

The Hawaiian islands were created as the Pacific Plate traveled over a hot spot in the mantle. A mantle plume is believed to be the center of vertically rising convection cells, assumed to be deep below Earth's surface. Their effect upon the surface is the production of a *hot spot* which is the site of volcanic activity.

By graphically comparing the age of the islands of the Hawaiian Islands and seamounts and studying a map of the Hawaiian Islands, you will be able to infer the location of the hot spot and the direction and rate of movement of the Pacific Plate.

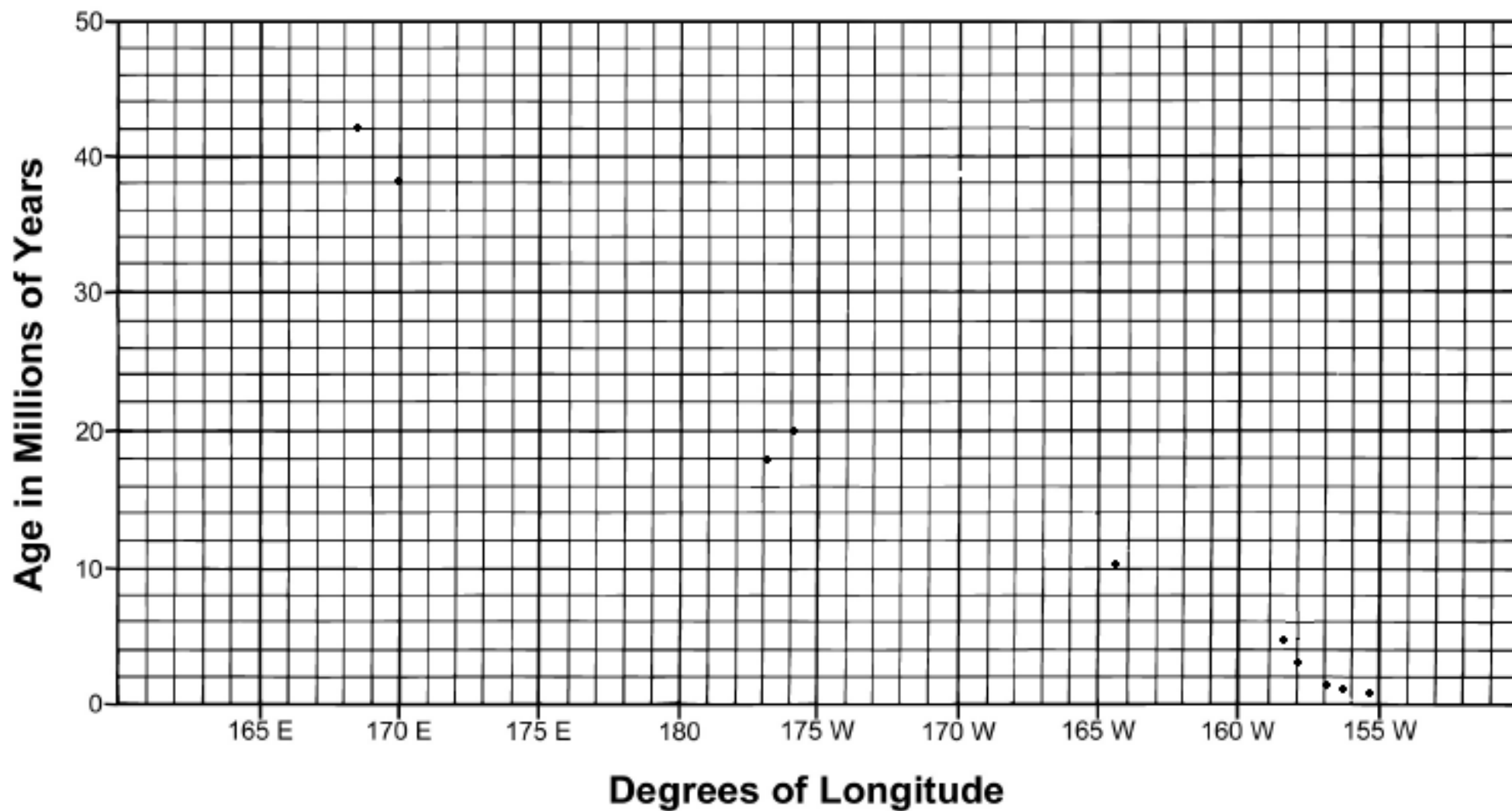
- Using the information in Table 2, label the islands (the dots) on the map on page 2. (10 pts)
- Next to each point label the name of the island.
- Connect the points with a smooth "best-fit" line.
- Estimate the age of Nihoa and plot its position on the graph. (1 pt)

Table 2

	Island (or reef)	Approximate age (in millions of years)	Longitude (in degrees & minutes)
island-->	Hawaii	0.5	155° 30' W
	Kanum	39.0	170° E
island-->	Kauai	4.7	158° 30' W
island-->	Maui	1.1	156° 15' W
	Midway	18.0	177° 30' W
island-->	Molokai	1.6	157° W
	Necker	10.1	164° 30' W
	Nihoa	no data provided	162° W
island-->	Oahu	2.5	158° W
	Pearl	20.1	176° W
	Yuruaku	42.3	168° 30' E

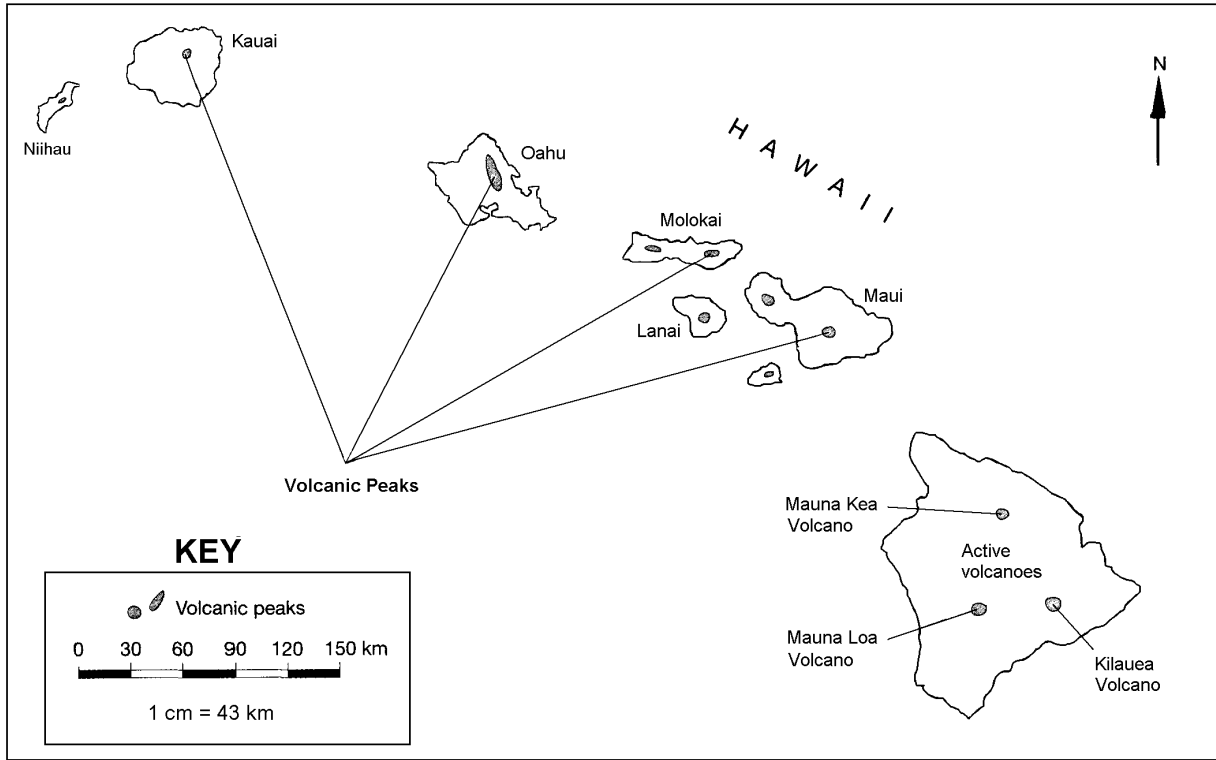
- Using the information in Table 2, write the ages of the following islands on the map of the Hawaiian Islands: Kauai, Oahu, Molokai, Maui, Hawaii (at Kilauea Volcano).
- Using the map scale, calculate the distance from one island to the next by measuring from the center of each volcanic peak at the end of the long pointer line. Using the map scale, determine the actual distance in kilometers. (Record this information in Table 3).
- Convert the actual distance in kilometers from each island to Kilauea Volcano to centimeters (1 km - 100,000 cm) and record in Data Table 3.
- Using the distance and approximate age (in millions of years) calculate the average rate of movement for each island in centimeters per year (cm/yr).
- Show all calculations for distance and rate on separate paper.

AGE OF THE HAWAIIAN ISLANDS



Map 3: HAWAII

Adapted from *Laboratory Manual In Physical Geology, 3rd Edition* (AGI/NAGT, 1993) in *Explorations in Earth Science*, UPCO, (Osmun, Vorwald, and Wegner, 2006)



Map of the Hawaiian Islands, showing volcanic peaks. Absolute ages were determined from basalts that form the islands.

Table 3

Island	Measured Distance (cm)	Actual Distance (km)	Actual Distance (converted to cm)	Approximate Age in Years	Average Rate (cm/year)
Kauai to Oahu					
Oahu to Molokai					
Molokai to Maui					
Maui to Kilauea					

Questions

- Which Hawaiian island is the youngest? _____
- Which Hawaiian island is the oldest? _____
- Referring to the Hawaii map and your graph, what is the relationship between the age of the islands and their location on the map?

4. What is the inferred age of Nihoa? _____
 5. Which island does not seem to fit the pattern of the others? _____
 6. As distance west of Kilauea increases the size of the islands generally appears to decrease. What is the likely reason for this trend?
 7. Predict where the next volcanic Hawaiian island will form.
 8. Describe the change in the rate of movement of the Pacific Plate during the last 4.7 million years.
 9. In which direction is the Pacific Plate moving? _____
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