

**OVERVIEW:** Having studied the autotrophic prokaryotes of Kingdoms Bacteria and Archaea, and the autotrophic eukaryotes of Kingdom Protista, Chapter 20 introduces us to Kingdom Plantae, the true plants. Review Table 16.2, p. 285, and the outline of taxonomic phyla below for an overview of our progression so far.

**READING:** Read Chapter 20, pages 371-384.

**EMPHASIS:** We will emphasize the Bryophyta or mosses, which share many characteristics in common with the chlorophyll-bearing members of the Bacteria and Protista. Why then are the bryophytes placed in the Plant Kingdom? You will learn answers to this question as you achieve the following learning goals:

1. List and discuss the common features between *algae* (especially Chlorophyta) and Bryophyta.
2. Discuss the implications of the above features from both *evolution* and *creation* points of view.
3. Discuss the morphology, reproduction, and significance of common Bryophytes (mosses).

**PROCEDURE:** Note that "Study Questions" and the "Study Outline" are combined for this chapter. Fill in the outline as you study the chapter, and use your understanding to complete the *Attendance/Participation Quiz* (attached). Don't forget to use the graphics you created in Lab. Ex. #8.

**TAXONOMIC CLASSIFICATION:** Autotrophic phyla emphasized in our survey (Table 16.2):

KINGDOM BACTERIA -- e.g. Classes Cyanobacteriae and Prochlorobacteriae

KINGDOM ARCHAEA – e.g. methanogenic, halophilic, and thermophilic bacteria

KINGDOM PROTISTA

Heterotrophic Phyla – Phylum Protozoa, Myxomycota (slime molds), etc.

Autotrophic Phyla:

Phylum CHLOROPHYTA - green algae (*chloro* = green)

Phylum EUGLENOPHYTA - euglenoids, green flagellates

Phylum DINOPHYTA (Pyrrophyta) – "fire algae", dinoflagellates

Phylum CHROMOPHYTA – diatoms (former Chrysophyta) and brown algae (former Phaeophyta)

Phylum RHODOPHYTA - red algae (*rhodo* = red)

KINGDOM FUNGI -- Not included in our study.

KINGDOM PLANTAE:

Phylum BRYOPHYTA - mosses

Phylum HEPATICOPHYTA - liverworts (visual recognition only)

Phylum PSILOTOPHYTA - wisk ferns

Phylum LYCOPHYTA - clubmosses, spike mosses, quillworts

Phylum EQUISETOPHYTA - horsetails

Phylum POLYPODIOPHYTA - ferns

Phylum GNETOPHYTA - including *Ephedra*

Phylum CYCADOPHYTA - cycads

Phylum GINKGOPHYTA - ginkgoes

Phylum PINOPHYTA - conifers

Phylum MAGNOLIOPHYTA - flowering plants      Class Magnoliopsida - dicots

Class Liliopsida - monocots

## STUDY OUTLINE and LECTURE DISCUSSION QUESTIONS:

## I. INTRODUCTION TO PLANT KINGDOM– Fill in the blanks using Text, p. 372 and earlier notes

## A. COMMON FEATURES -- Plant Kingdom and (many) Green Algae (Chlorophyta):

1. PIGMENTS: \_\_\_\_\_
2. ENERGY STORAGE: \_\_\_\_\_
3. CELL WALLS: \_\_\_\_\_
4. \_\_\_\_\_ MEIOSIS (as in *Polysiphonia*, *Chara*, and other Chlorophyta)  
(type of meiosis)
5. \_\_\_\_\_ GAMETES (as in *Oedogonium* and *Chara*)  
(type of )
6. *Chara* (sometimes separate Phylum, Charophyta) RESEMBLES TRUE PLANTS IN HAVING:
  - a. Multicellular gametangia
  - b. Phragmoplasts (p 48)
  - c. Flavonoids (*e.g.* red antheridia)

B. PLANT KINGDOM IS MORE COMPLEX THAN CHLOROPHYTA IN HAVING:

1. VASCULAR TISSUES -- conduction of water and assimilates
  - a. Xylem -- water conduction (some mosses have hydroids which are functionally like xylem)
  - b. Phloem - organic substances (some mosses have leptoids which are functionally like phloem)
2. RHIZOIDS or ROOTS -- water absorption (dermal or vascular tissue)
3. DERMAL TISSUE -- outer protective cellular layer
 

>> Protection for photosynthetic cells, gametangia, sporangia
4. CUTICLE -- outer waxy layer of *cutin*
5. PORES (fixed openings in dermal layer of most Bryophytes) or STOMATES (rest of Plantae)
6. EMBRYO -- a multicellular ( $2n$ ) early stage of sporophyte via mitosis/cytokinesis from zygote develops within protective tissue -- *e.g.* VENTER, the enlarged base of an archegonium

## II. ORIGIN OF PLANT KINGDOM

A. EVOLUTION MODEL -- Review: What is the key *presupposition* and the *inference(s)* for developing the phylogenetic "tree?" See SA #14-15

1. PRESUPPOSITION – \_\_\_\_\_
2. INFERENCE (concerning closeness of relationship) –
3. INFERENCE (concerning position on phylogenetic tree) –

APPLICATION -- How is the above (page 21.2) reasoning applied to plant kingdom?

1. What is proposed origin of Plant Kingdom? Supporting evidence?
  
2. What is proposed phylogenetic sequence between Chlorophyta and Kingdom Plantae?

Discussion Topic for Cooperative Learning Group – Use Attendance/Participation Quiz Form -->

B. CREATION MODEL -- Presupposition: Intelligent design and purpose is evident in creation.

1. Is there *design* and *purpose* in bryophytes having six features that make them more complex than algae (see part I. B.)?

OR -- Is there a purpose in ALGAE not having these six features?

APPLICATION of your logic (below are some of the six features; extend to others in I.B):

- a. RHIZOIDS
  - b. WATER STORAGE CELLS – *e.g. Sphagnum* versus *Spirogyra*
  - c. MESOPHYLL and PORES
  - d. (include additional features)
2. Why are bryophytes seen as less complex than "higher plants"
    - a. EVOLUTION VIEWS: *with minor exceptions, bryophytes differ from higher plants in lacking...conductive tissue. Because of this, none of the [bryophytes] became very large.*  
-- K.R. Stern, Botany Lab Manual, p. 135 (1994)  
  
*Bryophytes lack well developed vascular tissues and lignified tissues. As a result, they grow low to the ground and absorb water by capillarity.* Moore, *et.al.* text, p. 664 (1997)
    - b. CREATION VIEW: Present a creationist rationale for these differences in apparent complexity? [Use Quiz Form.]

III. BRYOPHYTE REPRODUCTION -- Continue this outline with emphasis on Asexual and Sexual Reproduction in Mosses with emphasis on the following Key Structures.

KEY STRUCTURES: Gametophyte – protonema, archegonial head, archegonium, antheridial head, antheridium, ventor, neck canal, paraphyses  
Sporophyte – zygote, embryo, seta, capsule, operculum, peristome

NAME(S): \_\_\_\_\_

Note: This is a Cooperative Learning Group Feedback form for use in presenting your responses.

INSTRUCTIONS: Please meet or confer through threaded discussion in WebCT to formulate logical and concise answers to the two questions given in the Text Box, page 21.3 of this Study Guide You may pose additional questions or claims where appropriate to represent insights gained in your individual and corporate study.

1. Is there *design* and *purpose* in bryophytes having six features that make them more complex than algae? OR -- Is there a purpose in ALGAE not having these six features?  
*See Box, p. 21.3.*

2. Why are bryophytes seen as less complex than "higher plants?" Present a creationist rationale for these differences in apparent complexity?