

- 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 1: The real and the apparent positions of the stars in Orion (Database and spreadsheet)

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
	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

The student is enthusiastic and excited about the investigation. He or she uses the internal assessment opportunity to extend his or her understanding of the stars of Orion, nicely combining syllabus content with personal interest. The approach is thorough and well done. There is clearly a personal touch to the work.

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	<ul style="list-style-type: none"> • 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. • The report shows evidence of full awareness of the significant safety, ethical or environmental issues that are relevant to the methodology of the investigation.*

Moderator's comment

Moderator's award

6

There is no doubt that the topic, research question and context are nicely identified and explained. Sufficient social and historical, as well as scientific, background is covered. The method of analysis and presentation are relevant, and the bubble graph is a nice touch, once again emphasizing the student's involvement. The student did have an afterthought of just looking up the distances of the various stars, which would have taken the wind out of the sails of this investigation. The student mentions that stellar distances were not given in the database but could be found in others. Such detail is not required in the context of this otherwise excellent investigation. The issue of "sufficient

data” is not relevant here, and errors and uncertainties were appreciated. The student might have consulted another source for parallax angle and compared this to the data he or she used, but for the purpose of the research this precaution is not essential. There were no safety, ethical or environmental issues relevant to this investigation. Although one might say there is no physics content here, just measurement methods, the investigation is relevant, directly related to astrophysics and commensurate with the syllabus; no more physics content is expected.

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
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 report shows evidence of full and appropriate consideration of the impact of measurement uncertainty on the analysis. • 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	The data is clearly processed appropriately and interpreted thoughtfully for a valid conclusion. The impact of uncertainty is not fully addressed, but because the conclusions were somewhat qualitative, the graph of uncertainties counts as an appreciation of the impact (or lack of impact) on the conclusion. The student did make a reasonable attempt at evaluative analysis. The third bullet aspect under markband 5–6 might not, on its own, earn a full 6, but the best-fit method is applied in awarding the mark.
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"> • A detailed conclusion is described and justified which is entirely relevant to the research question and fully supported by the data presented.

- A conclusion is correctly **described and justified** through relevant comparison to the accepted scientific context.
- Strengths and weaknesses of the investigation, such as limitations of the data and sources of error, are **discussed** and provide evidence of a clear understanding of the **methodological issues** involved in establishing the conclusion.
- The student has **discussed** realistic and relevant suggestions for the improvement and extension of the investigation.

Moderator's comment

Moderator's award
6

The conclusion is visually presented and summarized in the text. The data supports the conclusion and the research question has been answered. The student realizes, only after most of the work was done, that there are databases with distance values, but the student uses two reliable sources to determine the error of his or her methods. The student is aware that the comparison values have uncertainties, but these are not given in the databases. The expectation of improving the method is somewhat an outlier for this investigation. The "justification" of the conclusion can be found through the report as the student is clearly on top of the content. The sources of error other than raw data are not relevant for this is type of database investigation. That is, the student is making use of a database, not making measurements him- or herself. It is normal that errors and uncertainties can be large when using the astronomical parallax method. The method is straightforward and relevant. If the student had taken his or her own astronomical data then this criterion would have been easier to apply and assess; given the nature of this database report, and the degree of appreciation demonstrated by the student, the descriptors under evaluation are demonstrated and it is a matter of interpreting a 5 or 6 here.

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 award
Moderator's comment

4

The student's report is clearly written and presented, and there are many illustrations and mathematical calculations to remove any doubt of what the student is talking about. The report flows nicely and is within the page limit. There are a number of personal touches too that help make the work interesting. The structure is clear and divided into manageable sections. The language is mostly concise, perhaps a little too much at times, but the text always remains focused and relevant to the topic. Subject-specific terminology and conventions are appropriate.



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



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



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