

Wallingford Public Schools - HIGH SCHOOL COURSE OUTLINE

Course Title: Biology	Course Number: B 2215, G 2214, A 2213, H 2212
Department: Science	Grade(s): 10 (B, G, A) 9 -10 (H)
Level(s): Basic, General, Academic, and Honors <i>Objectives that have an asterisk ** are expected to be mastered by honors level students. Academic, General and Basic level students may be introduced to these concepts, as appropriate.</i>	Credit: 1
Course Description This course stresses those major concepts of biology that all persons should know if they are to be scientifically literate. It also emphasizes the ways or processes by which scientists form ideas and make discoveries. It involves students in frequent activities designed to prepare them for living in a world that is greatly influenced by science. Topics studied will include: biochemistry, cells, genetics, and ecology.	
Required Instructional Materials Honors <i>Biology</i> , McGraw Hill, 1998. (Mader) Academic <i>Biology</i> , Prentice Hall, 2008. (Miller Levine) General/Basic <i>Life Science</i> , Glenco, 2005. <ul style="list-style-type: none"> • Teacher resources that accompany the text • Current and sufficient laboratory materials and equipment for each of the learning strands • Appropriate safety equipment – goggles, aprons, eyewash, safety shower, gloves, etc. • Information technologies – internet and library resources 	Completion/Revision Date Revisions Approved by Board of Education February 25, 2009 Adopted by Board of Education April 25, 2005

Mission Statement of the Curriculum Management Team

The mission statement of the Science Curriculum Management team is to promote scientific literacy emphasizing the process, content, and interdisciplinary nature of science.

Enduring Understandings for the Course

- Inquiry is the integration of process skills, the application of scientific content and critical thinking to solve problems.
- Science is the method of observation and investigation used to understand our world.

<ul style="list-style-type: none"> • Living things are complex systems of interacting and evolving chemical, physical and biological processes.
<ul style="list-style-type: none"> • Energy provides the ability to do work.
<ul style="list-style-type: none"> • Energy is required by all living things to carry out life processes.
<ul style="list-style-type: none"> • Proteins, carbohydrates, lipids and nucleic acids are the fundamental organic groups found in living things.
<ul style="list-style-type: none"> • Energy is transferred from the sun in the form of carbohydrates via photosynthesis.
<ul style="list-style-type: none"> • Cellular respiration releases the energy from carbohydrates to fuel life processes.
<ul style="list-style-type: none"> • Enzymes decrease the amount of energy needed for reactions to occur in living systems.
<ul style="list-style-type: none"> • DNA is responsible for storing the information needed for cell reproduction and survival.
<ul style="list-style-type: none"> • Complex living things are organized in different levels.
<ul style="list-style-type: none"> • Change in any interacting process will impact cells/living things.
<ul style="list-style-type: none"> • Microorganisms play an essential role in life processes and cycles on Earth.
<ul style="list-style-type: none"> • Cells/living things have optimal ranges for different environmental conditions in which they perform life processes.
<ul style="list-style-type: none"> • The cell membrane regulates movement of substances in and out of a cell based on their size and chemical charge.
<ul style="list-style-type: none"> • Understanding the growth and spread patterns of bacteria and viruses enables the development of methods to prevent and treat infectious diseases.
<ul style="list-style-type: none"> • Scientific ideas evolve as new information is uncovered.
<ul style="list-style-type: none"> • The environment is a complex assemblage of interacting processes.
<ul style="list-style-type: none"> • The current state of an environment is maintained by the dynamic exchange of the processes that dictate its nature.
<ul style="list-style-type: none"> • There is a process of inheriting traits from parents to offspring through genes.
<ul style="list-style-type: none"> • Sexual reproduction increases variation in offspring.
<ul style="list-style-type: none"> • Predictions can be made using Punnett squares, pedigrees or other methods to determine frequencies of genotypes and/or phenotypes in offspring.
<ul style="list-style-type: none"> • Organisms that produce few offspring and have few variations are at greater risk to die off when there are environmental changes.
<ul style="list-style-type: none"> • There are differences between genetic disorders and infectious diseases.
<ul style="list-style-type: none"> • Changes in the environment may result in the selection of organisms that are better able to survive and reproduce.
<ul style="list-style-type: none"> • There is evidence that supports the theory of evolution including fossil evidence.
<ul style="list-style-type: none"> • Population size is affected by many factors, including environmental factors.
<ul style="list-style-type: none"> • Technological advances have effected human population growth and size.
<ul style="list-style-type: none"> • The rapid increase in human population size has effected the environment.
<ul style="list-style-type: none"> • When emigration and immigration are equal and the birth rate exceeds the death rate, population growth rate will become exponential.
<ul style="list-style-type: none"> • Adaptation is any structural or behavioral change in a species that takes place over time and helps the species to survive in its habitat.
<ul style="list-style-type: none"> • Species survival is affected by environmental concerns.
<ul style="list-style-type: none"> • Structural and behavioral characteristics help an organism to survive in its environment.
<ul style="list-style-type: none"> • The current state of any environment is maintained by the dynamic exchange of the processes that dictate its nature. Changes in any of the interacting processes will impact the current state (for better or worse).
<ul style="list-style-type: none"> • Energy drives systems and cycles in our universe.

<ul style="list-style-type: none">• The elements of living things take many forms.
<ul style="list-style-type: none">• Diverse habitats provide the 'needs of life' for a variety of organisms.
<ul style="list-style-type: none">• The cycling of matter and the flow of energy are required for the functioning of ecosystems.

NOTE:

- Learning strand 5, Ecology, must be taught near the end of the school year, in the spring. This learning strand is not addressed in the 9-10th grade CT State Science Frameworks (2004) and therefore, with the science portion of the 10th grade CAPT assessment.
- The letter D accompanied by a number denotes the related CT State Science Framework Expected Performance.

LEARNING STRAND

1.0 Scientific Reasoning and Communication Skills

NOTE: This learning strand should be taught through the integration of the other learning strands. This learning strand is not meant to be taught in isolation as a separate unit.

ENDURING UNDERSTANDING(S)

- Inquiry is the integration of process skills, the application of scientific content and critical thinking to solve problems.
- Science is the method of observation and investigation used to understand our world.

ESSENTIAL QUESTION(S)

- How is inquiry used to solve problems or gather data to better understand a situation?
- How do you evaluate data and conclusions to determine its validity?
- How is scientific knowledge created and communicated?
- How do prior knowledge, bias, and opinion affect inquiry?
- How does new knowledge gained create new questions?
- How do science and technology affect the quality of our lives?

LEARNING OBJECTIVES The student will:

- 1.1 Generate scientific questions to be investigated.
- 1.2 Read, interpret and examine the credibility and validity of scientific claims in different sources of information.
- 1.3 Formulate a testable hypothesis in the 'If...then...because...' form that demonstrates logical connections between the scientific concepts guiding the hypothesis and the design of the experiment.
- 1.4 Design and conduct appropriate types of scientific investigations to answer different questions.
- 1.5 Identify independent and dependent variables, including those that are kept constant and those used as controls.
- 1.6 Apply appropriate instruments needed to make observations and collect data precisely.
- 1.7 Analyze experimental design and data so as to question validity/reliability, identify variables, and improve experimental design.
- 1.8 Develop conclusions based on critical data analysis identifying further investigations and/or questions based on the results.
- 1.9 Use mathematical operations to analyze

INSTRUCTIONAL SUPPORT MATERIALS

- Sufficient laboratory instrumentation

SUGGESTED INSTRUCTIONAL STRATEGIES

- Performance tasks
- Open-ended labs
- Inquiry
- Modeling
- Hands-on, minds-on lab activities
- CAPT style open-ended/constructed response questions – content and experimental
- Computer created spreadsheets and graphs
- See other learning strands for integration

SUGGESTED ASSESSMENT METHODS

- Lab reports
- Open-ended questions
- Teacher observations
- Essays and/or compositions
- CAPT style open-ended/constructed response questions – content and experimental
- Research based projects
- Computer created spreadsheets and graphs
- See other learning strands for integration

and interpret data, and present relationships between variables in appropriate forms (tables, graphs, etc.)

- 1.10 Utilize graphs in order to determine patterns and make predictions.
- 1.11 Apply computer-based tools to present and research information.
- 1.12 Gather information using a variety of print and non-print sources.
- 1.13 Support scientific arguments using a variety of print and non-print sources.
- 1.14 Communicate about science in different formats, using relevant science vocabulary, supporting evidence and clear logic.
- 1.15 Understand and demonstrate lab safety practices and procedures.

LEARNING STRAND

2.0 Biochemistry

ENDURING UNDERSTANDING(S)

- Living things are complex systems of interacting and evolving chemical, physical and biological processes.
- Energy provides the ability to do work.
- Energy is required by all living things to carry out life processes.
- Proteins, carbohydrates, lipids and nucleic acids are the fundamental organic groups found in living things.
- Energy is transferred from the sun in the form of carbohydrates via photosynthesis.
- Cellular respiration releases the energy from carbohydrates to fuel life processes.
- Enzymes decrease the amount of energy needed for reactions to occur in living systems.
- DNA is responsible for storing the information needed for cell reproduction and survival.

ESSENTIAL QUESTION(S)

- How is energy transferred to living things from the sun?
- How is energy released from carbohydrates in living systems?
- How do living things use energy?
- What chemical processes occur in living things? How do they happen?
- How are enzymes important in the chemical reaction of living systems?
- What are the fundamental types of organic molecules found in living things? How are they used?
- Why is DNA a critical component to modern biology?
- What is the relationship between DNA, proteins and traits?

LEARNING OBJECTIVES: The student will:

- 2.1 Analyze how macromolecules are broken down into micromolecules for energy and other life processes. (D29)
- 2.2 Describe the flow of matter and energy in the processes of photosynthesis and cellular respiration. (D27, D29)
- 2.3 Identify the function of the main nutrients needed by living things. (D27, D30, D28)
- 2.4 Identify the structure of DNA. (D28)
- 2.5 Demonstrate how replication, transcription and translation relate to protein synthesis. (D28)
- 2.6 Investigate the factors that affect the efficiency of enzyme function. (embedded task)
- 2.7 Identify the structure and function of carbohydrates, lipids and proteins. **

INSTRUCTIONAL SUPPORT MATERIALS

- Food samples (simple sugar, starch, protein)
- Indicators (iodine, methylene blue, etc.)
- Magnetic DNA models
- Craft supplies
- Various leaves (spinach, coleus, geranium, etc.)
- <http://www.accessexcellence.org/> (Access Excellence)
- Embedded task supplies including apple sauce, filter paper, filters, pectinase, cellulose, glass ware

INSTRUCTIONAL STRATEGIES/APPROACHES

- CAPT experimental constructed response warm-ups
 - 9.1 soda can calorimeter
 - 10.1 yeast lab
- Labs:
 - **CSDE Embedded task: Enzymes (apple juice)**
 - Fast food analysis
 - Macromolecule identification lab

	<ul style="list-style-type: none"> ○ Geranium stomata/chloroplast lab ○ Chromatography lab ○ DNA ornaments/jewelry ○ CAPT lab: Catalase Lab ● Cooperative group activities ● Read and summarize articles on related current issues ● Dietary analysis ● Role play: transcription-translation ● Concept mapping ● Open-ended/ CAPT style labs ● Explore the formation of polymers using different paper cut outs from lab ● Students record their diets for a day and classify the foods that they've eaten into types of molecules (protein, carbohydrate, fat) ● Create a concept map/web that summarizes the types of molecules of life, elements they are composed of, descriptions of monomers and polymers and their functions ● Compare the use of carbohydrates and lipids as sources of energy ● Draw a diagram/flow chart that compares the processes of photosynthesis and respiration ● Design an experiment that can test the optimal pH and temperature range for an enzyme ● Draw a venn diagram that compares aerobic and anaerobic respiration ● Make a concept map with energy as the focal point – include words such as photosynthesis, cellular respiration, enzymes, etc. ● Burn a peanut to demonstrate that energy is stored in food – discuss how to investigate the amount of energy ● Demonstrate what happens when sugar is added to a yeast solution – how is energy being transferred from sugar to yeast? ● Create a concept map using tRNA, mRNA, ribosome, transcription, translation, amino acids, DNA, and protein synthesis ● Given data showing a student's blood glucose levels as measured hourly over a 24 hour period, draw conclusions about regulatory response from the data and use their conclusions to make inferences about the effects of injected insulin on diabetes
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ASSESSMENT METHODS/TOOLS

- Open-ended/constructed response questions focusing on content and experimentation skills
- Tests/quizzes
- Lab reports
- Demonstrations using models (DNA, RNA, Proteins, etc.)
- Open-ended prompts
- Rubrics
- Analyze experimental design, identify the question being explored, defend the validity of the data, and/or conclusions drawn from a sample lab situation

LEARNING STRAND

3.0 Cells

ENDURING UNDERSTANDING(S)

- Complex living things are organized in different levels.
- Living things are complex systems of interacting and evolving chemical, physical and biological processes.
- Change in any interacting process will impact cells/living things.
- Cells/living things have optimal ranges for different environmental conditions in which they perform life processes.
- The cell membrane regulates movement of substances in and out of a cell based on their size and chemical charge.
- Microorganisms play an essential role in life processes and cycles on Earth.
- Understanding the growth and spread patterns of bacteria and viruses enables the development of methods to prevent and treat infectious diseases.

ESSENTIAL QUESTION(S)

- How do (cell) structures differ among living things?
- How is structure related to function?
- How is the cell membrane organized?
- How does the cell membrane control movement of substances into and out of the cell?
- How do environmental factors affect living things?
- How does a cell re-establish homeostasis when its environment changes?
- What do living things have in common?
- How are living things different?
- How do science and technology affect the quality of our lives?
- What are the differences between bacteria and viruses?
- How are bacteria and viruses both helpful and harmful to humans?
- How can humans prevent, and treat infectious diseases?

LEARNING OBJECTIVES – The student will:

- 3.1 Relate the structure and function of cellular organelles to the overall performance of the cell and therefore the organism.(D27)
- 3.2 Analyze how materials move in and out of cells.(D30)
- 3.3 Differentiate between plant and animal cells.(D27)
- 3.4 Compare and contrast the differences in structure of viruses, bacteria, and yeasts.(D31, D33)
- 3.5 Describe how infectious diseases are transmitted to humans by bacteria, viruses and other microorganisms.(D32)
- 3.6 Examine the role of sanitation, vaccination, and antibiotic medications in the prevention and treatment of infectious diseases. (D32)
- 3.7 Explain how bacteria and yeasts are used to produce foods for human consumption. (D33)

INSTRUCTIONAL SUPPORT MATERIALS

- Cell models
- Prepared slides – mitosis, plant, animal, etc.
- Play-Doh
- Videos (mitosis)
- National Institute of Health (free resources)
<http://science-education.nih.gov/home2.nsf/Educational+Resources/Grade+Levels/+High+School?OpenView&start=1&>
 - *Emerging and Re-emerging Infectious Diseases*
 - *Cell Biology and Cancer*
 - *Inside the Cell*
- www.cdc.gov
- <http://bio.rutgers.edu/> (The Virtual Biology Labs – Rutgers)
- <http://www.accessexcellence.org/> (Access Excellence)

3.8 Compare and contrast methods of passive and active transport mechanisms.
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INSTRUCTIONAL STRATEGIES/APPROACHES

- CAPT experimental constructed response warm-ups
 - 10.1 Cellular Diffusion
 - 10.1 & 10.5 Salinity
- Create mitosis models
- Labs - diffusion, osmosis, yeast, etc.
- Microscope work
- Open-ended/ CAPT style labs
- Cooperative group activities
- Research and present infectious diseases (symptoms, vectors, treatments, etc)
- Debate and explain the rationale behind the 'over prescribed' use of antibiotics
- Guest speaker – microbiologist, epidemiologist, lab technician, etc.
- Read and summarize articles on related current issues
- Display an array of pictures of cells from many organisms for students to observe and identify the type of cell and related structure and function
- Observe the rates of diffusion when food coloring is dropped in hot water vs. cold water
- Starch/iodine investigation with a semi-permeable membrane
- Leave raisins in water overnight to demonstrate how water travels across a cell membrane
- Investigate the effect of salt water, distilled water and tap water on the mass of potatoes
- Analyze a graph that shows the relationship between salt concentration and the rate of contractions of a paramecium's contractile vacuole
- Diagram semi-permeable membranes to clarify the relationship between pore size and the ability of molecules to cross the membrane
- See Emerging and Re-emerging Infectious Diseases module for activities such as:
 - Students assume the roles of public health experts to investigate the cause of a mystery disease
 - Investigate the growth of bacteria in the presence of antibiotics and use the results to explain a case of antibiotic-resistance tuberculosis

	<ul style="list-style-type: none">○ Students use simulations of the spread of an infectious disease to discover the phenomenon of herd immunity○ Students evaluate proposals to combat three infectious diseases and recommend one to support● Research and present on how vaccinations are made and how the body responds to them● Research and present how bacteria/yeasts are used to make cheese, bread, yogurt, alcohol, etc.● Interview a civil engineer or city manager to discuss some of the waste treatment problems/solutions in Wallingford.● Web quests <p><u>ASSESSMENT METHODS/TOOLS</u></p> <ul style="list-style-type: none">● Open-ended/constructed response questions focusing on content and experimentation skills● Tests/quizzes● Lab reports● Projects● Demonstrations● Class participation● Open-ended prompts● Rubrics● Analyze experimental design, identify the question being explored, defend the validity of the data, and/or conclusions drawn from a sample lab situation
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LEARNING STRAND

4.0 Genetics

ENDURING UNDERSTANDING(S)

- Science is the method of observation and investigation used to understand our world.
- Scientific ideas evolve as new information is uncovered.
- The environment is a complex assemblage of interacting processes.
- The current state of an environment is maintained by the dynamic exchange of the processes that dictate its nature.
- There is a process of inheriting traits from parents to offspring through genes.
- Sexual reproduction increases variation in offspring.
- Predictions can be made using Punnett squares, pedigrees or other methods to determine frequencies of genotypes and/or phenotypes in offspring.
- Organisms that produce few offspring and have few variations are at greater risk to die off when there are environmental changes.
- Genetic mutations can be harmful and cause genetic disorders or they can be beneficial and offer advantages to organisms.
- Adaptation is any structural or behavioral change in a species that takes place over time and helps the species to survive in its habitat.
- Species survival is affected by environmental concerns.
- Structural and behavioral characteristics help an organism to survive in its environment.
- There are differences between genetic disorders and infectious diseases.
- Changes in the environment may result in the selection of organisms that are better able to survive and reproduce.
- There is evidence that supports the theory of evolution including fossil evidence.

ESSENTIAL QUESTION(S)

- What couldn't we do if we didn't understand inheritance patterns?
- How are characteristics of living things passed on through generations?
- How can Punnett squares and pedigrees be used to determine genotypic and phenotypic frequencies of offspring?
- How do cells divide to produce more cells?
- How are traits passed from parent to offspring?
- How does the process of meiosis and sexual reproduction affect the variation of offspring?
- How are the characteristics of an organism determined?
- How do species become more diverse?
- How do some species survive environmental changes while others do not?
- How do species become extinct?
- How do science and technology affect the quality of our lives?
- How are living things linked to each other and their environment?
- How are genetic disorders different from infectious diseases?
- What evidence is used to support the Theory of Evolution, including the fossil record.

LEARNING OBJECTIVES – The student will:

- 4.1 Apply the Punnett squares to solve genetic problems. (D37)
- 4.2 Explain how events that occur during meiosis contribute to genetic variation and/or mutations. (D36)
- 4.3 Deduce the probable mode of inheritance of traits from pedigree diagrams showing phenotypes. (D37, D38)
- 4.4 Describe the difference between genetic disorders and infectious diseases.(D39)
- 4.5 Investigate how bioengineering (transgenics/GMO) in foods and medicine benefit humans. (D34, D35)
- 4.6 Examine how mutations and adaptations apply to Darwin’s theory of natural selection. (D32)
- 4.7 Explain how the many pieces of evidence scientists have discovered supports the theory of evolution. (D41, D42)
- 4.8 Compare and contrast infectious diseases and genetic disorders. (D39)
- 4.9 Analyze the pros and cons of genetically modified foods. (D35) (STS Activity)
- 4.9 Describe how cloning is accomplished and examine the benefits and ethical issues Involved. **

INSTRUCTIONAL SUPPORT MATERIALS

- Phenolphthalein and small plastic cups
- <http://www.cdc.gov/> (Center for Disease Control and Prevention)
- <http://www.accessexcellence.org/> (Access Excellence)
- <http://science-education.nih.gov/home2.nsf/Educational+Resources/Grade+Levels/+High+School> (National Institute of Health) (free resources)
 - *Stem Cell Information*
 - *Human Genetic Variation*
 - *Genetic Basic*
 - *Birth Defects*
 - *Cystic Fibrosis Tutorial*

INSTRUCTIONAL STRATEGIES/APPROACHES

- **CSDE STS Activity: Bioengineered Foods (GMO’s)**
- CAPT experimental constructed response warm-ups
 - 10.4 PTC Pedigree
- Cooperative group activities
- Creative evolution activity
- Genetic disorder research project
- Oral presentations - genetic diseases
- Read and summarize articles on related current issues
- Labs - Blood typing – prepared slides or simulated lab
- Debate - Biotechnology
- Videos with discussion questions
- Concept mapping
- Open-ended/ CAPT style labs
- Transmission tracker lab - students ‘share’ (by pouring into a different cup then back into their cup) their clear liquid in a cup with others then the indicator phenolphthalein is used to identify ‘infected’ parties
- Guest speakers – epidemiologist, geneticist, food safety, etc.
- Career presentation (genetic counselor, geneticist, forensic scientist)
- Solve Punnett problems and analyze data from a Punnett square to predict the mode of inheritance displayed by a trait
- Write an article in a scientific journal about a genetic trait that you have discovered.

	<p>Describe your research by explaining how meiosis allows the trait to be passed, the different combinations of alleles for the trait, and a sample Punnett Square showing the mode of inheritance for the trait</p> <ul style="list-style-type: none"> • List some different traits found in humans. Collect data on how many students in the class exhibit the selected traits • Analyze diagrams of the anatomy of limbs of a whale, bat, and human, what conclusions can be drawn? • Research and present on antibiotic resistance, insecticide resistance, artificial selection (controlled breeding of livestock and pets), etc • Debate the issue of genetic engineering and bioethics • You are a genetic counselor who has a patient with a sex-linked trait. Explain the inheritance of sex-linked traits to your patient. Use a pedigree chart to help with the explanation. Review with your patient how forms of genetic engineering have helped us learn more about genetics. • Create a venn diagram identifying and comparing infectious diseases and genetic disorders • Web quest - research current information about genetic engineering of food crops - how can genes in plants can be changed, why they are changed, and what the possible side effects might be, if any – should genetically engineered food crops be specially labeled for consumers? why? • Research different topics related to genetically modified foods, selective breeding, stem cell research, cloning and share findings with class • Create a graphic organizer/concept map that identifies pros and cons, the relevant science concepts, and other key issues related to a specific topic of bioengineering • DNA finger printing labs • Cloning lab or simulation • Cloning web quest • Karyotyping lab • Create simulated model/poster of natural selection principles
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	<p><u>ASSESSMENT METHODS/TOOLS</u></p> <ul style="list-style-type: none">• Open-ended/constructed response questions focusing on content and experimentation skills• Projects• Presentations• Lab reports• Tests/quizzes• Class participation• Genetic problems (probability and Punnett squares)• Analyze experimental design, identify the question being explored, defend the validity of the data, and/or conclusions drawn from a sample lab situation
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LEARNING STRAND

5.0 Population Ecology

ENDURING UNDERSTANDING(S)

- Population size is affected by many factors, including environmental factors.
- Technological advances have effected human population growth and size.
- The rapid increase in human population size has effected the environment.
- When emigration and immigration are equal and the birth rate exceeds the death rate, population growth rate will become exponential.

ESSENTIAL QUESTION(S)

- What are the factors that effect the size of a population?
- How can population graphs be analyzed to explain population growth?
- How have technological advances effected human population growth and size?

LEARNING OBJECTIVES – The student will:

- 5.1 Identify biotic and abiotic factors that determine the carrying capacity of an environment. (D43)
- 5.2 Describe the parts of an exponential growth curve in terms of emigration, immigration, birth rate, death rate and related factors. (D44)
- 5.3 Name and describe some technological advances that have effected human population growth and size. (D45)
- 5.4 Predict how technology will affect future population changes in underdeveloped countries. (D45)
- 5.5 Analyze population graphs. (D44)
- 5.6 Describe when population growth rate will become exponential (D44)
- 5.7 Compare an age structure population diagram of a developed and underdeveloped (developing) country. (STS Activity)
- 5.8 Describe factors that create the differences between a developed and an underdeveloped country. (D45)
- 5.9 Investigate how limiting factors affect the growth of yeast populations.(D43)
(Embedded Task)

INSTRUCTIONAL SUPPORT MATERIALS

- Articles on human population and its effects

INSTRUCTIONAL STRATEGIES/APPROACHES

- **CSDE Human Populations Dynamics STS**
- **CSDE Yeast Population Dynamics embedded task**

ASSESSMENT METHODS/TOOLS

- Open-ended/constructed response questions focusing on content and experimentation skills
- Test/quizzes
- Lab reports
- Projects
- Presentations
- Analyze experimental design, identify the question being explored, defend the validity of the data, and/or conclusions drawn from a sample lab situation.

LEARNING STRAND

6.0 Ecology

NOTE: This should be the last unit taught in the course (after the 10th grade CAPT assessment).

ENDURING UNDERSTANDING(S)

- The current state of any environment is maintained by the dynamic exchange of the processes that dictate its nature. Changes in any of the interacting processes will impact the current state (for better or worse).
- Energy drives systems and cycles in our universe.
- The elements of living things take many forms.
- Structural and behavioral characteristics help an organism to survive in its environment.
- Diverse habitats provide the ‘needs of life’ for a variety of organisms.
- The cycling of matter and the flow of energy are required for the functioning of ecosystems.

ESSENTIAL QUESTION(S)

- How do matter and energy move through the biosphere?
- What relationships exist between living things?
- How do structures differ among living things? How is structure related to function?
- How do ecosystems change over time?
- How have human activities effected the environment?
- What needs are met by an organism’s surroundings?
- What factors impact population size?
- What energy roles do organisms play in an ecosystem?
- How do science and technology affect the quality of our lives?
- How are living things linked to each other and their environment?
- What evidence do we have of change?
- How do human activities impact and alter the environment?
- How can we conserve and protect our environment?

LEARNING OBJECTIVES – The student will:

- 6.1 Relate the availability of resources to growth/decline of populations.
- 6.2 Demonstrate the flow of energy in an ecosystem.
- 6.3 Examine the ways in which populations within communities interact.
- 6.4 Examine the carbon, nitrogen, oxygen, and water cycles
- 6.5 Describe how structural and behavioral adaptations increase organisms’ chances for survival in their environment.
- 6.6 Analyze human impact on ecosystems.

INSTRUCTIONAL SUPPORT MATERIALS

- Nets, buckets, etc.
- Models
- Craft supplies
- Predator-prey game materials
- Various books on CT ecology and environmental law

INSTRUCTIONAL STRATEGIES/APPROACHES

- Field trip/nature walk
- Case studies
- Concept diagrams
- Cooperative group activities
- Labs – population, predator-prey
- Ecosystems demonstrations
- Read and summarize articles on related current issues
- Construct energy pyramids and food webs

- Analyze population graphs
- Stream, pond or wetland study – observations of biotic, abiotic and relationships between organisms
- Discuss examples of feeding relationships and symbiotic relationships that exist in a chosen ecosystem
- Write an environmental impact statement for a new dam, highway, or forestry project – what factors must be considered when designing the project?
- Research and present on an environmental issue and it's impact on the living ecosystem or endangered species

ASSESSMENT METHODS/TOOLS

- Open-ended/constructed response questions focusing on content and experimentation skills
- Test/quizzes
- Lab reports
- Projects
- Presentations
- Analyze experimental design, identify the question being explored, defend the validity of the data, and/or conclusions drawn from a sample lab situation
- Energy flow diagrams

Biology Curriculum Map

Feb 12, 2008

Time	Sept – January These EP will be assessed on the common mid-term	January – March CAPT
State Expected Performances	<p>D27 Describe significant similarities and differences in the basic structure of plant and animal cells.</p> <p>D28 Describe the general role of DNA and RNA in protein synthesis.</p> <p>D29 Describe the general role of enzymes in metabolic cell processes.</p> <p>D30 Explain the role of the cell membrane in supporting cell functions.</p> <p>D34 Describe, in general terms, how the genetic information of organisms can be altered to make them produce new materials.</p> <p>D35 Explain the risks and benefits of altering the genetic composition and cell products of existing organisms.</p> <p>D36 Explain how meiosis contributes to the genetic variability of organisms.</p> <p>D37 Use the Punnet Square technique to predict the distribution of traits in mono- and di-hybrid crossings.</p> <p>D38 Deduce the probable mode of inheritance of traits (e.g., recessive/dominant, sex-linked) from pedigree diagrams showing phenotypes.</p>	<p>D40 Explain how the processes of genetic mutation and natural selection are related to the evolution of species.</p> <p>D41 Explain how the current theory of evolution provides a scientific explanation for fossil records of ancient life forms.</p> <p>D42 Describe how structural and behavioral adaptations increase the chances for organisms to survive in their environments.</p> <p>D43 Describe the factors that affect the carrying capacity of the environment.</p> <p>D44 Explain how change in population density is affected by emigration, immigration, birth rate and death rate, and relate these factors to the exponential growth of human populations.</p> <p>D45 Explain how technological advances have affected the size and growth rate of human populations throughout history. (Tie in D32- sanitation, vaccinations, antibiotics)</p> <p>D 39 Describe the difference between genetic disorders and infectious diseases.</p> <p>D33 Explain how bacteria and yeasts are used to produce foods for human consumption.</p>

		<p>D31 Describe the similarities and differences between bacteria and viruses.</p> <p>D32 Describe how bacterial and viral infectious diseases are transmitted, and explain the roles of sanitation, vaccination and antibiotic medications in the prevention and treatment of infectious diseases.</p>
Embedded Tasks and STS	Apple Sauce Embedded Task Genetically Modified STS	Yeast Embedded Task Population STS
Experimental Warm-ups	Cell Block warm up Salinity Seed warm up	Yeast warm up