Course in Biogeochemistry, Division of Earth System Science,
Graduate School of Environmental Science, Hokkaido University

Entrance Examination for the Master's Course for Admission in April 2025

Essay Assignment

Answer the following questions and submit the answers in an uneditable file format, such as PDF, JPEG, GIF, or PNG, to Professor Koji Suzuki, Course Head (biogeochemistry.hokudai@gmail.com) via email by Sunday, February 9, 2025.

If you have any questions about the examination, please contact Professor Koji Suzuki (biogeochemistry.hokudai@gmail.com) by e-mail.

The oral examination includes your presentation on Assignment 2 (10 min), followed by the question-and-answer session (10 min). For Assignment 2, make a presentation of your answer to question (8) below with PowerPoint (or PDF) slides. There is no limit to the number of presentation slides.

Assignment 1

Explain (i) your motivation for applying to the Course in Biogeochemistry, (ii) your research aspirations after admission, and (iii) your appeal within 300 words in total.

Assignment 2

After reading the following paper by McClymont et al. (2022);

McClymont, E. L., Ho, S. L., Ford, H. L., Bailey, I., Berke, M. A., Bolton, C. T., et al. (2023). Climate evolution through the onset and intensification of Northern Hemisphere Glaciation. Reviews of Geophysics, 61, e2022RG000793. https://doi.org/10.1029/2022RG000793

as well as their related literature and textbooks, answer the questions (1)–(10).

Question (1)

Explain the following each technical term used in the paper briefly (in 50 words or less for each).

　　NHG, LR04 $\delta^{18}O_{benthic}$ stack, orbital forcing, ice-albedo feedbacks

Question (2) This paper's authors categorized the NHG period into two distinct phases: oNHG and iNHG. Explain how they distinguish each phase in this paper in 100 words or less.

Question (3) The mPWP is often regarded as an analogue of a future warm climate. Describe the reasons for this in 100 words or less.

Question (4) Describe the issues of UK_{37}', TEX_{86}, foraminiferal Mg/Ca, and foraminiferal $\delta^{18}O$ palaeotemperature proxies in 200 words or less.

Question (5) Explain why this paper recommends multiproxy water temperature reconstructions in 50 words or less.

Question (6) In this paper, the authors tried to extract continental ice volume variability from the $\delta^{18}O_{benthic}$, but it was unsuccessful. Explain how they tried to extract the ice volume change and why it was unsuccessful in 200 words or less.

Question (7) Describe your ideas on what paleoenvironmental reconstruction should be undertaken in which areas in the future to better understand the causes and mechanisms of NHGs in 150 words or less.

Question (8) Summarize what Figure 4 indicates in 200 words or less.

Question (9) Explain what the presence of ice-rafted debris in marine sediments indicates in 50 words or less.

Question (10) Indicate the geographical area where SST variability was intensified during the NHG in one sentence.