1Chapter 1: Botany: An Introduction

Multiple-Choice Questions

1. Introduction; p. 2; easy; ans: c
The process of photosynthesis results in the formation of two substances essential to our existence:

a. chlorophyll and water.
b. electrons and protons.
c. sugar and oxygen.
d. sugar and water.
e. chlorophyll and oxygen.

2. Evolution of Plants; p. 3; moderate; ans: d
Life existed on Earth as early as _____ years ago.

a. 300 to 400 thousand
b. 3 to 4 million
c. 300 to 400 million
d. 3 to 4 billion
e. 300 to 400 billion

3. Evolution of Plants; p. 3; moderate; ans: c
Which of the following statements about stromatolites is FALSE?

a. They contain layers of microorganisms.
b. They contain sediment.
c. They are fossil structures, with none alive today.
d. They can be formed by cyanobacteria.
e. They provide information about the earliest forms of life.

4. Evolution of Plants; p. 4; moderate; ans: e
On Mars, there is evidence for the presence of water in the form of_____.

a. ice only.
b. liquid water only
c. snow only
d. ice and liquid water but not snow
e. ice, liquid water and snow

5. Evolution of Plants; p. 4; moderate; ans: a
Which of the following statements about proteinoid microspheres is FALSE?

a. They are thought to be the first forms of life.
b. They grow by the accumulation of additional proteinoid material.
c. They are cell-like structures.
d. They are assemblages of organic molecules.
e. They can be produced in the laboratory.

6. Evolution of Plants; p. 4; difficult; ans: b
Which of the following statements concerning primitive cells is FALSE?

a. They used organic molecules to satisfy their energy requirements.
b. They constructed new cells from organic molecules made via photosynthesis.
c. They acquired the ability to grow.
d. They acquired the ability to reproduce.
e. They acquired the ability to pass on their characteristics to subsequent generations

7. Evolution of Plants; p. 4: easy; ans: c
A heterotroph:

a. is a "self-feeder."
b. uses energy from the sun to make food.
c. is exemplified by a fungus.
d. makes its own energy-rich molecules from simple inorganic materials.
e. is exemplified by algae.

8. Evolution of Plants; pp. 4-5; moderate; ans: a
Which of the following statements about photosynthetic autotrophs is FALSE?

a. They obtain their required organic compounds from external sources.
b. They channel radiant energy into the biosphere.
c. The word autotroph means "self-feeder."
d. They have a complex pigment system.
e. An example of an autotroph is a plant.

9. Evolution of Plants; p. 5; difficult; ans: e
Which of the following statements concerning the earliest photosynthetic organisms is FALSE?

a. They were simple compared to plants.
b. They were more complex than primitive heterotrophs.
c. They had a complex pigment system.
d. They had a way of storing energy in an organic molecule.
e. They have been found in rocks 4 billion years old.

10. Evolution of Plants; p. 5; easy; ans: b
The oxygen gas released in photosynthesis originates from:

a. carbon dioxide.
b. water.
c. ozone.
d. sugar.
e. nitrates.

11. Evolution of Plants; p. 5; moderate; ans: b
Atmospheric levels of oxygen gas approached modern levels approximately _____ years ago.

a. 5 billion
b. 500 million
c. 50 million
d. 5 million
e. 500 thousand

12. Evolution of Plants; p. 5; easy; ans: d
Ozone in the outer layer of the atmosphere has important consequences for living things in that it:

a. is a pollutant.
b. is involved directly in respiration.
c. aids in the aggregation of molecules.
d. absorbs ultraviolet rays from sunlight.
e. is used by autotrophs to make sugars.

13. Evolution of Plants; p. 6; moderate ans: c
Respiration refers to the process by which organisms:

a. absorb carbon dioxide under aerobic conditions.
b. absorb oxygen.under anaerobic conditions.
c. break down molecules under aerobic conditions.
d. break down molecules under anaerobic conditions.
e. produce sugars under aerobic conditions.

14. Evolution of Plants; p. 6; easy; ans: b
Prokaryotic cells differ from eukaryotic cells in that prokaryotic cells:

a. lack chromosomes.
b. lack a nuclear envelope.
c. contain mitochondria.
d. contain chloroplasts.
e. contain genetic material.

15. Evolution of Plants; p. 6; easy; ans: a
Which are prokaryotic organisms?

a. cyanobacteria and archaea
b. oak trees and elephants
c. archaea and humans
d. dandelions and animals
e. bacteria and amoebas

16. Evolution of Plants; p. 6; difficult; ans: e
The first cells on Earth were most likely:

a. bacteria.
b. autotrophs.
c. eukaryotes.
d. proteinoid microspheres.
e. archaeans.

17. Evolution of Plants; p. 6; difficult; ans: e
Which of the following is NOT an adaptation of photosynthetic organisms to rocky coasts?

a. a multicellular body
b. strong cell walls
c. structures to anchor their bodies
d. food-conducting tissues
e. pigment systems

18. Evolution of plants; p. 7; easy; ans: b
The function of the cuticle is:

a. absorbing water.
b. retarding water loss.
c. anchoring the plant.
d. providing support.
e. carrying out photosynthesis.

19. Evolution of Plants; p. 7; moderate; ans: c
The function of stomata is:

a. providing support.
b. anchoring the plant.
c. regulating the exchange of gases.
d. transporting food.
e. adding cells to the plant body.

20. Evolution of plants; p. 7; easy; ans: a
Which of the following statements concerning stomata is FALSE?.

a. They form a waxy covering on all aboveground portions of the plant.
b. They consist of a pair of guard cells.
c. They are found in the epidermis.
d. They help maintain a balance between water loss and oxygen and carbon dioxide requirements.
e. They open and close.

21. Evolution of Plants; p. 7; moderate; ans: e
In perennials, the _____ is most similar in function to the cuticle-covered epidermis of annuals.

a. xylem
b. phloem
c. stoma
d. vascular cambium
e. cork

22. Evolution of Plants; p. 7; easy; ans: c
Water is transported upward through the plant body in the:

a. epidermis.
b. cork.
c. xylem.
d. phloem.
e. apical meristems.

23. Evolution of Plants; p. 7; easy; ans: d
The food manufactured by photosynthesis is transported throughout the plant body in the:

a. epidermis.
b. cork.
c. xylem.
d. phloem.
e. apical meristems.

24. Evolution of Plants; p. 7; easy; ans: e
The function of phloem is to _____.

a. retard water loss.
b. transport water
c. transport oxygen
d. photosynthesize
e. transport food

25. Evolution of Plants; p. 7; moderate; ans: b
If a plant is a vascular plant, then by definition that plant must contain _____.

a. cork
b. phloem
c. a cuticle
d. stomata
e. guard cells

26. Evolution of Plants; p. 9; easy; ans: d
Secondary growth refers to growth:

a. that is of secondary importance to the plant.
b. that results in the extension of roots and stems.
c. originating from apical meristems.
d. originating from lateral meristems.
e. originating from the epidermis.

27. Evolution of Plants; p. 9; easy; ans: d
The activity of the _____ results in a thickening of stems, branches, and roots.

a. xylem and phloem regions
b. epidermal regions
c. vascular systems
d. lateral meristems
e. apical meristems

28. Evolution of Plants; p. 9; moderate; ans: c
A seed is composed of three parts:

a. root, stem, and leaves.
b. xylem, phloem, and seed coat.
c. seed coat, embryo, and food supply.
d. apical meristems, lateral meristems, and seed coat.
e. spore coat, embryo, and vascular system.

29. Evolution of Communities; p. 9; moderate; ans: e
Natural communities of organisms of wide extent, characterized by distinctive, climatically controlled groups of plants and animals, are called:

a. biospheres.
b. ecosystems.
c. aggregations.
d. species.
e. biomes

30. Evolution of Communities; p. 10; moderate; ans: d
What organisms are found at the base of productivity in almost all ecosystems?

a. photosynthetic bacteria and algae only
b. animals only
c. plants and algae only
d. photosynthetic bacteria, algae, and plants only
e. photosynthetic bacteria, algae, plants, and animals

31. Evolution of Communities; p. 10; easy; ans: a
In all ecosystems, heterotrophs are completely dependent on the productivity of all the following groups of organisms EXCEPT:

a. animals.
b. autotrophs.
c. photosynthetic bacteria.
d. plants.
e. algae

32. Appearance of Human Beings; p. 10; easy; ans: c
Humans first appeared about _____ years ago.

a. 2000
b. 200,000
c. 2 million
d. 20 million
e. 200 million

33. Appearance of Human Beings; p. 10; moderate; ans: b
The development of agriculture started at least _____ years ago.

a. 1000
b. 10,000
c. 100,000
d. 1 million
e. 10 million

34. Appearance of Human Beings; p. 11; moderate; ans: e
Cytology is the study of:

a. energy transformations.
b. plant form.
c. heredity.
d. fossil plants.
e. cell structure, function, and life histories.

35. Appearance of Human Beings; p. 12; easy; ans: b
The projected human population of the Earth by 2050 is _____ billion.

a. 5
b. 9
c. 16
d. 21
e. 31

36. Appearance of Human Beings; p. 12; moderate; ans: d
The greenhouse effect refers to the:

a. depletion of the ozone layer.
b. increased incidence of skin cancer.
c. problem of feeding the world's population.
d. trapping of heat radiated from Earth.
e. disappearance of species.

37. Appearance of Human Beings; p. 13; easy; ans: a
Phytoremediation refers to the process by which plants:

a. clean up polluted environments.
b. deter pests.
c. control weeds.
d. form hybrids.
e. transfer genes.

True-False Questions

1. Evolution of Plants; p. 4; easy; ans: F
Evidence exists for the presence of ice but not liquid water on Mars.

2. Evolution of Plants; p. 4: easy; ans: T
On the early Earth, hydrothermal vents provided one source of organic molecules.

3. Evolution of Plants; p. 4; moderate; ans: T
Proteinoid microspheres provide evidence that organic molecules in water can aggregate into cell-like structures

4. Evolution of Plants; p. 4; easy; ans: T
Just about all organisms use the same genetic code.

5. Evolution of Plants; p. 5; easy; ans: F
Most likely, autotrophs evolved before heterotrophs.

6. Evolution of Plants; p. 6; easy; ans: F
Eukaryotic cells evolved before prokaryotic cells.

7. Evolution of Plants; p. 6; moderate; ans: F
Carbon dioxide is the limiting factor for plant growth in the seas.

8. Evolution of Plants; p. 7; moderate; ans: T
In plants, water moves in a continuous stream from roots to stems to leaves.

9. Evolution of Plants; p. 7; easy; ans: F
Perennials have a life-span of only one year.

10. Evolution of Plants; p. 7; easy; ans: F
In annuals, the stem becomes woody and covered with cork.

11. **Evolution of Plants; p. 7; easy; ans: T**
Xylem transports water through the plant body.

12. **Evolution of Plants; p. 7; easy; ans: T**
Plants that contain xylem and phloem are called vascular plants.

13. **Evolution of Plants; p. 9; easy; ans: F**
Primary growth results in a thickening of the stem and root.

14. **Evolution of Plants; p. 9; moderate; ans: T**
Apical meristems are responsible for the extension of the plant body.

15. **Evolution of Plants; p. 9; difficult; ans: T**
A plant must first exhibit primary growth before it can exhibit secondary growth.

16. **Evolution of Plants; p. 9; moderate; ans: F**
An example of a seed plant is a fern.

17. **Evolution of Plants; p. 9; moderate; ans: T**
The evolution of the seed was important because the seed confers protection and nutrition to the embryo.

18. **Evolution of Communities; pp. 9-10; easy; ans: T**
An ecosystem consists of living organisms and their nonliving environment.

19. **Evolution of Communities; p. 10; moderate; ans: F**
In an ecosystem, elements and energy are recycled.

20. **Appearance of Human Beings; p. 10; easy; ans: T**
Plant morphology is the study of the form of plants.

21. **Appearance of Human Beings; p. 11; easy; ans: T**
Mycorrhizal fungi form symbiotic relationships with their plant hosts.

22. **Appearance of Human Beings; p. 12; easy; ans: T**
One effect of chlorofluorocarbons has been to deplete the ozone layer.

23. **Appearance of Human Beings; p. 12; moderate; ans: F**
The greenhouse effect is caused by the trapping of ozone in the stratosphere.

24. **Appearance of Human Beings; p. 13; easy; ans: T**
A transgenic plant is one that contains genes from entirely different species.

Essay Questions

1. **Evolution of Plants; p. 3; moderate**
What are stromatolites, and why are they important in evolution?

2. **Evolution of Plants; p. 4; difficult**
   Describe the evidence for the existence of different forms of water on Mars.

3. **Evolution of Plants; p. 4; moderate**
   List the four main properties that characterize living things, and explain the significance of each.

4. **Evolution of Plants; pp. 4-5; moderate**
   What is the difference between an autotroph and a heterotroph? In what way was the evolution of autotrophs crucial to the survival of life on Earth?

5. **Evolution of Plants; pp. 5–6; moderate**
   In what two ways did photosynthesis alter the Earth's early atmosphere, and what was the significance of each for life on Earth?

6. **Evolution of Plants; p. 6; moderate**
   What environmental factors at the seashore favored the evolution of photosynthetic organisms? What plant structures evolved in response to this environment?

7. **Evolution of Plants; p. 6; moderate**
   List the differences and similarities between prokaryotic cells and eukaryotic cells.

8. **Evolution of Plants; p. 6; moderate**
   Discuss the principal characteristics that helped plants adapt to life on land.

9. **Evolution of Plants; p. 7; moderate**
   Explain the difference in function between xylem and phloem. Why was their evolution important?.

10. **Evolution of Plants; p. 9; easy**
    What is the difference between primary growth and secondary growth? Which types of meristems are involved in each?

11. **Evolution of Plants; p. 9; moderate**
    List the characteristics of a vascular plant.

12. **Evolution of Plants; p. 9; moderate**
    List the components of a seed, and explain the role of each.

13. **Evolution of Communities; pp. 9-10; easy**
    Define the term "ecosystem," and give an example.

14. **Evolution of Communities; p. 10; easy**
    Give an example of something that is "cycled" in an ecosystem. Give an example of something that is not.

15. **Appearance of Human Beings; p. 10-11; moderate**
    Which groups of organisms are studied under the umbrella of botany, and why?

16. **Appearance of Human Beings; pp. 11–12; moderate**
    Discuss the ways in which plants are involved in many of the environmental issues facing today's world.

17. **Appearance of Human Beings; pp. 12-13; easy**
List some detrimental effects that human activities have had on the environment.

18. **Appearance of Human Beings; p. 13; moderate**
Give examples of how transgenic plants have benefitted humans.

19. **Appearance of Human Beings; p. 13; moderate**
Explain how the High Line in New York City has been developed into a green space.