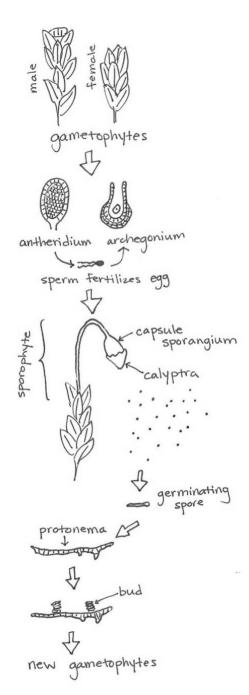
ANSWERS

Nonvascular Plants: Alternation of Generations

Crash Course Biology #36

- 1. The first plants to evolve were nonvascular plants, which include the <u>liverworts</u>, the **hornworts**, and the **mosses**.
- 2. Key traits of nonvascular plants:
 - Don't have specialized **conductive** tissues such as roots and stems
 - Take moisture in directly through their **cell walls** and move it through osmosis
 - Rely on **diffusion** to transport minerals
 - Limited **growth** potential
 - Need water for **reproduction**
 - True plants multicellular; cell walls made of **cellulose**; do photosynthesis
- 3. All the non-vascular plants are collectively referred to as **bryophytes**. There are three phyla of bryophytes. It is not understood which phylum evolved first.
 - Phylum Bryophyta the **mosses**; about 15,000 species
 - Phylum Hepatophyta the <u>liverworts</u>, about 9,000 species
 - Phylum Anthocerophyta the hornworts, about 100 species
- 4. In animal reproduction, two haploid gametes (one from the mom and one from the dad) fuse to make a <u>diploid</u> cell that combines the genetic material from both parents. That diploid cell divides and divides and divides until a new organism results.
- 5. Plants, along with algae and a handful of invertebrate animal species, have evolved a cycle in which they take on two different forms over the course of their lives. This type of reproductive cycle is called **alternation of generations**.
- 6. In all **land** plants, the alternating generations fundamentally differ from each other.
- 7. One generation, called the **gametophyte**, reproduces sexually by producing gametes, eggs and sperm (haploid cells that only carry one set of chromosomes).
- 8. When the sperm and egg fuse, they give rise to the second generation, called the **sporophyte** generation, which is asexual.
- 9. The sporophyte itself is diploid (has two sets of chromosomes in each cell). It has a little capsule called a **sporangium**, which produces haploid reproductive cells called **spores**.
- 10. During its life, the sporophyte remains attached to its parent gametophyte, which it relies on for water and **nutrients**.

- This means that the green, leafy parts of non-vascular plants that we all recognize are actually gametophytes.
 Sporophytes are only found tucked inside the females, and they're super small and hard to see.
- 12. In the gametophyte generation, individuals are always either male or female.
 - Males makes sperm in antheridia
 - Females make eggs in archegonia
- 13. By way of <u>water</u>, the sperm finds its way to the female and then into the egg, where the two gametes fuse to create a diploid <u>zygote</u>, which divides by mitosis and grows into a sporophyte.
- 14. The sporophyte grows inside the mother gametophyte, until it cracks open and the sporophyte sends up a long stalk with a little cap on top called the **calyptra**. Under it is a capsule full of thousands of little diploid **spores**.
- 15. When the capsule is mature, the lid falls off, and the spores are exposed to the air. If **humidity** levels are high enough, the capsule will let the spores go to meet their fate.
- 16. If a spore lands on moist ground, it germinates, producing a little filament called the <u>protonema</u>, that gives rise to the buds.
- 17. The **buds** eventually grow into a patch of moss, which is a just a colony of haploid gametophytes. That generation will mate, and make sporophytes, and the generations will continue their alternation indefinitely!



- 18. In contrast, reproduction in vascular plants is complex because they have many kinds of specialized tissue.
 - plants that produce unprotected seeds, like conifers or ginkgo trees, are gymnosperms
 - at this level that we start to see pollen
 - flowering plants are called **angiosperms** are the most diverse group of land plants
- 19. Summary: The main difference between the alternation of generations in vascular and non-vascular plants is:
 - In bryophytes you recognize the **gametophyte** as the plant part (moss, liverwort, hornwort. The sporophyte is less recognizable and smaller.
 - In vascular plants, the **sporophytes** become the dominant phase, more prominent or recognizable. The flower of an angiosperm, for instance, is actually the sporophyte.