



## **Internal Assessment in IB Chemistry: Student support**

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## ***YOUR IB SCIENCE COURSE AND YOUR GRADE***

Your final IB grade for your group 4 science course is based on three examination papers and an independent research project, called an 'internal assessment' or IA. The IA is a scientific investigation that mirrors a real-world scientific study. You will define your own unique research question and, with the guidance of your teacher, you will spend about ten hours of class time working on your IA. Your investigation grade will contribute 20% to your total science grade, so it is important that you do your best with this assignment.

### ***BACKGROUND***

Before your teacher introduces you to the internal assessment investigation you will have experienced a wide range of scientific theory and a wide range of related experimental work. You will have learnt about safety and environmental issues in science, you will have worked with a variety of scientific equipment, and you will have studied scientific methods, including the handling of uncertainties, the construction of graphs and charts, and evaluating techniques and methodologies. You will have learnt ICT skills, such as word-processing, data-logging and data analysis using a spreadsheet as well as graphing using appropriate software. And, of course, you will have learnt how to work on the internet and interact with computer simulations as well as work with online databases.

### ***IA CONTENT***

The scientific content of your IA needs only to be in line with the course you are taking. This means that if you are a Standard Level student, your IA need not go beyond the course content of Standard Level. The skills and knowledge you require for the IA are well within the course limits. This does not mean, however, that you cannot study topics or issues that take you beyond the course content. Moreover, you can apply methods and techniques that go beyond the course content. The opportunities are there for you to follow up on something that interests you.

### ***INVESTIGATION TYPES***

The IA criteria allow for and indeed encourage a wide range of investigation types.

**Hands-on investigations** – This includes many traditional experiments. Your teacher may outline a number of standard investigations. The hands-on investigation type also includes non-traditional research questions, where questions are open-ended and exploratory. You may not know the answers to your research question but you will investigate it.



**Modelling and spreadsheet investigations** – Here you may process primary or secondary data and analyse it with a computer model. Spreadsheets and graphing software can be used in all investigation types. In some cases, real data can be compared to ideal data (based on theory) by using a spreadsheet or designing a mathematic model.

**Database investigations** – Here you would access online databases for scientific information. You would design a method to answer your research question using the database, and perhaps graph or model the results. There is an increasing amount of online scientific data, and your teacher can help you here.

**Computer-simulation investigations** – Investigations may involve computer simulations. Here, you can obtain information or data that can be uniquely processed to discover something that goes beyond the simulation's routine. You can combine a hands-on investigation with a computer model and compare the results.

**Hybrid investigations** – The types of investigations are not exclusive categories but rather illustrate the wide range of acceptable investigation approaches. An investigation can make use of any of these approaches.

## **THE IA OVERVIEW**

Your investigation should have a purposeful research question and a scientific rationale for the study. The IA models a real scientific study in style, form and content. The following is an overview of the internal assessment.

**Research question** – You are to define your own unique research question. However, your teacher can guide you into plausible and productive areas. You should have some topic or idea about what to study before you talk to your teacher.

**Guidance** – Your teacher will be there to help with technical issues and to guide you through the entire IA process. However, success is up to you. Your IA is your work, not the teacher's work. Your teacher will provide a structure and all the information you need about the requirements and expectations.

**Time allocation** – You will be given ten hours of class time but you can do additional work on your own.

**Research** – You are expected to do academic research on your topic. You need to set your research question in a proper scientific content.



**Report length** – Your final report will be between 6 to 12 pages (excessive length will be penalised). The maximum length includes footnotes or references as well as data tables, graphs and charts, pictures and, of course, text.

**Personal involvement** – You are expected to ‘own’ your investigation, to demonstrate some insight, initiative or personal interest in your investigation. This is what makes the work fun.

**Self-management** – You are responsible for your work, including meeting deadlines.

**Technology skills** – You need to use ICT skills, including word-processing, spreadsheets, graphing software, and internet searches. You must also know how to reference all the resources you use.

**Presentation** – The final report will be electronic, with word-processed text, mathematical equations and electronically drawn graphs. The entire report should be a single document, including appropriate referencing.

### ***TEACHER’S RESPONSIBILITY***

Your teacher will explain the IA requirements to you. Here is an outline of what to expect. Your teacher will:

- introduce the ideas and expectations of the IA
- explain the scheduling and internal deadlines
- outline the wide range of possible investigation types
- provide an overview of available science resources and materials
- outline a number of plausible investigation topics
- provide you with several exemplar IA reports
- provide you with one-to-one consultation to help you define a research question
- approve or reject your research question before you start work
- give you class time to perform your investigation
- provide feedback to you on your first draft and give you time to make revisions.

### ***STUDENT’S RESPONSIBILITY***

You are responsible for having all the appropriate ICT skills, from word-processing and spreadsheet analysis, to using graphing software as well as knowing how to search the internet. You must also know how to write a science report. Your teacher will help you here, and your biggest responsibility is to guarantee the authenticity of your work. This means your work must be your own work, and that any resources used (ideas, text, data, pictures) are appropriately

referenced. Plagiarism is a serious academic and moral crime, and any cheating will result in failure.

Your teacher will double-check the authenticity of your IA report, but you will sign an IB form confirming that your work is indeed your own work. This is why references (giving credit, referencing) are so important.

You are also responsible for your own time management. You are expected to meet the deadlines your teacher assigns, as well as accepting the general advice that your teacher gives you about your work.

Finally, you should be enthusiastic about your work; you should demonstrate initiative and even ingenuity in the planning, design and production of your IA. You should be dedicated to scientific problem solving. After all, your IA is your investigation.

### **ASSESSMENT CRITERIA**

Your IA is a unique scientific investigation. No two students will do the same thing, although two or more students may investigate the same general topic. The IA is to have a **purposeful** research question and a scientific **rationale** for the study.

To help you understand the parameters of the IA you should look at the assessment criteria in the IB *Course Guide*. These are not to be understood as a checklist but rather they represent the skills and content that are expected in a good IA. Your teacher will mark your report when you are finished so you do not have to worry about applying the criteria. You should, however, be familiar with the five assessment criteria and what aspects you should address.

Each criterion begins with a general statement of what is assessed. Your teacher will provide you with a detailed list of the assessment descriptors, the statements regarding what you are expected to address in your lab report. The following comments about each criterion are to help you appreciate what is being addressed in each. Because of the wide range of possible investigations, not all descriptors may be applicable. If, for example, you work with a computer simulation, there may be no safety issues (which are assessed under the Exploration criterion).

#### **Personal engagement**

This criterion addresses your involvement in the investigation. It is important that you are interested in your topic such that you can demonstrate independent thinking, initiative or creativity. You must also demonstrate a justification for your research question; perhaps there is some personal significance, interest or curiosity here. Finally, you are to provide some personal input and initiative in the designing, implementation or presentation of the investigation. You are to 'own' your project, not just repeat something found in a science

journal. The expectations of personal engagement actually mean that you will have fun doing the work.

### **Exploration**

This criterion addresses your ability to select, develop and apply the scientific method to a specific issue. You are to express a well-defined research question, set it in an appropriate scientific context, and select relevant scientific equipment and methodologies to address your question. You are to appreciate any factors that may influence the quality of your data. Finally, you should appreciate any safety, environmental, and ethical considerations that may be relevant.

### **Analysis**

This criterion addresses your ability to obtain and process appropriate data in a way that addresses your research question. This appreciation includes the treatment of errors and uncertainties where relevant, the presentation of graphs or charts, and the precision and accuracy of your data. Analysis also concerns the validity of your data in relation to answering your research question.

### **Evaluation**

This criterion addresses your methodology and your results as set within a genuine and relevant scientific context. It focuses on how well your data supports the conclusion, including the method and appreciating the strengths and weakness of your work. You are expected to provide realistic and relevant suggestions for the improvement and extension of your investigation.

### **Communication**

This criterion addresses the overall quality of your report; it is a holistic appreciation of the style and form of your presentation. You are expected to write in a clear and logical style that is easy to follow. Your report needs to be relevant (no unnecessary explanations or tangential issues) and concise (6 to 12 pages, and more than 12 pages will be penalised). The process and the outcomes must be clearly stated. Appropriate scientific terminology and conventions must be followed, and graphs, tables, images, charts must all be presented in a clear way.

### **ADVICE**

The key to a successful IA investigation is in the initial planning. You will want to have a well-focused research question, one that you and your teacher know you can research, experiment on, analyse the results, then conclude and evaluate within the scheduled time. Albert Einstein's genius came from seeing complicated phenomena in basic ways. His famous energy and mass equation is as simple as  $1 + 1 = 2$ , and yet the equation  $E = mc^2$  is profound, insightful. In a



similar way, but perhaps not expecting the Nobel Prize in science, you are to come up an interesting and well-defined scientific investigation. This is science at its best.

It is also important that when you do the research for your investigation you fully understand and appreciate the existing scientific context of your study. Although your final report should not read like a textbook, you should demonstrate a competent understanding of the relevant scientific terminology, concepts and styles of presentation and analysis.

Twenty percent of your total IB science grade is based on your IA. You will have time to study, revise, and receive your teacher's help and advice, so the IA is a perfect opportunity to earn a good grade.

Finally, you should have fun!