

**Geneva CUSD 304**  
**Content-Area Curriculum Frameworks**  
**Grades 6-12**  
**Science**

<p><b>Mission Statement</b></p>	<p><u>The Mission of Science Education Is:</u></p> <ol style="list-style-type: none"> <li>1) To nurture an active interest in science that continues throughout life.</li> <li>2) To teach the learning skills and concepts necessary for the scientific process.</li> <li>3) To develop student understanding of the interrelationships between science, society, and the environment</li> <li>4) To encourage students to discover and develop their talent in science.</li> </ol>
<p><b>Course Sequence</b> (Grades 6-12)</p>	<p><b>6<sup>th</sup> grade:</b> Earth Science</p> <p><b>7<sup>th</sup> grade:</b> Life Science</p> <p><b>8<sup>th</sup> grade:</b> Physical Science</p> <p><b>9<sup>th</sup> grade:</b> General Science Earth Science Biology Biology Honors</p> <p><b>10<sup>th</sup> ,11<sup>th</sup> ,12 grade:</b> Chemistry Chemistry Honors Physics Astronomy Natural Disasters Anatomy and Physiology I and II Horticulture I and II AP Chemistry AP Biology AP Environmental Science</p>

## *Course Framework*

<b>Course Title</b> <b>Grade Level</b> <b>Semesters (1-2-3-4)</b> <b>Prerequisite</b>	Biology 9 <sup>th</sup> /10 <sup>th</sup> 2 none (Earth Science is recommended)
<b>Course Description</b>	This laboratory science is a traditional high school life science course with a moderate to high challenge level. Instruction is primarily student-centered with a great deal of individual and group work including laboratory, projects, and problem based learning experiences. Areas of study include basic chemistry, biochemistry, molecular biology, genetics, evolution, taxonomy and classification of organisms, zoology (selected animal groups), botany (plant science), and ecology. Biology is open to all students who have an interest in science.
<b>District-approved Materials and/or Resources</b>	Modern Biology Publisher: Holt Rinehart and Winston ISBN: 0-03-056541-3 Copy write: 2002

## *Unit Frameworks*

<b>Unit of Study: major topics</b>	<b>The Science of Life</b>	Resources that will support instruction
<b>Illinois Learning Standards, Benchmarks, National Standards Assessment Frameworks, or other standards that will be taught in this unit</b>	11.A.4a Formulate hypotheses referencing prior research and knowledge. 11.A.4b Conduct controlled experiments or simulations to test hypotheses. 11.A.4c Collect, organize, and analyze data accurately and precisely. 11.A.4f Using available technology, report, display, and defend to an audience conclusions drawn from investigations. 12.A.4a Explain how genetic combinations produce visible effects and variations among physical features and cellular functions of organisms. 12.A.4b Describe the structures and organization of cells and tissues that underlie the basic life functions including nutrition, respiration, cellular transport, biosynthesis, and reproduction. 12.A.4c Describe the processes by which organisms change over time using evidence of comparative anatomy and physiology, embryology, the fossil record, genetics, and biochemistry. 12.B.4a Compare physical, ecological, and behavioral factors that influence interactions and interdependence of organisms.	
<b>Objectives</b> <ul style="list-style-type: none"> <li>○ <b>Conceptual</b></li> <li>○ <b>Factual</b></li> <li>○ <b>Procedural</b></li> </ul>	<ul style="list-style-type: none"> <li>● List six unifying themes of biology.</li> <li>● Explain how organisms get the energy they need to survive.</li> <li>● Describe the main difference between the structure of a living thing and that of a nonliving thing.</li> <li>● List six characteristics of life.</li> <li>● Describe how a living thing is organized.</li> <li>● Explain why all living things on Earth are not yet well understood.</li> <li>● Define and give examples of observing, measuring, organizing and analyzing data, inferring and modeling.</li> <li>● Explain the relationship between hypothesizing, predicting, and experimenting.</li> <li>● Explain why good communication is so important in science.</li> <li>● Describe the methods that scientist use in their work.</li> </ul>	
<b>Assessments</b>	Performance Tasks Homework completion Design and carry out a controlled experiment Lab work and reports Quizzes Exams	Other Evidence

## *Unit Frameworks*

<b>Unit of Study: major topics</b>	<b>Chemistry</b>	Resources that will support instruction
<b>Illinois Learning Standards, Benchmarks, National Standards Assessment Frameworks, or other standards that will be taught in this unit</b>	12.A.4b Describe the structures and organization of cells and tissues that underlie the basic life functions including nutrition, respiration, cellular transport, biosynthesis, and reproduction. 12.C.4a Use kinetic theory, wave theory, quantum theory, and the laws of thermodynamics to explain energy transformations. 12.C.4b Analyze and explain the atomic and nuclear structure of matter. 12.D.4b Describe the effects of electromagnetic and nuclear forces including atomic and molecular bonding, capacitance, and nuclear reactions.	
<b>Objectives</b> <ul style="list-style-type: none"> <li>○ <b>Conceptual</b></li> <li>○ <b>Factual</b></li> <li>○ <b>Procedural</b></li> </ul>	<ul style="list-style-type: none"> <li>● Define element, atom, compound, and molecule.</li> <li>● Draw a model of the structure of an atom.</li> <li>● Explain what determines an atom's stability.</li> <li>● Contrast ionic and covalent bonds.</li> <li>● List the three states of matter, and explain how matter can change state.</li> <li>● Describe how energy changes are involved in chemical reactions.</li> <li>● Explain how enzymes affect chemical reactions in organisms.</li> <li>● Explain what a redox reaction is.</li> <li>● Describe solution, solute, solvent and concentration.</li> <li>● Explain the dissociation of water.</li> <li>● Contrast properties of acids and bases.</li> <li>● Describe the use of the pH scale.</li> <li>● Explain the action of buffers.</li> </ul>	
<b>Assessments</b>	Performance Tasks  Homework completion Experiment Lab work and reports Quizzes Exams	Other Evidence

## *Unit Frameworks*

<b>Unit of Study: major topics</b>	<b>Biochemistry</b>	Resources that will support instruction
<b>Illinois Learning Standards, Benchmarks, National Standards Assessment Frameworks, or other standards that will be taught in this unit</b>	12.C.4b Analyze and explain the atomic and nuclear structure of matter. 12.A.4c Describe the processes by which organisms change over time using evidence of comparative anatomy and physiology, embryology, the fossil record, genetics, and biochemistry	
<b>Objectives</b> <ul style="list-style-type: none"> <li>○ <b>Conceptual</b></li> <li>○ <b>Factual</b></li> <li>○ <b>Procedural</b></li> </ul>	<ul style="list-style-type: none"> <li>• Describe the structure of a water molecule.</li> <li>• Explain how water’s polar nature affects its ability to dissolve substances.</li> <li>• List two of water’s properties that result from hydrogen bonding.</li> <li>• Define organic compound and name three elements often found in organic compounds</li> <li>• Explain why carbon forms so many different compounds</li> <li>• Define functional group and explain its significance</li> <li>• Compare a condensation reaction with hydrolysis</li> <li>• Define monosaccharide, disaccharide, and polysaccharide, and discuss their significance to organisms.</li> <li>• Relate the sequence of amino acids to the structure of proteins.</li> <li>• Relate the structure of lipids to their functions.</li> <li>• List two essential functions of nucleic acids.</li> </ul>	
<b>Assessments</b>	Performance Tasks Homework completion Lab work and reports Quizzes Exams	Other Evidence

## *Unit Frameworks*

<b>Unit of Study: major topics</b>	<b>Structure &amp; Function of the Cell</b>	Resources that will support instruction
<b>Illinois Learning Standards, Benchmarks, National Standards Assessment Frameworks, or other standards that will be taught in this unit</b>	12.A.4a Explain how genetic combinations produce visible effects and variations among physical features and cellular functions of organisms. 12.A.4b Describe the structures and organization of cells and tissues that underlie the basic life functions including nutrition, respiration, cellular transport, biosynthesis, and reproduction.	
<b>Objectives</b> <ul style="list-style-type: none"> <li>○ <b>Conceptual</b></li> <li>○ <b>Factual</b></li> <li>○ <b>Procedural</b></li> </ul>	<ul style="list-style-type: none"> <li>● Outline the discoveries that led to the development of the cell theory</li> <li>● State the cell theory</li> <li>● Identify a limiting factor on the size of cells</li> <li>● Describe the relationship between cell shape and cell function</li> <li>● Distinguish between prokaryotes and eukaryotes</li> <li>● Describe the structure, composition, and function of the cell membrane</li> <li>● Name the major organelles found in a eukaryotic cell, and describe their function</li> <li>● Describe the three structures characteristic of plant cells</li> <li>● Distinguish between tissues, organs, and organ systems</li> <li>● Describe the features of a colonial organism</li> </ul>	
<b>Assessments</b>	Performance Tasks Homework completion Lab work and reports Quizzes Exams	Other Evidence

## *Unit Frameworks*

<b>Unit of Study: major topics</b>	<b>Homeostasis &amp; Transport</b>	Resources that will support instruction
<b>Illinois Learning Standards, Benchmarks, National Standards Assessment Frameworks, or other standards that will be taught in this unit</b>	12.A.4b Describe the structures and organization of cells and tissues that underlie the basic life functions including nutrition, respiration, cellular transport, biosynthesis, and reproduction.	
<b>Objectives</b> <ul style="list-style-type: none"> <li>○ <b>Conceptual</b></li> <li>○ <b>Factual</b></li> <li>○ <b>Procedural</b></li> </ul>	<ul style="list-style-type: none"> <li>● Explain how an equilibrium is established as a result of diffusion</li> <li>● Distinguish between diffusion and osmosis</li> <li>● Explain how substances cross the cell membrane through facilitated diffusion</li> <li>● Explain how ion channels assist the diffusion of ions across the cell membrane</li> <li>● Distinguish between passive and active transport</li> <li>● Explain how the sodium-potassium pump operates</li> <li>● Compare and contrast endocytosis and exocytosis</li> </ul>	
<b>Assessments</b>	Performance Tasks Homework completion Lab work and reports Quizzes Exams	Other Evidence  Project: Build an analogous cell

## *Unit Frameworks*

<b>Unit of Study: major topics</b>	<b>Cell Reproduction</b>	Resources that will support instruction
<b>Illinois Learning Standards, Benchmarks, National Standards Assessment Frameworks, or other standards that will be taught in this unit</b>	12.A.4b Describe the structures and organization of cells and tissues that underlie the basic life functions including nutrition, respiration, cellular transport, biosynthesis, and reproduction. 12.A.4a Explain how genetic combinations produce visible effects and variations among physical features and cellular functions of organisms.	
<b>Objectives</b> <ul style="list-style-type: none"> <li>○ <b>Conceptual</b></li> <li>○ <b>Factual</b></li> <li>○ <b>Procedural</b></li> </ul>	<ul style="list-style-type: none"> <li>● Describe the structure of a chromosome</li> <li>● Compare prokaryotic chromosomes with eukaryotic chromosomes</li> <li>● Explain the difference between sex chromosomes and autosomes</li> <li>● Give examples of diploid and haploid cells</li> <li>● Describe the events of binary fission</li> <li>● Describe each phase of the cell cycle</li> <li>● Summarize the phases of Mitosis</li> <li>● Compare cytokinesis in animal cells with cytokinesis in plant cells</li> <li>● List and describe the phases of meiosis</li> <li>● Compare the end products of mitosis with those of meiosis</li> <li>● Explain crossing-over and how it contributes to the production of unique individuals</li> <li>● Summarize the characteristics of spermatogenesis and oogenesis</li> </ul>	
<b>Assessments</b>	Performance Tasks Homework completion Lab work and reports Quizzes Exams	Other Evidence



## *Unit Frameworks*

<b>Unit of Study: major topics</b>	<b>Fundamentals of Genetics</b>	Resources that will support instruction
<b>Illinois Learning Standards, Benchmarks, National Standards Assessment Frameworks, or other standards that will be taught in this unit</b>	12.A.4a Explain how genetic combinations produce visible effects and variations among physical features and cellular functions of organisms. 12.A.4b Describe the structures and organization of cells and tissues that underlie the basic life functions including nutrition, respiration, cellular transport, biosynthesis, and reproduction.	
<b>Objectives</b> <ul style="list-style-type: none"> <li>○ <b>Conceptual</b></li> <li>○ <b>Factual</b></li> <li>○ <b>Procedural</b></li> </ul>	<ul style="list-style-type: none"> <li>● Distinguish between genetics and heredity</li> <li>● Summarize the steps involved in Mendel’s experiments on garden peas</li> <li>● Be able to distinguish between dominant and recessive traits</li> <li>● List and explain Mendel’s Laws of Heredity</li> <li>● Be able to describe the importance of Mendel’s Law to modern genetics</li> <li>● Distinguish between phenotype and genotype</li> <li>● Be able to predict the outcome of genetic crosses by using punnett squares</li> <li>● Differentiate between a genotype and a phenotype</li> <li>● Be able to predict and explain the outcomes of a monohybrid, dihybrid, a trihybrid cross</li> </ul>	
<b>Assessments</b>	Performance Tasks Homework completion Lab work and reports Quizzes Exams	Other Evidence

## *Unit Frameworks*

<b>Unit of Study: major topics</b>	<b>Inheritance Patterns &amp; Human Genetics</b>	Resources that will support instruction
<b>Illinois Learning Standards, Benchmarks, National Standards Assessment Frameworks, or other standards that will be taught in this unit</b>	12.A.4a Explain how genetic combinations produce visible effects and variations among physical features and cellular functions of organisms. 12.A.4b Describe the structures and organization of cells and tissues that underlie the basic life functions including nutrition, respiration, cellular transport, biosynthesis, and reproduction.	
<b>Objectives</b> <ul style="list-style-type: none"> <li>○ <b>Conceptual</b></li> <li>○ <b>Factual</b></li> <li>○ <b>Procedural</b></li> </ul>	<ul style="list-style-type: none"> <li>● Explain the structure and function of sex chromosome and the role they play in determining sex</li> <li>● Explain sex linked genes and the effects they have on inheritance</li> <li>● Differentiate between somatic and germ cell mutations</li> <li>● List and compare the types of mutations</li> <li>● Identify the types of mutations and the resulting consequences</li> <li>● Explain the use and importance of a pedigree in the inheritance of traits</li> <li>● Explain multiple–allele traits and describe how blood types are involved</li> <li>● Identify genetic disorder, causes, and possible prevention or treatments</li> </ul>	
<b>Assessments</b>	Performance Tasks Homework completion Lab work and reports Quizzes Exams	Other Evidence

## *Unit Frameworks*

<b>Unit of Study: major topics</b>	<b>Nucleic Acids &amp; Protein Synthesis</b>	Resources that will support instruction
<b>Illinois Learning Standards, Benchmarks, National Standards Assessment Frameworks, or other standards that will be taught in this unit</b>	12.A.4a Explain how genetic combinations produce visible effects and variations among physical features and cellular functions of organisms. 12.A.4b Describe the structures and organization of cells and tissues that underlie the basic life functions including nutrition, respiration, cellular transport, biosynthesis, and reproduction. 12.A.4c Describe the processes by which organisms change over time using evidence of comparative anatomy and physiology, embryology, the fossil record, genetics, and biochemistry.	
<b>Objectives</b> <ul style="list-style-type: none"> <li>○ <b>Conceptual</b></li> <li>○ <b>Factual</b></li> <li>○ <b>Procedural</b></li> </ul>	<ul style="list-style-type: none"> <li>● Explain the structure and function of DNA</li> <li>● List the building blocks of the DNA molecule</li> <li>● Understand complementary base pairing</li> <li>● List the Nitrogen bases and categorize them into two groups</li> <li>● Summarize DNA Replication including the enzymes that are involved</li> <li>● Compare the structures of DNA and RNA</li> <li>● List and describe the types of RNA</li> <li>● Describe the process of transcription</li> <li>● Describe the process of translation</li> <li>● Differentiate between transcription and translation and the importance of each</li> <li>● Explain the function and importance of a genetic code</li> <li>● Identify structures involved in translation and the uses of each</li> </ul>	
<b>Assessments</b>	Performance Tasks Homework completion Lab work and reports Quizzes Exams	Other Evidence

## *Unit Frameworks*

<b>Unit of Study: major topics</b>	<b>DNA Technology</b>	Resources that will support instruction
<b>Illinois Learning Standards, Benchmarks, National Standards Assessment Frameworks, or other standards that will be taught in this unit</b>	13.B.4e Evaluate claims derived from purported scientific studies used in advertising and marketing strategies. 13.B.4b Analyze a particular occupation to identify decisions that may be influenced by a knowledge of science. 13.A.4c Describe how scientific knowledge, explanations, and technological designs may change with new information over time (e.g., the understanding of DNA, the design of computers). 12.A.4a Explain how genetic combinations produce visible effects and variations among physical features and cellular functions of organisms. 11.B.4b Conduct controlled experiments or simulations to test hypotheses. 11.B.4a Formulate hypotheses referencing prior research and knowledge.	
<b>Objectives</b> <ul style="list-style-type: none"> <li>○ <b>Conceptual</b></li> <li>○ <b>Factual</b></li> <li>○ <b>Procedural</b></li> </ul>	<ul style="list-style-type: none"> <li>● Explain the role of restriction enzymes in genetic engineering</li> <li>● List and describe the steps involved in gene transfer</li> <li>● Describe the uses and benefits of recombinant DNA</li> <li>● Explain what a DNA fingerprint is and how it is prepared</li> <li>● Describe the benefits of the procedure of PCR</li> <li>● Explain the Human Genome Project and the potential uses of the information collected in the project</li> <li>● Explain how DNA technology is being used in various fields of study (medicine, agriculture, law, etc.)</li> <li>● Describe the impact DNA technology will have in the future</li> <li>● Discuss some environmental and ethical issues in genetic engineering</li> </ul>	
<b>Assessments</b>	Performance Tasks Homework completion Lab work and reports Quizzes Exams	Other Evidence

## *Unit Frameworks*

<b>Unit of Study: major topics</b>	<b>Origin of Life &amp; Evolution: Evidence &amp; Theory</b>	Resources that will support instruction
<b>Illinois Learning Standards, Benchmarks, National Standards Assessment Frameworks, or other standards that will be taught in this unit</b>	11.B.4f Using available technology, report, display, and defend to an audience conclusions drawn from investigations. 12.A.4b Describe the structures and organization of cells and tissues that underlie the basic life functions including nutrition, respiration, cellular transport, biosynthesis, and reproduction. 12.B.4a Compare physical, ecological, and behavioral factors that influence interactions and interdependence of organisms. 12.B.4b Simulate and analyze factors that influence the size and stability of populations within ecosystems (e.g., birth rate, death rate, predation, migration patterns). 12.C.4a Use kinetic theory, wave theory, quantum theory, and the laws of thermodynamics to explain energy transformations 12.C.4b Analyze and explain the atomic and nuclear structure of matter. 12.D.4b Describe the effects of electromagnetic and nuclear forces including atomic and molecular bonding, capacitance, and nuclear reactions. 12.E.4a Explain how external and internal energy sources drive Earth processes (e.g., solar energy drives weather patterns; internal heat drives plate tectonics). 12.E.4b Describe how rock sequences and fossil remains are used to interpret age and changes in the Earth. 12.F.4a Explain theories, past and present, for changes observed in the universe.	
<b>Objectives</b> <ul style="list-style-type: none"> <li>○ <b>Conceptual</b></li> <li>○ <b>Factual</b></li> <li>○ <b>Procedural</b></li> </ul>	<ul style="list-style-type: none"> <li>● List some of the observations that lead some people to believe that life could arise from nonliving things.</li> <li>● Summarize the setups and results obtained in the experiments performed by Redi and Spallanzani testing the hypothesis of spontaneous generation.</li> <li>● Describe how Pastuer’s experiment disproved the hypothesis of spontaneous generation.</li> <li>● Outline the modern scientific understanding of the formation of the earth.</li> <li>● Summarize the concept of half-life.</li> <li>● Describe the production of organic compounds in the Urey-Miller experiment.</li> <li>● Summarize the possible importance of cell-like structures produced in the laboratory.</li> <li>● Explain the importance of the chemistry of RNA in relation to the origin of life.</li> <li>● List three inferred characteristics that describe the first forms of cellular</li> </ul>	

	<p>life on earth.</p> <ul style="list-style-type: none"> <li>• Name two types of autotrophy and explain the difference between them.</li> <li>• Explain how photosynthesis and aerobic respiration are thought to be related</li> <li>• Define endosymbiosis, and explain why it is important in the history of eukaryotes.</li> <li>• Define fossil and tell how the examination of fossils led to the development of evolutionary theories.</li> <li>• Explain the law of superposition and its significance to evolutionary theory.</li> <li>• Describe how early scientists inferred a succession of life-forms from the fossil record.</li> <li>• Tell how biogeographic observations suggest descent with modification</li> <li>• Define evolution.</li> <li>• Explain Lamarck's theory of evolution, and describe how it was flawed.</li> <li>• List some of the evidence that led Darwin to his idea of how species might change over time.</li> <li>• Explain Darwin's two major theories.</li> <li>• Describe the difference between homologous, analogous and vestigial structures.</li> <li>• Tell how similarities in macromolecules and embryos of different species suggest a relationship between them.</li> <li>• Explain the difference between coevolution, and divergent and convergent evolution.</li> </ul>	
<p><b>Assessments</b></p>	<p>Performance Tasks  Homework completion  Lab work and reports  Quizzes  Exams</p>	<p>Other Evidence</p>

## *Unit Frameworks*

<b>Unit of Study: major topics</b>	<b>The Evolution of Populations and Speciation &amp; Human Evolution</b>	Resources that will support instruction
<b>Illinois Learning Standards, Benchmarks, National Standards Assessment Frameworks, or other standards that will be taught in this unit</b>	<p>12.A.4a Explain how genetic combinations produce visible effects and variations among physical features and cellular functions of organisms.</p> <p>12.A.4c Describe the processes by which organisms change over time using evidence of comparative anatomy and physiology, embryology, the fossil record, genetics, and biochemistry.</p> <p>12.B.4a Compare physical, ecological, and behavioral factors that influence interactions and interdependence of organisms.</p> <p>12.B.4b Simulate and analyze factors that influence the size and stability of populations within ecosystems (e.g., birth rate, death rate, predation, migration patterns).</p> <p>12.E.4b Describe how rock sequences and fossil remains are used to interpret age and changes in the Earth.</p>	
<b>Objectives</b> <ul style="list-style-type: none"> <li>○ <b>Conceptual</b></li> <li>○ <b>Factual</b></li> <li>○ <b>Procedural</b></li> </ul>	<ul style="list-style-type: none"> <li>• Explain the importance of the bell curve in population genetics.</li> <li>• Describe two causes of genotypic variation in a population.</li> <li>• Explain how to compute allele frequency and phenotype frequency.</li> <li>• Explain Hardy-Weinberg genetic equilibrium</li> <li>• List the five conditions that can cause evolution to take place.</li> <li>• Give an example of how migration can affect evolution.</li> <li>• Define genetic drift, and tell how it affects endangered species.</li> <li>• Contrast the effects of stabilizing, directional, and disruptive selection on variations in a trait over time.</li> <li>• Give an example of sexual selection.</li> <li>• Explain the difference between the morphological concept of species and the biological species concept.</li> <li>• Define geographic isolation, and explain how it can lead to speciation.</li> <li>• Name three kinds of reproductive isolation.</li> <li>• Summarize the punctuated equilibrium hypothesis, and contrast it with the hypothesis of gradual change.</li> <li>• List and describe 5 characteristics of primates.</li> <li>• Explain the importance of bipedalism, the human foot, and human brain have had on our survival as a species.</li> <li>• When studying hominid fossils, why do scientists study posture bones such as the pelvis and where the spinal cord enters the skull?</li> <li>• What is the importance of finding hominid fossils that are not ancestral to modern humans?</li> </ul>	

	<ul style="list-style-type: none"> <li>• How did Lucy change the hypothesis about the evolution of bipedalism?</li> <li>• Compare and contrast <i>Homo habilis</i> and <i>Homo erectus</i> to <i>Homo sapiens</i>.</li> </ul>	
<b>Assessments</b>	Performance Tasks Homework completion Lab work and reports Quizzes Exams	Other Evidence



## *Unit Frameworks*

<b>Unit of Study: major topics</b>	<b>Classification</b>	Resources that will support instruction
<b>Illinois Learning Standards, Benchmarks, National Standards Assessment Frameworks, or other standards that will be taught in this unit</b>	12.A.4c Describe the processes by which organisms change over time using evidence of comparative anatomy and physiology, embryology, the fossil record, genetics, and biochemistry. 12.B.4a Compare physical, ecological, and behavioral factors that influence interactions and interdependence of organisms. 12.B.4b Simulate and analyze factors that influence the size and stability of populations within ecosystems (e.g., birth rate, death rate, predation, migration patterns). 12.E.4b Describe how rock sequences and fossil remains are used to interpret age and changes in the Earth.	
<b>Objectives</b> <ul style="list-style-type: none"> <li>○ <b>Conceptual</b></li> <li>○ <b>Factual</b></li> <li>○ <b>Procedural</b></li> </ul>		<ul style="list-style-type: none"> <li>● Describe Aristotle’s classification system, and explain why it was replaced.</li> <li>● Explain Linnaeus’s system of classification, and identify the main criterion he used to classify organisms.</li> <li>● List Linnaeus’s levels of classification from the most general to the most specific.</li> <li>● Name the primary criterion that modern taxonomists consider when they classify and organism.</li> <li>● Define phylogenetic tree, and explain what information a phylogenetic tree shows.</li> <li>● List for types of evidence used to organize organisms in systematic taxonomy.</li> <li>● Name two differences found in the embryos of vertebrates and arthropods that suggest a very different phylogenetic history.</li> <li>● Explain cladistic taxonomy, and identify one conclusion that is in conflict with classical, systematic taxonomy.</li> <li>● Describe the six-kingdom system of classification.</li> <li>● List the characteristics that distinguish archaeobacteria from eubacteria.</li> <li>● Explain why the protests are grouped together in the six-kingdom system in spite of having differences that are greater than those between plants and animals.</li> <li>● Describe the evidence that prompted the creation of the three-domain system of classification.</li> <li>● Explain the principal difference between the six-kingdom system and the three-domain system of classification.</li> </ul>

<b>Assessments</b>	Performance Tasks Homework completion Lab work and reports Quizzes Exams	Other Evidence
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## *Unit Frameworks*

<b>Unit of Study: major topics</b>	<b>Bacteria</b>	Resources that will support instruction
<b>Illinois Learning Standards, Benchmarks, National Standards Assessment Frameworks, or other standards that will be taught in this unit</b>	12.A.4a Explain how genetic combinations produce visible effects and variations among physical features and cellular functions of organisms. 12.A.4b Describe the structures and organization of cells and tissues that underlie the basic life functions including nutrition, respiration, cellular transport, biosynthesis, and reproduction. 12.A.4c Describe the processes by which organisms change over time using evidence of comparative anatomy and physiology, embryology, the fossil record, genetics, and biochemistry. 12.B.4a Compare physical, ecological, and behavioral factors that influence interactions and interdependence of organisms. 12.B.4b Simulate and analyze factors that influence the size and stability of populations within ecosystems (e.g., birth rate, death rate, predation, migration patterns). 13.B.4e Evaluate claims derived from purported scientific studies used in advertising and marketing strategies	
<b>Objectives</b> ○ <b>Conceptual</b> ○ <b>Factual</b> ○ <b>Procedural</b>	<ul style="list-style-type: none"> <li>● Define, describe and explain the terms bacteria, eubacteria and archaeobacteria.</li> <li>● Describe the methods used to classify bacteria.</li> <li>● Distinguish between gram(+) and gram(-) bacteria.</li> <li>● Describe a cyanobacteria and the important role they played in the formation of the earth's atmosphere</li> <li>● Describe ways that bacteria can cause diseases in humans</li> <li>● Explain how bacteria have become resistant to antibiotics and the consequences of this occurrence</li> <li>● List three ways that bacteria are helpful to humans</li> </ul>	
<b>Assessments</b>	Performance Tasks Homework completion Lab work and reports Quizzes Exams	Other Evidence

## *Unit Frameworks*

<b>Unit of Study: major topics</b>	<b>Viruses</b>	Resources that will support instruction
<b>Illinois Learning Standards, Benchmarks, National Standards Assessment Frameworks, or other standards that will be taught in this unit</b>	12.A.4a Explain how genetic combinations produce visible effects and variations among physical features and cellular functions of organisms. 12.A.4b Describe the structures and organization of cells and tissues that underlie the basic life functions including nutrition, respiration, cellular transport, biosynthesis, and reproduction. 12.A.4c Describe the processes by which organisms change over time using evidence of comparative anatomy and physiology, embryology, the fossil record, genetics, and biochemistry. 12.B.4a Compare physical, ecological, and behavioral factors that influence interactions and interdependence of organisms. 12.B.4b Simulate and analyze factors that influence the size and stability of populations within ecosystems (e.g., birth rate, death rate, predation, migration patterns).	
<b>Objectives</b> <ul style="list-style-type: none"> <li>○ <b>Conceptual</b></li> <li>○ <b>Factual</b></li> <li>○ <b>Procedural</b></li> </ul>	<ul style="list-style-type: none"> <li>• Describe the structure and classification of viruses</li> <li>• Identify the range of shapes and sizes among viruses</li> <li>• Compare and contrast a virus a prion and a viroid</li> <li>• Diagram and compare and contrast the lytic and lysogenic viral cycles</li> <li>• Name and describe several common viral diseases</li> <li>• Explain how a vaccine works and discuss other forms of viral-disease prevention</li> <li>• Define and give two examples of emerging viruses</li> </ul>	
<b>Assessments</b>	Performance Tasks Homework completion Lab work and reports Quizzes Exams	Other Evidence

## *Unit Frameworks*

<b>Unit of Study: major topics</b>	<b>Protozoa &amp; Algae and Fungus-like Protists</b>	Resources that will support instruction
<b>Illinois Learning Standards, Benchmarks,  National Standards Assessment Frameworks, or other standards that will be taught in this unit</b>	12.A.4a Explain how genetic combinations produce visible effects and variations among physical features and cellular functions of organisms. 12.A.4b Describe the structures and organization of cells and tissues that underlie the basic life functions including nutrition, respiration, cellular transport, biosynthesis, and reproduction. 12.A.4c Describe the processes by which organisms change over time using evidence of comparative anatomy and physiology, embryology, the fossil record, genetics, and biochemistry. 12.B.4a Compare physical, ecological, and behavioral factors that influence interactions and interdependence of organisms. 12.B.4b Simulate and analyze factors that influence the size and stability of populations within ecosystems (e.g., birth rate, death rate, predation, migration patterns).	
<b>Objectives</b> ○ <b>Conceptual</b> ○ <b>Factual</b> ○ <b>Procedural</b>	<ul style="list-style-type: none"> <li>● Describe the characteristics of protozoa</li> <li>● Explain the role protozoa may play in an aquatic ecosystem</li> <li>● Explain the classification and evolution of protozoa</li> <li>● List and describe the human importance of several common protozoans</li> <li>● Compare algae with other types of protist</li> <li>● Compare algae with plants</li> <li>● Describe the body structure of algae</li> <li>● Explain the classification and evolution of algae</li> <li>● List and describe the human importance of several common algae</li> </ul>	
<b>Assessments</b>	Performance Tasks Homework completion Lab work and reports Quizzes Exams	Other Evidence

## *Unit Frameworks*

<b>Unit of Study: major topics</b>	<b>Fungi</b>	Resources that will support instruction
<b>Illinois Learning Standards, Benchmarks, National Standards Assessment Frameworks, or other standards that will be taught in this unit</b>	12.A.4a Explain how genetic combinations produce visible effects and variations among physical features and cellular functions of organisms. 12.A.4b Describe the structures and organization of cells and tissues that underlie the basic life functions including nutrition, respiration, cellular transport, biosynthesis, and reproduction. 12.A.4c Describe the processes by which organisms change over time using evidence of comparative anatomy and physiology, embryology, the fossil record, genetics, and biochemistry. 12.B.4a Compare physical, ecological, and behavioral factors that influence interactions and interdependence of organisms. 12.B.4b Simulate and analyze factors that influence the size and stability of populations within ecosystems (e.g., birth rate, death rate, predation, migration patterns). 12.E.4b Describe how rock sequences and fossil remains are used to interpret age and changes in the Earth.	
<b>Objectives</b> ○ <b>Conceptual</b> ○ <b>Factual</b> ○ <b>Procedural</b>	<ul style="list-style-type: none"> <li>● Describe the origin and evolution of fungus</li> <li>● Compare fungi with algae, animals and plants</li> <li>● Describe how fungi obtain nutrients</li> <li>● List the three major groups of fungi</li> <li>● Explain the ecological importance of micorrhizae and lichens</li> <li>● Describe the (+) and (-) impact fungi have on humans</li> </ul>	
<b>Assessments</b>	Performance Tasks Homework completion Lab work and reports Quizzes Exams	Other Evidence

## *Unit Frameworks*

<b>Unit of Study: major topics</b>	<b>Plant Evolution and Classification &amp; Plant Structure and Function</b>	Resources that will support instruction
<b>Illinois Learning Standards, Benchmarks, National Standards Assessment Frameworks, or other standards that will be taught in this unit</b>	12.A.4a Explain how genetic combinations produce visible effects and variations among physical features and cellular functions of organisms. 12.A.4b Describe the structures and organization of cells and tissues that underlie the basic life functions including nutrition, respiration, cellular transport, biosynthesis, and reproduction. 12.A.4c Describe the processes by which organisms change over time using evidence of comparative anatomy and physiology, embryology, the fossil record, genetics, and biochemistry. 12.B.4a Compare physical, ecological, and behavioral factors that influence interactions and interdependence of organisms. 12.B.4b Simulate and analyze factors that influence the size and stability of populations within ecosystems (e.g., birth rate, death rate, predation, migration patterns). 12.E.4b Describe how rock sequences and fossil remains are used to interpret age and changes in the Earth.	
<b>Objectives</b> <ul style="list-style-type: none"> <li>○ <b>Conceptual</b></li> <li>○ <b>Factual</b></li> <li>○ <b>Procedural</b></li> </ul>	<ul style="list-style-type: none"> <li>● Describe ways that people use plants.</li> <li>● Distinguish between cereals, root crops, legumes, fruits and vegetables.</li> <li>● Explain how humans have increased food production in the world.</li> <li>● List three plants that are widely used as medicines.</li> <li>● Compare and contrast green algae and plants.</li> <li>● Name three adaptations plants have made to life on land.</li> <li>● Compare vascular plants with nonvascular plants.</li> <li>● Name three types of plants that make up the bryophytes.</li> <li>● List distinguishing characteristics shared by nonvascular plants.</li> <li>● List two main characteristics of vascular plants.</li> <li>● Distinguish between seedless plants and seed plants.</li> <li>● Distinguish between gymnosperms and angiosperms.</li> <li>● Summarize the adaptive advantages of seeds.</li> <li>● Distinguish between monocots and dicots.</li> <li>● List the three major functions of roots.</li> <li>● Explain the difference between a taproot system and a fibrous root system.</li> <li>● Describe the differences between monocot stems and dicot stems.</li> <li>● List the different structures of the stem.</li> </ul>	

	<ul style="list-style-type: none"> <li>• Explain how annual rings are formed.</li> <li>• Identify the difference between a simple leaf and a compound leaf.</li> <li>• Describe the tissues that make up the internal structure of a leaf.</li> <li>• Describe adaptations of leaves for special purposes.</li> <li>• Explain the importance of stomata</li> </ul>	
<b>Assessments</b>	Performance Tasks Homework completion Lab work and reports Quizzes Exams	Other Evidence



## *Unit Frameworks*

<b>Unit of Study: major topics</b>	<b>Introduction to Animals</b>	Resources that will support instruction
<b>Illinois Learning Standards, Benchmarks, National Standards Assessment Frameworks, or other standards that will be taught in this unit</b>	12.A.4a Explain how genetic combinations produce visible effects and variations among physical features and cellular functions of organisms. 12.A.4b Describe the structures and organization of cells and tissues that underlie the basic life functions including nutrition, respiration, cellular transport, biosynthesis, and reproduction. 12.A.4c Describe the processes by which organisms change over time using evidence of comparative anatomy and physiology, embryology, the fossil record, genetics, and biochemistry. 12.B.4a Compare physical, ecological, and behavioral factors that influence interactions and interdependence of organisms. 12.B.4b Simulate and analyze factors that influence the size and stability of populations within ecosystems (e.g., birth rate, death rate, predation, migration patterns). 12.E.4b Describe how rock sequences and fossil remains are used to interpret age and changes in the Earth.	
<b>Objectives</b> ○ <b>Conceptual</b> ○ <b>Factual</b> ○ <b>Procedural</b>	<ul style="list-style-type: none"> <li>● List and define the four major characteristics of animals</li> <li>● How did animals evolve?</li> <li>● List and describe the 3 patterns of symmetry and give an example of each</li> <li>● Define the benefits of having a body cavity</li> <li>● Compare and contrast invertebrates, chordates, and vertebrates</li> <li>● Distinguish between an acoelomate, a pseudocoelomate and a coelomate</li> </ul>	
<b>Assessments</b>	Performance Tasks Homework completion Lab work and reports Quizzes Exams	Other Evidence

## *Unit Frameworks*

<b>Unit of Study: major topics</b>	<b>Invertebrates</b>	Resources that will support instruction
<b>Illinois Learning Standards, Benchmarks, National Standards Assessment Frameworks, or other standards that will be taught in this unit</b>	12.A.4a Explain how genetic combinations produce visible effects and variations among physical features and cellular functions of organisms. 12.A.4b Describe the structures and organization of cells and tissues that underlie the basic life functions including nutrition, respiration, cellular transport, biosynthesis, and reproduction. 12.A.4c Describe the processes by which organisms change over time using evidence of comparative anatomy and physiology, embryology, the fossil record, genetics, and biochemistry. 12.B.4a Compare physical, ecological, and behavioral factors that influence interactions and interdependence of organisms. 12.B.4b Simulate and analyze factors that influence the size and stability of populations within ecosystems (e.g., birth rate, death rate, predation, migration patterns). 12.E.4b Describe how rock sequences and fossil remains are used to interpret age and changes in the Earth.	
<b>Objectives</b> ○ <b>Conceptual</b> ○ <b>Factual</b> ○ <b>Procedural</b>	<b>Sponges, Cnidarians and Ctenophores</b> <ul style="list-style-type: none"> <li>• What phylum do sponges belong to?</li> <li>• Describe the feeding mechanism of a sponge</li> <li>• Distinguish between the polyp form and medusa form of a cnidarian</li> <li>• Describe the nervous system in a cnidarian</li> <li>• List and describe the three classes of cnidarians</li> <li>• Distinguish between a cnidarian and a ctenophore</li> </ul> <b>Flatworms, Roundworms and Rotifers</b> <ul style="list-style-type: none"> <li>• Describe two evolutionary advancement of a flatworm</li> <li>• Describe the lifecycle of a parasitic flatworm</li> <li>• Distinguish between the body cavity of a flatworm and a tapeworm</li> <li>• List one major evolutionary advancement of a roundworm</li> <li>• Identify the symmetry of flatworms, roundworms and rotifers</li> </ul> <b>Mollusks and Annelids</b> <ul style="list-style-type: none"> <li>• Describe one major evolutionary advancement of a mollusk</li> <li>• Describe how a mollusk is a coelomate</li> <li>• Describe the symmetry of a mollusk</li> <li>• Describe what is meant by a closed circulatory system and why it is considered an advancement</li> <li>• Distinguish between a gastropod and a bivalve</li> </ul>	

	<ul style="list-style-type: none"> <li>• Define the body cavity and symmetry of an annelid</li> <li>• Describe one major evolutionary advancement of an annelid</li> </ul> <p>Arthropods</p> <ul style="list-style-type: none"> <li>• Describe one major evolutionary advancement of arthropods</li> <li>• List and describe 3 sensory adaptations of arthropods</li> <li>• List and describe some members of each of the 4 subphyla of arthropods</li> <li>• Describe the respiratory system of a spider</li> </ul> <p>Insects</p> <ul style="list-style-type: none"> <li>• List the phylum that insects belong to</li> <li>• List and describe three major insect adaptations</li> <li>• Define the characteristics that make the insect group so successful</li> <li>• Describe the importance of metamorphosis</li> </ul>		
<p><b>Assessments</b></p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td data-bbox="423 909 974 1459"> <p>Performance Tasks Homework completion Lab work and reports Quizzes Exams</p> </td> <td data-bbox="974 909 1521 1459"> <p>Other Evidence</p> </td> </tr> </table>	<p>Performance Tasks Homework completion Lab work and reports Quizzes Exams</p>	<p>Other Evidence</p>
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## *Unit Frameworks*

<b>Unit of Study: major topics</b>	<b>Vertebrates</b>	Resources that will support instruction
<b>Illinois Learning Standards, Benchmarks, National Standards Assessment Frameworks, or other standards that will be taught in this unit</b>	12.A.4a Explain how genetic combinations produce visible effects and variations among physical features and cellular functions of organisms. 12.A.4b Describe the structures and organization of cells and tissues that underlie the basic life functions including nutrition, respiration, cellular transport, biosynthesis, and reproduction. 12.A.4c Describe the processes by which organisms change over time using evidence of comparative anatomy and physiology, embryology, the fossil record, genetics, and biochemistry. 12.B.4a Compare physical, ecological, and behavioral factors that influence interactions and interdependence of organisms. 12.B.4b Simulate and analyze factors that influence the size and stability of populations within ecosystems (e.g., birth rate, death rate, predation, migration patterns). 12.E.4b Describe how rock sequences and fossil remains are used to interpret age and changes in the Earth.	
<b>Objectives</b> ○ <b>Conceptual</b> ○ <b>Factual</b> ○ <b>Procedural</b>	<b>Echinoderms and Invertebrate Chordates</b> <ul style="list-style-type: none"> <li>• Differentiate the body organization of an adult echinoderm and its larvae</li> <li>• List and briefly describe 2 examples of echinoderms</li> <li>• Describe the function of a water vascular system</li> <li>• Identify the body systems present in an echinoderm</li> <li>• Define what it means to be an invertebrate chordate</li> <li>• List 2 examples of invertebrate chordates</li> </ul> <b>Fish</b> <ul style="list-style-type: none"> <li>• List and describe the three major vertebrate characteristics</li> <li>• Describe some of the characteristics of fish evolution</li> <li>• List and describe the three major classes of fish</li> <li>• Describe the three key features of bony fish</li> <li>• List and describe the characteristics of the fish thought to be ancestral to amphibians</li> </ul> <b>Amphibians</b> <ul style="list-style-type: none"> <li>• Define the characteristics needed for the movement of vertebrates to land</li> <li>• Define the characteristics that define amphibians</li> <li>• Describe the structure and efficiency of an amphibian heart</li> <li>• Describe the gas exchange/respiratory mechanisms of amphibians</li> <li>• Describe amphibian eggs and how they are fertilized</li> </ul> <b>Reptiles</b>	

	<ul style="list-style-type: none"> <li>• List two major evolutionary advancements of reptiles</li> <li>• Describe the structure and efficiency of the reptilian heart</li> <li>• Differentiate between an ectotherm and an endotherm</li> <li>• List and describe the three patterns of reproduction related to eggs</li> </ul> <p>Birds</p> <ul style="list-style-type: none"> <li>• List and describe the distinguishing characteristics of birds</li> <li>• Describe the structure and efficiency of the bird heart</li> <li>• Describe the unique respiratory system of birds</li> <li>• List and describe the characteristics of birds that make flight possible</li> </ul> <p>Mammals</p> <ul style="list-style-type: none"> <li>• List and describe the distinguishing characteristics of mammals</li> <li>• Compare and contrast monotremes, marsupials and placental mammals</li> <li>• Describe how mammals process their food</li> <li>• Describe the structure and efficiency of the mammalian heart</li> </ul>		
<p><b>Assessments</b></p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 5px;">           Performance Tasks            Homework completion            Lab work and reports            Quizzes            Exams         </td> <td style="width: 50%; padding: 5px;">           Other Evidence         </td> </tr> </table>	Performance Tasks Homework completion Lab work and reports Quizzes Exams	Other Evidence
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## *Unit Frameworks*

<b>Unit of Study: major topics</b>	<b>Ecology</b>	Resources that will support instruction
<b>Illinois Learning Standards, Benchmarks, National Standards Assessment Frameworks, or other standards that will be taught in this unit</b>	<p>12.A.4a Explain how genetic combinations produce visible effects and variations among physical features and cellular functions of organisms.</p> <p>12.A.4b Describe the structures and organization of cells and tissues that underlie the basic life functions including nutrition, respiration, cellular transport, biosynthesis, and reproduction.</p> <p>12.A.4c Describe the processes by which organisms change over time using evidence of comparative anatomy and physiology, embryology, the fossil record, genetics, and biochemistry.</p> <p>12.B.4a Compare physical, ecological, and behavioral factors that influence interactions and interdependence of organisms.</p> <p>12.B.4b Simulate and analyze factors that influence the size and stability of populations within ecosystems (e.g., birth rate, death rate, predation, migration patterns).</p> <p>12.E.4a Explain how external and internal energy sources drive Earth processes (e.g., solar energy drives weather patterns; internal heat drives plate tectonics).</p> <p>12.E.4b Describe how rock sequences and fossil remains are used to interpret age and changes in the Earth.</p> <p>13.B.4a Compare and contrast scientific inquiry and technological design as pure and applied sciences.</p> <p>13.B.4b Analyze a particular occupation to identify decisions that may be influenced by knowledge of science.</p> <p>13.B.4c Analyze ways that resource management and technology can be used to accommodate population trends.</p> <p>13.B.4d Analyze local examples of resource use, technology use, or conservation programs; document findings; and make recommendations for improvements</p>	
<b>Objectives</b> <ul style="list-style-type: none"> <li>○ <b>Conceptual</b></li> <li>○ <b>Factual</b></li> <li>○ <b>Procedural</b></li> </ul>	<b>Ecology</b> <ul style="list-style-type: none"> <li>● Define the term ecology, and explain why ecology is important.</li> <li>● List and describe three human caused environmental problems.</li> <li>● Identify the five different levels of organization in ecology.</li> <li>● Explain the theme of interconnectedness.</li> <li>● Identify the importance of models to ecology.</li> <li>● Contrast abiotic factors with biotic factors, and list two examples of each.</li> <li>● Explain the importance of tolerance curves.</li> <li>● Describe some adaptations that allow organisms to avoid unfavorable conditions.</li> </ul>	

- Explain the concept of the niche.
- Contrast the fundamental niche with the realized niche

#### Populations

- Explain the differences between population size, density and dispersion.
- Describe the three main patterns of population dispersion.
- Explain the importance of a population's age structure.
- Contrast the three main types of survivorship curves.
- Describe the exponential model of population growth.
- Compare the similarities and differences between the logistic model and the exponential model.
- Distinguish between density-dependent and density-independent regulatory factors.
- List three reasons why small populations are more vulnerable to extinction.
- Explain how the development of agriculture changed the pattern of human population growth.
- Describe the change in human population growth that began around 1650.
- Describe how growth rates have changed since World War II.
- Compare the general standard of living in developed countries with that in developing countries

#### Communities

- Distinguish predation from parasitism
- Evaluate the importance of mimicry as a defense mechanism.
- Describe two ways plants defend themselves against herbivores.
- Explain how competition can affect community structure.
- Explain the difference between species richness and species diversity.
- Describe how species richness varies with latitude, and explain a hypothesis for this pattern.
- Explain the cause and consequences of the species-area effect.
- Explain the two main views of the relationship between species richness and stability.
- Distinguish between primary and secondary succession
- Identify some of the characteristics of a pioneer species.
- Describe the sequence of changes occurring at Glacier Bay.
- Explain the successional changes that can occur when an existing community is disrupted

#### Biosphere

- Contrast producers with consumers.
- Explain the important role of decomposers in an ecosystem.
- Contrast a food web with a food chain.
- Explain why ecosystems usually contain only a few trophic levels.
- Define biogeochemical cycle.
- Trace the steps of the water cycle.
- Summarize the major steps in the nitrogen cycle.
- Describe the steps of the carbon cycle.

	<ul style="list-style-type: none"> <li>• Describe the differences between tundra and taiga biomes.</li> <li>• Contrast temperate grassland with savanna.</li> <li>• Describe three water conservation adaptations of desert organisms</li> <li>• Compare tropical rain forests with temperate deciduous forests.</li> <li>• Contrast the aphotic and photic zones in the ocean.</li> <li>• Describe the differences between the neritic zone and the oceanic zone.</li> <li>• Explain how organisms near deep-sea vents obtain energy.</li> <li>• Contrast eutrophic lakes with oligotrophic lakes</li> </ul>	
<b>Assessments</b>	Performance Tasks Homework completion Lab work and reports Quizzes Exams	Other Evidence