L-Università ta' Malta

MATSEC
Examinations Board

Examiners' Report
SEC Chemistry

Main Session 2024

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A. STATISTICAL INFORMATION

The total number of candidates who registered for the SEC Chemistry May 2024 session was 778, which is 64 candidates more than in May 2023. There were 597 registrations for Paper IIA and 181 registrations for Paper IIB. Table 1 shows the distribution of grades for the Main 2023 session of the examination.

GRADE	1	2	3	4	5	6	7	U	ABS	TOTAL
PAPER A	83	109	144	92	76	-	-	81	12	597
PAPER B	-	-	-	29	25	29	13	60	25	181
TOTAL	83	109	144	121	101	29	13	141	37	778
% OF TOTAL	10.7	14.0	18.5	15.6	13.0	3.7	1.7	18.1	4.8	100.0

Table 1: Distribution of grades – SEC Chemistry 2024 Main Session

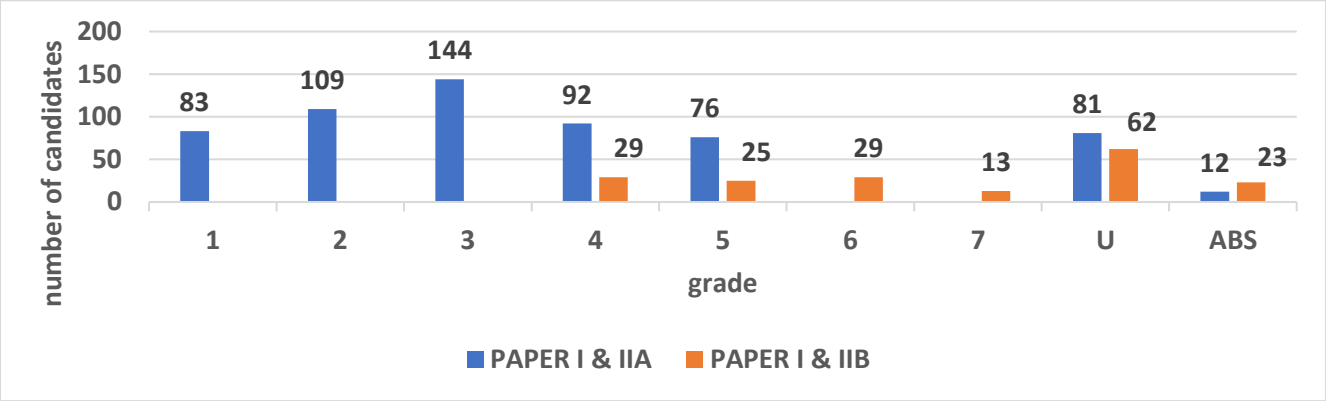

Figure 1: Distribution of grades for Paper A and B candidates – SEC chemistry 2024 Main Session

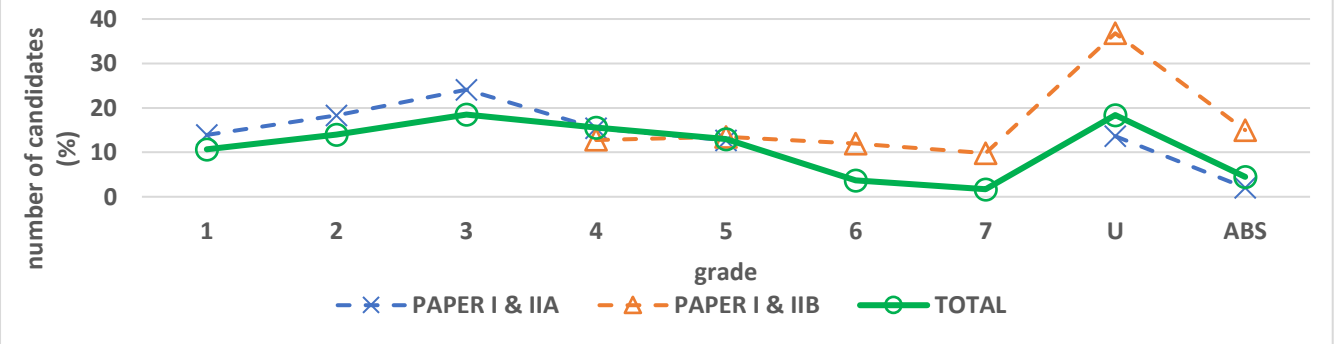

Figure 2: Distribution of grades (%) – SEC chemistry 2024 Main Session

B. GENERAL REMARKS

Coursework

The examiners moderated a total of 186 projects in nine (9) state and church schools in Malta and Gozo. In addition, a small number of private candidates submitted their portfolios of practicals. These were corrected and the private candidates were called for an interview which was held virtually. The coursework presented by the private candidates was, in general, of a lower standard than that of school candidates. In most cases, the work presented by the private candidates and the subsequent interview did not show much evidence of proper planning and execution and showed minimal to no practical knowledge of the experiments they claimed to have done.

Statistics for Individual Questions

Paper I	Section A											Section B		
(A candidates)	coursework	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Total
max mark	**15**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**20**	**20**	**100**
no. max mark	104	486	205	422	137	116	97	61	66	43	256	55	20	0
max mark (%)	17.4	81.4	34.3	70.7	22.9	19.4	16.2	10.2	11.1	7.2	42.9	9.2	3.4	0.0
no. of zeroes	29	0	80	1	1	9	7	21	0	8	7	11	0	0
zeroes (%)	4.9	0.0	13.4	0.2	0.2	1.5	1.2	3.5	0.0	1.3	1.2	1.8	0.0	0.0
mean	13.0	5.8	3.7	5.4	4.6	3.7	4.0	3.1	4.0	3.6	4.5	14.6	11.2	68.1
median	14	6	4	6	5	4	4	3	4	4	4	16	12	71
mode	14	6	6	6	5	4	5	2	5	3	6	18	15	85
standard dev.	2.1	0.4	2.2	1.2	1.1	1.6	1.5	1.7	1.3	1.4	1.6	4.7	5.3	17.9

Table 2: Data for Paper I for Paper IIA Candidates

Paper IIA	Section A										Section B				
	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**
Choice (out of 585 candidates) =											225	341	262	310	
Choice (out of 585 candidates) (%) =											38.5	58.3	44.8	53.0	
no. max mark	135	94	54	440	66	303	349	378	25	0	0	5	20	6	0
max mark (%)	22.6	15.7	9.0	73.7	11.1	50.8	58.5	63.3	4.2	0.0	0.0	0.8	3.4	1.0	0.0
no. of zeroes	25	8	85	1	40	0	40	3	59	7	0	0	0	6	0
zeroes (%)	4.2	1.3	14.2	0.2	6.7	0.0	6.7	0.5	9.9	1.2	0.0	0.0	0.0	1.0	0.0
mean	4.2	3.5	2.6	5.5	3.1	5.3	4.7	5.3	2.6	3.6	11.0	11.3	14.6	12.2	65.0
median	5	4	3	6	3	6	6	6	2	4	11	12	15	13	67
mode	5	5	3	6	2	6	6	6	2	4	17	17	19	19	74
standard dev.	1.7	1.8	1.8	1.1	1.8	0.9	1.9	1.2	1.7	1.4	4.6	5.4	4.2	5.3	18.0

Table 3: Data for Paper II for Paper IIA Candidates

Paper I (B candidates)	Section A										Section B		
	coursework	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Total
max mark	**15**	**7**	**6**	**6**	**6**	**6**	**5**	**7**	**6**	**5**	**6**	**20**	**20**	**100**
no. max mark	1	10	0	8	1	1	4	1	8	0	0	0	0	0
max mark (%)	0.8	7.5	0.0	6.0	0.8	0.8	3.0	0.8	6.0	0.0	0.0	0.0	0.0	0.0
no. of zeroes	36 (np)	0	44	1	25	4	34	45	36	28	42	23	38	0
zeroes (%)	27.1	0.0	33.1	0.8	18.8	3.0	25.6	33.8	27.1	21.1	31.6	17.3	28.6	0.0
mean	10.4	5.2	1.6	3.6	2.2	2.4	1.4	1.0	2.2	1.4	0.9	4.4	2.0	28.3
median	11	5	1	3	2	3	1	1	2	1	1	4	1	26
mode	13	6	0	3	0	3	0	0	0	0	0	0	0	15
standard dev.	3.2	1.2	1.8	1.3	1.8	1.1	1.4	1.3	2.1	1.2	0.9	4.2	2.5	15.0

Table 4: Data for Paper I for Paper IIB Candidates

Paper IIB	Section A										Section B				
	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**
Choice (out of 158 candidates) =											76	82	47	63	
Choice (out of 158 candidates) (%) =											48.1	51.9	29.7	39.9	
no. max mark	21	0	13	1	0	0	35	3	0	5	0	0	0	0	0
max mark (%)	11.6	0.0	7.2	0.6	0.0	0.0	19.3	1.7	0.0	2.8	0.0	0.0	0.0	0.0	0.0
no. of zeroes	19	14	6	4	9	27	15	35	33	12	6	9	2	1	0
zeroes (%)	10.5	7.7	3.3	2.2	5.0	14.9	8.3	19.3	18.2	6.6	1.0	1.5	0.3	0.2	0.0
mean	3.0	1.8	3.2	2.9	2.4	1.8	3.7	1.7	1.8	2.6	6.2	8.1	11.0	9.3	41.7
median	3	1.5	3	3	2	2	4	1	2	3	5	8	12	9	43
mode	2	1	3	3	3	2	6	1	2	3	4	8	17	7	45
standard dev.	2.0	1.3	1.6	1.3	1.3	1.2	2.0	1.6	1.4	1.6	4.6	4.7	5.6	3.9	18.2

Table 5: Data for Paper II for Paper IIB Candidates

	P I & P IIA	P I & P IIB
max mark	**100**	**100**
absent	12 (out of 597)	23 (out of 181)
no. max mark	0	0
max mark (%)	0.0	0.0
no. of zeroes	0	0
zeroes (%)	0.0	0.0
highest mark	97	82
lowest mark	6	0
mean	67.5	38.3
median	71	41
mode	82	50
standard dev.	18.7	20.1

Table 6: Data for Final Mark for Paper I & IIA and Paper I & IIB Candidates

C. GENERAL COMMENTS ON INDIVIDUAL QUESTIONS

Paper I – Section A

Question 1

Generally well answered. Melting and boiling point were at times mixed, while some candidates referred to sea water as a compound rather than a mixture.

Question 2

(a) Several candidates wrote that one mole of oxalic acid occupies a volume of 22.4 dm^3, forgetting that it is a solid in the question. The mole ratio with carbon dioxide was missing or not implied. Candidates often did not physically write the mole ratio.

(b) (i) A relatively common answer that was given was carbon monoxide. Carbonic acid was accepted as an answer.

(ii) Candidates who gave the correct answer in part (i) gave correct answers in part (ii), either to the carbonate or hydrogencarbonate. The answer given in the previous part affected the equation.

Question 3

(a) This question was mostly answered correctly.

(b) This question was mostly answered correctly.

(c) Some candidates answered incorrectly by completely ignoring the masses and used the ratio of atoms in the formula, i.e. 3/7 x 100. A common mistake was the use of 56 for Fe rather than 168 at the percentage stage. Some answers were rounded off to less than three significant figures.

Question 4

This question was generally answered correctly. Several candidates got part (a) incorrect, marking it as 'true', and marked part (b) incorrectly as 'false'. Some candidates gave an incorrect answer for part (c) too.

Question 5

(a) & (b) In many cases, the answers for parts (a) and (b) were correct. In certain cases, the answers for parts (a) and (b) were switched; butane was quite a common answer for part (b).

(c) There were several incorrect equations, giving H_2 as product. A relatively low number of candidates got this part correct; they often gave an addition reaction rather than a substitution reaction.

(d) This question was generally correctly answered, although some alkenes and cyclic molecules were given as answers. In certain cases, mirror images rather than structural isomers were drawn.

Question 6

a) Very few candidates mentioned Brownian motion. There was a variety of wrong answers showing no knowledge of what was going on: oxidation, chromatography, sublimation, condensation, evaporation, diffusion, dispersion, etc. Some candidates even wrote "Na" as one of the products!

(b) Some candidates gave diagrams which did not show any change in the position of the bromine molecules. Arrows showing the movement were only drawn by a few candidates. Others did not draw random positions but rather drew them in pairs.

(c) This question was generally answered correctly. Most candidates were aware of the toxicity of bromine.

(d) There were incorrect answers that associated the faster reaction to the higher reactivity of chlorine. Certain answers were not accepted, as: 'chlorine is smaller' (since a small atom does not necessarily mean that it is lighter); 'it is more reactive'; 'it is above bromine in the halogens group'.

Question 7

(a) Answers in terms of equal rates of forward and backward reactions, or reversible got full credit. The word 'rate' was rarely written.

(b) This question asked for observations. The most common issue was that candidates did not actually write observations but statements such as 'water is formed' rather than specifying that a liquid is observed.

(c) (i) This question was generally well-answered.

(ii) Some answers contained good detail as to how neutralisation removes the acid and shifts the equilibrium to the left, that is further helped by the fact that the water produced also enhances the reverse reaction. Some answers referred to Le Chatelier's Principle without applying it to the question. Several candidates were very confused on how to explain their answer. Some wrote that since NaOH is a base, the equilibrium will shift to the left to form acid and therefore oppose the change. Others referred to the fact that NaOH is a solution, and therefore the amount of water is increasing and the equilibrium shifts to oppose this change. Very few noted that, in fact, the NaOH decreases the concentration of the acid in the equilibrium.

Question 8

This question was generally well-answered.

(b) Quite a few answers did not refer to the fact that nitrogen and oxygen have different solubilities in water. In many cases, solubility was not even mentioned. Candidates argued that it is because of atmospheric pressure, or that oxygen is more soluble in water than in air (?!), or that there is more oxygen in the water molecule.

(c) Several candidates were aware that both hygroscopic and deliquescent substances absorb water but then failed to make the distinction that, unlike hygroscopic substances, deliquescent substances form a solution. There were relatively few correct answers.

(d) (i) & (ii) These parts of this question were generally well-answered.

Question 9

a) (i) This question was generally well-answered.

(ii) Answers in terms of colour change with acidified dichromate or acidified permanganate got full credit. No credit was given if the term 'acidified' was missing. At times, the correct chemical was written but no colour changes were included. No marks were given for: smell, litmus, flame tests (which were often mentioned), etc.

(b) (i) There were several possible answers in terms of colour or the fact that a solid and a liquid are formed from gases. Candidates rarely wrote actual observations.

(ii) & (iii) There were several incorrect answers.

(iv) Many candidates were aware of the toxicity of hydrogen sulphide.

Question 10

Generally well-answered, with a good number of candidates scoring full marks.

Paper I – Section B

Question 11

(a) (i) Many candidates scored full marks. It is important to show the mole ratio in such calculations. In certain answers, ratios were not included; marks were awarded if the final answer was correct. Many candidates found the mass of $ZnCO_3$ and then subtracted from it ZnO, rather than finding CO_2 immediately – given as correct.

(ii) Several candidates gave colours which are not relevant to either the reactants or the products. Many wrote black! Marks were awarded only if both colours were correct.

(iii) Some impossible experimental techniques were given, as crucibles heated directly on a tripod with no gauze. Incorrect labelling was quite common: deflagrating spoons labelled as crucibles, tripods labelled simply as stand or as stand and clamp. A number of candidates also included water baths.

(iv) The most common answer was to leave the apparatus to cool down – accepted. Some incorrect answers included: calibrate the scale; put a tissue between the balance and the container; the mass must be tared before taking the final mass; not to forget to subtract the mass of the crucible (which is not a precaution but part of the method).

(b) (i) Inappropriate catalysts, randomly selected from across the syllabus, including V_2O_5 and UV light, were mentioned.

(ii) Some incorrect answers included: oxygen collected over H_2O_2; hydrogen collected; oxygen collected over water labelled as upwards delivery. Impossible diagrams included condensers and flasks with no stoppers connected to other parts of the apparatus; if there is no rubber bung, the experiment will not work. In some cases, upward and downward air displacement were used! Drying agents and the use of Bunsen burners were accepted as the experiment would still work.

(iii) The answers to this question were generally correct. A "lighted splint is reignited" was given no credit.

Question 12

(a) (i) Correct answers included lead(II) nitrate with either hydrochloric acid or sodium chloride solution. Lead sulfate was quite a common answer!

(ii) In general, the answer to this question – filtration – was correct, but answers like evaporation and precipitation were also noted.

(b) (i) Various incorrect answers included: precipitation; displacement; and hydrogenation. Double decomposition and decomposition were quite common answers!

(ii) Some candidates did not cross out the spectator ions and lost marks. In ionic equations, state symbols must be included; they were quite often forgotten.

(iii) This question was generally quite well-answered. Both methylorange and phenolphthalein were accepted.

(iv) Several candidates got full marks. However, candidates who did not work from first principles got entangled in their own working, especially when converting units. Many candidates made use of the equation: concentration = moles / volume.

(c) (i) Many answers were correct.

(ii) The correct answer was that MgO is not soluble in water and so a base while KOH is soluble in water and an alkali. Incorrect answers included: MgO does not have OH^-; MgO is a neutral oxide; it is amphoteric; it is acidic.

(d) (i) & (ii) There were several incorrect equations giving sodium sulfate as product. Very few candidates gave acid salts, with most giving a normal salt and water. The answer to part (ii) depended on whether part (i) was correct.

Paper IIA – Section A

Question 1

(a) Candidates did fairly well in this question. Some mentioned different number of neutrons but lost marks as they did not mention same number of protons.

(b) Some candidates tried to calculate the percentage instead of just stating the 50%.

(c) Most candidates did well in this question, however it was observed that most of them wrote grammes as the unit of RAM; the RAM has amu as units.

(d) Most candidates got this question right.

Question 2

(a) Most candidates got this question right.

(b) Some candidates gave the formula with n instead of the empirical formula.

(c) Some candidates left the n out of the diagram, while others drew more than one repetitive unit of the monomer. Some also left the double bond between the carbon atoms.

(d) Most candidates got this answer right.

Question 3

(a) Many candidates did not mention the triple bond between the nitrogen atoms.

(b) Most candidates got this answer right.

(c) Some candidates left the units out, especially for pressure. Some gave a large range for temperatures / pressures, which was not accepted.

(d) Most candidates did not get this question right.

Question 4

Most candidates got this answer right. Some confused washing soda and baking soda.

Question 5

(a) Most candidates got this answer right.

(b) Many candidates did not give the correct answer. Many left the state symbols of the half equation out.

(c) Few candidates mentioned electrons as the correct answer.

(d) Most candidates got this answer right.

Question 6

Most candidates got this answer right.

Question 7

(a) Most candidates got this answer right. Some left out the balancing.
(b) Most candidates got this answer right. Some gave a reaction of oxygen with calcium carbonate.
(c) Most candidates got this answer right. Some left out the balancing.

Question 8

(a) Most candidates got this answer right.
(b) Most candidates got this answer right. Some did not mention water in the explanation and were not awarded any marks.
(c) Most candidates got this answer right.

Question 9

(a) There were a lot of misconceptions in the answers. Some mentioned that sodium is alkaline and so changes the colour of the indicator. There were a lot of mistakes in the colour of the indicator or candidates did not mention that the colour changed to pink and just repeated the explanation in the question itself.
(b) Many did not mention in the presence of water / in solution.
(c) Many answered that aluminium does not rust. This is not chemically accepted as aluminium does not rust but corrodes. The accepted answers were only those where the oxide layer was mentioned.
(d) Some discussed the uses of copper rather than the advantages of recycling. Answers including conservation of copper and less expensive were accepted.

Question 10

(a) (i) Many candidates mentioned carbon dioxide.
    (ii) Few candidates managed to get the right answer as they did not refer to the harmful rays in their answers. Candidates mentioned removal of excess rays and blocking of rays; these were not accepted.
(b) (i) Many candidates gave the correct answer, although some candidates mentioned carbon monoxide.
    (ii) Few candidates got the answer correct. Many still mix greenhouse effect and ozone depletion. A few candidates mentioned the term 'reflection of rays'. Most candidates used trapping of rays, and this was not accepted.
(c) (i) Answers including burning of fossil fuels and cars without mentioning car engines or exhaust were not accepted.
    (ii) Most candidates got this answer right.

Paper IIA – Section B

Question 11

(a) Only a few candidates mentioned the volumetric pipette. Pipette was not accepted, and many mentioned the use of a measuring cylinder. Very few candidates used the term accurate as part of their reasoning.

(b) Many candidates got this question correct although quite a few candidates mentioned that if a polystyrene cup is used this will react with the acid.

(c) Most diagrams were correct.

(d) Most candidates got this answer right.

(e) Most candidates got this answer right.

(f) Many candidates mentioned the energy change rather than the energy released; this was not accepted. Some candidates managed to give the answer per 1 mole of water. Many candidates got the calculation correct with some not giving the full units for the enthalpy of neutralisation. However, it was observed that many candidates are still using the formula for concentration / volume and moles; in such cases, marks were deducted.

(g) Few candidates got this question right as although many mentioned that ethanoic acid is a weak acid, only a few candidates mentioned that the heat released is used to break bonds.

Question 12

(a) Most candidates got this answer right. Some candidates gave 'halides' as the name of the group.

(b) Most candidates got this answer right.

(c) Most candidates got this answer right.

(d) Most candidates got this answer right.

(e) Most candidates got this answer right, although quite a few candidates gave the reaction of potassium with the halogens or else mentioned displacement reactions and to check the rate of the reactions by using a stopwatch.

(f) (i) Most candidates got this answer right. However, marks were deducted if heat was shown in the diagram. Some suggested the collection of chlorine with a gas syringe; this was accepted. Some did not label concentrated sulfuric acid. No marks were awarded if the concentration was not mentioned.

(ii) Many candidates failed to state that the hydrochloric acid is concentrated by writing the symbol (l). There were many mistakes in the answers to this equation. Only a few candidates got this question correct.

Question 13

(a) Most candidates got this answer right.

(b) (i) Most candidates got this answer right.

(ii) Some candidates made mistakes in the plotting or the scale. It was noticed that quite a few candidates used a small part of the graph paper, which reduced accuracy.

(iii) – (vi) Most candidates got these answers right.

Question 14

(a) Most candidates got this answer right.

(b) (i) Most candidates got this answer right, although a number left the state symbols out.
(ii) Most candidates got this answer right.
(iii) Most candidates got this answer right.
(Iv) Most candidates got this answer right. However, many stated that the colour will change to white not colourless; this was not accepted.

(c) (i) Most candidates got this answer right.
(ii) Most candidates got this answer right, although nearly all candidates did not draw the heat source.
(iii) Most candidates got this answer right.

Paper IIB – Section A

Question 1

(a) Only a few candidates mentioned the term atoms. Some candidates wrote electrons instead of protons; this was not accepted.

(b) Only a few candidates got this question correct.

Question 2

(a) Many candidates answered this question correctly.

(b) Only a few candidates managed to choose the correct monomer.

(c) Many candidates answered this question correctly.

(d) Only a few candidates knew the correct use of the polymer.

Question 3

Only a few candidates managed to answer correctly.

Question 4

Only a few candidates answered correctly.

Question 5

(a) Many candidates answered this question correctly.

(b) A few candidates filled in the blanks correctly. Many left the charge out.

(c) Only a few manged to underline the correct answer.

Question 6

(a) Most candidates did not give the correct definition. Many mentioned speed but this was not accepted.

(b) Most candidates did not know the correct units.

(c) Many candidates gave the correct answer.

Question 7

Many candidates left the balancing of copper(II) oxide out.

Question 8

(a) Many candidates left the number of protons or the number of neutrons out.
(b) Many gave single bond as an answer; this was not awarded any marks.
(c) Many candidates confused the test with the glowing splint with the test for hydrogen.
(d) Only a few candidates managed to give the correct answer. Some mentioned hydrogen peroxide as the product.

Question 9

(a) Only a few candidates gave the answer as NaOH.
(b) Many candidates mentioned the colour blue; this was not accepted.
(c) Many candidates mentioned that these elements form part of the Earth's crust, but only a few mentioned that it turns alkaline in solution.
(d) Many candidates got this question correct.
(e) Only a few candidates gave the answer.

Question 10

(a) (i) A low number of candidates underlined CFCs. Many chose carbon dioxide.
    (ii) Only a few candidates mentioned harmful rays in their reasoning.
(b) (i) Many candidates mentioned carbon dioxide as the answer.
    (ii) Only a few candidates managed to use the term reflect in their reasoning.
(c) (i) Only a few candidates mentioned car exhaust.
    (ii) Many candidates gave an incorrect answer or mentioned limestone rather than the chemical name.

Paper IIB – Section B

Question 11

(a) Many candidates confused the stirrer with a glass rod.
(b) Most candidates gave a good answer.
(c) Many candidates mentioned the energy change rather than the energy released; this was not accepted. Some candidates gave the answer per mole of water.
(d) Many candidates got the calculations incorrect.
(e) Few candidates gave the correct answer.

Question 12

(a) Many candidates gave the correct name of the group.
(b) Only a few candidates got this answer correct. Many stated that chlorine is a white solid.
(c) Many candidates got this question correct.
(d) Many candidates got this question correct.
    (i) A lot of candidates gave the incorrect labelling.
    (ii) Many left the balancing of water out.
    (iii) Only a few candidates gave the correct answer.
    (iv) Many candidates answered this question correctly.
    (v) Only a few candidates mentioned toxic as one of the reasons.
    (vi) Many candidates just mentioned pools. This answer was not accepted as candidates had to specify that it is used as a steriliser.

Question 13

Most candidates did generally very well in these questions. There were a few mistakes in the graph and the calculation.

Question 14

(a) Many candidates answered correctly.

(b) (i) Many wrote Iodine as either "I" or else with a charge.

(ii) Few candidates mentioned spectator ions. Some explained that the ion was not changed, and this was accepted.

(iii) & (iv) Only a few candidates gave the correct answer.

(v) Only a few candidates gave the correct reasoning.

(vi) Only a few candidates mentioned the correct colour change.

(c) (i) Many candidates gave the correct labelling.

(ii) Many candidates gave the correct equations.

(iii) Only a few candidates managed to find the correct mass of lithium produced.

Chairperson
Examination Panel 2024