Part 1: Fungi Characteristics

1. Explain how fungi acquire nutrients. What are exoenzymes?

Fungi are heterotrophs but instead of ingesting food they absorb nutrients from outside their bodies (the definition of a saprobe). Fungi secrete exoenzymes, a type of hydrolytic enzyme, into the environment to assist in breaking down nutrients.

2. Below is the structure of a fungus. Label each part. Which structure is the reproductive structure?

**Fungus Structure**

- **Hyphae** - the tiny filaments that make up the body of a fungi
  - Hyphae can be septate or coenocytic. In *septate* hypha, the structure is divided into cells by septa (like a wall). The septa walls have openings to allow organelles to flow between them. *Coenocytic* hyphae lack these divisions between cells. Due to the lack of septa, coenocytic hypha is a mass of cytoplasm with hundreds of nuclei.

- **Mycelium** - the mass of hyphae; this mass **MAXIMIZES THE SURFACE AREA TO VOLUME RATIO** (aka: this is super efficient for the fungus)
  * the structure you see above the ground is the reproductive structure of a fungi

- **Haustoria** are specialized hyphae that allow the fungi to get nutrients from a host (instead of, say, the ground)
3. When a mycelium infiltrates an unexploited source of dead organic matter, what are most likely to appear within the food source soon thereafter?
   a. Fungal haustoria
   b. Soredia
   c. Fungal enzymes
   d. Increased O2 levels
   e. Larger bacterial populations

4. Many fungi reproduce both sexually & asexually (though some can only reproduce one way or the other); usually prefer __aexual________________ reproduction during good times and __sexual________________ reproduction during bad times.

   Sexual reproduction occurs during the bad times because it creates new genetic diversity, which may allow the fungus to survive the harsher conditions.

5. Complete the following diagram. Describe plasmogamy and karyogamy

6. Immediately after karyogamy occurs, which term applies?
   a. Plasmogamy
   b. Heterokaryotic
   c. Dikaryotic
   d. Diploid

7. Which description does not apply equally well to both sexual and asexual spores?
   a. Have haploid nuclei
   b. Represent the dispersal stage
   c. Are produced by meiosis
d. Upon germination, will subsequently undergo S phase and mitosis

8. Which process occurs in fungi and has the opposite effect on a cell's chromosome number than does meiosis 1?
   a. Mitosis
   b. Plasmogamy
   c. Crossing over
   d. Binary fission
   e. **Karyogamy**

9. What is the imperfect fungus and why is it called this?
The Deuteromycetes are the imperfect fungus because they have no known sexual phase. Once a sexual phase is discovered they are usually classified as ascomycetes

**Part II: Fungal Phyla**

1. **Phylum Chytridiomycota** - called chytrids and are the most least primitive fungi; they are mostly aquatic, mainly found in lakes and soil; chytrids are the only fungi to have ____**zoospores**______, which are spores that have ____flagellated________

2. Phylum Zygomycota
   Describe the life cycle:

3. Phylum Ascomycota
Describe the life cycle:

- **Sexual reproduction:** Conidia may fuse with hyphae of a different mating type; fusion is followed by plasmogamy, resulting in dikaryotic cells (each with two haploid nuclei representing the two parents); the cells at the tips of these dikaryotic hyphae develop into many asci.
  - Within each ascus – karyogamy combines the parental genomes, and then **meiosis** forms four genetically different nuclei; **meiosis / mitosis** follows, forming eight **ascospores**.

- **Asexual reproduction:**
  - The sporangium produces spores (n). The spores grow into mycelium, which then grows into a sporangium. This sporangium can produce spores so the cycle starts over again.

4. **Phylum Basidiomycota**
Describe the life cycle:
5. **Fungal Life Cycle Summary**

<table>
<thead>
<tr>
<th>Fungal Phylum</th>
<th>Distinguishing Features of Morphology &amp; Life Cycles</th>
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<tbody>
<tr>
<td>Chytridiomycota</td>
<td>Flagellated spores</td>
</tr>
<tr>
<td>Zygomycota</td>
<td>Sexual stage: <em>zygosporangium</em> that is resistant to harsh conditions</td>
</tr>
<tr>
<td>Glomeromycota</td>
<td>Form arbuscular <em>Mycorrhizae</em> with plants</td>
</tr>
<tr>
<td>Ascomycota</td>
<td>Sexual spores: <em>Ascospores</em> (made in the asci)</td>
</tr>
<tr>
<td></td>
<td>Asexual spores: <em>Conidia</em> (made on conidiophores)</td>
</tr>
<tr>
<td>Basidiomycota</td>
<td>Sexual only: <em>Basidiospores</em> (made in the basidia)</td>
</tr>
</tbody>
</table>

6. You are given an organism to identify. It has a fruiting body that contains many structures with eight haploid spores lined up in a row. What kind of fungus is this?
   a. Zygomycete
   b. **Ascomycete**
   c. Deuteromycete
   d. Chytrid
   e. Basidiomycete