GCE

Chemistry (Salters)

Advanced GCE **A2 7887**

Advanced Subsidiary GCE **AS 3887**

Report on the Units

January 2009

3887/7887/MS/R/09J

Oxford Cambridge and RSA Examinations

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REPORTS ON THE UNITS

3887/7887 Chief Examiner's Report

This was the last January session for the AS units 2850 and 2848. Both units were taken almost entirely by re-take candidates. 2848 had more candidates than last year when they were re-takes too but the standard remained very similar. 2850 had many fewer candidates than last year, the Year 12 candidates now taking F331. The standard of the re-takes in 2850 was higher than the overall population last year, which is encouraging for candidates and their teachers.

Candidates should be reminded that when sitting examination papers, draft answers should be clearly crossed out and any draft pencil marks carefully erased.

Tip for candidates:
Avoid rubbing out as much as possible, cross out and re-draw wherever you can. Never over-write a number or word to change it, always cross it out and write it again. While neatness makes you proud of your work and the Examiner's job easier, it must take second place to clarity.

At A2, it was business as usual, though with a gratifying rise in the number of candidates for each written unit. 2849 was taken predominantly by candidates in Year 13 and performed in a similar fashion to previous years. There was a 40% increase in the number of candidates taking 2854, though this only pushed the total to just over 100. The vast majority were re-takes and thus in 'Year 14'.

In all units, the examiners reported better efforts at calculations, with candidates setting out their work more carefully, enabling the award of 'error carried forward' marks even if they did not get everything right. This is greatly to be encouraged and congratulations to the candidates and their teachers for achieving this. Literacy skills seemed better at AS than at A2. The main area of concern across all units was the poor knowledge of organic reactions.

Note that legacy AS units (2850, 2848, 2852) will be available for the last time in June 2009. This is the last re-sit opportunity for legacy AS candidates. For first time AS candidates there will be no more *Open Book* and the AS coursework will be much changed. There will be a distinct resemblance, however, between 2850 and F331 and also between 2848 and F332. Further details of the new specification and changes to assessment arrangements are available from the OCR web site:

http://www.ocr.org.uk/qualifications/asa_levelgceforfirstteachingin2008/chemistry_b_salters/

There is no facility to mix and match units from the legacy (3887/7887) and new (H035/H435) specifications.

INSET events for new GCE Chemistry B (Salters)

OCR A2 Level Chemistry B (Salters) (H435): ***Get Started – towards successful delivery of the new specification.***

These **new full day** courses will give guidance and support to those planning to deliver the new A2 level Chemistry B (Salters) (H435) specification.

Course dates and codes – Tuesday 10 March 2009 (London, OSCD501), Wednesday 25 March 2009 (Birmingham, OSCD502), Wednesday 1 April 2009 (London, OSCD503).

Fee – £160 including refreshments, lunch and course materials. £190 if you book within 7 days of the course date.

Places may be booked on these courses using the booking form available on-line (http://www.ocr.org.uk/training/alevel_inset_training.html). Please quote the course code in any correspondence.
For details of INSET events from Autumn 2009 please see www.ocr.org.uk\training

2848 Chemistry of Natural Resources

General Comments

Candidates' marks covered a wide range, from single figures to the high eighties. A good proportion of candidates scored satisfactorily overall, with the paper's mean mark being 55. There was no indication that candidates had a problem with the length of the paper, with answer spaces that were left blank being uncommon and tending to indicate a lack of knowledge and understanding rather than time constraints.

Good attempts were made at the calculation questions (including values for oxidation states), where candidates generally set out their answers clearly and it was evident what was being calculated at each stage. This meant that candidates gained credit even if they had made a mistake, because they were given marks under the 'error carried forward' rules. Answers to the question on chemical equilibria were, on the whole, good – and much better than on similar questions on previous papers. Literacy skills were much better than in recent sessions for this paper, with marks for the long answer questions being much higher than previously and candidates showing an improved grasp of technical vocabulary.

Marks were generally much lower on questions that required candidates to write about organic chemistry (particularly reaction reagents and conditions and molecules' structures), the greenhouse effect and problems caused by ozone in the atmosphere.

Comments on Individual Questions

Question 1
This was a high scoring question for many candidates, with the majority scoring well over half marks.

1a Most answered this correctly.

1b(i) The majority of candidates scored both marks here.

1b(ii) Less than half the candidates scored here, with replacement being commonly given as an incorrect response.

1b(iii) Many scored this mark. Those who did not often forgot the alphabetical order rule when naming halogen containing organic compounds.

1b(iv) Marks on this question were generally good, with half the candidates scoring 4 or more out of 6. Responses were frequently well structured, logically sequenced and showed good use of technical terms, allowing the candidate to score the quality of written communication mark.

1b(v) The majority of candidates scored here.

1b(vi) The majority of candidates scored at least one mark here, for correctly mentioning electronegativity. The second mark was less frequently awarded, with the impact of the differences in electronegativity not being sufficiently clearly explained.

1b(vii) Few candidates failed to score at all and almost half the candidates gained both marks here. Those who gained one mark usually gave an incorrect bond angle, often 120º.

1b(viii) Only the best candidates scored this mark, with the majority of candidates not wording their answers clearly enough to gain credit.

1b(ix) Less than half the candidates scored this mark, with instantaneous dipole – induced dipole being a common incorrect response.

1c(i) About half the candidates failed to score, often because they did not mention that the remoulding process happened when the thermoplastic is heated or warmed.

1c(ii) Many candidates gained the mark here. Those who did not often gave 5-valent carbon atoms in their structure.

1c(iii) Many candidates gained at least two marks here for a saturated chain with bonds at each end to show how the unit they had drawn links to the rest of the polymer chain. Few gained all three marks for a completely correct structure.

1c(iv) The majority of candidates scored here.

Question 2
This question was generally lower scoring than question 1, with less than half the candidates scoring over half marks.

2a(i) Many scored the mark here, with a common incorrect response being hydration.

2a(ii) The majority of candidates failed to score at all on this question, with many confusing this process with an elimination reaction and writing answers referring to concentrated sulphuric acid and heat.

2b(i) Many candidates scored both marks here and few failed to score at all. The common error for those scoring one mark was failing to realise that the two volumes they were given were in different units.

2b(ii) About half the candidates gained this mark. Those who did not score often failed to see the link to their answer from the previous part.

2b(iii) This question was generally low scoring, with the majority of candidates failing to gain any credit. Again, many did not see the link to their previous answers to this part and just gave $C_{30}H_{60}$ with the reason being that it is unsaturated so must have a double bond.

2c Many candidates scored both marks for secondary and a clearly explained reason relating to the molecule's structure.

2d(i) The majority of candidates gained this mark.

2d(ii) Only a third of candidates scored all the marks here and nearly a quarter failed to score at all. Those failing to gain credit usually gave heat under reflux with a random selection of reagents, often including water. Those who got the dichromate tended to go on to score all three marks.

Question 3
Many scored well on this question, with two thirds of candidates gaining at least two thirds of the marks.

3a(i) Less than half the candidates gained this mark, with most not understanding the significance of the word 'systematic' in the question and giving answers like dicopper oxide.

3a(ii) Nearly half the candidates failed to gain credit here, even though most went on to score the mark in part **(iii)** for defining the term base and showing they know what an acid is in ionic terms.

3a(iii) Most scored this mark.

3a(iv) Answers to this question were very good, with strong evidence that candidates have used mark schemes to past papers in preparation for this exam. Over half the candidates scored all three marks for clearly drawn and labelled diagrams. Few candidates failed to score here.

3b(i) Many scored all three marks for this part.

3b(ii) This part was also a high scoring question, with many candidates gaining both marks.

3b(iii) The majority of candidates scored well here, with over half gaining full credit and few failing to score at all. Some calculated the molar mass incorrectly, but went on to score the other marks, due to the application of the error carried forward rule.

3b(iv) Nearly half of candidates gained both marks here, with many more gaining one mark for $4s^2 3d^9$ or $3d^9 4s^2$.

3c Marks for this question were generally very good, with the majority of candidates gaining four marks or more out of six. Answers were commonly clearly worded and well structured, allowing the candidate to gain the quality of written communication mark as well as marks for the content of their answer.

3d(i) Most candidates scored here.

3d(ii) Few scored this mark, with many just giving 'pipette' and not qualifying it with volumetric or graduated.

3d(iii) Many gained both marks here and few failed to gain credit.

3d(iv) Again, most candidates scored this mark, clearly showing their understanding of the link between parts **(iii)** and **(iv)** of the question.

3d(v) Nearly half of candidates scored all three marks here, with a common reason for only scoring two being a lack of understanding of the term '3 significant figures' (or the candidate failing to notice that part of the instruction).

Question 4
The quality of answers to this question was generally very good, although low marks on parts **b(ii)** and **(d)** resulted in weaker performances for some candidates.

4a(i) Most failed to gain this mark, with some very odd answers being offered – including water.

4a(ii) Only a quarter of candidates scored all three marks, with a common error being carbon dioxide as the third most abundant gas, rather than argon. Two thirds of candidates scored two marks or more here.

4b(i) Few failed to score here and about half the candidates gained both marks, with burning fossil fuels and deforestation being the most commonly given correct responses.

4b(ii) Only the best very candidates scored full credit here, with a third of candidates failing to score at all. Low scoring answers often referred to vibrations of the molecule rather than its bonds and many could not relate the vibrations to the warming of the atmosphere.

4c(i) Few candidates failed to score here and the majority gave well worded answers that clearly explained the concept of chemical equilibrium and its impact on the HCO_3^- concentration.

4c(ii) About half the candidates scored this mark.

4d(i) Only a third of candidates gained this mark, with those who failed to score often giving a vague response about being harmful to humans.

4d(ii) Most candidates gained both marks here.

4d(iii) Only a third of candidates gained both marks and a third failed to score at all. Answers were often poorly worded and did not explain where in the atmosphere the processes they were describing take place.

4e(i) Most gained this mark.

4e(ii) Many gained full credit here, with clearly worded definitions.

2849 Chemistry of Materials

General Comments

The paper gave a wide spread of marks and candidates of all abilities were able to show their knowledge and understanding; there are still a significant number who would be better advised to wait until the June examinations, since they lack both knowledge and the necessary examination skills to make the most of their ability.

Several important groups of chemical ideas remain a stumbling block for many, although some centres have clearly grasped the nettle in tackling these areas; optical and geometrical stereoisomerism are much confused, as are the different branches of spectroscopy and electrode potentials remains a mine field.

The overall quality of written communication and answer presentation by candidates other than the most able continues to deteriorate; spelling, grammar and use of correct technical words are poor and there was little evidence of planning for the longer answers, as seen particularly in their responses to the effect of temperature change on polymers and why enzymes are specific in their action.

There was a marked improvement in the candidates' ability to tackle calculations; candidates across the whole ability range successfully used the correct equations, whilst clearer presentation enabled most to gain credit when errors crept in. Centres are to be commended for their obvious efforts in tutoring candidates to include their working. Many however were ignorant about the meaning of 'appropriate significant figures'.

Although knowledge of chemical reactions was slightly better than last year, many still had problems in trying to construct equations of all types, balancing seems to have gone out of fashion.

Comments on Individual Questions

Question 1
Candidates found this the easiest of the questions and many scored well.

1a(i) Some failed to identify the correct repeating unit, this must contain the appropriate structures from the two monomers; they started with a benzene ring and ended by drawing a complete amide group on the second benzene.

1a(ii) The commonest errors were drawing an N-H group as the amine or naming it as an amide. Sometimes only one -COOH group was shown

1b Many gained two marks, although few recognised that the appropriate H is attached to an electronegative N which requires a δ- charge. Sometimes the lone pair on the O was missing or not aligned with the hydrogen bond.

Tip for candidates:
First draw in the appropriate lone pair, draw in the 3 relevant partial charges and lastly draw the hydrogen bond from the lone pair to the appropriate atom.

1c Part **(i)** was fine and most understood the implication that flat molecules could pack more closely leading to stronger intermolecular forces. However a significant number argued that flat molecules are able to slide more and hence Twaron's strength would be weaker.

Most candidates correctly identified T_g as the temperature where polymers become brittle and also wrote about Tm, but always identify it as the melting point. Too many tried to explain the changes in terms of crystallinity or amorphous regions instead of discussing the movement or otherwise of polymer chains. Candidates need to be reminded that when a force is applied to a polymer below its T_g value, it is the polymer chains that break.

A few unfortunately failed to score the QWC mark for, poor spelling, illegibility, writing in capitals or no knowledge of basic grammar.

1d Conditions fine but concentrated sulphuric acid was often incorrectly used as the reagent

Question 2

2a There were a lot of confused answers indicating that many did not really understand the purpose of 'refluxing'; Sealed systems were common and many referred that its purpose was to prevent the loss of products rather than volatile compounds.

2b(i) Very poorly done, most failed to refer to mass spectra, rather discussing the difference in structures of the two compounds without reference to the effect this would have on the mass spectra; fragmentation patterns were often suggested as being different, but vaguely so. Some confused the different types of spectroscopy using both infrared and n.m.r. data.

2b(ii) Many just described two differences without explaining why they would allow the compounds to be distinguished.

2b(iii) Many failed to gain the mark because of insufficient detail; both range and units were required. It was common to see the answer given as 'peak/trough around 3600'.

2b(iv) Excellent, nearly everyone had successfully learned this.

2c(i) Many decided on 'hetero' despite being asked about systematic naming.

2c(ii) The first mark for 'restricted rotation' about the C=C bond was the more common, most failed to recognise the need for different groups.

Misconception:
Geometric isomerism was often confused with optical isomerism, sometimes even when trans had correctly been identified in part **(i)**.

2d(i) Very few were able to give a quantitative method; the commonest error was use of indicators, sometimes coupled with a colorimeter.

2d(ii)-(iv) Graphs were generally well drawn, though the use of the graph in part **(ii)** often lacked detail and suggested that the variation of the rate with concentration could be determined from a single gradient measurement.

Question 3

3a Oxidation state calculations are good, some, even good candidates, made careless errors. It is always worth a check to see that the sign has been included.
Many chose vanadium as a suitable metal, showing that they were already on a slippery downhill slope with this question.

3b The ions of vanadium are an integral part of the course, but it was answered by most candidates as if it was completely new material. Not that this really mattered since all the required information was given.
However few were able to correctly explain that the final colour of the solution would be blue.

Tip for candidates:
Understanding the significance of the values of standard electrode potentials is the key to solving this type of question.
You need to recognise that oxygen will only oxidise (grab electrons from) those ions which have a more negative (or less positive) standard electrode potential. In this case oxygen will oxidise V(II) to V(III) then to V(IV) but NOT to V(V).

Most could not identify why acid was added, thinking that it was probably a catalyst.

3c Nearly everyone understood shapes of complexes, bonding by ligands and complex reactions. The only point to watch is the ligand bonds by dative/coordinate bonding rather than just covalent.

Question 4

4a The half-equations in parts **(i)** and **(ii)** were well attempted though, as in previous papers, the electrons were either omitted, left unbalanced or located on the wrong side of the equation.

Tip for candidates:
With half- or ionic equations, check that both the mass and charge on each side of the equation balance.

Few were able to identify oxygen as the oxidising agent for the iron(II) conversion to iron(III); the commonest answers were water and hydroxide ions.

Part **(iv)** also proved exceptionally difficult; even though the question asked for an ionic equation, state symbols not required, for the precipitation of iron(III) hydroxide, most wrote an equation for the precipitation of iron(II) hydroxide or tried to conjure up something that would equate with 'rust', $Fe_2O_3.xH_2O$.

4b A much better understanding of acidity was shown by candidates of all abilities than on previous papers; the main error was the discussion of H loss instead of proton/H+.

The structural formula of the dicarboxylic acid was often correct though some forgot to include the charges. (A common error throughout the paper where ions are involved.)

The hydrolysis of a secondary amide was well known but many failed to recognise that the amine group would be protonated in acid.

There were a lot of 'woolly' answers for the last part; the word specific, given in the question was seized upon and over used without any reference to the shape of the active site or the reaction being carried out. Many answers also focused on the 'specific' overall shape of the enzyme explaining how the various interactions were responsible.

Tip for candidates:
In answering questions involving enzymes:
USE words/phrases like 'active site', 'substrate', ' interactions between the active site and substrate', 'the shape of the substrate allows it to fit in the active site' etc.
DO NOT USE, 'lock and key'.

Question 5

5a Naming of the ester was good, a few propyl ethanoates.
Two problems were common in the alkaline hydrolysis in part **(ii)**; the charge on the hydroxide was often omitted and the carboxylic acid was drawn rather than the carboxylate ion. In addition some turned ethanol into an alkoxide ion, despite stating in a previous question that alcohols are not acidic.
Reagents were generally sorted though a number do like to use concentrated sulphuric acid for everything!
Most got the structure for ester grouping correct, errors were made in attempting to draw out the side chains. $C_{17}H_{33}$ is not saturated.

Tip for candidates:
Do NOT attempt to draw full structural formulae unless you are asked to do so. It is easy to make a mistake.

5b There was a significant improvement too in the ability to construct an equilibrium expression, though deducing the correct units was much less certain.
Again there were many excellent answers to the equilibrium calculation; by far the commonest error was to give the answer to 2 significant figures instead of 3.
In part **(iii)** many failed to answer the question asked by stating that 'more products would form' rather than describing where the equilibrium position would lie.
Again in part **(iii)** some described the effect on position of equilibrium instead of the effect on K_c.

2850 Chemistry for Life

General Comments

This paper seemed to perform well, with few candidates failing to finish and almost all writing full answers to most parts.

The experimental design in part **2d** was the weakest area overall. Calculations were reasonable and long answers were mostly coherent.

Question 1

1a(i) Most candidates were correct here, but some gave 20ºC

1a(ii) This was again often well done. Some selected the wrong data and some failed to multiply by 2 and 3 correctly. Some worked out 'reactants minus products'.

Tip for candidates:
Always give a sign with your answer in ΔH calculations, even if it is positive.
Numerical answer: –1368

1b(i)&(ii) The bond angle here was often incorrect, 180 being a common error. The explanation was often quite well done, with the four groups of electrons identified as being around the oxygen atom. Relatively few fell into the linguistic trap of saying that the electrons 'repelled as much as possible'.

Tip for candidates:
In such questions, remember to count the 'groups of electrons' and specify the atom around which you are counting them.

1b(iii) The majority scored here, the commonest error being 'ester'.

1b(iv) Most got this right.

1b(v) This was very well understood.

Question 2

2a(i) There was a high scoring rate here with just a few putting 56Fe. A few candidates left this question out altogether.

2a(ii) This was usually correct, with just a few getting the number of neutrons wrong.

2a(iii) Usually well done.

2b There was a lack of attention to detail here. Some candidates drew the ions quickly in an irregular way, and some labelled them 'protons' or 'nuclei'. Some did not use the words 'delocalised' or 'free' to describe the electrons. Many failed to answer the second sentence and describe how the structure is held together. Those that did, did not always make it clear that it was an attraction between positive and negative charges. A few candidates left this question out.

2c(i) This was often well done. Some gave the Fe(III) to Fe(IV) equation and some did not indicate that the ions must be gaseous.

Tip for candidates:
Ionisation enthalpy equations are one of the few areas where you need to give state symbols without being asked.

2c(ii) Many candidates got this right. A few did not subtract to get the mass of oxygen and rather more did not have the courage of their convictions and 'rounded' 3:4 to 1:1. Numerical answer Fe_3O_4

2c(iii) Most scored for the balanced equation but some did not notice that the iron was molten, or made the iron oxide molten as well.

2d(i) This was not well done. 'Alkaline' was not accepted.

2d(ii) This was poorly done. X was not always identified as 'limewater' and very few gave any indication of making it a 'fair test'. There were many vague answers, for example 'from the time it takes to go cloudy, one can tell the thermal stability of the carbonate', without specifying how the time was related to the stability.

2e(i) This was nearly always correct.

2e(ii) Most candidates scored one mark for mentioning dangers to health or cancer-inducing. Fewer went on to talk about damage to cells or mutations.

Tip for candidates:
Never use the word 'harmful' on its own; always give more detail.

Question 3

3a There were many examples of full marks here. The commonest error was to describe benzene as an alkene.

3b(i) Most could draw a correct isomer, though some placed the 'branch' on an end carbon. Fewer could name it correctly. Errors such as '2,2-methylbutane' were the commonest.

Tip for candidates:
Design such formulae in the margin and then draw the real thing, in ink, in the box. Cross through your working before moving on

3b(ii) Most scored all three marks. The commonest, though rare, error was to reverse 'reforming' and 'cracking' in the second and third parts. In the first part, candidates who were not aware of the erratum details were allowed 'cracking'.

3c Candidates have never been good at drawing diagrams and they do not seem to have improved. Some left the question out, presumably, here, through lack of knowledge of what was required. Quite a proportion were unaware of what they should be drawing. Those who designed the apparatus approximately correctly often put the catalyst in a delivery tube and failed to heat it. Collection over water was a concept that not all could represent correctly. Rulers were infrequently used but there were very few 'gaps' between pieces of apparatus, examiners were pleased to note.

Tip for candidates:
Use a ruler to draw apparatus and label heat sources reagents and water levels carefully. Always draw a cross-section with free passage for gases.

3d Almost all candidates scored in both parts here.

3e This was reasonably done, though some gave hydrogen as the other product.

Question 4

4a(i) This was reasonably done, with relatively few drawing a covalent structure. The commonest error was a single negative charge on the sulphur.

4a(ii) This was only reasonably done. Most had the idea of the electron falling through energy levels, emitting light, but relatively few said that the frequency of the light was proportional to the energy gap or gave the equation. Even fewer said that there were several different energy gaps thus giving a set of lines.

4b(i) The powers of ten seemed to confuse some candidates. A few missed dividing by two to obtain the moles of dihydrogen and there were quite a few answers to three or more significant figures.
Numerical answer 2.1 x 109

4b(ii) Finding three reasons is always going to increase the difficulty. Many, however, found at least two. 'Hydrogen is readily available as it is found in the air' cropped up on occasions. The renewability of hydrogen was allowed but not its ready availability. 'Water is the product' was not sufficient, but 'Water is the only product' did score as well as the more complete 'Water is the (only) product and there are no polluting gases'.

4b(iii) Many were confused by the fact that the number of molecules decreased in the reaction and did not realise that the liquids turning to gases would have a much larger effect on the entropy change. The mark-scheme was allowed credit for answers that followed from 'decrease' or 'stays the same'.

2854 Chemistry by Design

General

This paper was taken by just over one hundred re-take candidates, rather more than in past years. There were very few marks in triple figures and relatively few really low marks below thirty-five. Understanding of molecular spectroscopy, mole calculations and g.l.c. was particularly good and the drawing of organic structures was very respectable. Conditions for organic reactions were poorly remembered, however, and understanding of atomic spectra was variable.

Question 1

1a Most scored this mark

1b(i) Nearly all candidates scored here

1b(ii) The majority of candidates could do this

1b(iii) Here, very few understood what was required. Most started by assuming that the concentration of benzoate was equal to that of hydrogen ions. Of those who saw what was required, the majority worked out the ratio of [salt]:[acid] rather than [acid]:[salt].

1c(i) Most answers here showed that the mode of action of buffer solutions was at least reasonably understood. Even the idea of 'reservoirs' of HA and A^- was mentioned on quite a few occasions.

1c(ii) A very straightforward answer was all that was required here 'Buffers solutions hold the solution at a pH which is not the optimum for the enzyme'. Relatively few scored both marks, however.

1d(i) This was often right, though a few negative charges were seen on the OH and 'lone' was fairly often erroneously suggested as a substitute for 'unpaired'.

1d(ii) Very few scored here, since the word 'decomposition' was not picked out of the question.

1d(iii) The correct equation would have led to the answer 'catalyst' but some got this anyway.

1d(iv) Many got the two species, with a reasonable number putting on the positive charge.

1e This was an example of an organic structure that was well done by most.

1f(i) This, however, was an example of candidates not knowing reaction conditions. Aluminium chloride and chloromethane were slightly more popular than the correct answer.

1f(ii) This was variable. There was the usual lack of use of rulers, but few lost marks through leaving gaps through which the vapours would escape. On the contrary, some of the condensers were sealed. Incorrect labelling of the water connections lost a lot of marks.

Question 2

2a(i) On the whole this was well done.

2a(ii) Quite a proportion of candidates lost the mark here by failing to mention that the double bond was between *carbon atoms*.

2a(iii) This elementary test was known by a reasonable proportion of candidates.

2a(iv) This answer, from a relatively obscure part of the course, was less well-known, though several scored both marks.

2b Many knew this. Several marks were lost for failing to mention that the stationary phase was an *involatile* liquid.

2c There were a lot of correct answers here.

2d Some candidates did not grasp what was required of them. Those that did scored several marks, provided they realised that they should write about emission not absorption. The idea of different *gaps* between energy levels in different elements was the most difficult mark to score.

Question 3

3a(i) About half the candidates got this correctly.

3a(ii) Many said that lead was in Group IV but few then said how this related to the formula.

3a(iii) There were many correct answers, but a lot gave extra shells.

3b(i) Many scored one mark here, but relatively few scored two.

3b(ii) Many scored this mark.

3b(iii) A reasonable number said ‘reduction’ and justified it but some said ‘redox’ which is not relevant here.

3b(iv) Not many could see their way to the simple answer (eg ‘taking in electrons’) required here.

3b(v) Very few got this right, the clue being in the stem of the question at the top of the page.

3c Such questions seldom score well. Some failed to read in the question that lead oxide was insoluble, others tired to explain the yellow colour. Most scored the quality of written communication mark.

3d(i) Quite a few scored one mark for showing lead oxide reacting with some acid on the left, but few could produce a balanced equation.

3d(ii) This also proved difficult. Of course a straight ‘no’ did not score as it is a ‘50/50’.

Question 4

4a Most could do this.

4b(i) Many could name 'amide' but not all drew the full structural formula correctly, several being confused by the fact that it was a group, not a compound.

4b(ii) Ethanoic acid was an answer which, though wrong, was on the right track. Of those who got either the name or the formula of ethanoyl chloride correct, quite a number got the formula or the name wrong.

4b(iii) This was poorly done, in common with other questions requiring knowledge of reaction conditions.

4c Many failed to realise that the pharmocophore had to fit on to a receptor site on the bacterium or one of its enzymes and block its action.

4d This question was well-answered, showing that most candidates had a good knowledge of infrared and n.m.r. spectroscopy. Some thought they saw a ketone group in the structures and others claimed there was a CH_3NH group in the amide, but these were the only common errors. Many answered well, using correct technical terms, and scored the two marks for quality of written communication.

4e(i) This was the best of the reaction condition questions, with many candidates being able to transfer the conditions they knew for making bromobenzene to the fluorine situation.

4e(ii) Most could score one mark for mentioning a positive reagent, but very few mentioned that the lone pair to which it was attracted formed a covalent bond with the electrophile.

4e(iv) There were many equations forming hydrogen gas and candidates seemed unaware that this would react with fluorine to form HF.

Question 5

5a(i) There were quite a lot of correct answers, though there were many with [$CaCO_3$] on the bottom of the expression.

5a(ii) Only a few realised that the molar concentration of calcium carbonate was the same as the calcium ion concentration, which was the square root of the solubility product.

5b(i) –19, achieved by adding all the numbers together, was almost as common as the correct answer (–204.8).

5b(ii) An A2 definition of entropy in terms of number of ways of arrangement was required here which meant that fewer candidates scored.

5b(iii) Many appreciated the high charge density of the calcium ion, and that this caused the attraction of many water molecules. However, the link to decreased entropy was seldom made.

5c The main problem here was in reconciling the kJ and J units. Those who did this often scored two marks, especially as there was 'error carried forward' from part **b(i)**.

5d There were some good answers here that scored the four points in a logical manner. Some indication of the meaning of Le Chatelier's principle (eg 'to oppose the change') was quite often lacking. Error carried forward was allowed where possible when a candidate made an error earlier in their answer and then followed it through correctly.

5e Many had no memory of K_w and thus found both parts difficult.

5f(i) The paper ended with some easy questions. Nearly all scored on this one.

5f(ii) Most coped with the tonne units here and most gave the answer to two significant figures.

2855 Individual Investigation

General Comments

The entry for this component was very small, consisting of only sixteen candidates from nine Centres. Other Centres had made entries but candidates were withdrawn after the entry had been made.

Only two of the sixteen marks awarded by Centres were found to be outside the tolerance allowed by OCR. In one case the marks awarded were too generous and in the other case the marks awarded were too harsh.

Many candidates choose to investigate reaction kinetics and carried out their investigations effectively. In a small number of cases the investigation chosen was of limited demand and did not allow the candidates to access the higher mark levels.

The annotation of candidates' work to show why marks had been awarded in each skill area was often excellent. Some Centres devised and used their own 'tick lists' based on coursework descriptors which also assisted the process of moderation.

Comments on Individual Skill Areas

Planning

To meet the descriptors at level 11 it is necessary for candidates to include fine detail of their plan. This should include fine detail of experimental procedures as well as comprehensive coverage of the background chemical ideas which have been researched while devising the plan. Risk assessments of solutions such as acids should be appropriate to the concentrations of the solutions actually used in the investigation.

References:

It has become increasingly common for candidates to include references to the internet. These should contain a brief description of the content of the link and not simply be a complicated web address. References to books should include appropriate page numbers.

Implementing

In order to match the descriptors at the highest mark levels it is expected that the data recorded will be of high quality. It is therefore expected that similar readings will be obtained where experiments are repeated several times or that that the experiment will be further investigated if there are significant difference in data from repeated experiments.

Analysing

In some cases, candidates did not meet the higher level descriptors because they did not clearly link their conclusions with underlying chemical knowledge and ideas. In other cases, conclusions were superficial and tended to describe rather than evaluate the collected data.

Evaluating

The identification of sufficient limitations of experimental procedures was often less well done than the calculation of percentage uncertainties and this prevented candidates from accessing the highest mark levels. Sometimes there were sufficient comments on experimental procedures but they were not sufficiently relevant.

Grade Thresholds

Advanced GCE Chemistry (Salters) (3887/7887)
January 2009 Examination Series

Unit Threshold Marks

Unit		Maximum Mark	A	B	C	D	E	U
2848	Raw	90	73	66	59	52	45	0
	UMS	120	96	84	72	60	48	0
2849	Raw	90	69	62	55	48	42	0
	UMS	90	72	63	54	45	36	0
2850	Raw	75	59	54	49	44	39	0
	UMS	90	72	63	54	45	36	0
2854	Raw	120	85	75	66	57	48	0
	UMS	120	96	84	72	60	48	0
2855	Raw	90	76	68	60	52	44	0
	UMS	90	72	63	54	45	36	0

Specification Aggregation Results

Overall threshold marks in UMS (ie after conversion of raw marks to uniform marks)

	Maximum Mark	A	B	C	D	E	U
3887	300	240	210	180	150	120	0
7887	600	480	420	360	300	240	0

The cumulative percentage of candidates awarded each grade was as follows:

	A	B	C	D	E	U	Total Number of Candidates
3887	11.1	35.8	62.1	84.1	96.0	100.00	608
7887	14.3	41.1	67.0	93.8	99.1	100.00	116

724 candidates aggregated this series

For a description of how UMS marks are calculated see:
http://www.ocr.org.uk/learners/ums_results.html

Statistics are correct at the time of publication.

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