Qualification Accredited

OCR
Oxford Cambridge and RSA

GCSE (9–1)

Examiners' report

GATEWAY SCIENCE COMBINED SCIENCE A

J250

For first teaching in 2016

J250/01 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 1 series overview

J250/01 (Paper 1 Foundation Tier) is one of two biology examination components for GCSE (9-1) Combined Science A (Gateway Science), worth 16.7% of the total GCSE. This component examines the following specification content:

- Topic B1: Cell level systems
- Topic B2: Scaling up
- Topic B3: Organism level systems
- Topic CS7: Practical skills (PAGs B1-B5).

To do well on this paper candidates need to be to be comfortable with the whole of the specification content; to be prepared to answer questions using their knowledge and understanding of practical techniques and procedures; to show understanding of scientific quantities and corresponding units, SI base and derived units, listed in Section 5d (Units in science) of the specification, such that they are able to use them in quantitative work and calculations; and to have acquired competence in the appropriate areas of mathematics relevant to biology as listed in Section 5f (Mathematical skills) of the specification, and to be able to apply these skills in the context of biology.

The practical activities described in the specification need to be covered in preparation for the 15% of questions in the paper that will assess practical skills; candidates need to be prepared to answer questions using their knowledge and understanding of practical techniques and procedures. Centres should provide learners with opportunities to carry out a wide range of practical activities during the course, these can be the ones described in the specification or can be ones devised by the centre ranging from whole investigations to simple starters and plenaries.

Candidates should have an understanding of number, size and scale, and the quantitative relationship between units; be able to translate information between graphical and numerical form, plot and draw graphs selecting appropriate scales and axes; and be able to extract and interpret information from charts, graphs, and tables.

Candidates who did well on this paper generally did the following:	***Candidates who did less well on this paper generally did the following:***
• used appropriate scientific terminology • showed clear working in all calculations • demonstrated sound knowledge of practical procedures.	• found it difficult to apply knowledge to unfamiliar contexts • made mistakes when rounding to a specified number of decimal places • found it difficult to analyse and interpret data • misinterpreted question requirements.

Section A

Overview

Section A consists of multiple choice questions. This section of the paper is worth 10 marks.

Section B

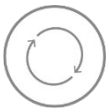
Overview

Section B consists of structured and short-answer question styles (including coverage of practical techniques and mathematical skills) and an extended six-mark level of response question. This section of the paper is worth 50 marks.

Comments on responses by question type

Multiple choice questions

Candidates coped well with selecting choices, however, there were instances where candidates had overwritten responses to change their choice – this should be discouraged as it can be difficult to distinguish the desired response. Instead the original response should be crossed-out and the desired response written clearly to the side of the response box.

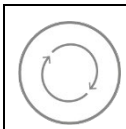
	**AfL**	Some candidates had 'No Response' answers or selected two choices. These errors could be eliminated through developing examination technique. Candidates could be encouraged to annotate options to help with the process of narrowing-down and identifying the correct response.

Level of response question

The level of response question on this paper was Question 14(d). Level 3 responses analysed and interpreted the patterns in the data and demonstrated good knowledge and understanding of scientific ideas about enzymes with reference to optimum pH and the effect of changing pH on the shape of the active site leading to denaturation of the enzyme at extremes of pH. Lower ability candidates did not interpret the data but simply described the pattern of data and did not explain the results by using knowledge and understanding of scientific ideas about enzymes. Many responses lacked a clear and logical structure, which prevented the candidate from developing a well-presented line of reasoning.

Other

Higher ability candidates demonstrated that they had read the full question carefully and understood exactly what they were being asked to do. Lower ability candidates often failed to identify the command word or focus of the question and consequently misinterpreted the question requirements. A common mistake where candidates were required to provide a set number of responses to a short answer question was to provide a list of responses longer than that required, with irrelevant or incorrect responses suggested first.

	**AfL**	A good teaching strategy for centres to adopt would be for candidates to deconstruct questions, paying particular attention to the command word as well as identifying the focus of the question.

Common misconceptions

There was confusion around the nature of osmosis in Question 2: it was often identified as requiring energy and/or being involved in the movement of glucose as water and/or against a concentration gradient.

The term replication was frequently confused with mitosis as a form of cell division in Question 3.

Responses to Question 5 and Question 11(c)(i) which involved biological drawings revealed that many candidates had difficulty interpreting drawings of common structures which were different to those they may previously have encountered. Candidates should be exposed to as wide a range of representations as possible.

Candidates commonly had difficulty understanding the concept of a cell as a 3D structure in Question 11(a). This should be addressed through teaching using 3D models of cells.

In Question 12(a) and Question 14(a) there was confusion around the distinction between control variables, the independent variable, and the dependent variable in scientific investigations; candidates also had difficulty in identifying relevant control variables. Candidates should carry out a wide range of practical activities so they can answer questions using first-hand knowledge and understanding of equipment and techniques.

i	**OCR support**	This *Language of measurement in context resource* can be used with candidates to help familiarise them with terminology for scientific investigations. It can also be used to support their understanding of how to identify variables.

In Question 13(a)(ii) light was often mistaken as a raw material for photosynthesis instead of water, which was frequently overlooked.

In Question 14(b), confusion was evident in candidates' knowledge of quantitative tests for biological molecules, both in terms of reagents used and in the correct observation for a positive result.

Candidates of all abilities found it challenging to suggest and justify improvements to experimental procedures in Question 14(c). Frequently the idea of doing more repeats to improve accuracy/precision/reliability/validity was suggested. When carrying out practical activities, candidates should be encouraged to identify and justify improvements to procedures, so that they can use their understanding to answer questions around this topic.

Candidates showed some confusion as to the nature of stem cells, both where they are found in plants and the difference between embryonic and adult stem cells in animals in Question 15(a)(i) and Question 15(a)(ii). Unfamiliarity with scientific terminology presented a problem when identifying the area where stem cells are found in plants. The distinction between totipotent/pluripotent embryonic stem cells and multipotent adult stem cells should be emphasised to candidates.

In Question 16(b)(i) and Question 16(b)(ii), candidates of all abilities found it challenging describing the roles of the hormones oestrogen, progesterone, and FSH in female reproduction, especially their interactions in the control of the menstrual cycle.

Key teaching and learning points – comments on improving performance

Centres should ensure that candidates are familiar with the command words used in OCR examinations, so that they are clear about what they are required to do, the exact response to a command word will be dependent on the context of the question. A list of common command words used in OCR examinations is shown in Section 3c (Command words) of the specification.

To answer level of response questions candidates need to be able to develop a clear and coherent line of reasoning to produce a logically structured response. The ability to write in a logical way reinforces a real understanding of subject content rather than basic recall of facts. Practising this skill will improve a student's overall understanding and help them to link ideas and make connections between concepts and increase their skill and resilience in tackling these questions.

Candidates should be given as many opportunities as possible to practise using the key terminology used in science investigations. Evidence from candidate responses shows that they do not understand the terms accuracy, precision, reliability, and validity, and they are used interchangeably as one and the same. With repeated opportunities to practise their use candidates should become proficient in the use of these terms.

Centres should provide candidates with multiple opportunities to practise the mathematical skills required in the specification. The required mathematical skills can be covered alongside the subject content in an integrated fashion. Teachers should aim to specifically assess candidates' understanding of the mathematical concepts as a matter of course. A consistent approach to this element of the specification will produce candidates that are well equipped to address the mathematical content of the examination, candidates who are not given the opportunity to practise each element of the requirements throughout the duration of the course are unlikely to master the required skills.

i	**OCR support**	Definitions of key terms used in science investigations are listed in the *Glossary of terms* available from the OCR website.

i	**OCR support**	Further guidance and support for delivering the mathematical content of the specification is contained in the *Mathematical Skills Handbook* available from the OCR website.

i	**OCR support**	This *How to answer 6 mark level of response* resource will be useful to share with candidates. It will allow them to experience a variety of answers, worth different marks, familiarise themselves with marking requirements and practice answering questions themselves.

Guidance on using this paper as a mock

There are three assessment objectives (AO) in this paper, which are further broken down into assessment objective elements, as shown in Section 3b (Assessment objectives (AO)) of the specification. These are referenced on the mark-scheme. When marking mock papers teachers may find it helpful in assessing candidate performance to link each mark-point awarded to the relevant assessment objective.

Where a multiple choice question has only a single correct response and a candidate provides two responses then no mark should be awarded, even if one of the responses is correct.

For short-answer questions where a candidate provides a contradictory statement to a correct response then no mark should be awarded, the contradictory statement negates the correct response. Where candidates are required to provide a set number of short-answer responses only the set number of responses should be marked. The response space should be marked from left to right on each line, and then line-by-line until the specified number of responses have been considered, the remaining responses should not be marked.

For answers marked by levels of response (Question 14(d)) the science content determines the level, the communication of the science content determines the mark within a level. Read through the whole answer from start to finish, using the level descriptors to help decide whether it is a strong or weak answer; the indicative science content in the Guidance column indicates the expected parameters for candidates' answers, but unexpected approaches should be credited where they show relevance. Using a 'best-fit' approach, based on the science content within the answer, decide which level descriptor best describes the overall quality of the answer. Once the level has been decided, the higher mark should be awarded where all aspects of the communication statement (in italics) have been met, the lower mark should be awarded where aspects of the communication statement are missing.

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