

- 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 8: The exponential nature of a bouncing ping-pong ball (Hands-on and modelling)

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

	<b>Personal engagement</b>	<b>Exploration</b>	<b>Analysis</b>	<b>Evaluation</b>	<b>Communication</b>	<b>Total</b>
	x/2	x/6	x/6	x/6	x/4	x/24
2		6	6	6	4	24

### 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 clear with significant independent thinking, initiative or creativity.**

- 2
- The justification given for choosing the research question and/or the topic under investigation demonstrates **personal significance, interest or curiosity**.
  - There is evidence of **personal input and initiative** in the designing, implementation or presentation of the investigation.

Moderator's comment

Moderator's award

2

There are a number of comments that demonstrate the student's personal involvement, even enthusiasm, with the investigation. How wonderful to see that a mathematical model can be applied to a hands-on physics lab investigation. Teacher and student alike must have enjoyed this work. Independent thinking, initiative and some creativity were also involved in designing the spreadsheet and in the analysis.

## 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

- 5-6
- The topic of the investigation is identified and a relevant and fully focused research question is clearly described.
  - The background information provided for the investigation is entirely appropriate and relevant and enhances the understanding of the context of the investigation.
  - The methodology of the investigation is highly appropriate to address the research question because it takes into consideration all, or nearly all, of the significant factors that may influence the relevance, reliability and sufficiency of the collected data.

Moderator's comment

Moderator's award

6

The student has clearly established the context of his or her investigation, mentioning examples of exponential change from a number of areas in science and nicely explaining the meaning of exponential change. The research question could not be more focused, and the methods used are totally appropriate to the physics Diploma Programme. In fact, the student did an insightful job at programming the spreadsheet for determining the bouncing heights. Overall the investigation is totally in line with all the highest level descriptors.

## 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
3–4	<ul style="list-style-type: none"> <li>The report shows evidence of some consideration of the impact of measurement uncertainty on the analysis</li> </ul>
5–6	<ul style="list-style-type: none"> <li>The report includes sufficient relevant quantitative and qualitative raw data that could support a detailed and valid conclusion to the research question.</li> <li>Appropriate and sufficient data processing is carried out with <b>the accuracy</b> required to enable a conclusion to the research question to be drawn that is fully <b>consistent</b> with the experimental data.</li> <li>The processed data is correctly interpreted so that a completely valid and detailed conclusion to the research question can be deduced.</li> </ul>

### Moderator's comment

Moderator's award	The student clearly selected, controlled and obtained relevant data, processed it and interpreted the data in relevant and competent ways. Although the log graph had no uncertainty bars, errors and uncertainties were considered in other places, and there is no official checklist of what must or may not be included. A valid conclusion is clearly supported by the analysis here. The research question has been addressed, answered, explained and understood.
6	

## 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
5–6	<ul style="list-style-type: none"> <li>A detailed conclusion is <b>described and justified</b> which is entirely relevant to the research question and fully supported by the data presented.</li> <li>A conclusion is correctly <b>described and justified</b> through relevant comparison to the accepted scientific context.</li> <li>Strengths and weaknesses of the investigation, such as limitations of the data and sources of error, are <b>discussed</b> and provide evidence of a clear understanding of the <b>methodological issues</b> involved in establishing the conclusion.</li> <li>The student has <b>discussed</b> realistic and relevant suggestions for the improvement and extension of the investigation.</li> </ul>

## Moderator's comment

Moderator's award 6 The student is aware of assumptions and uncertainties and systematic errors throughout the investigation, and these are all addressed in the concluding comments. No more is expected at this level. Although uncertainty bars could have been added to the log graph, the student explains an alternative approach, and it is justified here. Improvements are appreciated and although there is only the briefest thought about extensions, this does not justify lowering the mark 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**

**The presentation of the investigation is clear. Any errors do not hamper understanding of the focus, process and outcomes.**

3-4

- 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 award

Moderator's comment

4

The overall report flows nicely, has interesting and detailed subtleties in it, and the reader feels that not a word is wasted. Moreover, the calculation techniques are explained, and the graphs illustrate beautifully what the reader is to understand.



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



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



Examiner comments

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