Chemistry teacher support material

Introduction

- The purpose of the teacher support material
- Nature of science
- International-mindedness

Structuring a course

- Schemes of work
- Time allocation for sub-topics
- Higher level/standard and higher level combined class
- Standard level class

Planning activities for a sub-topic

- Introduction
- Planner for a sub-topic page
- Activity 1: Introduction to energetics
- Activity 2a: Chemical terms in energetics
- Activity 2b: Cognitive academic language proficiency (CALP)
- Activity 3: Determining the enthalpy change of a reaction
- Activity 4: Combustion calorimetry and fuels
- Activity 5: Energy from food
- Activity 6: Group project

Cognitive academic language proficiency (CALP)

- A framework for the use of cognitive academic language proficiency

Information and communication technology

- Introduction
- Use of smart phones
- Guidance for the use of simulations

Practical work

- Introduction
- Errors and uncertainties in chemistry
- The group 4 project
- Guidelines for the use of animals in IB world schools

Internal assessment

- Facilitating the individual investigation
- The internal assessment criteria
- Guidance for the use of the internal assessment criteria

Assessed student work
• Overview
• Investigation 1: Factors effecting the boiling and melting points in organic homologous series
• Investigation 2: The effect of halogen atom substitution on bond angles in halogenated compounds
• Investigation 3: Positive inductive effect of methyl groups in nine simple alcohols
• Investigation 4: An investigation into the dependence of egg protein denaturation on temperature
• Investigation 5: Impact of increased water acidity on coral reefs based on a study of the kinetics of CaCO₃ and HCl
• Investigation 6: A study of the saponification reaction of olive oil
• Investigation 7: Investigating the oxidative rancidity of polyunsaturated oils
• Investigation 8: The enthalpy of combustion of alcohols
• Investigation 9: Investigating lipids suitable for manufacturing soap for a school project
• Investigation 10: Effect of cooking time on chlorophyll degradation

Appendix

• Changes in the syllabus content

Investigation 1: Factors effecting the boiling and melting points in organic homologous series

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.

Investigation 1: Moderator comments

Personal Engagement  Exploration  Analysis  Evaluation  Communication  Total
x/2 x/6 x/6 x/6 x/4 x/24

2  6  5  5  4  22

Personal engagement

Mark  Descriptor

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

The report throughout shows evidence of the student’s interest and curiosity in the

Moderator’s research question.

Award

2  The personal input is manifested through the fact that the report appears original throughout and definitely not based on a standard template or commonplace exemplar, while the independent thinking in the interpretation of the results was indicative of fine insight.
Exploration

Mark: Descriptor

- 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.

5–6

Moderator’s Comment

Moderator’s Award

The topic and research question are clearly described and relevant background information given. The chosen methodology is highly appropriate although there was opportunity to find other data sources as well. However descriptor for 5/6 states “nearly all” so that is the best fit. There are no relevant safety, ethical or environmental issues to be raised so this is not included in the assessment of this criterion

Analysis

Mark: Descriptor

3–4

The report shows evidence of some consideration of the impact of measurement uncertainty on the analysis

- 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 processed data is correctly interpreted so that a completely valid and detailed conclusion to the research question can be deduced.

Moderator’s Comment

The student finds sufficient relevant quantitative data, including uncertainties, to be able to ultimately draw a conclusion. There is no need for qualitative data in this database focused methodology. The processing is quite simple but effective graphing enables valid qualitative interpretation. There is qualitative consideration of the measurement uncertainty on the analysis although it is hard to see if true best fit curves have been constructed.

The interpretation of the processed data, leading to a valid and detailed conclusion, has been done successfully.
Evaluation

Mark  

1–2  

• The student has **outlined** very few realistic and relevant suggestions for the improvement and extension of the investigation.

• A conclusion is **described and justified** which is relevant to the research question and supported by the data presented.

• A conclusion is correctly **described and justified** through relevant comparison to the accepted scientific context.

5–6  

• 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.

Moderator’s Comment

The student describes and justifies a conclusion that is supported by the data presented. The student shows evidence of very fine understanding in their description and justification of their conclusion within the scientific context. There is also evidence of a sophisticated understanding of the limitations of the data and the methodology and how this impacts the conclusion and the student does not overstate their findings.

The student’s fulfilment of this Evaluation criterion falls short of the maximum because the suggestions for improvement and extension are rather limited and not well clarified.

Communication

Mark  

3–4  

• 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 Comment

The report is well structured and very clear. The report remains relevant, coherent and concise throughout and it is very easy to follow the research’s development through to the conclusion. Suitable terminology, such as the correct nomenclature for homologous series and types of intermolecular force are used and the tables and graphs are presented clearly and unambiguously. There is consistent precision in recorded data and with uncertainties. Diagrams showing structures of molecules, functional groups and intermolecular formulae would have enhanced interpretation and it is not clear which data points are derived from median values and should have shown ranges in raw data.
Overall though the report definitely is an example of effective communication and deserves the highest level.

- Student work (PDF)
- Annotated student work (PDF)
- Examiner comments

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