WELSH JOINT EDUCATION COMMITTEE
CYD-BWYLLGOR ADDYSG CYMRU

General Certificate of Education **Tystysgrif Addysg Gyffredinol**

EXAMINERS' REPORTS

SUMMER 2005

AS/Advanced CHEMISTRY

WJEC
CBAC

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

2005

Advanced Subsidiary/Advanced

Statistical Information

The following information is included in this report in order to provide centres with as full a picture as possible of the examination in each component. The statistics include all candidates entered for the unit, whether or not they 'cashed in' for an AS/A level award. The attention of centres is drawn to the fact that the statistics listed should be viewed strictly within the context of the paper and that differences will undoubtedly occur between one year and the next and also between subjects in the same year. Moreover, information is provisional in the sense that it does not take account of changes resulting from appeals.

Component	Entry	Max. Mark	Mean Mark	Grade	Raw Mark	Cumulative %
CH1	2221	66	34.4	A	45	26.1
				B	39	40.8
				C	34	54.4
				D	29	65.9
				E	24	77.7
CH2	2548	66	33.9	A	45	25.9
				B	39	40.5
				C	34	52.0
				D	29	64.9
				E	24	75.2
CH3a	2450	30	18.6	A	22	30.6
				E	14	83.4
CH3b	101	103	86.9	A	89	51.0
				E	67	99.0
CH3c	2372	103	82.1	A	89	47.5
				E	67	88.2

Advanced Level

Component	Entry	Max. Mark	Mean Mark	Grade	Raw Mark	Cumulative %
CH4	993	75	37.9	A	52	19.2
				B	45	35.5
				C	39	49.4
				D	33	63.7
				E	27	76.5
CH5	1385	75	32.6	A	46	19.7
				B	40	32.0
				C	34	47.4
				D	29	58.6
				E	24	72.3
CH6a	1380	50	26.8	A	36	15.1
				E	23	70.5
CH6b	48	103	88.5	A	89	56.3
				E	61	100.0
CH6c	1332	103	85.2	A	89	47.3
				E	61	96.2

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

CHEMISTRY

General Certificate of Education June 2005

Advanced Subsidiary

Paper CH1

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

General Comments

As in previous June examination sessions, this paper was taken mainly by candidates in Year 12.

The range of marks was again very wide with, sadly, around forty candidates scoring in single figures whilst others gained 60 or more out of 66. Two candidates were found who scored full marks. The examiners continue to feel that some candidates with low scores are unprepared for the greater intellectual demand required in AS papers. As before, a number of relatively simple questions were answered very superficially.

All questions were accessible with no dead marks and there was no evidence of an inadequate time allowance for this paper.

Candidates continue to make better headway with calculation questions.

However, the use of chemical equations was noted as a weak area, both at AS and A2 levels.

Answers that required detailed responses were often lacking content in depth and were unclear. This was particularly true in question 8b.

Section A

Q.1 Many candidates gave the correct mass number (238) but then used the Periodic table to identify the element as uranium rather than plutonium.

Q.2 Most candidates answered this correctly.

Q.3 The examiners were disappointed that so few could write the correct chemical equation for the reaction of aluminium with oxygen.

Q.4 Although some candidates gave the correct volume in (i), they could not use the relationship between pressure and volume to obtain the answer to (ii). The question asked for the answer to be given to three significant figures. Relatively few bothered to do this and were penalised as a result.

Q.5 Most gave the correct response, C.

Q.6 Although many correct answers were given, a number of candidates gave an incorrect formula for a metal oxide that they believed to be acidic.

Q.7 Some candidates believed that a chlorine anion, Cl^-, was smaller that the Na cation, Na^+; although the co-ordination number was often correct.

Section B

Q.8 (a) (i) Candidates generally had a reasonable understanding of VSEPR theory with the majority being able to identify the shape and bond angle of the ammonium ion.

(ii) Fewer candidates mentioned that the nitrogen atom in the amide ion had **two** lone pairs and that this was partly responsible for its shape.

(b) Questions about intermolecular forces have caused problems in the past, but this question about liquid ammonia scored generally better. As noted in the introduction, any question requiring a more extended answer will cause problems and this was seen from the responses of weaker candidates.

(c) (i) It was surprising to see that some could not balance this equation even though the formulae of reactants and products were given.

(ii) There were a significant number of candidates who failed to mention oxidation numbers, as required, and a larger proportion who gave wrong values.

(d) (i) Many candidates knew what a co-ordinate bond was but could not describe it accurately. Few stated that it was a form of a covalent bond. In some responses the answer provided could be interpreted as an ionic transfer of electrons.

(ii) Only better candidates could relate their knowledge of graphite to boron nitride. Some gave 'a lubricant' as a physical property; this is a use, as a consequence of a physical property.

Q9. (a) (i),(ii),(iii) As always, there were candidates who failed to attempt the calculations; of those who did many had a problem giving their answer to three significant figures or had problems with standard form. It was common to see calculator errors with responses ten times too big or too small.

(iv) Most could give the correct observation but the ionic equation caused problems with $AgCl_2$ being a common wrong formula for silver chloride.

(b) This was generally well answered although some candidates gave an incorrect flame colour.

(c) Most candidates correctly calculated the relative formula mass of *epsomite* but then spoilt their answer by using this figure in part (ii)

(d) Many candidates gained full credit for the uses of calcium and magnesium in living systems.

Q.10 (a) The examiners were disappointed to see that a number of candidates could not use the Periodic Table to help them identify the elements required.

(b) Only the better candidates scored well in this part, as the majority answered in terms of the stability of a half filled or full shell of electrons. Fewer explored the distance from the nucleus and shielding consequences.

(c) Relatively few candidates could give assumptions about ideal gases. This is an area of the specification that requires more attention.

(d) It was disturbing to read that silicon tetrachloride was an ionic liquid and that when 'dissolved' in water free electrons were able to carry the charge. To see an absolutely clear and correct response was uncommon.

Q.11 (a) (i) All of the marking team have commented that a very large percentage of candidates had no idea what was meant by the term 'empirical formula'. This was disturbing as the concept has important relevance in organic chemistry.

(ii) Some candidates found the percentage of lactic acid in yoghurt to be 72; surely they must have realised that this value would make yoghurt completely unpalatable? When candidates do calculations they should examine their answer to see if the value obtained is realistic and, if not, re-examine their calculations. Many candidates also had trouble with the use of significant figures in this calculation, too.

(b) Many candidates stated that the solubility of calcium lactate increased as the temperature decreased even though the numbers given clearly indicated the opposite. From a simple perspective, there are very few substances whose solubility increases as the temperature drops.

(c) (i) Almost everybody gained a mark for the equation showing the reaction of magnesium with steam.

(ii) By way of contrast with (i) very few give a reason why magnesium hydroxide was not produced when magnesium reacts with steam. The examiners were only looking for thermal decomposition but few got anywhere near this.

(iii) The electron density distribution in a hydrogen molecule was usually correctly drawn but some 'egg' shapes were given. Part II was clearly discriminating and, although most candidates obtained at least one mark, it was only stronger candidates who could make comments about electronegativity differences, electron transfer and the formation of 'full' electron shells.

(iv) Most described magnesium oxide as a basic oxide and gained credit but there was vague use of the term 'alkali' (really a repeat of the question stem) and some even stated that magnesium oxide was an acidic oxide.

CYMRAEG

Braf oedd gweld Cymraeg safonol ar nifer fawr o sgriptiau. Nid oedd arwydd fod iaith y cwestiynau wedi achosi unrhyw anhawster mawr, hyd yn oed gyda dau ystyr y gair 'arian' yng nghwestiwn 9.

Roedd safon wyddonol yr atebion yn debyg yn y papurau cyfrwng Cymraeg a Saesneg. Gwelwyd iaith raenus a defnydd da o'r termau Cymraeg, ond roedd defnydd o dermau ac atebion Saesneg yn amlwg ymysg nifer fach o'r ymgeiswyr. Pryder oedd gweld y camddefnydd o dermau cyffelyb fel grym niwclear yn lle gwefr niwclear, hyd yn oed gan ymgeiswyr da. Roedd llai o gamddefnyddio'r termau 'atom', 'moleciwl' ac 'ïon' eleni, ond yn aml roedd eu camddefnydd yn gwneud yr atebion yng anghywir, gyda nifer yn trafod bondiau cofalent rhwng molecylau ac nid rhwng atomau.

ENGLISH

It was pleasing to see Welsh of a high standard on a large number of scripts. There was not any indication that the language of the questions caused any major problems, even in question 9 where the word 'arian' had two meanings.

The standard of the science in the answers was similar in the Welsh and English medium papers. High quality written Welsh was seen, with good use of Welsh medium terms, but a very few candidates showed frequent use of the English medium answers and terms. It was worrying to see the misuse of similar phrases such as 'power of the nucleus' in place of 'nuclear charge', even for more able pupils. There was less confusion in the use of the terms atom, molecule and ion this year, but where it occurred it led to incorrect answers, with some pupils discussing covalent bonds between molecules and not between atoms.

CHEMISTRY

General Certificate of Education June 2004

Advanced Subsidiary

Paper CH2

Chief Examiner: Mr. Elfed Charles

General Comments

For about four fifths of candidates, this was their first attempt at the CH2 module. It was felt that the paper gave plenty of opportunity for weaker candidates to show positive achievement. There was no evidence that the paper was too long, there were no dead marks and very few scripts contained blank pages.

The range of marks was again very wide, with 36 candidates scoring 10% or less and 39 candidates gaining 90% or more. As with previous examination papers the problem of candidates writing in pencil was evident on a number of occasions.

The standard of presentation of answers for many candidates was quite high and these papers were a pleasure to mark. However, as was the case in last year's report, for a significant number of candidates, answers that required detailed responses often lacked content in depth and were sometimes contradictory. This was particularly true in Question 13(a)(i) fractional distillation and cracking.

It was pleasing to note that many of the candidates performed well in the calculation questions apart from Question 12(b)(iii) and to a lesser extent Question 10(c), although attention to appropriate number of significant figures is still required for many. However types of organic reactions (Question 10(e)) and to a lesser extent types of organic reactants (Question 10(d)) disappointingly proved to be a mystery to most candidates.

Atebion Cyfrwng Cymraeg

Safodd tua 8% o'r ymgeiswyr y papur trwy gyfrwng y Gymraeg. Gwelwyd aeddfedrwydd yn yr atebion a sylw i fanylder a chywirdeb y disgrifiadau cemegol. Nid oedd iaith y cwestiynau wedi achosi unrhyw anhawster a ni welwyd diffygion yn ansawdd yr iaith. Cafodd yr ymgeiswyr gwanaf mwy o drafferth gyda'r termau, ond roedd y camgymeriadau yn debyg iawn i'r rhai a welwyd gan y myfyrwyr Saesneg.

Section A

The candidates generally scored quite highly in this section, with the average mark being about 6 out of 10.

Q.1 The majority correctly drew the required structure. A few candidates incorrectly put the ethyl group instead of the methyl group on the 2 position while others lost the mark through sloppily linking the alkyl group via the hydrogen to the main chain.

Q.2 Well answered, most correctly stated that hexane has the highest boiling temperature.

Q.3 The vast majority correctly chose C.

Q.4 Less than half the candidates gave a satisfactory definition of Hess's Law. A lack of clear expression cost many candidates the mark. Some confused it with the Law of Conservation of Masses, others just wrote $\Delta H = \Delta H_1 - \Delta H_2$ without any further explanation.

Q.5 Fairly well answered. Although over 50% gave the correct answer, since the cycle had been given, a larger percentage should have obtained this mark.

Q.6 Again only fairly well answered. Too many incorrectly gave 'carboxyl group' as the answer.

Q.7 Very well answered. Most candidates understand geometrical isomerism.

Q.8 Poorly answered. Common incorrect responses for why CdO is more stable were 'it is more exothermic', 'it requires more energy to be formed', 'ΔH_f is higher'.

Q.9 Both parts generally well answered although a surprising number of candidates thought that less hydrogen would form at a lower temperature.

Section B

Q.10 This was the least successfully answered question in this section.

(a) (i) Surprisingly only about half the candidates drew the correct curve

(ii) Very well done. The meaning of activation energy was well understood by the vast majority.

(iii) Disappointingly answered. Many of the answers lacked the required precision and omitted 'greater than'.

(b) Well answered. Over two thirds of the candidates scored at least 1 mark with just under a half getting both marks.

(c) (i) About half the candidates could name a suitable catalyst.

(ii) About a third of the candidates obtained full marks for this calculation. The main error by the majority was to ignore the $\Delta H = -137$ kJ mol^{-1}, giving the bond enthalpy of C = C as 736 kJ mol^{-1} instead of 599 kJ mol^{-1}. Some candidates were confused with regard to the sign of bond formation and bond breaking.

(d) (i) Very poorly answered. Less than one third of the candidates could give a correct formula for an electrophile. Unfortunately it was all too common to see Na^+ or Ca^{2+} as examples.

(ii) Fairly well answered with about half being able to give a correct formula for a nucleophile.

(e) Part (ii) an electrophilic addition reaction was fairly well known however both part (i) an elimination reaction and part (iii) a nucleophilic substitution reaction were extremely poorly answered. Candidates need to learn the types of reaction and realise the importance of different conditions in organic reactions.

Q.11 This was the most successfully answered question in this section.

(a) (i) Generally very well answered. However some candidates still do not use square brackets and others persist in using a '+' sign instead of multiplying the concentrations.

(ii) Adequately answered but many candidates failed to give the required comparison.

(b) Generally well answered with about two thirds of the candidates giving the required definition of a base as a proton acceptor.

(c) (i) Very poorly answered. Ionic equations seem to cause great problems to candidates and many had no idea how to answer this part. Some candidates gave the general equation for neutralisation, not the one for the reaction in question.

(ii) Only the better candidates explained the answer in terms of protons being donated or accepted. An explanation in terms of neutralisation alone was not enough to gain the mark.

(d) (i) About three quarters of the candidates scored at least 1 mark. Again marks were lost due to a '+' sign or round brackets in the expression.

(ii) Generally well answered. Le Chatelier's Principle is well understood. However many candidates lost marks by not answering the question and failing to state what happened to the yield of NO or by not giving a full explanation, merely stating that equilibrium shifts to the left.

(iii) About 40% managed to give the correct answer of heterogeneous. Unsurprisingly heterolytic was the most common incorrect answer.

(e) (i) Very well answered. The vast majority knew that iron is the catalyst in the Haber process.

(ii) Extremely well answered. Almost all the candidates could give a correct use of ammonia, with fertilisers easily being the most common answer. One poor candidate wrote fertilisation. I hope that this was a genuine slip on the candidate's part.

Q.12 (a) (i) Fairly well answered. About half the candidates gave the correct answer, the main error being the omission of the word 'rate'.

(ii) Generally well done, although some candidates still incorrectly insist on using square brackets.

(iii) Only about one third of the candidates gained all three marks. The main error was to state 1 atmosphere instead of just above atmospheric pressure, followed by omitting the oxidation state of vanadium. However about one in eight failed to score any mark. It seems that learning facts has gone out of fashion.

(iv) Only about 40% could state how sulphur trioxide is converted to sulphuric acid. Many simply said that the sulphur trioxide was added to water.

(b) (i) Well answered. Over three quarters of the candidates could correctly calculate the number of moles of sodium hydroxide. However a failure to use the appropriate number of significant figures was apparent throughout this question.

(ii) Again well done, but a significant number lost a mark since they did not take into account the 2:1 ratio of $NaOH:H_2SO_4$.

(iii) Only about a third of the candidates realised that the original acid was ten times as strong as the dilute acid.

(c) (i) Well answered with over half getting the full 3 marks. About one in seven candidates failed to give the unit and so lost a ½ mark. Only a small number failed to score any mark.

(ii) Poorly answered. Only about one in five gave an adequate explanation. The majority of candidates failed to mention standard state.

Q.13 (a) (i) This part of the question was about fractional distillation and cracking. It was generally well answered with over 20% gaining at least 6 marks and fewer than 10% gaining less than 2 marks out of 7. Most candidates lost marks by failing to **explain** why both processes are necessary. However a significant number of descriptions tended to be disjointed and confusion arose between the two processes. Also cracking was often incorrectly described as the breaking of long polymer chains into smaller monomers.

(ii) Almost all the candidates managed to correctly give one factor that influences the choice of site for an oil refinery and about two thirds could give two factors.

(iii) Over two thirds of the candidates knew that sulphur dioxide caused acid rain but only about half of these could link this to the burning of fossil fuels.

(b) Only fairly well answered. About half could write a correct balanced equation for the combustion of propane. A significant number gave the formula for butane instead of propane and some candidates did not even know that carbon dioxide and water are the products of this combustion.

(c) (i) Too many answers were too vague e.g. free radical mechanism, free radical chain reaction instead of the required (free) radical substitution or photochlorination.

(ii) Well answered with over 60% giving the correct equation for the initiation step for the photochlorination of methane. A further significant number also gave the equation but spoilt their answer by including a propagation step as well.

CHEMISTRY

General Certificate of Education June 2005

Advanced Subsidiary

Paper CH3a

Chief Examiner: P. G. Blake, B.Sc., D. Phil., Formerly Senior Lecturer in Chemistry
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Introduction

The paper was generally well-received this year and the continuing framing of the questions around the objectives of application, analysis, synthesis and evaluation appears to be working well and achieving the desired aims with regard to the experimental/theoretical interface. There was good discrimination between those candidates who could navigate this region confidently, many of whom obtained virtually full marks, and those who found it somewhat foggy.

Q.1 Answers to this question were generally satisfactory although section (b) revealed lack of understanding in many cases.

(a) (i) Plotting was usually correct, although the slightly awkward scale had some discriminating effect. The quality of curve drawing was variable.

(ii) Errors were of the usual type:- not realizing that the slope comes from differences($\Delta V/\Delta t$), inverting the data and not using the straight line initial section. Some candidates converted time into seconds although this was not necessary.

In (b) most errors came in (ii), the point of the process being to markedly slow the rate, in (iii), where rate depends on the concentration of reactants and not on the volume and in (v), where measuring a change in temperature cannot be used since this itself, of course, alters the rate.

Q.2 Some candidates lost marks here through being too vague; everything must be spelled out to the (ignorant) examiners.

In (ii) the key point is that the number of moles of wax burned must be known; it is trivial merely to answer " to find the mass of wax burned".

In (iii) "the mass of water is needed for the equation" is all that was wanted, although more detailed explanations were accepted.

(v) was generally satisfactory although errors in temperature measurement, etc., could produce higher as well as lower values.

Q.3 This was probably the most searching of the questions but reasonable answers were common and there are definite signs of improvement in this area. However, simple equation writing in (a)(i) and (b)(i) was often poor.

(a)(iii) Few candidates correctly saw that temperature and pressure were needed to calculate the number of moles of gas; concentration was accepted for a half mark.

(a)(iv) Many correct answers, with more gaining consequential marks for the second calculation having erred in the number of moles.

(b)(ii) and (iii) were usually correct but the key point in (iv), namely that the test must be carried out on the filtrate, was often omitted.

In (b)(v) calculations were very often correct, again with some consequential marks, following an error in the molar mass.

In (c) titration against standard acid was the obvious method, but many candidates suggested what was basically the method used in (a) and many more had no suggestion at all. The candidate who suggested electrical conductivity got a mark for ingenuity!

Conclusion

The ability to perform correct calculations certainly seems to be improving, but is somewhat offset by an inability to write correct simple equations. It might be mentioned that the use of phrases such as "a fair test" or "a fair experiment" will not add to the number of marks gained.

On the whole it is felt that this short examination is serving a useful purpose in directing students to think about why they do what they do in experimental work and their generally satisfactory performance in it is an encouraging sign.

CHEMISTRY

General Certificate of Education June 2004

Advanced Subsidiary

Paper CH3b/c

Chief Examiner: P. G. Blake, B.Sc., D. Phil., Formerly Senior Lecturer in Chemistry University of Wales College of Cardiff.

Introduction

This has again been a generally satisfactory year for the AS coursework with much good and some excellent work from candidates. Once again the CH3c route predominated with just a few centres opting for CH3b.

Inevitably with a, very welcome, period of stability for coursework there will be much repetition of points and comments but there are signs that some, although not all, of previous problems and errors are being overcome and avoided; it is hoped that the report will assist in expediting this. Unfortunately not all teachers seem to receive the report so that one may be preaching to the converted!

Presentation

This was generally good, but there are some important points to be made in order to assist the marking process and prevent errors.

Q.1 Please do not under ANY circumstances use old type proformas or old Teacher Result sheets. This is still happening three years down the line and such false economy gives endless trouble to the assistant examiners and can lead to candidates' part marks being missed, to their detriment.

Q.2. It is strongly recommended that the proformas be used. Students writing their own reports not infrequently omit mark-gaining steps, notably in the Analysis sections and expend much effort in writing pages of material which is not relevant to the mark scheme, such as drawings of pipettes and dropping bottles and long lists of routine apparatus. Few, if any, additional sheets should be necessary.

Q.3. Treasury tags are now almost universally used: just ONE in the top left-hand corner, please, so that the marker can see all the work without undoing anything. A few centres still use paper clips, which always fall off!

Q.4. Excessive use of pencil continues and is penalized under Quality of Written Communication. Biros are cheap!

Q.5. It is essential that scripts are arranged in order of candidate number (or that each set is in the case of different groups having different solutions) and that both reports are attached together along with the front sheet.

Q.6. Packaging. We are still receiving ripped brown envelopes resealed by the Royal Mail, fortunately without loss of scripts so far. The strong plastic envelopes, sent to the exams officer, should always be used.

Teacher Result Sheets

These are of course an essential feature of the assessment of the Implementation sections in Experiments 1-4 and, while most are clear and complete, a significant number of defective sheets were encountered, containing either omissions or errors. These include improper rounding up, such as an actual 0.0972 becoming 0.1, a mass of MgO of 0. (sic)in thermochemistry, recording internally incompatible data (fortunately there is some redundancy in the titration data), not recording the precision of the thermometers used and recording results which appear not to relate to any of those obtained by the candidates.

The assistant examiners do their best to help these candidates in various ways, but it is of course the teacher's responsibility to present an accurate and complete sheet and not to compromise the futures of his/her students. It is very important to make it clear if different solutions have been used for different candidates or if NaOH has been placed in the burette in expt 2.

Planning

There is always one mark for the aim, which is not always given. The aim should always be at the start of the plan and should be sufficiently specific (e.g., not just " measure a rate" but which rate). The plan should be concise and not contain obvious detail about apparatus, routine method etc. Bullet points are fine.

Evaluation

There is further improvement in this conceptually rather difficult area and it is hoped that this will continue. The answer is to keep it simple and not hide the wood among the trees.

Decimal places are still a major, probably the major, problem and should be banned in this work. For example, an answer on the calculator of 0.0014527 is 0.00145 to three significant figures and 0.001 to three decimal places which is some difference!

The key question for the student to answer is whether the results are precise to 0.1%, 1% or 10%, which governs how many figures are quoted. The answer is found by identifying the largest likely error, such as temperature or volume errors, not usually weighing, and expressing this as a percentage, e.g., 0.2/10 for temperature (2%), 0.1/25 for volume (0.4%). This is then the approximate % error in the result, which should then be quoted with this in mind with perhaps one extra figure for luck. So 74 or 74.3 kJ/mol with a 2% error, or 0.402 or 0.4021 mol dm-3 for a concentration, is sensible, whereas 74.345678 is nonsense since we are not even sure of the 4 in 74.

There are other and more sophisticated methods, but this is perfectly adequate for AS and it is encouraging to see that many candidates are now identifying the largest error (burette/pipette or thermometer) and simply doing the sum above to get a % figure.

The next stage is more tricky; namely, to decide on the number of sig. figs used on the basis of the % error, e.g., "my error is 1% so I shall record my calculated concentration of 0.101234 as 0.101", since this could be 0.100 or 0.102 and the other numbers, 234, have no meaning. We are not going to worry about one extra figure, it is the 0.1023456 that is bad and shows a failure to understand the meaning of an experimental result, i.e., number-precision-units.

However, it remains true that over-truncation, such as 0.0014527 to 0.001 above, is a much more serious error since information is discarded.

Individual Experiments

Expts 1A,1B and 2

Again most titrations were good or satisfactory, many were excellent and a few clearly did not have much idea about how to titrate. In expts 1, litle endpoint trouble was reported this year, with a few candidates finding the phenolphthalein end point difficult. One remedy, if this is so, is for the teacher to make up a hydrogencarbonate solution of the expected concentration, add phenolphthalein and give to the candidates to use as a reference colour.

In expt 2, KHP weighings outside the range given are penalized and this also applies in expts 3 and 4.

In all the titrations marks were lost through not drawing up a table of "initial burette reading", "final burette reading' and "volume used", for not recording all these values to 0.05 cm^3 and for not stating these units. The results used for averaging must be clearly indicated to avoid a mark penalty. In the Analysis sections errors caused by inverting the volumes were not uncommon. This can be quickly checked by saying that if you need more of solution B than A, then B has the lower concentration.

There has been some confusion between 1A and 1B in calculating the concentration of carbonate, etc., from the titrations, even though any candidate only does one of them. Teachers should emphasise the point since it is easy to get confused.

Expts 3A,3B,3C and 4

Generally good results and graphs but there were some minor problems and some worrying features. There was sometimes a huge range (up to threefold) in the temperature change per gram reported by the teacher for what was nominally the same solid, which must therefore be impure or wet in some cases. This false economy can have an adverse effect on candidates' marks and only pure, dry solids should be used. It was sometimes suspected that the solids used were not homogeneous. Temperature changes per gram are typically around 95 degrees for Mg, 2.7 degrees for the carbonate and at least 10 for the oxide. All temperature changes should be at least five degrees to give a reasonable precision.

In at least one centre some rather erratic extrapolations gave ΔT values that were substantially in error; also the determination of ΔT values from the graph was sometimes incorrect, although examiners corrected this, under penalty, where they could.

Mg should not be used with two-place balances - too imprecise, since an uncertainty around the second place in 0.10 g is asking for trouble. In particular, Expt 4 should NOT be used unless precise thermometers are available and, even then, temperature changes should exceed 5 degrees. A change of 3 degrees with a 0.5 degree thermometer, that is seen each year, is a nonsense and such results will in future be penalised.

Again, one graph is needed for each determination, but there is no need for duplicate runs. Masses outside the ranges given are penalized.

There is still some confusion over signs with ΔT and ΔH, which all refer to Final value - Initial value, so that if the temperature rises ΔT is positive. ΔH is then negative, since the reacting system has lost energy to heat up the water. Many candidates lose a mark in Evaluation by failing to relate these two; the use of the word exothermic is not sufficient and all that is required is to say that ΔH is negative if ΔT is positive and vice versa.

The Bomb Calorimeter as a way to obtain more accurate data appeared again this year: this is used for combustion reactions and not those measured here.

Expts 5 and 6

There were no major problems with these experiments which frequently gave good straight line results. The relation between concentration and rate should be clearly stated and time and volume not mentioned

Marks were again lost through poor significant figures such as $1cm^3$ instead of $1.0cm^3$ and recording reciprocals of the times to one significant figure only, e.g., for a time of 27s, 1/t is recorded as 0.003/s and not 0.0037/s.

Other losses were caused by using too limited a concentration range, inverting the y and x axes and absence of graph title, units and poor scales.

In expt 6 each graph must have four points, one of which is common to both plots.

Postscript This year's new spelling winner is "glasswear".

Conclusion

A solid performance by most candidates, clearly demonstrating that the aims of the coursework module have been achieved; they and their teachers are to be congratulated on their efforts.

CHEMISTRY

General Certificate of Education January 2005

Advanced Level

Paper CH4

Chief Examiner: M. E. Anthoney Ph.D.

General Comments

There were 993 entries for this paper, a slight increase on recent years. 55% of the candidates were resitting the exam and 45% were first-time entries. As might be expected, the first-time entries provided stronger candidates than those resitting: the average mark for first-time candidates was 3% higher than the overall average.

There was no evidence of candidates having insufficient time to complete the paper. With the proviso that the organic questions were generally answered better than those on physical topics, there was a reasonable distribution of marks over the questions. The atomic hydrogen spectrum was the topic which gave candidates the most problems.

One disappointing aspect of many scripts was the candidates' inability to adapt their knowledge to the specific questions asked. At 'A' level, candidates cannot expect to simply regurgitate lengthy chunks of work, and to achieve high marks must tailor their answers to the individual questions. A classic example was question 2(b) (i) where candidates were asked to describe how the currently accepted structure and bonding in benzene differ from those in cyclohexatriene. Script after script contained a detailed account of the bonding in benzene but made no attempt to compare it to cyclohexatriene.

Section A

Q.1 (a) A surprising number of candidates omitted the obvious chlorine gas as a necessary reagent for chlorination..

(b) (i) Nearly all candidates knew the correct stages in the calculation. A few lost marks by inappropriate rounding up of figures, but a bigger problem was the inevitable confusion between empirical formula and molecular formula. Too many scripts simply left the examiner to guess which was which.

(ii) Compound **P** was usually correctly identified.

(iii) Nucleophilic substitution or hydrolysis was well known.

(iv) Many candidates made hard work of the test for chloride ions. The evolution of chlorine gas from alkaline solution was a surprisingly common mistake.

(c) Though stronger candidates scored high marks, the chlorination of benzene was not well known. Chlorine gas was again a common omission from the reagents.

Q.2 (a) (i)&(ii) The arrow for increasing energy and the allocation of the transition processes were usually well answered though a fair amount of latitude was allowed in the reasons accepted.

(iii)&(iv) In contrast, the two part-questions on the atomic hydrogen spectrum were badly answered. There was widespread confusion between the energy level diagram of atomic hydrogen and its spectrum, with few candidates recognising that each line in the spectrum corresponds to an *energy difference* between *two* levels. The question on the derivation of ionisation energy produced many vague and imprecise answers such as "measure the energy when the electron is in the $n = \infty$ level". Lengthy discussions of the energy level diagram gained no credit whereas concise answers specifying determination of the convergence frequency of the Lyman series and converting frequency to energy using Planck's constant gained full marks.

(b) (i) As mentioned in the introduction, candidates often failed to answer this question even though they clearly possessed the relevant knowledge.

(b) (ii) The delocalization energy and extra stability of benzene were well known.

Q.3 (a) (i) The aldehyde and phenol tests were well known. The main errors were to use 2,4-DNPH (which identifies a carbonyl, not necessarily an aldehyde) and to try and oxidise the phenol with acidified dichromate.

(ii) The structure of the product of the addition of HCN to an aldehyde was quite well known, with most errors being due to carelessness rather than lack of understanding. The same could not be said of the mechanism which was poorly known and even more poorly drawn out. Comments have been made in several previous reports about the difficulty candidates have with mechanisms even though full marks can be achieved by rote learning.

(b) (i) There were a surprisingly large number of imprecise answers to this question, with only a minority clearly identifying two acidic groups on the benzene ring.

(b) (ii) The esterification was generally well answered.

Section B

Q.4 (a) A large majority of candidates correctly drew the four structures, but more errors arose when naming the structures, particularly the two branched alcohols.

(b) Nearly all candidates correctly identified **F** as methylpropan-2-ol, but only the best candidates fully explained the NMR spectrum: one peak due to the nine hydrogens in CH_3 groups, a second peak due to the alcohol H, with neither peak being split because of the absence of hydrogens on the central carbon.

(c) Butan-2-ol was correctly given by most candidates as the optically active isomer, but even when correctly identified the iodoform test brought some very confused and incomplete answers.

(d) Many candidates scored well on this question. The most common errors were a failure to identify a specific starting compound and trying to use hydration of an alkene as a preparative method under conditions which produce a secondary alcohol in preference to a primary one.

(e) Dehydration in step 1 was better known than addition of HBr in step 2. Use of bromine for the addition was a frequent mistake. **H** was usually correctly identified as butan-1-ol.

Q.5 (a) Though the basic nature of amines was recognised by a majority of candidates, it was not always followed through to explain the *difference* in solubility. A good answer to part (i) was normally followed by correct answers to parts (ii) and (iii) as well, with only a few students claiming an H^+ ion bonded to the amine by hydrogen bonding.

(b) A very high percentage of candidates wrote a correct equation for the reaction, but the reasons for using dry conditions in (ii) were too often vague ("water would interfere with the reaction") or just plain silly ("you need to use dry water for this reaction").

Amide was well known as the functional group. Peptide was not allowed because aminoacids or their derivatives were not involved.

Despite the number of recent papers in which the technique has occurred, there were still a surprising number of poor answers to the recrystallisation question (iv), showing a lack of understanding of practical techniques. Several candidates suggested boiling point determination to test the purity of a solid, or even more bizarrely simply weighing the product.

Although candidates usually have an aversion to calculations, part (v) was pleasingly well done, with mistakes usually confined to incorrect Mr values.

(c) A reasonable number of candidates correctly stated the difference in the products of the two diazotisation reactions, though the explanation was usually missing.

In contrast, part (ii) was badly done, with large numbers of candidates explaining diazotisation and chromophore rather than coupling and azo-dye as asked by the question.

Since students could not be expected to predict it, for the structure of the molecule produced by the coupling reaction, the 4-ethylaminobenzene was allowed to couple to any free position on the phenol ring.

CHEMISTRY

General Certificate of Education June 2005

Advanced Level

Paper CH5

Chief Examiner: Mr Elfed Charles

General Comments

It was felt that the paper was fair and accessible with some good differentiating questions that tested the most able. There were no dead marks and there was no evidence of insufficient time to complete the paper. There was a good spread of marks with twenty seven candidates scoring less than 10 out of 75 but only four candidates scored 65 or more. As was the case in previous years' examinations a number of candidates lacked basic knowledge of physical and inorganic chemistry, which prevented competent answers.

The simple calculations e.g. Q.2(d)(i), Q.3(b) were well done, but only the better candidates were confident in the calculations which required some manipulation e.g. Q.4(a)(ii), Q.4(b). It seems that too many candidates rely on a 'magic' formula given by the teacher instead of applying first principles. In all calculations the use of significant figures continues to be a cause for concern, even in the questions that stipulate the number of significant figures expected in the answer.

Although several candidates gave good answers, the quality of written communication was slightly disappointing on the whole and many candidates had difficulty in expressing chemical ideas and principles when required to write explanations e.g. Q.1(b) (covalency maxima), Q.4(c) and (e) (rates of reaction).

The ability to write equations and remember formulae of inorganic ions again proved to be too demanding for many candidates. It seems that many candidates rely on rote learning of a few sections of the specification and have little grasp of the subject. It is apparent that these have made little progress in understanding from GCSE level.

The examiners continue to be concerned that the practical knowledge of the candidates is very weak e.g. Q.2(b) (Group VII), Q.5(b)(ii),(c) (Groups I and II) and Q.5(e) (Group IV) were all poorly answered. Chemistry is a practical subject and making observations and extracting inferences from those observations is central to the understanding of chemical principles.

Papur Arholiad Cymraeg

Roedd safon yr iaith a ddefnyddiwyd gan yr ymgeiswyr cyfrwng Cymraeg yn uchel ar y cyfan. Eithriad prin iawn oedd ymgeisydd yn defnyddio term neu air Saesneg a chalonogol iawn yw gweld dros y blynyddoedd sut mae'r safon iaith wedi gwella. Roedd safon y goreuon yn dda iawn a braf oedd gweld atebion mor dda yng nghwestiwn 5(a) lle roedd gofyn am ddefnydd o iaith estynedig. Roedd y camgymeriadau yn gyffredinol i'r ymgeiswyr cyfrwng Saesneg yn ogystal a'r ymgeiswyr cyfrwng Cymraeg, er nodwyd roedd canran ychydig yn uwch o ymgeiswyr cyfrwng Cymraeg yn gadael atebion allan yn gyfangwbl os oedd ansicrwydd am yr ateb.

Section A

Q.1 (a) Parts (i) to (iv) were well answered with over two thirds of the candidates getting each part correct. However the correct answer was only given by about one in eight in part (v) and by about one in five in part (vi). It was clear that many candidates were guessing as the entire range of elements was used in most parts.

(b) Poorly explained. Almost half the candidates failed to obtain any mark and less than one in eight obtained both marks. Many candidates just stated that phosphorus had two oxidation states while others wrote about the inert pair effect or that phosphorus was a larger atom than nitrogen.

(c) (i) Only about one third could successfully write a balanced equation for the reaction between phosphorus(V) chloride and water.

(ii) The equation for the reaction between chlorine and water was much better known with over two thirds of the candidates getting it correct.

Q.2 (a) (i) This ionic equation was very well known with around three quarters getting the mark.

(ii) Generally well answered. The main error was to omit nitric acid from or to include sodium hydroxide in the reagents. A significant minority incorrectly chose to use an alkene as the reagent. Although bromine (not bromide) will react with alkenes, the test cannot be used the other way round.

(b) Although the question asked the candidates to name gases, most gave formulae (they were not penalised on this occasion). It was obvious that many guessed the answers to both parts as hydrochloric acid, sodium oxide, sodium sulphate, hydrogen and nitrogen were not uncommon answers.

(c) The vast majority knew that disproportionation referred to concurrent oxidation and reduction, however fewer could explain it in terms of oxidation numbers and only about one third could give the correct equation.

(d) (i) Disappointingly only about half the candidates gave the correct concentration. Many could not calculate the relative molecular mass of the salt while others did not give the answer to three significant figures.

(ii) Fairly well done. Too many candidates did not think about the question and simply used the formula $[H^+] = \sqrt{K_a[\text{acid}]}$ and so lost both marks.

Q.3 This was the best answered question as a whole on the paper.

(a) (i) Fairly well done. About half gave the correct answer of Ag^+. However many candidates incorrectly gave the answer as Ag. Candidates need to be more precise, they must realise that silver and silver ions are different chemical species.

(ii) Quite well done. Although again some were confused and thought that Cu^{2+}, Fe^{2+} and Ni^{2+} could be oxidised further.

(iii) Well answered as a whole, although lack of precision cost some candidates the mark.

(iv) The diagram of the cell was often well drawn and well labelled, the main error being to omit the standard conditions.

(b) Well answered. Most candidates gave the correct formula of Fe_3O_4, but a significant number rounded 1:1.33 to 1:1 and gave FeO as the formula. Some however showed their lack of understanding of chemistry by giving answers such as $Fe_{10}O_{13}$ or $Fe_{50}O_{139}$.

(c) Fairly well answered. Marks were lost because candidates thought that the electrons were lost from the 3d orbitals, or a full answer about the electronic configuration of the two iron ions was not provided.

(d) (i) Candidates either knew the half equation or they did not have a clue. Unfortunately the majority did not know it.

(ii) It was pleasing to see so many candidates getting the 3 marks for this part (many due to consequential marking from (d)(i)). The vast majority scored at least 1 mark for calculating the moles of dichromate(VI) ions.

Section B

Q.4 (a) (i) Very well done. The vast majority gave the correct expression for K_p.

(ii) Very poorly answered. Only about 10% of the candidates gave a correct value for K_p. The commonest error was simply to substitute the numbers given in the question into the expression for K_p. This clearly shows that the true significance of K_p is alien to most candidates.

(b) Many correct answers and many 'near misses' where the appropriate values had not been multiplied by two were seen. However the wide range of answers given suggested that candidates were listing all the values provided and adding them up in what seemed to be a wholly random fashion. The concept of exothermic and endothermic reactions seemed a foreign one to most of the candidates.

(c) In both parts marks were lost due to misuse of language rather than lack of chemical understanding.

Examples are

(i) 'Order of reaction is the factor by which increasing concentration of a reactant increases overall rate.'
'Order of reaction is the value obtained when the concentration of one reactant is changed and the rest are kept constant to cause an effect on the rate of reaction e.g. rate is doubled, quadrupled.'

(ii) 'Rate determining step is the step that is the hardest.'
'Rate determining step is the step which must happen to trigger the other steps.'
Candidates must learn to express themselves clearly.

(d) (i) Well answered. Over three quarters managed to obtain at least 1 mark.

(ii) Again well answered, although many candidates only stated that an increase in temperature increases the rate of a reaction without mentioning the rate constant.

(iii) Extremely poorly answered. Many candidates misunderstood the question and simply stated nucleophilic substitution or S_N1 instead of showing a mechanism. Others showed a slow step but showed an OH^- ion being attracted to the relevant carbon atom at exactly the same time as the I^- ion was being lost.

(e) Disappointingly answered. Although the vast majority of candidates gained a mark for controlling temperature and a significant number for giving details of a particular example, few actually addressed the principles involved and the all important relevance of time in rate measuring reactions seemed to have been ignored by many.

Q.5 (a) This part required the candidates to write fluently about some of the chemistry of transition elements. The better candidates gave excellent answers and many high marks were seen in this part. Even weaker candidates managed to pick up much needed marks. However more care needs to be taken to ensure that the charges on complex ions are correct and some candidates need reminding that zinc, lead and aluminium are not transition elements.

(b) (i) This part was generally fairly well answered but only about 10% gained the full 4 marks. Considering that the reaction of sodium and water is also covered at GCSE this is very disappointing. Again far too many candidates could not write a correct equation for the reaction.

(ii) Poorly answered. There was a marked lack of understanding of the reaction patterns of Group I and Group II oxides. Many thought that they reacted vigorously with water and that hydrogen was produced.

(c) Very poorly answered. Inorganic practical work has been a cause for concern for some years and continues to be so. Less than 10% managed to get both marks and only about another 10% managed to score 1 mark. Worryingly a number of candidates used water as the reagent to distinguish between the salts despite the fact that both salts were already aqueous solutions. One candidate thought that there was a vigorous reaction between sodium chloride and water. He clearly has never added table salt to water when cooking vegetables.

(d) Again poorly done. Many explained this question in terms of salts of strong acid/strong base and weak acid/strong base, which was insufficient. Many thought that NaCl formed HCl and NaOH in water and since these two "cancelled each other out", NaCl was neutral. Others stated that sodium ethanoate accepted a proton and so had a pH greater than 7. Not many appreciated the hydrolysis reaction of the ethanoate ion and often those that did omitted the explanation for the sodium chloride.

(e) The final part of the paper was about the relative stability of the +2 oxidation state for lead and tin (*Topic 20.1.2 Learning outcome (c)*). Both parts were poorly answered. The range of reactions was not limited by chemical protocols, with candidates inventing equations and then trying to balance the reactants and products. Of the two, the tin reaction was least well known.

CHEMISTRY

General Certificate of Education June 2005

Advanced Level

Paper CH6a

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

General Comments

This was the fourth time that this synoptic paper had been set, in which questions could be set that reflected the whole of the specification. The response by the candidates was very varied with only a few candidates scoring in single figures and around 60 candidates gaining 80% or more of the marks.

The paper attempted to explore as much of the specification as possible but of necessity some topics cannot be covered in a paper of only 50 marks. The calculations were generally done quite well but the examiners were disappointed to see poor responses to AS level organic chemistry topics. Presumably this was because this was covered at an early stage in the course.

Another weak area continues to be intermolecular bonding where hydrogen boding and other intermolecular forces were mentioned without a logical setting as seen in Q2 (c)(ii). As in other papers, any questions that required extended writing were less well done, with contradictory statements at times. This was seen particularly in Q1 (iv). Similarly, questions requiring structured responses directly from the specification were quite well done but more open ended questions requiring application often proved troublesome.

Section A

Q.1 (i) The equation for the reaction between aqueous solutions of sodium carbonate and calcium chloride was meant to be an easy starter question but for many it was far from that. Inspection of a sample of 150 papers showed that only around half gained the mark allowed and of those who got it wrong over two thirds thought that the formula of sodium carbonate was something other than Na_2CO_3. Most candidates gained the mark for the observation but the examiners felt that cloudiness/milkiness was not such a strong answer as a white precipitate but some credit was given for this response.

(ii) Most candidates correctly stated that the carbonate anion was acting as a base in this reaction because it was a **proton acceptor**. A few used hydrogen in place of protons and some discussed redox reactions.

(iii) This question required candidates to work out the concentration of hydroxide ions in a solution of pH 11. There were many errors here in the gaining of both marks, perhaps because of the relative unfamiliarity of using logs / antilogs on the calculator. Some did not use K_w and assumed that the $[H^+]$

value obtained was the same as the [OH^-] value. One examiner commented that candidates do not realise the lack of sensibility of their answer when a value of 1 x 10^{-25} is obtained.

(iv) This question proved to be a good discriminator and it was generally seen that a high mark on this section often resulted in a high mark overall. This was a free response question based on simple practical techniques and qualitative analysis which required more open ended writing. Unfortunately a number of candidates found this difficult and the practical sequence described was often illogical with vital stages being omitted. Credit was given where possible but some answers were very muddled.

One of the marking team has listed the most common errors :

- not adding water to dissolve the *natron*
- neglecting to neutralise the carbonate present
- adding sodium hydroxide before acidifying
- adding hydrochloric acid and then testing for an iodide
- giving the wrong formulae for the silver compounds
- giving most of the procedures but in an incorrect and logical order

The question was really an extension of the sand and salt exercise together with qualitative analysis of the iodide ion. Some candidates identified the iodide ion by use of aqueous Pb^{2+} ions or by using chlorine. Both of these routes gained credit.

Section B

Q.2 (a) Many candidates, sadly, thought that copper metal had an incomplete 3d shell but gained some credit for stating that transition metal character stems from an incomplete d sub-shell in the metal or in one or more of its ions. Only the stronger candidates described copper as Ar]$3d^{10}4s^1$ and Cu^{2+} as Ar]$3d^9$.

(b) (i) Most candidates gained full credit for describing the surface area increase but a few spoilt their response by then discussing other rate determining effects, even though the question only awarded one mark

(ii) This question concerned oxidation numbers and showed the inadequacies of some candidates. Good answers were uncommon and few went on to state that it was a decrease in oxidation number that identified reduction, as required by the question.

(iii) Most knew the catalyst for the Contact process and could write the K_p expression for this process. Many candidates could do the calculation that followed but many gave the wrong unit. It was common to see atmospheres or atmospheres^{-1} being given.

(c) (i) Most recognised the need for a lone pair of electrons to be involved in the bonding between nitrogen and oxygen atoms with a copper ion.

(ii) The responses to this question about solubility and its relationship to intermolecular bonding were often very poor and even contradictory.

Common errors noted by an examiner were:

- stating that Compound **A** was non-polar (but presumably meaning that **part** of it was non-polar).
- confusing intermolecular and intramolecular bonding / forces.
- neglecting the interaction of water with compound **A**
- confusing hydrogen bonding with weaker intermolecular forces.
- describing the forces/bonding present in each molecule but neglecting to mention the forces between them

Some good answers were seen however, and these tended to be from the most able candidates.

(d) Many worked out the emf of the cell correctly and then gained the second mark for stating that, as it was positive, the reaction was feasible. It was a pity that others did not take this direct response route and clouded their answers without an adequate explanation.

(e) Many candidates stated a correct reagent for the identification of an aldehyde by an oxidation procedure.

Section C

Q.3 (a) There were two marks for this question which demanded a more detailed response than mere evaporation. A number seemed intent on describing recrystallisation instead of just obtaining crystals.

(b) A large number of candidates lost a mark for neglecting to calculate the relative molecular mass of sodium diethanoate correctly, often by neglecting the water.

(c) (i) Some candidates lost marks by simply describing a buffer solution rather than how it worked in **this** case.

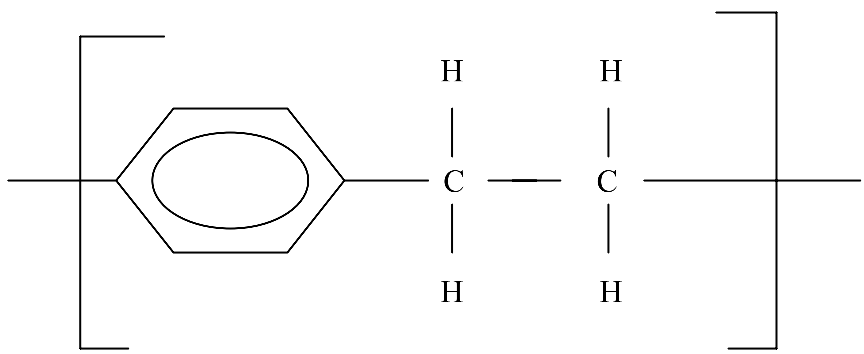
(ii) Most candidates dropped one or two marks here by assuming that the concentrations of H^+ and CH_3COO^- were equal as in a simple K_a calculation and wrongly obtained a value of 2.72. as their answer.

(d) A number of good answers were seen but an equally large number do not know where to put 'curly arrows' in an organic mechanism. A clear differentiation should be made if the arrow is to come to / go from an atom or a bond. Electron pair movement cannot go from an electron deficient centre (an electrophile) to an electron rich centre (a nucleophile). Most candidates knew that the ethanoate ion was acting as a nucleophile in this reaction.

Q.4 (a) The structural formula of phenylethene was, sadly, too often drawn incorrectly. The benzene ring was sometimes given an OH group. A number of structures were drawn that lacked all the hydrogen atoms in the ethene part of the molecule. If these are missing the examiners see it as an incomplete structure and it is penalised accordingly (in common with the other examination boards).

(b) This question asked candidates to define the term **free radical**. Sadly, out of a sample of 125 scripts exactly half could not gain the mark awarded here. Mention of a lone pair and 'it is a free electron' gained no credit.

(c) The structural formula of the repeating unit in poly(phenylethene) too, was often drawn incorrectly. A common error was the structure:



(d) Many candidates knew the test for a phenol but it was necessary to correctly state the reagent to obtain the observation mark.

(e) (i) Too many candidates did not realise that I mole of the amide gave 2 moles of nitrogen and lost a mark in consequence.

(ii) Disappointingly few realised that an **amide** would give ammonia when warmed with sodium hydroxide solution.

(f) The reasons for colour in organic compounds were often given correctly and many candidates gained full credit

(g) (i) In a sample of 125 candidates, 50 could not give the balanced equation for the decomposition of sodium hydrogencarbonate even though the formula and most of the products were given.

(ii) Most gave the flame test for sodium and its correct colour. A few spoilt their response by stating that burning occurred. A number of candidates gave only a partial response for the carbonate test. Either they simply acidified and said that carbon dioxide was evolved (how did they know that it was carbon dioxide?) or stated that carbon dioxide turned lime water milky (but how did they obtain it?). Some added aqueous calcium or magnesium ions and obtained a white precipitate but this is not conclusive for a carbonate.

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