

REGENTS - LIVING ENVIRONMENT

Code: 5441 Full Year (9, 10) (1 credit)

(Rank weight = 1.00)

Prerequisite: Completion of Science 8R and Math 8R

Recommendation: Completion of the Physical Setting — Earth Science

Areas of Study Include:

- Science of Biology
 - What is science? What does Biology study?
 - How does Science work? — The Scientific Method & Experimental Design
 - The Tools of Biology, including the Metric System & Microscopes
- The Chemistry of Life
 - Basic Chemistry
 - Biochemistry
 - Carbohydrates
 - Lipids
 - Nucleic Acids
 - Proteins
 - Enzymes
- Cellular Biology
 - Cell Structure & Function
 - The cell theory
 - Organelles
 - Comparing prokaryotes and eukaryotes
 - Comparing Plant & Animal Cells
 - The plasma membrane & membrane transport: Diffusion/Osmosis/Active Transport
- Photosynthesis
 - Key Idea: Light Energy to Chemical Energy
 - Key Idea: Inorganic carbon (carbon dioxide) to organic carbon (glucose)
 - Occurs in chloroplasts of plant cells (and many single-celled organisms)
- Cellular Respiration
 - Key Idea: Sugars are converted to universal energy molecule, ATP
 - Glucose is converted to inorganic carbon dioxide
 - Aerobic respiration (=36 ATP) is better than anaerobic respiration (= 2 ATP)
 - Occurs in mitochondria of ALL cells, and occurs 24/7!
 - Mitochondria are likely descendants of ancient prokaryotes...
- Cell Growth & Division
 - Why do Cells Divide? Comparing surface area and volume...
 - Mitosis: one diploid cell splits into two identical cells, & mitosis nuclear division
 - Cancer = mitosis that is out-of-control...
 - Examination of mitosis in onion cells and whitefish cells
 - Cancer research projects in library
 - Meiosis: formation of gametes in the gonads
 - One diploid cell forms four haploid cells

- Comparing Mitosis & Meiosis

- Intro. To Genetics
 - What is meant by “genetics”?
 - Mendelian genetics
 - Punnett squares and assessing genetic probability
 - Difficulty of assessing probability for non-Mendelian traits
 - Genotype vs. phenotype
 - Dominant vs. recessive traits
 - Polygenic traits
 - Other modes of inheritance
 - Genetic Disease projects
- Modern Genetics: DNA & RNA
 - Discovery of shape of DNA (1953)
 - DNA as a polymer of nucleotides
 - Role of DNA in transmission of genetic material
 - Protein Synthesis: DNA to mRNA to protein
 - Mutations and their significance
 - DNA and cancer
- Genetic Engineering
 - What is genetic engineering?
 - What are some uses for genetic engineering?
 - How is genetic engineering done?
 - Ethical issues in genetic engineering
- The Human Genome
 - The Human Genome Project
 - DNA fingerprinting
 - Gene therapy
 - Other uses of genetic technology
 - Fact vs. fiction in “Jurassic Park”, and other films/media
 - Ethical issues in genetic technology
- Darwin ‘s Theory of Evolution
 - Connections that exist throughout all of Earth’s life forms
 - All organisms are DNA-based (except certain viruses, which are not considered to be alive — so they are not really “organisms”)
 - All organisms are made of different combinations of only 20 amino acids
 - Nearly all organisms share various biochemical pathways
 - A history of various ideas of evolution through the millennia
 - Lamarckian evolution
 - Charles Darwin’s “Theory of Evolution by Natural Selection~~
 - Comprehensive notes and observations eventually led to the development of a complex, cohesive theory of organic evolution over a period of 30 years...
 - The significance of the term “adaptation” to biologists since Darwin
 - Evidence for evolution
 - Fossil evidence, including some intact fossil sequences, like that of whales and horses

- Relative dating and radioactive dating of both fossils and rock strata
- Geographic connections, e.g. fossils and geology support continental drift
- Similarities in the structures (and functions) of various organisms
- Biochemical similarities
- Darwin's theory:
 - All organisms possess inheritable variations, and some variations are better than others for obtaining and using resources — these are ADAPTATIONS
 - Overproduction of offspring
 - A struggle for existence — competition for insufficient resources
 - Organisms with the best adaptations are MORE LIKELY to survive and reproduce
- Species alive today are descended, with modifications, from previous species
- All organisms on Earth are therefore descended from common ancestors
- Evolution of Populations
 - Modern theories of evolution
 - Populations evolve, individuals do not
 - Evidence for evolution from the Galapagos finches
 - Antibiotic resistance as evidence for evolution
- The History of Life
- Classification
- ** Human Evolution, if time... **
- Animal Maintenance:
- Digestion & Excretion
 - Adaptations for Maintenance
 - Diseases
- Circulation & Respiration
 - Adaptations for Maintenance
 - Diseases
- The Immune System
 - Adaptations for Maintenance
 - Diseases
- Skeleton & Muscles
 - Adaptations for Maintenance
 - Diseases
- Nervous & Endocrine Systems
 - Adaptations for Maintenance
 - Diseases
- Reproductive Systems
 - Adaptations for Maintenance
 - Diseases
 - Sexual vs. Asexual Reproduction
 - Reproductive Technology
- Plants
 - Roots, Stems, & Leaves
 - Reproduction of Seed Plants
 - Plant Responses & Adaptations

- Ecology & Environmental Science
 - The Biosphere
 - Ecosystems & Communities
 - Humans Impact on the Biosphere

Assessment:

All Living Environment students who complete the required 1200 minutes of labs will take the Living Environment Regents Exam in June.

For the complete NYS Core Curriculum for Living Environment, see <http://www.emsc.nysed.gov/ciai/mst/pub/livingen.pdf>