

Biology 1C STUDY GUIDE #1

Note: I have tried to put the key points in here. *However*, I may remember something in lecture (or come upon something) that I feel you need to know and that I *may include on the exam* that is not in here. If that is the case I will *make sure* and point it out in lecture.

- Ecology: definition and ‘subfields’ (population, community, organismal, ecosystem)
- What are the three domains of life and how do they relate to one another (draw a phylogenetic tree with the three of them)?
- Describe the five kingdoms
- What are abiotic and biotic factors?
- What is an autotrophy (photo and chemo)? Heterotrophy? Mixotrophy (can do both!)
- Know the differences between prokaryotic and eukaryotic cells
- Know when the earliest life forms on earth were found (when we think life originated)
- What is one scientific hypothesis for the origin of life? Know the ‘four stage hypothesis’
- Know the basics of the Miller Urey and Pasteur experiments, and why they were important
- What is serial endosymbiosis and what do scientists believe it led to?
- What evidence do we have that chloroplasts were the result of endosymbiosis?
- Know when oxygen production became important, and which organism was largely responsible for it.
- What were some of the general adaptations of algae and plants as they moved towards and on to land?
- What is adaptation?
- Explain what a shared, derived, homologous trait is (synapomorphy), and briefly explain why it is used in the construction of phylogenies.
- Know what an apomorphy is
- What does monophyletic mean? Polyphyletic? Paraphyletic?
- Know what an analogous trait is
- What are some general properties of the fluid mosaic model of cell membranes?
- What are 4 types of transport across the membrane?
- What is osmosis? Diffusion?
- What is the function of the cytoplasm? What type of structure provides mobile support in the cytoplasm (cytoskeleton)?

- Be able to state the general formula for photosynthesis
- Be able to describe the three main stages of photosynthesis: photosystems II and I (water splitting/ATP producing and NADPH producing), and the Calvin cycle. For each be able to list the main inputs and the main products. Be able to diagram them.
- What is photorespiration and under what conditions does it become a problem?
- What is the role/significance of pigments in photosynthesis?
- What is Rubisco?
- What are the main differences in C4 and CAM plants? What are some examples of plants that use these pathways?
- Know the general formula for respiration, and the major input and products
- What are the three basic requirements of life?
- Be able to describe the three metabolic relationships to oxygen (obligate anaerobe, obligate aerobe and facultative anaerobe)
- What is the cell wall of most prokaryotes made of?
- How is genetic variation achieved in prokaryotes? In eukaryotes? (know how meiosis and sexual reproduction achieve this)
- You need to know the difference between mitosis and meiosis
- Did photosynthesis likely arise once or several times?
- What major photosynthetic pigments do cyanobacteria use?
- What are stromatolites and when did they first show up in the geological record?
- Be able to list characteristics of cyanobacteria including growth forms and other characteristics and natural history. What are *heterocysts* and *akinetes*?
- Know that archaea are extremophiles and what are three main types (halophiles, methanogens, thermophiles). Where are archaea placed in terms of their phylogenetic relationship to eukarya (evolutionarily closer to eukarya).
- Know the three kinds of symbiotic relationships (mutualism, commensalism, parasitism).
- Know the major eukaryotic (plant cell) organelles and their functions (review this in Campbell if necessary) – also see the handout I gave to you
- Know the major differences between plant and animal cells (know the components of a plant cell and the functions). Focus on : the vacuole, nucleus, chloroplast/plastids, cell wall, differences in cytokinesis (during mitosis and meiosis), mitochondria, plasma membrane, cytoskeleton
- Know the structure of a plant cell wall, and what a plasmodesma is
- What is cytoplasmic streaming?

- Know what haploid, diploid and polyploid mean, and be able to describe polyploidy and how it can arise.
- Know the *general* stages of mitosis and meiosis and how they differ (I will NOT ask you to describe anaphase 1 of meiosis (for example), but you DO need to know that Meiosis leads to variation, and how (random assortment, crossing over etc. and what stage those occur in).
- Know three types of sexual life cycles (Zygotic meiosis, Gametic and Sporic), be able to draw the sporic and zygotic general life cycles and understand their main differences. Focus on the sporic life cycle. DRAW THESE!
- Know what *isomorphic* and *heteromorphic* alternation of generations is
- Why should the protists not belong to one classification group (eg. A kingdom)? Are they monophyletic?
- Know that sporophytes (2N) go through *meiosis* to produce haploid spores, whereas Gametophytes (1N) use *mitosis* to produce gametes, through the process of *cellular differentiation*.
- Know the three tissue systems of plants (dermal, vascular, ground), and their general functions.
- Know the following cell types and their general functions (look at your handouts): parenchyma, sclerenchyma (sclerids and fibers), collenchyma, vascular: phloem (including companion cells and sieve tube members), xylem (including tracheids and vessel elements), epidermal: guard cells and stomata.
- For the following protist groups, be able to list the distinguishing characteristics (including photosynthetic pigments, cell wall material, life history etc.), diagram a simple representative life cycle, describe some of their ecology, and if appropriate, some human uses. Also, know the *phylum* and *clade*.
 - Euglena
 - Dinoflagellates (Dinophyta)
 - Diatoms (Bacillariophyta)
 - Golden browns (Chrysophyta)
 - Red algae (Rhodophyta)
 - Brown Algae (Phaeophyta)
 - Green algae (Chlorophyta)
- Be able to describe the evolutionary placement (phylogeny) of these groups
- Be able to describe the levels of endosymbiosis that each group probably went through (eg. Primary vrs. Secondary and even tertiary (dinoflagellates))
- Be able to list and describe the relationship between chlorophytes and charophyceans and the relationship to land plants