GACE® Biology Assessment Test I (026)
Curriculum Crosswalk

	Required Coursework Numbers														
Subarea I. Cell Biology: Cell Structure and Function (50%)															
Objective 1: Understands the basic biochemistry and metabolism of living organisms															
A. Understands the chemical structures and properties of biologically important molecules															
• Atomic and molecular structures and chemical bonding															
• Organic versus inorganic molecules															
• Properties of water based on structure and bonding characteristics															
• Major macromolecules, including nucleic acids, proteins, lipids, and carbohydrates															
B. Understands that biological processes are dependent on chemical principles															
• Chemical and physical gradients, and factors that influence the gradients															
• Thermodynamics															
• Anabolic and catabolic reactions															
• Reduction-oxidation reactions															
C. Understands the structure and function of enzymes and the factors that influence their activity															
• Active site structure and substrate binding															

	Required Coursework Numbers														
• Energy profile of a reaction in the presence or absence of an enzyme															
• Reaction kinetics, including the effects of temperature, pH, and inhibitors															
• Regulation, including cooperative binding and feedback inhibition															
D. Understands major biochemical pathways and energy flow within an organism															
• Cellular locations of biochemical pathways															
• Photosynthesis, including photosystems, electron transport, Calvin cycle, C3 versus C4, CAM															
• Cellular respiration, including glycolysis, Krebs cycle, electron transport, fermentation															
• Chemosynthesis for photosynthesis and cellular respiration															
Objective 2: Understands the structure and function of cells and the mechanisms of basic cellular processes															
A. Understands the characteristics of living versus nonliving things															
• Cellular organization															
• Obtaining and using energy															
• Growth and reproduction															
• Regulation and responses to the environment															

	Required Coursework Numbers														
B. Understands the defining characteristics of viruses, bacteria, protists, fungi, plants, and animals															
• Structural differences between prokaryotes and eukaryotes, including organelles, cell walls, and chromosomes															
• Structural characteristics of viruses, bacteria, protists, fungi, plants, and animals															
• Cellular organization, including unicellular versus multicellular															
• Modes of nutrition, including autotrophic versus heterotrophic															
• Modes of reproduction/replication															
C. Understands the structure and function of cells and organelles															
• Plant cells versus animal cells															
• Cell membranes															
• Membrane-bound organelles and ribosomes															
• Cytoskeleton															
D. Understands how cells maintain their internal environment and respond to external signals															
• Selective permeability															
• Active and passive transport															
• Water movement, including osmolarity and water potential															
• Cell surface proteins, cell communication, and signal molecules															
• Exocytosis and endocytosis															
• Negative-feedback mechanisms															

	Required Coursework Numbers														
E. Understands eukaryotic cell division, the cell cycle, and regulation of the processes															
• Cell cycle stages															
• Mitosis and meiosis, including functions, stages, and results															
• Cytokinesis, including differences between animals and plants															
• Cell cycle checkpoints															
Subarea II. Genetics and Evolution (50%)															
Objective 1: Understands the mechanisms of molecular biology and the predictions of transmission genetics															
A. Understands the structure of nucleic acids and chromosomes															
• Sugar-phosphate backbone and complementary base pairing															
• DNA versus RNA															
• Chromosome structure, including nucleosomes and telomeres															
B. Understands the transfer of genetic information															
• DNA replication															
• Promoters, enhancers, and transcription factors															
• Process of RNA transcription															
• Pre-mRNA processing in eukaryotes															
• Translation and the genetic code															
• Prokaryotic operons															

	Required Coursework Numbers														
C. Understands that cells may undergo differentiation and specialization															
• Differential gene expression															
• Stem cells, including characteristics and sources															
D. Understands the nature of mutations															
• Cause of mutations, including recombination and mutagens															
• Types of mutations, including point mutation, deletion, inversion, and translocation															
• Significance of somatic versus germ-line mutations															
• Disorders resulting from point mutations, frameshift mutations, changes in chromosome structure, and changes in chromosome numbers															
E. Understands basic laboratory techniques and more complex DNA technologies															
• Microscopy															
• Gel electrophoresis															
• Spectrophotometry															
• DNA sequencing and polymerase chain reaction (PCR)															
• Genome sequencing projects															
• Gene therapy															
• Transgenic and genetically engineered cells															

	Required Coursework Numbers														
F. Understands Mendel's postulates and how to use the postulates to predict probable outcomes of given genetic crosses															
• Dominant and recessive alleles															
• Independent assortment															
• Segregation															
• Monohybrid and dihybrid crosses															
• Pedigree analysis															
G. Understands non-Mendelian inheritance															
• Gene linkage and mapping by recombination analysis															
• Sex-linked inheritance															
• Multiple alleles, codominance, and incomplete dominance															
• Polygenic inheritance, epistasis, and pleiotropy															
• Extranuclear inheritance, including mitochondrial and chloroplast inheritance															
• Environmental influences, including epigenetics															
Objective 2: Understands mechanisms of evolution as a consequence of genetic variation and factors affecting evolution															
A. Understands the sources of genetic variation															
• Mutation															
• Crossing-over															

	Required Coursework Numbers														
• Sexual reproduction, including segregation and independent assortment															
• Horizontal genetic exchange, including conjugation, transformation, and transduction															
B. Understands the mechanisms of evolution															
• Hardy-Weinberg equilibrium and factors that may alter the equilibrium															
• Effects of mutations, gene flow, genetic drift (including bottleneck and founder effects), and nonrandom mating (including sexual selection)															
• Natural and artificial selection															
• Coevolution															
• Adaptive radiation															
• Convergent versus divergent evolution (analogous versus homologous structures)															
C. Understands the evidence that supports evolution															
• Fossil record															
• Endosymbiosis															
• Structural and developmental evidence, including homology and embryology															
• Molecular evidence, including DNA and RNA sequence comparisons															

	Required Coursework Numbers														
D. Understands models of evolutionary rates and the genetic basis of speciation															
• Gradualism															
• Punctuated equilibrium															
• Reproductive isolation, including behavioral and postzygotic															
• Mechanisms of speciation, including allopatric and sympatric															
E. Understands scientific explanations for the origin of life on Earth															
• Abiotic synthesis of organic compounds and the Miller-Urey experiment															
• Biological influences on atmospheric composition, including the role of photosynthesis															
• Development of self-replication, including the RNA-first hypothesis															
F. Understands factors that lead to the extinction of species															
• Lack of genetic diversity															
• Interspecific competition															
• Environmental pressures, including climate and habitat change															
• Human impacts															
• Meteor impacts															