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Examiners' report

CHEMISTRY A

H432

For first teaching in 2015

H432/02 Autumn 2020 series

Version 1

Introduction

Our examiners' reports are produced to offer constructive feedback on candidates' performance in the examinations. They provide useful guidance for future candidates.

	Reports for the Autumn 2020 series will provide a broad commentary about candidate performance, with the aim for them to be useful future teaching tools. As an exception for this series they will not contain any questions from the question paper nor examples of candidate answers.

The reports will include a general commentary on candidates' performance, identify technical aspects examined in the questions and highlight good performance and where performance could be improved. The reports will also explain aspects which caused difficulty and why the difficulties arose, whether through a lack of knowledge, poor examination technique, or any other identifiable and explainable reason.

A full copy of the question paper and the mark scheme can be downloaded from OCR.

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Paper 2 series overview

H432/02 is the second of the three examination components for GCE Chemistry A. This component is focused on organic chemistry and brings together topics from modules 4 and 6 of the specification, including relevant practical techniques. There is a synoptic element to all three of the A Level examinations and as such this paper also contains some content of modules 1 and 2 set in the context of organic chemistry. The paper consists of two sections comprised of multiple choice and a mixture of short and long response questions respectively.

There was no evidence that any time constraints had led to a candidate underperforming and scripts where there was no response to the final question also had large sections of the paper which had not been tackled.

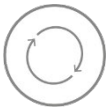
Candidates who did well on this paper generally did the following:	***Candidates who did less well on this paper generally did the following:***
• Solved calculations with clear and logical steps. • Demonstrated knowledge of reagents and conditions in organic reactions. • Drew clear diagrams in reaction mechanisms. • Provided answers that used structures as required in the question. • Knew key definitions and were able to apply these to unfamiliar examples.	• Showed unclear setting out of calculations. • Wrote equations that were not balanced or had atoms with an incorrect number of bonds around them. • Showed unclear presentation of structures and organic mechanisms with curly arrows, lone pairs and dots for radicals incorrectly placed. • Provided unclear written explanations for either the purification of cyclopentene or the difference in reactivity between an alkene and benzene.

Comments on responses by question type

Multiple choice questions

Candidates needed to make sure their answer is clear to the examiner, particularly when they change their answer. Candidates who performed well, drew structures or wrote equations next to their responses to aid their choice.

Candidates found Question 10 challenging as they were required to demonstrate knowledge of the term alicyclic and to work out the number of isomers.

	**AfL**	There were occasionally some candidates who had "No response" answers which could easily be overcome through developing examination technique. You should encourage students to enter an answer for all MCQs, even if they are unsure of the correct answer in some cases.

Level of response questions

Question 20(a)

This question differentiated well. Those that did not achieve a mark often provided a mass of 6.25g of cyclopentanol, with no purification steps provided. Many candidates incorrectly described the purification steps for an organic solid and checking of purity via melting point analysis. Candidates that answered this question well calculated the mass of cyclopentanol required and described the steps required for purification accurately and with enough detail. Candidates achieving Level 1 or 2, did not provide detail or explanation of the purification steps.

Question 22(b)

Candidates achieving Level 2 had most of the key features, e.g. CN, C=O bond and a methyl group but did not consider the splitting patterns seen in the NMR. Most candidates could correctly work out the empirical and molecular formula but then did not use their analysis of the NMR and IR data to suggest a structure. This limited their response to Level 1. The IR spectrum had no O-H peak from an alcohol or carboxylic acid, but candidates often included these groups in their suggested structures.

Other questions

Question 16(c)

Often candidates did not use skeletal formula, as required by the question, and did not place the radical dot in the correct position.

Question 17(a)(ii)

Candidates answered this question well. Many were able to correctly use the terms delocalised and localised in their responses and were able to provide comparisons for both electron density and attack of an electrophile.

Question 18(a)(i)

Many candidates did not correctly balance this equation or missed water as a product entirely.

Question 18(a)(ii)

Candidates who answered this question well had clear, labelled diagrams. Too often, labels, dipoles and lone pairs were missing.

Question 19(b)

Candidates who found this question difficult often did not give a response that would identify all three of the functional groups (aldehyde, ketone and alkene). The use of Tollens' in identifying aldehydes was well demonstrated, however no reaction with Tollens' was less well demonstrated as a result for ketones.

Question 19(c)(ii)

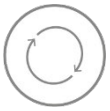
Candidates often referred to NaCN and HCN in their responses. Candidates who identified the correct bond breaking often then incorrectly wrote that the oxygen atom gained the lone pair of electrons.

Common misconceptions

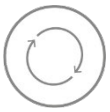
	**Misconception**	Question 16(a) Many candidates either reversed the order of the locant numbers for the bromo/dimethyl substituents or did not recognise the need for two locant numbers for the dimethyl group (e.g. 3,3 – often reported as just 3 dimethyl).

	**Misconception**	Question 22(a) The use of deuterated compounds in NMR analysis was often explained the use in terms of lack of spin but did not give examples (e.g. $CDCl_3$ as a solvent or D_2O as for identifying OH/NH protons)

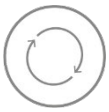
Key teaching and learning points – comments on improving performance

	**AfL**	For level of response questions, candidates need to use the information provided in the question. They should look to include explanation for their choice of steps and show all their working.

	**AfL**	Candidates need to make sure that when they draw structures of molecules, these must have the correct connectivity of atoms and the structures must be viable (each atom must have the correct number of bonds).

	**AfL**	Candidates need to develop their ability to perform calculations that require them to convert between different units, e.g. mg to kg.

Guidance on using this paper as a mock

	**AfL**	Candidates will need to be well prepared on the synthetic routes and reagents from content across the A Level specification.

This paper should be used in conjunction with H432/01 and H432/03. Candidates should sit the paper under examination conditions in the allotted time. The marked paper should be reviewed, in conjunction with the mark scheme, by the student to identify the terminology and structure required within the questions to achieve full credit. Internal moderation will add validity to the credit given.

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