Version 1.0: 1.0 0709

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Chemistry 1421

CHEM2 Chemistry in Action

Report on the Examination

2009 examination - June series

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Set and published by the Assessment and Qualifications Alliance.

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General

This was the first CHEM2 paper for the new Specification. The content of this unit covers aspects of the legacy CHM2 and CHM3/W, together with new areas of work. The approach to the chemistry and, in consequence the approach to the style of questions, seeks contexts which are designed to consider "how science works". Not surprisingly, candidates found the demand of this first paper relatively high and Centres had undertaken a significant challenge to ensure appropriate coverage in their teaching.

Against this background, it was particularly pleasing to see that full marks were seen on every question and overall scores up to 98% were seen for the paper. Moreover there was no evidence that candidates ran out of time to complete the paper. The lower achieving candidates had ample opportunity to show what they could do, with many parts of the paper taking information directly from the Specification. These questions should have been accessible provided that the candidates had a full awareness of the ideas, concepts and facts given in the Specification. A useful method for encouraging students to understand the material in the Specification is by carrying out appropriate experimental work and a useful starting point for that work is the collection of PSA experiments published on the AQA website.

Section A

Question 1

This question took as its context an experiment similar to that considered in PSA6 and while parts 1(a) and 1(b) proved relatively accessible for most candidates, the question posed in 1(c) proved very demanding. Only the better candidates were able to express adequately the meaning of the term *rate of reaction* and only those who read the whole question with care could access the relatively straightforward idea behind part 1(d)(ii).

Question 2

The range of answers given to the meaning of the term *standard enthalpy of formation* in part 2(a)(i) indicated the variation in the ability of the candidates to learn basic information. Application of that information in the remainder of part (a) was generally well done, although too many candidates had their data the wrong way around in part 2(a)(iii).

Part 2(b) was answered correctly by approximately half of the candidates and there were some good answers in each section of part 2(c). The ability to construct and balance equations, including the simplest ionic equation in part 2(c)(ii), was made impossible for those candidates who did not know that Ba^{2+} is the formula of the barium ion.

Question 3

This was generally a well-answered question suggesting that the students were able to apply their knowledge in a novel context provided they had sufficient information. More than 70% of candidates scored full marks in all three parts 3(a)(i), 3(a)(ii) and 3(a)(iii) and almost half the candidates were able to use the calculated data for each liquid to arrive at some credit in part 3(a)(iv). Almost a third of the candidates gave plausible reasons for why the students may have made an incorrect deduction.

Question 4

Part 4(a) was taken straight from the Specification but only 20% of candidates scored full marks. The explanation in part 4(b) was generally done well and part 4(c) was relatively high scoring, even though the demand in 4(c)(i) required reference both to the change in rate and the idea that a catalyst is not used up in the reaction. Most candidates gave a correct answer to part 4(d)(i), but only a minority of candidates could work out what to do in part 4(d)(ii).

Question 5

This question involved a good deal of learned facts about metal extraction and all parts had correct answers from approximately 45% of the candidates. The equations in parts 5(b)(i) and 5(c)(ii) were among the least well answered parts.

Question 6

This question proved difficult for many candidates because they did not know the basic chemistry and could not write the simplest ionic equation. They appeared to guess at the observations.

Question 7

This question was generally well answered. The mechanism in part 7(b) discriminated well with the full range of marks scored and 60% of the candidates scoring at least 3 marks. The new part of the Specification tested in part 7(c)(ii) was answered well.

Question 8

While some very good answers were seen for all parts of this question, the general impression was that some candidates found this question demanding. Relatively few candidates were able to state correctly the meaning of the term *nucleophile*, but almost 70% could gain at least half of the marks in the nucleophilic substitution mechanism in part 8(b). Part 8(c) was recognised by examiners to be a difficult question and only a minority of candidates were successful. Part 8(d) discriminated very well with the full range of marks seen and more than half the candidates were able to score at least half of the marks.

Question 9

This question involved a good deal of chemistry new to the Specification. Part 9(b) was well answered with almost 70% of the candidates able to gain at least 2 marks. By contrast, part 9(c) was badly answered with only 10% of the candidates able to identify the correct alcohol and then draw its displayed formula with **all** of the bonds shown. In particular, the O-H bond was often incorrectly shown as just OH.

Section B

Question 10

This question aimed to test areas of the Specification in the context of the historical methods used for the extraction of bromine and a real application of the chemistry of bromine in its use in swimming pools in France and the USA. Part 10(a) proved quite demanding although almost 75% of candidates gained some credit. Part 10(b) discriminated well with the full range of marks seen and more than half of the candidates were able to gain at least 2 marks. Candidates who could balance the equation had no difficulty with this part of the question. Part 10(c) was often well answered with 80% of the candidates gaining at least 2 marks.

Question 11

The stem of this question was about the development of compounds used as anaesthetics. Part 11(a) was an example of free-radical substitution. Candidates have difficulty with this mechanism beyond its name and the initiation step and this proved to be the case here with only 45% of the candidates gaining more than two marks. Part 10(b) was chemistry new to this unit. The question was about the probable impact of chlorine-containing compounds on the ozone layer in the upper atmosphere. Only a minority scored all 6 marks, with only 45% able to score at least 2 marks. Rather too many candidates made imprecise statements or did not know the content of the Specification sufficiently well to allow them to access this question. Part 11(c) required an appreciation of the difference, in terms of bonds and atoms present, between *desflurane* and *halothane.* Almost 75% of the candidates were able to gain at least half of the marks.