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# Moving, Exploding Earth



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## Fifth-Grade Teacher Resource Guide

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## Moving, Exploding Earth: Lesson Summary and Vocabulary

**Lesson Summary:** YSI's *Moving, Exploding Earth* program offers students a comprehensive overview of geological forces. Students will first work with the instructors to discuss the earth and identify its composition. A food-based model provides an early snack and helps students visualize the layers of the earth and how they move. From there, students split into two groups to cycle between 'plate tectonics' and 'rocks and minerals' stations. In the first, they recreate tectonic forces and discover the nature of different boundaries and the earthquakes they produce. In the second, they learn how minerals can be combined and form into rocks, and how one type of rock can transform into another. Lastly, programs scheduled at YSI facilities will go on an instructor-led hike to observe some of the features and forces of our local earth. Throughout the program, students will be challenged to address and respond to a wide range of open-ended questions and help their classmates build a better picture of the planet we live on.

**Vocabulary:** Below are words and concepts that relate to the *Moving, Exploding Earth* program.

**Asthenosphere:** the soft, flowing part of the mantle that is near the surface and higher in temperature but lower in pressure than the inner mantle

**Convergent:** a type of boundary where plates come together; colliding or merging

**Core:** the iron and nickel center of the earth; includes a solid inner core and liquid outer core

**Crust:** the solid outer layer of the earth, the crust is more dense under the ocean and less dense under the continents

**Divergent:** a type of boundary where plates move apart; splitting

**Earthquake:** strong vibrations in the lithosphere caused by motion at faults and boundaries

**Erosion:** the process by which the surface of the earth is worn away by wind, water, or other natural forces

**Igneous:** a type of rock produced by the heat of a volcano; literally "born in fire"

**Lava:** melted rock that has exited the surface of the earth

**Lithosphere:** cool layer of rigid rock that includes the cooler, outermost layer of the mantle

**Magma:** melted rock just below the surface of the earth's crust

**Mantle:** the semisolid portion of the earth between the crust and the core

**Mesosphere:** the dense lower rock layer between the asthenosphere and core; flows very slowly

**Metamorphic:** a type of rock that has changed forms due to extreme heat and pressure

**Mineral:** an inorganic crystalline solid

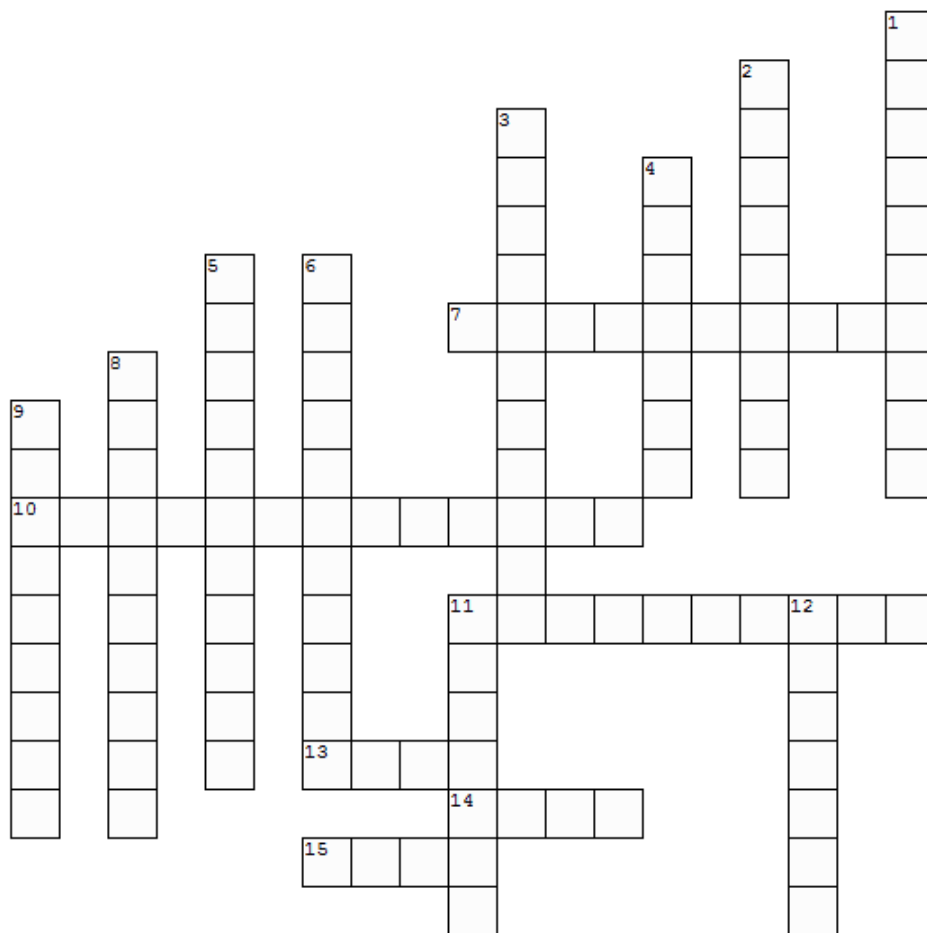
**Rock:** a substance composed of mineral matter put together under heat or pressure

**Sedimentary:** a type of rock formed by small deposited particles that are compressed over time

**Subduction:** the process by which one tectonic plate is pushed or driven under another

**Transform:** a type of boundary where plates move sideways to each other; change

## Moving, Exploding Earth Language Arts Crossword Puzzle



MINERAL	LAVA	CORE	ROCK	CONVERGENT	IGNEOUS	EROSION	ASTHENOSPHERE
LITHOSPHERE	SEDIMENTARY	METAMORPHIC	TRANSFORM	DIVERGENT	MESOSPHERE		
		EARTHQUAKE	SUBDUCTION				

### Down

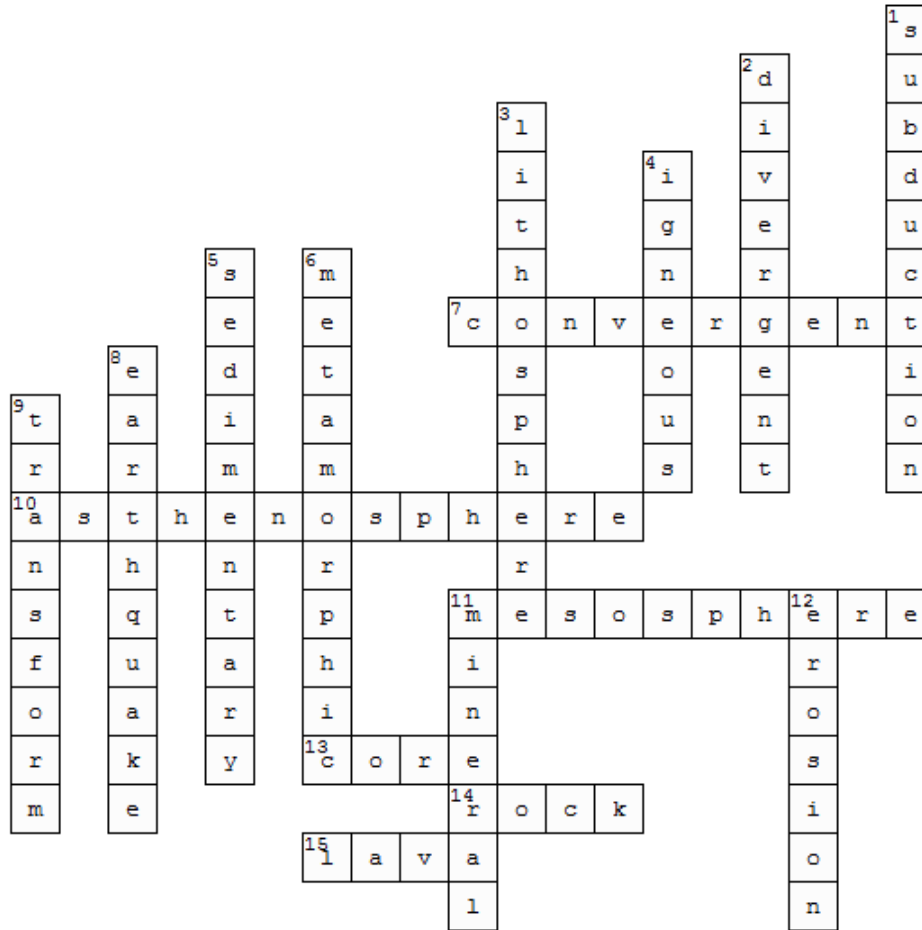
- The process by which one tectonic plate moves under another.
- A type of boundary where plates move apart.
- The outermost layer of the earth; includes everything we see.
- Rock produced by the heat of a volcano.
- Rock formed by small deposited particles that are compressed over time.
- Rock that changed forms due to heat and pressure.
- Strong vibrations in the earth's crust caused by motion at faults and boundaries.
- A type of boundary where plates slide sideways past each other.
- An inorganic crystalline solid.
- The process by which the surface of the earth is worn away by wind, water, or other natural forces.

### Across

- A type of boundary where plates come together.
- The layer of fluid and semi-fluid rock just below the lithosphere.
- The dense semi-solid rock layer between the asthenosphere and core.
- The iron and nickel center of the earth; includes a solid inner part and liquid outer part.
- A substance composed of mineral matter put together under heat or pressure.
- Melted rock that has exited the surface of the earth.

## Answer Key

### Moving Exploding Earth Language Arts Crossword Puzzle



#### Down

1. The process by which one tectonic moves under another (**subduction**).
2. A type of boundary where plates move apart (**divergent**).
3. The outermost layer of the earth; includes everything we see (**lithosphere**).
4. Rock produced by the heat of a volcano (**igneous**).
5. Rock formed by small deposited particles that are compressed over time (**sedimentary**).
6. Rock that changed forms due to heat and pressure (**metamorphic**).
8. Strong vibrations in the earth's crust caused by motion at faults and boundaries (**earthquake**).
9. A type of boundary where plates slide sideways past each other (**transform**).
11. An inorganic crystalline solid (**mineral**).
12. The process by which the surface of the earth is worn away by wind, water, or other natural forces (**erosion**).

#### Across

7. A type of boundary where plates come together (**convergent**).
10. The layer of fluid and semi-fluid rock just below the lithosphere (**asthenosphere**).
11. The dense semi-solid rock layer between the asthenosphere and core (**mesosphere**).
13. The iron and nickel center of the earth; includes a solid inner part and liquid outer part (**core**).
14. A substance composed of mineral matter put together under heat or pressure (**rock**).
15. Melted rock that has exited the surface of the earth (**lava**).

## Language Arts Word Search

### Moving, Exploding Earth

Circle the vocabulary in the word search below. Can you find all the earth-related words?

C	C	O	N	V	E	R	G	E	N	T	D	M	C	I	F	Y
I	Q	I	Q	W	P	R	L	A	V	A	U	X	G	B	M	S
B	C	T	R	A	N	S	F	O	R	M	M	N	A	X	D	N
U	S	M	Z	J	M	T	X	C	P	S	E	X	N	L	M	P
U	C	D	N	V	Y	B	R	N	Y	O	H	J	O	N	A	T
O	I	I	V	B	T	O	G	E	U	B	N	D	X	E	T	L
N	H	V	U	G	C	K	X	S	M	W	F	F	G	B	X	A
W	P	E	F	K	E	S	U	B	D	U	C	T	I	O	N	I
C	R	R	Z	S	P	J	E	B	V	J	K	L	J	U	Q	R
V	O	G	D	G	E	A	R	T	H	Q	U	A	K	E	V	D
V	M	E	R	E	H	P	S	O	H	T	I	L	B	O	X	C
F	A	N	G	S	E	D	I	M	E	N	T	A	R	Y	F	I
X	T	T	W	E	C	A	I	J	R	O	Z	Q	E	A	M	E
N	E	D	C	E	R	E	H	P	S	O	S	E	M	I	X	K
J	M	O	M	I	N	E	R	A	L	W	O	L	S	D	L	L
G	R	X	Z	F	N	O	I	S	O	R	E	O	P	Z	V	F
E	P	R	A	S	T	H	E	N	O	S	P	H	E	R	E	S

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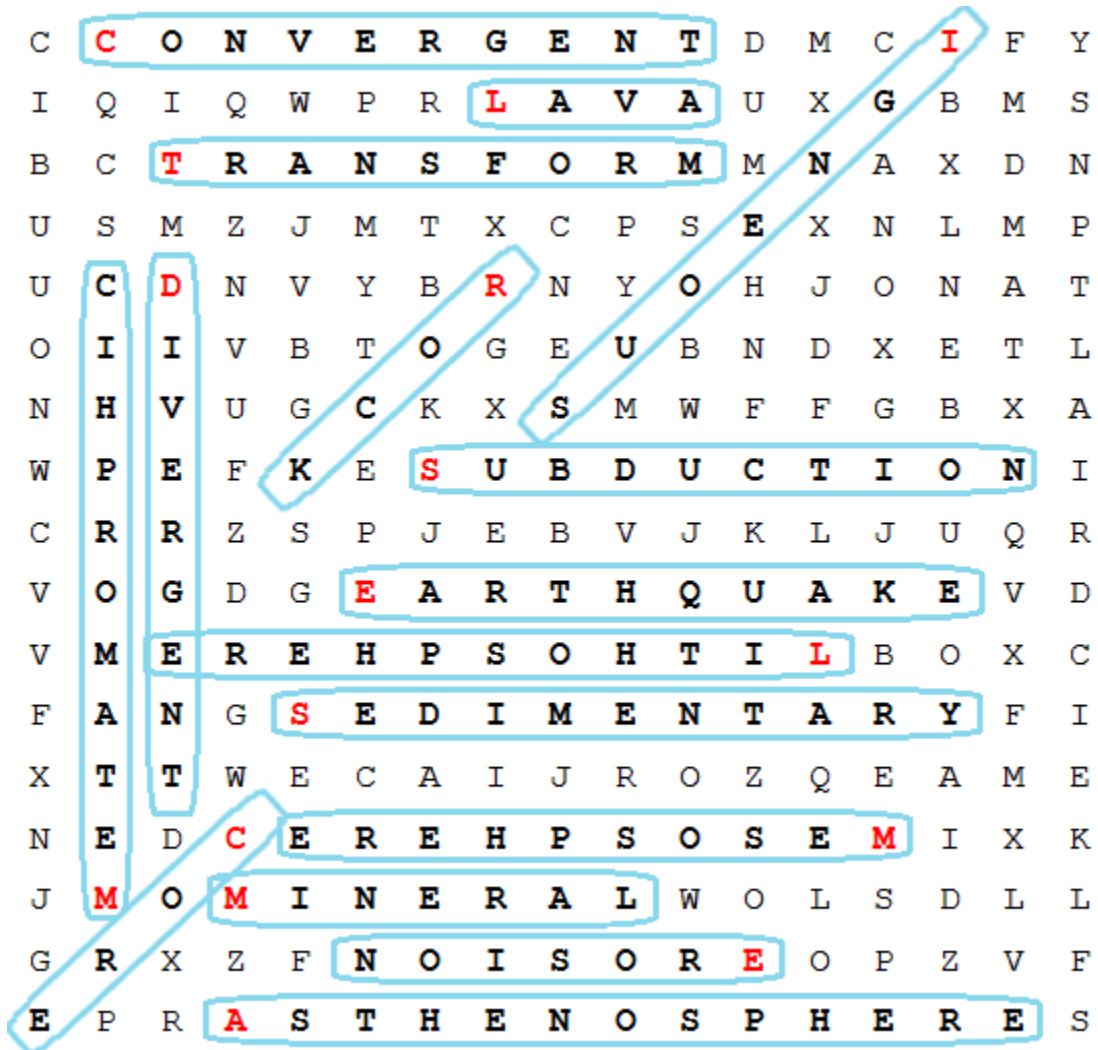
### Word Bank

ASTHENOSPHERE  
CONVERGENT  
CORE  
DIVERGENT  
EARTHQUAKE  
EROSION

IGNEOUS  
LAVA  
LITHOSPHERE  
MESOSPHERE  
METAMORPHIC  
MINERAL

ROCK  
SEDIMENTARY  
SUBDUCTION  
TRANSFORM

**Answer Key**  
**Language Arts Word Search**  
**Moving, Exploding Earth**



**Word Bank**

ASTHENOSPHERE  
 CONVERGENT  
 CORE  
 DIVERGENT  
 EARTHQUAKE  
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## **Moving, Exploding Earth: Extension Activities**

The extension activities listed below are from RAFT (Resource Area For Teaching). RAFT educational content is available online ([www.raftbayarea.org](http://www.raftbayarea.org)) at no cost and is aligned to California Science Standards and Next Generation Science Standards. Below is a selection of post-visit activities from RAFT to build on student learning about geology and the forces that make up our planet.

### [RAFT Idea: Playing with the Rock Cycle - Resource Area For Teaching - RAFT Bay Area](#)

**Grades Covered:** 2 through 8

**Subjects Covered:** Physical Science, Earth/Space Science

**Curriculum topics:** Rocks and Minerals, Rock Cycle, Patterns of change

**Description:** Given enough time, everything changes...

<http://www.raftbayarea.org/ideas/Playing%20with%20the%20Rock%20Cycle.pdf>

### [RAFT Idea: Foam Faults – Resource Area For Teaching – RAFT Bay Area](#)

**Grades Covered:** 4 through 12

**Subjects Covered:** Earth/Space Science

**Curriculum topics:** Earthquakes, Plate Tectonics, Faults

**Description:** In this activity, students will model the three main types of faults and examine the terrestrial movement that occurs along the fault lines.

<http://www.raftbayarea.org/ideas/Foam%20Faults.pdf>

### [RAFT Idea: On A Roll With Geologic Time – Resource Area For Teaching – RAFT Bay Area](#)

**Grades Covered:** 2 through 12

**Subjects Covered:** Life Science, Earth/Space Science, Math

**Curriculum topics:** Geologic Time, Earth History, Scale

**Description:** Shrink billions of years and Earth's significant events...

<http://www.raftbayarea.org/ideas/On%20a%20Roll%20with%20Geologic%20Time.pdf>

### [RAFT Idea: California Geographic Assembly - Resource Area For Teaching - RAFT Bay Area](#)

**Grades Covered:** 4 through 8.

**Subjects Covered:** Earth/Space Science, Social Studies.

**Curriculum topics:** Geology, Maps, California Land Features.

**Description:** Use transparent layers to diagram and represent different map details of California.

<http://www.raftbayarea.org/ideas/California%20Geographic%20Assembly.pdf>

## Moving, Exploding Earth: Education Standards

*Our Moving Exploding Earth program will contribute to students' ability to meet the California Science Content Standards, Common Core, and Next Generation Science Standards listed on the page below.*

### California Science Content Standards Fifth Grade:

**Physical Sciences: 1.** Elements and their combinations account for all the varied types of matter in the world. As a basis for understanding this concept:

- a. *Students know* metals have properties in common, such as high electrical and thermal conductivity.
- f. *Students know* differences in chemical and physical properties are used to separate mixtures and identify compounds.

**Earth Sciences: 3.** Water on Earth moves between the oceans and land through the processes of evaporation and condensation. As a basis for understanding this concept:

- a. *Students know* most of Earth's water is present as salt water in the oceans, which cover most of the Earth's surface.

**Investigation and Experimentation: 6.** Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:

- a. Classify objects (e.g. rocks, plants, leaves) in accordance with appropriate criteria.

Excerpted from CA State Standards: <http://www.cde.ca.gov/>

### Common Core Fifth Grade:

**Speaking and Listening Standards:** Students will...

1. Engage effectively in a range of collaborative discussions with diverse partners on *grade five topics*, building on each others' ideas and expressing their own clearly.
  - a. Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.
  - b. Follow agreed-upon rules for discussions and carry out assigned roles.
  - c. Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.
  - d. Review the key ideas expressed and draw conclusions in light of information and knowledge gained from discussions.

Excerpted from Common Core Standards: <http://www.corestandards.org/>

### Next Generation Science Standards Fifth Grade:

#### Structure and Properties of Matter

- **5-PS1-3:** Make observations and measurements to identify materials based on their properties.
  - **Science and Engineering Practices:**
    - **Planning and Carrying Out Investigations** Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and



## Moving, Exploding Earth: Education Standards

- provide evidence to support explanations or design solutions.
- Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (5-PS1-3)
- **Disciplinary core ideas:**
  - **PS1.A: Structure and Properties of Matter:** Measurements of a variety of properties can be used to identify materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.) (5-PS1-3)
- **Crosscutting Concepts**
  - **Scale, Proportion, and Quantity:** Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. (5-PS1-3)

Excerpted from NGSS: <http://www.nextgenscience.org/>