

Biol. 463  
Global Ecology  
Fall 2024  
Exam III ("Final" Exam)

### **Readings & associated study questions**

Post et al. 1990	Schindler 1974
Norby et al. 2005	Charlson and Wigley 1994
Pan et al. 2011	Kasting 2004
Townsend et al. 2003	

### **Textbook chapters**

Chapters: 2, 3, 8, 12, 14, 15 (pgs. 301-320), and 16. ***Focus on parts that were mentioned/discussed in lecture.***

### **Web sites & associated study questions**

What is hypoxia?

### **Lecture materials from "global nutrient cycles" through "our changing climate" (inclusive)**

Handouts available as PDF & PowerPoint files on class web site.  
Lecture recordings 25-42 available in shared Google Drive folder

### **Web videos & associated study questions – located on course web site in the "Web Sites" tab.**

Videos on:

- Greenhouse gas physics (also see pgs. 48-50 of textbook)
- The naked climate model (also see pg. 44 of textbook)
- The greenhouse effect (also see pg. 45 of textbook)
- Good news on energy & environment by Richard Alley

### ***In addition to the study questions, be able to answer the following:***

- What properties of a gas make it a greenhouse gas?
- Why is the 1-layer model more realistic for Earth than the "naked" climate model and, compared to the "naked" climate model, what effect does adding the layer have on surface temperatures?
- Does the 1-layer model accurately predict surface temperatures on Earth? If not, how might it be improved?
- Which model would you use to calculate the surface temperature of the moon and why would it be more appropriate?

## Items of special note (not a comprehensive list):

The N, P, and S cycles: Processes, importance, & human impact  
General information about reactions involved with AMD formation  
DMS feedback loop (be able to draw the diagram of this for long and short temporal scales & know processes involved)  
Negative & positive feedback loops and negative & positive couplings (again)  
The relationship between the radiation laws (where applicable) and the meaning of these laws  
Understanding the terms found in the energy balance equation for a planet (any planet) and their meaning

Calculating the greenhouse effect with 1-layer atmosphere model (Box on pg. 45 of textbook)  
Faint young sun paradox  
Feedback loops that might amplify the 100,000 year eccentricity signal of interglacial/glacial transitions  
Teachable moments from Earth's climate history and what they teach us  
Ecological effects of elevated CO<sub>2</sub> concentrations and reasons/evidence for why we are to blame for increases since ca. the 1880's  
The features of present & future environmental change as presented in class lectures and the assigned video talk by Richard Alley

## Useful terms to know (not a comprehensive list):

Keeling Curve  
Beta Factor  
The Long Thaw  
Carbonate-Silicate Long-Term Feedback Loop  
Dissolved Inorganic Carbon (DIC)  
N Fixation  
Nitrogenase  
Legumes  
Anabaena  
Heterocyst  
Leghemoglobin  
Ammonification  
Nitrification  
Immobilization  
Denitrification  
Haber process  
Nitrogen saturation  
Ectotrophic mycorrhizae

Endotrophic mycorrhizae  
Mutualism  
Guano  
Apatite  
Cultural eutrophication  
Hypoxia  
Dimethyl sulfide (DMS)  
Yellowboy  
Dry deposition  
Heat  
Electromagnetic Radiation  
Blackbody  
Stephan-Boltzman Law  
Planck's Law  
Wein's Displacement Law  
Beer's Law  
Spectral Irradiance Curve  
Wavelength of maximum emission

Rayleigh Scattering  
Mei Scattering  
Subsolar point  
Climate forcing  
Suess Effect  
Eccentricity  
Obliquity  
Precession  
Faint Young Sun Paradox  
Ice Age  
Glacial/Interglacial Periods  
Radiation vs. Energy Balance  
Water Use Efficiency (WUE)  
Photorespiration  
Phenology

## Exam time & structure

Time of the exam: Thursday May 2; 2-4 PM

Location: In person in 3306 LSB

Structure of exam: The exam will consist of three parts: answer 4 out of 5 term explanations (10 pts each); answer 3 out of 4 multiple choice (5 pts each); and answer 3 out of 4 in depth questions (15 pts each).

No questions will be from the homework problem sets.

No questions will be from material covered only in textbook, but the textbook should reinforce/clarify information in lectures and other readings.

The exam is not comprehensive.

**Detailed answers expected** for term explanations & in-depth questions!

This is a **closed book exam**, meaning that **no outside sources of information are to be used during the exam (books, internet, notes, other people, etc.)**.

Extra credit for Exam III should be done ahead of time and turned in as a single PDF file attached to an email before midnight on the day of Exam III. Instructions for the Extra Credit are found at:

<https://www.as.wvu.edu/biology/bio463/Exam%20III%20Extra%20Credit.docx>