Branches and Bodies

Use plant models and evolutionary branches to connect structures with functions.

BOT.1.1 "Analyze models (3-D, paper, and/or computer-based) to distinguish the basic morphology of the plant kingdom, with attention to structures and their related functions..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline each plant structure and its function, then number the evolutionary features in the order they appear on the land-plant branch. Use your marks to compare the models.

Four Plants on a Museum Table

1. Imagine a museum table holding paper models of a moss, a fern, a pine, and a sunflower. A model simplifies an organism, so inspect what each part represents rather than trusting its size. On the moss model, small leaflike flaps take in light, while threadlike rhizoids anchor the plant; rhizoids are not true roots. The fern model shows roots that absorb water and fronds that capture light. Inside its stem, vascular tissue carries water upward and sugars to other parts. On the pine and sunflower models, roots, stems, and leaves also work together to gather and move resources.

2. The models also show different ways to make new plants. Mosses and ferns release spores; fern spores form in clusters on the undersides of fronds. Pines make seeds in cones, while sunflowers produce seeds inside fruits that develop from flowers. Seeds contain an embryo and a food supply, wrapped in a protective coat. In seed plants, pollen carries sperm cells without requiring a film of water for the sperm to swim through. A flower can attract pollinators, and a fruit can help spread seeds. A model that omits these structures might hide a major evolutionary difference.

3. A branching evolutionary tree helps interpret these models. Follow one branch from an ancestor shared by green algae and land plants. Both groups inherited chloroplasts for photosynthesis and cell walls made largely of cellulose. On the land-plant branch, embryos develop while protected by parent tissue. Later, the moss branch splits off before vascular tissue evolves; the fern branch splits off before seeds evolve. Pine and sunflower branches share the seed-plant ancestor, but flowers and fruits arise only on the sunflower's flowering-plant branch. Fungi belong on a separate branch: they lack chloroplasts, absorb nutrients from other organisms, and have walls made of chitin rather than cellulose.

2 ANSWER WITH EVIDENCE

Use the passage

1. A model has roots, fronds, and spore clusters beneath the fronds. Which of the four plant branches best fits it, and which feature separates it from the moss branch?

2. Two models both make spores. One has rhizoids; the other has roots and a stem with vascular tissue. How would water movement through the two models differ?

3. A specimen has chloroplasts and cellulose cell walls. What additional evidence would place it on the land-plant branch rather than the green-algae branch?

4. A seed-bearing model shows neither flowers nor fruits. Which branch, pine or sunflower, is the better match? Name a structure the model could show to support your choice.

3 YOUR TURN

Your own words

Describe a paper model of a new land plant adapted to a windy, dry ridge. Include three labeled structures and their functions, then use two evolutionary features to place your plant on a branch described in the passage.

ANSWER KEY

Branches and Bodies

PART 1 · READ AND MARK

Underline each plant structure and its function, then number the evolutionary features in the order they appear on the land-plant branch. Use your marks to compare the models. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	A model has roots, fronds, and spore clusters beneath the fronds. Which of the four plant branches best fits it, and which feature separates it from the moss branch?	**The fern branch fits. Its vascular tissue separates it from the earlier-splitting moss branch.**
2	Two models both make spores. One has rhizoids; the other has roots and a stem with vascular tissue. How would water movement through the two models differ?	**The model with vascular tissue can carry water upward through its stem. The model with rhizoids lacks vascular tissue, and its rhizoids anchor it rather than serving as true roots.**
3	A specimen has chloroplasts and cellulose cell walls. What additional evidence would place it on the land-plant branch rather than the green-algae branch?	**An embryo developing while protected by parent tissue would place it on the land-plant branch.**
4	A seed-bearing model shows neither flowers nor fruits. Which branch, pine or sunflower, is the better match? Name a structure the model could show to support your choice.	**The pine branch is the better match; the model could show seeds in cones.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

My paper model has deep roots labeled “anchor the plant and absorb water,” narrow waxy leaves labeled “limit water loss,” and cones labeled “hold seeds.” A cutaway stem shows vascular tissue that moves water and sugars. I place this plant on the pine branch because it has vascular tissue and seeds in cones, but no flowers or fruits.

Accept other plausible ridge adaptations if the student explains each structure's function. Branch placement must agree with the evolutionary features the student gives.