



Amanita →
← *Psilocybe* (Liberty Cap)

1. Be sure to study all of the pictures for identification purposes. Fungi or fungi structures to recognize include: hyphae, mycelium, stolons, rhizoids, black bread mold, black bread mold life cycle, sac fungi, morels, jelly fungi, coral fungi, club fungi, gills, button mushroom, sporangia, sproangiophores, gametangia, zygospores, puffballs, lichen, fairy rings, truffles, wheat rust, *Amanita muscaria* (poisonous – page 417 and above), magic mushrooms (*psilocybe*) (above)
2. List the characteristics that unify fungi. ***Fungi are heterotrophic and eukaryotic organisms that have hyphae. They can be saprotrophic or parasitic.***
3. What is the ecological role of fungi. ***Fungi are the major decomposers of the world (along with bacteria).***
4. Describe the basic structure and functions of fungi, including hyphae, mycelium, sporangiophore, sporangia, spores, gametangia, zygospores, fruiting bodies, rhizoids, and stolons. Be sure to include whether the structure is haploid or diploid and when meiosis occurs.

Hyphae – tiny, filaments that may or may not have cross-walls. They may or may not be multinucleate. With the exception of the 2^o mycelium in club fungi, all hyphae are haploid.

Mycelium – all the hyphae of a fungi matted together. Can include stolon, rhizoids, sporangiophores and sporangia all together.

Sporangiophores – structures that produce sporangia. Sporangioophores are haploid.

Sporangia – structures that produce spores. Sporangia are haploid.

Spores – reproductive structures of fungi. Scattered by the wind, water or by insects, spores can germinate into hyphae creating a new mycelium. Spores are haploid.

Gametangia are gamete forming structures that are formed when the (+) and (-) mating types meet. Each mating type makes it's own gametangia.

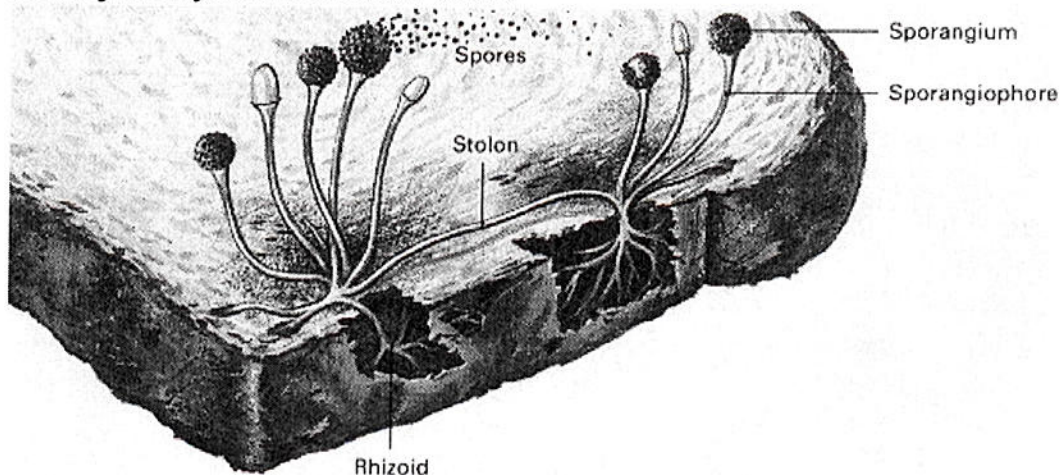
Zygospore – forms when the gametangia and the nuclei from the two mating types fuse. The zygospore is diploid, but it quickly undergoes meiosis, and creates a sporangium filled with haploid cells.

Fruiting bodies – created in sac and club fungi instead of zygospores. The fruiting body of sac and club fungi are dinucleate, haploid.

Stolons – act as runners in plants. They grow along the surface of the bread and create new sporangia, rhizoids or gametangia (if it meets it's opposite mating type). This way the fungi is able to spread itself over the bread. Stolons are haploid.

Rhizoids – act as roots in plants. They anchor the organism to the bread, excrete the digestive enzymes and then absorb the nutrients from the bread. Rhizoids are haploid.

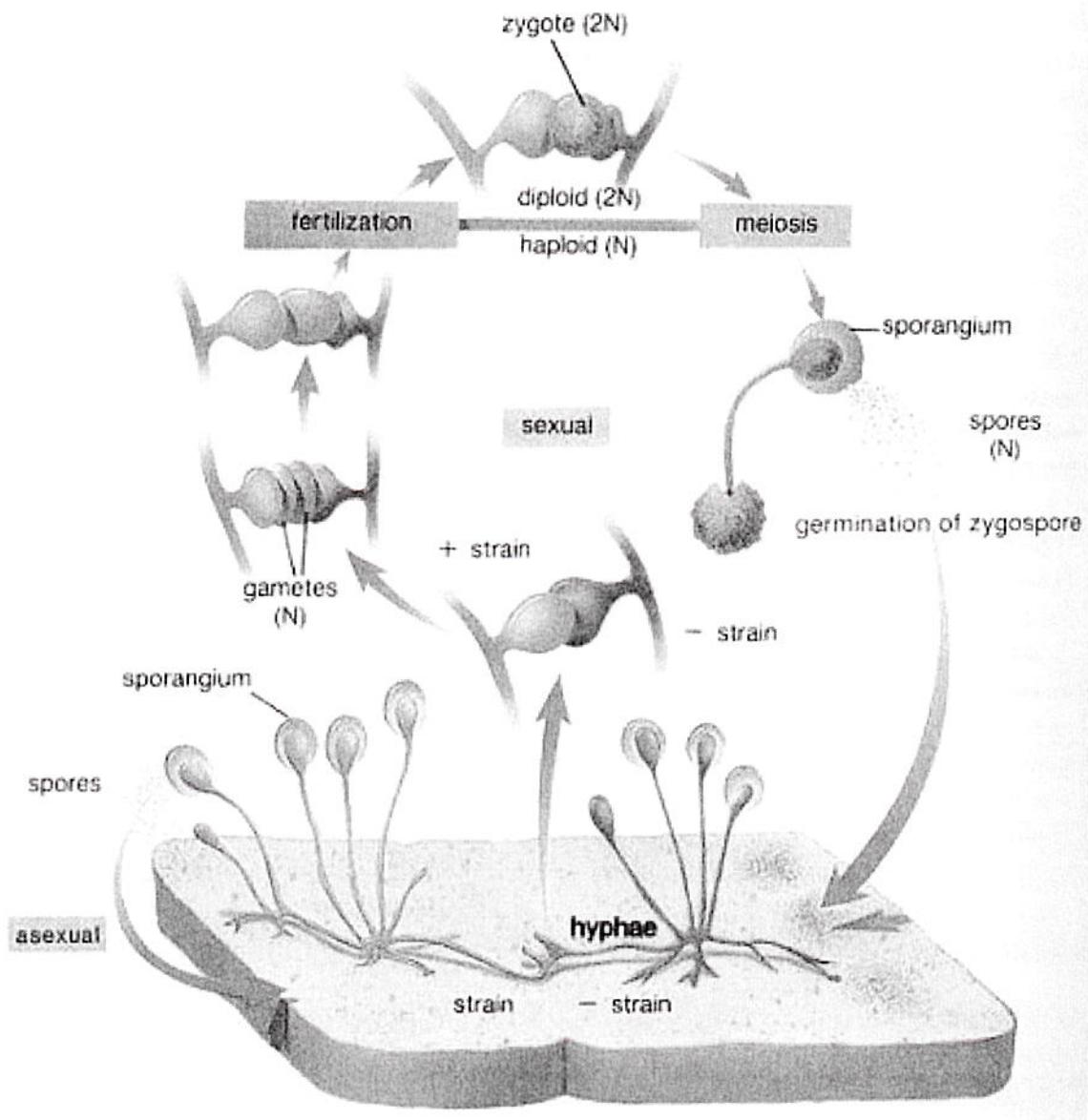
- List some examples of water molds diseases. *Water molds are the organisms that cause white fuzz to grow on fish in aquaria. They are also responsible for potato blight, the disease that wiped the entire crop of potatoes in Ireland in 1845. This catastrophic loss of potatoes causes a famine in Ireland that year –over 1 million people starved to death.*
- How are the spores of water molds unique? *They are the only fungi that have flagellates spores that swim to new food sources.*
- How do you identify the common molds? *The black bread mold is easy to identify because of it's distinct sporangiophores and black sporangia. You might also look closely and see the stolon growing along the surface of the bread if the mycelium is not too dense.*



- Describe the life cycle of common molds. *(I would use a diagram to support my answer) Asexual reproduction begins as sexual reproduction begins: spores from the sporangia land on a site that is warm and moist. The spores germinate into hyphae. The hyphae differentiate into rhizoids (to externally digest the substrate and absorb the nutrients), stolon (to run along the surface of the bread and spread out the rhizoids) and sporangiophores. The sporangiophores will produce the black sporangia, which in turn, produce spores by mitosis. The spores are therefore genetically identical to the sproangiophore, sporangia and other hyphae from which they came. These spores will be distributed and will germinate into new organisms to begin the cycle again.*

SEXUAL reproduction begins in the same manner – spores germinate into hyphae which differentiate into the different kinds of hyphae. However, when two opposite mating types come into contact with each other, they will each create a gametangia

(gamete forming structure). The two gametangia will fuse, and then the nuclei from the opposite mating types will also fuse. From this fusion, a diploid zygospore is produced. Within the zygospore, meiosis occurs. The new haploid cells will then produce a sporangiophore and a sporangium. The spores in these sporangia are haploid, but they are genetically different than the parent hyphae. They will each be new, unique combinations of the parent hyphae genomes. These newly combined pores will produce (+) or (-) mating types depending on their genetic makeup.



9. How do you identify the sac fungi? What edible sac fungus is considered a delicacy? *The easiest sac fungi to identify are the cup fungi – they have fruiting bodies that look like cups. The only unicellular fungi is also a sac fungi – the yeast. The morel (which doesn't look like a cup at all) is the sac fungus that is a*

- delicacy. Truffles are also a type of sac fungus. They are mycorrhizae forming sac fungi which produce fruiting bodies that are underground. They can be found by animals that can smell them. The chemicals the truffles produce are the same found in the testicles of swine, the breath and saliva of rutting boars (used to make the females more sexually receptive), in the underarm perspiration of males and the urine of females. Truffles have been used as aphrodisiacs.*
10. How are the spores different in sac fungi than in others? *Sac fungi produce conidia – a type of spore that is very fine. (conidia means “dust”)*
 11. What do we use sac fungi for? *We eat morels, but more important to most of us, we use yeast to make bread and alcohol.*
 12. List some examples of club fungi. *Mushrooms, jelly fungi, coral fungi, rusts, stinkhorns, puffballs, psilocybe (hallucinogenic), amanita (poisonous)*
 13. What are imperfect fungi infamous for? *Many imperfect fungi cause diseases such as ringworm and athlete’s foot.*
 14. What good thing has come out of imperfect fungi? *We derived the antibiotic Penicillin from Penicillium.*
 15. Where are fungi found? *Everywhere (almost)*
 16. How do fungi disperse their spores? *By wind, water and insect vectors.*
 17. Describe the relationship that creates lichen. *Lichen are fungi and an autotrophic bacteria (or green algae) living in symbiosis. The fungus is able to retrieve nutrients from very harsh substrates, and the cyanobacteria is able to get energy from the sun. This enables them to move into nearly barren environments, and begin succession of the area.*
 18. Describe the relationship that creates mycorrhizae. *Mycorrhizae are symbiotic relationships between fungi and plants. The fungi’s mycelium covers the root hairs of the plant and increases the surface area for absorption of nutrients and water. The fungi get some of the products of photosynthesis in return. Truffles are a type of sac fungi that create mycorrhizae with trees. The fruiting body of the fungi is what everyone eats, but it is sprouted and stays underground.*
 19. What process is used to create alcohol? How is this done? *Alcohol is created by fermentation – cellular respiration without oxygen. The products of fermentation are carbon dioxide and alcohol. To do this, simply give the yeast a food supply (sugar) and limit its oxygen.*
 20. What plant diseases are caused by fungi? *Potato blight, early tomato blight, black spot of rose, corn smut, wheat rust and mildew.*
 21. What human diseases are caused by fungi? *Thrush and other yeast infections of the urinary and reproductive tracts, athlete’s foot and ringworm.*