



Leaving Certificate Chemistry Committee Convenor's Report 28th June 2022

Opinions on these papers are based on discussions held by members of our Association around the country. This report was collated by the convenor of a committee of experienced teachers of Leaving Certificate Chemistry, elected by members of the ISTA.

General Comments on the 2022 Chemistry Higher Level Paper

This year's paper was **not** very well received by many students and teachers. It was regarded as a '*quantum leap*' from Junior Cycle and *far too challenging for the average student*. On initial viewing of topics, it seemed fair but testing with wide coverage of the syllabus, however when one delved into tackling the paper, there were many new manoeuvres that students would have to negotiate in almost all questions. It should be remembered that it is a *new cohort of students each year* who are, in most cases, encountering 'real chemistry' for the first time. The Higher-Level paper was a good test for teachers, but unfair for students, especially this year when time was limited for revision or completion of courses due to the pandemic.

It was felt that the *extra proclaimed choices were yet again negated by the blending of topics*. Anyone who may have legitimately not covered the whole course, especially the practical element due to the pandemic, may have been limited in their choices. The emphasis on practicals is always good and rewards students who were lucky enough to have been able to have carried out the practical work over the past two years.

Although from a teaching perspective it was nice to see some fresh questions that required a lot of higher order thinking, from the student perspective in an exam situation, they were thrown by some aspects of the paper, and many compensated by doing extra questions.

We appreciate that the syllabus has been examined since 2002 and that it is difficult to keep coming up with fresh questions, there is always a trade-off between maintaining standards and making the subject accessible. We fear that based on these exam papers, students will have yet *another reason to perceive chemistry as too difficult an option* choice subject in fifth year and it is unlikely to encourage more students to take chemistry as a Leaving Certificate subject. While we commend the SEC for the good range of STS topics that show the relevance of chemistry in our everyday lives, overall, it was a *very tough paper*.

Feedback from teachers expressed concern about the future of chemistry in their schools. The introduction of new Leaving Certificate subjects (e.g. Physical Education, Computer Science and Politics and Society) is having the effect of drawing students away from chemistry. Therefore, students should not come out of the examination with regret at having taken chemistry as a subject because they have had to tackle questions with difficult twists that they have never encountered before.

There was a **lot of frustration** in the responses from teachers at the chalkface.

Some General Comments from Teachers around the country:

"This is the first time that I have given feedback on the exam. I feel compelled to do so because I found that many of my hardest working students over the two years came out from the exam distraught. The word is spreading that chemistry exam is getting more demanding each year. I also had a LC physics class with some of the same students. Their reaction to the physics was totally different, they came out tired but happy that it was a fair and manageable paper."

"Overall, it was an interesting paper for teachers of chemistry - with some twists in the final parts of most questions. However, it must be kept in mind that the overwhelming majority of students who are doing the actual exam are doing it for the first time. This cohort has come through the new Junior Cycle and encountered the massive step up to Senior Cycle chemistry during a year when there was a lock-down. Therefore, they do not have the solid foundation in chemistry that previous year groups would have had. Many of them also had anxieties and have struggled to cope in the past year."

"I felt that the accommodations made for the 2022 exam did not go far enough, especially when compared with Biology, which I also teach. Also, unlike biology, the paper this year was very difficult for students to access. The presentation of some questions had changed e.g. Q8 which may have thrown some students, even if they had a good knowledge of the subject matter. Feedback from my students and from students in other schools was that the paper was very hard. I feel that while the H1/H2 students may have been ok, those at the lower end of Higher level will have been disadvantaged by this year's paper. I have noticed a trend in the last few years was papers have become increasingly unpredictable and questions more difficult to interpret. My concern is that we will see a drop in numbers selecting chemistry at all if this continues."

"I think more students will stop opting for Chemistry as it is much more difficult than Biology, which I also teach (22 experiments in Biology & Physics, compared to Chemistry's 28 + demos, also you don't see that trying to catch students out aspect in Biology). I always struggle with the length of the course & regularly leave out 2 chapters & resort to teaching other topics after school. I and students really welcomed the 6 questions instead of 8 this year8 in 3 hours is a very difficult task, especially if mathematical parts of some are tricky. I feel the 6-question allowance was overly compensated by the twisted way some question parts were phrased."

"I have no Chemistry incoming 5th year class this year '22/23 I am told. The new JC Science is not encouraging Chemistry uptake & there are HUGE gaps in JC coming through. I have job shared for the last 3 years to avoid JC Science. I abhor the vagueness of it so much...I hope they will throw it out in a few years' time when they realise it's not working... Sorry, maybe not the forum for this, but related...."

"Whilst I feel there was a good spread of topics, a decent choice and that most of the paper was fair, I get the impression that the powers that be are trying so hard to make the paper unpredictable that it makes it much more difficult for students by asking Qs in a such a unique way that were never asked before. Almost trying to catch students out by checking what they don't know, instead of what they do know. I appreciate the higher order thinking assessment & the principle of trying to move away from rote learning, but it has become more like a problem-solving test in parts than Chemistry knowledge."

"It seems to me that the chemistry paper has become something of an ego trip for the examiner (I don't know the person at all), the students and teachers are being completely discounted. Some of the questions the last couple of years and particularly this year seemed to be solely designed to catch out the students and show off the examiner's knowledge of chemistry or ability to ask questions that barely fit into the constraints of the syllabus. I also teach Maths and they seem capable of asking difficult questions that are also fair and leave enough marks for every level of student to get by. For all the hard work we put in, it's, quite frankly, insulting that these questions are being landed on our students in a high stress situation for a subject that is already one of the most difficult on the Leaving Cert."

"I am a teacher with 20 years' experience teaching the current LC course. In the past I have never felt the need to get in contact with ISTA as for the most part I believed that the exams were tough but fair. I was disappointed with some aspects of this year's exam however and had a number of very upset students at the end of the exam. While I appreciate that the students were given allowance of only answering 6 questions, for the first time in my career I didn't get to adequately finish the course, also there were a number of very challenging questions that in any other year would have been tough but especially so this year. I hope that the marking scheme adequately reflects the efforts the candidates have made while navigating the LC course over the past two years."

Additional Specific Comments on the Higher-Level Paper

Question 1:

A relatively fair and testing first question. However, the 9.2 cm^3 "less" may cause confusion for some students. Assume the deioniser was operating at 100% efficiency. Due to time constraints, some may not have covered the chapter on water, and this would have limited their choices.

Question 2:

A testing question, however having separate experiments within one question was deemed unfair to students, who may not have had the class time to have completed all their practical work.

Question 3:

A relatively fair but challenging question.

(b) The storage of hydrogen peroxide is of concern to the teacher not necessarily to the student and it is unfair to ask this question of students. We ask that a broad range of answers be accepted, e.g. it should be stored with the other oxidising agents should be acceptable. The risk may be that decomposition will occur and the hydrogen peroxide will not work in the experiment. Manage the risk would be store it in a dark bottle.

(d) part (ii) Students who recognise that increasing the amount of catalyst also increases the rate should get full marks. However, students who realise that the increase in mass is so small that very little difference in rate would be observed, should also get full marks.

Even though it is obvious now that the curves should be drawn on the graph from part (c) it was not all that clear to some students in the pressurised situation on the day. The insertion of the phrase "using the graph from part (c)" would have greatly helped. Those that used the same axes for both parts complained that the graph ended up very cluttered, considering that they already had drawn a tangent to the curve in part (c). Again, this cause upset for some on the day and caused doubts to creep in.

Question 4:

This was another testing question.

(f) Expressing mass in 1098 carats rather than in SI units is confusing for students.

(h) full marks should be obtained for mention of any fluoride compound.

(l) i and Q11 were both on Atmospheric Chemistry Option A – would it not be fairer if one of these parts dealt with Industrial Chemistry to cover all option choices.

Question 5:

Overall, this was a fair question.

Question 6:

Mixed reaction to this question. It was regarded as far too wordy especially, especially for our International students where English is not their first language.

(c) (ii) Accept 'electrolysis of water' or 'dehydrocyclisation' or 'shift reaction'.

(c) (iii) We would hope that any reference to the explosive or highly reactive nature of hydrogen should be accepted.

(c) (v) The not so obvious cancelling in the equations here threw some students off. All these little things increase students' anxiety and then they perform below par.

Question 7:

Overall, this was regarded as a fair but testing question and may suit some students, but more work in it compared to other questions. We do not expect it to be very popular.

Question 8:

Some felt that this question was structured in an unusual fashion. Not including a reaction scheme would have thrown many and most of the questions very highly specific requiring very precise answering. The absence of a chemical formula in parts (a) and (b) (i-v) was disappointing for some students who were familiar with schemes given in questions in previous years. It was disappointing that a lot of this question depended on memory recall. The top achieving students would have coped well but what about the rest. Many seem to get stuck very early in the question.

Question 9:

Overall, a demanding question and we expect that it will not be popular with most students. The average student would have found (d) very challenging, trying to assimilate the data from 4 curves, and almost half the total marks for this part. This was regarded as very unfair for the average student, who may have banked on this topic for their choice.

Question 10:

Parts (a) and (b) were deemed fair question, apart from students needing to take care with units in (iv), however (c) was deemed far too wordy and confusing to students. There was too much data to process for what was only half a full question. Under exam conditions, students felt they were bombarded with figures and information about a reaction which they would not be familiar with. Under the pressure of an exam, it was too much data and made overly complicated and elaborate, despite the calculation being more straightforward than the original preamble would have led to believe and this may have students avoiding it. We expect this to be an unpopular part.

Question 11:

A fair question with good choice.

In general, it was felt that the **Higher-Level paper was very challenging, and not a student friendly paper.** Question choice will be critical to successful outcomes.

General Comments on the 2022 Chemistry Ordinary Level Paper

Overall, it was a difficult paper. Far too difficult for OL students. We hope that this will be taken into consideration when designing the marking scheme.

Question 1

(b) Too demanding for OL. This experiment is best kept for Higher Level.

Question 3

(a) (iii) Full marks should be given to any student who recognised that speed of replacing the cork after adding the catalyst is essential.

Part (c) is too difficult for OL.

Question 5

(a) (iii) Question on noble gas configuration is too difficult for OL students.

(d) Circular Bohr orbits – this is a really outdated method of describing bonding and is not in keeping with modern developments in chemical education where the emphasis is on showing just the outer electrons in cross dot configuration.

Question 8

(a) Including enzymes on OL chemistry is too difficult as these are no longer on Junior Cycle science.

(c) This was very difficult for OL and very wordy.

Question 9

9(c) This is a difficult question – the electrochemical series should really be avoided for OL students.

Question 10

(b) (v) Too difficult for OL.

Question 11

(b) (iv) Too difficult for OL students.

(c). Too wordy and confusing to combine the three methods of separation in one question.

(d) Too wordy and difficult for OL students.

(d) part (iv) Very wordy and unclear as it depends if the coproducts are of use. Since the question refers to isolated and purified full marks should be awarded to any reference to the coproducts being sold.

Additional Observations: With the introduction of one-hour classes in many schools, 20 mins are being lost every week for the two years of Senior Cycle and this is putting severe pressure on teachers to complete the syllabus in school time. We are getting reports that many are having to take their students for classes after school to complete the course. Additionally, the gap between the Junior Cycle and Senior Cycle Science subjects has become a chasm, as the new Junior Cycle science specifications do not prepare students for Senior Cycle chemistry. Also, the level of mathematical content on the LC Higher Chemistry paper seems to be increasing year on year and this for students coming from JC Chemistry with little or no mathematical content. Finally, we are confident that the SEC will take the *views of teachers at the coalface* on board when devising **fair marking schemes** for this year's examination papers.

Mary Mullaghy

(Convenor of the ISTA Chemistry Committee)