Examination Reconstructing Quaternary Environments (GEO4-4409)

January 29, 2015

**Answers to the open questions may be given in English or Dutch,
in any case: please answer concise and readable !**
For every sub-question you can earn 4 points. (subtotal 60)

The second part consists of **20 multiple choice (MC) questions** based on the
presented papers. Only one answer is supposed to be correct. For each of the correct
MC answers you can earn 2 points. (subtotal 40)

The results will be available within 2 weeks and published on blackboard,
Good-luck !

OPEN questions:

1) Give a short and to-the-point description of the following subjects:
   a) Reservoir age
   b) Palaeosol
   c) Mutual Climatic Range

2) Dating:
   a) In a coring from the western part of the Netherlands, marine shells are present
      at about 15 meters below the present sea level in a fluvial deposit underlying a
      layer of coversand. How old are these shells and how can they be dated?
   b) What is OSL-dating, and how can it be applied in dating past fluvial activity?
   c) Annually laminated sediments provide a fantastic dating archive. What is the
      general principle behind the formation of biochemical varves ?

3) Proxies:
   a) You obtained a core from the W Netherlands close to the North Sea containing
      an alternation of sand, silt and clay beds. How can you determine the
      environmental setting during deposition of the material in the core?
   b) How can you reconstruct palaeohydrological changes in a peat bog?
   c) How can you use the Loss on Ignition method for the reconstruction of
      environmental changes?

4) Events:
   a) Why should individual tree ring records be detrended before comparing them
      to other records ?
   b) How has the Quaternary been sub-divided ?
   c) Describe the relationship and differences between Heinrich events and
      interstadials

5) Synthesis:
   a) Sketch the Greenland oxygen isotope record for the Last Glacial-Interglacial
      Transition, give the approximate ages on the vertical axis;
   b) make a comparison with the vegetation development in the Netherlands;
   c) which methods can you use to correlate these records ?

Multiple Choice questions (MC): write down only a, b, c, or d !

6) Which of the following features is NOT a good indicator for past permafrost conditions?
   a) Speleothems
   b) Palsas
   c) Rock Glaciers
   d) Trimlines

7) Which of the following proxies in NOT a good indicator for summer temperatures?
   a) Pollen
   b) Testate amoebae
   c) Chironomids
   d) Coleoptera

8) Which of the following species became extinct before the end of the Pleistocene ?
   a) Woolly Rhino
   b) Irish Elk
   c) Mammoth
   d) Horse

9) In Europe several tephra layers have been found in the last decade, which of the following tephras is directly named after the volcanic system responsible for its distribution ?
   a) Laacher See Tephra
   b) Borrobol Tephra
   c) Saksunarvatn Ash
   d) Vedde Ash

10) Several environments record a nearly complete sequence of Glacials and Interglacials during the Quaternary. In the China these are represented as an alternation of loess and soils. How many Interglacials soils are recognized in these sequences?
   a) 22
   b) 33
   c) 44
   d) 55

11) Currently the the Global Last Glacial Maximum is defined to occur between:
   a) 15-40 ka
   b) 15-23 ka
   c) 19-23 ka
   d) 19-40 ka

12) Which of the materials mentioned below is providing the most reliable age determination with U-Th dating
   a) Speleothems
   b) Bones
   c) Gastropods
   d) Diatoms

13) Alpine glaciers shows several glacial advances during the last 3500 years, how many of these can be recognized based on the recent study of the Mer de Glace, Mont Blanc ?
   a) 1
   b) 2
   c) 5
   d) 10

14) Lake Van in Turkey documents the last 360,000 years, what is recorded in the lake sediments of Lake Van ?
   a) Lake level changes during Glacial Terminations
   b) Soil formation during extreme droughts
   c) Marine ingressions linked to Interglacials
   d) Repetitive tectonic activity linked to deglaciations

15) What is the approximate date for the Pleistocene-Holocene Transition ?
   a) 11,700 b2k
   b) 11,700 BP
   c) 11,700 BC
   d) 11,700 ka

16) What is one of the most characteristic elements in the Eemian vegetation in Europe ?
   a) The occurrence of dry continental species such as spruce (*Picea*)
   b) The occurrence of cold adapted species such as birch (*Betula*)
   c) The occurrence of warm species such as hornbeam (*Carpinus*)
   d) The occurrence of subtropical species such as hemlock (*Tsuga*)

17) Glacier advances can be dated using ^{10}Be, what usually sampled for this dating method ?
   a) Lake sediment cores
   b) Moraine boulders
   c) Lichens
   d) Organic deposits

18) Several tree species immigrated N Europe after the end of the last Glacial. The distribution of alder (Alnus, Els) into Scandinavia occurred round:
   a) 3 ka BP
   b) 5 ka BP
   c) 7 ka BP
   d) 9 ka BP

19) According to Hoek (1997) the Lateglacial vegetation development in the Netherlands is characterized by the succession of pine (*Pinus*), birch (*Betula*) and willow (*Salix*) trees. Which is the general order of appearance in Dutch Lateglacial pollen diagrams ?
   a) Pine, Birch, Willow
   b) Willow, Pine, Birch
   c) Pine, Willow Birch,
   d) Willow, Birch, Pine

20) When was Scotland completely deglaciated ?
   a) 11.5 ka cal BP
   b) 13 ka cal BP
   c) 15 ka cal BP
   d) 20 ka cal BP

21) What is based on the insolation variability seen as the best analogue for the current interglacial ?
   a) MIS 3
   b) MIS 5
   c) MIS7
   d) MIS 11

22) What is the approximate age of Marine Isotope Stage 5
   a) 100 ka
   b) 200 ka
   c) 300 ka
   d) 400 ka

23) For the Early Holocene several cooling events are reported in the North Atlantic region. The 8.2 event has been recognized:
   a) An increase in AP percentage (arboreal pollen)
   b) A reduction in Mesolithic population density (W Scotland)
   c) An expansion of the Ice sheet (Central Scandinavia)
   d) A decrease in NAP percentage (non arboreal pollen)

24) The engraving into dated shells on Java implies that the first indication to cognition and human behaviour can be set at:
   a) ~ 1.0 Ma
   b) ~ 0.5 Ma
   c) ~ 250 ka
   d) ~ 100 ka

25) The Little Ice Age is likely caused by:
   a) Glacial expansion
   b) Meltwater drainage
   c) Orbital changes
   d) Redueced solar activity

THE END