

# 24.1 Deformation of the Crust



Summarize main points from each video.

Video Title / topic \_\_\_\_\_

Video Title / topic \_\_\_\_\_

Video Title / topic \_\_\_\_\_

# Topic Introduction



**Summarize your understanding of each paragraph.**

Earth continually changes. Earth's crust undergoes change. The expressions "deformation" and "deform" are commonly used in describing much of the Earth's change and reshaping. Deformation is the bending, tilting, and breaking of Earth's crust.

Deformation is the change in shape of rock in response to stress. There are a dozen or so words like "deformation" and "stress" that are commonly used in every-day language. In science, though, these words often have a specific meaning.

The crust is broken into several parts, known as the continental plates. When the plates are pulled or pushed together, stress occurs. Four types of stresses affect the Earth's crust: compression, tension, shear and confining (sometimes called "overburden") stress.

Take note of differences between the specific (scientific) meaning of words in this topic – compared to other meanings in every day language. For examples, "stress" has several meanings. Some other words to pay attention to are "strain", "fault", "strike", and "fold."

# Read/Summarize Text



1. Read the passage.
2. Underline key expressions in each sentence.
3. Re-write each word (or expression) you underlined.
4. Summarize the passage.

*Stress, strain, and structures in rock.*

Tension, compression, and shearing work over millions of years to change the shape and volume of rock. Stress that pushes masses of rock in opposite directions, in a sideways movement. Strain can cause rock to break and slip apart or to change its shape. The differences between stress, strain and structures formed during strain become key concepts.

- **Stress** is a force acting on a rock per unit area.
- **Structures** in geology are deformation features that result from permanent (brittle or ductile) **strain**.

<https://serc.carleton.edu>

*Re-write words you underlined*

\_\_\_\_\_

\_\_\_\_\_

*Using a complete sentence, summarize or rephrase the passage*

\_\_\_\_\_

# Read Text for Comprehension

Read this article for deeper understanding. No summary is required, although you may want to circle, underline, or mark key ideas and words.

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## **Rocks deform**

Many students have a difficult time realizing that rocks can bend or break. They also may have difficulty imagining the forces necessary to fold or fault rocks or comprehending that the seemingly constant Earth can change dramatically over time.

This is especially true of students who live in tectonically stable areas. If students are to understand the basics of stress and strain, they must overcome this barrier since it will be difficult to examine the causes and conditions of deformation if students cannot comprehend deformation.

## **Stress causes strain, strain results in structures**

Many geologists consider it important for introductory students to understand that visible structures are a record of the stress and physical conditions in the Earth. As a result, the differences between stress, strain and structures formed during strain become key concepts.

Stress, strain and structure start with the same three letters, yet mean very different things. These words are also used differently in geology than in common usage in English, which can cause confusion. However, here are some tricks that I use to remember:

- Stress is the same as pressure. When you are under pressure, you are stressed!
- Stress can happen with out strain, but strain cannot happen without stress.

## **Different conditions lead to different deformation styles**

There are many factors that contribute to the style of the deformation in a rock, including pressure, temperature, rock composition, presence or absence of fluids, type of stress, rate of stress, and others. However, the type of stress, the rate of stress and the temperature may be the most critical factors for most introductory students.

## **Relating faults to stress - hanging walls, footwalls, and different types of faults**

One of the goals of structural geology is to relate the nature of deformation to the stress that caused it. Therefore, it is important that students be able to distinguish between normal faults (generated by tension) and reverse faults (generated by compression).

# Draw Illustration



Copy and Label the Illustration in the Space Provided

Force applied to an Area – Differences in the Effect



<http://geologylearn.blogspot.com/2016/03/rock-deformation.html>

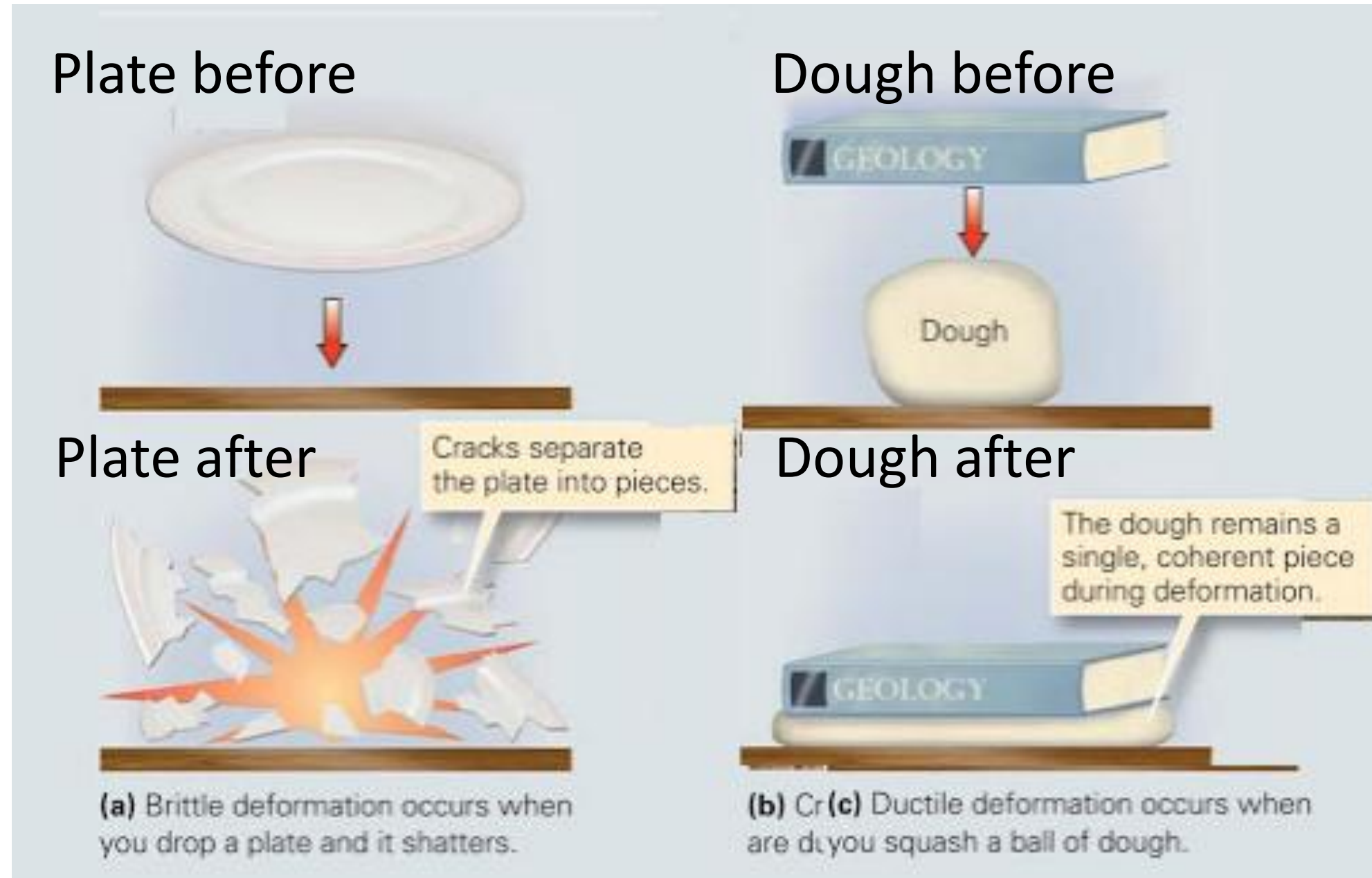
**Draw (Copy) the Illustration Here**

# Draw Illustration



Copy and Label the Illustration in the Space Provided

## Differences in Brittle compared to Ductile deformation



<http://geologylearn.blogspot.com/2016/03/rock-deformation.html>

**Draw (Copy) the Illustration Here**

# Show-Off Your Smarts!



## Instructions

- Complete as an individual or small group.
- Discuss your ideas/answers/responses in a small group.
- Select one person to present your responses to the class.

**Q1. How can this information be applied to a young-person's life?**

**Q2. How does this information apply to (or impact) communities?**

**Q3. When do scientists need to apply this information? How?**

**Q4. How would a person from 100 years ago view this information?**

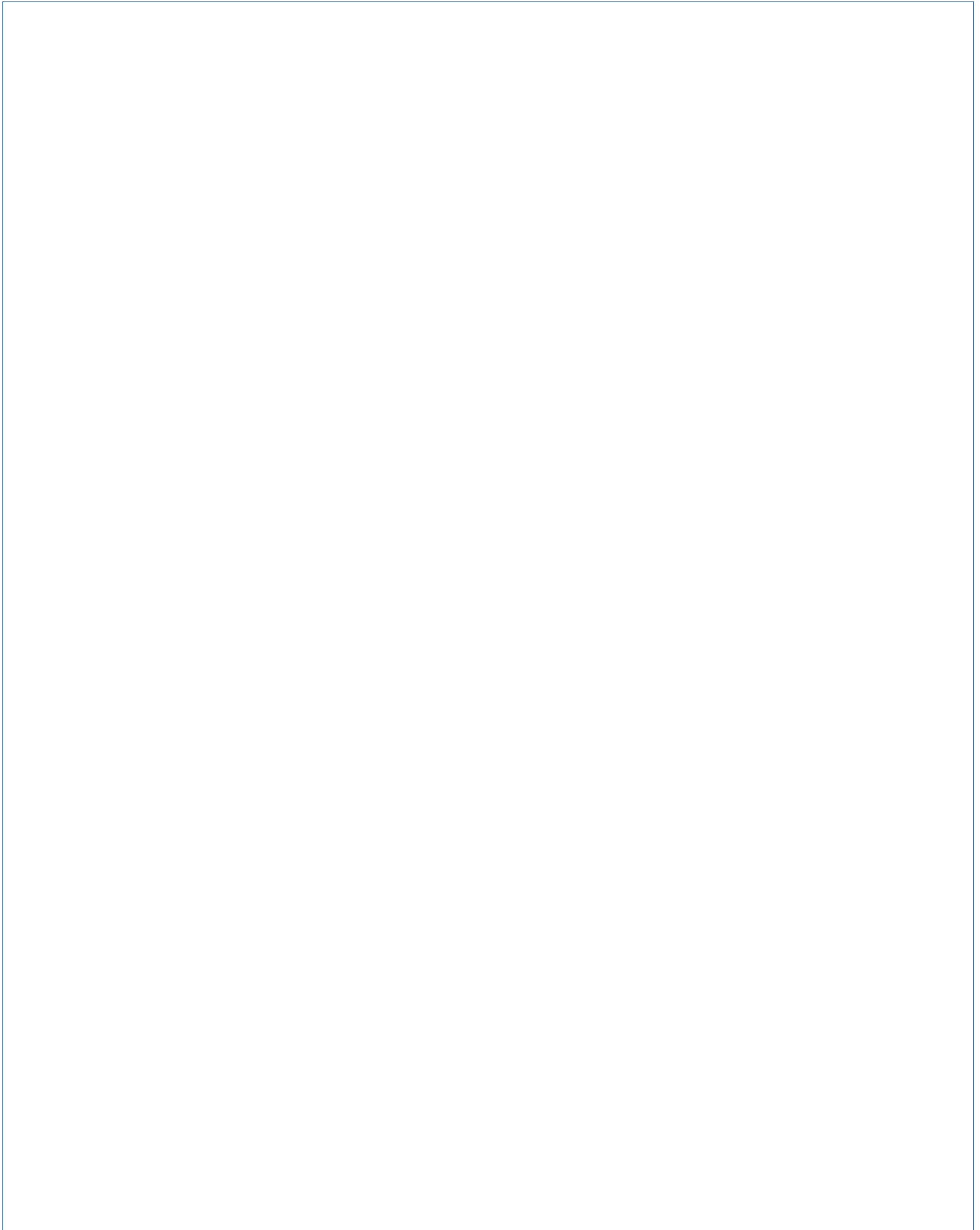
**Q5. How does this topic connect to other science topics or math?**

*Write down at least three words introduced or covered by this topic.*

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

# Make a Poster

In the space provided here, create/draw a poster which conveys the concepts you have learned on this topic.

A large, empty rectangular box with a thin blue border, intended for the student to create a poster. The box occupies the majority of the page below the instructions.