A-LEVEL
CHEMISTRY

CHEM2 Chemistry in Action
Report on the Examination

2420
June 2014

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General

This paper was found to be less demanding than the June 2013 paper but discriminated almost as well, as shown by a high standard deviation. The demand of the paper was more comparable with the 2012 CHEM2 papers. Full marks were seen on all questions.

Question 1

Part (a) was straightforward but only a small number of students scored the mark in part (a)(i) whereas most scored the mark in part (a)(ii). Explanation of the term "dynamic" in part (b) proved demanding. Only the higher-scoring students conveyed the idea that both reactions are occurring all of the time and the common misconception was that this term meant only that the rates were equal. Part (c)(i) was straightforward and the majority of students scored both marks. However, part (c)(ii) proved more demanding with considerable confusion between time and rate. Fewer than half of all students scored 2 marks and only a very small number were able to state clearly why an increase in the total pressure would lead to a decrease in the time taken to reach equilibrium and score all 3 marks.

Question 2

Overall this was a relatively high-scoring question. The demanding part (b) highlighted some significant misconceptions about the Maxwell–Boltzmann distribution. It was evident that many students had little idea why the curve started at the origin. Common misconceptions were that the origin referred to zero rate or that the reaction had not started or even that the origin is absolute zero.

Question 3

Too many students had problems writing and balancing the equations in each of parts (a)(i), (a)(ii) and (b)(i). The calculation in part (c)(i) was straightforward and most students scored all 3 marks although errors were seen in simple mathematical operations. The remainder of the question was also relatively high scoring.

Question 4

Incorrect formulae of Group 2 compounds and that of titanium(IV) chloride were common and it was problems with these that contributed to only about two-thirds of students scoring the mark in parts (b) and (d), respectively. Just over half of students scored both marks in part (e).

Question 5

Part (a) required a free-radical substitution mechanism for molecules with two different halogens and it discriminated well. In common with previous questions involving a similar mechanism, the second propagation step proved to be the most demanding part of this question. The remainder of the question was relatively high scoring.

Question 6

Part (a) was answered well but part (b) proved more demanding. Only about one-third of students were able to balance the equation in part (b)(i) and only about half of students gave correct half-equations in parts (b)(ii) and (b)(iii). The halide ion analysis in part (c) was well known with the lowest scoring part being (c)(iv), with many having failed to recognise that it is insufficient to simply

state that AgCl is formed. Any question involving NaClO is always demanding and part (e) was no exception with less than half of the students scoring the mark.

Question 7

Fewer than a third of students scored both marks for the definition in part (a)(i), often missing the requirement to state that stereoisomers are compounds with the same structural formula. Part (b) was generally well answered with most students scoring all 3 marks. Part (c)(ii) required appreciation of the fingerprint region or some equivalent idea and only about one-third of students scored this mark. The displayed formula in part (d) caused the usual problems and few were able to score this mark. The mechanisms in parts (e)(i) and (f) were the most discriminating questions on the paper, producing a good spread of marks. Part (e)(ii) required an explanation involving the relative stability of carbocations, with a low demand and a much higher demand mark and only the highest-scoring students scored both marks. It was a surprise to see answers that referred to the 'Markownikoff rule' without any explanation in terms of the stability of carbocations.

Question 8

Students were not put-off by the novelty of part (a) and many good answers were seen. Lower marks for the mechanism in part (a)(i) were often attributable to poorly presented curly arrows. Part (b) was relatively demanding but nevertheless almost half of all students scored all 3 marks. Part (c)(i) differed from many previous questions of this type and a number of students attempted to answer it in terms of an increase in pressure consequent upon the 1 to 10 mole ratio. Notwithstanding this, about half of all students scored at least 2 of the 3 available marks.

Question 9

Part (a) discriminated almost as well as the earlier mechanism questions with well over half of the students scoring at least 3 of the 5 marks. Relatively few recognised that (fractional) distillation is a process used to produce a much more concentrated solution of ethanol and many referred to the hydration of ethene, having missed the requirement to start "from a dilute aqueous solution". The concept of carbon-neutral "in the context of this biofuel" required reference both to carbon dioxide **and** the atmosphere. Part (b) was well answered with over half of all students scoring 4 out of 5 marks. By comparison, part (c) proved more demanding. The definition in part (c)(i) most often yielded only 1 of the 2 marks. Too often in part (c)(ii) it proved difficult to decipher the jumble of numbers that some students recorded on the page and only about one-third of students scored all 3 marks.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.

Converting Marks into UMS marks

Convert raw marks into Uniform Mark Scale (UMS) marks by using the link below.

UMS conversion calculator