Name _____ Date _____ (1-1)

ACROSTICS—VOCABULARY ACTIVITY ON *AS THE EARTH MOVES*

Directions

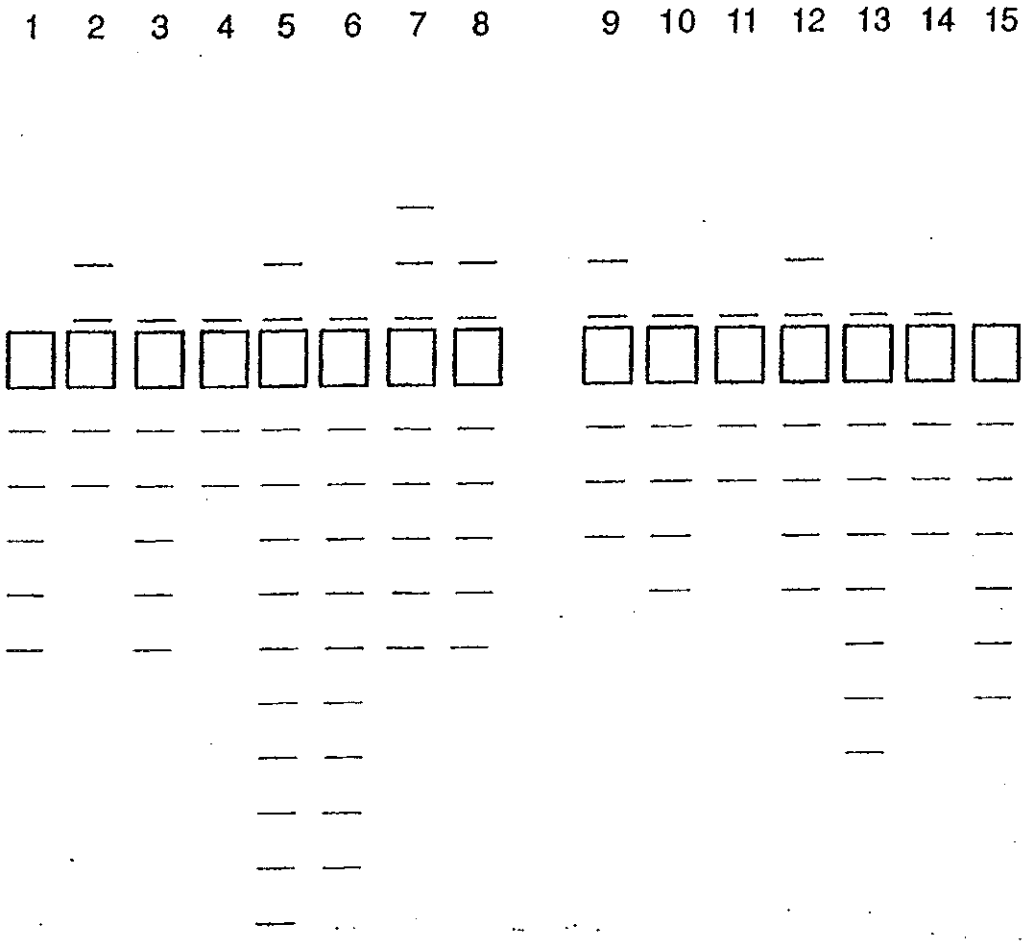
After reading the content on plate tectonics, answer the following questions. Enter your answers vertically in the blanks. The numbers are written across the top of the puzzles. When you finish, you will form a two-word message horizontally in the boxes in the puzzle.

Clues

1. Breaks or cracks in the lithospheric plates that may result in earthquakes as the plates slide by each other.
2. Specific locations at the boundaries of the plates that mark the location of the volcanic and earthquake activity.
3. A _____ can be caused by subduction of plates. Hot molten rock then moves upward toward the surface of the earth.
4. Scientists believe that the earth has spreading centers where _____ wells up from within the earth to form new rocks and push older material aside.
5. The partially melted layer of the mantle that is able to flow due to convection currents and carry the plates along with it is the _____.
6. The crust and the upper portion of the mantle that is rigid in consistency is the _____.
7. When plates converge or collide, the lithosphere may be pushed upward at the boundary into the formation of _____.
8. Over the past 4 million years, the _____ poles of the earth have been reversed.
9. The appearance of one of these in both Africa and South America, but nowhere else in the world, supports the plate tectonic theory.
10. This is the semisolid layer beneath the crust but above the core.
11. Convection currents within the earth bring new materials to the surface of the earth and _____ older material aside.
12. This ocean has the majority of volcanic activity.
13. Plate _____ is the study of formation and movement of the plates of the earth.
14. Preceding plate tectonics was the theory of continental _____.
15. During convection currents of the mantle, the cooler currents are _____ and the plates are being pulled together in some plates.

As the Earth Moves (*continued*)

Vocabulary Acrostics



Mountain Maker, Earth Shaker

Name _____ Date _____ Block _____

Go to the following website

http://www.pbs.org/wgbh/aso/tryit/tectonics/

Read the introduction, then go to the "Plate Tectonics Activity".

Build mountains. Trigger volcanoes. Create see floor. You now have the power to change the landscape with the slightest push of your mouse. Four types of plate tectonic activity are demonstrated in this feature. Keep an eye on the map to see where in the world the activity takes place.

Describe what happens during each of the following activities along with a detailed diagram.

Divergent Boundary

Convergent Boundary

Collisional Boundary

Transform Boundary

Using the additional links answer the following questions.

1. What is the Earth's longest mountain chain? Where is it found?

2. What is a rift valley?

3. What is the spreading rate between North America and Europe? At the East Pacific Rise?

4. What disturbance occurs at a transform boundary?

5. What is the most famous transform boundary? What 2 plates are involved?

6. Where will Los Angeles be in 16 million years?

7. What is the result of a collisional boundary? Name 2 examples

8. What is the keeping the Earth the same size (preventing the Earth from growing?)

9. What is the major resulting feature at a subduction boundary? What is a minor feature fault?

10. Who proposed the theory of continental drift?

11. How are Harry Hess and Arthur Holmes? Why are they important?

12. Go to 2 of the links under "Related People and Discoveries entries" (located on home page.) Describe how each link relates to what we are currently studying.

NAME _____ DATE _____ CLASS _____

Evidence for Continental Drift

Match the items in Column I with the terms or phrases in Column II. Write the letter of the correct term or phrase in the blank at the left.

Column I

_____ 1. Reptile fossil found in South America and Africa

_____ 2. Fern fossil found in Africa, Australia, India, South America, and Antarctica

_____ 3. Clues that support continental drift

_____ 4. Mountains similar to those in Greenland and western Europe

_____ 5. An underwater mountain range

_____ 6. Scientist who suggested theory of continental drift

_____ 7. Scientist who suggested theory of sea-floor spreading

_____ 8. Material that rises to surface at mid-ocean ridge

_____ 9. Direction in which ocean floor moves

_____ 10. Place where the seafloor is forced down into the mantle

_____ 11. Research ship

_____ 12. Age of oldest seafloor rocks

_____ 13. Age of oldest continental rocks

_____ 14. Location of youngest seafloor rocks

_____ 15. Rock containing iron

_____ 16. Poles that reverse themselves

_____ 17. Machine that records magnetic data

_____ 18. Process that forms new seafloor

_____ 19. Movement of continents

_____ 20. Evidence that Africa was once cold

Column II

a. Alfred Wegener

b. Appalachians

c. away from the mid-ocean ridge

d. basalt

e. continental drift

f. glacial deposits

g. *Glomar Challenger*

h. *Glossopteris*

i. Harry Hess

j. magnetic

k. magnetometer

l. *Mesosaurus*

m. mid-ocean ridge

n. molten material in the mantle

o. nearest to ridge

p. rock, fossil, and climate

q. sea-floor spreading

r. 3 billion years

s. trench

t. 200 million years

NAME _____ DATE _____ CLASS _____

Structure of Earth

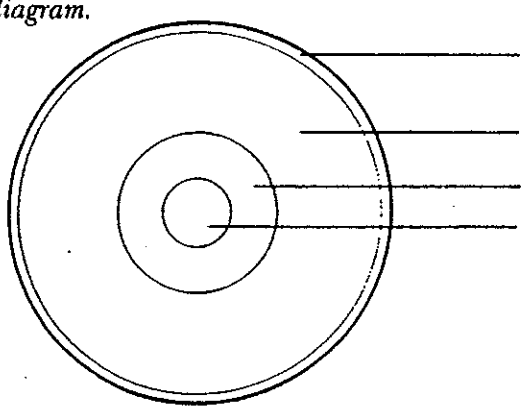
Complete the chart by writing each word or phrase from the box under the correct heading. Some words and phrases may be used more than once.

dense	mountains	silicon
iron	nickel	solid
largest layer	outermost layer	thicker under continents
liquid	oxygen	thinnest layer
magnesium	plasticlike	valleys

Crust	Mantle

Outer core	Inner core
	dense

Label each part of the diagram.



Name _____ Class _____ Date _____

Enrichment Worksheet 25 **Use with Lesson 8–2**

Sea-floor Spreading

Skills: *interpreting, organizing, recording data*

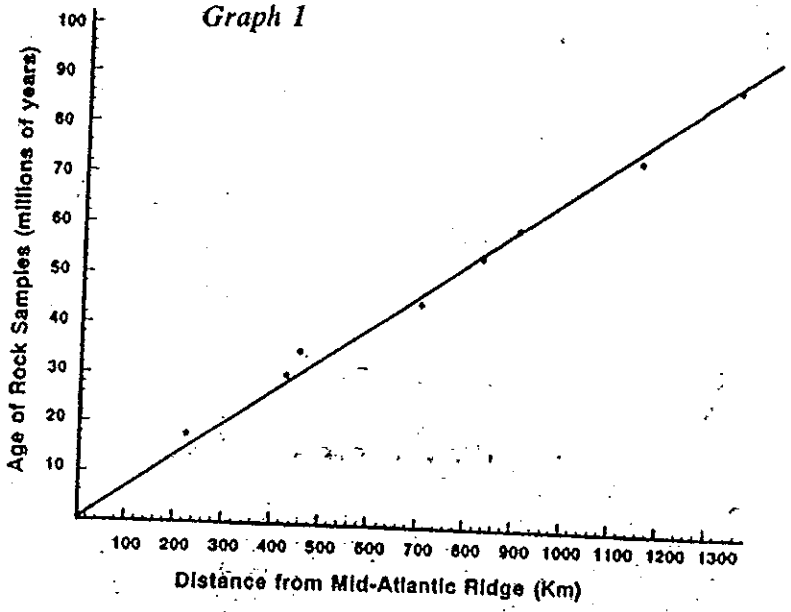
Part A *Deep-sea drilling has brought up rock samples from the ocean floor. Scientists have measured the ages of these rock samples. Some of their measurements are shown in Graph 1. Use the information in Graph 1 to answer the following questions.*

1. About how old are rock samples found 700 km from the mid-Atlantic ridge?_____

2. About how old are rock samples found 425 km from the mid-Atlantic ridge?_____

3. How many kilometers from the mid-Atlantic ridge are rock samples that are 75 million years old?_____

Graph 1



4. What is the relationship between the age of rocks on the ocean floor and their distance from the mid-Atlantic ridge?_____

5. What generalization can you make about the ages of rocks that are close to the mid-Atlantic ridge?_____

6. How does sea-floor spreading explain why the youngest rocks are found near the mid-Atlantic? ridge? _____

7. Would you expect a rock sample found 1500 km from the mid-Atlantic ridge to be younger or older than 90 million years? Explain._____

_____

_____

Name _____ Class _____ Date _____

8–5 What causes plate tectonics?

Lesson Review

Part A *In the space provided, write the letter of the term that best completes each statement..*

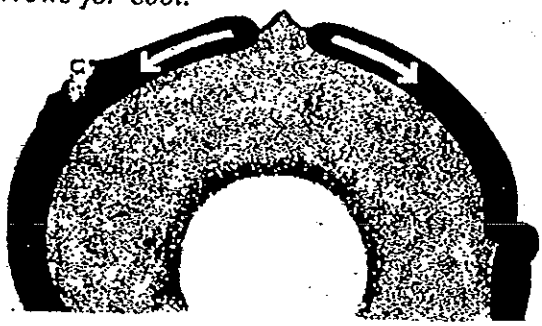
_____ 1. A convection current is caused by differences in
a. temperature. b. air pressure. c. mass. d. color.

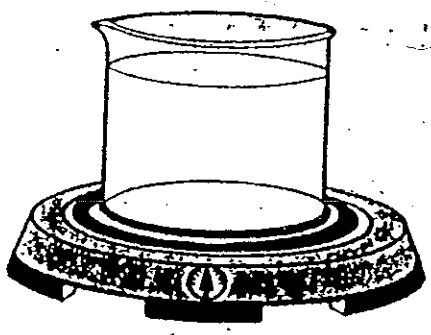
_____ 2. Scientists think that the movement of crustal plates is caused by
a. conveyor belts b. heat in the earth's core. c. convection currents.
d. pressure in the earth's crust.

_____ 3. Crustal plates that move apart most likely are located along
a. mountains. b. continents. c. islands. d. rift valleys.

_____ 4. In the earth, hot melted rock, rises from the
a. core. b. crust. c. inner core. d. mantle.

Part B *Draw arrows on each diagram to show a convection current. Use red arrows for hot and blue arrows for cool.*



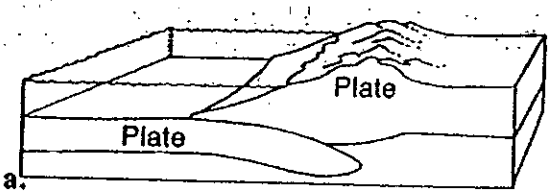


Skill Challenge

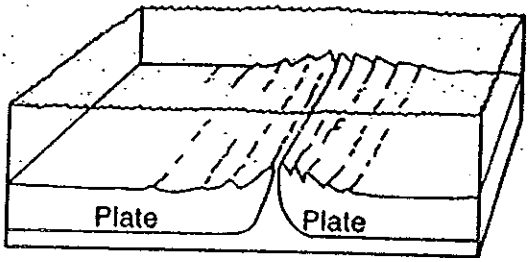
Skills: *modeling, analyzing*

On each diagram, draw arrows to show the different ways in which crustal plates move.

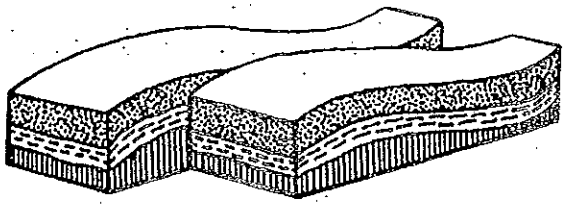
a.



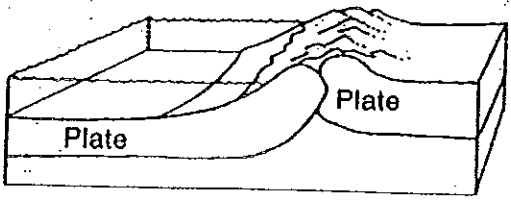
b.



c.



d.



UPS & DOWNS AT THE BOTTOM

Most people never see much of the ocean floor. But if you did get a good look at it, you'd see that it's not just a flat, bland floor. The ocean floor has a topography like the dry surface of Earth—with mountains and valleys and plains. But the features of the underwater surface are even more spectacular and pronounced than the ones above water.

These are some topographical features of the ocean floor. Write the letter (A-G) that gives the correct description for each one. Then find the letter on the diagram below (S-Z) that shows an example of the feature.

FEATURE	DEFINITION	EXAMPLE
1. continental shelf	_____	_____
2. continental slope	_____	_____
3. abyssal plain	_____	_____
4. mid-ocean range	_____	_____
5. oceanic trench	_____	_____
6. seamount	_____	_____
7. island	_____	_____

A. steeply sloping edge of continental shelf that drops to the ocean basin

B. volcano that does not rise above sea level

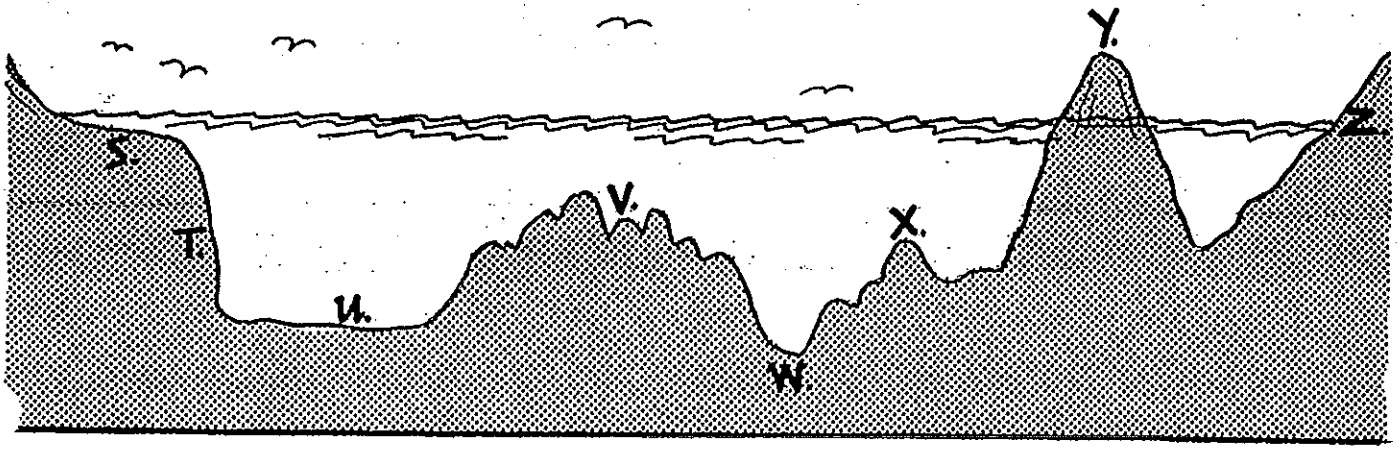
C. mountain that rises above sea level

D. relatively flat part of continent covered by sea water

E. deep ocean trough

F. flat, almost level, area of ocean basin

G. underwater mountain chain

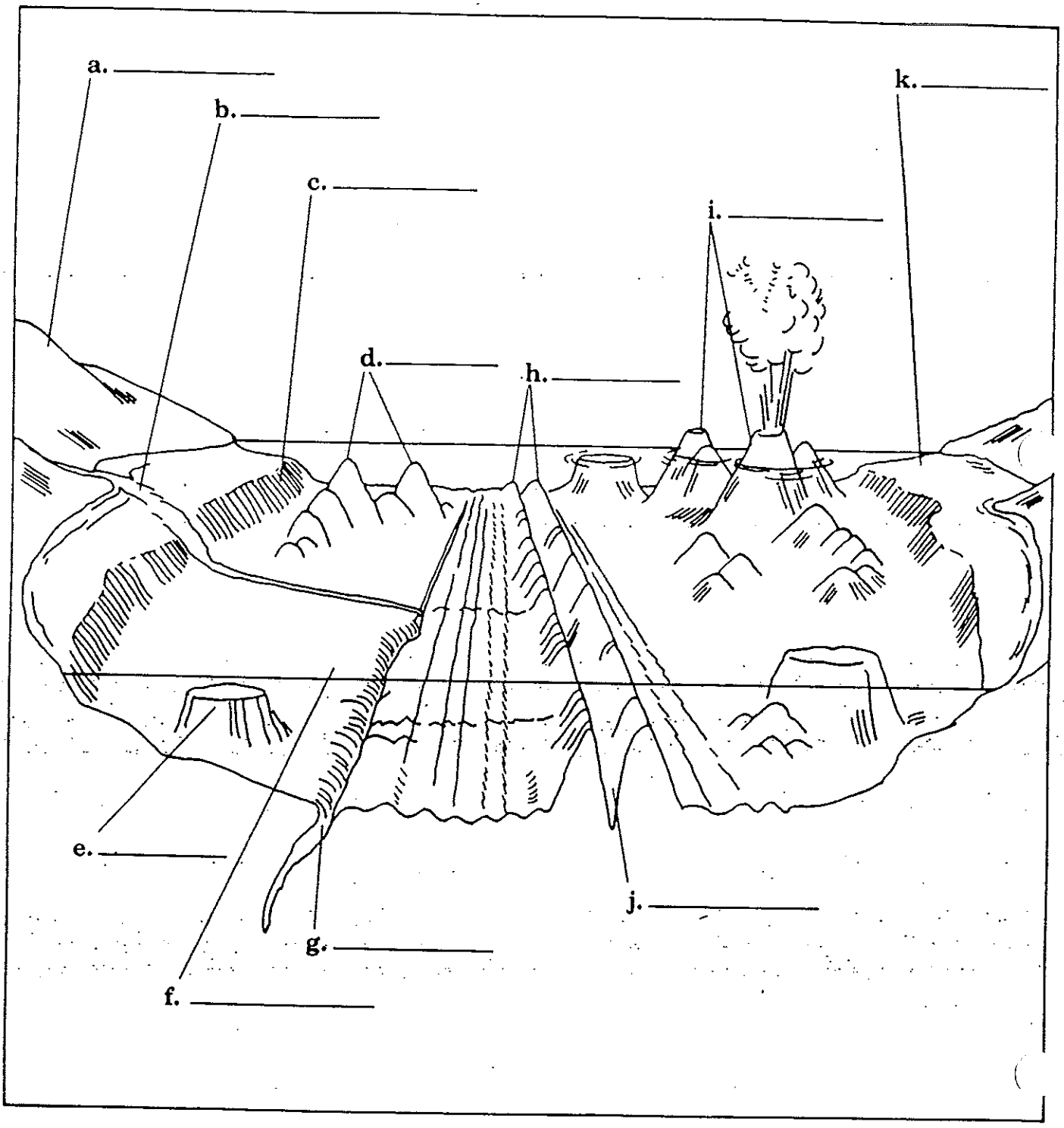


Name

Name _____ Class _____ Date _____

Features of the Ocean Floor

Fill in the correct terms in the spaces labeled **a** through **k**.



Oceanominoes Plate Tectonics and Sea Floor Features

Cut ONLY on the solid black lines. Match terms with definitions. Practice before gluing down. Must end with "END-YEAH!" or you made a mistake

Start Here	Area splits, separates, moves apart	San Andreas Fault	Large Supercontinent	Inner Core	Liquid layer of the Earth
Alfred Wegener	Semi-solid layer, makes up 70% of Earth	Continental Shelf	Sublayers of the mantle	Spreading Center	% Earth Covered by ocean
Outer Core	Where new crust forms above magma	Contour Map	Developed concept of plate tectonics	Hudson Bay Area	Formed by lateral movement
Rift Zone	Outermost layer of Earth	13	Location of Magnetic North Pole	Converging Plates	Deep ocean trench
One hot spot over a moving plate	Flat bottom of ocean basin	Marianas Trench	Mountains, trenches and faults	Formed by Subduction zones	Total # of lithospheric plates
Abyssal Plain	Center, solid layer of Earth	Features of the ocean floor	Found in South Pacific Ocean	Mantle	How Hawaiian Islands formed
Magnetic South Pole	3-D Map on a flat surface	Lithosphere and Asthenosphere	Makes mountains or ridges	Pangaea	Flat area at edge of continent
71%	Famous transform fault	Crust	Deepest trench in the world	Faults	End - Yeah!!

Name _____

NOAA Learning Objects

Please listen to the interactive presentations and answer the questions below, the questions are in the order of the presentation

Plate Tectonics

1. Approximately how many large earthquakes and volcanic eruptions occur each year? _____
2. The theory that the earth is in constant motion is called _____
3. What are the four primary layers of the Earth in order? _____
4. Where does tectonic activity occur? _____
5. How thick is the lithosphere? _____ What occurs in this layer? _____
6. What occurs in the asthenosphere? _____
7. How fast do plates move against each other? _____
8. List the three types of plate boundaries: _____
9. When magma rises up at divergent boundaries, what kind of rock does it become? _____
10. What kind of rock forms at a convergent boundary? _____
11. What does not reach the surface at transform boundaries? _____

Global Impact

1. What word in the Greek language does tectonic come from? _____
2. What two important components come from volcanoes? _____
3. Why does civilization rely on plate tectonics? _____

Mid-Ocean Ridges

1. What lies 60 nautical miles off the coast of northwestern United States? _____
2. How long is the mid-ocean ridge? _____
3. What lies at the top of most ridges along the mid-ocean ridge? _____
4. How active volcanically are mid-ocean ridges? _____
5. What is the lower 7-9 km of oceanic crust called? _____
   1-3 km of oceanic crust called? _____
6. How long does it take the Juan de Fuca Ridge to spread 6 meters? _____
7. How fast is the Southwest Indian Ridge spreading? _____
   Mid-Atlantic Ridge spreading? _____
8. What do hydrothermal vents precipitate? _____
9. Why are hydrothermal vents important? _____

Global Impact

1. How much of the Earth's surface is oceanic crust? _____
2. What occurs when there is rapid seafloor spreading? _____
3. How do vents help scientists better understand global current circulation? _____

Subduction Zones

1. What process only occurs beneath the ocean? _____
2. Where is the Ring of Fire? _____
3. Why does subduction not occur when two continental plates collide?
   _____
4. What forms on the seafloor at a subduction zone? _____
5. What are the huge granite masses below a continent called? _____
6. When two oceanic plates collide both with basalt, which plate subducts?
   _____
7. What is created at the surface of an oceanic-oceanic collision? _____

Global Impact

1. List 5 natural resources are derived from subduction zones?
   _____
2. What are the negative drawbacks of subduction zones? _____

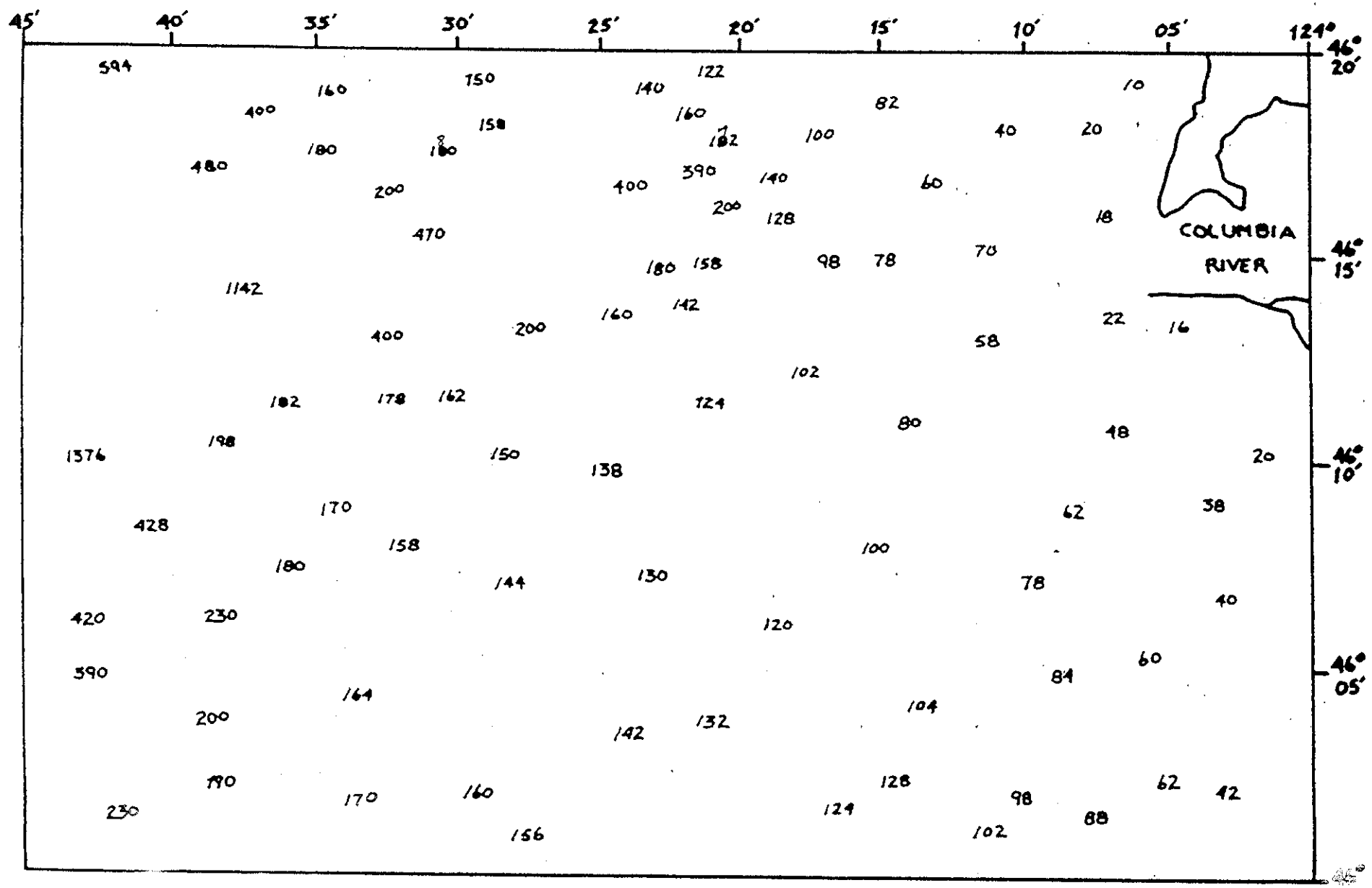
Seamounts

1. Mountains tall enough to penetrate the sea surface are called _____
2. What are smaller mountains that hug the ocean floor called? _____
3. Volcanoes taller than 1000 meters but below the ocean surfaced are called
   _____
4. What two places are seamounts usually found? _____
5. Why does so much marine life live near a seamount? _____
6. What is considered a rare but valuable habitat for marine organisms, why?
   _____
7. What large organisms congregate around seamounts to hunt giant squid?
   _____
8. What are species called that are found nowhere else on Earth except one location?
   _____

Global Impact

1. Why are seamounts bad locations to fish?
   _____
2. What do trawlers do to the ocean floor around seamounts?
   _____

SOUNDING DATA CHART



Student Notes- Oceanography **Name _____**
Plate Tectonics And Ocean Basins Date _____

Vocabulary: Please number and define each term below in a complete sentence on a separate sheet of paper. (those that have a *, please illustrate the term)

P-Waves*	S-Waves*	Seismic Waves	Inner Core
Outer Core*	Mantle	Moho*	Granite
Basalt	Crust*	Lithosphere	Asthenospere
Mesosphere	Gondwandaland	Continental Drift	Pangaea*
Ridges	Magma*	Trenches*	Seafloor Spreading
Subduction zones*	Plate Tectonics	Epicenters*	Cores*
Sediments	Dipole	Paleomagnetism	Polar Reversals*
Divergent boundary*	Convergent Boundary *	Transform boundary	Rift Valley*
Pillow Basalts	Wadati-Benioff Zones	Island Arc*	Passive Margin
Active Margin	Spreading Rate	Seamounts	Subsidence
Continental Shelf*	Continental Slope*	Turbidity Currents	Submarine Canyons*
Continental Rise	Abyssal Plain	Abyssal Hill	Fringing Reef
Barrier Reef	Atoll*	Guyots *	Ridge and Rises
Echo Sounder	Neritic	Pelagic	Lithogenous
Biogenous	Hydrogenous	Cosmogenous	

Plate Tectonics

A. The Interior of the Earth

1. What are seismic waves and why are they important to Earth Science?
   -Seismic waves- vibrations in the Earth that can tell us a great deal about the _____ _____-
2. Describe the two types of seismic waves below:
   -P Wave- primary waves or compressional waves, _____, travel through solids, liquids and gases
   S-Wave- secondary waves or shear waves, oscillate at right angles to their direction of motion, _____
3. What determines the velocity of a seismic wave?
   -chemistry, _____, _____ of matter caused by variations in temperature and pressure with depth
4. Describe the different layers of Earth:
   -_____- made up of iron and nickel and a solid state
   -_____ - made up of iron and nickel and a liquid state
   -_____- contains the largest mass of any layer, a state called plastic that flows and made up of magnesium and iron
   -Crust- both solid state
      1) _____- made up of rocks such as granite, average 25 miles thick
      2) _____- made up of rocks such as basalt, average only 4.3 miles thick
   -Moho- a sudden change in _____, boundary between the crust and the mantle

B. The Lithosphere and Asthenosphere

1. What is the lithosphere?
   - the mantle just below the crust which is fused with the crust at the Moho

-up _____

2. Where is the asthenosphere and how is it different than the lithosphere
   -layer below the lithosphere that is _____ (seismic waves slow down here)
   -up to _____

C. History of a Theory

1. What is Gondwanaland, who proposed this idea?
   -Eduard Suess proposed idea in 1909 that _____ and _____ could have been connected
2. Who was Alfred Wegner and what did he propose?
   -Continental Drift- _____ coined the phrase and proposed a single continent existed called _____ existed
3. What evidence supported Wegener's theory which was not accepted until the 1960's?
   -_____,
   -_____,
   -presence of ancient coral reefs at high latitudes,
   -_____

D. Evidence for a New Theory

1. Why could oceanographers begin to survey the deep-ocean floor in the 1950's?
   -armed with new technology from _____ , such as sonar
2. Who was Harry Hess and what did he promote?
   -the concept of _____ of heated material rising up from the core
3. What occurs at upward moving segments of mantle convection?
   - mountain ranges and ridges on the sea floor, _____ is found
4. What is the difference between:
   a. Magma-
   b. Lava-
5. What are trenches?
   -very deep, narrow areas of the ocean where old oceanic crust _____ (see the map on pages 60 and 61 for large trenches)
6. What is seafloor spreading?
   -occurs at _____ where new crust is formed from rising magma
7. What are subduction zones?
   -areas where ocean crust is pushed back into the asthenosphere (_____)

E. Evidence for Crustal Motion

1. Where are most Earthquakes found and why?
   -occur along ridges (spreading centers) or trenches (subduction zones), plate boundaries
2. Why were probes sent to the sea floor?
   -Probes in the sea floor indicate higher temperatures closer to ridges and cooler further away
3. What did the vessel Glomar Challenger find out about the age of the ocean floor?
   -The took _____ of the ocean floor, the youngest found near the ridges and the oldest (_____ million years old) near the continents
4. What does paleomagnetism indicate about sea floor spreading?

-_____ found in the ocean floor are arrange towards the magnetic north pole when they cooled

-The _____ has changed locations many times so the ocean floor rocks have 'stripes' arranged towards past locations of the magnetic North Pole, matching stripes of sea floor are same age on opposite sides of mid-ocean ridges indicates sea floor spreading

F. Plate Tectonics

1.What is Plate Tectonics?

-The concept that combines _____ with _____ , seven major lithospheric plates are recognized along with many smaller plates

2.What are the three types of plate boundaries

-_____, _____ and _____

G. Divergent boundaries

1.What happens at a divergent boundary, what are some examples?

-Spreading zones where the lithosphere splits and new material is lifted to the surface in the oceans and on the continents

-Examples: Mid-Ocean Ridge in the Atlantic Ocean, the _____ and the Red Sea (eventually a rift widens enough where seawater penetrates, such as the Red Sea)

H. Transform Boundaries

1.What occurs at a transform boundary?

-two plates slide past each other, usually creating _____

2.Where are most transform boundaries located?

-found _____ to mid ocean ridges

3. Where are other transform boundaries found and what are some examples?

-found along various plate boundaries

-ex: San Andreas Fault- CA- Pacific and North American Plates sliding past each other _____- off coast of CA and OR, Juan de Fuca Plate and N.A. plate

I. Convergent Boundaries

1.What occurs at a convergent boundary?

-two plates are _____

2.What are the three types of convergent boundaries, what is found at them and list examples:

a. Oceanic Plate collides with continental plate- Oceanic sinks underneath Continental due to _____ causing a trench in the ocean and volcanoes on the continent, also known for powerful earthquakes

1) Examples: Andes Mountains and Peru- Chile trench, _____ of Northwestern U.S.

b. Continental Plate collides with another continental plate- both are the same density so both are thrusted upward creating large mountains

2) Examples: Himalayas of Asia and the _____ in Europe

c. Two Oceanic plates collide- one _____ underneath another and a volcanic island chain is created

3) Example: Volcanic Island Arc Chain- Japan and the Philippines

J. Passive and Active Margins

1. What is the difference between an active and a passive margin?

-_____- areas of past rifting that have moved away from the spreading centers, i.e. much of the U.S. Eastern Coast

-_____- plate boundaries are located along a continental margin

2.What are terranes?

-crustal fragments with distinct histories added to the continents by past collisions

-ex: Delaware Valley- combination of _____-

K. The Motion of the Plates

1.How fast do plate move apart at divergent boundaries?

-At spreading or divergent boundaries, new sea floor is created and moves pushes old sea floor out at rates of _____, about the rate of your fingernail growing, over millions of years plates have moved around dramatically

1. If a plate were moving at 10 cm per year, how many miles would it move in 2 million years? (_____)

L. Hot Spots

1.What are hot spots?

-Areas where volcanic activity occurs in the middle of a plate

-Examples: Hawaiian Islands on the Pacific Plate and _____ on the North American Plate

2. When will the new Hawaiian island, Loihi appear?

-50,000 to 100,000 years from now, it's accumulating layer after layer from the ocean floor at 8,000 feet from the ocean floor

M. The Breakup of Pangaea

1.What has been suggested about a possible cycle based on the knowledge from the breakup of Pangaea?

-A _____occurs where the continents separate and reassemble powered by the radioactive decay of the core

N. Research Projects

1.What does JOIDES stand for and what are its goals?

-Joint Oceanographic Institutions for Deep Earth Sampling

-goals are to drill in all oceans, to seek answers to _____, creation and destruction of ocean basins and underwater earthquakes

2. What was discovered in 1977 at the Galapagos Rift?

-discovered _____, large communities of animals living in superheated water at 8,000 ft in depth

1. Temperature sensors, seismic recorders and magnetic sensors have been left behind to record information at some of these sites

Ocean Basins

A. The Sea Floor

1.Unlike on land where land is eroded by rain, wind and ice how is the ocean floor reshaped?

-by _____ and _____ and accumulates sediments from above

B. The Continental Margin

1.What is a passive continental margin composed of?

-Composed of the continental shelf, continental break, slope and rise

2. Describe the continental shelf:

-extensions of the continent that can stretch into the water from a few meters up to_____ off the coast, they are usually full of sediments carried from rivers, these shelves were above _____ during ice ages but then flooded recently

3. Describe the continental break and slope:

-the break indicates a steep drop off and the continental slope can be shore and steep, continental slopes are usually bare of sediments due to the slope (see figure ____ page ___)

4. What is a submarine canyon?

-resemble canyons on land and are associated with continental rivers, sometimes _____ occur releasing large amounts of sediments (mud, sand, and water) to the deep sea floor due to earthquakes, or overloading of sediments

5.What is a continental rise?

-found at the base of the con. slope where an accumulation of sediments have been deposited due to _____

C. The Ocean Basin Floor

1. What % of Earth is made up of ocean basin floor, what about % of Earth for continents?

-Ocean basin floor: _____ (between 4000-6000 meters), Continents: _____ of the Earth's surface,

2.What is the abyssal plain?

-covered with sediments, ordinary and flat

3. What are abyssal hills?

-less than 1000 meters above the ocean floor,_____ feature on Earth

4. What are Seamounts, how are they related to coral reefs?

-steep sides underwater _____, some rising to the sea surface

-Barrier reefs colonize seamounts near the ocean surface eventually surrounding the island

-If the seamount begins to sink or erode the reefs grow upward creating an _____

5.What is a guyot?

-also called tablemounts, 3300-5600 ft. below ocean surface, flat shaped top indicates they were once above ocean surface

D. The Ridges and Rises

1.What is the difference between a ridge and a rise?

-Are found in every ocean extending across the globe, if the slope is steep= _____, if the slope are more gentle= _____

2.What is a rift valley?

-can be found at the top of these underwater mountain chains and are volcanically active

E. The Trenches

1.What are trenches and where are they found?

-Deepest sections of the ocean usually associated with volcanic mountain chains or island arcs (chain of volcanic islands, such as the Philippines)

-_____, is a portion of the Mariana Trench, recorded a depth of 11,020 meters

F. Measuring the Depths

1.How did early sailors make ocean soundings?

-Depth of oceans used to be measured in _____ (6 feet) by sending a rope to the bottom

2.How were soundings made after 1920?

-In the 1920's, the _____ was invented allowing for many deep sea measurements, sound waves are bounced off the bottom and timed to record depth

3.What has become the most precise way to make an ocean sounding?

-Satellite measurements have become even more precise with each new year

G. Sediments

1. How do oceanographers classify sediments?

-Sediments are deposited throughout the oceans from organisms, rivers, atmosphere etc., oceanographers classify them by their source, _____, place of deposit, particle size, age and color

H. Sediment Location

1.How are neritic and pelagic sediments different?

-_____ sediments- derived from land and sea and found on the continental shelf

-_____ sediments- deep sea sediments derived from land, found on the continental slope and abyssal plain

I. Sediment Sources and Chemistry

1.What are Lithogenous sediments

-derived from rock from the land, nearly half of these sediments come from the tropics due to such high rainfall and erosion, also called _____ or abyssal clay

2.What are Biogenous sediments?

- originated from living organisms, usually shells of _____, much of the deep sea are covered in single celled organisms called calcareous or siliceous depending on elements found (called ooze, if enough), depending on the chemistry of the water much of the biogenous sediments are dissolved before they reach the ocean floor

3.What are Hydrogenous sediments?

-created by seawater _____, such as carbonates, phosphorites and manganese nodules

4.What are Cosmogenouos sediments?

-iron- rich sediments that were originally meteors and meteorites, found in very low concentrations

J. Seabed Resources

1.List at least three important resources found in the ocean?

-Various minerals and other materials have been mined out of the oceans if profitable

-Sand is used for concrete and artificial beaches

-Oil and gas represent the majority of mining in the oceans due to our dependence for transportation and energy