

REPORT ON THE CHEMISTRY OLYMPIAD ROUND 1 PAPER 2007

This year as last we gave schools the option of either entering five or fewer candidates for the competition and leaving the marking to our committee, or entering more than five candidates so long as they pre-marked all of their entries.

The number of schools registering and the number of scripts received were similar to last year: 372 schools registered, 265 schools took part (what happened to the other 107?) and the total number of scripts received was 1360.

All high-scoring scripts were remarked by the committee: the marks were changed only slightly at this stage, and this suggests that supplying a detailed mark-scheme to teachers is sensible.

The very helpful and largely positive comments that we have received on this year's Olympiad paper suggest that we have again managed to set a paper which is both relevant and challenging to sixth form students and much appreciated by teachers. Some teachers felt that the paper was too difficult this year, but every part of each question was answered correctly by at least one candidate. Other teachers felt that the paper was taken too early in the year and that candidates would do better if they attempted it later in their course; sadly the timetable is fixed because of the dates of the final international competition, and Round 1 cannot be moved any later.

Although we use the results of this test to select the students who proceed to Round 2 and eventually into the UK Chemistry Olympiad team we hope that it does more than that: it should promote Chemistry as a relevant and exciting subject and stretch the most able students in the sixth form who may find existing post-16 courses less-than-demanding.

It was certainly a testing paper but there was a good distribution of marks: about 4.5 % of candidates were awarded a gold certificate for scoring 48 or more marks out of 73, 12% got silver certificates for between 38 - 47 marks, and 21% got bronze certificates for marks between 30 - 37. There were many other creditable performances outside of this range with commendation certificates being awarded to candidates scoring 16 – 29 (45%). Only a very small number of candidates (< 6%) failed to score double figures.

This year, responding to requests from teachers, we introduced a 'school certificate' – acknowledging the achievements of all candidates from a specific centre – for display in school.

An encouraging number of scripts were received from students in the Lower Sixth (or equivalent): one of the top marks was, in fact, from a Lower Sixth student! This was very impressive since presumably some these candidates may have only been studying advanced level Chemistry for a term and a half. We want to encourage even more entries from talented Lower Sixth applicants in the future. To help this we will invite the best performers in the Lower Sixth to Cambridge for a short course later this year to reward and spur them on to apply again next year. We did this for this first time last year and it seemed to be a great success.

Comments on individual questions are given below.

Question 1: launching the space shuttle

We thought that this question would be a nice easy starter, which good Lower Sixth candidates should have been able to do. It proved harder than we intended, however, with many candidates losing valuable marks through careless errors. There were problems with orders of magnitude, and in part (e) the mark was given for the energy released by the whole reaction and not per mole of aluminium.

Question 2: geometric shapes

This is a question which required careful reading. Candidates who had studied phosphorus chemistry might have had an advantage when answering it, but those who thought should have been able to excel. Again there were many worrying errors, such as a P_4 tetrahedron which had five P atoms (one in the middle as in $CH_4!$), and oxide formulae PO_3 and PO_5 . Quite a few candidates got the correct numbers of atoms in part (j) but then couldn't work out the charge and so fell at the last hurdle.

Question 3: phosphate levels in our environment

Parts (a) and (c) were hard and few candidates got the correct answers. There should be no excuses for not getting parts (d), (e) since K_{sp} was defined, and (f), however.

Question 4: a flame-retardant

This question was harder than similar questions in the past since the explanation of how the spectra arise was not given this year. It was possible to work out, however, and we were encouraged and impressed by how well some candidates tackled it. The earlier parts of the question (including the idea of labile Hs) were well answered, but the later parts really sorted people out. This year, as last, candidates experienced the usual difficulties in drawing and naming three-dimensional shapes: PH_3 is not planar!

Question 5: Tamiflu™

We knew that this would be the hardest question on the paper and it was more difficult than similar questions in previous years (Rohypnol, Rimonabant, Viagra™). But it was certainly very relevant at the time the paper was sat! The early parts were accessible if the question was carefully read and thought about or 'guessed' sensibly, but the later parts were demanding. No-one got the question completely correct, but each part was answered correctly by some-one. The azide ion caused problems: we expected it to be recognised just as a nucleophile and hoped that candidates would simply write N_3 in the structures, but often N just seemed to appear everywhere! A three-membered ring also caused problems (unless candidates had seen an epoxide) even though this information was given in the question.

One of the comments on last year's paper was that it was too long so this year's paper was deliberately cut down to give more 'thinking time'. But perhaps it was still too long. Logical thought got the better Chemists to part (g) as we had hoped, but after that it was very challenging. Only the very best candidates got anywhere with the last part.

Question 6: chlorine dioxide

Answers to this question were rather disappointing, and perhaps candidates would have done it better if it had come before Tamiflu™ rather than after it. Schools are teaching less inorganic chemistry than in the past, and for some candidates dealing with unfamiliar topics is difficult. Oxidation states were well understood, but getting correct formulae and balancing chemical equations was often disappointing.

All committee members hope that students enjoyed the experience of attempting a really demanding paper and that teachers will use questions (and answers!) in their teaching. The key difference between the Olympiad paper and AS and A level exams is that this paper requires candidates to think and not just recall what they have been taught. We are not surprised that even candidates who have scored 300/300 in their AS modules and gained places at the best universities found our paper challenging. There are parts which are absolutely straight-forward (such as balancing equations) but these were not always

well done. There are also some very difficult parts which could be answered by logical thought. A reasonable score in the paper (perhaps 50%) shows real achievement. Any candidate from any type of school could do really well if they were prepared to think.

We hope that even more schools and even more students will be encouraged to enter the competition next year. With the UK due to host the International Chemistry Olympiad in 2009 (in Cambridge) we will be looking to field a very strong team....

Tim Hersey
Chairman of the UK Chemistry Olympiad Selection Committee