

Earlham College Geosciences 211, **Physical Geology**
Assistant Professor Ron Parker
Study Guide for Test # 4, Final Exam
Exam scheduled for 8:00 AM Monday, May 2nd in Room 014 Dennis Hall
Review guide prepared April 26, 2005

The final exam will be comprehensive but will focus on the material covered since the last exam. This study guide is for that last 1/4 of the course. Please consult the previous 3 study guides for previous questions regarding the first 3/4 of the course. The subject areas for this test include: Deserts, Surface Water, Ground Water, Oceans and Shorelines, Glaciers, and Global Change. These topics are described in Marshak, 2004, Chapters 14, 15, 16, 17, 18 and 19.

1. Deserts (Marshak, Chapter 21)

- a. What regions of the globe are characterized by deserts?
- b. What are the different types of deserts?
- c. How do tectonic processes influence the location of deserts?
- d. What processes of weathering and erosion typify deserts?
- e. Describe the formation of deflation armor (desert pavement), ventifacts and yardangs.
- f. How do the erosional effects of water and wind differ in a desert?
- g. What are the environments that accumulate sediment in deserts?
- h. What features characterize desert landscapes?
- i. How do humans contribute to the expansion of desert environments (desertification)?

2. **Streams and Floods: The Geology of Running Water (Chapter 17)**

- a. Know definitions to the Key Terms listed on the webpage.
- b. What are the elements of the hydrologic cycle?
- c. Why is surface water important?
- d. How does precipitation turn into running surface water?

- e. What are the types of drainage network and where do they develop?
- f. How is a watershed determined? What constitutes a divide?
- g. What are the characteristics of flow in channels?
- h. How does base level control stream form? Terraces?
- i. What are the types of stream load.
- j. What are capacity and competence?
- k. How does sediment erosion and transport change with changes in discharge?
- l. What are the sediment deposits that are formed in stream channels and floodplains?
- m. How does the thalweg and helicoidal flow contribute to meandering?
- n. Draw a cross-section of a channel that shows the process by which river channels develop (and continuously alter) meanders.
- o. How does headward erosion modify valleys? What is stream piracy?
- p. What are some mechanisms humans have developed to preventing flooding?
- q. How does a stream change in longitudinal profile from headwater to mouth.
- r. What is a delta and how does it change with time?

3. A Hidden Reserve: Ground Water (Marshak Chapter 16)

- a. Know definitions to the Key Terms listed on the webpage.
- b. What is ground water? Why is it important?

- c. What are some common misconceptions people have about ground water?
- d. How does ground water “fit” in the hydrologic cycle?
- e. What are porosity and permeability? How do they differ? How are they related?
- f. How do ground water and surface water interact in gaining vs. losing streams?
- g. What are the characteristics of aquifers and aquitards?
- h. What is the water table? What controls water table slope and depth?
- i. How does topography influence ground water recharge, flow and discharge?
- j. Know the terms that constitute Darcy's Law.
- k. What factors control ground water flow?
- l. How does pumping from water wells modify the ground water system? What is a cone of depression?
- m. Draw a cross-section showing how an artesian aquifer develops.
- n. What problems are associated with ground water overuse?
- o. List sources of ground water contamination.
- p. Where and how does karst topography develop?
- q. What unique geomorphological features develop in karstified landscapes?

4. The Restless Realm: Oceans and Coasts (Marshak Chapter 15)

- a. Know definitions to the Key Terms listed on the webpage.
- b. How does the tectonic setting determine the characteristics of the seafloor?

- c. How does a passive margin differ from an active margin?
- d. What are the average temperature, salinity and density characteristics of seawater? How and where do these vary?
- e. How does the Coriolis effect influence oceanic currents?
- f. What is an Ekman spiral and how does it influence upwelling or downwelling currents?
- g. How are neap tides and spring tides produced?
- h. What are the characteristics of the different types of water waves?
- i. How is the wave erosion of shorelines modified by refraction?
- j. Describe the processes that generate longshore currents and longshore (or beach) drift.
- k. How do shorelines evolve?
- l. Where does salt content of the ocean vary from 35 parts per thousand?
- m. How do deep ocean currents influence surface currents.
- n. Know the erosional and depositional landform features of shorelines.
- o. Know the factors that control shoreline erosion and our engineering responses to it.
- p. Know the characteristics of emergent vs. submergent coasts and how these evolve.
- q. How are coastlines influenced by tectonic compression? Sea-level fluctuation?
- r. How do human interaction with the shoreline sometimes result in disaster?

5. Amazing Ice: Glaciers and Ice Ages (Marshak Chapter 18)

- a. Know definitions to the Key Terms listed on the webpage.

- b. Who first advanced the idea of continental scale glaciation?
- c. When in Earth history were continental glaciers present?
- d. What are the salient differences between alpine and continental glaciers?
- e. How is glacial ice formed?
- f. What are the differences between brittle and ductile flow? Where do these occur in a glacier?
- g. How is the brittle to ductile transition similar between glacial ice and the continental crust? How is it different?
- h. Understand the concept of glacial budgets.
- i. What controls glacial advances? Retreats? Stagnation?
- j. What are the landform features found at the margin of a glacier in the cases listed in the previous question.
- k. What are the mechanisms by which glaciers erode landscapes?
- l. What are the wide range of landforms that result from glacial erosion?
- m. What are the characteristics of ice contact and melt-water deposited glacial drift?
- n. What are mechanisms that form the different types of moraines.
- o. What are some of the mechanisms that are considered as likely causes of glaciation?
- p. What are some of the global effects of glaciation?

6. Global Change in the Earth System (Marshak Chapter 19)

- a. Know definitions to the Key Terms listed on the webpage.
- b. Cite examples of the the following kinds of changes:

- i. Gradual
 - ii. Catastrophic
 - iii. Unidirectional
 - iv. Cyclic
 - v. Geogenic
 - vi. Anthropogenic
- c. How have the crust and the atmosphere changed since the beginning of Earth?
- d. Name several greenhouse gases. Which are the most important?
- e. Describe in detail the process by which greenhouse gases influence the average global temperature of the atmosphere.
- f. How does global warming occur? What are its potential effects on the surface of the Earth?
- g. What are human impacts on the surface of the Earth?
- h. Given our present rates of consumption, how many years do we have left before we deplete the following resources?
- i. Petroleum
 - ii. Coal
 - iii. Natural Gas
 - iv. Uranium
 - v. Gold
- i. Why is sustainability a necessary prerequisite for the future of humans on planet Earth?