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Examiners' report

GATEWAY SCIENCE CHEMISTRY A

J248

For first teaching in 2016

J248/04 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 exam paper nor examples of candidate responses.

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.

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Paper 4 series overview

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

J248/04 is the second 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 C4 – C6 and C7, with assumed knowledge of topics C1 – C3, 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 C4 – C6, and 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.

J248/04 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. In addition, this paper also contains questions that have elements of synopticity, drawing on material covered by topics C1 - 3. There are several 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 equations for familiar reactions: Question 18(a). • Performed standard and novel calculations following the required rubric (e.g. clear working, units and, where needed, significant figures) relating to moles and reacting masses: Questions 17(c)(i) and 22(c), Percentage yield: Question 17(c)(ii), Titration calculations: Question 21(b)(i) and (ii), Gas volumes, moles and mass: Question 22(b)(i) and (ii). • Produced a clear, concise, and well-structured answer for the Level of Response Question: 20(c). • Clearly described a procedure to investigate the effect of changing the concentration of an acid on the rate of reaction: 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 analyse data and then make a judgement, or draw a conclusion, in relation to the data, e.g. Questions 16(a), 16(c)(ii) and 23(a). • Showed imprecise use of scientific terminology, e.g. Questions 17(a), 18(c), 19(b)(iii) and 21(a). • Could not plot a graph of experimental results, using a linear scale and drawing a line of best fit in Question 19(b)(i). • Could not explain why compounds are members of the same homologous series in Question 20(a). • Could not draw the displayed formula of a polymer from a monomer in Question 20(b)(i) or describe a difference between addition polymerisation and condensation polymerisation in Question 20(b)(ii). • Showed little knowledge and understanding of bioleaching in Question 22(d)(i) and (ii) or what is meant by the greenhouse effect in Question 23(b).

Section overview

Section A includes 15 multiple choice questions assessing topics across C4 – C6. Comments on individual questions are shown below.

Section B also assesses topics from C4 – C6 and contains a mixture of short answer, extended prose and Level of Response questions. Section B also includes questions that have elements of synopticity, drawing on material covered by topics C1 – 3. 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 responses 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 2, 3, 6, 7, 10, 12 and 14 were well answered by most candidates.

Question 1, 4, 8, 9, 13 and 15 proved more challenging.

In Question 1, many candidates did not appreciate that the mass of a catalyst is unchanged at the end of a reaction.

In Question 4, A or D were common errors.

In Question 8, Question 9 and Question 13, a range of incorrect responses were seen.

In Question 15, A was a common error, with candidates selecting the smallest, rather than largest, surface area.

Questions 5 and 11 proved to be the most challenging questions.

In Question 5, many responses were A or B with candidates recognising the correct uses of brass and bronze, but not realising that the main metals in the each of the alloys were incorrect.

In Question 11, many candidates gave C as an answer.

Level of response questions

Question 20(c), the 6-mark Level of Response question, assessed AO1 and AO2 and required candidates to demonstrate knowledge and understanding of the tests for alkenes/alkanes and carboxylic acids and apply this to the compounds in the question. To gain Level 3, 6 marks, candidates were required to describes the tests, and their results, to identify the three liquids and include correct balanced symbol equations for the reactions which occur. Higher ability candidates were familiar with the use of bromine water to distinguish between alkanes and alkenes and could construct a correct balanced symbol equation for the reaction of bromine water with pentene. A suitable test to identify ethanoic acid (e.g. addition of a suitable carbonate and observation of effervescence) was less well known. The weaker responses often suggested fractional distillation or titration to identify each of the three liquids.

Other questions

The questions requiring mathematical skills were generally well answered.

Question 17(c)(i) involved a reacting mass calculation and was handled well by most candidates. Error carried forward was given for those who incorrectly calculated the relative formula mass of either ammonia or ammonium nitrate.

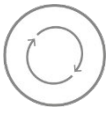
In Question 21(b)(i) some candidates did not appreciate the requirement to select the concordant results. The second marking point was not given for an answer given to only one decimal place. The most common error in the titration calculation in Question 22(b)(ii) was not appreciating the 1:2 ratio of the moles of alkali to moles of acid.

In Question 22(b)(i), the relationship between molar amounts of gases and their volumes was well known by higher ability candidates. Weaker responses multiplied the gas volume by 24, rather than dividing, or omitted to covert the volume in cm^3 to dm^3.

In the practical based questions, there were some good responses although centres should encourage candidates to take care to draw an *accurate* diagram, showing apparatus that will work, when asked to draw a labelled diagram as in Question 19(a).

	**Misconception**	Question 20(b)(ii) highlighted a common misconception with candidates describing that addition polymerisation makes one bigger product and condensation polymerisation makes one smaller product. In Question 23(a), weaker responses linked the greenhouse effect to the ozone layer.

Key teaching and learning points – comments on improving performance

	**AfL Mathematical questions**	In mathematical questions, candidates need to be reminded of the need to check the instructions in the question carefully. They need to give their response 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 a response 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 suggested that fertilisers provided nutrients or minerals but did give credit to answers that talked about the essential elements that fertilisers provide for crops. In Question 18(c), when describing why rubidium reacts much faster than sodium, candidates needed to give an explanation in terms of the atoms' *outer* electron. Examiners did not give credit for the ideas that the outer electron is lost more *quickly* but did give credit for the ideas that the outer electron is lost more

easily. Candidates needed to refer to collision *frequency*, rather than just 'more collisions' to gain full credit in Question 19(b)(iii). In Question 21(a), candidates needed to explain precisely why their suggested improvement would give a more accurate result. Many simply repeated the stem of the question, stating that the results would be 'more accurate'.

More experience on practical activities, either hands-on or via computer simulations, may help candidates to perform better on questions identifying particular types of chemicals or requiring the planning of experiments.

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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