

# Tentamen Economic Minerals and Rocks TA3140

27 Oktober 2008

Tijd: 9:00 – 12:00 h

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## Nota Bene:

- Voorzie elk vel van uw naam, datum en studienummer
  - Lees de vragen goed door alvorens te antwoorden.
  - Niet elke vraag telt even zwaar.
  - Schrijf a.u.b. duidelijk.
  - De vragen bij voorkeur in het *Engels* beantwoorden. Indien u liever in het *Nederlands* wilt antwoorden, is dat uiteraard toegestaan.
  - In verband met het corrigeren van de antwoorden door twee docenten wordt u verzocht de antwoorden van *Ores and Industrial Minerals* en de antwoorden van *Coal* op verschillende vellen te schrijven.
  - U wordt verzocht de vragen weer in te leveren.
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## Questions on Ores and Industrial Minerals

- 1) What is the definition of a mineral?
- 2) Explain as concise as possible the terms Grade, Cut-off Grade, Recovery. Which of these three is determined by the geology?  
*koort te bepalen*
- 3) Explain the rock-type "Greisen". How does it form, and which rocks are associated with it? Indicate which ore minerals are associated with this type of rock.
- 4) Would you use sandstone as armourstone in sea-walls (Nederlands: zeekeringen). Explain your answer.
- 5) What is the set of ore-minerals to be expected in an ore body formed by the process of liquation?
- 6) Rare Earth mineral deposits (non placers) occur associated with a specific rock type. Describe this rock type, and indicate to what general class it belongs.
- 7) Dutch beach sands and placer sands consist mainly of quartz, feldspars, micas, and heavy minerals. Consider the fact that the minerals in the sands are in majority deposited by the action of the major rivers (Rhine, Meuse, IJssel), and take into account the hinterland, consisting in majority of (diagenetically altered) sediments, and felsic magmatic and low to high grade metamorphic rocks (granites, gneiss, shales, etc.). Which heavy minerals do you expect to occur in the beach/placer sands? Explain your choice.

**Nota Bene:**

*Felsic*: acid rock type, silica-rich, as opposed to (ultra)mafic.

*Diagenesis*: the process of slow physical and chemical alteration of a rock from fresh deposited sediment until the onset of metamorphism.

Typical heavy minerals (s.g.  $> 3.5 \text{ g/cm}^3$ ) are:

- ilmenite,  $\text{FeTiO}_3$
- monazite,  $\text{LREE}(\text{PO}_4)$ ,
- xenotime  $\text{HREE}(\text{PO}_4)$ ,
- zircon  $\text{ZrSiO}_4$ ,
- garnet,  $X_3Y_2(\text{SiO}_4)_3$ ,  $X = \text{Ca, Mg, Fe}^{2+}$ ,  $Y = \text{Al, Fe}^{3+}, \text{Cr}^{3+}$ ,
- rutile, anatase,  $\text{TiO}_2$ ,
- chromite,  $\text{FeCr}_2\text{O}_4$ ,
- cassiterite,  $\text{SnO}_2$ ,
- wolframite,  $(\text{Fe, Mn})\text{WO}_4$ ,
- hematite,  $\text{Fe}_2\text{O}_3$ ,
- magnetite,  $\text{Fe}_3\text{O}_4$ .

- 8) What are the seven properties which distinguish the sulphides from the common rock-forming minerals?
- 9) Since many years, asbestos is regarded as extremely hazardous for human health. What industrial mineral is the source for the product that is the main replacer of asbestos. How is this product made?
- 10) Explain the terms "proven ore", "probable ore", "possible ore", "hypothetical ore".
- 11) Which metals are called the "Base Metals"? What are the major ore deposits for these metals? *type of ore*
- 12) It is a generally accepted theory that kimberlitic magma's must have risen from upper mantle levels to the surface at a very high speed (in a very short time interval). Explain the main reason for this theory.
- 13) What are the classes in which the sulphides are subdivided according to crystal structure? Mention one mineral example per class.
- 14) Explain the difference and similarity between sulphide and sulphosalt.

## Questions on Coal

*Answers on sheets separate from the others please!  
Put your name and study number on each sheet.*

- 15) What is the difference between ombrogenous and topogenous peatlands?
- 16) Coking coal is a process of carbonization. Describe the process.
- 17) Name the 3 maceral groups and briefly their original content.
- 18) Name the five stages of coalification and clarify the stage of debutiminization.
- 19) What can be the original causes of seam splitting. Name one.
- 20) Name 3 reasons why ash content can be troublesome when using coal.