ES322 Geomorphology Exam 3 Study Guide
Fall 2016

Exam Format

Two-Part Exam, Tuesday December 6, 2016

Part 1 - Closed Book, short answer essay – terms and definitions, draw sketches, long answer essay – "compare and contrast", "discuss", "explain".

Part 2, Open Book, lab-style problem solving, you will be able to use all of your class resources to solve math-based, lab-style problems.

Study Tips

- go through the web site, look at the figures and slide shows, compare to notes
- use study guide in combination with notes
- go back through the in class / lab exercises, make sure you can work the math / units
- spend a couple days studying, the exam will be essay and there is much material.
- don't wait until the last minute!
- carefully go through the notes, some of the material we briefly discussed, but did not spend much time on in class... but the notes will give you the detail
-finish all your lab exercises before taking the exam!!! Lab questions will appear.
-Exam format: Part 1. Closed book short answer / essay. Part 2. Open-book lab-style problem solving.
- Review the video exercise questions for glaciers, deserts, and climate change.

Digital Lab Portfolio 3 Moodle Upload Due Thursday December 8, 2016

Review Montgomery and Bierman "Key Concepts in Geomorphology" Text Chapters (posted on Moodle class site); focus on following key words and concepts:

Chapter 9 Glacial Geomorphology

Glaciers
Permafrost
Alpine glacier
Cirque glacier
Piedmont glacier
Continental glacier
Ice sheets
Ice cap
Pleistocene
Last Glacial Maximum
Laurentide Ice Sheet
Cordilleran Ice Sheet
Glacial Mass Balance
Glacial advance
Glacial retreat
Ice accumulation
Ice Ablation
Meltwater
Firn-snow-ice
Equilibrium line altitude
Ice creep
Internal flow / deformation
Basal sliding
Viscoplastic solid
Brittle deformation
Ductile deformation
Glacial calving
Ice margin
Ice shelf
Marine ice
Plucking / quarrying
Warm vs. cold glaciers
Temperate vs. polar glaciers
Moulon
Jokulhlaups
Meltwater lake
Striation-polish-rock flour
Glacial buzzsaw
Diamicton
Till
Melt-out till
Ice-contact till
Kettle
Kame
Crevasse
Esker
Outwash plain
Varves
Dropstones
Rhythmites
Ice rafted debris
Moraine
Terminal moraine
End moraine
Lateral moraine
Recessional moraine
Arete-horn-cirque
Tarn – paternoster lake
Pro-glacial lake
Drumlin-esker
Nunataks
Periglacial
Paraglacial
Permafrost
Patterned ground

Chapter 13 Climate Change

Global climate change
Carbon cycle
Carbon dioxide emission
Carbon sequestration
Greenhouse effect
LGM – last glacial maximum
Relict landform
Holocene/Pleistocene
Glacial / interglacial
Pluvial environment
Glacial advance /retreat
Lake / marine sediment
Varves
IRD ice rafted debris
Pollen
Macrofossils
Packrat middens
Foraminifera
Oxygen isotope ratio
O^{18}/O^{16} isotopes
H_2O^{16} vs. H_2O^{18}
Marine isotope stage
Paleothermometry
Ice cores
Gas / fluid inclusions
Loess
Paleosol
Climate cycle
Glacial cycle
Isotopic excursion
Terminations
Orbital forcing
Solar radiation
Celestial mechanics
Eccentricity
Obliquity
Precession
Milankovitch cycle
Thermohaline circulation
Gulf Stream
North Atlantic Conveyor
Younger Dryas
Heinrich Events
IRD
Altithermal / midHolocene
Little Ice Age
High Sea Level Stand
Low Sea Level Stand

Chapter 10 Wind / Deserts

Aeolian / wind
Wind velocity
Air pressure
Stokes equation
Katabatic winds
Wind throw
Saltation
Ventifact
Loess
Yardang
Blow out
Deflation
Desert pavement
Erg
Transverse dune
Linear dune
Start dune
Parabolic dune
Barchan dune
Desert varnish

Key Words from Notes
(Web links provided below)

Glacial Processes and Landforms
http://www.wou.edu/las/physci/taylor/g322/glacial.pdf

Glacier
Snowfield
Snow-firn-ice
Ice stratification/accumulation
Ice deformation
    Plastic vs. brittle
Plastic = internal flow
Brittle = crevasses/fracture
Ice Flow Mechanisms
    Basal sliding
    Internal deformation
    Plastic deformation
    Crevassing
Glacial surging
Glacial meltwater
Ice-water mixture
Glaciers as aquifers
Temperate glaciers = wet
Polar glaciers = dry
Alpine vs. Continental glaciers
Glacial advance
Glacial retreat
Ablation/melting
Zone of accumulation
Zone of ablation
Glacial erosion
    Plucking
    Abrasion
    Subglacial water flow
Glacial Deposits
    Drift
    Till
    Outwash
    Erratics
    Diamicton
Alpine Erosional Landforms
    Cirque
    Tarn
    Arete
    Cols/Horn
    U-shape valley
    Hanging valley
    Fjords
    Roche Moutonee
    Striated pavement
Alpine Depositional Landforms
    Moraine
    End Moraine
    Lateral Moraine
    Medial moraine
    Terminal moraine
Continental Landforms
    Drumlin
    Esker
    Kame
    Kettle
    Outwash Plain

Quaternary Climate Change
http://www.wou.edu/las/physci/taylor/g322/quaternary_climate_change.pdf

Pleistocene Ice Ages
Glacial/Interglacial Climates
Solar-Geothermal Exchange
Global climate change
Greenhouse effect
Greenhouse gases
Carbon Cycle
Quaternary Sea Level Curve
Evidence of Past Glaciation
    Continental Landforms
    Continental Deposits
    Marine Record
    Oxygen Isotopes
    Fossil Evidence
    Paleoclimatology
Laurentide Ice Sheet
Cordilleran Ice Sheet
Sea-Level Fluctuation
Global Sea Level Change
Pluvial Lakes
Great Lakes
Missoula Floods
Ice Cores
Glacial maximum
Oxygen isotope stages
Ice-Ocean Isotope Exchange
Ocean cores
Ice cores
100,000-43,000-20,000
Stable Isotope Analysis
Oxygen18/Oxygen16
Global ice budget
Global ocean budget
isotopic fractionation
"heavy water"
"light water"
glacial climate
interglacial climate
ice sheet
evaporation
late Wisconsinan ice
global sea level
eustatic sea level
deep sea drilling
O18 stratigraphy
O18/O16 ratio
global correlation
radiometric dating
orbital forcing
general circulation model
Milankovitch Theory
obliquity
eccentricity
precession
angle of earth tilt
orbital path
plane of ecliptic
Global Warming

Wind & Deserts
http://www.wou.edu/las/physci/taylor/g322/deserts.pdf

arid / semi-arid defined
precipitation levels
Causes of Deserts
    High pressure
    Orographic
    Latitude
    Cold ocean currents
Sub-tropical deserts
Polar deserts
Rainshadow deserts
Wind vs. Fluvial processes
Desert Landforms
    Alluvial fans
    Fault-block mountains
    Mesa
    Butte
    Playa

- Dune vs Ergs
- Bajada
- Pediment
- Inselberg

Wind Processes (Aeolian)

- Deflation
- Saltation
- Suspension

Dune Types

- Transverse
- Longitudinal
- Parabolic
- Barchan

Loess

Desert pavement

Desert varnish

Ventifact

LAB SKILLS / CONCEPTS

Unit algebra / basic problem solving skills
Process Rate / volume / mass / density calculations
Basic map reading / landform identification from a topographic map.
Map scaling, determining fractional scales
Calculate long term and short term erosion rates at the watershed scale
Interpret geomorphic information from soil survey maps / data
identification of basic landforms and geomorphic process by examining aerial imagery
Identify glacial processes and landforms from air photos and field photographs.
Identify desert processes and landforms from air photos and field photographs.

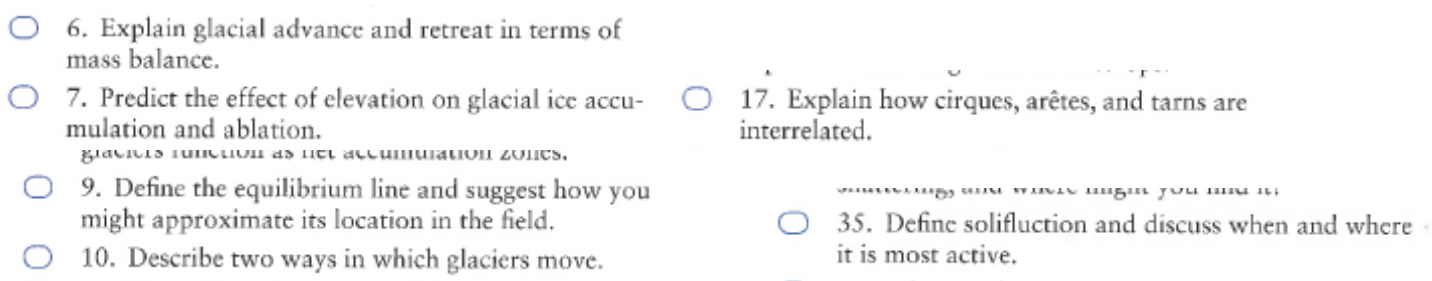
be able to interpret relationships between tectonic uplift and global sea level change, can you identify which process is affecting a given sea level record

make sure you can calculate slopes and gradients from topographic maps

Big Ideas / Key Concepts

List and discuss the four criteria used in landscape analysis.
Discuss the significance of convection, heat flow and influence on tectonic and climatic systems
Discuss the concepts of gravity, density, buoyancy and isostasy
Describe landscape evolution in terms of unroofing, uplift and denudation over geologic time.
List and discuss the three energy sources that drive forces on planet Earth, provide example geologic phenomena of each.
How has climate changed during the Quaternary period? List and discuss the main sources of evidence used to derive the record of climate change on planet Earth.
What is a glacier, how is it defined, what are the key processes.
Discuss the concept of glacial movement, how does it occur.
Compare and contrast erosion / deposition processes between mass wasting, rivers, glaciers, and wind… how are they similar and how are they different. What are the driving forces and sediment transport functions?
Provide sketches and definitions of alpine and continental glacial features and landforms.
Provide sketches and definitions of desert / wind features and landforms.
How are sediment, ice cores and isotope studies used to recreate climate history of the earth.

Bierman Text Practice Essay Questions:



- 6. Explain glacial advance and retreat in terms of mass balance.
- 7. Predict the effect of elevation on glacial ice accumulation and ablation.
- 9. Define the equilibrium line and suggest how you might approximate its location in the field.
- 10. Describe two ways in which glaciers move.
- 17. Explain how cirques, arêtes, and tarns are interrelated.
- 35. Define solifluction and discuss when and where it is most active.

- 23. How are kettle ponds thought to form?
- 24. Define outwash and outwash plains and explain how they form.
- 25. What landform is often used to determine the elevation of now-vanished ice-marginal lakes?
- 26. Describe the appearance of varved sediment and explain how it was deposited.

- 19. Describe glacial till.
- 20. What does an esker look like and how does one form?

- 1. Identify in what settings aeolian processes are the dominant geomorphic actors and explain why.

- 5. Compare and contrast the physical properties of water and air and explain what differences control the geomorphic effectiveness of these fluids.
- 6. Define turbulence and explain why it is important for understanding aeolian geomorphic processes.

- 10. What is ventifaction and how and where does it occur?

- 13. Make a diagram illustrating the differences in movement and typical particle size in transport for suspension, saltation, and creep.

- 15. Which grain size is optimal for wind erosion? Explain why.
- 16. What is loess and what is the primary control on the grain size and thickness of loess deposits?
- 17. What is a yardang and where might you find one?
- 22. Dunes can be separated into two distinct categories. List those categories and explain how they differ.
- 23. Explain how barchan, parabolic, and star dunes form and move, highlighting similarities and differences.
- 24. Give three examples of the importance of dust/loess in soil formation.