



GCE AS EXAMINERS' REPORTS

**CHEMISTRY
AS**

AUTUMN 2020

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COMPONENT 1 – THE LANGUAGE OF CHEMISTRY, STRUCTURE OF MATTER AND SIMPLE REACTIONS

General Comments

This paper was accessible to all with very few questions not attempted, and then only by a very small number of candidates. There were some excellent answers seen from many candidates. The paper tested all aspects of the specification – both theory and practical work. Overall performance was very strong with a mean mark of 64 out of a total of 80.

Comments on individual questions/sections

Section A

This was done well with only question 7 causing noticeable problems for some candidates. Some definitions of electronegativity were incorrectly worded and many candidates were not able to draw correct dipoles on the molecules.

Section B

- Q.8 The definition of molar ionisation energy was handled well. There were many well worded answers to the QER questions with candidates understanding the differences between the Balmer and Lyman series. Most candidates referred to $E = hf$ in the final part of the answer but occasionally forgot Avogadro's constant or did not explain how the frequency was measured. The calculation was generally done well with a few candidates forgetting to convert wavelength from nm to m. Some did not use Avogadro's constant to convert to a value per mole. Part (d) was also done well by most. The commonest reason for loss of marks was the lack of reference to the position/identity of the different electrons being removed.
- Q.9 Many candidates gave the correct dot cross diagram for hydrazine in part (a). A few forgot the lone pairs but gained a mark for the single bonds. They were then given a maximum of two marks in part (ii) if they correctly interpreted the diagram they had drawn. The calculation in part (b) was extremely well done. A few candidates used a molar volume of 24 dm^3 (instead of 22.4 dm^3) and thus gained 3 of the 4 marks. Part (c) caused no problems.
- Q.10 The use of formulae instead of names in part (a) was not penalised. Most candidates based their answers on calcium chemistry but a few answers involving barium were seen. These were marked correct as appropriate. Some candidates named **A** as a metal despite the question clearly stating that is a compound, but many good answers were seen. In part (b), whilst many correctly identified **D** they did not realise this was a neutralisation reaction and therefore did not choose an acid. For the rest of the question, whilst many good answers were seen it was clear that the practical aspects were challenging to some candidates. They did not recognise the reactions or tests involved. Part (d) was the hardest question on the whole paper and it was rare to see a correct answer.

- Q.11 Questions on structures and bonding are often troublesome as candidates do not always word their answers well. It was good to see here, however, that these candidates had good knowledge and understanding and most scored very well. The isotope question in part (c) was also well done. The commonest weakness was lack of reference to the 1:1 ratio of abundance of the isotopes.
- Q.12 Candidates completed the calculation well but the practical aspects of the question caused more issues. Only those with a good understanding of the method were able to give good answers to parts (b) and (c). Errors were seen in part (d) because a few candidates did not notice that two mass readings were taken. Part (e) was done well.
- Q.13 Part (a) was done well with the vast majority of candidates gaining 5 marks. If errors were seen, they were usually linked to incorrect numbers being substituted into the ideal gas equation. Candidates answered part (b) well showing good understanding of acids and bases. However only the best candidates gained the second mark in part (ii) by “describing” how ammonia accepts a proton e.g. by reference to co-ordinate bond formation. Part (c) was mainly done well but a few candidates confused “structure” with shape.

Summary of key points

Candidates should consider the following points to improve performance:

- Learn the meanings of key chemical terms as these can give access to “easy” marks
- Review all the practicals when preparing for an exam and focus on understanding how the stages in the method link to the data generated
- Learn the practical content of Topic 1.6 to ensure good recall of the reactions of Group 2 elements and key analytical tests
- Practise ionic equations associated with Group 2 chemistry.

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COMPONENT 2 –ENERGY, RATE AND CHEMISTRY OF CARBON COMPOUNDS

General Comments

As in previous years the paper appeared to be quite accessible to all candidates. The mean mark was 56.4. The highest mark was 78 and the lowest 20. The vast majority of candidates had prepared thoroughly for this examination and the responses were often well expressed and detailed. The majority of candidates scored at least 75% of the marks and only a few failed to gain 50%.

Section A proved to be very successful for the majority of candidates. In **Section B**, Q.10 and Q.11 were both very well answered but Q.9 proved to be difficult.

Calculations were generally excellent.

Comments on individual questions/sections

Section A

This was very well answered, with the mean mark being just over 8 out of 10.

In Q.4 some candidates lost a mark for 'lazy' drawing of the structure rather than a lack of knowledge. In Q.5 a number of candidates failed to give the correct formula for sodium ethanoate and so lost the mark.

Section B

- Q.7 Part (a) proved to be the most difficult question on the paper. Only about a quarter of candidates gained the marks. Some thought that biogas did not produce carbon dioxide on burning. Others simply stated that biogas was renewable, which was insufficient on its own to gain the marks. However, many misinterpreted the question. The first line states that biogas is 'produced in the absence of oxygen' but they read it as 'biogas was burned in the absence of oxygen'. Consequently, they did not gain a mark. Performance in the mathematical elements of part (b) and in parts (c) and (d) was excellent.
- Q.8 Part (a) testing knowledge of organic practical work was not well answered. In part (i) the majority thought that the halogenoalkane was a solid, despite the diagram showing it as a liquid. In part (ii) not many knew why anti-bumping granules were added and a significant number failed to state that the thermometer bulb should be opposite the opening to the condenser. The percentage yield in part (b) proved to be the most difficult calculation on the paper. Weaker candidates based their answers on the mass of reactant and product rather than the molar ratio. In part (c) the vast majority knew the type of reaction and could recall the mechanism. However, less than half could fully explain why 2-bromo-2-methylbutane is the major product. Many simply stated that 2-bromo-2-methylbutane is more stable than 2-bromo-3-methylbutane instead of discussing the stability of the carbocations. Some lost marks in part (d)(iii) by making no reference at all to the double bond. 'There are two different groups attached to the carbon' is not a creditworthy answer.

- Q.9 In part (a) most candidates managed to gain at least two marks by deducing that compound **X** cannot be a tertiary alcohol and that its relative mass is 74. Many gained a further mark by stating there are three different carbon environments but only a minority used this information correctly. Many candidates used the information about the secondary carbocation incorrectly and thought that the compound was a secondary alcohol. Candidates had to use each piece of information to score full marks. Part (b) was poorly answered as drawing the ^1H NMR peaks proved more difficult than interpreting a given spectrum. Only about 20% gained all 4 marks while around 40% failed to score at all. The main errors were omitting the peak due to the HC—O proton and not giving the peak areas.
- Q.10 The QER question in part (a) was well answered with about two thirds scoring a higher band mark. The two main weaknesses were omission of reference to a calorimeter/polystyrene cup and to the plotting of a graph with extrapolation of the lines to calculate the maximum temperature. The calculations in the remaining parts of question 10 were very well done.
- Q.11 Part (a) was very well answered although some failed to correctly label the transition state. Part (b) was also very well done. A small number failed to draw a tangent on the graph and others gave an incorrect unit. Some described how the rate could be measured without any reference to time and so lost a mark.

Summary of key points

Candidates should consider the following points to improve performance:

- Ensure that all bonds and atoms are positioned carefully and unambiguously when drawing structures of organic molecules
- When performing practical organic experiments, think through the implications of a particular action carried out
- Use **all** the information given in questions where the structure of a compound has to be identified in order to access all available marks
- Practise sketching simple NMR spectra with focus on the position of peaks only in ^{13}C NMR spectra and on the position and relative areas of peaks in ^1H NMR spectra.



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