1. Explain how the risks of a tectonic hazard can be reduced.

(Total 4 marks)

2. Study the table below, showing the largest and deadliest earthquakes from 2008 to 2012.

	Largest Earthquakes			Deadliest Earthquakes		
Year	**Location**	**Magnitude (Richter Scale)**	**Number of deaths**	**Location**	**Magnitude (Richter Scale)**	**Number of deaths**
2012	Sumatra	8.6	No data	Philippines	6.7	113
2011	Japan	9.0	20 896	Japan	9.0	20 896
2010	Chile	8.8	507	Haiti	7.0	316 000
2009	Samoa Islands	8.1	192	Sumatra	7.5	1 117
2008	China	7.9	87 587	China	7.9	87 587

(a) Use information from the table above to complete the Fact File.

Fact File

Earthquake with the highest magnitude — Year _____ Location _____

Earthquake with the highest number of deaths — Year _____ Location _____

How many times has the largest earthquake been the deadliest? — Number of times _____

(3)

(b) Outline **one** reason why the largest earthquakes do not always cause the most deaths.

(2)

(Total 5 marks)

3.

Figure 1

Figure 2

Study **Figures 1 and 2** above, photographs showing responses to the earthquake in Christchurch, New Zealand in 2010.

Use **Figures 1 and 2** to describe how people respond to earthquakes.

(Total 4 marks)

4. Explain why earthquakes and volcanic eruptions take place along destructive plate margins.

(Total 4 marks)

5. Using a volcanic eruption or an earthquake you have studied, describe the short-term responses to the disaster.

(Total 4 marks)

6. Explain the causes of **either** earthquakes **or** volcanic eruptions.

(Total 4 marks)

7. Explain how volcanoes form at constructive plate margins.

(Total 4 marks)

8. Draw an annotated diagram to explain why earthquakes occur at destructive plate margins.

(Total 4 marks)

Mark schemes

1.

Level	Marks	Description
2 (Clear)	3 – 4	AO1 Demonstrates accurate knowledge about the strategy(ies) used to reduce the risks of a tectonic hazard. AO2 Shows a clear understanding of the way(s) that strategy(ies) can help to reduce the risks associated with a tectonic hazard. Explanations are developed.
1 (Basic)	1 – 2	AO1 Demonstrates limited knowledge about the strategy(ies) used to reduce the risks of a tectonic hazard. AO2 Demonstrates limited understanding of the way(s) that strategy(ies) can help to reduce the risks associated with a tectonic hazard. Explanations are partial.
	0	No relevant content.

- **Level 2** (clear) responses will be clear explanation(s) or linked statements. Some accurate use of geographical terms.
- **Level 1** (basic) responses are likely to be simple random statements. Limited subject vocabulary used.
- Max Level 1 for strategies used to reduce the risk of non-tectonic types of hazard.
- Answers may focus on one or more of monitoring, prediction, protection and planning. Maximum marks can be achieved for a developed answer about any one type of strategy.

Indicative content

- The command word is “explain” which requires an account of how and why one or more strategies are helpful in reducing the risks posed by a tectonic hazard.
- Answers are likely to be specific to earthquakes or volcanoes, but credit more general responses that are appropriate to both. Allow reference to tsunamis as a type of tectonic hazard.
- Strategies to reduce risk are likely to involve one or more of the following, although it is not necessary to use the same terms:
- Monitoring – recording physical changes, such as earthquake tremors around a volcano, to help forecast when and where a natural hazard might strike.
- Prediction – attempts to forecast when and where a hazard will strike. This can be done to some extent for volcanic eruptions, but less reliably for earthquakes.
- Planning – actions taken to enable communities to respond to, and recover from, natural disasters, through emergency evacuation plans and warning systems.
- Protection – actions taken before a hazard strikes to reduce its impact, such as educating people or improving building design.
- For **earthquakes, monitoring** and **prediction** may involve using seismometers to monitor earth tremors, but specific times and locations are not possible to predict.

- **Protection** includes constructing buildings so that they are safe to live in and will not collapse. Some examples of building improvements are rubber shock absorbers in the foundations to absorb the Earth tremors, steel frames that can sway during Earth movements, and open areas outside of the buildings where people can assemble during an evacuation.
- **Planning**. Hospitals, emergency services and residents may practise for an earthquake. They have drills in all public buildings so that people know what to do in the event of an earthquake. This helps to reduce the impact and increases their chance of survival. Planning may also involve emergency evacuation plans.
- **For volcanic eruptions, monitoring and prediction** may involve measuring gas concentrations, using tiltmeters to monitor changes in the volcano's surface), using seismometers to measure small earthquakes and tremors and thermal heat sensors to detect changes in the temperature of the volcano's surface.
- **Protection** is difficult but it may be possible to use earth embankments or explosives to divert lava flows away from property.
- **Planning.** Hazard maps have been produced for many of the world's most dangerous volcanoes, showing the likely areas to be affected. They can be used in planning to restrict certain land uses or to identify which areas need to be evacuated when an eruption is about to happen.

AO1 – 2 marks
AO2 – 2 marks

[4]

2. *This mark scheme is from a question paper that assessed a previous specification and has not been edited.*

Click [here] to access a document explaining the differences that might apply to it.

(a) Earthquake with highest magnitude: 2011 Japan.
Earthquake with highest no. of deaths: 2010 Haiti.
Number of times…: Two.

AO1 – 1
AO3 – 2
3

(b) One basic point plus one elaboration here, e.g. population density maybe low so few people present in the danger area; some areas may be poor and so buildings just collapse killing people.
Level of development, depth of focus.
1 + 1

AO1 – 1
AO2 – 1
2

[5]

3.

This mark scheme is from a question paper that assessed a previous specification and has not been edited.

Click [here] to access a document explaining the differences that might apply to it.

Figure 1 shows advice given to people and tells them what they must do and how they will know if or when to evacuate. There are clear guidelines to keep people safe. Figure 2 shows damaged buildings being shored up using metal structures to prevent them from falling; the coloured area is cordoned off by barriers and fencing.

Level 1 (Basic) (1 – 2 marks)
There is reference to at least one photo. Text will be selectively 'lifted' rather than used. Separate, simple points are made.
People must drop, cover, hold in an earthquake. They have to stay behind the fences. There is scaffolding around the big building.

Level 2 (Clear) (3 – 4 marks)
Both photos are referred to – although may be imbalanced. Text is used. Develops and links points.
People know what to do if an earthquake happens because the sign tells them to seek cover and to follow instructions given. They know if they hear a siren that doesn't stop that they must get out. The area around the building with scaffolding is cordoned off so people cannot go in as the cathedral has to be supported in case part of it falls.

AO2 – 2
AO3 – 2

[4]

4.

Level	Marks	Description
2 (Clear)	3 – 4	AO1 Demonstrates accurate knowledge of earthquakes and volcanoes and their link to destructive plate margins. AO2 Shows some geographical understanding of why earthquakes and volcanoes take place along destructive plate margins.
1 (Basic)	1 – 2	AO1 Demonstrates limited knowledge about earthquakes and/or volcanoes and their link to destructive plate margins. AO2 Shows limited geographical understanding of why earthquakes and/or volcanoes take place along destructive plate margins.
	0	No relevant content.

- **Level 2 (clear) responses** are likely to have clear reasons why earthquakes and volcanoes take place along destructive plate margins.
- **Level 1 (basic) responses** will be simple statements with limited understanding of why earthquakes and/or volcanoes take place along destructive plate margins.
- Max Level 1 for explanation of one of earthquakes or volcanoes only.

Indicative content

- This question requires an explanation of why earthquakes and volcanoes take place along destructive plate margins.
- Destructive plate margins occur when two tectonic plates move towards each other and one is subducted under the other.
- Allow reference to collision boundaries. If two continental plates collide, the pressure and strain may cause an earthquake.
- If an oceanic and continental plate collide, the denser oceanic plate is subducted and sinks below the continental plate and into the Earth's mantle. This causes part of the mantle to melt and hot magma may rise up through the overlying mantle and lithosphere. This may eventually erupt out of the earth's surface causing a volcano.
- Accept explanations that refer to slab pull and gravitational movement of plates: the denser plate sinks into the mantle under the influence of gravity, which pulls the rest of the plate along behind it (slab pull).
- An earthquake may occur because as the plates converge, pressure builds up, the rock may fracture and the pressure is released as an earthquake.

AO1 – 2 marks
AO2 – 2 marks

[4]

5. *This mark scheme is from a question paper that assessed a previous specification and has not been edited.*

Click [here] to access a document explaining the differences that might apply to it.

Level marking

Level 1 (1-2 marks)
Simple, may be without an example e.g. people were evacuated, aid was sent.

Level 2 (3-4 marks)
Clear, information rings true for example given, e.g. in Montserrat the people moved to the north of the island and e.g. tents from the UK were sent.
2 responses for top of Level 2.
No credit simply for effects.

[4]

6. *This mark scheme is from a question paper that assessed a previous specification and has not been edited.*

Click [here] to access a document explaining the differences that might apply to it.

Level 1 Basic (1–2 marks)
Gives a basic idea of plate movement. Elaboration is very limited.
E.g. plates moving towards each other. One plate pushed below another. As plates move there are shock waves.
Knowledge of basic information.
Simple understanding.
Few links; limited detail; uses a limited range of specialist terms.
Limited evidence of sentence structure. Frequent spelling, punctuation and grammatical errors.

Level 2 Clear (3–4 marks)
Gives clear indication of process, linking statements.
E.g. one plate subducted beneath another. As plates move, they snag and tension builds up. A sudden movement sends out shock waves, which causes earthquakes.
Destructive, constructive, conservative, collision, convergent, divergent – correct use of = L2
Knowledge of accurate information.
Clear understanding.
Answers have some linkages; occasional detail/exemplar; uses some specialist terms where appropriate.
Clear evidence of sentence structure. Some spelling, punctuation and grammatical errors.

[4]

7. *This mark scheme is from a question paper that assessed a previous specification and has not been edited.*

Click [here] to access a document explaining the differences that might apply to it.

There should be reference to two (continental) plates moving apart. This is the result of convection currents in the Earth's crust that determine the direction of movement. As they pull apart, a 'gap' is created between the plates. This is filled by magma rising up out of the mantle to plug the gap and make the crust complete.
As this occurs again and again, layers of lava solidify and build up to create volcanoes. This often happens under the oceans.

Level 1 Basic (1-2) marks
A partial explanation – may have start, end or random parts of sequence.
Sequence incomplete.
Plates move apart and a gap is left. Lava builds up in the hole. Volcanoes are found there.

CMI annotation

- ***L1 Partial explanation. Incomplete sequence***

Level 2 Clear (3-4 marks)
Stages are clear and explanation is coherent and complete.
Sequence complete.
Develops and links points.
Plates pull apart due to convection currents in the mantle.
A gap is created, which is plugged by rising magma. This cools to form lava. As the plates shift apart again, more magma is released from the mantle to fill the gap and the layers build up to form a volcano under the ocean.
Diagrams may be drawn to support text.

CMI annotation

- ***L2 Clear and sequential. Explanation clear***

AO1 – 2
AO2 – 2

[4]

8. *This mark scheme is from a question paper that assessed a previous specification and has not been edited.*

Click [here] to access a document explaining the differences that might apply to it.

Two plates move towards each other. One is made from oceanic crust and one of continental crust. The oceanic plate is denser than the continental. It sinks beneath the continental plate – which is subduction. This exerts great pressure on the crust and the release of the pressure that has built up over time causes the plates to shift and results in an earthquake. Diagram should show oceanic and continental crust, direction of plate movement and consequences.
Diagrams may cross section or three dimensional.

Level 1 (Basic) (1 – 2 marks)
A partial diagram – piecemeal – offers some back up to labels / text.
Sequence incomplete – may show initial plate movement or the release of pressure.

Level 2 (Clear) (3 – 4 marks)
Diagram is clear and supports labels / text – makes clearer.
Sequence complete – will be clear how specific plate movement at the destructive boundary results in earthquakes.
Develops points.

AO1 – 2
AO2 – 1
AO3 – 1

[4]