Name: _____

Montsaye ACADEMY
Excellence Resilience Aspiration

# Geography

## Homework Booklet

# Year 9

## Term 3: Tectonic Hazards

| | | | |
|---|---|---|---|
| Homework 1 | Learn keywords | Due date: | Completed? Yes/No |
| Homework 2 | Guided Reading Activity | Due date: | Completed? Yes/No |
| Homework 3 | Prepare for knowledge test | Due date: | Completed? Yes/No |

# Geography Homework Tasks Term 3

## Homework 1 - Learn the keywords below for a mini test at the start of next lesson.

You could read through the words, write them out, create a match up activity or get someone to test you.

| Keyword | Definition |
|---|---|
| **Tectonic hazard** | A hazard produced by the movement of the earth's tectonic plates and the processes that cause the movement. |
| **Plate boundaries** | The places where two or more tectonic plates meet. |
| **Tsunamis** | Destructive waves created by undersea earthquakes or explosive volcanic island eruptions. |
| **Pyroclastic flow** | A dense, destructive mass of very hot ash, lava fragments, and gases ejected explosively from a volcano and typically flowing at great speed. |
| **Volcanic hotspots** | An area of the Earth's mantle from which hot plumes rise upward, forming volcanoes on the overlying crust. They are not on plate boundaries. |
| **Magma** | Hot fluid or semifluid material below or within the earth's crust from which lava and other igneous rock is formed by cooling. |
| **Lava** | Rock that in its molten form (as magma) issues from volcanoes; lava is what magma is called when it reaches the surface. |
| **Subduction Zone** | Is the process that takes place at convergent boundaries by which one tectonic plate moves under another tectonic plate, sinking into the Earth's mantle, as the plates converge |
| **Epicentre** | The point on the earth's surface directly above the hypocentre, where the energy of an earthquake is first released. |

## Homework 2 – Complete the guided reading activity on the next page.

You may wish to write your answers out on paper, so you have more space.

## Homework 3 - Use the knowledge organiser and the guided reading activity to make flashcards, a revision poster or notes for your end of term assessment

guided READING

# AN INCONVENIENT PLUME

The eruption of Eyjafjallajokull, Iceland

In April and May 2010, a little-known Icelandic volcano erupted and caused massive disruption to the industries, business and airline companies of Europe and further afield. It's outpouring of ash led to the skies above Northern Europe being empty for several days. Why was this so? Several factors make this eruption punch well above its weight.

**The location of Eyjafjallajokull**

Iceland sits astride the Mid Atlantic Ridge, an important tectonic plate boundary, and is literally being split in two. To its east, the Eurasian plate is moving eastwards, whilst the west of Iceland is slowly moving towards the USA. This is a constructive boundary where, as the plates move apart, new material (magma) rises from the earth's mantle below to create new rock at its spreading edges. This plate boundary is further complicated by the fact that Iceland is thought to be located over a hotspot in the upper mantle, so there is more magma production and volcanic activity than might otherwise be expected. A hotspot is where the earth's crust is thinner and it is easier for magma to upwell in the region. Eyjafjallajokull lies in the south of Iceland and is 1660m high, 20km from its more famous sister, Katla.

**What occurred**

Eruptions at constructive margins are generally less explosive than at destructive ones although at one point Eyjafjallajokull achieved a VEI (volcanic explosivity index) of 4 when its ash plume was blown almost 10km into the atmosphere. However, it was not the eruptive power of the volcano which was the main problem. The volcano was overlain with an ice cap 250m thick and as the magma rose to the surface, the lava that was emitted passed through the ice and melted it. The mix of water and lava increased the explosivity in the caldera and helped eject ash high into the atmosphere where it caused the most serious impacts of the eruption. The ash ejected from the volcano was cooled by the glacier ice, creating a fine, glassy texture with 58% silica (much higher than normal). Iceland is located beneath the fast flowing Polar jet stream winds which picked up this ash and spread it across Europe. The melting ice also caused a surge or jokulhlaup – a fast flowing flood of water mixed with volcanic material.

**The impacts of the Eyafjallajokull eruption**

The impacts of the eruption were felt locally in Iceland, across much of northern and Western Europe and the USA. However, the eruption did not cause any discernible impact on global temperatures as the material emitted from the volcano contained relatively little sulpher (which is what can lead to colder temperatures following an eruption). Whilst the main period of the impact only lasted for around 2 weeks, what it did show was the way the impact was modified by an interconnected globalised world.

**1** When did the eruption take place?

**2** Why does the location of Iceland make it vulnerable to tectonic events?

**3** What is a 'hotspot'?

**4** Where is Eyjafjallajokull located?

**5** How is the magnitude of volcanos measured?

**6** Why are eruptions at constructive margins generally less explosive than at destructive margins?

**7** Why was this eruption worse than expected?

**8** What do you think are the effects of a jokulhlaup?

**9** What do you think are the effects of an ash cloud?

**10** How long did the eruption last?

**11** How does globalization modify the impacts of tectonic events?

# Knowledge Organiser: Y9 Tectonics

## Overview of topic

What is a tectonic hazard?
Where are volcanoes and earthquakes located?
What are plate boundaries and what different types are there?
What are the impacts of volcanic eruptions?
What are the impacts of earthquakes?
How can people prepare for earthquakes?
What are the impacts of tsumanis?
Why do people live in tectonic hazard risk areas?

## Keywords

**Tectonic hazard** is a hazard produced by the movement of the earth's tectonic plates and the processes that cause the movement.
**Plate boundaries** are the places where two or more tectonic plates meet.
**Constructive plate boundaries** are where two plates move apart usually in the middle of oceans creating effusive (lava) volcanoes and earthquakes.
**Destructive plate boundaries** are where two plate collide and the one plate (oceanic) slides down under the other one (continental or oceanic) creating explosive (ash and pyroclastic flow) volcanoes and earthquakes.
**Conservative plate boundaries** are where two plates slide past each other creating only earthquakes.
**Tsunamis** are destructive waves created by undersea earthquakes or explosive volcanic island eruptions.

## Key concept #1

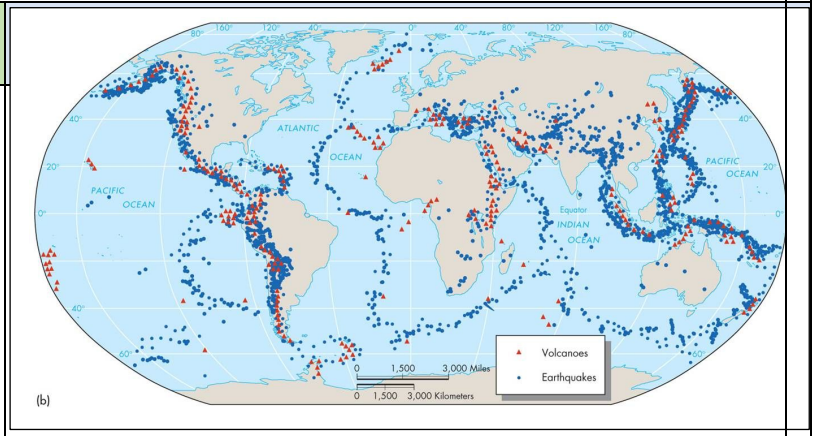
*Where are volcanoes and earthquakes located?*

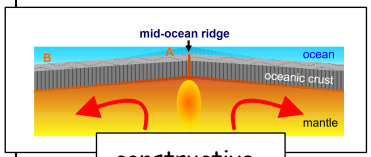
Most volcanoes and earthquakes are located on tectonic plate boundaries. The earth's crust consists of about 15 large tectonic plates and many small ones. These move at a rate between 4 and 16 cm per year, because of plastic flow in the upper mantle. Some plates are made up of dense oceanic (basaltic) crust, most are made up of oceanic crust parts and other parts that are less dense continental (granitic) crust. There are three different types of plate boundary depending on which way the plates are moving. Movement and heat from the mantle partially melts some of the crust producing magma and volcanoes. Stress, friction and sudden movement produces earthquakes.

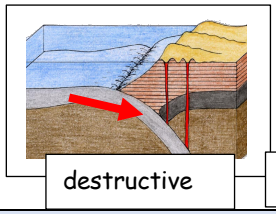
## Question #2

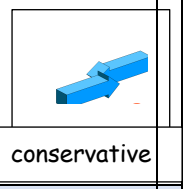
*What are the impacts of volcanic eruptions?*

Volcanic eruptions differ in size and in what comes out of the volcano. Volcanoes at **constructive** plate boundaries (e.g. Mid-Atlantic Ridge – Iceland) **erupt runny basaltic lava** and some ash, but are usually not explosive and not that dangerous. The volcanoes tend to be circular shield shapes. Eruptions often come out of cracks or **fissures** because the crust is being pulled apart. Volcanoes at **destructive** plate boundaries (e.g. Pacific Ring of Fire) **explode thick andesitic lava** and **ash** and **pyroclastic flows** (very hot heavy ash travelling at great speed) that are very dangerous. Other volcanic hazards include **poisonous gases** and **mudflows** (mix of water and ash travelling at great speed).




## Key concept # 3 *What are the impacts of earthquakes?*

## Geographical Skills

Earthquakes cause **ground shaking**, building damage and collapse. **Shallow earthquakes**, more crustal movement and **energy release** (high Richter scale) cause the most damage and casualties. LIC earthquakes cause the most damage and casualties as there is a lack of **adequate preparation** and **'life-safe' building design**, in comparison to HICs.

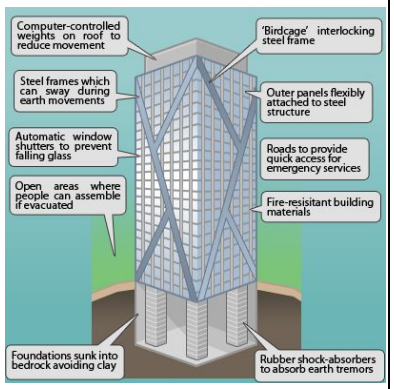
- Identify and describe volcano and earthquake distribution patterns om maps
- Extract and interpret data from hazard tables
- Describe and interpret patterns on graphs of hazard events
- Annotate diagrams of different plate boundaries to explain the processes happening at each
- Explain the formation of several different erosional and depositional features

## Case study #1 Montserrat volcano 1995-1998

Montserrat is small LIC located on a **destructive plate boundary** (subduction zone) on the edge of the Caribbean Sea. Short term impacts of the explosive pyroclastic flow eruptions were: 23 deaths and over 100 injured, Plymouth (capital) covered in ash and abandoned, high % of homes, businesses and important infrastructure destroyed, main airport and port closed, 75% of the island was covered in ash, 5000 people (50% of population) evacuated to the north of island. Long term impacts: long time taken to rebuild homes and vital infrastructure e.g. roads, telephone lines, ongoing problems of respiratory disease, environmental damage to beaches, forests, wildlife and offshore coral reefs, population fell from 12,000 in 1995 to 1,500 by 2001, serious skills shortage due to emigration. Farming and tourist economy devastated.


## Case study#2 Haiti earthquake 2010

Haiti is a very low income LIC in the Caribbean Sea located on a conservative plate boundary. 7.0 Richter scale shallow earthquake in Jan 2010 near to the capital of Port-au-Prince (2.5 million people). 222,500 people killed, 300,572 injured, 2.5 million displaced from their homes and $7.8 billion in damages and losses. 1.5 million people were made homeless, forcing 800,000 people to live outdoors in 450 improvised camps in Port-au-Prince. Only 40% of these had improvised shelter material and only 3 camps had potable water. The main port was destroyed, airport runways were damaged and phone lines failed soon after the earthquake, adding to the chaos as communications were impossible. These figures make the Haiti earthquake more than twice as lethal as any previous magnitude 7.0 event, and the reasons for this lie in low level of development of Haiti. A 7.0 earthquake in San Francisco (USA) in 1979 killed only 59 people. Haiti had no earthquake building rules and builders had used brittle steel, weak cement mixed with dirty or salty sand and often, steel reinforcement rods had been terminated at the joints between columns and floors of buildings, where earthquake stresses are highest (so buildings were not 'life-safe' and just collapsed killing people inside them).


'Life-safe' buildings like in San Francisco (USA) an HIC

## Homework and enrichment opportunities

- Research a contrasting HIC example of a volcanic eruption such as Eyjafjallajkull (Iceland 2010). Create a table of similarities and differences between the impacts of this and the Montserrat eruptions.
- Research a contrasting HIC example of an earthquake such as San Francisco 1979. Create a table of similarities and differences between this and the Haiti earthquake.

## 8 marker example (WAGOLL)

**Using examples of places explain why earthquakes have greater impacts in LICs than in HICs.**
The Jan 2010 Haiti earthquake killed 222,500 people and made 1.5 million people homeless. It was a shallow focus earthquake with a 7.0 Richter scale magnitude. In 1979 a 7.0 Richter scale earthquake happened near San Francisco (USA) killing only 59 people. The Haiti earthquake was twice as lethal as any previous magnitude 7.0 event. San Francisco is in one of the highest income HICs and is very well prepared for earthquakes. It lies near to the San Andreas Fault and is at high risk of destructive earthquakes. As a result the authorities in San Francisco and California have made sure that the area is very well prepared. We cannot predict when an earthquake will happen but we can identify high risk

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|---|---|
| • Research an example of a tsunami: Indian Ocean 2004 or Japan 2011. Create a factfile describing the impacts and explaining the causes of and responses to the disaster. | zones like conservative plate boundaries. Being prepared for an earthquake means having earthquake practice drills so that people know what to do during an earthquake to survive, but it also means having strict building regulations to make sure that buildings are 'life-safe' so that they do not collapse onto people during an earthquake. Neither of these had happened in Haiti, because it is a very low income LIC and did not have the money or efficient government to make these things happen. Buildings collapsed in Haiti because they had been poorly constructed without any proper rules. |