**UK Chemistry Olympiad 2018**

**Examiners' Report, Round 1**

The members of the Royal Society of Chemistry (RSC) Olympiad Working Group would again like to thank teachers for their hard work supporting students and the RSC to run Round 1 of the UK Chemistry Olympiad.

The quality of marking on the sample of papers seen by the working group was again very high. There was evidence on some scripts of internal moderation before scripts were submitted to the RSC, which was pleasing to see, and the annotations made by some teachers to show why marks had or had not been awarded continue to be very helpful. Markers should take care with the awarding of half-marks as per the mark scheme, as there were cases where papers were moderated down due to over awarding of marks.

The members of the working group are always pleased to receive letters and emails from teachers about the administration, content and demand of the Round 1 paper and take on board this welcome feedback, including making some alterations to the versions of the paper and mark scheme that will be put online for future use. Considering feedback from last year, an alternative 2 x 1-hour paper option was made available for schools and colleges who found it difficult to administer the exam in a two-hour slot. Feedback from the examination series this year reported that students who had sat the two separate papers were at some disadvantage to those sitting the two-hour paper, as they could not go back to previous questions once the paper had been collected in. The working party noted that out of the top 100 scripts moderated only 1 paper was in the alternative 2 x 1-hour format.

The paper this year was out of 81 marks. It was noted that this year more candidates were able to attempt all the questions set and therefore attempt some of the more accessible marks, however, it is always worth reminding students not to get tied up in a question and to look through the paper for accessible marks. Parts f) and g) on question 5 were relatively straightforward and most candidates who attempted these questions scored very highly.

Over 183 teachers responded to the online survey that was issued at the end of the Round 1 window and the comments have been reviewed by the working group.

Feedback from the teacher survey reported that the Introduction of 2 x 1hr papers was much appreciated and easier to manage for some schools and colleges and the OWG will bear this in mind as we develop further papers. Teachers commented that the competition was "an excellent way to challenge our brightest students". Students sitting Round 1 were invited to give their feedback on the competition and comments included that the paper "can help make difficult A level questions easier, as you get used to different, harder ways of asking questions". Many comments suggested that students felt that it is good preparation for the chemistry A level exam for those aiming for the

top grades with comments reflecting the problem solving, stretch, challenge, creativity and opportunity to apply their chemical knowledge.

900 schools registered for the competition, including 30 international schools.

There was an increase in participation from 2017 with 6542 students' marks entered into the online score submission system, to give the second highest number of student participants in R1 of the UK competition. We were especially pleased to see that 109 schools had participated for the first time and we look forward to seeing them continue to participate in future years.

Whilst the paper has always been written with upper sixth form students in mind, we encourage ambitious lower sixth form students to enter if they have been able to cover the required topics in their independent study. Approximately 44% of entries received were from Year 12 or equivalent students, with a small number (0.4%) of Year 11 or below participating. There were a number of excellent entries from lower sixth form students and it is hoped that these students would be strongly encouraged to enter the C3L6 written paper later in the summer. The top performing student in Year 12 achieved a score of 85%. The average score for Year 12 students of 16.6 compared to an average score of 24.4 for Year 13 students. The average score for Year 11 students was 24.5 marks.

It was noted that many of the top scoring students had previously participated in the C3L6 lower sixth written paper and it was pleasing to see that they have continued to participate in chemistry competitions. The thresholds required for Gold, Silver and Bronze certificates indicate the challenge of the paper. We felt that 5-10 marks should be accessible to a good GCSE candidate and approximately 15 marks could be scored by a good A level candidate. A score of 16 or above was therefore felt to be a commendable achievement and worthy of a certificate.

Question 1: This question was about applications of some lithium compounds. The examiners felt that this was a straightforward opening question, although the movement of electrons between anode and cathode did, as expected, discriminate between candidates. The balanced equations were well answered, although some more able students lost marks through trivial mistakes and students would be advised to check that their chemical equations balance. Part c) caused the most difficulties for the candidates, with the most common incorrect response including linear structures. The empirical formula calculation was very well answered but students should be reminded to check the number of electrons around atoms in their dot and cross representations.

Question 2: This question was about making ammonia, which is a topic familiar to students from GCSE chemistry courses. The conversion of units caused difficulties for some students, but the examiners noted that this question was generally well answered, and error carried forward was allowed throughout the question. It was noted, however, that the majority of students did not take the number of significant figures that the data was reported to into consideration when giving an appropriate answer to their calculations. This was not penalised in this question. Part d) was

generally very well answered and those candidates who tackled parts e) – g) usually scored some marks and students should be encouraged to attempt all questions set.

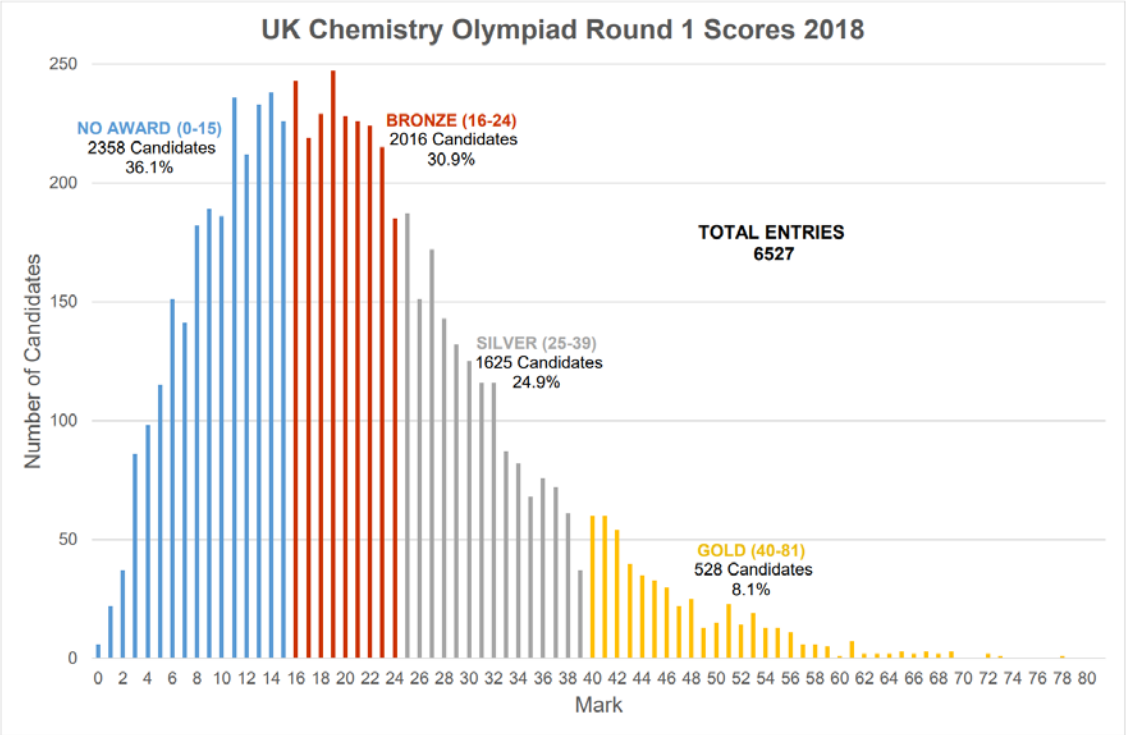
Question 3: This question was about the uses of enriched uranium. Parts a) – g) were found to be very accessible to the majority of candidates although in part g) some candidates lost marks by only giving one oxidation state. Part h) was more demanding and the formula of the anionic part $U_2O_7^{2-}$ was seen only by a few candidates. The majority of answers seen for the identity of compounds **X** and **Z** were correct and many candidates were able to write alpha decay equations. Part j) was very accessible to most students although some did not use the axis values and did not report the values in standard form. Part k) was found to be trickier for a lot of students and was very differentiating at the top end of the mark range.

Question 4: This question was about cough suppressants and there were some very pleasing attempts to answer the first part of this question with many candidates correctly identifying compounds **A** – **E**. A significant number of students did not give the correct molecular formula of dextromethorphan, often miscounting hydrogen atoms, but incorrect numbers of carbon atoms were also seen in responses. The determination of the molar mass from a given name was very discriminating.

There were some pleasing attempts at the deduction of the structures of the anions in part d). Many students correctly identified carbon 9 in part e) but carbon 13 was less commonly seen, with many students finding it challenging to count the number of nearest neighbours. The latter intermediates were difficult to deduce, but there were a number of fully correct answers and this question was very helpful at differentiating the top students. We considered that part i) was going to be extremely difficult for the candidates, but we were very pleasantly surprised to note the number of correct answers.

Question 5: This question was about the 'inert' gas helium. It was again noted that some students were unable to finish the question paper due to the pressures of the time allowed, however, those students who did attempt this question scored on the question. Error carried forward was permitted where students did not correctly identify the number of Na and He atoms in the unit cell and many students who used incorrect values in part e) from part c) were able to score full marks in part e). It would be worth reminding students that it is always worth attempting multiple choice questions, and to allow time to check through their work for relatively straightforward marks.

The distribution of scores for Round 1 of the UK Olympiad is shown below.

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