

KISII UNIVERSITY
DEPARTMENT OF PHYSICS

BSMN 326: SEDIMENTOLOGY

NOTES:

1. This examination has **5** questions on **3** pages.
2. Question Q1 is of 30 marks and is compulsory. Each of questions Q2-Q5 has 20 marks and you choose any 2 of them. There are 70 possible marks for this examination.
3. Clarity and organization of the answers are important.
4. Duration: 2 Hours

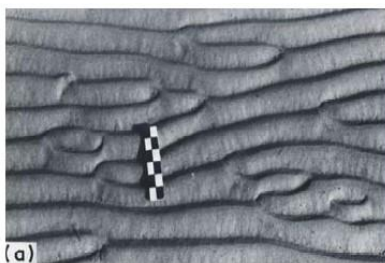
Q1.

- a) Describe 3 physical processes that contribute to the weathering of rocks. (3 mks).
- b) Describe 3 factors that influence (control) rates of weathering. (6 mks)
- c) Describe two properties of grain(s), other than sorting/size, in a rock that reflect upon transport history. (2 mks).
- d) In terms of velocity and water depth, explain the difference between laminar (critical) and turbulent flow. (4 mks).
- e) Gravity flows differ in part by how grains are supported during flow. Describe how grains/clasts are supported in a debris flow versus a turbidity current, and how this influences grain distribution (i.e., sorting) when the flow comes to rest and sediments are deposited. (5 mks).
- f) Viscosity is a measure of the resistance of a fluid to being deformed by shear stress.
 - (i) A. What is eddy viscosity? (2 mks)?
 - (ii) B. Under what kind of flow regime does a fluid experience eddy viscosity? (2 mks).
- g) Draw and label a sand ripple that is being deposited in a stream in which the suspended load is very high relative to the bedload. Be sure to include foresets, bottomsets, and topsets. (4 mks).
- h) You have a rock for which you have the following observations: 60% lithic clasts, 10% feldspar clasts, and 30% quartz clasts. Clast size on average is 0.5 mm (long axis), and there is

approximately 17% matrix. Provide a name for the rock (as complete as possible). (2 mks).

Q2.

- a) In terms of grain size, sorting, shape and mineralogy, describe the characteristics of texturally immature siliciclastic rock (4 mks).
- b) In terms of grains sizes, shapes, sedimentary structures (bedforms), bedding, and other indicators, how would you distinguish a succession of sediments deposited in alluvial fan from those deposited in a submarine fan? List/describe 6 characteristics. (6 mks)?
- c) Given the bed forms in the photo below, what can you say about the direction of current flow and relative current velocity and water depth? (4 mks).



Scale bar is inches

- d) The calcite compensation depth (CCD) determines the depth to which carbonate sediments are preserved in the deep sea. List or explain the factors that control the depth of the CCD. (4 mks).
- e) Sediments deposited in lakes are often laminated. Why is that? In other words, what factors (~3) contribute to this? (3 mks).

Q3.

- a) Draw and describe the primary depositional facies of a meandering river system. Label your diagrams. (8 mks).
- b) For the stratigraphic sections described below, list the most probable environment of deposition. Be specific. (2 mks each.).
 - (i) 5 meters of interbedded mudstone with starved ripples and sandstone with bimodal current directions and clay drapes.
 - (ii) 5 meters of bedded limestones and cherts.
 - (iii) 10 meters of planar and cross bedded poorly sorted sands, overlain by 40 meters of channel conglomerates and poorly sorted debris with angular clasts.
 - (iv) 10 meters of well sorted, cross-bedded sands, with 3- to 4-meter thick, high-angled foresets overlying a lag gravel deposit.
- c) How would you describe the sedimentary structure in the photo below? Where do you think this was deposited? (4 mks).



Q4.

- a) In terms of overall structure and depositional facies, how do ramped and rimmed carbonate platforms differ? (2 mks)?
- b) List or describe the key processes that control the buildup of carbonates platforms. (4 mks)?
- c) What is traction and which sedimentary particles are transported in this way? (2 mks).
- d) What is the importance of the cohesive character of clay to the erosion of mud deposits? (2 mks).
- e) Which are the extrabasinal sedimentary rocks and which are the intrabasinal? What does it mean to be intrabasinal? (6 mks).
- f) How does water, as an agent of transportation, sort sediments into separate mud deposits and sand deposits? (4 mks).

Q5.

- a) What are the similarities and differences between alluvial and deltaic sedimentary deposition? How might rocks from alluvial and deltaic environments differ? (5 mks).
- b) How do continental shelves build up tabular layers of sediment? How do deltas build up tabular, continuous layers of sediment? (5 mks).
- c) What is regression? Transgression? What makes sea level rise and fall? (5 mks).
- d) What characteristic sequence of sedimentary rocks is associated with sea level rise and why. (5 mks).