

GEOL/ESS 2000: Review Sheet, Final Exam

Dec. 11, 2017

Again, here are some preliminaries:

- 1) You do not have to memorize the equations we have looked at in class or in lab. I am interested in whether or not you understand the general concept – I'll give you equations or data that you may need for a calculation.
- 2) Roughly half of the final exam will cover the material since the third exam (Chapters 11, 12, 13, 14 and some of 15). Concepts from lab may also be on the exam.
- 3) The final will also cover a smattering of major concepts from the course up until the third exam.
- 4) There WILL BE simple quantitative problems on the exam. There are likely to be a few problems in which you have to think your way through a series of simple calculations. It will be possible to solve the problems without a calculator.

IN GENERAL, previously provided review sheets will give you guidance on the main subjects covered previously. FOR THE MOST RECENT MATERIAL SINCE THE LAST (THIRD) EXAM, the general subjects are:

- Genomic tree of life; “last common ancestor”; how did Earth’s earliest life make a living?
- Endosymbiosis, heterocysts
- Isotopic fractionation, relation to existence of life on Earth, formation of organic matter
- Evidence for the rise of oxygen in Earth’s atmosphere, ozone in Earth’s atmosphere
- Relationship between atmospheric oxygen levels and burial of organic carbon; forest fires
- Ocean biological pump in relation to oxygen feedback
- Faint young sun paradox revisited, constraints on greenhouse gas concentrations; feedbacks
- Logistic growth
- Taxonomy; know that there is a lot more fluctuation at the species and genera level than at the class and order level (but no need to memorize the details!)
- KT impact: evidence for it, nature of crater, effect on biological pump in oceans
- Milankovitch cycles – eccentricity, obliquity, precession, different frequencies
- What feedback systems on Earth amplify the Milankovitch variations in solar energy input to lead to ice ages? (Shelf exposure hypothesis, Fe fertilization hypothesis, coral reef hypothesis)
- Oxygen and carbon isotope fraction as a way to tell temperature and ice volume
- Methanesulfonic acid etc. from marine algae – what does it tell us?
- Short-term climate variability- Holocene, Younger Dryas, Holocene Climate Optimum, Medieval Warm Period, Little Ice Age, effects of volcanic eruptions, sunspot cycles, El-Nino
- Energy Usage – coal, oil, natural gas
- Different CO₂ emission scenarios
- Is CO₂ the only greenhouse gas? [Methane (CH₄), N₂O, CFCs (not to mention water!)]
- Various scenarios for global warming, and various scenarios for what emissions and atmospheric CO₂ will do over the next century or two
- Sea-level rise
- Changes in biodiversity
- Ocean acidification and its effects on corals, etc.
- Exponential growth and doubling time, the 70 divided by percent growth rate rule
- Think about the effects of climate change on people all around the world.