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BIOS 430 - **PLANT SYSTEMATICS** - Fall 2001

Exam III - 100 points

Practical questions (1-10): 3 points each;

Numbered, written questions (11-19): 10 points each

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Answer exactly seven of the following nine questions. Please write legibly, concisely, and in complete sentences using correct spelling and grammar.

- 11) Write an essay on extracting and isolating DNA from leaf tissue. In your essay, describe the advantages of homogenizing leaf tissue in liquid nitrogen. Also, identify four of the five major components of a typical DNA extraction buffer and the function of each component during the extraction process.

12) Floral formulas are concise notations of floral characteristics. Consider the floral formula below. For each question, write the letter (capital letters, please) of the best answer in the blank next to the question.

\* , (5) , (5) , 5 , (2) ; berry

\_\_\_ The androecium of this flower is:

- a) comprised of five stamens connate by the anthers;
- b) comprised of five connate stamens adnate to the corolla;
- c) comprised of five distinct stamens adnate to the corolla;
- d) comprised of five distinct stamens superior to the gynoecium;
- e) diadelphous.

\_\_\_ The perianth of this flower is:

- a) uniseriate;
- b) comprised of 5 tepals;
- c) comprised of 10 tepals;
- d) comprised of 5 petals and 5 staminodes;
- e) biseriate.

\_\_\_ The petals of this flower are:

- a) absent;
- b) distinct;
- c) clawed;
- d) adnate to the calyx;
- e) connate and adnate to the androecium.

\_\_\_ This flower has:

- a) five stamens connate into a staminal tube;
- b) bilateral symmetry;
- c) radial symmetry;
- d) an inferior ovary;
- e) numerous stamens.

\_\_\_ The gynoecium of this flower:

- a) has five locules;
- b) is comprised of two fused carpels in a superior ovary;
- c) is adnate to the androecium;
- d) is bilaterally symmetric;
- e) develops into a dry, dehiscent fruit.

13) For each question below, write the letter (capitol letters, please) of the best answer in the blank next to the question.

\_\_\_\_\_ Which of the following nucleotide sites is phylogenetically informative?

Site:	a)	b)	c)	d)	e)
Species1	T	G	C	G	A
Species2	T	T	C	A	A
Species3	T	C	C	G	C
Outgroup	T	A	C	A	G

\_\_\_\_\_ Which of the following components of a polymerase chain reaction catalyzes the synthesis of new DNA?

- a) dNTPs (deoxynucleotide phosphates);
- b) buffer;
- c) *Taq* DNA polymerase;
- d) oligonucleotide primer;
- e) MgCl<sub>2</sub>.

\_\_\_\_\_ Which of the following steps of a polymerase chain reaction is conducted at the highest temperature?

- a) denaturation;
- b) quenching;
- c) synthesis;
- d) annealing;
- e) touchdown.

\_\_\_\_\_ One component of a polymerase chain reaction is the primer. Primers are

- a) metal ions;
- b) relatively short, synthetic single-stranded DNA molecules;
- c) mixtures of chromosomes from the three genomes of plants;
- d) polymerases isolated from bacteria naturally found in hot springs;
- e) none of these.

\_\_\_\_\_ During which of the steps of a polymerase chain reaction does the primer bind to the single-stranded template DNA?

- a) denaturation;
- b) hot start;
- c) synthesis;
- d) annealing;
- e) chain extension.

14) Write an essay on the angiosperm family Lentibulariaceae. In your essay identify the taxonomic order in which this family is classified by the authors of your text. Describe the main characteristics of this family. Finally, describe the “bladder traps” that characterize species of *Utricularia*.

15) For each question below, write the letter (capitol letters, please) of the best answer in the blank next to the question.

\_\_\_\_\_ The chloroplast genome of flowering plants is

- a) diploid;
- b) the largest of the three genomes found in plants;
- c) inherited strictly from the maternal (ovule-producing) parent;
- d) inherited strictly from the paternal (pollen-producing) parent;
- e) comprised of two or more linear chromosomes.

\_\_\_\_\_ The mitochondrial genome of flowering plants is

- a) the smallest of the three genomes found in plants;
- b) comprised of a single, circular chromosome;
- c) inherited strictly from the paternal (pollen-producing) parent;
- d) comprised of numerous multi-gene families;
- e) none of these.

\_\_\_\_\_ The nuclear genome of flowering plants is

- a) diploid;
- b) inherited biparentally;
- c) comprised of two or more linear chromosomes;
- d) comprised of numerous multi-gene families;
- e) all of these.

\_\_\_\_\_ Gene number and gene order is

- a) most highly conserved in the mitochondrial genome;
- b) most variable in the chloroplast genome;
- c) most highly conserved in the nuclear genome;
- d) most highly conserved in the chloroplast genome;
- e) none of these.

\_\_\_\_\_ The largest genome of flowering plants is

- a) diploid;
- b) comprised of a single, circular chromosome;
- c) the mitochondrial genome;
- d) most highly conserved in terms of gene number and order;
- e) inherited solely from the maternal (ovule-producing) parent.

16) For each question below, write the letter (capitol letters, please) of the best answer in the blank next to the question.

\_\_\_\_\_ Which of the following families is comprised of many species that produce milky latex containing cardiac glycosides?

- a) Apocynaceae;
- b) Plantaginaceae;
- c) Boraginaceae;
- d) Cactaceae;
- e) Passifloraceae.

\_\_\_\_\_ Which of the following families is comprised of many species with a 5-merous two-lipped corolla?

- a) Brassicaceae;
- b) Passifloraceae;
- c) Convolvulaceae;
- d) Solanaceae;
- e) Plantaginaceae.

\_\_\_\_\_ Which of the following families contain at least some parasitic species?

- a) Oxalidaceae;
- b) Plantaginaceae;
- c) Convolvulaceae;
- d) Saxifragaceae;
- e) Malvaceae.

\_\_\_\_\_ Which of the following families is comprised of many species with stamens strongly connate by their filaments into a staminal tube surrounding the gynoecium?

- a) Passifloraceae;
- b) Plantaginaceae;
- c) Convolvulaceae;
- d) Malvaceae;
- e) Apocynaceae.

\_\_\_\_\_ Which of the following families is comprised of many species with palmately compound leaves which have prominent pulvini at the base of the leaflets?

- a) Saxifragaceae;
- b) Salicaceae;
- c) Oxalidaceae;
- d) Solanaceae;
- e) Brassicaceae.

17) Write an essay on the floral structure of Asteraceae. In your essay, use and define each of the following terms: head, pappus, ligulate floret and disk floret. Finally, name and describe the characteristic pollination syndrome in this family.

18) Write an essay in which you describe the general characteristics of Lamiales. In your essay, specify whether Lamiales is classified with eurosids or euasterids. Identify the taxonomic family that is phylogenetically basal in Lamiales. Identify at least four other taxonomic families classified in this group.

19) Write an essay in which you compare and contrast the three areas of study: plant taxonomy, plant systematics, and molecular plant phylogenetics. In your essay describe some of the activities of each. Finally, explain how each of these disciplines contributes to the activities of the other two.