SAMPLE ASSESSMENT TASKS

EARTH AND ENVIRONMENTAL SCIENCE
ATAR YEAR 11
Sample assessment task

Earth and Environmental Science – ATAR Year 11

Task 1 – Unit 1

Assessment type: Investigation

Conditions
Time for the task: one session for planning
one session for conducting
25 minutes for in-class validation test

Task weighting
5% of the school mark for Units 1 and 2

Investigate soil properties: wettability

Many soils in Western Australia are ‘non-wetting’, which means that water applied to the soil is unable to penetrate, and therefore is not available for plant uptake.

You are to work in groups of two or three students to design and conduct an investigation into this issue.

You could compare the wettability of different soils, or test the effect of soil wetting agents on soil.

Your scientific report includes the following:

Planning 7 marks
Background research: What is soil wettability and how could you measure it?
How do soil wetting agents work?

Decide what you are going to investigate and write a hypothesis that relates the dependent and independent variables.

Plan the equipment you will require and the measurements you will make. Include replicates or repeat trials.

Conducting 12 marks
Write your procedure in sufficient detail to enable someone to replicate your investigation.

Draw a labelled diagram of your equipment setup.

Record your results in a suitable table.

Processing and analysis 11 marks
Discuss your results, including trends in your data, and make a conclusion. Relate your conclusion to your hypothesis.

Discuss the limitations of your investigation and make suggestions for improvements.

Hand in your scientific report.

Answer the in-class validation questions. 18 marks
In-class validation questions – soil wettability investigation

1. Describe in detail how you measured the wettability of your soil. (5 marks)

2. a. List the variables that you controlled in your investigation. (3 marks)
   
   b. Identify your independent variable. (1 mark)
   
   c. Identify your dependent variable. (1 mark)

3. What did your investigation tell you about soil wettability? Discuss your conclusion using your understanding of this topic. (4 marks)

4. Why is soil wettability important to gardeners? (2 marks)

5. Describe two ways that you could improve your investigation to obtain higher quality results. (2 marks)
### Marking key for sample assessment task 1 — Unit 1

<table>
<thead>
<tr>
<th>Description</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scientific report</strong></td>
<td>/30</td>
</tr>
<tr>
<td><strong>Planning</strong></td>
<td>/7</td>
</tr>
<tr>
<td>Develops a hypothesis which relates the independent and dependent variables.</td>
<td>1–2</td>
</tr>
<tr>
<td>Lists all materials.</td>
<td>1–2</td>
</tr>
<tr>
<td>States how controlled variables are controlled.</td>
<td>1–2</td>
</tr>
<tr>
<td>Plans for repeat trials.</td>
<td>1</td>
</tr>
<tr>
<td><strong>Conducting</strong></td>
<td>/12</td>
</tr>
<tr>
<td>Clearly lists the procedure including:</td>
<td></td>
</tr>
<tr>
<td>• logical detailed sequence of steps</td>
<td>1–2</td>
</tr>
<tr>
<td>• specifies how soil samples are measured</td>
<td>1</td>
</tr>
<tr>
<td>• specifies how added water (and wetting agent if used) is measured</td>
<td>1</td>
</tr>
<tr>
<td>• specifies how the amount of water absorbed is measured or calculated.</td>
<td>1</td>
</tr>
<tr>
<td>Provides a labelled diagram of equipment setup.</td>
<td>1–2</td>
</tr>
<tr>
<td>Selects appropriate equipment and collects accurate results.</td>
<td>1–2</td>
</tr>
<tr>
<td>Displays data in a table with appropriate headings and units of measurement.</td>
<td>1–2</td>
</tr>
<tr>
<td>Averages the data from repeat trials.</td>
<td>1</td>
</tr>
<tr>
<td><strong>Processing and analysis</strong></td>
<td>/11</td>
</tr>
<tr>
<td>Graphs data collected from the investigation (if applicable):</td>
<td></td>
</tr>
<tr>
<td>• appropriate graph title</td>
<td></td>
</tr>
<tr>
<td>• axes correctly labelled</td>
<td>1–5</td>
</tr>
<tr>
<td>• includes appropriate units of measurement</td>
<td></td>
</tr>
<tr>
<td>• plots data correctly</td>
<td></td>
</tr>
<tr>
<td>• draws the appropriate type of graph.</td>
<td></td>
</tr>
<tr>
<td>Refers to specific data when describing trends in the results.</td>
<td>1–2</td>
</tr>
<tr>
<td>States a conclusion and relates it to the hypothesis.</td>
<td>1–2</td>
</tr>
<tr>
<td>Makes reasonable suggestions for improvements to procedure.</td>
<td>1–2</td>
</tr>
<tr>
<td><strong>In-class validation questions</strong></td>
<td>/18</td>
</tr>
<tr>
<td>1. Clear logical description of how the measurements for wettability were taken, and any calculations conducted:</td>
<td></td>
</tr>
<tr>
<td>• measure initial mass of soil sample</td>
<td>1</td>
</tr>
<tr>
<td>• add a measured volume of water</td>
<td>1</td>
</tr>
<tr>
<td>• measure mass of wet soil or volume of water that was not absorbed</td>
<td>1</td>
</tr>
<tr>
<td>• calculate amount of water absorbed by samples</td>
<td>1</td>
</tr>
<tr>
<td>• average results from repeat trials.</td>
<td>1</td>
</tr>
<tr>
<td>2. a. Lists at least three controlled variables</td>
<td>1–3</td>
</tr>
<tr>
<td>b. Correctly identifies independent variable.</td>
<td>1</td>
</tr>
<tr>
<td>c. Correctly identifies dependent variable.</td>
<td>1</td>
</tr>
<tr>
<td>3. Clearly states a relevant conclusion based on the data.</td>
<td>1–2</td>
</tr>
<tr>
<td>Discusses the conclusion using relevant science understanding.</td>
<td>1–2</td>
</tr>
<tr>
<td>4. Describes the need for soils to allow water to penetrate so it is available for plant roots.</td>
<td>1–2</td>
</tr>
<tr>
<td>5. Describes 2 appropriate measures for improving the procedure.</td>
<td>1–2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>/48</td>
</tr>
</tbody>
</table>
Sample assessment task

Earth and Environmental Science – ATAR Year 11

Task 9 – Unit 2

Assessment type: Extended task

Conditions
Time allowed for completion of the task: 2 weeks

Task weighting
5% of the school mark for Units 1 and 2

Research the use of satellite information to monitor and manage biomass production

Satellite technology provides a vast amount of data including land surface temperature, sea surface temperature, infrared images, position, biomass estimates, spectral analysis, evapotranspiration, and much more. Farmers, horticulturists, foresters, conservationists and fishers can use this information to assist with monitoring and managing biomass production or natural resources.

Your task is to research this data as it applies to an Australian location of your choice and to discuss your findings. Use the points below to guide your research.

- Select an area to investigate and describe it.
- Describe at least two types of satellite data, the type of radiation they use and the information they provide.
- Describe the information that satellite data provides about your chosen area.
- Describe how the information gives a greater understanding of what is happening over time in the area.
- Discuss how the satellite information is or could be used to make decisions about managing the area.

You will be asked to respond to an in-class question based on your research. You may bring your research notes with you for this task.

Below are some resources to get you started, but you will find more information yourself.

Resources
http://en.wikipedia.org/wiki/Precision_agriculture
http://www.satimagingcorp.com/applications/natural-resources/agriculture/
In-class extended response on your research.

Time allowed 25 minutes

Student name ____________________________

Using the information you researched, describe how satellite information can be used to monitor and manage the biomass and other factors of the location you studied.

Include the following in your response:

• describe the topography, vegetation and land use of your selected research area (4 marks)
• describe two different types of information that satellites provide about the area (4 marks)
• discuss how this information can be used to monitor changes in two biotic or abiotic factors in your area (4 marks)
• discuss two management strategies based on this monitoring. (4 marks)
### Marking key for sample assessment task 9 — Unit 2

<table>
<thead>
<tr>
<th>Description</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Describes the selected area</td>
<td></td>
</tr>
<tr>
<td>• topography, vegetation (1 mark for brief or 2 marks for detailed)</td>
<td>1–2</td>
</tr>
<tr>
<td>• land use or other relevant information (brief or detailed)</td>
<td>1–2</td>
</tr>
<tr>
<td>Describes two methods of satellite imaging e.g. photographic, infrared and</td>
<td>1–2</td>
</tr>
<tr>
<td>the information this provides about the area e.g. vegetation, water sources,</td>
<td>1–2</td>
</tr>
<tr>
<td>stock</td>
<td></td>
</tr>
<tr>
<td>Describes in detail how satellite information can show changes in two factors</td>
<td>1–2</td>
</tr>
<tr>
<td>over time such as</td>
<td>1–2</td>
</tr>
<tr>
<td>• changes in vegetation cover</td>
<td></td>
</tr>
<tr>
<td>• water resources</td>
<td></td>
</tr>
<tr>
<td>• stocking rates</td>
<td></td>
</tr>
<tr>
<td>Describes two management strategies that could be developed or implemented</td>
<td>1–2</td>
</tr>
<tr>
<td>for this area such as</td>
<td>1–2</td>
</tr>
<tr>
<td>• removal of pest species</td>
<td></td>
</tr>
<tr>
<td>• planting vegetation</td>
<td></td>
</tr>
<tr>
<td>• selective fertilising of land</td>
<td></td>
</tr>
<tr>
<td>• monitoring water extraction</td>
<td></td>
</tr>
<tr>
<td>• observing the effects of strategies in subsequent satellite information</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>/16</td>
</tr>
</tbody>
</table>

Accept other relevant answers
Sample assessment task
Earth and Environmental Science – ATAR Year 11
Task 11 – Unit 2

Assessment type: Test

Conditions
Time for the task: 45 minutes
Under test conditions

Task weighting
5% of the school mark for Units 1 and 2

Test: Ocean processes, energy transfer and biogeochemical processes

Question 1
a. Use your understanding of the water cycle to describe the processes that transform salty seawater into the fresh water stored in underground aquifers. (4 marks)

__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________

b. Show three (3) of these processes in a labelled diagram. (6 marks)
Question 2

a. Explain the importance of photosynthesis to the organisms living in a freshwater lake ecosystem. (4 marks)

b. Select five (5) appropriate plants and animals (both aquatic and terrestrial) from a freshwater lake ecosystem, and draw a labelled food web diagram which shows their relationships to each other. (7 marks)
Question 3

a. Describe the role of nitrogen-fixing bacteria in the nitrogen cycle. (2 marks)

__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________

b. Describe the role of nitrifying bacteria in the nitrogen cycle. (2 marks)

__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________

c. Describe one (1) way that humans have interfered with the natural nitrogen cycle and how this affects the levels of nitrogen in the relevant parts of the cycle. (2 marks)

__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________

Question 4

a. Oceans transport both energy and matter around the globe. Explain this statement. (4 marks)

__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________

b. Describe an important characteristic of El Niño? (1 mark)

__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________

c. Describe the main effect of El Niño on the climate of south eastern Australia. (1 mark)

__________________________________________________________________________________
__________________________________________________________________________________
Question 5

Water is becoming an increasingly valuable resource as the rainfall in WA decreases.

In the table below list three methods that the Western Australian government uses to supply water for the population to use.

In the table, compare how much water each method will produce in the future and how much it will cost in the future. Use words such as most, least, moderate to complete the table. (9 marks)

<table>
<thead>
<tr>
<th>Method of water supply</th>
<th>Amount of water produced</th>
<th>Comparative cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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</tbody>
</table>

Question 6

A horticulturist is growing a crop of lettuces in the soil at Wanneroo. This crop requires inputs of energy and matter in order for the plants to grow. List them below: (4 marks)

Energy input: _________________________________________________

Matter input: _________________________________________________

_________________________________________________

_________________________________________________
## Marking key for sample assessment task 11 — Unit 2

### Test: Ocean processes and biogeochemical processes

<table>
<thead>
<tr>
<th>Question</th>
<th>Description</th>
<th>Marks</th>
</tr>
</thead>
</table>
| **Question 1** | a. evaporation: pure water evaporates from seawater leaving salt behind  
precipitation  
percolation into aquifer  
b. diagram showing the three processes  
labelled arrows in correct direction | 1–2  
1  
1  
1–3  
1–3 |
| **Question 2** | a. photosynthesis converts sun’s energy into biomass  
enables the producers to grow  
producers provide the food for first order consumers in the ecosystem  
higher order consumers eat the lower order consumers  
b. selects five appropriate labelled organisms e.g. algae, grass, trees, appropriate aquatic and terrestrial animals  
shows correct relationships between producers and consumers; 1 for each correct arrow | 1  
1  
1  
1  
1–2  
1–5 |
| **Question 3** | a. nitrogen-fixing bacteria absorb nitrogen from air  
convert it to ammonia  
b. nitrifying bacteria convert ammonia  
into nitrites or nitrates  
c. applying nitrogen-rich fertiliser, septic sewage systems or other relevant methods  
nitrogen levels increase in groundwater or freshwater | 1  
1  
1  
1  
1 |
| **Question 4** | a. describes transport of energy: heat energy transported by warm water in ocean currents  
describes transport of matter: nutrients, biomass transported by masses of moving water  
b. warm ocean temperatures  
c. drier than average | 1–2  
1–2  
1 |
| **Question 5** | Methods used:  
• water catchment in dams  
• extraction of water from aquifers  
• desalination of salt water  
compares future availability of water from each source  
discusses comparative cost of each method | 1  
1  
1  
1–3  
1–3 |
| **Question 6** | Sun’s energy or UV light  
Matter inputs include  
• water  
• nutrients/fertiliser  
• growing medium/soil  
• carbon dioxide (max 3) | 1  
3 x 1 |

| Total | /46 |

Accept other relevant answers