Stage 2 Scientific Studies: Assessment Type 1: Investigation Folio

**Science Inquiry Skills – Task 3**

**“*Make it clear: flocculation and filtration*”**

The purpose of this task is to design and carry out an investigation to remove insoluble materials from water.

**Introduction**

Water is a scarce resource in many places around the world and millions of people don’t have easy access to clean drinking water. Water is often taken from sources filled with dirt and silt and other contaminants. Despite this, people still drink the water or use it for day-to-day activities like food preparation and sanitation.

**Task**

Your task is to design and conduct an investigation using either a scientific method or the design process to economically and in an environmentally friendly way, take a sample of dirty water and make it clear. The investigation should be based on flocculation and/or filtration.

Your teacher will provide you with a sample of water that contains impurities. Your task is to make it clear again.

The task is broken down into four phases:

**Phase 1: Problem deconstruction**

* You will be allocated one lesson in supervised, open-book conditions to individually deconstruct the problem.
* Factors you might consider include:
* Variables – what are they and what can be controlled?
* Results – what to record and what to measure?
* Materials – the cost and environment impact?

You will keep a record of your deconstruction. The nature of this record is your choice. You will submit this to your teacher at the end of the lesson.

**Phase 2: Design a solution**

When you teacher has reviewed your deconstruction and made recommendations, you are allocated two lessons in supervised open-book conditions to complete the design for your investigation.

This must include:

* Introduction
* Purpose
* Hypothesis
* Variables
* Apparatus list and diagram
* Method
* Justification of the most appropriate materials, method or model you are planning to use
* Blank results table

At the end of Phase 2, you (or your teacher) will gather the necessary materials to allow you to construct your solution to the flocculation and filtration problem based in the deconstruction and design that you have completed.

**Phase 3: Implementing the investigation**

You are allocated one lesson to construct your filter, carry out your investigation and collect your results.

**Phase 4: Results analysis and conclusions drawn**

* Students complete – under the same conditions as before:
* Analysis of results
* Analysis of errors
* Evaluation of the procedure(s) used
* A conclusion

**Assessment conditions**

The final submission should be a maximum of 6 pages or the equivalent in multimodal form. Pages should be single-sided A4 with minimum font size 10. Page reduction, such as two A4 pages reduced to fit on one A4 page, is not acceptable

The submissions from all four phases **must** be combined into a single practical report and submitted electronically using the following naming protocol:

*SACE registration number-2STU20-AT1-SIS task 3*

**Assessment Design Criteria**

Your report will be assessed against the following Performance Standards

* Investigation, Analysis, and Evaluation: IAE 1, 2, 3, 4
* Knowledge and Application: KA 4

Notes for teachers:

Teachers can amend time allowed for the task and the requirements for the design to suit the availability of materials, or in light of access to higher grade analytical purity measurements.

Students complete their work in supervised open book conditions to enable access to information and resources whilst ensuring that the work completed is their own. Teachers may wish to use other appropriate measures to ensure individual work.

Individual preparation at home for all phases of the assignment is highly recommended but not essential.

It is recommended that a mixture of sand, clay and organic matter added to the water, be the minimum mixture for students to attempt to purify.

**You may wish to remove this list before printing the task**

Performance Standards for Stage 2 Scientific Studies

| - | **Investigation, Analysis, and Evaluation** | | **Knowledge and Application** |
| --- | --- | --- | --- |
| **A** | **Critically** deconstructs a problem and designs a **logical**, **coherent**, and **detailed** scientific investigation using a scientific method and/or engineering design process.  Obtains, records, and represents data, using **appropriate** procedures, 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.  **Critically** and **perceptively** evaluates the effectiveness of collaboration and its impact on results/outcomes. | **Demonstrates deep and broad knowledge and understanding of a range of science inquiry skills and scientific concepts.**  Applies science inquiry skills and scientific 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 science concepts coherently, with **highly effective** use of **appropriate** terms, conventions, and representations. | |
| **B** | **Logically** deconstructs a problem and designs a **well**-**considered** and **clear** scientific investigation using a scientific method and/or engineering design process.  Obtains, records, and represents data, using **appropriate** procedures, 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.  **Critically evaluates the effectiveness of collaboration and its impact on results/outcomes.** | **Demonstrates some depth and breadth of knowledge and understanding of a range of science inquiry skills and scientific concepts.**  Applies science inquiry skills and scientific 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 science concepts with **mostly coherent and effective** use of appropriate terms, conventions, and representations. | |
| **C** | Deconstructs a problem and designs a **considered** and **generally** **clear** scientific investigation using a scientific method and/or engineering design process.  Obtains, records, and represents data, using **generally** **appropriate** procedures, 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.  **Evaluates the effectiveness of collaboration and its impact on results/outcomes.** | **Demonstrates knowledge and understanding of a general range of science inquiry skills and scientific concepts.**  Applies science inquiry skills and scientific concepts **generally effectively** in new **or** familiar contexts.  **Explores and understands aspects of the interaction between science and society.**  Communicates knowledge and understanding of science concepts with **generally effective** use of appropriate terms, conventions, and representations. | |
| **D** | Prepares a **basic** deconstruction of a problem and an **outline** of a scientific investigation using a scientific method and/or engineering design process.  Obtains, records, and represents data, using procedures, 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.  **Attempts to evaluate the effectiveness of collaboration and its impact on results/outcomes.** | **Demonstrates some basic knowledge and partial understanding of science inquiry skills and scientific concepts.**  Applies **some** science inquiry skills and scientific concepts in **familiar** contexts.  **Partially explores and recognises aspects of the interaction between science and society.**  Communicates basic scientific information, using **some** appropriate terms, conventions, **and/or** representations. | |
| **E** | **Attempts** a **simple** deconstruction of a problem and a procedure for a scientific investigation using a scientific method and/or engineering design process.  **Attempts** to use **some** procedures and 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.  **Acknowledges the effectiveness of collaboration and its impact on results/outcomes.** | **Demonstrates limited recognition and awareness of science inquiry skills and/or scientific concepts.**  **Attempts** to apply science inquiry skills **and/or** scientific concepts in **familiar** contexts.  **Attempts to explore and identify an aspect of the interaction between science and society.**  **Attempts** to communicate **information** about science. | |