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GCSE (9–1)

Examiners' report

GATEWAY SCIENCE COMBINED SCIENCE A

J250

For first teaching in 2016

J250/06 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 6 series overview

J250/06 is the second Physics foundation tier paper in the Gateway GCSE Combined Science suite. The 60 mark paper assesses content from specification topics P4-P6. It also assumes knowledge of the topics in P1-P3.

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.

To perform well on this paper, candidates need to have a sound knowledge of the theory covered in topics P4-P6 and be able to apply this to novel situations. They also need to apply the skills and understanding that they have developed in the practical activities covered in topic CS7.

This paper also contains questions that have elements of synopticity, drawing on material covered by topics P1-P3. There are also questions that involve the assessment of key mathematical requirements and working scientifically from the appendices 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:***
• performed calculations involving substituting into equations including conversion of units • extracted and used information from tables and graphs • showed knowledge of required practical skills.	• did not know standard definitions such as mass number • showed little understanding of energy stores or energy dissipation. • did not know the conventions for household wiring.

Section overview

The component consisted of two sections.

Section A - ten multiple choice questions – 1 mark each.

Section B - One Level of Response question worth up to 6 marks and short response questions and calculations making up the rest of the marks.

Comments on responses by question type

Multiple choice questions

All candidates attempted all of the multiple-choice questions and many achieved good marks on this section. The main strengths were in the questions involving calculations where the majority of the possible marks were obtained. Questions which required application of knowledge were generally not so well answered.

Short answer questions

The candidates consistently scored well on calculations such as Question 16bii where most candidates were able to select the correct equation and substitute values given in the question. Many pupils understood the terms significant figures (Question 16bii) and mean (Question 12ai) and could correctly apply these. Questions where pupils extracted information from tables or graphs (Questions 14c and 16a) were also generally well-answered. Not so well answered was Question 12aii which required applying the knowledge that nuclear decay is random to explain a set of data or Question 12ciii that needed knowledge of half-life and properties of alpha, beta and gamma radiation to be able to select a suitable isotope.

Level of Response questions

The Level of Response question involved interpreting two graphical representations of the same wave, one a displacement¬–time graph the other a displacement–distance graph. Candidates were expected to use knowledge of wave definitions such as wavelength, amplitude and frequency to extract information from the graphs. The majority of candidates did not realise that both graphs represented the same wave and struggled to correctly state and apply definitions as a result. Many candidates' responses were level 1 or did not receive any credit.

Common misconceptions

There were a number of common misconceptions.

?	**Misconception**	• That there is a net movement of molecules as a wave moves through. • That the deceleration of a car is inversely related to the size of the force on passengers. • Mass number changes in beta decay. • Few candidates knew that energy lost from a system increases the thermal energy store of the surroundings.

In Question 8 many candidates choose answer C. They correctly noted the up and down movement of the cork but incorrectly assumed that the water moves along with the wave fronts.

Many candidates in Question 9 opted for answer B correctly identifying that a small force needed to be transferred to the passengers but thinking this was due to large deceleration. This may have been due to a misunderstanding of the meaning of deceleration not realising that it is the same as acceleration but in an opposite direction, or a failure to understand that acceleration is proportional to force (Newton's Second Law).

In Question 12b most candidates failed to obtain the mark for the definition of mass number and many candidates did not realise that the mass number of the daughter nuclei remains the same as its parent during beta decay suggesting they were not familiar with the nuclide notation.

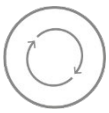
In Question 16c, on the concept of energy stores and energy conservation, most candidates lost at least one mark and a significant majority lost both. Many candidates did not name the energy store of the hot water. Few candidates realised that this energy needed to be transferred somewhere, in this case increasing the energy store of the air/atmosphere/surroundings.

Key teaching and learning points – comments on improving performance

The candidates, this series, showed a good ability to substitute numbers into equations, to select appropriate equations and to extract information from graphs and tables. Candidates also could correctly select laboratory equipment.

The main difficulties seemed to be a lack of knowledge of physics definitions or explanations of standard concepts. This was evidenced by the vast majority of pupils not scoring knowledge in isolation marks on standard definitions e.g. isotopes, half-life, household wiring and properties of electromagnetic waves. This made it difficult for candidates to access questions involving application of knowledge such as the Level of Response question.

To improve performance on this paper there should be more of an emphasis on candidates learning basic physics definitions and rules and the application of these. There is a free to download list of physics keywords and definitions by PMT Education on TES.com resources.

	**AfL**	Strategies to help learn knowledge could include: • use knowledge-based quizzes e.g. 'Who wants to be a Millionaire' • student research and presentation • escape room puzzles – using physics knowledge to be the first group to escape by solving physics based problems • market place activities, students becoming experts and teaching peers • peer assessment and improvement • rote learning – getting pupils to learn and recite definitions.

Guidance on using this paper as a mock

This paper would be suitable to use as a mock examination. It provides opportunity to interpret graphical data and perform calculations, alongside applying knowledge. It has several questions that require a good knowledge of physics concepts to be able to obtain the available marks and can therefore be used to assess shortfalls in candidate knowledge.

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