

**STUDY GUIDE FOR EXAM III - Spring 2017**  
**REVIEW SESSION ON TUESDAY, APRIL 18 AT 5:00PM IN COX 126**

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**REMEMBER:** This guide is not a substitute for coming to class, taking notes and reading your text. Just because I may have accidentally missed listing something here on the guide that I covered in lecture (or is in the text readings or a video) doesn't mean it might not be on the exam. Consider all the short videos embedded in the lectures to be required viewing.

### **PROKARYOTES**

Know the meaning/significance of the three domains, and what types of organisms are included in each. Know the basic cellular characteristics of organisms in all three Domains. (Cell walls, organelles, etc.)

Know the three basic types of Archaeans and the main characteristics that define them.

Know the basic structure of a prokaryotic cell, and the anatomical structures inside and around it. Know what the following bacterial structures are: nucleoid, ribosome, gel capsule, cell wall, fimbriae, pilus, plasma membrane

Understand that bacterial ribosomes are different from eukaryotic ribosomes

Know the basic structure of the bacterial flagellum, and how it differs from a eukaryotic flagellum. Know what an endospore is, and its purpose.

Know the meaning/significance of: binary fission, conjugation, transformation, transduction, horizontal gene transfer. For a nice, clear video of these, go to: [https://www.youtube.com/watch?v=7sZ5Nz8\\_cfc](https://www.youtube.com/watch?v=7sZ5Nz8_cfc) and <https://www.youtube.com/watch?v=pXifkkakzWA> and <https://www.youtube.com/watch?v=EHTEFdSadXM>

Understand the importance of photosynthesis in the generation of the oxygen-rich atmosphere.

Understand the various types of symbioses and earth processes (e.g. pathogenesis, nitrogen cycle, mutualisms, etc.) in which prokaryotes participate.

Know the meaning/significance of: Gram staining, peptidoglycan, bacterial cell wall, different types of taxis

Know the meaning/significance of: aerobic, anaerobe (obligate and facultative), photoautotroph, chemoheterotroph,

Understand the nature of bacteria as pathogens. Know the meaning/significance of: opportunistic pathogen, bacteriostatic vs.

bacteriocidal drugs, plasmid (*NOTE:* plasmids are found in bacteria, but may also be found in certain eukaryotic organisms (yeast, some plants), where they can be pathogenic. In bacteria, they often carry genes for antibiotic resistance, toxins, etc. that actually

*benefit* the bacterium hosting the plasmid), iatrogenic infection, exotoxin vs. endotoxin, the main mechanisms of action of antibiotics.

Know the significance of the Nitrogen Cycle, as well as the different types of bacteria that play roles in the cycle. Understand the roles of nitrogen fixer, denitrifier, leguminous plants, decomposer, detritivore

Understand Koch's Postulates, what they mean, and what they are used to determine.

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### **EUKARYOTES**

Recall what is meant by the Cambrian Explosion and adaptive radiation.

Know the synapomorphies that define each Domain, as well as the general characteristics of each.

Recall the Autogenous and Endosymbiont Models of eukaryote origin. Know the meaning of primary and secondary endosymbiosis, and which major taxa resulted from Secondary Endosymbiosis. Understand the relationship between endosymbiosis and horizontal gene transfer.

Know the synapomorphies that define eukaryotes as a Domain, as well as the more derived eukaryote features (e.g., multicellularity, hard body parts, etc.) seen in some, but not all, eukaryotes.

Know the general characteristics/synapomorphies that define each monophyletic group of "protists" (Excavata, Chromalveolata, Archaeplastida, Unikonta) and the main groups within each taxon. In which of these clades are Animals, Plants, and Fungi?

Don't forget the definitions of monophyletic, polyphyletic, and paraphyletic taxa.

Know the meaning/significance (and types of organisms involved in): red tides, ciguatera poisoning, geological formations such as the White Cliffs of Dover, trypanosomiasis, African Sleeping Sickness, malaria, coccidiosis (and the anatomical features that allow Apicomplexan cells such as coccidial parasites to penetrate host cells), choanoflagellate, entamoeba, slime mold, Rhodophyta

Know the meaning/significance of: unicellular, aggregate, colonial, multicellular, sexual vs. asexual reproduction

Understand the significance of silica (glass) and calcium carbonate as structural materials used by protists to manufacture tests (shells). Which one requires more energy to precipitate? What does this imply about protists that might use each?

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### **FUNGI**

Recall the major groups of fungi (Chytridiomycota, Zygomycota, Ascomycota, Basidiomycota,

Glomeromycota, "Deuteromycota"), their generalized life cycle and their evolutionary relationships to one another.

Understand the generalized fungus life cycle and the ploidy of the various stages.

Know the meaning/significance of: mycelium, thallus, hyphae, fruiting body, dikaryotic, heterokaryotic, plasmogamy, karyogamy

Recall that the fungal cell wall, like the arthropod exoskeleton and structures of other "invertebrates" (but unlike plant cells) contains **chitin**.

Review and understand the various types of symbiotic relationships in which fungi engage.

Understand the role of fungi in the nitrogen cycle and nutrient cycling.

Know the basic anatomy and structure of endomycorrhizae (V.A.M.) and ectomycorrhizae, and what their associations with plants do for ecosystems. What does each partner get out of the symbiosis?

What is a lichen? Is it symbiotic? In what way? What does each partner get out of the relationship?

## **ANIMALIA: FORM AND FUNCTION**

Use the workshops on Animal Body Plans and Animal Form and Function to help with this.

Know the meaning/significance of: true tissues, embryonic germ layers (ectoderm, endoderm, mesoderm), ingestive heterotroph, glycogen, organ systems (know the basic characteristics of the animal organ systems in the notes), blastomere, blastula, gastrula (and its parts: blastopore, blastocoel, archenteron, etc.), gastrulation, morphogenesis, diploblasty, triploblasty.

Know the basic types of nitrogenous waste, and the properties of each (toxicity vs. solubility; energy expense to produce, etc.) relative to the others. Which types of animals produce which types of waste?

Know the meaning/significance of: Metazoa, Eumetazoa, planes of symmetry, radial vs. bilateral symmetry, asymmetry, cephalic vs. caudal, oral vs. aboral, longitudinal, transverse, sagittal, mid-sagittal, etc.

Know the basic tissue types found in animals, and their basic composition and function. Know what characteristics make an animal an animal, and which are unique to animals.

What is a *Hox* gene? What does it do?

Know the meaning/significance of: acoelomate, pseudocoelomate, coelom, schizocoely vs. enterocoely, spiral vs. radial cleavage, determinate vs. indeterminate cleavage (and in which animals you'd find each of these).

Know the difference between protostomes and deuterostomes, and which major animal phyla belong to each lineage. Check the phylogenetic tree if you're not sure.

Know the meaning/significance of: metamerism, tagmatization, somite, choanoflagellate ancestor, gastraea, bauplan.

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## **ANIMALIA: PROGRESSION OF COMPLEXITY**

Use the workshop on Animal Form and Function to help with this. The items related to the workshop will appear on the exam.

Know the major planes of animal body symmetry, and the types of animal body symmetry. Know which apply to Porifera, Radiata, and Bilateria

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

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

- **"Porifera" (probably polyphyletic)**
- **Ctenophora**
- **Cnidaria**
  - Hydrozoa
  - Scyphozoa
  - Anthozoa
- **Acoelomorpha**
- **Platyhelminthes** –
  - Turbellaria (also known as “planarians”)
  - Trematoda (flukes)
  - Cestoda (tapeworms, consisting of a scolex and proglottids covered by a protective tegument)

## **ANIMAL DIVERSITY**

Use the workshops on Animal Body Plans and Animal Form and Function to help with this. The items related to the workshop will appear on the exam.

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

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

- **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! The horseshoe worms 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.

Mollusks: Know the meaning/significance of: headfoot, mantle, shell, visceral mass, haemocoel, gonocoel and pericardium (derived from coelom). Be able to recognize examples from the main classes of mollusks above

It will help if you practice locating the appearance of new characteristics on a phylogenetic tree, as you did for the workshop on animals you've done so far. 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.