

JEFFERSON COLLEGE

COURSE SYLLABUS

BIO101H

HONORS GENERAL BIOLOGY

5 Credit Hours

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BIO101H HONORS GENERAL BIOLOGY

I. CATALOGUE DESCRIPTION

Prerequisite: Honors Program Admission
5 semester credit hours

Honors General Biology examines the physical, chemical and functional aspects common to all organisms and presents a general survey of all life forms. Students will have the opportunity to learn and apply scientific processes based on lecture and discussions, conducting individual research projects, and reading and analyzing current scientific articles. Laboratory time is required. Honors General Biology will satisfy the laboratory requirements for the Associate of Arts degree and fulfills part of the requirement for an Honors Certificate or Honors Diploma. (F)

II. COURSE GENERAL OBJECTIVES

Upon completion of this course, the student will be able to:

- A. Understand the basic processes of living things
- B. Understand very basic chemical processes
- C. Understand and be able to apply some basic procedures of the scientific method
- D. Understand basic terminology used in the field of Biology
- E. Be able to identify universal processes used by biological organisms and some special variations from those universal processes
- F. Gain the competence to read Biology related articles in the media (magazines and newspapers) with basic comprehension
- G. Be able to analyze data from a laboratory exercise and:
 - 1. Draw specific conclusions
 - 2. Record results
 - 3. Present results using written and graphic means
- H. Be able to understand a basic biological model of processes that cannot be directly viewed
- I. Have a basic understanding of our biological past
- J. Have a basic understanding of the interrelationships in nature
- K. Use technology to enhance presentations

III. COURSE OUTLINE

- A The Scientific Method
- B. Chemistry
 - 1. Inorganic
 - 2. Organic
- C. The Cell
- D. Classification
- E. Nutrition
 - 1. Plant
 - 2. Animal
- F. Gas exchange and Cell Respiration
- F. Control Systems
 - 1. DNA
 - 2. Nervous control
 - 3. Endocrine control
- G. Reproduction
 - 1. Cellular
 - 2. Plant
 - 3. Human
- H. Genetics
 - 1. Monohybrid cross
 - 2. Dihybrid cross
 - 3. Sex-linkage
 - 4. Multiple alleles
- I. Evolution
 - 1. Natural Selection
 - 2. Species Formation
- J. Ecology
 - 1. Food chains
 - 2. Cycling of nutrients
 - 3. Major biomes
 - 4. Succession
 - 5. Population ecology

IV. UNIT OBJECTIVES

A. Scientific Method

1. The student must be able to describe the subject matter with which science deals and be able to differentiate between those subjects which are in the domain of science and those which are not.
2. The student must be able to explain the steps he or she must follow in applying the scientific method to its solution.
3. The student shall be able to define hypothesis, theory, and law as the terms are used scientifically.
4. Be able to develop a hypothesis.
5. Differentiate between inductive and deductive logic.
6. The student will be able to interpret data and present the data in a graph or figure format.
7. The student will be able to interpret material from a graph, figure, or diagram, and describe that material in a logical or useful way.

B. Chemistry

1. Be able to define an atom, an element, a molecule, and a compound.
2. Be able to list the three particles (electron, proton, and neutron) of which matter consists and to describe their mass, relative to one another, and their electrical properties.
3. Given the number of basic particles, you must be able to describe their location in an atom and give the electrical charge of the atom.
4. Be able to describe the difference between an atom and an ion in regard to the number of particles and the electrical charge.
5. Know the three physical states of matter and the most common cause for the change from one state to another.
6. Be able to define energy and tell the difference between kinetic and potential energy.
7. Be able to explain the difference between organic and inorganic compounds.
8. Be able to recognize the following two types of chemical reactions:
 - a. Synthesis
 - b. Decomposition
9. Know what the symbol pH represents.
10. Be able to define catalyst.
11. Know what an organic catalyst is called.
12. Know how we believe an enzyme works.
13. Know the four major classes in organic compounds found in living things.
14. Know the role of ATP in biological systems.

C. The Cell

1. Be able to define spontaneous generation, autotrophic and heterotrophic nutrition, photosynthesis, tissue, organ, and organ

system.

2. Be able to list two major statements of the cell theory.
3. Be prepared to label diagrams of cells like those shown in the text.

D. Classification

1. Be able to list the classification hierarchy and be able to apply this system to the classification of humans.
2. Differentiate between multicellular and colonial organisms.
3. Be able to list the five kingdoms and the major definitive characteristics of the organisms in each.

E. Nutrition

1. Be able to recognize autotrophic and heterotrophic organisms, and tell what each requires from its environment with regard to nutrients.
2. Be able to recognize, from a diagram, the parts of a root tip.
3. Know the functions that roots and stems have in a plant, other than absorption and conduction.
4. Be able to list the chemicals causing the various colors in leaves (including autumn leaves), flowers, and fruits.
5. Know the raw materials needed for photosynthesis and the products obtained.
6. Be able to list the end products of the complete digestion of lipids, carbohydrates, and proteins and the kind of enzyme responsible for their digestion.
7. Be able to label a diagram showing the organs of digestion and elimination of a human.
8. Describe the kinds of digestive secretions found in the digestive organs, the organs producing each secretion, and the function of each.
9. Know why food containing essential amino acids, vitamins, and minerals must be included in the daily diet.

F. Gas Exchange and Cell Respiration

1. Know the difference between cellular respiration and breathing.
2. Know how different organisms carry oxygen to cells and CO₂ away from their body cells.
3. Know that a breathing membrane must be kept moist in order for O₂ to pass through it.
4. Be able to label a drawing of the human breathing system.
5. Know that a difference in air pressure between the inside and outside of the body allows air to be inhaled or exhaled.
6. Be able to explain how the rate of breathing is regulated by the amount of CO₂ in the blood and the parts of the nervous system involved.
7. Be able to explain why O₂ and CO₂ diffuse through the alveolus walls to and from the circulatory system and from and to the body cells.
8. Know where the energy available for respiration is stored in organic

fuels.

9. Know how burning and respiration are similar and how they differ.
10. Know how aerobic and anaerobic respiration differ.
11. Know why enzymes are necessary in respiration.
12. Be able to give a summary equation for aerobic respiration.

G. Control Systems

1. Know how DNA functions in living organisms.
2. Know the structures and functions of the nervous system.
3. Know the various hormones produced by the endocrine system.

H. Reproduction

1. Know the functions of the chromosomes in living organisms.
2. Know the processes of cell division, mitosis, and meiosis.
3. Know the definition of the following:
 - a. Homologous and non-homologous chromosomes
 - b. Cellular reproduction
 - c. Organismic reproduction
 - d. Vegetative reproduction
 - e. Reproduction by spores
 - f. Sexual reproduction
 - g. Gamete
 - h. Sperm
 - i. Egg
 - j. Fertilization
 - k. Zygote
 - l. Testis
 - m. Ovary
 - n. Hermaphrodite
 - o. Daughter cells
 - p. Haploid
 - q. Diploid
 - r. Parthenogenesis
4. Describe the different methods that animals employ for egg development.
5. Be able to describe the sequence of embryonic development.
6. Be able to label the stages of a gastrula.
7. Know the difference between reptilian and mammalian eggs.
8. Know the parts of the placenta.
9. Know the location and functions of the plant reproductive structures.

I. Genetics

1. Know the two basic laws of genetics.
2. Be able to define the following terms:
 - a. Dihybrid cross
 - b. Dominant gene

- c. Recessive gene
 - d. True-breeding
 - e. Homozygous
 - f. Heterozygous
 - g. Phenotype
 - h. Genotype
 - i. Monohybrid cross
 - j. P, F₁, F₂ generations
 - k. Incomplete dominance
 - l. Linkage
 - m. Crossing over
 - n. Sex chromosomes
 - o. Autosomes
 - p. Sex-linked genes
 - q. Sex-influenced genes
 - r. Mutation
3. Be able to perform genetic crosses.

J. Evolution

- 1. Be able to describe the hypothesis regarding the origin of our solar system.
- 2. Be able to define:
 - a. organic evolution
 - b. anaerobic respiration
 - c. aerobic respiration
 - d. species
- 3. Know the roles that Wallace, Lamarck, Malthus, and Darwin played in developing the theory of evolution.
- 4. Know the most common source of variations in living organisms.

K. Ecology

- 1. Be able to correctly define the following terms:
 - a. ecology
 - b. population
 - c. community
 - d. ecosystem
 - e. habitat
 - f. niche
 - g. symbiosis
 - h. producer
 - i. consumer
 - j. decomposer
 - k. ecotone
 - l. mutualism
 - m. commensalism
 - n. parasitism

- o. predation
- p. competition
- 2. Know the vital relationship between organisms.
- 3. Know the different biotic regions.
- 4. Describe what is meant by the concept of limiting factors.
- 5. Know the components of a food pyramid
- 6. Know the processes of succession.
- 7. Know the consequences of over-population.
- 8. Know the cumulative principle of persistent pollutants.
- 9. Know the three factors on which the standard of living is based.

V. METHOD(S) OF INSTRUCTION

- A. Lecture
- B. Laboratory Work
- C. Laboratory Work Sheets
- D. Handouts
- E. Textbook
- F. Student Presentations
- G. Student Lead Discussions

VI. REQUIRED TEXTBOOK(S) WITH PUBLICATION INFORMATION

Tobin/Dusheck, "Asking About Life", Thomson (Brooks/Cole), 3rd Ed.

VII. REQUIRED MATERIALS

Writing Paper
Pens

VIII. SUPPLEMENTAL MATERIALS

Biology Lab Manual-required.

IX. METHOD OF EVALUATION (STUDENT)

Five Hourly Exams	500 pts.
One Comprehensive Final	100 pts.
Laboratory Exercises	100 pts.
Current Events in Biology Presentation	100 pts.

NOTE: The lowest test score is dropped for a total of 700 points.

- A 90%-100%
- B 80%-89%
- C 70%-79%
- D 60%-69%
- F Below 60%