

Name: \_\_\_\_\_

## BIOLOGICAL PRINCIPLES II

Exam No. 2

This is a closed book/closed notes exam and should be easily finished in the time allotted.

**Please read both the instructions and the questions very carefully.  
If something is not clear, please ask me.**

There is to be no **talking, whispering** or **any other form of communication** during this exam. Your answers on this exam are to be yours and only yours. Neither cheating nor helping each other will be tolerated.

**Please turn all cell phones and pagers off. If any electronic device on your person makes a noise, you'll get a zero on this exam.**

Good luck!

**Multiple choice.** Mark the one best answer of your choice (2 pts each).

1. Events in meiosis account for most of the phenotypic differences between individuals. When in a flowering plant's life cycle does this occur?

- A. fertilization.
- B. formation of gametes.
- C. formation of spores.
- D. seed dispersal.

2. Most coal was formed during the Carboniferous period. What is a reasonable hypothesis that explains this observation?

- A. Coal was formed from an explosion of fungal species during this period.
- B. There were not many mycorrhizal fungi during this period.
- C. There were not many decomposing fungi during this period.
- D. Plants from this period did not require fungal associations.

3. The eggs of seed plants are fertilized within ovules, and the ovules then develop into:

- A. seeds
- B. spores
- C. fruit
- D. ovaries

4. Which of the following is true for all protists?

- A. photosynthetic
- B. unicellular
- C. smaller than animal cells
- D. contain a nucleus

5. Which of these is a major trend in land plant evolution?

- A. the trend toward a sporophyte-dominated life cycle
- B. the trend toward smaller size
- C. the trend toward larger gametophytes
- D. the trend toward a gametophyte-dominant life cycle

6. Which of the following supports the idea that fungi are more closely related to animals than plants?

- A. Chytrid flagella are similar to animal flagella.
- B. Animals and fungi both store polysaccharides as glycogen.
- C. The cell wall of fungi and insects are both made of chitin.
- D. all of the above

7. What is the basis for dividing prokaryotes into two domains?

- A. ecological characteristics such as the ability to survive in extreme environments
- B. microscopic examination of staining characteristics of the cell wall
- C. metabolic characteristics such as chemoautotrophy and photosynthesis
- D. genetic characteristics such as ribosomal RNA (rRNA) sequences

8. How are gymnosperms and angiosperms similar?
- A. Plants in both groups have cones that produce pollen and seeds.
  - B. Plants in both groups have flowers and fruits.
  - C. Plants in both groups lack vascular tissue.
  - D. Plants in both groups produce seeds and pollen.
9. The group of fungi that most closely resemble the common fungal ancestor is:
- A. Chytridiomycota (chytrids)
  - B. Choanoflagellida
  - C. Ascomycota
  - D. Porifera
10. Which set contains the most closely related terms?
- A. megasporangium, megaspore, pollen, ovule
  - B. microsporangium, microspore, carpel, ovary
  - C. megasporangium, megaspore, egg, ovule
  - D. microsporangium, microspore, egg, ovary
11. Red tides result from blooms of marine protists called:
- A. diatoms.
  - B. red algae.
  - C. dinoflagellates.
  - D. foraminifera.
12. Vascular tissues of plants include:
- A. xylem for conducting water and minerals from soil, and phloem for conducting dissolved organic molecules from leaves.
  - B. xylem for conducting organic molecules from leaves, and phloem for conducting water and minerals from soil.
  - C. lignin for conducting organic molecules from soil, and phloem for conducting sugars from leaves.
  - D. cuticles for conducting water from leaves, and phloem for conducting organic molecules from soil.
13. What sexual processes in fungi generate genetic variation?
- A. Karyogamy and meiosis
  - B. Karyogamy and release of spores
  - C. Plasmogamy and meiosis
  - D. Budding and meiosis
14. Nitrogen fixation is a critical process performed by bacteria that takes atmospheric nitrogen and “fixes” it in molecules such as:
- A. lipids and carbohydrates.
  - B. ATP.
  - C. nucleic acids and proteins.
  - D. cellulose and starch.

15. Which of these are spore-producing structures?
- A. capsule of a moss
  - B. archegonium of a moss or fern
  - C. antheridium of a moss or fern
  - D. all of the above
16. The body of most fungi consists of threadlike \_\_\_\_\_, which form a network called a \_\_\_\_\_.
- A. hyphae ... mycelium
  - B. mycelia ... hypha
  - C. mycelia ... dikaryon
  - D. sporangia ... dikaryon
17. Which of the following is the least derived lineage of land plants?
- A. cycads
  - B. bryophytes
  - C. gnetophytes
  - D. charophytes
18. The embryo contained within a seed is technically:
- A. a spore.
  - B. a young sporophyte.
  - C. an ovule.
  - D. a young gametophyte.
19. An organism that grows in the absence of oxygen and cannot survive exposure to oxygen is best described as a(n):
- A. obligate aerobe.
  - B. obligate anaerobe.
  - C. facultative aerobe.
  - D. aerotolerant anaerobe.
20. Which two eukaryotic organelles are hypothesized to be the result of endosymbiosis?
- A. nuclei and mitochondria
  - B. mitochondria and chloroplasts
  - C. ribosomes and rough ER
  - D. peroxisomes and lysosomes

21. For each of the following, determine whether the organism listed is a chemoautotroph, a photoautotroph, a chemoheterotroph or a photoheterotroph. (1 pt each)

- a. A bacterium that uses light energy and obtains carbon from CO<sub>2</sub>. \_\_\_\_\_
- b. A goldfish. \_\_\_\_\_
- c. A common bread mold. \_\_\_\_\_
- d. An archaeal cell that consumes inorganic substances and CO<sub>2</sub>. \_\_\_\_\_
- e. A protist that uses light energy, but obtains carbon from glucose. \_\_\_\_\_

22. Explain how each of the following organisms obtains nutrients (2 pts each):

*Gloeocapsa* (a cyanobacterium)

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*Paramecium* (a protozoan)

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*Psilocybe cubensis* (a hallucogenic mushroom)

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23. Define the term *protist* (2 pts).

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24. Biologists are currently in the process of reclassifying the protist kingdom. Why? What do they view as “wrong” with the protist kingdom? Why are the animal, plant, and fungi kingdoms acceptable, but the protists aren’t? (5 pts)

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25. How will future textbooks cover the protists? What is the new classification, and why will this be “better” than a kingdom of protists? (2 pts)

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26. In class, we have spent a great deal of time focusing on life cycles that use alternation of generations. Take the events in the lettered boxes below and place them in the correct order, **beginning with the mature sporophyte**. Write the letters in the spaces provided. You will not use all of the boxes (2 pts each).

**A** Male and female haploid gametes fuse to produce a diploid zygote.

**B** Multicellular, haploid gametophytes produce haploid gametes.

**C** A multicellular, diploid sporophyte produces diploid spores through meiosis.

**D** A multicellular, diploid sporophyte produces haploid spores through meiosis.

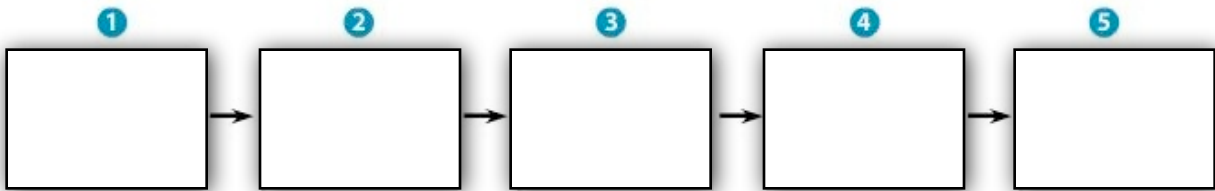
**E** A unicellular, haploid spore divides by mitosis to produce haploid gametophytes.

**F** The diploid zygote matures into a multicellular, diploid sporophyte.

**G** Multicellular, haploid gametophytes produce diploid gametes.

**H** A multicellular, diploid spore divides by meiosis to produce haploid gametophytes.

**I** The diploid zygote matures into a unicellular, haploid sporophyte.



27. In class, we discussed the intimate details of the sex lives of fungi. The three major fungal phyla (Ascomycota, Zygomycota and Basidiomycota) get their names from specific reproductive structures that they form. Provide a description of the sexual structure that characterizes each group (1 pt each).

Phylum	Description of reproductive structure
Zygomycota	
Ascomycota	
Basidiomycota	

28. Pick one of the phyla listed above and describe how it reproduces sexually. Make sure you use the appropriate terminology. To help, I've provided a word bank of relevant terms for all three phyla (in alphabetical order). Note: some of these terms are specific for only one phylum, while others can be applied to all (4 pts).

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**Word bank:**

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|--------------|--------------|----------------|
| ascocarp     | basidium     | plasmogamy     |
| ascogonium   | conidia      | sporangium     |
| ascus (asci) | conidiophore | zygosporangium |
| basidiocarp  | karyogamy    |                |
| basidiospore | mycelium     |                |

If you prefer to draw out your life cycle (rather than write it in paragraph form), use the blank page provided at the end of the exam.

29. In class, we discussed the several pieces of evidence that identify charophyte algae as the closest living relatives of the plant kingdom. We also described some of the features that make plants unique from these algae. For each of the traits listed below, check off whether they are found in charophytes, modern land plants, or both.

Traits (2 pts each)	Charophyte algae	Modern land plant
• Chloroplasts	<input type="checkbox"/>	<input type="checkbox"/>
• Rosettes	<input type="checkbox"/>	<input type="checkbox"/>
• Multicellular	<input type="checkbox"/>	<input type="checkbox"/>
• Alternation of generations	<input type="checkbox"/>	<input type="checkbox"/>
• Certain peroxisomal enzymes	<input type="checkbox"/>	<input type="checkbox"/>
• Apical meristems	<input type="checkbox"/>	<input type="checkbox"/>
• Cuticle	<input type="checkbox"/>	<input type="checkbox"/>

30. Which of the following flowering plant structures is homologous to an **antheridium**?

carpel      sporophyte      archegonium      stamen      (1 pt)

What function do they have in common? \_\_\_\_\_ (1 pt)

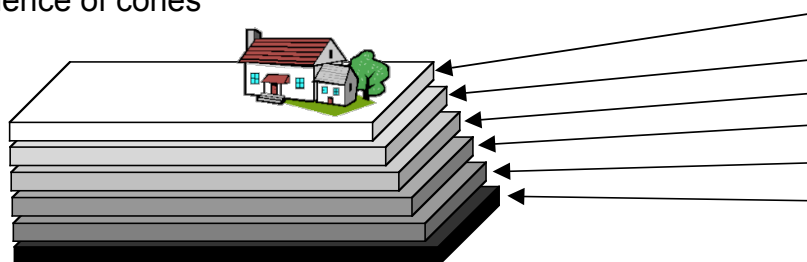
31. Which of the following flowering plant structures is homologous to an **archegonium**?

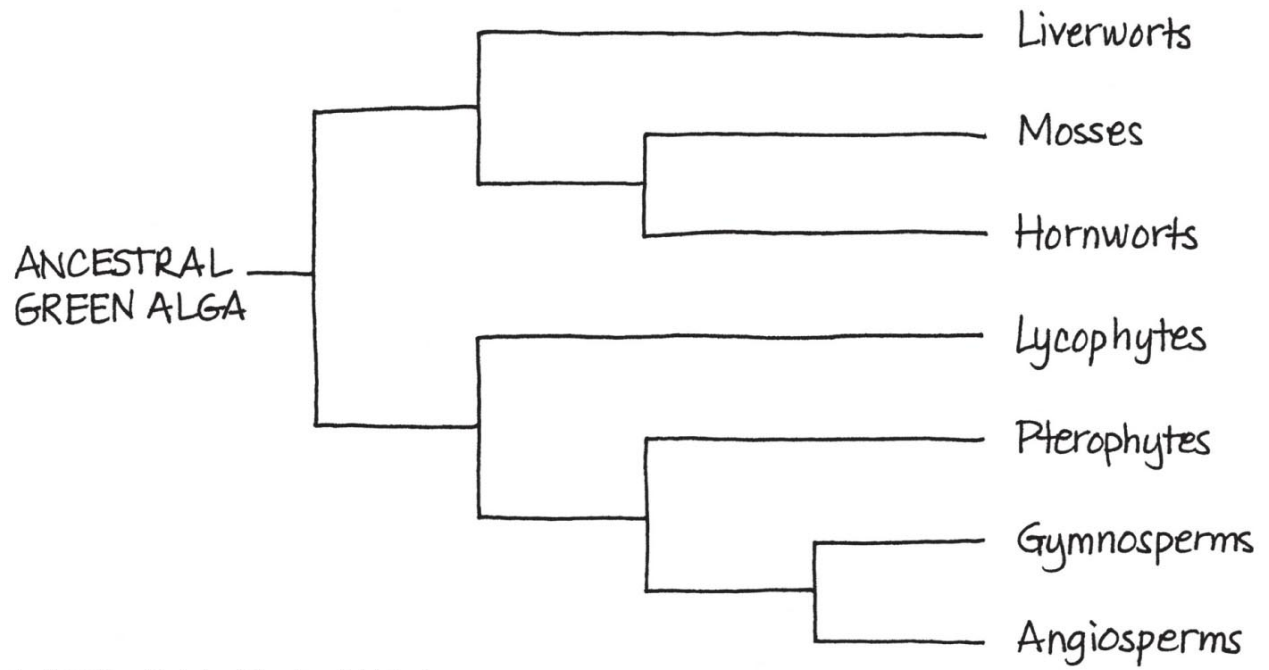
pollen      gametophyte      ovule      seed      (1 pt)

What function do they have in common? \_\_\_\_\_ (1 pt)

32. The figure below represents a cross-section through the fossil record. Each of the arrows is pointing to a particular stratum (layer of earth). Assign each of the following events to its relative position in the fossil record, based on our understanding of the evolution of land plants. (Just put the letter; no need to rewrite each phrase.) A basic phylogenetic tree for plants is provided on the back, if that helps (1 pt each).

- first evidence of vascular tissue
- first evidence of chloroplasts
- large amounts of coal
- first evidence of a multicellular sporophyte generation
- first evidence of carpals
- first evidence of cones





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