

1. How are rocks and minerals different?
2. What are the three types of rock?
3. Which rock types are most common within Earth's crust? Which type is most common at Earth's surface?

CRITICAL THINKING

4. **Analyze** Why is the set of natural processes by which rocks change into other types of rocks called a cycle?
5. **Infer** Which type of rock would you expect to be common on the floor of a large, deep lake? Why?

CHALLENGE

6. **Synthesize** Draw a diagram showing how an igneous rock could change into a metamorphic rock and how the metamorphic rock could change into a sedimentary rock.

ANSWERS

1. *Minerals have an orderly crystal structure and a definite composition, but rocks do not.*

2. *igneous, sedimentary, metamorphic*

3. *igneous and metamorphic; sedimentary*

4. *because the steps occur over and over and have no beginning or end*

5. *sedimentary; because layers of sediment can build up in the center of a large lake*

6. *The diagram should show the following: heat and/or*

pressure change the igneous rock into a metamorphic rock; the metamorphic rock reaches the surface as overlying rocks are worn away; at the surface, the metamorphic rock breaks down into sediments, which are then cemented together to form sedimentary rock.

1. What is the main difference between intrusive and extrusive igneous rocks?
2. What are the two major properties used to classify igneous rocks?
3. Why can intrusive igneous rocks be left behind when surrounding rocks are worn away?

CRITICAL THINKING

4. **Draw Conclusions** If granite within Earth melts and then erupts at the surface, what type of extrusive rock is likely to form?
5. **Analyze** Would you expect extrusive rocks produced by an explosive volcano to be light or dark in color? Why?

CHALLENGE

6. **Synthesize** Why are the names *intrusive* and *extrusive* appropriate for the two types of igneous rocks?

ANSWERS

1. *Intrusive rocks cool slowly below Earth's surface, while extrusive rocks cool quickly on Earth's surface.*

2. *crystal size and silica content*

3. *Igneous rocks can be harder than other rock types and may not wear away as quickly.*

4. *rhyolite (also pumice and obsidian)*

5. *light in color because an explosive volcano is likely to have silica-rich lava*

6. *Intrusive means "to push in." Magma pushes into earlier rocks and cools to form intrusive igneous rocks.*

Extrusive means "to push out." Lava is pushed out onto Earth's surface, where it cools to form extrusive igneous rocks.

1. What types of material can make up sediments?
2. Describe the three processes by which sedimentary rocks form.
3. Describe how a sedimentary rock can show how fast water was flowing when its sediments were laid down.

CRITICAL THINKING

4. **Infer** Why is coal called a fossil fuel?
5. **Analyze** How could the speed of flowing water change to lay down alternating layers of sand and mud?

CHALLENGE

6. **Synthesize** How is it possible for a single sedimentary rock to contain rock particles, animal shells, and minerals that crystallized from water?

ANSWERS

1. *pieces of minerals, rocks, plant and animal remains*
2. *pieces of minerals and rocks are cemented together; shells and skeletons of ocean animals are cemented together; dissolved minerals are left behind as water evaporates*
3. *A rock made of large pieces shows that water was moving quickly.*
4. *It is made of the remains of ancient plants.*
5. *Weather patterns cause flow rates of rivers to vary. Sand settles from faster-moving water; smaller pieces of*
6. *silt and clay that make up mud settle from slower-moving water.*
6. *A rock that forms from sediment on a beach could have pieces of shells and rocky sand cemented together by minerals that crystallized from water.*

1. What conditions can cause a sedimentary or igneous rock to change into a metamorphic rock?
2. How do new minerals grow within existing rocks?
3. Why do bands of minerals develop in most metamorphic rocks?

CRITICAL THINKING

4. **Draw Conclusions** Would gneiss be more likely to form at shallow depths or at great depths where mountains are being pushed up? Why?
5. **Infer** Would you expect to find foliated or nonfoliated metamorphic rocks next to a lava flow? Why?

CHALLENGE

6. **Synthesize** What features of sedimentary rocks are unlikely to be found in metamorphic rocks? What features of metamorphic rocks do not occur in sedimentary rocks?

ANSWERS

1. *increasing temperature or pressure or both*
2. *Heat and pressure can break bonds in minerals, and the atoms can then join in new ways to make new minerals.*

3. *because most rocks contain several types of minerals*
4. *deep below the surface; because it takes high temperature and pressure to form this rock*
5. *nonfoliated; because it would have been changed by*

the heat of lava flows and not by high pressure

6. *pieces of sediment, fossils, ripple marks, and mud cracks; flat or wavy bands of minerals, a shiny surface due to mica, and growth of new minerals from old ones*