



GENERAL CERTIFICATE OF EDUCATION  
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# EXAMINERS' REPORTS

## CHEMISTRY AS/Advanced

JANUARY 2008

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## **Statistical Information**

This booklet contains summary details for each unit: number entered; maximum mark available; mean mark achieved; grade ranges. *N.B. These refer to 'raw marks' used in the initial assessment, rather than to the uniform marks reported when results are issued.*

## ***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

General Certificate of Education January 2008

## Advanced Subsidiary

*Chief Examiner:* D.H. Ballard, B.Sc., Ph.D., C.Chem., F.R.S.C.  
Lecturer in Science Education, Nottingham Trent University

### Unit Statistics

The following statistics include all candidates entered for the unit, whether or not they 'cashed in' for an AS award. The attention of centres is drawn to the fact that the statistics listed should be viewed strictly within the context of this paper and that differences will undoubtedly occur between one year and the next and also between subjects in the same year.

<b>Unit</b>	<b>Entry</b>	<b>Max Mark</b>	<b>Mean Mark</b>
CH1	1580	66	29.3

### Grade Ranges

A	40
B	35
C	30
D	25
E	20

*N.B. The marks given above are raw marks and not uniform marks.*

## CH1

### General Comments

The range of marks obtained by candidates taking this unit continues to be very wide, with around 35 candidates who could not, sadly, obtain a score in double figures. This paper was seen as a little more challenging in places when compared with some previous CH1 papers but there were still around 25 candidates who gained a creditable 55 marks or more out of a total of 66. The examiners feel that some candidates are still quite unprepared for the increased intellectual rigour of AS level compared with KS4 examinations, particularly when asked to explain a point or to apply their knowledge to a new situation. A number of papers were seen that showed little effort had been made to learn basic facts during the teaching or revision time. This was particularly noticeable in the questions on simple qualitative analysis where tests for chlorides and sulphates were often seen to be conjectural guesswork. As a result, a number of candidates lost several marks in this section and this affected the overall mean.

The use of chemical equations continues to cause problems; some candidates were woefully ignorant of the formulae of calcium oxide and phosphorus(V) oxide.

The standard of numerical work continues to improve but a number of candidates do not look at their answer to see if what they have obtained is feasible. In Question 9(a) the concentration of ethane-1,2-diol was sometimes seen as  $90 \text{ mol dm}^{-3}$  or more.

Some centres were worried that the use of the unfamiliar lithium hydride in Question 8 would confuse the candidates and that sodium chloride should have been used instead. Perusal of papers from a number of centres showed that this was not the case. Similarly in Question 9 some centres were worried by the appearance of an organic compound to illustrate empirical formulae, hydrogen bonding and molarity. Again there was no evidence that this had affected the candidates, who generally scored well in this question. The final question included the use of a graph to enable candidates to calculate the number of molecules of hydration in hydrated calcium chloride. It was rare to see a paper with no marks for this section and the examiners thought that the candidates had dealt very adequately with this situation.

We have noted in previous papers that candidates deal quite well with data presented in a different way – despite the worries of their teachers. Far more marks were lost in basic recall questions, as in the example of qualitative analysis, as outlined above. Marks were also lost when candidates did not read the question clearly and answered something that was not requested.

### Section A

- Q.1 Most candidates obtained this easy opening mark, although a few thought that the atomic number was reduced and gave an isotope of silicon.
- Q.2 Most candidates correctly gave the electronic configuration of the phosphide ion.
- Q.3 Nearly all candidates recognised that in an ideal gas there are no attractive forces between molecules.

- Q.4 This is an area that needs attention. Many papers were seen where the state symbols were not given or were incorrect. The team of examiners was amazed at how many candidates could not give the correct symbol for potassium. The letter P being provided as a common error in many cases. A Periodic Table was provided for recourse when candidates were in doubt.
- Q.5 Some candidates were careless when reading the graph.
- Q.6 Nearly all candidates gave D (hydrogen cyanide) as the (correct) answer.
- Q.7 (a) Most gave graphite correctly.
- (b) Some gave iodine here. There seems to be some confusion when candidates are asked to compare the melting temperature of compounds in different physical states.
- (c) Chlorine was generally given here, correctly.
- (d) Sodium oxide was recognised by nearly all candidates as reacting with water to give an alkaline solution.

## Section B

- Q.8 (a) The correct answer for the relative atomic mass of this lithium sample was 6.92 and this was often seen. Some candidates looked at the Periodic Table and simply gave the value given there, 6.94: this obviously gained no credit. A few candidates assumed that it was 6.94 and put this value into the calculation, thereby obtaining 6.94.
- (b) The question asked candidates to give the electronic structure of lithium but this was sometimes omitted, despite their writing implying that they knew it.
- (c) (i) Sadly, some candidates still think that hydrogen gas consists of hydrogen atoms. The question then asked for candidates to assign oxidation numbers to the reactants and products and to use these to explain the oxidising nature of hydrogen in this reaction. The ionic charges in lithium hydride were given but some candidates decided not to use them. A number of candidates who got this first stage correct did not then use the oxidation numbers for the second part of the question.
- (ii) The question stem clearly indicated that lithium hydride was ionic and even gave the formulae of the ions present. Even so, a number of candidates chose to give a dot and cross diagram showing covalent bonding.
- (iii) The rock salt structure was well known and the crystal co-ordination numbers were generally correct.
- (iv) This mole calculation involving gases was discriminating, but one mark could be obtained for giving the relative molecular mass / molar mass of lithium hydride and this first mark was often awarded.
- (d) The examiners expected some mention of covalency or electron sharing and this was not always given.

- (e) This was an attempt to use a volumetric calculation in a vocational context. It was pleasing to see a number of the stronger candidates deal with this in a confident way. Even weaker candidates often gained one mark for the correct mole ratio. Sometimes the calculation was correct but the units were wrong.
- Q.9 (a) (i) Many candidates were able to give the empirical formula correctly.
- (ii) The descriptions of hydrogen bonding continue to improve and many scripts were seen where most of the marks were gained. The commonest omission was the lone pair on the oxygen atom.
- (iii) The number of moles of ethane-1,2-diol was 20 and this was often given. However, some candidates revealed a lack of understanding of the meaning of concentration and did not divide their answer by the volume given in the question. Some multiplied by 1000, although the question used  $\text{dm}^3$  throughout to make it easier.
- (b) Candidates were not worried by the use of the two ether structures of 'ethylene glycol' and merely related the difference in size of the molecules to increased van der Waals forces. The two ethers can be used in brake fluid and this was a link to the previous section. Generally candidates obtained at least one mark out of two here. However, many candidates seemed to believe that covalent bond breaking was occurring, rather than a change in intermolecular forces.
- (c) This part tested candidates on simple qualitative analysis. The response showed that is a very weak area and many candidates scored poorly here. The test for a chloride was better known than the test for a sulphate. The examiners believe that a reagent is a compound such as barium chloride or silver nitrate. Credit was not awarded for stating that the reagents were barium ions or silver ions, although the latter was required for the ionic equation. The displacement of iodine from iodide ions by chlorine was very poorly expressed with few relating it correctly to the oxidising power of chlorine.
- Q.10 (a) Candidates did not always state that the lone pair of electrons needs to be in the outer shell.
- (b) The shape of a molecule of silicon(IV) chloride was generally given clearly and correctly.
- (c) This question required candidates to express their answers in more detail. Unfortunately, many answers were over long, rambling and poorly focussed on the responses expected. Some candidates described magnesium rather than magnesium chloride. Reference to delocalised electrons was common for both compounds. Some candidates were confused by volatility – although this is clearly mentioned in Section 5.1 (g) of the specification. Most candidates knew that magnesium chloride dissolved in water and then assumed that the converse must be true with silicon(IV) chloride. The whole of this question was direct recall from the specification but the response was often weak, even though the question stem gave the type of bonding present in each compound. Sadly, it is a question of simply sitting down and learning the work thoroughly and the examiners thought that some had really failed to do this to any degree.

- (d) (i) Some candidates did not know the formulae of calcium oxide and phosphorus(V) oxide and could not therefore complete the equation. Some gave phosphorus(V) oxide as  $P_2O_5$ . The compound exists in the solid phase as covalently bonded  $P_4O_{10}$  molecules and nowadays  $P_2O_5$  is its empirical formula. The formula is given in the specification.
- (ii) Many complicated responses were given here but the examiners simply needed a statement relating metallic oxides with bases and non-metallic oxides as acidic in nature. Some candidates tried to explain the answer in terms of the amphoteric nature of the oxides and others described it as a redox reaction even though the question stated that it was an acid-base process.
- Q.11 (a) The examiners were looking for a description of the flame test for calcium, this was given by a majority of candidates.
- (b) Some simply stated that 'carbon dioxide is in the air' but did not mention that limewater reacted with it and that calcium carbonate was produced.
- (c) (i) Most candidates indicated that a white precipitate was produced using magnesium hydroxide and that nothing was seen using barium hydroxide solution. Sometimes the response was the reverse.
- (ii) Those who got part (i) correct generally gave the correct answer here too. Some candidates gave a rather more vague answer – barium is more soluble than magnesium – this was imprecise and not accepted.
- (d) (i) This was old-fashioned chemistry – two ways to make magnesium sulphate. This type of question seems to cause problems, as the detailed knowledge of such processes does not seem to be in place any more. The commonest correct equation was the reaction of magnesium with sulphuric acid.
- (e) (i) The results were given in an order so that simple subtraction would give the correct answer. This caused few problems with candidates. Results should be displayed so that the mass of the empty vessel is given at the bottom, for this reason. It may be that some candidates may not have used a crucible but this did not seem to affect candidates performance as only simple subtraction was necessary.
- (ii) The correct answer (49.3%) was seen in the papers of the stronger candidates but even incorrect answers were able to gain credit in (iii).
- (iii) The reading from the graph was generally accurate and errors in (ii) carried into part (iii) were not penalised.
- (iv) A number of candidates gained at least one of the two available marks here and it was obvious that nearly all candidates had some idea of how to do this question even though their answers were not always completely correct.

## **CYMRAEG**

Braf oedd gweld y cynnydd yn y nifer o ganolfannau ac ymgeiswyr ar gyfer y papur cyfrwng Cymraeg. Gwelwyd iaith raenus yn y mwyafrif, ond roedd mynegiant nifer fach o ymgeiswyr yn aneglur ac yn achosi iddynt golli marciau. Mae'n rhaid dweud bod hyn yn amlwg ar bapurau Saesneg cyffelyb hefyd, felly nid problem iaith ydyw. Ychydig iawn o ymgeiswyr a ddefnyddiodd eirfa Saesneg yn eu hatebion, a gwelwyd nifer o ymgeiswyr yn defnyddio geiriau Cymraeg ar y papurau Saesneg. Roedd mwy o ymgeiswyr yn defnyddio'r termau 'atom' 'moleciwl' ac 'ïon' yn gywir eleni, ond mae rhai yn dal i golli marciau yn ddiangen trwy eu camddefnyddio, yn enwedig pan maent yn son am rymoedd van der Waals rhwng atomau. Gwelwyd defnydd da o dermau gwyddonol cywir.

## **ENGLISH**

It was pleasing to see an increase in the number of centres and candidates for the Welsh medium paper. A good standard of Welsh was apparent on most scripts, though a few candidates lacked clarity and hence lost marks. It must be said that this was also apparent on English medium papers, so it is not a problem with language. Very few candidates used English vocabulary in their answers, and some candidates were seen to use Welsh words on English medium papers. More candidates use the terms 'atom', 'molecule' and 'ion', although some are still losing unnecessary marks by misusing them, especially when they talk of van der Waals' forces between atoms. Good use of correct scientific terms was also seen.

# CHEMISTRY

General Certificate of Education January 2008

## Advanced Subsidiary

*Principal Examiner:* M. E. Anthony Ph.D.

### Unit Statistics

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<b>Unit</b>	<b>Entry</b>	<b>Max Mark</b>	<b>Mean Mark</b>
CH2	591	66	38.0

### Grade Ranges

A	47
B	42
C	37
D	32
E	27

*N.B. The marks given above are raw marks and not uniform marks.*

## CH2

### General Comments

As usual for CH2 papers in January, most of the candidates were resitting this unit. Although there was a wide range of marks, as might be expected for a cohort of resits there was a large number of weak candidates, but we were pleased by the number of really excellent scripts, with several candidates achieving full marks or close to full marks. Very few candidates failed to complete the paper because of insufficient time.

Again matching previous experience of January CH2, Organic Chemistry questions were reasonably well answered, suggesting that candidates may have benefited from extra work on the A level CH4 module since their first attempts at CH2.

Responses to the Physical Chemistry questions were of much lower quality, particularly Question 12, with a trend towards giving vague and simplistic answers more akin to GCSE than AS level. The drawing of simple apparatus diagrams was particularly poor.

### Section A

- Q.1 Quite well answered, despite the expected omission by some candidates of “2” or “di” from 2,2-dimethylbutane.
- Q.2 Most candidates knew one of the two common oxidising agents, though some lost credit by giving incorrect oxidation states for dichromate(VI) or manganate(VII). More care is needed when quoting conditions, the omission of acid conditions being a common error.
- Q.3 Too many candidates seemed not to know the meaning of “alkene monomer”, with many answers giving an alkane or another, different, chain.
- Q.4 The terms *dynamic equilibrium* and *activation energy* seem to be better known than the last time this question was set, but “forward reaction equals reverse reaction” was still seen too frequently.
- Q.5 Most candidates answered correctly with rate of reaction (C).
- Q.6 Presumably by not reading the instructions properly, many candidates only gave one of the two alkanes required.
- Q.7 As we had feared, a significant number of candidates believed a  $K_a$  value of  $1.7 \times 10^{-5}$  was larger than  $1.6 \times 10^{-4}$ .
- Q.8 Well answered.

### Section B

- Q.9 (a) (i) A surprising number of candidates believed a negative  $\Delta H^\ominus$  value corresponds to an endothermic reaction.
- (ii) A significant number of candidates lost credit by rounding 0.025 moles down to 0.02.

- (iii) Poorly answered. There was a great deal of confusion over the conversion of kJ to J.
  - (iv) Though marked consequentially if incorrect answers had been given in (ii) or (iii), very few candidates who got (ii) or (iii) wrong went on to gain both marks here.
- (b) Candidates tended to earn either both marks or zero, with very few single marks for a partially correct answer.
- (c) (i) A disappointing standard of the replies to these questions, with, as mentioned in the introduction, a tendency for trivial answers.
- (ii) The omission of p (pressure) and the use of square brackets continue to trouble some candidates. Most candidates knew the catalyst and temperature for this reaction.
- (iii) Generally well answered, but both here and in Q12 a worrying number of candidates believed a catalyst pushes the equilibrium in favour of the products.
- (iv) Apart from a few who confused this with changes in total pressure, most candidates knew and applied Le Chatelier's Principle correctly.
- Q.10 (a) Most candidates scored well on these questions, though the explanations were rarely lucid and often difficult to follow.
- (b) Generally well answered.
- (c) Despite the involvement of calculations in the identification of **A**, most candidates scored heavily in this section, and it was encouraging to see a large number of excellent, well-argued answers.
- Q.11 (a) (i) Apart from some rather obscure explanations of *homolytic*, this section was well answered.
- (ii) It was not uncommon to see answers where candidates drew two different versions of the same isomer. This, perhaps, is an area teachers need to address.
- (b) (i) *Electrophilic* was generally well understood, but only the best candidates gave a clear explanation of *addition*.
- (ii) Well answered.
- (iii) The examiners reported an encouraging improvement on descriptions of the organic mechanism compared to previous years.
- (iv) Most candidates seemed to recognise the symmetry of but-2-ene, but could not always find the correct words to describe it.
- (c) Generally well answered apart from some candidates confusing hydrogenation with hydration or propane with pentane.

Q.12 By far the worst answered question on the paper.

- (a) (i) Far too many answers seemed to rely on guesswork rather than an understanding of activation energies.
- (ii) Poorly answered by the majority of candidates, with only the best adopting an organised, structured approach to calculating the bond energy. The more common jumble of figures suggested candidates found the jump from GCSE-standard bond energy calculations too much to cope with.
- (b) (i) Very poorly answered. One examiner commented: "Some amazing answers were witnessed. The drawing and correct labelling of a very basic diagram left much to be desired".
- (ii) The mark scheme allowed sufficient choice for most candidates to gain good marks, but not all answers covered all the points listed. As mentioned previously, a worrying number of candidates believed a catalyst pushes the equilibrium in favour of the products.
- (c) (i) Too many answers used incorrect phrases such as "unbonded electrons" or "unattached electrons" in describing free radicals.
- (ii) Only a minority of candidates recognised the role of UV light in providing energy to break bonds or allow endothermic reactions to occur.
- (iii) Sadly, there were far too many vague or trivial answers such as "damages the environment", "damages buildings" or "kills plants and animals" which gained no credit.

# CHEMISTRY

## General Certificate of Education January 2008

### Advanced

*Principal Examiner:* E.W. Charles BSc.  
Assistant Headteacher, Ysgol Gyfun Gartholwg

#### Unit Statistics

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<b>Unit</b>	<b>Entry</b>	<b>Max Mark</b>	<b>Mean Mark</b>
CH4	1218	75	41.9

#### Grade Ranges

A	54
B	47
C	41
D	35
E	29

*N.B. The marks given above are raw marks and not uniform marks.*

## CH4

### General Comments

There was a very good spread of marks, with many outstanding scripts, about 15% of the candidates achieving 60 marks or more. Fewer very poor scripts were seen, with only about 5% obtaining 15 marks or less out of a total of 75.

The examiners felt that the overall standard of organic chemistry was similar to, if not better than, previous examinations. There seemed to be an improvement in knowledge of reaction types.

Strong areas noted were practical information as an aid to structure elucidation, chirality in molecules, test for carboxylic acid, empirical formula calculations and reactions of aldehydes and ketones.

Areas which need attention are percentage yield calculations, elimination reactions, ethanoylation and intermolecular bonding. Once again there was a lack of precision in drawing fully graphic formulae with the bonding atoms in the correct order. For many candidates stating if a reactant is 'aqueous' or is 'in solution' does not seem important and 'reflux' is a condition for all reactions.

Finally, despite reference to this in previous reports, questions involving comparisons being made in order to differentiate between compounds should be given some attention. A number of candidates persist in describing the reaction between one compound and a reagent, but 'forget' to describe how the same reagent would react with the second compound. This omission results in the loss of important marks.

### Papur Arholiad Cymraeg

Nid oedd problemau o safbwynt safon y Gymraeg – mae'r Gymraeg wedi hen ennill ei phlwy fel iaith gwbl naturiol ar gyfer Cemeg a braf yw gweld yr hyder a ddefnyddir gan ymgeiswyr wrth ymdrin â'r geiriau a'r derminoleg.

Cafwyd yr un dryswch cemegol ag a gafwyd gan yr ymgeiswyr cyfrwng Saesneg gydag ychydig fwy o'r ymgeiswyr cyfrwng Cymraeg, efallai, yn dangos ansicrwydd wrth ymdrin â phroblemau cyfrifo e.e. Cwest 1(b) a Cwest 5(c). Dylid cadw golwg ar y math hwn o gwestiwn i'r dyfodol.

Cododd, unwaith yn rhagor, y broblem arferol am safon y llawysgrifen. Oherwydd natur y derminoleg cemeg, mae'r gwahaniaeth rhwng sillafiad un cyfansoddyn a'r llall yn aml yn dibynnu ar un llythyren e.e. bwtan a bwten. Er mwyn osgoi unrhyw ddryswch gofynnir i'r ymgeiswyr cyfrwng Cymraeg dalu sylw arbennig i ymddangosiad y geiriau hyn wrth ateb cwestiynau.

### Section A

- Q.1 (a) (i) A fair start, with about three quarters of the candidates obtaining one mark. However, only about a quarter obtained both marks. The most common mistakes were 'hydroxyl' or 'carboxyl' being regarded as functional groups.
- (ii) The vast majority correctly calculated the molecular mass of salicylic acid.

- (iii) I. Just over half the candidates gave the correct structure for the ester. However, there was evidence of desperate guesswork as candidates tried to invent possible products.
  - II The addition of sodium hydroxide to the compound also proved perplexing to many candidates. A majority managed to substitute one sodium, but only about 1 in 5 substituted both. This is clearly an area that needs to be strengthened.
  - (b) (i) Well answered with most candidates obtaining the full three marks. However, a significant number lost a mark since they did not state the molecular formula.
  - (ii) Again well done with about two thirds gaining both marks.
- Q.2 (a) Only about 40% gave the correct structure for the monomer. Most candidates drew the structure of the repeating unit omitting the double bond between the carbons.
- (b) (i) Although about two thirds obtained the mark, many candidates lost marks either due to 'sloppily' drawn structures with one OH the wrong way round or failing to give a full structure.
  - (ii) Well answered with only a few candidates failing to gain any mark. However, only just over half gained full marks. The main errors being to state 'carbon dioxide produced' with no reference to bubbles or failing to prove the identity of the gas given off.
  - (iii) Poorly answered. Most candidates did not know what was meant by ethanoylation.
  - (iv) Most candidates knew that amines are bases which accept protons readily.
  - (v) Both parts were poorly answered. In part I, only just over a third of candidates knew that nylon was a polyamide. In part II, around two fifths could explain why nylon-6,6 is so called.
  - (vi) The large scale uses of nylon were well known, although a significant number only gave one use instead of two or gave 'plastic' as a use which was considered to be too vague.
- (c) Fairly well answered with about two fifths of candidates correctly stating that a nitrile was reduced to an amine and naming the reagent. A further two fifths gave only one correct answer.
- Q.3 (a) (i) Well answered with over two thirds giving the correct structure of a dipeptide. However, once again some candidates lost marks for drawing 'sloppy' structures.
- (ii) Proved to be the easiest mark on the paper with over 90% of candidates obtaining the mark.
  - (iii) Poorly answered. Too many candidates did not draw 3D structures and so lost the mark.

- (iv) Most candidates knew how to distinguish optical isomers from each other. Common errors were the omission of 'plane' in 'plane polarised light' and the use of "reflect" or "deflect" instead of 'rotate'.
  - (v) Generally well answered with over 60% giving the correct formula for the zwitterion.
  - (vi) The worst answered part in the whole paper. Most candidates were not able to apply their knowledge to everyday situations. Only the best candidates gave hydrolysis as the reason for the breakdown.
- (b)
- (i) Most candidates knew something about the processes that cause electromagnetic radiation to be emitted and over a third scored all 3 marks. The main error was the failure to state that energy is released in the process.
  - (ii) Fairly well answered. In parts I and II, about half the candidates could explain why the emission spectrum lines of hydrogen are discrete and converge. In part III, about two thirds correctly gave ionisation energy as the answer.

## Section B

**Q.4** This question was answered better than Q.5.

- (a)
- (i) This question was welcomed by the vast majority of candidates with almost half obtaining 7 or 8 marks and only about 1 in 5 scoring 4 or fewer marks. The most common error was to give A as pentanal. Some lost marks by failing to use enough of the information. Another error was the failure to give a positive charge to the mass spectrum peak.
  - (ii)
    - I. Very well answered, with over three quarters correctly stating the reaction type as reduction.
    - II. About two thirds gave the correct answer. The main error was to give condensation as the reaction type possibly due to the fact that water was formed.
  - (iii)
    - I. Very well answered. Around three quarters of the candidates correctly stated geometric isomerism.
    - II. Over half were able to explain why two isomers were produced. Many lost the mark by not being sufficiently specific, merely stating that bromine could add to different carbon atoms.
    - III. Less than half were able to correctly identify the type of isomerism. Optical and functional group isomerism were popular incorrect answers.

- (b) (i) This part asked for the name of the product and the mechanism for the reaction between 1-bromobutane and dilute aqueous sodium hydroxide. The vast majority managed to score at least 1 mark. Some candidates lost the mark for naming the compound by simply writing butanol. Many candidates omitted the intermediate stage in the mechanism and so lost a mark.
- (ii) This part asked about the reaction between 1-bromobutane and concentrated sodium hydroxide and was very poorly answered. Some candidates lost a mark by simply stating butane as the product or by failing to balance the equation properly. However, most did not have any idea that an alkene was the product.
- (c) Fairly well answered. Many candidates lost the mark because of a general reference to CFCs instead of naming a specific organic halogen-containing compound. Some weak candidates even offered 'chlorine in swimming pools' or 'sodium chloride' as possible answers.
- Q.5 (a) (i) Over half the candidates correctly stated that A (propanoic acid) had the highest boiling temperature, but only about half of these could give a correct explanation. Many vague explanations in terms of hydrogen bonding without any comparison to the other compounds did not gain any credit. Many incorrectly thought that F (methyl propanoate) had the highest boiling temperature since it was the largest molecule.
- (ii) Very well answered. Carbonyl chemistry is well known.
- (iii) I. In this part the candidates had to distinguish between propanal and propanone and it was extremely well answered. Over three quarters gained both marks. Some failed to give the observations for each compound and were penalised accordingly.
- II. In this part the candidates had to distinguish between propan-1-ol and propan-2-ol and it was only fairly well answered. Instead of the simple iodoform test, a significant number of candidates oxidised the alcohols then tried to distinguish between the products. This led to mistakes such as failing to separate the carboxylic acid oxidation product from the acid used in oxidation before testing with sodium carbonate. Unfortunately some candidates who gave the iodoform reaction used a substance called 'iodoform reagent'. The use of this mythical reagent seems to be growing in popularity and should not be encouraged.
- (iv) The candidates had to state how to convert A (propanoic acid) to B (propan-1-ol) to F (methyl propanoate). The reagents and conditions for the conversion of B to A was better known than the conversion of A to F. Common mistakes in the latter conversion were to give alcohol instead of methanol and failing to state that the acid was concentrated.

- (b) (i) Well answered, although some candidates stated 'substitution' alone, which gained no mark.
- (ii) Reasonably answered, although many candidates had difficulty in expressing themselves clearly and so lost a mark.
- (iii) The vast majority recognised the synthesis of benzene to nitrobenzene as the first step and so gained some credit. Marks were lost in both parts by failing to stipulate that the acids were concentrated. Marks were also lost in the first part by failing to give a correct range for the temperature and in the second part by failing to use sodium hydroxide to release the amine.
- (c) Finally the candidates had to calculate a percentage yield and this question was disappointingly answered. Less than a quarter of candidates obtained all 3 marks. Some candidates lost some marks due to incorrect calculation of molecular mass or failure to use the correct number of significant numbers. Most candidates could not convert volume to mass and many who could simply gave  $4.2/8.78 \times 100 = 47.8\%$  as the answer.



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)