GEOL 104 Dinosaurs: A Natural History
Exam Test I Review Sheet

The nature of Science: empirically based hypothesis testing; observation, inference & speculation; role of publication and peer review; falsification, parsimony, consilience. Scientific publications. Peer-review.

Major events in history of paleontology, evolutionary biology, and geology, in particular the major contributions of:
Georges Cuvier   William Buckland   Gideon & Mary Ann Mantell
Richard Owen   Joseph Leidy   Edward Drinker Cope & Othniel Charles Marsh
John Ostrom   Nicolas Steno & James Hutton Carolus Linnaeus
William "Strata" Smith   Charles Darwin & Alfred Russel Wallace   Willi Hennig

Major changes in our understanding of dinosaurs since the early 19th Century

Major groups of rocks, with emphasis on sedimentary rocks (biogenic, chemical, and detrital) and how they form (weathering, transport, deposition, cementation, recrystallization)

Environments of deposition and sedimentary structures; be able to reconstruct the environment from rock type and sedimentary structures (high energy vs. low energy; sedimentary structures [e.g., cross-beds, mudcracks, ripple marks, trough cross-beds, coal, etc.])

Body Fossils vs. Trace Fossils

Taphonomy : burial, fossilization [unaltered, permineralized, replaced, carbonization, impressions]); Different preservational potentials in different types of organisms and different environments

Basics of Stratigraphy:
- Principles of Original Horizontality, Superposition, Cross-Cutting Relationships, Fossil Succession
- Formations
- Relative vs. Numerical Ages
- Index fossils and correlation; properties of a good index fossil
- Radiometric dating, Magnetostratigraphy
- Combining relative and radiometric dating to find possible ages for fossils
- The Geologic Time Scale: Eras, Periods, Epochs (**know the periods & epochs of the Mesozoic**)

Plate tectonics: How does it affect the surface of the Earth? How does plate tectonics result in the Rock Cycle?

Ecology:
- Photosynthesis and aerobic respiration. Autotrophs vs. heterotrophs.
- Trophic relationships, trophic levels (producers, decomposers, consumers (1st, 2nd, 3rd, etc.))
- Food chains/webs, Energy pyramid

Comparative Anatomy:
- Homology vs. Analogy
- Functions of the skeleton; how does the skeleton work and fit together?
- Anatomical directions
- Be familiar with major skull landmarks, skull bones, and postcranial bones

Taxonomy: know the basic rules, principles, and grammar of Linnaean taxonomy (esp. for genera and species); type specimens & type species; principle of priority; lumping vs. splitting

Species: What are species? What are some of the sources of variation that makes it difficult to distinguish species (sexual, ontogenetic, geographic, stratigraphic, individual)

Evolution = Descent with Modification
> Initial evidence of evolution: homologies; adaptations; vestigial organs; the Linnean hierarchy; natural hybrids; transitional/intermediate fossils; embryology; fossil succession; biogeography

Fixed vs. Changing views of the world

Natural Selection = Differential Survival and Reproduction of Variants in a Population Resulting in Net Change in the Phenotype of the Descendant
Darwin & Wallace's contributions: Common Ancestry, Individual Variation, Natural Selection

Genetics and inheritance; mutations. The importance of geologic time, environmental change, and isolation for evolution.

What is "fitness" in the evolutionary sense?

Patterns of Evolution: Divergence, Correlated Progression, Adaptive Radiations, Niche Partitioning; Sexual Selection, Convergence, Co-evolution, Heterochrony (Paedomorphosis vs. Peramorphosis), Mass Extinctions

Systematics: **Be able to read a cladogram!**
- Why cladograms are more secure than trying to reconstruct direct ancestor-descendant trees
- How are cladograms constructed? How are they read?
- Be able to recognize shared derived, shared primitive, unique, convergence, and reversed character states: which are useful in phylogenetic analysis?
- Using cladograms to recognize membership in higher taxa, infer missing information, and determine minimum divergence times