

**EAS 421/521 STRUCTURAL GEOLOGY AND TECTONICS  
FINAL EXAMINATION**

**Answer Question 1 and four others. Question 8 is not available if you are registered in EAS 521.** Question 1 carries 28% of the marks. The remaining questions are equally weighted (18% each). (Actual weightings in the exam may differ.)

**You are encouraged to illustrate your answers with clearly labelled diagrams.**

**Please circle the numbers of the questions that you answer on the mark list inside the cover page of the answer booklet**

**Question 1**

a) Determine the orientation of the strain ellipse and the principal strains from the sample of deformed brachiopods shown in Figure 1. (You may use the Wellman technique or any other appropriate technique to determine the strain.) Sketch a labelled strain ellipse on the diagram.

b) A cross-section (Figure 2) is provided, based on a seismic profile through an oilfield. The vertical scale shows true depth. Use the 'chevron construction' to reconstruct the trace of the fault. What type of strain are you assuming in the hanging wall? A porous sandstone layer at 1650 m depth in well 005-01 dips gently away from the fault, and is represented by a prominent reflection. Predict the position of the footwall cutoff of this horizon at the fault.

**Do FOUR of the remaining questions. If you are registered in EAS 521 you must choose from questions 2-7. If you are registered in EAS 421 you may choose from questions 2-8**

2. What are stress axes, principal planes of stress, and principal stresses? Explain how the Mohr circle construction can be used to calculate the normal and shear stress on planes oblique to the maximum principal stress.

3. Explain with the aid of a diagram what is meant by a 'dislocation', and what is meant by the 'Berger's vector' associated with a dislocation. What is the difference between an edge dislocation and a screw dislocation? Explain how dislocation glide can lead to the permanent deformation of a crystal.

4. Describe the history of an asymmetric rift system that evolves to form two passive continental margins and an ocean basin.

5. Describe the typical tectonic scenarios of plate convergence that can lead to shortening of the crust and the generation of orogenic belts.

6. What is meant by *mélange*? Explain the different processes that can contribute to the formation of *mélanges* in subduction zones and elsewhere.

7. Describe carefully, with diagrams, the various origins of folds that are related to thrust faults in a typical thrust-fold belt.

8. **This choice is NOT available to students registered in EAS 521.** Describe an experiment that might be carried out to simulate a basement reverse fault beneath a sedimentary succession, and draw a diagram to show the possible results.

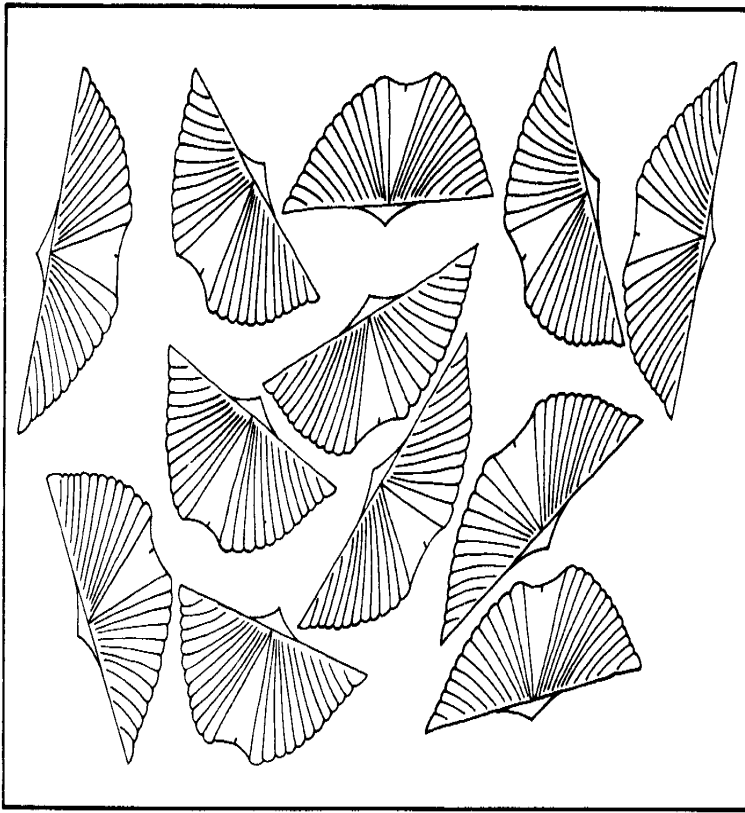


Figure 1

Figure 2

