Name: _____ Date: _____

How Earthquakes Are Measured

Circle group

An earthquake starts deep underground. Blocks of rock have been pressing on each other, and then they slip. The slip sends out waves of energy. These are called seismic waves. They travel through the planet in every direction. When they reach the surface, the ground shakes.

Scientists record the shaking with a seismograph. It has a heavy weight that hangs from a frame. When the ground moves, the frame moves too. But the weight stays almost still, because of its inertia. A pen or a sensor records the difference. The result is a wiggly line that shows how strong the shaking was.

Seismic waves come in types, and they travel at different speeds. The fastest are P waves. They arrive first. The slower S waves arrive a bit later. A scientist can measure the gap between them to find out how far away the earthquake was. Readings from three or more stations can be put together to find the epicenter. This is the spot on the surface right above where the rock slipped.

To tell how big an earthquake is, scientists use a number called magnitude. In 1935, an American scientist named Charles Richter made the first scale that many people used. Today most experts use a newer one, the moment magnitude scale. It works better for very large earthquakes. On both scales, one whole number up means the ground moves about ten times more.

Thousands of earthquakes happen every day. Nearly all are too small to feel. Measuring them helps engineers build safer buildings.

Questions

1. What makes an earthquake begin?

_____

_____

2. What tool do scientists use to record shaking?

_____

_____

3. Which waves arrive first, P waves or S waves?

_____

_____

4. What is the epicenter?

_____

_____

5. What does one whole number up on the scale mean?

_____

_____

6. Why does the weight in a seismograph stay almost still?

_____

_____

7. What can the gap between P waves and S waves tell a scientist?

_____

_____

Words to know

seismic: having to do with earthquakes
seismograph: an instrument that records the shaking of the ground
inertia: the tendency of an object to keep still or keep moving
epicenter: the spot on the surface above where an earthquake begins
magnitude: a number that tells how big an earthquake is

Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

Name: _____ Date: _____

How Earthquakes Are Measured

Triangle group

An earthquake begins deep underground when blocks of rock that have been pressing against each other suddenly slip. The slip sends out waves of energy, called seismic waves, that travel through the planet in every direction. When those waves reach the surface, the ground shakes.

Scientists record this shaking with an instrument called a seismograph. The main part of a seismograph is a heavy weight hanging from a frame. When the ground moves, the frame moves with it, but the weight stays almost still because of its inertia. A pen or a sensor records the difference between the two, and the result is a wiggly line that shows how strong the shaking was.

Seismic waves come in different types that travel at different speeds. The fastest, called P waves, arrive first. The slower S waves arrive a little later. By measuring the gap between the two, a scientist can work out how far away the earthquake was. Readings from at least three stations in different places can then be combined to pinpoint the epicenter, the spot on the surface directly above where the rock slipped.

To describe the size of an earthquake, scientists use a number called magnitude. In 1935, an American scientist named Charles Richter created the first widely used scale. Today most experts use a newer method, the moment magnitude scale, which works better for very large earthquakes. On both scales, each step up of one whole number means the ground moves about ten times more.

Thousands of earthquakes happen every day, but nearly all are too small for anyone to feel. Measuring them carefully helps engineers design safer buildings.

Questions

1. What causes an earthquake to begin?

_____

_____

2. What instrument do scientists use to record shaking?

_____

_____

3. Which waves arrive first, P waves or S waves?

_____

_____

4. What is the epicenter?

_____

_____

5. What does each step up of one whole number on the scale mean?

_____

_____

6. Why does the weight in a seismograph stay almost still when the ground moves?

_____

_____

7. How can the gap between P waves and S waves tell a scientist something?

_____

_____

Words to know

seismic: having to do with earthquakes
seismograph: an instrument that records the shaking of the ground
inertia: the tendency of an object to keep still or keep moving
epicenter: the spot on the surface above where an earthquake begins
magnitude: a number that tells how big an earthquake is

Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

Name: _____ Date: _____

How Earthquakes Are Measured

Square group

An earthquake originates deep beneath the surface when blocks of rock that have been pressing against one another with tremendous force suddenly slip. The slippage releases waves of energy, known as seismic waves, which radiate through the planet in every direction, and when those waves finally reach the surface, the ground begins to shake violently enough to be felt.

Scientists document this shaking with an instrument called a seismograph. Its central component is a heavy weight suspended from a frame. When the ground moves, the frame moves along with it, yet the weight remains nearly motionless because of its inertia. A pen or an electronic sensor records the difference between the two, producing a wavering line that reveals how powerful the shaking was.

Seismic waves come in several varieties that travel at different speeds. The swiftest, called P waves, arrive first, while the slower S waves follow a little later. By measuring the interval between the two, a scientist can calculate how far away the earthquake occurred. Readings gathered from at least three stations in different locations can then be combined to pinpoint the epicenter, which is the spot on the surface directly above the place where the rock slipped.

To describe the size of an earthquake, scientists rely on a number called magnitude. In 1935, an American scientist named Charles Richter devised the first widely adopted scale. Today most experts prefer a newer approach, the moment magnitude scale, which is more reliable for extremely large earthquakes. On both scales, each step upward by one whole number indicates that the ground moves roughly ten times more.

Thousands of earthquakes occur every day, but nearly all are far too weak for anyone to notice. Measuring them carefully helps engineers design buildings that are considerably safer.

Questions

1. What causes an earthquake to originate?

_____

_____

2. Which instrument do scientists use to document shaking?

_____

_____

3. Which arrive first, P waves or S waves?

_____

_____

4. What is the epicenter?

_____

_____

5. What does each step upward by one whole number on the scale indicate?

_____

_____

6. Why does the weight in a seismograph remain nearly motionless when the ground moves?

_____

_____

7. How can the interval between P waves and S waves help a scientist?

_____

_____

Words to know

seismic: having to do with earthquakes
seismograph: an instrument that records the shaking of the ground
inertia: the tendency of an object to keep still or keep moving
epicenter: the spot on the surface above where an earthquake begins
magnitude: a number that tells how big an earthquake is

Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

For the teacher: How Earthquakes Are Measured

Each student sheet carries a shape, not a level. The same topic and facts, written three ways.

Circle: How Earthquakes Are Measured

Easier · 254 words · Flesch-Kincaid grade 4.6

1. Blocks of rock that were pressing on each other suddenly slip.
2. A seismograph.
3. P waves.
4. The spot on the surface right above where the rock slipped.
5. The ground moves about ten times more.
6. Its inertia keeps it from moving with the frame.
7. A bigger gap means the earthquake was farther away.

Triangle: How Earthquakes Are Measured

This passage · 271 words · Flesch-Kincaid grade 7.7

1. Blocks of rock that have been pressing against each other suddenly slip.
2. A seismograph.
3. P waves.
4. The spot on the surface directly above where the rock slipped.
5. The ground moves about ten times more.
6. Its inertia keeps it from moving along with the frame.
7. The bigger the gap, the farther away the earthquake was.

Square: How Earthquakes Are Measured

Harder · 293 words · Flesch-Kincaid grade 10.8

1. Blocks of rock that have been pressing against one another suddenly slip.
2. A seismograph.
3. P waves, the swiftest.
4. The spot on the surface directly above the place where the rock slipped.
5. The ground moves roughly ten times more.
6. Its inertia keeps it from moving along with the frame.
7. A longer interval means the earthquake occurred farther away.