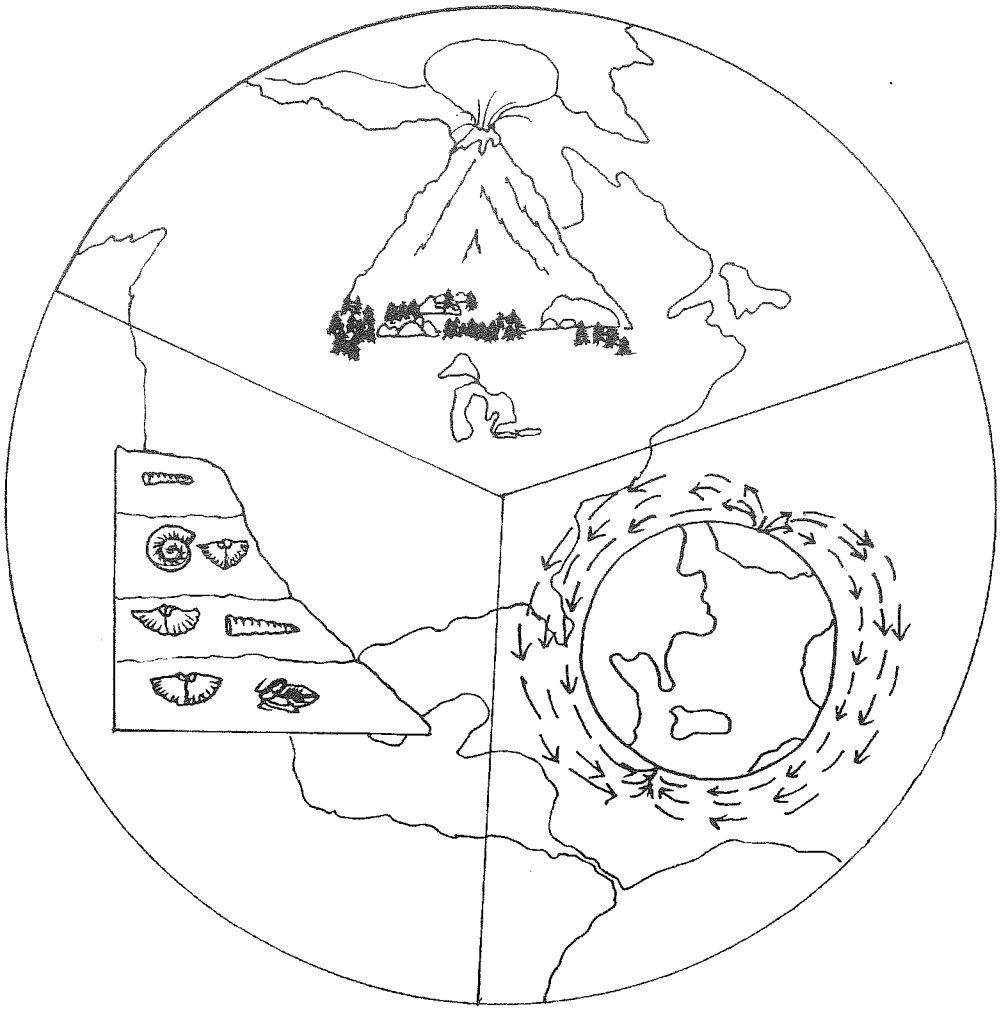
BATTLE CREEK AREA
Mathematics & Science Center

Student Journal

6ES2

Earth: Yesterday, Today, and Tomorrow



A Sixth Grade Unit
supporting the
Michigan Science K-7 Content Expectations

Name: _____

Name: _____

Date: _____

JOURNAL

Earthquakes Around the World

1

1. By plotting the earthquakes that occurred over one year on the world map, I learned:

2. I still have questions about:

ACTIVITY

What Are Plate Tectonics? (cont.)

Name: _____

Date: _____

2

Group Discussion Questions: Write ideas of what your group thinks would happen if...

1. What would happen if two plates started pushing against each other?

2. What would happen if two plates tried to pull away from each other?

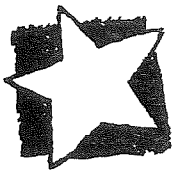
3. What would happen if two plates rubbed back and forth against each other?

Name: _____

Date: _____

JOURNAL

What Are Plate Tectonics? (cont.)



2

1. Draw and label a picture of the layers of the Earth.

2. Describe how the layers of the Earth are related to the movement of the Earth's tectonic plates.

Earthquakes, Volcanoes, Mountains and Tectonic Plate Movement

Name: _____

Date: _____

1. Draw a picture of the basalt specimen. Describe the properties of the rock and any evidence of pieces of minerals in the specimen.

2. Draw a picture of the granite specimen. Describe the properties of the granite and any evidence of pieces of minerals in the specimen.

3. Compare the basalt specimen to the granite specimen:

Rock	Mass	Color	Hardness	Evidence of Minerals
basalt				
granite				

Name: _____

Date: _____

Earthquakes, Volcanoes, Mountains and Tectonic Plate Movement (cont.)

1. What would happen if two large plates, made of granite, rubbed against one another, sliding past one another? Give an example of when that might happen.

2. What would happen if two large plates of granite collided? Give an example of when that might happen.

3. What would happen if one large plate of granite and one large plate of basalt collided? Give an example of when that might happen.

J O U R N A L

Earthquakes, Volcanoes, Mountains and Tectonic Plate Movement (cont.)

Name: _____

Date: _____

3

1. Draw and label a picture of how earthquakes occur. Write a caption for your picture.

2. Draw and label a picture of how mountains occur. Write a caption for your picture.

Name: _____

Date: _____

3. Draw and label a picture of how volcanoes occur. Write a caption for your picture.

4. Describe what all three changes in the surface of the Earth have in common.

A C T I V I T Y

The Earth Moves Under My Feet!

Name: _____

Date: _____

4

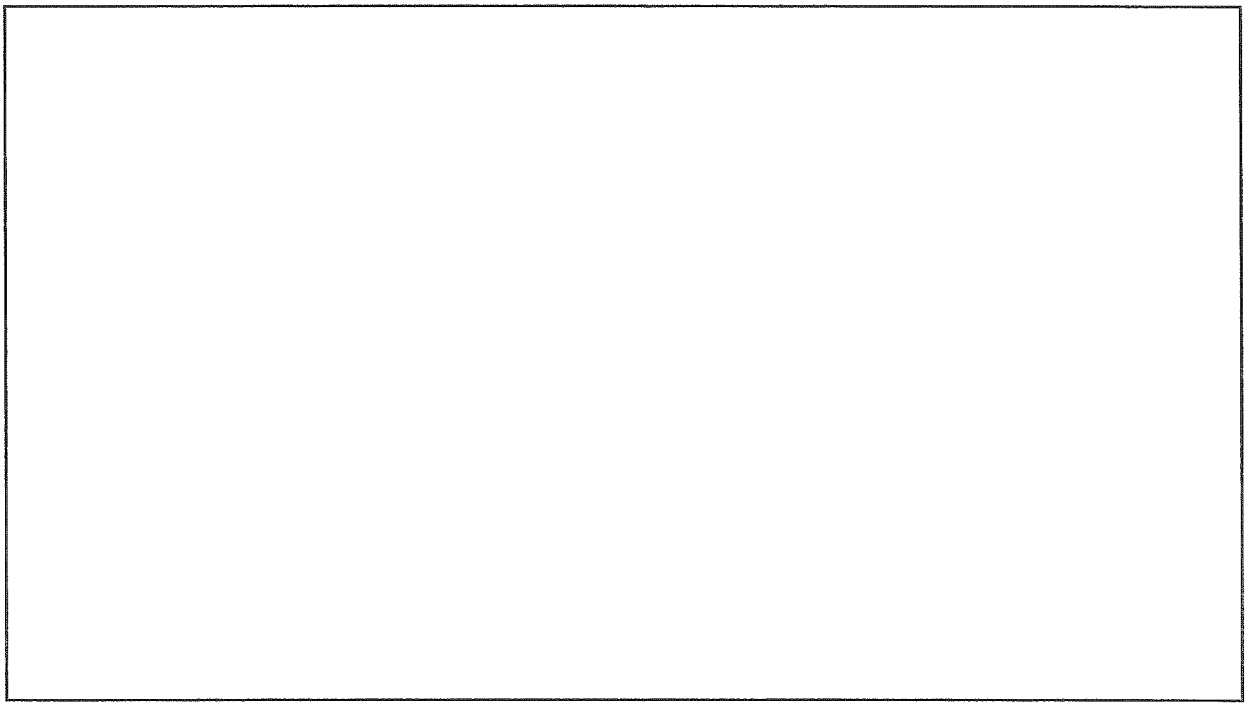
Divergent Boundary - Continental Plates

Divergent Boundary - Oceanic Plates

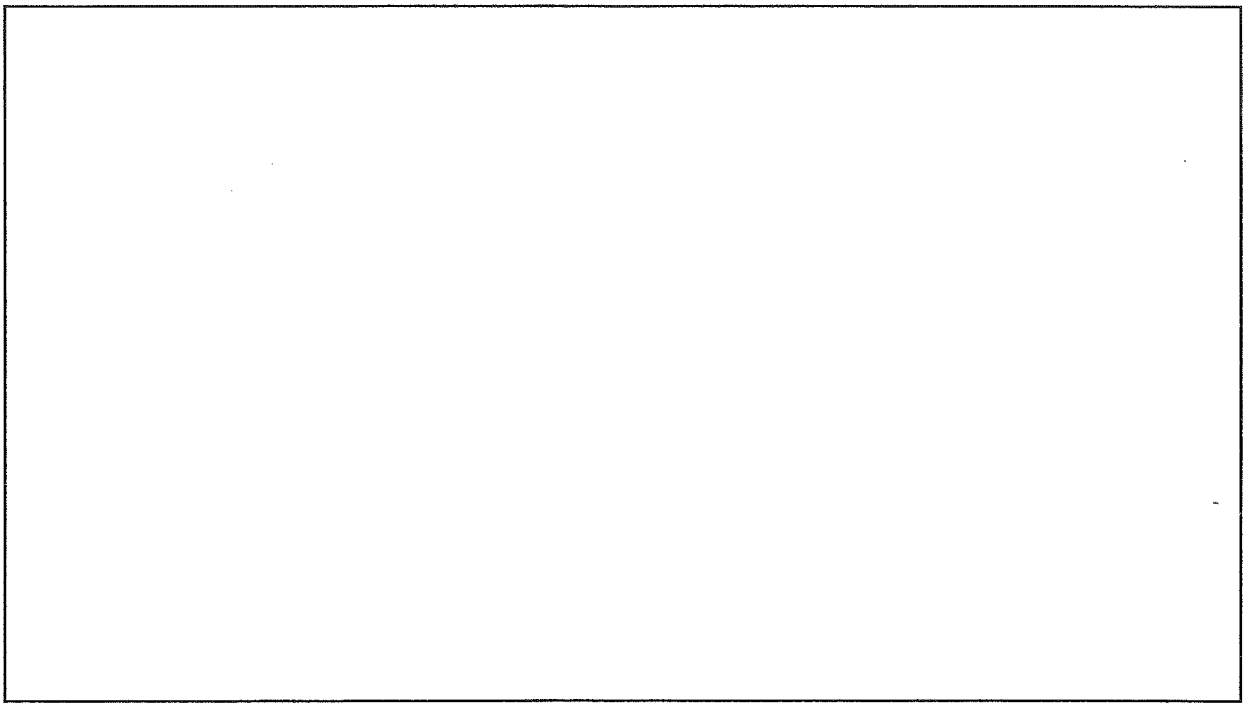
Name: _____

Date: _____

Convergent Boundary - Oceanic/Continental Plates



Convergent Boundary - Continental/Continental Plates



Name: _____

Date: _____

4

Convergent Boundary - Oceanic/Oceanic Plates

Transform Boundary - Continental/Continental Plates

Name: _____

Date: _____

ACTIVITY 4

The Earth Moves Under My Feet! (cont.)

1. Topic: (Describe the plate boundaries and resulting change in the surface of the Earth you are going to present.)

_____

_____

_____

_____

2. List the materials you will use to make a model of the boundaries and surface changes.

3. Describe the steps you will take to make the model.

ACTIVITY

The Earth Moves Under My Feet! (cont.)

Name: _____

Date: _____

4

4. Describe how you will present your model. (Power Point presentation, posters, charts)

Name: _____

Date: _____

1. Draw a picture of the bar magnet that demonstrates what part of the magnet is the strongest.

2. What materials were attracted to the magnet? Explain why some materials are attracted to magnets and others are not.

J O U R N A L

Magnets and Magnetic Fields (cont.)

Name: _____

Date: _____

5

1. Draw a picture of the magnetic field of a bar magnet. Label the poles of the magnetic field.

2. Describe what happens when two magnets with like poles are together.

_____

_____

_____

_____

_____

3. Describe what happens when two magnets with unlike poles are together.

_____

_____

_____

_____

_____

Name: _____

Date: _____

JOURNAL

The Earth As a Magnet

6

1. Explain the statement: The Earth is a giant magnet. Include what evidence scientists have that supports the statement.

2. Compare and contrast the Earth as a magnet to a bar magnet.

Name: _____

Date: _____

6

3. Draw how your compass would look when you are traveling south.

4. Where else might a compass be useful?

Name: _____

Date: _____

JOURNAL

Compass Construction

7

1. Explain why a magnetized object has one end that points north.

2. Explain how the compass works using the magnetic field of the Earth.

3. Draw and explain another way you could construct a compass.

ACTIVITY

Fossils Help To Put the Pieces Together

Name: _____

Date: _____

8

Paleontologist Assignment Instructions

You are a well-known paleontologist and have been selected to join a team to dig for fossils on an assigned continent. After you have completed the "dig" on your continent, you will collaborate with other teams from the same continent and other continents and draw conclusions based on the findings of all the teams.

You will receive an assignment package with the following materials:

- Four maps of your assigned continent:
  * Red - 300 million years ago
  * Blue - 200 million years ago
  * Green - 100 million years ago
  * Yellow - Modern day
- Artists' renderings of plants and animals that lived in ancient times on your continent based on the information from fossils.
- Student Journal activity pages

Instructions:

1. Stack the continents with the oldest on the bottom and the youngest on the top.
2. Read the information about the plants and animals in the Student Journal and place the appropriate plant and animal cards in the layers of the sediments that were discovered on your assigned continent. (Note: Not all plant and animal remains were discovered on all continents.)
3. Record your information on the *Fossils Across Five Continents* chart on page 25 in your Student Journal.
4. Share your findings with the other teams and complete the chart.
5. Discuss with all the paleontologists any ideas and conclusions that can be reached based on the information on the chart.
6. Discuss the following questions in your collaboration with other scientists:
   a. Do the continents have any ancient plants and animals in common?
   b. How do the plants and animals change over hundreds of millions of years?
   c. How did the remains of the same species of plant or animal travel from continent to continent when vast oceans separate the landmasses? Can dinosaurs swim that far? How did the plants get there?
   d. Have the continents always had oceans separating them?
   e. In modern times, are the same species of animals on all continents? Why do you think Australia has kangaroos and Antarctica and South America do not?

Name: _____

Date: _____

ACTIVITY 8

Fossils Help To Put the Pieces Together (cont.)

Record ideas from other scientists:

Fossils Help To Put the Pieces Together (cont.)

Name: _____

Date: _____

Fossil Facts:

Fossils give evidence of the history of the Earth. The following descriptions of fossils include plant and animal fossils as old as 300 million years.

Fossils of Plants

Early Glossopteris Flora

Early Glossopteris plants are an extinct group of seed ferns. There are over 70 species of early Glossopteris discovered in India, with many additional species discovered in Africa, South America, Australia, and Antarctica. The fossils are predominantly found in the Southern Hemisphere. Scientists believe the plants grew and spread rapidly and had a relatively quick extinction. The early Glossopteris is dated to have lived 300 million years ago.

Later Glossopteris Flora

The later Glossopteris flora demonstrated different physical characteristics than their older counterparts but is believed to be a related species of the early Glossopteris. Scientists believe that the plants were woody, seed bearing shrubs or trees. Their root structures had regular cross partitions that resemble the markings of a backbone. The later species of Glossopteris is believed to have lived 200 million years ago and fossils have been discovered in Africa, India, Australia, Antarctica, and South America.

Dicroidium Flora

The Dicroidium flora dominated the flora 200 million years ago and replaced the Glossopteris flora. The Dicroidium is a seed fern that flourished in warm, dryer conditions, giving scientists evidence of a major climate change between the time when the glossopteris flourished and the dicroidium became the dominant flora. The fossils of the plants were discovered on the continents of Africa, India, Australia, Antarctica, and South America.

Name: _____

Date: _____

Fossils of Animals

Mesosaurus

The earliest remains of animals are believed to be over 275 million years old! The Mesosaurus was a fish and crustacean-eating reptile that grew to approximately one meter (3.2 feet) in length. It is believed to have lived in freshwater lakes, ponds and rivers. Fossilized remains of the Mesosaurus were discovered in Africa and South America.

Lystrosaurus

The Lystrosaurus fossils belong to the same period, 240 million years ago, as the Mesosaurus. The Lystrosaurus resembled a large pig, with short legs, a barrel-shaped body, approximately 1 meter (3.2 feet) long and weighing about 90.7 kg (200 pounds). Its diet consisted of plants, which it consumed with its beak-like jaws. The Lystrosaurus remains have been discovered in Africa, India, and Antarctica and is believed to have thrived in a hot, dry environment.

Minmi

Minmi was as small, armored dinosaur that roamed the part of the Earth over 100 million years ago. Minmi was a plant-eating dinosaur. It grew to about 2 meters long (6.5 feet) and 1 meter (3.2 feet) high. It had much longer hind legs than front legs. It had bony protrusions, also known as body armor, on its head, back, abdomen, legs and along the tail. To date, the fossilized remains of Minmi have been discovered in Australia and Antarctica.

Brachypodosaurus

The Brachypodosaurus, meaning short-legged lizard, is believed to have been a plant-eating dinosaur. However, very few fossilized remains have been uncovered by paleontologists and only in India. It lived between 70 and 90 million years ago and could be either an armored dinosaur or a plated dinosaur. Scientists still have much to learn about the Brachypodosaurus.

Name: _____

Date: _____

Kentrosaurus

Kentrosaurus means spiked lizard. The dinosaur measured about 5 meters (16.4 feet) long and weighed approximately two tons. Spikes lined its back and the giant lizard had hind legs that were longer than its front legs. It was a herbivore that lived between 150 and 155 million years ago. To date its fossilized remains have only been discovered in Africa. A very close relative of the Kentrosaurus is the more commonly known Stegosaurus that has been discovered to roam North America.

Austrosaurus

The Austrosaurus is known as the "southern lizard." It reached a height of approximately 9 meters (29.5 feet) and 15 meters (49.2 feet) long. This plant-eating dinosaur had long limbs and lived on dry land. The Austrosaurus roamed Australia and Antarctica around 98 to 113 million years ago.

Secernosaurus

Secernosaurus means "severed lizard." It was a duck-billed, flat-headed dinosaur that was uncovered in South America and lived 65 to 75 million years ago. The dinosaur was approximately 3 meters (9.8 feet) long and its diet consisted of plants. The Secernosaurus was the first duck-billed dinosaur discovered in South America. Other duck-billed dinosaurs were discovered in North America.

Name: _____

Date: _____

Modern Organisms Across the Continents

Aardvark

Although not related to the domestic pig, the aardvark ("earth pig") has physical features that closely resemble the pig on the farm. The aardvark is a nocturnal mammal that is native to Africa. It feeds on ants and termites. Aardvarks are solitary animals, though they dig deep extensive tunnels for their burrows with multiple entrances, chambers, and the tunnels can measure up to 15 meters (49 feet) in length. The mature aardvark weighs between 40 and 65 kg (88–145 lbs) and usually grows to 1 to 1.3 meters (3.2–4.2 feet) in length, not including its tail, which can measure another 1.3 meters!

Echidna

The echidna, sometimes referred to as "spiny anteater," is found throughout the continent of Australia. It is a mammal that lays eggs and produces milk to nurse its young. Along with the platypus, it is the only known animal left on Earth that lays eggs and produces milk. The Echidna resembles the hedgehog and porcupine in appearance. It is covered with hair and sharp spines. It grows to be 35–45 cm (13.7–17.7 inches) in length and weighs between 2–7 kg (4.4–15.4 lbs). The echidna has a pointy snout and long tongue that it uses to catch ants and termites. It feeds mainly at night and uses its sharp claws to dig through ant and termite hills.

Giant Anteater

The giant anteater is the largest of four species. It measures 1.5 to 2.1 meters (5–7 feet) in length and can weigh between 18 kg to 45 kg (40–100 pounds). It is found in South America and feasts on ants and termites. It will also eat an occasional ripe fruit if found on the ground. The giant anteater has a sticky tongue that measures 61 cm (2 feet) long, which it uses to sweep up ants, termites, and their eggs. It has long claws that are used to tear apart termite mounds and anthills.

Name: _____

Date: _____

Pangolin Manis

The Pangolin manis, or Indian Pangolin, has large armored scales and will curl up in a ball if threatened. It grows to 60–65 cm (2-2.5 feet) and weighs between 8–9 kg (17–19 lbs). The Pangolin manis is an insectivore and has a tongue that can extend over 23 centimeters (9 inches). It is a solitary animal except during breeding season and when raising young. It is found throughout India. It climbs trees and also digs burrows up to 6 meters (20 feet) deep. If disturbed, it can emit an odor much like the skunk.

Earthworms

There are over 3,000 species of earthworms throughout the world. They are invertebrates and range in color from red to brown. They have soft-segmented bodies that travel by making waves with their long muscles. They have hair-like cilia on their underside to propel them forward. They eat soil and organic material, making tunnels in the earth as they move. Earthworms can range from a few centimeters (2–3 inches) to 6.7 meters (22 feet). The largest worms are in South America and Australia.

Ferns

Modern day ferns are green leafy vascular plants that grow in moist, shady areas. Ferns are commonly found growing under the canopy of other trees, along creeks, streams, and in wetlands. Ferns do best in moist soil and humid air.

Ferns have evolved from a very old family of plants. Different varieties of ferns may have existed over 350 million years ago. They covered the forest floors before flowering plants and animals existed on Earth.

Name: _____

Date: _____

ACTIVITY 8

Fossils Help To Put the Pieces Together (cont.)

1. Complete the appropriate column on the chart below with the data you are collecting on your "dig."

2. Discuss the results from your "dig" with the results from other continent teams and record the data from each continental "dig."

Fossils Across Five Continents

Time	Antarctica	Australia	India	Africa	South America
Modern Day					
100 million years ago					
200 million years ago					
300 million years ago					

J O U R N A L

Fossils Help To Put the Pieces Together (cont.)

Name: _____

Date: _____

8

You have just returned from your archeologic "dig" on an assigned continent and shared your results with other paleontologists from other continents. All scientists were in agreement that there was sufficient evidence to infer that today's separate continents were once one large land mass. Draw and label an illustration of your evidence and describe the evidence collected by the paleontologists that supports the theory.

Name: ____________________

Date: ____________________

Fossil Observation Chart

1. Draw a picture of your fossil.

→ 2. What shape is your fossil?

→ 3. What imprints or objects are in the fossil? (Describe what you see.)

4. Do you think the imprints are remains of ancient life forms?

→ 5. Compare what you see to the physical characteristics of plants and animals you know about. What do you think your fossil might be?

→ 6. What evidence do you have that makes you think that?

7. How do you think the imprint or object got into the fossil?

→ 8. What does the material look like that surrounds the object or imprint?

→ 9. Compare the surrounding material to modern earth material. Does it look like anything you know about?

J O U R N A L

Sedimentary Rock Layers (cont.)

Name: _____

Date: _____

9

Write and illustrate a short story about a prehistoric plant or animal that died and its remains became fossilized in the layers of the rock. Explain how the fossilized remains give evidence of life on Earth millions of years ago.

Name: _____

Date: _____

ACTIVITY 10

Making Fossils

Molds and Casts

The formation of fossils through molds and casts is the most common type of fossil. When a plant or animal died millions of years ago and sank to the bottom of a lake or swamp, the soft parts of the plant or animal decomposed so only the hard parts of the organism remained. Over time, sediments from the water covered the parts that remained. The heavy mud and sand sediments pressed down on the plants and animals and hardened around them. The sediments compressed and became more compact and eventually turned to rock. Minerals from the water that seeped through the rock either dissolved the hard parts to create a mold of the organism or filled the mold to create a cast of the organism. A cast is a hard copy of the organism, only the opposite of the part that created it. A mold is a hollow area in sediment in the shape of the organism. A mold forms when the hard parts of the organism, such as a shell or bones, are buried in the sediment. A cast is the opposite of its mold.

Petrified Fossils

Petrified fossils are the remains of plants and animals that were changed by chemicals in the earth and turned into rocks and minerals. Petrified wood is a common example of a petrified fossil. These fossils formed after water and sediment covered the wood. Then the dissolved minerals from the water seeped into places in the plant's cells. Over a long period of time, the minerals come out of the solution and harden, filling in all the spaces. Some of the original wood is preserved and the minerals replace some. The petrified fossils have similar properties to rock, but they look much like the piece of wood when it was alive. Some fossil shellfish are made of stone or the original hard parts of the shell may be preserved within the rock.

Trace Fossils

Trace fossils provide evidence of the activity of once living things. Trace fossils include a track or footprint (an impression made by a single foot), track path (a number of tracks made during a single trip), trail (an impression made by an animal without legs), burrows (a hole or holes an animal dug into loose sediment), borings (a hole or holes an animal dug into wood or rock), eggs and nests, and fossilized feces. When the traces of animal activity are left, the mud and sand of the imprint become buried in sediments and slowly compress and finally form rock, preserving the evidence of plant and animal life as an imprint in the rock. The imprints provide evidence of size and shape of plants and animals. By examining the surrounding area, scientists can gain evidence of other animal activity and surrounding life. Trace fossils are more common due to the number of traces an organism can leave in a lifetime.

Name: _____

Date: _____

Preserved Fossils

Some fossils are the preserved remains of organisms with little or no change. Some remains of plants and animals become trapped in a substance that preserves the organism over thousands of years. When an insect such as a bee or mosquito became stuck in the sticky sap of a tree, the sap covered the insect, hardened and preserved the animal remains for millions of years. Some plants and animals have been discovered frozen in ice. They became trapped in the crevices of glaciers and were covered with ice and snow and became deep-frozen. Many fossilized remains were discovered in tar in the Rancho La Brea tar pits in Los Angeles, California. Thousands of years ago, animals became stuck in the tar and died. The tar soaked into their bones and preserved the bones from decay.

Carbon Film Fossils

Carbonization occurs when the remains of plants and animals convert to a carbon film or residue by heat and pressure from its burial in layers of sediments and rock. All living things contain carbon. When sediment buries the carbon-based organism, some of the materials that make up the organism evaporate and escape as a gas. A thin carbon film is left behind. This process preserves the delicate parts of plant leaves and insects.

Name: _____

Date: _____

Making a Mold Model of a Fossil

1. Draw and label a picture of the living material you chose to use as a mold model of a fossil.

2. Write the process your living material will go through to become a model of a fossil.

_____

_____

_____

_____

3. Use the clay as sediments and rock layers and make a mold of your specimen.

4. Apply pressure on the model rock layers.

5. Carefully remove the clay from the mold of your specimen.

ACTIVITY

Making Fossils (cont.)

Name: _____

Date: _____

10

6. Pretend you are a paleontologist from the future. Write what you might learn about the history of the Earth by uncovering your mold fossil.

Name: _____

Date: _____

Making a Model of a Preserved Fossil

1. Draw and label a picture of your specimen before it was preserved in amber.

2. Write the process a living thing might go through to become a preserved fossil.

_____

_____

_____

_____

3. What part of the process does the hot liquid represent? How is the model material similar to, and different than, the real material in nature?

_____

_____

_____

_____

_____

Name: _____

Date: _____

4. If you were a paleontologist of the future, what information would you be able to learn from your preserved fossil?

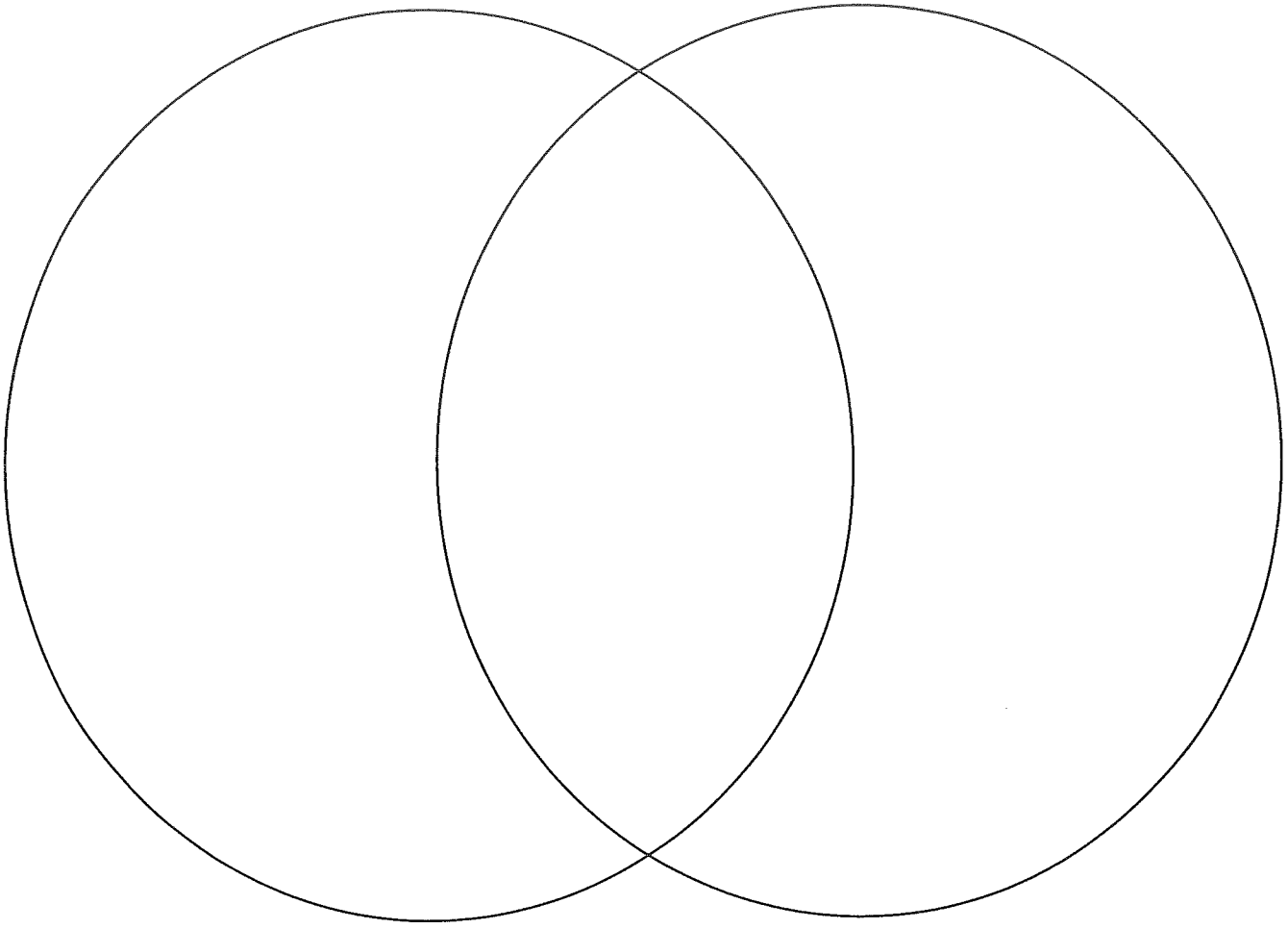
_____

_____

_____

_____

5. Use the Venn diagram to compare and contrast the mold and cast process with the preservation process in the formation of fossils.

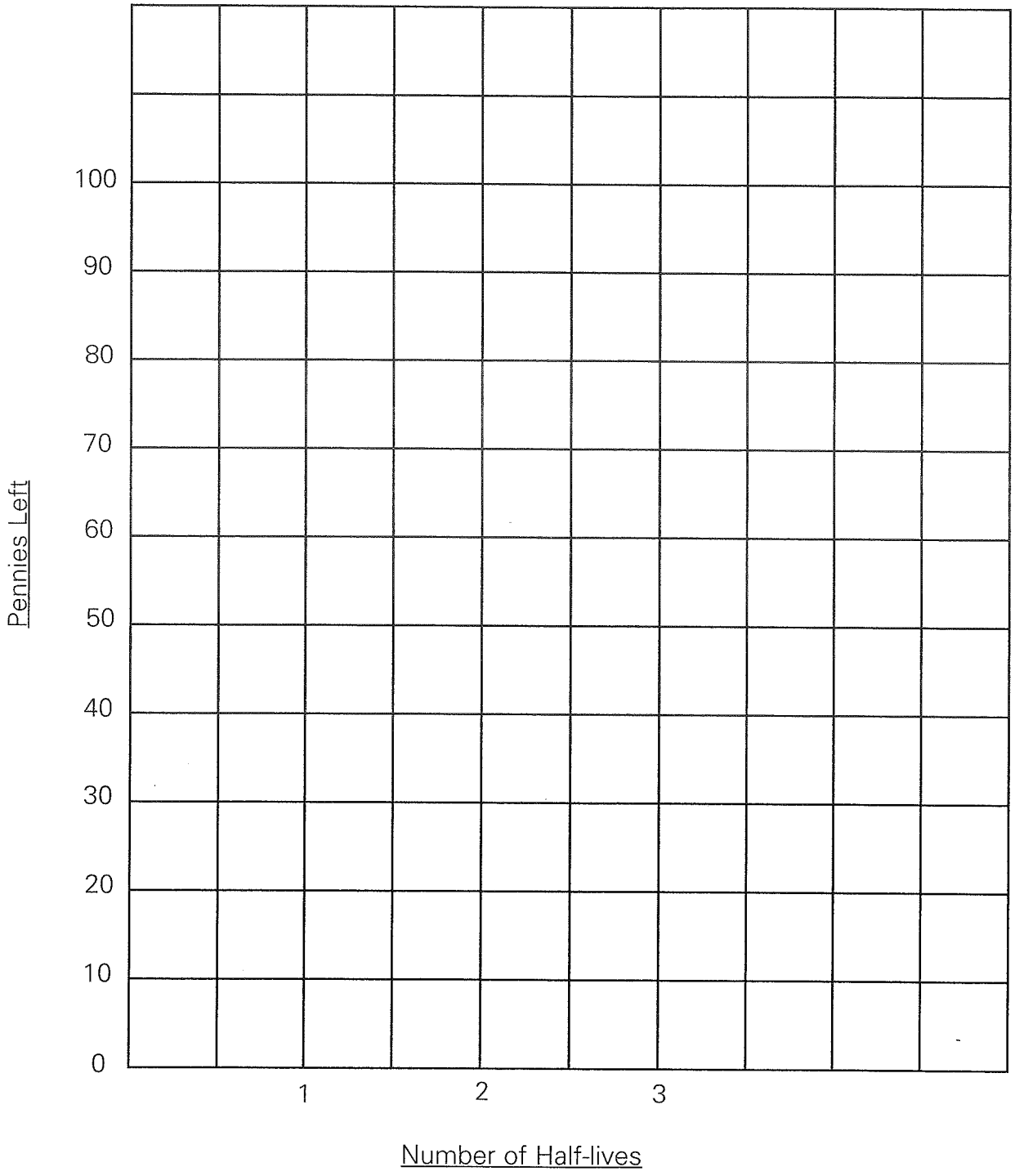


Name: _____

Date: _____

Part 1

Radiocarbon Dating



Rocks, Fossils, and the History of the Earth (cont.)

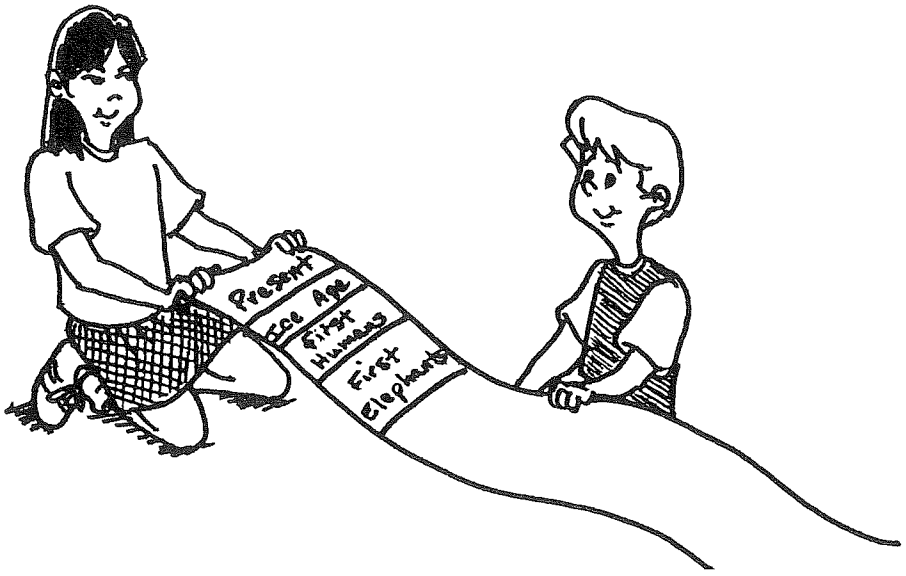
Name: _____

Date: _____

Part 2

Geologic Time

1. You and your partner will create a timeline that shows events that have occurred in the Earth's history.
2. You will need 5 meters of adding machine tape, a measuring tape, a pencil, and markers.
3. Start at one end of the adding machine tape. Write *The Present* across the top and draw a line under it.
4. Read Line 1 on the *Geologic Timetable.* Measure down 1 millimeter from *The Present* line and draw another line. Label this as *Ice Age Begins: 1 million years ago.*
5. Read Line 2 on the *Geologic Timetable.* Measure down 2 mm from *The Present* line on the tape and draw another line. Write *First Humans: 2 million years ago.*
6. Read Line 3 on the *Geologic Timetable.* Measure down 40 mm from *The Present* line on the tape and draw another line. Write *First Elephants: 40 million years ago* on the line. If possible, sketch a picture of an elephant.
7. Continue placing the events from the timetable on the adding machine tape. Be sure you always measure distances from *The Present* line.
8. Sketch and color pictures of the events next to the matching labels, if possible.
9. Display the timeline for others to see. *The Present* line will be on the right hand side of the display.



Name: _____

Date: _____

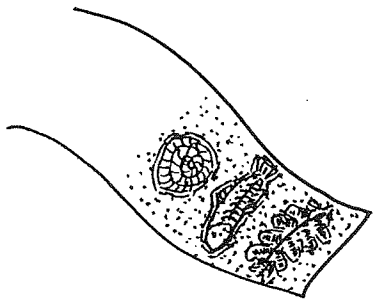
Part 2

Geologic Timetable

Outline of the Geologic History of the Earth

Scale: 0.1 cm - 1 million years

Age	Event	Number of Years Ago	Position of the Timeline
Cenozoic	1. Beginning of Ice Age	1 million years ago	1 millimeter
	2. First humans	2 million years ago	2 millimeters
	3. First elephants	40 million years ago	4 centimeters
	4. Mammals and birds abundant	50 million years ago	5 centimeters
Mesozoic	5. Dinosaurs extinct	65 million years ago	6.5 centimeters
	6. First birds	160 million years ago	16 centimeters
	7. Flowering plants develop	180 million years ago	18 centimeters
	8. First dinosaurs	225 million years ago	22.5 centimeters
Paleozoic	9. First reptiles	320 million years ago	32 centimeters
	10. First land animals	350 million years ago	35 centimeters
	11. First land plants	400 million years ago	40 centimeters
	12. First fish	480 million years ago	48 centimeters
	13. Jellyfish, sponges, worms are abundant	600 million years ago	60 centimeters
Precambrian	14. Algae, fungi, and bacteria are abundant	3 billion years ago	3 meters
	15. Life on Earth begins	3.5 billion years ago	3.5 meters
	16. Earth begins	4.6 billion years ago	4.6 meters



J O U R N A L

Rocks, Fossils, and the History of the Earth (cont.)

Name: _____

Date: _____

11

Pretend you are a hunter of fossils. Describe how fossils are used to determine the age and geologic history of the Earth.

Key Terms

ancient life forms – Ancient life forms are very old. They existed many thousands and millions of years ago.

compass - A compass is a scientific tool used to show direction. A compass has a magnetic needle that moves and points toward Earth's magnetic north.

continental plates - Continental plates are tectonic plates that are located beneath the continents or land masses. Continental plates are mainly made up of the igneous rock, granite.

convecting mantle - The convecting mantle (also referred to as the outer core) is made up of very hot liquid iron and nickel. The convecting mantle moves slowly around the Earth's metallic core.

crust - Earth's crust is the outer layer of the planet. It is very thin compared to the other layers and is made up of soil and rock.

earth processes - Earth processes refer to the geological events, such as weathering, erosion, earthquakes, volcanic eruptions and mountain building, that shape and reshape the surface of the Earth.

earthquake - An earthquake is the shaking or trembling of the Earth due to the movement of tectonic plates.

environmental conditions - Environmental conditions refer to the climate and terrain that support plant and animal life.

extinct – An extinct plant or animal once lived on Earth but has died.

faults - Faults are the boundaries of the tectonic plates where plate movement occurs.

fossil - A fossil is the remains or evidence of a plant or animal that lived long ago.

Key Terms (cont.)

geological events - Geological events include earthquakes, volcanic eruptions, mountain building, and glacier movement. Geological events change the surface of the Earth.

geological history - Geological history is the history of the Earth through the study of rocks, rock layers, and fossils.

latitude - Latitude determines north and south angular distance from the equator.

lithosphere - The lithosphere is the Earth's outermost shell. The lithosphere includes the crust and uppermost part of the mantle.

lithospheric plates - Lithospheric plates are the fractured or broken pieces of the surface of the Earth, also referred to as the tectonic plates.

longitude - Longitude determines direction east and west and is measured in respect to the prime meridian.

magnet - A magnet is a material that has the ability to attract iron, steel, or an iron alloy.

magnetic field - a magnetic field is the magnetized area that surrounds a magnet or magnetic object.

magnetic north - Magnetic north is the direction on the Earth where the north pole of freely-suspended magnets and compass needles point.

magnetize - To magnetize a substance is to make it act like a magnet.

magnitude - Magnitude is the amount of energy released by an earthquake. Magnitude relates to the strength of an earthquake.

metallic core - The Earth's metallic core (also referred to as the inner core) is located at the center of the Earth. It is very hot sphere of solid iron and nickel. The great weight and pressure of the outer layers of the Earth lead scientists to believe that the metallic core is a solid.

modern life forms – Modern life forms are plants and animals that exist right now or have existed within modern history.

mountain building - Mountain building occurs when two continental plates collide or push against one another. The rock piles up, making a mountain range.

navigation - Navigation is the science of figuring out direction and a course for travel on land and sea.

oceanic plates - Oceanic plates are tectonic plates that are located beneath the ocean floor. Oceanic plates are mainly made up of the igneous rock, basalt.

plate tectonics - Plate tectonics describes the motion of the Earth's plates. Tectonic plates are thick moving slabs of rock that lie beneath the oceans and continents. Tectonic plates are also referred to as lithospheric plates.

pole - A pole is the area on a magnet where the pull or attraction is the strongest. The ends of a bar magnet are the magnetic poles.

relative dating - When people compare the ages of several objects, they are comparing the relative dates of those objects. The ages of different fossils and rock layers are very large when compared to our own age, but when compared to each other, the relative ages of some fossils and rocks are quite young and some are quite old.

rock - A rock is a natural, solid earth material that is made up of one or more minerals. Rocks make up most of the Earth's crust.

Key Terms (cont.)

rock layers - Rock layers are layers of sediments deposited over millions of years that form sedimentary rock. Scientists examine rock layers to determine events that happened on the Earth millions of years ago. Fossils are found in some rock layers.

sedimentary rock - Sedimentary rock is formed when sediments are deposited in layers, pressed down, and become cemented or fastened together.

timeline - A timeline shows the sequence of events that happen over a period of time. A geologic timeline records the geological history of the Earth, as shown in the fossil record, rock layers, and other geological features.

upper mantle - The upper mantle lies beneath the Earth's crust. The upper mantle is very hot. Most of the upper mantle is solid, yet some of the upper mantle (that part closest to the convecting mantle) is partially melted rock that moves very slowly.

vibrations - Vibrations are the rapid back and forth movements of a material. Earthquakes cause vibrations in rocks that travel out in all directions from the focal point.

volcanic eruptions - Volcanic eruptions occur when hot, melted rock and gases rise and emerge from the opening in a volcano.