

Physics Assignment General assessment information

This pack contains general assessment information for centres preparing candidates for the assignment Component of Higher Physics Course assessment.

It must be read in conjunction with the specific assessment task for this Component of Course assessment, which may only be downloaded from SQA's designated secure website by authorised personnel.

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Introduction

This is the general assessment information for Higher Physics assignment.

This assignment is worth 20 marks out of the total of 120 marks available for this Course. The Course will be graded A-D.

Marks for all Course Components are added up to give a total Course assessment mark which is then used as the basis for grading decisions.

This is one of two Components of Course assessment. The other Component is a question paper.

The assessment task will be set and externally marked by SQA and conducted in centres under the conditions specified by SQA.

This document describes the general requirements for the assessment of the assignment Component for this Course. It gives general information and instructions for assessors.

It must be read in conjunction with the assessment task for this Component of Course assessment.

Equality and inclusion

This Course assessment has been designed to ensure that there are no unnecessary barriers to assessment. Assessments have been designed to promote equal opportunities while maintaining the integrity of the qualification.

For guidance on assessment arrangements for disabled candidates and/or those with additional support needs, please follow the link to the Assessment Arrangements web page: www.sqa.org.uk/sqa/14977.html

Guidance on inclusive approaches to delivery and assessment in this Course is provided in the *Course Support Notes*.

What this assessment covers

This assessment contributes 16.7% of the total marks for the Course.

The assessment will assess the skills, knowledge and understanding specified for the assignment in the Course Assessment Specification. These are:

- applying knowledge of physics to new situations
- selecting information from a variety of sources
- processing the information/data collected (using calculations and units, where appropriate)
- presenting information appropriately
- analysing the data/information collected/processed
- drawing valid conclusions and giving explanations supported by evidence/justification
- evaluating experimental procedures/practical investigations
- communicating findings/information effectively

Assessment

Purpose

The purpose of this assessment is to generate evidence for the added value of this Course by means of an assignment.

Assessment overview

Assessment should take place when the candidates are ready to be assessed.

This assignment requires candidates to apply skills, knowledge and understanding to investigate a relevant topic in physics. The topic should draw on one or more of the key areas of the Course. The assessor must review the topic chosen to ensure that it is appropriate.

The assignment offers challenge by requiring skills, knowledge and understanding to be applied in a context that is one or more of the following:

- unfamiliar
- familiar but investigated in greater depth
- integrating a number of familiar contexts

The assessor has responsibility for ensuring that the topic chosen to be investigated by the candidate is sufficiently demanding. Some examples of suitable investigations are provided in the Higher Physics *Course and Unit Support Notes*. None of these examples are mandatory: they are intended simply to illustrate the level of demand that is expected of an assignment at Higher. Candidates should choose, with guidance, relevant topical contexts appropriate to the learning and teaching, but it is the assessor's responsibility to ensure that the topic will allow the candidate to provide evidence of an appropriate standard to achieve the full range of marks available.

This assignment has two stages:

- a research stage
- a communication stage

The **research** stage involves gathering data/information from experiment(s)/practical investigation(s), the internet, books, newspapers, journals, or any other appropriate source. Candidates must select, use and record their referenced sources. An appropriate experiment/practical investigation **must** be used as one of the data sources, but candidates may choose to include data from more than one experiment if it is appropriate for the aim The experimental work from the Researching Physics Unit should normally be used as one (or more) of the experimental/practical investigation data sources. Any practical work undertaken will not be assessed as part of the assignment but may be assessed in the Researching Physics Units. Candidates may work individually or in small groups as part of the **research** stage when gathering data/information and especially when undertaking experiments/practical investigations, but assessors must ensure that candidates are able individually to meet the evidence requirements of this assessment.

In the course of their assignment, candidates are required to:

- choose a relevant topic in physics (the assessor must review the appropriateness of the topic chosen)
- state appropriate aim(s)
- explain the underlying physics of the topic researched
- research the topic by selecting relevant data/information
- process and present relevant data/information
- consider experimental uncertainties
- analyse data/information
- state conclusions
- evaluate their investigation
- present the findings of the research in a report

The evidence for this assignment will consist of the report. Of the total of 20 marks available for the assignment, the marking instructions provide 16 marks for skills and 4 marks for knowledge and understanding. The table below shows how these marks are allocated to each of the criteria against which the evidence will be assessed.

Criteria	Mark allocation
Aim(s)	1
Applying knowledge and understanding of physics	4
Selecting information	2
Processing and presenting data/information	4
Uncertainties	1
Analysing data/information	2
Conclusion(s)	1
Evaluation	3
Presentation	2

Assessment conditions

Assessors must exercise their professional responsibility in ensuring that evidence submitted by a candidate is the candidate's own work.

Candidates should start the assignment at an appropriate point in the Course. This will normally be when they have started work on the Units in the Course and have sufficient knowledge and skills to undertake the assignment. It is recommended that candidates use their work from the Researching Physics Unit, which is a 20 hour Unit, as the basis for the assignment. This assessment is not a timed assessment and in addition to the work undertaken in the Researching Physics Unit, candidates should be given sufficient time to complete the assignment report. This assignment has two stages:

- a research stage
- a communication stage, during which the report is written

Candidates may access any appropriate resources during the research stage of this assignment.

During the communication stage of this assignment, candidates should have access to the following resources:

 Material collected by the candidate during the research stage. This may include, for example, the experimental data collected as part of the Researching Physics Unit, statistical, graphical, numerical or other experimental data; data/information from the internet; published articles or extracts; notes taken from a visit or talk; notes taken from a written or audio-visual source.

The assessor should check that the material used by the candidate in this communication stage conforms to the criteria above. It must not include a prepared draft report or elements of one.

Candidates may produce their report over a period of time. If the report is done over a number of sessions, then the assessor must retain the candidate's work between sessions. Following completion of the report there should be **no** re-drafting.

As a guide, evidence which meets the requirements of this Component of Course assessment should be 800-1500 words, excluding calculations, tables, charts, diagrams and references.

The requirements of the assignment should be made clear to candidates at the outset.

Reasonable assistance may be provided prior to the formal assessment process taking place. Reasonable assistance may be given on a generic basis to a class or group of candidates. The term 'reasonable assistance' is used to try to balance the need for support with the need to avoid giving too much assistance. If any candidates require more than what is deemed to be 'reasonable assistance', they may not be ready for assessment or it may be that they have been entered for the wrong level of qualification.

In the research stage, reasonable assistance may include:

- directing candidates to the Instructions for Candidates
- clarifying instructions/requirements of the task
- advising candidates on their choice of topic
- In the **communication** stage, reasonable assistance may include:

- directing candidates to the Instructions for Candidates
- clarifying instructions/requirements of the task

At any stage, reasonable assistance does not include:

- providing model answers
- providing feedback on drafts

The **research** stage will be conducted under some supervision and control. This means that although candidates may carry out some research outwith the learning and teaching setting, assessors should put in place processes for monitoring progress and ensuring that the work is the candidate's own and that plagiarism has not taken place.

Assessors should put in place mechanisms to authenticate that the research is the candidate's own work. For example:

- regular checkpoint/progress meetings with candidates
- short spot-check personal interviews
- checklists which record activity/progress
- photographs, film or audio evidence
- checking candidate lab books/blogs

Candidates may work individually or in small groups during the **research** stage. However, there must be clear evidence for each candidate to show that the candidate has met the evidence requirements.

The **communication** stage will be conducted under a high degree of supervision. This means that:

- candidates must be in direct sight of the assessor (or other responsible person) during the period of the assessment
- candidates must not discuss their work with each other

Evidence to be gathered

The following candidate evidence is required for this assessment:

• a report

The report will be submitted to SQA, within a given timeframe, for marking. The same report cannot be submitted for more than one subject.

General Marking Instructions

General Marking Principles for Higher Physics assignment

This information is provided to help you understand the general principles you must apply when marking candidate responses to this assignment. These principles must be read in conjunction with the detailed Marking Instructions, which identify the key features required in candidate responses.

- (a) Marks for each candidate response must <u>always</u> be assigned in line with these general marking principles and the detailed Marking Instructions for this assessment.
- (b) Marking should always be positive. This means that, for each candidate response, marks are accumulated for the demonstration of relevant skills, knowledge and understanding: they are not deducted from a maximum on the basis of errors or omissions.

Detailed Marking Instructions for Higher Physics assignment

Read the whole report before assigning any marks. Credit should be given for appropriate information wherever it is given in the report.

Criteria	Expected response	Max mark	Additional guidance	Notes
Aim(s)	States appropriate aim(s)	1	The aim(s) must be clearly stated and appropriate to the investigation undertaken.	The aim must describe clearly what is to be investigated, eg 'to investigate how the amount an optical fibre is bent affects the transmission of light through the fibre'. Acceptable versions of an aim could be: 'to compare the energy of an earthquake with the maximum amplitude of the seismic waves' NOT : 'the effectiveness of sun cream'.
				The aim must be stated separately from the title. The word 'aim' does not need to be stated.

Criteria	Expected	Max	Additional guidance	Notes
	response	mark		
Apply knowledge and	Explains the topic, using the	4	4 marks should be awarded to a candidate who has:	Ideally the underlying physics would be within one section within the
understanding of	underlying			report; however markers should be
physics	physics		 provided correct explanations of the topic researched using physics terms/ideas which are at a depth appropriate to Higher Physics (this does not mean the answer has to be 	aware that candidates may include the underlying physics throughout the report.
			'excellent' or 'complete')	Credit should only be given for underlying physics not general
			The response might include the use of physics concepts and principles, eg momentum and impulse, internal	information, eg historical/ socio-economic/medical information.
			resistance, refraction, as well as related formulae and calculations.	If any of the candidate's explanation of the underlying physics has been
			3 marks should be awarded to a candidate who has:	given credit in any other section then that piece of information should not be considered when awarding marks
			• provided mostly correct explanations	for the underlying physics.
			of the topic researched using physics terms/ideas which are at a depth appropriate to Higher Physics	If the underlying physics has been copied verbatim from a reference or website then the candidate is not
			2 marks should be awarded to a candidate who has:	demonstrating understanding and should be awarded 0 marks .
			 provided some correct explanations of the topic researched using physics terms/ideas which are at a depth appropriate to Higher Physics 	Information which is quoted from references in this section and then explained or expanded upon by the candidate is acceptable.

Criteria	Expected	Max	Additional guidance	Notes
	response	mark		
			 1 mark should be awarded to a candidate who has: provided only one correct explanation of the topic researched, using physics terms/ideas which are at a depth appropriate to Higher Physics 0 marks: The candidate fails to meet the minimum standards required for 1 mark. 	It is sufficient for the underlying physics to be relevant to the topic without being specific to the aim.
Select information	Selects sufficient relevant data/information for inclusion in the report	2	2 marks: The data/information selected by the candidate for presentation/ processing/analysis is both relevant and sufficient.	This means that the raw data/information MUST be included in the report. This could take the form of photocopies of pages from journals, books, print-outs of appropriate sections of webpages, tables of data from experiments conducted by the candidate, etc. It must be clear what is raw data and what is processed data. If it is unclear treat first set of information/data for each source as raw data. For the experiment/practical the raw data are the measurements that the candidate has made. If there are no results from experiment/practical then no marks

Criteria	Expected	Max	Additional guidance	Notes
	response	mark		
			1 mark: The data/information selected by the candidate for presentation/ processing/analysis is relevant but insufficient .	 can be awarded for this section. Web links, book and journal references are not sufficient on their own. 2 marks: there must be relevant data from a minimum of two sources, which relate to the aim.
			0 marks: The data/information selected by the candidate for presentation/ processing/analysis is neither relevant nor sufficient.	For physics, one of these sources must be data from practical work in which the candidate has taken an active part.
			This could include raw data from experiments/practical activities, extracted tables, graphs, diagrams and text. It might include, for example, statistical, graphical, numerical or experimental data; data/information from the internet; published articles or extracts; notes taken from a visit or talk; notes taken from a written or audio-visual source.	For the data/information to be sufficient there should be enough data/information which could allow the candidate to draw a conclusion that relates to the aim. 1 mark: there must be relevant data from one source, which relates to the aim.

Criteria	Expected	Max	Additional guidance	Notes			
	response	mark					
					_		
				Source	Relevant	Sufficient	Mark
				2	\checkmark	\checkmark	2
				2	\checkmark	×	1
				2	×	×	0
				1	✓	✓	1
				1	✓	x	1
				1	×	×	0
Process and	Data/information	4	Processing can include for example:	one relev two relev are suffic	vant source vant sources cient gains 2	gains 1 mar s both of wh 2 marks	k ich
present data/information	is processed and presented	4	performing calculations, summarising referenced text — although the marks are awarded for processing, it must be clear where the raw or extracted data/information came from.	included marks to and prese Only one processe	in the repo be awarded enting. set of data d.	needs to be	or sing
			Presenting processed data/information can include, for example, appropriate formats from: summary, graph, table or chart (one must be graph, table or chart). In each case, sufficient detail should be included to convey the data/information. In all cases the candidate must clearly reference the source of the original data.	Mark all set of ray they incl and awar NB For 20 to experi To access evidence	pieces of pr w data sepa ude a graph d the mark 017 onward mental data s these mar	ocessing for rately (as lo , table or ch for the best s, this will a a. ks there mu ocessing and	r each ong as nart) t one. pply st be

Criteria	Expected	Max	Additional guidance	Notes
	response	mark		
			NB For 2017 onwards, candidates must process and present their experimental data.	presenting. If either processing or presenting is not included then 0 marks can be awarded for this section.
			4 marks should be awarded to a candidate who has processed and presented all data/information correctly and appropriately.	There is no requirement for candidates to present data/information in different formats. However, one of the chosen formats must be a graph, table or
			3 marks should be awarded to a candidate who has processed all data/information correctly and appropriately and presented	chart; otherwise no marks can be awarded in this section.
			most data/information correctly and appropriately or	For plotting of graphs and charts using graph paper, allow $\pm \frac{1}{2}$ box tolerance.
			who has processed most data/information correctly and appropriately and presented all data/information correctly and appropriately.	For calculations: a suitable presentation format would be a clearly set-out worked example.
			2 marks should be awarded to a candidate who has processed and presented some of the data/information correctly and appropriately.	When using graphing packages, all major and minor gridlines should be included. Points should be visible but not excessively large. Lines or curves of best fit should be used.
			1 mark should be awarded to a candidate who has processed and presented little data/information correctly and appropriately.	The presentation format should be appropriate to the data/information.

Criteria	Expected	Max	Additional guidance	Notes
	response	mark		
			0 marks : The candidate fails to meet the minimum standards required for 1 mark.	To attain 4 marks, processing and presenting must be correct, eg all appropriate labels, units, headings must be included, almost all (≥ 90%) calculations (with units)/points plotted within tolerance/table contents/summaries (with units) must be correct and there must be cross- referencing directly associated with each piece of raw/presented data/information. 1 mark: all presentation formats are correct including line or curve best fit. 1 mark: all headings/labels/units/ scales are correct 1 mark: almost all (≥ 90%) of processing is correct ie, plotting/calculations/table contents/summaries (with units) etc. Do not award if minor gridlines are missing or if it is difficult for marker to check the accuracy of plotting, eg excessively large points are used.
				1 mark: cross-referencing directly

Criteria	Expected	Max	Additional guidance	Notes
	response	mark		
				associated with each piece of raw/presented data/information. If there are no references at the back of the report for each piece of data given, then to award the 'cross- referencing' mark, the full reference (eg full URL) must be given with the data.
Uncertainties	Reading and random uncertainties	1	 1 mark should be awarded to a candidate who includes appropriate reading and random uncertainties in their experimental work. 0 marks: The candidate fails to meet the minimum standards required for 1 mark. 	Reading uncertainties, including the correct units, should be included for all measurements made. (If the reading uncertainty is the same for all measurements a statement to this effect is satisfactory, eg 'the reading uncertainty in each distance is ± 0.0005 m'). If repeated readings are taken then a random uncertainty in each set of readings should be calculated and included. A sample calculation should be included to show how the random uncertainty was calculated. Allow a small number (10%) of slips in calculating random uncertainty.

Criteria	Expected response	Max mark	Additional guidance	Notes
Analyse data/information	Data/information is analysed	2	Analysis will include interpreting data/information included in the report (which may/may not have been processed by the candidate) to identify relationships. This may include further calculations.	Candidates may use either raw data/information (eg graphs or tables from the internet, journals) that they have included, or their processed data/information or a combination of both.
				patterns and trends, discussion of results, eg the calculation of a constant, the relationship between variables, what graphs show.
			2 marks: for correctly analysing the data/information.	2 marks: for correctly analysing data/information from at least two sets of data/information.
			1 mark: for some correct analysis of the data/information.	1 mark: for either correctly analysing one set of data or correctly analysing part of the data from at least two sets of data/information — the candidate could correctly identify the trend in a set of data but fail to compare this to another set of data or using their data to correctly calculate a constant but making no comparison to the accepted value from a

Criteria	Expected response	Max mark	Additional guidance	Notes
			0 marks: The candidate fails to meet the minimum standards required for 1 mark.	literature/internet source.
Conclusion(s)	States valid conclusion(s)	1	 1 mark for stating a conclusion that relate(s) to the aim(s) and is supported by evidence from the candidate's research. 0 marks: The candidate fails to meet the minimum standards required for 1 mark. 	 If no aim has been stated then the mark cannot be awarded. Although the conclusion may relate to the aim, it must be supported by information in their report; otherwise the conclusion mark cannot be awarded. If the candidate states multiple aims then the conclusion must relate to all aims given (unless the candidate stated that the aim was modified to narrow the focus). If it is appropriate for the data, this mark can be awarded if the candidate explains why the data does not allow a conclusion to be drawn.
Evaluation	Evaluation of the investigation	3	For marks to be awarded for evaluation, candidates must make judgements based on criteria. The criteria, upon which judgements of the investigation are made, may include the following (not an exhaustive list):	Each comment must be supported by appropriate justification , for example: Robustness — findings are supported by other reputable sources.

Criteria	Expected	Max	Additional guidance	Notes
	response	mark		
			 robustness of findings 	Validity of sources – explanation of
			 validity of sources 	why a source might be considered to
			 reliability of data/information 	be biased/unbiased, why or how key
			• evaluation of (experimental) procedure	variables are controlled.
			1 mark for each valid, evaluative comment based on relevant criteria, to a	Reliability of data/information — explanation of why a source may be
			maximum of 3 marks.	considered reliable, eg from a peer- reviewed scientific journal, repeated
			0 marks: The candidate has not met the standards described for 1 mark.	results (eg to reduce the random uncertainty), a .gov website is reliable because it is produced by government researchers.
				Evaluation of procedures — when experimental data is analysed using a graph and a straight line is established passing close to, but not through, the origin, consideration could be given to systematic uncertainties. Consideration could be given to the equipment used to make measurements, eg 'a more precise balance could be used to measure mass' followed by some justification (not 'a better balance could be used').
				Evaluation of procedures is only valid if the experimental method is described in the report.

Criteria	Expected	Max	Additional guidance	Notes
Presentation	Appropriate presentation	2	Maximum of 2 marks for the presentation of the report.	The third person, passive voice is the preferred style for report writing, but this is not a requirement.
	References		 of the report. 1 mark for each of: appropriate title and structure the references to at least two sources used in the report are given in sufficient detail to allow them to be retrieved by a third party – if one of the sources is an experiment/practical activity, then the title and the aim should be recorded 	<pre>preferred style for report writing, but this is not a requirement. Although references may appear within the body of the report they must also appear at the end of the report. The 'end' could be just before any clearly labelled appendices. The structure of the report does not need to follow the structure listed in the Marking Instructions or Candidates' Guide. If one of the sources is an experiment/ practical activity, then only the title of the experiment/practical and aim</pre>
				are required as raw data has been dealt with elsewhere. References of websites must be complete URL addresses — www.bbc.co.uk is not acceptable. References of text books must include title, author, page number and either ISBN number or version/edition

Criteria	Expected response	Max mark	Additional guidance	Notes
				number. References of journals must include journal title, author, volume and page number. At least two references must be given
		20		correctly to access this mark.

Administrative information

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History of changes

Version	Description of change	Authorised by	Date
1.1	'What this assessment covers' section and 'Assessment overview' section — list of skills, knowledge and understanding assessed in the assignment amended for clarification. Detailed Marking Instructions amended to include a column of additional notes.	Qualifications Manager	September 2014
1.2	Detailed Marking Instructions updated to further clarify Marking Instructions.	Qualifications Manager	September 2015
1.3	Detailed Marking Instructions updated to further clarify Marking Instructions.	Qualifications Manager	September 2016

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