CLEP EXAMINATION: ***BIOLOGY***

DESCRIPTION OF THE EXAMINATION:
The Biology examination covers material that is usually taught in a one-year college general biology course. The subject matter tested covers the broad field of the biological sciences, organized into three major areas: molecular and cellular biology, organismal biology, and population biology. The examination gives approximately equal weight to these three areas, and the questions related to them are interspersed randomly throughout the test.The examination contains 115 questions to be answered in 90 minutes. Some of these are pretest questions that will not be scored. Any time candidates spend on tutorials and providing personal information in addition to the actual testing time.

KNOWLEDGE AND SKILLS REQUIRED:
Questions on the Biology examination require candidates to demonstrate one or more of the following abilities:

- Knowledge of facts, principles, and processes of biology
- Understanding the means by which information is collected, how it is interpreted, how one hypothesizes from available information, how one draws conclusions and makes further predictions
- Understanding that science is a human endeavor with social consequences.

The subject matter of the Biology examination is drawn from the following topics. The percentages next to the main topics indicate the approximate percentages of exam questions on those topics: 33% Molecular and Cellular Biology; 34% Organismal Biiology; 33% Population Biology

STUDY RESOURCES:
Most textbooks used in college-level biology courses cover the topics in the outline given earlier, but the approaches to certain topics and the emphasis given to them may differ. To prepare for the Biology exam, it is advisable to study one or more college textbooks which can be found in most college bookstores. When selecting a textbook, check the table of contents against the “Knowledge and Skills Required” for this test. In addition, candidates would do well to consult pertinent articles form the monthly magazine Scientific American, available in most libraries. The Internet is another resource the candidate could explore. Additional suggestions for preparing for CLEP exams are given in “Preparing to Take CLEP Examinations.”

From Biology Test Information Guide. Retrieved January 1, 2008 from https://apps2.collegeboard.com/clp/CLEPResourceCenter/test_info.jsp

CLEP TEST KNOWLEDGE AND SKILLS REQUIRED	Minnesota Life Science Standards (9-12)	Notes

	Sub-Strand	Standard	Benchmarks	
Molecular and Cellular Biology				
Chemical composition of organisms				No alignment to Life Science Standards. Some of these topics are covered in a college prep chemistry course.
Cells	A. Cells	The student will comprehend that all living things are composed of cells, and that the life processes in a cell are based on molecular interactions.	1. The student will relate cellular structures to their functions. 2. The student will compare and contrast the structures found in typical plant, animal and bacterial cells. 3. The student will explain the role of the cell membrane as a highly selective barrier in diffusion, osmosis and active transport.	
	F. Flow of Matter and Energy	The student will describe and explain the cycling of matter and flow of energy through an ecosystem's living and non-living components.	3. The student will explain that sunlight is transformed into chemical energy by photosynthetic organisms. 4. The student will explain that respiration releases chemical energy through the breakdown of molecules.	
Enzymes	A. Cells	The student will comprehend that all living things are composed of cells, and that the life processes in a cell are based on molecular interactions.	4. The student will describe the role of enzymes as catalysts in metabolism and cellular synthesis of new molecules.	

Energy transformations	A. Cells	The student will comprehend that all living things are composed of cells, and that the life processes in a cell are based on molecular interactions.	5. The student will differentiate between the processes of photosynthesis and respiration in terms of energy flow, reactants and products	
Cell Division	A. Cells	The student will comprehend that all living things are composed of cells, and that the life processes in a cell are based on molecular interactions.	6. The student will describe and compare the processes of mitosis and meiosis and their roles in the cell cycle.	
	D. Heredity	The student will explain how inherited characteristics are encoded by genes.	2. The student will define the relationship between DNA, genes and chromosomes. 5. The student will describe how genetic information is transmitted from parents to offspring through the processes of meiosis and fertilization as they relate to chromosome recombination and sexual reproduction.	
Chemical nature of the gene	D. Heredity	The student will explain how inherited characteristics are encoded by genes.	1. The student will explain that the instructions for the characteristics of all organisms are carried in nucleic acids. 2. The student will define the relationship between DNA, genes and chromosomes. 3. The student will describe the structure and function of DNA and distinguish between replication, transcription and translation.	
	E. Biological Populations Change Over Time	The student will understand how biological evolution provides a scientific explanation for	1. The student will understand that species change over time and the term biological evolution is used to describe this process. 2. The student will use the principles of natural	

		the fossil record of ancient life forms, as well as for the striking molecular similarities observed among the diverse species of living organisms.	selection to explain the differential survival of groups of organisms as a consequence of: o The potential for a species to increase its numbers; o The genetic variability of offspring due to mutation and recombination of genes; o A finite supply of the resources required for life; and, o The ensuing selection based on environmental factors of those offspring better able to survive and produce reproductively successful offspring.	

Organismal Biology				
Structure and function in plants with emphasis on angiosperms	A. Cells	The student will comprehend that all living things are composed of cells, and that the life processes in a cell are based on molecular interactions.	1. The student will relate cellular structures to their functions. 2. The student will compare and contrast the structures found in typical plant, animal and bacterial cells. 3. The student will explain the role of the cell membrane as a highly selective barrier in diffusion, osmosis and active transport.	
Plant reproduction and development	B. Diversity of Organisms	The student will classify, compare and contrast the diversity of organisms on Earth and their modes of accommodating the requirements for life.	2. The student will recognize that organisms have both innate and learned behavioral responses to internal and external stimuli, including the tropic responses in plants.	
Structure and function in animals with emphasis on vertebrates	B. Diversity of Organisms	The student will classify, compare and contrast the diversity of organisms on Earth and their modes of	1. The student will relate the structure, complexity and organization of organ systems to the methods of obtaining, transforming, releasing and eliminating the matter and energy used to sustain the organism.	

		accommodating the requirements for life.		
	G. Human Organism	The student will understand how all organ systems, including the nervous system, interact to maintain homeostasis.	1. The student will understand and describe the basic anatomy and physiology of the nervous system and sense organs. 2. The student will describe how the functions of individual organ systems are integrated to maintain a homeostatic balance in the body.	
Animal reproduction and development	D. Heredity	The student will explain how inherited characteristics are encoded by genes.	5. The student will describe how genetic information is transmitted from parents to offspring through the processes of meiosis and fertilization as they relate to chromosome recombination and sexual reproduction.	
Principles of heredity	D. Heredity	The student will explain how inherited characteristics are encoded by genes.	2. The student will define the relationship between DNA, genes and chromosomes. 4. The student will know that different species of multicellular organisms have a characteristic number of chromosomes, and that in typical humans there are 22 autosomal pairs and 2 sex chromosomes. 5. The student will describe how genetic information is transmitted from parents to offspring through the processes of meiosis and fertilization as they relate to chromosome recombination and sexual reproduction. 6. The student will use Mendel's laws of segregation and independent assortment to determine the genotype and phenotype of a monohybrid cross. 7. The student will differentiate between dominant, recessive, co- dominant, incompletely dominant, polygenic and sex-linked traits.	

Population Biology				
Principles of ecology	C. Interdependence of Life	The student will describe how the environment and interactions between organisms can affect the number of species and the diversity of species in an ecosystem.	3. The student will identify examples of mutualism, commensalism, and parasitism in a stable ecosystem.	
	E. Biological Populations	The student will understand how biological evolution provides a scientific explanation for the fossil record of ancient life forms, as well as for the striking molecular similarities observed among the diverse species of living organisms	1. The student will understand that species change over time and the term biological evolution is used to describe this process.	
	F. Flow of Matter and Energy	The student will describe and explain the cycling of matter and flow of energy through an ecosystem's living and non-living components.	1. The student will explain the relationship between abiotic and biotic components of an ecosystem in terms of the cycling of water, carbon, oxygen and nitrogen. 2. The student will know that all matter tends to become more disorganized over time, and that living systems require a continuous input of energy in order to maintain their chemical and physical organizations and prevent death. 3. The student will explain that sunlight is transformed into chemical energy by photosynthetic organisms. 4. The student will explain that respiration releases chemical energy through the breakdown of molecules.	

			5. The student will understand that matter and energy flow through different levels of organization of living systems, from cells to communities, as well as between living systems and the physical environment as chemical elements are recombined in different ways. Each recombination results in both storage and dissipation of energy	
Principles of evolution	B. Diversity of Organisms	The student will classify, compare and contrast the diversity of organisms on Earth and their modes of accommodating the requirements for life.	3. The student will use scientific evidence, including the fossil record, homologous structures, embryological development or biochemical similarities, to classify organisms in order to show probable evolutionary relationships and common ancestry.	
	C. Interdependence of Life	The student will describe how the environment and interactions between organisms can affect the number of species and the diversity of species in an ecosystem.	2. The student will explain how adaptations of species and co-evolution with other species are related to success in an ecosystem.	
	E. Biological Populations Change Over Time	The student will understand how biological evolution provides a scientific explanation for the fossil record of ancient life forms, as well as for the striking molecular similarities observed among the diverse species of living organisms.	1. The student will understand that species change over time and the term biological evolution is used to describe this process. 2. The student will use the principles of natural selection to explain the differential survival of groups of organisms as a consequence of: o The potential for a species to increase its numbers; o The genetic variability of offspring due to mutation and recombination of genes; o A finite supply of the resources required for life; and, o The ensuing selection based on environmental	

			factors of those offspring better able to survive and produce reproductively successful offspring. 3. The student will describe how genetic variation between populations is due to different selective pressures acting on each population, which can lead to a new species. 4. The student will use biological evolution to explain the diversity of species.	
Principles of behavior				None in MN standards
Social biology	C. Interdependence of Life	The student will describe how the environment and interactions between organisms can affect the number of species and the diversity of species in an ecosystem.	1. The student will describe the factors related to matter and energy in an ecosystem that both influence fluctuations in population size and determine the carrying capacity of a population. 4. The student will predict and analyze how a change in an ecosystem, resulting from natural causes, changes in climate, human activity or introduction of invasive species, can affect both the number of organisms in a population and the biodiversity of species in the ecosystem.	

Minnesota Life Science Standards and Benchmarks not met by assessment:

9-12 History and Nature of Science standards are not reflected in this test.

In CLEP but not in the Standards:

Beyond HS content in CLEP: see notes