

Science
Biology: Honors
Unit 8: Science and Society

Essential Understandings	<ul style="list-style-type: none"> ▪ Science and technology have wide-reaching implications/impacts on society.
Essential Questions	<ul style="list-style-type: none"> ▪ How does science and technology impact human health? ▪ How does population growth affect natural resources? ▪ How do natural and human-induced hazards affect the environment? ▪ What role do science and technology play in the global challenges play?
Essential Knowledge	<ul style="list-style-type: none"> ▪ Science and technology affect human health on a global scale. ▪ Population fluctuations impact natural resources. ▪ Natural and human-induced hazards impact the sustainability of natural resources. ▪ Science and technology play a role in global environmental quality.
Vocabulary	<ul style="list-style-type: none"> ▪ <u>Terms:</u> <ul style="list-style-type: none"> ○ population density, exponential growth, logistic growth, carrying capacity, limiting factor, density-dependent limiting factor, density-independent limiting factor, demography, renewable resources, nonrenewable resources, sustainable use, soil erosion, desertification, deforestation, pollution, acid rain, green revolution, pathogen, vector, antibiotic, Louis Pasteur, Koch's postulate, immunity, vaccination, infectious disease, epidemic/pandemic, disease reservoirs, carcinogens, nutrition
Essential Skills	<ul style="list-style-type: none"> ▪ Use the microscope correctly. ▪ Use sterile techniques when culturing organisms. ▪ Construct a graph on population growth versus environmental resources. ▪ Research environmental topics and/or the impact of biotechnology on the environment/society.

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Related Maine Learning Results	<p><u>Science</u></p> <p>B. The Skills and Traits of Scientific Inquiry and Technological Design</p> <p>B1. Skills and Traits of Scientific Inquiry</p> <p>Students methodically plan, conduct, analyze data from, and communicate results of in-depth scientific investigations, including experiments guided by a testable hypothesis.</p> <ol style="list-style-type: none">a. Identify questions, concepts, and testable hypotheses that guide scientific investigations.b. Design and safely conduct methodical scientific investigations, including experiments with controls.c. Use statistics to summarize, describe, analyze, and interpret results.d. Formulate and revise scientific investigations and models using logic and evidence.e. Use a variety of tools and technologies to improve investigations and communications.f. Recognize and analyze alternative explanations and models using scientific criteria.g. Communicate and defend scientific ideas. <p>C. The Scientific and Technological Enterprise</p> <p>C1. Understandings of Inquiry</p> <p>Students describe key aspects of scientific investigations: that they are guided by scientific principles and knowledge, that they are performed to test ideas, and that they are communicated and defended publicly.</p> <ol style="list-style-type: none">a. Describe how hypotheses and past and present knowledge guide and influence scientific investigations.b. Describe how scientists defend their evidence and explanations using logical argument and verifiable results. <p>C2. Understandings About Science and Technology</p> <p>Students explain how the relationship between scientific inquiry and technological design influences the advancement of ideas, products, and systems.</p> <ol style="list-style-type: none">a. Provide an example that shows how science advances with the introduction of new technologies and how solving technological problems often impacts new scientific knowledge.b. Provide examples of how creativity, imagination, and a good knowledge base are required to advance scientific ideas and technological design.c. Provide examples that illustrate how technological solutions to problems sometimes lead to new problems or new fields of inquiry.
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**Related
Maine Learning
Results**

C3.Science, Technology, and Society

Students describe the role of science and technology in creating and solving contemporary issues and challenges.

- a. Explain how science and technology influence the carrying capacity and sustainability of the planet.
- b. Explain how ethical, societal, political, economic, and cultural factors influence personal health, safety, and the quality of the environment.
- c. Explain how ethical, societal, political, economic, religious, and cultural factors influence the development and use of science and technology.

C4.History and Nature of Science

Students describe the human dimensions and traditions of science, the nature of scientific knowledge, and historical episodes in science that impacted science and society.

- a. Describe the ethical traditions in science including peer review, truthful reporting, and making results public.
- b. Select and describe one of the major episodes in the history of science including how the scientific knowledge changed over time and any important effects on science and society.
- c. Give examples that show how societal, cultural, and personal beliefs and ways of viewing the world can bias scientists.
- d. Provide examples of criteria that distinguish scientific explanations from pseudoscientific ones.

D. The Physical Setting

D2.Earth

Students describe and analyze the biological, physical, energy, and human influences that shape and alter Earth Systems.

- a. Describe and analyze the effect of solar radiation, ocean currents, and atmospheric conditions on the Earth's surface and the habitability of Earth.
- c. Describe and analyze the effects of biological and geophysical influences on the origin and changing nature of Earth Systems.
- d. Describe and analyze the effects of human influences on Earth Systems.

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<p>Related Maine Learning Results</p>	<p>D3.Matter and Energy Students describe the structure, behavior, and interactions of matter at the atomic level and the relationship between matter and energy.</p> <ul style="list-style-type: none">a. Describe the structure of atoms in terms of neutrons, protons, and electrons and the role of the atomic structure in determining chemical properties.b. Describe how the number and arrangement of atoms in a molecule determine a molecule's properties, including the types of bonds it makes with other molecules and its mass, and apply this to predictions about chemical reactions. <p>E. The Living Environment</p> <p>E1.Biodiversity Students describe and analyze the evidence for relatedness among and within diverse populations of organisms and the importance of biodiversity.</p> <ul style="list-style-type: none">d. Analyze the effects of changes in biodiversity and predict possible consequences. <p>E2.Ecosystems Students describe and analyze the interactions, cycles, and factors that affect short-term and long-term ecosystem stability and change.</p> <ul style="list-style-type: none">a. Explain why ecosystems can be reasonably stable over hundreds or thousands of years, even though populations may fluctuate.b. Describe dynamic equilibrium in ecosystems and factors that can, in the long run, lead to change in the normal pattern of cyclic fluctuations and apply that knowledge to actual situations.c. Explain the concept of carrying capacity and list factors that determine the amount of life that any environment can support.d. Describe the critical role of photosynthesis and how energy and the chemical elements that make up molecules are transformed in ecosystems and obey basic conservation laws.
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<p>Related Maine Learning Results</p>	<p>E3.Cells Students describe structure and function of cells at the intracellular and molecular level including differentiation to form systems, interactions between cells and their environment, and the impact of cellular processes and changes on individuals.</p> <ol style="list-style-type: none"> b. Describe the relationship among DNA, protein molecules, and amino acids in carrying out the work of cells and how this is similar among all organisms. c. Describe the interactions that lead to cell growth and division (mitosis) and allow new cells to carry the same information as the original cell (meiosis). d. Describe ways in which cells can malfunction and put an organism at risk. e. Describe the role of regulation and the processes that maintain an internal environment amidst changes in the external environment. <p>E4.Heredity and Reproduction Students examine the role of DNA in transferring traits from generation to generation, in differentiating cells, and in evolving new species.</p> <ol style="list-style-type: none"> a. Explain some of the effects of the sorting and recombination of genes in sexual reproduction. b. Describe genes as segments of DNA that contain instructions for the cells and include information that leads to the differentiation of cells. c. Explain how the instructions in DNA that lead to cell differentiation result in varied cell functions in the organism and DNA. d. Describe the possible causes and effects of gene mutations. <p>E5.Evolution Students describe the interactions between and among species, populations, and environments that lead to natural selection and evolution.</p> <ol style="list-style-type: none"> a. Describe the premise of biological evolution, citing evidence from the fossil record and evidence based on the observation of similarities within the diversity of existing organisms. d. Relate structural and behavioral adaptations of an organism to its survival in the environment.
<p>Sample Lessons And Activities</p>	<ul style="list-style-type: none"> ▪ Microscope Lab ▪ Graphing exercises ▪ Controlling for Bacteria Growth Lab ▪ Bacterial and Viruses Models ▪ Computer modeling

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	<ul style="list-style-type: none">▪ Web Quests▪ Modeling recombinant DNA
Sample Classroom Assessment Methods	<ul style="list-style-type: none">▪ Quiz▪ Chapter Test▪ Lab Reports
Sample Resources	<ul style="list-style-type: none">▪ <u>Publications:</u><ul style="list-style-type: none">○ <u>Biology</u> – Kenneth Miller and Josephine Levine○ Scientific Journals▪ <u>Videos:</u><ul style="list-style-type: none">○ <u>Cycle of Life</u> series▪ <u>Other Resources:</u><ul style="list-style-type: none">○ Internet resources