Stage 2 Biology

Assessment Type 1: Investigations Folio

Deconstruction and Design Investigation: Factors Affecting Enzyme Activity in Laundry Detergents

Enzymes are often added to laundry detergents to help remove stains by breaking down the macromolecules that cause them. There are different kinds of enzymes which may be used depending on the type of macromolecule. When manufacturers are considering which enzyme(s) to add, they need to take into account cost, safety, and the various conditions under which they may be used.

Many factors affect the effectiveness of enzymes during the washing of clothes etc. These questions include: Which enzymes may assist in the washing process? Why? What factors affect enzyme activity? How can the suitability of an enzyme for use in laundry detergent be tested?

You will consider and explore the question: *How can a washing powder enzyme be used to remove stains most efficiently?*

You will then design and conduct an experiment to determine the effect of *one* factor on the activity of *one* enzyme that may be used in a laundry detergent.

Purpose provides guidance and provides a problem to deconstruct which leads to the design of a method.

**A Deconstruct the problem**

Consider the question and could it be tested.

* Research which enzymes can assist in the washing process and how they work. Consider the factors can affect their activity.
* Explore the various factors that would be involved in selecting an enzyme to use in laundry detergent.
* Make informed decisions about a process that could be used to determine experimentally how one factor might affect enzyme activity and how this could be measured in the context of stain removal.
* Explore the risk factors involved in the process.

Then select *one* enzyme and develop a method to investigate *one* factor that might influence a manufacturer’s directions for using that enzyme in their laundry detergent.

**B Designing your own investigation**

Use the guidelines on Page 7 of the subject outline to help you design your investigation. Also, keep in mind the requirements of the practical report that are described on page 53 of the subject outline.

Annotate your deconstruction and design to justify the decisions you have made about such things as the weed you have chosen, the independent and dependent variables, how and why you will control other variables, number of trials, measurements.

Evidence of deconstruction, the method/procedure chosen as most appropriate, and a justification of the plan of action must be a maximum of 4 sides of an A4 page.

Part A and B will be completed individually and will be submitted for assessment on:

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**C Implementing an investigation**

In defined groups, students in consultation with the teacher will select one method to implement and to collect data.

Students have an opportunity to work collaboratively.

**D Writing an individual report**

You will use the data collected to write an individual report using the specification on Page 53 of the subject outline. This report is based on the investigation that was actually undertaken in Part C.

The report should be a maximum of 1500 words if written, or a maximum of 10 minutes for an oral presentation, or the equivalent in multimodal form.

Only the following sections of the report are included in the word count:

• introduction

• analysis of results

• evaluation of method/procedure

• conclusion.

**The evidence of the deconstruction and design component must be attached to the practical report.**

The practical report with the deconstruction and design summary and individual method attached is to be submitted on:

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**Performance Standards**

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|  | Investigation, Analysis and Evaluation | Knowledge and Application |
| A | Critically deconstructs a problem and designs a logical, coherent, and detailed biological investigation.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 their effect on data. | Demonstrates deep and broad knowledge and understanding of a range of biological concepts.Applies biological 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 biology coherently, with highly effective use of appropriate terms, conventions, and representations. |
| B | Logically deconstructs a problem and designs a well-considered and clear biological investigation.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 biological concepts. Applies biological 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 biology mostly coherently, with effective use of appropriate terms, conventions, and representations. |
| C | Deconstructs a problem and designs a considered and generally clear biological investigation.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 biological concepts.Applies biological concepts generally effectively in new or familiar contexts.Explores and understands aspects of the interaction between science and society.Communicates knowledge and understanding of biology generally effectively, using some appropriate terms, conventions, and representations. |
| D | Prepares a basic deconstruction of a problem and an outline of a deconstruction and biological 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 biological concepts.Applies some biological concepts in familiar contexts.Partially explores and recognises aspects of the interaction between science and society.Communicates basic biological information, using some appropriate terms, conventions, and/or representations. |
| E | Attempts a simple deconstruction of a problem and a procedure for a biological 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 biological concepts.Attempts to apply biological concepts in familiar contexts.Attempts to explore and identify an aspect of the interaction between science and society.Attempts to communicate information about biology. |