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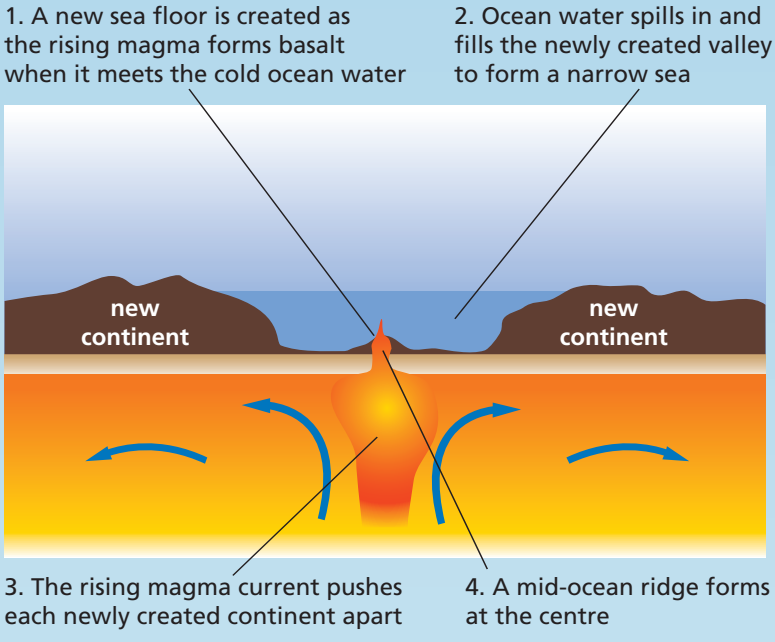
SAMPLE EXAM QUESTION AND ANSWER

Question: Discuss the geographical distribution and impacts of constructive plate boundaries. (2016, 30 marks)

Marking scheme:

- Impact identified – 2 marks
- Reference to geographical distribution – 2 marks
- Discussion – 13 × SRPs
- Relevant labelled diagram – 1 × SRP
- Credit relevant extra information on labelled diagram for 2 × SRP.

Note: Draw a simple diagram or diagrams with a few labelled sentences/SRPs

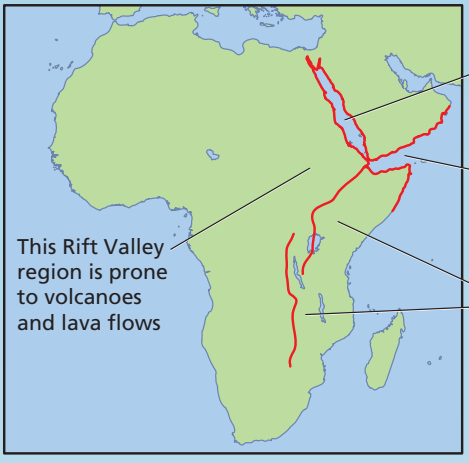


A mid-ocean ridge is a boundary of construction associated with seafloor spreading

Answer: Most volcanoes form at boundaries of destruction.

Distribution

- Constructive plate boundaries are locations where **plates separate** and **rift valleys** are created. These constructive plate boundaries form on continents in some cases, but mostly on ocean floors.
- The best-known continental plate boundary occurs at the East African Rift Valley but it is in the early stages of separation. **This process is known as continental rifting**. This is causing the continent of Africa to move away from Arabia by forming the Red Sea and causing Africa to split apart, forming a separate new plate that is now called the **Nubian Plate**.
- Separating plates generally **form a Y-shape**, in this case creating the **Red Sea** and the **Gulf of Aden which the sea has flooded**, and the **East African Rift Valley which has not fully developed**. The process that drives this separation is **a plume of magma**, forming a **Hot Spot** that rises towards the surface from the mantle.



- The more southern section of the East African Rift Valley has many large lakes that formed on its floor, e.g. Lake Tanganyika and Lake Malawi.
- **Mid-ocean ridges** are formed from new rock at constructive boundaries on ocean floors. This new rock pushes continents apart in a process called **continental drift**. The best known to Irish students is the **Mid-Atlantic Ridge** that pushes Europe and Africa away from the Americas.
- Mid-ocean ridges are located in all the major oceans; examples include: The Mid-Atlantic Ridge in the Atlantic Ocean, the Mid-Indian Ridge in the Indian Ocean, and the East Pacific Rise in the Pacific Ocean.
- As continents move apart, the new rock accumulates into high mountain ridges that sit on the ocean floor. The **Mid-Atlantic Ridge** is a mid-ocean ridge in the Atlantic Ocean. This new rock forms on both sides of the separating plates, thus increasing the width of the ocean floor. Sea floor rock is always youngest nearest to these separating plates and oldest at continental edges.
- The magma beneath the ocean ridges is hot and light and it pushes the thin seabed upwards, making the mountains higher. Most igneous rock is formed at these locations when magma cools quickly to form **basalt**.
- Iceland is an island that formed at a hot spot on the Mid-Atlantic Ridge, and the rift valley on the Atlantic Ocean floor continues on land through the island. Volcanoes regularly occur in Iceland. Magma close to the surface provides thermal energy for the island and heats homes and greenhouses.
- The island of Surtsey is a nearby island that formed from the sea bed in 1963 during a volcanically active period in Iceland.
- **Earthquakes** also occur along constructive plate boundaries. These earthquakes are rarely very powerful because new rock breaks easily under low strain so there is little build-up of tension sufficient to create a powerful earthquake.

The best way to revise volcanoes is by using past questions and sample answers.

Volcanoes

Volcanoes at hot spots throw pyroclasts into the air

key point

Most volcanoes occur at **subduction zones** where plates collide.

Some volcanoes also occur at **hot spots**.

SAMPLE EXAM QUESTION AND ANSWER

Question: Discuss how plate tectonics has increased our understanding of the global distribution of volcanoes. (30 marks)

Note: draw a **simple** diagram or diagrams with a few labelled sentences/SRPs.

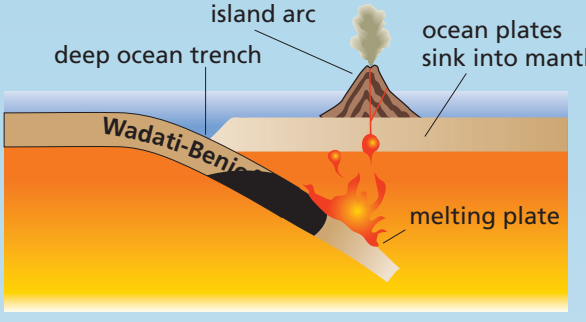
Marking scheme:

- Two global examples – 2 marks each
- Plate tectonics examined – 13 SRPs @ 2 marks each.

Answer: Most volcanoes form at boundaries of destruction.

- The earth's crust is divided into plates and these plates move due to seafloor spreading and continental drift.
- Convection currents carry the plates of the earth's crust in a piggy-back motion.
- The plates collide at boundaries of collision or destruction.
- **Most volcanoes form at two types of destructive plate boundaries: (a) where an ocean plate collides with a continental plate; and (b) where two ocean plates collide.**
- As plates approach each other, the intervening ocean floor plate is subducted into the mantle. As it descends, it melts at a depth of about 100 km.
- The continental plate scrapes layers of sediment from the descending ocean floor and they are forced upwards, buckled and compressed into fold mountains.
- The melting descending plate creates magma that rises through the folded rock above.
- Small amounts of this magma rise and collect into huge masses of magma called batholiths.
- These batholiths are the source of magma, which creates volcanoes at the surface in fold mountains such as Cotopaxi in the Andes.

- Most volcanoes are located around the western edge of the Pacific Ocean where ocean plates collide. They form part of the Pacific Ring of Fire.
- The sinking plates melt, forming magma.
- Eventually, the compressed gases and liquid magma are blasted through the ocean floor and build up volcanic cones, such as those in the Philippines and Japan.

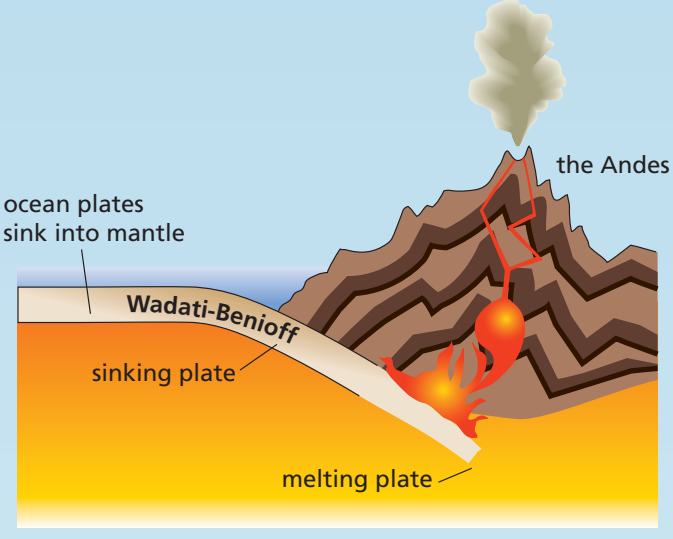


Ocean–ocean boundary: Western Pacific

exam focus

You should:

- write at least 15 SRPs (2 marks each)
- name two plates that collide to cause subduction
- name a volcano.



Ocean–continent boundary: Eastern Pacific

Some volcanoes occur at **hot spots**. These are areas where large batholiths are close to the surface at locations away from plate boundaries. *Examples:* Yellowstone National Park, USA.

exam focus

A question on hot spots may appear in short-answer questions.

key point

- **Black smokers** are chimney-like openings at mid-ocean ridges.
- Very **hot water** containing **dissolved minerals** gushes from these openings.
- **Hot spots** are localised areas of volcanic activity that may be far from plate boundaries.

Effects of volcanoes

Positive

- Lava soils are rich in iron, which is good for coffee production.
- Geothermal energy can be generated from hot rock and geysers.
- Mineral ores and veins are important resources.
- New land is created on volcanic islands.
- Tourists visit volcanic regions. *Examples:* Iceland; Mount Etna, Sicily.

Negative

- People can be killed by **nuées ardentes** (clouds of poisonous gases and ash).
- Lava flows destroy houses and towns.
- Eruptions force people to evacuate their homes.

key point

- Earthquakes usually occur at plate boundaries as a result of plate tectonic processes.
- There are three types of earthquake: shallow-focus, intermediate-focus and deep-focus.
- Some earthquakes, like those in Ireland, occur on old faultlines.

Earthquakes

Causes of earthquakes

Tectonic plates

Strain builds up in tectonic plates as they get stuck when they try to move past, apart or under each other. This strain suddenly releases and readjusts itself. This readjustment is felt on the surface as an earthquake.

The Ice Age

Thousands of metres of ice pressed down the land surface. When the ice sheets melted at the end of the Ice Age, the land gradually bounced back to its original level. This change still causes earthquakes from time to time.