

## Answer Sheet

ESS 101

1. Find the East Pacific Rise on the Plate-Tectonic Map of the Circum-Pacific Region.

(a) What type of plate boundary is this?

Divergent Plate boundary. ✓

(b) What type of volcanic rock is produced here?

Igneous rock is produced here, specifically basaltic igneous rock. ✓

(c) Is the topography higher or lower at this plate margin compared to the surrounding ocean basin?

It is higher compared to surrounding basin. ✓

(d) Do the nearly symmetrical 'stripes' reinforce the idea that the plates are moving apart? What causes these 'stripes'?

Yes, each line is a chron, and it shows that the plates have been moving away due to a reverse in polarity as the magma cools.

(e) What could be a possible explanation for the asymmetry in these stripes?

Plates are moving at different rates. ✓

2. Find the west coast of South America on the Plate-Tectonic Map of the Circum-Pacific Region.

(a) What type of plate boundary is this?

A convergent plate boundary. ✓

(b) What type of volcanic rock is produced here?

Igneous rock is produced here, specifically andesitic igneous rock.

(c) What topographic feature is produced on the continent by this plate motion?

The Andes mountains. ✓ volcanoes

3. Find the Juan de Fuca plate off the coast of Washington State on the Plate-Tectonic Map of the Circum-Pacific Region.

(a) How fast is the Juan de Fuca plate moving, and in what direction?

Its moving north at 1.6 cm/yr. ✓

(b) How fast is the North American plate moving, and in what direction?

Its moving at 2.5 cm/yr ✓

(c) What will eventually happen to the Juan de Fuca plate?

It will subduct under the North American Plate completely.

(d) Calculate when "c" will happen (remember that velocity equals distance divided by time) Show

your calculations.  $\frac{1 \text{ yr}}{4 \text{ cm}} \cdot \frac{100,000 \text{ cm}}{1 \text{ km}} \cdot 460 \text{ km} = 11,250,000 \text{ yrs}$

(e) What will happen to the Cascade volcanoes when the answer to "c" happens?

They will grow until they eventually erupt ← this is happening now.

4. From data table in question 4 above. the volcanoes will grow dormant

(b) Use a ruler to draw a best-fit straight line through the data. What does the graph indicate about the general relation between age and distance from Kilauea?

The older the volcano the farther from Kilauea it is. ✓

## Lab 2: Plate Tectonics

- (c) Calculate the average rate of plate movement in centimeters per year (divide the distance by the time interval over which the travel took place). Show your calculations. (1 km = 100,000 cm)

$$\frac{4860 \text{ km}}{64.7 \text{ Myrs}} = 75.12 \text{ km/Myr} \quad \boxed{7.512 \text{ cm/yr}} \quad \checkmark$$

- (d) The chain of seamounts bends where the Hawaiian and Emperor chains meet. When did the change in direction in the chain occur? Explain how you arrived at your answer.

$$\frac{2400 \text{ km}}{100,000 \text{ yr}} = 24 \text{ km/Myr} \quad \frac{24 \text{ km/Myr}}{7.512 \text{ cm/yr}} = 31,948,881 \text{ yr}$$

- (e) Assuming the hotspot has remained stationary, what could have caused the chain to change directions?

~~The hotspot changes direction due to the force of another plate~~ <sup>plate</sup> ~~force of another plate~~

5.

Rock Specimen	Igneous, Sedimentary, or Metamorphic	Reason for classification
A	Sedimentary	layered <span style="float: right;">✓</span>
B	Igneous	crystalline structure <span style="float: right;">✓</span>
C	Metamorphic	looks as if it has been altered by heat/pressure <span style="float: right;">3</span>

6. Each type of rock has a particular tectonic setting with which it is commonly associated. For each of the tectonic settings indicate which type of rock is likely to be formed. Use an I for igneous, S for sedimentary, and M for metamorphic. Remember that the crust of earth is complicated, and some setting may contain more than one type of rock.

(a) Mountain chain above where an oceanic plate is being subducted under a continental plate: I, M, S

(b) A 'passive' margin, such as the east coast of North America: S 2

(c) A convergent margin where two continental plates are colliding: M, S, (I)

(d) A divergent margin, below sea level: I

(e) An island chain above where one ocean plate is subducting under another ocean plate: I, M, S

(f) Mid-continent, maybe like Wyoming: S ✓

7. Which are the data: the rocks or the model of plate tectonics? Why?

The rocks are the data because the model is something we create.

8. In your opinion, do the data support the interpretation? Why?

yes, because there is physical evidence of it, and comparisons can be made between the dif types of rocks at the dif. plate boundaries.

9. As a group, try to come up with some explanations (in addition to plate tectonics) that explain why Earth's surface is not perfectly flat. You should also explain why there are things like metamorphic rocks at the surface, and sedimentary rocks on top of the Rocky Mountains. 3/4

The isostatic weight of the continents versus the oceanic plates. The oceanic plates are more dense. Because of movement of plates and convergence of plates rocks have been displaced. Not flat b/c of erosion and other natural processes.

10. Why might it be difficult to convince people that the continents actually are moving, especially if you were a geologist in the early 1900s?

You can't feel it b/c it is such a slow process; especially if you were a geologist in the early 1900's. They didn't have proper instruments, didn't record data. ✓



