Here's a Study Guide for the Exam on Protists.

Parts of this study guide:
1. Examples of fill in the blanks.
2. Examples of multiple choice questions.
3. What else should I study?

1. Examples of fill in the blanks.
   1. Some protists are photosynthetic autotrophs and are called ____________.
   2. Protists move chiefly by either flagellar rotation or by cytoplasmic streaming called ______ movement.
   3. The formation of a structure called a _______________ is important to many parasites that must survive a harsh environment between hosts.
   4. Some protist cell surfaces have ___________, including silica or calcium carbonate.
   5. The ____________ are a group within the Euglenozoa that have a unique, single mitochondrion.
   6. The members of ____________ include dinoflagellates, apicomplexes, and ciliates.
   7. Typical asexually reproducing protists can reproduce ________ in times of stress.
   8. The individual cellular slime molds behave as separate amoebas while feeding. They aggregate and become a moving mass, the slug, which produces the spore containing ________ at a certain stage of life.
   9. __ are characterized by pore-studded shells (called tests) composed of organic materials usually reinforced by grains of inorganic matter.
   10. All apicomplexes are nonmotile, spore forming, and live as __________ in animals.
   11. Mitochondria and chloroplasts are thought to have arisen through _____.

2. Examples of multiple choice questions.
   1. Pelomyxa is a good model of an early eukaryote in that they
      A) resemble archaeabacteria more than bacteria
      B) are larger than bacteria
      C) contain bacteria which may perform as mitochondria
      D) contain a complex system of internal membranes
      E) all of the above

   2. Mitochondria ____________ as bacteria do.
      A) divide by simple fission
      B) have small ribosomes
      C) have a circular, closed molecule of DNA
      D) a and c
      E) a, b, and c

   3. The common characteristic of Alveolata is
      A) a single, unique mitochondria
      B) membrane sac beneath the plasma membrane
      C) silica covering
      D) funnel-shaped, contractile collar
      E) presence of a plasmodium
4. A common characteristic of Choanoflagellida is
   A) a single, unique mitochondria
   B) space beneath the plasma membrane
   C) silica covering
   D) funnel-shaped, contractile collar
   E) presence of a plasmodium

5. The most diverse of the four eukaryotic kingdoms is the
   A) Protista Kingdom
   B) Bacteria Kingdom
   C) Plantae Kingdom
   D) Animalia Kingdom

6. A non-walled, multinucleate mass of cytoplasm that resembles a moving mass of slime that is
   produced by plasmodial slime molds is called
   A) a sorocarp
   B) a plasmodium
   C) a pseudopod
   D) a filamental hyphé
   E) a motile endospore

7. Amoebas move from place to place by means of their
   A) cysts
   B) pseudopods
   C) pseudomonads
   D) sorocarps
   E) plasmodia

8. The marine multicellular protists including the larger brown algae belong to the
   A) dinoflagellates
   B) Choanoflagellida
   C) Stramenopila
   D) euglenoids
   E) foraminifera

9. Organisms that are characterized by being unicellular, photosynthetic, and having double
   shells made of silica are known as
   A) dinoflagellates
   B) diatoms
   C) kelps
   D) euglenoids
   E) foraminifera

10. The tropical diseases such as African sleeping sickness, East Coast fever, Chaga's disease,
    and leishmaniasis are caused by
    A) foraminifera
    B) sporozoans
    C) phytomastigotes
    D) trypanosomes
    E) oomycetes
11. All ________ have two very different types of nuclei within their cells, small micronuclei and larger macronuclei.
   A) sporozoans  
   B) protists  
   C) oomycetes  
   D) ciliates  
   E) dinoflagellates

12. The parasite that is responsible for causing malaria is called
   A) Streptococcus  
   B) Chlamydomonas  
   C) Plasmodium  
   D) Entamoeba  
   E) Pelomyxa

13. Protists are classified into a single kingdom because of which of the following features?
   A) They are not fungi, plants, or animals.
   B) Most are microscopic, although some are as large as trees.
   C) Many are unicellular, but there are some colonial multicellular forms.
   D) All types of nutritional modes are found.
   E) All of the above are true.

14. Amoebas lack
   A) a plasma membrane  
   B) flagella  
   C) nuclei  
   D) meiosis  
   E) any form of sexuality

15. A possible missing link in the evolution of eukaryotes, a stage before mitochondria were acquired and before mitosis had evolved, can be seen in
   A) Pelomyxa palustris  
   B) Chlamydomonas  
   C) Euglena  
   D) Dinoflagellate  
   E) Diatom

16. Which of the following is not true about Chlorella?
   A) it belongs to the same phylum as Chlamydomonas  
   B) contains flagella  
   C) widespread in soil, fresh and salt water, and barks of trees  
   D) reproduces asexually  
   E) none of the above
17. The organism, *Phytophthora infestans*, responsible for the Irish Potato Famine of 1845 and 1847 belong to
A) Euglenozoa  
B) Alveolata  
C) Rhodophyta  
D) Chlorophyta  
E) Stramenopile

18. Oomycetes
A) produce zoospores asexually  
B) are able to reproduce sexually  
C) contain motile spores  
D) contain two unequal flagella  
E) all of the above

19. The unique double shells of diatoms are made of
A) cellulose  
B) silica  
C) chlorophylls  
D) agar  
E) proteins

20. The limestones making up the famous landmark in England, the White Cliffs of Dover, are the pore-studded shells (tests) of
A) diatoms  
B) dinoflagellates  
C) brown algae  
D) spirochetes  
E) foraminifera

21. Which of the following is not one of the distinctive features of dinoflagellates?
A) They are unicellular.  
B) They are photosynthetic.  
C) Some exist in fresh water, while some are part of marine plankton.  
D) They form large, spherical colonies.  
E) Some planktonic members are luminous and cause flashes in the night.

22. The disease that makes it impossible to use large areas of potential grazing land in Africa to raise domestic cattle for meat or milk is caused by
A) a trypanosome  
B) a spirochete  
C) a virus  
D) a sporozoan  
E) bacteria
23. Trypanosome disease known as sleeping sickness is spread by
A) mosquitoes
B) airborne droplets
C) tsetse flies
D) fleas on rats
E) contaminated water

24. Vacuoles for ingesting food and regulating their water balance are characteristic of
A) sporozoans
B) trypanosomes
C) ciliates
D) algae
E) spirochetes

25. In addition to their characteristic cilia, ciliates like *Paramecium* contain two types of
A) nuclei
B) chloroplasts
C) flagella
D) wood-digesting enzymes
E) cysts

26. The malarial parasite, *Plasmodium*, is a member of the group
A) Euglenozoa
B) Stramenopiles
C) Alveolata
D) Rhodophyta
E) none of the above

27. Protists are extremely diverse and thus pose a challenge to their classification. Four of the
five statements are true concerning protists and their classification. Select the exception.
A) The Kingdom Protista contains unicellular, colonial, and multicellular members.
B) The Kingdom Protista contains autotrophs and heterotrophs.
C) The Kingdom Protista contains members that have chloroplasts.
D) The Kingdom Protista contain eukaryotes and prokaryotes.
E) The members of the single Kingdom Protista are not representative of any evolutionary
relationships.

28. Some protists use multiple fission as a means of reproduction. Multiple fission is also
referred to as
A) budding
B) zygotic meiosis
C) schizogony
D) syngamy
E) intermediary meiosis
29. The Kingdom Protista contains 15 major phyla. These phyla have been roughly divided into six groups. Taxonomists have used all of the following characteristics in their classification of protists except
A) the ability to cause diseases in humans and their domestic animals
B) the presence or absence of flagella and cilia
C) the presence of pigments
D) if the cell has any type of shell
E) types and modes of nutrition

30. Members of the Euglenozoa move within their habitats with the aid of
A) tests
B) pseudopodia
C) cilia
D) flagella
E) pellicles

31. Which of the following terms is NOT associated with the Euglenozoa?
A) stigma
B) pellicle
C) cilia
D) reservoir
E) flagellum
32. Which term is not associated with the ciliates?
A) micronuclei
B) conjugation
C) contractile vacuole
D) cytoproct/gullet
E) macrocysts

3. What else should I study?
1. Be very familiar with the general biology of protists. Understand diversity regarding cell surface, locomotion, dormancy, nutrition and reproduction.
2. Be very familiar with the six major lineages of protists, the characteristics of the lineage and specific characteristics of each group within a lineage.
3. You should understand the characteristics of other protists (like amoeba) that do not “fit” in any lineage among the protists.
4. Life cycles: You should be familiar with the following two life cycles:
   - Plasmodium (malarial parasite)
   - Physarum (plasmodial slime mold)
5. Many protists were associated with disease. A good exercise would be to make a table with three columns. In the first column enter the lineage (like Alveolata), next a representative group (like dinoflagellates) and finally something about disease (like red tides or paralytic shellfish poisoning or Na+ channel blockers & respiratory toxins). A table could look something like this:

<table>
<thead>
<tr>
<th>Lineage</th>
<th>Representative group</th>
<th>Disease or impact on man</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alveolata</td>
<td>Dinoflagellates</td>
<td>Red tide, paralytic shellfish poisoning, Na+ channel blockers &amp; respiratory toxins</td>
</tr>
</tbody>
</table>

6. Specific representative protists were used for many groups. A good exercise would be to construct a table with three columns. In the first column enter the lineage (like Alveolata), next a representative genus (like Plasmodium), and finally enter unique or identifying characteristics observed in the representative organism. A table could look something like this:

<table>
<thead>
<tr>
<th>Lineage</th>
<th>Representative genus</th>
<th>Identifying characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alveolata</td>
<td>Plasmodium</td>
<td>Unicell, Apical complex of organelles (microtubules, fibrils, vacuoles) Nonmotile, Parasitic (e.g. causes malaria in humans)</td>
</tr>
</tbody>
</table>

7. Terminology – Several new words were encountered in the protists. Here’s a checklist of some of the words you should understand.

<table>
<thead>
<tr>
<th>Endosymbiosis</th>
<th>Flagellum</th>
<th>Alveolus</th>
<th>Apicomplex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyst</td>
<td>Stigma</td>
<td>Cellulose</td>
<td>Sporozoite</td>
</tr>
<tr>
<td>Gamete</td>
<td>Pellicle</td>
<td>Histone</td>
<td>Merozoite</td>
</tr>
<tr>
<td>Spore</td>
<td>Paramylon</td>
<td>Zooxanthellae</td>
<td>Trophozoite</td>
</tr>
<tr>
<td>Asexual</td>
<td>Kinetoplastid</td>
<td>Red tide</td>
<td>gametocyte</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>--------------------------</td>
<td>---------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>Sexual</td>
<td>Kinetoplast</td>
<td>Bioluminescence</td>
<td>cilium</td>
</tr>
<tr>
<td>Symbiosis</td>
<td>Leishmaniasis</td>
<td>Plankton</td>
<td>gullet/cytostome</td>
</tr>
<tr>
<td>endosymbiosis</td>
<td>Chagas disease</td>
<td>Red tide</td>
<td>macro &amp; micronucleus</td>
</tr>
<tr>
<td>schizogeny</td>
<td>Sargasso sea</td>
<td>Mannitol</td>
<td>food vacuole</td>
</tr>
<tr>
<td>tinsel-type/whiplash flagella</td>
<td>Chrysolaminarin</td>
<td>Biocolloid</td>
<td>gullet/cytostome</td>
</tr>
<tr>
<td>kelp</td>
<td>Centric &amp; penate</td>
<td>Unicellular</td>
<td>trichocyst</td>
</tr>
<tr>
<td>Plasmodium (as in a slime mold)</td>
<td>pseudopodium</td>
<td>Filamentous</td>
<td></td>
</tr>
<tr>
<td>test (as in radiolarian)</td>
<td></td>
<td>Colonial</td>
<td></td>
</tr>
<tr>
<td>axopodium</td>
<td></td>
<td>membranous</td>
<td></td>
</tr>
</tbody>
</table>