# Y9 MID-TERM GEOGRAPHY REVISION GUIDE

Exam Date: November 2024

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# UNIT 1:

# TECTONIC HAZARDS



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# THE REVISION GUIDE

This revision guide is aimed to **support** the work you have completed with your teacher in your **OneNote** this year. Use it thoroughly alongside your OneNote to prepare for your upcoming **November exam**. The guide is split into the following sections:

**A:** Structure of the Earth

**B:** The Distribution of Earthquakes and Volcanoes

**C:** Plate Boundaries

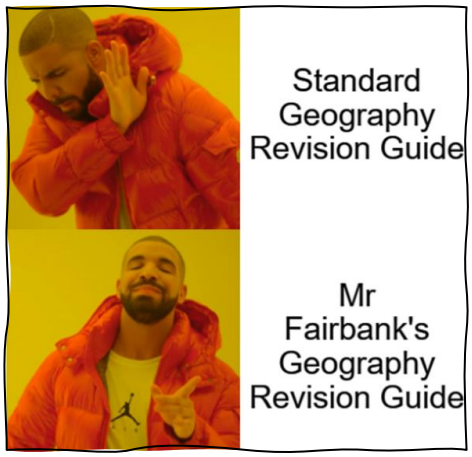
**D:** Volcanoes

**E:** Earthquakes

**F:** Haiti, 2010 Earthquake Case Study

**G:** Sample Exam Questions

**H:** Keywords



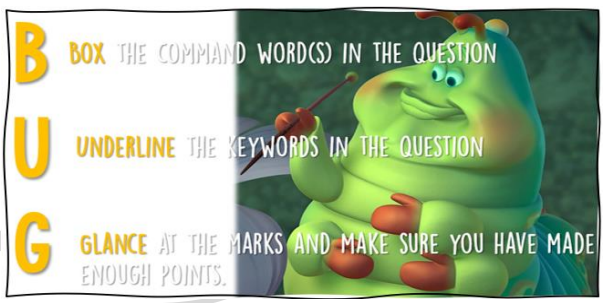

# THE EXAM: WHAT TO EXPECT

**Style of questions:**

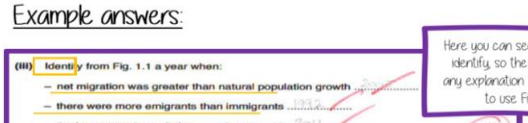
The exam will consist of a series of **short response** questions and one **extended response** question (7-mark case study required).. Below are some sample answers and examiners comments. It is very important that you remember to **BUG** every question and really focus on the **command word**, so you know what the examiner wants you to write. Have a look at the table below to remind yourself of the command words to expect then read the sample answers and comments.

**TYPICAL EXAM COMMAND TERMS:**

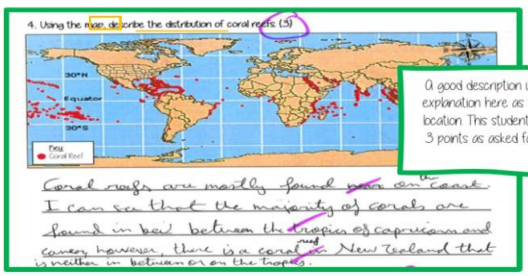
**ANALYSE:** Separate information and discuss its parts.
**COMPARE:** Describe the similarities and differences of at least two things.
**DEFINE:** Give the meaning of a word.
**DESCRIBE:** Give the main characteristics or account in words.
**DISCUSS:** Bring out the important points, consider the good/bad and conclude.
**EVALUATE:** Give an opinion by exploring the pros and cons of something.
**EXPLAIN:** give reasons on why or how something happens.
**IDENTIFY:** give an example.



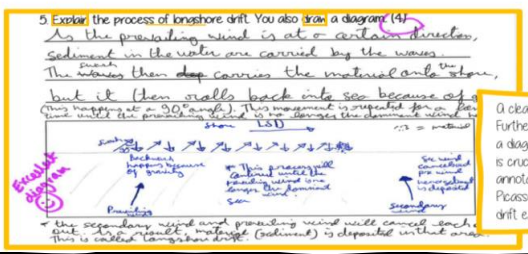

Example answers:


(iii) Identify from Fig. 1.1 a year when:
– net migration was greater than natural population growth ...2...
– there were more emigrants than immigrants ...2014...
– the largest total population growth occurred. ...2011...
[3]

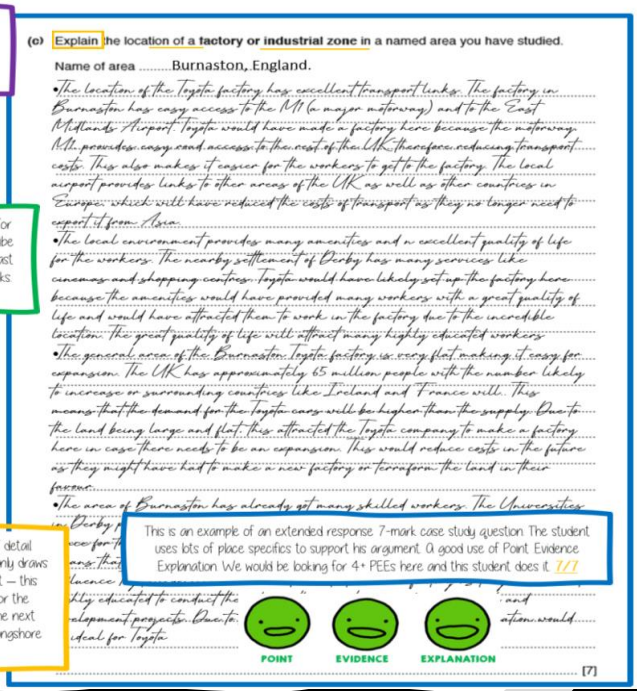
Here you can see the command word is identify, so the student doesn't need any explanation or detail and just needs to use Fig 1.1 only. 3/3


4. Using the map, describe the distribution of coral reefs. (3)
Coral reefs are mostly found near or on coast. I can see that the majority of corals are found in between the tropics of capricorn and cancer however there is a coral in New Zealand that is neither in between or on the tropics.

A good description using the map. No need for explanation here as the question as to describe location. This student also clearly makes at least 3 points as asked for by the number of marks. 3/3


5 Explain the process of longshore drift. You also draw a diagram. (4)
As the prevailing wind is at a certain direction, Sediment in the water are carried by the waves. The waves then drop carries the material onto the shore, but it then rolls back into sea because of gravity (this happens at a 90° angle). This movement is repeated for a few more times until the prevailing wind is no longer the dominant wind.

A clear explanation with lots of detail. Furthermore, the student not only draws a diagram but also annotates it – this is crucial. Marks are awarded for the annotations not for creating the next Picasso painting. All points of longshore drift explained. 4/4


(c) Explain the location of a factory or industrial zone in a named area you have studied.
Name of area .....Burnaston, England.
•The location of the Toyota factory has excellent transport links. The factory in Burnaston has easy access to the M1 (a major motorway) and to the East Midlands Airport. Toyota would have made a factory here because the motorway M1 provides easy road access to the rest of the UK, therefore reducing transport costs. This also makes it easier for the workers to get to the factory. The local airport provides links to other areas of the UK as well as other countries in Europe, which will have reduced the costs of transport as they no longer need to export it from Asia.
•The local environment provides many amenities and an excellent quality of life for the workers. The nearby settlement of Derby has many services like cinemas and shopping centres. Toyota would have likely set up the factory here because the amenities would have provided many workers with a great quality of life and would have attracted them to work in the factory due to the incredible location. The great quality of life will attract many highly educated workers.
•The general area of the Burnaston Toyota factory is very flat making it easy for expansion. The UK has approximately 65 million people with the number likely to increase as surrounding countries like Ireland and France will. This means that the demand for the Toyota cars will be higher than the supply. Due to the land being large and flat, this attracted the Toyota company to make a factory here in case there needs to be an expansion. This would reduce costs in the future as they might have had to make a new factory or terraform the land in their favour.
•The area of Burnaston has already got many skilled workers. The Universities of Derby [illegible] educated to conduct the [illegible] and attain would [illegible] ideal for Toyota.
[7]

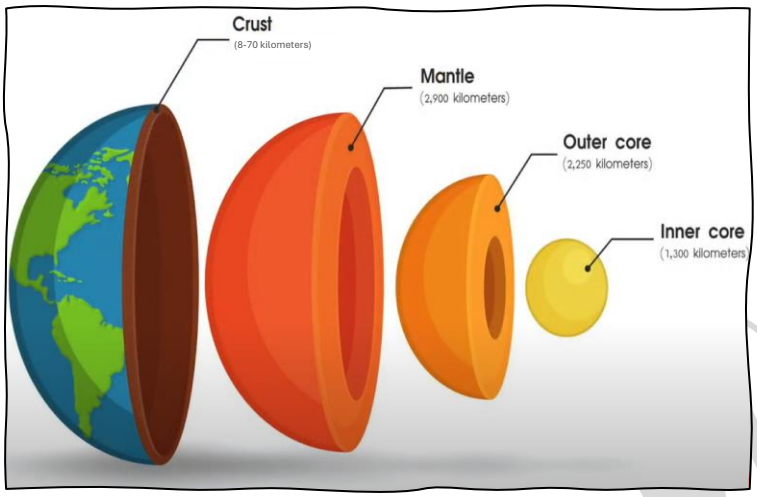
This is an example of an extended response 7-mark case study question. The student uses lots of place specifics to support his argument. A good use of Point Evidence Explanation. We would be looking for 4+ PEEs here and this student does it. 7/7

POINT EVIDENCE EXPLANATION

# A: THE STRUCTURE OF THE EARTH

## The Structure of The Earth:

Understanding the structure of the Earth is essential for grasping tectonics. The Earth is made up of four main layers: the **crust**, **mantle**, **outer core**, and **inner core**. The crust is the outermost layer where we live, and it's broken into plates that float on the semi-fluid mantle beneath. Beneath the mantle, the outer core is liquid, and the inner core is solid due to immense pressure.




- *Can you identify the layers and describe characteristics of the Earth?*

**1.The Inner core** is in the centre and is the hottest part of the Earth. It is solid and made up of iron and nickel with temperatures of up to 5,500°C.

**2.The Outer core** is the layer surrounding the inner core. It is a liquid layer, also made up of iron and nickel.

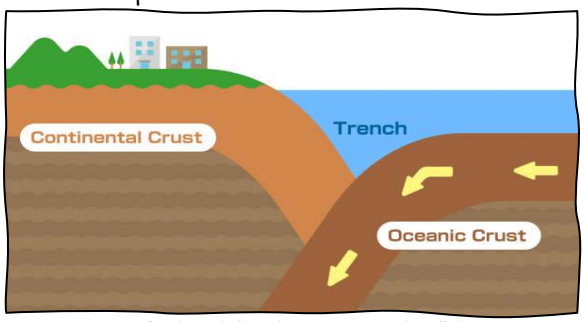
**3.The Mantle** is the thickest section of the Earth at approximately 2,900 km. The mantle is made up of semi-molten rock called magma.

**4.The Crust** The outermost layer, divided into tectonic plates. It's thin, with oceanic crust about 5 km thick and continental crust up to 70 km thick.

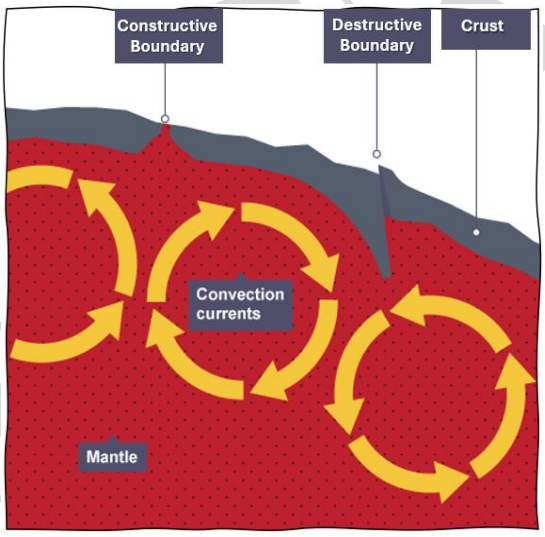
## Two Types of Tectonic Plates

The Earth's crust is divided into many tectonic plates moving in various directions due to the mantle forces (we will learn about this below). There are **two** main types of tectonic plates:

1. **Continental** plates, which are thicker and **less dense**, forming landmasses.
2. **Oceanic** plates, which are thinner and **denser**, found beneath oceans. These differences lead to unique interactions at plate boundaries, influencing tectonic activity




- *Continental and oceanic crust colliding.*




- *Convection currents in the mantle*

## Why do Tectonic Plates Move?

### 1. Convection Currents:

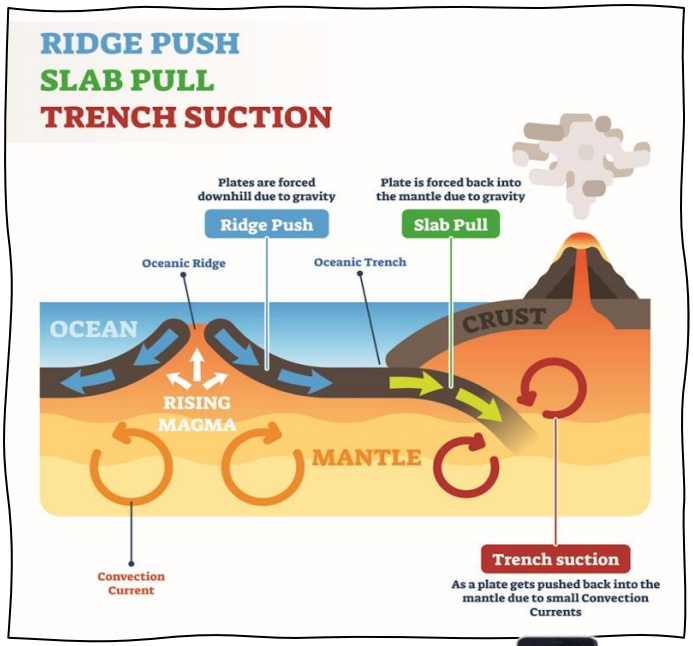
Convection currents are movements within the Earth's **mantle** driven by **heat** from the **core**. The core heats the lower mantle, causing it to become less dense and **rise** toward the crust. As it **cools**, it becomes denser and **sinks** back down, creating a **continuous cycle**. These currents exert **drag** on tectonic plates, facilitating their movement and resulting in various interactions at **constructive**, **destructive**, and **conservative** boundaries.

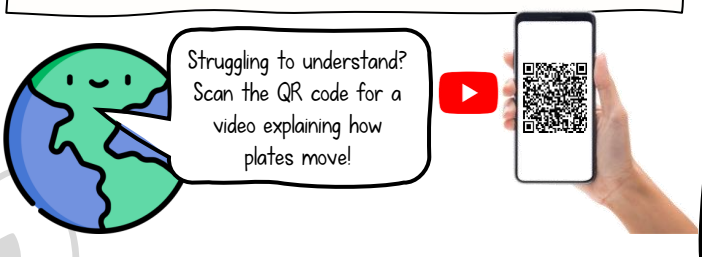
## 2. Slab Pull

Slab pull is the force generated by a **sinking tectonic plate** at a subduction zone. When a **denser oceanic** plate collides with another plate, it is **forced down** into the mantle. The **weight** of this **subducting plate** pulls the rest of the plate along with it, driving its movement away from mid-ocean ridges and toward subduction zones, where it recycles back into the mantle.

## 3. Ridge Push

Ridge push is the force that drives **tectonic plates away** from mid-ocean ridges. As **magma rises** and creates new oceanic crust, the **cooling crust** becomes denser and **slides away** due to gravity. The elevated position of the ridge compared to the surrounding ocean floor creates a slope, facilitating this movement. **Ridge push** contributes to the ongoing formation of new **ocean floor** and overall plate dynamics.

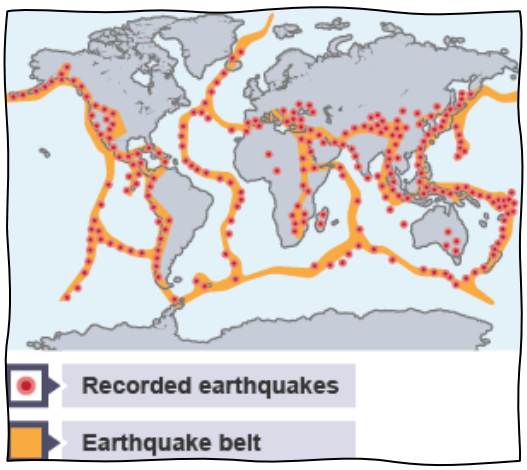


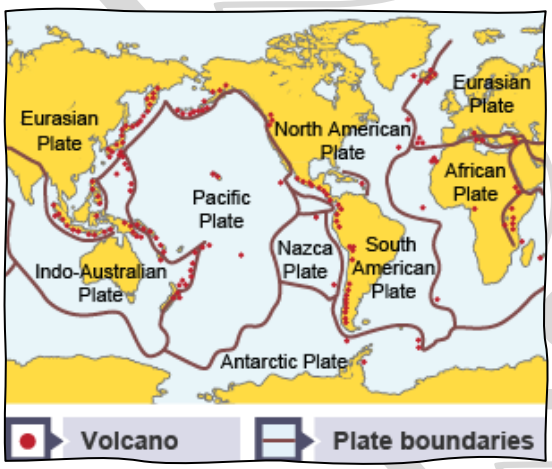




# B: THE DISTRIBUTION OF EARTHQUAKES AND VOLCANOES

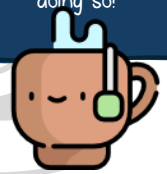
As can be seen from the map, **earthquakes** can be found:

- **Concentrated Along Plate Boundaries**: Most earthquakes occur at the edges of tectonic plates, where they interact with each other.
- **Linear Patterns**: Earthquakes often follow linear patterns, forming along constructive, destructive, and conservative plate boundaries.
- **Ring of Fire**: A significant concentration of earthquakes is found in the Pacific Ring of Fire, a horseshoe-shaped area known for its high seismic activity and numerous volcanoes.




**EXAM FOCUS:**
IGCSE questions often ask students to describe the distribution of tectonic hazards. Remember to follow the **TEA** rule when doing so!



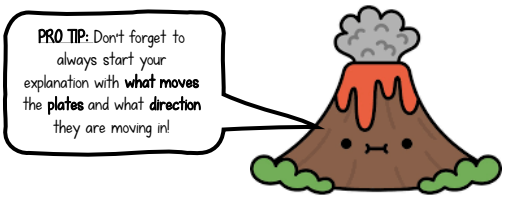
**Volcanoes** are also mainly formed at **plate boundaries**. There are some important exceptions. e.g., the **Hawaiian Islands**, which are entirely volcanic in origin, formed in the middle of the Pacific Ocean, more than 3,200km from the nearest plate boundary.

This is explained by the **'hotspot' theory**, that there are fixed spots in the mantle where **magma** rises to the **surface**. As the crust moves over these fixed spots, volcanoes are created, eventually forming a **chain** of **volcanoes**.

# C: PLATE BOUNDARIES

## Types of Plate Boundaries:

There are a **four** different types of **plate boundary** that you need to be familiar with. Make sure you can **explain** what happens at each boundary **confidently** and in **detail**!

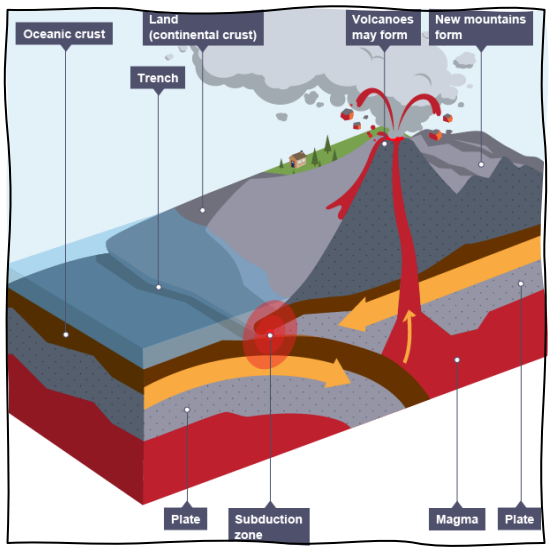


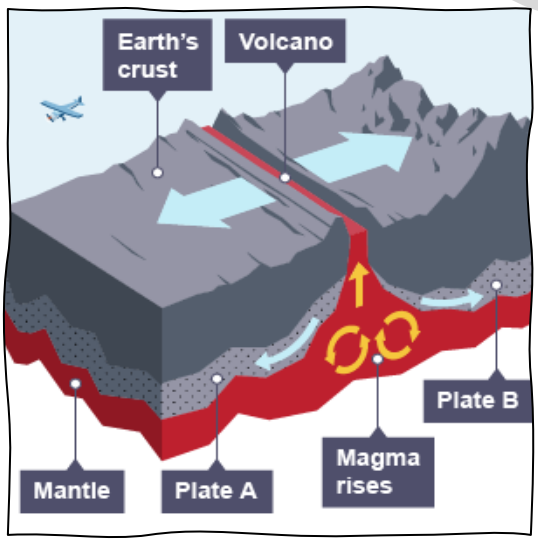

### 1. Destructive Plate Boundaries:

As the plates **collide**, the oceanic plate is forced beneath the continental plate. This is known as **subduction**. This happens because the oceanic plate is **denser** than the continental plate.

When the plate **sinks** into the **mantle** it **melts** to form magma. The pressure of the magma builds up beneath the Earth's surface. The **magma escapes** through weaknesses in the rock and rises up through a **composite volcano**. The volcanic eruptions are often violent, with lots of steam, gas and ash.

Earthquakes occur due to the **intense pressure** that builds when an oceanic plate is forced beneath a continental plate during subduction. The **friction locks** the plates together, and when the **stress exceeds** this friction, the plates **suddenly slip**, releasing energy as **seismic waves**.



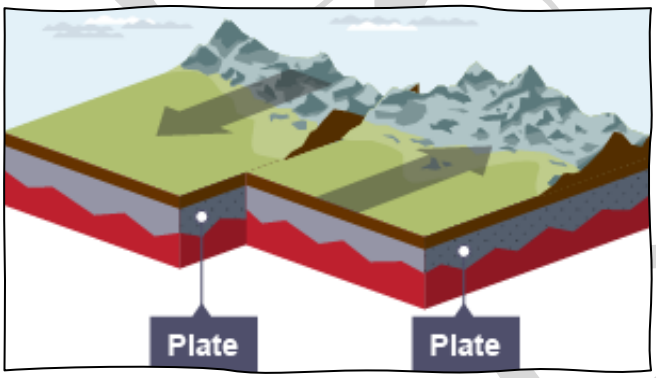

### 2. Constructive Plate Boundaries:

Constructive boundaries occur where tectonic plates move **apart** from each other, allowing **magma** to **rise** from the mantle to fill the **gap** and **construct** new crust. **Stress builds** from this movement, and when it is released, **shallow earthquakes** occur.

**Earthquakes** at these boundaries tend to be **less powerful**, resulting from the fracturing of rock as the plates separate. **Shield volcanoes**, which have **gentle slopes** and are formed from large volumes of low-viscosity lava flows, are common at divergent boundaries.

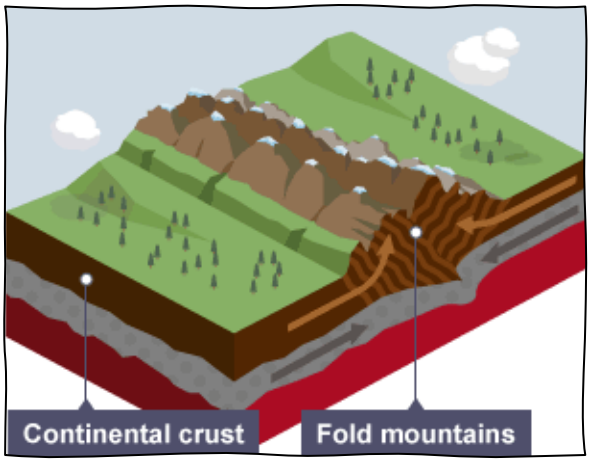
### 3. Conservative Plate Boundaries:

Two tectonic plates slide past each other **horizontally**, leading to a **build-up** of **friction** and **stress**. When this stress is released, it can generate significant **earthquakes**, which are often **intense** and occur at **shallow depths**. Unlike other boundary types, there are typically **no volcanoes** associated with transform boundaries due to the absence of magma generation.



### 4. Collision Plate Boundaries:

Collision boundaries occur when **two continental plates** collide, causing the crust to **crumple** and **fold**, which can lead to the formation of **fold mountain ranges**. The earthquakes generated at these boundaries can be **intense** and **shallow**, resulting from the **significant pressure** exerted by the colliding plates. Unlike other boundaries, there are few to **no active volcanoes** at collision boundaries since both plates are **too buoyant** to subduct easily.



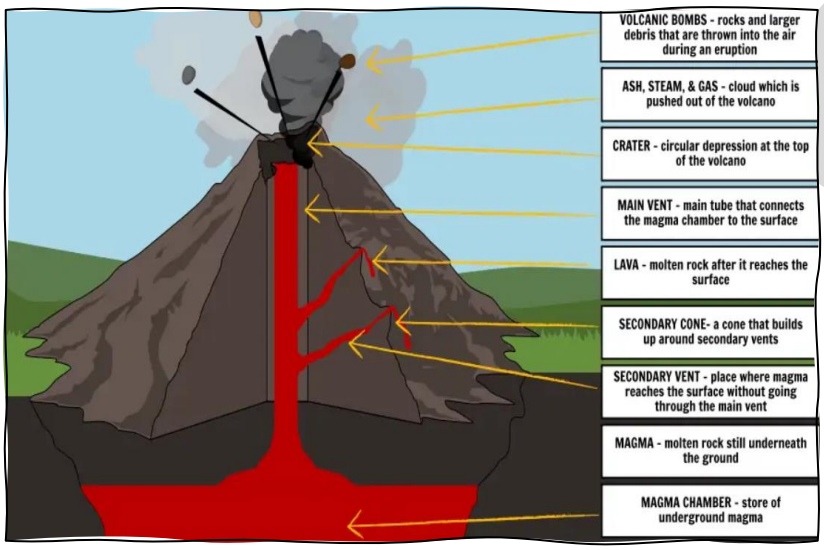

Use the table to the right to check your understanding of what happens at each boundary.

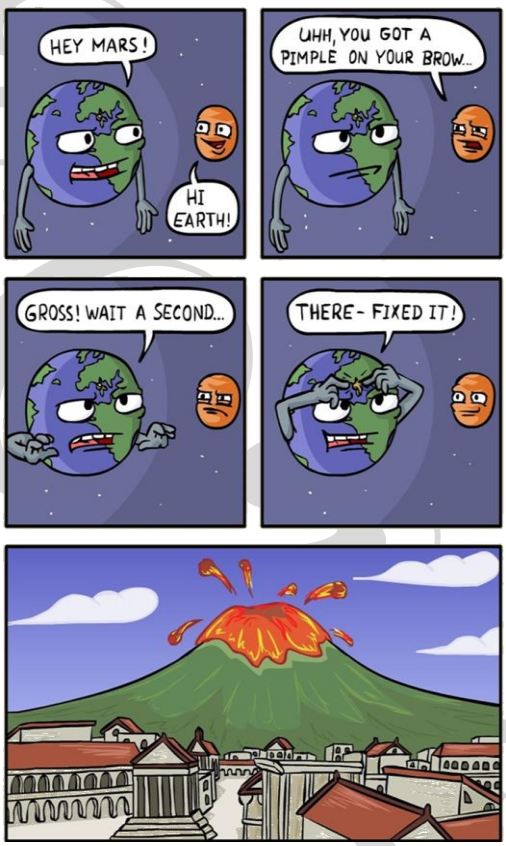
| BOUNDARY TYPE | EARTHQUAKES | VOLCANOES | PROCESSES |
|---|---|---|---|
| 1. Destructive | Powerful, deep earthquakes | Composite Volcanoes | Subduction, crust destruction |
| 2. Constructive | Frequent, shallow earthquakes | Shield Volcanoes | Magma rises, new crust formation |
| 3. Conservative | Intense, shallow earthquakes | None | Plates slide past each other |
| 4. Collision | Intense, shallow earthquakes | Few to none | Crust crumples, mountain building |

## D: VOLCANOES

### Features of a Volcano

Volcanoes are geological formations created by the movement of molten rock (magma) from the Earth's interior to the surface. They occur when pressure builds up from gases and magma within the Earth, leading to eruptions. Volcanoes can vary in shape, size, and eruption style, ranging from gentle lava flows to explosive eruptions that can propel ash and debris high into the atmosphere.



## Types of Volcano

There are three main types of volcano: **Shield**, **Composite**, and **Cinder Cone** Volcanoes. You need to be able to describe the differences between the **two** most common - **Shield** and **Composite**.

## Composite Volcanoes

- ❑ **Shape**: Steep, conical shape with a pointed summit.
- ❑ **Composition**: Made up of alternating layers of solidified lava flows, ash, and volcanic rocks.
- ❑ **Eruption Style**: Characterized by explosive eruptions due to the high viscosity of magma, which traps gases.
- ❑ **Lava Type**: Typically composed of andesitic or rhyolitic lava, which is more viscous than basaltic lava.
- ❑ **Examples**: Mount St. Helens (USA), Mount Fuji (Japan), and Mount Vesuvius (Italy).
- ❑ **Hazards**: Can produce pyroclastic flows, ash clouds, and lahars.


- *Semeru in Indonesia is an active composite volcano*


- *Erta Ale is an active shield volcano in the Afar Region of Ethiopia.*

## Shield Volcanoes

- ❑ **Shape**: Broad, gently sloping sides resembling a warrior's shield.
- ❑ **Composition**: Built primarily from low-viscosity basaltic lava that can flow over long distances.
- ❑ **Eruption Style**: Generally characterized by non-explosive eruptions, resulting in lava flows rather than explosive activity.
- ❑ **Lava Type**: Composed mainly of basaltic lava, which is fluid and allows gases to escape easily.
- ❑ **Examples**: Mauna Loa (Hawaii), Kilauea (Hawaii), and Olympus Mons (Mars).
- ❑ **Hazards**: While less explosive, can still produce lava flows that threaten nearby areas, as well as volcanic gases.

## Volcanic Hazards

The most **extreme hazards** associated with volcanoes include **pyroclastic flows**, which can travel at high speeds and reach extremely high temperatures, and **lahars**, which are destructive volcanic mudflows that can occur suddenly and devastate surrounding areas.

- *Pyroclastic can reach temperatures of 1,000 degrees Celsius*

- *The devastation created by a lahar.*

## Why do people live in areas of volcanic activity?

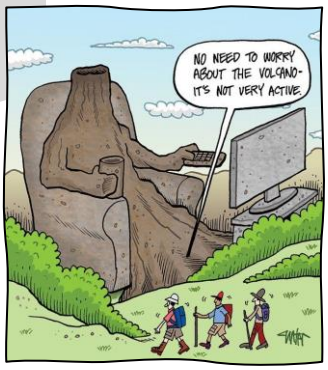
Living near volcanoes may seem risky due to the potential for eruptions and associated hazards, yet many people choose to inhabit these regions. The unique geological features and fertile landscapes created by volcanic activity offer numerous benefits that can outweigh the dangers. Below are some reasons why:

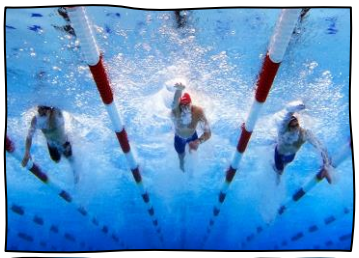
- **Fertile Soil**: Volcanic ash enriches the soil, making it highly fertile and ideal for agriculture.
- **Geothermal Energy**: Volcanic regions provide access to geothermal energy, a renewable energy source for heating and electricity.
- **Mineral Resources**: Volcanoes can be rich in valuable minerals, such as sulfur, gold, and other ores, supporting mining industries.
- **Tourism Opportunities**: Active and dormant volcanoes attract tourists for activities like hiking, sightseeing, and cultural experiences, boosting local economies.
- **Natural Hot Springs**: Volcanic activity creates hot springs, which are popular for recreation and therapeutic benefits.
- **Employment Opportunities**: Industries related to agriculture, tourism, and geothermal energy provide jobs and economic growth in volcanic areas.
- **Community Resilience**: Many communities have developed disaster preparedness plans and awareness of volcanic risks, making them more resilient to eruptions.
- **Cultural Significance**: Volcanoes often hold cultural and historical importance for local communities, forming a part of their identity and heritage.
- **Scenic Beauty**: Volcanic landscapes offer stunning views and unique geological features, enhancing the quality of life for residents.

## What scale are volcanic eruptions measured on?

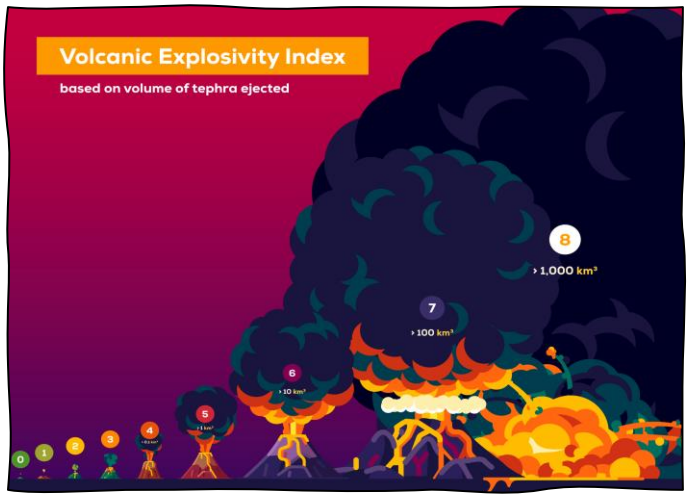
Volcanic eruptions are measured on **several scales**, each serving a different purpose. The most used scale is the **Volcanic Explosivity Index**.

**Scale Range**: 0 to 8
**Purpose**: The VEI measures the explosiveness of volcanic eruptions based on criteria such as eruption height, volume of ejected material, and duration.
**VEI 0**: Non-explosive eruptions (e.g., Hawaiian eruptions)
**VEI 1-2**: Gentle to moderate eruptions (e.g., small lava flows)
**VEI 3-4**: Explosive eruptions that can impact nearby areas (e.g., Plinian eruptions)
**VEI 5-8**: Major to colossal eruptions with global implications (e.g., super-eruptions)



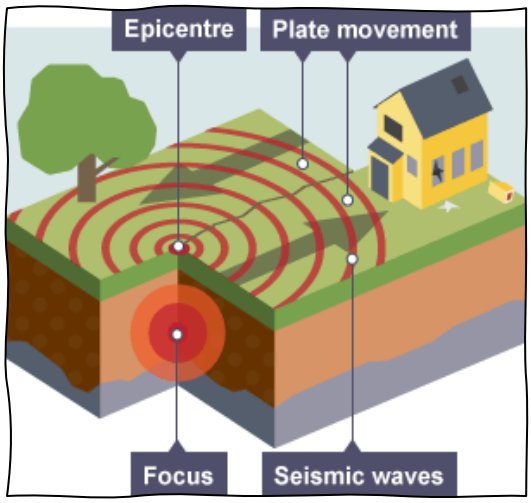
**DID YOU KNOW?** At VEI 2 there is already enough lava released to fill around 400 full Olympic swimming pools.



# E: EARTHQUAKES

## What are earthquakes?

Earthquakes are the sudden violent shaking of the ground. This happens because the Earth's plates are constantly moving. Sometimes because of **friction**, plates try to move but become **stuck**. **Pressure** builds up because the plates are still trying to move. When the pressure is released it sends out huge amounts of energy causing the Earth's surface to shake violently.
The point inside the Earth's crust where the earthquake originates from is known as the **focus**. The earthquake's energy is released in **seismic** waves, which spread out from the focus.
The seismic waves are most powerful at the . The **epicentre** is the point on the Earth's surface directly above the focus.




## Measuring Earthquakes:

The **Moment Magnitude Scale (Mw)** is the standard for measuring earthquakes, replacing the older *Richter Scale*. It measures the total energy released by an earthquake, considering the fault's size, the movement along it, and the strength of the rocks involved.

### Earthquake Magnitude Scale:

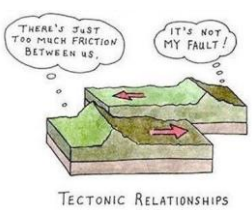
- **Small earthquakes**: Magnitude 2-3 (often not felt).
- **Moderate earthquakes**: Magnitude 4-5 (felt by most people, may cause minor damage).
- **Large earthquakes**: Magnitude 6-7 (causes significant damage, shaking over a wide area).
- **Major earthquakes**: Magnitude 7-8 (widespread destruction).
- **Great earthquakes**: Magnitude 8+ (massive energy release, catastrophic damage).

**DID YOU KNOW?** The 1960 Valdivia Earthquake in Chile had a magnitude of 9.5, the largest ever recorded.

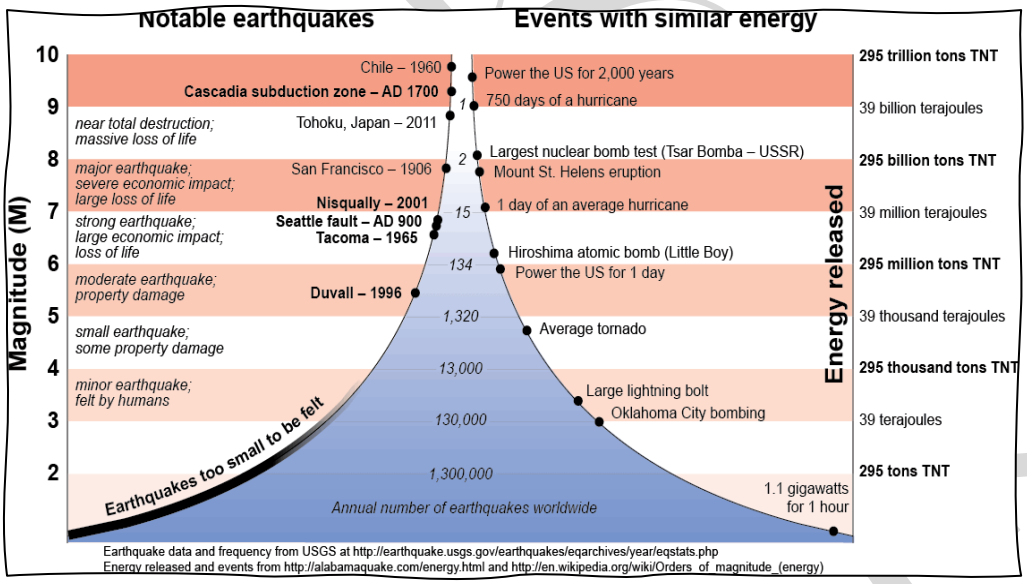
### Largest Recorded Earthquake:

Earthquakes are measured using instruments called seismographs, which detect seismic waves and produce a visual record called a seismogram. This helps scientists determine the earthquake's magnitude, location, and depth. Seismographs are essential tools in understanding and measuring the energy released during an earthquake.

**A LOGARITHMIC SCALE**
A magnitude 5 earthquake has 10 times the wave amplitude of a magnitude 4 earthquake. However, in terms of energy, a magnitude 5 earthquake releases 32 times more energy than a magnitude 4 earthquake.



TECTONIC RELATIONSHIPS



Earthquake data and frequency from USGS at http://earthquake.usgs.gov/earthquakes/eqarchives/year/eqstats.php
Energy released and events from http://alabamaquake.com/energy.html and http://en.wikipedia.org/wiki/Orders_of_magnitude_(energy)

## Reducing vulnerability in earthquake active regions

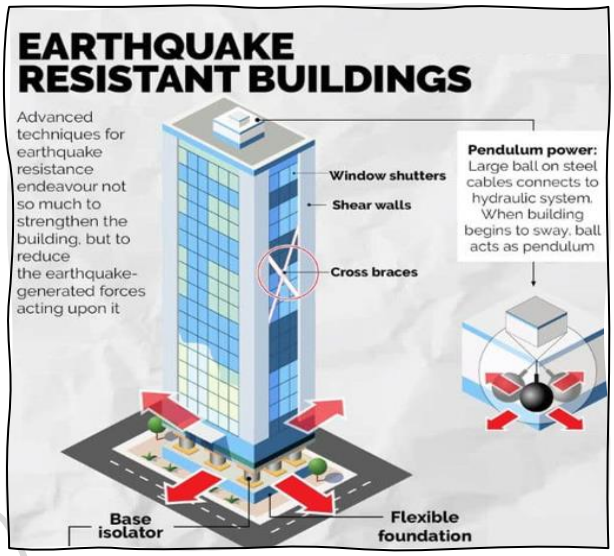
### Prediction

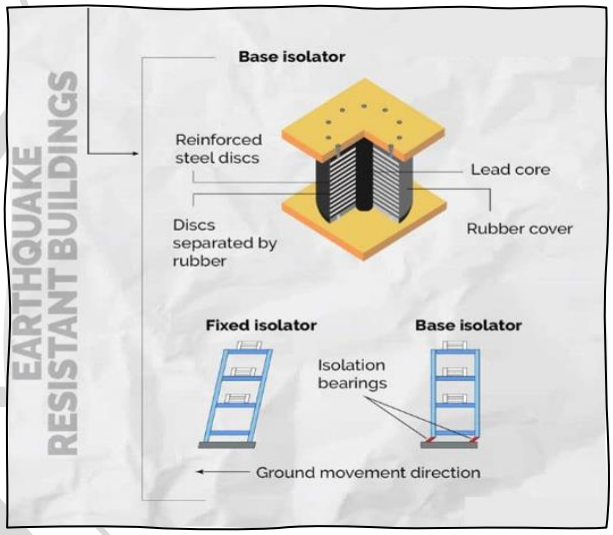
Prediction involves using **seismometers** to **monitor** earth tremors. Experts know where earthquakes are likely to happen, however it's **very difficult** to **predict** when they will happen. Even looking at the time between earthquakes doesn't seem to work. Along the San Andreas fault in California, USA, scientists have some of the most advanced technical equipment and education in predicting earthquakes - but they too **cannot** be **exactly sure** of when or where an earthquake may strike.

### Protection

Many areas prone to earthquake hazards now use **building codes**. Any **new building** or **adjustment** to **existing** buildings must be built to strict guidelines that would protect people from future earthquake hazards. **Protection** involves 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.
- Open areas outside of the buildings where people can assemble during an evacuation.
- Evacuation drills and evacuation routes
- Flexible wires and pipes to prevent leaks and fires.
- Low-cost methods, such as wire mesh retrofitting are used in rural areas and developing countries. These are affordable and appropriate to the resources and people living there.
- Lightweight roofs and safety shatterproof glass designed to reduce damage and injury.



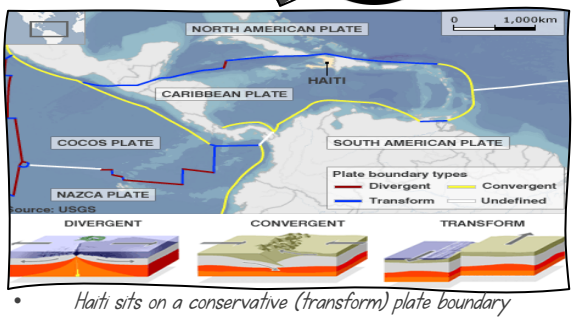




**DID YOU KNOW?** In the 2011 Tōhoku earthquake (magnitude 9.0), Japan experienced approximately 18,500 fatalities, thanks to its strict building codes and advanced engineering practices, including earthquake-resistant designs. In contrast, the 2010 Haiti earthquake (magnitude 7.0) resulted in an estimated 230,000 to 316,000 deaths due to poorly constructed buildings and a lack of enforced building regulations. This stark difference underscores the critical role of effective building standards in reducing casualties during seismic events.

# F: EARTHQUAKES: CAUSE, IMPACT, RESPONSE

CASE STUDY ALERT

The 2010 Haiti earthquake struck on **January 12**, at **4:53 PM** local time. With a magnitude of **7.0**, the quake was centered near the town of **Léogâne**, approximately **25 kilometers** (16 miles) west of **Port-au-Prince**, Haiti's capital. This devastating event resulted in catastrophic **destruction**, leading to a **humanitarian** crisis and highlighting the challenges faced by a nation already struggling with **poverty** and **weak infrastructure**.




- *Haiti sits on a conservative (transform) plate boundary*

**EXAM FOCUS:** Can you categorise the impacts into SEE?

| **PRIMARY** (caused directly by the earthquake) | **SECONDARY** (result from primary effects) |
|---|---|
| 316,000 people were killed, and 1 million people were made homeless. 3 million people were affected by the earthquake | 1 in 5 people lost their jobs because so many buildings were destroyed. Haiti's largest industry, clothing was one of the worst affected |
| 250,000 homes and 30,000 other buildings, including the President's Palace and 60% of government buildings, were either destroyed or badly damaged | The large number of deaths meant that hospitals and morgues became full, and bodies then had to be piled up on the streets |
| Transport and communication links were also badly damaged by the earthquake | The large number of bodies meant that diseases, especially cholera, became a serious problem |
| Hospitals (50+) and schools (1,300+) were badly damaged, as was the airport's control tower | It was difficult getting aid into the area because of the destruction at the airport and destruction of the port leaving Haiti isolated. |
| The main prison was destroyed, and 4,000 inmates escaped. | People were crammed into shanty towns or onto the streets because their homes had been destroyed leading to poor sanitation and health, and looting became a real problem. |

## Responses to the earthquake

### SHORT-TERM RESPONSES

**1. International Aid:**
The **U.S. Agency for International Development (USAID)** provided over **$1.1 billion** in humanitarian aid, while countries around the world sent resources, personnel, and funds to assist in recovery efforts.

**2. Search and Rescue Operations:**
Approximately **30 international search and rescue teams** were deployed to Haiti, including personnel from the **United States, Canada, and Japan**. These teams rescued over **130 survivors** from the rubble in the days following the earthquake.

**3. Shelter and Temporary Housing:**
More than **1.5 million people** were displaced, with many seeking refuge in **over 1,300 temporary camps** established in Port-au-Prince and surrounding areas. Organizations like the **International Federation of Red Cross and Red Crescent Societies** distributed tents and tarps to provide immediate shelter.

### LONG-TERM RESPONSES

**1.Reconstruction Efforts:**
By 2014, only about 18,000 houses had been built through formal reconstruction programs. Ongoing efforts aimed to improve housing conditions and restore communities.

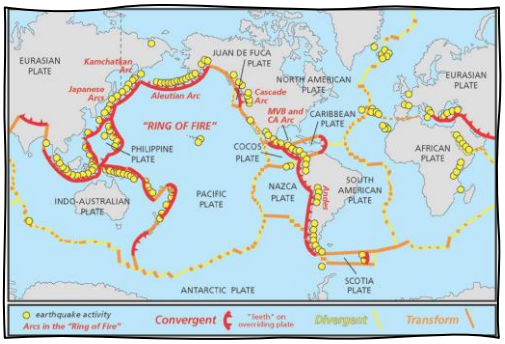
**2.New Building Codes:**
The Haitian government, with international support, began implementing new building codes focused on earthquake resilience. This included training local builders and architects to adhere to safer construction practices.

**3.International Support and Funding:**
Over $13 billion was pledged for Haiti's reconstruction, with a significant portion allocated for rebuilding infrastructure, education facilities, and health services following the UN donor conference in March 2010.

**EXAM FOCUS:**
Can you **describe** the **impacts** and **responses** of the 2010 earthquake?

# G: SAMPLE EXAM QUESTIONS

1. USING FIGURE 1, DESCRIBE THE GLOBAL DISTRIBUTION OF EARTHQUAKES (3)




- *Figure 1: Distribution of earthquake activity*

2. EXPLAIN HOW EARTHQUAKES AND VOLCANOES ARE CREATED AT A DESTRUCTIVE PLATE BOUNDARY. YOU MAY DRAW A DIAGRAM TO SUPPORT YOUR ANSWER. (4)

3. EXPLAIN HOW EARTHQUAKES OCCUR AT A CONSERVATIVE PLATE BOUNDARY. YOU MAY DRAW A DIAGRAM TO SUPPORT YOUR ANSWER. (3)

4. EXPLAIN WHY PEOPLE LIVE IN AREAS OF VOLCANIC ACTIVITY (5)

5. DESCRIBE THREE DIFFERENCES BETWEEN A COMPOSITE AND A SHIELD VOLCANO (3)

6. DESCRIBE THE IMPACT AND RESPONSE TO AN EARTHQUAKE YOU HAVE STUDIED (7)

# H: KEYWORDS

Being confident with your keywords and definitions is super important if you want to be a Geographical Genius!

**Magnitude**: A measure of the energy released during an earthquake, commonly measured using the Richter scale or the Moment Magnitude Scale (Mw).

**Seismic Waves**: Energy waves produced by an earthquake that travel through the Earth. They include primary (P) waves, secondary (S) waves, and surface waves.

**Epicentre**: The point on the Earth's surface directly above the location where an earthquake originates (the focus).

**Focus** The actual location beneath the Earth's surface where the earthquake originates.

**Tectonic Plates**: Large, rigid pieces of the Earth's lithosphere that move and interact with each other, causing earthquakes and volcanic activity.

**Fault Line**: A fracture or zone of weakness in the Earth's crust along which movement has occurred.

**Subduction Zone**: An area where one tectonic plate is being forced under another, often leading to volcanic activity and earthquakes.

**Magma**: Molten rock located beneath the Earth's surface. When it erupts, it is referred to as lava.

**Lava**: Molten rock that reaches the Earth's surface through a volcanic eruption.

**Pyroclastic Flow**: A fast-moving current of hot gas and volcanic matter that flows down the slopes of a volcano during an explosive eruption.

**Tephra**: Volcanic material, including ash, pumice, and rocks, ejected during a volcanic eruption.

**Volcanic Ash**: Fine particles of rock and glass that are expelled during an explosive volcanic eruption.

**Crater**: A bowl-shaped depression at the top of a volcano formed by explosive eruptions or the collapse of a volcanic cone.

**Lahar**: A destructive mudflow composed of volcanic ash and water, often occurring during or after an eruption.

**Hotspot**: A location where magma rises through the mantle to form volcanoes, independent of tectonic plate boundaries (e.g., the Hawaiian Islands).

**Seismograph**: An instrument used to measure and record the intensity, duration, and direction of seismic waves during an earthquake.

**Destructive Plate Boundary:** A tectonic plate boundary where one plate is forced under another, leading to subduction, earthquakes, and volcanic

**Constructive Plate Boundary**: A tectonic plate boundary where two plates move apart, allowing magma to rise and create new crust, often resulting in volcanic activity

**Conservative Plate Boundary:** A tectonic plate boundary where two plates slide past each other horizontally, causing friction and earthquakes without the creation or destruction of crust