**STUDY GUIDE FOR THE PLANT TAXONOMY MIDTERM MONDAY OCTOBER 5, 2015**

**Principles of Plant Systematics**

Vocabulary to know: Plant, taxonomy, Phylogeny, Chlorophyll a, Chlorophyll b, starch, α1-4 linkage, β1-4 linkage, glycosidic bond, -ales, -aceae, Monophyly, Clade, Sister Group, Rooting, outgroup, ingroup, polyphyletic, paraphyletic, synapomorphy, homologous, homoplasy, parallelism, reversal, symplesiomorphy, plesiomorphic, shared, derived, ancestral. Know how to draw the basic chemical formula of chlorophyll a, chlorophyll b, starch, glucose. Know the difference between α-D-glucose and β-D-glucose.

**Morphology of Vegetative Structures**

Vocabulary to know: fibrous root, taproot, stolon, rhizome, leaf axil, node, haustoria, stem, internode, axillary bud, leaf, alternate, opposite, whorled, leaf complexity simple vs. compound, trifoliolate, pinnately compound, twice pinnately compound, acute leaf apex, obtuse leaf apex, ovate, ob-, obovate, oblong, cuneate leaf base, cordate leaf base, petiole, blade, pinnate venation vs. parallel venation

**Know how to:**

Define synapomorphy= a shared derived character state.

Define clade= monophyletic group= a group consisting of an ancestor and all its descendants

Interpret a cladogram: how to determine if a group is monophyletic or not, find a sister group, what it takes to root a network, understand meaning of more than two lines diverging from a point on the cladogram, be able to differentiate between well-supported and poorly supported clades on a cladogram

Describe leaf arrangement (alternate, opposite, whorled)

Describe leaf complexity (simple, compound—palmate, pinnate, twice or thrice pinnate, trifoliolate)

Determine what constitutes a leaf: where does the leaf start (find axillary bud)

**Floral Morphology**

Be sure you can label all the floral parts on Figure 4.16 in Judd et al. You need to be able to identify, define and label the stigma, ovule, carpel, gynoecium, filament, stamen, androecium, petal, sepal, calyx , corolla, perianth, pedicel, bract, anther, connective, ovary, style.

Understand difference between complete vs. incomplete flowers.

Understand difference between bisexual vs. unisexual flowers; monoecious vs. dioecious.

Understand difference between carpellate and staminate flowers.

Patterns of floral symmetry: actinomorphic (radial), zygomorphic (bilateral)

Funnelform vs. Salverform corollas

Apo- (distinct) vs. Syn- or Sym- (connate) as in syncarpous, apocarpous, sympetalous, apopetalous etc: see pg. 64 Judd et al.

How is adnate different from connate? What are the four floral whorls?

Number of parts: 4-merous, 5-merous etc.

Insertion types and inferior vs. superior ovary: study Judd et al Figure 4.21: hypogynous with superior ovary, epigynous with inferior ovary (conspicuous or inconspicuous hypanthium); what is a hypanthium? Perigynous with superior ovary (hypanthium=floral cup)

Placentation: axile and parietal especially, see Judd et al Figure 4.22

Miscellaneous terms: locule, tetradynamous, monadelphous stamens, diadelphous stamens, exserted, included

**The Angiosperm Life Cycle** (Study J&C Figure 4.17 on page 63)

Be able to define, label, and know the ploidy level and function (and whether mitosis or meiosis was involved) where appropriate of:

Microsporangium, microsporocyte, microspore, microgametophyte, pollen, intine, exine, columella, tectum, generative nucleus, vegetative nucleus, pollen tube, sperm nuclei and how many (2), double fertilization and what it means, micropyle, endosperm, megasporangium, megasporocyte, megaspore, megagametophyte, egg cell, antipodal cells, synergid cells, polar nuclei, testa, tegmen, nucellus, reduction of the gametophyte and how it relates to green plant phylogeny, alternation of generations, zygote, gametes, sporophyte, gametophyte, haploid, diploid, triploid, mother cell, seed coat, surviving megaspore, mature female gametophyte consists of 8 nuclei in 7 cells (usually), endosperm is triploid nutritive tissue for the developing embryo, pollen contains the mature male gametophyte, male gametophyte is NOT the same as sperm

**Inflorescences, Fruits & Seeds**

Know the difference between determinate and indeterminate inflorescences (J&C Fig. 4.29-4.30)

What is a cyme? A helicoid cyme? A panicle? A spike? A raceme? Umbel? Head?

Define fruit, inflorescence, pericarp, endocarp, mesocarp, exocarp

Fruits: based on dry vs. fleshy, dehiscent vs. indehiscent, number of carpels, size and shape (J&C pp. 75-78)

Types of fruits you need to be able to define and identify: achene, berry, capsule (loculicidal vs. septicidal), drupe, follicle, legume (& loment), nut, pome, samara, schizocarp

What is the seed coat and where did it come from? What is an aril?

What is an aggregate fruit? Multiple fruit?

Where do the edible parts of different food plant fruits come from?

**Molecular Systematics**

Be able to draw and understand the basic structure of the plant chloroplast genome (J&C Figure 5.1) You do not need to know the locations of individual genes on the genome!

Understand the differences between nuclear, chloroplast and mitochondrial genomes: which is circular vs. straight, relative sizes, usefulness in molecular genetics

Have a basic understanding of how speed of mutation relates to usefulness of a gene in studying closely related vs. early divergent groups.

Have a basic understanding of what Polymerase Chain Reaction is and how it works.

What is dideoxyribose and how is it used in sequencing? (see handout, not in J&C)

Understand how Sanger sequencing works (the method using dideoxyribose).

What is Next-Generation (Next-Gen) sequencing?

**Sight ID plant list for lab portion of the midterm:**

Euphorbia (term to know: cyathium) in the EUPHORBIACEAE

Tribulus (terms to know: schizocarp, actinomorphic vs. zygomorphic=bilateral symmetry) in the ZYGOPHYLLACEAE

Chamaesyce (terms to know: serrate, pubescent) in the EUPHORBIACEAE

Ipomopsis (term to know: exserted) in the POLEMONIACEAE

Sphaeralcea (term to know: monadelphous) in the MALVACEAE

Hesperidanthus (terms to know: tetradynamous, silique, clawed petal) in the BRASSICACEAE

Phaseolus (term to know: keel= 2 fused petals, papilionaceous) in the FABACEAE

Guilleminea in the AMARANTHACEAE

Helianthus (terms to know: phyllary, Involucre) in the ASTERACEAE

Juncus (term to know: rhizome vs. stolon) in the JUNCACEAE

Castilleja (terms to know: hemiparasite vs. holoparasite) in the OROBANCHACEAE

Boerhavia (term to know: involucre) in the NYCTAGINACEAE

Croton (term to know: dioecious) in the EUPHORBIACEAE

Solanum (term to know: sympetalous) in the SOLANACEAE

Mentha (term to know: anthocyanins) in the LAMIACEAE

Berula (term to know: umbel) in the APIACEAE

Anemopsis (term to know: Magnoliid) in the SAURURACEAE

Verbena in the VERBENACEAE

Kochia (term to know: betalains) in the CHENOPODIACEAE

Argemone (term to know: caducous) in the PAPAVERACEAE

Polanisia in the CLEOMACEAE

Eriogonum in the POLYGONACEAE

Lepidium in the BRASSICACEAE

Phoradendron in the SANTALACEAE

Froelichia in the AMARANTHACEAE

Ephedra (term to know: Gnetophyte) in the EPHEDRACEAE