
GCSE

COMBINED SCIENCE: TRILOGY

8464/C/2F: Paper 2 - Chemistry (Foundation tier)
Report on the Examination

8464
June 2022

Version: 1.0

Further copies of this Report are available from aqa.org.uk

Copyright © 2022 AQA and its licensors. All rights reserved.
AQA retains the copyright on all its publications. However, registered schools/colleges for AQA are permitted to copy material from this booklet for their own internal use, with the following important exception: AQA cannot give permission to schools/colleges to photocopy any material that is acknowledged to a third party even for internal use within the centre.

General

This paper was more accessible than the last comparable paper in 2019, with the mean mark on the paper increasing by 5.

Questions six and seven were common to Foundation and Higher tiers and were targeted at standard demand.

Students should be prepared to expect that they will be given unfamiliar contexts and information. Familiar contexts are those mentioned in the specification and assess recall, selection and communication of students' knowledge and understanding. The mark scheme was designed to allow students to gain marks for showing knowledge, understanding and application of chemistry. Knowledge and understanding in familiar and in unfamiliar situations, including in the laboratory, are tested throughout this paper. This means that it is essential that students read and analyse the information provided, then read and understand the question before writing their response.

This report should be read in conjunction with the published mark scheme.

Levels of demand

Questions are set at two levels of demand for this paper:

- **low demand** questions are designed to broadly target grades 1–3.
- **standard demand** questions are designed to broadly target grades 4–5.

A student's final grade, however, is based on their attainment across the qualification as a whole, not just on questions that may have been targeted at the level at which they are working.

Question 1

A straightforward introduction to the paper which mainly relied on interpreting supplied information.

- 01.1** Only about half of all students achieved this mark. Many students misinterpreted the scale on the y-axis and drew the line at 22% rather than 21%. There was no tolerance allowed on this graph for that reason. It is advised that students bring a ruler to their exams to use when drawing bar charts.
- 01.2** Many students knew that a burning splint is required to test for oxygen in this question.
- 01.3** Information taken from the pie charts was answered correctly by most students, with over half gaining 2 marks and 95% gaining at least 1 mark.
- 01.4** Another question testing knowledge of specification content that was not always well known with just over 60% of students gaining at least 1 mark.
- 01.5** Almost all students answered this correctly gaining 2 marks. The most common incorrect responses stated the concentrations at the peaks rather than the times.

- 01.6** The mark scheme required a link between increased use of transport at these times and the emissions of oxides of nitrogen, with approximately a third of students recognising this. Students should be encouraged to read the stem of each question.

Question 2

This question about fuels was on specification content that was not well known by students. The questions that were most successfully answered were the interpretative questions rather than AO1 knowledge and understanding based questions.

- 02.1** Only a half of students achieved this mark. Many students named respiration rather than photosynthesis as the process.
- 02.2** The formation of coal and oil was not well known by students, with only 2 in 5 giving the correct answer. Most answered that trees are burnt.
- 02.3** The most common response was sulfur oxide which was not credited. Only 1 in 10 students were able to answer sulfur dioxide.
- 02.4** The problems caused by sulfur dioxide were not well known. There were many vague answers such as bad for the environment or health problems. Students need to provide specific problems caused by any example of pollution, rather than generic statements.
- 02.5** This was another question where students were required to interpret information provided. Over half of students gained at least 1 mark and three quarters gained at least 2 marks.

Question 3

The equilibrium identified in this question is detailed in the specification, however, many students found the questions challenging.

- 03.1** Around half of the students were able to identify hydrogen chloride or hydrochloric acid as the other product.
- 03.2** Students were told that ammonia is a gas in the stem of the question. However only half of the students gained the mark on this item.
- 03.3** Nearly two thirds of students were able to either draw the equilibrium symbol or describe the symbol with sufficient clarity.
- 03.4** Three quarters of students identified the reverse reaction as exothermic.
- 03.5** Approximately 60% of students were able to identify rate in this item. Nearly all the incorrect responses were concentration.

-
- 03.6** Less than a third of students identified C correctly. The most common incorrect responses were B and D with similar numbers identifying each.
- 03.7** Approximately one third of students gained a mark here. The most common correct response was for increasing the rate. Responses such as catalysts were not used up or catalysts could be reused did not answer the question.
- 03.8** In this open question only 1 in 20 students were able to identify a formulation. Bleach was the most seen incorrect response.

Question 4

The skills tested in this question led to some good responses from students, particularly when reading scales, graph plotting and in guided calculations.

- 04.1** Identifying variables from a practical procedure is still one of the skills that students find challenging. Only 1 in 5 scored both marks, with a further quarter of these students correctly identifying one of the variables.
- 04.2** Nearly 95% of students were able to read the thermometer to give the temperature.
- 04.3** A quarter of students gained all the marks for plotting the graph, including a curved line of best fit. Fewer than 1 in 5 gained no marks. The common error was the line of best fit, with many drawing a straight line. Students need to realise that lines of best fit can be curved or straight and they need to make that judgement.
- 04.4** A quarter of students were able to successfully extrapolate the graph to find the value requested. Students should be encouraged to extrapolate the lines and read from that line, as opposed to estimating where the line crosses the point.
- 04.5** Two thirds of students correctly completed the sentence.
- 04.6** Guided calculations with no manipulation of the equation are well understood by students, and this one was no exception, with nearly 4 in 5 achieving both marks for the calculation. Transposition errors (both written and putting into calculators) accounted for a number of the incorrect responses.
- 04.7** The units were correctly identified by nearly 80% of students.
- 04.8** Around 1 in 4 students achieved all three marks for this calculation. The two most frequently seen errors were including the anomalous result and not rounding to 3 significant figures. This is another example where students need to read the whole question, perhaps highlighting the requirements, before embarking on the solution.

Question 5

The small amount of organic chemistry contained within the Trilogy specification was not well known by students.

- 05.1** Fewer than 2 in 5 gained the mark for this question. The question tested the student's ability to interpret a structural displayed formula and how to write a formula correctly. Students need to be encouraged to write the numbers in formulae as subscripts.
- 05.2** Fewer than 1 in 5 students were able to name the alkane as propane. A full range of alternatives were given, many of which were not even hydrocarbons.
- 05.3** The meaning of the term homologous series is not well known and fewer than 10% of students were able to identify alkanes. Group 1 was a commonly seen incorrect response.
- 05.4** Around a third of students identified the correct expression here.
- 05.5** When identifying trends in data, students need to be encouraged to name both variables. The use of 'it' or 'they' is often confusing and leads to the mark not being awarded as the marker cannot be sure what is meant. Two thirds of students were awarded this mark.
- 05.6** Barely 1 in 10 students were able to identify one of the conditions required for cracking. In questions like this, vague answers such as heat, hot etc., are insufficient for a mark.
- 05.7** A quarter of students were able to gain the mark on this question. Many students added formulae to the equation in the gap given rather than mole ratios.
- 05.8** Just over 10% gained this mark on this recall question.
- 05.9** The skill of making judgements based on supplied data is well ingrained with students. Over 60% of students gained all three marks, with more than 4 in 5 achieving at least one mark. Distinctions should be made between whether the data relates to required resources or waste produced, as a number of students did not make the distinction which meant some responses could not be credited.

Question 6

This Required Practical Activity is a familiar context on examination papers and most students were able to make some progress.

- 06.1** Often students gave solutions as opposed to the problems the errors would lead to. The start line being drawn in ink was the most common correct response, however, the problems encountered were often vague such as the experiment would not work. A quarter of students gained at least 1 mark, with a further quarter gaining 2. Far fewer were able to progress much beyond this.

-
- 06.2** Conclusions were often poorly expressed or incomplete. The conclusion needed to be in terms of what was in brown ink. Common incorrect responses referred to the amount of a colour being linked to where it is found on a chromatogram.
- 06.3** Just over three quarters of students were able to identify that the green colour was insoluble in the solvent.
- 06.4** The calculation of the R_f value relied on the skill of rearranging the given equation. Just over 35% of students gained all 3 marks. Where an incorrect response was obtained, no further credit was given when there was no working. Students should be encouraged to show their working in calculations so that appropriate credit can be awarded if a final answer is not given or is incorrect.

Question 7

The topic of water purification was generally not well known.

- 07.1** Over 60% of students were able to score at least 1 mark comparing the methods of treatment of ground and wastewater to make potable water. This was usually for a simple statement that both waters need to be filtered. Responses were lacking in specific detail in this recall question. The idea that both waters need to be distilled was very commonly seen, mistaking this with sea water.
- 07.2** About one third of students were able to identify distillation to desalinate sea water. The most common incorrect response was filtration.
- 07.3** About a quarter of students were able to score two of the three marks on this item, the conversion of cm^3 to dm^3 being the most likely mark missed.

Use of statistics

Statistics used in this report may be taken from incomplete processing data. However, this data still gives a true account on how students have performed for each question.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the [Results Statistics](#) page of the AQA Website.