

# Maine's Learning Results Science and Technology Performance Indicators Content Clarification Crosswalk for High School Grades 9-11

## Standard A: Classifying Life Forms

Maine's Learning Results	Maine's Curriculum Framework	Science for All Americans	Project 2061 Benchmarks for Science Literacy	National Science Education Standards	Project 2061 Atlas of Science Literacy
A1: Explain the role of DNA in resolving questions of relationship and evolutionary change	A(9-12)#1 p II-64 D(9-12)#5 p II-68 Snapshot p II-66	Diversity of Life pp 60- 61 Evolution of Life p 67	5A(9-12) Essay p105 <b><u>5A(9-12)#2</u></b> 5F(9-12) Essay p124 <b><u>5F(9-12)#2</u></b> 6A(9-12) Essay p130 <b><u>6A(9-12)#1</u></b>	9-12/C Essay p 181 9-12/C3c p185	DNA and Inherited Characteristics Map p 71 Mechanism of Inheritance Strand p 71 Biological Evolution Map 81
A2: Describe similarities and differences among organisms within each level of the taxonomic system for classifying organisms (kingdom through species)	A(9-12)#2 p II-64	Diversity of Life p 60	5A Essay p 101 5A(6-8) Essay p104 5A(6-8)#3 5A Research p340	9-12/C Essay p 181 <b><u>9-12/C3e</u></b> p185	Biological Evolution Map p 81
A3: Analyze the basic characteristics of living things, including their need for food, water, and gases and the ability to reproduce	N/A	Cells p 62	5C(9-12) Essay p113 5C(9-12)#2 5C(6-8)#3	9-12/C1a p184 9-12/C5d p186	Basic Needs Strand p 73

## Standard B: Ecology

Maine's Learning Results	Maine's Curriculum Framework	Science for All Americans	Project 2061 Benchmarks for Science Literacy	National Science Education Standards	Project 2061 Atlas of Science Literacy
B1: Illustrate the cycles of matter in the environment and explain their interrelationships	B(9-12)#1 p II-65	Processes that Shape the Earth pp 45-46 Flow of Matter and Energy pp 66-67	5E 9-12 Essay p121 <b><u>5E(9-12)#1,2,3</u></b> <b><u>4C(9-12)#1,2</u></b> 5E(6-8) Essay p120 5E(6-8)#2 5E Research p343	<b><u>9-12/C4a</u></b> p186 <b><u>9-12/C5e.f</u></b> p186 9-12/D Essay p187 <b><u>9-12D/2a,b</u></b> p189	Flow of Matter in Ecosystems Map p 77 Changes in the Earth's Surface Map p 51

### Standard B: Ecology (Continued)

B2: Compare the process of photosynthesis and respiration and describe the factors that affect them	B(9-12)#2 p II-65	Flow of Matter and Energy p 66 Basic Functions p 77	5E(9-12) Essay p121 5E(6-8) Essay p120 5E(6-8)#1,3 6C(6-8)#3 5E(9-12)#2,3	<b>9-12/B3b</b> p 179 <b>9-12/C1b,e</b> p184 <b>9-12C5b,c,d</b> p 186 9-12/F Vignette pp194-96	Flow of Matter in Ecosystems Map p 77 Flow of Energy in Ecosystems Map p 79
B3: Analyze the factors that affect population size	B(9-12)#4 p II-66	Interdependence of Life pp 65-66	9-12 Essay p117 <b>5D(9-12)#1,2,3</b> <b>5E(9-12)#2</b> Research p342	9-12/C Essay p184 <b>9-12/C4d</b> p186 <b>9-12/C5e</b> p186 9-12/F Essay p193 <b>9-12/F2a,b,c</b> p198	No Maps
B4: Analyze the impact of human and other activities on the type and pace of change in ecosystems	B(9-12)#5 p II-66	The Human Presence pp 32-33 Flow of Matter and Energy pp 66-67 Decisions about the Use of Technology pp 35-37	5D(9-12) Essay p121 <b>5E(9-12)#2</b> <b>5D(9-12)#3</b> 3C(9-12) Essay p56 <b>3C(9-12)#3,4,5</b>	<b>9-12/C4e</b> p186 9-12/F Essay pp 193,197 <b>9-12/F2c</b> p198 <b>9-12/F3a,b,c</b> p198 <b>9-12/F4a,b,c</b> p198 <b>9-12/F5b,d</b> p199 <b>9-12/F6e</b> p 199	Decisions about Using Technology Map p 39

### Standard C: Cells

Maine's Learning Results	Maine's Curriculum Framework	Science for All Americans	Project 2061 Benchmarks for Science Literacy	National Science Education Standards	Project 2061 Atlas of Science Literacy
C1: Relate the parts of a cell to its function	C(9-12)#1 p II-66	Cells pp 62-65	Essay p110 9-12 Essay p113 <b>5C(9-12)#1,2,3,4</b> Research p342	9-12/C Essay p181 <b>9-12/C1a,b,c,d,e</b> p184	Cell Functions Map p 73 Cells and Organs Map p 75
C2: Illustrate how cells replicate and transmit information, including the roles of DNA and RNA	C(9-12)#2 p II-67	Heredity pp 61-62 Cells p 64	5B Essay p 106 5B(9-12) Essay p108 <b>5B(9-12)#3,4,5,6</b> <b>5C(9-12)#4,5</b> 6B(9-12) Essay p134 <b>6B(9-12)#1</b> <b>6C(9-12)#3</b>	9-12/C Essay p181 <b>9-12/C1c,d</b> p184 <b>9-12/C2a,b</b> p185	DNA and Inherited Characteristics Map p 69 Variation in Inherited Characteristics Map p 71 Cells and Organs Map p 75 Structures Strand p 73

### Standard C: Cells (Continued)

C3: Discuss the function of the important “molecules of life”	C(9-12)#3 p II-67	Cells pp 63-64	5C(9-12) Essay p113 <b>5C(9-12)#1,3,4,5, 7</b>	9-12/C Essay p181 <b>9-12/C1b,c,d,e</b> p184 <b>9-12/C2a</b> p185 <b>9-12/C5 b,c</b> p186 9-12/B2f p179 <b>9-12/B3a,e</b> p 179	Basic Functions Strand p 73 Mechanism of Inheritance Strand p 69
C4: Explain how the human body protects itself against disease and how the body might lose that ability	C(9-12)#4 p II-67	Physical Health pp 80-82 Health Technology pp 123-126	6E(9-12) Essay p146 <b>6E(9-12)#1,4</b> 6E(6-8)#4 <b>6C(9-12)#1</b> <b>8F(9-12)#4</b>	9-12/F Essay p193 <b>9-12/F1 b</b> p197	Disease Map p 87
C5: Analyze and debate basic principles of genetic engineering: how it is done, its uses, and some ethical implications	C(9-12)#5 p II-67	Agriculture pp108-109 Health Technology p124	5B(9-12) Essay p108 <b>5B(9-12)#1,4</b> <b>8A(9-12)#1</b> <b>8F(9-12)#3,7</b>	9-12/F6a,b,c, d p199	Mechanism of Inheritance Strand p 71 Controlling Characteristics Strand p 107

### Standard D: Continuity and Change

Maine's Learning Results	Maine's Curriculum Framework	Science for All Americans	Project 2061 Benchmarks for Science Literacy	National Science Education Standards	Project 2061 Atlas of Science Literacy
D1: Explain how mutations can be caused by gene mutation or chromosomal alteration and describe the possible results of such mutations on individuals or populations	D(9-12)#1 p II-68	Heredity p 62 Cells p 64 Evolution of Life p 69 Physical Health pp 81-82	5B Essay p106 5B(9-12) Essay p108 <b>5B(9-12)#1,4,5</b> <b>5F(9-12)#5</b> <b>6E(9-12)#2</b>	<b>9-12/C2c</b> p185	Mechanism of Inheritance Strand p 71 Genetic Problems Strand p 87
D2: Describe why the offspring of sexually reproducing species have different survival rates than those of sexually reproducing species under a variety of conditions. Describe the advantages and disadvantages of each.	D(9-12)#2 p II-68	Heredity pp 61-62	5A(9-12)#1 <b>5B(9-12)#2</b> 5F Essay p 122 5F(9-12)#3,5 5B Research p 341 5F Research p 343	9-12/C2b,c p 185 9-12/C3a p 185	Variation Strand p 71 Variation and Advantage Strand p 83

### Standard D: Continuity and Change (Continued)

D3: Explain and document the importance of relatively short term changes (e.g. one generation) on a species' survival	D(9-12)#9 p II-68	Evolution of Life p 69	5F(9-12) Essay p 124 5A(9-12)#1 5F(9-12)#3,6 5F Research pp343-44	9-12 /C3a p 185	Natural Selection Map p 83 Variation in Inherited Characteristics Map p 71
D4: Describe how genetic manipulation can cause unusually rapid changes in species	D(9-12)#10 p II-68	Heredity p 62 Evolution p 178	5B(9-12)#1,4	9-12/C Essay p 181	Variation in Inherited Characteristics Map p 71
D5: Compare and contrast fertilization, zygote formation, and embryo development in humans and other species	D(9-12)#3 p II-68	Human Development pp 73-75	6B(6-8)#1,3 <b>6B(9-12)#1,3</b> 6B Research p 344	<b>9-12/ C1f</b> p 184,185 9-12 /C2b p 185	Cell Differentiation Strand p 75
D6: Analyze a theory scientists use to explain the origin of life	D(9-12)#4 p II-68	Evolution of Life p 68	<b>5F(9-12)#8</b>	9-12/D3d p 190	Biological Evolution Map p 81
D7: Explain both the evidence used to develop the geologic time scale and why an awareness of geologic time is important to an understanding of the process of change in the universe as well as on earth	D(9-12)#6 p II-68	Processes that Shape the Earth p 46 Extending Time pp 151-152	4C(9-12) Essay p74 4C(6-8) Essay p73 4C(6-8)#5 10D Essay p 246 10D(9-12)#1,2	9-12/D Essay p187-188 <b>9-12/ D 3a,b,c,d</b> pp 189-190	Changes in the Earth's Surface Map p 51

### Standard E: Structure of Matter

Maine's Learning Results	Maine's Curriculum Framework	Science for All Americans	Project 2061 Benchmarks for Science Literacy	National Science Education Standards	Project 2061 Atlas of Science Literacy
E1: Trace the development of models of the atom to the present and describe how each model reflects the scientific understanding of their time	E(9-12)#1 p II-70	Understanding Fire p 155 Structure of Matter pp 46-47	4D(9-12) Essay p79 4D(9-12)#1,2,3,5 10F (9-12)#3 10F(6-8) Essay p250 10F(6-8)#1	9-12/B Essay p177 9-12/B1a,b,c p 178 9-12/G Essay p 200 <b>9-12/G3c</b> p 204	Atoms and Molecules Map p 55
E2: Analyze how matter is affected by changes in temperature, pressure, and volume	E(9-12)#2 p II-70	Structure of Matter pp 47-48	4D(9-12)#9	9-12/ B2e p179 9-12/ B3d p179 9-12/ B5c p 180	Reaction Rates Strand p 61
E3: Describe the characteristics and behavior of acids and bases	E(9-12)#3 p II-70	Structure of Matter p 49	4D (9-12)#7	9-12/ B3c p 179	Chemical Reactions Map p 61

### Standard D: Structure of Matter (Continued)

E4: Describe an application of the Law of Conservation of Matter	E(9-12)#5,6 p II-70	Flow of Matter and Energy p 66 Understanding Fire p 154 Constancy pp 173-174	<b>4D (6-8)#7</b> 10F(6-8) Essay p250 10F(6-8)#3,4 5E(9-12) Essay p 121 <b>4C(9-12)#2</b> 10F(9-12)#1 Research 4D pp 336-37, 11C p 357	5-8/B1b p 154 9-12/B Essay p177 <b>9-12/C5f</b> pp 186-187 9-12/D2a p 189 9-12/F Essay p 193,197	Flow of Matter in Ecosystems Map p 77 Conservation of Matter Map p 57 Changes in the Earth's Surface Map p 51
E5: Describe how atoms are joined by chemical bonding	E(9-12)#7 p II-70	Structure of Matter p 48	<b>4D(9-12) #7,8</b> 10F(9-12) Essay p251 10F(9-12) #4	<b>9-12 /B2a,c,d,e,f</b> pp 178-179 9-12/B Essay p 177 9-12 /B3c p 179	Basic Ingredients Strand p 55 Chemical Reactions Map p 61
E6: Compare the physical and chemical characteristics of elements	E(9-12)#8 p II-70	Structure of Matter pp 46-49	4D(6-8) #5,6 4D(9-12) Essay p79 <b>4D(9-12) #1,2,3,6,9</b> <b>5C(9-12)#8</b> 4D Research p337	9-12/B Essay p177 <b>9-12/ B2b, f</b> pp 178-179 <b>9-12 /B6c,d</b> pp 180-81	Atoms and Molecules Map p 55 Chemical Reactions Map p 61
E7: Describe nuclear reactions, including fusion, fission, and decay, their occurrences in nature, and how they can be used by humans	E(9-12)#11 p II-70	The Universe pp 40-41 Structure of Matter p 49 Energy Transformations p 52 Splitting the Atom pp 155-7	<b>4A(9-12)#2</b> 4C(9-12) Essay p 74 4D(9-12) Essay p79 <b>4D (9-12) #4</b> <b>4E (9-12) #6</b> 10G (9-12) Essay p253 <b>10G (9-12) #1,2,3,4,5</b>	<b>9-12/ B1c,d</b> p178 <b>9-12/ D3b</b> p190 <b>9-12/ D4c</b> p190	The Sun and Stars Strand p 47 Invisibly Tiny Pieces Strand p 55

### Standard F: The Earth

Maine's Learning Results	Maine's Curriculum Framework	Science for All Americans	Project 2061 Benchmarks for Science Literacy	National Science Education Standards	Project 2061 Atlas of Science Literacy
F1: Describe how air pressure, temperature, and moisture interact to cause changes in the weather	F(9-12)#1 p II-71	The Earth p 43	4B(9-12)# 2	9-12/D Essay pp 187-88 9-12/D1c p 189	No Maps

### Standard F: The Earth (Continued)

F2: Analyze potential effects of changes in the earth's oceans and atmosphere	F(9-12)#2,3 p II-71	The Earth pp 43-44 Processes that Shape the Earth p 46	4B(9-12)#1,2 4B(6-8)#6,9	9-12/D Essay pp 187-88 9-12/D1c,d p 189 5-8/D1i,j,k p 160 9-12/F51 p 198	No Maps
F3: Describe the impact of plate movement and erosion on the rock cycle	F(9-12)#4 p II-71	Processes that Shape the Earth p 45 Moving Continents pp 152-153	4C(9-12) Essay p74 <b>4C(9-12)#2,5</b> 4C(6-8) Essay p73 <b>4C(6-8)#4</b> 10E Essay p 247 10E(9-12) Essay p 248 10E(9-12)#3	9-12/D Essay pp 187-88 9-12/D1b, 2a p 189 9-12/D3c p 189 5-8/D1a,b,c,d p 160	Changes in the Earth's Surface Map p 51 Plate Tectonics Map p 53
F4: Describe ways that scientists measure long periods of time and determine the age of very old objects	F(9-12)#5 p II-71	Structure of Matter p 49 Extending Time pp 151-152	4C(9-12) Essay p 74 10D Essay p246 10D(9-12) Essay p246 10D(9-12)#1,2 10G(9-12)#5 <b>4D(9-12)#4</b> 4C(6-8)#5 5F(6-8) Essay p124 4C Research p336	9-12/D Essay p188 <b>9-12/D3b</b> p189	Invisibly Tiny Pieces Strand p 56
F5: Demonstrate how rocks and minerals are used to determine geologic history	F(9-12)#7 p II-71	Processes that Shape the Earth p 46 Structure of Matter p 49	10D Essay p246 <b>10D(9-12)#2</b> 4C(6-8) Essay p73 <b>4C(6-8)#5</b> 4C Research p336	9-12/D Essay pp 187-88 <b>9-12/D3b</b> p 189 6-8/D2b p 160	Rocks and Sediments Strand p 51
F6: Analyze the changes in continental position and the evidence that supports the concept of tectonic plates	F(9-12)#8 p II-71	Processes that Shape the Earth p 45 Moving Continents pp 152-153	<b>4C(9-12)#4,5</b> 10E Essay p247 10E(9-12) Essay p248 <b>10E(9-12)#1,2,3</b>	9-12/D Essay pp 187-88 9-12/D1b p 189 9-12/D3c p 189 9-12/G3c p 204 5-8/D1b, 2a p 160	Plate Tectonics Map p 53

### Standard G: The Universe

Maine's Learning Results	Maine's Curriculum Framework	Science for All Americans	Project 2061 Benchmarks for Science Literacy	National Science Education Standards	Project 2061 Atlas of Science Literacy
G1: Describe how scientists gather data about the universe	G(9-12)#1 p II-72	The Universe 41-42	4A Essay p 61 4A(9-12) Essay p65 <b>4A(9-12)#3,4</b>	9-12/E2b p 192	Stars Map p 47 Galaxies and the Universe Map p 49
G2: Research current explanations for phenomena such as black holes and quasars	G(9-12)#2 p II-72	The Universe pp 40-42 Relating Matter and Energy and Time and Space p 151	10C Essay p 244 10C(9-12)#4 4A(9-12)#1,2 4F(9-12)#5	9-12/D4a,b,c p 190	Stars Map p 47 Galaxies and the Universe Map p 49 Gravity Map p 43
G3: Explain how astronomers measure interstellar distances	G(5-8)#3 p II-72	The Universe p 40 Relating Matter and Energy and Time and Space p 151 Scale p 179	4F(9-12)#3 4A(9-12) Essay p65 11D(9-12)#1 4A 6-8 Essay p63 11D Essay p 276	9-12/D Essay p 188	Galaxies and the Universe Map p 49

### Standard H: Energy

Maine's Learning Results	Maine's Curriculum Framework	Science for All Americans	Project 2061 Benchmarks for Science Literacy	National Science Education Standards	Project 2061 Atlas of Science Literacy
H1: Analyze the evidence that leads scientists to conclude that light behaves somewhat like a wave and somewhat like a particle	H (9-12)#2 p II-73	Motion pp 53-55	4F(9-12) Essay p91 4F(9-12)#3,5,6	9-12/B6 a,b,c p 180	Waves Map p 65
H2: Examine and describe how light is reflected and refracted by mirrors and lenses	H(9-12)#1,3 p II-73	Motion pp 54-55	4F(9-12) Essay p91 4F(9-12)#6 4F Research pp338-39	5-8/B3c p 155	Waves Map p 65
H3: Explain or demonstrate how sound waves travel	H(9-12)#4 p II-73	Motion pp 53-54	4F(6-8)#4 4F(9-12)#6	9-12/B6a p 180	Waves Map p 65
H4: Analyze the relationship between the kinetic and potential energy of a falling object	H(9-12)#5 p II-73	Energy Transformations pp 49-50	4E Essay p 81 4G(9-12)#1	9-12/B Essay p 178 <b>9-12/B5b</b> p 180	Gravity Map p 43

### Standard H: Energy (Continued)

H5: Use mathematics to describe work and power in a system	H(9-12)#6 p II-73	Not in SFAA	4E Essay p 82	No Related NSES	No Maps
H6: Describe the relationship between matter and energy and how matter releases energy through the processes of nuclear fission and fusion	H(9-12)#7 p II-73	Energy Transformations p 52 Relating Matter & Energy p151	4A(9-12)#2 <b>4E(9-12)#6</b> <b>10C(9-12)#3</b> <b>4G(9-12)#6</b> 4E Research p 338	<b>9-12/B1c,d</b> p 178 9-12/D4c p 190 9-12/B6b p 180	The Sun and Stars Strand p 47
H7: Use mathematics to describe and predict electrical and magnetic activity (e.g.: current, resistance, voltage)	H(9-12)#8 p II-73	Forces of Nature p 56 Symbolic Relationships pp 133-34	4G Essay p93 4G(9-12) Essay p 96 4G(9-12)#5 9B(9-12) Essay p220	9-12/B4c,e p 180	No Maps
H8: Compare and contrast how conductors, semiconductors, and superconductors work and describe their present and potential uses	H(9-12)#9 p II-73	Forces of Nature p 56	<b>4G(9-12)#4</b>	<b>9-12/B6d</b> p 181	No Maps
H9: Demonstrate an understanding that energy can be found in chemical bonds and can be used when it is released from those bonds	H(9-12)#11 p II-73 Snapshot p II-73	Energy Transformations pp 51-52 Flow of Matter and Energy p 66	4E(9-12)#4 <b>5E(9-12)#3</b> 4E(6-8)#4 4E Research p338	<b>9-12/B3b</b> p 179 9-12/C1b,e p 184	Flow of Energy in Ecosystems Map p 79

### Standard I: Motion

Maine's Learning Results	Maine's Curriculum Framework	Science for All Americans	Project 2061 Benchmarks for Science Literacy	National Science Education Standards	Project 2061 Atlas of Science Literacy
I1: Use mathematics to describe the law of conservation of momentum	I(9-12)#1 p II-74	Symbolic Relationships pp 132-133	9-12 Essay p 91 4F(9-12)#1,4 9-12 Essay p 220 Research p 339	9-12/B4a p 179	Forces and Motion Strand p 63
I2: Explain some current theories of gravitational force	I(9-12)#2 p II-74	Forces of Nature p 55 Uniting the Heavens and Earth pp 149-150	4G Essay p93 4G(9-12) Essay p 96 <b>4G(9-12)#1</b> 10B(9-12) Essay p243 10C(9-12) Essay p 245 <b>10B(9-12)#1,2,3,4,5</b> <b>10C(9-12)#4</b> 4F Research p 340	<b>9-12/B4b</b> p 180 9-12/D4b p 190	Gravity Map p 43

### Standard I: Motion (continued)

I3: Use Newton's Laws to qualitatively and quantitatively describe the motion of objects	I(9-12)#3 p II-74	Forces of Nature p 53 Uniting the Heavens and Earth pp 149-150	4F Essay p 87 4F(9-12) Essay p91 <b>4F(9-12)#1,4</b> 10B(9-12)Essayp 243 10B(9-12)#1,2,3 4F(6-8) Essay p 90 4F(6-8)#3 4F Research pp 339-40	<b>9-12/B4a,b,c</b> p 179	Gravity Map p 43 Forces and Motion Strand p 43
I4: Describe how forces affect fluids	I(9-12)#4 p II-74	Not in SFAA	No Related Benchmarks Research p 339	No Related NSES	No Maps
I5: Describe the relationship between temperature, heat, and molecular motion	I(9-12)#5 p II-74	Structure of Matter pp 47-48	4D(9-12)#9 4E(9-12)#2 4D(6-8)#3 4E(6-8)#3 4E Research p 337	9-12/B Essay p 178 <b>9-12/B5c</b> p 180	States of Matter Map p 59 Reaction Rates Strand p 61
I6: Describe how forces within and between atoms affect their behavior and the properties of matter	I(9-12)#7 p II-74	Forces of Nature pp 55-56	4G(9-12) Essay p 96 <b>4G(9-12)#2,3,6</b>	<b>9-12/B2 a,d,e</b> p 179 <b>9-12/B4 c,d</b> p 180	Chemical Reactions Map p 61

### Standard J: Inquiry and Problem Solving

Maine's Learning Results	Maine's Curriculum Framework	Science for All Americans	Project 2061 Benchmarks for Science Literacy	National Science Education Standards	Project 2061 Atlas of Science Literacy Strand Maps
J1: Make accurate observations using appropriate tools and units of measure.	Essay p II-19	Scientific Inquiry pp 3-4 Manipulation & Observation pp 191-2	1B Essay p 9 12C(9-12)#1	9-12/A Essay pp 173-174 <b>9-12/A1c</b> p 175	Observation and Evidence Strand p 17 Scientific Investigations Map p 19
J2: Verify, evaluate, and use results in a purposeful way. This includes analyzing and interpreting data, making predictions based on observed patterns, testing solutions against the original problem conditions, and formulating additional questions.	Essay pp II-19-21 A(All levels)#3 p II-39 Snapshot p II-38,II-67, II-68	Scientific Inquiry pp 3-6 Summarizing Data pp137-139	1B Essay p 9 1B(9-12) Essay p 13 1B(9-12)#1,2,3 1B Research p 332 9D(9-12) Essay p 230	9-12/A Essay pp 173-174 <b>9-12/A1a,b,c,d</b> p 175 9-12/A2a,b,c,d,e,f p 176	Observation and Evidence Strand p 17 Sci. Investigations Map p 19 Scientific Theories Map p 21 Expectations and Explanations Strand p 23 Correlation Map p 125

### Standard J: Inquiry and Problem Solving (continued)

J3: Demonstrate the ability to use scientific inquiry and technological method with short term and long term investigations, recognizing that there is more than one way to solve a problem. Demonstrate knowledge of when to try different strategies.	Essay pp II-39-40 A(All levels)#2 p II-39	Technology and Science pp 26-27	1B Essay p 9 3A Essay p 43 3A(9-12) Essay pp 47 and 51 3A(9-12)#1,3 3A Research p 334 12E(9-12)#6	9-12/A Essay pp 173-174 <b>9-12/A1a,b,c,d,e,f</b> p 175 9-12/E Essay pp 190-192 <b>9-12/E1a,b,c,d,e</b> p 192	Scientific Investigations Map p 19 Design Constraints Map p 33
J4: Design and construct a device to perform a specific function, then redesign for improvement.	N/A	Design and Systems pp 28-32	3B Essay p 48 9-12 Essay p 47 9-12 Essay p 51 <b>3B(9-12)#1, 5, 6</b>	9-12/E Essay pp 190-192 <b>9-12/E1a,b,c,d,e</b> p 192	Design Constraints Map p 33 Designed Systems Map p 35

### Standard K: Scientific Reasoning

Maine's Learning Results	Maine's Curriculum Framework	Science for All Americans	Benchmarks for Science Literacy	National Science Education Standards	Project 2061 Atlas of Science Literacy
K1: Judge the accuracy of alternative explanations by identifying the evidence necessary to support them.	Essay p II-33 B(9-12)#1 p II-35	Science Demands Evidence p 4 Critical Response Skills pp 193-194	<b>12E(9-12)#4, 6</b> 12E Research p 361	9-12/A Essay p 174 <b>9-12/A1e</b> p 175 9-12/G2a,b,c p 201	Evidence and Reasoning in Inquiry Map p 17 Alternative Explanations Strand p 21
K2: Explain why agreement among people does not make an argument valid.	Essay p II-33 C(9-12)#1 p II-36	Science Tries to Identify and Avoid Bias pp 6-7 Critical Response Skills pp 193-194	12E Essay p 298 12E(6-8)#1 12E(9-12)#4,5,6	9-12/A Essay pp 173-174 9-12/A1e p 175 9-12/G 2b p 201	Lines of Reasoning Strand p 17 Alternative Explanations Strand p 21
K3: Develop generalizations based on observations.	B(All levels)p II-35	Science Explains and Predicts p 6 Reasoning pp 142-143	9E(6-8)#3 9E(9-12)#3,4	9-12/A1d p 175	Expectations and Explanations Strand p 23
K4: Determine when there is a need to revise studies in order to improve their validity through better sampling, controls, or data analysis techniques.	Essay p II-33 B(9-12)#5 p II-35	Scientific Inquiry pp 3-7 Critical Response Skills pp 193-194 Sampling p 139	1A(6-8)#1 1B(9-12)#3,5 Essay p 281-283 Essay p 230 9E(9-12)#4 12E(9-12)#1,4 Research p 361	9-12/A Essay p 174 <b>9-12/A1d,e</b> p 175	Evidence and Reasoning in Inquiry Map p 17 Control and Conditions Strand p 19, 123, 125 Avoiding Bias in Science Map p 23 Sampling Strand p 127

### Standard K: Scientific Reasoning (Continued)

K5: Produce inductive and deductive arguments to support conjecture.	Essay p II-33 B(9-12)#6 p II-35	Nature of Science pp 4-6 Reasoning pp140-143	2B(9-12)#3 12E Essay p 298 12D(9-12)#5 Ch 12 Essay p 281-283 9E Essay p231 9E(9-12) Essay p 234 <b>9E(9-12)#1,2,3,4,5</b>	<b>9-12/A1d,e</b> p 175 9-12/A2 e,f p 176	Evidence and Reasoning in Inquiry Map p 17 Expectations and Explanations Strand p 23
K6: Analyze situations where more than one logical conclusion can be drawn.	Essay p II-33 B(9-12)#7 p II-35	Scientists Try to Identify and Avoid Bias pp 6-7	2B(9-12)#3 12E(6-8)#4 <b>12E(9-12)#6</b>	<b>9-12/A1e</b> p 175	Alternative Explanations Strand p 21

### Standard L: Communication

Maine's Learning Results	Maine's Curriculum Framework	Science for All Americans	Benchmarks for Science Literacy	National Science Education Standards	Project 2061 Atlas of Science Literacy
L1: Analyze research or other literature for accuracy in the design and findings of experiments.	Essay p II-25-26 A(9-12)#1 pII-27 E(9-12)#5 pII-31 Snapshot p II-28	Critical Response Skills pp 193-194	Ch 12 Essay p 281-283 12E Essay p 298 12D Essay p 295	9-12/A2f p 176 9-12/A Essay p 174	Safeguards Strand p 23
L2: Use journals and self-assessment to describe and analyze scientific and technological experiences and to reflect on problem-solving processes.	Essay p II-25-26 B(9-12)#1,2 p II-28	Not in SFAA	No related Benchmarks	No related NSES	No Maps
L3: Make and use appropriate symbols, pictures, diagrams, scale drawings, and models to represent and simplify real-life situations and to solve problems.	Essay p II-25-26 C(9-12)#1,2,4 p II-29	Communication pp 192-193 Physical Models pp 168-172 Symbolic Relationships pp 132-134	2B(9-12)Essay p 33 <b>2B(9-12)#1</b> <b>3B(9-12)#6</b> 12D Essay p 295 <b>12D(9-12)#1</b> 11B Essay p 267 11B(9-12)Essayp 270 <b>11B(9-12)#1,2,3</b> 11B(6-8)#1,2,3 11B Research p 357 <b>9B(9-12)#2,4</b> <b>8E(9-12)#1</b>	<b>9-12/A1c,d,f</b> p 176 9-12/A2d p 176 Unifying Concepts and Principles K-12 p 117 (Models)	Graphic Representation Map p 115 Symbolic Representation Map p 117 Mathematical Models Strand p 29 Failure Strand p 35 Calculating and Modeling Strand p 111

### Standard L: Communication (continued)

L4: Employ graphs, tables, and maps in making arguments and drawing conclusions.	Essay p II-25-26 C(9-12)#3 p II-29	Symbolic Relationships p 132 Communication pp 192-193	<u>12C(9-12)#2</u> 12D Essay p 295 12D(6-8)#1,2,5 <u>12D(9-12)#7</u> 12E(9-12)#2 9B Research p 351 9B Essay p 220 9B(9-12)#4	9-12/A Essay pp 173-174 <u>9-12/A1c,f</u> p 176	Graphic Representation Map p 115 Symbolic Representation Map p 117 Computers Map p 111
L5: Critique models, stating how they do and do not effectively represent the real phenomenon.	Essay p II-25-26 C(9-12)#6 p II-29	Models pp 168-172 Information Processing p 121	<u>11B(9-12)#3</u> 11B Research p 357 <u>9B(9-12)#3</u>	Unifying Concepts and Principles K-12 p 117 (Models) 9-12/A1d,e p 175	Computers Map p 111 Mathematical Models Map p 29 Scientific Theories Map p 21
L6: Evaluate the communication capabilities of new kinds of media.	Essay p II-25-26 D(9-12)#4 p II-30	Information Processing pp 120-122	12C(6-8)#2,4 8D(9-12)#1,2 <u>8D(6-8)#4</u>	No related NSES	Communication Technology Map p 109
L7: Use computers to organize data, generate models, and do research for problem solving.	Essay p II-25-26 C(9-12)#5 II-29 D(9-12)#2,3 p II-30 Snapshot p II-24	Information Processing pp 120-122 Manipulation and Observation pp 192-193	8E Essay p 200 8E(9-12) Essay p 203 <u>8E(9-12)#1</u> <u>12C(9-12)#2</u>	9-12/A Essay pp 173-174 <u>9-12/A1c,d,e</u> p 175 9-12/A2c p 176	Calculating and Modeling Strand p 111
L8: Engage in a debate, on a scientific issue, where both points of view are based on the same set of information.	Essay p II-25-26 E(9-12)#1,2 p II-31	Communication pp 192-193	12D(9-12)#6,7	9-12/A1e,f pp 175-176	No Maps

### Standard M: Implications of Science and Technology

Maine's Learning Results	Maine's Curriculum Framework	Science for All Americans	Benchmarks for Science Literacy	National Science Education Standards	Project 2061 Atlas of Science Literacy
M1: Examine the impact of political decisions on science and technology.	N/A	Political and Economic Systems pp 97-100 Decisions about the Use of Technology Are Complex pp35-37	1C(9-12) Essay pp 18-19 1C(9-12)#8 <u>3C(9-12)#1</u>	9-12/F Essay p 197 9-12/F6 b,c p 199	Society Influences Technology Strand p 37

### Standard M: Implications of Science and Technology (Continued)

M2: Demonstrate the importance of resource management, controlling environmental impacts, and maintaining natural ecosystems.	A(9-12)#6 pII-42 B(9-12)#2 pII-43 C(9-12)#1,2,3 p II-44 B(9-12)#5 pII-48 Snapshot p II-42	The Earth p 44 Flow of Matter and Energy 67 Materials p 112	3C(9-12)#4	9-12/F Essay pp 193, 197 9-12/F2c p 198 <b>9-12/F3a,b,c</b> p 198 <b>9-12/F4a,b,c</b> p 198	No Maps
M3: Evaluate the ethical use or introduction of new scientific and technological developments.	D(9-12)#3 p II-50 B(9-12)#1,2,3,4,5 p II-48 Snapshot p II-47	Ethical Principles and Conduct pp 10-11 Health Technology pp 125-126	<b>1C(9-12)#5,7</b> 3C Essay p 53 <b>3C(9-12)#1,3,5</b>	9-12/F Essay p 197 <b>9-12/F6b,d</b> p 199	Risk and Side Effects Strand p 39 Society Influences Technology Strand p 37
M4: Analyze the impacts of various scientific and technological developments.	A(9-12)#2,5 pII-42 B(9-12)#1 pII-43 C(9-12)#1,2,3 p II-44 B(9-12) #1,2,3,4,5 pII-48 C(9-12) #1,2,3,,4,5,6 p II-49	Technology's Side Effects pp 30-34 The Designed World 107-126 Historical Perspectives pp 145-163	1C(9-12) Essay p 18-19 1C(9-12)#1,2,3, 3A(9-12) Essay p 47 3A(9-12)#1,3 3B(9-12)#2 3C Essay p 53	9-12/F Essay pp 193, 197 9-12/F4a,b,c p 198 <b>9-12/F6d</b> p 199	Technology Affects Society Strand p 37 Decisions about Using Technology Map p 39
M5: Examine the historical relationships between prevailing cultural beliefs and breakthroughs in science and technology.	A(9-12)#1,2 pII-47	Historical Perspectives pp 145-163	1C(9-12) Essay p 18-19 <b>1C(9-12)#1,2,3</b> Ch 10 Essay pp 237-238	9-12/G Essay p 200 <b>9-12/G3a,b,c,d</b> pp 201, 204	Map Commentary pp 128-129
M6: Research issues that illustrate the effects of technological imbalances and suggest some solutions.	E(9-12)#1 pII-51	Technological and Social Systems Interact Strongly p 34	<b>3C(9-12)#1</b> <b>7G(9-12)#1</b>	No related NSES	Society Influences Technology Strand p 37

**Benchmarks for Science Literacy- Chapter 10 - Selected Episodes, Individuals, and Advances in the History of Science for High School:**

- Ptolemy, Copernicus, Kepler, and Galileo
- Isaac Newton - unified view of earth and the universe
- Einstein - relating matter and energy and time and space
- Early views of the age of the earth and Charles Lyell's work
- Alfred Wegener and continental drift leading up to the theory of plate tectonics
- Lavoisier- quantitative methods and conservation of matter
- John Dalton and the modernization of atomic theory
- Significance of discovery of nuclear fission and its impact on world affairs
- Charles Darwin
- Industrial Revolution in contemporary and modern contexts leading to the technological revolution

**National Science Education Standards - Standard G- Selected Episodes and Advances in the History of Science for High School:**

- Copernican Revolution
- Newtonian Mechanics
- Relativity
- Geologic Time Scale
- Plate Tectonics
- Atomic Theory
- Nuclear Physics
- Biological Evolution
- Germ Theory
- Industrial Revolution
- Molecular Biology
- Information and Communication
- Quantum Theory
- Galactic Universe
- Medical and Health Technology

Read vignette on pp 202-203

\* For an explanation of the codes used in this document, please refer to the coding guide.