Campbell's Biology, 9e **(Reece et al.)**
Chapter 31 Fungi

Though fungal divisions have traditionally been based on modes of sexual reproduction, molecular considerations are becoming more important. Consequently, no emphasis has been placed on the vagaries of sexual and asexual reproduction among various fungi in this Test Bank. Instead, new questions assess students' abilities to think logically about fungal morphology, genetics, and ecology. Two new sets of scenario questions deal with the biology of microsporidians and chytrids, fungi thought to play a substantial role in the worldwide decline of many amphibians.

Multiple-Choice Questions

1) The hydrolytic digestion of which of the following should produce monomers that are aminated (i.e., have an amine group attached) molecules of β-glucose?
A) insect exoskeleton
B) plant cell walls
C) fungal cell walls
D) Three of these responses are correct.
E) Two of these responses are correct.
Answer: E
Topic: Concept 31.1
Skill: Knowledge/Comprehension

2) If all fungi in an environment that perform decomposition were to suddenly die, then which group of organisms should benefit most, due to the fact that their fungal competitors have been removed?
A) plants
B) protists
C) prokaryotes
D) animals
E) mutualistic fungi
Answer: C
Topic: Concept 31.1
Skill: Application/Analysis

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 oxygen levels
E) larger bacterial populations
Answer: C
Topic: Concept 31.1
Skill: Application/Analysis

4) Which of the following is a characteristic of hyphate fungi (fungi featuring hyphae)?
A) They acquire their nutrients by phagocytosis.
B) Their body plan is a unicellular sphere.
C) Their cell walls consist mainly of cellulose microfibrils.
D) They are adapted for rapid directional growth to new food sources.
E) They reproduce asexually by a process known as budding.
Answer: D
Topic: Concept 31.1
Skill: Knowledge/Comprehension

5) The functional significance of porous septa in certain fungal hyphae is most similar to that represented by which pair of structures in animal cells and plant cells, respectively?
A) desmosomesÃtonoplasts
B) gap junctionsÃplasmodesmata
C) tight junctionsÃplastids
D) centriolesÃplastids
E) flagellaÃcentral vacuoles
Answer: B
Topic: Concept 31.1
Skill: Application/Analysis

6) What do fungi and arthropods have in common?
A) Both groups are commonly coenocytic.
B) The haploid state is dominant in both groups.
C) Both groups are predominantly heterotrophs that ingest their food.
D) The protective coats of both groups are made of chitin.
E) Both groups have cell walls.
Answer: D
Topic: Concept 31.1
Skill: Knowledge/Comprehension

7) In septate fungi, what structures allow cytoplasmic streaming to distribute needed nutrients, synthesized compounds, and organelles throughout the hyphae?
A) multiple chitinous layers in cross-walls
B) pores in cross-walls
C) complex microtubular cytoskeletons
D) two nuclei
E) tight junctions that form in cross-walls between cells
Answer: B
Topic: Concept 31.1
Skill: Knowledge/Comprehension

8) What accounts most directly for the extremely fast growth of a fungal mycelium?
A) rapid distribution of synthesized proteins by cytoplasmic streaming
B) a long tubular body shape
C) the readily available nutrients from their ingestive mode of nutrition
D) a dikaryotic condition that supplies greater amounts of proteins and nutrients
Answer: A
Topic: Concept 31.1
Skill: Knowledge/Comprehension

9) The vegetative (nutritionally active) bodies of most fungi are
A) composed of hyphae.
B) referred to as a mycelium.
C) usually underground.
D) Three of these responses are correct.
E) Two of these responses are correct.
Answer: D
Topic: Concept 31.1
Skill: Knowledge/Comprehension

10) Both fungus-farming ants and their fungi can synthesize the same structural polysaccharide from the β-glucose. What is this polysaccharide?
A) amylopectin
B) chitin
C) cellulose
D) lignin
E) glycogen
Answer: B
Topic: Concept 31.1
Skill: Application/Analysis

11) Consider two hyphae having equal dimensions: one from a septate species and the other from a coenocytic species. Compared with the septate species, the coenocytic species should have
A) fewer nuclei.
B) more pores.
C) less chitin.
D) less cytoplasm.
E) reduced cytoplasmic streaming.
Answer: C
Topic: Concept 31.1
Skill: Application/Analysis

12) Immediately after karyogamy occurs, which term applies?
A) plasmogamy
B) heterokaryotic
C) dikaryotic
D) diploid
Answer: D
Topic: Concept 31.2
Skill: Knowledge/Comprehension

13) 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
Answer: C
Topic: Concept 31.2
Skill: Knowledge/Comprehension

14) Plasmogamy can directly result in which of the following?
1. cells with a single haploid nucleus
2. heterokaryotic cells
3. dikaryotic cells
4. cells with two diploid nuclei
A) 1 or 2
B) 1 or 3
C) 2 or 3
D) 2 or 4
E) 3 or 4
Answer: C
Topic: Concept 31.2
Skill: Knowledge/Comprehension

15) After cytokinesis occurs in budding yeasts, the daughter cell has a
A) smaller nucleus and more cytoplasm than the mother cell.
B) smaller nucleus and less cytoplasm than the mother cell.
C) larger nucleus and less cytoplasm than the mother cell.
D) similar nucleus and less cytoplasm than the mother cell.
Answer: D
Topic: Concept 31.2
Skill: Knowledge/Comprehension

16) In most fungi, karyogamy does not immediately follow plasmogamy, which consequently
A) means that sexual reproduction can occur in specialized structures.
B) results in multiple diploid nuclei per cell.
C) allows fungi to reproduce asexually most of the time.
D) results in heterokaryotic or dikaryotic cells.
E) is strong support for the claim that fungi are not truly eukaryotic.
Answer: D
Topic: Concept 31.2
Skill: Application/Analysis

17) If all of their nuclei are equally active transcriptionally, then the cells of both dikaryotic and heterokaryotic fungi, in terms of the gene products they can make, are essentially
A) haploid.
B) diploid.
C) alloploid.
D) completely homozygous.
E) completely hemizygous.
Answer: B
Topic: Concept 31.2
Skill: Knowledge/Comprehension

18) Which process occurs in fungi and has the opposite effect on a cell's chromosome number than does meiosis I?
A) mitosis
B) plasmogamy
C) crossing over
D) binary fission
E) karyogamy
Answer: E
Topic: Concept 31.2
Skill: Knowledge/Comprehension

19) Which of the following statements is true of deuteromycetes?
A) They are the second of five fungal phyla to have evolved.
B) They represent the phylum in which all the fungal components of lichens are classified.
C) They are the group of fungi that have, at present, no known sexual stage.
D) They are the group that includes molds, yeasts, and lichens.
E) They include the imperfect fungi that lack hyphae.
Answer: C
Topic: Concept 31.2
Skill: Knowledge/Comprehension

20) Fossil fungi date back to the origin and early evolution of plants. What combination of environmental and morphological change is similar in the evolution of both fungi and plants?
A) presence of "coal forests" and change in mode of nutrition
B) periods of drought and presence of filamentous body shape
C) predominance in swamps and presence of cellulose in cell walls
D) colonization of land and loss of flagellated cells
E) continental drift and mode of spore dispersal
Answer: D
Topic: Concept 31.3
Skill: Knowledge/Comprehension

21) Which of the following characteristics is shared by both chytrids and other kinds of fungi?
A) presence of flagella
B) zoospores
C) autotrophic mode of nutrition
D) cell walls of cellulose
E) nucleotide sequences of several genes
Answer: E
Topic: Concept 31.3
Skill: Knowledge/Comprehension

22) The multicellular condition of animals and fungi seems to have arisen
A) due to common ancestry.
B) by convergent evolution.
C) by inheritance of acquired traits.
D) by natural means, and is a homology.
E) by serial endosymbioses.
Answer: B
Topic: Concept 31.3
Skill: Knowledge/Comprehension

23) Asexual reproduction in yeasts occurs by budding. Due to unequal cytokinesis, the "bud" cell receives less cytoplasm than the parent cell. Which of the following should be true of the smaller cell until it reaches the size of the larger cell?
A) It should produce fewer fermentation products per unit time.
B) It should produce ribosomal RNA at a slower rate.
C) It should be transcriptionally less active.
D) It should have reduced motility.
E) It should have a smaller nucleus.
Answer: A
Topic: Concept 31.3
Skill: Application/Analysis

24) The microsporidian, *Brachiola gambiae*, parasitizes the mosquito, *Anopheles gambiae*. Adult female mosquitoes must take blood meals in order for their eggs to develop, and it is while they take blood that they transmit malarial parasites to humans. Male mosquitoes drink flower nectar. If humans are to safely and effectively use *Brachiola gambiae* as a biological control to reduce human deaths from malaria, then how many of the following statements should be true?
1. *Brachiola* should kill the mosquitoes before the malarial parasite they carry reaches maturity.
2. The microsporidian should not be harmful to other insects.
3. Microsporidians should infect mosquito larvae, rather than mosquito adults.
4. The subsequent decline in anopheline mosquitoes should not significantly disrupt human food resources or other food webs.
5. *Brachiola* must be harmful to male mosquitoes, but not to female mosquitoes.

A) one statement only
B) two statements
C) three statements
D) four statements
E) all five statements
Answer: C
Topic: Concept 31.3
Skill: Synthesis/Evaluation

25) Many infected animals are induced by the parasitic microsporidians to develop huge cells, known as xenomas, which are full of spores. Given their large size, what should be true of the xenomas?
A) The parasite must endow the xenoma with some way to overcome its unfavorable surface area-to-volume ratio.
B) The xenoma must obtain mitochondria to survive.
C) The xenoma must gain a cell wall; otherwise, it will lyse.
D) The xenoma acts as a prison, of sorts, to keep the spores from escaping and infecting other organisms.
Answer: A
Topic: Concepts 6.2, 31.3
Skill: Synthesis/Evaluation

26) What are the sporangia of the bread mold *Rhizopus*?
A) asexual structures that produce haploid spores
B) asexual structures that produce diploid spores
C) sexual structures that produce haploid spores
D) sexual structures that produce diploid spores
Answer: A
Topic: Concept 31.4
Skill: Knowledge/Comprehension

27) Which of these paired fungal structures are structurally and functionally most alike?
A) conidia and basidiocarps
B) sporangia and hyphae
C) soredia and gills
D) haustoria and arbuscules
E) zoospores and mycelia
Answer: D
Topic: Concept 31.4
Skill: Knowledge/Comprehension

28) 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 a fungus is this?
A) zygomycete
B) ascomycete
C) deuteromycete
D) chytrid
E) basidiomycete
Answer: B
Topic: Concept 31.4
Skill: Knowledge/Comprehension

29) Which of the following has the least affiliation with all of the others?
A) Glomeromycota
B) mycorrhizae
C) lichens
D) arbuscules
E) mutualistic fungi
Answer: C
Topic: Concept 31.4
Skill: Knowledge/Comprehension

30) Arrange the following from largest to smallest:
1. ascospore
2. ascocarp
3. ascomycete
4. ascus
A) 3 → 4 → 2 → 1
B) 3 → 2 → 4 → 1
C) 3 → 4 → 1 → 2
D) 2 → 3 → 4 → 1
E) 2 → 4 → 1 → 3
Answer: B
Topic: Concept 31.4
Skill: Knowledge/Comprehension

31) Arrange the following from largest to smallest, assuming that they all come from the same fungus.
1. basidiocarp
2. basidium
3. basidiospore
4. mycelium
5. gill
A) 4 → 5 → 1→ 2 → 3
B) 5 → 1 → 4 → 2 → 3
C) 5 → 1 → 4 → 3 → 2
D) 5 → 1 → 3 → 2 → 4
E) 4 → 1 → 5 → 2 → 3
Answer: E
Topic: Concept 31.4
Skill: Knowledge/Comprehension

32) Among sac fungi, which of these correctly distinguishes ascospores from conidia?
A) Ascospores are diploid, whereas conidia are haploid.
B) Ascospores are produced only by meiosis, whereas conidia are produced only by mitosis.
C) Ascospores have undergone genetic recombination during their production, whereas conidia have not.
D) Ascospores are larger, whereas conidia are smaller.
E) Ascospores will germinate into haploid hyphae, whereas conidia will germinate into diploid hyphae.
Answer: C
Topic: Concept 31.4
Skill: Knowledge/Comprehension

33) A fungal spore germinates, giving rise to a mycelium that grows outward into the soil surrounding the site where the spore originally landed. Which of the following accounts for the fungal movement, as described here?
A) karyogamy
B) mycelial flagella
C) alternation of generations
D) breezes distributing spores
E) cytoplasmic streaming in hyphae
Answer: E
Topic: Concept 31.4
Skill: Application/Analysis

34) In what structures do both *Penicillium* and *Aspergillus* produce asexual spores?
A) asci
B) zygosporangia
C) rhizoids
D) gametangia
E) conidiophores
Answer: E
Topic: Concept 31.4
Skill: Knowledge/Comprehension

35) Chemicals, secreted by soil fungi, that inhibit the growth of bacteria are known as
A) antibodies.
B) aflatoxins.
C) hallucinogens.
D) antigens.
E) antibiotics.
Answer: E
Topic: Concept 31.5
Skill: Knowledge/Comprehension

36) Lichens are symbiotic associations of fungi and
A) mosses.
B) cyanobacteria.
C) green algae.
D) Three of these responses are correct.
E) Two of these responses are correct.
Answer: E
Topic: Concept 31.5
Skill: Knowledge/Comprehension

37) In both lichens and mycorrhizae, what does the fungal partner provide to its photosynthetic partner?
A) carbohydrates
B) fixed nitrogen
C) antibiotics
D) water and minerals
E) protection from harmful UV
Answer: D
Topic: Concept 31.5
Skill: Knowledge/Comprehension

38) Which of the following best describes the physical relationship of the partners involved in lichens?
A) Fungal cells are enclosed within algal cells.
B) Lichen cells are enclosed within fungal cells.
C) Photosynthetic cells are surrounded by fungal hyphae.
D) The fungi grow on rocks and trees and are covered by algae.
E) Algal cells and fungal cells mix together without any apparent structure.
Answer: C
Topic: Concept 31.5
Skill: Knowledge/Comprehension

39) If haustoria from the fungal partner were to appear within the photosynthetic partner of a lichen, and if the growth rate of the photosynthetic partner consequently slowed substantially, then this would support the claim that
A) algae and cyanobacteria are autotrophic.
B) lichens are not purely mutualistic relationships.
C) algae require maximal contact with the fungal partner in order to grow at optimal rates.
D) fungi get all of the nutrition they need via the "leakiness" of photosynthetic partners.
E) soredia are asexual reproductive structures combining both the fungal and photosynthetic partners.
Answer: B
Topic: Concept 31.5
Skill: Application/Analysis

40) When pathogenic fungi are found growing on the roots of grape vines, grape farmers sometimes respond by covering the ground around their vines with plastic sheeting and pumping a gaseous fungicide into the soil. The most important concern of grape farmers who engage in this practice should be that the
A) fungicide might also kill the native yeasts residing on the surfaces of the grapes.
B) lichens growing on the vines' branches are not harmed.
C) fungicide might also kill mycorrhizae.
D) sheeting is transparent so that photosynthesis can continue.
Answer: C
Topic: Concept 31.5
Skill: Application/Analysis

41) Which of the following terms refers to symbiotic relationships that involve fungi living between the cells in plant leaves?
A) pathogens
B) endosymbioses
C) endophytes
D) lichens
E) mycorrhizae
Answer: C
Topic: Concept 31.5
Skill: Knowledge/Comprehension

42) If *Penicillium* typically secretes penicillin without disturbing the lichen relationship in which it is engaged, then what must have been true about its partner?
A) It should have lacked peptidoglycan in its cell wall.
B) It was probably a red alga.
C) It was probably a member of the domain Bacteria.
D) It was probably a heterotrophic prokaryote.
E) It was probably infected by bacteriophage.
Answer: A
Topic: Concept 31.5
Skill: Application/Analysis

43) Sexual reproduction has never been observed among the fungi that produce the blue-green marbling of blue cheeses. What is true of these fungi and others that do not have a sexual stage?
A) They are currently classified among the ascomycetes.
B) They do not form heterokaryons.
C) Their spores are probably produced by mitosis.
D) Three of these responses are correct.
E) Two of these responses are correct.
Answer: C
Topic: Concept 31.5
Skill: Knowledge/Comprehension

44) Both fungus-derived antibiotics and hallucinogens used by humans probably evolved in fungi as a means to
A) reduce competition for nutrients.
B) help humanity survive.
C) promote their ingestion of foodstuffs.
D) eliminate other fungi.
E) discourage animal predators.
Answer: A
Topic: Concept 31.5
Skill: Knowledge/Comprehension

45) A billionaire buys a sterile volcanic island that recently emerged from the sea. To speed the arrival of conditions necessary for plant growth, the billionaire might be advised to aerially sow what over the island?
A) basidiospores
B) spores of ectomycorrhizae
C) soredia
D) yeasts
E) leaves (as food for fungus-farming ants)
Answer: C
Topic: Concept 31.5
Skill: Application/Analysis

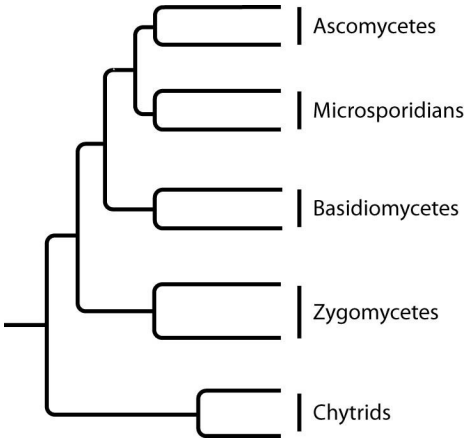
46) Mycorrhizae are to the roots of vascular plants as endophytes are to vascular plants'
A) leaf mesophyll.
B) stem apical meristems.
C) root apical meristems
D) xylem.
E) waxy cuticle.
Answer: A
Topic: Concept 31.5
Skill: Knowledge/Comprehension

47) Which of the following conditions is caused by a fungus that is accidentally consumed along with rye flour?
A) ergotism
B) athlete's foot
C) ringworm
D) candidiasis (*Candida* yeast infection)
E) coccidioidomycosis
Answer: A
Topic: Concept 31.5
Skill: Knowledge/Comprehension

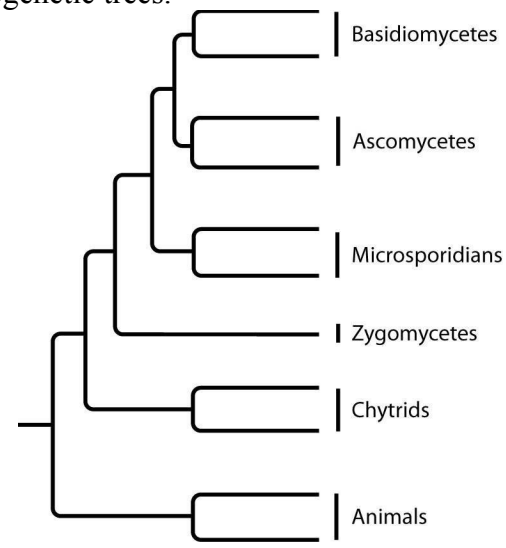
48) Orchid seeds are tiny, with virtually no endosperm and with miniscule cotyledons. If such seeds are deposited in a dark, moist environment, then which of the following represents the most likely means by which fungi might assist in seed germination, given what the seeds lack?
A) by transferring some chloroplasts to the embryo in each seed
B) by providing the seeds with water and minerals
C) by providing the embryos with some of the organic nutrients they have absorbed
D) by strengthening the seed coat that surrounds each seed
Answer: C
Topic: Concept 31.5
Skill: Application/Analysis

Art Questions

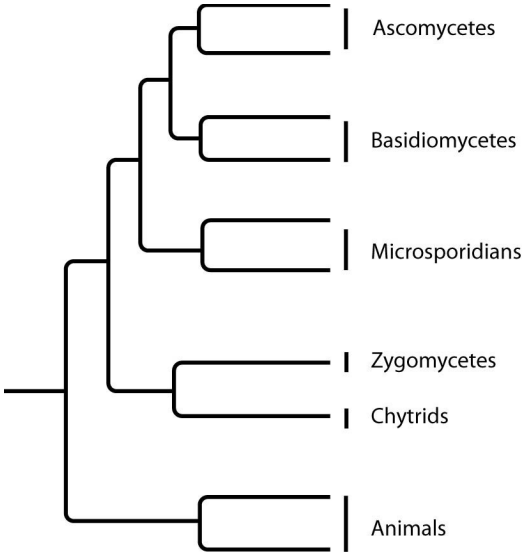
The next few questions refer to the following phylogenetic trees.



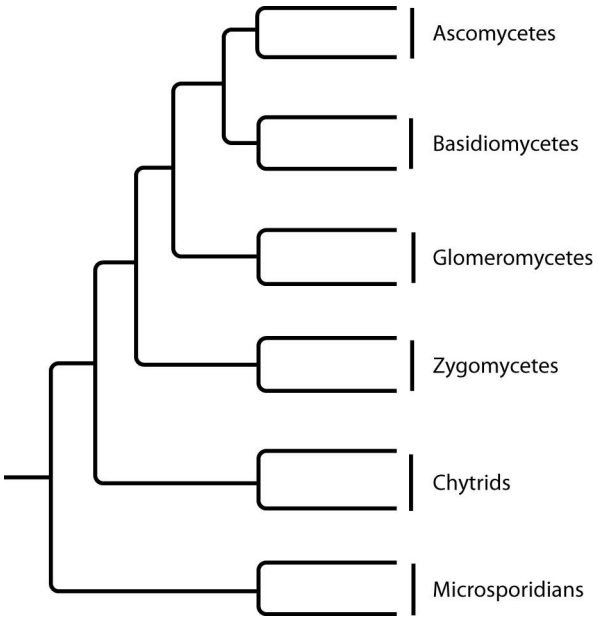
I.



II.



III.



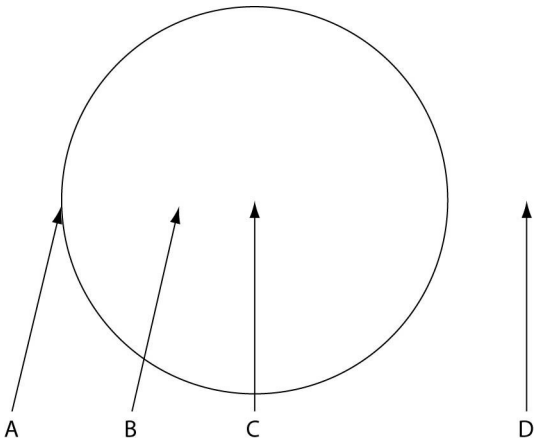
IV.

49) Which tree depicts the microsporidians as a sister group of the ascomycetes?
A) I
B) II
C) III
D) IV
Answer: A
Topic: Concepts 26.1, 31.3
Skill: Application/Analysis

50) Which tree depicts the closest relationship between zygomycetes and chytrids?
A) I
B) II
C) III
D) IV
Answer: C
Topic: Concepts 26.1, 31.3
Skill: Application/Analysis

51) Which tree depicts the microsporidians as a sister group of the fungi, rather than as a fungus?
A) I
B) II
C) III
D) IV
Answer: D
Topic: Concepts 26.1, 31.3
Skill: Application/Analysis

The following figure depicts the outline of a large fairy ring that has appeared overnight in an open meadow, as viewed from above. The fairy ring represents the furthest advance of this mycelium through the soil. Locations AÃD are all 0.5 meters below the soil surface. Responses may be used once, more than once, or not at all.



52) What is the most probable location of the oldest portion of this mycelium?
A) A
B) B
C) C
D) D
Answer: C
Topic: Concept 31.4
Skill: Application/Analysis

53) Which location is nearest to basidiocarps?
A) A
B) B
C) C
D) D
Answer: A
Topic: Concept 31.4
Skill: Application/Analysis

54) At which location is the mycelium currently absorbing the most nutrients per unit surface area, per unit time?
A) A
B) B
C) C
D) D
Answer: A
Topic: Concept 31.4
Skill: Application/Analysis

55) At which location should one find the lowest concentration of fungal enzymes, assuming that the enzymes do not diffuse far from their source, and that no other fungi are present in this habitat?
A) A
B) B
C) C
D) D
Answer: D
Topic: Concept 31.4
Skill: Application/Analysis

56) Assume that all four locations are 0.5 m above the surface. On a breezy day with prevailing winds blowing from left to right, where should one expect to find the highest concentration of free basidiospores in an air sample?
A) A
B) B
C) C
D) D
Answer: D
Topic: Concept 31.4
Skill: Application/Analysis

57) In which of the following human mycoses should one expect to find a growth pattern most similar to that of the mycelium that produced the fairy ring?
A) skin mycoses
B) coccidiomycosis (lung infection)
C) systemic (bloodborne) *Candida* infection
D) Sporothrix infection of lymphatic vessels
E) Tinea tonsurans infection limited to interior of hair shafts
Answer: A
Topic: Concept 31.4
Skill: Application/Analysis

58) If the fungus that produced the fairy ring can also produce arbuscules, then which of the following is most likely to be buried at location "C"?
A) septic tank
B) tree stump
C) deceased animal
D) fire pit
E) cement-capped well
Answer: B
Topic: Concepts 31.4, 31.5
Skill: Application/Analysis

Scenario Questions

Please refer to the following information to answer the next few questions.

Diploid nuclei of the ascomycete, *Neurospora crassa*, contain 14 chromosomes. A single diploid cell in an ascus will undergo one round of meiosis, followed in each of the daughter cells by one round of mitosis, producing a total of eight ascospores.

59) If a single, diploid G_2 nucleus in an ascus contains 400 nanograms (ng) of DNA, then a single ascospore nucleus of this species should contain how much DNA (ng), carried on how many chromosomes?
A) 100, carried on 7 chromosomes
B) 100, carried on 14 chromosomes
C) 200, carried on 7 chromosomes
D) 200, carried on 14 chromosomes
E) 400, carried on 14 chromosomes
Answer: A
Topic: Concept 31.2
Skill: Application/Analysis

60) What is the ploidy of a single mature ascospore?
A) monoploid
B) diploid
C) triploid
D) tetraploid
E) polyploid
Answer: A
Topic: Concept 31.2
Skill: Knowledge/Comprehension

61) Each of the eight ascospores present at the end of mitosis has the same chromosome number and DNA content (ng) as each of the four cells at the end of meiosis. What must have occurred in each spore between the round of meiosis and the round of mitosis?
A) double fertilization
B) crossing over
C) nondisjunction
D) autopolyploidy
E) S phase
Answer: E
Topic: Concept 31.2
Skill: Application/Analysis

Unicellular yeasts can be represented as spheres, whereas filamentous hyphae more closely resemble cylinders. As these two geometric figures increase in size, their surface area-to-volume ratios change. The following tables demonstrate how this ratio changes, first for spheres, and second for cylinders. For the cylinder, girth (i.e., radius, *r*) will remain constant, whereas length, *L*, will increase. Note the formulas below the respective tables.

A sphere's change in surface area and volume with increasing radius, *r*

Radius	Surface Area	Volume
1	12.56	4.19
2	50.24	33.48
3	113.04	113.01
4	200.96	267.87
5	314.0	523.0

Area of a Sphere = $4r^2$ Volume of a Sphere = $4/3r^3$

A cylinder's change in surface area and volume with increasing length, *L*

Radius	Surface Area	Volume
1	12.56	3.14
2	37.68	6.28
3	75.36	9.42
4	125.6	12.56
5	188.4	15.7

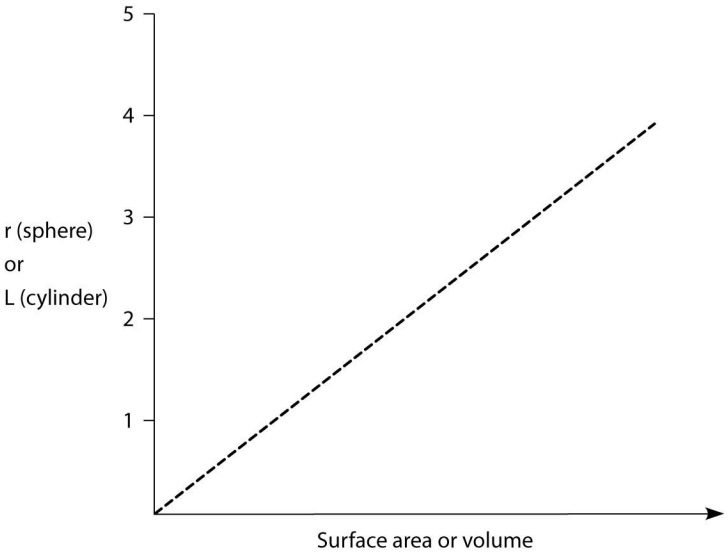
Area of a Cylinder = $2(r^2) + 2rL$ Volume of a Cylinder = r^2L

62) As a direct result of increasing surface area in both yeasts and filamentous hyphae, which cell structures/materials must also increase?
1. amount of chitin
2. number of nuclei
3. amount of plasma membrane
4. number of mitochondria
5. amount of peptidoglycan

A) 1 only
B) 1 and 3
C) 2 and 3
D) 2 and 4
E) 1, 3, and 5
Answer: B

Topic: Concepts 6.2, 31.1, 31.2
Skill: Application/Analysis

63) Which statement is a correct interpretation of the data in the previous tables?
A) As a sphere gets bigger, its surface area and volume increase at about the same pace.
B) As a cylinder gets bigger, its surface area increases at a greater pace than does its volume.
C) As a cylinder gets bigger, its volume increases at about the same pace at which the volume of a sphere increases.
D) As spheres and cylinders get bigger, the surface area of a cylinder increases at a faster pace than does the surface area of a sphere.
Answer: B
Topic: Concepts 6.2, 31.2
Skill: Application/Analysis



64) Both axes of the graph are linear. Thus, the shape of the line plotted on this graph most accurately depicts the
A) volume of a sphere as the radius, *r*, increases.
B) surface area of a sphere as the radius, *r*, increases.
C) volume of a cylinder as length, *L*, increases.
D) surface area of a cylinder as length, *L*, increases.
Answer: C
Topic: Concepts 6.2, 31.2
Skill: Synthesis/Evaluation

65) Surface area represents the area available for exchange with the environment, whereas volume represents the cytoplasm which requires nutrients and from which waste products (usually toxic) must be removed. Which of the following should provide the most favorable conditions for effective exchange?
A) a smaller unicellular yeast
B) a larger unicellular yeast
C) a shorter filamentous hypha
D) a longer filamentous hypha
Answer: D
Topic: Concepts 6.2, 31.2
Skill: Synthesis/Evaluation

66) Some fungi can exist either as unicellular yeasts or as filamentous hyphae. Which of these forms would be most favorable in an environment where nutrients are limited?
A) a smaller unicellular yeast
B) a larger unicellular yeast
C) a shorter filamentous hypha
D) a longer filamentous hypha
Answer: D
Topic: Concepts 6.2, 31.2
Skill: Synthesis/Evaluation

Recent genetic studies of the structure of microsporidian genomes, as well as the sequences of their tubulin genes and the gene for RNA polymerase II, indicate that microsporidians are closely related to the fungi. Microsporidians lack flagella, centrioles, peroxisomes, and mitochondria (although they do have degenerate mitochondria, called mitosomes). They have the smallest genome of any eukaryote, and it is a genome that changes quickly. The genome is contained within two haploid nuclei. All microsporidians are obligate intracellular parasites. They use a unique organelle called a polar filament to gain access to the cells of their hosts. One species causes chronic diarrhea in AIDS patients. Another parasitizes *Anopheles gambiae*, the mosquito that transmits a fatal form of malaria to humans.

67) Given the eukaryotic structures they lack, it should be expected that microsporidians also lack
A) the "9 + 2 pattern" of microtubules.
B) chitin.
C) lysosomes.
D) nuclei.
E) centrosomes.
Answer: A
Topic: Concepts 6.6, 31.3
Skill: Application/Analysis

68) The lifestyle of microsporidians is most similar to that of
A) scavengers.
B) viruses.
C) free-living yeasts.
D) ectoparasites.
Answer: B
Topic: Concepts 19.2, 31.3
Skill: Application/Analysis

69) Which of the following microsporidian features are shared with many other fungi?
1. chitinous cell wall
2. two haploid nuclei per cell
3. polar filament
4. chemoheterotrophy
A) 1 and 2
B) 1 and 3
C) 1 and 4
D) 1, 2, and 4
E) 2, 3, and 4
Answer: D
Topic: Concepts 31.1, 31.2, 31.3
Skill: Application/Analysis

For several decades now, amphibian species worldwide have been in decline. A significant proportion of the decline seems to be due to the spread of the chytrid fungus, *Batrachochytrium dendrobatidis* (Bd). Chytrid sporangia reside within the epidermal cells of infected animals, animals that consequently show areas of sloughed skin. They can also be lethargic, which is expressed through failure to hide and failure to flee. The infection cycle typically takes four to five days, at the end of which zoospores are released from sporangia into the environment. In some amphibian species, mortality rates approach 100%; other species seem able to survive the infection.

70) Apart from direct amphibian-to-amphibian contact, what is the most likely means by which the zoospores spread from one free-living amphibian to another?
A) by wind-blown spores
B) by flagella
C) by cilia
D) by pseudopods
E) by hyphae
Answer: B
Topic: Concept 31.4
Skill: Application/Analysis

71) The chytrid sporangia reside *within* the amphibian epidermal cells. Consequently, which term(s) apply to Bd?
1. ectosymbionts
2. parasites
3. commensals
4. pathogens
5. endosymbionts
A) 1 and 2
B) 1 and 3
C) 2 and 4
D) 2, 3, and 5
E) 2, 4, and 5
Answer: E
Topic: Concepts 27.5, 31.4
Skill: Application/Analysis

72) Which of the following are protists, the organisms thought to share the closest ancestor with the chytrids?
A) nucleariids
B) choanoflagellates
C) zygomycetes
D) algae
E) diplomonads
Answer: A
Topic: Concept 31.4
Skill: Knowledge/Comprehension

73) Sexual reproduction has not been observed in Bd. A Bd sporangium initially contains a single, haploid cell. Which of the following processes must be involved in generating the multiple zoospores eventually produced by each sporangium?
1. S phase
2. cytokinesis
3. mitosis
4. meiosis
A) 1 and 2
B) 1 and 3
C) 2 and 3
D) 1, 2, and 3
E) 1, 2, and 4
Answer: D
Topic: Concepts 12.1, 31.4
Skill: Application/Analysis

74) Sexual reproduction has not been observed in Bd. If its morphology and genetics did not identify it as a chytridiomycete, then to which fungal group would Bd be assigned?
A) ascomycetes
B) zygomycetes
C) glomeromycetes
D) basidiomycetes
E) deuteromycetes
Answer: E
Topic: Concepts 31.2, 31.4
Skill: Knowledge/Comprehension

75) If infection primarily involves the outermost layers of adult amphibian skin, and if the chytrids use the skin as their sole source of nutrition, then which term best applies to the chytrids?
A) anaerobic chemoautotroph
B) aerobic chemoautotroph
C) anaerobic chemoheterotroph
D) aerobic chemoheterotroph
Answer: D
Topic: Concepts 27.3, 31.4
Skill: Application/Analysis

76) If Bd cannot grow properly at temperatures above 28°C (82°F), then, assuming the amphibians *can* survive, in which time or place should the chytrid infection proceed most rapidly?
1. cooler months
2. warmer months
3. lower altitudes
4. higher altitudes

A) 1 or 3
B) 1 or 4
C) 2 or 3
D) 2 or 4
Answer: B
Topic: Concept 31.4
Skill: Synthesis/Evaluation

77) What makes it risky to rely on the presence of chitin in adult amphibian skin as the sole positive test for the presence of chytrids?
A) Other mycoses may be in progress in the same amphibian simultaneously.
B) The amphibian may harbor arthropod ectoparasites simultaneously.
C) Bacterial infections may be simultaneously underway in the amphibian.
D) Three of the responses above are correct.
E) Two of the responses above are correct.
Answer: E
Topic: Concepts 5.2, 31.4, 31.5
Skill: Application/Analysis

78) The fact that infection by Bd causes lethargy in many infected amphibians can have what effect on efforts to accurately census the numbers of dead or dying amphibians at a particular time, in a particular habitat?
A) It can cause underestimation, due to infected amphibians preferring to seek out refuges relative to uninfected amphibians.
B) It can cause underestimation, due to increased predation on, and removal of, infected amphibians relative to uninfected amphibians.
C) It can cause overestimation, because infected frogs should be more readily observable to human census-takers than should uninfected amphibians.
D) All three of the above statements are plausible.
E) Two of the above statements are plausible.
Answer: E
Topic: Concept 31.4
Skill: Synthesis/Evaluation

79) When adult amphibian skin harbors populations of the bacterium, *Janthinobacterium lividum* (Jl), chytrid infection seems to be inhibited. Which of the following represents the best experimental design for conclusively determining whether this inhibition is real?
A) Inoculate uninfected amphibians with Jl, and determine whether the amphibians continue to remain uninfected by chytrids.
B) Inoculate infected amphibians with Jl, and determine whether the amphibians recover from infection by chytrids.
C) Take infected amphibians and assign them to two populations. Leave one population alone; inoculate the other with Jl. Measure the rate at which infection proceeds in both populations.
D) Take infected amphibians and assign them to two populations. Inoculate one population with a high dose of Jl; inoculate the other with a low dose of Jl. Measure the survival frequency in both populations.
Answer: C
Topic: Concept 31.4
Skill: Synthesis/Evaluation

80) A researcher took water in which a Jl population had been thriving, filtered the water to remove all bacterial cells, and then applied the water to the skins of adult amphibians to see if there would subsequently be a reduced infection rate by Bd when frog skins were inoculated with Bd. For which of the following hypotheses is the procedure described a potential test?
A) the hypothesis that a toxin secreted by Jl cells kills Bd cells when both are present together on frog skin
B) the hypothesis that Jl cells infect and kill Bd cells when both are present together on frog skin
C) the hypothesis that Jl outcompetes Bd when both are present together on a frog's skin
D) the hypothesis that the presence of Jl on frog skin causes a skin reaction that prevents attachment by Bd cells
Answer: A
Topic: Concept 31.4
Skill: Synthesis/Evaluation

Rose-picker's disease is caused by the yeast, *Sporothrix schenkii*. The yeast grows on the exteriors of rose-bush thorns. If a human gets pricked by such a thorn, the yeasts can be introduced under the skin. The yeasts then assume a hyphal morphology and grow along the interiors of lymphatic vessels until they reach a lymph node. This often results in the accumulation of pus in the lymph node, which subsequently ulcerates through the skin surface and then drains.

81) The answer to which of these questions would be of most assistance to one who is attempting to assign the genus *Sporothrix* to the correct fungal phylum?
A) Do these yeasts perform fermentation while growing on the rose-bush thorns, or do they wait until inside a human host?
B) Does *S. schenkii* rely on animal infection to complete some part of its life cycle, or is the infection merely opportunistic?
C) Are the hyphae in lymphatic vessels septate, or are they coenocytic?
D) Is *S. schenkii* best described as a decomposer, parasite, pathogen, or mutualist of humans?
E) Being a yeast, does *S. schenkii* perform the process of budding?
Answer: B
Topic: Concept 31.5
Skill: Synthesis/Evaluation

82) Say *S. schenkii* had initially been classified as a deuteromycete. Asci were later discovered in the pus that oozed from an ulcerated lymph node, and the spores therein germinated, giving rise to *S. schenkii* yeasts. Which two of these are conclusions that make sense on the basis of this information?
1. *S. schenkii* produces asexual spores within lymph nodes.
2. *S. schenkii* should be reclassified.
3. *S. schenkii* continues to have no known sexual stage.
4. The hyphae growing in lymphatic vessels probably belonged to a different fungal species.
5. *S. schenkii* yeasts belonging to two different mating strains were introduced by the same thorn prick.

A) 1 and 3
B) 1 and 5
C) 2 and 3
D) 2 and 5
E) 4 and 5
Answer: D
Topic: Concept 31.5
Skill: Synthesis/Evaluation

83) Humans have immune systems in which lymph nodes are important, because many phagocytes and lymphocytes reside there. Given that a successful infection by *S. schenkii* damages lymph nodes themselves, which of the following is most probable?
A) The hyphae secrete antibiotics, which increases the ability of the infected human to tolerate the fungus.
B) Their conversion from yeast to hyphal morphology allows such fast growth that the body's defenses are at least temporarily overwhelmed.
C) Defensive cells of humans cannot detect foreign cells that are covered with cell walls composed of cellulose.
D) Given that most fungal pathogens attack plants, human defenses are simply not adapted to seek out and destroy fungi.
E) Given that most fungal pathogens of humans infect only the skin, human defenses are not adapted to seek out and destroy systemic fungal infections.
Answer: B
Topic: Concept 31.5
Skill: Application/Analysis

End-of-Chapter Questions

The following questions are from the end-of-chapter "Test Your Understanding" section in Chapter 31 of the textbook.

84) *All* fungi share which of the following characteristics?
A) symbiotic
B) heterotrophic
C) flagellated
D) pathogenic
E) act as decomposers
Answer: B
Topic: End-of-Chapter Questions
Skill: Knowledge/Comprehension

85) Which feature seen in chytrids supports the hypothesis that they diverged earliest in fungal evolution?
A) the absence of chitin within the cell wall
B) coenocytic hyphae
C) flagellated spores
D) formation of resistant zygosporangia
E) parasitic lifestyle
Answer: C
Topic: End-of-Chapter Questions
Skill: Knowledge/Comprehension

86) Which of the following cells or structures are associated with *asexual* reproduction in fungi?
A) ascospores
B) basidiospores
C) zygosporangia
D) conidiophores
E) ascocarps
Answer: D
Topic: End-of-Chapter Questions
Skill: Knowledge/Comprehension

87) The photosynthetic symbiont of a lichen is often
A) a moss.
B) a green alga.
C) a brown alga.
D) an ascomycete.
E) a small vascular plant.
Answer: B
Topic: End-of-Chapter Questions
Skill: Knowledge/Comprehension

88) Among the organisms listed here, which are thought to be the closest relatives of fungi?
A) animals
B) vascular plants
C) mosses
D) brown algae
E) slime molds
Answer: A
Topic: End-of-Chapter Questions
Skill: Knowledge/Comprehension

89) The adaptive advantage associated with the filamentous nature of fungal mycelia is primarily related to
A) the ability to form haustoria and parasitize other organisms.
B) avoiding sexual reproduction until the environment changes.
C) the potential to inhabit almost all terrestrial habitats.
D) the increased probability of contact between different mating types.
E) an extensive surface area well suited for invasive growth and absorptive nutrition.
Answer: E
Topic: End-of-Chapter Questions
Skill: Application/Analysis