SI Biology - Full Discipline Demo

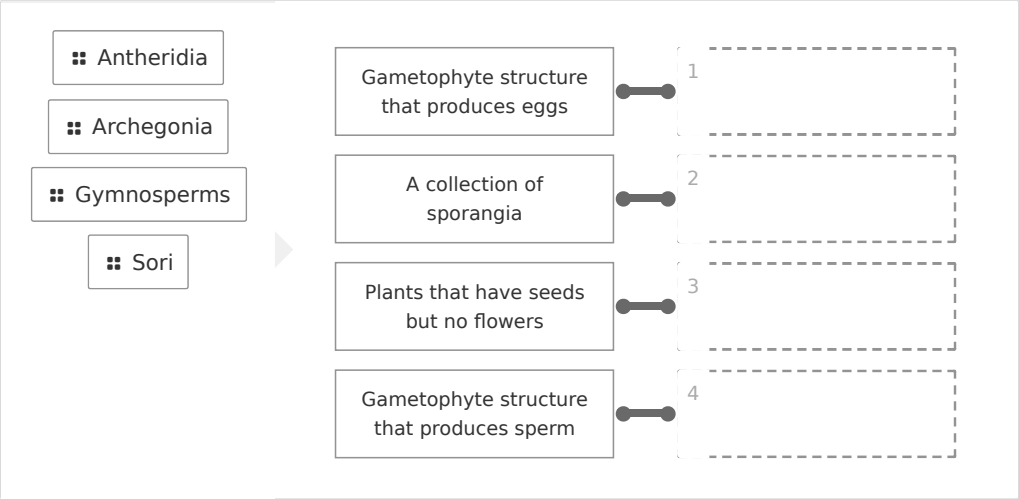
Simple Plants and Gymnosperms

Final Report - Answer Guide

Institution	Science Interactive University
Session	SI Biology - Full Discipline Demo
Course	SI Biology - Full Discipline Demo
Instructor	Sales SI Demo

Test Your Knowledge

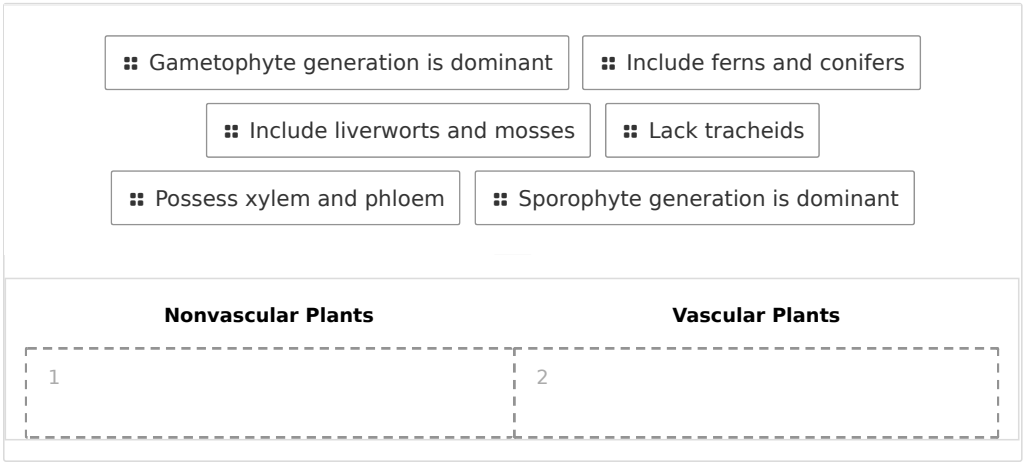
Match each term with the best description.



Correct answers:

1 Archegonia 2 Sori 3 Gymnosperms 4 Antheridia

Categorize each statement as a characteristic of nonvascular or vascular plants.



Correct answers:

1 Include liverworts and mosses Gametophyte generation is dominant Lack tracheids

2 Include ferns and conifers Possess xylem and phloem Sporophyte generation is dominant

Exploration

Rhizoids serve to both transport water and anchor nonvascular plants.

- True
- False ✔

The _____ produce spores in nonvascular plants.

- archegonia
- antheridia
- sporangia ✔
- tracheids

____ is a tissue that transports the products of photosynthesis in vascular plants.

- [x] Phloem
- [ ] Sori
- [ ] Xylem
- [ ] Pteridophyte

Conifer trees are seed-bearing vascular sporophytes that do not require wet environments for reproduction.

- [x] True
- [ ] False

Exercise 1

Explain the features that ferns share with nonvascular plants and with seed-bearing plants. Which of these features limits the distribution of ferns?

Ferns share reproductive structures with nonvascular plants: antheridia, archegonia, and spores. Ferns share vascular tissue, true roots, true leaves, and true stems with seed bearing plants. The reproductive structures of ferns require that fertilization occurs in a moist environment and limits their distribution.

What are the sporophyte and gametophyte generations? How do these generations differ in nonvascular, seedless vascular, and seed-bearing plants?

The sporophyte generation in plants consists of structures that have diploid cells that produce haploid spores by meiosis. The gametophyte generation in plants consist of haploid structures that produce gametes by mitosis. The gametophyte generation is the dominant life form in nonvascular plants, while the sporophyte generation is dominant in seedless and seed-bearing vascular plants.

Data Table 1: Description of Phylogenetic Tree
(SAMPLE ANSWER BELOW)

Number on Phylogenetic Tree	Group	Characteristics	Example
1	Charophytes	Freshwater only, no terrestrial adaptions	Freshwater green algae
2	Bryophytes or nonvascular plants	Simple root and leave-like structures; lack a true vascular system	Mosses and liverworts
3	Seedless vascular plants	Vasculature but no seeds	Ferns
4	Gymnosperms	Vasculature and bare seeds	Conifers
5	Angiosperms	Vasculature and bare seeds and flowers	Flowering plants and grasses

Data Table 2: Comparison of Mosses, Ferns, and Conifers
(SAMPLE ANSWER BELOW)

Plant	Dominant Vegetative Form	Vasculature	Reproductive Structures	Water Required for Fertilization	Environment
Mosses	Gametophyte	No true vascular system; root-like and leaf-like structures present	Antheridium, archegonium, eggs, sperm, spores	Requires water	Moist environments, such as forest floors and stream sides
Ferns	Sporophyte	True vascular system with roots and leaves	Antheridium, archegonium, eggs, sperm, sori, sporangium, spores	Requires water	Moist environments, such as forest floors
Conifers	Sporophyte	True vascular system with roots and leaves	Cones, strobili, pollen, sperm, eggs, seed	Does not require water	A large variety of environments worldwide

Exercise 2

Why are the leaf-like structures, stem-like structures, and rhizoids of mosses not true leaves, stems, and roots? How do these structures limit the environments that mosses can exist?

The structures of mosses are not true leaves, stems, and roots because they lack tracheids and other vascular tissues. This limits the environments that mosses can occupy as all cells of the plant must have access to water and nutrients.

Describe how fertilization occurs in mosses? Why does this process limit which environments that mosses can colonize?

Fertilization in mosses occurs when sperm released from the antheridium swim to fertilize eggs in the archegonium. Since the process requires water, mosses are restricted to damp environments.

Photo 1: Moss Specimen
(SAMPLE ANSWER BELOW)

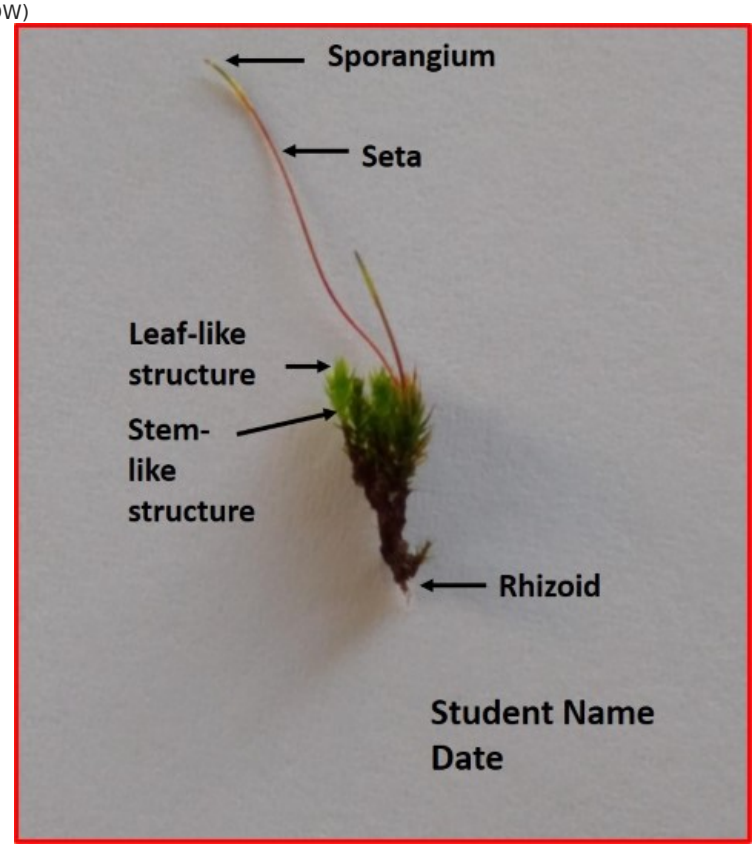


Photo 2: Archegonium
(SAMPLE ANSWER BELOW)

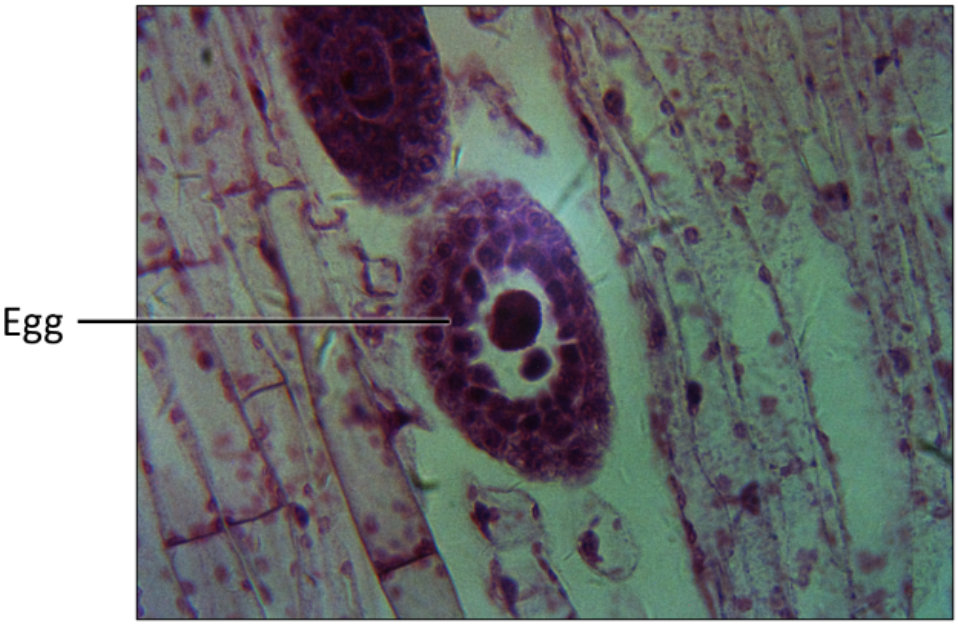
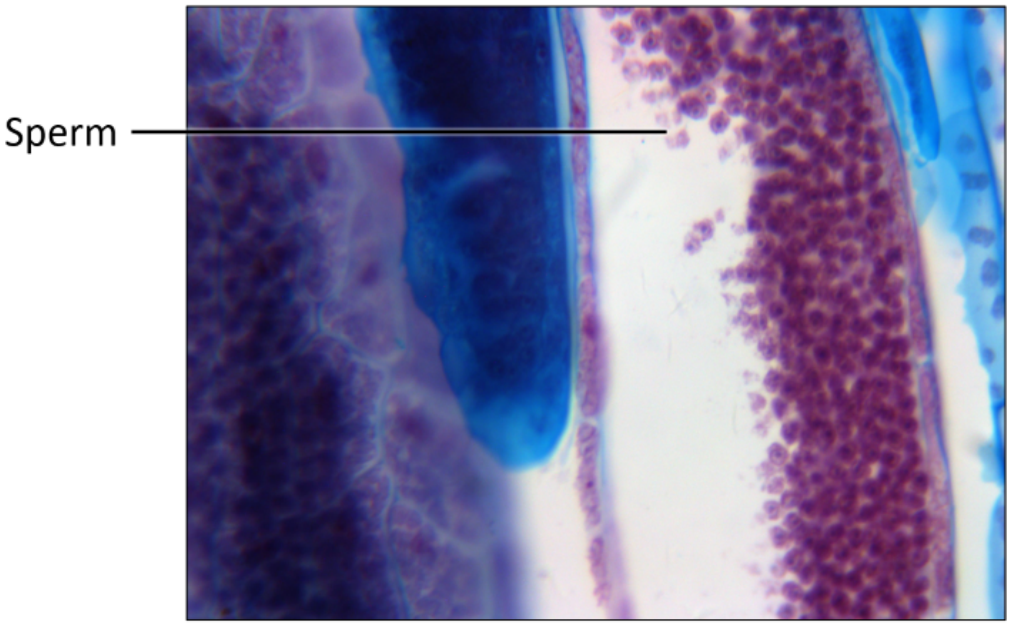


Photo 3: Antheridium
(SAMPLE ANSWER BELOW)



Exercise 3

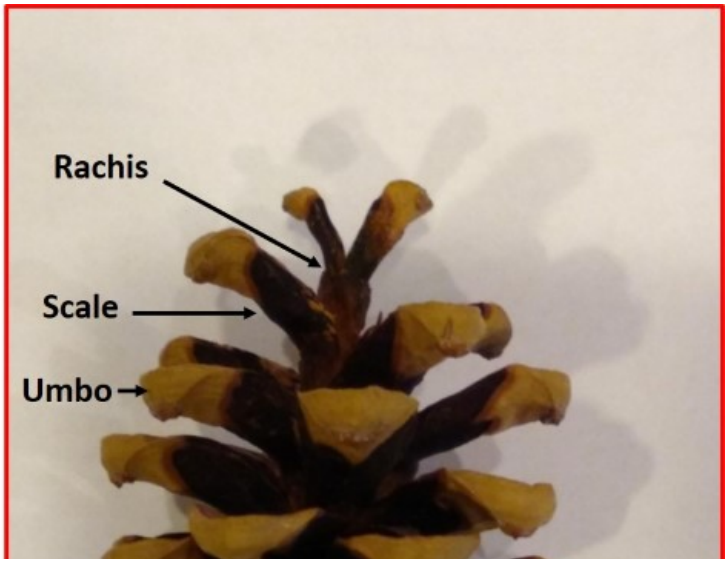
Describe how fertilization occurs in conifers. Does this process limit the environments that conifers can colonize?

Fertilization occurs in conifers when pollen grains containing sperm are released by the pollen cone and are carried by the wind to a egg cone. The pollen then travels to the eggs held within the cone where fertilization occurs. This process does not limit where conifers occur, since water is not required for fertilization as it is for seedless vascular and nonvascular plants.

What leaf adaptations do conifers have that permit them to colonize arid and cold habitats? Include features examined in Photo 5 in your explanation.

Conifer needles have well-developed vascular bundles, sunken stomata, a thick cuticle covering the epidermis, and lignified cells between the epidermis and endodermis to provide strength and resist collapse from dehydration and freezing.

Photo 4: Pinecone
(SAMPLE ANSWER BELOW)



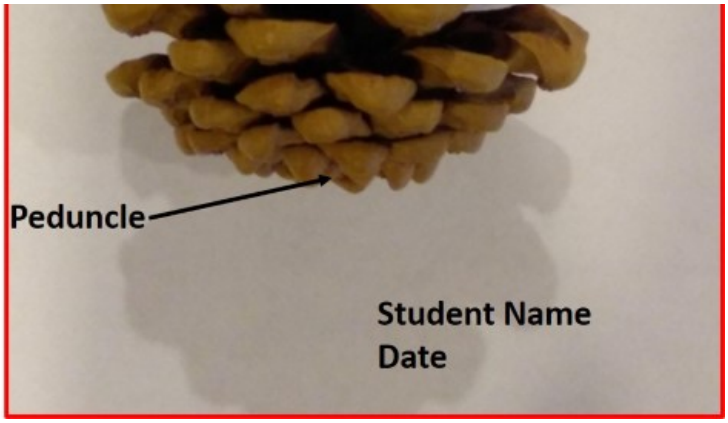
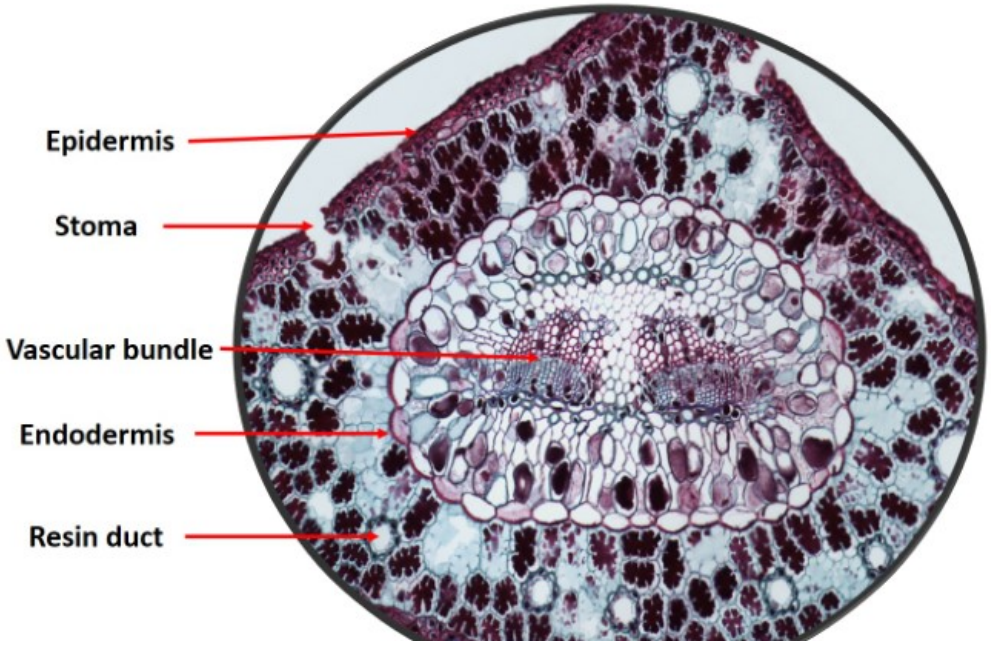


Photo 5: Pine Needle Cross Section
(SAMPLE ANSWER BELOW)



Competency Review

Bryophytes are characterized by _____.

- a lack of tracheids ✔
- a dominant sporophyte generation
- the presence of true leaves
- seed production

Antheridia and archegonia are located on the _____ of nonvascular plants.

- gametophyte ✔
- sporangium
- sporophyte
- rhizoid

Pteridophytes produce _____ on the undersides of leaves that release spores.

- antheridia
- archegonia
- sori ✔
- capsules

The _____ is the dominant generation in ferns.

- archegonium
- sporangium
- gametophyte
- sporophyte ✔

Gymnosperms are seed-bearing vascular plants that lack flowers and fruit.

- True ✔
- False

Conifers produce sperm within _____.

- seed cones
- sori
- pollen cones ✔
- umbos

Gymnosperms appeared on Earth between seedless vascular plants and flowering plants.

- True ✔
- False

Water is required for fertilization in _____.

- angiosperms
- conifers
- pteridophytes ✔
- gymnosperms

The _____ of a moss are pictured in the slide image.

- archegonia ✔
- antheridia
- sori
- strobili

Fertilization occurs within the _____ of a conifer.

- seed cone ✔
- needle
- sori
- pollen cone

Extension Questions

The horsetail plant is a seedless vascular plant that produces spores for a cone-like structure at the tops of stems as shown in the figure below. Apply your knowledge of the reproduction and growth of seedless plants to predict the habitats where the horsetail plant is found.

(SAMPLE ANSWER BELOW)

The horsetail plant should only occur in moist areas or areas that are moist for part of the growing season. Since the plant is seedless and produces spores, water is required for fertilization in this species just as with all seedless, spore-producing plants.