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GCSE (9–1)

Examiners' report

GATEWAY SCIENCE COMBINED SCIENCE A

J250

For first teaching in 2016

J250/05 Autumn 2020 series

Version 1

ocr.org.uk/science

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 5 series overview

J250/05 is a 60 mark paper and one of the two Foundation Physics papers for the GCSE (9–1) Gateway Science Combined Science A. It covers the topics:

- P1 Matter
- P2 Forces
- P3 Electricity and Matter
- CS7 Practical Skills.

Section A of the paper has 10 multiple-choice questions, each worth one mark.

Section B has mainly short answer response questions and includes one six-mark Level of Response question.

Mathematical skills and the Working scientifically content may be assessed throughout the examination.

To do well on this paper, candidates needed to able to select and manipulate equations, and be comfortable applying their knowledge and understanding to both familiar and unfamiliar contexts and practical science activities.

Candidates who did well on this paper generally did the following:	***Candidates who did less well on this paper generally did the following:***
• applied and manipulated equations • demonstrated knowledge of scientific procedures (e.g. identifying pieces of apparatus and linking to their uses) • analysed and interpreted graphs to describe relationships.	• could not rearrange equations correctly • could not identify mistakes made when results were recorded in a table • could not read values from a graph or describe the relationship shown.

Comments on responses by question type

Multiple choice questions

The majority of candidates were successful in choosing the correct answer when substituting values provided in the question, or on a circuit diagram, into an equation that did not require rearrangement (Questions 2, 4 and 8).

Question 7 assessed candidates' knowledge of the size of an atom and calculating the volume of a cube. Few candidates answered this correctly and there was no evidence that candidates could recall the size of an atom.

	**Misconception**	The majority of candidates found Question 5 challenging as they did not know that speed is a scalar. Most candidates wrongly identified speed as a vector and therefore incorrectly chose distractor A.

	**Misconception**	Although most candidates were aware that the nucleus is smaller than an atom, a common misconception in Question 9 was that the nucleus contains no mass.

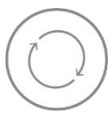
Level of Response questions

Question 18 was the Level of Response question, targeted up to Grade 5, and it assessed AO1 and AO3. The question required students to analyse information from the graph about the properties of springs and to apply their knowledge of Hooke's law.

The question proved challenging to most candidates. Very few candidates answered both parts of the question with clear, creditworthy statements about Hooke's law and properties of the springs. Some candidates were only able to compare the amount of 'stretch' for the springs but poor use of scientific terminology and communication prevented them from achieving a higher mark.

Candidates who achieved a Level 2 often demonstrated knowledge of plastic and elastic deformation but did not always use these terms.

A more complete response for Level 3 would have also included ideas about Hooke's law.

	**AfL**	Poor quality of communication prevented some candidates from gaining higher marks. Candidates should try to use more scientific terminology instead of terms such as 'drastic' or 'successful' extensions. Many candidates would also benefit by underlining key parts of the question to help make sure that they include all necessary detail in their response.

Other

Question 12

Very few candidates gained full credit in Question 12a. Despite the question clearly indicating that only two pieces of apparatus were needed, many candidates made links from all four pieces of equipment to their names and quantities.

Nearly all candidates incorrectly included the anomalous result in Question 12biii in the calculation of the mean, despite it being very different from the other two readings in the table.

	AfL	Many candidates would benefit from underlining key parts of the question to help them to focus on important instructions. Candidates could also be given short activities where they have to match pieces of apparatus with what needs to be measured. Candidates need to be aware that anomalous readings in a set of results are not included in calculations of the mean.

Question 13

Many candidates could not correctly read the temperature scale on the graph in Question 13b and thought that each grid line represented 1 °C.

Question 13d discriminated well, with only the higher ability candidates linking the correct section on the graph to where the salol was both solid and liquid.

In Question 13ei, the majority of candidates were unable to convert grams into kilograms correctly.

	AfL	Candidates could benefit from practising reading values from, and plotting point on, graphs with different axis scales.

?	**Misconception**	In Question 13d, many candidates had the misconception that the kinetic energy of the particles increased during the section of the graph relating to a change of state.

Question 14

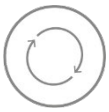
The majority of candidates correctly identified that to charge the plastic rod, it needed to be rubbed. However, very few candidates were able to explain why.

?	**Misconception**	In Question 14b, many candidates referred to positive electrons, or protons moving to or from the plastic rod.

Question 15

In Question 15a, the majority of candidates could not convert mA into amps correctly and were not aware that the reading on ammeter 1 was the sum of the readings on ammeters 2 and 3.

Candidates were confident with substituting the values into the equation provided in Question 15b, and most candidates gained full credit. Many candidates are now increasingly showing their calculations, so that compensatory marks may be awarded.

	**AfL**	Candidates could benefit from practising converting units and recognising and using unit prefixes.

Question 17

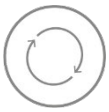
Overall, candidates struggled with the concepts in the question and few scored more than half marks.

In Question 17a, the most common creditworthy statement referred to the direction of the field or force. Few references were made to the strength of the field or magnitude of the force.

Candidates struggled to explain how the blocks could be identified in Question 17b although some were able to describe part of the process correctly.

Question 17ci assessed AO3 and required candidates to interpret graphs and draw conclusions about the variation of the dip angle with distance from Earth's North Pole. Many candidates were unable to identify the simple relationship from the graph. To gain full credit, candidates needed to give a more detailed relationship, i.e. as the distance increases, dip angle decreases at an increasing rate.

Question 17d assessed candidates' abilities to interpret and use data from the graph in order to draw conclusions about the statements of student X and student Y. A small proportion of candidates identified that both students were incorrect but only the higher ability candidates were able to use the data to prove that the suggested relationships were incorrect, or to show that the graph showed an inversely proportional relationship.

	**AfL**	Candidates could benefit from underlining key command words and having a better understanding of what the command words mean e.g. explain means that the candidates are required to describe *and* give reasons such as 'the permanent magnet will not attract the copper block *because* copper is not a magnetic material.' Candidates may also benefit from activities where they have to describe the relationship shown on familiar and unfamiliar graphs, e.g. directly proportional, increasing at an increasing rate etc.

Key teaching and learning points – comments on improving performance

- labelling apparatus and describing their use
- rearranging equations
- converting units
- recognising unit prefixes
- describing patterns and relationships from graphs or tables of data
- reading values from and plotting values on graphs with different axis scales.

Guidance on using this paper as a mock

The paper and mark scheme are constructed in a similar way to the summer examinations and the questions tested a range of topic areas. It is therefore suitable for use as a mock paper.

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