**Practical Investigation: Effectiveness of solid oxygen bleach in stain removal**

The aim of this investigation is to design an experiment to investigate the following problem:

“Is the effectiveness of solid oxygen bleach in removing stains from fabrics affected by different water temperatures?”

Solid oxygen bleach contains the compound sodium percarbonate, a colourless, crystalline, hygroscopic and water-soluble solid. When dissolved in water, it forms a mixture of hydrogen peroxide and [sodium carbonate](https://en.wikipedia.org/wiki/Sodium_carbonate) ("soda ash").[https://en.wikipedia.org/wiki/Sodium\_percarbonate - cite\_note-Jones-1](https://en.wikipedia.org/wiki/Sodium_percarbonate#cite_note-Jones-1) <https://en.wikipedia.org/wiki/Sodium_percarbonate>

The hydrogen peroxide decomposes to form water and [oxygen](https://en.wikipedia.org/wiki/Oxygen). Both hydrogen peroxide and oxygen act as bleaching agents. Bleaches breakdown stains into smaller, more soluble units that are easily removed in water.

**Part A: Experimental Design**

Students work individually to deconstruct the problem and design an experimental procedure to investigate the problem. They:

* consider how various factors could affect the outcome of the investigation
* write a hypothesis
* identify the dependent and independent variables
* consider factors that should be held constant and explain why and how they will attempt to control these factors
* identify factors that may not be able to be controlled
* prepare a list of materials required
* write a method to test the hypothesis
* consider how the data will be displayed and analysed
* identify safety considerations.

The design is submitted to the teacher at the end of the lesson.

**Part B: Investigation**

Students work in pairs. In consultation with the teacher, one of the two students’ methods will be selected, and modified if appropriate, for the investigation. Students will then submit a materials and equipment request form. They may collect their own samples of fabric for pre-testing before the double lesson in which the experiment will be conducted.

Each student should record their own data.

**Part C: Report**

Each student writes an individual report, to be submitted two days after the experiment is completed, using the following headings:

**Introduction** – an outline of the purpose of the investigation, relevant chemistry concepts, the hypothesis, and identification of variables.

**Results** – presentation of data and observations in a table and graph.

**Discussion** – analysis of the data identifying trends and linking results to concepts, and evaluation of the method identifying sources of uncertainty and their effects on the data.

**Conclusion** –a conclusion, with justification, relating to the hypothesis

**Assessment Conditions for this task:**

Part A – One lesson supervised in class.

Part B – A double lesson to undertake the practical in pairs.

Part C – Each student to complete a practical report at home.

Word Count: maximum of 1000 words or 6 minutes for an oral presentation for the introduction, discussion and conclusion sections only of the report.

| - | Investigation, Analysis, and Evaluation | Knowledge and Application |
| --- | --- | --- |
| A | Critically deconstructs a problem and designs a logical and coherent chemistry investigation with detailed justification.  Obtains, records, and represents data, using appropriate conventions and formats accurately and highly effectively.  Systematically analyses and interprets data and evidence to formulate logical conclusions with detailed justification.  Critically and logically evaluates procedures and discusses their effect on data. | Demonstrates deep and broad knowledge and understanding of a range of chemical concepts.  Applies chemical concepts highly effectively in new and familiar contexts.  Critically explores and understands in depth the interaction between science and society.  Communicates knowledge and understanding of chemistry coherently, with highly effective use of appropriate terms, conventions, and representations. |
| B | Logically deconstructs a problem and designs a well-considered and clear chemistry investigation with reasonable justification.  Obtains, records, and represents data, using appropriate conventions and formats mostly accurately and effectively.  Logically analyses and interprets data and evidence to formulate suitable conclusions with reasonable justification.  Logically evaluates procedures and their effect on data. | Demonstrates some depth and breadth of knowledge and understanding of a range of chemical concepts.  Applies chemical concepts mostly effectively in new and familiar contexts.  Logically explores and understands in some depth the interaction between science and society.  Communicates knowledge and understanding of chemistry mostly coherently, with effective use of appropriate terms, conventions, and representations. |
| C | Deconstructs a problem and designs a considered and generally clear chemistry investigation with some justification.  Obtains, records, and represents data, using generally appropriate conventions and formats, with some errors but generally accurately and effectively.  Undertakes some analysis and interpretation of data and evidence to formulate generally appropriate conclusions with some justification.  Evaluates procedures and some of their effect on data. | Demonstrates knowledge and understanding of a general range of chemical concepts.  Applies chemical concepts generally effectively in new or familiar contexts.  Explores and understands aspects of the interaction between science and society.  Communicates knowledge and understanding of chemistry generally effectively, using some appropriate terms, conventions, and representations. |
| D | Prepares a basic deconstruction of a problem and an outline of a chemistry investigation.  Obtains, records, and represents data, using conventions and formats inconsistently, with occasional accuracy and effectiveness.  Describes data and undertakes some basic interpretation to formulate a basic conclusion.  Attempts to evaluate procedures or suggest an effect on data. | Demonstrates some basic knowledge and partial understanding of chemical concepts.  Applies some chemical concepts in familiar contexts.  Partially explores and recognises aspects of the interaction between science and society.  Communicates basic chemical information, using some appropriate terms, conventions, and/or representations. |
| E | Attempts a simple deconstruction of a problem and a procedure for a chemistry investigation.  Attempts to record and represent some data, with limited accuracy or effectiveness.  Attempts to describe results and/or interpret data to formulate a basic conclusion.  Acknowledges that procedures affect data. | Demonstrates limited recognition and awareness of chemical concepts.  Attempts to apply chemical concepts in familiar contexts.  Attempts to explore and identify an aspect of the interaction between science and society.  Attempts to communicate information about chemistry. |

Performance Standards for Stage 1 Chemistry