MYP Objectives and Assessment Criteria

Science Objectives

A. Using knowledge
This objective refers to enabling students to use scientific knowledge (facts, ideas, concepts, processes, laws, principles, models and theories) and to apply it to explain scientific knowledge, solve problems and express scientifically supported judgments.

At the end of the course, students should be able to:

i. explain scientific knowledge
ii. apply scientific knowledge and understanding to solve problems set in familiar and unfamiliar situations
iii. analyse and evaluate information to make scientifically supported judgments

B. Inquiring and designing
This objective refers to enabling students to develop intellectual and practical skills through designing, analysing and performing scientific investigations.
While the scientific method may take on a wide variety of approaches, it is the emphasis on experimental work that characterizes MYP scientific inquiry.

At the end of the course, students should be able to:

i. explain a problem or question to be tested by a scientific investigation and justify the selection
ii. formulate a testable hypothesis and explain it using scientific reasoning
iii. explain how to manipulate the variables, and describe how data will be collected
iv. design scientific investigations.

C. Processing and evaluating
This objective refers to enabling students to collect, process and interpret qualitative and/or quantitative data and explain appropriately reached conclusions. Students are expected to develop analytical thinking skills to evaluate the method and discuss possible improvements or extensions.

At the end of the course, students should be able to:

i. present collected and transformed data
ii. interpret data and explain results using scientific reasoning
iii. evaluate the validity of a hypothesis based on the outcome of the scientific investigation
iv. evaluate the validity of the method
v. discuss improvements or extensions to the method.

D. Reflecting on the impact of science
This objective refers to enabling students to gain a global understanding of science.

Reflecting on the impacts of science provides the opportunity to apply a variety of communication modes to demonstrate an understanding of science through evaluating the implications of scientific developments and their applications to a specific problem or issue.

Students are expected to become aware of the importance of documenting the work of others when communicating in science.

At the end of the course, students should be able to:

i. explain the ways in which science is applied and used to address a specific problem or issue
ii. discuss and evaluate the various implications of the use of science and its application in solving a specific problem or issue
iii. apply communication modes effectively
iv. document the work of others and sources of information used.

Science Assessment Criteria

The following assessment criteria have been established by the IB for the sciences subject area of the MYP. All assessment in each year of the MYP must be based on the age appropriate version of these assessment criteria as provided in this guide.

Criterion A	Using knowledge	Maximum 8
Criterion B	Inquiring and designing	Maximum 8
Criterion C	Processing and evaluating	Maximum 8
Criterion D	Reflecting on the impacts of science	Maximum 8

For each assessment criterion, a number of band descriptors are defined. These describe a range of achievement levels, with the lowest represented as 0.

Criterion A: Using knowledge

Maximum: 8

At the end of the course, students should be able to:

i. explain scientific knowledge
ii. apply scientific knowledge and understanding to solve problems set in familiar and unfamiliar situations
iii. analyse and evaluate information to make scientifically supported judgments

Achievement Level	Level Descriptor Year 5
0	The student does not reach a standard described by any of the descriptors below.
1–2	The student is able to: • state scientific knowledge • apply scientific knowledge and understanding to suggest solutions to problems set in familiar situations • interpret information to make judgments.
3–4	The student is able to: • outline scientific knowledge • apply scientific knowledge and understanding to solve problems set in familiar situations • interpret information to make scientifically supported judgments.
5–6	The student is able to: • describe scientific knowledge • apply scientific knowledge and understanding to solve problems set in familiar situations and suggest solutions to problems set in unfamiliar situations • analyse information to make scientifically supported judgments.
7–8	The student is able to: • explain scientific knowledge • apply scientific knowledge and understanding to solve problems set in familiar and unfamiliar situations • analyse and evaluate information to make scientifically supported judgments.

Notes

Criterion A must be assessed using tests or exams.

The first strand of the criterion requires students to —state/outline/describe/explain scientific knowledge‖. This scientific knowledge could be in relation to scientific ideas, concepts, processes, models, laws, principles and theories, as appropriate to the task.

An unfamiliar situation refers to a problem or situation in which the context or the application is modified so that it is considered unfamiliar for the student.

To reach the highest level of the criterion, students are required to make scientifically supported judgments about the validity and/or quality of the information presented to them. For this purpose, assessment tasks could include questions dealing with —scientific claims‖ presented in media articles (newspapers, television, the internet , and so on), or the results and conclusions from experiments carried out by others, or any question that challenges students to analyse and evaluate the information and that allows them to construct arguments about its validity and/or quality using their knowledge and understanding of science.

Criterion B: Inquiring and Designing

Maximum: 8

At the end of the course, students should be able to:

i. explain a problem or question to be tested by a scientific investigation
ii. formulate a testable hypothesis and explain it using scientific reasoning
iii. explain how to manipulate the variables, and explain how data will be collected
iv. design scientific investigations.

Achievement Level	Level Descriptor Year 5
0	The student does not reach a standard described by any of the descriptors below.
1–2	The student: • is able to state a problem or question to be tested by a scientific investigation • is able to outline a testable hypothesis • is able to outline the variables • attempts to design a method.
3–4	The student is able to: • outline a problem or question to be tested by a scientific investigation • formulate a testable hypothesis using scientific reasoning • outline how to manipulate the variables, and outline how relevant data will be collected • design a safe method in which he or she selects materials and equipment.
5–6	The student is able to: • describe a problem or question to be tested by a scientific investigation • formulate and explain a testable hypothesis using scientific reasoning • describe how to manipulate the variables, and describe how sufficient, relevant data will be collected • design a complete and safe method in which he or she selects appropriate materials and equipment.
7–8	The student is able to: • explain a problem or question to be tested by a scientific investigation • formulate and explain a testable hypothesis using correct scientific reasoning • explain how to manipulate the variables, and expalain how sufficient, relevant data will be collected • design a logical, complete and safe method in which he or she selects appropriate materials and equipment.

Notes

To formulate and explain the hypothesis using correct scientific reasoning requires students to include in their explanations the scientific concepts, theories or understanding that support their thinking on why or how something might happen the way they have hypothesized.

When students design a scientific investigation they should develop a method that will allow them to collect sufficient data so that the problem or question can be answered.

To allow students to design scientific investigations independently, teachers must ensure that they provide students with an open-ended problem to investigate. An open-ended problem is one that has several independent variables from which students are able to choose one as a suitable basis for the investigation. This should ensure that students formulate a range of plans and that there is sufficient scope to identify both independent and controlled variables. To ensure that the task is appropriate for the assessment of criterion B, teachers should not give students closed or very directed experiments, where the focused problem or research question and relevant variables are given.

In order to achieve the highest level for the descriptor strand in which students are asked to design a logical, complete and safe method, the student would include only the relevant information, correctly sequenced.

Criterion C: Processing and evaluating

Maximum: 8

At the end of the course, students should be able to:

i. present collected and transformed data
ii. interpret data and explain results using scientific reasoning
iii. evaluate the validity of a hypothesis based on the outcome of the scientific investigation
iv. evaluate the validity of the method
v. discuss improvements or extensions to the method.

Achievement Level	Level Descriptor Year 5
0	The student does not reach a standard described by any of the descriptors below.
1–2	The student is able to: • collect and present data in numerical and/or visual forms • interpret data • outline the validity of a hypothesis based on the outcome of a scientific investigation • outline the validity of the method based on the outcome of a scientific investigation • outline improvements or extensions to the method.
3–4	The student is able to: • collect and present data in numerical and/or visual forms correctly • accurately interpret data and explain results • describe the validity of a hypothesis based on the outcome of a scientific investigation • describe the validity of the method based on the outcome of a scientific investigation • describe improvements or extensions to the method that would benefit the scientific investigation.
5–6	The student is able to: • collect, organize and present data in numerical and/or visual forms correctly • accurately interpret data and explain results using scientific reasoning • discuss the validity of a hypothesis based on the outcome of a scientific investigation • discuss the validity of the method based on the outcome of a scientific investigation • explain improvements or extensions to the method that would benefit the scientific investigation.
7–8	The student is able to: • collect, organize, transform and present data in numerical and/or visual forms correctly • accurately interpret data and explain results using correct scientific reasoning • evaluate the validity of a hypothesis based on the outcome of a scientific investigation • evaluate the validity of the method based on the outcome of a scientific investigation • discuss improvements or extensions to the method that would benefit the scientific investigation..

Notes

The strand asking students to outline/describe/discuss/evaluate the validity of a hypothesis based on the outcome of a scientific investigation only applies to tasks in which both criteria B and C are assessed.

Transforming data involves processing raw data into a form suitable for visual representation. This process may involve, for example, combining and manipulating raw data (by adding, subtracting, squaring or dividing) to determine the value of a physical quantity and also taking the average of several measurements. It might be that the data collected are already in a form suitable for visual representation – in the case of the distance travelled by a woodlouse, for example. If the raw data are represented in this way and a best-fit line graph is drawn, the raw data have been processed.

Numerical forms may include mathematical calculations such as averaging, or determining values from a graph or table.

Visual forms may include drawing graphs of various types appropriate to the kind of data being displayed (line graphs, bar graphs, histograms, pie charts , and so on).

Qualitative data refers to non-numerical data or information that is difficult to measure in a numerical way.

Quantitative data refers to numerical measurements of the variables associated with the investigation.

Presentation of data includes the use of significant figures or decimal places. Where applicable, these factors must be present in order for students to reach the highest level.

Validity of the method refers to whether the method allows for the collection of sufficient valid data to answer the question. This includes factors such as whether the measuring instrument measures what it is supposed to measure, the conditions of the experiment and the manipulation of variables (fair testing).

Criterion D: Reflecting on the impact of science

Maximum: 8

At the end of the course, students should be able to:

i. explain the ways in which science is applied and used to address a specific problem or issue

ii. discuss and evaluate the various implications of the use of science and its application in solving a specific problem or issue

iii. apply communication modes effectively

iv. document the work of others and sources of information used.

Achievement Level	Level Descriptor Year 5
0	The student does not reach a standard described by any of the descriptors below.
1–2	The student: • is able to outline the ways in which science is applied and used to address a specific problem or issue • is able to outline the implications of the use of science and its application in solving a specific problem or issue interacting with a factor • attempts to apply scientific language to communicate his or her understanding but does so with limited effectiveness • makes little attempt to document sources.
3–4	The student: • is able to outline and summarize the ways in which science is applied and used to address a specific problem or issue • is able to describe the implications of the use of science and its application in solving a specific problem or issue interacting with a factor • is able to apply scientific language to communicate his or her understanding but does not do so clearly or precisely • attempts to document sources correctly.
5–6	The student is able to: • describe the ways in which science is applied and used to address a specific problem or issue • discuss the implications of the use of science and its application in solving a specific problem or issue interacting with a factor • apply scientific language to communicate his or her understanding clearly and precisely but does not do so consistently • document sources but does not always do so correctly.
7–8	The student is able to: • explain the ways in which science is applied and used to address a specific problem or issue • discuss and evaluate the implications of the use of science and its application in solving a specific problem or issue interacting with a factor • consistently apply scientific language to communicate his or her understanding clearly and precisely • document sources completely.

Notes

Students must reflect on the implications of the use of science and its application in solving a specific problem or issue that interacts with one of the following factors: moral, ethical, social, economic, political, cultural or environmental, as appropriate to the task. However, it is recognized that the student's chosen factor may be interrelated with other factors.

Suggested definitions for the "Reflecting on the impacts of science" factors are provided in the glossary.

The student's ability to apply language is assessed during both written and oral assignments.

a) Written: deals with expression of understanding and correct use of scientific terms. It does not deal with the aesthetics of handwriting. The same recurring error should be treated as a single error.

b) Oral: deals with expression of understanding and correct use of scientific terms. It does not deal with the accomplished mastery, or otherwise, of oratory technique. The same recurring error should be treated as a single error.

It is required that the range of scientific language, as well as the complexity of its application must increase as students progress through the year levels.