

Examiners Report for Chemistry Supplementary Subject 2004

Aromatic and Heterocyclic Pharmaceutical Chemistry

34 candidates entered for the examination but only 33 candidates actually sat the paper. The pass mark was 40, and distinctions were awarded to candidates who scored 70 or more. There were 14 distinctions, 15 passes and 4 fails (not including the no-show candidate). The maximum mark was 88, the minimum mark 24 and the mean mark 61.9 with a standard deviation of 19.0. Candidates were clearly grouped into three categories: those who performed very well and easily earned distinctions, those who grasped some of the concepts of the course and who all passed, and those who clearly understood little of the subject material or had not been to the lecture courses, who all failed. No candidate was near a mark borderline, and all candidates who failed scored less than 30. Eight questions were set, all of which related to material contained in the lecture courses and problem classes.

Question 1 (11 answers, average mark 10.2). Mode of action of omeprazole and structure activity relationships. Apart from two good scripts this question was answered quite poorly, with many candidates not understanding the mechanistic basis for biological activity.

Question 2 (15 answers, average mark 11.1). Synthesis of omeprazole. Some reasonable answers but asymmetric oxidation proved beyond almost everyone.

Question 3 (11 answers, average mark 12.9). Synthesis of nucleosides. In general a well answered question though few candidates understood the role of the trifluoroacetic anhydride in Part B step c.

Question 4 (30 answers, average mark 13.5). Synthetic transformations. The most popular and best answered question on the paper. Candidates found it easy to choose which of the two potential products would be formed.

Question 5 (22 answers, average mark 11.8). Benzenoid synthesis. Part A proved quite straightforward, but many candidates did not recognize the sigmatropic rearrangement in Part B

Question 6 (21 answers, average mark 13.4). Synthetic transformations. Reasonably straightforward with most candidates being able to find at least three transformations familiar to them.

Question 7 (25 answers, average mark 11.7). 1,4-Dicarbonyl chemistry. Part A was answered quite poorly; candidates for some reason find carbonyl synthesis difficult. Answers to Parts B and C, which were covered directly in the lectures, were much better.

Question 8 (30 answers, average mark 12.7). Heterocycle synthesis. Generally straightforward though several candidates (mistakenly!) thought there was an error on the question paper for the structure of the product of Part A (b).

Dr A.J. Fairbanks

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Quantum Chemistry
March 2004

27 candidates took this examination. There were many good answers and about half of the candidates showed that they had a knowledge of all of the course material.

The average mark was 60.7. There were 9 distinctions and 3 failures.

Detailed comments on the questions (number of non-null attempts and average mark in parentheses).

Question 1 (18; 11) Group theory : Few candidates knew the definitions of (i) a group, (ii) a class, (iii) a matrix representation and (iv) an irreducible representation but were able apply group theoretical techniques to determine the irreducible representations of the hybrids of a planar AX_4 molecule.

Question 2 (13; 15) Polarizability : This question was well answered by most of the candidates that attempted it.

Question 3 (24; 16) Angular momentum : This question was well answered by most of the candidates that attempted it.

Question 4 (21; 16) Huckel theory : This question was well answered by most of the candidates that attempted it.

Question 5 (15; 7) Group Theory : This question was poorly answered. Few candidates could establish the mutual exclusion principle. Most could not determine the Raman and infared modes in C_2H_2 .

Question 6 (12; 7) Operators : This question was poorly answered. Most candidates could not manipulate the operators correctly and had little idea how to proceed.

Question 7 (20; 12) Variational technique : Most candidates who attempted this question knew what to do. Problems of this nature require some mathematical skill evaluating the integrals and in the main most candidates did well. There were several almost correct solutions.

Question 8 (12; 8) Time dependent perturbation theory : Some candidates had a good understanding of the bookwork in this question but found the problem - a standard one- difficult and most were not able to correctly apply the oscillatory perturbation. There were, however, a significant number of candidates who picked up a few marks with some random comments.

Supplementary Subject

History and Philosophy of Science

The general standard of this year's scripts was high. In a total of twenty-five scripts, there were few weak performances, and the candidates who were awarded a distinction deserve great credit.

All but two of the candidates answered three questions (the maximum allowed) from Section A and one from Section B. Within Section A (the historical part of the paper), questions 8 (on scientific naturalism in the twentieth century) and 9 (on modern reductionist views of life) were virtually ignored, but the other questions proved more or less equally popular. On the whole, essay technique was better than it has been in recent years, although weaker candidates still allowed their answers to drift off either into narrative (when analysis and evaluation were explicitly called for) or irrelevance (the consequence, all too often, of apparently trying to answer a question other than the one set). Elementary mis-spellings cropped up more frequently than they should have done: Priestly, Wedgewood, Sedgewick, and Davey all made their familiar depressing appearances.

Of the questions that were conspicuously well answered, special mention should be made of Q.3, on Harvey, where the tricky matter of Harveys sixteenth-century precursors was usually handled both accurately and perceptively, and Q.5, which elicited answers that judiciously qualified exaggerated claims on behalf of Lavoisier as 'the father of modern chemistry'. Many other answers, although competent enough, would have benefited from a more rigorous engagement with the detailed content of the science concerned. This was most obviously true of the answers on Darwin (Q.7), too many of which conveyed rather inadequately the nature of Darwin's observations during his voyage on the Beagle and the gravity of the scientific objections to Darwin's theory of evolution by natural selection; discussions of the latter tended to stray too easily into the religious issues and hence into irrelevance.

Whilst only two candidates offered more than one answer to Section B, at least almost all questions were attempted by one or other candidate (only Q.10 Part 2 was not), indicating that this section, though judged more demanding than Section A, was at least of uniform standard. Q.10 Part 1, Q.12, Q.13, and Q.14 proved particularly popular, with Q.15 and 17 runners up. Answers meriting a distinction did so by virtue of addressing the question, showing good knowledge of relevant background material, and displaying no obvious inconsistencies; since virtually all the questions called for genuine thought (as opposed to rote learning) it is perhaps not surprising, although disappointing, that only a handful of candidates produced scripts of this quality. The best answers were by candidate 23119, who otherwise did poorly on Section A; and candidate 19985, the only one to attempt three questions from Section B: they are to be congratulated.

Answers of poor quality showed the usual failings: failure to address the question; inability to reason, as opposed to reproducing arguments from the readings and lectures; and, at the lower end, muddle and confusion. Also at fault were those who answered Q.12 and Q.13 who did not say which part of the question they were attempting (and worse,

whose answers did not make it clear either). Particularly poor answers were given to those questions that called for the most original thought, Q.15, Q.16 and Q.18.

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