Why the Earth Shakes and Erupts

Teacher		**Class**	Year 8
Subject	Geography	**Topic**	Volcanoes and earthquakes
Date		**Room**	
Lesson length	60 minutes	**Country**	United Kingdom

Students learn how plate movement causes earthquakes and volcanoes. They draw and label an eruption cross-section to show magma, lava and ash.

Curriculum links

- describe and understand key aspects of physical geography, including: volcanoes and earthquakes [1]

Learning objectives

- Students will describe how plate movement causes earthquakes and volcanoes.
- Students will explain where earthquakes and volcanoes cluster worldwide.
- Students will label magma, lava and ash in an eruption diagram.

Success criteria

- I can explain how stuck plates release energy as an earthquake.
- I can describe where volcanoes and earthquakes cluster worldwide.
- I can label magma, lava and ash on my diagram.

What students already know

Show fists sliding past each other: ask what happens when moving rock sticks then slips, and what comes out of a volcano.

Key words

magma	very hot melted rock found below the ground [6]
lava	hot melted rock that has come out onto the surface [6]
epicentre	point on the surface directly above where a shake starts below [8]
plate margin	the edge where two moving slabs of crust meet [8]
hotspot	place where unusually hot melted rock rises far from an edge [8]

Materials

- A3 paper
- coloured pencils
- rulers
- Slides 1-7, 9-12
- Video clip 1 (0:00-2:02) on Slide 6
- Worksheet Task B copies - Venn diagram

Before the lesson

- Print Worksheet Task B, one per pair, and A3 paper for diagrams
- Load Slides 1-7 and 9-12 and test Video clip 1 (0:00-2:02) with sound
- Set out coloured pencils and rulers and clear tables for drawing
- Prepare one labelled example diagram for support

Lesson outline

0–5 min **Starter** 5 min · Whole class

Hook interest in eruptions and recall what students know about volcanoes.

YOU DO

1. Show Slide 1 title and read the hook: Draw me an eruption that a scientist would actually believe.
2. Show Slide 2 objectives and read the three goals for the lesson.
3. Ask pairs to list in 1 minute what comes out of a volcano.
4. Take 3 quick answers and keep the labelled diagram challenge for later.

STUDENTS DO

1. Discuss with partner what an eruption contains.
2. Offer ideas for what a scientist would expect to see.

Say: Draw me an eruption that a scientist would actually believe. In pairs, tell each other what you think shoots out of a volcano. By the end you will label the real parts correctly.

Ask: What do you think comes out when a volcano erupts? (Magma as lava, ash and gases escape through an opening in the crust [20].) · Why might a scientist not believe a drawing with only red liquid? (Because eruptions also produce ash clouds and gases, not only lava.)

Check understanding: Hands up for who named lava and ash; if few did, promise the labels will be taught and drawn today.

Support: Show word bank: magma, lava, ash, gas to prompt talk. **Stretch:** Ask which part of an eruption would travel furthest and why.

Use: Slides 1-2

5–15 min **Teaching** 10 min · Whole class

Explain how plate movement causes earthquakes and what volcanoes produce.

YOU DO

1. Show Slide 3 steps and model plates creeping then sticking with hands.
2. Explain friction makes pressure build until it releases suddenly as a shock wave [4].
3. Show Slide 4 cards for lava flows, ash clouds and pyroclastic flows.
4. Define magma as molten rock and lava when it reaches the surface [6].

STUDENTS DO

1. Copy the three earthquake steps as a tiny flow diagram.
2. Repeat definitions of magma and lava with partner.

Say: Plates fit together like a jigsaw and move a few centimetres a year [6]. Their edges stick, friction makes pressure build up, then pressure releases suddenly as a shock wave [4]. That shock wave is an earthquake, a sudden release of energy in the crust [9].

Worked example: Earthquake in steps: 1. Plates creep a few centimetres each year. 2. Edges stick and friction makes pressure build. 3. Pressure passes the limit and slips, sending out seismic waves. The spot above the start is the epicentre [8].

Ask: What causes pressure to build up at a plate edge? (Friction as plates try to move in different directions until energy releases as a shock wave [4].) · What is the difference between magma and lava? (Magma is molten rock below ground; when it reaches the surface it is called lava [6].) · Name two dangerous products of an eruption. (Ash clouds of small rock and glass carried for kilometres and volcanic bombs of very hot rock [4].)

Check understanding: Mini whiteboards: write magma or lava for melted rock underground; reteach if mixed up.

Support: Give sentence frame: Magma is ___ below ground, lava is ___ above ground. **Stretch:** Ask why most quakes are not felt if thousands happen each day.

Use: Slides 3-4

15–25 min **Patterns worldwide** 10 min · Whole class

Show that quakes and volcanoes cluster in narrow belts at margins.

YOU DO

1. Show Slide 5 question about clustering in narrow belts.
2. Play Video clip 1 (0:00-2:02) on Slide 6 about magma, lava and stuck plates.
3. Show Slide 7 cards for destructive and constructive margins.
4. Teach Ring of Fire and Mid-Atlantic Ridge as narrow zones of activity [5].

STUDENTS DO

1. Watch the clip and note one fact about slow flows and one about explosions.
2. Answer the pair question on why hazards share the same belts.

Say: Earthquakes sit mostly in long, narrow belts along all types of plate boundary [5]. These include the Pacific Ring of Fire around the Pacific Ocean and the Mid-Atlantic Ridge along the floor of the Atlantic Ocean [5]. About 80 percent of earthquakes occur along the rim of the Pacific Ocean [14].

Ask: Where do most earthquakes and volcanoes occur? (In narrow zones of activity that coincide with plate margins [8].) · Why are earthquakes found at all margins but volcanoes not at conservative margins? (Earthquakes are produced by tectonic movements at all plate margins, but volcanoes are not found at conservative margins where plates slide past [8].)

Check understanding: Thumbs up if you can name the two belts; point to them on a world map if unsure.

Support: Pre-shade one belt where tectonic hazards are caused by movements of crust and mantle [8] for matching. **Stretch:** Ask how Hawaii, more than 3,200 km from the nearest boundary [5], challenges the pattern.

Use: Slides 5-7, Video clip 1 (0:00-2:02)

25–45 min **Main activity** 20 min · Pairs

Draw and label a scientific cross-section of a volcanic eruption.

YOU DO

1. Show Slide 9 task: draw two labelled boxes with plates, magma, lava and ash.
2. Model a cross-section on the board with magma chamber, vent, lava and ash cloud.
3. Hand out A3 paper, coloured pencils and rulers for paired sketching.
4. Remind pairs to add arrows for movement and one risk sentence under each box.

STUDENTS DO

1. Sketch two boxes in pairs showing plates, magma, lava and ash.
2. Label parts, add arrows, then write quake or volcano risk sentence under each.

Say: A volcano is an opening in the Earth's crust through which magma, ash and gases escape [20]. Draw it in cross-section, label magma, lava, ash cloud and volcanic bombs, then add arrows to show which way plates and magma move.

Worked example: Teacher model: draw crust as two blocks, gap in middle as vent, blob below labelled magma, wavy shape on top labelled lava, dotted cloud above labelled ash cloud of small rock and glass carried for kilometres [4]. Add upward arrow in vent and sideways arrows for plates. Add sentence: Lava flow burns and blocks roads.

Ask: What must your diagram show to prove the opening in the crust? (A vent linking magma below to lava and ash above [20].) · Which labels prove magma changed to lava? (Magma below ground, lava as molten rock that reached the surface [20].)

Check understanding: Circulate with checklist for four labels and arrows; direct missing labels to the support example.

Support: Give a labelled example where lava is shown as molten rock that reaches the Earth's surface [20] for students to copy and colour. **Stretch:** Ask students to add a caption explaining which part would cause most damage to buildings and why.

Use: Slide 9

45–60 min **Plenary** 15 min · Pairs

Sort ideas about volcanoes, earthquakes and living with risk.

YOU DO

1. Hand out Worksheet Task B Venn diagram for Volcanoes, Earthquakes or both.
2. Show Slide 10 bullets about swaying frames and drop and cover.
3. Run Slide 11 vote on living near a quiet volcano or in a quake-ready city.
4. Finish with Slide 12 true or false on magma, lava and hotspots.

STUDENTS DO

1. Complete Worksheet Task B by placing numbers in the Venn diagram.
2. Vote, justify choice, then answer true or false as exit check.

Say: In quake places they build earthquake-resistant buildings that sway with the shock waves rather than fall down [4]. During shaking, take cover under sturdy furniture to guard against falling debris [4]. Now sort your ideas, then vote with reasons.

Ask: Primary or secondary: lava destroys houses, then people are homeless? (Destruction of buildings is primary, homelessness is secondary because secondary effects are caused by primary effects [20].) · True or false: all volcanoes sit on plate margins? (False, hotspots like Hawaii sit far from margins, explained by the hotspot theory [5].)

Check understanding: Collect Task B Venn sheets and count true/false hands; reteach magma-lava and hotspot if errors remain.

Support: Give two solved Venn examples and sentence starters for vote reasons. **Stretch:** Ask what extra data on magnitude, a measure of energy released [8], would change their vote.

Use: Slides 10-12, Worksheet Task B

Common mistakes

Mistake	How to spot it	How to fix it
Mixing up magma and lava	Labels swapped on diagram or Venn	Repeat magma is molten rock below, lava is called lava when it reaches the surface [6].
Thinking quakes and volcanoes are spread evenly	Marks scattered randomly on maps	Stress they occur mostly in long, narrow belts along boundaries [5] and coincide with margins [8].
Thinking all volcanoes are at plate edges	Claims hotspot volcanoes must be on a margin	Recall Hawaiian Islands formed in the middle of the ocean, more than 3,200 km from the nearest boundary, explained by hotspots [5].

Support

- Word bank and labelled example diagram to copy for magma, lava and ash
- Sentence starters and pre-shaded belt to show narrow zones
- Paired work and half-finished frames for explanations

Stretch

- Add caption on which eruption product causes most building damage and why
- Predict hotspot pattern compared with margin pattern using distance data
- Justify living choice with magnitude and secondary effects

For the LSE or teaching assistant

Sit with pairs needing literacy support during main drawing; prompt label spelling, check arrows, scribe risk sentences if needed.

Check for understanding

Question	Answer
How does plate movement cause an earthquake?	Friction makes pressure build until energy releases suddenly as a shock wave [4].
Where do most volcanoes and earthquakes cluster and why?	In narrow belts along plate margins, including the Pacific Ring of Fire [5].
Label this: melted rock below ground and after it erupts?	Below is magma, once it reaches the surface it is called lava [6].

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