Date

Earthquakes • Guided Reading and Study

# Forces in Earth's Crust

*This section explains how stresses in Earth's crust cause breaks, or faults, in the crust. The section also explains how faults and folds in Earth's crust form mountains.* 

### **Use Target Reading Skills**

The first column in the chart lists key terms in this section. In the second column, write what you know about the key term. As you read the section, write a definition of the key term in your own words in the third column. Some examples are done for you.

Key Term	What You Know	Definition
Stress		
Tension	pulling, as on a rope	
Compression	squeezing together	
Shearing		
Normal fault		A fault in which one part of the rock is above another part and slips downward when movement occurs
Hanging wall		
Footwall		
Reverse fault		
Strike-slip fault		
Anticline	anti means "against"	
Syncline		
Plateau	flat land feature	

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### Forces in Earth's Crust (continued)

1. Circle the letter of the term that refers to force that acts on rock to change its shape or volume.

**a.** fault **b.** stress **c.** pressure **d.** heat

2. The amount of space a rock takes up is its \_\_\_\_\_\_.

#### **Types of Stress**

3. List the three types of stress that occur in Earth's crust.

a. \_\_\_\_\_ b. \_\_\_\_\_ c. \_\_\_\_

4. Complete the cause-events-effect chart to show how the different types of stress change the shape and volume of rock.

Cause	Event	Effect
Tension	с.	e.
a.	d.	Rock folds or breaks
b.	Pushes rock in two different directions	f.

**g.** Which type of stress causes the crust to become thinner?

5. A break in Earth's crust is a(n) \_\_\_\_\_\_.

### **Kinds of Faults**

Match the kind of fault with its description.

#### **Type of Fault**

- \_\_\_\_\_ **6.** strike-slip fault
- \_\_\_\_\_ **7.** normal fault
- **8.** reverse fault

#### Description

- **a.** The hanging wall slides up and over the footwall.
- **b.** There is little up-or-down motion.
- **c.** The hanging wall slips downward below the footwall.

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- **9.** Is the following sentence true or false? A strike-slip fault that forms the boundary between two plates is called a convergent boundary.
- **10.** Circle the letter of each sentence that is true about a hanging wall.
  - **a.** It slips downward when movement occurs along a normal fault.
  - **b.** It is the half of a fault that lies below in a reverse fault.
  - **c.** It is the same as a footwall.
  - **d.** It occurs when the fault is at an angle.
- **11.** Circle the letter of each sentence that is true about both normal and reverse faults.
  - **a.** The faults are at an angle.
  - **b.** The faults are caused by tension.
  - c. The faults are caused by compression.
  - **d.** The faults have footwalls.
- **12.** Complete the flowchart to show the types of faults and movements caused by stress on rock.



**g.** Two types of faults can result in mountains. Which are they, and how do you know from examining this flowchart? \_\_\_\_\_

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## Forces in Earth's Crust (continued)

Match the landform with the type of fault or faults found there.

Landform	Type of Fault	
13. San Andreas Fault	<b>a.</b> reverse fault	
<b>14.</b> Rio Grande rift valley	<b>b.</b> strike-slip fault	
<b>15.</b> Rocky Mountains	<b>c.</b> normal fault	
Match the term with its definition.		
Term	Definition	
<b>16.</b> anticline	<b>a.</b> Fold in rock that bend	

- \_\_\_\_ 17. syncline
- **18.** folded mountains
- s upward
- **b.** Parallel ridges and valleys
- **c.** Fold in rock that bends downward

### **Changing Earth's Surface**

- **19.** Circle the letter of the sentence that describes how a fault-block mountain is created.
  - **a.** It is created by two normal faults.
  - **b.** It is created by two reverse faults.
  - **c.** It is created by a strike-slip fault.
  - **d.** It is created by shearing.
- **20.** Circle the letter of each mountain range that was caused by folding.
  - a. Alps
  - **b.** Himalayas
  - c. Appalachian
  - d. Great Basin
- **21.** What is a plateau? \_\_\_\_\_

Class

Earthquakes • Section Summary

## Forces in Earth's Crust Key Concepts

- How does stress in the crust change Earth's surface?
- Where are faults usually found, and why do they form?
- What land features result from the forces of plate movement?

The movement of Earth's plates creates enormous forces that squeeze or pull the rock in the crust. A force that acts on rock to change its shape or volume is **stress**. Stress adds energy to the rock. The energy is stored in the rock until it changes shape or breaks.

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Three different kinds of stress can occur in the crust—tension, compression, and shearing. **Tension, compression, and shearing work over millions of years to change the shape and volume of rock. Tension** pulls on the crust, stretching rock so that it becomes thinner in the middle. **Compression** squeezes rock until it folds or breaks. **Shearing** pushes a mass of rock in two opposite directions.

When enough stress builds up in rock, the rock breaks, creating a fault. A fault is a break in the rock of the crust where rock surfaces slip past each other. Most faults occur along plate boundaries, where the forces of plate motion push or pull the crust so much that the crust breaks. There are three main types of faults: normal faults, reverse faults, and strike-slip faults.

Tension causes a normal fault. In a **normal fault**, the fault is at an angle, and one block of rock lies above the fault while the other block lies below the fault. The block of rock that lies above is called the **hanging wall**. The rock that lies below is called the **footwall**. Compression causes reverse faults. A **reverse fault** has the same structure as a normal fault, but the blocks move in the opposite direction. Shearing creates strike-slip faults. In a **strike-slip fault**, the rocks on either side of the fault slip past each sideways, with little up or down motion.

Over millions of years, the forces of plate movement can change a flat plain into landforms such as anticlines and synclines, folded mountains, fault-block mountains, and plateaus. A fold in rock that bends upward into an arch is an anticline. A fold in rock that bends downward to form a valley is a syncline. Anticlines and synclines are found on many parts of the Earth's surface where compression forces have folded the crust. The collision of two plates can cause compression and folding of the crust over a wide area. Where two normal faults cut through a block of rock, fault movements may push up a fault-block mountain. The forces that raise mountains can also uplift, or raise plateaus. A plateau is a large area of flat land elevated high above sea level.

Earthquakes • Review and Reinforce

# **Forces in Earth's Crust**

## **Understanding Main Ideas**

*Use the diagrams below to answer items* 1–3*.* 

	Diagram A	Diagram B		Diagram C		
1.	Diagram A					
	<b>a.</b> Type of Fault:		-			
	<b>b.</b> Stress Force:					
	c. Movement Along Fau	ult:				
2.	Diagram B					
	<b>a.</b> Type of Fault:		_			
	<b>b.</b> Stress Force:					
	c. Movement Along Fau	alt:				
3.	Diagram C					
	<b>a.</b> Type of Fault:		_			
	<b>b.</b> Stress Force:					
	c. Movement Along Fau	alt:				
Building Vocabulary						
Write a definition for each of these words. Use the back of this sheet if you need more space.						
4. shearing						
5. hanging wall						
6	6. syncline					

9. anticline \_\_\_\_\_

7. footwall

10. plateau \_\_\_\_\_

#### Earthquakes • Enrich

## **Evidence of Movement Along Faults**

Each picture below shows how an earthquake changed the land surface at a fault. Examine the pictures carefully. Decide what kind of fault is shown in each. Then explain how movement along the fault caused the changes you see. Write your answers in the spaces provided.





Fault 2



Fault 3

