Chapter 22 **Plant Diversity** **Name** _____

Lab Investigating Mosses and Ferns

Background Information

Part A Mosses and Liverworts

Liverworts and mosses belong to a division called Bryophyta. As in the case of algae and fungi, bryophytes do **not** have true roots, stems, or leaves. The ancestors of the bryophytes are believed to be among the first multicellular organisms to live on land. Present day bryophytes are generally found in moist environments, perhaps giving a clue to the association of their ancestors with water. The structure and life cycle of mosses and liverworts demonstrate both adaptations and limitations to survival on land.

Moss plants may be found growing in dense clumps on the forest floor or compact mats on a fallen log. A clump of moss plants is composed of many **gametophyte** plants growing close to each other for support. At certain times of the year the sporophyte generation may be seen growing from some of the green gametophyte plants.

Structure and Life Cycle of Mosses

Both mosses and liverworts go through a similar life cycle involving **alternation of generations**. Mosses differ from liverworts in that their gametophytes have a definite vertical "stem" and a large number of "leaves" attached in a complex way. Also, the moss gametophyte begins as an algae-like green filament known as a **protonema**. Moss sporophytes are larger than those of liverworts, and they develop a **capsule** mechanism regulating the production and dispersal of spores.

Procedure

1. Examine a moss plant that has a long stalk and capsule attached to it. The green "leafy" part is a **female** gametophyte; the stalk, or **seta**, and **capsule** comprise the dependent sporophyte part of the plant.

2. From what cell did the sporophyte generation develop?

3. Explain why the sporophyte generation is present only on certain gametophyte plants.

4. **Draw** a complete moss plant including the sporophyte and gametophyte generations. **Label** all parts of your drawing. Use preserved specimens, or a chart or textbook drawing.

Female Moss Plant	**Male Moss Plant**

5. Locate the **capsu1e** at the tip of the **seta**. Examine the capsule using a hand lens or dissecting microscope. Determine if a tiny lid, the **operculum**, is present. As **spores** mature within the capsule the operculum will fall away.

6. What happens to the spores when the operculum falls off?

7. Using a prepared slide, **draw** a moss capsule showing the internal structure. **Label** the drawing by using the bold terms in step 5 If there are mature capsules available, break the capsule open in a drop of water on a slide. Squeeze out the spores, cover with a coverslip and observe them at high power. **Draw** several spores.

Capsule	**Spores**

8. Under favorable conditions a spore germinates into a threadlike structure, the **protonema**. The protonema eventually develops into a mature gametophyte. Examine a prepared slide of moss protonema. **Draw** and **label** a protonema at high power.

Protonema or Algae-like Filament of Moss

9. Observe a green "leafy" gametophyte with a hand lens or dissecting microscope. Can you find any evidence of veins or conducting tubes in the "leaves"?

10. Root like structures at the base of the leafy stem absorb water and minerals. What are these called? How are water and dissolved minerals transported within the tissues of this **nonvascular** plant?

11. Gamete producing structures, called **archegonia** and **antheridia**, are located at the tips of the leafy stems in a cluster of leaves. Using prepared slides of the antheridia and archegonia, **draw** and **label** an example of each.

Antheridium _	**Archegonium _**

12. The male sex organ is called the _____? What does it produce? _____ .

13. The female sex organ is called the _____? What does it produce? _____ .

14. In what structure would the zygote be formed?

15. Why is water necessary for the life cycle of mosses?

16. Why is the moss sporophyte generation considered **dependent** on the gametophyte generation?

17. On the following diagram, **label** all structures. **Color** the gametophyte generation green and the sporophyte generation yellow. The gametophyte generation is composed of cells that contain only one set of chromosomes. These cells are referred to as being haploid. Indicate which cells are **haploid** by putting an **"n"** by each term. Do the same with the sporophyte generation, except use **"2n"** because these cells are **diploid**.

Life Cycle of Mosses

In the life cycle of a moss, the gametophyte generation is **green** and **distinct**. It is this haploid (n) sexual generation that is recognized as a moss plant. There are **male** and **female** gametophyte plants. Sperm released from the male sex organs, **antheridia**, **swim** through dew or rain **water** to the egg in the female sex organs, called **archegonia**. Fertilization of the egg produces a diploid sporophyte generation that grows directly out of the female archegonium. At the tip of the sporophyte, a **capsule** develops. Within the capsule, haploid **spores** are produced by **meiotic cell division**. The spores are released, and when they germinate, haploid gametophyte plants are produced.

Diagram of the Moss Life Cycle