

**Purpose:** To think about what happens to rocks when plates move.

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**Guiding Questions:**

- How do rocks change when earth's plates move?
- What affects how rocks change?

**Pre-activity.** Answer the following questions to help you situate your thinking about the guiding question. *Answers will vary for question 1-4.*

1. What happens to a stick when you bend it at both ends?
2. What happens to a substance like Silly Putty when you bend it at both ends?
3. What do you think would happen to a rock when you bend it at both ends?
4. What do you think would happen to a rock from the mantle when you bend it at both ends?

**Activity.** Answer the following questions.

5. What do you think happens to rocks when plates move? (Tip: think about rocks at all locations on a plate. Think about rocks being pushed into the earth, rocks found where plates meet, etc.) Give specific examples/locations to support your thinking.

*Answers will vary. Sample response: "Rocks at a divergent boundary may be stretched out and broken as plates move away from each other."*

6. Look at the rocks on your table. The rocks are in pairs and show changes that happened to the rocks. Describe the changes you see. Be sure to include the names of the rocks in your answer.

*The rocks granite and gneiss are both made of various pieces and the pieces are easy to see. The pieces in granite have no pattern or arrangement. The pieces in gneiss are arranged in layers.*

7. Observe and list some properties of the objects you are given (essentially, describe the object). Then, classify each one as being brittle or ductile. You can find the definition of these terms on page 92.

Term	Definition
<b>Brittle</b>	<i>Breaks when a force is applied to it.</i>
<b>Ductile</b>	<i>Bends, stretches, or flows when a force is applied.</i>

Object	Observations	Brittle or Ductile?
<i>Wooden Stick</i>	<i>It bends slightly when you apply pressure, but it breaks after a certain point.</i>	<i>Mostly Brittle</i>
<i>Twizzler</i>	<i>It bends very easily. It does not break when we push on it.</i>	<i>Ductile</i>
<i>Room Temp Caramel Candy</i>	<i>It is easy to flatten the candy. It does not break when we push on it.</i>	<i>Ductile</i>
<i>Cold Caramel Candy</i>	<i>It is hard to bend. It shatters when a large amount of pressure is placed on it.</i>	<i>Mostly Brittle</i>

8. Discuss your group's classifications and reasons for choosing each with the class. Answer the following:

a. How did you apply force to each object? How did each object respond to that force?

b. How did temperature and pressure affect the behavior of your objects?  
*An increase in temperature causes an increase in ductility. An increase in pressure increases the distortion or likelihood the object will break.*

c. Based on these observations, what do you think are the conditions that affect how an object responds to a force?  
*How an object responds to force depends on how the force is applied (e.g. pushing, pulling, etc.), the amount of force, the duration of the force, the properties of the object, and other conditions such as temperature.*

**Connecting.** Using the ideas from this activity, answer the following questions about earth's rocks.

9. In what part of the earth might rocks be more brittle and fracture more easily? In what part do you think they would be more ductile?  
*Rocks at or near the earth's surface, where the temperatures are cooler, are more brittle and fracture more often than rocks deeper in the earth, which are subject to higher temperatures.*