School Logo	School Name	Name	
		Teacher	

Subject	Aquatic Practices	Instrument No.	
Technique	Investigation		
Unit	1. Water Monitoring: Land to Sea Investigation		
Topic	Coastal Abiotic and Biotic Factor		

Conditions			
Duration	30 hours class time	**Length**	500-800 words (not including tables and references)
Mode	Written Scientific Report	**Seen/Unseen**	Seen
Individual/Group	Individual Report Group Data Collection	**Due Date**	Week 10
Resources Available	"A" level exemplar, Scientific Report Scaffold, use of school laboratory, library (online: internet, intranet, databases and journals). Fresh and Water monitoring data log (See Appendix 1). Field work at 3 different aquatic locations Abiotic monitoring equipment (temp, pH, O^2, salinity, sieve, scales) Biotic: Tree, micro and macro organism identification charts, microscopes.		

Context

During this unit, students have covered:
The water cycle of coastal aquatic environments.
A/biotic data collection comparing three aquatic environments.
Discussion of how water quality is influenced by various biotic and abiotic factors.
Identification of a/biotic influences on environmental conditions and impacts to the three environments.

Task

Using your knowledge of a coastal aquatic environments, address the following research question:

"**How do the abiotic and biotic factors influence water quality in the three different locations?**

To Complete this task you must:

- **Conduct** a risk assessment to account for any risks
- **Gather** results from three different locations
- **Collect** evidence/results in the form of a data table and log book (numbers and written observations)
- **Analyse** the evidence to identify trends, patterns and relationships
- **Evaluate** the reliability and validity of the experimental process
- **Recommend** possible improvements and extensions to the experiment
- **Interpret** the evidence to draw conclusions
- **Communicate** findings in a log book and or written Scientific report

Stimulus

-

Checkpoints

- ☐ Handout – Week 2
- ☐ Risk Assessment
- ☐ Draft Due
- ☐ Final Due

Criterion	Marks Allocated	Result
Knowing and Understanding	-	
Analysing and Applying	-	
Planning and Evaluating	-	

Authentication Strategies	• Teacher will provide class time for task completion. • Students must document the process, as indicated in the checkpoints. • Teacher will collect and annotate drafts. • Teacher will consult with each student as they develop the response. • Teacher will compare the responses of students who have worked together in groups. • Moderation
Scaffolding	The response must be **communicated** in the Scientific Report genre. It must have the following subheadings: **TITLE (Investigation Question)** **INTRODUCTION** • **Describe** and **explain** the marine concepts that are involved. Eg: abiotic factors, biotic factors, food webs and chains, trophic levels, species interactions. • Introduce the independent, dependent and control variables and **describe** why they are to be changed, measured and controlled. **AIM** • The purpose of the experiment • To investigate how changing the _____ will affect the _____. **HYPOTHESIS** • A **prediction** of what will happen and why (**justification**) • If _____ then _____. This is because _____. **MATERIALS** • A comprehensive list of all materials required. Be specific about size and quantity eg 1x, 250mL. **METHOD** • A step by step plan or **procedure** of how the experiment was completed. Written in third person, past tense. • **Evaluate** how to manage safety considerations by completing a risk assessment. **RESULTS** • **Collection** of reliable data, placed into a table of results in numbers. • A graph of the results from the table • Written results (observations) can also be included. • Work Log book. **DISCUSSION** • Restate results from table/graph • **Analyse** information and relationships from the table/graph • **Explain** relationships by referring to knowledge of concepts and ideas from the introduction. • **Recommend (with justification)** how effective modifications would improve the method (by referring to the quality of the data) **CONCLUSION** • Restate aim and hypothesis • Was the hypothesis supported?, to what extent? **REFERENCE LIST**

Instrument-specific standards

Execution	Interpretation	Evaluation	Grade
The student work has the following characteristics:			
selection of sufficient and relevant methodology/sources efficient, effective and safe execution of experimental/research methodology efficient collection and effective collation of information	thorough and appropriate identification of patterns and relationships in information thorough and appropriate identification of errors/limitations of information conclusion supported with relevant evidence	recommendations for effective future investigations supported with relevant evidence fluent and concise use of aquatic language effective use of representations and genre conventions	**A**
selection of relevant methodology/sources effective and safe execution of experimental/research methodology collection and collation of information	appropriate identification of patterns and relationships in information appropriate identification of errors/limitations of information conclusion related to evidence	recommendations for appropriate future investigations related to evidence competent use of aquatic language appropriate use of representations and genre conventions	**B**
guided selection of relevant methodology/sources safe execution of experimental/research methodology collection of information	identification of patterns and relationships in information identification of errors/limitations of information conclusion to the research question	recommendations for future investigations use of aquatic language use of representations and genre conventions	**C**
selection of relevant methodology/sources effective and safe execution of experimental/research methodology guided execution of given experimental or research methodology	statements about patterns and relationships in information statements about errors/limitations of information statements about the research question	statements about investigations use of language disjointed use of basic representations and conventions	**D**
directed execution of given experimental or research methodology.	statement related to the research question.	partial description of investigation.	**E**

Aquatic Practices Water Monitoring Log

Draw a picture below of how a drop of water travels from the top of the mountain out to the sea. Using labels add detail about different environments and threats to water quality.

Students will know/ understand/ do:

- Compile information about sample sites, materials and methods.
- Test water samples for pH levels, nitrates, ammonium, phosphates, temperature, and dissolved oxygen using scientific equipment.
- Collect data (and compare where possible)
- Identify aquatic flora and fauna
- Draw conclusions based on collected data
- Explain how physical and chemical properties can affect water habitat health.

Aim: Abiotic and biotic factors of three aquatic environments will be assessed to determine if the system is healthy.

Hypothesis: I think that the abiotic and biotic factors _____ (can or can not) determine the health of an aquatic system and the healthiest system will be location X

Variables

Control	Dependent	Independent

What is water quality testing?

Why is water quality important?

What affect does water quality have on the ecosystems?

What can we do to improve water quality?

Testing Techniques

- Biotic factors tested:
- Abiotic chemical factors tested:
- Abiotic physical factors tested:

Equipment List

Write the method used to measure pH

1. _____
2. _____
3. _____

Write the method used to measure temperature

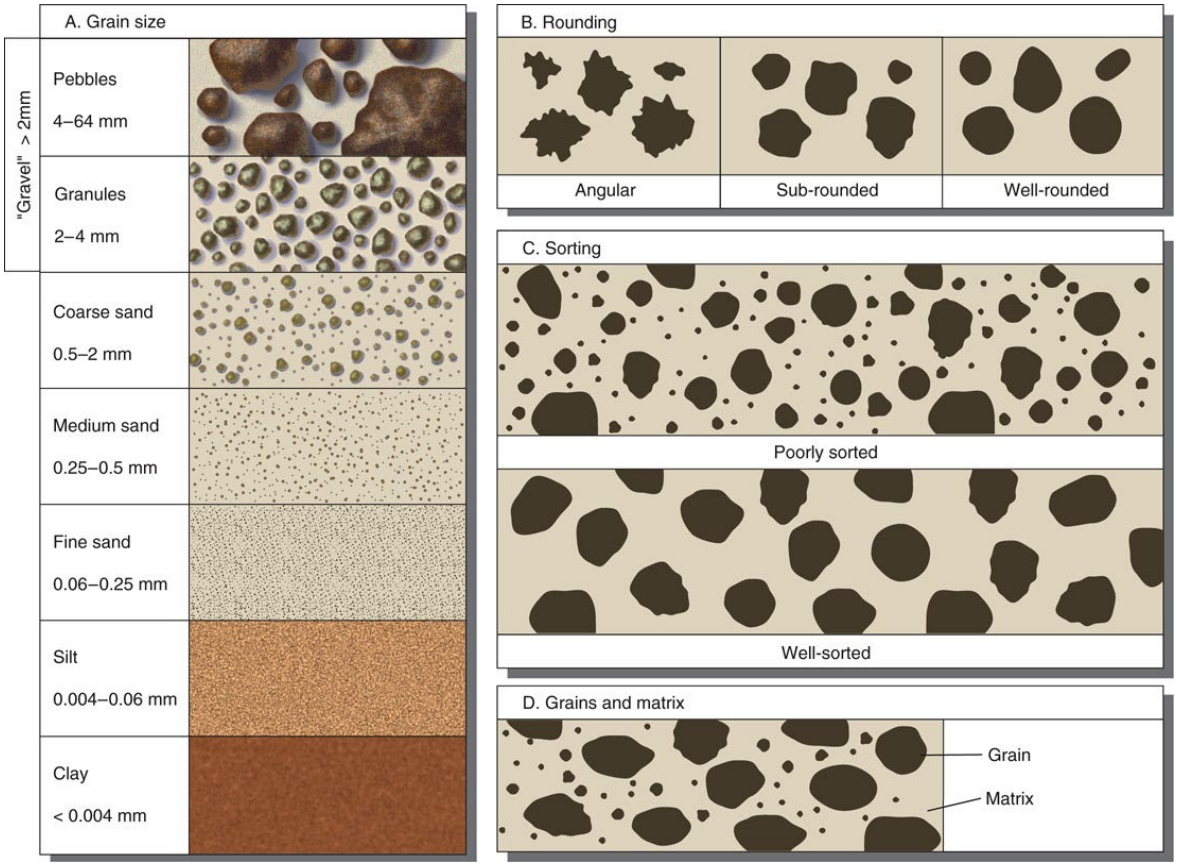
1. _____
2. _____
3. _____

Write the method used to sort and weigh the sediment

1. _____
2. _____
3. _____

Sediment Sorting

Sort the sediment using sifting techniques and weigh each category of sediment size



Grain Size (mm)	Location 1 Mass (g)	Location 2 Mass (g)	Location 3 Mass (g)
4-64 (Pebbles)			
2-4 (Granules)			
0.5-2 (course sand)			
0.25 – 0.5 (medium sand)			
0.06 – 0.25 (fine sand)			
0.04- 0.006 (silt)			
<0.006 (clay)			
Total weight of sediment sample			

Tree Identification at three locations

Picture	Common and scientific name	Location/ GPS/ Site	Amount
		Location 1	
		Location 2	
		Location 3	

Threat Identification

Environment	**Possible Threats**	**Possible solutions**

Location 1

Location 1 Quality Data Log Sheet

***Complete below quality data log sheet for all three locations*

Physical abiotic factors	Log 1	Log 2	Log 3	Average
Date				N/A
Site name/ GPS				N/A
Tank depth/ volume dimensions				
Start time				N/A
Weather conditions at time of sampling				
Rainfall				
Water flow (not flowing, slow, temporary, fast)				
Water appearance (clear, muddy oily, stained brown, stained green)				
Chemical abiotic Factors				

pH Acidity / alkalinity				
Air temperature	°C	°C	°C	°C
Water temperature	°C	°C	°C	°C
Salinity Calibrated EC (electrical conductivity)	mS/cm	mS/cm	mS/cm	mS/cm
Nitrates (nutrient level)	*mg/L*	*mg/L*	*mg/L*	*mg/L*
Phosphates (nutrient level)	*mg/L*	*mg/L*	*mg/L*	*mg/L*
Dissolved Oxygen	*mg/l*	*mg/l*	*mg/l*	*mg/l*
Ammonia (nutrient level)	*mg/l*	*mg/l*	*mg/l*	*mg/l*

Location1 Microscopic Activity

Draw or list the organisms found in a drop of location 1 water:

Location 2

Background Information on location 2.

Can insert map, photos, diagram or GPS co-ordinates below:

**Complete Location 2 Quality Data Log Sheet*

Identify and count the macroinvertebrates in the sample and record results in the table below. Using the cards provided, determine the diet for each of them.

Name	Riffle beetle	Riffle beetle larva	Mayfly nymph	Caddisfly larva	Water mite	Damselfly nymph	Dragonfly nymph	Water flea	Mosquito larva	Diving beetle	Diving beetle larva	Screech beetle larva
Animal												
Number of organisms												
Tolerance	Very sensitive			Sensitive					Tolerant			
*Diet												

Name	Water strider	Back-swimmer	Shrimp	Snail	Amphipod	Leech	Water boatman	Cyclops	Seed shrimp	Soldier fly larva	Flatworm	Worm
Animal												
Number of organisms												
Tolerance	Tolerant										Very Tolerant	
*Diet												

*Key: C = carnivore H = herbivore O = omnivore D = detritivore P = parasite = zooplankton

Tally of number of microorganisms found in water samples:

Tolerance	Animal	# Log 1	# Log 2	# Log 3	Average
Very sensitive	*Rifle Beetle*				
Taxa Richness	(>10 very high)				

Location 3

Background Information of Location 3

Can insert map, photos, diagram or GPS co-ordinates below

`*Complete Location 3 Quality Data Log Sheet*

Biodiversity Inventory

Collate a list of the different birds, fish, and crustaceans in the three locations:

Choose a minimum of one set of data to compare eg average temp of 3 environments.

Graph 1: _____

Insert a Graph with X and Y axis

Discussion questions

What are some possible reasons for variation in the sediment data?

What are some possible reasons for variation in the tree data?

What are some possible reasons for variation in the biotic data?

What are some possible reasons for variation in the abiotic data?

Which system had the highest and lowest temperatures and why?

Which system had the highest and lowest levels of nitrate and why?

Which system had the highest and lowest levels of salinity and why?

What do our test results tell us about water quality?

How can we improve or what could be done next year?

Conclusion questions

How can abiotic and biotic factors be used to assess the health of an aquatic system?

Which system was the healthiest and why?