

- The internal assessment criteria
- Guidance for the use of the internal assessment criteria

Assessed student work

- Overview
- Investigation 1: The real and the apparent positions of the stars in Orion (Database and spreadsheet)
- Investigation 2: Investigating the lift force of a toy helicopter (Hands-on)
- Investigation 3: Obtaining Wien's displacement law of electromagnetic radiation (Simulation)
- **Investigation 4: Investigating the force on an electric charge moving through a magnetic field (Simulation)**
- Investigation 5: Determining solar characteristics using planetary data (Database)
- Investigation 6: Physical and mathematical models of the greenhouse effect (Hands-on and mathematical models)
- Investigation 7: Exploring the relationship between the pressure of the ball and coefficient of restitution (Hands-on)
- Investigation 8: The exponential nature of a bouncing ping-pong ball (Hands-on and modelling)
- Investigation 9: Investigation water depth pressure (Hands-on)
- Investigation 10: How temperature affects the vibration rate of a tuning fork (Hands-on)

Appendix

- Changes in the syllabus content

Investigation 4: Investigating the force on an electric charge moving through a magnetic field (Simulation)

To view the various elements of this example, please use the icons at the side of the screen.

Note: The comments in the annotated examples match the labelling on teacher forms.

Examiner comments

	Personal engagement	Exploration	Analysis	Evaluation	Communication	Total
	x/2	x/6	x/6	x/6	x/4	x/24
1	1	4	3	3	12	

Personal engagement

This criterion assesses the extent to which the student engages with the exploration and makes it their own. Personal engagement may be recognized in different attributes and skills. These could include addressing personal interests or showing evidence of independent thinking, creativity or initiative in the designing, implementation or presentation of the investigation.

Mark

Descriptor

The evidence of personal engagement with the exploration is limited with little independent thinking, initiative or creativity.

- 1
- The justification given for choosing the research question and/or the topic under investigation does not demonstrate **personal significance, interest or curiosity**.
 - There is little evidence of **personal input and initiative** in the designing, implementation or presentation of the investigation.

Moderator's comment

- Moderator's award
- 1
- The student shows some initiative in searching for various simulations to find the one that would help confirm the known equation. The motivation of developing a better understanding of the equation is admirable, but there is no insight, independent thinking or creativity here, and the feeling is that the student is going through the motions.

Exploration

This criterion assesses the extent to which the student establishes the scientific context for the work, states a clear and focused research question and uses concepts and techniques appropriate to Diploma Programme level. Where appropriate, this criterion also assesses awareness of safety, environmental, and ethical considerations.

Mark	Descriptor
1–2	<ul style="list-style-type: none"> • The background information provided for the investigation is superficial or of limited relevance and does not aid the understanding of the context of the investigation. • The methodology of the investigation is only appropriate to address the research question to a very limited extent since it takes into consideration few of the significant factors that may influence the relevance, reliability and sufficiency of the collected data.
3–4	<ul style="list-style-type: none"> • The topic of the investigation is identified and a relevant but not fully focused research question is described.

Moderator's comment

- Moderator's award
- 1
- The only explicit scientific context for this investigation is when the student mentions the quantities in the equation. It is assumed that the angle of the plane to the magnetic field is perpendicular, hence $\sin \theta = 1$. This assumption is okay but there is no real background information. Scientific context means more than having studied it in class. Nonetheless, the research question is stated, although the student does not appreciate the issue of proof versus confirmation or proof versus mere illustration. There is no

thought given to the method; the student assumes we know he or she will just enter values and record data for the three parameters. Holding controlled variables constant is recognition of the process, but reliability and sufficiency of data are not considered. In a simulation, this descriptor of exploration may not always be relevant or appropriate for assessment. The moderator would like to give this a 0 mark, but the research question and the method are commensurate with the course, so achievement level 1 is awarded.

Analysis

This criterion assesses the extent to which the student's report provides evidence that the student has selected, recorded, processed and **interpreted** the data in ways that are relevant to the research question and can support a conclusion.

Mark	Descriptor
1–2	<ul style="list-style-type: none"> The report shows evidence of little consideration of the impact of measurement uncertainty on the analysis.
3–4	<ul style="list-style-type: none"> Appropriate and sufficient data processing is carried out that could lead to a broadly valid conclusion but there are significant inaccuracies and inconsistencies in the processing. The processed data is interpreted so that a broadly valid but incomplete or limited conclusion to the research question can be deduced.
5–6	<ul style="list-style-type: none"> The report includes sufficient relevant quantitative and qualitative raw data that could support a detailed and valid conclusion to the research question.

Moderator's comment

Moderator's award 4

There is no doubt that the student has selected, recorded and interpreted the data in a relevant way to answer the research question. The only processing was constructing the graphs. Errors were not discussed but uncertainties were considered, most likely due to the least count. This is often all that can be done when working with a simulation. The least count uncertainty approach with the charge data is obviously inappropriate, but the student did not think of this. The accuracy of the results was addressed, even if the small percentage was a result of rounding off. The student's research project is so simplistic that there is no question that the simulation will provide a valid conclusion. As a result the moderator finds it difficult to assess analysis. The descriptor about appropriate consideration of uncertainties on analysis can be said to have been addressed, if only superficially with no true understanding. The descriptor about a conclusion has been addressed by the student, although the depth of the conclusion is limited. Overall, this criterion falls someplace between 4 and 5; using the best-fit approach and an overview of the entire work resulted in a mark of 4.

Evaluation

This criterion assesses the extent to which the student's report provides evidence of evaluation of the investigation and the results with regard to the research question and the accepted scientific context.

Mark	Descriptor
1–2	<ul style="list-style-type: none"> Strengths and weaknesses of the investigation, such as limitations of the data and sources of error, are outlined but are restricted to an account of the practical or procedural issues faced. The student has outlined very few realistic and relevant suggestions for the improvement and extension of the investigation.
3–4	<ul style="list-style-type: none"> A conclusion is described which is relevant to the research question and supported by the data presented. A conclusion is described which makes some relevant comparison to the accepted scientific context.

Moderator's comment

Moderator's award

3

The student clearly answered the research question(s). The method was to illustrate the given equation. He or she did not do an "interesting" scientific investigation with the data, however. The student's appreciation of the results (the limits of a simulation) counts here as a justified conclusion. There is no way to compare the results with the accepted values, as this was a virtual experiment, so comparing to itself is sufficient here. No thought is given to the scope or limit of the method, data analysis or any other aspect of the methodology. There are a few obvious extensions mentioned, but nothing that is really different in kind than the equation illustrations that were already done. There are no suggestions for improvements (doing a real lab is not an improvement). Using the best-fit method of assessment the moderator decided that the evaluation criterion earns a mark in the 3–4 markband. Given the unimaginative nature of this investigation a final mark of 3 was awarded.

Communication

This criterion assesses whether the investigation is presented and reported in a way that supports effective communication of the focus, process and outcomes.

Mark	Descriptor
3–4	<p>The presentation of the investigation is clear. Any errors do not hamper understanding of the focus, process and outcomes.</p> <ul style="list-style-type: none"> The report is well structured and clear: the necessary information on focus, process and outcomes is present and presented in a coherent way. The report is relevant and concise thereby facilitating a ready understanding of

the focus, process and outcomes of the investigation.

- The use of subject specific terminology and conventions is appropriate and correct. Any errors do not hamper understanding.

Moderator's comment

Moderator's award 3 The report is structured in a clear and logical way. The language is mostly appropriate and mistakes in the use of terms like “prove” do not really hamper the reader's understanding of the report. There were some digressions when the inappropriate simulations were discussed and the thoughts about a real mechanical investigation of the equation (not a plausible idea) but overall the report flows. The graphs and data are nicely presented. The positive and negative nature of charge is nicely appreciated. More depth would have improved the quality of the communication aspect of the report.



[Student work \(PDF\)](#)



[Annotated student work \(PDF\)](#)



[Examiner comments](#)

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