



**COWLEY COLLEGE
& Area Vocational Technical School**

COURSE PROCEDURE FOR

**GENERAL BIOLOGY I
BIO4125 5 Credit Hours**

Student Level:

This course is open to students on the college level in either the freshman or sophomore year.

Catalog Description of the Course:

BIO4125 - GENERAL BIOLOGY I (N) (5 hrs)

KRSN BIO 1020/1021/1022

A study of the fundamental concepts in cellular and molecular biology, that lead to further studies in the diversity of life. Emphasis in lab is placed on the biological functions that define life, including basic biochemistry, cell and membrane functions, bioenergetics, reproduction and genetics, and phylogeny and evolution.

Prerequisites:

Advanced HS biology class, BIO4111 Principles of Biology, or a science ACT score of 21.

Controlling Purpose:

This course is designed to provide those students majoring in the biological sciences with an adequate foundation for further work in other biological areas. For the non-science student, this course is an introduction to the biological sciences at the molecular and cellular level.

Learner Outcomes:

Upon completion of this course, the student will be able to understand the functions of biological systems at the molecular and cellular level.

The learning outcomes and competencies detailed in this course meet, or exceed the learning outcomes and competencies specified by the Kansas Core Outcomes Project for this course, as sanctioned by the Kansas Board of Regents.

Units Outcomes and Criterion Based Evaluation Key for Core Content:

The following defines the minimum core content not including the final examination period. Instructors may add other content as time allows.

Evaluation Key:

A = All major and minor goals have been achieved and the achievement level is considerably above the minimum required for doing more advanced work in the same field.

- B = All major goals have been achieved, but the student has failed to achieve some of the less important goals. However, the student has progressed to the point where the goals of work at the next level can be easily achieved.
- C = All major goals have been achieved, but many of the minor goals have not been achieved. In this grade range, the minimum level of proficiency represents a person who has achieved the major goals to the minimum amount of preparation necessary for taking more advanced work in the same field, but without any major handicap of inadequacy in his background.
- D = A few of the major goals have been achieved, but the student's achievement is so limited that he is not well prepared to work at a more advanced level in the same field.
- F = Failing, will be computed in GPA and hours attempted.
- N = No instruction or training in this area.

UNIT I: THE CHEMICAL COMPOSITION OF LIFE						
Outcomes: Upon completion of this unit, the student will be able to describe atoms and molecules as the building blocks of life						
A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Diagram the basic atomic structure
						Determine the correct number of subatomic particles of an element
						Discuss the principles behind chemical bonding.
						Compare ionic and covalent bonding.
						Understand the difference between isotopes of an element.
						Explain how ions are different from a neutral atom.
						List and describe the four main groups of organic compounds in living systems.
						Distinguish between organic and inorganic compounds.
						Describe electrolytes and their importance in living systems.
						Explain the processes of hydrolysis and dehydration synthesis and how they relate to the formation of organic substance.
						Discuss the chemical properties of water and its role in living systems.

UNIT II: THE DEVELOPMENT OF CELL STUDIES and THE LEVELS OF ORGANIZATION

Outcomes: Upon completion of this unit, the student will gain an overview of the history and development of life, and the structure and function of cells and cellular transport mechanisms.

A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Explain briefly what the scientific method is and what hypotheses are.
						Name or identify a contribution to the development of science made by each of the following: Theophrastus, Leeuwenhook, Malpighi, Grew, Van Helmont, Linnaeus.
						List and describe the structure and function of the cytoplasm, organelles, and cellular components of the animal cell.
						Describe the attributes of living organisms.
						Label the following cell structures and organelles and indicate the function of each: plasma membrane, mitochondria, plastids, ribosomes, endoplasmic reticulum, Golgi bodies, vacuoles.
						Explain the importance of microscopy to the study of life and compare several kinds of light and electron microscopes
						Describe the fluid mosaic model of cell membrane structure.
						Describe the difference between passive and active transport in the movement of materials across cell membranes.
						In simple terms, explain the types of passive and active transport.
						Discuss tonicity and how it affects movement across the membrane.

UNIT III: BIOENERGETICS

Outcomes: Upon completion of this unit, the student will be able to describe the energy transfers that occur in living systems.

A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Explain the role of enzymes in metabolic pathways.
						Formulate how energy pathways may have evolved.
						Contrast the generalized equations of photosynthesis and respiration.
						Relate the structure and function of chloroplast and mitochondria.
						Discuss what occurs in the light and carbon-fixing reactions of photosynthesis, and know the principle products of the reactions.
						Explain what occurs in glycolysis, the Krebs cycle, and the electron transport chain of respiration.
						Distinguish between aerobic respiration and fermentation.
						Explain the role of electron carriers in the process of oxidation phosphorylation.
						Discuss how the 1st and 2nd Laws of thermodynamics relate to photosynthesis and respiration.

UNIT IV: CELL DIVISION, REPRODUCTION AND DEVELOPMENT

Outcomes: Upon completion of this unit, the student will be able to explain the significance of meiosis and mitosis to the reproduction and development of organisms.

A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Describe the continuum of mitosis and cytokinesis, including the main events of prophase, metaphase, anaphase, and telophase.
						Define meiosis and its role in sexual reproduction.
						Contrast meiosis in males (spermatogenesis) with that in females (oogenesis), giving the correct terms and number of chromosomes for cells at each stage.
						Compare and contrast the stages of mitosis with those of meiosis.
						Identify the phases of meiosis and briefly describe what occurs in each of them.
						Relate meiosis and Alternation of Generations to the process of DNA replication.
						Compare the basic types of asexual reproduction including vegetative propagation.
						Define yolk and explain the effect of quantity and distribution of yolk on cleavage pattern.
						Name three primary germ layers (ectoderm, mesoderm, endoderm) and their derivatives in vertebrates.
						Diagram the cleavage process from zygote to gastrula, and the development of germ layers.
						Discuss tissue development from germ layers.

UNIT V: MOLECULAR GENETICS, PATTERNS OF INHERITANCE, GENE TECHNOLOGY AND BIOETHICS

Outcomes: Upon completion of this unit, the student will be able to explain the roll of DNA and RNA in the diversity of life.

A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Discuss the nature of DNA and the process of replication

UNIT V: MOLECULAR GENETICS, PATTERNS OF INHERITANCE, GENE TECHNOLOGY AND BIOETHICS

Outcomes: Upon completion of this unit, the student will be able to explain the roll of DNA and RNA in the diversity of life.

A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Describe transcription and translation.
						Discuss the role of DNA and RNA to the process protein synthesis.
						Explain the significance of Mendel’s experiments with peas.
						Give the ratios of the offspring in the first two generations from a monohybrid and a dihybrid cross. Describe the genotypes involved.
						Solve simple genetic problems.
						Delineate the basic steps involved in gene splicing.
						Compare and explain tissue culture, mericloneing, and related techniques.
						Discuss the ethics associated with issues, such as stem cell research, cloning, genetically altered foods and transgenics.
						Define mutation and know the levels and effects.

UNIT VI: POPULATION GENETIC AND EVOLUTION

Outcomes: Upon completion of this unit, the student will be able to discuss the origin of life and evolution.

A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Discuss the origin and chemical evolution of life presented in your text.
						Distinguish between domain and kingdom.
						Discuss the terms convergent evolution and adaptive radiation, giving examples.
						Explain the theory of endosymbiosis.
						Explain the concepts of macroevolution and speciation.

UNIT VI: POPULATION GENETIC AND EVOLUTION

Outcomes: Upon completion of this unit, the student will be able to discuss the origin of life and evolution.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Explain the concepts of microevolution.
						Discuss the Hardy-Weinberg rule as it applies to evolving populations.
						Discuss the species concept and factors that can lead to speciation.
						Explain the process of natural selection and how it can lead to change.
						Discuss population dynamics and the changes that can occur in the gene pool.

Projects Required:

Laboratory reports in a lab book are required. Reports are to include drawings, graphs, results, and other data where indicated. Two special projects will be assigned as determined by the instructor. They may include, but are not limited to, specimen collections, research papers, current events folders, and class presentations. Each project is worth 50 points.

Text Book: Contact Bookstore for current textbook.

Materials/Equipment Required: None

Major Pieces of Equipment:

Compound and dissecting microscopes
 Miscellaneous prepared slides
 Collecting equipment
 Models
 Computers and CD ROMs
 Charts

Attendance Policy

Students should adhere to the attendance policy outlined by the instructor in the course syllabus.

Grading Policy:

The grading policy will be outlined by the instructor in the course syllabus.

Maximum class size:

Based on classroom occupancy

Course Time Frame:

The U.S. Department of Education, Higher Learning Commission and the Kansas Board of Regents define credit hour and have specific regulations that the college must follow when developing, teaching and assessing the educational aspects of the college. A credit hour is an amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally-established equivalency that reasonably approximates not less than one hour of classroom or direct faculty instruction and a minimum of two hours of out-of-class student work for approximately fifteen weeks for one semester hour of credit or an equivalent amount of work over a different amount of time. The number of semester hours of credit allowed for each distance education or blended hybrid courses shall be assigned by the college based on the amount of time needed to achieve the same course outcomes in a purely face-to-face format.

Refer to the following policies:

[402.00 Academic Code of Conduct](#)

[263.00 Student Appeal of Course Grades](#)

[403.00 Student Code of Conduct](#)

Disability Services Program:

Cowley College, in recognition of state and federal laws, will accommodate a student with a documented disability. If a student has a disability which may impact work in this class which requires accommodations, contact the Disability Services Coordinator.