

Chemistry Extended Essay – A Student's Guide.

Why Chemistry?

The chemistry extended essay (EE) offers a valuable opportunity to investigate a specific aspect of our environment through chemical analysis. This essay focuses on a research question while adhering to broader criteria. Chemistry explores substance composition, characterisation, and transformation. The goal is to produce a well-structured essay that addresses the research question and presents a distinct conclusion. Use this chance to explore a topic of interest, deepen knowledge, conduct experiments, and provide a thoughtful argument reflecting your unique perspective as a student.

What topic do I choose?

the extended essay (EE) topic must specifically involve chemistry. The treatment of the material should primarily focus on the chemistry perspective, even if the topic can be approached from different viewpoints. The chosen topic should have a scope that allows addressing all criteria effectively, with a sharply focused research question that can be treated within the word limit.

What topics are suitable?

Certain topics should be avoided for the extended essay (EE) due to their limitations. Broad or complex literature-based topics restrict the discussion of conflicting ideas, theories, and in-depth personal analysis within the word limit. Examples include investigating health problems caused by water pollution, chemotherapy for cancer treatment, or the use of spectroscopy in chemical analysis.

Safety considerations should also guide topic selection. Experiments involving toxic or dangerous chemicals, carcinogenic substances, or radioactive materials should be avoided unless proper safety apparatus and qualified supervision are available. It is essential to evaluate the level of risk based on national or local guidelines, which vary by country.

Additionally, topics that have well-known outcomes already documented in standard textbooks may not be suitable.

How does it differ from my IA?

It is important to distinguish between the extended essay (EE) in chemistry and the internal assessment (IA) task.

- The IA primarily focuses on syllabus content, whereas the EE could explore aspects of chemistry not covered in the syllabus.
- The IA must include data collection and analysis (from hands-on experiments, databases, simulations, or modelling) and cannot purely be a literature review.
- The EE must construct a theoretical framework for the underlying chemistry of the chosen topic, whereas the IA focuses on the application of the scientific method to a problem of interest and will only include some background information.
- The EE explicitly assesses the students' ability to analyse and evaluate scientific arguments.

Students must ensure that their extended essay (EE) does not duplicate any other work they are submitting for the Diploma Programme.

Can I use secondary data?

Students can incorporate data collected from external sources in their extended essay (EE). i.e. databases

However, to achieve high marks, students must develop their own method of analyzing the secondary data to directly address their research question.

In any chemistry EE, students must showcase their understanding of the underlying theory and state any assumptions made during experimental work.

Students should critically evaluate inadequate experimental design, limitations of the experimental method, and potential systematic errors.

Encouraging students to explore unresolved questions and propose new areas for investigation is essential.

What are some examples of experimental RQ's

Remember, it's highly recommended that you answer something not syllabus related.

- Investigating the effect of different natural dyes on the dye-sensitized solar cell efficiency.
- Exploring the synthesis and characterization of biodegradable polymers for drug delivery applications.
- Analysing the antimicrobial properties of plant extracts against common pathogens.

What are some examples of data/literature based RQ's?

Data Base:

What would be the reduction in CO₂ emission (measured as % change by mass) in Germany of replacing all coal-fired power plants with modern CH₄ power stations?

Literature:

What is the impact of nanoparticle size on the catalytic activity of platinum nanoparticles in hydrogenation reactions?

Chemistry Extended Essay – Breaking Down the Assessment Criteria

Criterion A – Focus and Method

The extended essay (EE) in chemistry should have a distinct focus on chemistry and center around the chemical aspects of the investigation. It should incorporate fundamental chemical principles and relate to the study of matter and its chemical transformations.

- The topic for the EE can be chosen from the core, the Additional Higher Level (AHL) topics, or one of the IB chemistry options outlined in the syllabus. However, the primary emphasis should always be on chemistry.
- When formulating the research question, it is essential to present it as an actual question. For example, "Can the presence of spectator ions influence the rate of oxidation-reduction reactions?"
- To address the research question, students must conduct a thorough literature review on the chosen topic and select an appropriate methodology for their investigation. This can involve conducting experiments in the laboratory or basing the research on existing data.
- If practical work is carried out, it is important to clearly explain the rationale behind the chosen experimental procedure. In cases where the investigation takes place in an external laboratory, students need to demonstrate a comprehensive understanding of the methods, materials, and their role in data collection.

Criterion B – Focus and Method

- Students must exhibit comprehension of relevant chemical principles and accurately apply them. The essay should provide a clear explanation of the chemistry underlying the research question and chosen techniques.
- Source materials used should be relevant, appropriately referenced, and effectively integrated into the essay to demonstrate the student's understanding. Scientific sources should be predominantly cited in the literature.
- Consistency in linguistic style is expected throughout the essay, and chemical nomenclature and terminology should be used consistently and effectively.

Criterion C – Critical Thinking

In a chemistry EE, research refers to relevant literature sources and student-collected data. Students must effectively apply their selected sources and methods to support their argument.

- Data analysis should include mathematical transformations, statistical analysis, and tables/graphs. Graphs should only be included if they improve communication and accurately illustrate key elements of the analysis.
- A reasoned, logical argument focused on the research question should be maintained. The extent to which the question is answered by the data or accessed information should be assessed. The conclusion must align with the research presented.
- Unresolved issues and suggestions for further investigation should be addressed if the original research question is not fully answered. Inadequate experimental design and systematic errors should be exposed, and measurement uncertainties evaluated and discussed.
- The quality, balance, and quantity of sources should be commented upon. Limitations and uncertainties in the approach should be acknowledged, and the validity and reliability of data in relation to variable management should be critically assessed.

Criterion D – Presentation

Criterion D assesses the adherence to academic standards in presenting the essay and how well these elements contribute to its readability, understanding, and evaluation.

- Students should use numbered and headed paragraphs to provide a clear structure, ensuring that subheadings do not detract from the overall essay structure or argument.
- When including charts, images, or tables from literature sources, students should carefully select and label them, ensuring they directly relate to the research question, enhance understanding, and have good graphic quality. Raw data tables are best placed in an appendix, while processed data tables and graphs should highlight pertinent aspects related to the argument.
- Bibliographies are essential and should visually contribute to criterion D, along with other presentation requirements like title page, table of contents, and page numbers.

Criterion E – Engagement

This criterion evaluates the student's engagement with their research focus and process.

Students should reflect on:

- The chosen approach and strategies and their success
- The impact of Approaches to learning skills on their learning
- How their conceptual understanding has evolved through research
- Overcoming research challenges
- Emerging questions from the research
- Lessons learned for future research.