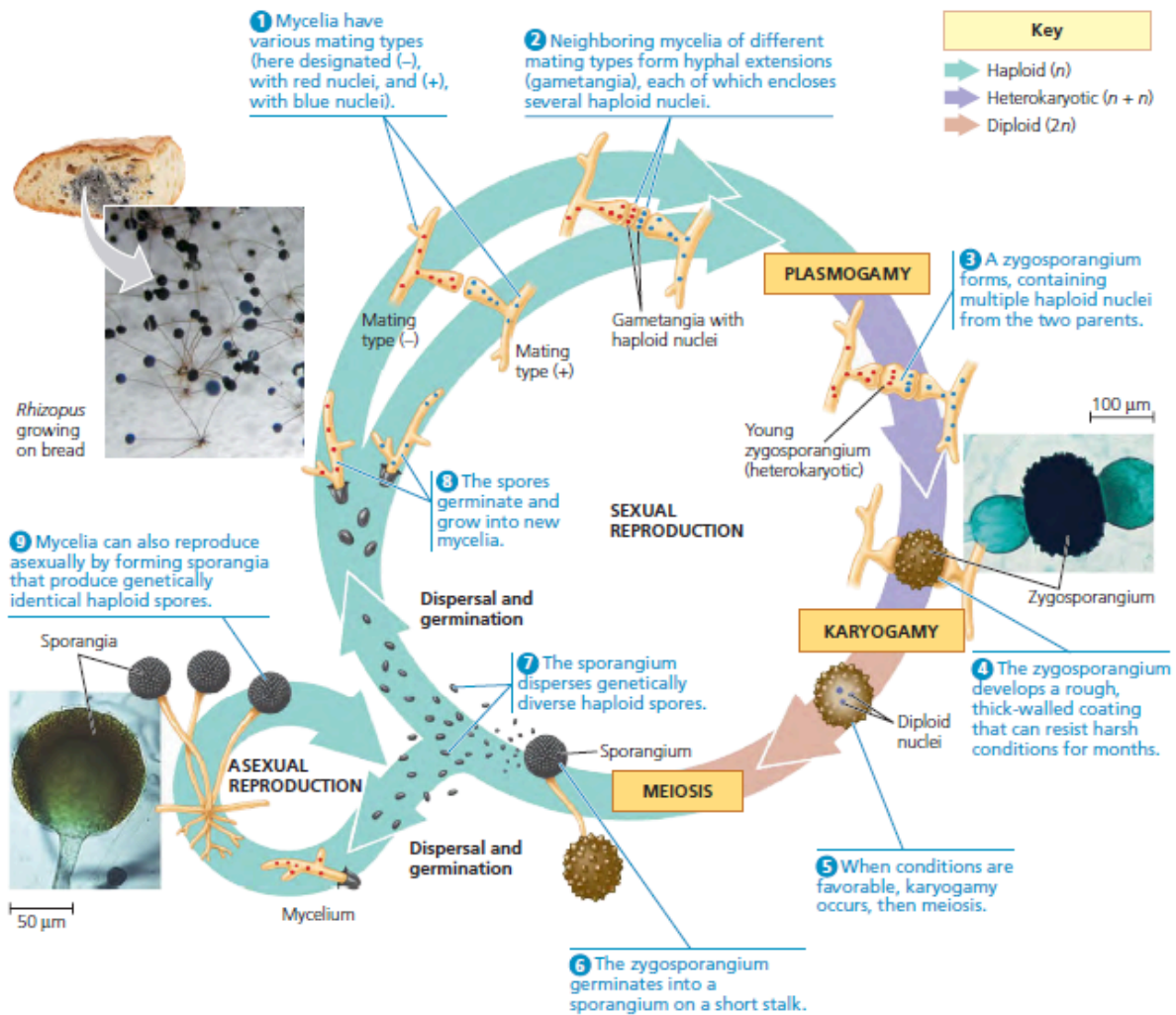
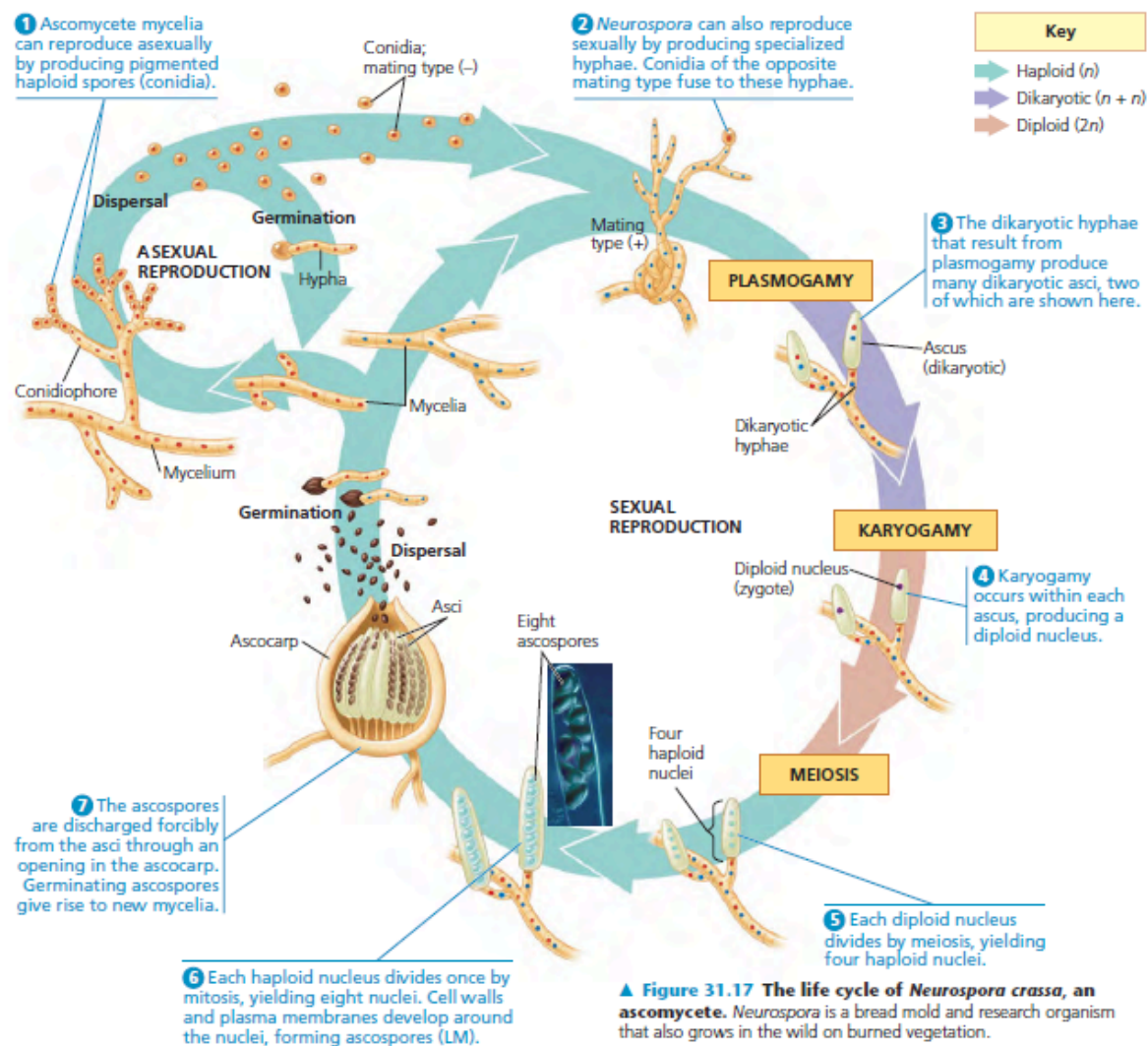


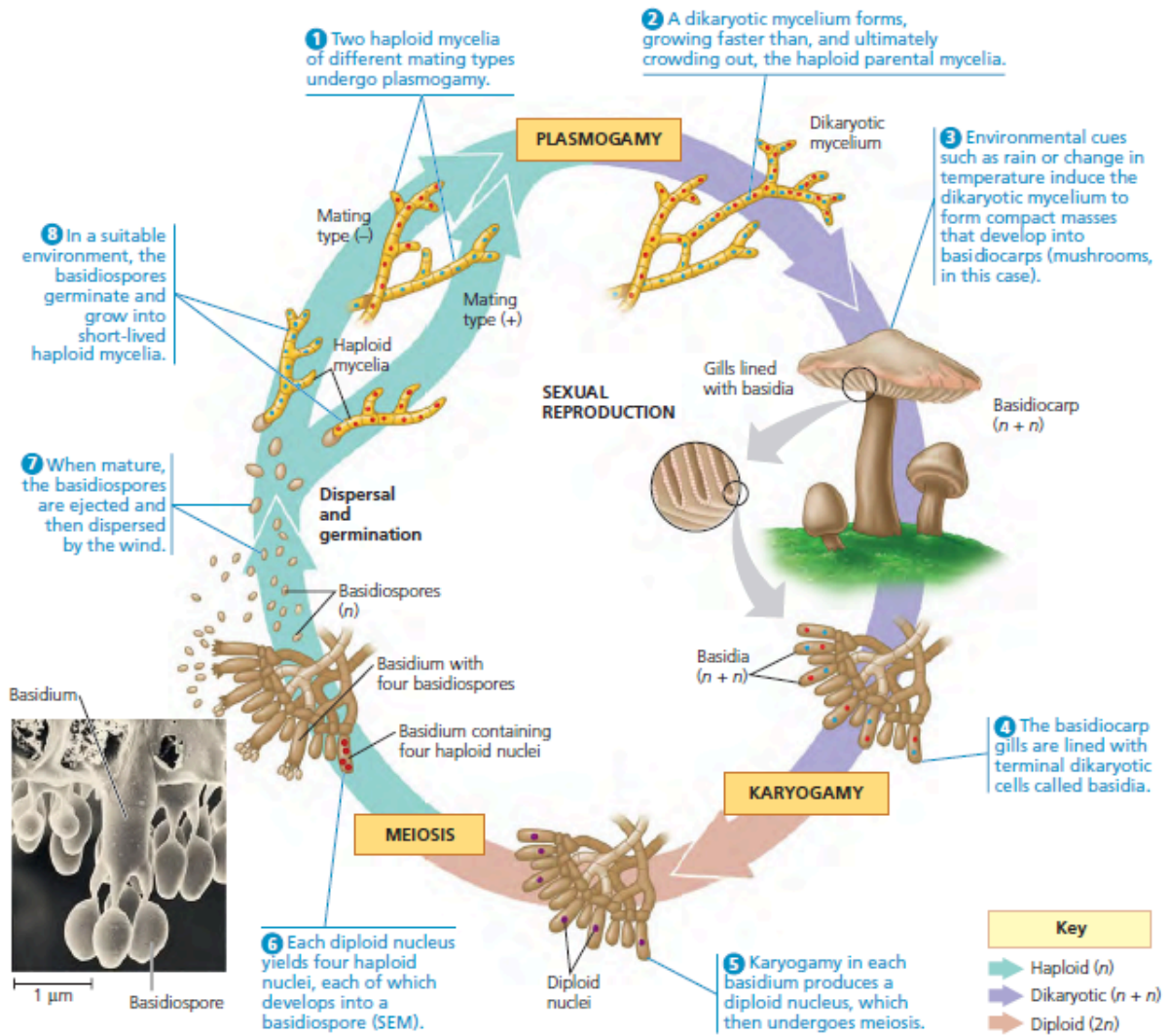
## Cheat Sheet



▲ **Figure 31.13** The life cycle of the zygomycete *Rhizopus stolonifer* (black bread mold).



▲ **Figure 31.17** The life cycle of *Neurospora crassa*, an ascomycete. *Neurospora* is a bread mold and research organism that also grows in the wild on burned vegetation.



▲ **Figure 31.19** The life cycle of a mushroom-forming basidiomycete.

## Chapter 31 Questions

1. How do fungi absorb nutrients?
2. What are the most common body structures of fungi?
3. What are hyphae?
4. What is the difference between septate hyphae and coenocytic hyphae?
5. What is a mycelium?
6. What do fungi concentrate their energy and resources on?
7. What are haustoria?
8. What are arbuscules?
9. What are mycorrhizae?
10. What are the two types of mycorrhizal fungi?
11. How do fungi propagate?
12. What are puffballs?
13. Describe the fungal sexual reproductive cycle.
14. Describe the asexual fungal reproductive cycle.
15. What are deuteromycetes?
16. Why do scientists believe that fungi evolved from a flagellated ancestor?
17. What are opisthokonts?
18. Why do scientists believe that fungi evolved from a unicellular ancestor?
19. What is cryptomycota?
20. What are *sym* genes?
21. Describe the 5 groups of fungi.
22. Describe the life cycle of *Rhizopus stolonifer*.
23. Describe the life cycle of *Neurospora crassa*.
24. Describe the life cycle of a mushroom-forming basidiomycete.
25. What are endophytes?
26. What is the scientific name for the cacao tree?
27. What is a lichen?
28. How do lichens reproduce asexually?
29. What percent of fungi are parasitic?
30. What is *Cryphonectria parasitica*?
31. What is *Fusarium circinatum*?
32. What is *Claviceps purpurea*?
33. What is *Batrachochytrium dendrobatidis*?
34. What is mycosis?
35. What is ringworm?
36. What are systemic mycoses?
37. What is coccidioidomycosis?
38. What is *Candida albicans*?
39. What are morels and truffles?
40. For what medical purposes can ergots be used for?

41. Where does penicillin come from?
42. Give two more examples of pharmaceuticals derived from fungi.
43. What is *Gliocladium roseum*?

## Chapter 31 Answers

1. Most secrete enzymes that break down complex molecules into simple molecules that the fungi can absorb into their cells. other fungi use enzymes to penetrate the walls of cells, enabling the fungi to absorb nutrients from them
2. Mostly multicellular filaments and some single cells (yeasts), many grow as both, very few grow only as yeasts
3. tiny nutrient-absorbing filaments, consist of tubular cell walls strengthened by chitin (strong, flexible polysaccharide that enhances feeding by absorption and prevents water uptake to cause lysing).
4. Have cross-walls (septa, have pores that allow ribosomes, mitochondria, and nuclei to pass through) that divide the hyphae into cells  
Have continuous cytoplasmic mass with hundreds of thousands of nuclei
5. interwoven mass of hyphae
6. Increasing hyphal length rather than girth
7. Modified hyphae that allow fungi to extract nutrients from plants
8. specialized hyphae that some fungi use to exchange nutrients with their plant hosts
9. Mutually beneficial relationships between fungi and plant roots (fungi can improve delivery of minerals to plants because of mycelial networks, plants supply fungi with organic nutrients such as carbohydrates)
10. Ectomycorrhizal fungi (form sheaths of hyphae over the surface of a root and grow into extracellular spaces of the root cortex)

Arbuscular mycorrhizal fungi (extend arbuscules through root cell wall and into tubes formed by invagination of root cell plasma membrane)

11. Disperse haploid cells called spores
12. The reproductive structures of certain fungal species
13. Hyphae from two mycelia release pheromones (sexual signaling molecules). If fungi are of different mating types, they grow towards each other and hyphae fuse (union of cytoplasm of two parent mycelia is called plasmogamy). Two nuclei coexist (do not fuse right away), mycelium in this state called heterokaryon. Sometimes, nuclei pair of two to a cell (one from each parents), mycelium called dikaryotic, as it grows the nuclei divide at the same time but do not fuse. During karyogamy (next stage), haploid nuclei fuse to form diploid cells, zygotes form and divide meiosis to produce haploid spores
14. Many fungi grow as filamentous fungi that produce haploid spores by mitosis (are molds if they form visible mycelia). Others grow as single-celled yeasts then divide by mitosis (most yeasts and filamentous fungi have no known sexual stage in their life cycle).
15. All fungi lacking sexual reproduction
16. The earliest diverging lineages of fungi (chytrids) have flagella and most of the protists that share a close common ancestor with animals and fungi have flagella
17. animals, fungi, and related protists (forms monophyletic group)

18. Fungi are more closely related to several groups of single-celled protists than they are to animals (e.g. nucleariids, consists of amoebas that feed on algae and bacteria), animals are more closely related to choanoflagellates than they are to fungi or nucleariids, so multicellularity probably evolved separately in animals and fungi
19. Clade of unicellular chytrids that diverged from other fungi early in the history of the group, have flagellated spores and do not synthesize chitin-rich cell wall, includes genus *Rozella*
20. Three genes whose expression is required for the formation of mycorrhizae in flowering plants, likely present in the oldest plant species
21. Chytrids (phylum Chytridiomycota), ubiquitous in lakes and soil, found in marine communities, some are decomposers, others are parasites, have flagellated spores called zoospores (unique to chytrids)

Zygomycetes- Some grow rapidly on foods, may act as decomposers, parasites, or commensal symbiotes. (phylum Zygomycota), hyphae are coenocytic, septa found where reproductive cells form. Plasmogamy produces zygosporangium (sturdy structure where karyogamy and then meiosis occur, resistant to freezing/drying, metabolically inactive, multinucleate)

Glomeromycetes (phylum Glomeromycota), formerly thought to be zygomycetes, Nearly all form arbuscular mycorrhizae (80% of plants have mycorrhizae with glomeromycetes)

Ascomycetes (phylum Ascomycota) - variety of marine, freshwater, terrestrial habitats, produces spores (ascospores) in saclike asci, often called sac fungi, during sexual stage form fruiting bodies called ascocarps that contain asci, include deadly plant pathogens, important decomposers, 25% live with green algae/cyanobacteria in symbiotic relationships called lichens, reproduce asexually by producing spores called conidia (not formed inside sporangia, produced at tips of specialized hyphae (conidiophores))

Basidiomycetes (phylum Basidiomycota) - includes mushrooms, puffballs, and shelf fungi, includes mutualists and plant parasites (two groups: rusts and smuts), have a basidium (cell where karyogamy occurs followed immediately by meiosis (shape of basidium gives common name, club fungus). Important decomposers of wood and other plant material, some are the best decomposers of lignin (component of wood), forms basidiocarps (elaborate fruiting bodies, what you see in stores)

22. see picture
23. see picture
24. see picture
25. fungi or bacteria that live inside the plant without causing harm, most are ascomycetes, make toxins that deter herbivores or increase plant tolerance to heat/drought/etc.
26. *Theobroma cacao*
27. A symbiotic association between a photosynthetic microorganism and a fungus (photosynthetic cells are held in mycelium, fungus pairs with unicellular or filamentous



green algae or cyanobacteria, fungus usually ascomycete, 1 glomeromycete and 75 basidiomycete lichens known). Photosynthetic microorganism provides carbon compounds (cyanobacteria can fix nitrogen). Fungus provides suitable environment for growth

28. Parental lichen fragments or soredia (small clusters of hyphae with embedded algae) form, the fungi of the lichens can produce asexually
29. 30%, mostly of plants
30. Ascomycete fungus that causes chestnut blight
31. Ascomycete that causes pine pitch canker
32. Ascomycete, Grows on rye plants, forms purple structures called ergots, toxins in ergots can cause ergotism characterized by gangrene, nervous spasms, hallucinations, temporary insanity, ergots contain lysergic acid (material from which hallucinogen LSD is made)
33. chytrid that has led to the recent decline/extinction of 200 species of frogs and other amphibians, can cause severe skin infections
34. INfection in an animal caused by a fungal parasite
35. Skin mycoses that appears as circular red areas on skin, ascomycetes that cause more commonly grow on feet, causing athlete's foot (itching and blisters), can be treated with fungicidal lotions and powders
36. Spread through the body and cause serious illnesses, typically caused by inhaled spores.
37. Systemic mycosis that produces tuberculosis-like symptoms in the lungs
38. One of the normal inhabitants of moist epithelia, can grow to rapidly, becoming pathogenic, causes yeast infections
39. edible fruiting bodies of ascomycetes, release strong odors and have complex flavors
40. compound in them used to treat high blood pressure and stop maternal bleeding after childbirth
41. Ascomycete mold *Penicillium*
42. Cholesterol-lowering drugs and cyclosporine (drug used to suppress immune system after organ transplants)
43. Ascomycete that can grow on wood or agricultural waste, naturally produces hydrocarbons similar to diesel fuel, researched to find way to be used to produce biofuel