National 5
Coursework
Assessment Task

National 5 Physics
Assignment
Assessment task

Valid from session 2017–18 and until further notice.

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Contents

Introduction

This document contains instructions for teachers and lecturers, marking instructions and instructions for candidates for the National 5 Physics assignment. It must be read in conjunction with the course specification.

This assignment is worth 20 marks (scaled to 25). The marks contribute 20% of the overall marks for the course assessment.

This is one of two course assessment components. The other component is a question paper.

Instructions for teachers and lecturers

General information

This information applies to the assignment for National 5 Physics.

The purpose of the assignment is to assess the application of skills of scientific inquiry and related physics knowledge and understanding.

The assignment gives candidates an opportunity to demonstrate the following skills, knowledge and understanding:

- applying knowledge of physics to new situations, interpreting information and solving problems
- planning, designing and safely carrying out experiments/practical investigations to test given hypotheses or to illustrate particular effects
- selecting information from a variety of sources
- presenting information appropriately in a variety of forms
- processing the information (using calculations and units, where appropriate)
- making predictions based on evidence/information
- drawing valid conclusions and giving explanations supported by evidence/justification
- suggesting improvements to experiments/practical investigations
- communicating findings/information

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
- integrates a number of familiar contexts

Candidates research and report on a topic that allows them to apply skills and knowledge in physics at a level appropriate to National 5.

The topic should be chosen with guidance from teachers or lecturers and must involve experimental work.

The assignment has two stages:

- research
- report

The research stage must involve an experiment which allows measurements to be made. Candidates must also gather data from the internet, books and/or journals to compare against their experimental results.

Candidates must produce a report on their research.

Assessment should take place when candidates are ready to be assessed. It is not advisable to undertake the assignment too early as it is important that candidates are adequately prepared in the skills needed to undertake all parts of the assignment.

Conditions of assessment

Setting, conducting and marking the assignment

Setting
The assignment is:

- set by centres within SQA guidelines
- set at a time appropriate to the candidate's needs
- set within teaching and learning and includes experimental work at a level appropriate to National 5

Conducting
The assignment is:

- an individually produced piece of work from each candidate
- started at an appropriate point in the course
- conducted under controlled conditions

Marking
The report is submitted to SQA for external marking.

All marking is quality assured by SQA.

Controlled assessment conditions
Controlled assessment is designed to:

- ensure that all candidates spend approximately the same amount of time on their assignments
- prevent third parties from providing inappropriate levels of guidance and input
- mitigate concerns about plagiarism and improve the reliability and validity of SQA awards
- allow centres a reasonable degree of freedom and control
- allow candidates to produce an original piece of work

There are two levels of control.

Under a high degree of supervision and control	Under some supervision and control
♦ the use of resources is tightly prescribed ♦ all candidates are within direct sight of the supervisor throughout the session(s) ♦ display materials which might provide assistance are removed or covered ♦ there is no access to e-mail, the internet or mobile phones ♦ candidates complete their work independently ♦ interaction with other candidates does not occur ♦ no assistance of any description is provided	♦ candidates do not need to be directly supervised at all times ♦ the use of resources, including the internet, is not tightly prescribed ♦ the work an individual candidate submits for assessment is their own ♦ teachers and lecturers can provide reasonable assistance

The assignment has two stages.

Stage	Level of control
♦ research	conducted under some supervision and control
♦ report	conducted under a high degree of supervision and control

Instructions

Teachers and lecturers must exercise their professional responsibility to ensure that the report submitted is the candidate's own work.

It is recommended that no more than 8 hours is spent on the **whole** assignment.

A maximum of 1 hour and 30 minutes is allowed for the report stage.

The instructions for candidates outline the requirements for the assignment and must be issued to candidates at the outset. Teachers and lecturers must ensure candidates understand the requirements of the task.

It is not permitted at any stage to provide a template or model answers.

Research stage

The research stage is conducted under some supervision and control. See conditions of assessment section.

Choosing the topic
At the start of the research stage, the teacher or lecturer must agree the choice of topic with the candidate to ensure that it:

- is commensurate with National 5 Physics
- has associated experimental work that can generate numerical data
- will allow candidates the opportunity to access all of the available marks

Once the topic has been agreed, the candidate must formulate an aim.

Formulating the aim
The teacher or lecturer must provide advice on the suitability of the candidate's aim, taking into account the factors below:

- health and safety considerations
- availability of resources
- availability of literature/internet data

Any advice on the suitability of an aim is only to ensure that it is achievable, taking into account the factors identified above.

Teachers and lecturers are **not** permitted to provide an aim.

After the candidate has formulated an aim, they can progress through the research stage.

The order in which the research is carried out need not be the order outlined below.

Experimental research
Teachers and lecturers can supply instructions for the experimental procedure.

It is the responsibility of teachers and lecturers to ensure that appropriate risk assessment has been carried out and to provide guidance on the safe and correct use of equipment.

Teachers and lecturers must not provide candidates with a set of experimental data.

Teachers and lecturers must not provide a blank or pre-populated table for experimental results.

The experimental work must be carried out either individually or as part of a small group (a small group is defined as having between two and four candidates).

Group work may be an appropriate approach in a number of circumstances, for example:

- to encourage diversity of research topic
- where experiments are labour or time intensive
- where resources are limited

Where group work is undertaken, teachers and lecturers must ensure every candidate participates in the experimental work. Within the small group, it is acceptable for candidates to share experimental data but experimental data must not be shared between groups.

A teacher or lecturer must not provide feedback to candidates on their results. However, where **candidates** identify a problem with their results and indicate that they wish to repeat the experimental work, candidates may do so.

Internet/literature research
Candidates may carry out research to find comparative data/information and underlying physics outwith the direct supervision of teachers or lecturers.

The internet/literature research must be the work of the individual candidate. If candidates are working in a small group to gather data/information, each candidate must take an active part in this and choose their own sources of data/information.

Candidates must undertake research using only websites, journals and/or books, to find secondary data/information. A wide list of URLs and/or a wide range of books and/or journals may be provided (a wide list is specified as a minimum of six). Where internet access is an issue, it is permissible to provide a printed copy of **all** of the content of **all** URLs given in the list. When a wide

list is provided, candidates must have a sufficient range of sources to make decisions about which data/information is relevant.

Candidates must find internet/literature data to compare against their experimental data and record the reference to the source.

This can be data which:

- matches the sample range used
- is not an exact match for the sample range used
- is generic and illustrates a trend or pattern expected in the experimental data

Teachers and lecturers must not provide candidates with a set of experimental data to compare with the candidate's own data.

Report stage

The report stage is conducted under a high degree of supervision and control. See conditions of assessment section.

Candidates must be given a maximum of 1 hour and 30 minutes to produce the report.

- This can be a continuous period of time or split over a number of successive subject lessons.
- It is the responsibility of the centre to ensure candidates are given no more than the maximum time.
- If the report is produced over a number of lessons, then the teacher or lecturer must retain candidates' work and store it securely between lessons.

Reports can be word-processed and graphs may be produced using appropriate software packages, provided that the assessment conditions are met.

The teacher or lecturer must check that the materials to be used by each candidate in the report stage fit the criteria below.

The only materials which **can** be used in the report stage are:

- the instructions for candidates
- the candidate's raw experimental data
- the internet or literature data (including a record of the source of the data)
- information on the underlying physics
- the experimental method, if appropriate

Candidates **must not** have access to a previously prepared:

- draft of a report
- draft of a description of the underlying physics
- specimen calculation or set of calculations for mean or derived values
- graph
- comparison of data
- conclusion
- evaluation of an experimental procedure

In addition, candidates **must not** have access to the assignment marking instructions during the report stage.

Teachers and lecturers **must not** read the reports or provide any form of feedback to candidates during the report stage.

Following completion of the report stage candidates **must not** be given an opportunity to redraft their report.

Evidence to be gathered
The following candidate evidence is required for this assessment:

- a report

The report is submitted to SQA, within a given time frame, for marking.

The same report cannot be submitted for more than one subject.

Marking instructions

In line with SQA's normal practice, the following marking instructions are addressed to the external marker. They will also be helpful for those preparing candidates for course assessment.

This information is provided to help understanding of the general principles that will be applied when marking candidate responses for this assignment. These principles must be read in conjunction with the marking instructions that will be used to mark the assignment.

a Marking should always be positive, ie marks will be awarded for what is correct and not deducted for errors or omissions.

b There are no half marks awarded.

Marks for each candidate response will always be assigned in line with these general marking principles and the following marking instructions.

The marking instructions provide the basis on which the general marking principles should be applied.

Read the whole report before assigning any marks.

Credit should be given for appropriate information wherever it is given in the report.

Section	Max mark	Expected response and marking instructions
1 Aim (1 mark)		
	1	**An aim that describes clearly the purpose of the investigation.** The word 'aim' is not required but the statement of the aim should be separate from the title. Acceptable versions of an aim could be: ♦ 'to investigate how the resistance of a lamp filament varies with applied voltage' ♦ 'to investigate the effects of the length of crumple zones on the force experienced in a collision' Note: 'to investigate filaments' or 'to investigate crumple zones' would **not** be acceptable.

Section	Max mark	Expected response and marking instructions
2 Underlying physics (3 marks)		
	3	**An account of physics relevant to the aim of the investigation.** This section is marked holistically and is an opportunity to give marks for the 'quality' of underlying physics at a depth appropriate to National 5. Underlying physics may be found anywhere in the assignment report but the marks are awarded in this section. Candidates must demonstrate an understanding of relevant physics and use their own words wherever possible. It is acceptable, however, to include complex diagrams from a literature/internet source. ♦ 3 marks should be awarded for demonstrating a good understanding of relevant physics. The account does not need to be what might be termed 'excellent' or 'complete'. ♦ 2 marks should be awarded for demonstrating a reasonable understanding of relevant physics. ♦ 1 mark should be awarded for demonstrating a limited understanding of relevant physics. ♦ 0 marks should be awarded for demonstrating no understanding of relevant physics. Credit should only be given for underlying physics not general information, eg historical or socio-economic.

Section	Max mark	Expected response and marking instructions
3 Data collection and handling (6 marks)		
3(a)	**1**	**A brief description of the approach used to collect experimental data.** The description need only include sufficient detail for a marker to be able to visualise the nature of the experiment. Details, such as the range of the independent variable and the number of repeats, do not need to be included in the description. Where the candidate has not demonstrated the ability to summarise the method, for example if only a full procedure is provided, the mark should not be awarded. Acceptable descriptions of an experimental approach would include: ♦ 'The resistance of the filament of a lamp was determined using measurements of current and voltage for different applied voltages.' ♦ 'The deceleration of vehicles colliding with a fixed object was measured, using vehicles with different lengths of crumple zone.'

Section	Max mark	Expected response and marking instructions
3(b)	**1**	**Sufficient raw data from the candidate's experiment.** Where appropriate, repeated measurements must be included. The number of values must be appropriate to the aim. While a minimum of three values will be appropriate in some investigations, the number will depend on the aim of the investigation. For example: ♦ Where the aim was to establish a quantitative relationship between variables, at least five values would be required. ♦ Where the aim was to show how the variables qualitatively relate to each other, a minimum of three values would be acceptable. Errors in the presentation of the data, such as missing headings or units from tables are not penalised in this section. This mark is awarded for raw, unprocessed data and not for mean or derived values calculated from raw data.

Section	Max mark	Expected response and marking instructions
3(c)	**1**	**Data presented in a correctly produced table.** Experimental data must be tabulated with correct headings and units of measurement. Every column in the table must have a clear heading. Units must be indicated in the heading of the columns or given after every data entry.
3(d)	**1**	**Mean and/or derived values calculated correctly.** Mean and derived values must be based on the candidate's experimental data.
3(e)	**1**	**Data relevant to the experiment from an internet/literature source.**

<table>
<tr><th>Section</th><th>Max mark</th><th>Expected response and marking instructions</th></tr>
<tr><td>3(f)</td><td>1</td><td>
A reference for the source of the internet/literature data.

A reference to the source of the internet/literature data must be given in sufficient detail to allow it to be retrieved by a third party.

The reference must appear beside the internet/literature data or be cited and referenced later in the report.

<table>
<tr><th>Source</th><th>Reference</th></tr>
<tr><td>website</td><td>full URL for the page or pages,
ie the URL ‘www.bbc.co.uk’ is not acceptable, but www.bbc.co.uk/education/subjects/z6fsgk7 is an acceptable reference</td></tr>
<tr><td>journal</td><td>title, author, journal title, volume and page number</td></tr>
<tr><td>book</td><td>title, author, page number and either edition or ISBN</td></tr>
</table>
</td></tr>
</table>

Section	Max mark	Expected response and marking instructions
4 Graphical presentation (4 marks)		
		Computer-generated graphs are marked in the same way as hand-drawn graphs. Graphs should be of a size that allows the scaling and labelling of the axes, and the accuracy of the plotting of the data points, to be readily checked. It may not be possible to check the accuracy of plotting if data points are excessively large, minor gridlines are omitted or graph paper has not been used. The graph produced must be based on candidate's experimental data.
4(a)	**1**	**An appropriate format from the options of scatter graph, line graph or bar graph.**
4(b)	**1**	**The axis/axes of the graph has/have suitable scale(s).**

Section	Max mark	Expected response and marking instructions
4(c)	**1**	**The axes of the graph have suitable labels and units.** Spelling mistakes or the use of abbreviations must not be penalised if the meaning of an axis label can be clearly understood within the context of the investigation.
4(d)	**1**	**Accurately plotted data points and, where appropriate, a line of best fit.** If it is not possible to check the accuracy of plotting, this mark must not be awarded.
5 Analysis (1 mark)		
	1	**A valid comparison of the experimental data with data from the internet/literature source.**

Section	Max mark	Expected response and marking instructions
6 Conclusion (1 mark)		
	1	**A valid conclusion that relates to the aim and is supported by the data in the report.** If the candidate has stated multiple aims then the conclusion must relate to all of the aims. Where no aim has been stated, this mark cannot be awarded.
7 Evaluation (2 marks)		
	2	**An evaluation of the experimental procedure.** 1 mark should be awarded for identifying a factor which can be expected to have a **significant** effect on the reliability, accuracy or precision of the experiment. 1 mark should be awarded for an explanation of what could have been, or was done to minimise the effect of the identified factor or the evidence supporting the identification of the factor.

Section	Max mark	Expected response and marking instructions
8 Structure (2 marks)		
8(a)	**1**	**An informative title.**
8(b)	**1**	**A clear and concise report.** The structure of the report does not need to follow the structure suggested in the marking instructions or instructions for candidates, but should flow in a logical manner.
Total	**20**	

Instructions for candidates

These instructions apply to the assignment for National 5 Physics.

This assignment is worth 20 marks. The marks contribute 20% of the overall marks for the course assessment.

It assesses the following skills, knowledge and understanding:

- applying knowledge of physics to new situations, interpreting information and solving problems
- planning, designing and safely carrying out experiments/practical investigations to test given hypotheses or to illustrate particular effects
- selecting information from a variety of sources
- presenting information appropriately in a variety of forms
- processing the information (using calculations and units, where appropriate)
- making predictions based on evidence/information
- drawing valid conclusions and giving explanations supported by evidence/justification
- suggesting improvements to experiments/practical investigations
- communicating findings/information

Your teacher or lecturer will tell you how the assignment will be carried out and any required conditions for doing it.

In this assignment you have to investigate a topic in physics by doing research.

Your research involves gathering data/information from an experiment and from internet/literature sources.

You then produce a report on your investigation.

Your report is not marked at any point by your teacher or lecturer. It is sent to SQA for marking.

Your assignment has two stages:

- research
- report

Research stage

Choosing your topic

- You need to choose a relevant topic in physics to investigate.
- Your topic must be agreed with your teacher or lecturer.

Deciding your aim

- Once you have chosen your topic you need to decide what the aim of your investigation is. Remember that you need to do an experiment **and** try to find data/information to compare with your experimental results.
- Your teacher or lecturer will provide advice on the suitability of your aim.

Experimental research

- When choosing your experiment, remember it must allow measurements to be taken.
- When carrying out your experiment, you must either work on your own or as part of a small group. If you are working as part of a small group, you must take an active part.
- Make sure you take measurements over a wide enough range to meet the aim of your investigation.
- You should repeat measurements, if possible.
- You will use your raw experimental data during the report stage.

Internet/literature research

- You need to find data/information from the internet, books and/or journals that you can compare to your experimental data. This could be a table or a graph, or information from diagrams or text.
- It is important that you record where you get your data/information from in enough detail that another person could find it. This is known as a reference.
- In your report you need to explain, in your own words, the physics relevant to your aim. You can gather information using the internet, books and/or journals.

Report stage

Producing the report

- The report must be all your own work.
- When producing your report, you are supervised by your teacher or lecturer at all times.
- You have 1 hour and 30 minutes to complete your report.

Resources

In the report stage, the only materials you are allowed to have are:	In the report stage, you cannot have a previously prepared:
♦ these instructions for candidates ♦ information you have gathered from the internet, books and/or journals to help you explain the physics relevant to your aim ♦ the experimental method ♦ your raw experimental data ♦ your internet or literature data/information, including the reference to the source of the data/information	♦ draft of your report ♦ draft of your explanation of physics relevant to your aim ♦ specimen calculation or set of calculations for mean or derived values ♦ graph ♦ comparison of data ♦ conclusion ♦ evaluation of your experimental procedure

Your teacher or lecturer cannot provide you with feedback or tell you how to improve your report.

Guidance on producing your report

Your report must be easy to follow.
You may find that using headings will help to make your report clear.

Title

- Your title must tell the reader what your report is about.

Aim

- Your aim must describe clearly the purpose of your investigation.

Underlying physics

- You must explain the physics relevant to your aim.
- You must use your own words as much as possible.
- You may choose to include:
  - relationships or equations
  - definitions of symbols used
  - explanations or justifications of relationships or equations
  - explanations of physical properties
  - copies of diagrams which you would find difficult to draw
- You can quote from sources as long as you give a description or explanation showing that you understand the physics.
- Do not include a passage copied directly from a source. This would not show that you understand the physics.

Description of experiment

- You must give only a **brief** description of the experiment you carried out.
- You must show that you can summarise your experimental method and must not give a full description.

Experimental data

- You must include a table showing **all** of the measurements you recorded in your experiment.
- Make sure you include column headings and units.
- You must use the data from your table to carry out calculations.
- If you have repeated measurements, you should calculate average values. These can be included in your table of results.
- If you've used the results from your experiment to determine further values, you should show at least one sample calculation.

Graphical presentation

- You must produce a graph of your experimental results.
- The graph must:
  - be a scatter graph, line graph or a bar graph, whichever is appropriate for your data
  - be large enough to allow points to be read accurately
  - have suitable scales, labels and units on the axes
- You must use graph paper or a computer graphing package.
- If you are using a computer graphing package, include both major and minor gridlines, and use plotting symbols which are clear but not too large.
- If you are plotting a scatter graph, a line or curve of best fit should usually be drawn. However, if there is no obvious pattern to your plotted data points, you should not try to draw a line or curve of best fit.

Data/information from an internet/literature source

- You must include data/information obtained from an internet/literature source that you can compare with the data from your experiment.
- You must include a reference to this source of data/information, which would allow another person to find it. For example:

Source	Reference
website	full URL for the page or pages
journal	title, author, journal title, volume and page number
book	title, author, page number and either edition or ISBN

Analysis

- You must compare your experimental data with the data/information from your internet/literature source.

Conclusion

- You must state a conclusion which relates to your aim. The conclusion must be based on the data in your report.

Evaluation

- You must identify a factor in your experiment which had a significant effect on the reliability, accuracy or precision of your experiment.
- You must then explain either:
  - what you did or could have done to minimise the effect of this factor

  or
  - how you know this factor had a significant effect.

Summary

You can use this table to check you have covered all sections in your report.

Section	Description	Marks
Title	The report has an informative title.	1
Aim	A description of the purpose of your investigation.	1
Underlying physics	A description of the physics relevant to your aim, which shows your understanding.	3
Data collection and handling	A brief description of your experimental method.	1
	Sufficient data from your experiment.	1
	Data from your experiment presented in a table with headings and units.	1
	Values correctly calculated from your experimental data.	1
	Data/information from an internet/literature source.	1
	A reference for the internet/literature source.	1
Graphical presentation	Appropriate type of graph used to present your experimental data.	1
	Suitable scales.	1
	Suitable labels and units on axes.	1
	All data plotted accurately, with line or curve of best fit if appropriate.	1
Analysis	Experimental data compared to data/information from internet/literature source.	1
Conclusion	A conclusion relating to your aim, based on data in your report.	1
Evaluation	Identification of a factor affecting the reliability, accuracy or precision of your experiment **and** a related explanation.	2
Structure	A report which can be easily followed.	1
Total		**20**

Once complete, your report should be given to your teacher or lecturer for submission to SQA.

Administrative information

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History of changes

Version	Description of change	Date

Security and confidentiality

This document can be used by practitioners in SQA approved centres for the assessment of National Courses and not for any other purpose.

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