Qualification Accredited

OCR
Oxford Cambridge and RSA

GCSE (9–1)

Examiners' report

GATEWAY SCIENCE PHYSICS A

J249

For first teaching in 2016

J249/04 Autumn 2020 series

Introduction

Our examiners' reports are produced to offer constructive feedback on candidates' performance in the examinations. They provide useful guidance for future candidates.

i	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 exam paper nor examples of candidate responses.

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 exam paper and the mark scheme can be downloaded from OCR.

Paper 4 series overview

J249/04 is one of the two Higher Tier papers for the GCSE (9-1) Physics A (Gateway Science). The 90 mark paper is 50% of the overall qualification.

It covers the topics:

- P5 Waves in matter
- P6 Radioactivity
- P7 Energy
- P8 Global challenges
- P9 Practical skills
- P1–P4 knowledge is assumed

Section A of the paper has 15 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 are assessed throughout the examination.

Paper 4 tests students' ability to pull together their knowledge, skills and understanding from across the full course of study (synoptic assessment).

Candidates who did well on this paper generally did the following:	***Candidates who did less well on this paper generally did the following:***
• recalled and applied or manipulated equations • gave a detailed and logically structured response to the Level of Response question • interpreted graphs to draw detailed conclusions about the relationship between variables • applied knowledge of practical procedures to situations similar to those encountered in the classroom.	• had poor recall of equations • lacked the necessary knowledge to draw a ray diagram for a convex lens • gave responses that lacked detail, e.g. the Level of Response question • demonstrated poor knowledge of practical procedures.

Comments on responses by question type

Multiple choice questions

Candidates struggled with the first two multiple choice questions on the paper with many not gaining credit for either question. In Question 1, candidates did not know that 'precise data' has a small spread which means that measurements are close together.

Questions 7 and 11 were very well answered, with most candidates writing the equation and/or their calculations next to the question in order to reduce the likelihood of making an error.

?	**Misconception**	In Question 2, most candidates correctly identified electromagnetic waves as being a transverse wave but a common misconception was that the speed of the wave in space changed as the wavelength changed.

Level of Response (LoR) question

Question 18 was the LoR question and assessed AO1 and AO3. It required candidates to demonstrate their knowledge and understanding of the advantages and disadvantages of wind power, and this was clearly set out by most candidates.

Candidates also had to analyse the data on both graphs in order to interpret patterns and draw conclusions about the generation and use of wind power. Most candidates made a very good attempt at this and the more able candidates gave logically structured responses that gained full marks.

Level 1 and Level 2 responses lacked sufficient detail or candidates misinterpreted the graphs due to the different scales on the y axes.

Other

Question 16

This question was of standard demand but candidates struggled and it was generally not well answered.

Few candidates successfully complete the ray diagram in Question 16a with either the ray that passed directly through the centre of the lens or the ray that went through the focal point on the left hand side of the lens and then parallel to the principal axis.

Most candidates could explain why the projector with a plastic case in Question 16cii did not need an earth wire. However, their responses for the metal case required more detail that just stating that metal is a conductor.

	AfL	Candidates could benefit from practising drawing ray diagrams for a convex lens.

?	**Misconception**	A common misconception in Question 16ci was that the potential difference between the earth wire and live wire is 0 V.

Question 17

Question 17a required candidates to apply their knowledge of a familiar experiment about the cooling of water to a similar situation. Most candidates gained at least 2 marks. Some candidates demonstrated poor knowledge of the experimental procedure and often just repeated the stem of the question.

In Question 17bii, few candidates knew that the line of best fit should have been a curve, with most candidates attempting to draw a straight line through the points on the graph.

Only the more able candidates, who correctly drew a curved line of best fit in Question 17bii, were able to give a detailed description of how the temperature of the water changed with time. Other candidates gained 1 mark for the simple description that as time increased, the temperature decreased.

	AfL	Candidates could benefit from writing out a clear method when they carry out or observe practical procedures.

Question 19

Nearly all candidates wrote down their calculations in Question 19bii. This was of benefit to many candidates as it showed that they could correctly rearrange the equation and substitute in the values for 2 marks, even though they then forgot to write their final response in standard form and to 2 significant figures.

Question 19di and dii assessed the knowledge and understanding of using ultrasound in medical imaging. Candidates found these two questions very challenging and, although many recalled that ultrasound was reflected by the kidney, the reflection off both the front and back of the kidney was not well known, which also prevented candidates gaining credit in Question 19dii.

	AfL	Candidates could benefit from underlining key information in the question, such as the need for standard form and significant figures, in order to remind themselves to check that they have written their final response in the correct form.

Question 21

Candidates often gained full credit in Question 21aii and those who did not, due to recalling the incorrect equation for energy transfer, gained compensatory marks for clearly showing their calculations for power.

Although most candidates selected the correct equation from the data sheet for Question 21c, many struggled to manipulate the equation in order to calculate the current in the primary coil.

	AfL	Candidates need to be careful not to confuse energy stores with energy transfers in Question 21ai.

Question 22

Question 22bi clearly stated that candidates were required to use the data from the graph. They had to show that the speed of the galaxy was directly proportional to the distance from the Earth by concluding the data showed that speed increased by the same factor as the distance. Most candidates found this very challenging and some could not accurately read values from the graph.

?	**Misconception**	The idea of red-shift was well known in Question 22a but a common misconception was that galaxies have an increasing wavelength. Candidates need to be explicit in their response that it is the wavelength of the light that is increasing.

Key teaching and learning points – comments on improving performance

- Describing detailed patterns and relationships from graphs or tables of data.
- Drawing ray diagrams for convex lenses.
- Describing a method for experimental procedures.
- Manipulating and rearranging equations.
- Underlining key information and instructions in the questions.

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.

Supporting you

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Supporting you through 2020-2021

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