



## **UK Chemistry Olympiad 2017**

### **Examiners' Report, Round 1, 2017**

The members of the Royal Society of Chemistry (RSC) Olympiad Working Group would 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.

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. Over 150 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.

The paper this year was out of 75 marks following feedback from the 2016 paper that candidates found managing their time very hard.

It was noted that this year more candidates were able to attempt all of the questions set and therefore attempt some of the more accessible marks. Feedback from the teacher survey reported that in particular there were enough accessible marks in questions 1 and 2 to encourage students in Year 12 and below to 'keep going' and to work through the rest of the paper.

727 schools registered for the competition, including 30 international schools. There was a slight decrease in participation in 2017 with 5389 students' marks entered into the online score submission system, but we were especially pleased to see that 68 schools had participated for the first time and we look forward to seeing them continue to participate in future years.

Approximately 43% of entries received were from Year 12 or equivalent students, with a small number (0.6%) 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, was a Year 12 student, achieved a score of 73 / 75!

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.

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 20 or above was therefore felt to be a commendable achievement and worthy of a certificate.

### Question 1

This question was about possible causes of the green coloration of the diving pool at the Rio Olympics. The examiners felt that this was a fairly straightforward opening question although it was noted that a number of top students made trivial mistakes when writing and balancing equations and that the formula for hydrogen peroxide was not known by all 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 OH<sup>-</sup> in the answer. In the final part of the question the most common incorrect response seen was CuSO<sub>4</sub> and candidates seemed less familiar with the solubility rules.

### Question 2

This question was related to atmospheric chemistry. FeS<sub>2</sub>, or sometimes FeSO<sub>4</sub> was sometimes seen rather than FeS. Few candidates considered S<sub>8</sub> in their answers. The conversion of units caused difficulties for some students but the examiners noted that this question was generally well answered.

### Question 3

This question was about the chemistry of Iron Man. Part a) was found to be very accessible by the majority of candidates although part b) was more demanding. Part (e) was found to be trickier for a lot of students and was very differentiating at the top end of the mark range, with many students finding it challenging to count the number of nearest neighbours. We considered that part f) was going to be extremely difficult for the candidates, but we were very pleasantly surprised to note the number of correct answers with many students doing better on this question than the working group!

#### Question 4

This question was based on the molecule twistane. In part a) many candidates knew the tetrahedral bond angle but quoting this rather than the difference between this and the bond angle in a regular hexagon did not score the marks. Parts b), c) and d) were well answered. A number of candidates in the moderation of the scripts had additional marks awarded for parts b) and d) as they had been penalised for including -1-2-3-4-5-6- in their answers. It is noted by the working group that a number of candidates would not have covered much organic chemistry prior to the sitting of the paper. However, in part g) it was noted that students who attempted to draw the structures of the intermediates often scored some marks. Some students approached the question by working backwards from the final product which was pleasing as organic synthesis questions used in Round 1 are designed to give students a variety of access points into the question. It is always difficult to account for all possible ways of error carried forward in organic questions. In moderation of the top scripts we tried to be generous where there was clear evidence of correct chemical intuition. However, candidates should be advised that if they write a 'C' atom in skeletal formula then they should write in all of the atoms that it is attached to. 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.

#### Question 5

This question was about superbases. It was 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 well on parts a) and b). Many candidates who attempted part c) recognised that there was a COOH group in the R group, although not all deduced the full structure of the R group and therefore were not able to determine the number of signals in the  $^{13}\text{C}$  NMR as a result.

# UK Chemistry Olympiad Round 1 Scores 2017

