

Earth & Environmental Science 2025 v1.2

IA2: Sample assessment instrument

This sample has been compiled by the QCAA to assist and support teachers in planning and developing assessment instruments for individual school settings.

Student name	sample only
Student number	sample only
Teacher	sample only
Issued	sample only
Due date	sample only

Marking summary

Criterion	Marks allocated	Provisional marks
Forming	5	
Finding	5	
Analysing	5	
Interpreting and Evaluating	5	
Overall	20	

Conditions

Technique	Student experiment
Unit	Unit 3: Living on Earth — extracting, using and managing Earth resources
Topic/s	Topic 1: Use of non-renewable Earth resources Topic 2: Use of renewable Earth resources
Duration	Approximately 10 hours of class time
Mode / length	Written: up to 2000 words
Individual / group	Individual
Other	Students use a practical or simulation performed in class as the basis for their methodology and research question.
Resources	School science laboratory and library (online: internet and school intranet, databases, journals)

Context

You have completed the following practicals in class:

- experiments to model separation or processing techniques, e.g. crushing, smelting, froth flotation, gravitational separation
- investigate the effect of slope revegetation on the volume of water run-off and amount of topsoil lost through erosion
- investigate a factor that affects evaporation rates of water (e.g. surface area, volume, temperature, turbidity, salinity) in a lake/dam situation
- model different turbidity management strategies using settling ponds
- investigate geophysical and geochemical exploration datasets to predict the presence of a resource
- investigate a variable that affects the efficiency of a renewable energy source, such as solar, wind or hydroelectric
- investigate local water samples using standard water quality testing and compare to data from other waterways, or historical data of the same waterway.

Task

Modify (i.e. refine, extend or redirect) an experiment relevant to Unit 3 subject matter to address your own related hypothesis or question.

You may use a practical performed in class, a related simulation or another practical related to Unit 3 (as negotiated with your teacher) as the basis for your methodology and research question.

To complete this task, you must:

- identify an experiment to modify
- develop a research question to be investigated
- research relevant background scientific information to inform the modification of the research question and methodology
- conduct a risk assessment and account for risks in the methodology
- conduct the experiment
- collect relevant qualitative data and/or quantitative data to address the research question
- process and present the data appropriately
- analyse the evidence to identify trends, patterns or relationships
- analyse the evidence to identify uncertainty and limitations
- interpret the evidence to draw conclusion/s to the research question
- evaluate the reliability and validity of the experimental process
- suggest possible improvements and/or extensions to the experiment
- communicate findings in an appropriate scientific genre, e.g. report, poster presentation, journal article, conference presentation.

You may collaborate with other students when:

- identifying an experiment
- developing a research question
- conducting a risk assessment
- conducting the experiment
- collecting data.

Checkpoints

- ☐ Term 1, Week 8: Select modifications, develop research question and complete risk assessment.
- ☐ Term 1, Week 9: Start experiment.
- ☐ Term 2, Week 1: Collect and analyse data.
- ☐ Term 2, Week 3: Submit draft.
- ☐ Term 2, Week 8: Submit final response.

Authentication strategies

- You will be provided class time for task completion.
- You will provide documentation of your progress at indicated checkpoints.
- Your teacher will collect and annotate a draft.
- You will use plagiarism-detection software to submit your response.
- You must acknowledge all sources.
- Your teacher will compare the responses of students who have worked together in groups.

Scaffolding

The response must be presented using an appropriate scientific genre (i.e. scientific report) that contains:

- a research question
- a rationale for the experiment
- reference to the initial experiment and identification and justification of modifications to the methodology
- raw and processed qualitative data and/or quantitative data
- analysis of the evidence
- conclusion/s based on the interpretation of the evidence
- an evaluation of the methodology and suggestions of improvements and extensions to the experiment
- a reference list.

Example of how a practical could be modified to develop a research question

Practical that will be modified: Investigate the effect of slope/revegetation on the volume of water runoff and amount of topsoil lost through erosion.

Research question: Can a mathematical model be used to describe the relationship between the slope gradient of the land and the mass of soil lost through water erosion?

Developing the research question:

Steps	Details
Identify the independent variable to be investigated.	Percent slope gradient
Identify the dependent variable.	Mass of soil collected in run-off
Identify the methodology to be used.	Laboratory/field trial
Draft research questions.	How does the slope of the ground affect erosion? What is the relationship between per cent slope gradient and soil erosion?
Refine and focus the research question.	What is the effect of increasing per cent slope gradient on the amount of soil lost through water erosion?
Present research question to teacher for approval.	Can a mathematical model be used to describe the relationship between the slope gradient of the land and the mass of soil lost through water erosion?

Note: You cannot use this sample research question for your experiment.

Instrument-specific marking guide (IA2): Student experiment response (20%)

Forming	Marks
The student response has the following characteristics:	
<ul style="list-style-type: none"> a considered rationale for the experiment justified modifications to the methodology a specific and relevant research question a methodology that enables the collection of sufficient and relevant data appropriate use of genre and referencing conventions 	4–5
<ul style="list-style-type: none"> a reasonable rationale for the experiment feasible modifications to the methodology a relevant research question a methodology that enables the collection of relevant data use of basic genre and referencing conventions 	2–3
<ul style="list-style-type: none"> a vague or irrelevant rationale for the experiment inappropriate modifications to the methodology an inappropriate research question a methodology that causes the collection of insufficient and irrelevant data inadequate use of genre and referencing conventions. 	1
The student response does not match any of the descriptors above.	0

Finding	Marks
The student response has the following characteristics:	
<ul style="list-style-type: none"> considered management of risks/ethical issues/environmental issues collection of sufficient and relevant raw data fluent and concise use of scientific language and representations 	4–5
<ul style="list-style-type: none"> management of risks/ethical issues/environmental issues collection of relevant raw data competent use of scientific language and representations 	2–3
<ul style="list-style-type: none"> inadequate management of risks/ethical issues/environmental issues collection of insufficient and irrelevant raw data simplistic use of language and representations. 	1
The student response does not match any of the descriptors above.	0

Analysing	Marks
The student response has the following characteristics:	
<ul style="list-style-type: none"> • correct and relevant processing of data • thorough identification of relevant trends/patterns/relationships • thorough and appropriate identification of the uncertainty and limitations of evidence 	4–5
<ul style="list-style-type: none"> • basic processing of data • identification of obvious trends/patterns/relationships • basic identification of uncertainty and/or limitations of evidence 	2–3
<ul style="list-style-type: none"> • incorrect or irrelevant processing of data • identification of incorrect or irrelevant trends/patterns/relationships • incorrect or insufficient identification of uncertainty and limitations of evidence. 	1
The student response does not match any of the descriptors above.	0

Interpreting and Evaluating	Marks
The student response has the following characteristics:	
<ul style="list-style-type: none"> • justified conclusion/s linked to the research question • justified discussion of the reliability and validity of the experimental process • suggested improvements and extensions to the experiment that are logically derived from the analysis of evidence 	4–5
<ul style="list-style-type: none"> • reasonable conclusion/s relevant to the research question • reasonable description of the reliability and/or validity of the experimental process • suggested improvements and/or extensions to the experiment that are related to the analysis of evidence 	2–3
<ul style="list-style-type: none"> • inappropriate or irrelevant conclusion/s • cursory or simplistic statements about the reliability and validity of the experimental process • ineffective or irrelevant suggestions. 	1
The student response does not match any of the descriptors above.	0



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