidates gained only one mark for this question. It was evident that candidates were guessing observations and had not seen this reaction. Many candidates confused the reaction with that of metals with water and subsequently gave answers referring to 'popping' and 'lilac flames'.

- Q.9 Parts (i) and (iii) were generally well answered. However, part (ii) was extremely poorly answered. Only the more able foundation candidates gained marks in part (ii). Candidates confused 'method' with 'reason' and gave two references to the fire triangle, instead of one, when giving the reason for their choice of method. Some candidates failed to read the instructions, e.g., 'give a *different* method' for each situation.
- Q.10 Parts (i)-(iii) were poorly attempted. Candidates' attempts for this answer demonstrated little knowledge of the reaction between concentrated sulphuric acid and glucose. Correct answers to part (ii) were rarely seen. Part (iv) was well answered.
- Q.11 Generally well answered by most candidates. However, weaker candidates failed to understand the question and made reference to 'denaturing'.

## Higher Tier

Chief Examiner: Mrs Rebecca Ennion

This paper was generally very well answered, the strength of this very able cohort being reflected in the high mean mark of 36.6.

- Q.1 Parts (i) and (iii) were generally well answered. However, part (ii) was extremely poorly answered. Many candidates confused 'method' with 'reason', and many gave two references to the fire triangle instead of one when giving the reason for their choice of method. Some candidates failed to read the instructions, e.g., 'give a *different* method' for each situation.
- Q.2 Parts (i)-(iii) were poorly attempted. Candidates' attempts for this answer demonstrated little knowledge of this reaction. Correct answers to part (ii) were rarely seen. Part (iv) was well answered.
- Q.3 This was generally well answered by most candidates. However, weaker candidates failed to understand the question and made reference to 'denaturing'.
- Q.4 All parts of this question were generally well answered.
- Q.5 Surprisingly, only the more able candidates gained full marks on this question. Candidates' attempts for this question demonstrated little knowledge of the reactions involved. Many candidates failed to use the information given in the question.
- Q.6 Parts (i) and (ii) were generally well answered. However, the terms 'addition polymerisation' (part (iii)) and 'isomerism' (part (iv) II.) were not known by most candidates. Part (iv) I. was well known and most candidates gained full marks. The most common error was the second structure being the 'straight chain' with a bend in it.

- Q.7 Parts (i) and (ii) were generally well answered. Only the more able candidates gained both marks for part (iii). Many candidates failed to specify that *concentrated* sulphuric acid was needed in the first stage of the conversion of sulphur trioxide to dilute sulphuric acid.
- Q.8 Many candidates lost marks due to the inability to express themselves clearly.
- (i) Only the more able candidates knew that ethanol and water had different boiling points.
  - (ii) Most candidates obtained the 'advantage' mark by stating that ethanol is a renewable fuel. However, few could give a disadvantage. Many stated an environmental disadvantage, which the stem of the question specifically instructed was not to be given.
  - (iii) Answers to both parts I. and II. tended to be vague and did not answer the specific conditions, e.g., part I. related to *health* problems over a *long* period of time and part II. related to a *social* problem with an *excessive* intake of alcohol.
- Q.9 This highly structured question on chemical analysis was far better answered than in previous years. Most candidates were successful in achieving credit in this question. Only weaker candidates failed to obtain marks.
- Q.10 This unstructured style of question allowed more candidates than in the past to achieve marks for this topic. Weaker candidates failed to gain credit and some did not attempt the question.





WJEC  
245 Western Avenue  
Cardiff CF5 2YX  
Tel No 029 2026 5000  
Fax 029 2057 5994  
E-mail: [exams@wjec.co.uk](mailto:exams@wjec.co.uk)  
website: [www.wjec.co.uk/exams.html](http://www.wjec.co.uk/exams.html)