

# Groups of Fungi

## Section 2

# Chytrid Fungi

Key Idea: The chytrids are a group of aquatic fungi that provide clues about the evolution of fungi.

# Chytrid Fungi

- Chytrids were once classified with protists because the two groups share two important characteristics.
  - Like protists, many chytrids are unicellular
  - Like protists, chytrids produce spores and gametes that have flagella.

- Chytrids are now classified with fungi because chytrids have:
  - chitin in their cell walls.
  - digest food outside their bodies.
  - produce hyphae that form rhizoids.
  - The sexual reproductive structures contain spores.

- Most chytrids are aquatic, although some live in moist places on land.
- They are mainly saprobes, which feed on dead algae or plants.
- Some chytrids are parasites that feed on protists, plants, animals, or even other fungi.

# Zygoter Fungi

Key Idea: Zygoter fungi are named for **sexual reproductive structures** that produce **zygotes** inside a tough capsule.

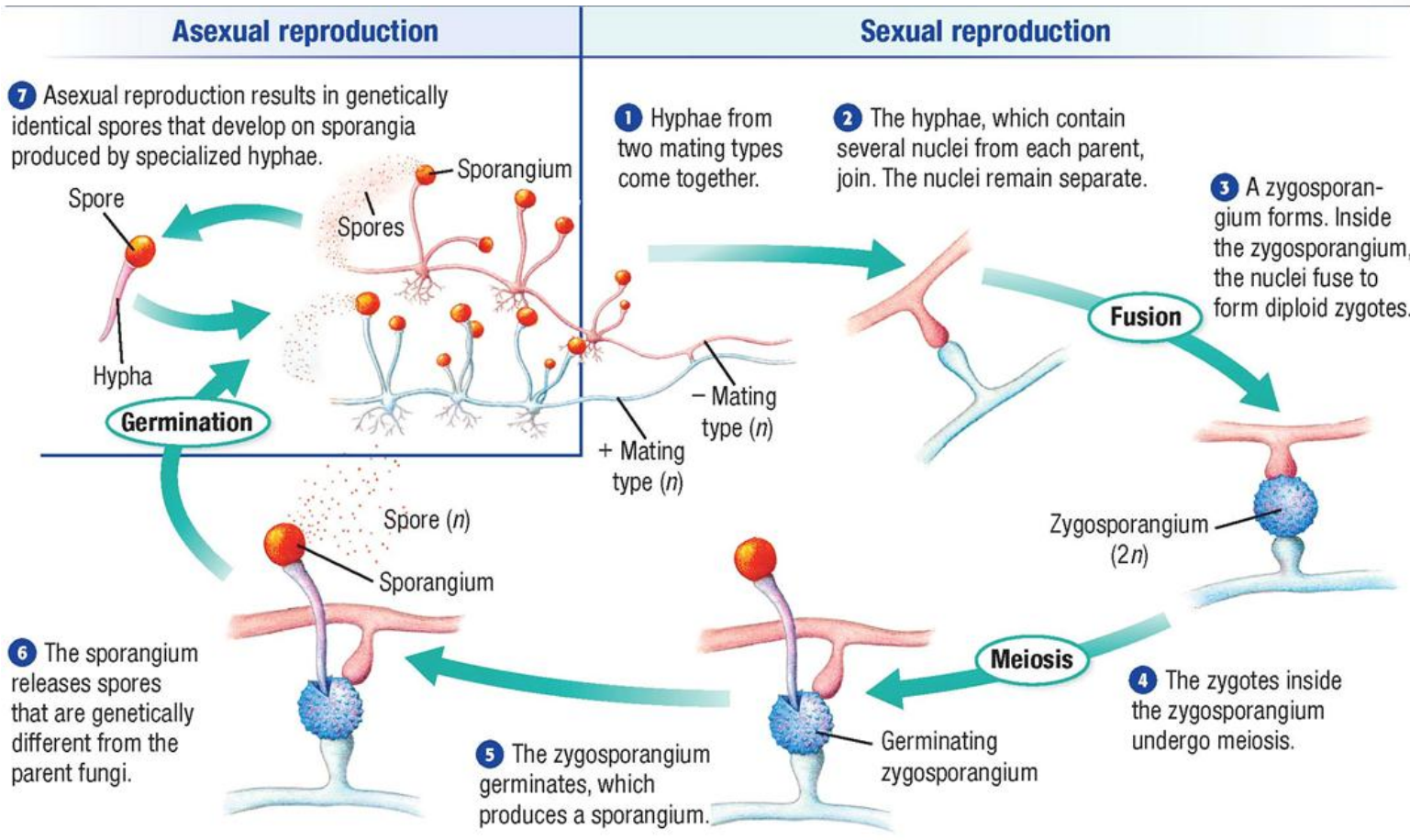
- A **zygosporangium** is a tough capsule which is a sexual structure that contains zygotes. It is resistant to hot, cold, and dry conditions.
- The word **identical** means looking exactly the same.

- Sexual reproduction in zygote fungi begins when hyphae from two mating types come together.
- In fungi, different mating types are not referred to as male and female, because they are physically identical. Instead, they are called “+” and “-.”
- The hyphae join, but the nuclei remain separate.
- When conditions are right for growth, the nuclei fuse to form diploid ( $2n$ ) zygotes. The zygotes undergo meiosis.

- During asexual reproduction, haploid spores are produced in structures called *sporangia* that form at the tips of specialized hyphae.
- The haploid spores are produced by mitosis.
- Spores are carried by wind to new locations, where they grow into new fungi.
- Asexual reproduction is more common than sexual reproduction in zygote fungi.



# Life Cycle of Zygote Fungi



# Sac Fungi

Key Idea: Sac fungi are characterized by an ascus, a saclike sexual reproductive structure that produces spores.

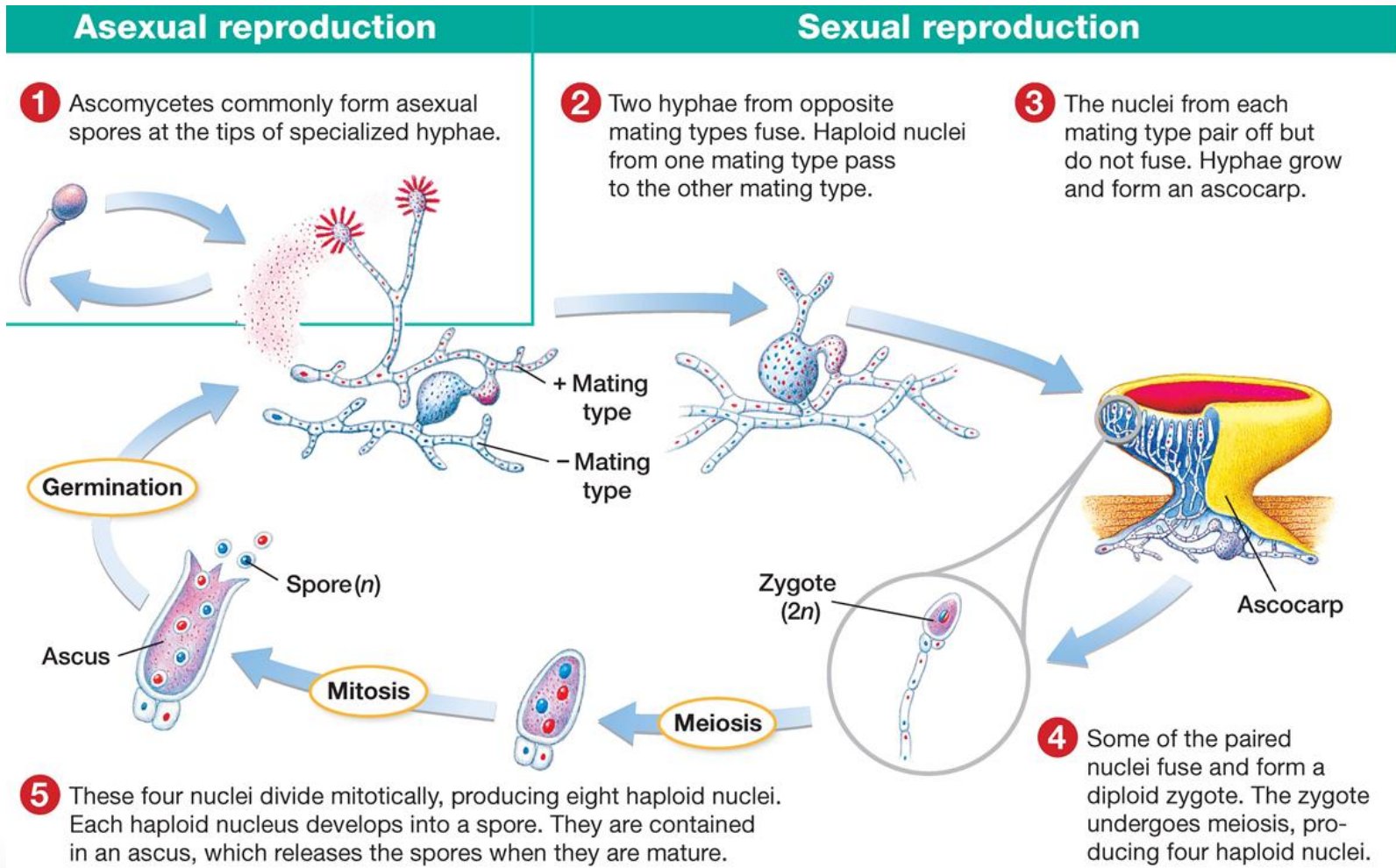
- An ascus is a “sac.”

# Sac Fungi

- Sexual reproduction in sac fungi is similar to sexual reproduction in zygote fungi.
- Hyphae of two mating types fuse.
- Haploid nuclei from one mating type move into the tip of a hypha of the other mating type.
- The nuclei pair up, one “+” with one “-.”
- The cells, and the nuclei inside the cells, divide.
- When the cells and the nuclei divide, the hyphae that form have two nuclei per cell.

- These *dikaryotic* (having two nuclei) cells form a reproductive structure called an *ascocarp*.
- Certain cells within the ascocarp become asci.
- The nuclei within the asci fuse, undergo meiosis, and produce spores.
- Sac fungi usually reproduce asexually.
- Asexual spores form by mitosis on specialized hyphae called *conidiophores*.
- Spores on a conidiophore usually form in chains and are not covered.
- The spores are carried by wind and germinate to form new fungi.

# Life Cycle of Ascomycetes



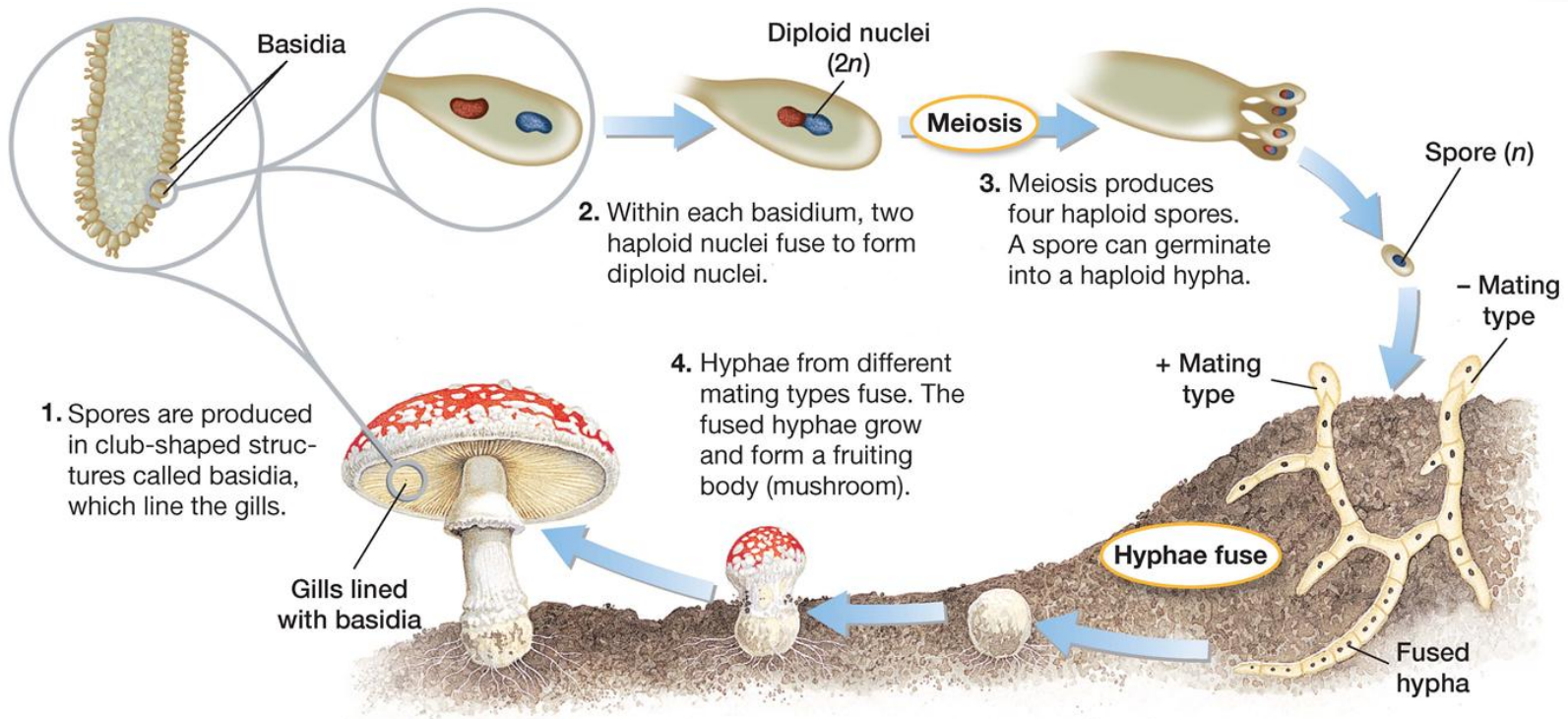
# Club Fungi

- Key Idea: Club fungi are characterized by a **basidium**, a clublike sexual reproductive structure that produces spores.

# Club Fungi

- Sexual reproduction of club fungi is very similar to that of sac fungi.
- Hyphae from two mating types fuse and produce a dikaryotic reproductive structure called a basidiocarp.
- A mushroom is one example of a *basidiocarp*.
- On the underside of the basidiocarp, club-shaped cells called *basidia* form.
- Inside the basidia, nuclei fuse, undergo meiosis, and produce spores.
- Asexual reproduction is rare among club fungi, but does occur in some rusts and smuts.

# Life Cycle of Basidiomycetes





- Basidiocarps often form at the outer edges of the large mycelial mats that club fungi produce. The mycelia grow out from a central starting point and form an expanding ring of hyphae.
- When the fungus reproduces sexually, a ring of mushrooms appears.
- The largest known organism on the planet is a club fungus in Oregon that is 3.5 miles across.

# Fungal Partnerships

Key Idea: Fungi form mutualistic symbiotic associations to form lichens and mycorrhizae.

- A lichen is an association between a fungus and a photosynthetic partner, such as a cyanobacterium, a green alga, or both.
- The photosynthetic partner provides carbohydrates to the fungus. The fungus provides a protected environment, vitamins, and minerals.
- Lichens can survive in extreme environments, such as on volcanic rock and arctic tundra.
- Lichens can be damaged by chemicals in their environment and serve as indicators of air pollution.

# Fungal Partnerships

- A **mycorrhiza** is an association between fungi and the roots of nearly all plants.
- The fungal hyphae grow inside or around the plant root and out into the soil.
- The hyphae transfer phosphorus and other minerals from the soil to the roots of the plant.
- The plant supplies carbohydrates to the fungus.