Qualification Accredited

Oxford Cambridge and RSA

A LEVEL

Examiners' report

CHEMISTRY B

H433

For first teaching in 2015

H433/02 Autumn 2020 series

Version 1

ocr.org.uk/science

Introduction

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

i	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.

Paper 2 series overview

H433/02 is one of the three examination components for GCE A Level Chemistry B (Salters). This component, entitled 'Scientific literacy in chemistry', links together different areas of chemistry within different contexts, some practical, some familiar and some novel. The paper also includes questions based on a pre-released Advance Notice article, included as an insert with the question paper. To do well on this paper, candidates need to have studied the pre-release material and to have researched some of the unfamiliar contexts included in this document. They also need to be comfortable applying their knowledge and understanding to unfamiliar contexts and be familiar with a range of practical techniques that they should recognise from completing the required practical elements of the course.

Candidates who did well on this paper generally did the following:	Candidates who did less well on this paper generally did the following:
• Described the procedure of chromatography in detail as per the required practical element of the course, Q1(e)(i). • Carried out calculations involving K_a, pK_a and pH values successfully, Q3(c)(ii), 3(c)(iii) and 3(e). • Identified practical tests that could be used to identify functional groups within organic structures, Q4(a)(i). • Interpreted a variety of spectroscopic data to correctly identify an unknown compound, explaining the steps used in a clear and logical manner, Q4(h).	• Failed to clearly explain the steps involved in multi-step calculations and so did not score many marks. Q2(c), 2(d)(iii), 3(b), 3(e) and 4(a)(ii). • Struggled to correctly identify different types of intermolecular forces present within species and to explain how some of these arise. Q1(d), 5(c)(iii) and 5(d)(iii). • Struggled to describe how a buffer solution works, in terms of the equilibrium that is established. They often described the composition of the buffer solution rather than how it works. Q3(d) and 3(f)(i).

Section overview

Question 1

This was generally completed fully by most candidates with very few instances of sub-sections not being attempted.

In part (a) the most commonly seen error was in identifying the amide group as the -NH- (or $-NH_2$) group and omitting the C=O group.

In part 1(b)(iii) few candidates scored more than 1 mark as they did not recognise that aspartame contains an ester as part of its structure; any hydrolysis reaction of the molecule would also result in the hydrolysis of the ester producing methanol as a further product of the reaction. However, when it came to describing the practical technique used to identify the products of hydrolysis, chromatography, this was very well answered and demonstrated that candidates had used this technique within the required practical element of the course.

Question 2

Most candidates scored some marks in parts (a) and (b) but did not score full marks as they gave incomplete answers. For example, in part (a)(i), although they correctly identified the need for a salt bridge, its composition was often incorrectly stated and in part (b)(i) the temperature was usually stated but not the concentration of the solutions.

This theme was continued in 2(d)(ii) where most candidates correctly stated that the standard cell should contain a platinum (or graphite) electrode, but then did not include any H^+ ions in the solution which they should have been able to identify from the information provided in table 2.2.

Question 3

Most candidates scored at least 1 mark in part (a) as they correctly identified the 8 or 10 electrons surrounding the P atom, but then did not complete the diagram fully as they did not make ensure that each oxygen atom had a full outer shell of electrons.

This question was then developed to test candidates' knowledge and understanding of buffers. In 3(c)(i), while most candidates could state that a base is defined as a proton acceptor, they often did not identify the correct species from the equation given. In parts (c)(ii) and (iii) these candidates carried out the required calculations successfully, often scoring full marks.

However, in parts 3(d) and 3(f)(i), where the concept of buffers and equilibria was tested, many candidates did not score many marks. The most common omissions were not giving an appropriate equilibrium equation in 3(d) and failing to explain why the equilibrium moves to the left in 3(f)(i).

Question 4

This question was generally well done by many candidates.

In part (a)(i) and (ii) most candidates scored 3 or 4 marks, usually missing the final conversion from amount of NaOH to volume of NaOH by failing to include the reaction stoichiometry in their calculation.

In part (e), the mechanism in (e)(i) was found challenging by many candidates. Common errors included the inclusion of additional arrows in the first step and the arrow in the second step going to the carbocation rather than to the desired location to form the final double bond.

4(g)(i) and (ii) were well answered by most candidates, although (g)(iii) saw marks being lost for use of an inappropriate number of significant figures in the final answer.

Question 5

Part (a) was generally well done; the only common error was giving an incorrect principal quantum number in (a)(ii).

In part (b) most candidates could correctly identify a bidentate ligand but did not include the charges required for the oxygen ions.

In 5(d)(iii) most candidates recognised that satraplatin formed more hydrogen bonds with water than cisplatin, but some did not state why this was happening, and very few candidates could explain why this resulted in greater solubility compared to cisplatin.

Comments on responses by question type

Level of response questions

The two Level of Response questions on this paper were in general attempted fully by most candidates.

Question 4(h) was based around interpreting data from three types of spectra to identify an organic compound. This was well done with many candidates achieving a mark at Level 3.

When candidates did not reach this level, it was often due to either producing a structure that was incorrect, or in misidentifying compound A (by name). Provided that they had made a reasonable attempt to identify the compound supported by relevant evidence from the spectra they usually scored at Level 2. The most commonly seen incorrect structure was that for butanoic acid, which was understandable given that they had been told that compound A contained 4 carbon atoms and they had deduced the presence of the carboxylic acid functional group.

Incorrect deductions were often made in the interpretation of the different carbon environments from the ^{13}C spectrum. However, the evidence from this question seems to indicate that this is an area from the specification where teachers have taken on board comments from previous reports and made a conscious effort to strengthen candidate's knowledge and understanding, which is appreciated.

Question 5(e) was based around the pre-release material about platinum based cancer treatments. This question was well attempted; however, for reasons explained further below, most candidates achieved a mark at Level 2.

Under normal circumstances teachers would have been able to provide candidates with support to further their understanding of some of the key ideas contained within the article, but as this was not a normal examination session I suspect that teachers had less time available to them to provide as much support as they would have ideally liked to provide.

This became evident in candidates' responses, which were characterised by a good discussion around the disadvantages of cisplatin related to its toxicity, and how newer second and third generation platinum based drugs are helping to overcome some of these disadvantages. However, hardly any candidates gave information about how cancer cells became resistant to cisplatin. This is an area that I am sure would have been addressed by teachers had they had enough time available. A consequence of this was most candidates being limited to a mark at Level 2 or Level 1 as to access Level 3 they had to include a detailed account of how cells became resistant to the use of cisplatin as a treatment for cancer.

Common misconceptions

?	**Misconception**	In Question 1(c) candidates were asked to circle ALL atoms that could hydrogen bond, and a common incorrect response saw only the electronegative elements circled and the relevant hydrogen atoms left alone.
?	**Misconception**	In Question 1(e)(ii) many incorrect responses saw candidate's answer in terms of rate theory and did not recognise that increasing temperature would cause the enzyme, pepsin, to denature. Similarly, in 1(e)(iii) many incorrect responses were seen in terms of collision theory – i.e. increased concentration leading to increasing numbers of collisions and rate, rather than recognising that for the enzyme-substrate system the reaction is limited by the number of enzyme molecules available and that when aspartame is in excess all of the active sites would be occupied and the rate would not change even if the concentration of aspartame is increased.
?	**Misconception**	In Question 4(b)(i) candidates were asked for an empirical formula and often gave a molecular formula as an incorrect response.

Key teaching and learning points – comments on improving performance

Calculations are still causing problems for candidates. The main concerns here are that too often we saw responses where candidates had produced a jumble of numbers which, if they resulted in an incorrect final value, meant that they lost all of the marks available. It is essential that candidates give some thought to structuring the steps in their calculations and set out their working indicating clearly what they are trying to achieve in each step.

For example, in Question 2(c), candidates were asked to calculate the concentration of silver ions using the equation provided. Many candidates arrived at a final value that was incorrect and had simply produce a set of numbers with no indication as to what these numbers referred to. Had they stated an initial step to calculate the standard cell potential using the data provided in Fig 2.1, then this alone would have scored 1 mark and would have allowed for the subsequent application of the error carried forward rule to the remainder of the calculation. Quite often this first value, 0.46V, was not seen.

The second step in this calculation involved the re-arrangement of the equation provided to arrive at a statement linking the standard cell potential and the measured cell potential to the silver ion concentration. This step was often missed out and candidates had often appeared to put a set of numbers into their calculators and arrived at a value for the concentration of silver ions that was incorrect. With no evidence of how this was arrived at, there was no way that any credit could be given. Other examples where this lack of detail/explanation was evident was in Questions 2(d)(iii), 3(e) and 4(a)(ii).

Guidance on using this paper as a mock

This paper provides a good opportunity for students to assess their progress if used as a mock examination once most of the specification has been completed. It is essential that some time is given to students to read through the pre-release article and to have time to discuss the content of this with their teachers, similar to how they would with their live assessment piece.

The Level of Response questions are readily accessible and Question 4(h) in particular would demonstrate to candidates that it is possible to score marks at the highest level if they read the question carefully and construct their answers in a clear and logical manner.

The calculations on this paper would demonstrate to students the need to explain the steps involved and to show that simply using a calculator could cost them a significant number of marks if they consistently get their calculated final answer wrong. Marks are always available for 'show your working' as this allows the examiner the scope to give credit and apply the error carried forward rule, so for example in Question 3(e) where there are 4 marks available, a candidate making an error in re-arranging their equation could lose the mark for this skill but could still score the other 3 marks provided that all of their working is shown and explained.

Supporting you

Review of results

If any of your students' results are not as expected, you may wish to consider one of our review of results services. For full information about the options available visit the OCR website. If university places are at stake you may wish to consider priority service 2 reviews of marking which have an earlier deadline to ensure your reviews are processed in time for university applications.

Supporting you through 2020-2021

Our priority is supporting you and your students this autumn and to support you as you prepare for summer 2021 exams. We'll update our website information regularly with resources, guidance and key information.

Take a look at our support for:

- Teachers
- Students
- Exams officers
- Assessment specialists

Keep up-to-date

We are sending a weekly roundup to tell you about important updates. You can also sign up for your subject specific updates. If you haven't already, sign up here.

OCR Professional Development

Attend one of our popular CPD courses to hear directly from a senior assessor or drop in to a Q&A session. All our courses for the academic year 2020-2021 are being delivered live via an online platform, so you can attend from any location.

Please find details for all our courses on the relevant subject page on our website or visit OCR professional development.

Signed up for Exambuilder?

ExamBuilder is the question builder platform for a range of our GCSE, A Level, Cambridge Nationals, Cambridge Technicals and Functional Skills qualifications. See the full list of available qualifications in the sign up form.

ExamBuilder is **free for all OCR centres** with an Interchange account and gives you unlimited users per centre. We need an Interchange username to validate the identity of your centre's first user account for ExamBuilder.

If you do not have an Interchange account please contact your centre administrator (usually the Exams Officer) to request a username, or nominate an existing Interchange user in your department.

Need to get in touch?

If you ever have any questions about OCR qualifications or services (including administration, logistics and teaching) please feel free to get in touch with our Customer Support Centre.

General qualifications
01223 553998
general.qualifications@ocr.org.uk

Vocational qualifications
02476 851509
vocational.qualifications@ocr.org.uk

For more information visit
ocr.org.uk/i-want-to/find-resources/
ocr.org.uk
/ocrexams
/ocrexams
/company/ocr
/ocrexams

We really value your feedback

Click to send us an autogenerated email about this resource. Add comments if you want to.
Let us know how we can improve this resource or what else you need. Your email address will not be used or shared for any marketing purposes.

I like this **I dislike this**

Cambridge Assessment