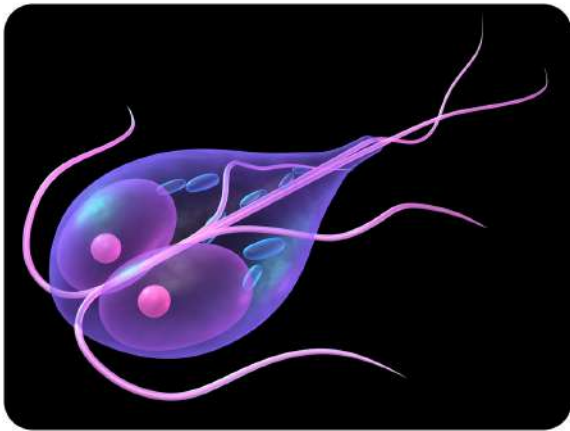


# Chapter 14

## Eukaryotes: Protists and Fungi Worksheets



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- **Lesson 14.1: Introduction to Protists**
- **Lesson 14.2: Types of Protists**
- **Lesson 14.3: Introduction to Fungi**
- **Lesson 14.4: Ecology of Fungi**
- **Lesson 14.5: Protists, Fungi, and Human Disease**

# 14.1 Introduction to Protists

## Lesson 14.1: True or False

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

*Write true if the statement is true or false if the statement is false.*

- \_\_\_\_\_ 1. Protists are prokaryotes.
- \_\_\_\_\_ 2. There is currently no scientific evidence supporting the endosymbiotic theory.
- \_\_\_\_\_ 3. According to the endosymbiotic theory, eukaryotic cells evolved from prokaryotic cells.
- \_\_\_\_\_ 4. According to the endosymbiotic theory, mitochondria evolved from small aerobic bacteria that were engulfed by a larger prokaryotic cell.
- \_\_\_\_\_ 5. According to the endosymbiotic theory, chloroplasts evolved from small protists.
- \_\_\_\_\_ 6. Chloroplasts, but not mitochondria, have DNA.
- \_\_\_\_\_ 7. Chloroplasts and mitochondria are surrounded by membranes.
- \_\_\_\_\_ 8. Protists contain organelles.
- \_\_\_\_\_ 9. All protists are multicellular.
- \_\_\_\_\_ 10. Most protists require a watery environment in which to live.
- \_\_\_\_\_ 11. Protists have no way of moving on their own; they must hitch a ride with a motile organism.
- \_\_\_\_\_ 12. Algae are protists.
- \_\_\_\_\_ 13. Spores can be produced by some protists as a response to harsh conditions in their environment.
- \_\_\_\_\_ 14. Some protists can carry out photosynthesis.
- \_\_\_\_\_ 15. Protists cannot reproduce sexually.

# Lesson 14.1: Critical Reading

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

Read these passages from the text and answer the questions that follow.

## Evolution of Protists

Scientists think that protists are the oldest eukaryotes. If so, they must have evolved from prokaryotic cells. How did this happen? The endosymbiotic theory provides the most widely accepted explanation. That's because it is well supported by evidence.

## The First Eukaryotic Cells

According to the endosymbiotic theory, the first eukaryotic cells evolved from a symbiotic relationship between two or more prokaryotic cells. Smaller prokaryotic cells were engulfed by (or invaded) larger prokaryotic cells. The small cells (now called endosymbionts) benefited from the relationship by getting a safe home and nutrients. The large cells (now called hosts) benefited by getting some of the organic molecules or energy released by the endosymbionts. Eventually, the endosymbionts evolved into organelles of the host cells. After that, neither could live without the other.

Some of the endosymbionts were aerobic bacteria. They were specialized to break down chemicals and release energy. They evolved into the mitochondria of eukaryotic cells. Some of the small cells were cyanobacteria. They were specialized for photosynthesis. They evolved into the chloroplasts of eukaryotic cells.

## Evidence for Endosymbiotic Theory

Many pieces of evidence support the endosymbiotic theory. For example:

- Mitochondria and chloroplasts contain DNA that is different from the DNA found in the cell nucleus. Instead, it is similar to the circular DNA of bacteria.
- Mitochondria and chloroplasts are surrounded by their own plasma membranes, which are similar to bacterial membranes.
- New mitochondria and chloroplasts are produced through a process similar to binary fission. Bacteria also reproduce through binary fission.
- The internal structure and biochemistry of chloroplasts is very similar to that of cyanobacteria.

## Questions

1. What does the endosymbiotic theory attempt to explain?
  
  
  
  
  
  
  
  
  
  
2. What benefits did the ancient endosymbionts get from their host cells?
  
  
  
  
  
  
  
  
  
  
3. What benefits did the host cells get from the endosymbionts?



## Lesson 14.1: Multiple Choice

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

Circle the letter of the correct choice.

- Which of the following is **not** a principle of the endosymbiotic theory?
  - Mitochondria evolved from aerobic bacteria that were engulfed by a larger prokaryotic cell.
  - Chloroplasts evolved from endosymbiotic photosynthetic bacteria.
  - Prokaryotic cells evolved from eukaryotic cells.
  - The first eukaryotic cells evolved from a mutually beneficial relationship between two or more prokaryotic cells.
- How are mitochondria and chloroplasts similar?
  - They are both organelles in eukaryotic cells.
  - They are both surrounded by membranes.
  - They divide by binary fission.
  - all of the above
- Which location is least likely to have a population of protists?
  - desert
  - damp soil
  - ocean
  - lake
- Cilia
  - are false feet.
  - are short appendages that help some protists move.
  - contain all of the DNA in a protist.
  - all of the above
- The algae *Spirogyra* produces spores
  - when conditions in their environment are ideal.
  - to get rid of extra chloroplasts.
  - when conditions in their environment become unfavorable.
  - as a way to make food.
- The fusion of two *Spirogyra* spores to form a diploid zygote is an example of
  - asexual reproduction.
  - sexual reproduction.
  - binary fission.
  - triploid fission.
- Ingestive protists obtain food by
  - photosynthesis.
  - diffusion.
  - osmosis.
  - engulfing the food.
- Photosynthesis is
  - the process of engulfing food particles.
  - the process of transforming light energy, carbon dioxide, and water into chemical energy (food).
  - a type of cell movement.

(d) none of the above.

# Lesson 14.1: Vocabulary I

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

*Match the vocabulary word with the proper definition.*

## Definitions

- \_\_\_\_\_ 1. the simplest eukaryotes
- \_\_\_\_\_ 2. a mutually beneficial relationship between a cell and the cell that engulfed it
- \_\_\_\_\_ 3. longer, whip-like appendages that aid movement
- \_\_\_\_\_ 4. an organelle that carries out photosynthesis
- \_\_\_\_\_ 5. cell without a nucleus
- \_\_\_\_\_ 6. cell with a nucleus
- \_\_\_\_\_ 7. an organelle that carries out cellular respiration
- \_\_\_\_\_ 8. short, whip-like appendages that aid movement
- \_\_\_\_\_ 9. the ability to move
- \_\_\_\_\_ 10. “false feet”
- \_\_\_\_\_ 11. a reproductive cell produced by protists and other organisms
- \_\_\_\_\_ 12. prokaryotes that use oxygen for cellular respiration

## Terms

- a. aerobic bacteria
- b. chloroplast
- c. cilia
- d. endosymbiosis
- e. eukaryote
- f. flagella
- g. mitochondria
- h. motility
- i. pseudopods
- j. protists
- k. prokaryote
- l. spore

## Lesson 14.1: Vocabulary II

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

*Fill in the blank with the appropriate term.*

1. A term for the ability to move is \_\_\_\_\_.
2. Whip-like cellular appendages some protists use to help them move are \_\_\_\_\_.
3. Cells that live inside other cells in a mutually beneficial relationship are called \_\_\_\_\_.
4. \_\_\_\_\_ are the simplest eukaryotes.
5. A temporary, foot-like extension of the protist's cytoplasm that it can use for movement is a \_\_\_\_\_ - \_\_\_\_\_.
6. Mitochondria are cellular \_\_\_\_\_.
7. Photosynthesis in protists happens in the \_\_\_\_\_.
8. Protists have a nucleus containing \_\_\_\_\_.
9. \_\_\_\_\_ are the haploid *Spirogyra* cells that can survive in harsh environments.
10. Haploid cells are produced from a diploid zygote by \_\_\_\_\_.
11. Protists can be single celled or \_\_\_\_\_.
12. Protists have get food by \_\_\_\_\_, \_\_\_\_\_, or \_\_\_\_\_.



## Lesson 14.1: Critical Writing

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_-

*Thoroughly answer the question below. Use appropriate academic vocabulary and clear and complete sentences.*

Many protists are capable of both asexual and sexual reproduction, including *Spirogyra*. How does *Spirogyra* benefit from being able to reproduce by both asexual and sexual reproduction?

# 14.2 Types of Protists

## Lesson 14.2: True or False

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

*Write true if the statement is true or false if the statement is false.*

- \_\_\_\_\_ 1. Protists are often classified based on how similar they are to animals, fungi, or plants.
- \_\_\_\_\_ 2. Protozoa are fungus-like protists.
- \_\_\_\_\_ 3. Many protists are single-celled organisms.
- \_\_\_\_\_ 4. Some protists are multicellular organisms.
- \_\_\_\_\_ 5. Some protozoa eat bacteria.
- \_\_\_\_\_ 6. Some protists eat algae.
- \_\_\_\_\_ 7. Malaria is caused by algae that live in protozoa.
- \_\_\_\_\_ 8. Sporozoan protozoa are those that move only when they are adults.
- \_\_\_\_\_ 9. Diatoms are a type of protozoa.
- \_\_\_\_\_ 10. Kelp are fungus-like protists.
- \_\_\_\_\_ 11. Kelp are multicellular organisms that live in the ocean.
- \_\_\_\_\_ 12. All algae have roots, stems, and leaves.
- \_\_\_\_\_ 13. All algae reproduce only by sexual reproduction.
- \_\_\_\_\_ 14. On rotting logs, one may find slime molds.
- \_\_\_\_\_ 15. Fish may have parasites called water molds.

## Lesson 14.2: Critical Reading

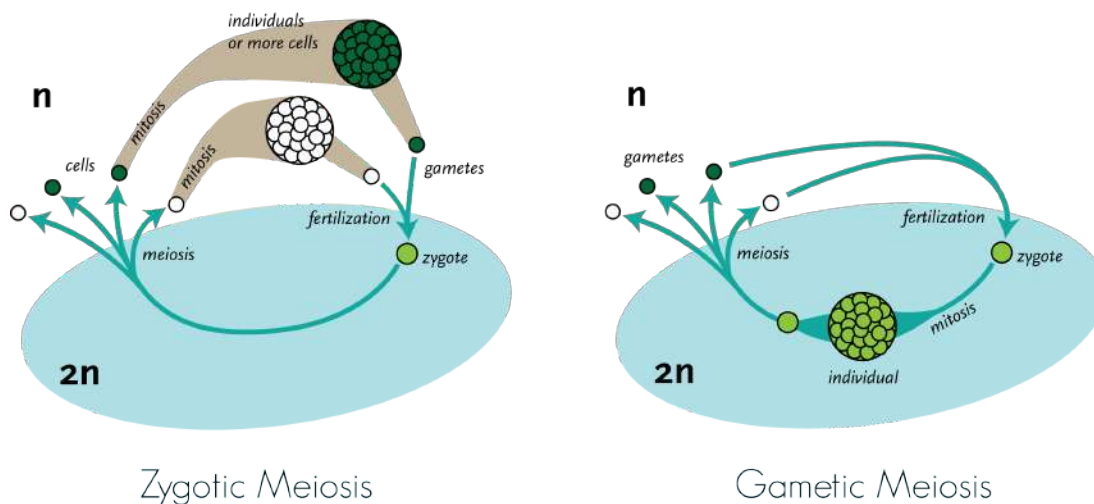
Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

Read these passages from the text and answer the questions that follow.

### Reproduction of Algae

Algae have varied life cycles. Two examples are shown in the figure below. Both cycles include phases of asexual reproduction (haploid,  $n$ ) and sexual reproduction (diploid,  $2n$ ). Why go to so much trouble to reproduce? Asexual reproduction is fast, but it doesn't create new genetic variation. Sexual reproduction is more complicated and risky, but it creates new gene combinations. Each strategy may work better under different conditions. Rapid population growth is adaptive when conditions are favorable. Genetic variation helps ensure that some organisms will survive if the environment changes.

Life Cycles of Algae: Two Examples



Life Cycles of Algae: Two Examples - Zygotic meiosis and Gametic meiosis. In life cycle A, diploid ( $2n$ ) zygotes undergo meiosis and produce haploid ( $n$ ) gametes. The gametes undergo mitosis and produce many additional copies of themselves. How is life cycle B different from life cycle A? (Image courtesy of CK-12 Foundation and under the Creative Commons license CC-BY-NC-SA 3.0.)

#### Questions

1. What are the two types of life cycles of algae shown in the figure?
2. What is meiosis?
3. In the zygotic meiosis life cycle, what is the ploidy level ( $n$  or  $2n$ ) of the individuals? Explain your reasoning.

4. In the gametic meiosis life cycle, what is the ploidy level ( $n$  or  $2n$ ) of the individuals? Explain your reasoning.

5. What are the advantages of asexual and sexual reproduction? What are the disadvantages of each?

## Lesson 14.2: Multiple Choice

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

*Circle the letter of the correct choice.*

- Protozoa can get their food by
  - eating algae.
  - eating dead organic material.
  - preying on other organisms and engulfing and digesting them.
  - all of the above.
- Which of the following is **not** a class of protozoa?
  - flagellate
  - sporozoan
  - bacteria
  - amoeboid
- The type of protozoan that uses pseudopods (false feet) to move is
  - a ciliate protozoan.
  - an amoeboid protozoan.
  - a sporozoan.
  - an algae.
- Algae are considered plant-like because
  - they have roots, stems, and leaves.
  - they are often unicellular.
  - they eat dead organic matter.
  - they have chloroplasts and carry out photosynthesis.
- The common feature shared by dinoflagellates, euglenids, green algae, and red algae is that they
  - all have chlorophyll.
  - all are multicellular organisms.
  - never carry out photosynthesis.
  - all of the above
- Fungus-like protists have
  - cell walls made of cellulose.
  - cell walls made of chitin.
  - chloroplasts for photosynthesis.
  - none of the above.
- Slime molds will start to swarm when
  - the sun is out.
  - it is a full moon.
  - food is scarce.
  - there is a lot of pollen in the air.
- Water molds are
  - a type of fungus-like protist.
  - a type of animal-like protist.
  - found only in the ocean.
  - found only in Australia.

## Lesson 14.2: Vocabulary I

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

*Match the vocabulary word with the proper definition.*

### Definitions

- \_\_\_\_\_ 1. animal-like protists
- \_\_\_\_\_ 2. an organism that hunts living organisms and consumes them as food
- \_\_\_\_\_ 3. multicellular seaweed
- \_\_\_\_\_ 4. fungus-like protist typically found on decaying organic matter such as rotting logs
- \_\_\_\_\_ 5. an organism that uses flagella for motility
- \_\_\_\_\_ 6. an organism that uses psuedopods for motility
- \_\_\_\_\_ 7. an organism that uses cilia for motility
- \_\_\_\_\_ 8. an organism that consumes plants
- \_\_\_\_\_ 9. fungus-like protist typically found on surface water and moist soil
- \_\_\_\_\_ 10. type of protozoa that cannot move in the adult stage
- \_\_\_\_\_ 11. plant-like protists
- \_\_\_\_\_ 12. an organism that gets food from dead organic matter

### Terms

- a. algae
- b. amoeboid
- c. ciliate
- d. decomposers
- e. flagellate
- f. herbivore
- g. kelp
- h. predator
- i. protozoa
- j. slime mold
- k. sporozoa
- l. water mold

## Lesson 14.2: Vocabulary II

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

*Fill in the blank with the appropriate term.*

1. *Plasmodium*, the organism that causes malaria, is the \_\_\_\_\_ type of protozoan.
2. Some members of the \_\_\_\_\_ group of protists infect plants and destroy crops such as potatoes, corn, grapes, and lettuce.
3. When food is scarce, cells of the \_\_\_\_\_ group of protists swarm together and crawl as a mass, ingesting any food they find along the way.
4. The \_\_\_\_\_ are animal-like protists.
5. The \_\_\_\_\_ protozoa use flagella to move.
6. The \_\_\_\_\_ are multicellular seaweeds that can grow as large as some trees.
7. \_\_\_\_\_ are the unicellular protists that can carry out photosynthesis.
8. \_\_\_\_\_ capture and engulf prey.
9. The \_\_\_\_\_ protozoa uses pseudopods to move.
10. \_\_\_\_\_ eat algae.
11. \_\_\_\_\_ eat dead organic matter.
12. The \_\_\_\_\_ protozoa use cilia for motility.

## Lesson 14.2: Critical Writing

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

*Thoroughly answer the question below. Use appropriate academic vocabulary and clear and complete sentences.*

What are some common characteristics of all protists? What are the main distinguishing characteristics of the protozoa, algae, and fungus-like protists?



# 14.3 Introduction to Fungi

## Lesson 14.3: True or False

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

*Write true if the statement is true or false if the statement is false.*

- \_\_\_\_\_ 1. Fungi are a kingdom in the domain Prokarya.
- \_\_\_\_\_ 2. Mushrooms are fungi.
- \_\_\_\_\_ 3. Yeasts are fungi.
- \_\_\_\_\_ 4. Amoeba are fungi.
- \_\_\_\_\_ 5. Fungi spend most of their life cycle in the diploid state.
- \_\_\_\_\_ 6. Fungi have cell walls made of cellulose, just like plants do.
- \_\_\_\_\_ 7. Many fungi grow as hyphae.
- \_\_\_\_\_ 8. Most fungi reproduce only by sexual reproduction.
- \_\_\_\_\_ 9. A fungal spore is a diploid cell produced by meiosis of the parent cell.
- \_\_\_\_\_ 10. Fungal spores can be transported by wind, water, and even by traveling on other organisms.
- \_\_\_\_\_ 11. A yeast cell produced by budding off of a parent cell is genetically identical to the parent cell.
- \_\_\_\_\_ 12. Mating of two haploid fungal hyphae produces a diploid zygospore.
- \_\_\_\_\_ 13. Fungi first colonized land at about the same time as plants did.
- \_\_\_\_\_ 14. In general, fungi are able to move themselves around.
- \_\_\_\_\_ 15. Baker's yeast is a fungus.

## Lesson 14.3: Critical Reading

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

*Read these passages from the text and answer the questions that follow.*

### Reproduction of Fungi

The majority of fungi can reproduce both asexually and sexually. This allows them to adjust to conditions in the environment. They can spread quickly through asexual reproduction when conditions are stable. They can increase their genetic variation through sexual reproduction when conditions are changing and variation may help them survive.

### Asexual Reproduction

Almost all fungi reproduce asexually by producing spores. A fungi spore is a haploid cell produced by mitosis from a haploid parent cell. It is genetically identical to the parent cell. Fungi spores can develop into new haploid individuals without being fertilized.

Spores may be dispersed by moving water, wind, or other organisms. Some fungi even have “cannons” that “shoot” the spores far from the parent organism. This helps to ensure that the offspring will not have to compete with the parents for space or other resources. You are probably familiar with puffballs. They release a cloud of spores when knocked or stepped on. Wherever the spores happen to land, they do not germinate until conditions are favorable for growth. Then they develop into new hyphae. Yeasts do not produce spores. Instead, they reproduce asexually by budding. **Budding** is the pinching off of an offspring from the parent cell. The offspring cell is genetically identical to the parent.

### Sexual Reproduction

Sexual reproduction also occurs in virtually all fungi. This involves mating between two haploid hyphae. During mating, two haploid parent cells fuse, forming a diploid spore called a **zygospore**. The zygospore is genetically different from the parents. After the zygospore germinates, it can undergo meiosis, forming haploid cells that develop into new hyphae.

### Questions

1. How do fungi benefit from being able to reproduce both asexually and sexually?
2. What are fungal spores? How are they made?
3. Why have fungi evolved mechanisms for dispersal of their spores? Name a few of these mechanisms.
4. How do many yeast reproduce asexually? What is this process called?

5. How do fungi mate?

## Lesson 14.3: Multiple Choice

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

*Circle the letter of the correct choice.*

- The thread-like filaments of fungi are called
  - hyphae.
  - spores.
  - zygospores.
  - chitin.
- The largest known fungus is
  - in the Sahara desert and is 3 square feet.
  - in Antarctica and covers the entire surface of the continent.
  - in Oregon and covers 8.9 square kilometers.
  - none of the above.
- When environmental conditions are favorable, \_\_\_\_\_ is generally more beneficial for a fungal species.
  - asexual reproduction
  - sexual reproduction
  - moving to a new location
  - stopping reproduction completely
- Sexual reproduction of fungi involves
  - production of genetically identical offspring.
  - fusion of six haploid parent cells to form one giant cell.
  - fusion of two haploid parent cells to form a zygospore.
  - fusion of two diploid parent cells to form a tetraploid spore.
- Germination of a diploid zygospore followed by meiosis produces
  - four haploid cells.
  - four diploid cells.
  - two diploid cells.
  - a yeast bud.
- The earliest fungi evolved
  - independently from thousands of different ancestors.
  - at least 600 million years ago.
  - before prokaryotes.
  - after the first humans appeared on the earth.
- One way that fungi are similar to plants is
  - they both have cell walls made of cellulose.
  - they both carry out photosynthesis.
  - they both move rapidly from place to place.
  - none of the above.
- The phylum of fungi that is found in Antarctica, is often part of a symbiotic relationship, and is found in terrestrial ecosystems throughout the world is
  - protozoa.
  - ascomycota.

- (c) algae.
- (d) water mold.

## Lesson 14.3: Vocabulary I

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

*Match the vocabulary word with the proper definition.*

### Definitions

- \_\_\_\_\_ 1. a kingdom whose members include mushrooms
- \_\_\_\_\_ 2. thread-like filaments consisting of haploid cells connected end-to-end and which can form branches
- \_\_\_\_\_ 3. having two copies of each kind of chromosome ( $2n$ )
- \_\_\_\_\_ 4. two sequential cell divisions producing four cells, each of which has half the number of chromosomes as the parent cell
- \_\_\_\_\_ 5. the general name for cell division in all organisms that produces cells that have the same number of chromosomes as the parent cell
- \_\_\_\_\_ 6. a diploid spore formed by fusion of two haploid cells
- \_\_\_\_\_ 7. the material that makes up the cell wall of fungi
- \_\_\_\_\_ 8. the material that makes up the cell wall of plants
- \_\_\_\_\_ 9. a mass of fungal hyphae
- \_\_\_\_\_ 10. a form of asexual reproduction in yeast
- \_\_\_\_\_ 11. a reproductive cell specialized for dispersal and survival in harsh environmental conditions
- \_\_\_\_\_ 12. having one copy of each kind of chromosome ( $n$ )

### Terms

- a. budding
- b. cellulose
- c. chitin
- d. diploid
- e. haploid
- f. fungi
- g. hyphae
- h. meiosis
- i. mitosis
- j. mycelium
- k. spore
- l. zygospore

## Lesson 14.3: Vocabulary II

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

*Fill in the blank with the appropriate term.*

1. Fusion of two haploid fungal cells produces a \_\_\_\_\_.
2. \_\_\_\_\_ is the kingdom whose members include baker's yeast and mushrooms.
3. Many fungi can make thread-like filaments called \_\_\_\_\_, which consists of haploid cells aligned end-to-end and which may form branches.
4. Haploid cells can be formed via \_\_\_\_\_ of a diploid zygospore.
5. A haploid offspring cell is produced by \_\_\_\_\_ of a haploid parent cell.
6. A puffball mushroom releases \_\_\_\_\_ into the air when it is disturbed.
7. A \_\_\_\_\_ is a mass of fungal hyphae.
8. A \_\_\_\_\_ cell is said to have  $2n$  number of chromosomes.
9. A \_\_\_\_\_ cell is said to have  $n$  number of chromosomes.
10. The cell wall of a growing plant cell is of made primarily of \_\_\_\_\_.
11. The cell wall of a fungus is made of \_\_\_\_\_.
12. Yeast can reproduce asexually by \_\_\_\_\_, a process in which a bleb-like extension pinches off from the parent cell.

## Lesson 14.3: Critical Writing

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

*Thoroughly answer the question below. Use appropriate academic vocabulary and clear and complete sentences.*

Why were fungi once classified as plants? What findings led to their reclassification into their own kingdom?



# 14.4 Ecology of Fungi

## Lesson 14.4: True or False

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

*Write true if the statement is true or false if the statement is false.*

- \_\_\_\_\_ 1. Fungi make chlorophyll.
- \_\_\_\_\_ 2. Fungi carry out photosynthesis.
- \_\_\_\_\_ 3. Fungi are heterotrophs.
- \_\_\_\_\_ 4. Most fungi use dead organisms as their food.
- \_\_\_\_\_ 5. When fungi break down dead organic matter, nutrients are also released, and these nutrients can be used by other living organisms.
- \_\_\_\_\_ 6. In all parasitic relationships involving fungi, the fungi are attacked by an animal parasite.
- \_\_\_\_\_ 7. Fungi make enzymes that help break down organic compounds.
- \_\_\_\_\_ 8. Bacteria, but not fungi, can break down the cellulose in plant cell walls.
- \_\_\_\_\_ 9. Fungi use their hyphae to access organic matter not reachable to other organisms.
- \_\_\_\_\_ 10. Fungi are the primary producers of carbon-containing compounds in forests.
- \_\_\_\_\_ 11. A mycorrhiza is a parasitic relationship between a plant and a fungus.
- \_\_\_\_\_ 12. A lichen is a mutualistic relationship between a photosynthetic organism (such as a cyanobacterium) and a fungus.
- \_\_\_\_\_ 13. Lichens are often found on rocks.
- \_\_\_\_\_ 14. Some fungi make antibiotics such as penicillin.
- \_\_\_\_\_ 15. Human hormones such as insulin can be produced by genetically engineered fungi.



5. Why do you think that parasitism exists, when one of the organisms is harmed by the relationship?

## Lesson 14.4: Multiple Choice

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

*Circle the letter of the correct choice.*

1. Fungi are \_\_\_\_\_ like \_\_\_\_\_.
  - (a) autotrophs, plants
  - (b) autotrophs, animals
  - (c) heterotrophs, animals
  - (d) heterotrophs, plants
2. Saprotrophs get their food
  - (a) by doing photosynthesis.
  - (b) from absorbing dead organic matter.
  - (c) by engulfing living organisms .
  - (d) by eating live plants.
3. Some of the nutrients that plants absorb from the soil
  - (a) are released into the soil from dead organic matter by fungi.
  - (b) are cellulose and lignin.
  - (c) are saprotrophs engulfed by the plant's leaves.
  - (d) none of the above
4. Fungal hyphae
  - (a) are long filaments that aid in absorption of water and minerals.
  - (b) can penetrate deep into organic matter.
  - (c) release enzymes that can digest organic matter such as cellulose and lignin.
  - (d) all of the above
5. Parasitic fungi
  - (a) help their host.
  - (b) harm their host.
  - (c) carry out photosynthesis.
  - (d) make lignin.
6. Mycorrhiza is
  - (a) a parasitic relationship between a plant and an animal.
  - (b) a mutualistic relationship between a plant and an animal.
  - (c) a mutualistic relationship between a plant and a fungus.
  - (d) a parasitic relationship between a plant and a fungus.
7. A lichen is
  - (a) a parasitic relationship between a plant and an animal.
  - (b) a parasitic relationship between a plant and a fungus.
  - (c) a mutualistic relationship between an animal and a fungus.
  - (d) a mutualistic relationship between a fungus and a photosynthetic organism.
8. Penicillin is
  - (a) an antibiotic produced by plants.
  - (b) an antibiotic produced by a fungus.
  - (c) a parasite of some insects.
  - (d) a mutualism between a fungus and an animal.

## Lesson 14.4: Vocabulary I

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

*Match the vocabulary word with the proper definition.*

### Definitions

- \_\_\_\_\_ 1. a mutualism between a fungus and a photosynthetic organism (an algae or a cyanobacterium)
- \_\_\_\_\_ 2. a type of fungus that gets its food from dead organisms
- \_\_\_\_\_ 3. a relationship between two organisms that helps both organisms
- \_\_\_\_\_ 4. a relationship between two organisms in which one is helped and the other is harmed
- \_\_\_\_\_ 5. a kingdom whose members include yeasts, mushrooms, and molds
- \_\_\_\_\_ 6. a kind of fungus used by humans in making bread and beer
- \_\_\_\_\_ 7. a mutualism between a fungus and the roots of a plant
- \_\_\_\_\_ 8. an organism that can make its own food
- \_\_\_\_\_ 9. an organism that cannot make its own food and gets food made by other organisms
- \_\_\_\_\_ 10. an organism that gets organic compounds from dead organisms
- \_\_\_\_\_ 11. a carbon-containing molecule that is the main building block of plant cells walls
- \_\_\_\_\_ 12. long, thin, often branching filaments made of fungal cells; helps with absorption of water and nutrients

### Terms

- a. autotroph
- b. cellulose
- c. decomposer
- d. fungi
- e. heterotroph
- f. hyphae
- g. lichen
- h. mycorrhiza
- i. mutualism
- j. parasitism
- k. saprotroph
- l. yeast

## Lesson 14.4: Vocabulary II

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

*Fill in the blank with the appropriate term.*

1. A \_\_\_\_\_ is an organism that cannot make its own food and gets food made by other organisms.
2. \_\_\_\_\_ is a relationship between two organisms that helps both organisms.
3. The kingdom of \_\_\_\_\_ includes members such as yeasts, mushrooms, and molds.
4. \_\_\_\_\_ is the main building block of plant cells walls.
5. \_\_\_\_\_ is a mutualism between a fungus and the roots of a plant.
6. Long, thin, often branching filaments made of fungal cells that help with absorption of water and nutrients are called \_\_\_\_\_.
7. An organism that can make its own food is an \_\_\_\_\_.
8. An organism that gets organic compounds from dead organisms is called a \_\_\_\_\_.
9. \_\_\_\_\_ is a kind of fungus used by humans in making bread and beer.
10. A \_\_\_\_\_ is a type of fungus that gets its food from dead organisms.
11. \_\_\_\_\_ is a a relationship between two organism in which one is helped and the other is harmed.
12. A \_\_\_\_\_ is a mutualism between a fungus and a photosynthetic organism (an algae or a cyanobacterium).

## Lesson 14.4: Critical Writing

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

*Thoroughly answer the question below. Use appropriate academic vocabulary and clear and complete sentences.*

Can fungi be helpful to humans? Support your answer with specific examples.

# 14.5 Protists, Fungi, and Human Disease

## Lesson 14.5: True or False

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

*Write true if the statement is true or false if the statement is false.*

- \_\_\_\_\_ 1. Of all the protists, algae cause the most disease in humans.
- \_\_\_\_\_ 2. Mutualistic relationships between protists and humans cause harm to human health.
- \_\_\_\_\_ 3. Sleeping sickness is a disease caused by a protozoan, which is an animal-like protist.
- \_\_\_\_\_ 4. Diseases such as sleeping sickness and Chagas disease are spread to humans by insects.
- \_\_\_\_\_ 5. The work of thousands of researchers at the same time was needed to discover what caused Chagas disease.
- \_\_\_\_\_ 6. One definition of vector is a living organism that transfers a disease-causing organism to a host.
- \_\_\_\_\_ 7. Without treatment, Chagas disease always goes away by itself.
- \_\_\_\_\_ 8. Giardia are fungi with many hyphae.
- \_\_\_\_\_ 9. Symptoms of giardiasis include abdominal pain, diarrhea, and fever.
- \_\_\_\_\_ 10. Protozoa in the genus *Plasmodium* cause malaria.
- \_\_\_\_\_ 11. Malaria is spread only when people drink contaminated water.
- \_\_\_\_\_ 12. Symptoms of malaria include abdominal pain, diarrhea, and increased energy.
- \_\_\_\_\_ 13. Malaria is common in the United States in the 21st Century.
- \_\_\_\_\_ 14. It is easy to tell if a mushroom is poisonous just by looking at it.
- \_\_\_\_\_ 15. Ringworm, a skin disease that shows itself as a ring-shaped rash, is caused by a fungus.



## Lesson 14.5: Critical Reading

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

Read these passages from the text and answer the questions that follow.

### Fungi and Human Disease

Fungi cause human illness in three different ways: poisonings, parasitic infections, and allergic reactions. Fungal poisoning and fungal parasites are described below.

#### Fungal Poisoning

Many fungi protect themselves from parasites and predators by producing toxic chemicals. If people eat toxic fungi, they may experience digestive problems, hallucinations, organ failure, and even death. Most cases of mushroom poisoning are due to mistaken identity. That's because many toxic mushrooms look very similar to safe, edible mushrooms.

#### Fungal Parasites

Some fungi cause disease when they become human parasites. Two examples are fungi in the genera *Candida* and *Trichophyton*.

- *Candida* are yeast that cause **candidiasis**, commonly called a “yeast infection.” The yeast can infect the mouth or the vagina (in females). If yeast enter the blood, they cause a potentially life threatening illness. However, this is rare, except in people with a depressed immune system.
- *Trichophyton* are fungi that cause **ringworm**. This is a skin infection characterized by a ring-shaped rash. The rash may occur on the arms, legs, head, neck, or trunk. The same fungi cause **athlete's foot** when they infect the skin between the toes. Athlete's foot is the second most common skin disease in the U.S.

#### Questions

1. How do fungi make people sick?
2. Why is it extremely dangerous to eat the “destroying angel” mushroom?
3. What are *Candida*? How do they affect humans?
4. What is ringworm? What causes it?

5. How are ringworm and athlete's foot related?

## Lesson 14.5: Multiple Choice

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

Circle the letter of the correct choice.

- Humans can catch giardiasis by \_\_\_\_\_ the *Giardia* parasite.
  - drinking water contaminated with
  - breathing air containing
  - not having any contact with
  - all of the above
- Humans who live in \_\_\_\_\_ are at risk for getting malaria.
  - Alaska
  - Norway
  - Florida
  - Mexico
- Puffball mushrooms
  - are highly toxic.
  - are edible.
  - grow only in areas where there is malaria.
  - often cause hallucinations when eaten.
- Infection with *Candida* is life-threatening most often
  - in all people.
  - in people with immune systems that don't work well.
  - when it infects the mouth.
  - none of the above
- The second most common skin disease in the United States is
  - mushroom poisoning.
  - ringworm.
  - athlete's foot.
  - mold allergy.
- Symptoms of an allergy to mold may include
  - coughing.
  - trouble breathing.
  - sneezing.
  - all of the above.
- Allergies to mold
  - are very rare in humans.
  - are very common in humans.
  - occur only in children under two years old.
  - occur only in adults over 65 years old.
- Mold can grow
  - indoors.
  - outdoors.
  - only in deserts.
  - a and b

## Lesson 14.5: Vocabulary I

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

Match the vocabulary word with the proper definition.

### Definitions

- \_\_\_\_\_ 1. a kingdom including yeast, mushrooms, and molds
- \_\_\_\_\_ 2. technical name for a yeast infection caused by *Candida* fungi
- \_\_\_\_\_ 3. a disease spread by mosquitoes infected with a protozoan parasite
- \_\_\_\_\_ 4. the group of protozoa that causes malaria
- \_\_\_\_\_ 5. a fungal skin infection typified by a ring-shaped rash
- \_\_\_\_\_ 6. an infection caused by a *Trypanosoma* parasite and spread by an insect known as the “kissing bug”
- \_\_\_\_\_ 7. a group that includes protozoa with flagella that cause sleeping sickness
- \_\_\_\_\_ 8. an infection, most often in between the toes, by *Trichophyton* fungi
- \_\_\_\_\_ 9. a general name for an organism that can transmit a disease to humans
- \_\_\_\_\_ 10. animal-like protists
- \_\_\_\_\_ 11. a group of eukaryotic organisms including algae, slime molds, and protozoa
- \_\_\_\_\_ 12. a disease caused by a flagellate protozoan and transmitted through water or feces contaminated with this protozoan

### Terms

- a. athlete’s foot
- b. candidiasis
- c. Chagas disease
- d. fungi
- e. giardiasis
- f. malaria
- g. *Plasmodium*
- h. protist
- i. protozoa
- j. ringworm
- k. *Trypanosoma*
- l. vector

## Lesson 14.5: Vocabulary II

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

*Fill in the blank with the appropriate term.*

1. Mosquitoes are the \_\_\_\_\_ that transmits the *Plasmodium* protozoa that cause malaria.
2. A \_\_\_\_\_ spreads Chagas disease via an insect vector.
3. \_\_\_\_\_ is a common skin disease typified by a ring-shaped rash.
4. Mushrooms, yeast, and mold are all \_\_\_\_\_.
5. Algae, slime molds, water molds, and protozoa are all \_\_\_\_\_.
6. \_\_\_\_\_ is a common yeast infection.
7. \_\_\_\_\_ is a disease spread by a mosquito vector.
8. \_\_\_\_\_ are animal-like protists.
9. The second most common skin disease is \_\_\_\_\_.
10. People can get \_\_\_\_\_ by drinking water contaminated by this flagellated protozoan parasite.
11. \_\_\_\_\_ protozoa cause malaria.
12. A sometimes deadly disease spread by the “kissing bug” is \_\_\_\_\_.

## Lesson 14.5: Critical Writing

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

*Thoroughly answer the question below. Use appropriate academic vocabulary and clear and complete sentences.*

What are some possible strategies people could use to reduce the incidence of malaria, Chagas disease, and giardiasis?