Chapter 23 Exercises

Review Questions

1. What event is thought to have contributed to the evolution of eukaryotes?
- **a.** global warming
- **b.** glaciation
- **c.** volcanic activity
- **d.** oxygenation of the atmosphere

2. Which characteristic is shared by prokaryotes and eukaryotes?
- **a.** cytoskeleton
- **b.** nuclear envelope
- **c.** DNA-based genome
- **d.** mitochondria

3. Mitochondria most likely evolved by _____.
- **a.** a photosynthetic cyanobacterium
- **b.** cytoskeletal elements
- **c.** endosymbiosis
- **d.** membrane proliferation

4. Which of these protists is believed to have evolved following a secondary endosymbiosis?
- **a.** green algae
- **b.** cyanobacteria
- **c.** red algae
- **d.** chlorarachniophytes

5. In 2016, scientists published the genome of *Monocercomonoides* and demonstrated that this organism has no detectable mitochondrial genes. However, its genome was arranged in linear chromosomes wrapped around histones which are contained within the nucleus. *Monocercomonoides* is therefore a(n) _____.
- **a.** bacterium
- **b.** archaean
- **c.** eukaryote
- **d.** endosymbiont

6. Which of the following observations about a bacterium would distinguish it from the last eukaryotic common ancestor?
- **a.** a double-stranded DNA genome
- **b.** lack of a membrane-bound structure surrounding the genome
- **c.** fatty acids in the lipid bilayer of the plasma membrane
- **d.** enclosed by a cell wall

7. Protists that have a pellicle are surrounded by _____.
- **a.** silica dioxide
- **b.** calcium carbonate
- **c.** carbohydrates
- **d.** proteins

8. Protists with the capabilities to perform photosynthesis and to absorb nutrients from dead organisms are called _____.
- **a.** photoautotrophs
- **b.** mixotrophs
- **c.** saprobes
- **d.** heterotrophs

9. Which of these locomotor organs would likely be the shortest?
- **a.** a flagellum
- **b.** a cilium
- **c.** an extended pseudopod
- **d.** a pellicle

10. Alternation of generations describes which of the following?
- **a.** The haploid form can be multicellular; the diploid form is unicellular.
- **b.** The haploid form is unicellular; the diploid form can be multicellular.
- **c.** Both the haploid and diploid forms can be multicellular.
- **d.** Neither the haploid nor the diploid forms can be multicellular.

11. The amoeba *E. histolytica* is a pathogen that forms liver abscesses in infected individuals. Its metabolic classification is most likely _____.
- **a.** anaerobic heterotroph
- **b.** mixotroph
- **c.** aerobic phototroph
- **d.** phagocytic autotroph

12. Which protist group exhibits mitochondrial remnants with reduced functionality?
- **a.** slime molds
- **b.** diatoms
- **c.** parabasalids
- **d.** dinoflagellates

13. Conjugation between two *Paramecia* produces _____ total daughter cells.
a. 2 **b.** 4 **c.** 8 **d.** 16

14. What is the function of the raphe in diatoms?
a. locomotion
b. defense
c. capturing food
d. photosynthesis

15. What genus of protists appears to contradict the statement that unicellularity restricts cell size?
a. *Dictyostelium*
b. *Ulva*
c. *Plasmodium*
d. *Caulerpa*

16. A marine biologist analyzing water samples notices a protist with a calcium carbonate shell that moves by pseudopodia extension. The protist is likely to be closely related to which species?
a. *Fuligo septica* (dog vomit slime mold)
b. *Circogonia icosahedra* (radiolarian)
c. *Euglena viridis*
d. *Ammonia tepida*

17. An example of carbon fixation is _____.
a. photosynthesis
b. decomposition
c. phagocytosis
d. parasitism

18. Which parasitic protist evades the host immune system by altering its surface proteins with each generation?
a. *Paramecium caudatum*
b. *Trypanosoma brucei*
c. *Plasmodium falciparum*
d. *Phytophthora infestans*

19. Which of the following is *not* a way that protists contribute to the food web?
a. They fix carbon into organic molecules.
b. They occupy the apex producer niche.
c. They enter symbiotic relationships with animals.
d. They recycle nutrients back into the carbon and nitrogen cycles.

Critical Thinking Questions

20. Describe the hypothesized steps in the origin of eukaryotic cells.

21. Some aspects of eukaryotes are more similar to Archaea, while other aspects of eukaryotic cell composition appear more closely related to Bacteria. Explain how endosymbiosis could resolve this paradox.

22. Explain in your own words why sexual reproduction can be useful if a protist's environment changes.

23. *Giardia lamblia* is a cyst-forming protist parasite that causes diarrhea if ingested. Given this information, against what type(s) of environments might *G. lamblia* cysts be particularly resistant?

24. Explain how the definition of protists ensures that the kingdom Protista includes a wide diversity of cellular structures. Provide an example of two different structures that perform the same function for their respective protist.

25. The chlorophyte (green algae) genera *Ulva* and *Caulerpa* both have macroscopic leaflike and stemlike structures, but only *Ulva* species are considered truly multicellular. Explain why.

26. Why might a light-sensing eyespot be ineffective for an obligate saprobe? Suggest an alternative organ for a saprobic protist.

27. Opisthokonta includes animals and fungi as well as protists. Describe the key feature of this phylum and an example of how an organism in each kingdom uses this feature.

28. Describe two ways in which *Paramecium* differ from the projected traits of the last eukaryotic common ancestor.

29. How does killing *Anopheles* mosquitoes affect the *Plasmodium* protists?

30. Without treatment, why does African sleeping sickness invariably lead to death?

31. Describe how increasing stress to the ocean would affect a food chain containing zooxanthellae, corals, parrotfish, and sharks.