GEOL 104 Dinosaurs: A Natural History
Test I Review Sheet

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

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	
William "Strata" Smith	Alfred Wegner, Harry Hess & John Tuzo Wilson	
Carolus Linnaeus	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)

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?

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 Linnean taxonomy (esp. for genera and 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

Basic observations of Natural Selection:

I. Variation in all populations (Variability)
II. Some (but not all) variation is inherited (Heritability)
III. More are born in a population than can possibly survive (Superfecundity)

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, Living Fossils, 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