Qualification Accredited

Oxford Cambridge and RSA

A LEVEL

Examiners' report

CHEMISTRY A

H432

For first teaching in 2015

H432/01 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.

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 exam 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 exam paper and the mark scheme can be downloaded from OCR.

Paper 1 series overview

H432/01 is the first of the three examination components for GCE Chemistry A. This component is focused on physical and inorganic chemistry and brings together topics from modules 3 and 5 of the specification, including relevant practical techniques. In this paper and H432/02 there is more of an emphasis on knowledge and understanding of the assessment outcomes from the specification, as compared to H432/03 which involves more application of knowledge. The paper consists of two sections, made up of multiple choice questions and a mixture of short and long response questions respectively

Candidates who did well on this paper generally did the following:	***Candidates who did less well on this paper generally did the following:***
• Produced clearly structured working for calculations – 16(b)(ii),16(d)(ii),16(b)(ii),17(c), 17(d),18(c)(ii),20(b),22(c). • Produced clear and concise responses for the two Level of Response questions – 16(c) and 22(a). • Were able to identify and explain observations based on their knowledge – 19(b),21(a) and 22(a). • Had a strong recall of transition metal chemistry – 22(a). • Gave answers to the correct number of significant figures or decimal places – 16(b)(ii),17(d). • Ably process experimental results – 20(a)(i), 20(a)(ii),20(a)(iii).	• Found it difficult to apply what they had learned to unfamiliar situations. • Produced unstructured responses to Level of Response questions which were lacking in depth or explanation, or contained contradictory information – 16(a) and 22(a). • Did not clearly set out calculations, making it difficult for marks to be given for working – 16(b)(ii),16(d)(ii),16(b)(ii),17(c),17(d),18(c)(ii), 20(b),22(c). • Did not give answers to calculations to the specified number of significant figures or decimal places – 16(b)(ii),17(d). • Either did not realise the need to convert between units or use the scale from the graph for some calculations, or found this difficult – 17(c), 20(a)(ii),20(a)(iii).

Comments on responses by question type

Multiple choice questions

Some candidates showed good practice by using the space around the multiple choice response to show working. This often resulted in credit being given for the question. A number of candidates did not provide an answer to every multiple choice question. Whether this was deliberate or caused by forgetting to return to the question at a later point in the examination is not certain, but centres should advise candidates to provide an answer to every multiple choice question. There is no penalty for giving a wrong answer.

	AfL	Practice multiple choice questions can improve the skill in solving them and identifying the distractors. Exposure to this type of question style will decrease the time taken over each question. These can often form the basis of end of topic tests. Multiple choice question banks can be found on the 'Planning and Teaching' section of the qualification page, under 'Teaching activities' → 'Multiple choice topic quizzes'. They can also be found via the resource-finder page on the OCR web site: https://www.ocr.org.uk/qualifications/resource-finder/ Our quizzes come in both Microsoft Word and online formats. Details on how to use the online multiple choice quizzes can be found on: https://www.ocr.org.uk/Images/594811-digital-mcq-quiz-instructions.pdf

Level of response questions

The first Level of Response question – 16(c) - was generally well answered with many candidates achieving maximum marks by simply considering what was required in the question.

Candidates who scored well linked the bonds/forces with melting point and conductivity and gave a logical sequence to their response. Lower-attaining candidates included electrons for ionic bonding conductivity. These candidates also referred to Van der Waals, rather than London forces. Van der Waals forces are a collective term for several different intermolecular forces (https://goldbook.iupac.org/terms/view/V06597), so when students intend to refer to specific intermolecular forces their specific names should be used.

Some candidates erroneously included intermolecular forces in addition to the ionic/metallic bonds to explain the melting points of ionic and metallic substances.

	OCR support	Further support can be found in the AS delivery guide 'Theme: Bonding' https://www.ocr.org.uk/Images/231738-bonding.pdf

In the second Level of Response question – 22(a) – the higher-attaining candidates had a good understanding of the species and equations. The communication mark was often given when the candidates gave an explanation that linked the correct equation, e.g. colour of precipitate/solution means that the formula is $Fe(OH)_2$ /$CoCl_3$, making their inferences clear.

There were equal numbers of precipitation reactions using the OH^- ion as there were equations involving the deprotonation of the complex ion using NH_3. Some candidates did not label species or had a correct formula with a wrong letter, especially for D and E. Lower-attaining candidates did not identify F or write a correct equation. Some candidates identified the unknown compounds but did not give any equations which limited their level.

i	**OCR support**	Further support can be found in: The AS delivery guide 'Theme: Identifying Unknowns' https://www.ocr.org.uk/Images/208563-identifying-unknowns.pdf 'Transition elements': https://www.ocr.org.uk/qualifications/as-a-level-gce-chemistry-a-h032-h432-from-2015/delivery-guide/module-cam05-module-5-physical-chemistry-and-transition-elements/delivery-guide-cadg016-transition-elements The colours of the transition metal ions and complexes can be reviewed at: https://www.ocr.org.uk/Images/598991-colours-of-inorganic-ions-and-complexes-poster-.pdf

Themes in candidate responses

Calculation based questions

Questions 16(d)(ii) and 16(d)(iii)

This Born Haber cycle combined the traditional cycle with the enthalpy solution/hydration cycle. Many candidates were successful in calculating the values from the information given and showed full working to complete the calculation. The commonest errors were not doubling the atomisation and electron affinity values (112 and 325) and not dividing the enthalpy of hydration by two.

Some candidates did not show working or just listed numbers. Candidates should remember to provide written indications of what it is they are working out – presenting the calculations without any annotations can make it harder for error carried forward marks to be given if there is an error in their calculation. Some candidates did not produce an equation for 16(d)(iii) and wrote the lattice enthalpy sum in its place.

Question 17(d)

This was an unfamiliar expression linking ΔG and K_p. Many candidates correctly calculated this number. Some candidates calculated ln K_p as 10.0 but then put a – in front for the e calculation. The question required the answer to 3 significant figures. Higher-attaining candidates were able to work out the units as any pressure unit $^{-2}$.

Question 18(c)(ii)

This question required the candidate to calculate the original concentration of ethanoate ions in the buffer. Higher-attaining students gained full credit. Most students calculated the concentration in the buffer solution but did not factor for the original solution. Lower-attaining candidates often scored the first two marking points but did not use the buffer equation.

Question 20(b)

This question asked the candidate to calculate K_c. Higher-attaining students tended to gain full marks. Some candidates made full use of tables (e.g. RICE: Reaction, Initial concentration, Change in concentration, Equilibrium concentration) which allowed for credit to be given through error carried forward.

Some candidates did not use 0.03 as the change, and lower-attaining candidates did not use water in the K_c expression. Candidates should remember to provide written indications of what it is they are working out – presenting the calculations without any annotations can make it harder for error carried forward marks to be given if there is an error in their calculation.

Question 22(c)

This question asked the candidate to determine the amount of sodium sulfite in food. Many candidates gained full marks. Most candidates calculated the number of moles of MnO_4^- and SO_3^{2-}. Some candidates calculated the mass in 525 g of meat, although some used the wrong Mr, e.g. 80, for the sulfite ion. The lower ability candidates did not process the scaling to 1 Kg.

Rates of reaction

Question 20(a)

Most candidates used incorrect ideas about reaction going to completion or the methanol not being limiting.

Question 20(a)(ii)

Very few candidates were given full marks. Higher-attaining students calculated one half life in range but very few could come up with a second half life as the graph did not allow another successive half life to be obtained. Higher-attaining candidates chose alternative half lives from the data given.

?	**Misconception**	Candidates are advised that half lives can be calculated from any numerical values on the graph. Further guidance on rates of reaction can be found at: https://www.ocr.org.uk/Images/371956-experiments-on-rates-of-reaction.doc

Question 20(a)(iii)

This question required the candidate to draw a line of best fit and then draw a tangent at t=0. Many candidates did not draw a line of best fit, and many did not get a tangent in the acceptable range. Very few candidates processed the gradient by using the correct subtraction on the y axis (scale was from 1 to 5) or by using the 10^{-3} on the axis label.

Electrode potentials

Question 19(a)

Most candidates drew a circuit containing a voltmeter and the silver half cell but very few candidates included the H^+ in the MnO_4^-/Mn^{2+} cell.

Question 19(b)

Higher-attaining candidates described two oxidations starting from HCHO to end up with CO_2. Many candidates used the data correctly but stopped at the first oxidation to form HCOOH.

Lower-attaining candidates did not state that the direction of reaction of redox equilibria is dependent on the relative negativity/positivity of the standard electrode potentials. Some candidates are still using higher/lower to compare the E cell values, and should be encouraged to instead use the phrasing 'more positive' or 'more negative'. Many candidates wrote a correct first equation, although some did not cancel down the H^+ and/or water.

Group 17

Question 16(d)(i)

Many candidates got the second ionisation energy equation. Very few candidates got the correct state symbol on the lower line for Br_2, with solid being the common response.

Question 21(a)

This question required the candidate to explain the reactivity of the halogens given experimental observations. Higher-attaining candidates were able to explain the observations with ionic equations and explain the reactivity in terms of gaining electrons. Some candidates did not associate the colour with the halogen and linked it with the halide ion, but then did explain the trend in reactivity due to the ability to gain electrons. Lower-attaining candidates explained the reaction in terms of displacement (which was ignored) and they did not proceed with ionic equations or describe the ability to gain electrons.

?	**Misconception**	Some candidates linked the ability to gain electrons to ionisation energy rather than electron affinity. The colour of the organic layer was also associated with the halide ion rather than the halogen.
i	**OCR support**	Further guidance can be found in the AS Level delivery guide 'Theme: Patterns' (Group 2 and Group 17): https://www.ocr.org.uk/Images/231740-patterns.pdf

Key teaching and learning points – comments on improving performance

Candidates could improve their performance in this examination by:

- Practising the skills required to complete multiple choice questions.
- Showing clearly structured working in their calculation questions so that methods are understood and followed.
- Practising linking experimental observations with theoretical understanding to improve the quality of descriptions and explanations.
- Making sure that they use the appropriate terminology.
- Developing their ability to write ionic equations.
- Improving their ability to process experimental results from graphical data.

i	**OCR support**	Links to the legacy coursework tasks and PAG practice question sets can be found on OCR Interchange. Exam hints for students can be found at: https://www.ocr.org.uk/Images/592305-exam-hints-for-students.pdf

Guidance on using this paper as a mock

This paper should be used in conjunction with H432/02 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.

i	**OCR support**	Further topic tests can be constructed via: https://www.ocr.org.uk/Images/587672-building-a-topic-test-in-exambuilder.docx Students could use the revision check list at: https://www.ocr.org.uk/Images/592327-student-revision-checklist.docx

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