

- The highest level descriptors do not imply faultless performance but should be achievable by a student. Teachers should not hesitate to use the extremes if they are appropriate descriptions of the work being assessed.
- A student who attains a high achievement level in relation to one criterion will not necessarily attain high achievement levels in relation to the other criteria. Similarly, a student who attains a low achievement level for one criterion will not necessarily attain low achievement levels for the other criteria. Teachers should not assume that the overall assessment of the students will produce any particular distribution of marks.
- It is recommended that the assessment criteria be made available to students.

## Practical work and internal assessment

### General introduction

The internal assessment requirements are the same for biology, chemistry and physics. The internal assessment, worth 20% of the final assessment, consists of one scientific investigation. The individual investigation should cover a topic that is commensurate with the level of the course of study.

Student work is internally assessed by the teacher and externally moderated by the IB. The performance in internal assessment at both SL and HL is marked against common assessment criteria, with a total mark out of 24.

Note: Any investigation that is to be used to assess students should be specifically designed to match the relevant assessment criteria.

The internal assessment task will be one scientific investigation taking about 10 hours and the write-up should be about 6 to 12 pages long. Investigations exceeding this length will be penalized in the communication criterion as lacking in conciseness.

The practical investigation, with generic criteria, will allow a wide range of practical activities satisfying the varying needs of biology, chemistry and physics. The investigation addresses many of the learner profile attributes well. See section on "Approaches to teaching and learning" for further links.

The task produced should be complex and commensurate with the level of the course. It should require a purposeful research question and the scientific rationale for it. The marked exemplar material in the teacher support material will demonstrate that the assessment will be rigorous and of the same standard as the assessment in the previous courses.

Some of the possible tasks include:

- a hands-on laboratory investigation
- using a spreadsheet for analysis and modelling
- extracting data from a database and analysing it graphically
- producing a hybrid of spreadsheet/database work with a traditional hands-on investigation
- using a simulation provided it is interactive and open-ended.

Some tasks may consist of relevant and appropriate qualitative work combined with quantitative work.

The tasks include the traditional hands-on practical investigations as in the previous course. The depth of treatment required for hands-on practical investigations is unchanged from the previous internal assessment and will be shown in detail in the teacher support materials. In addition, detailed assessment of specific aspects of hands-on practical work will be assessed in the written papers as detailed in the relevant topic(s) in the "Syllabus content" section of the guide.

The task will have the same assessment criteria for SL and HL. The five assessment criteria are personal engagement, exploration, analysis, evaluation and communication.

## Internal assessment details

### Internal assessment component

**Duration: 10 hours**

**Weighting: 20%**

- Individual investigation.
- This investigation covers assessment objectives 1, 2, 3 and 4.

### Internal assessment criteria

The new assessment model uses five criteria to assess the final report of the individual investigation with the following raw marks and weightings assigned:

Personal engagement	Exploration	Analysis	Evaluation	Communication	Total
2 (8%)	6 (25%)	6 (25%)	6 (25%)	4 (17%)	24 (100%)

Levels of performance are described using multiple indicators per level. In many cases the indicators occur together in a specific level, but not always. Also, not all indicators are always present. This means that a candidate can demonstrate performances that fit into different levels. To accommodate this, the IB assessment models use markbands and advise examiners and teachers to use a **best-fit approach** in deciding the appropriate mark for a particular criterion.

Teachers should read the guidance on using markbands shown above in the section called "Using assessment criteria for internal assessment" before starting to mark. It is also essential to be fully acquainted with the marking of the exemplars in the teacher support material. The precise meaning of the command terms used in the criteria can be found in the glossary of the subject guides.

### 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
0	The student's report does not reach a standard described by the descriptors below.
1	<p><b>The evidence of personal engagement with the exploration is limited with little independent thinking, initiative or creativity.</b></p> <p>The justification given for choosing the research question and/or the topic under investigation does not demonstrate <b>personal significance, interest or curiosity.</b></p> <p>There is little evidence of <b>personal input and initiative</b> in the designing, implementation or presentation of the investigation.</p>
2	<p><b>The evidence of personal engagement with the exploration is clear with significant independent thinking, initiative or creativity.</b></p> <p>The justification given for choosing the research question and/or the topic under investigation demonstrates <b>personal significance, interest or curiosity.</b></p> <p>There is evidence of <b>personal input and initiative</b> in the designing, implementation or presentation of the investigation.</p>

### 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 the Diploma Programme level. Where appropriate, this criterion also assesses awareness of safety, environmental, and ethical considerations.

Mark	Descriptor
0	The student's report does not reach a standard described by the descriptors below.
1–2	<p>The topic of the investigation is identified and a research question of some relevance is <b>stated but it is not focused.</b></p> <p>The background information provided for the investigation is <b>superficial</b> or of limited relevance and does not aid the understanding of the context of the investigation.</p> <p>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.</p> <p>The report shows evidence of limited awareness of the significant <b>safety</b>, ethical or environmental issues that are <b>relevant to the methodology of the investigation*</b>.</p>
3–4	<p>The topic of the investigation is identified and a relevant but not fully focused research question is described.</p> <p>The background information provided for the investigation is mainly appropriate and relevant and aids the understanding of the context of the investigation.</p> <p>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.</p> <p>The report shows evidence of some awareness of the significant <b>safety</b>, ethical or environmental issues that are <b>relevant to the methodology of the investigation*</b>.</p>

Mark	Descriptor
5–6	<p>The topic of the investigation is identified and a relevant and fully focused research question is clearly described.</p> <p>The background information provided for the investigation is entirely appropriate and relevant and enhances the understanding of the context of the investigation.</p> <p>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.</p> <p>The report shows evidence of full awareness of the significant <b>safety</b>, ethical or environmental issues that are <b>relevant to the methodology of the investigation*</b>.</p>

\* This indicator should only be applied when appropriate to the investigation. See exemplars in TSM.

### 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
0	The student's report does not reach a standard described by the descriptors below.
1–2	<p>The report includes <b>insufficient relevant</b> raw data to support a valid conclusion to the research question.</p> <p>Some <b>basic</b> data processing is carried out but is either too <b>inaccurate or too insufficient to lead to a valid</b> conclusion.</p> <p>The report shows evidence of little consideration of the impact of measurement uncertainty on the analysis.</p> <p>The processed data is incorrectly or insufficiently interpreted so that the conclusion is invalid or very incomplete.</p>
3–4	<p>The report includes relevant but incomplete quantitative and qualitative raw data that could support a simple or partially valid conclusion to the research question.</p> <p>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.</p> <p>The report shows evidence of some consideration of the impact of measurement uncertainty on the analysis.</p> <p>The processed data is interpreted so that a broadly valid but incomplete or limited conclusion to the research question can be deduced.</p>



Mark	Descriptor
5–6	<p>The report includes sufficient relevant quantitative and qualitative raw data that could support a detailed and valid conclusion to the research question.</p> <p>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.</p> <p>The report shows evidence of full and appropriate consideration of the impact of measurement uncertainty on the analysis.</p> <p>The processed data is correctly interpreted so that a completely valid and detailed conclusion to the research question can be deduced.</p>

### 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
0	The student's report does not reach a standard described by the descriptors below.
1–2	<p>A conclusion is <b>outlined</b> which is not relevant to the research question or is not supported by the data presented.</p> <p>The conclusion makes superficial comparison to the accepted scientific context.</p> <p>Strengths and weaknesses of the investigation, such as limitations of the data and sources of error, are <b>outlined</b> but are restricted to an <b>account of the practical or procedural issues</b> faced.</p> <p>The student has <b>outlined</b> very few realistic and relevant suggestions for the improvement and extension of the investigation.</p>
3–4	<p>A conclusion is <b>described</b> which is relevant to the research question and supported by the data presented.</p> <p>A conclusion is described which makes some relevant comparison to the accepted scientific context.</p> <p>Strengths and weaknesses of the investigation, such as limitations of the data and sources of error, are <b>described</b> and provide evidence of some awareness of the <b>methodological issues*</b> involved in establishing the conclusion.</p> <p>The student has <b>described</b> some realistic and relevant suggestions for the improvement and extension of the investigation.</p>

Mark	Descriptor
5–6	<p>A detailed conclusion is <b>described and justified</b> which is entirely relevant to the research question and fully supported by the data presented.</p> <p>A conclusion is correctly <b>described and justified</b> through relevant comparison to the accepted scientific context.</p> <p>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.</p> <p>The student has <b>discussed</b> realistic and relevant suggestions for the improvement and extension of the investigation.</p>

\*See exemplars in TSM for clarification.

### 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
0	The student's report does not reach a standard described by the descriptors below.
1–2	<p><b>The presentation of the investigation is unclear, making it difficult to understand the focus, process and outcomes.</b></p> <p>The report is not well structured and is unclear: the necessary information on focus, process and outcomes is missing or is presented in an incoherent or disorganized way.</p> <p>The understanding of the focus, process and outcomes of the investigation is obscured by the presence of inappropriate or irrelevant information.</p> <p>There are many errors in the use of subject-specific terminology and conventions*.</p>
3–4	<p><b>The presentation of the investigation is clear. Any errors do not hamper understanding of the focus, process and outcomes.</b></p> <p>The report is well structured and clear: the necessary information on focus, process and outcomes is present and presented in a coherent way.</p> <p>The report is relevant and concise thereby facilitating a ready understanding of the focus, process and outcomes of the investigation.</p> <p>The use of subject-specific terminology and conventions is appropriate and correct. Any errors do not hamper understanding.</p>

\*For example, incorrect/missing labelling of graphs, tables, images; use of units, decimal places. For issues of referencing and citations refer to the "Academic honesty" section.