UNIVERSITY OF MALTA

SECONDARY EDUCATION CERTIFICATE
SEC

CHEMISTRY
May 2013

EXAMINERS' REPORT

MATRICULATION AND SECONDARY EDUCATION
CERTIFICATE EXAMINATIONS BOARD

SEC Chemistry
May 2013
Examiners' Report

1. General Statistics

The number of candidates opting for Papers I and IIA was 704, while 119 candidates opted for Paper I and Paper IIB. Thus a total of 823 candidates applied for SEC Chemistry in the May 2013 session. The details regarding the candidates' performance are shown in Table 1.

Table 1: Number and percentage of candidates per grade – May 2013 session

Grade		1	2	3	4	5	6	7	U	abs	Total
PI & PIIA	**N**	85	135	151	132	80	~	~	115	6	704
candidates	**%**	12.07	19.18	21.45	18.75	11.36	~	~	16.34	0.85	100.00
PI & PIIA	**N**	~	~	~	9	16	15	14	62	3	119
candidates	**%**	~	~	~	7.56	13.45	12.61	11.76	52.10	2.52	100.00
All	**N**	85	135	151	141	96	15	14	177	9	823
candidates	**%**	10.33	16.40	18.35	17.13	11.66	1.82	1.70	21.51	1.09	100.00

The information in Table 1 is reported graphically and plotted in three separate graphs: the percentage of Paper I and Paper IIA per grade in Figure 1, the percentage of Paper I and Paper IIB per grade in Figure 2, and the percentage candidates considering the whole population of candidates in Figure 3.

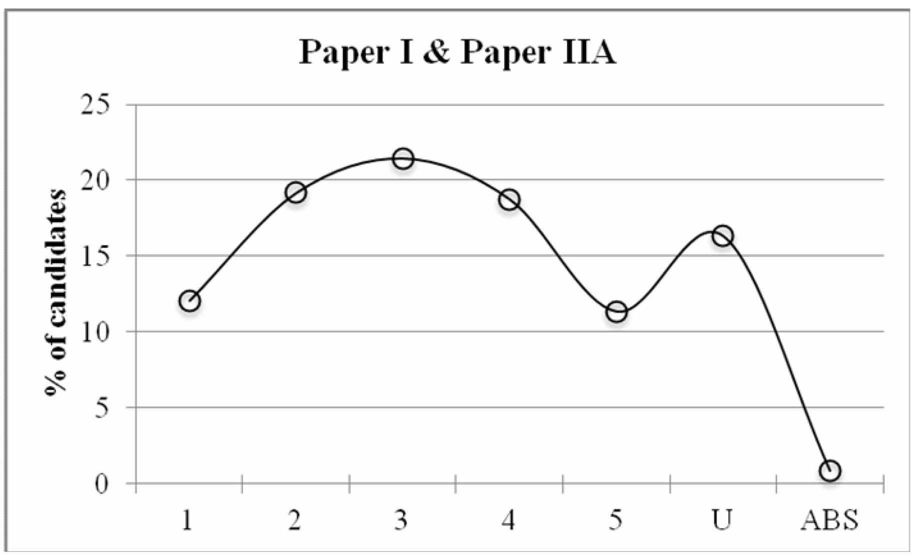

Figure 1: Percentage of Paper I & Paper IIA candidates per grade – May 2013 session

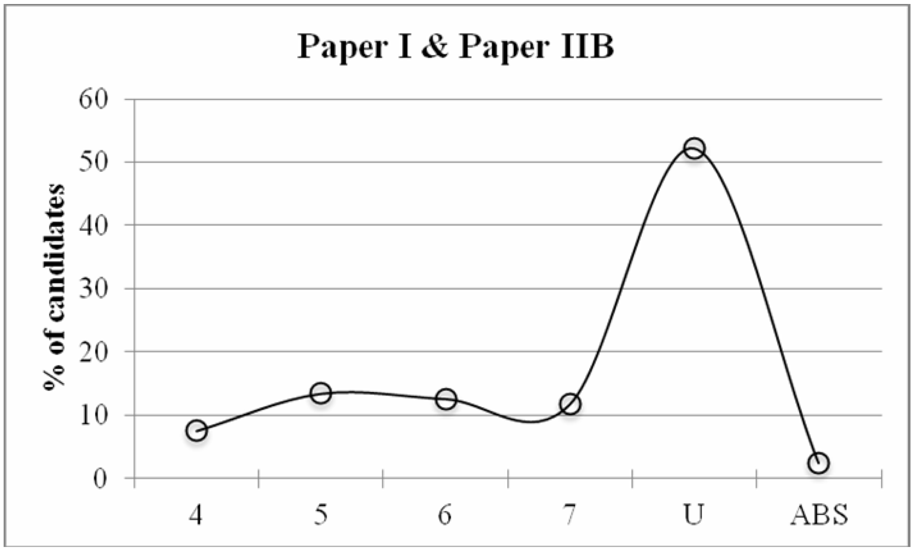

Figure 2: Percentage of Paper I & Paper IIB candidates per grade – May 2013 session

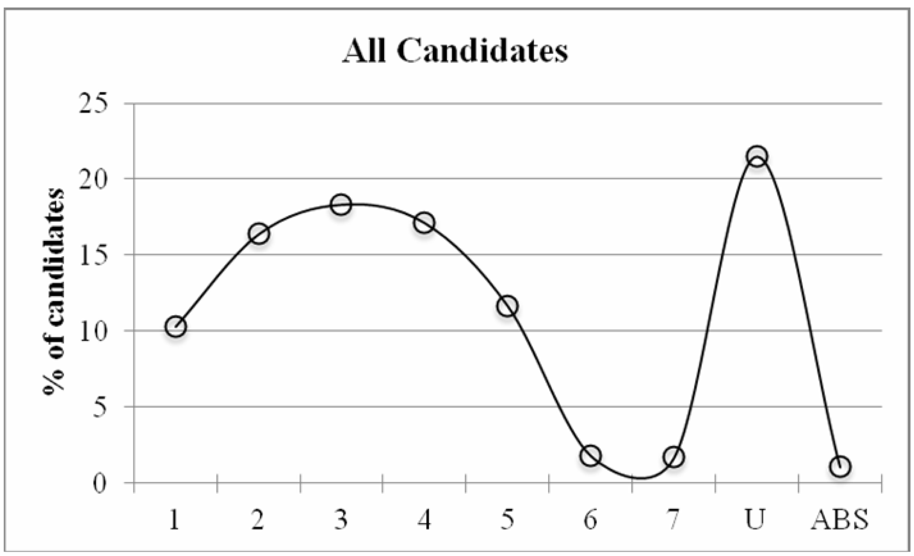

Figure 3: Percentage of candidates per grade – May 2013 session

2. Candidates registering for the May session: 2006 to date

Table 2 shows the number of candidates (and respective percentages) registering for SEC Chemistry in the May session since 2006. The numbers of candidates registering for Option A and Option B respectively are shown separately for each year.

As can be seen from the data in Table 2, there was an increase in the number of candidates registering for SEC Chemistry from 863 in 2006 to 1009 on 2008 whilst there was then a steady decrease in the number of candidates sitting for SEC Chemistry with the lowest number in these last eight years – at 823 – registered in this last May 2013 session. It is evident that the proportion of SEC Chemistry candidates choosing option A was always considerably higher than the fraction of those taking option B. The percentage of candidates choosing option A in May 2013 has been the highest since 2006, at 85.5%.

Table 2: Number and percentage of candidates per option per year – 2006 to 2013

	Option A		Option B		Total
Year	**N**	**%**	**N**	**%**	**N**
2006	655	75.9	208	24.1	863
2007	779	78.1	218	21.9	997
2008	784	77.7	225	22.3	1009
2009	725	79.2	190	20.8	915
2010	721	79.4	187	20.6	908
2011	644	77.0	192	23.0	836
2012	698	84.6	127	15.4	825
2013	704	85.5	119	14.5	823

3. Statistics for each individual paper

Tables 3 to 6 depict data for the Paper I and Paper IIA candidates:
(i) Table 3 reports general statistical information about Paper I, namely, the maximum mark, the number of candidates that scored zero marks, the three common measures of central tendency (mean, median and mode) and the standard deviation for every question;
(ii) Table 4 reports the same information and data about the questions in Paper IIA;
(iii) As candidates had to choose two questions out of four in Section B of Paper IIA, Table 5 gives the choice per question in Section B of Paper IIA (two out of four) in terms of raw numbers and as a percentage; and
(iv) Table 6 reports the number of Paper I and Paper IIA option candidates (excluding the absentees) that scored zero marks, together with the three common measures of central tendency (mean, median and mode) and the standard deviation when considering the candidates' global percentage mark.

Table 3: PI & PIIA candidates – Data for Paper I

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Total
Max mark	**6**	**7**	**4**	**5**	**9**	**6**	**6**	**6**	**6**	**5**	**20**	**20**	**100**
No. of zeroes	116	0	9	72	92	9	7	5	7	12	4	102	0
Mean (raw)	3.3	5.5	2.7	3.26	3.2	3.6	4.5	4.6	3.9	3.3	11.1	6.2	55.3
Mean (%)	55.4	78.1	68.5	65.27	35.5	60.0	75.3	76.9	65.6	65.8	55.5	31.2	55.3
Median	3.0	5.0	3.0	4.00	3.0	4.0	5.0	5.0	4.0	3.0	12.0	4.0	55.0
Mode	6.0	7.0	4.0	5.00	4.0	4.0	6.0	6.0	5.0	4.0	12.0	0.0	48.0
Standard dev.	2.3	1.5	1.1	1.71	2.1	1.6	1.4	1.4	1.5	1.2	4.7	6.0	20.0

Table 4: PI & PIIA candidates – Data for Paper IIA

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q1	
Max mark	5	8	6	8	6	6	6	6	5	4	20	20	20	2	
No. of zeroes	20	0	39	63	45	78	19	43	38	59	14	11	7	C	
Mean (raw)	2.8	5.8	4.1	4.0	3.9	3.0	4.3	4.1	2.8	2.3	11.8	8.9	9.4	11	
Mean (%)	55.5	73.1	68.5	50.0	64.6	49.7	71.8	68.7	55.7	58.1	59.1	44.7	46.9	59	
Median	3.0	6.0	5.0	4.5	4.0	3.0	5.0	5.0	3.0	2.0	13.5	9.5	10.0	12	
Mode	3.0	7.0	6.0	5.0	6.0	5.0	6.0	6.0	4.0	3.0	16.0	12.0	10.0	11	
Standard dev.	1.3	1.5	1.9	2.3	2.0	1.9	1.9	1.9	1.3	1.2	5.6	4.7	4.9	3.	

Table 5: PI & PIIA candidates – Choice in questions 11 to 14 in Paper IIA

Question No.	Q11	Q12	Q13	Q14
No. of choices (N)	279	345	196	560
No. of choices (%)	39.63%	49.01%	27.84%	79.55%

Table 6: PI & PIIA candidates – Data for final global mark (excluding absent candidates)

Number of zeroes	7
Mean (%)	60.1
Median (%)	62.0
Mode (%)	0.0
Standard deviation	19.0

Likewise, Tables 7 to 10 report the data for the Paper I and Paper IIB candidates, giving similar information as that depicted in Tables 3 to 6 respectively.

Table 7: PI & PIIB candidates – Data for Paper I

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Total
Max mark	**6**	**7**	**4**	**5**	**9**	**6**	**6**	**6**	**6**	**5**	**20**	**20**	**100**
No. of zeroes	51	1	4	33	56	6	11	8	17	17	13	58	0
Mean (raw)	1.1	4.1	1.5	1.56	1.0	2.0	2.5	2.9	2.0	1.9	4.1	0.9	25.6
Mean (%)	18.2	58.2	38.5	31.11	11.5	32.7	41.3	48.8	33.6	38.9	20.6	4.4	25.6
Median	1.0	4.0	1.5	1.00	0.0	2.0	2.5	3.0	2.0	2.0	3.5	0.0	23.8
Mode	0.0	5.0	0.5	1.00	0.0	1.0	2.0	2.0	1.0	2.0	1.0	0.0	25.5
Standard dev.	1.4	1.4	1.0	1.5	1.4	1.1	1.5	1.7	1.5	1.3	3.4	1.3	12.0

Table 8: PI & PIIB candidates – Data for Paper IIB

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Total
Max mark	6	6	6	6	6	6	6	6	6	6	20	20	20	20	**100**
No. of zeroes	22	3	39	15	23	53	9	1	22	11	19	7	7	4	0
Mean (raw)	1.7	3.8	1.9	1.7	1.5	1.0	3.0	2.6	1.8	2.3	2.1	4.4	3.6	7.9	31.8
Mean (%)	29.0	62.6	31.3	27.8	25.6	16.4	50.4	43.4	29.6	37.8	10.6	21.9	18.1	39.3	31.8
Median	2.0	4.0	1.5	1.0	1.0	0.8	3.0	3.0	2.0	2.0	1.0	3.0	2.0	8.0	31.3
Mode	2.0	5.0	0.0	1.0	1.0	0.0	3.0	3.0	1.0	2.0	0.0	0.0	1.0	12.0	38.5
Standard dev.	1.2	1.5	1.9	1.4	1.3	1.2	1.7	1.1	1.4	1.4	2.8	4.4	3.8	4.0	13.8

Table 9: PI & PIIB candidates – Choice in questions 11 to 14 in Paper IIB

Question No.	Q11	Q12	Q13	Q14
No. of choices (N)	41	31	50	94
No. of choices (%)	34.45%	26.05%	42.02%	78.99%

Table 10: PI & PIIB candidates – Data for final global mark (excluding absent candidates)

Number of zeroes	4
Mean (%)	31.8
Median (%)	33.3
Mode (%)	0.0

Standard deviation	14.6

4. Markers' comments

School-based assessment: Practical reports

In general, the practical reports that were presented for school-based assessment were of the desired level and satisfied the requirements as exposed and expected in the syllabus.

The examiners note that, at times, teachers can carry out more thorough correction by indicating also the faults and mistakes in structure and general grammar present in candidates' reports. Although marks are not assigned, and are not deducted for the latter defects, one should realise that such indications consolidate the candidates' general competencies of written expression and should be parallel to teaching taking place in other areas.

Paper I – Section A

Q1. This question spanned topics since it tested the composition of air using tests for gases and for water, including the use of observations while incorporating everything by representing the reactions using balanced equations. The answers ranged from very good to very poor. The colour changes expected were sometimes completely off with answers to part (a) incorrectly stating that in (i) a brick red solid forms and that in (ii) there is evidently a pungent smell and a rusty coloured solid. Similarly it is not correct to say in (ii) that a blue 'solution' forms.
It is to be noted as well that the opposite of anhydrous is hydrated.
In (b) several candidates were not familiar with the formula $CuSO_4.5H_2O$. Some answers showed reaction with $CaSO_4$ rather than $CuSO_4$ while several others attempted equations for reactions of $Ca(OH)_2$ and $CuSO_4$ respectively with O_2 rather than with the corresponding constituent present in a sample of air.

Q2. (a) Most candidates scored full marks although a few gave the mass number for R as being 35.5.
(b) The answer should have been in terms of Q and R as stipulated in the question.
(c) The answers were in the great majority correct but great attention must be given to spelling of technical terms, e.g. 'convalent', 'covaliant', 'ioning'.

Q3. (a) A significant number of candidates showed a lack of understanding of the relation between molecule length and boiling point as a consequence of different intermolecular attractive forces. Thus they were not able to apply the idea to deduce which substance was most probably a liquid.
Incorrectly written technical/chemical terms were very common, e.g. 'etyene', 'ethine', 'ethayne', 'ethyene'. It is to be noted as well that the correct spelling is pentane and not 'penthane'.
Several correct answers were given to parts (b) and (c).

Q4. (a) In the definition of isotopes, the absolute majority said that isotopes 'have the same number of protons but a different number of neutrons' but seemed not to grasp the idea that isotopes are actually atoms of the same element. Several incorrect explanations for the term 'isotopes' were given, e.g. 'same elements', different 'forms' instead of different 'atoms', 'neurones' instead of neutrons etc. The word 'atoms' was often missing. Some mistook isotopes for isomers.
(b) Most calculations were correct although in a number of cases the answer was incorrectly rounded off from 6.93 to 7.

Q5. (a) The descriptions for the flame observed when propane burns in oxygen were numerous and varied, and in some cases were off as 'straight', 'strong', 'not wavy', 'hot'.
(b) Several incorrect equations were submitted, many of them including H_2 as one of the products. This then obviously had a ripple effect on the answer to part (c).
(c) This part was not well-attempted even by some of the candidates who had a correct equation to work on from part (b). Several failed to realise that oxygen gas was present in excess. Others attempted to invoke 22.4 dm^3 or even included the volume of liquid water.

Most candidates mentioned the right products and deduced the right balanced equation. The majority of candidates however failed to apply Gay-Lussac's law correctly, failing to realise that there was an excess of $10cm^3$ of oxygen in the original reaction mixture.

Q6. (a) The answers ranged from perfectly correct to pure guesswork. However a very high percentage scored the mark for part (iv).
(b) An incorrect answer given to (a)(iii) obviously could not get the marks in part (b). Some of the candidates who got (a)(iii) correct often gave an incorrect equation in part (b), or else gave HNO_3 as the only product.

Q7. (a) It was surprising to come across several incorrect formulae for zinc chloride. This is very disappointing considering that chemistry needs to be based on a sound knowledge of valencies and hence formulae.
(b) Various parts of the apparatus were incorrectly labelled, e.g. conical flask labelled when a different type of flask is shown. Various types of funnels, plausible or otherwise were drawn. Obviously, using a burette instead of a dropping funnel is not normal laboratory practice. Some diagrams showed collection of the gas over water, when the question actually specified that the gas was collected in a gas syringe.
The types and variations of the diagrams presented tend to suggest that unfortunately some candidates are not familiar with standard basic laboratory apparatus.
(c) Mostly well-answered, with candidates noting that the plunger moves out and the gas burns with a pop when tested.

Q8. (a) Most candidates scored full marks.
(b) (i) A large number of scripts showed incorrect spellings for methyl orange and phenolphthalein. It is imperative that technical terms are written correctly.
(ii) Some answers gave all the colours associated with the various pH possibilities but then stopped short of specifying what the colour would be for lemon juice and the indicator quoted in (b)(i). Of course, tasting the substance is surely not an acceptable test!
It is to be noted that phenolphthalein solution is colourless. So lemon juice will not make phenolphthalein change in colour.
Although, most candidates tackled this question well a significant number of candidates demonstrated a lack of familiarity with indicators other than litmus and universal indicator.

Q9. (a) Most candidates got graphite correct but there were several instances where, instead of allotropes/polymorphs, the term 'isotopes' was incorrectly given as the answer. Most knew the correct names for the allotropes of sulfur although some just filled the spaces with whatever came to mind. One can mention 'diclinic', which does not exist, while 'rhombus' is naturally not an allotrope of sulfur.
(b) A simple test was required as an answer to this question. This consisted of burning the two different forms in air or oxygen and subsequently testing the SO_2 produced using either acidified potassium permanganate (potassium manganite (VII)) or acidified potassium dichromate. Many candidates actually mentioned the combustion of different forms of sulfur to show that they react similarly. However a number did not substantiate their answer by mentioning the product (SO_2) and the visible chemical test demonstrating its formation.

Q10. The majority of candidates fared very well in this question. It was disappointing to note a number of candidates losing marks by just filling in the spaces haphazardly, without even considering whether the resulting sentence made sense chemically.

Paper I – Section B

Q11. (a) A few candidates gave the configuration for Mg rather than for Mg^{2+}.
(b) A significant number of candidates found it difficult to give two specific examples of substances that cause water hardness. The most common answer was calcium hydrogencarbonate and many simply said 'calcium or magnesium ions'. Those answers that

just indicated 'calcium ions and magnesium ions' did not get any credit since the question asked for 'names of substances'. No credit was given for answers saying 'magnesium and calcium' either.
(c) Several misconceptions were evident, e.g. that water reacts with calcium carbonate forming $Ca(HCO_3)_2$.
(d) A number of candidates wrote 'soap does not lather in hard water' as a test for hardness, which is not a reliable test especially when the amount of hardness is low. Moreover a **chemical** test was required, and the formation of a lather or not is not a chemical test.
Parts (e) and (f) were satisfactorily answered.
(g) The examiners were pleased to see some very good answers to this part of the question. Candidates fared quite well in the calculation. The balanced equation most probably helped the candidates keep on track. However it was noted that some 'unorthodox' methods are adopted for carrying out such calculations, resulting in some candidates not really knowing what they are doing. Although trying to find the shortest method for working out a calculation is to be lauded and encouraged, this must not be at the expense of a logical exposition of the working out of a problem. Multiplying the formula mass by 2 from the very beginning very often resulted in candidates losing track of the '2' and hence led to an incorrect answer for the number of moles of sodium hydrogencarbonate. It is grossly incorrect to write 'formula mass of $2NaHCO_3$ = '. Those candidates who adopted this strategy very often divided by 2 again at a later stage, giving rise to an incorrect answer. Working from first principles is recommended and avoids such mistakes.
As a general comment, it was very worrying to note that several candidates were quoting and using all the digits showing on their calculators, rather than giving the answer **at each stage of the calculation** to 3 significant figures.

Q12. This question, aimed at testing the qualitative analysis aspect of chemistry, produced very different results. As a general comment, for several candidates, applying the theory to the laboratory situations that form part of the chemistry syllabus proved rather difficult. Even the better candidates were unable or reluctant to write correct formulae for even simple substances. As stated elsewhere in the report, chemistry requires mastery of formulae and balanced equations rather than being able to write long paragraphs of, at times, irrelevant text.
(a) It was disappointing to see several answers giving incorrect formulae for magnesium nitrate and ammonium sulfate or ammonium carbonate. Such mistakes affected the subsequent equations in part (b).
A number of candidates did not spot the sulfite in the first unknown substance, mentioning sulfate instead, because they failed to realise that the white precipitate produced from the reaction with barium chloride solution was soluble in hydrochloric acid.
(b) The scoring on this part of the question was subsequent to the answers in part (a). As has been stated several times in previous SEC chemistry reports, ammonium hydroxide or NH_4OH are not acceptable alternatives for ammonia solution. NH_4OH cannot be written as a product in an equation but should be given as $NH_3 + H_2O$.
It was disconcerting to find a number of candidates for whom equations do not have any relevance or significance as shown by '$NH_4OH + NaOH$' as part of an equation in part (ii).
(c) Potassium permanganate and potassium dichromate must be used in acid solution. A few candidates indicated the colour changes the other way round, with potassium dichromate starting purple and potassium permanganate starting orange.
(d) The better candidates scored well.
On the whole, candidates found the application of the principles of qualitative analysis quite challenging, as success at this skill was dependent on a sound knowledge and understanding of the qualitative tests highlighted in the syllabus. Thus candidates without the necessary background knowledge did very badly, whereas those with the necessary preparation fared much better. Candidates who could handle critical thinking and problem-solving skills did very well.

Paper IIA – Section A

Q1. (a) Many candidates knew that ice would 'melt faster' when salt is added but did not relate it to the idea that impurities decrease the melting point of a substance. There seems to be some confusion in the candidates' minds on how this works.
(b)(i) In the applicative question relating to the different position of the line AB in the cooling

curve, a variety of correct answers were given, such as 'it is a different substance', 'same substance with impurities', and 'has a different boiling point'. Some candidates incorrectly said 'it has a different melting point', showing a lack of skill in interpreting the curve.
It was surprising to note that a number of candidates gave 35 as the answer. This was not because candidates were unable to interpret a graph but because they mistakenly thought that AB was the melting point. This also effected the way they answered part b(ii).
In part b(ii) there were also references to the time taken, to which the different positioning of AB from the x axis would bear no significance.

Q2. Most candidates did well and scored more than half the marks assigned for this question, although a number tended to forget that moisture is also essential for iron to rust. Moreover, many candidates failed to connect the different parts of the question opting to answer the question from memory. For example, a significant number of candidates said that they would expect to see rusting in salt water in part (i) but then failed to mention that salt causes rusting in part (ii). Or else saying that both air and water must be present for rusting to take place but then failing to mention that the rust prevention technique that they propose prevents the iron from coming into contact with both air and water.

Q3. (a) Some candidates gave a reaction starting with a reactant other than propane, probably indicating that that they did not know the formula of propane. Most candidates tended to mention carbon monoxide and water as the main product of hydrocarbon combustion in a limited air supply. Few also mentioned the formation of soot.
(b) Most candidates were able to name at least one product. Most candidates were able to give the correct test to distinguish between propane and propene, however there were quite a few candidates who seemed to indicate that these two substances are liquids.

Q4. (a) Only a few candidates did not answer correctly all or most parts of this section.
(b)(i) There were some candidates who indicated that they knew the catalyst but could not give its formula, and quite a few did not know the answer at all and indicated catalysts for another reaction.
(ii) In this question there was the usual mix of answers, but the number of candidates who answered it correctly was tendentially higher than when similar questions were given in previous years.
(iii) Very few candidates could explain the compromise correctly. Most candidates stopped at explaining that increasing the heat would favour the reverse reaction and thus decreasing the yield, not indicating that decreasing the temperature too low would result in a slow reaction and that therefore a compromise is found. Some who, most probably, had a biology background referred the to the catalyst as an enzyme and said that the catalyst would be "denatured". These affirmed that at high temperature, the catalyst would not function or will be destroyed, confusing the inorganic catalyst used in the process with an enzyme.
In general, candidates did better in the recall type parts of this question while many failed to explain why a compromise temperature of 450ºC is used in the contact process rather than adopting the higher suggested temperature of 1000 ºC. They did not associate the principle of dynamic equilibrium to the reversible process. Some candidates stated that at 450ºC, the yield of sulfur trioxide is already very high so increasing the temperature would not justify the cost. They confused the idea of a compromise temperature with the fact that the process is carried at a low pressure of around 2 atmospheres since yield is already high.

Q5. Most candidates did well in this recall type question.
(a) Marks were lost because of mistakes in the balancing of equations. A common mistake prevalent in the equation required for the reaction of iron(III) oxide with carbon monoxide was the addition of elemental oxygen as one of the products.
(b) Most candidates were able to score marks in this part.

Q6. (a)(i) The most common mistake was that some candidates gave cracking as the answer to this question.
(ii) A number of candidates gave an insufficient explanation or vague answers leaving out references to long-chained and short-chained hydrocarbons.
(b) Quite a few candidates either did not know the equations, or the catalyst, or both. It should be mentioned that in part (ii) it was not enough to give yeast as an answer, as it contains a

number of enzymes but only zymase actually catalyses this particular reaction.

Q7. It seems as if candidates used the acronym OIL RIG (oxidation is loss and reduction is gain) or a similar principle to help them through this question. This works only for loss or gain of electrons but it does not work if oxidation numbers are applied. As a result quite a number of candidates got wrong answers.
One also notes that a number of candidates did not give reasons to explain their answer.

Q8. Some candidates lost marks because they did not indicate the 'arch' for activation energy and where the energy change is on the diagram.

Q9. Very few candidates did not score any marks in this question, although very few scored full marks.
Mistakes were mainly registered in part (c) as many just mentioned fruitful or successful collisions without explaining well. Some just indicated an increased number of collisions. Some candidates failed to mention that for a reaction to take place there must be a collision between two or more particles, and that the increase in rate results from an increased number of collisions.
Many candidates found the application of Le Chatelier's principle difficult, and the explanations given were often incomplete or lacking depth of thought. At times, candidates found it difficult to express themselves coherently and accurately.

Q10. Quite a number of candidates seem not have noticed that the substances given were all solids and some gave answers as "they become more diluted". There were a number of possible correct answers for this question.
Candidates familiar with solubility rules and who presumably have a good practical experience tackled this question well. Others who lacked a sound practical experience should have relied on recall.

Paper IIA – Section B

Q11. (a) Most candidates did not specify that when sodium nitrate is heated it melts before it forms sodium nitrite while only a few candidates indicated that zinc oxide is yellow when hot and white when cold.
Many candidates worked out the calculations considering proportion by mass instead of by moles. Although in most cases they obtained the right answer when working the second part of the question, a number of candidates incurred in mistakes.
Candidates who opted for this question and were well prepared in the patterns governing the decomposition of compounds due to heat found no particular difficulty in this question. These candidates, on the whole, applied the mole concept to tackle the gravimetric calculations effectively. However, there was no pronounced correlation between question (c) and parts (a) and (b) since it involved understanding of the reactions of acids and application of the concept of molarity.

Q12. (a)(i) The answers given in this section were not always clear enough, although candidates seem to have a good general idea. Candidates with sufficient knowledge of industrial processes tackled this question well. Such candidates however found question (a)(i) challenging since they had to evaluate and compare two extractions of metals and create an explanation for the difference.
(ii) Many candidates gave correct ionic equations for the reactions at the electrodes, and many equations were left unbalanced.
(iii) This part was answered correctly by most candidates who opted for this question.
(iv) Although many candidates correctly worked out the number of moles of electrons that are produced by the current, many disregarded that 3 moles of electrons are needed to give 1 mole of aluminium metal.
(b) This question was answered satisfactorily by most candidates.

Q13. (a) This question was answered satisfactorily by many candidates who attempted this question.
(b) Quite a number of candidates could not give correct equations for this question. A significant number of candidates tended to include a lot of irrelevant information in their answers that was not related to the context of the questions. They found it difficult to give succinct answers that included a

brief explanation, equations and reaction conditions as stated by the main question.

Q14. This question was by far the most popular choice amongst candidates. They seemed to be quite aware of the effects of pollutants and most candidates fared well in the question. A common mistake was the attribution of carbon monoxide and nitrogen dioxide in the air to car exhaust, whereas this is not the case due to the universal use of catalytic convertors. There exists a lot of confusion in what causes and what are the effects of the greenhouse effect and global warming, and the destruction of the ozone layer.

Paper IIB – Section A

Q1. This question was answered vey poorly by most candidates.
(a)(iii) Most candidates did not even realise that there is no change in temperature.
(b) Few candidates mentioned that fact that salt lowers the freezing point and so the ice melts.

Q2. This question was answered well by most candidates
(b) Some candidates gave acid for an answer. Although acid does corrode iron it does not necessarily cause rusting in that it forms hydrated iron(III) oxide.
(c)(iii) Some candidates did not realise that only oiling and greasing can be used to protect moving parts as any other sort of protection would break or chip with the movement of the parts themselves against each other.

Q3. (a) Most candidates were not able to give a correct balanced equation for the reaction for the burning of butane.
(c) Quite a number of candidates did not explain clearly that CO attaches itself to haemoglobin in preference to oxygen and so the organs do not get the oxygen needed for respiration.
(d) Many candidates did not give the correct equation.

Q4. (a) Most candidates got the formula for A correct but B, C and D were answered correctly to varying degrees.
(c) This part was answered correctly by some candidates only.
(d) None of the candidates knew the equation for the lab preparation of HCl.

Q5. (a)(i) Most candidates gave the incorrect equation.
(ii) A colour change implies that one gives the starting colour and the colour at the end of the experiment. Unfortunately many candidates had no idea of the colours that are involved in such a change, while many others just gave only one colour without indicating if this was at the start or at the end of the experiment.
(b)(i) This question was answered correctly by many candidates however many failed to point out in (ii) that hydrogen is not used on a large scale because it is expensive to manufacture. The fact that it is explosive can be catered for in industry so it is not the reason why it is not used.
(c) Most candidates did not realise that the hydrogen is burnt so that it does not accumulate in the lab where it will mix with oxygen and become explosive, and so answered this question incorrectly.

Q6. Many candidates did not score any marks in this question because they either did not even attempt the question or they answered it totally incorrectly, which highlights the lack of knowledge of organic chemistry.
Parts (a) and (b)(i) were the parts that were mostly answered correctly.
Parts (b)(ii) and (iii) were only answered correctly by just a few candidates.
(c) Candidates did not realise that it is the fermentation of glucose that gives alcohol and that although yeast provides the enzyme zymase, which catalysts this reaction, the answer "yeast" could not be accepted because yeast provides many more enzymes which do not catalyze this fermentation of glucose.

Q7. The majority of candidates managed to surpass the half way mark in this question. However while many could accurately state whether reduction or oxidation took place quite a number could not work the oxidation number correctly.

Q8. The majority of candidates scored past the half mark in this question.
(a) Only very few candidates got this part of the question correct. Only some candidates could draw the curves correctly and fewer still could correctly mark the activation energy.
(b) Most candidates got this part correct.
(c) Most of the candidates who got part (b) correct got (c)(i) incorrect and part (ii) correct while those who got part (b) wrong got (c)(i) correct and (c)(ii) incorrect.
It seems that most candidates studied this topic by heart.

Q9. (a) Most candidates answered this question correctly.
(b) Most candidates answered this question correctly.
(c) Many candidates did not answer this part correctly. In some cases candidates wrote that the catalyst does not affect the reaction, which is not correct although the position of equilibrium is not effected.
(d) Many candidates did not score marks in this part. Some only mentioned that the particles will collide more and did not indicate that the increase in temperature also brings about more fruitful collisions. Many candidates simply mentioned that the particles vibrate more which in itself will not make the reaction go faster as the particles have to collide for a reaction to take place.

Q10. Although this was indicatively a relatively easy question, there were a number of common mistakes namely:
Some candidates still mix the notion of dissolve and melt.
Quite a number of candidates seem to have interpreted coke as the drink and not carbon giving their answer as "the amount of bubbles decrease".
Many candidates did not even use basic knowledge, and their common sense, in answering this question. For example, they should know of calcium hydroxide solution, or lime water, and that being a solution it is inconceivable that they can write that it is insoluble.

Paper IIB – Section B

Q11. (a) Most candidates made mistakes in giving the equations for the thermal decomposition of sodium nitrate and zinc nitrate.
(b)(i) There were also a lot of mistakes in giving the equation for the thermal decomposition of sodium hydrogen carbonate.
(ii) Many candidates had some idea of the calculation in this part of the question. However there were quite a few who carried out the calculation as a proportion of masses. Although this returns a correct answer, candidates found it difficult to work out the volume of a solution or the volume of a gas as the number of moles had not been found. The use of this method should be discouraged as it does not serve the candidates well either at SEC level or the levels beyond. Candidates should be encouraged not to skip steps in their working a calculation as they can easily incur into mistakes.

Q12. (a) Very few candidates answered this part correctly. Those who came close, confused their answers with some other process involving ethanol like dehydration of ethanol. However many just gave the atmospheric oxidation of ethanol.
(b)(i) There were quite a few candidates who could not give the correct structural formula of ethnocide acid.
(ii) Some candidates gave the litmus test as an answer and although this was accepted they could not give the complicated equation for this test. Some others gave the neutralization reaction with an acid or reaction with a carbonate without saying how they would show that either neutralisation has taken place or that hydrogen or carbon dioxide has been given off.
In parts (c) and (d), many could not give correct equations for these reactions.
(e) Most candidates scored marks in this part of the question.
(f) Most candidates could not identify the reaction as dehydration and could only give one correct use of polythene.

Q13. Most candidates who attempted this question did rather poorly in it.
(a) Very few candidates actually mentioned that since aluminium is more reactive then iron, its oxide would be more stable and it would require electrolytic reduction to extract the metal from its oxide ore.

(b) Although many candidates had a general idea of the extraction of these metals their knowledge was superficial and many could not give correct balanced equations for the reactions that take place.
Part (c)(i) was answered correctly by most candidates.
(ii) Many candidates only gave an unbalanced equation for the reaction at the cathode. Quite a number mentioned the hydroxide ion as the ion that migrates to the anode instead of the oxide.
(iii) Only a few candidates worked this part of the question correctly to the end, as many simply stopped at calculating the number of coulombs.

Q14. (a) Manny candidates did not understand what was meant by the most likely source, giving totally irrelevant answers for this part of the question. Other candidates put car exhaust as a likely source of the gases mentioned in the question. Although this is not incorrect, since most cars are now fitted with a catalytic converter teachers should play down the importance of it being a likely source and should put more emphasis on other sources.
In parts (b) and (c) there was a lot of confusion in many cases between the greenhouse effect and global warming, and the depletion of the ozone layer and its harmful effects. Candidates were also not clear about what rays cause the earth to heat up and what are "harmful rays".
Most candidates were also limited in their knowledge of greenhouse gases to what had been given in the question and so when they were asked to mention another two, they did not give correct answers.

Chairperson
2013 Examination Panel