

Spring 98

BIOLOGY 5B (Principles of Botany) =====2

COURSE DESCRIPTION

INSTRUCTOR: Dr. Foletta (LS 5, ext. 257) **OFFICE HOURS:** MWF 10 AM or by appointment

This course is a requirement for the biological major, and is designed to introduce the student to a variety of topics in the area of **plant biology**. These topics include the scientific method, cytology, plant anatomy, plant metabolism including photosynthesis and plant responses to stimuli, classification (viruses, bacteria, protists, fungi and plants), Mendelian and population genetics, plant growth and development, evolution, plant biotechnology, and ecology.

Your active participation in all lectures and laboratory sessions is mandatory because of the many oral questions and discussions, demonstrations, exercises, and quizzes carried out during these periods. Your point totals on weekly quizzes and lab reports will be reduced by your absence from lecture and lab. Excessive unexcused absences will cause you to be dropped from the course.

Microscopes and lab supplies will be made available to each student. Each student is responsible for his/her laboratory materials and a replacement fee will be charged for lost or broken materials. You will be responsible for obtaining your own textbook, the botany coloring book, coloring pens or pencils, and course syllabus which includes the course description, lecture and laboratory topics, course objectives, and lab experiments.

1. The final course grade will be determined as follows:
 - a) 60% of your grade (600 points) will be based on 3 lecture-lab exams given at the end of each major section. (6th week, 12 week and 18th week).
 - b) 15% of your grade (200 points) will be based on weekly quizzes taken during the latter part of the lab period or in the lecture period. Attendance during the entire lecture or lab period is a requirement for taking the quiz. On a number of occasions you will be required to take notes during demonstrations and A/V presentations. Your point totals on weekly quizzes and lab reports will be reduced by the lack of these required notes. **There will be no makeup quizzes (no early quizzes and no late quizzes)** but your lowest quiz grade will be dropped and extra credit will be available on some quizzes.
 - c) 25% of your grade (200 points) will be based on completed laboratory reports which will be due at the end of each lab period. Completed laboratory report questions (including all color plates and assignments) turned in on time will be given 0-10 points (A: 9-10; B: 8; C: 7; D: 6; F: 0-5)

Late Lab Report	1 Day Late	2-7 Days	7 Plus Days
Points Given	0-9	0-7	0-5

- d) Percentage Required For Each Grade: A/90% or higher B/80-89% C/70-79% D/60-69% F/Less than 60%
 - e) Occasionally a student's grade will fall on the borderline, for example an 89.6%. As your instructor, I reserve the right to place that grade above the line if I think it is warranted. Some of the criteria that I use to make this judgement are: performance in lab, a steady increase in test scores, and attendance in lecture and lab.
2. Students can discuss any items related to this course by making an appointment with me immediately after the lecture, during the laboratory period, or during my office hours.
 3. It is the student's responsibility to make up missed work as soon as possible and according to a schedule worked out by the instructor.
 4. If you decide to drop this course you should (a) complete the appropriate drop card and return it to the admissions office and (b) drop the course before the official drop date, which is Fri, March 13, 1998 .

BIOLOGY 5B ===== 1

CONTENTS IN BRIEF

PAGE

Biology 5B Lab Manual Index	1
Course Description	2-3
Course Objectives	4-7
Lab 1A-B Kingdom Monera	8-17
Lecture Topic: Kingdom Monera (Ch. 4, Color Plates, and AV materials)	
Lab 2A Kingdom Fungi	18-20
Lab 2B Kingdom Protista	21-23
Lecture Topic: Kingdom Protista and Kingdom Fungi (App. D, Color Plates, and AV materials)	
Lab 3 Mosses, Horsetails, and Ferns	24-27
Lecture Topic: Plant Kingdom (Ch. 30, 31, App. D, Color Plates, and AV materials)	
Lab 4A Gymnosperms	28-30
Lab 4B Plant Review	31-34
Lecture Topic: Plant Life Cycles (Ch. 31, App. D, Color Plates, and AV materials)	
Lab 5 Flowering Plants	35-38
Lecture Topic: Plant History (Ch. 31, Color Plates, and AV materials)	

Lecture-Lab Exam #1 (Mon or Wed During Lab Period of 6th Week)

Lab 7 Scientific Method (Plant Growth Experiment)	39-41
Lecture Topic: The Scientific Method (Ch.2)	
Lab 8A-B Plant Cells and Tissues	42-46
Lecture Topic: Plant Cells and Tissues (Ch.4, 5, 30, and Color Plates)	
Lab 9 Plant Anatomy (Roots and Stems)	47-50
Lecture Topic: Plant Anatomy (Ch. 30 and Color Plates)	
Lab 10A Plant Growth and Development	51-54
Lab 10B Fruits and Seeds	55-58
Lecture Topic: Plant Growth and Development (Ch. 9, 30, and Color Plates)	
Lab 11 Plant Responses to Stimuli	59-61
Lecture Topic: Plant Responses (Ch. 32 and Color Plates)	

Lecture-Lab Exams #2 (Mon or Wed During Lab Period of 12th Week)

Lab 13A Leaf Structure	62-64
Lab 13B Leaf Collection	65
Lecture Topic: Leaf Anatomy and Plant Metabolism (Ch. 6, 7, 8, 30, and Color Plates)	
Lab 14 Plant Metabolism (Photosynthesis)	66-70
Lecture Topic: Plant Metabolism (Ch. 6, 7, 8, 30, and Color Plates)	
Lab 15 Classical (Mendelian) Genetics	71-77
Lecture Topic: Mendelian Genetics (Ch. 3, 10, 13, 14, 15, and Color Plates)	
Lab 16 Evolution	78-80
Lecture Topic: Darwin's Evolution (Ch. 3, 4, 18, 19, 20, and Color Plates)	
Lab 17 Ecology 81-83	
Lecture Topic: Ecology (Ch. 34, 35, 36, and Color Plates)	

Lecture-Lab Exam #3 During Finals Week (Thur, May 21, 1998 - 8:00 AM)

BIOLOGY 5B (Principles of Botany) =====3

COURSE DESCRIPTION

REQUIRED BASIC SKILLS:

Eligibility for Math 1, Engl 25, and Engl 26.

Because a great deal of writing on lab reports and exams will be required in this course it is strongly recommended that you complete English 25 and English 26 before you take Biology 5B.

SUBJECT PRE-REQUISITES:

Chemistry 3A or 1A (Chemistry 1A is required for students transferring to the University of California)

RECOMMENDED COURSES: College English, math, chemistry and biology courses

REQUIRED MATERIALS

Life (R. Lewis, latest edition is recommended) and Biology 5B Lab Manual (Foletta, 1996)

Botany Coloring Book (Young) and coloring pens or pencils

IMPORTANT DATES:

Instruction Begins () Lecture Hours () Laboratory Hours ()

Holidays - Spring Semester:

MLK Holiday (), Lincoln Day (), Washington Day ()

Spring Recess ()

Staff Development Day - No Classes ()

Last Day To Change To Or From A CR/NC Grading Basis ()

Last Day to Drop Class Without Assigned Grade ()

Final Exams Week ()

Biology 5B Final Examination (Thur, May 21, 8AM)

BRIEF SUMMARY OF LABORATORY EXERCISES

Objectives for the week: Outline of major topics covered during the week.

Introduction: Brief summary of the topics to be covered in each exercise.

Materials: List of laboratory items (glassware, microscope, equipment, etc.) used in each exercise.

Procedure: Includes some or all of the following sections (note-taking section, reading assignments, short activities, demonstrations, video instructional material).

Laboratory Questions: Questions to be completed with the help of lecture and laboratory notes, lab materials, and with the help of the instructor and your laboratory partners. Do not copy your lab partners work. For complete credit the lab report including completed color plates must be turned in on the assigned date.

Color Plates: Directions for completing each assigned color plate including a list of the structures to be colored and the color to be used. All color plates should be carefully completed as follows:

- a) **Do not follow the coloring directions in the Botany Coloring Book.**
- b) Carefully fill in the structures and their names (or outline if the structure is excessively large) with the color listed in your lab manual. Do not use excessively light or dark colors. The light colors provide poor contrast and the dark colors cover up important details. Do not use slanted lines or any other markings which interfere with the details of the drawings.
- c) Many structures are seen in different views, and for full credit you must color in all similar structures whether they are labeled or not. Ask your lab partner or your instructor for help in identifying all structures to be colored.
- d) Each color plate should be removed carefully from the Botany Coloring Book so that its edges are not torn. If necessary ask your instructor for help in removing the color plates. Excessively damaged color plates will not be accepted until they are repaired.
- e) Neatly staple your color plates (in correct numerical order) behind the last page of the laboratory report.

BIOLOGY 5B =====4

SECTION 1 COURSE OBJECTIVES: Life by Ricki Lewis (Chapters 4, 30, 31, Color Plates, and AV materials)

Week 1 - Kingdom Monera (Ch. 4, Color Plates, and AV materials)

1. Briefly review the concepts of symbiosis (mutualism, commensalism and parasitism).
2. Briefly review the science of biological classification - taxonomy..
3. Briefly review the major characteristics of the 5 kingdoms.
4. Know the features of the Kingdom Monera. Be able to describe cell structure and reproduction.
5. Know basic classification of bacteria and cyanobacteria (blue-green bacteria) and examples of each group.
6. Study basic types of bacterial nutrition.
7. Learn how bacteria cause disease and know examples of bacterial pathogens. Understand Koch's postulates.
8. Describe the form and reproduction of viruses. Know examples of viral pathogens.

Week 2 - Kingdom Protista and Kingdom Fungi (Appendix D, Color Plates, and AV materials)

1. Classify the Kingdom Protista (Protozoans, Protozoans or algae \implies Phyla Euglenophyta, Chrysophyta, Pyrrophyta, Chlorophyta, Phaeophyta, and Rhodophyta), Protomycota or slime molds \implies Phyla Oomycota, Myxomycota, and Acrasiomycota)
2. Classify the Kingdom Fungi (Phyla Zygomycota, Ascomycota, and Basidiomycota)
3. Discuss important features which distinguish protists and fungi from other groups.
4. Learn the common names of several protists and fungi.
5. Differentiate between parasitic fungi and saprophytic fungi.
6. Understand the ecology of algal protists and fungi.
7. Understand the basic structure of the lichens and how they are classified.

Week 3 - Plant Kingdom: Mosses, Horsetails, and Ferns (Ch. 30, 31, App. D, Color Plates, and AV materials)

1. Classify the Kingdom Plantae
 - Division Bryophyta - nonvascular plants including liverworts, hornworts and mosses
 - Tracheophytes - primitive vascular plants including the Divisions Pterophyta and Sphenophyta
2. List the general characteristics of the Plant Kingdom and discuss plants through history. Discuss various ways we use and depend on plants. How did agriculture arise? Discuss the importance of grains such as rice, wheat and corn. What are some examples of plant biochemicals used as medicines?
3. Discuss alternation of generations and the life cycle of a moss.
4. Describe how the bryophytes differ in unique ways from the other members of the Plant Kingdom.
5. Discuss other nonvascular plants and the life cycles of selected plants such as Equisetum, the horsetail, and ferns.
6. Discuss the reduction of the gametophyte phase and the dominance of the sporophyte part of the plant.
7. List important uses of bryophytes and seedless plants, and explain how they are ecologically important.

Week 4 - Plant Kingdom: Gymnosperms (Ch. 31, App. D, Color Plates, and AV materials)

1. Classify the Kingdom Plantae (Seed plants; Naked seed plants including the Divisions Coniferophyta, Cycadophyta, and Ginkgophyta; Angiosperms of the Division Anthophyta).
2. Define a major structure of the seed producing plants, the ovule.
3. Characterize the major divisions of gymnosperms, and describe the life cycle of a pine tree.
4. Understand what the term gymnosperm means.
5. List common uses for conifers, and understand how they are ecologically important.

Week 5 - Plant Kingdom: Flowering Plants (Ch. 31, Color Plates, and AV materials)

1. Describe the principle differences between angiosperms and gymnosperms.
2. Describe the basic parts of a simple flower, and discuss the life cycle of a typical flowering plant including the mechanisms of pollination, formation of gametes, and double fertilization.
3. Know the uses of a herbarium specimens and describe how plants are preserved.

Week 6 (Lecture and Lab Exam #1)

BIOLOGY 5B =====5

SECTION 2 COURSE OBJECTIVES: Life by Ricki Lewis (Chapters 2, 4, 5, 9, 30, 32)

Week 7 - The Scientific Method (Ch. 2)

1. The scientific method consists of making observations, formulating a hypothesis, designing an experiment, collecting and interpreting data, and reaching conclusions.
2. A good experiment has a large sample size, it is controlled so that only one variable is assessed, it is placebo controlled, and it is conducted in a double-blind manner.
3. The value of the scientific method is limited by our ability to interpret experimental results.

Week 8 - Plant Cells and Tissues (Ch. 4, 5, 30 and Color Plates)

1. Review the development of the cell theory (all living matter is composed of cells, the cell is the structural and functional unit of life, and biogenesis)
2. Review the differences and similarities of prokaryotic and eukaryotic cells.
3. Review the structure and function of the major organelles (cell membrane, plasmodesma, nucleus, nucleolus, chromatin, nuclear membrane, mitochondria, rough and smooth endoplasmic reticulum, ribosomes, lysosomes, centrioles, Golgi bodies, plastids especially chloroplasts, vacuoles) of a typical plant cell.
4. Compare and contrast plant and animal cells.
5. Briefly review the structure and function of the cell membrane (diffusion, osmosis, facilitated diffusion, active transport, endocytosis, exocytosis)
6. Discuss the primary tissues (meristems, ground tissue, dermal tissue, and vascular tissue - Ch. 30).

Week 9 - Plant Anatomy - Stems and Roots (Chapter 30 and Color Plates)

1. Study the basic functions of stems and roots.
2. Know the basic features of monocot roots and stems as compared to dicot roots and stems.
3. Study the following basic parts of a stem (nodes, internodes, rosettes, epidermis, vascular bundles, cortex and pith).
4. Identify modified or specialized stems such as stolons, thorns, succulent stems, tendrils, and tubers.
5. Discuss the difference between taproots, fibrous roots, and adventitious roots.
6. Study the following basic parts of a root (root cap; zones of division, elongation, and maturation; root hairs, epidermis; cortex consisting of hypodermis, parenchyma, and endodermis; pericycle; vascular tissue).
7. Identify modified or specialized roots such as storage roots, pneumatophores, aerial roots, and mycorrhizae.

Week 10 - Plant Growth and Development (Chapter 9, 30, 31, and Color Plates)

1. Review the cell cycle, cell division (mitosis and meiosis), and interphase.
2. Compare and contrast plant and animal mitosis.
3. How is mitosis controlled?
4. Discussion of a cellular growth curve.
5. Discussion of abnormal cell growth - cancer.
6. Learn the difference between primary and secondary growth and discuss the role of the apical meristems, vascular cambium and cork cambium.
7. Understand the basic features of wood including annual growth rings, hardwoods, softwoods, sapwood, heartwood, bark, periderm, cork cambium, cork, and phelloderm.
8. Discuss seed development, seed dormancy, fruit formation., fruit and seed dispersal, seed germination, and basic plant development.
9. New Routes to Plant Reproduction (Ch. 31)

BIOLOGY 5B =====6

Week 11 - Plant Responses to Stimuli (Chapter 32 and Color Plates)

1. Discuss how plant hormones regulate a plant's growth and development ==> auxins (cell elongation), gibberellins (cell division and elongation), cytokinins (cell division), ethylene (ripening), abscisic acid (inhibits growth)
2. Discuss plant tropisms such as phototropism, apical dominance, geotropism, thigmotropism, thermotropism, chemotropism, and hydrotropism).
3. Discuss nastic movements (seismonasty, nyctinasty) and thigmomorphogenesis.
4. Discuss seasonal responses of plants to the environment. Discuss how flowering and other responses are influenced by photoperiodism and phytochrome.
5. Discuss senescence, dormancy, and circadian rhythms

Week 12 (Lecture and Lab Exam #2)

SECTION 3 COURSE OBJECTIVES: Life by Ricki Lewis (Chapters 3, 4, 6, 7, 8, 10, 13-15, 18-20, 30, 34-36)

Week 13-14 - Plant Metabolism and Leaf Anatomy (Ch. 6, 7, 8, 30)

1. Study the basic anatomical features and functions of leaves.
2. Study the basic structures of a leaf including the blade, petiole, upper and lower epidermis, stomata, veins, palisade and spongy mesophyll.
3. Study the following features of a leaf (blade structure, attachment pattern, organization around nodes, and leaf venation).
4. Identify modified or specialized leaves such as tendrils, spines, bracts, storage leaves, insect-trapping leaves, and cotyledons.
5. Briefly review metabolism, catabolism, anabolism, and the role played by ATP.
6. Review the terms chemoautotroph, photoautotroph, chemoheterotroph, and chemoautotroph.
7. Briefly discuss the principle parts of aerobic respiration (glycolysis, Krebs Cycle, and the Electron Transport Chain) and anaerobic respiration or fermentation.
8. In general terms, define photosynthesis, and then discuss the more specific chemical reactions that occur during the photochemical (light) reactions and the biochemical (light-independent) reactions of photosynthesis including electron-transport chains, photophosphorylation, and photolysis.
9. Discuss photorespiration.
10. Summarize the major characteristics of photosynthesis, glycolysis, fermentation, and aerobic respiration.
11. How did the energy pathways evolve?

Week 15 - Classical (Mendelian) Genetics (Ch. 3, 10, 13, 14, 15, Color Plates)

1. Review molecular genetics (DNA, chromosome, gene - Ch. 3, 15)
2. Discuss the details of meiosis (reduction division) including oogenesis and spermatogenesis (Ch. 10).
3. Understand the significance of Mendel's experiments with pea plants.
4. Learn the terminology associated with genetics, especially those related to monohybrid and dihybrid crosses. Know the following terms: genes, alleles, autosomal chromosome, sex chromosome, homozygous, heterozygous, phenotype, genotype, dominant, recessive, wild type, mutant, Punnett square, and test cross.
5. Discuss Mendel's Laws of Inheritance (segregation and independent assortment)
6. Discuss disruptions of Mendelian ratios such as incomplete dominance, overdominant or hybrid vigor, codominant.
7. Be able to solve simple genetics problems and more complex ones involving principles of probability, the Hardy-Weinberg equation (Ch. 20), Pasqual's triangle, and factorials.
8. Discuss examples of sex-linked traits, sex determination, sex ratio, and sex preselection.

BIOLOGY 5B =====7

Week 16 - Darwin's Evolution (Ch. 3, 4, 18, 19, 20, and Color Plates)

1. Review of the theories of the origin of life on earth (spontaneous generation, life from space, common ancestry, chemical evolution) in Ch. 3.
2. Review the endosymbiont theory of the origin of eukaryotic cells (Ch. 4).
3. Discuss island evolution, macroevolution, microevolution, and geological evidence for evolution (Ch. 18).
4. Discuss the voyage of the HMS Beagle, adaptive radiation, artificial selection, and natural selection.
5. Discuss evolution and epidemiology.
6. Discuss the evidence for evolution including the formation and dating of fossils, comparing structures in modern species (known as comparative anatomy and physiology), and molecular evolution (Ch. 19).
7. Briefly review the evolution of humans.
8. With regards to evolution discuss populations, gene pools, the Hardy-Weinberg equilibrium, migration and nonrandom mating, and genetic drift, mutation, and types of natural selection (Ch. 20).
9. Discuss how species arise and how they become extinct.
10. Discuss the artificial selection of dogs and cats.
11. Briefly discuss the history of life on earth.

Week 17 - Ecology (Ch. 34, 35, 36, and Color Plates)

1. Discuss population growth curves, density independent and density dependent factors.
2. Define habitat and niche.
3. Discuss predator-prey interactions.
4. Define the following structural levels of organization (individual, population, community, ecosystem, biome, biosphere).
5. Define the major terms relating to a food chain or web (trophic levels, primary producers, primary consumers, secondary consumers, scavengers and decomposers, ecology pyramids).
6. Describe how matter (water, carbon, nitrogen) is recycled while energy "flows through" the ecosystem.
7. Discuss biomagnification of chemicals and biogeochemical cycles (carbon, nitrogen and phosphorus)
8. Discuss the mechanism of ecological succession.
9. Define terrestrial biomes (tropical rain forest, temperate deciduous forest, temperate coniferous forest, taiga, grasslands, tundra, and desert) freshwater biomes (lakes and ponds, rivers and streams), and marine biomes (the coast, the ocean).
10. Briefly discuss some important environmental concerns such as acid rain, the greenhouse effect, destruction of the ozone layer, the shrinking tropical rain forest (Ch. 36).

Week 18 - Final Lecture and Lab Exam