



Procedure

Preliminary

(Instruct students to move to the daytime side of the Sphere and sit in two rows facing the Sphere and perpendicular to it.)

(Distribute 3D glasses to the students.)

Primary - Part A

The teacher should review the names of continents and oceans for the students. Also, review the names for a sampling of countries on each continent and island locations on the oceans. Use the laser pointer.

Primary - Part B

(This is a relay game to see which team of students can identify locations of Earth’s plate boundaries faster.)

1. Give a laser pointer to the first student in each row.
2. The teacher calls the name of a location that is on the nighttime side of Earth.
3. As the named location approaches Earth’s daytime terminus, have the first two students stand up with their pointers on and ready.





4. The first student whose pointer touches the correct location on the Sphere and follows it through the daytime rotation gets the point for his or her team.
5. As the named location recedes towards Earth’s terminus, the students who played move to the back of the line and the next students prepare to repeat the process.
6. Practice once or twice before beginning the game.
7. Repeat sites that you want students to remember.

Locations to be identified. (Add any other interesting locations.)

- | | |
|--|---|
| ⇒ Mountain chain from Alaska south to tip of South America | ⇒ Continental Shelf along the Bering Strait |
| ⇒ Mid-Atlantic Ridge | ⇒ East Pacific Rise |
| ⇒ New Zealand | ⇒ 90 Degree East Ridge |
| ⇒ Red Sea Rift | ⇒ Mt. Everest |
| ⇒ Continental Shelf off eastern U.S. | ⇒ Mariana Trench |

Primary - Part C

The teacher should explain that...



A “Hot Spot” is magma that rises from the Earth’s mantle to produce a volcano at the surface. It is not along a plate boundary. The Hawaiian Islands are forming above a “Hot Spot”. As the Pacific plate moves northwesterly over the spot, new islands form in a chain. (Notice that the Hawaiian Islands are a chain.)

Ask a student to use the laser pointer to trace the underwater seamounts (islands under the surface of the water) northwest of Hawaii that were once above the “Hot Spot”.



Primary - Part D

The teacher should have students take turns using a laser pointer to trace the following major plate boundaries on the Sphere.

(Guide students through the process of locating the plate boundaries. For example, to locate the African plate boundaries, have a student use the laser pointer to point





to the Mid Atlantic Ridge and trace it to the Indian Ocean, through the Red Sea Rift and the Mediterranean Sea, then back to the Mid Atlantic Ridge. Use the “Plate Tectonics” map towards the end of this lesson to help you identify the plate boundaries beforehand.)

- ⇒ African
- ⇒ North American
- ⇒ Eurasian
- ⇒ South American
- ⇒ Antarctica
- ⇒ Australian

(If students successfully find the above major boundaries, then have them trace the following smaller plate boundaries using the same procedure.)

- ⇒ Arabian
- ⇒ Scotia
- ⇒ Nazca
- ⇒ Juan de Fuca
- ⇒ Philippine

Primary - Part E

Tell students about four main ways that plate boundaries form. Use the laser pointer to identify examples of each as you talk.

1. Converging tectonic plates - where two plates come together usually forming mountains - Example: the Himalayan Mountains between the Indian and Asian plates.
2. Diverging tectonic plates - where two plates pull apart - Example: the Mid Atlantic Ridge.
3. Subducting tectonic plates - where one plate slides beneath another - Example: the Pacific plate slides beneath the South American plate sometimes forming volcanoes (Andes Mountains).
4. Transverse fracturing of tectonic plates - where areas next to one another move at different speeds and/or in opposite directions - scraping past one another to form fracture zones - Example: the San Andreas Fault near San Francisco.

(The next section might be difficult for middle school students who have not studied plate tectonics. Therefore, ask the group as a whole to call out answers. Be sure to give them the correct response after they answer.)





Ask students to identify the following geologic or oceanic characteristics as being formed by converging, diverging, or subducting plates, or a transverse fracture zone.

1. Mountain chain from Alaska, south, to the tip of South America (Hint: Volcanoes form many of these mountains.)
2. Mid Atlantic Ridge. (Hint: The Atlantic Ocean is growing wider between its east and west boundaries.)
3. Red Sea Rift (Hint: The Red Sea Rift is growing larger.)
4. East Pacific Rise (Hint: Mountains beneath the ocean.)
5. 90 Degree East Ridge
6. Mt. Everest
7. Mariana Trench
8. Mendocino Escarpment



Conclusion

(Ask students to answer the question stated at the beginning.)

Earth's crust is divided into plates that form a continuous system of cracks along plate boundaries that are visible in satellite images from space.

These boundaries occur in:

- ⇒ the middle of oceans;
- ⇒ along the edges of continents; and
- ⇒ less frequently within continents.



Answer Key For "Procedure - Part E"

- | | | |
|---------------|-----------------------------|---------------|
| 1. Subducting | 2. Diverging. Larger | 3. Diverging |
| 4. Converging | 5. Diverging | 6. Converging |
| 7. Diverging | 8. Transverse fracture zone | |





Information on the theory of Plate Tectonics to help students and teachers with this lesson.

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Dinosaur Floor
Earth Floor
Resource Room
Teacher's Lounge
Elevator

Plate Tectonics

The theory of plate tectonics has done for geology what Charles Darwin's theory of evolution did for biology. It provides geology with a comprehensive theory that explains "how the Earth works." The theory was formulated in the 1960s and 1970s as new information was obtained about the nature of the ocean floor, Earth's ancient magnetism, the distribution of volcanoes and earthquakes, the flow of heat from Earth's interior, and the worldwide distribution of plant and animal fossils.

Tectonic Plate Boundary Types:

Extensional

Compressional

Transform (sliding) or Undefined

EARTH FLOOR

Diversity
Adaptation
Plate Tectonics
Cycles
Spheres
Biomes
Geologic Time

★ Plate Tectonics

- [Convergent Boundaries](#)
- [Divergent Boundaries](#)
- [Transform Boundaries](#)

The theory states that Earth's outermost layer, the lithosphere, is broken into 7 large, rigid pieces called plates: the African, North American, South American, Eurasian, Australian, Antarctic, and Pacific plates. Several minor plates also exist, including the Arabian, Nazca, and Philippines plates.

The plates are all moving in different directions and at different speeds (from 2 cm to 10 cm per year--about the speed at which your fingernails grow) in relationship to each other. The plates are moving around like cars in a demolition derby, which means they sometimes crash together, pull apart, or sideswipe each other. The place where the two plates meet is called a plate boundary. Boundaries have different names depending on how the two plates are moving in relationship to each other

- crashing: [Convergent Boundaries](#),
- pulling apart: [Divergent Boundaries](#),
- or sideswiping: [Transform Boundaries](#)

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