

Practice exam questions from previous years...

- 1) (22 pts) Match the letter of the characteristics for a plant given below or on the right with the family on the left. Not all of the choices of characteristics will be used, but all families should be represented. There should be only one correct answer per family.

_____ Araceae	a) Herbs; many simple pistils; tricolpate pollen
_____ Magnoliaceae	b) 6 showy tepals; 6 stamens; superior ovary
_____ Ranunculaceae	c) shrub with opposite leaves; 3 fused carpels with one mature seed in fruit; inferior ovary
_____ Cyperaceae	d) fruit a follicle; floral parts spirally arranged; 3 fused carpels; alkaloids
_____ Iridaceae	e) 3-ranked leaves; single ovule in superior ovary; no perianth; stem hollow
_____ Juncaceae	f) monoecious; basal, linear leaves; wetland plant;
_____ Liliaceae	g) flowers zygomorphic; pollen aggregated into pollinia; ovary inferior
_____ Orchidaceae	h) 6 showy tepals; leaves basal and 2-ranked; radial symmetry; inferior ovary
_____ Poaceae	i) Trees; laminar stamens; monocolpate pollen
_____ Typhaceae	j) 3-ranked leaves; many-seeded capsule; 3-parted flowers; stem round, solid; flowers inconspicuous, wind-pollinated
_____ Papaveraceae	k) 4 free petals, actinomorphic floral symmetry; inferior ovary
	l) leaves simple and highly dissected; 2 sepals, deciduous; fruit a capsule
	m) plant monoecious; inflorescence surrounded by a single showy bract; smell of carrion
	n) inflorescence, called a spikelet, subtended by 2 bracts, zygomorphic; wind pollinated; stems hollow

2) (10 pts) Match the letter of the definitions given on the right with the term on the left. Not all of the choices of definitions will be used, but all terms should be represented (only one correct answer per term).

_____ fruit

_____ node

_____ monoecious

_____ deciduous

_____ seed

A) the condition of a plant that loses its leaves for a part of the year

B) The collective term for the pistils of a flower

C) Derived from the ovary, contains the seeds

D) Leaves with a single mid-rib

E) A plant with separate staminate (male) and pistillate (female) flowers

F) Develops from the ovule following fertilization

G) Point on a stem where a leaf attaches

3) (10) Fill in the blanks to make the following statements complete and correct.

When constructing a phylogenetic tree, we use the principle of _____, which says that the explanation requiring the least number of changes is probably correct.

A _____ is a similarity in two or more organisms that can be traced to a common ancestor. A group of species identified by a shared derived similarity is _____, a group identified by a convergent similarity is _____, and a group identified by a shared ancestral similarity is _____.

The plant life cycle consists of the _____ generation (diploid or $2n$) and the _____ generation (haploid or $1n$). The transition from the former to the latter occurs when the process of meiosis produces _____. The transition from the latter to the former occurs when fertilization produces a _____. Among the vascular plants, the _____ have free-living plants (not dependent on the other generation for nutrition) in both generations.

4) (15) Briefly contrast the following pairs of terms.

A. Adnate vs. Connate

B. Pollination vs. Fertilization

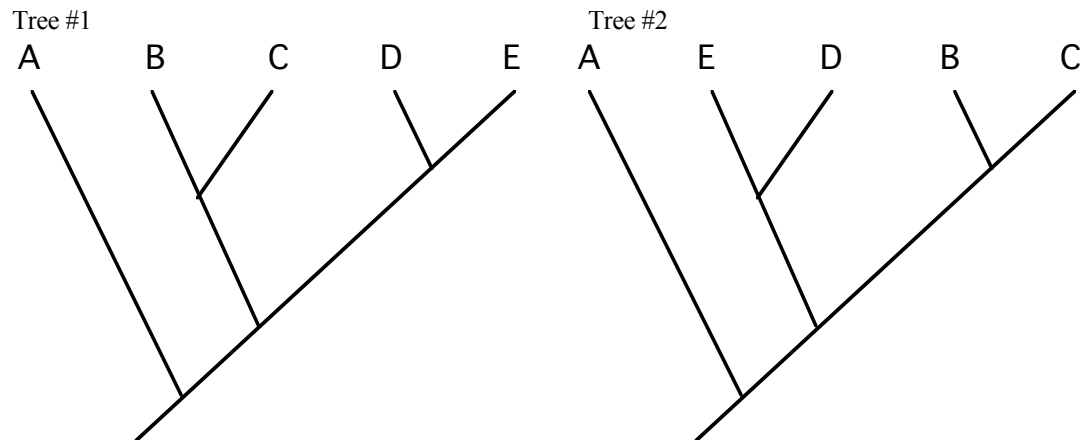
C. Androecium vs. Gynoecium

D. Rhizome vs. Bulb

E. Angiosperm vs. Gymnosperm

5) (3) Explain why the dicots are considered a paraphyletic group.

6) (10) Answer the questions below about the phylogenetic trees depicted here.



How do relationships among species A-E depicted in these two trees differ?

Which one of these groups is not monophyletic in Tree #2?

- a) Species E,D
- b) Species E,D,B,C
- c) Species A,E,D
- d) Species A,E,D,B,C
- e) All of the groups in a-d are monophyletic after all!

What is the sister group to species A in tree #1?

- a) B + C
- b) B + C + D + E
- c) D + E
- d) B
- e) B + C + D

List all the monophyletic groups having more than one species in tree #1.

If species A, B, and D all have red flowers and species C and E have white flowers, would this be a sufficient basis to classify these species into two genera on the basis of flower color? Why or why not?

7) (18) Circle the best answer from the choices available with each question.

A red flower with a tubular corolla and a substantial nectar reward is most likely pollinated by which of the following?

- a) moths
- b) beetles
- c) hummingbirds
- d) wind
- e) mammals

Which of the following is NOT a characteristic of wind pollination?

- a) minute anthers
- b) flowers appearing before leaves
- c) high pollen to ovule ratio
- d) inconspicuous flowers without showy petals
- e) flowers typically in catkins

“Buzz” pollination is characterized by the following set of floral traits:

- a) nectar rich in proteins, anthers connivent, pollen clumped in masses
- b) pollen as sole pollinator reward, anthers dehiscent by terminal pores, anthers held together in center of flower
- c) flowers white, flowers with long tubular corollas, anthers dehiscent by terminal pores
- d) flowers without petals or sepals, flowers unisexual, nectar as pollinator reward
- e) petals with ultraviolet markings, connivent anthers, nectar rich in proteins

A white flower with strong scent and opening at dusk is likely pollinated by which of the following?

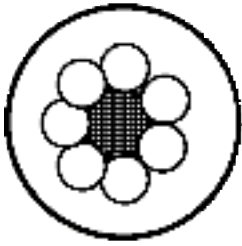
- a) moths
- b) bees
- c) hummingbirds
- d) wind
- e) carrion flies

An ingroup and its sister group make up a

- a) paraphyletic group
- b) outgroup
- c) polyphyletic group
- d) monophyletic group
- e) family

8) (9) Give the type of placentation and number of locules for the following ovary types (drawings represent ovary cross-sections):

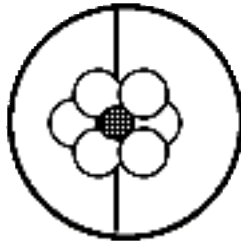
A.



_____.

_____.

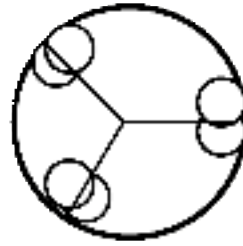
B.



_____.

_____.

C.



_____.

_____.

9) (4) Under what circumstances are a pistil and a carpel the same in a flower AND under what circumstances are they different.

10) (9) What are three shared, derived characters of angiosperms?

1)

2)

3)

13) (24) Some families have very specialized structures that have their own terms to refer to them. Briefly describe the following structures and identify a family they are found in. You may supplement your description with an illustration.

A) Spadix

B) Petaloid styles

C) Pseudobulb

D) Column

E) Glumes

F) Perigynium

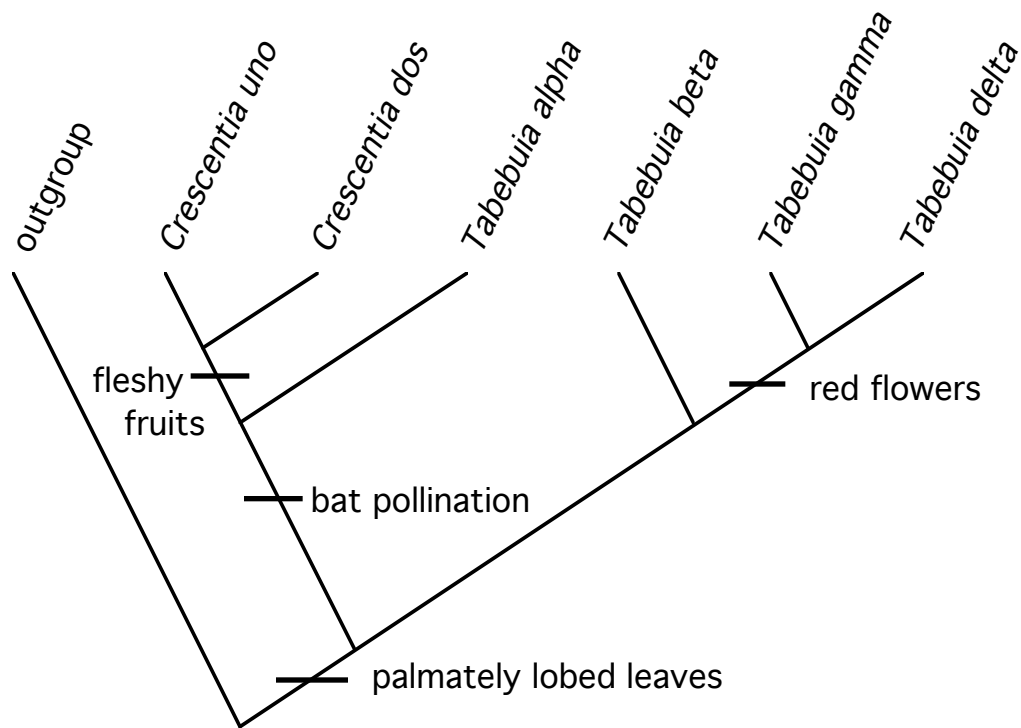
14) (12) Fill in the following table

	<u>Monocots</u>	<u>Dicots</u>
Typical number of flower parts		
Vascular cambium in secondary stem tissue		
number of pollen apertures		
number of cotyledons		
Leaf venation		
Arrangement of vascular bundles in stem		

15) (4) Monocots are not considered to be woody plants, yet some grow as large as trees (eg, palms and bamboos). Describe why monocots are not woody plants and how a monocot (eg, a palm) may still grow to be tree-like.

16) (6) Describe three vegetative traits exhibited by many epiphytic orchids that may function as adaptations to the epiphytic environment.

17) (15) Answer the questions below about the phylogenetic trees depicted here.



A. Should the genus *Tabebuia* be recognized as presently delimited (4 species in this figure) in a phylogenetic classification?

Why or why not?

B. What trait is a synapomorphy for the genus *Crescentia*?

C. What is the sister group to *Tabebuia beta*?

D. *Tabebuia gamma* and *Tabebuia delta* live in the cloud forests of Puerto Rico. Their flowers are red, with long corolla tubes, and produce large amounts of nectar. How are they likely to be pollinated?

18) Circle the best answer from the choices available with each question.

Which of the following is the preferred method to assess character polarity?

- a) Correlation
- b) Ontogeny
- c) Fossil record
- d) Simple to complex
- e) Outgroup comparison

An underground structure consisting of a stem surrounded by many swollen leaf bases is called a

- a) Corm
- b) Tuber
- c) Rhizome
- d) Bulb
- e) Stolon

The tissue lining the ovary to which the ovules are attached is called the

- A. Perisperm
- B. Placenta
- C. Endosperm
- D. Pistil
- E. Filament

After fertilization has occurred, the ovary of a flower is called a

- A) Seed
- B) Carpel
- C) Fruit
- D) Stigma
- E) Gynoecium

Which of the following major groups of land plants has both free living sporophytes and gametophytes?

- A) Angiosperms
- B) Seed plants
- C) Conifers
- D) Ferns
- E) Mosses

Which of the following major groups of land plants has free-living gametophytes and dependent sporophytes?

- a) Angiosperms
- b) Seed plants
- c) Conifers
- d) Ferns
- e) Mosses

Which one of the following has a life cycle in which both the sporophyte and gametophyte generations are free-living, independent organisms?

- a) Conifers
- b) Mosses
- c) Angiosperms
- d) Ferns
- e) Cycads

The goal of modern plant classification is to define groups that are

- a) paraphyletic
- b) artificial
- c) polyphyletic
- d) monophyletic
- e) symplesiomorphic

You have discovered a plant here-to-fore unknown to science. It has characteristics suggesting either Magnoliaceae or Ranunculaceae. Which of the following characteristics absolutely confirms its membership in one or these families?

- a) simple leaves
- b) laminar stamens
- c) multiple simple carpels
- d) bisexual flowers
- e) flower parts spirally arranged

An incomplete, perfect flower is one that:

- a) has calyx, corolla, androecium, and gynoecium
- b) has calyx, corolla, and androecium
- c) has calyx and gynoecium
- d) is not yet opened
- e) has corolla, androecium, and gynoecium

Which of the following correctly pairs a pollinator with the associated floral traits?

- a) Moths - white flowers, nectar reward, flowers opening at midday
- b) Carrion flies - flowers brightly colored, scent of dead animals, flowers in catkins
- c) Hummingbirds - tubular corolla, lots of nectar, flowers red
- d) Butterflies - flowers opening at night, amino-acid rich nectar, flowers white
- e) Whales - flowers very large, flower color gray, corolla shaped to resemble female whale

What is the ploidy level (number of chromosome sets) of the sporophyte?

- a) $1n$
- b) $2n$
- c) $3n$
- d) $4n$
- e) $6n$

Which of the following describes a spore?

- a) Egg
- b) Diploid
- c) Product of fertilization
- d) Product of meiosis
- e) Sperm

A synapomorphy, or shared derived trait, is evidence of what?

- a) Paraphyly
- b) Monophyly
- c) Superphyly
- d) Polyphyly
- e) Convergent evolution

22) (2) How can you tell the difference between a simple leaf and a single leaflet belonging to a compound leaf?

23) (6) In the space below, make simple drawings to illustrate three patterns of leaf venation:

Palmate

Pinnate

Parallel

24) (8) Provide short definitions for the following terms:

Dioecious

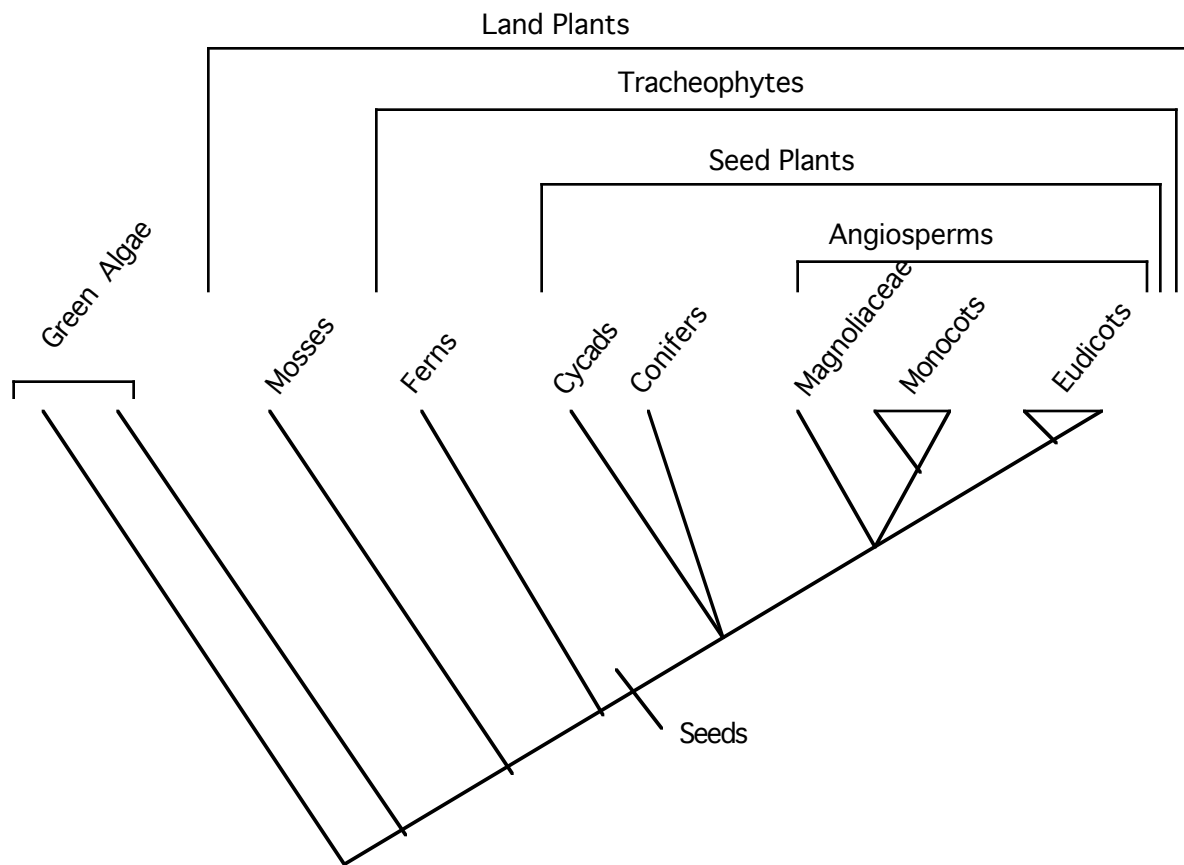
Polypetalous

Monophyletic

Follicle

25) (8) List four ways that wind pollinated flowers differ from animal pollinated flowers and indicate why they might differ for these traits.

26) (25) The diagram below depicts the phylogenetic relationships among the major groups of land plants (with green algae as the ancestors shown here as the outgroup branches). Please answer the following questions about the phylogeny of plants.



A) Draw a line or slash mark on the tree to indicate when in the evolutionary diversification of plants the following traits first arose. The first trait is already marked on the tree as an example.

- | | |
|------------------|-------------------|
| Seeds | Carpel |
| Endosperm | True leaves |
| Cuticle | Tricolpate pollen |
| Single Cotyledon | Pollen |

B) What is the **sister group** to Ferns?

C) What are three **synapomorphies** of Angiosperms?

D) What are the **shared ancestral** conditions for Pollen aperture/pore number and cotyledon number in Angiosperms?

28) (12) Fill in the blanks to make the following statements complete and correct.

- A) The _____ are bracts that are found at the base of the inflorescence in grasses.
- B) Each flower in a grass inflorescence is called a _____ and has two bracts at the base called the _____ and the _____.
- C) The _____ is a part of the grass leaf that is attached at the junction of the sheath and blade.
- D) Stems of rushes (Juncaceae) are _____ and _____ in cross section.

29) (3) Tropical rainforests, including some of the wettest terrestrial habitats on earth, are rich in epiphytes, yet these plants, including many orchids, often exhibit adaptations to conserve moisture. List two such traits found in orchids AND explain BRIEFLY why this is true

(8) In many north temperate zone ecosystems, where there is sufficient rainfall, the forests are dominated by angiosperm trees that are wind pollinated. List four characteristics that are part of the ‘wind pollination syndrome’ of wind pollinated trees AND explain briefly for each why it would be advantageous.

<u>Characteristic</u>	<u>Explanation</u>
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1)

2)

3)

4)

4) (12) In land plant life cycles, the terms ‘dominant’ and ‘dependent’ are often used to describe one generation or part of the life cycle.

In this context, what is meant by dominant?

In this context, what is meant by dependent?

For each of the following groups of land plants, indicate which, if either, part of the life cycle is dominant and which is dependent.

Mosses

Ferns

Seed Plants