STUDY GUIDE FOR THE NON-CUMULATIVE PORTION OF THE FINAL EXAM

Your Study Guide for the Final Exam should consist of:

- Your first three study guides (As always, you must understand, connect and apply concepts—not just memorize facts).
- The posted class notes from all lectures. Consider all videos embedded in all lectures to be required viewing.
- Your own notes from class.
- Your textbook readings (Try the problems at the end of the chapters. They really do help. If you’re not sure about a word or concept…Google it. Resistance is futile.

The following is a brief checklist to help you prepare for the non-cumulative part of the exam. Let the notes be your guide.

ANIMAL DIVERSITY

Study the workshop on Animal Form and Function to help with this section. Workshop material will be on the exam.

Know the major types of animal cells, organs, organ systems and their basic functions.

Recognize the common names, examples, and important characteristics, organ systems, natural history, etc. of:

- Lophotrochozoans
  - Lophophorates (what’s a lophophore, and what does it do? What are the lophophorate taxa, and what do they look like? (HINT: Brachiopoda (lamp shells), Bryozoa (moss animals), and Phoronids (horseshoe worms. Google them with an image search! They are pretty.)
  - Annelida
    - Be able to tell the difference between a marine segmented worm, an earthworm, and a leech.
  - Mollusca
    - Polyplacophora
    - Bivalvia
    - Gastropoda
    - Cephalopoda
    - H.A.M.

Know the meaning/significance of these Lophotrochozoan items:

- headfoot
- haemocoel
- visceral mass
- veliger
- mantle
- gonocoel (derived from coelom)
- lophophore
- shell
- pericardium
- trochophore

Practice locating the appearance of new characteristics on a phylogenetic tree, as you did for the workshop on animals. If you understand where synapomorphies appear on the tree, you will be better able to identify them as synapomorphies that link taxonomic groups to a common ancestor.

ECDYSOZOA

Recall the major planes of animal body symmetry, and the types of animal body symmetry.

Know the common names and important characteristics, organ systems, natural history, etc. of major ecdysozoan taxa, especially

- Nematoda
- Onychophora
- Tardigrada
- Arthropoda

Know what characteristics are unique to each group. What links them to their related taxa, and what sets them apart?

Know the major groups of arthropods we covered in class, and their general characteristics.

Study the structure and function of the arthropod compound eye

Know the meaning/significance and developmental origin (where appropriate) of

- acoelomate
- metamerism
- ec dysis
- pseudocoelom/pseudocoelomate
- tagmosis
- coelom/coelomate
- open vs. closed circulatory system (and who has which)

What homoplasies (analogous characters) do mollusks share with arthropods?

DEUTEROSTOMES

Know the characteristics that link deuterostomes together, as well as those that set them apart from the protostomes.

Know the common names and important characteristics, organ systems, natural history, and evolutionary relationships. of each of the following taxa:

- Echinodermata (Crinoidea, Asteroidea, Ophiuroidea, Echinoidea, Holothuroidea)
- Hemichordata
- Chordata (Urochordata, Cephalochordata, Vertebrata)

Know the function and origin (coelom?) of the water vascular system and its components.
Understand the return of echinoderms to a radially symmetrical body form.
Know how hemichordates are similar to echinoderms and chordates, and how they are different.
Know the synapomorphies that vertebrates share with other chordates, and the synapomorphies set them apart
Recall the major tissue and organ systems of the vertebrates, their components, function, and structure.

CRANIATES – Use the information at: http://www.bio.miami.edu/dana/160/160S18_19a.html
Know the taxonomic and common names of the major vertebrate groups (fish, amphibians, reptiliomorphs (i.e., turtles, lizards, snakes, crocodilians, birds, mammals), as well as their defining characteristics.
What sympleiomorphies do vertebrates share with other animals, and what synapomorphies set them apart?
What is the function of the lateral line system found in both fish and amphibian larvae?
Which vertebrates are tetrapods? Which are fully terrestrial, and what helped them become fully terrestrial?
Know the meaning/significance of: synapsid, anapsid, diapsid (how do we distinguish among them? Hint: Skull!) swim bladder (fish), air sacs (birds)
Know the general anatomy of the vertebrate camera eye.
Understand the evolutionary significance and anatomy of the amniotic egg. Which taxa produce amniotic eggs? Which vertebrates have an amniotic egg or its homolog? What parts of the mammalian placenta are homologous to which amniotic egg structures?
Know the meaning/significance of: oviparous, ovoviviparous, viviparous
Know what characteristics set each of the vertebrate groups apart from the other vertebrates
Know the three main groups of mammals (in terms of reproductive mode), and the characters that distinguish them

ARCHAEPLASTIDA: PLANTS
Know the synapomorphies and synpleiomorphies that link and separate the members of the algal and land plant taxa? What are the general characteristics of land plants, and which do they share with green algae? With red algae (Rhodophyta)?
Know the meaning (and ploidy, where appropriate) of:
- thallus
- spore
- gamete
- dioecious
- stoma
- sporephyte
- gametophyte
- monoecious
- waxy cuticle
- sporophyll
- archegonium
- ovum
- cellulose
- sporangium
- antheridium
- sperm
- lignin
- “micro” vs. “mega” prefix
- sporopollenin
Know the course of events of the alternation of generations. Which cell division process produces spores (and which life cycle stage produces them?) Which cell division process produces gametes (and which life cycle stage produces them?)
Know the parts of a flower, and which parts are male and female.
What is meant by double fertilization (angiosperms only)
Know the meaning/significance/structure and function (and fate, where appropriate) of:
- waxy cuticle
- protoderm
- stem
- vascular tissue
- parenchyma
- stomates
- procambium
- leaf
- dermal tissue
- collenchyma
- secondary compounds
- ground meristem
- xylem
- ground tissue
- sclerenchyma
- apical meristem
- root
- phloem
Know the synapomorphies and synpleiomorphies that link and separate the major plant taxa? Know the general defining characteristics of the Bryophytes versus the Tracheophytes. Which are most closely related to each other?
Know the three organs of a plant (root, stem, leaf)
Know the meaning/significance of these herbaceous and woody plant terms:
- epidermis
- stele
- springwood
- sapwood
- cortex
- vascular cambium
- summerwood
- bark
- pith
- annual ring
- heartwood
- cork cambium

INTRODUCTION TO ECOLOGY
Know the meaning/significance of: species, population, community, ecosystem, biosphere, biotic vs. abiotic
Understand the scope of the various levels of ecological study: global, landscape, ecosystem, community, population, and organismal
Understand the significance and importance of abiotic ecological factors, and how they affect ecosystem structure
Understand the concepts of soil horizons and soil maturation. Know what is found in O, A, B, and C horizons.
Know the meaning/significance of:
- solar irradiance
- tropics
- subtropics
- temperate regions
- polar regions.
Understand why the tilt of earth’s axis generates seasons, and how those differ between northern and southern hemispheres.
Understand the general pattern of global air circulation, and how that contributes to biome formation.
Know the general features of the major terrestrial biomes, and be able to recognize a list of organisms you’d be likely to find in each one.
Know the meaning/significance of: photic vs. aphotic zone, littoral zone, benthic zone, abyssal zone (aquatic biomes)
Know what is meant by: oligotrophic, eutrophic, and mesotrophic systems, and be able to recognize an example of each one if it were described for you.

**ORGANISMAL ECOLOGY**

**Know** the meaning/significance of:

- poikilotherm vs. homeotherm
- endotherm vs. ectotherm
- regulator vs. conformer

**Know** the meaning/significance of:

- anadromous vs. catadromous
- evolutionary vs., individual adaptations
- acclimation vs. acclimatization

**Understand** the concept of the ecological niche

**COMMUNITY ECOLOGY**

**Recall** the meaning/significance of the different types of symbiosis, and be able to recognize examples of each.

**Know** the meaning/significance of:

- mimicry
- Batesian vs. Mullerian mimicry
- crypsis
- aposomatic (warning) coloration
- poisonous vs. venomous
- herbivory
- definitive host
- coevolution
- intermediate host

**Understand** the concepts of species diversity, species richness and relative abundance of species in an ecosystem

**Understand** the meaning of trophic levels, primary producer, primary, secondary, etc. consumers, food chain, food web

**Know** the difference between the Energetic Hypothesis vs. the Dynamic Stability Hypothesis of food chain length.

**Know** the meaning/significance of: dominant species, keystone species, foundation species. Be able to identify which type of species is being described in an imaginary scenario.

**ECOSYSTEM ECOLOGY**

**Understand** the meaning/significance/characteristics of: energy flow (Second Law of Thermodynamics), matter recycling in ecosystems (Law of Conservation of Mass), Gross Primary Production (GPP) vs. Net Primary Production (NPP), biomass, Energy and Biomass pyramids.

**Understand** energy transfer efficiency in food webs (i.e., only about 10% of energy converted to biomass of the next level)

**Know** the major features of a generalized biogeochemical cycles, e.g., Carbon Cycle, Water Cycle, Nitrogen Cycle, and Phosphorus Cycle (which is pretty much the same as any other mineral cycle.)

**POPULATION ECOLOGY**

**Understand** basic population dynamics (births, deaths, immigration, emigration)

**Understand** the concepts of: density, dispersion (and how these are determined)

**Understand** basics of demography: life tables, survivorship curves, cohort, Type I, II, and III survivorship curves, infant mortality, life expectancy

**Understand** the differences between population growth that is arithmetic, exponential (= geometric), and logistic.

**Understand** the concepts of intrinsic rate of increase ($r$), and carrying capacity ($K$). What life history strategies are typical of $r$-selected and $K$-selected species? What factors can limit populations? Which are density dependent? Independent?

REMEMBER: Passive reading will get you only so far.

You will do well on the GRE, DAT, MCAT or any other professional entry exam if you can not only remember facts, but connect them, apply them and solve problems with them. Study for all of your classes with this in mind and become a smarter, wiser person.

GOOD LUCK on all your finals, and in all your courses to come!