

- ~~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 2: Investigating the lift force of a toy helicopter (Hands-on)

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	3	5	4	3	16	

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

- There is little evidence of **personal input and initiative** in the designing, implementation or presentation of the investigation.

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**.

Moderator's comment

Moderator's
award

1

The student is interested in the toy helicopter and has come up with a legitimate research question. The justification for choosing the topic is minimal, however, and there is no expression of curiosity or strong personal interest in the physics of the toy. Concluding comments suggest the student enjoyed playing with the helicopter but just went through the motions of doing the experiment. There was little other involvement. The moderator feels the achievement level is someplace between 0 and 1 and the best-fit model was used to determine the mark.

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

3–4

- The topic of the investigation is identified and a relevant but not fully focused research question is described.
- The background information provided for the investigation is mainly appropriate and relevant and aids the understanding of the context of the investigation.
- The methodology of the investigation is mainly appropriate to address the research question but has limitations since it takes into consideration only some of the significant factors that may influence the relevance, reliability and sufficiency of the collected data.

Moderator's
award

3

Moderator's comment

The student has identified and focused on an appropriate investigation, and one that is interesting. The history of helicopters adds nothing to the scientific context, and there are a number of relevant issues that need exploration here, such as air density, the rotor

inflow ratio, and the overall theory of lift. There is much more context that needs to be explained here. The techniques, equipment and methods are all approximate for this investigation. However, a more thoughtful student would have gone deeper into these issues. The student was not aware that the strobe light might be on a multiple sub-frequency for a stable image. Safety issues were appropriately addressed.

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"> The report shows evidence of some consideration of the impact of measurement uncertainty on the analysis
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. Appropriate and sufficient data processing is carried out with the accuracy required to enable a conclusion to the research question to be drawn that is fully consistent with the experimental data. The processed data is correctly interpreted so that a completely valid and detailed conclusion to the research question can be deduced.

Moderator's comment

Moderator's award

5

The student has selected, recorded and processed appropriate data. He or she also appreciated the scope and limitations of the data. The details (problems with vibration and varied air flow) about mass measurement uncertainties are good, but there is no attempt at processing the uncertainty in the frequency, and no attempt to graph uncertainties. However, the standard deviation in the best straight-line data points gives the students a relevant uncertainty in the gradient. There should have been more discussion on the zero-zero origin. There is some consideration, then, of the impact of uncertainty in the analysis.

The moderator feels that the analysis achievement level here is a borderline, between 4 and 5. Some of the descriptors in the 3–4 markband are too harsh given the student's report, and yet the first two bullets in the 5–6 markband are not fully achieved. Because the last bullet in the 5–6 markband is achieved, the moderator, using the best-fit method of assessment, decides on a 5 mark for analysis.

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
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. • Strengths and weaknesses of the investigation, such as limitations of the data and sources of error, are described and provide evidence of some awareness of the methodological issues* involved in establishing the conclusion. • The student has described some realistic and relevant suggestions for the improvement and extension of the investigation.

Moderator's comment

Moderator's award	The purpose of the investigation was to confirm an established equation. The student's data did this within a limited range, and there was an appreciation of the standard deviation of the best-straight line. The scientific context was weak, and so describing the linear graph does not constitute a justification. We can say that the conclusion, however, is related to theory because that is how the investigation was set up. No further explanation is offered. Some strengths and weakness were covered, and the improvement of using a smooth-running motor was insightful.
4	

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	<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 award	Moderator's comment
3	The report flows reasonably well with just a few disjointed paragraphs. Section headings would have helped, and sometimes the student was not as direct as he or she could have been, such as in the title. The student's focus was more or less clear and the experimental process was clear and most comments were relevant. Much more could

have been explained when it came to the appreciation of uncertainties and the analysis of the graph, but what the student did was satisfactory. Overall, the presentation was clear and weaknesses did not hamper the purpose of the work.



• [Student work \(PDF\)](#)



• [Annotated student work \(PDF\)](#)



• [Examiner comments](#)

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