OXFORD
INTERNATIONAL
AQA EXAMINATIONS

INTERNATIONAL AS LEVEL CHEMISTRY

(9620) Unit 2

Report on the examination

January 2020

REPORT ON EXAMINATION: INTERNATIONAL AS LEVEL CHEMISTRY 9620 UNIT 2 CH02 JANUARY 2020

The vast majority of students who sat this paper were able to attempt to answer all questions. There were no inaccessible marks.

QUESTION 01

Students found it relatively hard to concisely explain the meaning of cracking although most were able to gain this mark. Recognising that smaller molecules are in more demand but in low supply and hence more valuable was not well expressed.

Almost all students were able to draw an isomer of A in 01.2 however a significant number of students lost the mark by failing to draw the skeletal formula.

Question 01.3 were generally answered well with most students who correctly identified that the reagent was bromine, testing for a carbon-carbon double bond.

Writing an equation for a cracking reaction where the products were given in question 01.4 was also generally well answered.

QUESTION 02

The majority of students correctly identified the mechanism in question 02.1 and the major product in question 02.2. Many students were able to provide some explanation for why this was the major product, but they were not always clear that there was an intermediate carbocation.

Question 02.3 proved slightly more challenging. Students frequently failed to explain both why propene is reactive and why poly(propene) is unreactive. A proportion of students also confused reactivity with bond strength incorrectly suggesting that carbon-carbon double bonds are weaker than carbon-carbon singe bonds.

QUESTION 03

Students struggled to draw the mechanism in question 03.1. Students frequently missed the fact that the reaction was in acidic conditions and therefore the initial step would be with a hydrogen ion rather than water and that there would be no OH^- present.

In question 03.2 where students were able to start, they generally answered the question well. The most accessible mark surprisingly was not the number of moles of epoxyethane but correct use of density to find the mass of ethane-1,2-diol.

QUESTION 04

The majority of students correctly named the mechanism (question 04.1) and gave at least one equation with the chlorine radical as a reactant (question 04.2). However, several students only ensured the chlorine radical was a reactant for one of their two equations.

Students generally understood the rough mechanism for the reaction of chloromethane with an excess of ammonia but their diagrams often lacked the detail needed for full marks (question 04.3).

Although students could define a nucleophile in question 04.4, very few students correctly identified that cyanide is a nucleophile because the carbon in the cyanide ion has a lone pair of electrons.

Students were usually able to identify that hydroxide ions were acting as a base in the dehydration reaction with 2-chlorobutane (question 04.5). They also demonstrated a good understanding of isomerism (questions 04.6, 04.7 and 04.8). The most common error in these questions was not explaining that stereoisomers have the same positional formula.

QUESTION 05

Although most students recognised that the oxidising agent for alcohols includes either potassium or sodium dichromate (or potassium permanganate), as in previous years marks were frequently lost due to the failure to include the fact that acidic conditions are essential (question 05.1).

In question 05.2 marks were most commonly lost for failing to show that the reactant was butan-1-ol and the product, butanal. However, students were usually successful at drawing the structure of the carboxylic acid formed in question 05.3 and naming the organic compound in question 05.4.

Many students correctly identified the aldehyde and ketone in question 05.5 although there were a significant number of errors in drawing the carbon 'backbone' with incorrect numbers of carbons and/or carbon with either 3 or 5 bonds rather than 4. Similar errors were also seen in answers to question 05.6 although most students were aware that they needed to draw a tertiary alcohol. Students also need to be reminded to make their final answer clear as many students drew several structures for question 05.6 without making their final answer clear and so lost marks.

In question 05.7, where students correctly identified that U was an acid, they were generally able to gain the marks for a suitable reagent and expected observation.

Most students correctly identified the secondary alcohol in question 05.8.

QUESTION 06

Question 06 was generally more challenging for students.

Students were generally able to access some credit in question 06.1 by correctly recalling the formula need to calculate enthalpy change. A common error after this point were failing to realise that when calculating a change in temperature, the temperatures do not need to be converted into K or if they chose to convert the temperatures, it is important to convert both temperatures and then find the difference rather than finding the difference and then adding 273. The other common error was simply to find enthalpy change and forget to calculate enthalpy change per mole.

In 06.2 there was some confusion over the fact that the mean bond enthalpy is an average value and that it is a bond between the same two atoms but in a variety of different compounds.

In 06.3 although there were many correct answers, a significant number of students either missed out a reactant/product or forgot that there are two H-O bonds in H_2O but only one O=O bond in O_2.

Most students correctly identified that heat loss to the surroundings was the most significant reason for a difference between experimental and bond-enthalpy determined values (question 06.4). An understanding that it is likely that some of the cyclohexane in the experiment would not have combusted fully was less well understood.

QUESTION 07

Students generally knew, and were able, to calculate the number of moles of carbon in carbon dioxide in question 07.1. However, a significant number of students then failed to realise there are two hydrogens in H_2O and hence did not correctly calculate the number of moles of hydrogen. Even when these two calculations were correct, a proportion of students then struggled to work out the percentage masses.

Despite these errors in 07.1, most students who attempted the calculation in question 07.2 were able to answer it successfully. The most common error in this question was to try to compare percentages directly rather than moles.

In question 07.3, most students correctly identified that Z was an alcohol but either failed to apply the information that the molecule is symmetrical (i.e. the hydroxide group must be on the central carbon) or that they were instructed to draw the displayed formula of Z and missed the O-H bond.

QUESTION 08

Most students correctly drew the repeating unit of poly(tetrafluoromethane) in question 08.1 and could explain that the standard enthalpy of formation involved the energy change when one mole of substance is formed in question 08.2. However, a significant number of students failed to say that the substance is formed from its constituent elements in their standard states.

08.3 was answered well by many although a significant proportion of those who carried out the calculation correctly then failed to give their answer to the appropriate level of accuracy (3 significant figures). Common errors were not multiplying either the enthalpy of formation of $CHClF_2$ and/or HCl by 2, or errors in which values should be added or subtracted. Students should be encouraged to draw a Hess's cycle as those who did generally gained full marks.

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In line with OxfordAQA's Fair Assessment promise, the assessment design, marking and awarding of this examination focused on performance in the subject, rather than English language ability.

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