



SAMPLE ASSESSMENT TASKS

EARTH AND ENVIRONMENTAL SCIENCE
ATAR YEAR 12

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Sample assessment task

Earth and Environmental Science – ATAR Year 12

Task 3 – Unit 3

Assessment type: Extended task

Conditions

Period allowed for completion of the task: two weeks

Task weighting: 5% of the school mark for Unit 3 and Unit 4

Case study of a resource site (51 marks)

Choose a mineral or energy resource that is mined or extracted in Western Australia to research.

Your extended research will be presented in the following formats:

1. A written report containing all the required information. (43 marks)
2. An oral presentation to the group, accompanied by a multimedia presentation. (8 marks)
You will be required to answer relevant questions from the audience.

Written report (43 marks)

For each of the points listed below, provide a detailed description. Use diagrams and maps to illustrate your response where appropriate.

Exploration: Discuss **two** exploration techniques which were used to locate this resource. Discuss how the exploration techniques identified the size and quality of the ore body. (10 marks)

Mining or extraction: With reference to the actual resource site, discuss the type of mining/extraction taking place and relate this to the depth, size of the resource deposit and grade of the deposit. Include a map and a geological cross-section diagram showing the deposit. (8 marks)

Environmental issues: Discuss **two** impacts of extraction or processing of this resource on the environment. Describe **two** measures that have been put in place to minimise environmental impact or to assist in the rehabilitation of the area after mining or extraction finishes. (8 marks)

Social and heritage issues: Describe **two** possible effects of mining or processing on the surrounding community or on traditional owners of the land. Discuss any negotiations or agreements that were made with the local traditional owners, members of the community or government prior to approval of extraction of the resource. (8 marks)

Economic significance: Discuss the importance of this resource to the Western Australian economy – export dollars, markets, jobs, construction of infrastructure and longevity of the operation. (6 marks)

Provide a reference list with at least **three** references. (3 marks)

Marking key for sample assessment task 3 – Unit 3

Extended task – Case study of a resource site

| Section | Possible mark | Allocated mark |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|----------------|
| Written report | | |
| Exploration | | /10 |
| Names two exploration techniques used to locate the resource | 1–2 | |
| Relates first exploration process in detail to the properties of the source rock | 1–2 | |
| Relates second exploration process in detail to the properties of the source rock | 1–2 | |
| Discusses how first technique identified size and quality of resource | 1–2 | |
| Discusses how second technique identified size and quality of resource | 1–2 | |
| Mining or extraction | | /8 |
| Includes a clearly labelled geological map of the resource site | 1–2 | |
| Includes an appropriately labelled cross-section of resource | 1–2 | |
| Describes main method of extraction, e.g. open cut/underground | 1–2 | |
| Relates method of extraction to characteristics of ore deposit | 1–2 | |
| Environmental issues | | /8 |
| Discusses two environmental impacts caused by mining/extraction, land clearing, transporting, waste, or processing of ore | | |
| <ul style="list-style-type: none"> names the cause of first impact describes how it impacts on the environment names the cause of second impact describes how it impacts on the environment | 1 1 1 1 | |
| Describes two measures to minimise environmental impact or assist in rehabilitation of area | | |
| <ul style="list-style-type: none"> names the first measure describes how it affects the environment names the second measure describes how it affects the environment | 1 1 1 1 | |
| Social and heritage issues | | /8 |
| Describes two effects on the community or traditional owners | | |
| <ul style="list-style-type: none"> names the first effect describes how it affects the community or traditional owners names the second effect describes how it affects the community or traditional owners | 1 1 1 1 | |
| Discusses negotiations related to this site | | |
| <ul style="list-style-type: none"> describes relevant consultations and feedback describes resultant agreements | 1–2 1–2 | |
| Economic significance | | /6 |
| Describes the economic significance to Western Australia (dollars, markets) | 1–2 | |
| Discusses current and future job opportunities | 1–2 | |
| Estimates the longevity of the resource | 1–2 | |
| References | | /3 |
| Correctly identifies three references | 1–3 | |
| Written report total | | /43 |
| Oral presentation | | |
| Is well prepared | 1 | |
| Uses appropriate audiovisual aids as a guide | 1–2 | |
| Uses clear speaking voice | 1 | |
| Maintains eye contact with the audience | 1 | |
| Keeps to time limit | 1 | |
| Answers questions from audience | 1–2 | |
| Oral total | | /8 |
| Total | | /51 |

Sample assessment task

Earth and Environmental Science – ATAR Year 12

Task 7 – Unit 4

Assessment type: Investigation

Conditions

Time for the task: two lessons for planning and construction
one lesson for testing the seismograph
one lesson for report writing

Task weighting: 6% of the school mark for Unit 3 and Unit 4

Construct and test a seismograph

(41 marks)

Scientists are able to measure the strength of earthquakes using seismographs. Your task is to design, construct and test a seismograph.

Research

(6 marks)

- How do scientists measure earthquakes?
- Why do we need to measure earthquakes?
- How are tsunamis formed, and why do we need warnings about them?

Plan and construct a seismograph

(12 marks)

- In your group, discuss the essential components of a seismograph and plan how you will construct a model seismograph.
- Describe the aim of the investigation.
- Describe how you made the model.
- Describe any modifications to your design, and why they were made.
- Submit a labelled diagram of your design to your teacher.
- Negotiate a time with your teacher to demonstrate your model and explain its use to the class.

Test your seismograph

(8 marks)

- Test your seismograph using the agreed class procedure, e.g. by dropping a hard ball onto the desk from different heights (e.g. 0.5 m, 1 m and 1.5 m), or from the same height but at different distances from the seismograph.
- Identify the independent and controlled variables.
- Describe the testing procedure. Include a diagram or photograph of the test equipment.
- Record the results of your tests. The seismograph that is most sensitive for all tests will be considered the best in the class.
- How is sensitivity defined?

Processing and evaluation

(11 marks)

- Analyse your results and reach a conclusion.
- Evaluate your results, making suggestions for improvements in experimental design.
- Compare your seismograph with those in earthquake early-warning centres.

Communication

(4 marks)

- Include your references.
- Use correct scientific terminology where applicable.

Marking key for sample assessment task 7 – Unit 4

Investigation – Construct and test a seismograph

| Description | Marks |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Research | /6 |
| How do scientists measure earthquakes? <ul style="list-style-type: none"> describes instruments describes scales of measurements or location of epicentre | 1–2 |
| Why do we need to measure earthquakes? <ul style="list-style-type: none"> describes predictive value of results describes assistance with risk mitigation planning | 1–2 |
| How are tsunamis formed, and why do we need warnings about them? <ul style="list-style-type: none"> describes earth movements causing wave describes risk mitigation planning | 1–2 |
| Planning and constructing | /12 |
| Describes aim in detail, mentions characteristics of trace produced | 1–2 |
| Describes essential components of seismograph <ul style="list-style-type: none"> isolation of marker from vibration how paper is fed through how frame moves with earth | 1–3 |
| Diagram/photograph is clearly labelled to show the structure of the seismograph | 1–2 |
| Explains why design features of constructed seismograph were included | 1–3 |
| Describes modifications of device and reasons for it | 1–2 |
| Testing | /8 |
| Clearly describes the procedure to be used for testing <ul style="list-style-type: none"> production of shock independent variable controlled variables | 1–3 |
| Shows a diagram or photograph of equipment set-up for testing | 1–2 |
| Performs repeat trials | 1 |
| Defines sensitivity of seismograph | 1–2 |
| Processing and evaluation | /11 |
| Displays data in suitable format <ul style="list-style-type: none"> displays labelled traces (seismograms) measures some aspects of the traces averages results of repeat trials | 1–3 |
| Makes a valid statement about the data collected <ul style="list-style-type: none"> relates aspects of trace to shock parameters | 1–3 |
| Makes reasonable suggestions for improvements to device and/or testing procedure | 1–2 |
| Compares made seismograph with professional ones: different stability measures, sensitivities | 1–3 |
| Communication | /4 |
| Lists references for research | 1–2 |
| Uses appropriate scientific terminology | 1–2 |
| Total | /41 |

Sample assessment task

Earth and Environmental Science – ATAR Year 12

Task 9 – Unit 4

Assessment type: Test

Conditions

Time for the task: 50 minutes

Task weighting: 5% of the school mark for Unit 3 and Unit 4

Test – Earth hazards

(46 marks)

Question 1

Scientists use a variety of techniques to monitor volcanoes in New Zealand in order to predict when a volcano may be about to erupt.

- (a) Name **three** techniques they could use to do this in the table below.
Also describe the results they may get which would indicate that volcanic activity is increasing.

One example has already been filled in.

(6 marks)

| Technique | Indicator of activity |
|------------------------------|--------------------------|
| e.g. chemistry of lake water | e.g. becomes more acidic |
| | |
| | |
| | |

- (b) Explain why, despite all the monitoring techniques available, it is impossible to accurately predict when a volcano will erupt.

(3 marks)

- (c) Describe how volcanic eruptions can affect climate. (2 marks)

Question 2

- (a) In March 2011, a massive tsunami was generated off the coast of Japan by an earthquake registering 9.0 on the Richter scale.

Explain, with reference to plate tectonics, how these two events are related. (5 marks)

- (b) Draw a labelled diagram to illustrate the process of ocean floor subduction beneath a continental plate. (5 marks)

- (c) Identify **two** parts of a tsunami warning system, and describe the function of each. (4 marks)

Question 3

Some parts of Australia have been affected by severe flooding in recent years.

- (a) Name **three** causes of flooding and explain each. (6 marks)

- (b) State **three** methods you could use to assess the risk of flooding at a particular locality. (3 marks)

Question 4

Describe **two** methods that are used to enable buildings to withstand earth tremors. Include a diagram in your answer.

(4 marks)

Question 5

(a) Describe **three short-term** effects on the biodiversity of an area that can be caused by a severe bushfire.

(3 marks)

(b) Describe **three longer-term** effects on the biodiversity of an area that can be caused by a severe bushfire. (3 marks)

(c) Describe **two** adaptations that Western Australian flora has, which help plants cope with bushfires. (2 marks)

Marking key for sample assessment task 9 – Unit 4

Question 1

- (a) Name **three** techniques they could use to do this in the table below.
Also describe the results they may get which would indicate that volcanic activity is increasing.
- (b) Explain why, despite all the monitoring techniques available, it is impossible to accurately predict when a volcano will erupt.
- (c) Describe how volcanic eruptions can affect climate.

| Description | Marks |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| (a) Identifies technique and appropriate indicator (x 3) | 1–2 |
| Subtotal | /6 |
| Answer could include, but is not limited to: | |
| <ul style="list-style-type: none"> • seismic monitoring/increased movement • ground deformation by GPS/sudden drop or rise • chemistry/decreased pH • temperature measurement/increase outside normal range • airborne gas monitoring by spectrometer/increased SO₂ • soil gas monitoring/increased CO₂ and H₂S | |
| (b) It is possible to predict increasing activity But not to pinpoint if and when an eruption will occur Geological events occur over very long time periods | 1 1 1 |
| Subtotal | /3 |
| (c) Dust and gases block/reflect sunlight Lower temperatures result, global cooling OR Increased CO ₂ levels can cause warming through greenhouse effect | 1 1 |
| Subtotal | /2 |
| Total | /11 |
| Accept other relevant answers | |

Question 2

- (a) In March 2011, a massive tsunami was generated off the coast of Japan by an earthquake registering 9.0 on the Richter scale. Explain, with reference to plate tectonics, how these two events are related.
- (b) Draw a labelled diagram to illustrate the process of ocean floor subduction beneath a continental plate.
- (c) Identify **two** parts of a tsunami warning system, and describe the functions of each.

| Description | Marks |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| (a) The earthquake was a result of movement along the tectonic plate boundaries between the Eurasian plate including Japan to the west and the Pacific plate to the east The Pacific plate is being subducted under the Eurasian plate (Japan) The earthquake resulted in a substantial uplift of rock on the sea floor The rock movement on the seafloor lifted the ocean surface This resulted in a wave spreading out both west (to Japan) and east (into the Pacific Ocean) The wave became larger in shallower water Any five statements or similar linked logically for 1 mark each | 1–5 |
| Subtotal | /5 |

| | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| (b) One mark for each of the following correctly drawn and labelled: <ul style="list-style-type: none"> trench lithosphere or asthenosphere volcanoes or volcanic arc arrow showing direction of subduction oceanic crust or continental crust | 1 1 1 1 1 |
| Subtotal | /5 |
| (c) Any two for 2 marks each or other relevant answer <ul style="list-style-type: none"> seismic station – detects earth movement; tsunami model – predicts size of potential tsunami; tsunami detector – measures water pressure; communication satellite – transmits information and warnings | 1–2 1–2 |
| Subtotal | /4 |
| Total | /14 |

Question 3

Some parts of Australia have been affected by severe flooding in recent years.

(a) Name **three** causes of flooding and explain each.

(b) State **three** methods you could use to assess the risk of flooding at a particular locality.

| Description | Marks |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| (a) Names cause of flooding (x 3) Links to an appropriate explanation (x 3) | 1 1 |
| Subtotal | /6 |
| Answer could include, but is not limited to: | |
| <ul style="list-style-type: none"> high rainfall concentrated in a short period, causing saturation of soil/substratum impervious subsoil/underlying rock, allowing water to accumulate on surface water flow from catchment is at a rate greater than the rate channel systems can remove it, causing 'ponding up' of water in limited area high tides/tsunami, so water level is temporarily far above normal removal of forests/vegetation, so run-off is immediate instead of gradual sudden snow-melt in high mountain regions, brings sudden surge of water into lower valleys | |
| (b) Any three of the following: <ul style="list-style-type: none"> examine flood/hydrographic records for the locality over a long period examine rainfall records for the locality over a long period examine tide tables consider form of valley consider perviousness or otherwise of soil/underlying rock statistical analysis/probability computer modelling consider evidence such as insurance claims/newspaper reports or other relevant answer | 1–3 |
| Subtotal | /3 |
| Total | /9 |

Question 4

Describe **two** methods that are used to enable buildings to withstand earth tremors. Include a diagram in your answer.

| Description | Marks |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Describes appropriate methods with a suitable diagram (x 2) | 1–2 |
| Total | /4 |
| Answer could include, but is not limited to: | |
| <ul style="list-style-type: none"> • foundations include sliding bearings, rubber, springs, seismic damping, shock absorbers • elevated footings/base isolation • building tapered towards the top • walls and roof reinforced with steel • tuned mass dampers (large mass on top which sways in opposition to building sway) • diagonal cables | |

Question 5

- (a) Describe **three short-term** effects on the biodiversity of an area that can be caused by a severe bushfire.
- (b) Describe **three longer-term** effects on the biodiversity of an area that can be caused by a severe bushfire.
- (c) Describe **two** adaptations that Western Australian flora has, which help plants cope with bushfires.

| Description | Marks |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| (a) Provides three appropriate effects, such as <ul style="list-style-type: none"> • kills animals/plants • injures animals/plants • removes food source, shelter or habitat • provides nutrient rich ash for plant growth • removes pest plants and animals • promotes germination of some native flora | 1–3 |
| Subtotal | /3 |
| (b) Provides three appropriate effects, such as <ul style="list-style-type: none"> • reduces breeding population • reduces diversity of gene pool • lack of food and shelter/nesting sites slows reproduction rate • reduces canopy for smaller plants • changes microclimate of area so some plants and animals no longer can flourish | 1–3 |
| Subtotal | /3 |
| (c) Provides two adaptations, such as <ul style="list-style-type: none"> • smoke promotes seed germination • lignotubers • thick bark protects trunk | 1–2 |
| Subtotal | /2 |
| Total | /8 |
| Accept other relevant answers | |