GEL 109 Final Study Guide - Winter 2009
A total of 100 points will be on the final. All questions will come from this study guide.

1. One of the following stratigraphic sections represents a turbidite flow and one represents a storm deposit. Each stratigraphic column represents a single event followed by the slow accumulation of background sedimentation of shale. Describe the flows that produced the sedimentary structures in each segment and label each with the appropriate depositional event. (6 points)

<table>
<thead>
<tr>
<th>Scale</th>
<th>Lithology</th>
<th>Mud Sand Gravel</th>
<th>Texture (Sorting, color, sedimentary structures, fossils, etc.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td></td>
<td></td>
<td>Bioturbation</td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td>Faint Planar Lamination Current ripples</td>
</tr>
<tr>
<td>0 cm</td>
<td></td>
<td></td>
<td>Planar Lamination</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sole Marks</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Bioturbation</td>
</tr>
</tbody>
</table>

Depositional Event for above column:
How does flow speed change through time?

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<tr>
<th>Scale</th>
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<td>40</td>
<td></td>
<td></td>
<td>Bioturbation</td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td>Wave ripples on top of bed</td>
</tr>
<tr>
<td>0 cm</td>
<td></td>
<td></td>
<td>Hummocky X-strat</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Faint Laminae Sole Marks</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Bioturbation</td>
</tr>
</tbody>
</table>

Depositional Event for above column:
How does flow speed change through time?
2. The following photo and sketch shows sediments deposited during an event. Describe the flow and processes that created the erosion surface, deposited the pebble to silt-sides sediment, and then deposited the fine sand. (4 points)

3. What are three sedimentary structures characteristic of tidal environments. Sketch each one and describe the variations in flow that create it. (9 points).

4. The following photo has a feature characteristic of tidal environments. Show the flow direction(s) indicated by the cross stratification, and name the resulting cross stratification type. (2 points)

5. In the previous photo, could the structures in it be ripple cross lamination? Why or why not? (2 points)
6. The following photo has a feature characteristic of tidal environments. Show the flow direction(s) indicated by the cross stratification, mark the feature indicating a change in flow on the photo and name it. (2 points)

7. In the previous photo, the rock hammer in the lower left is more than 30 cm long. Could the structures in it be ripple cross lamination? Why or why not? (2 points)

8. The following photo has a feature characteristic of tidal environments. The sediment consists of white quartz sand and grey clay-sized grains. Show the flow direction(s) indicated by the cross stratification, mark the feature indicating a change in flow on the photo and give it a name. (2 points)
9. In the previous photo, the squares are 1 cm on a side. Could the structures in it be ripple cross lamination? Why or why not? (2 points)

10. List a characteristic sedimentary structure for each of the environments labeled in the following sketch, describe the flow or process that created it, and why you predict that it would form at this site. (12 points)

Site A
Predicted sedimentary structure:

How it would form:

Why do you predict it at this site?

Site B
Predicted sedimentary structure:

How it would form:

Why do you predict it at this site?

Site C
Predicted sedimentary structure:

How it would form:

Why do you predict it at this site?

Site D
Predicted sedimentary structure:

How it would form:

Why do you predict it at this site?

11. The following sketch shows how storm deposits vary from near shore to deeper water. For each column, mark an erosion surface that represents the bottom of a storm deposit. Put an “F” next to beds that were deposited quickly, and put an “S” next to beds that were deposited slowly. (6 points)

12. List three environmental conditions that influence carbonate sediment production, and describe the conditions for maximum carbonate production. (For example, a condition would be the amount of calcium in seawater and high calcium promotes carbonate production. But you can’t use calcium for your answer...) (6 points)
13. The following diagram shows a carbonate platform. Use the terms on the diagram to answer the following questions and justify your answers. (8 points)

a) Where wave energy is highest? Why?

b) Where should mudstones form? Why?

c) Where should grainstones (sandstones with grains composed of carbonate) form? Why?

d) Where is an area with a very high fossil content? Why?

14. How does the production of carbonate sediment differ from production of siliciclastic sediment? (2 points)

15. How can you get large carbonate grains accumulating in very low energy depositional environments? (2 points)
16. The following stratigraphic columns represent a sequence of rocks deposited during changes in depositional environments. Choose one column, interpret the processes that deposited the sediment. Please include the type of flow that transported the sediment, e.g. air/ice/water and if water, as bedload or in suspension. (3 points)
17. Draw a simple sketch that illustrates the processes that deposited the sediment in the environments represented by the stratigraphic column you chose and show the spatial relationship among the environments. Label the environments on your sketch. (2 points)

18. The following stratigraphic column represents a sequence of rocks deposited during changes in depositional environments. Describe the process that transported the sediment in unit 2 and unit 4. Identify the depositional environment. (3 points).

19. Draw a simple sketch that illustrates the processes that deposited the sediment in the environments represented by the stratigraphic column you chose and show the spatial relationship among the environments. Label the environments where units 2 and 4 were deposited on your sketch. (2 points)
20. The following stratigraphic column represent a sequence of rocks deposited in a coastal depositional environment. Interpret the processes that deposited the sediment and use them to determine whether the coastal environment was influenced by storms or tides. The dip of the lamina for the cross stratification shows the direction of flow. (3 points)
21. Does the following delta represent a river-dominated, wave-influenced, or tide-influenced delta? Why? (3 points)

![Diagram of Papua New Guinea delta](image1.png)

Don Boyd, personal communication, 2007

22. Does the following delta represent a river-dominated, wave-influenced, or tide-influenced delta? Why? (3 points)

![Satellite image of the delta](image2.png)
24. Does the following delta represent a river-dominated, wave-influenced, or tide-influenced delta? Why? (3 points)

25. Sketch a map view of three types of deltas showing the differences in river, wave and tidal influences on delta morphology. Label the features that make them different or describe them in a list. List 3 types of cross stratification you would see in each and use arrows to indicate where each is likely to form. (9 points)

26. What characterizes sediments deposited by glacial processes? You can include associations with sediments from neighboring environments. (5 points for 5 items)
27. If sea level went up, how would sediment deposition change at points A, B and C in the following diagram? (5 points)

![Diagram showing Time 1, A, B, C, Glacier, Ice berg, and Granite.]

28. If you observe meter-high cross stratification in fine sand, what environment would you predict that the sand was deposited in? Why? (3 points)

29. Is the following picture more likely to show ripple x-lamination or dune x-stratification? Why? What type of flow produced it? (4 points; the hand lens is 2 cm across)
30. The following diagram shows the topography along which a river flows after it leaves the mountains. Part of the river is a braided river and part is a meandering river. (3 points; 1 point each)

![Diagram of river topography]

a) Which segment of the river is most likely to be braided? A or B
b) Which segment is most likely to be meandering? A or B
c) Which segment of the river will be transporting the coarsest sediment? A or B

35. The following image was taken from a satellite orbiting Mars.

![Satellite image of Mars surface]

Label three sedimentary features on the image that help you interpret a depositional environment. What process or depositional environment do you think made these features and why? (6 points)
36-38: Stratigraphy questions to come.