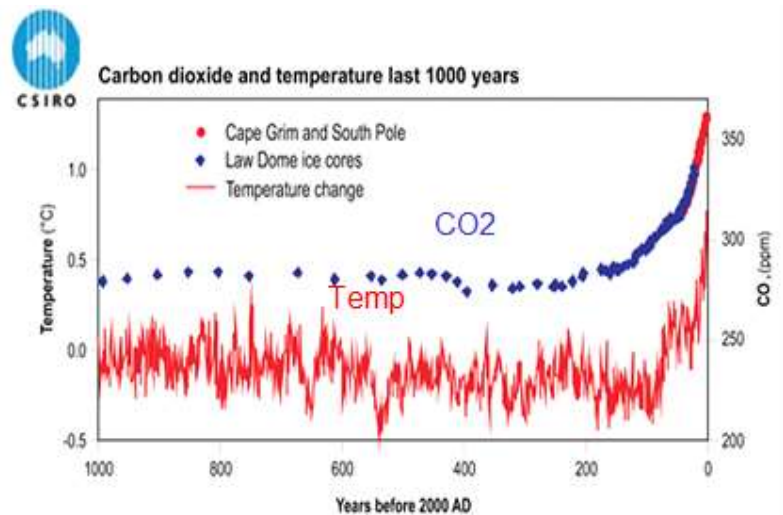




Year 9 Science

Earth and Space

Assessment Task



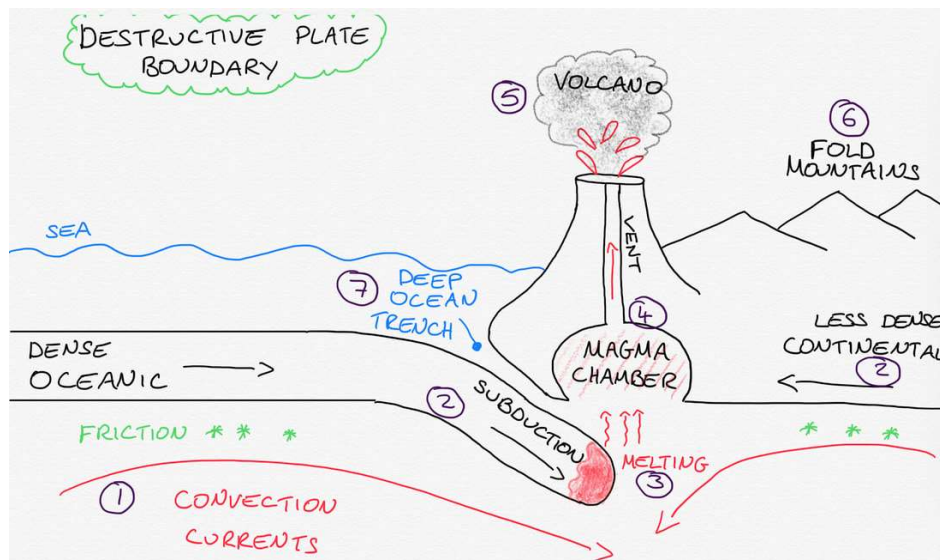
TOPIC: Earth and Space	MARKS: 40
SUBMISSION REQUIREMENTS: All components of this booklet to be submitted to the class teacher by 3pm Thursday September 7th 2020. Digital Copies of this booklet is available on CANVAS and the School website	WEIGHTING: 30%
OUTCOMES TO BE ASSESSED SC5-9WS Presents science ideas, findings and information to a given audience using appropriate scientific language, text types and representations. SC5-13ES Explains how scientific knowledge about global patterns of geological activity and interactions involving systems can be used to inform decisions related to contemporary issues	
DIRECTIONAL VERBS: Explains -Relate cause and effect; make the relationships between things evident; provide why and/or how Identify - Recognise and name Present - To display to others for their consideration.	
TASK DESCRIPTION: Students will complete a series of related tasks using their scientific skills of processing secondary data and information based on a natural geological event. These tasks will include; <ul style="list-style-type: none"> • drawing an annotated scientific diagram • gathering, identifying and presenting secondary source information • tabulating and graphing scientific data • constructing an extended written response. 	
Marking Criteria: See pages 14 and 15 of this booklet.	

Activity 1 – Plate Interactions

To complete this activity, you will need to draw an **annotated** scientific diagram.

Annotated diagrams include not only labels for key components but **also** short *concept captions* **describing** what *processes* occur and where, or **what products** are formed, or **how** *both* related.

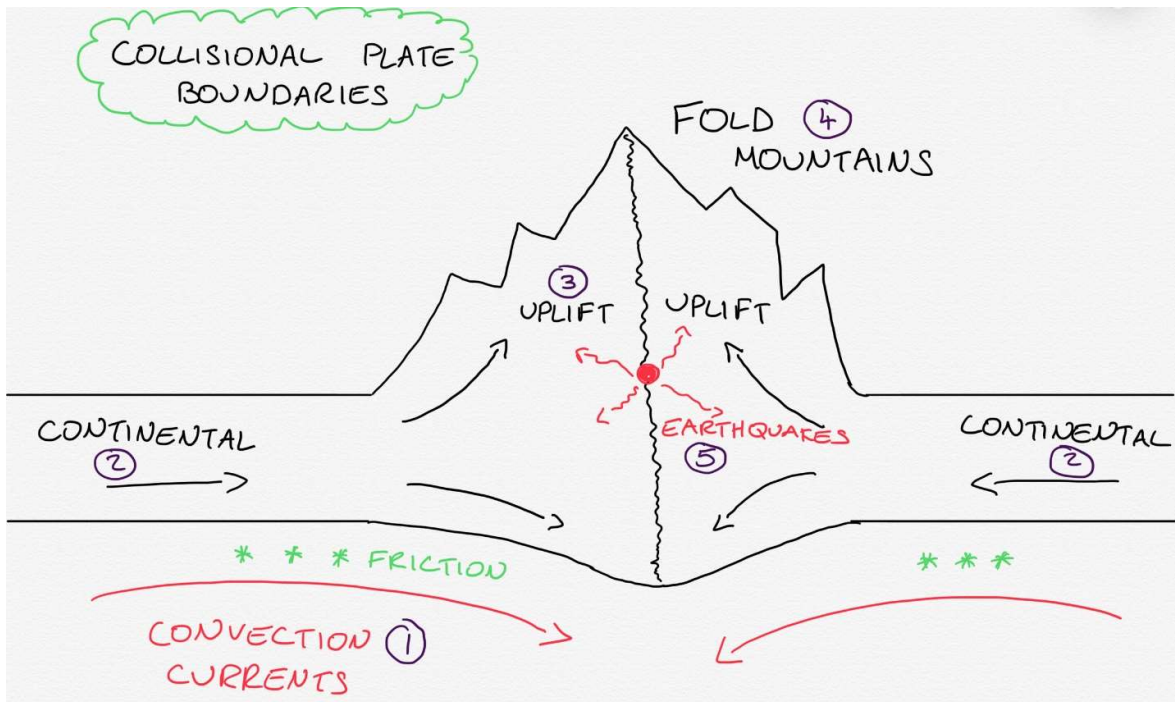
The diagram below is **labelled** and **annotated**



1. Convection currents in the Mantle move towards each other and sink back to the Core.
2. The friction generated between these convection currents and the tectonic plates move them towards each other. The more dense Oceanic plate is subducted under the less dense Continental plate.
3. The subducted plate melts due to the heat and extreme pressure.
4. The melted magma can rise and form a Magma Chamber.
5. As the Magma Chamber grows it builds pressure that can be released in a volcanic eruption.
6. The collision of the two plates stresses the plates which can bend/fold creating Fold Mountains.
7. Where the two plates meet in the ocean they can create a Deep Ocean Trench. These are some of the deepest points on our planet.

See that there are **labels** as well as numbered **annotations** that **describe** or **detail** *processes* and the resultant *products*.

Observe the diagram below of a Collisional plate boundary. Write an annotation for each of the numbers on the diagram.



1. _____

2. _____

3. _____

4. _____

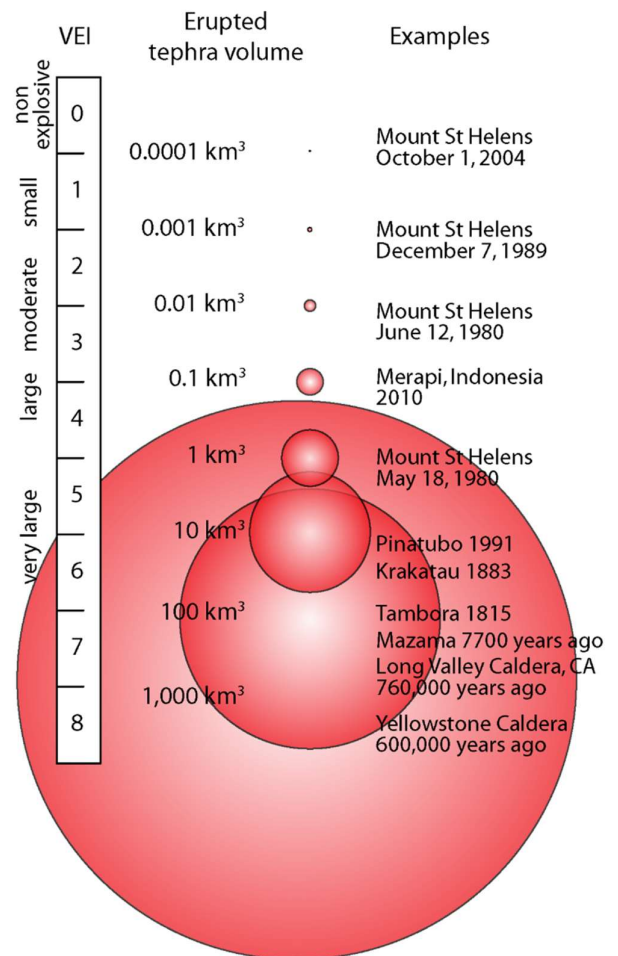
5. _____

Activity 2 – Case Study

To complete this activity; Use the scaffold provided, to present a case study on a **currently active** volcano of your choice. You will explore the volcanoes geological characteristics, eruption history, impacts on the environment and society, and the mitigation strategies used to reduce the risk of the volcanic hazard.

The Volcanic Explosivity Index or VEI

Volcanoes are measured using the Volcanic Explosivity Index, or VEI. This scale uses several volcanic characteristics to judge the size of an eruption. It uses the eruption cloud height, the volume of products erupted and more subjective qualitative observations (such as effusive and mega colossal!) to attribute a number to the eruption from 0 to 8. The amount of material ejected is on a logarithmic scale. The higher you go up the Index, the less frequent the event becomes.



The following web sites provide reliable information on Volcanoes. You might like to visit them to help you gather some information on your chosen volcano.

<https://www.ga.gov.au/education/classroom-resources/hazards/natural-hazards/volcano>

<https://www.nps.gov/subjects/volcanoes/about-volcanoes.htm>

<https://www.usgs.gov/science/science-explorer/natural-hazards/hazards-101>

Case Study Research Scaffold

Choose a specific volcano to study. It could be a historically significant or recent eruption, a well-known volcano, or one of personal interest.

Volcano Name:	
Geographic location:	
Features: <i>Include for example; type, size, surface area, height.</i>	
Geologic Characteristics: <i>Include for example a description of the type of volcano (stratovolcano, Shield volcano, Plinian etc.) Describe its geological formation, including tectonic setting and magma composition</i>	
Eruption History: <i>Present a chronological overview of notable eruptions, including dates, eruption styles, VEI and volcanic products (lava, ash, pyroclastic flows). Highlight any significant impacts on the environment and human settlements</i>	

<p>Environmental and Societal Impacts:</p> <p><i>Discuss the effects of past eruptions on the local environment, such as changes in landscape, soil fertility, and vegetation.</i></p> <p><i>Describe the impact on human settlements, including displacement, casualties, and economic consequences</i></p>	
<p>Mitigation and Preparedness:</p> <p><i>Investigate the strategies employed by authorities to mitigate volcanic hazards.</i></p> <p><i>Discuss preparedness measures, early warning systems, evacuation plans, and community education.</i></p>	
<p>Analysis and Reflection:</p> <p><i>Why is it important to understand the features and behaviour of Volcanoes?</i></p> <p><i>What are the risks and benefits of living close to an active volcano?</i></p>	

Activity 3 – Graphing Ice Core Data

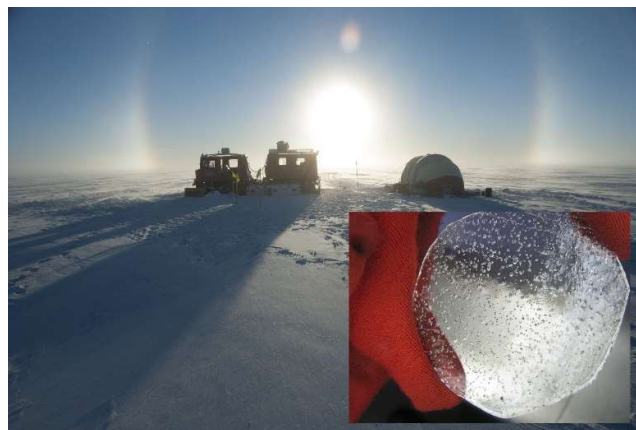
In 2016 a group of Australian scientists travelled to Antarctica and drilled down almost 3km into a glacier and extracted an ice core. The gas bubbles that had been trapped in the ice as it fell over thousands of years was analysed for the concentration of Carbon Dioxide gas(CO₂) present.

Carbon Dioxide is a Greenhouse Gas. Greenhouse gases are important as they help to maintain the Earth's temperature. Too little and the earth would freeze over, too much would make the earth's temperature unbearably hot.

The changes in Carbon Dioxide levels can be used by scientists to help understand how the earth's climate has warmed and cooled over time.

To complete this activity, you will need to construct a graph from the supplied Ice Core data.

Depth (m)	Year BP	CO ₂ levels (ppm)
180	0	280
177	100	260
175	200	240
160	300	220
163	400	240
152	500	260
139	600	280
125	700	300
118	800	320
105	900	340
97	1000	300
89	1100	280
81	1200	260
76	1300	280
70	1400	300
64	1500	320
56	1600	300
47	1700	280
38	1800	300
33	1900	340
25	2000	360
3	2023	420

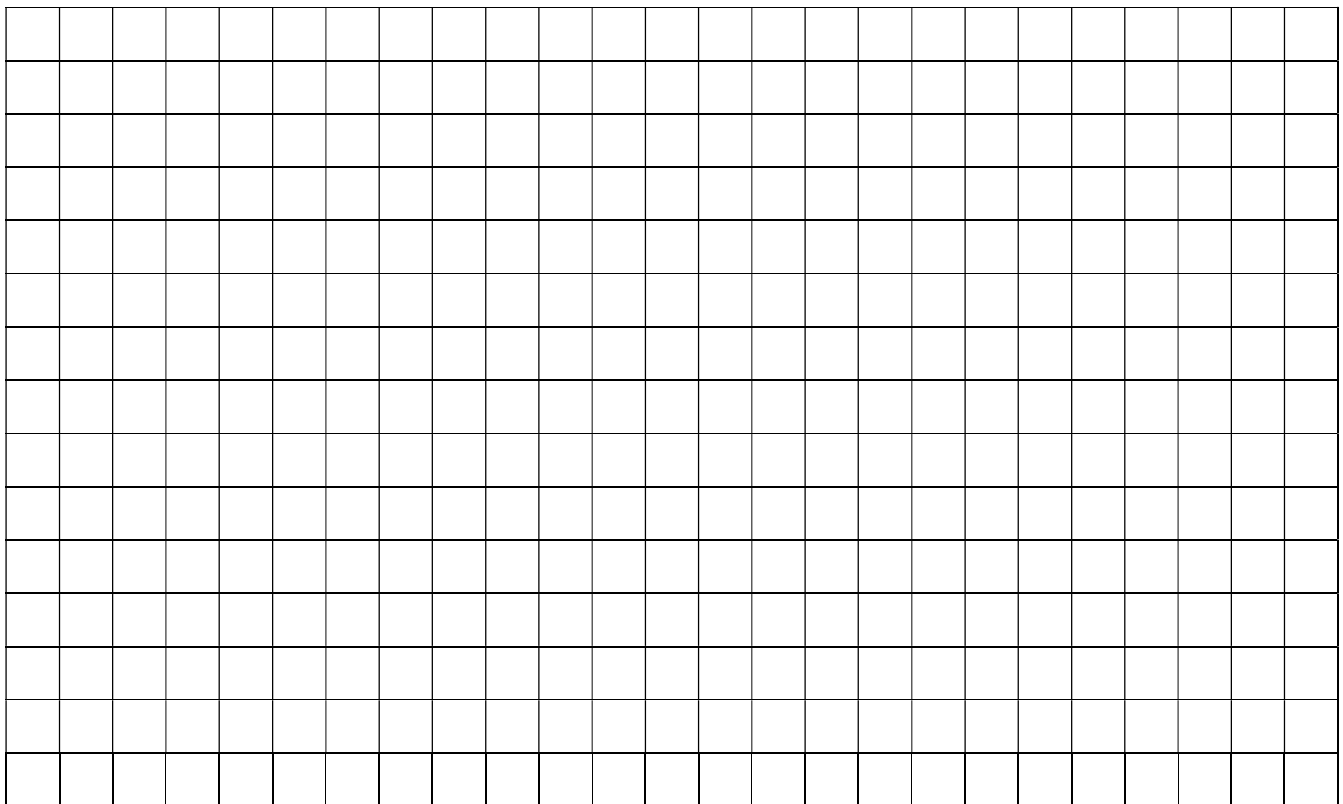


Ice Core Data Graph

Use the data in the table to construct your graph which shows the changes in Carbon dioxide concentration over time.

Include:

- Relevant scientific title
- Labelled horizontal and vertical axis including units
- Even scales for all axis
- Appropriate graph type
- Accurate plotting
- Clarity of data



Activity 4 – Extended Response: Impacts of Climate Change

Volcanoes for the most part, have been helping to maintain our atmospheric gas concentrations and Earth's global temperature, at just the right levels for many millions of years, contributing greenhouse gasses such as Carbon dioxide for all of Earth's history.

There have been very rare occasions, where colossal eruptions have emitted so much greenhouse gas that massive extinctions resulted. At the end of the Permian some 250 million years ago a, super volcano, (the size of India) erupted continuously for tens of thousands of years, outgassing so much greenhouse gas in to the atmosphere, that much of the Earth's ice caps and glaciers melted due to the super greenhouse that was created. Oceans became so acidic due to increased gas concentrations and sea levels rose by so many hundreds of meters that 96% of all marine life and 70% of life on land went extinct. This event was called the ***Great Dying***.



An artist's rendering of the mass extinction of life that occurred toward the end of the Permian Period, about 250 million years ago.

In 1991 Mount Pinatubo in the Philippines, erupted releasing 20 million tonnes of sulphur dioxide and ash particles into the upper atmospheric regions of the stratosphere. This was enough to block the sunlight from reaching the Earth's surface for a short period of time and in the region surrounding the Philippines, the lower atmospheric temperature dropped by 4°C. This affected plant growth and crop yields declined.

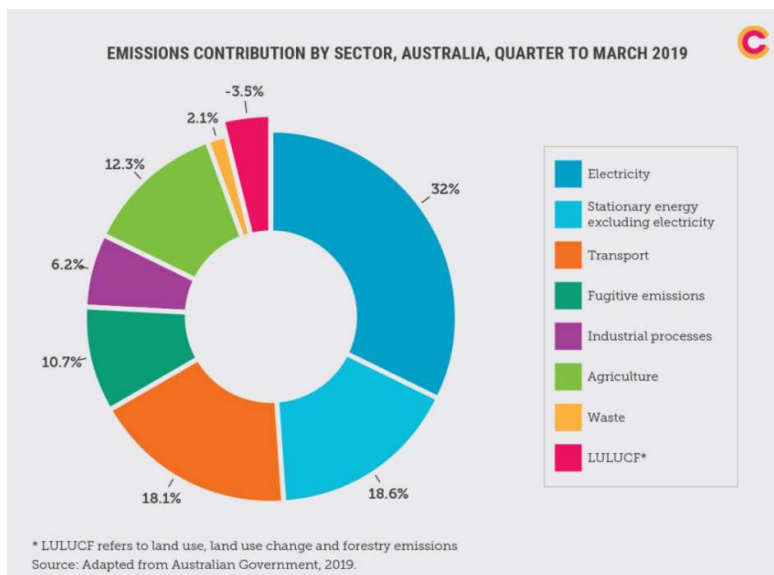


The 1991 Eruption of Mt Pinatubo sending gas and ash into the Stratosphere

Extended Response

Since 2015, global **human caused** carbon dioxide emissions have been around **37 billion** tonnes per year while annual volcanic CO₂ emissions are around **200 million** tonnes.

In 2018 it was measured that Greenhouse Gas emission by human activity was 185 times **higher** than volcanic emissions.



Australia's greenhouse gas emissions by sector, 2019. Electricity remains the biggest contributor of greenhouse gases in Australia.

In the last 250 years, since humans started burning fossil fuels to meet our energy needs for industry, electricity and transport, atmospheric carbon dioxide levels have increased at the fastest ever observed rate. As shown in the graph below.



To complete this activity, you will produce an extended written response (approximately 300 words) in response to the inquiry question:

“How does climate change affect the environment and people?”

Use the Alarm Matrix to help scaffold your response.

You should include:

- Correct Spelling, grammar and punctuation.
- Use of scientific terms, language or conventions eg. Carbon dioxide or CO₂ not CO2.
- Data, such as the change in gas concentrations eg CO₂ levels increasing from 218ppm to 471ppm over 250 years and an example of an activity that caused the increase.
- Incorporation of specific examples to help support your arguments eg. changes in cyclone frequency as a result of increased global temperatures.

Inquiry Question:	“Explain how climate change affects the environment and people?”
Identify: <i>What is causing the climate to change?</i>	
Describe: <i>A change in the environment due to climate change</i>	
Explain: <i>How the change in the environment affects people</i>	

Extended response

“How does climate change affect the environment and people?”

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Activity 1 – Plate Interactions Marking Criteria

SC5-9WS Presents science ideas, findings and information to a given audience using appropriate scientific language, text types and representations.	Mark 10
Independently completed with highly detailed and accurate annotations with correct spelling and scientific terminology. Annotations convey a deep understanding of the geologic process and products formed.	9-10
Completed with minimal guidance with mostly detailed and accurate annotations with correct spelling and some scientific terminology. Annotations convey sound understanding of the geologic process and products formed.	7-8
Completed with guidance with some detailed and mostly accurate annotations with correct spelling and some scientific terminology. Annotations convey sound understanding of the geologic process and products formed.	5-6
Completed with extensive guidance with limited detail. Inaccurate annotations or limited use of scientific terminology . Annotations convey limited understanding of the geologic process and /or products formed.	3-4
Completed with extensive guidance with very limited detail. Inaccurate annotations or limited use of scientific terminology. Some relevant information is provided.	1-2

Activity 2 – Case Study Marking Criteria

SC5-9WS Presents science ideas, findings and information to a given audience using appropriate scientific language, text types and representations. SC5-13ES Explains how scientific knowledge about global patterns of geological activity and interactions involving systems can be used to inform decisions related to contemporary issues	Mark 10
Independently completed with highly detailed, accurate data and information. Spelling is correct with frequent use of scientific terminology and measurement units. Responses convey extensive understanding of volcanic activity and insight into volcanic hazards.	9-10
Completed with minimal guidance with detailed, accurate data and information. Spelling is correct with use of scientific terminology and measurement units. Responses convey thorough understanding of volcanic activity and insight into volcanic hazards.	7-8
Completed with guidance, sound detail with included data and information. Some inaccuracy or inconsistency with spelling, scientific terminology and measurement units. Responses convey sound understanding of volcanic activity and insight into volcanic hazards.	5-6
Completed with substantial guidance with limited detail. Inaccurate spelling, lacking relevant data or information, limited use of scientific terminology . Responses demonstrate limited understanding of volcanic activity or volcanic hazards.	3-4
Completed with extensive guidance with very limited or missing detail. Inaccurate spelling or limited use of scientific terminology. Some relevant information is provided.	1-2

Activity 3 – Ice Core Data Graph Marking Criteria

SC5-9WS Presents science ideas, findings and information to a given audience using appropriate scientific language, text types and representations.	Mark 10
Independently completed with all graphical elements present and accurate. Exceptionally clear with attention to detail.	10
Completed with minimal guidance all graphical elements present. OR Minimal errors or some lack in data clarity.	9-8
Completed with guidance, all graphical elements present. OR some moderate errors or lack in data clarity. Some graphical elements are incomplete or missing.	7-6
Completed with substantial guidance, all graphical elements present. OR Some graphical elements are incorrect, incomplete or missing.	5-4
Completed with extensive guidance all graphical elements present. OR Many graphical elements are incorrect, incomplete or missing.	3-2
An attempt at a graph is evident or non-attempt	1-0

Activity 4 – Extended Response Marking Criteria

SC5-9WS Presents science ideas, findings and information to a given audience using appropriate scientific language, text types and representations. SC5-13ES Explains how scientific knowledge about global patterns of geological activity and interactions involving systems can be used to inform decisions related to contemporary issues	Mark 10
Independently completed with highly detailed, accurate data and information. Response satisfies the presentation brief with correct spelling, punctuation and grammar. Response conveys extensive understanding a cause(s) of climate change and insight into the impact(s) on the environment and people.	9-10
Completed with minimal guidance with detailed, accurate data and information. Response mostly satisfies the presentation brief with correct spelling, punctuation and grammar. Response conveys thorough understanding of a cause of climate change and insight into an impact on the environment and people.	7-8
Completed with guidance, sound detail with included data and information. Response mostly satisfies the presentation brief with some incorrect correct spelling, punctuation and grammar. Response conveys a sound understanding of a cause of climate change and links to an impact on the environment and people	5-6
Completed with substantial guidance with limited detail. Frequent inaccurate spelling, lacking relevant data or information, limited use of scientific terminology. Response conveys a limited understanding of a cause of climate change and a weak links to an impact on the environment and/or people	3-4
Completed with extensive guidance with very limited or missing detail. Inaccurate spelling or limited use of scientific terminology. Some relevant information is provided.	1-2