Geology 437, midterm 1994. My name is_____

1. Give concise, accurate, neat, geophysically relevant definitions or explanations of the following:

a) geocentric axial dipole hypothesis

b) thermal remanent magnetization

c) paleomagnetic Euler pole

d) frozen flux theory for origin of geomagnetic field

e) Curie temperature

f) Huygen's principle

2) Plate B is obliquely subducted beneath plate A at 6 mm/year; B moves southwest (225^o) relative to A. Plates B and C share a transform margin; B moves SE (135^o) at 3 mm/year relative to C.

Calculate plate A's motion relative to plate C; I would sketch the vectors first.

What kind of margin is between A and C?

3) Suppose you have two plates separated by a spreading ridge.
a) Explain what an Euler pole for the two plates is.

b) Explain what an angular velocity vector, A^wB, for the two plates is.

c) Now suppose you are given three sets of transform faults and spreading velocities on three ridge segments for the two plates. Explain how you would determine the angular velocity vector A^wB. How would you use the transforms and spreading velocities?

4) The apparent polar wander path to the right goes with the funny shaped continent and the following questions. The age of the poles increases with the numbers (4 is older than 3):

a) What did the continent do from 0 to 3 and where was its Euler pole during this time?

c) What did the continent do from 3 to 6 and where was its Euler pole during this time?

5) You have paleomagnetic samples from some Cambrian siltstones; their expected declination is directly southeast (135^{o}) with a shallow (10^{o}) inclination.

a) Suppose the rocks are flat lying and have a present-day viscous remanent magnetization (VRM) partially overprinting primary detrital remanence (DRM). How do you expect the natural remanent (NRM) directions to change as you successfully clean away the VRM?

b) Suppose the rocks are folded. How would the VRM and primary DRM differ in their behavior as you rotated the beds back to paleohorizontal (on a stereonet)? What does this tell you about the age of the magnetizations?

6) Use the attached T-delta curves for the following questions:

a) A P-wave from an earthquake 2,220 kilometers away rattles your cage. How long do you have before the S-wave arrives? (Earth radius is 6,371 km).

b) Use the slope of the P-wave between 20 and 40 degrees (assume it is linear) to calculate a rough average velocity for the P-wave in the mantle. Using that velocity, how thick is our mantle? Is your velocity reasonable?

average mantle velocity_____ mantle thickness _____

c) Using the information in b, what is the average velocity of P-waves in the core?