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A plan to assess student learning in a University General Education Core Curriculum course: BIOL1613/BIOL1611L, Plant Biology.

WHAT UNIVERSITY GENERAL EDUCATION OUTCOMES GUIDE STUDENT LEARNING IN COURSES THAT CARRY NATURAL SCIENCES CREDIT?

A primary goal of these courses is to develop an appreciation of the basic principles that govern natural phenomena and the role of experiment and observation in revealing these principles. Students should acquire an understanding of the relationship between hypothesis, experiment, and theory, and develop the skills common to scientific inquiry, including the ability to frame hypotheses and defend conclusions based on the analysis of data. These courses are designed to prepare a student for informed citizenship by illustrating the importance of science and technology to the present and future quality of life and the ethical questions raised by scientific and technological advances.

Upon completion of eight hours of science courses, students will:

- NSLO1a - Understand how scientific inquiry is performed.
- NSLO2a - Understand the boundaries of scientific data.
- NSLO3a - Have a basic working knowledge of a few areas of science.
- NSLO4a - Be able to make better-informed decisions regarding potential government policies that involve science.
- NSLO5a - Have improved problem solving skills.
- NSLO6a - Be able to identify challenges created by society's increasing reliance upon technology.

HOW DOES THE DEPARTMENT OF BIOLOGICAL SCIENCES INTEND TO ASSESS STUDENT LEARNING OF THESE OUTCOMES IN BIOL1603/1601L

BIOL1613/BIOL1611L (Plant Biology) is a university core class that focuses on a basic understanding of plants. The assessment consists of a pre-test at the start of the semester followed by a post-test near the end of the semester. Assessment exams included 40 questions composed and agreed upon by the faculty teaching BIOL1613/1611L. The questions were designed to be overarching and related to broad thematic components of the course. Analysis of student performance will be based on overall performance on the exam, not on the individual questions. The same assessment exam will be used for multiple semesters so that performance over time can be compared.

**HOW IS THE ASSESSMENT INSTRUMENT KEYED TO THE UNIVERSITY
GENERAL EDUCATION CORE CURRICULUM LEARNING OUTCOMES FOR THE
NATURAL SCIENCES?**

Plant Biology Assessment

1. Which of the features listed below does NOT apply to members of the kingdom Fungi?

- A. Capable of photosynthesis
- B. Usually made up of hyphae
- C. Occur in both terrestrial and aquatic habitats
- D. Reproduce with spores
- E. Decompose organic materials

NSLO3a

Topic: Kingdom Fungi

2. A mycorrhizal association involves which of the two groups of organisms listed below?

- A. Algae and animals
- B. Vascular plants and fungi
- C. Fungi and algae
- D. Algae and vascular plants
- E. Fungi and animals

NSLO3a

Topic: Kingdom Fungi

3. Which of the terms listed below is NOT an organelle found in plant cells?

- A. Vacuole
- B. Nucleus
- C. Chloroplast
- D. Trichome
- E. Mitochondrion

NSLO3a

Topic: Plant cells

4. One of the stages in the division of a cell into two daughter cells involves chromosomes moving to the two ends (poles) of a the cell. Identify this stage.

- A. Anaphase
- B. Telophase
- C. Prophase
- D. Metaphase
- E. Interphase

NSLO3a

Topic: Plant cells

5. Which of the following types of fungi is NOT a basidiomycete?

- A. Puffball
- B. Polypore
- C. Slime mold
- D. Bolete
- E. Bird's nest fungus

NSLO3a

Topic: Kingdom Fungi

6. Which of the following structures is NOT a part of a flower?

- A. Petal
- B. Sepal
- C. Petiole
- D. Carpel
- E. Stamen

NSLO3a

Topic: Plant morphology

7. Which of the sequences listed below does NOT conform to the overall sequence which is found in the alternation of generations type of life cycle?

- A. Gametophyte → Spores → Sporophyte → Gametes
- B. Gametophyte → Gametes → Sporophyte → Spores
- C. Sporophyte → Gametophyte → Spores → Gametes
- D. Gametophyte → Spores → Gametes → Gametophyte
- E. Sporophyte → Gametes → Gametophyte → Spores

NSLO3a

Topic: Bryophytes and lower vascular plants

8. The invasion of the land by vascular plants took place how long ago?

- A. 750 million years ago
- B. One billion years ago
- C. 12,000 years ago
- D. 400 million years ago
- E. 160 million years ago

NSLO2a, NSLO3a

Topic: History of botany

9. The levels of organization of living systems extends from molecules to ecosystems. Which of the following is not in the correct sequence?

- A. Cell → organelle → tissue
- B. Individual → population → community
- C. Molecule → population → tissue
- D. Cell → tissue → organelle
- E. Molecule → cell → organelle

NSLO3a

Topic: Plant cells

10. Eukaryotic cells and prokaryotic cells do not have which of the features listed below in common?

- A. Cytoplasm
- B. Cell wall
- C. Pigments
- D. Membranes
- E. Nucleus

NSLO3a

Topic: Plant cells

11. What is the most abundant organic molecule in the world?

- A. Ribosome
- B. Cellulose
- C. Lignin
- D. Chlorophyll
- E. Protein

NSLO3a

Topic: Plant cells

12. Which of the cells or tissues listed below is NOT associated with the vascular tissue of a plant?

- A. Xylem
- B. Vessel
- C. Phloem
- D. Tracheid
- E. Epidermis

NSLO3a

Topic: Plant morphology

13. Which of the specialized types of stems given below is NOT found underground?

- A. Bulb
- B. Corm
- C. Cladophyll
- D. Rhizome
- E. Tuber

NSLO3a

Topic: Angiosperms

14. Which of the structures listed below is NOT associated with a chloroplast?

- A. Double membrane
- B. Thylakoid
- C. Stroma
- D. Chlorophyll
- E. Tonoplast

NSLO3a

Topic: Plant cells

15. Which of the tissues listed below is NOT typically associated with the root of a vascular plant?

- A. Ground meristem
- B. Protoderm
- C. Apical meristem
- D. Epidermis
- E. Mesophyll

NSLO3a

Topic: Plant morphology

16. Which of the terms listed below is NOT associated with the leaves of vascular plants?

- A. Whorled
- B. Opposite
- C. Alternate
- D. Compound
- E. Lenticel

NSLO3a

Topic: Plant morphology

17. The basic equation for photosynthesis directly involves all but one of the things listed below. Identify the one which is not involved?

- A. Carbon dioxide
- B. Nitrogen
- C. Oxygen
- D. Glucose
- E. Water

NSLO3a

Topic: Plant cells

18. In the system of classification generally used for living organisms, there are seven levels. Which of the following does NOT occur in the proper sequence?

- A. Family → genus → species
- B. Kingdom → class → phylum
- C. Order → kingdom → species
- D. Class → order → kingdom
- E. Genus → order → species

NSLO3a

Topic: Plant classification

19. Which of the following is NOT a gymnosperm?

- A. Pine
- B. Cycad
- C. Ginkgo
- D. Podocarp
- E. Oak

NSLO3a

Topic: Gymnosperms

20. Which of the following is NOT a type of inflorescence?

- A. Raceme
- B. Cotyledon
- C. Umbel
- D. Head
- E. Catkin

NSLO3a

Topic: Angiosperms

21. Which of the following is a type of fleshy (as opposed to dry) fruit?

- A. Achene
- B. Nut
- C. Drupe
- D. Grain
- E. Samara

NSLO3a

Topic: Angiosperms

22. Which of the following is NOT a characteristic of bacteria as a group?

- A. Smallest of all living organisms
- B. Oldest of all living organisms
- C. Most numerous of living organisms
- D. Eukaryotic cells
- E. Some are pathogenic

NSLO2a, NSLO3a

Topic: Kingdom Monera

23. Which of the groups of algae listed below contains the largest (in terms of size) organisms?

- A. Diatoms
- B. Euglenoids
- C. Red algae
- D. Green algae
- E. Brown algae

NSLO3a

Topic: Kingdom Protista

24. Which of the organisms listed below is NOT a bryophyte?

- A. Club moss
- B. True moss
- C. Liverwort
- D. Hornwort
- E. Peat moss

NSLO3a

Topic: Bryophytes and lower vascular plants

25. Which of the terms listed below is NOT associated with ferns?

- A. Pinna
- B. Sorus
- C. Rhizome
- D. Indusium
- E. Seed

NSLO3a

Topic: Bryophytes and lower vascular plants

26. Which of the organisms listed below is NOT an alga?

- A. *Fucus*
- B. *Ulva*
- C. *Spirogyra*
- D. Dinoflagellate
- E. Polypore

NSLO3a

Topic: Kingdom Protista

27. Which of the organisms listed below reproduces by producing seeds and not spores?

- A. Angiosperms
- B. Mosses
- C. Ferns
- D. Mushrooms
- E. Liverworts

NSLO3a

Topic: Bryophytes and lower vascular plants

28. Soil is made up of a number of different components. Which of the following is something that wouldn't be found in soil?

- A. Rock fragments
- B. Air
- C. Water
- D. Light
- E. Living organisms

NSLO3a

Topic: Plant ecology

29. With which of the following plant structures would you typically associate stomata and trichomes?

- A. Leaf
- B. Root
- C. Stem
- D. Fruit
- E. Flower

NSLO3a

Topic: Angiosperms

30. Which of the plant families listed below is the MOST important to humans as a source of food?

- A. Rosaceae
- B. Fabaceae
- C. Orchidaceae
- D. Poaceae
- E. Fagaceae

NSLO3a

Topic: Angiosperms

31. Which of the features listed below is NOT characteristic of a monocot?

- A. Parallel leaf venation
- B. Flower parts in 3's
- C. Only primary growth
- D. Vascular bundles scattered in the stem
- E. Flower parts in 4's or 5's

NSLO3a

Topic: Angiosperms

32. Which of the features or structures listed below is something you would NOT expect to find on a woody twig?

- A. Node
- B. Internode
- C. Lenticel
- D. Bud
- E. Micropyle

NSLO3a

Topic: Angiosperms

33. Which of the structures listed below is NOT a reproductive structure?

- A. Antheridium
- B. Archegonium
- C. Pneumatophore
- D. Sperm cell
- E. Egg cell

NSLO3a

Topic: Bryophytes and lower vascular plants

34. How many microns (= micrometers) are there in one millimeter?

- A. 10
- B. 100
- C. 1000
- D. 10000
- E. 100000

NSLO3a, NSLO5a

Topic: The scientific method

35. Approximately how many years ago did the cultivation of plants (agriculture) begin?

- A. 100,000
- B. 50,000
- C. 5,000
- D. 12,000
- E. 120,000

NSLO3a, NSLO4a

Topic: History of botany

36. Which of the following is the study of the interactions of plants and their environment?

- A. Plant taxonomy
- B. Plant physiology
- C. Plant anatomy
- D. Plant ecology
- E. Plant morphology

NSLO2a, NSLO3a

Topic: Introduction to botany

37. Which of the following is the SINGLE most important thing that mankind derives from plants?

- A. Medicine
- B. Lumber
- C. Paper
- D. Food
- E. Dyes

NSLO3a

Topic: Introduction to botany

38. Which of the following is NOT a major ecological problem for mankind?

- A. Loss of global biodiversity
- B. Climate change
- C. Increase in the area of forests worldwide
- D. Loss of suitable habitat for numerous species of living organism
- E. Acid rain (= acid deposition)

NSLO3a, NSLO4a

Topic: Plant ecology

39. Which of the following is NOT an essential part of the scientific method?

- A. Develop a hypothesis
- B. Design an experiment to test the hypothesis
- C. Carry out the experiment
- D. Interpret the data obtained
- E. Publish the results in the primary literature

NSLO1a

Topic: The scientific method

40. Which of the following taxonomic groups contains only prokaryotic organisms?

- A. Archaea
- B. Animalia
- C. Plantae
- D. Protista
- E. Fungi

NSLO3a

Topic: Plant classification

HOW WILL THE DEPARTMENT OF BIOLOGICAL SCIENCES USE THE DATA GENERATED BY THIS INSTRUMENT TO PLAN CURRICULAR AND PEDAGOGICAL CHANGES THAT MIGHT BE NECESSARY IN BIOL11613/BIOL1611L?

Analysis of student performance was based on overall performance on the exam, not on the individual questions. Faculty review the exam results annually, including responses on individual questions and will modify some questions for the assessment to better respond to the Natural Science Learning Outcomes. The faculty will discuss the results of the assessment process to identify problem areas in the course that can be addressed through implemented curricular modification including changes to course content or structure, and delivery mechanisms necessary to meet the needs of the target audience and fully address the Natural Science Learning Outcomes.