

**Department:** BIOL

**Course No:** 103

**Credits:** 4

**Title:** The Biology of Human Health and Disease

**Contact:** Kenneth Noll

**Content Area:** Group 3 Science and Technology

**Catalog Copy:** 103 The Biology of Human Health and Disease.(Also offered as PVS 103.) First semester. Four credits. Three lecture periods and one 2-hour laboratory. This course may not be combined with BIOL 102 to satisfy the General Education Group VIII Requirement. Not open for credit to students who have passed PVS 103. Smolin, Staff

A laboratory course which introduces the concepts of biology and their application to the individual, society and humankind by focusing on health and disease issues.

**Course Information:**

**a.** BIOL 103 is a general biology course for non-majors. The goal of the course is to teach basic biological principles through the framework of human health and disease. The health and disease focus helps students to see the relevance of biological information to their own health and lives. The course provides students with the information and critical thinking skills necessary to make informed decisions about their own health and other biological issues they will encounter throughout life. BIOL 103 sharpens the student's application skills by providing them with a variety of hands-on problem-based laboratory exercises that support and supplement the lecture material.

**b.** The course requires that students average passing grades on four hour-long exams that each cover one quarter of the course material and one comprehensive final exam. These exams are 50% multiple choice and 50% short answer and other types of questions. Reading assignments supplement lecture material. These include approximately 1-2 Chapters per week from a text book and additional readings from books or articles to supplement the infectious disease portion of the course. The laboratory component of the course comprises 25% of the final grade, and is evaluated on the basis of quizzes, laboratory write up, and class participation.

**c.** The overall theme of the course is human health and disease. This theme is used to cover a variety of topics and issues. These include human reproduction and development, macromolecules, cell structure and function, digestion and absorption, the respiratory system and cellular respiration, atherosclerosis and the cardiovascular system, protein synthesis, inheritance and genetic disease, the human genome project, evolution, natural selection and the microevolution of cancer, viruses, AIDS and the immune system, diversity of life, the ecology and evolution of infectious agents, the nervous system, and aging.

**Meets Goals of Gen Ed:** BIOL 103 is proposed as a course to be included in the Science and Technology Content Area.

Goal 3. Acquire Critical Judgement: One of the goals of this course is to provide students with the background needed to understand the information related to human biology that they see everyday in magazines and in the news and to make informed decisions about this information. The laboratories are all set up as mysteries and problems that the student must solve. Throughout the course they are taught to make critical judgements about their own health care and other health-related information.

Goal 5. Acquire awareness of their era and society. Throughout the course our society and its technology are discussed within the context of other points in time and other places in the world. For example, today we hold genes in our hands that are providing information about genetic diseases that were a mystery only a decade ago. Infectious diseases that continue to kill millions of children in developing nations are rare in our society due to good nutrition, health care, clean water, and vaccinations. Students learn to recognize that we live in a time and place where infectious diseases are an emerging threat and chronic diseases a continuing battle.

Goal 7. Acquire a working understanding of the processes by which they can continue to acquire and use knowledge. The material taught in BIOL 103 is a product of the scientific processes of hypothesis testing, deductive reasoning, and rigorous interpretation of results. This is most evident to the students in the laboratory portion of the course where they experience the process of science first hand by conducting laboratory experiments, analyzing and interpreting the results, and presenting and thinking about the results when they answer questions at the end of each lab.

### **CA3 Criteria:**

1. BIOL 103 studies the biology of the healthy human state and the biological consequences of all types of disease, including chronic disease, genetic disease, and infectious disease. In all of these conditions students must comprehend the basic biology behind the condition and understand a range of technologies from the genetic tools used to isolate genes that cause disease to the biochemical abnormalities seen in various disease, and the epidemiology used to find the source of an infectious agent.
2. BIOL 103 involves a lecture and a laboratory component. In the lecture, the facts and concepts of biology are provided within the context of the observations and research discoveries that are responsible for our current state of understanding. On exams students are challenged to practice various elements of the scientific process, for example, to provide explanations for presented facts or data, to synthesize information from several lectures, or to interpret observations or data new to them. In the laboratory component of BIOL 103 students gain first-hand experience with testing hypotheses through experimentation, analyzing data they have collected, and interpreting the results. They are then asked to use a similar thought process when making their own lifestyle and health decisions.
3. Biology is full of unsolved questions and problems. We have not eliminated human disease and there are many for which we have no cures. For example, genetic diseases like Huntington's chorea are surrounded by unanswered questions. Why do symptoms appear so late in life? What can we do to prevent or cure it? In this case it is genetic engineering that is beginning to answer some of the questions by studying the disease at the molecular level.

4. Interest, competence, and commitment to continued learning are what BIOL 103 is all about. The information in this course is designed to target issues that apply directly to student's lives, whether it is a health concern that affects them or a family member, an issue such as infectious disease that is a world health problem, or a moral issue such as who has access to the results of genetic testing. To further stimulate interest and inspire students to continue learning about many of these topics this course has more personal attention than most large introductory biology courses. The size has been kept down so the instructor can attend the majority of lab sections and talk with and get to know the students.

**CA3 Lab Criteria:** Each lab requires two hours in class per week. For each lab the students must fill in a work sheet that is handed in the following week. This is not a formal lab report but does ask the students questions about the purpose of the lab and various aspects of the procedure. It requires that their data be recorded, analyzed, and interpreted.

Weeks 1. Reproduction: Students learn how to operate microscopes and then use them to observe sea urchin eggs and sperm. They then fertilize the eggs and observe and record information about the early cell divisions of cleavage.

Weeks 2. Cells and Tissues in Health and Disease: Students continue to refine their microscope skills by examining tissue sections to observe the different tissue types in the body. They then stain their own unknown tissue section and identify its tissue of origin. They are also given several case histories and asked compare healthy tissues with the disease tissues associated with these diseases and match an unknown tissue sample with the correct case.

Weeks 3. Biochemistry in the Kitchen: This lab uses things that are familiar in the kitchen to illustrate pH, enzyme activity, and aerobic metabolism. Students take the pH of household items that range from baking soda to black coffee and determine how much acid an antacid can neutralize. They explore conditions that affect the activity of the protein-digesting enzyme in pineapple juice by observing it digest the protein in Jell-O. Finally they experiment with how different temperatures and ingredients affect the metabolism of yeast by measuring how fast bread dough rises.

Weeks 4. Cardiovascular Anatomy and Fitness: This lab combines a dissection of a sheep heart with slides of healthy and diseased blood vessels. Students also take measures of their own heart rate and blood pressure at rest and during exercise.

Week 5. Nutrition and Cardiovascular Disease: This lab asks students to evaluate their own risk for developing cardiovascular disease by doing a computer analysis of their diet, evaluating whether their body weight is in a healthy range, and assessing their activity level relative to their energy intake. They randomly pick a set of blood lipid levels and must analyze how these levels affect cardiovascular risk. They are also asked to spend some time outside the lab reading food labels to assess whether foods are heart healthy.

Week 6. Chromosomes and Inheritance: Using cultured cells students have the opportunity to prepare a chromosome spread as is done for karyotype analysis. They are also given a drawing of

a chromosome spread that they must use to do an actual karyotype analysis and diagnose and chromosome abnormalities. This lab also exposes the students to pedigree analysis.

Weeks 7. DNA Analysis: In this lab the students become technicians in a biotech company. They are asked to analyze a plasmid by restriction digest and gel electrophoresis to determine if a gene has been inserted into the plasmid.

Week 8. DNA Detectives: In this lab students have the opportunity to isolate DNA from calf thymus. They then become forensic scientists who must solve a number of DNA mysteries by examining DNA data. They must determine who the father is in a paternity case, who the rapist is in a rape case, and who the murderer is in a murder case. They also become geneticists who must determine if an infant has inherited the disease cystic fibrosis and if a person has inherited the gene for Huntington's chorea.

Week 9. Virus Growth Cycle: In this lab the students explore viruses by doing a plaque assay to calculate the concentration of bacteriophage in an unknown solution. The results are collected during the laboratory period the following week.

Week 10 and 11. Bacteria and Disease: Students learn aseptic technique to work with bacteria. They explore the concept that bacteria are ubiquitous in our environment by exposing plates to the air and swiping objects in the building. They use the microbiological techniques they learn to test water samples for coliform bacteria and to determine the number of bacteria present on meat samples purchased from the grocery store.

Week 12: Immunology Tools: To further students understanding of the immune system this lab gives them the opportunity to do agglutination assays on blood samples from a mother, child, and 3 possible fathers and determine who the child's father is.

Week 13: Epidemiology: Medical Detectives: This lab simulates an epidemic on a cruise ship. The students act out the parts of passengers and crew members on the ship. They come in contact food, water, and other people on the ship by exchanging tags. At the end they go to the "infirmary" to see if they have been infected. This is done by screening their tags for fluorescence. As a class they must then trace the activities and contacts of the infected people and find the source of the infection.

**Role of Grad Students:** Graduate student TA's teach all laboratory sections, with two TA's per section. Supervision is by a laboratory coordinator and the course instructor. All TA's are required to attend weekly meetings in which all aspects of the upcoming labs are discussed by the coordinator and instructor. New TA's are required to attend teaching workshops offered to all incoming teaching assistants in the university.