



Government of **Western Australia**
School Curriculum and Standards Authority

SAMPLE ASSESSMENT TASKS

EARTH AND ENVIRONMENTAL SCIENCE
GENERAL YEAR 12

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Sample assessment task

Earth and Environmental Science – General Year 12

Task 1 – Unit 3

Assessment type: Investigation

Conditions

Period allowed for completion of the task: two weeks

One week for planning, conducting and writing up the investigation

One week for research

One lesson for in-class validation test

Task weighting

8% of the school mark for this pair of units

Task 1: Extraction of metals from ores

Plan and conduct an investigation into the extraction of a metal from its ore using carbon reduction and electrolysis techniques.

Part A: Research

Conduct research on how metals are extracted from their ores by industry, and how the process is adapted when used on a large industrial scale.

- Describe the process for extracting aluminium from its ore.
- Describe the process of smelting iron ore in a blast furnace.
- Describe any pollution problems that need to be tackled by industry during these two extraction processes.

Part B: Carbon reduction investigation

Part C: Electrolysis investigation

Part D: In-class validation test on investigations and research

Practical investigation – Teacher demonstration only

The **teacher may demonstrate** the extraction of lead from lead oxide using carbon reduction. This activity must be performed in a fume hood as the fumes are dangerous. All safety precautions need to be adhered to when handling lead compounds and to reduce exposure to any fumes.

Extraction of lead by the carbon reduction process

Introduction

Most metals occur naturally in chemically combined form, and therefore an extraction process is necessary. Carbon reduction is a process where the ore is combined with carbon and then heated. This drives off the oxygen from the ore, leaving the metal behind.

The carbon reduction process is involved in smelting ores and is used to extract iron, lead, copper, tin and mercury from their ores.

Materials required

- carbon block
- blow pipe
- Bunsen burner
- lead(II) oxide
- spatula (popstick)
- protective mat
- hand-lens
- tongs
- safety glasses
- tray with water

Procedure

Make a small hole in one face of the carbon block. Place a small amount of the lead(II) oxide in the hole, mixing it with some of the carbon particles. Add one or two drops of water and form a paste from the lead(II) oxide and carbon. This will prevent the lead(II) oxide being spread around.

Clamp the Bunsen burner in a slightly sloping-near horizontal position, then adjust the air supply of the flame on the Bunsen burner until the blue cone is just forming (the hottest flame is **not** required).

Using the blow pipe, direct the blue cone on to the lead(II) oxide on the carbon block until silver globules of lead form.

Safety precautions

Wear safety glasses.

Perform in a fume hood.

Wash hands after experiment.

Note: After the experiment, the carbon block **must** be immersed in water to prevent it from starting a fire.

Part B: Student investigation

Extraction of copper by carbon reduction

- Your task during this activity will be to prepare and use a miniature blast furnace to extract a metal from its ore. You will extract copper from copper(II) oxide using carbon reduction.
- Write a scientific report of your experiment. Include a description of the procedure, a labelled diagram of equipment, observations, and a description of safety precautions. Include a word equation for the chemical reaction taking place.

You may follow the method described in a chemistry textbook or use the method below.

Materials required

- Bunsen burner
- copper(II) oxide
- crucible (with lid)
- carbon powder e.g. charcoal
- spatula (popstick)
- protective mat
- hand-lens
- tongs
- clamp and stand
- safety glasses
- claypipe triangle
- tripod
- tin can with top and base removed
- matches

Procedure

Caution: You must wear safety glasses.

Be careful of hot objects. If you are burnt, notify the teacher and run the affected body part under cold water for at least two minutes.

Mix about 2 grams of copper oxide with a slightly smaller amount of carbon powder. Place it in the crucible and cover it with a layer of carbon powder to prevent oxidation.

Place the tin can around the crucible to enable the crucible to be heated to a much higher temperature. This will result in larger quantities of copper metal being produced.

The crucible is then heated by the Bunsen burner to red heat for at least 10 minutes. Then allow it to cool and, using the tongs, empty out the contents onto a heatproof mat.

Some powdered copper will be seen at the bottom of the crucible.

The following link provides a method and

questions: http://www.lgschemistry.org.uk/PDF/C1.2_Reduction_of_metal_oxides.pdf.

Part C: Student investigation

Electrolysis of copper sulfate solution

See <http://www.nuffieldfoundation.org/practical-chemistry/electrolysis-copperii-sulfate-solution> or a chemistry text for the method.

<http://www.youtube.com/watch?v=Q62UfP-ZADY> shows a 25-second video of the process.

This process (electrolysis or electrowinning) is used to recover metals such as copper and uranium which are extracted from the ore body by in-situ leaching (ISL). This form of extraction is used in the Beverley and Honeymoon uranium mines in South Australia.

Use the method in the link or from a chemistry textbook to carry out the electrolysis of copper sulfate solution.

Write a scientific report of your investigation.

Include a description of the procedure, a labelled diagram of equipment, and any observations you made during the experiment.

Describe any safety precautions that you took.

Include word equations for the chemical reactions taking place in the process.

Part D: In-class validation test

This includes questions on your investigations and your research.

Part D: In-class validation test**Total: 20 marks****Student name** _____

1. Describe the method you used to extract copper metal from a compound by electrolysis. (4 marks)

2. Draw a labelled diagram of the equipment set-up you used. (3 marks)

3. Describe what you observed during the electrolysis of the copper sulfate solution. (3 marks)

4. a) Describe the chemical reaction that occurs when iron ore and crushed carbon are heated to high temperatures in the process of carbon reduction. Explain why the ore changes from an oxide to a metal. (3 marks)

b) Write a word equation for this process. (1 mark)

5. a) Identify **two** of the main waste products emitted from smelters. (2 marks)

b) Describe **two** precautions taken by industry to ensure a lack of pollution from their smelters. (4 marks)

Marking key for sample assessment Task 1

1. Describe the method you used to extract copper metal from a compound by electrolysis.

Description	Marks
Describes the procedure in a clear, logical sequence	3–4
Describes the procedure in a rudimentary way	1–2
Total	/4

2. Draw a labelled diagram of the equipment set-up you used.

Description	Marks
Includes a clear, well-labelled diagram of equipment	3
Includes an unlabelled diagram	1
Total	/3

3. Describe what you observed during the electrolysis of the copper sulfate solution.

Description	Marks
Describes changes in colour of solution	1
Describes deposits forming on electrode	1
Describes other changes such as bubbles	1
Total	/3

4. a) Describe the chemical reaction that occurs when iron ore and crushed carbon are heated to high temperatures in the process of carbon reduction. Explain why the ore changes from an oxide to a metal.
b) Write a word equation for this process.

Description	Marks
The oxygen in the ore reacts with the carbon	1
Forms carbon dioxide gas	1
Leaves the metal behind	1
iron oxide + carbon \longrightarrow iron + carbon dioxide	1
Total	/4

5. a) Identify **two** of the main waste products emitted from smelters.
b) Describe **two** precautions taken by industry to ensure a lack of pollution from their smelters.

Description	Marks
Identifies two pollutants	1–2
Describes two methods used to produce clean emissions	1–4
Total	/6
Overall total	/20

Sample assessment task

Earth and Environmental Science – General Year 12

Task 2 – Unit 3

Assessment type: Extended task

Conditions

Period allowed for completion of the task: two weeks

Task weighting

10% of the school mark for this pair of units

Task 2: Case study of a mine site

Total: 39 marks

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

Your extended research will be presented in the following formats:

1. A written report containing all the required information. (31 marks)
2. An oral report to the group accompanied by a multimedia presentation. (8 marks)

1. Written report

For each of the points listed below, provide a detailed description. You may use diagrams and maps to illustrate your response.

Exploration: Discuss **two** exploration techniques which are used to locate this resource. Relate the techniques used to the properties of the source rock. (6 marks)

Mining or extraction: With reference to an actual resource site, discuss the type of mining taking place and relate this to the depth, size of the resource deposit and grade of the deposit. Include a diagram showing the deposit. (7 marks)

Environmental issues: Discuss **two** impacts of this mining on the environment, and any measures that are being taken to minimise this impact. (6 marks)

Social and heritage issues: Describe **two** possible effects of mining or processing on the surrounding community or on traditional owners of the land. (4 marks)

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

Provide a reference list. (2 marks)

2. Oral report

Use the information from your written report as the basis of an oral report to the group accompanied by a multimedia presentation. (8 marks)

Resources:

Australian atlas of minerals resources, mines and processing centres: www.australianminesatlas.gov.au

Aluminium fact

sheet: http://www.australianminesatlas.gov.au/education/fact_sheets/aluminium.html

Mineral sands:

http://www.australianminesatlas.gov.au/education/fact_sheets/titanium.html

Coal:

http://www.australianminesatlas.gov.au/education/fact_sheets/coal.html

Coal seam gas:

http://www.australianminesatlas.gov.au/education/fact_sheets/coal_seam_gas.html

Marking key for sample assessment Task 2

Section	Possible mark	Allocated mark
Written report		
Exploration		
Names two techniques used to locate the resource	1–2	
Describes the exploration processes in detail relating them to the properties of the source rock	1–4	
Total		/6
Mining or extraction		
Includes a geological map or labelled diagram of the resource site	1–2	
Describes main method of extraction, e.g. open cut/underground	1–2	
Relates type of mining to characteristics of ore deposit	1–3	
Total		/7
Environmental issues		
Discusses two environmental impacts of mining such as: land clearing, due to transporting, due to waste, due to processing of ore	1–4	
Describes issues arising in relation to traditional land owners	1–2	
Total		/6
Social and heritage issues		
Describes two effects on the community or traditional owners in detail	1–4	
Total		/4
Economic significance		
Describes the economic significance to Australia (dollars, markets)	1–2	
Discusses current and future job opportunities	1–2	
Estimates the longevity of the resource i.e. the timeframe for exhaustion of the resource	1–2	
Total		/6
References		
1–2 references	1	
Three or more references	2	
Total		/2
Oral report		
Presentation		
Is well prepared	1	
Presentation used as a guide with appropriate audiovisual aids	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	
Total		/8
Overall total		/39

Sample assessment task

Earth and Environmental Science – General Year 12

Task 5

Assessment type: Investigation

Conditions

Time for the task: 50 minutes

Task weighting

4% of the school mark for this pair of units

Task 5: Fossil identification practical activity

Total: 34 marks

In this activity, you will investigate the features of different fossils and the environments in which they formed. Select **four** fossils to describe.

Procedure

1. Draw and label each specimen. (2 marks each)
2. Describe each specimen. (2 marks each)
3. Describe the paleoenvironments in which each fossil formed, providing **one** piece of evidence to support your choice of environment. (3 marks each)
Use a reference to classify and name each specimen and the era(s) in which they lived. (1 mark each)
4. Present your results in a suitable table. (2 marks)

Marking key for sample assessment Task 5

Description	Possible mark	Allocated mark
Fossil 1: _____		
Diagram Correctly labelled	1 1	/2
Brief description of specimen or Detailed description of specimen	1 2	/2
Description of paleoenvironment Supporting evidence Fossil named	2 1 1	/4
Total		/8
Fossil 2: _____		
Diagram Correctly labelled	1 1	/2
Brief description of specimen or Detailed description of specimen	1 2	/2
Description of paleoenvironment Supporting evidence Fossil named	2 1 1	/4
Total		/8
Fossil 3: _____		
Diagram Correctly labelled	1 1	/2
Brief description of specimen or Detailed description of specimen	1 2	/2
Description of paleoenvironment Supporting evidence Fossil named	2 1 1	/4
Total		/8
Fossil 4: _____		
Diagram Correctly labelled	1 1	/2
Brief description of specimen or Detailed description of specimen	1 2	/2
Description of paleoenvironment Supporting evidence Fossil named	2 1 1	/4
Total		/8
Results in suitable table	1–2	/2
Overall total		/34

Sample assessment task

Earth and Environmental Science – General Year 12

Task 6 – Unit 3

Assessment type: Test**Time for the task:** 40 minutes**Task weighting**

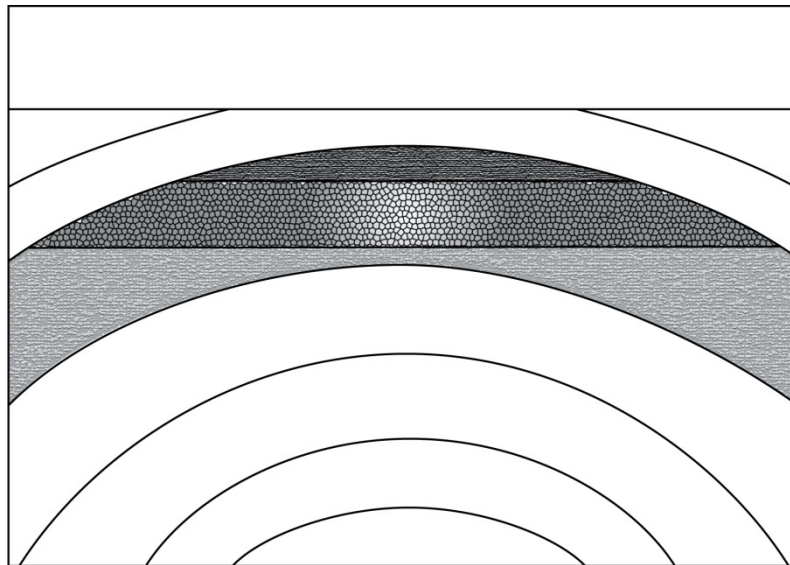
9% of the school mark for this pair of units

Student name _____

Fossils, fossil fuels, WA resources industry**Total: 26 marks****Question 1**

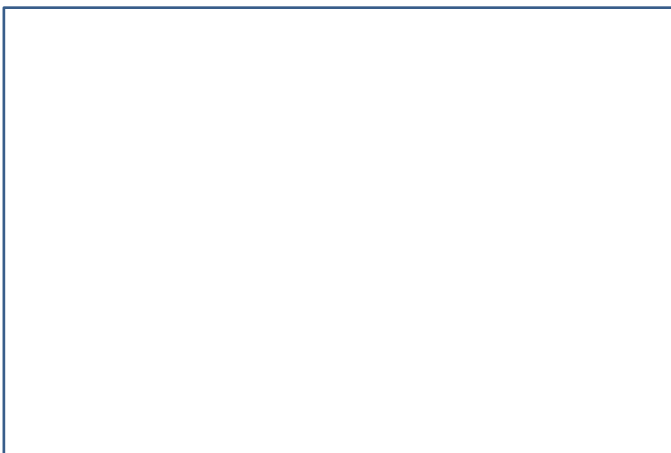
Below is a diagram of an oil and gas reservoir in a rock formation.

- a) Label the sections of the diagram to indicate the locations of *oil*, *water* and *gas*. (3 marks)



- b) Name an essential property of the rock layer above the trapped oil and gas. (1 mark)
- c) Do oil reserves form in igneous, sedimentary or metamorphic rocks? (1 mark)

- d) Use **three** labelled diagrams to describe the processes that were involved in forming the oil reservoir in Question 1a. (6 marks)



Question 2

a) Name an exploration technique which is used to locate oil reserves, and describe how it works. (3 marks)

b) Name **two** types of information that fossils from exploration drill cores provide to petroleum scientists. (2 marks)

Question 3

a) Name **three** occupations associated with the resources industry in Western Australia (WA). (3 marks)

b) Many workers in the oil industry in WA are employed on a fly in-fly out (FIFO) basis. Give **three** reasons that this occurs. (3 marks)

Question 4

a) Give **two** reasons why animals that live in the ocean are more likely to be preserved as fossils rather than those living on land. (2 marks)

1.

2.

b) What does the term 'paleogeography' mean? (2 marks)

Marking key for sample assessment Task 6

Fossils, fossil fuels, WA resources industry

1. a) Label the sections of the diagram to indicate the locations of *oil*, *water* and *gas*.
- b) Name an essential property of the rock layer above the trapped oil and gas.
- c) Do oil reserves form in igneous, sedimentary or metamorphic rocks?
- d) Use **three** labelled diagrams to describe the processes that were involved in forming the oil reservoir in Question 1a.

Description	Marks
a) labels appropriate sections	1–3
b) impermeability	1
c) sedimentary	1
d) diagram showing deposition and decaying of organic matter	1–2
diagram showing organic matter covered by sediment layers	1–2
diagram showing folding of layers	1–2
1 mark for each diagram, 1 mark for correct labels	
Total	/11

2. a) Name an exploration technique which is used to locate oil reserves, and describe how it works.
- b) Name **two** types of information that fossils from exploration drill cores provide to petroleum scientists.

Description	Marks
a) seismology or other appropriate technique	1
links technique to rock properties	1–2
b) age of the rock, paleoenvironment of rock formation	1–2
Total	/5

3. a) Name **three** occupations associated with the resources industry in Western Australia (WA).
- b) Many workers in the oil industry in WA are employed on a fly in-fly out (FIFO) basis. Give **three** reasons that this occurs.

Description	Marks
a) names three appropriate occupations	1–3
b) remote locations; saves on building accommodation; saves on building infrastructure (schools, shops etc.); oil rigs not suitable for permanent housing; cheaper for company; enables large workforce to be recruited; or other suitable response (any three, 1 mark each)	1–3
Total	/6

4. a) Give **two** reasons why animals that live in the ocean are more likely to be preserved as fossils rather than those living on land.
- b) What does the term 'paleogeography' mean?

Description	Marks
a) provides two appropriate reasons	1–2
b) palaeogeography is the reconstruction of the physical geography of past geologic ages. 1 mark for reconstruction or similar, and 1 mark for some reference to the past geography	1–2
Total	/4
Answer could include, but is not limited to:	
<p>more stable conditions in the ocean than on land</p> <p>more sediments (sand/mud) available in the ocean than on land</p> <p>more rapid soft sediment deposition</p> <p>more animals in ocean to start with so higher chance of some being preserved</p> <p>more likely to be buried by sediment immediately after death in the ocean which increases chances of body parts being preserved</p> <p>loose sediments protect body parts from the external elements while fossilisation occurs</p> <p>lack of air/oxygen on ocean bed</p>	

Sample assessment task

Earth and Environmental Science – General Year 12

Task 9 – Unit 4

Assessment type: Extended task

Conditions

Period allowed for completion of the task: two weeks

Task weighting

10% of the school mark for this pair of units

Task 9: The impact of climate change on a WA biotic resource

(37 marks)

Choose an industry that operates in Western Australia and is based on a biotic resource.

This could include:

- wineries
- fisheries
- forestry
- horticulture
- grain production
- poultry and livestock production for meat, wool, dairy, eggs
- tourism
- other.

You are to investigate this industry and present your findings as a case study report.

In your report, describe how the resource is managed, the impact on the region of the resource management (benefits and problems), and how the resource in this region is likely to be affected by climate change in the future.

What you need to do

- Choose your biotic resource and the area of WA in which it operates. Describe the industry and the region, including a map in your report.
- Describe the current climate of the region and how this relates to the industry.
- Research how climate change could affect this resource and its management in this region in the future.
- Record where you obtain your information for your reference list.
- Write a case study report. (25 marks)
- Prepare for your in-class response based on your research. (12 marks)

In-class questions on your case study

1. How is climate change likely to impact on the climatic conditions of the area you have researched? (4 marks)

2. How will climate change affect the industry that you have studied in the future? Suggest a strategy that could be used to manage this impact. (8 marks)

Marking key for sample assessment Task 9

The impact of climate change on a WA biotic resource

Case study report	Possible mark	Allocated mark
Introduction		
<ul style="list-style-type: none"> Describes the industry, includes a map Briefly describes the region 	1–4 1–2	
Total		/6
Effect of climate change		
<ul style="list-style-type: none"> Describes current climate 	1–2	
<ul style="list-style-type: none"> Relates current climate to production of the resource 	1–2	
<ul style="list-style-type: none"> Correctly relates the effects of climate change to the selected region Lists one or two effects of climate change 	3–4 1–2	
<ul style="list-style-type: none"> Relates the environmental changes to the resource being studied 	1–2	
<ul style="list-style-type: none"> Discusses possible adjustments that are necessary for this resource access in the future Lists a relevant adjustment 	3–4 1–2	
Total		/14
Conclusion		
<ul style="list-style-type: none"> Concisely summarises the findings of the case study Briefly describes the findings of the case study, omitting some key points 	2 1	
Total		/2
References		
<ul style="list-style-type: none"> Lists a variety of resources Uses correct format for references 	1–2 1	
Total		/3
Case study report total		/25
In-class questions		
1. Impact of climate change on region		
<ul style="list-style-type: none"> Describes two or more impacts in detail (e.g. lower rainfall, higher temperatures, rising sea level) Describes one impact 	2–4 1	
Total		/4
2. Effect of climate change on biotic resource		
<ul style="list-style-type: none"> Relates the effect of climate change to the resource in detail Briefly lists relevant effects on the resource 	3–4 1–2	
<ul style="list-style-type: none"> Describes in detail a relevant strategy to manage the impact Describes a strategy 	3–4 1–2	
Total		/8
In-class response total		/12
Overall total		/37