AQA
Realising potential

A-level
Chemistry

CHEM2 Chemistry in Action
Report on the Examination

2420
June 2015

Version: 1.0

General

Wherever possible, standards were carried forward from previous examinations and students were rewarded for what they knew, understood and could do.

Full marks were seen on all questions.

The paper in 2015 was slightly easier than that in 2014 with a mean of 65.7% compared with the 2014 mean of 63.7%.

Discrimination was similar to last year with a standard deviation of 21.8 in 2015 compared with 21.4 in 2014.

These two taken together mean that there is a good spread of marks and the paper has a "feel-good factor" for the students.

Question 1

This was a relatively straightforward start to the paper, but the usual errors were made in balancing equations. The idea of oxidation state is relatively well understood. In 1d, students demonstrated a lack of clarity in what happens during the process of boiling, often alluding to bond breakage and rarely referring to the forces between molecules.

Question 2

This was a high demand question, since it requires application of chemistry from the specification and a failure to provide a suitable test reagent leads to the loss of three marks in each part. The number of possible answers to distinguish silver nitrate in 2c was considerable and partial credit was awarded for test reagents that were unsuitable for test-tube tests, but which led to correct chemical observations. Less than one third of students scored all three marks on 2c and 2d, whereas three quarters scored full marks on 2b.

Question 3

This covered aspects of Group 2 chemistry and in 3a, the trend in atomic radius down the Group was usually correct, but the simple reason that one more main level of electrons was being added for each element in the Group was seen less than might have been expected. As has happened in the past, the failure to be able to work out the formula of Group 2 compounds resulted in the loss of marks for some students.

Question 4

This was the most demanding question on the paper. Students have begun to demonstrate considerable ability in using Le Chatelier's principle to explain the effect of changing reaction conditions on equilibrium yield, but are less effective in their explanations concerning rates of reaction. The low demand first mark in 4aii proved elusive for some and the higher demand mark was marred by incomplete answers missing important ideas such as more collisions *in a given time* and more particles *in a given volume* or words to that effect in each case. In 4aiii the idea that there is an increase in the available surface area when a catalyst is spread onto an inert honeycomb was understood by many, but the necessity to state that this would lead to an increase in *successful* collisions was often missed. Overall only about one fifth of students scored both marks in 4aii and 4aiii.

Question 5

This discriminated well with 85% scoring at least two marks in 5ai and 70% all four marks. In 5bii, only 35% were able to draw a correct displayed formula for the trifluoromethyl radical; many answers giving a correct structure but including a positive charge or a lone pairs of electrons on carbon. Many good answers were seen in 5bii in which the two carbon-halogen bonds were compared correctly. By contrast 5biii proved quite demanding with only 46% gaining all three marks. Errors in the formulas of species and in balancing equations were common, whilst the idea of the bromine atom being regenerated was well understood.

Question 6

This was answered well overall. In 6ai the answer required students to demonstrate that they could both identify the number they were rounding and follow through with that rounding process. Students who choose to draw displayed formulas on every occasion that they are required to draw an organic structure are far less likely to make errors in their structures and this proved to be the case in this question. Part 6ciii was expected to be very straightforward and 78% scored both marks; common errors included either incorrect values for the absorption ranges taken from Table A or reference to bonds such as C–O, C–H or C–C that are not due to functional groups. Only 69% correctly attributed functional group isomerism in 6dii, with 30% choosing position isomerism.

Question 7

This question was answered well. Balancing the equation in 7ai looks straightforward when you know the answer, but it is quite demanding if you have to work it out, and impressively half the students gave the correct answer. In 7bi, it was necessary to draw unambiguous structures both for propan-2-ol (not given in the question) and propanone (given in 7ai). The calculation in 7c was well answered with the focus on correct chemistry rather than on the number of significant figures and the mathematics of rounding the final answer. The definition in 7d was expected to be straightforward and yet still resulted in only 40% gaining all three marks. As many as 45% gained all three marks and 80% gained at least one mark from the very straightforward calculation in 7e, with errors occurring because some students did not know the bonding either in propanone or in carbon dioxide and used the unnecessary C—O that was given in the data set. It was decided that the very straightforward idea of “heat loss”, in whatever context, was worth only one mark in 7f and that students needed to come up with other reasons why the values in 7c and 7e differed; many were able to do so and this led to 54% scoring both marks.

Question 8

This was answered quite well. The naming of P and Q was a challenge for some with a demand both for correct spelling and correct use of the alphabet for functional groups and this led to only 48% scoring both marks. Question 8 included two curly arrow mechanisms and these questions always result in the best discrimination of student performance. Questions 8b and 8c provided an excellent distribution across the full range of marks with the usual errors seen, such as an incorrect carbocation in 8b, a negative charge on ammonia in 8c and, in both parts, a failure to use either a lone pair of electrons or a bond as the origin of a pair of electrons. It was essential in 8d to identify a reagent, in order to be able to access the reaction condition mark and some excellent responses were seen. It is worth reminding students that as a general guide, a reagent is something that you get out of a bottle; for example, sodium hydroxide and not hydroxide ion. Question 8e also discriminated well with most students able to write the equation and then to identify sulfur dioxide as one of the toxic gases.

Question 9

This question provided a range of challenges. The calculation in 9a was answered well and the necessity to focus on either the extraction or the reactivity of calcium was understood by many. In 9b, many students were unable to write a correct formula either for iron(III) oxide or for aluminium oxide and there was often a lack of clarity when stating the *change* in oxidation state of aluminium in this reaction. The equation in 9c was generally done well and many students correctly linked an appropriate hazard to each of hydrogen and hydrogen chloride. The idea that the HCl could escape as a gas and the only other product was vanadium, was necessary to gain the final mark.

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 www.aqa.org.uk/umsconversion