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Specification
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GCE Physics

Edexcel Advanced Subsidiary GCE in Physics (8PH07)
First examination 2009

Edexcel Advanced GCE in Physics (9PH07)
First examination 2010

International Alternative to Internal Assessment
(Units 3B and 6B)

January 2008

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Edexcel GCE in Physics (8PH07/9PH07)

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AS Unit 3B: Exploring Physics	**Unit code 6PH07**	
• Externally assessed • Availability: January and June • First assessment: January 2009	20% of the total AS marks	10% of the total GCE marks
Content summary: Students are expected to develop experimental skills, and a knowledge and understanding of experimental techniques, by carrying out a range of practical experiments and investigations while they study Units 1 and 2. This unit will assess students' knowledge and understanding of experimental procedures and techniques that were developed when they did those experiments and investigations.		
Assessment: Assessment for this unit consists of one externally assessed written examination paper of 1 hour 20 minutes' duration.		

A2 Unit 6B: Experimental Physics	**Unit code 6PH08**	
• Externally assessed • Availability: January and June • First assessment: January 2010	20% of the total A2 marks	10% of the total GCE marks
Content summary: Students are expected to further develop the experimental skills and the knowledge and understanding of experimental techniques that they acquired in Units 1 and 2 by carrying out a range of practical experiments and investigations while they study Units 4 and 5. This unit will assess students' knowledge and understanding of the experimental procedures and techniques that were developed when they did those experiments and investigations.		
Assessment: Assessment for this unit consists of one externally assessed written examination paper of 1 hour 20 minutes' duration.		

AS compulsory unit

Externally assessed (international centres only)

3.1 Unit description

Introduction

Students are expected to develop experimental skills, and a knowledge and understanding of experimental techniques, by carrying out a range of practical experiments and investigations while they study Units 1 and 2.

This unit will assess students' knowledge and understanding of experimental procedures and techniques that were developed when they did those experiments.

Development of practical skills, knowledge and understanding

Students should do a variety of practical work during the AS course to develop their practical skills. This should help them to gain an understanding and knowledge of the practical techniques that are used in experimental work.

Centres should provide opportunities for students to plan experiments, implement their plans, collect data, analyse their data and draw conclusions to prepare them for the assessment of this unit.

Experiments should cover a range of different topic areas and require the use of a variety of practical techniques. The specification for Units 1 and 2 contain suggestions for practical work, although these suggestions do not constitute an exhaustive list. This should help students to gain an understanding and knowledge of the practical techniques that are used in experimental work.

How Science Works

The QCA GCE Science criteria include *How Science Works* (see *Appendix 6: How Science Works* in the main specification). Students should be given the opportunity to develop their practical skills for *How Science Works*, numbers 2–6, as detailed in Appendix 6, by completing a range of different experiments that require a variety of different practical techniques.

Students should produce laboratory reports on their experimental work using appropriate scientific, technical and mathematical language, conventions and symbols in order to meet the requirements of *How Science Work*, number 8.

3.2 Assessment information

Examination paper

This unit is assessed by means of a written examination paper of 1 hour 20 minutes' duration. Students may be required to apply their knowledge and understanding of physics to situations that they have not seen before.

The total number of marks available for this examination paper is 40. It contributes 10 per cent to the Advanced GCE in Physics.

Materials

Students will need a scientific calculator, a protractor and a rule for this paper.

Formulae sheet

Students are provided with the formulae sheet in *Appendix 8: Formulae* in the main specification. Any other physics formulae that are required will be stated in the question paper.

3.3 Assessment details

This unit is assessed by means of a written examination paper. The assessment for this unit covers planning an experiment, analysing data and drawing conclusions. A laboratory is not required for this assessment.

Planning

Students will be expected to plan an experiment that is set by Edexcel, although they will not be expected to carry it out.

Students may be required to:

- identify the apparatus required
- discuss calibration of instruments, eg whether a meter reads zero before measurements are made
- describe how to measure relevant variables using the most appropriate instrument and correct measuring techniques
- identify and state how to control all other relevant variables to make it a fair test
- discuss whether repeat readings are appropriate
- identify health and safety issues and discuss how these may be dealt with
- discuss how the data collected will be used
- identify possible sources of uncertainty and/or systematic error and explain how these may be reduced or eliminated
- comment on the implications of physics (eg benefits/risks) and on its context (eg social/environmental/historical).

Implementation and measurements

Students will be given details of an experiment carried out by an inexperienced student. Results may be included.

Students may be asked to:

- comment on the number of readings taken
- comment on the range of measurements taken
- comment on significant figures
- check a reading that is inconsistent with other readings, eg a point that is not on the line of a graph — students may be shown a diagram of a micrometer that is being used to measure the diameter of a wire and be expected to write down the reading to the correct number of significant figures
- comment on how the experiment may be improved, possibly by using additional apparatus (eg to reduce errors) — examples include using a set square to determine whether a ruler is vertical and to aid the measurement of the extension of a spring.

Processing results

Students will be provided with a set of experimental results that was obtained by a more experienced student doing an experiment.

Students may be expected to:

- perform calculations, using the correct number of significant figures
- plot results on a graph using an appropriate scale
- use the correct units throughout
- comment on the trend/pattern obtained
- determine the relationship between two variables or determine a constant with the aid of a graph, eg by determining the gradient using a large triangle
- suggest realistic modifications to reduce errors
- suggest realistic modifications to improve the experiment
- discuss uncertainties, qualitatively and/or quantitatively (students will be expected to determine the percentage uncertainty of a single measurement).

Drawing conclusions

After processing results, students may be asked to provide a final conclusion for the experiment based on their quantitative evidence.

A2 compulsory unit

Externally assessed (international centres only)

6.1 Unit description

Introduction

Students are expected to further develop the experimental skills that they acquired in Units 1 and 2.

Students are expected to develop these skills, and a knowledge and understanding of experimental techniques, by carrying out a range of practical experiments and investigations while they study Units 4 and 5.

This unit will assess students' knowledge and understanding of the experimental procedures and techniques that were developed when they did those experiments.

Development of practical skills, knowledge and understanding

Students should do a variety of practical work throughout the A2 course to develop their practical skills.

Centres should provide opportunities for students to plan experiments, implement their plans, collect data, present and analyse their data, and draw conclusions to prepare them for the assessment of this unit.

Experiments should cover a range of different topic areas and use a variety of practical techniques. The specification for Units 4 and 5 contain suggestions for practical work, although these suggestions do not constitute an exhaustive list. This should help students to gain an understanding and knowledge of the practical techniques that are used in experimental work.

Students should gain experience of using log graphs to determine the relationship between two variables. The graphs need not always be obtained for variables that are related by the exponential function. For example, students could investigate how the pressure of a fixed mass of gas varies with its volume at constant temperature and plot an appropriate log/log graph to determine the relationship between the pressure and volume of the gas.

How Science Works

The QCA GCE Science criteria include *How Science Works* (see *Appendix 6: How Science Works* in the main specification). Students will develop their practical skills for *How Science Works* numbers 2–6, as detailed in Appendix 6, by completing a range of different experiments that require a variety of different practical techniques throughout the A2 course.

Students should produce laboratory reports on their experimental work during the course using appropriate scientific, technical and mathematical language, conventions and symbols in order to meet the requirements of *How Science Works* number 8.

6.2 Assessment information

Examination paper

This unit is assessed by means of a written examination paper of 1 hour 20 minutes' duration. Students may be required to apply their knowledge and understanding of physics to situations that they have not seen before.

The total number of marks available for this examination paper is 40. It contributes 10 per cent to the Advanced GCE in Physics.

Materials

Students will need a scientific calculator, protractor and rule for this paper.

Formulae sheet

Students are provided with the formulae sheet in *Appendix 8: Formulae* in the main specification. Any other physics formulae that are required will be stated in the question paper.

6.3 Assessment details

This unit is assessed by means of a written examination paper. The assessment for this unit covers planning an experiment, analysing data and drawing conclusions. A laboratory is not required for this assessment.

Planning

Students will be expected to plan an experiment that is set by Edexcel, although they will not be expected to carry it out.

Students may be required to:

- identify the most appropriate apparatus, giving essential details- essential details may include the range and precision of instruments and/or relevant dimensions of apparatus (eg the length of string used for a pendulum)
- discuss calibration of instruments, eg whether a meter reads zero before measurements are made
- describe how to measure relevant variables using the most appropriate instrument(s) and techniques
- identify and state how to control all other relevant variables to make it a fair test
- discuss whether repeat readings are appropriate
- identify health and safety issues and discuss how these may be dealt with
- discuss how the data collected will be used
- identify possible sources of uncertainty and/or systematic error and explain how these may be reduced or eliminated.

Implementation and measurements

Students will be given partial details of how an experiment was carried out. Results will be included.

Students may be asked to:

- comment on how the experiment could have been improved, possibly by using additional apparatus (eg to reduce errors) — examples include using set squares to measure the diameter of a cylinder and using a marker for timing oscillations
- comment on the number of readings taken
- comment on the range of measurements taken
- comment on significant figures — students may be required to identify and/or round up any incorrect figures in a table of results
- identify and/or amend units that are incorrect
- identify and check a reading that is inconsistent with other readings, eg a point that is not on the line of a graph.

Analysis

Students will be expected to use the set of experimental results to:

- perform calculations, using the correct number of significant figures
- plot results on a graph using an appropriate scale and units — the graph could be logarithmic in nature
- use the correct units throughout
- comment on the trend/pattern obtained
- determine the relationship between two variables or determine a constant with the aid of the graph, eg by determining the gradient using a large triangle
- use the terms *precision*, *accuracy* and *sensitivity* appropriately
- suggest realistic modifications to reduce errors
- suggest realistic modifications to improve the experiment
- discuss uncertainties qualitatively and quantitatively
- compound percentage uncertainties correctly.

Drawing conclusions

After processing results, students may be asked to provide a final conclusion for the experiment in relation to its original aim and based on their quantitative evidence.

They may also be asked to suggest further relevant work, for example to verify their conclusion(s).

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Acknowledgements

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Authorised by David Davies

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