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Examiners' report

GATEWAY SCIENCE CHEMISTRY A

J248

For first teaching in 2016

J248/03 Autumn 2020 series

Version 1

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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 3 series overview

This paper tested a small cohort of candidates, following the cancellation of examinations in Summer 2020 and the award of Centre Assessed Grades based on schools' data.

J248/03 is the first of two examination units for candidates entered for the Higher Tier of the GCSE examination for Gateway Science Chemistry A. This component assesses teaching topics C1 - C3 and C7 and is 50% of the total GCSE.

To do well on this paper, candidates need to demonstrate knowledge and understanding of scientific ideas in topics C1 – C3. They need to apply the skills and understanding that they have developed in the practical activities covered in topic C7. They need to be able to apply their knowledge and understanding to unfamiliar contexts as well as displaying the ability to analyse information. Candidates also need to be familiar with a range of experimental procedures and be able to think about how an experimental method could be improved.

J248/03 has an equal emphasis on knowledge and understanding of the assessment outcomes from the specification and application of this knowledge. There are less questions which assess analysis of information and ideas. This paper is not synoptic and so does not contain any material covered by topics C4-6. There are a number of questions that involve the assessment of key mathematical requirements from Appendix 5e of the specification.

Candidates who did well on this paper generally did the following:	***Candidates who did less well on this paper generally did the following:***
• Constructed and balanced symbol and half equations for familiar and unfamiliar reactions: Questions 18(a)(i), 21(b)(i), 23(d)(iii). • Performed standard and novel calculations following the required rubric (e.g. clear working, units and, where needed, significant figures) relating to bond energy: Questions 18(c)(ii)-(iv), moles and reacting masses: Question 19(b) and 22(b), R_f values: Questions 20(a)(i), pH: 21(b)(iv). • Produced a clear, concise and well-structured answer for the Level of Response Question: 19(a). • Applied knowledge and understanding to questions set in a novel context.	• Found it difficult to apply what they had learnt to unfamiliar situations. • Found it difficult to construct and balance half equations: Question 23(d)(iii). • Found it difficult to analyse data and then make a judgement, or draw a conclusion, in relation to the data, e.g. Question 16(b). • Showed imprecise use of scientific terminology, e.g. Questions 16(a)(i), 16(a)(ii), 16(a)(iii), 16(b), 18(b), 23(c)(ii), 23(e). • Could not explain the results shown in a chromatogram or compare and contrast gas chromatography and thin-layer chromatography in Question 20. • Could not state the ions present in an aqueous solution in Question 23(a) or explain why a particular electrolyte is used in electroplating in Question 23(c)(ii).

Section overview

Section A includes 15 multiple choice questions assessing topics across C1 - C3. Comments on individual questions are shown below.

Section B also assesses topics from C1 - C3 and contains a mixture of short answer, extended prose and level of response questions. Comments on these questions are shown below.

Themes in candidate responses

When answering multiple choice questions, centres should encourage candidates who wish to change an answer to cross through their answer and write their new response to the right of the answer box, rather than trying to overwrite their original answer. The latter can result in examiners being unable to decipher their answer.

Centres should also encourage candidates to set out their working to calculations clearly. 'Signposting' of calculations was often poor, with numbers written at random in the answer space. This makes it difficult for the examiner to seek out credit-worthy points and/or award marks for errors carried forward. Equally, for candidates, it often leads to them getting 'lost' going through the calculation.

Poor use of English and/or scientific terminology when explaining their answers is an issue for some candidates.

There was no evidence that time constraints had led to underperforming. Very few questions were left blank by candidates.

Comments on responses by question type

Multiple choice questions

Questions 1, 2, 4, 5, 6, 7, 8, 9, 11, 12 and 14 were well answered by most candidates.

Question 3, 13 and 15 proved more challenging. In Question 3, many candidates chose C as an incorrect answer, with the formula of magnesium chloride being MgCl rather than MgCl_2. In Question 13, B proved to be a common incorrect answer with candidates thinking that Group 2 elements gain, rather than lose, 2 electrons to form an M^{2+} ion. In Question 15, C was a common error.

Question 10 proved to be the most challenging question. Many answers to Question 10 were B, with candidates not realising that the question required the number of atoms, rather than the number of molecules, in 0.5 mol of water.

Level of response question

The 6-mark, level of response, question (Question 19(a)) assessed AO3 and required candidates to analyse and evaluate information and draw a conclusion. Many candidates wrote Level 3 answers, giving a detailed evaluation of the advantages and disadvantages of all of the pH test kits and suggesting that the farmer should use pH test kit A. The answers of lower ability candidates usually only related to test kit A, sometimes with a comparison to test kit D.

Other

The questions requiring mathematical skills were generally well answered.

Questions 18(c)(ii)-(iv) involved a bond energy calculation and was correctly answered by most candidates. In part (iv), a common error was for candidates to subtract the smaller of their answers in parts (ii) and (iii) from the larger, rather than appreciating that the energy change is calculated by 'energy transferred breaking bonds - energy transferred making bonds'.

In Question 19(b) some candidates only scored 2 marks as they did not give their answer to 3 significant figures.

In Question 20(a)(i), a R_f calculation, some candidates divided the distance travelled by the solvent by the distance travelled by the substance. Error carried forward was given for an answer correctly given to 2 significant figures.

Question 21(b)(iv) was correctly answered by higher ability candidates who calculated the decrease in hydrogen ion concentration as 100. The most common error was 2, i.e. 3.07 – 1.04.

The reacting mass calculation in Question 22 (a)(i) was handled well by most candidates, although some did not give their answer to 3 significant figures.

In the practical based questions, there were some good responses although, as previously stated, ideas around the technique of chromatography were not well known by candidates who performed less well on this paper.

Common misconceptions

Question 16 highlighted some misconceptions. In part (a)(ii) the idea that structure B (diamond) has a high melting point due to strong intermolecular forces was a common error.

In part (b) common misconceptions were that metals are malleable because they have weak bonding or because the cations are attracted to the delocalised electrons.

In Question 18(c)(i), which required candidates to explain why the reaction of methane with oxygen is exothermic, many candidates referred to bond breaking as exothermic and bond making as endothermic.

Key teaching and learning points – comments on improving performance

In mathematical questions, candidates need to be reminded of the need to check the instructions in the question carefully. They need to give their answer to the correct number of decimal places or significant figures, if requested. It is worth centres stressing to candidates that the award of 'error carried forward' is only possible when an answer is clearly set out.

Candidates should also be encouraged to use precise terminology; for example, in Question 17(a) credit was not given to candidates who described that Mendeleev arranged the elements in his Periodic Table in order of mass.

More experience on practical activities, either hands-on or via computer simulations, may help candidates to perform better on questions about electrolysis.

Guidance on using this paper as a mock

This paper showed good discrimination in the small cohort of candidates. The mark scheme was constructed in the same way as in previous summer examinations and the questions tested a good range of topic areas. It is therefore very suitable for use as a mock paper.

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