

**LAGUARDIA COMMUNITY COLLEGE
CITY UNIVERSITY OF NEW YORK
DEPARTMENT OF NATURAL SCIENCES**

**GENERAL BIOLOGY II
SCB 202**

(Note: This course was previously known as Fundamentals of Biology II)

COURSE SYLLABUS

Spring 2016

LECTURE OUTLINE

Lecture Textbook: **Biological Science** (5th edition, 2014) by Scott Freeman and others; Pearson Benjamin Cummings, San Francisco, CA.

Week	Topic	Chapter
1	Bacteria, Archaea, Viruses	29, 36
2	Protists, Fungi	30, 32
3	Land Plants, Plant Form and Function Quiz 1 on Chapters 29, 30, 32, 36	31, 37
4	Plant Transport, Plant Nutrition	38, 39
5	Plant Regulatory Mechanisms, Plant Reproduction Quiz 2 on Chapters 31, 37-39	40, 41
6	Intro. to Animals, Protostomes, Deuterostomes	33 – 35
7	Animal Form and Function, Water and Electrolyte Balance in Animals MIDTERM on Chapters 29 – 41	42, 43
8	Animal Nutrition, Gas Exchange and Circulation	44, 45
9	Animal Electrical Signals, Sensory/Motor Systems Quiz 3 on Chapters 42-45	46 – 48
10	Animal Chemical Signals, Animal Reproduction Quiz 4 on Chapters 46-49	49, 50
11	Intro. to Ecology, Population Ecology	52, 54
12	Community Ecology, Ecosystems Quiz 5 on Chapters 50, 52, 54	55, 56
Finals Week	FINAL EXAM on Chapters 42-50, 52, 54-56	

LABORATORY OUTLINE

Lab Manual: McGraw-Hill Create Fundamentals of Biology II (SCB202) Lab

Manual - Dilrukshan Wijesinghe, 2014. McGraw-Hill Create.

Van De Graaff's Photographic Atlas for the Biology Laboratory (7th Edition) by Byron J.

Adams and John L. Crawley, 2013. Morton Publishing. ISBN: 9781617310584.

Week	Lab Topic	Lab Manual Pages	Photographic Atlas Pages
1	Bacteria, Protists	3-14; 15-30	27-32; 33-66
2	Fungi, Seedless Plants	59-76; 31-44	67-80; 81-105
3	Seed Plants, Plant Anatomy & Reproduction	43-58; 159-176; 177-187	106-148
4	Lab Exam 1 (based on Weeks 1-3) Animals: Porifera, Cnidaria, Platyhelminthes	77-93	149-152; 153-159; 160-165
5	Animals: Annelida, Mollusca, Nematoda, Arthropoda	95-112; 113-128	173-175; 166-171; 176-178; 179-193
6	Animals: Echinodermata, Chordata; Animal Tissues	129-144	194-198; 200-222; 11-16
7	Lab Exam 2 (based on Weeks 4-6) Animal Form & Function; Digestive System	189-196	250-254; 290-292
8	Renal & Reproductive Systems	196-200	293-296
9	Circulatory & Respiratory Systems	201-214; 215-224	263, 286-289
10	Lab Exam 3 (based on Weeks 7-9) Muscles & Skeletal System	225-240	269-280; 230, 231, 244, 246, 255
11	Nervous System & Sensory Receptors	241-252	281-285
12	Ecology: Population Size Estimation; Review	253-264	
Finals Week	Lab Exam 4 (based on Weeks 7-12, includes a Practicum)		

Drawings, digital images and participation: Students are required to maintain a folder of annotated drawings as well as a collection of digital images of specimens examined. The drawings and digital images should be presented at the end of the course for assessment and are worth 5% of the course grade.

Global Learning/Oral Communication Assignment: See lab instructor regarding this assignment. Worth 5% of course grade.

Note: The lab manual, photo atlas and dissection kit (plus nitrile gloves for labs 5-12) must be purchased and brought to each lab session. Students should read the laboratory exercises prior to each lab.

Laboratory attendance is mandatory. Excessive absences will impact negatively on your final grade.

GRADING CRITERIA

The grades for the lecture and laboratory portions of the course represent 66% and 34% respectively of the course grade.

Lecture Grade (66%)

4 Quizzes (after dropping lowest of 5 quizzes) – 33%

Midterm Exam plus Final Exam – 33%

Laboratory Grade (34%)

3 Lab Exams (after dropping lowest of 4 lab exams) – 24%

Drawings (in folder) and digital images (in digital file) – 5%

Global Learning / Oral Communication Assignment – 5%

Quizzes and exams may comprise multiple-choice questions, short-response questions and some free-response questions requiring data analysis.

Students should be familiar with the College's policy on academic integrity and must uphold the standards expected by refraining from plagiarism and other types of academic misconduct. The College's policy on academic integrity is available at the following URL:

<http://library.laguardia.edu/files/pdf/academicintegritypolicy.pdf>

Course Objectives

On completing this course students should be able to:

1. Compare and contrast the characteristics of Bacteria, Archaea and Eukarya and describe their phylogenetic relationships.
2. Describe the structure and diversity of Bacteria and Archaea and explain their ecological and medical significance.

3. Describe the structure of a typical virus, compare and contrast the two modes of viral replication and describe the biology of human viral pathogens, such as HIV and Ebola.
4. Describe the diversity of eukaryotes, including the major types of protists.
5. Explain the structure and life cycle of a typical fungus, comparing and contrasting the major fungal phyla, and explain the ecological and economic importance of the group.
6. Define "land plant" and describe the adaptations and life cycle of land plants and outline their diversity.
7. Relate plant structure to function and compare and contrast the shoot and root systems, major types of tissues and growth.
8. Compare and contrast water and sugar transport within plants and list the various plant nutrients and their functions and describe nutritional adaptations of plants.
9. Explain the detection of external stimuli by plants using sensory mechanisms and the role of plant chemical signals.
10. Describe asexual and sexual reproduction in plants.
11. Describe the key innovations in animal phylogeny and define each phylum.
12. Explain animal structure and function, the concept of homeostasis, and maintenance of homeostasis by means of the excretory, digestive, respiratory and circulatory systems.
13. Compare and contrast electrical and chemical signals in the nervous and the endocrine systems in animals.
14. Describe the methods of animal reproduction and relate the structure of the mammalian reproductive system to its function.
15. Explain the study of ecology and describe how organisms are influenced by their environment at the organismal, population, community and ecosystem levels.

GENERAL BIOLOGY II Lesson Outlines

NOTE: Each lesson corresponds to a one-class hour

Lesson 1 - BACTERIA AND ARCHAEA

Chapter 29

- Compare and contrast the characteristics of Bacteria, Archaea and Eukarya.
- Define aerobe, obligatory and facultative anaerobe, autotroph, heterotroph, saprobe, photo and chemoautotrophy, decomposer, pathogen.
- Describe the characteristics of prokaryotic cells, Archaea, Eubacteria, Gram-positive and Gram negative bacteria, proteobacteria and cyanobacteria.
- Describe the importance of bacteria to the environment, food and disease.
- List Koch's postulates and describe how they are used to identify a pathogen.
- Define methanogen, halophile, and thermophile.

Lesson 2 - VIRUSES

Chapter 36

- Describe the structure and composition of viruses.
- List the ways in which viruses differ from living organisms.
- Viral reproduction: lytic cycle; lysogenic cycle; RNA reverse transcriptase.
- List several plant, animal and human diseases caused by viruses.

Lesson 3 - PROTISTA

Chapter 30

- Describe the distinctive characteristics of the Kingdom Protista and the phyla within it.
- Describe the means by which the protists carry out their 'basic functions'.
- Describe the 'endosymbiotic' theory and how it applies to mitochondria and chloroplasts
- Outline the steps in the evolution of multicellularity.

Lesson 4 - FUNGI

Chapter 32

- Describe the major characteristics of the Kingdom Fungi and explain why it was necessary to create a separate Kingdom for them.
- List the major divisions within the fungi and describe their distinguishing characteristics.
- Define hypha, mycelium, haustorium, spore, sporangium, ascus, basidium, fruiting body.
- Outline the life cycle of Chytridiomycota, Zygomycota, Ascomycota and Basidiomycota, with reference to alternating sexual and asexual phases.
- Discuss the ecological, economical and health importance of the fungi.
- Describe symbiotic associations involving fungi (mycorrhizae, lichens).

Lesson 5 - LAND PLANTS

Chapter 31

- Explain the reproductive cycle referred to as alternation of generations and how it relates to plant evolution.
- List the problems encountered by plants as they moved onto the land and describe the adaptations they evolved to overcome them.
- Define the terms vascular and nonvascular plant.
- Correctly identify any embryophyte as a sporophyte or gametophyte, and explain the increasing dominance of the sporophyte during the evolution of vascular plants.

Lesson 6 - LAND PLANTS (continued)

Chapter 31

- List the distinguishing characteristics of the four informal divisions within the group comprising the land plants.
- Describe the characteristics and life histories of mosses, ferns, gymnosperms and angiosperms as examples of these divisions.
- Describe the ecological importance of plants and how plants benefit humans.
- Describe the evolutionary relationship among land plants.

Lesson 7 - PLANT FORM AND FUNCTION

Chapter 37

Quiz 1 on Chapters 29, 30, 32, 36

- Explain how meristem cells are responsible for plant growth.
- Name the different plant tissue types and describe the function of each.
- List the tissues found in a plant leaf and describe how each one contributes to leaf function.
- Describe how a plant grows.

Lesson 8 - PLANT FORM AND FUNCTION (continued)

Chapter 37

- Describe the difference in dicot and monocot stem structure.
- List the tissues found in a plant stem and describe how each one contributes to stem function.
- Define the terms xylem and phloem.
- Describe the differences between a herbaceous and woody stem.
- Define the terms cambium, pith, cork, lenticel, axillary and apical bud.

Lesson 9 - PLANT TRANSPORT

Chapter 38

- Define the term 'water potential' and how it relates to plant transport.
- Describe some of the theories that attempt to explain how water is transported in a plant.
- Describe how the plant is able to supply nutrients to its separate parts.
- Describe what is meant by the Pressure-Flow Hypothesis of phloem.

Lesson 10 - PLANT NUTRITION

Chapter 39

- List the tissues found in a plant root and describe how each one contributes to root function.
- Define "plant nutrition" and list the types of nutrients needed by plants.
- Describe how the plant is able to obtain minerals for its metabolism.
- Describe how the plant is able to obtain water for its metabolism.
- Describe some of the ways plants have adapted to nutritionally poor environments.

Lesson 11 - SENSORY SYSTEMS IN PLANTS

Chapter 40

- Define the terms phototropism and gravitotropism.
- Describe the role of phytochrome in the ability of plants to measure light.
- Describe the role of phototropins in phototropism and response to blue light.
- Describe how a plant can respond to parasitic attack.

Lesson 12 - PLANT CHEMICAL SIGNALS

Chapter 40

- Describe how plant hormones regulate plant growth and development.
- Describe the function of auxin, gibberilin, cytokinins, ethylene and abscisic acid.
- Describe the stages in the life cycle of the plant from germination to senescence and how each stage is controlled.

Lesson 13 - PLANT REPRODUCTION

Chapter 41

Quiz 2 on Chapters 31, 37-39

- Contrast the benefits of sexual vs. asexual reproduction in the plant.
- Describe what is meant by the plant life cycle and the 'alternation of generations'.
- List the benefits of flowers over other organs of reproduction.
- Describe some of the mechanisms that flowers use for fertilization.

Lesson 14 - PLANT REPRODUCTION (continued)

Chapter 41

- Describe the process of embryogenesis in the angiosperm.
- List the three tissue types found in seeds and the function of each.
- Define pollination, fertilization and seed dispersal.
- Define seed dormancy and describe some of the mechanisms of dormancy.

Lesson 15 – INTRODUCTION TO ANIMALS

Chapter 33

- Contrast the Kingdom Animalia with the four other Eukaryotic kingdoms.
- List the three primitive germ layers of all animal embryos and their fate.
- Compare and contrast radial vs. bilateral symmetry in the animal body.
- Describe the body cavity with respect to coelomate, acoelomate and pseudocoelomate conditions and explain the functional and evolutionary importance of the coelom.
- Explain the adaptive advantages of the following characteristics: radial symmetry, bilateral symmetry, cephalization, motile stages and sessile stages of life history.
- Define suspension (filter) feeder, deposit feeder, fluid feeder, mass feeder.
- Define herbivore, carnivore, omnivore, predator, parasite.
- Compare and contrast protostome and deuterostome patterns of development and their evolutionary significance.
- Identify the characteristics of the most primitive animal phyla (e.g. Porifera, Cnidaria).

Lesson 16 – PROTOSTOME ANIMALS

Chapter 34

- List the phyla that comprise the Protostomes.
- List the phyla that belong to the Lophotrochozoa and the Ecdysozoa.
- Describe adaptations for feeding, locomotion and reproduction among Protostomes.
- List the characteristics of the major Protostome phyla Rotifera, Platyhelminthes, Annelida, Mollusca, Nematoda, Arthropoda and describe the diversity within the Platyhelminthes, Annelida, Mollusca and Arthropoda.

Lesson 17 – DEUTEROSTOME ANIMALS

Chapter 35

- List the phyla that comprise the Deuterostomes.
- List the characteristics of the phylum Echinodermata and describe the significance of the water vascular system.
- List the characteristics of the phylum Chordata and its three subphyla.
- Describe the diversity and evolution of the Vertebrata and trace the origin of jaws, lungs, limbs and the amniotic egg.
- Describe the phylogeny of the great apes and man and trace the evolution of man with respect to the fossil record.

Lesson 18 - ANIMAL FORM AND FUNCTION

Chapter 42

- Name the four types of animal tissue and the function of each.
- Describe how the tissues combine to form functional organs
- Describe how surface area and volume related to each other in the animal body.
- Define what is meant by the term allometry and give some examples.
- Compare and contrast the thermoregulatory mechanisms of ectothermy and endothermy.

Lesson 19

Midterm Examination on Chapters 29 - 41

Lesson 20 - WATER AND ELECTROLYTE BALANCE

Chapter 43

- Define what is meant by osmolarity and how it relates to osmotic stress.
- Describe some of the osmoregulatory mechanisms used by animals.
- Describe how the shark rectal gland can secrete excess salt.
- Describe some of the wastes excreted by animals and their properties.
- Draw and describe the function of the Malpighian tubules.
- Compare and contrast the urinary system of a mammal and that of an insect.
- Draw and describe the function of the human urinary system.
- Define what is meant by the term 'osmotic gradient' and how it is established in the mammalian urinary system.

Lesson 21 - ANIMAL NUTRITION

Chapter 44

- Name the major macronutrients and micronutrients and list the general function of each class.
- Explain the selective advantages of the various digestive adaptations found in the animal kingdom.
- List the parts of the human digestive tract in order and state what happens to nutrients in each part of the tract.

Lesson 22 - ANIMAL NUTRITION (continued) **Chapter 44**

- a. List the organs that secrete digestive enzymes in mammals and state the types of substrates secreted.
- b. Describe the digestive variations of herbivorous and carnivorous mammals and birds.
- c. List the function of the mammalian liver and explain the importance of this organism.

Lesson 23 - ANIMAL GAS EXCHANGE **Chapter 45**

- a. Distinguish between ventilation and respiration.
- b. Discuss the advantages and disadvantages of air and water as a respiratory medium.
- c. Describe the tracheal breathing mechanism of insects
- c. Compare and contrast lungs and gills with respect to structure and function.
- d. Explain how the countercurrent exchange mechanism works in the gills of fish.

Lesson 24 - ANIMAL CIRCULATION **Chapter 45**

- a. Describe the differences between an open and closed circulatory system.
- b. Compare and contrast the double circulatory system of birds and mammals and that of fishes.
- c. Describe the structure and state the main functions of the arteries, veins and capillaries.

Lesson 25 - ELECTRICAL SIGNALS IN ANIMALS **Chapter 46**

Quiz 3 on Chapters 42-45

- a. Describe the basic structure and function of neurons
- b. Define the sodium-potassium ion pump and membrane potential
- c. Draw and explain a graphical illustration of potential changes during a neuronal action potential
- d. Describe a myelin sheath and explain its function
- e. Draw a model of a synapse and explain its function in impulse transmission
- f. Explain the difference between an inhibitory and an excitatory impulse.
- g. Define the terms cephalization, ganglion, nucleus, brain and spinal cord.

Lesson 26 - ELECTRICAL SIGNALS IN ANIMALS (continued) **Chapter 46**

- a. List and briefly describe the function of each of the major parts of the brain and spinal cord.
- b. Draw and label a simple reflex arc and describe how it functions.

Lesson 27 - ELECTRICAL SIGNALS IN ANIMALS (continued) **Chapter 46**

- a. List the major cranial and spinal nerves and how they are integrated.
- b. Outline the major structural and functional differences between the sympathetic and parasympathetic division of the autonomic nervous system.
- c. Describe the pattern of autonomic innervation for each of the major viscera and the difference in sympathetic vs., parasympathetic stimulus.

Lesson 28 - ANIMAL SENSORY AND MOTOR SYSTEMS **Chapters 47-48**

- a. Describe the structure and function of the taste and smell senses.
- b. Describe the structure and function of the ear.
- c. Describe the structure and function of the eye.
- d. List the major types of muscle and how each one is capable of contraction.
- e. Describe how muscles are organized to permit movement of the body.

Lesson 29 - ANIMAL CHEMICAL SIGNALS **Chapter 49**

- a. Define the terms hormone and endocrine gland.
- b. Describe some of the chemical characteristics of hormones.
- c. List the major endocrine glands in the human, their hormones and their function.
- d. Describe the major mechanisms by which hormones act on target cells.

Lesson 30 - ANIMAL REPRODUCTION**Chapter 50****Quiz 4 on Chapters 46-49**

- Compare and contrast the process of asexual vs. sexual reproduction.
- Explain the advantages and disadvantages of external and internal fertilization, and internal and external development
- List the organs in the human male and female reproductive systems and give their functions.

Lesson 31 - ANIMAL REPRODUCTION (continued)**Chapter 50**

- Name the major sex hormones in the male and female and describe their function
- Describe how fertilization occurs in the human.
- Describe and contrast the various contraceptive devices that are available.

Lesson 32 - INTRODUCTION TO ECOLOGY**Chapter 52**

- Define the term ecology and distinguish between organismal ecology, population ecology, community ecology and ecosystem ecology.
- Compare and contrast a population versus a community.
- Describe how biotic and abiotic factors make up an ecosystem.
- Describe some of the typical biomes that exist on Earth and their biotic and abiotic characteristics.

Lesson 33 - POPULATION ECOLOGY**Chapter 54**

- Define the terms population dispersion, carrying capacity, exponential population growth and logistic population growth.
- Describe and contrast density dependent vs. density independent factors influencing population growth.
- Describe the 2 reproductive strategies used by organisms for survival.
- Discuss the dynamics of the human population explosion and the factors that impact on it.

Lesson 34 - COMMUNITY ECOLOGY**Chapter 55****Quiz 5 on chapters 50, 52, 54**

- Describe how competitive forces control population within a community.
- Define the term niche and how it influences species adaptation
- Describe the predator/prey relationship.
- Define parasitism and mutualism and give an example of each.
- Describe what is meant by a keystone species.
- List the stages of succession in a forest ecosystem.

Lesson 35 - ECOSYSTEMS**Chapter 56**

- Describe how energy flows through an ecosystem.
- Define the terms primary producer, consumer, herbivore, carnivore, and decomposer.
- List and give an example of each of the different trophic levels of a food web and how energy is exchanged.

Lesson 36 – ECOSYSTEMS (continued)**Chapter 56**

- Describe the water cycle and how it impacts ecosystems.
- Explain the carbon and nitrogen cycles and their significance in the maintenance of life on Earth.
- Describe how human activity is influencing the Earth's ecosystems and its eventual effect.

**THE FINAL EXAM ON CHAPTERS 42-50, 52, 54-56 WILL BE GIVEN
DURING THE FINAL EXAM WEEK**