

Exam: Sedimentology & Reservoir Geology – AESB2230  
Datum: 25 January 2016

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**N.B.:** In many of the questions you are asked to present a detailed description. This is meant to provide insight into your in-depth knowledge of the subject matter, and to exclude the 'gambling' element. In those cases a single-word answer, or a yes/no answer will not suffice. [Hint: use phrases with a subject and verb]. However, keep your answer short and to-the-point. Dutch students: you may use the Dutch language to answer the exam questions.

## 1 Alluvial fans [25/100]

*Processes of transport and deposition on an alluvial fan depend on water availability, amount & type of sediment, and gradient on the fan surface.*

- 1a Give the names of the three main types of transport and deposition modes.
- 1b Present a detailed description of each of these three types. Address the following topics:
  - 1b.1: the transport process;
  - 1b.2: the morphology of the alluvial fan;
  - 1b.3: the sediment characteristics (bedding type, grain size, sorting, sedimentary structures)
- 1c Make a drawing of a vertical grain-size log through a prograding alluvial fan.

## 2 Deep-marine sands [20/100]

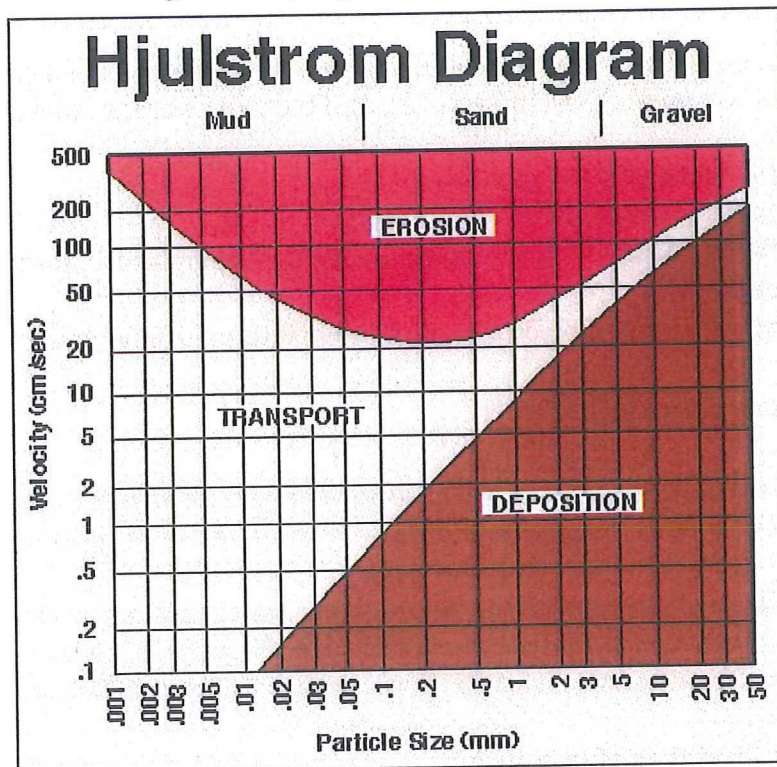
*Thick, extensive sandy deep-marine fan accumulations can form at the base of the continental slope. The sand is transported from shallower depths by gravity displacement.*

- 2a The process of gravity transport down the continental slope is characterized by four successive phases of gravity gliding with increasing water depths. Present a detailed description of each of the successive phases, and deal with the following topics:
  - 2a.1: the role of pore pressure;
  - 2a.2: the (plastic) deformation of the original bedding;
  - 2a.3: the resulting sedimentary structures.
- 2b Make a plan-view drawing of a sandy deep-marine fan. Clearly indicate the three different sub-environments in the drawing.
- 2c Give a detailed description of the sedimentary characteristics of each of these three sub-environments.
- 2d Do these sandy deep-marine fans have reservoir potential. Give a detailed argumentation of your answer.

#### 4 Delta deposits [20/100]

*The Hjulstrom diagram can be used to explain the processes of sediment transport and deposition on a delta coast.*

- 3a Describe what information can be derived from the Hjulstrom diagram.
- 3b Describe in detail the sedimentary processes at the river mouth where a delta is formed, and relate these processes to the Hjulstrom diagram.
- 3c Make a drawing of a cross section – perpendicular to the coast – of a prograding delta. Indicate the names and exact position of the different sub-environments of the delta.
- 3d Make a drawing of a vertical grain-size column through the prograding delta. Indicate the names of the different delta sub-environments at their exact position in the vertical column.
- 3e Draw a gamma-ray log next to the grain-size column. Be sure to use the right scale for the gamma-ray log!



#### 4 Walther's Law [20/100]

*Walther's Law represents one of the key principles to interpret sedimentary successions:*

- 4a Give the exact text of Walther's Law.
- 4b Describe the development in time and space of a transgressive barrier-island coast and relate this development to Walther's Law.

- 4c Make a drawing of a cross section – perpendicular to the coast – of a transgressive barrier-island coast. Clearly indicate the successive phases of the transgressive development.
- 4d Make a drawing of a vertical grain-size column through the transgressive barrier-island coast. Indicate the names of the different barrier-island sub-environments at their exact position in the vertical column.
- 4e Draw a gamma-ray log next to the grain-size column. Be sure to use the right scale for the gamma-ray log!

## 5 **Bedforms and sedimentary structures [15/100]**

*Sand can be transported over the floor of a river channel (bed load transport) as dunes. The dunes are bedforms that can be described by the shape of their crest lines. The two most common types are straight-crested dunes and sinuous-crested dunes.*

- 5a Make a block diagram drawing of each of these two bedform types. Clearly draw the morphology of the dunes in the top view of the block diagram, and the sedimentary structures in the side view (parallel to flow) and frontal view (perpendicular to flow).
- 5b Explain the differences in dune types in terms of the water flow over the dune surface.

