

Instructions:

There are 10 sets of questions in total, each set worth 16 points.

**PLEASE ATTEMPT ALL QUESTIONS, SINCE WE OFFER
A GREAT DEAL OF PARTIAL CREDIT.**

PLEASE WRITE LEGIBLY

PACE YOURSELF !!!!! By 12:30 you should have finished half of this exam.

**For short answer questions, the space provided for an answer tells much
about how much text is necessary and sufficient for each answer.**

Please fill but do not exceed the space provided.

**Read the questions carefully. When a question asks for a “list”
then just make a list, and when it says “state” then write a statement.
However, when it says “explain” you will need to have verbs in your sentences.**

Think before you write and economize on your prose.

Please do not waste words in your answer by repeating the question.

NAME _____

Pick any non-trivial 8 digit number
and copy this number to the top of
page 1 of the answer sheets to this
exam.

**DO NOT PUT YOUR NAME ON THE
REST OF THE EXAM.**

SECRET ID _____

Please note that under Widener University Academic Rules and Regulations,

Section G. Cheating and Academic Fraud

part 1 "Definitions. Academic fraud consists of any actions that serve to undermine the integrity of the academic process, including unauthorized inspection or duplication of test materials, cheating, attempting to cheat, or *assisting others to cheat* in a classroom test, take-home examination, or final examination, post-test alteration of examination responses, plagiarism, electronic or computer fraud, or comparable acts...."

part 2 "Penalties. The minimum penalty for individuals convicted of academic fraud shall be failure in the course...."

Exam Short Answer Assessment Rubric (assuming a 0-5 point scale)

Criteria for a Grade of:

- “5”** Your response **consists of clear concise and insightful points that are substantiated by details of both content and context.** ALL essential terms relevant to the answer are presented and correctly used. No extraneous material is included. The sequence of phrases and/or sentences flows effortlessly and indicates a high level of organization, preparation, and effort. All words are legible.
- “4”** Your response **consists of clear concise and insightful points that are mostly substantiated by details of both content and context.** However, you will receive a “4” if essential terms or ideas relevant to the answer are vaguely or incompletely presented, or omitted. Or, if extraneous material or digressions are included, or if the answer is mostly complete, but clearly lacks organization, you will receive a “4.” Lastly, if there are illegible words within an otherwise mostly complete answer, you will receive a “4,” since one cannot tell if these illegible words contain material that is relevant.
- “3”** Your response **includes most of the major points to answer the question, however, critical supportive details, terms, explanations, etc. are incomplete or lacking.** You will also receive a “2” if the flow of information is choppy and lacks a rigor of focus and/or contains irrelevant information as filler. You will also receive a “2” if basic information is presented accurately but with little synthesis or insight. For example, simply listing terms without explanation when a question asks you to “List AND briefly explain...” will earn you a “2” for that response. As another example, omitting a figure when one is asked for will earn you a “2.”
- “2-1”** Your response **contains major content, contextural and/or logical flaws, and/or critical components of the answer are omitted.** Key terms, if present, are imbedded in glaring misconceptions. Few points are made beyond the obvious, and/or for essay responses, the flow of information is very choppy, poorly connected, and suggests a lack of preparation for that question.
- “0”** **You left a question blank.**

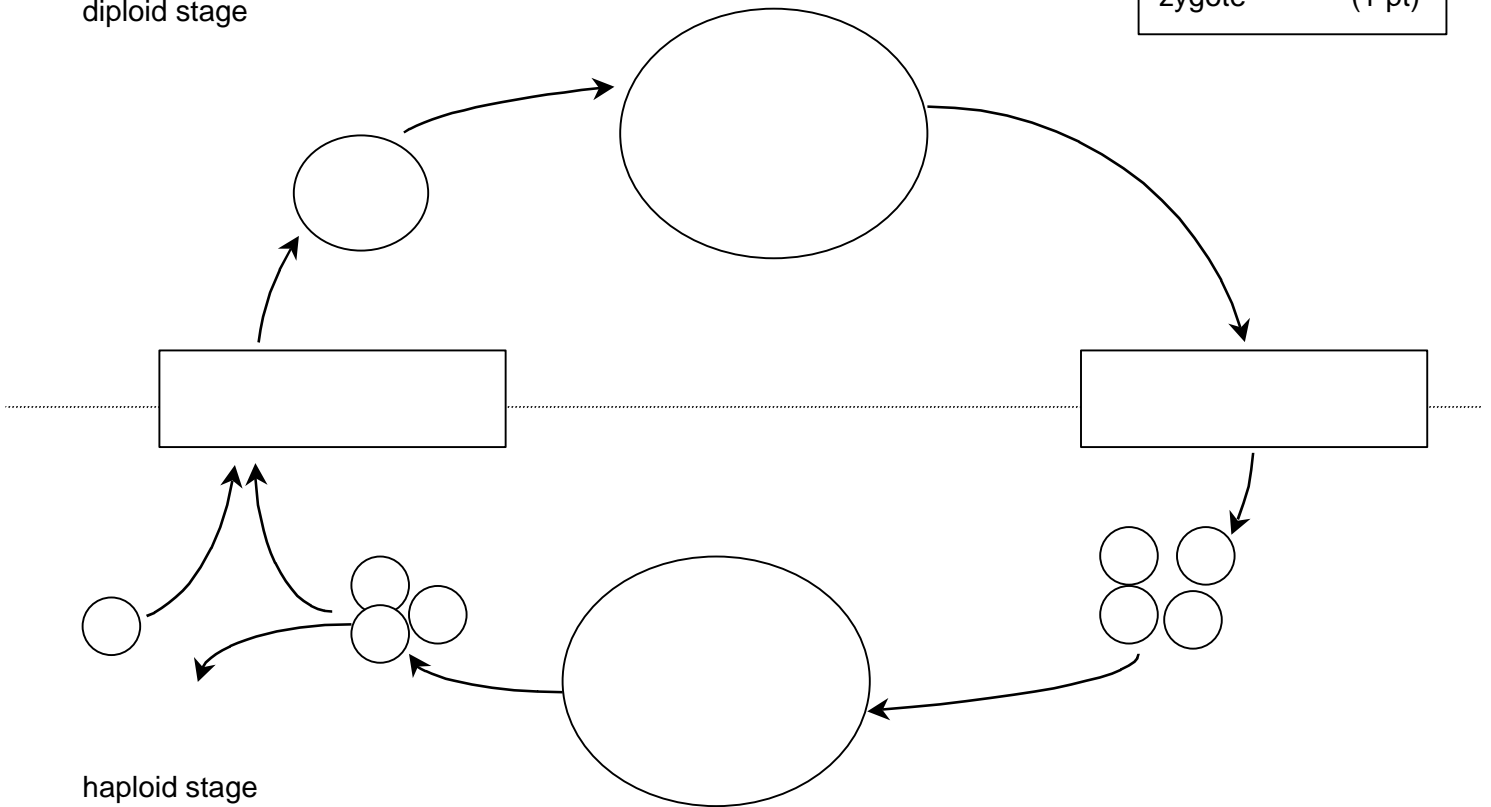
SECRET ID # _____

Question Set 1:

(a). Please clearly document the schematic figure below showing the generalized life cycle for a plant. Include in your figure ALL of the terms in the box at right to label either the appropriate life stage or process:

fertilization	(1 pt)
gametes	(1 pt)
gametophyte	(1 pt)
meiosis	(1 pt)
mitosis	(1 pt)
spores	(1 pt)
sporophyte	(1 pt)
zygote	(1 pt)

diploid stage



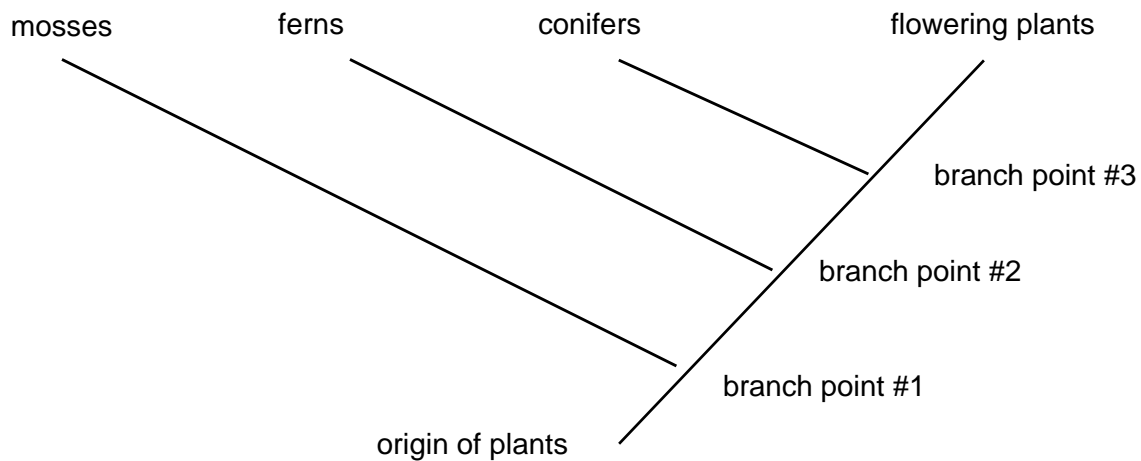
haploid stage

(8 pts)

(b). A major characteristic of plants is the "alternation of generations" during plant life cycles. What exactly alternates?

(2 pts)

Question Set 1 (continued): Consider the diagram below showing the evolutionary relationships among the major groups of plants:



(c). Branch point #1 marks the evolution of what major characteristics? These characteristics are found in all plants that derive to the RIGHT and are lacking in plants that derive to the LEFT.
(2 pts)

(d). Branch point #2 marks the evolution of what major characteristics? These characteristics are found in all plants that derive to the RIGHT and are lacking in plants that derive to the LEFT.
(2 pts)

(e). Branch point #3 marks the evolution of what major characteristics? These characteristics are found in all plants that derive to the RIGHT and are lacking in plants that derive to the LEFT.
(2 pts)

Question Set 2: Plant Transport Systems Above and Below Ground.

- (a). What 2 major ecological problems of terrestrial plants were solved by the evolution of vascular systems?

(3 pts)

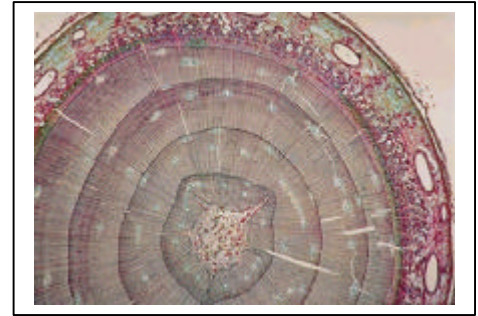
In figure at right show a woody stem crosssection.

- (b). Is this a **monocot** or a **dicot** ? {circle one}

(1 pt)

- (c). Please briefly explain your answer in (b).

(2 pts)



- (d). Assuming that the growth rings represent annual growth, how many years old is this stem?

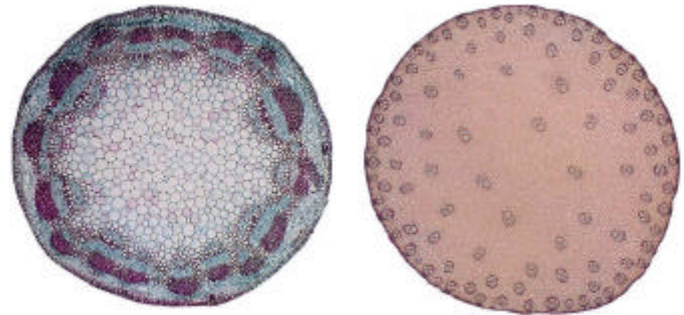
(2 pts)

- (e). Which of the stem crosssections at right is from a monocot? (circle it)

(1 pt)

- (f). Please briefly explain your answer in (e).

(2 pts)

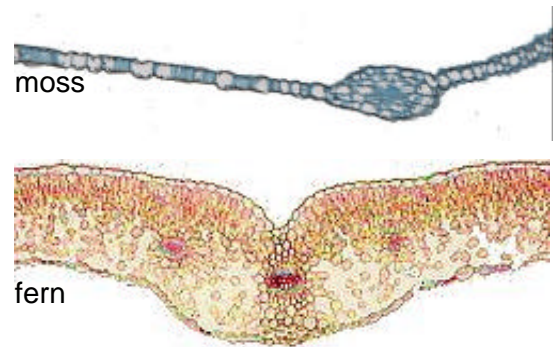


- (g). Briefly describe the major differences between xylem and phloem in angiosperms.

(5 pts)

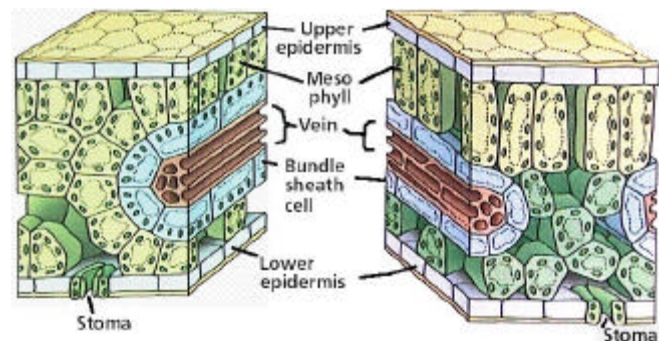
Question Set 3: Plant Photosynthetic Adaptation: Leaf and Stem Design, and Novel Pathways.

- (a). Please list and briefly explain what are the major novel features in leaf design that occurred with the origin of ferns from moss-like ancestral plants from which ferns evolved? (Hint: examine the figures at right of a moss leaflet and fern leaf cross-section.)



(4 pts)

- (b). Examine the leaf cross-sections at right. Which of them is adapted for C_4 metabolism {circle the C_4 leaf}, **and** state how can you tell?



(4 pts)

- (c). State what the "4" represents in the alternative carbon fixation mechanism called C_4 .

(4 pts)

- (d). Briefly explain the principal ways in which the alternative carbon fixation mechanism called CAM, which is found in cacti and other desert plants, differs from the more commonly observed C_3 photosynthetic pathway.

(4 pts)

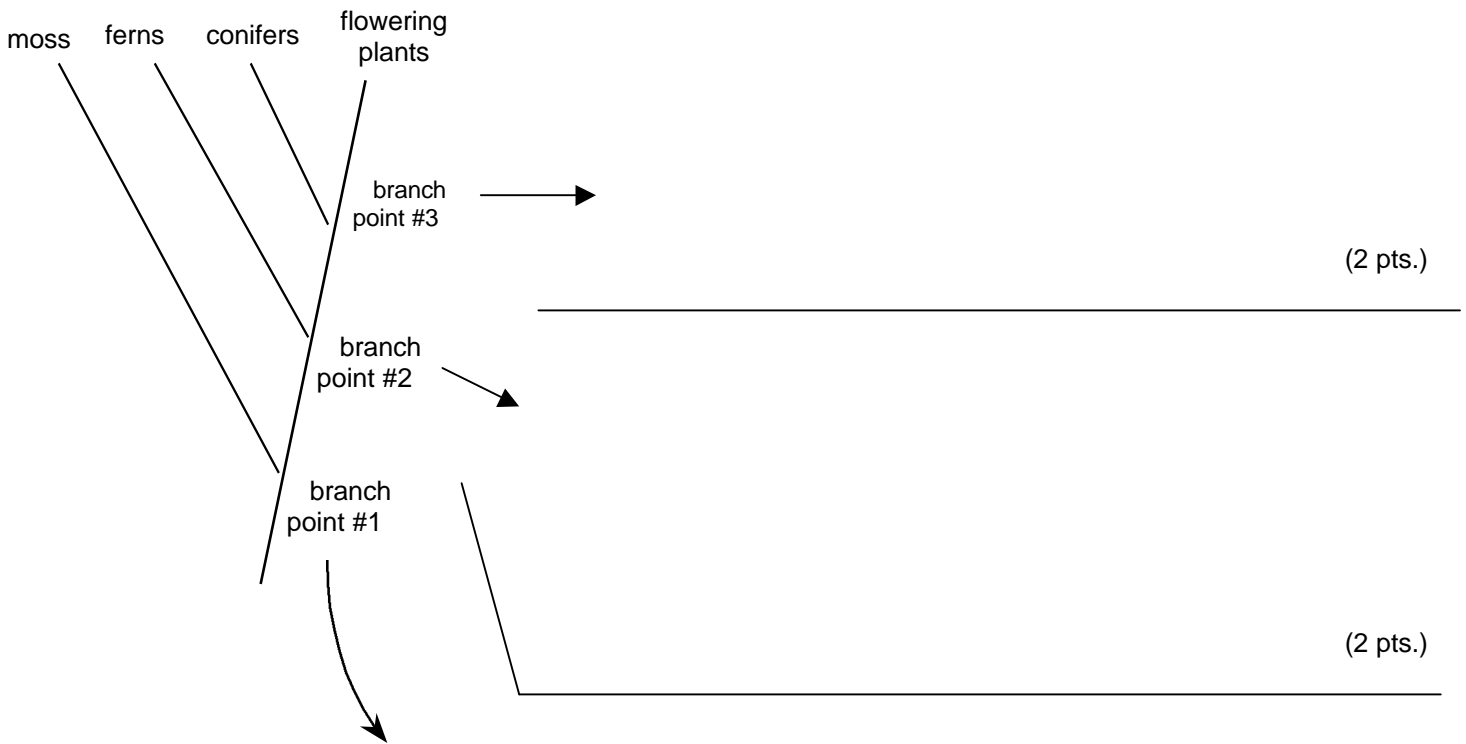
Question Set 4: Reproduction 1 (Gamete Production, Packaging, and Fertilization).

Please fill in the blanks with the appropriate term:

- (a). “The delayed meiosis hypothesis suggests that by delaying meiosis and growing a large multicellular sporophyte many more _____ can be produced per mating.”
(1 pt)
- (b). “The condition in which gametes for the mating types are identical is called _____.”
(1 pt)
- (c). “The condition in which gametes for the mating types differ is called _____.”
(1 pt)

One of the most important trends in the evolution of plants is the colonization of land and the progressive accumulation of terrestrial adaptations.

(d). Please briefly explain the key terrestrial adaptations of **gamete design, dispersal, and fertilization** for each of the three branch points below:



(2 pts.)

Question Set 4 (con.):

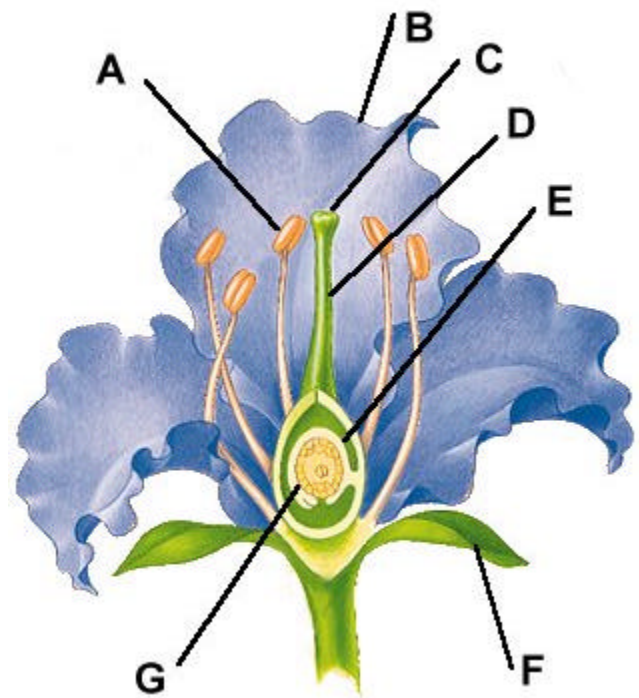
(e). Please examine the flower diagram at right and place the appropriate letter next to each of the terms below:

ovary _____ (0.5 pts)

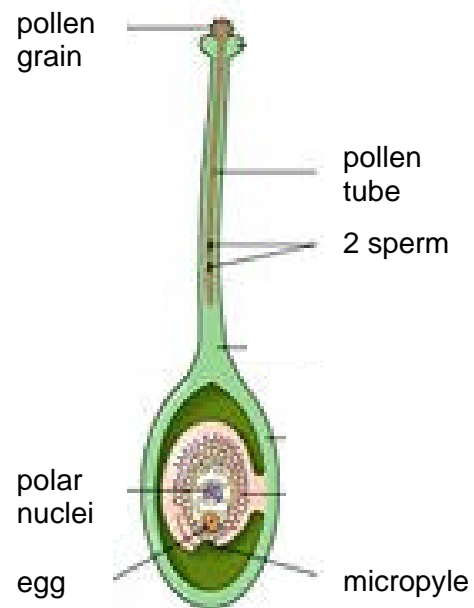
style _____ (0.5 pts)

anther _____ (0.5 pts)

stigma _____ (0.5 pts)



(f). Angiosperms are noted for a unique method of ovule fertilization known as “double fertilization” Please refer to the figure at right and briefly explain “double fertilization.”



(5 pts.)

Question Set 5: Reproduction 2 (Progeny Production, Packaging, & Dispersal).

A major theme in the evolution of sexual reproduction in plants is the retention of the female gamete by the gametophyte (and thus the male gamete travels to find it).

(a). Please briefly state the major advantages of this reproductive strategy to sporophyte success.

(4 pts)

(b). Briefly describe the products of fertilization (i.e. the zygote sporophyte) among the major groups of plants below:

moss:

(2 pts)

fern:

(2 pts)

conifer:

(2 pts)

(c). Please briefly define “mutualistic coevolution”.

(3 pts)

(d). How does the concept of “mutualistic coevolution” account for the evolution of elaborate resource intensive fleshy fruits within which many angiosperm seeds are encased?

(3 pts)

Question Set 6: Plant Defenses to Predation, Parasitism, & Disease.

- (a). Offer ONE specific example of a chemical defense to herbivory, and make sure you describe the type of herbivore against which this defense is likely to be successful. (2 pts)
- (b). Offer ONE specific example of a mechanical defense to herbivory, and make sure you describe the type of herbivore against which this defense is likely to be successful. (2 pts)
- (c). Offer ONE specific example of an inducible defense to herbivory (either chemical or mechanical), and make sure you describe the type of herbivore against which this defense is likely to be successful. (3 pts)
- (d). Please briefly describe the basic process of modifying crop plants through bioengineering. (3 pts)
- (e). Please briefly describe ONE specific example of bioengineering in a specific crop. (3 pts)
- (f). What are the principal concerns about developing and using bioengineered crops? (3 pts)

Question Set 7: Plant Nutrient Demand and Mutualisms for Nutrient Acquisition.

(a). Describe how plants and fungi have coevolved for their mutual benefit

(4 pts)

(b). What is the role of root hairs in plant nutrition?

(4 pts)

(c). How does the concept of “mutualistic coevolution” account for the evolution of specialized means of nitrogen uptake by plant roots – especially in the legumes (pea plants)?

(4 pts)

(d). Why does one expect carnivorous plants to be found in nutrient poor soils? What nutrient(s) are likely to be limiting that these plants must obtain by carnivory?

(4 pts)

Question Set 8: Plant Systems of Physiological Regulation, Control, and Environmental Response.

(a). Please list the three principal environmental causes of plant movement (tropisms).

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-

-

(3 pts.)

(b). Please briefly explain how rapid plant movement occurs (such as the folding closed of a venus fly trap). (hint: does the phrase turgor movement sound familiar?)

(4 pts.)

(c). In the growth of plants, hormones play mostly 2 different roles. What are they?

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(2 pts.)

-

(2 pts.)

(d). Why might plants benefit from an ability to tell the time of day, time of year? How might they do this?

(5 pts.)

Question 9:

What is the one really good question ON YOUR SYSTEM that you were prepared to answer that we did not ask you? And, what is the answer to that question?

WHAT SYSTEM DID YOU STUDY? _____

(a). the ESSAY question we didn't ask ON YOUR SYSTEM -

(note: think carefully about what question you put down here – it must be a question that warrants a detailed response of at least $\frac{1}{2}$ a page. Your maximum score for part (b) will depend on the degree of difficulty of the question you ask here [just like diving!])

(6 pts)

(b). its answer -

(10 pts)

Question 10:

What is the one really good question ON A SYSTEM OTHER THAN YOUR STUDY SYSTEM that you were prepared to answer that we did not ask you? And, what is the answer to that question?

WHAT SYSTEM DID YOU STUDY? _____

(a). the ESSAY question we didn't ask on a DIFFERENT SYSTEM –

(note: think carefully about what question you put down here – it must be a question that warrants a fairly detailed response of at least $\frac{1}{2}$ a page. Your maximum score for part (b) will depend on the degree of difficulty of the question you ask here [just like diving!]))

(6 pts)

(b). its answer -

(10 pts)