



South-Western
Educational Publishing

Correlation of

CORD Applications in Biology/Chemistry, 2/E,
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Research & Development

to

Ohio's Model Competency-Based Program:
Science, Grades 9-12

CORRELATION TO OHIO'S MODEL COMPETENCY-BASED PROGRAM: SCIENCE, GRADES 9-12

SUBMISSION TITLE: *CORD APPLICATIONS IN BIOLOGY/CHEMISTRY, 2/E*, © 1999, CENTER FOR OCCUPATIONAL RESEARCH & DEVELOPMENT

PUBLISHER: SOUTH-WESTERN EDUCATIONAL PUBLISHING

STRANDS	PAGE REFERENCES
GRADE LEVEL NINE	
Scientific Inquiry	
The learner will:	
<ul style="list-style-type: none"> Check the appropriateness and accuracy of measures and computations using various strategies (e.g., estimations, unit analysis, determination of significant figures). 	CML 24-26, 28-35, 50, 72-80, 84-88, 90-95, 117-121, 145- 151 COL 32-33, 84, 90, 119, 179-180 ALP 43-45, 49-51, 55-57, 131-132 MCR 103-104, 146-147 DAW 32-33, 41-42, 85-86, 90-91, 171-172 PLN 53-55, 62-63, 105-107, 113-114, 154-155 NUT 84-85, 113-116 WAT 71, 114, 120, 123-124 AIR35-36, 42-43, 112-114 WWM 42-43, 48-49, 86-87, 122-123 NAT 25-26, 56, 83, 106-108, 112 SMT 42-43, 49, 146-147
<ul style="list-style-type: none"> Use ratios, proportions, and probabilities in appropriate problem situations. 	CML 24-26, 28-35, 50, 72-80, 84-88, 90-95, 117-121, 145-151 COL 34, 79, 91, 119, 179-180 ALP 43-45, 49-51, 55-57, 131-132 MCR 103-104, 146-147 DAW 41-42, 171-172 PLN 105-106, 114, 153-155 NUT 84-85, 157-158 WAT 71-72, 123-124

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STRANDS	PAGE REFERENCES
	AIR113 NAT 54-55, 106 SMT 42, 87, 147, 153
<ul style="list-style-type: none"> Translate information from and represent information in various forms with equal ease (e.g., tables, charts, graphs, diagrams, geometric figures). 	CML 8, 32, 43, 44, 50, 59, 72-80, 84-88, 90-95, 117-121, 145-151 COL 34, 79, 91, 119, 149, 179-180 ALP 43-45, 49-51, 55-57, 131-132 MCR 103-104, 146-147 DAW 32-34, 41-42, 85-86, 90-91, 171-172 PLN 53-55, 62-63, 105-107, 113-114, 154-155 NUT 78-79, 84-85, 113-116 WAT 71-72, 114-115, 120, 123-124 AIR35-36, 42-43, 112-114 WWM 35-36, 42-43, 112-114 NAT 25-26, 56, 82-83, 106-108, 112 SMT 42-43, 49, 146-147
<ul style="list-style-type: none"> Use existing algebraic formulas and create new ones in appropriate problem-solving situations. 	CML 26, 32, 44, 50, 72-80, 84-88, 90-95, 117-121, 145-151 COL 34, 79, 91, 119, 179-180 ALP 48 MCR 103 DAW 41, 170-172 PLN 105-106, 114, 153-155, 191, 228 NUT 84-85, 157-158 WAT 71-72, 123-124 AIR113
<ul style="list-style-type: none"> Estimate and justify probabilities of outcomes of familiar situations based on experimentation and other strategies. 	CML 26, 33, 46, 47, 50, 72-80, 84-88, 90-95, 117-121, 145-151 COL 34, 40, 84, 91, 149, 179-180

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STRANDS	PAGE REFERENCES
	ALP 43-45, 49-51, 55-57, 131-132 MCR 47-48, 64, 140, 143 DAW 32-34, 41-42, 85-86, 90-91 PLN 53-55, 62-63, 105-107, 113-114, 154-155
<ul style="list-style-type: none"> Estimate and justify probabilities of outcomes of familiar situations based on experimentation and other strategies. <i>continued</i> 	NUT 30, 35, 78, 113-116 WAT 71-72, 114-115, 123-124 AIR 35-36 WWM 43, 49, 87, 103, 180, 184 NAT 25-26, 56, 83, 106-108, 112-113 SMT 42-43, 49, 146-147
<ul style="list-style-type: none"> Invent apparatus and mechanical tools needed to perform unique tasks in various situations. 	CML 31, 50, 72-80, 84-88, 90-95, 117-121, 145-151 COL 32, 39, 82, 91, 149, 179-180 ALP 43-45, 49-51, 55-57, 130, 162, 198, 248 MCR 45, 51, 57, 135-136, 143-144 DAW 82-86, 171-172 PLN 49, 51, 52, 59 NUT 156, 162 WAT 70, 107, 114, 119 AIR33, 39, 41, 73, 111, 118 WWM 42, 47, 85, 128 NAT 53, 81, 104 SMT 41, 48, 84, 85, 196
<ul style="list-style-type: none"> Identify, compare, and contrast different modes of inquiry, habits of mind, and attitudes and dispositions. 	CML 33, 80, 88, 93-94, 120, 150, 151 COL 34-35, 40, 84, 91, 119, 149, 180 ALP 43-45, 49-51, 55-57, 131-132 MCR 47-48, 64, 103-104, 146-147 DAW 32-344, 41-42, 85-86, 90-91, 171-172

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STRANDS	PAGE REFERENCES
	PLN 53-55, 62-63, 105-107, 113-114 NUT 30, 35, 113-116 WAT 71-72, 120 AIR 74-75, 112-114
<ul style="list-style-type: none"> Identify, compare, and contrast different modes of inquiry, habits of mind, and attitudes and dispositions. <i>continued</i> 	WWM 43, 49, 87, 103, 180, 184 NAT 25-26, 54-56, 106-108, 112-113 SMT 42-43, 49, 91, 146-147
<ul style="list-style-type: none"> Design investigations that are safe and ethical (i.e., obtain consent and inform others of potential outcomes, risks and benefits, and show evidence of concern for human health and safety, concern for non-human species). 	CML 24-27, 50, 72-80, 84-88, 90-95, 117-121, 145-151 COL 29-34, 35-40, 77-84, 85-92, 115-119, 142-149 ALP 40-45, 46-51, 52-57, 94-98, 127-132 MCR 42-48, 49-64, 99-104, 132-140, 141-148, 176-179 DAW 28-33, 34-42, 79-86, 87-91, 166-172 PLN 46-55, 56-63, 100-107, 108-114, 150-155, 225-230 NUT 25-30, 31-35, 74-79, 80-86, 110-116 WAT 66-72, 105-108, 109-115, 116-120, 121-124 AIR 29-36, 37-44, 76-81, 109-114 WWM 38-43, 44-49, 81-87, 118-123 NAT 22-26, 49-56, 79-83, 102-108, 109-114, 150-156 SMT 38-43, 44-49, 81-87, 88-92, 141-147, 148-153
<ul style="list-style-type: none"> Make and read scale drawings, maps, models, and other representations to aid planning and understanding. 	CML 32, 80, 88, 94, 120, 150-151 COL 34, 79, 91, 119, 149, 179 ALP 43, 511, 55-56, 98, 131 MCR 64, 103, 146-147 DAW 32-34, 41-42, 85-86, 90-91, 171-172, 178-181 PLN 105-107, 113-114 NUT 78, 113-116 WAT 71-72, 114-115, 120, 123-124

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	AIR 35-36, 42-43, 112-114 NAT 25-26, 54-56, 83, 106-108, 112-113 SMT 42-43, 49, 146-147
<ul style="list-style-type: none"> Seek elaboration and justification of data and ideas, and reflect on alternative interpretations of the information. 	CML 27, 32, 80, 88, 94, 120, 150-151 COL 34, 40, 84, 119, 149, 180 ALP 45, 51, 55-56, 97-98, 132, 199 MCR 47-48, 64, 103-104, 140, 146-147 DAW 32-34, 41-42, 85-86, 90-91, 171-172 PLN 53-55, 62-63, 105-107, 113-114, 154-155 NUT 30, 35, 113-116, 157-158 WAT 71-72, 114-115, 120, 123-124 AIR 35-36, 42-43, 112-114 WWM 42-43, 48-49, 86-87, 122-123 NAT 25-26, 54-56, 83, 106-108, 112-113 SMT 42-43, 49, 146-147
<ul style="list-style-type: none"> Utilize appropriate units for counts and measures. 	CML 26, 32, 79, 87-88, 94, 118-119, 150-151 COL 34, 84, 119, 149, 180 ALP 45, 51, 55-56, 97-98, 131 MCR 103 DAW 32-34, 41-42, 85-86, 90-91, 171-172 PLN 105-107, 113-114, 154-155 NUT 78, 113-116, 157-158 WAT 71-72, 114-115, 120, 123 AIR 35-36, 42-43, 112-114 NAT 54, 83, 106, 112 SMT 42, 49, 146

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STRANDS	PAGE REFERENCES
Scientific Knowledge	
The learner will:	
<ul style="list-style-type: none"> Investigate various types of dynamic equilibrium (e.g., biological, geological, mechanical, chemical). 	CML 19, 56, 99, 112, 132, 165-166 COL 6, 28-34 ALP 79-81 MCR 8 DAW 142 NUT 5-6, 178-179 AIR46-50 NAT 61-66, 87-88, 170 WWM 141-143
<ul style="list-style-type: none"> Investigate the relationship between the rates of energy exchange and the relative energy level of components within systems (e.g., trophic levels of ecosystems, osmosis, rate of heating and cooling, storms). 	CML 7, 177, 184 COL 6 ALP 67-77, 79-81 MCR 68-71 DAW 144-145, 166-172 PLN 17-18 NUT 7-12, 66-68 WAT 178-179 AIR61-65, 96-98 NAT 6-7, 38, 49-56 WWM 57, 166-167 SMT 35

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<ul style="list-style-type: none"> Investigate patterns in the natural world (e.g., heredity, crystalline structures, population and resource distributions, diffraction, dispersion, polarization). 	<p>CML 16, 56, 112, 132, 139 COL 152, 204-208 MCR 75, 81, 84, 87 DAW 100-102, 107-108 NUT 20, 132 WAT 42-47, 77-78 AIR22-25 NAT 61-66 WWM 16-17, 22-23 SMT 18-20, 117</p>
<ul style="list-style-type: none"> Investigate models and theories that help to explain the interactions of components in systems (e.g., conservation of mass, energy, and momentum; foodwebs; natural selection; entropy; plate tectonics; chaos; relativity; social-psychology). 	<p>CML 4, 7, 13, 14, 37, 56, 68, 89, 112, 139, 165 COL 56-57, 174-181 ALP 14-16, 19-20, 114-121 MCR 85-87, 94 DAW 6-7 NUT 104-105, 178-181 AIR 46-50 NAT 9-10, 87-88, 166, 170, 176-179 WWM 16-18, 29-30, 54-57, 139, 141 SMT 18-20, 95-98, 115</p>

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<ul style="list-style-type: none"> Investigate degrees of kinship among organisms and groups of organisms. 	CML 7, 56, 177 COL 204-208 MCR 61-63, 94 DAW 62-66, 87-91 PLN 68-69, 122 NUT 127-128 WAT 55-60 AIR140-143 NAT 102-108, 131, 160-165 WWM 28-30
<ul style="list-style-type: none"> Investigate the limits of the definition of life, and investigate organisms and physical systems that exist at or near these limits (e.g., viruses, quarks, black holes). 	CML 99, 104-109 COL 158, 160, 204-208 MCR 21 DAW 45-48, 70-71 AIR 131-137 NAT 9-10, 173-174 WWM 190-191
<ul style="list-style-type: none"> Investigate estimates and measurements of a wide range of distances and rates of change. 	CML 44, 45, 48, 50, 53, 165 ALP 25-26, 97-98, 131 MCR 103 DAW 171, 176, 178 PLN 71, 106, 153-154 NUT 77-78, 84, 121, 157, 165

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	WAT 16, 71, 92, 95-96, 122-124 AIR42, 80, 85-86, 112-113, 126 NAT 106, 112 WWM 86, 122, 129, 220
<ul style="list-style-type: none"> Investigate estimates and measurements of a wide range of distances and rates of change. <i>continued</i> 	SMT 146-167, 152-153
<ul style="list-style-type: none"> Investigate the historical development of theories of change over time (e.g., natural selection, continental drift, the big bang, geologic change). 	CML 37, 112 COL 174-181, 204-208 MCR 103, 182-187, 188-190, 191-193, 202-203 DAW 149 AIR 22-25, 85-86 NAT 124-125
<ul style="list-style-type: none"> Investigate physical and chemical changes in living and non-living systems (e.g., photosynthesis, weathering processes, glaciation, thermal effects on materials, energy cells). 	CML 50, 175, 177, 183-185 COL 9 ALP 12, 67-77, 79-81 MCR 77-79, 150-152, 167-168 DAW 138 PLN 76-78 NUT 42-43 AIR 61-65, 96-98 NAT 6-7, 31-35 WWM 26-27, 63-64 SMT 12-13, 32-35, 54-55
<ul style="list-style-type: none"> Investigate simulations of nuclear change (e.g., radioactivity, half life, carbon dating). 	WWM 101-103

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<ul style="list-style-type: none"> Investigate conservation principles associated with physical, chemical, and nuclear changes. 	CML 175-177, 183-184 COL 9 ALP 67-77, 79-81, 197-200 MCR 77-79, 150-153, 167-168 NUT 42-43 AIR 61-65, 96-98 NAT 6-7, 49-56 WWM 26-27 SMT 12-13, 32-35, 54-55
<p>Conditions for Learning Science</p>	
<p>The learner will be:</p>	
<ul style="list-style-type: none"> Participating actively in dialogue about and resolution of community issues. 	CML 13, 16, 19, 61, 106, 109, 135 COL 55, 61, 66, 156-157 ALP 153, 223 MCR 13, 89, 92, 107 DAW 15, 47, 115, 138 PLN 79, 137, 139, 162 NUT 15, 17, 19, 56, 66, 137 WAT 5, 10, 11, 59, 83, 133 AIR24, 50, 53, 59, 87, 99, 102, 136 NAT 10, 17, 29, 38, 72, 74, 139 WWM 12, 22, 61, 71, 97

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	SMT 107, 110, 133, 134, 184
<ul style="list-style-type: none"> Accessing information from various countries in the original language or translated form to ascertain the perspectives of many cultures. 	
<ul style="list-style-type: none"> Analyzing the scientific ideas presented in science fiction stories and films. 	
<ul style="list-style-type: none"> Performing and repeating investigations to verify data, determine regularity and reduce the impact of experimental error. 	CML 24, 50, 72, 84, 90, 95, 117, 195 COL 29, 35, 77, 85, 115, 142 ALP 40, 46, 52, 94, 127 MCR 42, 49, 99, 132, 141, 176 DAW 28, 34, 79, 87, 166 PLN 46, 56, 100, 108, 150, 225 NUT 25, 31, 74, 80, 110 WAT 66, 105, 109, 116, 121 AIR29, 37, 76, 109 NAT 22, 49, 79, 102, 109, 150 SMT 38, 44, 81, 88, 141, 148 WWM 38, 44, 81, 118
<ul style="list-style-type: none"> Presenting the results of investigations in a variety of forums. 	CML 33, 80, 88, 93, 120, 1150, 151 COL 34, 40, 84, 91, 119, 149 ALP 43, 49, 55, 131 MCR 47, 64, 103, 146 DAW 32, 41, 85, 90, 171 PLN 53, 62, 105, 113 NUT 30, 35, 113 WAT 71-72, 120 AIR74-75, 112-114 NAT 25, 54, 106, 108, 112 SMT 42, 49, 91, 146

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	WWM 43, 49, 87, 103, 180, 184
<ul style="list-style-type: none"> Contributing to the decisions regarding topics for investigation. 	CML 27, 32, 43, 44, 50, 84, 90, 117, 145 COL 34, 40, 84, 119, 149, 180 ALP 45, 51, 55-56, 97-98 MCR 47-48, 64, 103, 140, 196 DAW 32-34, 41-42, 85-86, 90-91, 171 PLN 53, 62, 105, 113, 154 NUT 30, 35, 113-116, 157 WAT 71-72, 114-115, 120, 123 AIR 35-36, 42-43, 112-114 NAT 25-26, 54-56, 83, 106, 112-113 SMT 42-43, 49, 146-147 WWM 42-43, 48-49, 86-87, 122-123
<ul style="list-style-type: none"> Using various creative means to communicate interpretations of scientific ideas, concepts, phenomena and events. 	CML 8, 32, 43, 44, 50, 84, 90, 117, 145 COL 34, 79, 81, 119, 149, 179 ALP 43-45, 49-51, 55-57, 131-132 MCR 103-104, 146-147 DAW 32-34, 41-42, 85, 91, 171 PLN 53, 62, 105, 113, 155 NUT 78-79, 84-85, 113 WAT 71, 114, 120, 123 AIR35, 42, 112 NAT 25, 56, 82-83, 106, 112 SMT 42, 49, 147

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	WWM 42, 48, 86, 102
<ul style="list-style-type: none"> Considering the scientific thinking and language of others. 	CML 20-22, 70-71, 114-115, 142-143, 194-195 COL 26-27, 73-75, 110-111 ALP 38-39, 91-92, 125-127, 156-157 MCR 38-40, 96-98 DAW 25-27, 74-75, 121-125 PLN 44-45, 97-98, 141-142 NUT 23-24, 70-71, 108-109, 151-152 WAT 30-311, 62-63, 102-103 AIR26-27, 67-68, 106-107, 146-147 NAT 18-20, 46-47, 100-101, 141-142, 170 SMT 9, 16, 36-37, 64, 79-80, 139-140 WWM 35-36, 79-80, 116-117
<ul style="list-style-type: none"> Individually and collaboratively producing clearly written representations of investigative results. 	CML 27, 32, 80, 88, 121, 151 COL 34, 40, 84, 149 ALP 45, 51, 97, 132, 199 MCR 47, 64, 103, 140 DAW 32, 41, 85, 91, 171 PLN 53, 62, 107, 114, 155 NUT 30, 35, 116, 158 WAT 72, 115, 120, 124 AIR 36, 43, 114 NAT 26, 56, 83, 108, 113 SMT 43, 49, 147

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	WWM 43, 49, 87, 123
<ul style="list-style-type: none"> Fulfilling responsibilities as part of a research group. 	CML 134, 183, 190 COL 15, 96, 102, 107, 128 ALP 7, 19, 216 MCR 119, 128 DAW 4, 6, 49, 63, 73, 95, 135 PLN 164 NUT 55, 100 WAT 13, 18, 57, 80, 85, 89 AIR 6, 13, 56, 127, 142 NAT 39, 97, 127, 129 SMT 7, 12, 58, 66, 73, 135 WWM 32, 67, 73, 93, 100
<ul style="list-style-type: none"> Selecting and utilizing resources by various criteria (e.g., efficiency, effectiveness, health, safety) that are appropriate to the investigations being conducted by groups. 	CML 23, 28, 72, 81, 89, 116, 144, 152, 196 COL 29, 35, 77, 85, 115, 141, 174, 182 ALP 40, 46, 52, 94, 128, 158, 195, 244 MCR 42, 49, 59, 99, 132, 141, 176, 215 DAW 28, 34, 79, 87, 126, 166, 173, 216 PLN 46, 56, 100, 108, 143, 160, 187, 225 NUT 25, 31, 74, 80, 110, 117, 154, 159 WAT 66, 105, 109, 116, 153, 159, 217 AIR 29, 37, 70, 76, 109, 115, 148 NAT 22, 49, 79, 102, 109, 143, 150, 188 SMT 38, 44, 81, 88, 1141, 148, 195, 201

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	WWM 38, 44, 81, 118, 124, 131, 174, 181, 222
<ul style="list-style-type: none"> Presenting persuasive argument based on the scientific aspects of controversial issues. 	CML 26, 33, 47, 50, 72, 84, 117, 145 COL 34, 40, 84, 91, 149 ALP 43, 49, 55, 131 MCR 47-48, 64, 140, 143 DAW 32-34, 41, 85, 90 PLN 53, 62, 105, 113, 154 NUT 30, 35, 78, 113 WAT 71-72, 114-115, 123 AIR 35-36 NAT 25-26, 56, 83, 106, 112 SMT 42-43, 49, 146 WWM 43, 49, 87, 103, 180, 184
<ul style="list-style-type: none"> Collecting, storing, retrieving and manipulating information with available technologies that may range from hand processes up through computer applications. 	CML 24, 27, 50, 72, 84, 90, 95, 145 COL 29, 35, 77, 85, 115 ALP 40, 46, 52, 94, 127 MCR 42, 49, 99, 132 DAW 28, 34, 87, 166 PLN 46, 100, 108, 150 NUT 25, 31, 74, 80, 110 WAT 66, 105, 116, 121 AIR 29, 37, 76, 109 NAT 22, 49, 79, 109, 150 SMT 38, 49, 88, 141

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	WWM 38, 44, 88
Applications for Science Learning	
The learner will be:	
<ul style="list-style-type: none"> Answering student-determined questions by designing databases and drawing inferences from the analyses of the information in these databases. 	CML 27, 32, 80, 88, 121 COL 34, 40, 84, 119, 149, 180 ALP 45, 51, 55, 56, 97, 98 MCR 47-48, 64, 104, 140, 146-147 DAW 32-34, 42, 86, 91, 172 PLN 55, 63, 107, 114, 155 NUT 30, 35, 116, 158 WAT 72, 115, 120, 124 AIR 36, 43, 114 NAT 26, 56, 83, 108, 113 SMT 42-43, 49, 146-147 WWM 43, 49, 87, 123
<ul style="list-style-type: none"> Making personal behavior decisions by interpreting information that has a scientific basis. 	CML 19, 69, 112, 141, 193 COL 24, 72, 109, 170, 209 ALP 36, 90, 124, 155, 191, 240 MCR 37, 95, 129, 172, 211 DAW 24, 7, 120, 161, 211 PLN 43, 96, 140, 18, 216 NUT 20, 69, 106, 149, 194 WAT 28, 61, 101, 149, 194 AIR 25, 66, 105, 144

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	NAT 17, 45, 75, 98, 140, 179 SMT 35, 79, 138, 192, 240 WWM 34, 78, 115, 171, 213
<ul style="list-style-type: none"> Proposing courses of action that will validate and demonstrate personal understanding of scientific principles. 	CML 27, 32, 80, 88 COL 34, 40, 84, 119, 149, 180 ALP 45, 51, 55, 56, 97, 98 MCR 48, 64, 104, 140, 147 DAW 34, 42, 86, 91, 172 PLN 55, 63, 107, 114, 155 NUT 30, 35, 1116, 158 WAT 72, 115, 120, 124 AIR 36, 43, 114 NAT 26, 56, 83, 108, 113 SMT 43, 49, 147 WWM 43, 49, 87, 123
<ul style="list-style-type: none"> Guiding other learners in their understanding of the interactions of technologies and society at various periods in time. 	CML 19, 69, 112, 141, 193 COL 24, 72, 109, 170, 209 ALP 36, 90, 124, 155, 191, 246 MCR 37, 95, 129, 172, 211 DAW 24, 73, 120, 161, 211 PLN 43, 96, 140, 183, 216 NUT 20, 69, 106, 149, 194 WAT 28, 61, 101, 149, 213 AIR 25, 66, 105, 144 NAT 17, 45, 75, 98, 140, 179 SMT 35, 78, 138, 192, 240

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STRANDS	PAGE REFERENCES
	WWM 34, 78, 115, 171, 213
<ul style="list-style-type: none"> Promoting and carrying out practices that contribute to a sustainable environment. 	CML 13, 16, 19, 61, 106, 109, 135 COL 55, 61, 66, 156-157 ALP 153, 223 MCR 13, 89, 92, 107 DAW 15, 47, 115, 138 PLN 79, 137, 139, 162 NUT 15, 17, 19, 56, 66, 137 WAT 5, 10, 11, 59, 83, 133 AIR 24, 50, 53, 59, 87, 89, 102, 136 NAT 10, 17, 29, 38, 72, 74, 139 SMT 107, 110, 133-134, 184 WWM 12, 22, 61, 71, 97
<ul style="list-style-type: none"> Studying and proposing improvements in public services and systems in their community. 	CML 13, 16, 19, 61, 106, 109, 135 COL 55, 61, 66, 156-157 ALP 153, 223 MCR 13, 89, 92, 107 DAW 15, 47, 115, 138 PLN 78, 137, 139, 162 NUT 15, 17, 19, 56, 66, 137 WAT 5, 10, 11, 59, 83, 133 AIR 24, 50, 53, 59, 87, 89, 102, 136 NAT 10, 17, 29, 38, 72, 74, 139 SMT 107, 110, 133-134, 184

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	WWM 16, 22, 61, 71, 97
<ul style="list-style-type: none"> Choosing consumer materials utilizing personal and environmental risk and benefit information. 	CML 13, 16, 19, 61, 106, 109, 135 COL 55, 61, 66, 156-157 ALP 153, 223 MCR 13, 89, 92, 107 DAW 15, 47, 115, 138 PLN 78, 137, 139, 162 NUT 15, 17, 19, 56, 66, 137 WAT 5, 10, 11, 59, 83, 133 AIR 24, 50, 53, 59, 87, 89, 102 NAT 10, 17, 29, 38, 72, 74, 139 SMT 107, 110, 133-134, 184 WWM 16, 22, 61, 71, 97
<ul style="list-style-type: none"> Making inferences, and drawing conclusions using databases, spreadsheets, and other technologies. 	CML 19, 69, 112, 141, 193 COL 24, 72, 109, 170, 209 ALP 36, 90, 124, 155, 191, 240 MCR 37, 95, 129, 172, 211 DAW 24, 73, 120, 161, 211 PLN 43, 96, 140, 183, 216 NUT 20, 69, 106, 149, 194 WAT 28, 61, 101, 1149, 213 AIR 25, 66, 105, 194 NAT 17, 45, 75, 98, 140, 179 SMT 35, 78, 138, 192, 240

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STRANDS	PAGE REFERENCES
	WWM 34, 78, 115, 171, 213
<ul style="list-style-type: none"> Doing simple trouble-shooting on common electrical and mechanical systems, identifying and eliminating possible causes of malfunctions. 	
<ul style="list-style-type: none"> Constructing devices that perform simple, repetitive actions. 	CML 31, 50, 85, 94, 119, 146 COL 32, 39, 82, 91, 149, 179-180 ALP 43, 49, 56, 130, 162, 198 MCR 45, 57, 135, 143 DAW 83, 171 PLN 49, 51, 52, 59 NUT 156, 162 WAT 70, 107, 114, 119 AIR 33, 39, 41, 73, 111, 118 NAT 53, 81, 104 SMT 41, 48, 84, 85, 196 WWM 42, 47, 95, 128
<ul style="list-style-type: none"> Investigating the functionality of various geometric shapes in the natural world and the designed world (e.g., translations from spherical to plane representations cause distortions, triangular shapes contribute to rigidity and stability in structures, round shapes minimize boundary for a given capacity). 	COL 8, 27 SMT 75-77, 103-106 WWM 163-164
Performance Objectives:	
1. Presented with appropriate charts, graphs, and other representations of changes in a dynamic system (e.g., rates of reaction, absorption and emission, homeostasis, momentum, energy, ecological balance in nature, carrying capacity, energy cells, climate, displacement and velocity) the learner will describe the type and rate of change represented.	CML 24-26, 28-35, 86, 94, 119, 149 COL 34, 79, 91, 119, 179-180 ALP 43-45, 49-51, 56, 132 MCR 103-104, 146 DAW 41-42, 171-172 PLN 105-106, 114, 153

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STRANDS	PAGE REFERENCES
	NUT 84-85, 157-158 WAT 71-72, 123-124 AIR 113 NAT 54-55, 106
1. Presented with appropriate charts, graphs, and other representations of changes in a dynamic system (e.g., rates of reaction, absorption and emission, homeostasis, momentum, energy, ecological balance in nature, carrying capacity, energy cells, climate, displacement and velocity) the learner will describe the type and rate of change represented. <i>continued</i>	SMT 42, 87, 147, 153 WWM 12, 17, 29, 69, 76, 97
2. The learner will test a physical or mathematical model of a pattern, structure, or behavior (e.g., energy content of foods, gas laws, conservation of energy and momentum, home energy consumption, planetary motion, earthquakes, circuit laws, genetic probabilities).	CML 32, 85, 88, 94, 120, 150-151 COL 34, 78, 91, 119, 144, 179 ALP 43, 51, 55-56, 98, 131 MCR 64, 103, 146-147 DAW 32-34, 41-42, 85-86, 171-172 PLN 105-107, 113-114 NUT 78, 113-116 WAT 71-72, 114-115, 120, 123-124 AIR 35-36, 92-93, 112-114 NAT 25-26, 54-56, 83-107, 112-113 SMT 42-43, 49, 146-147 WWM 33, 63-64
3. The learner will collect data on variability in a dynamic system (e.g., metabolic data, resistance to infection, spectra from various sources, reflection and refraction with various materials, moisture capacity of the air, planetary orbits, changing strategies for energy production and use, the Bernoulli principle, the doppler effect) and explain how the system remains predictably constant.	CML 17, 32, 80, 88, 94, 121, 150-151 COL 34, 40, 84, 119, 149, 180 ALP 45, 51, 55-56, 97-98 MCR 47-48, 64, 108, 140, 146-147 DAW 32-34, 41-42, 85-86, 171-172 PLN 53-55, 62-63, 113-114 NUT 30, 35, 113-116

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STRANDS	PAGE REFERENCES
	WAT 71-72, 120, 123-124 AIR 35-36, 42-43 NAT 25-26, 83, 106-108 SMT 42-43, 49, 146-147 WWM 42-43, 86-87, 122-123
4. The learner will access primary and secondary data from remote sources (e.g., weather satellites, radio telemetry, seismographs, radar, sonar) and make inferences and predictions that are possible from that data.	CML 41 PLN 17 WAT 78 AIR 23, 89
6. Given a learner-identified potential hazard (e.g., ground water contamination, air pollution, disposal of hazardous wastes), the learner will design an investigation of the hazard, collect data in the form of surveys and empirical data as a member of a research team, and present the results of the investigation.	DAW 116 NUT 138 WAT 186 AIR 133, 136, 138, 140, 142 NAT 61, 62, 64, 73 WWM 8, 12, 13, 73, 97
7. The learner will compare and contrast diverse structures and their associated functions (e.g., geological formations, chemical structures, engineered structures, ecosystems, subatomic structures).	CML 164-173 ALP 61, 78, 109, 113 MCR 37, 50, 188-191 NUT 44-46, 50-51 WAT 27, 85, 131 AIR 12, 32 NAT 32-34, 90, 163 SMT 28-29, 101-106, 174, 206
8. Presented with different versions of a historical event in science or technology (e.g., Wallace and Darwin and natural selection, Edison and Tesla and electric current, Lyell and Wegener and geological theories), the learner will discuss the impact of social and scientific context at the time of the event.	CML 19, 69, 112, 141, 193 COL 24, 72, 109, 170, 209 ALP 36, 90, 124, 155, 191, 240 MCR 37, 95, 129, 172, 211

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STRANDS	PAGE REFERENCES
	DAW 24, 73, 120, 161, 211 PLN 43, 96, 140, 193, 216 NUT 20, 69, 106, 149, 194 WAT 28, 61, 101, 149, 213 AIR 25, 66, 105, 144
8. Presented with different versions of a historical event in science or technology (e.g., Wallace and Darwin and natural selection, Edison and Tesla and electric current, Lyell and Wegener and geological theories), the learner will discuss the impact of social and scientific context at the time of the event. <i>continued</i>	NAT 17, 45, 75, 98, 140, 179 SMT 35, 78, 138, 192, 240 WWM 34, 78, 115, 172, 213
GRADE LEVEL TEN	
Scientific Inquiry	
The learner will:	
<ul style="list-style-type: none"> • Create and use databases (electronic and other) to collect, organize, and verify data and observations. 	CML 8, 32, 43, 44, 50, 59, 72-80, 84-88, 117-121, 145-158 COL 34, 79, 91, 119, 149, 179-180 ALP 43-45, 49-51, 55-57, 131-132 MCR 103-104, 146-147 DAW 32-34, 41-42, 85-86, 90-91, 171-172 PLN 53-55, 62-63, 105-107, 113-114, 154-155 NUT 84-85, 113-116 WAT 71, 114, 120, 123-124 AIR 35-36, 42-43, 112-114 NAT 25-26, 56, 83, 106-108, 112 SMT 42-43, 49, 146-147 WWM 42-43, 48-49, 86-87, 122-123
<ul style="list-style-type: none"> • Design and conduct investigations with multiple variables. 	CML 24-27, 50, 72-80, 84-88, 90-95, 117-121, 145-151 COL 29-34, 35-40, 77-84, 85-92, 115-119, 142-149

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STRANDS	PAGE REFERENCES
	ALP 40-45, 46-51, 52-57, 94-98, 127-132 MCR 42-48, 49-64, 99-104, 132-148, 1776-179 DAW 28-33, 34-42, 79-86, 87-91, 166-172 PLN 46-55, 56-63, 100-107, 108-114, 225-230 NUT 25-30, 31-35, 74-79, 80-86, 110-116
<ul style="list-style-type: none"> Design and conduct investigations with multiple variables. <i>continued</i> 	WAT 66-72, 105-108, 109-115, 116-120, 121-124 AIR 29-36, 37-41, 76-81, 109-114 NAT 22-26, 49-56, 79-83, 102-114, 150-156 SMT 38-49, 81-92, 141-147, 148-153 WWM 38-43, 44-49, 81-87, 118-123
<ul style="list-style-type: none"> Communicate the results of investigations clearly in a variety of situations. 	CML 8, 32, 43, 44, 50, 59, 72-80, 84-88, 145-159 COL 34, 79, 91, 119, 149, 179-180 ALP 43-45, 49-51, 55-59, 131-132 MCR 103-104, 146-147 DAW 32-34, 41-42, 85-86, 90-91, 171-172 PLN 53-55, 62-63, 105-107, 113-114, 154-155 NUT 78-79, 84-85, 113-116 WAT 71-72, 114-115, 120, 128-129 AIR 35-36, 42-43, 112-113 NAT 25-26, 56, 82-83, 106-108, 112 SMT 42-43, 49, 146-147 WWM 42, 48, 86, 122
<ul style="list-style-type: none"> Discuss societal controversies that surround scientific issues. 	CML 9, 14, 36, 5, 98, 109, 162, 171, 179, 188 COL 16, 19, 60, 94, 104, 150, 157, 196 ALP 23, 60, 77, 100, 101, 115, 122, 147, 173

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	MCR 7, 11, 67, 73, 77, 84, 89, 107, 124, 164, 200 DAW 11, 15, 16, 21, 46, 47, 60, 67, 96, 98, 111, 116, 184, 201 PLN 4, 36, 117, 196, 204, 211 NUT 4, 13, 38, 61, 91, 96, 129, 173, 179, 186, 190 WAT 3, 34, 35, 59, 75, 90, 95, 127, 135, 177, 200 AIR 4, 8, 13, 53, 56, 60, 92, 123, 131, 138
<ul style="list-style-type: none"> Discuss societal controversies that surround scientific issues. <i>continued</i> 	NAT 4, 8, 9, 59, 63, 64, 71, 86, 92, 94, 96, 126, 159, 167 SMT 4, 21, 60, 68, 162, 212 WWM 4, 8, 18, 30, 75, 90, 103, 106, 143, 162, 168, 187, 193, 200, 201
<ul style="list-style-type: none"> Examine relationships in nature, offer alternative explanations for the observations, and collect evidence that can be used to help judge among explanations. 	CML 8, 32, 43, 44, 52, 59, 72-80, 84-88, 90-95, 145-159 COL 34, 79, 91, 119, 149, 179-180 ALP 43-45, 49-51, 55-59, 131-132 MCR 103-104, 146-147 DAW 32-34, 41-42, 85-86, 90-91, 171-172 PLN 53-55, 62-63, 105-107, 113-114, 154-155 NUT 78-79, 84-85, 113-116 WAT 71-72, 114-115, 120, 123-124 AIR 35-36, 42-43, 112-114 NAT 25-26, 56, 82-83, 106-108, 112 SMT 42-43, 49, 146-147 WWM 42, 48, 86, 122
<ul style="list-style-type: none"> Trace the development (e.g., history, controversy, and ramifications) of various theories, focusing on supporting evidence and modification with new evidence. 	CML 9, 14, 36, 56, 98, 109, 162, 171, 179, 188 COL 16, 19, 60, 94, 104, 150, 157, 196 ALP 23, 60, 77, 100, 101, 115, 122, 147, 173

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	MCR 7, 11, 67, 73, 77, 84, 89, 107, 200 DAW 11, 16, 21, 46, 60, 67, 98, 111, 184 PLN 4, 36, 117, 196, 204, 211 NUT 4, 13, 38, 61, 91, 1229, 179, 186, 190 WAT 3, 34, 35, 59, 90, 95, 127, 135, 177, 200 AIR 4, 8, 13, 53, 60, 92, 123, 131, 138 NAT 4, 9, 59, 64, 71, 86, 94, 126, 159, 167
<ul style="list-style-type: none"> Trace the development (e.g., history, controversy, and ramifications) of various theories, focusing on supporting evidence and modification with new evidence. <i>continued</i> 	SMT 4, 21, 60, 68, 162, 212 WWM 4, 8, 18, 30, 75, 103, 106, 162, 168, 187, 193, 200, 201
<ul style="list-style-type: none"> Select, invent, and use tools, including analog and digital instruments, to make and record direct measurements. 	CML 31, 50, 72-80, 84-88, 90-95, 117-121, 145-151 COL 32, 39, 82, 91, 149, 179-180 ALP 43-45, 49-51, 55-59, 130, 162, 198, 248 MCR 45, 51, 57, 135-136, 143-144 DAW 82-86, 171-172 PLN 49, 51, 52, 59 NUT 156, 162 WAT 70, 107, 114, 119 AIR 33, 39, 41, 73, 111, 118 NAT 53, 81, 104 SMT 41, 48, 84, 85, 196 WWM 42, 47, 85, 128
<ul style="list-style-type: none"> Observe and document events and characteristics of complex systems. 	CML 8, 32, 43, 44, 50, 59, 72-80, 84-88, 90-95, 145-159 COL 34, 79, 91, 119, 149, 179-180 ALP 43-45, 49-51, 55-59, 131-132

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	MCR 103-104, 146-147 DAW 32-34, 41-42, 85-86, 90-91, 171-172 PLN 53-55, 62-63, 105-107, 113-114, 154-155 NUT 78-79, 84-85, 113-116 WAT 71-72, 114-115, 120, 123-124 AIR 35-36, 42-43, 112-114 NAT 25-26, 56, 82-83, 106-108, 112 SMT 42-43, 49, 146-147
<ul style="list-style-type: none"> Observe and document events and characteristics of complex systems. <i>continued</i> 	WWM 42, 48, 86, 122
<ul style="list-style-type: none"> Explain the influence of perspective (e.g., spatial, temporal, and social) on observation and subsequent interpretations. 	CML 9, 14, 36, 56, 98, 109, 162, 171, 179, 188 COL 16, 19, 60, 84, 104, 150, 157, 196 ALP 23, 60, 77, 100, 101, 115, 122, 147, 173 MCR 7, 11, 67, 73, 77, 84, 89, 107, 124, 164, 200 DAW 11, 15, 16, 21, 46, 47, 60, 67, 96, 98, 111, 116, 184, 201 PLN 4, 36, 117, 196, 204, 211 NUT 4, 13, 38, 61, 91, 96, 129, 173, 179, 186, 190 WAT 3, 34, 35, 59, 75, 90, 95, 127, 135, 177, 200 AIR 4, 8, 13, 53, 56, 6, 92, 123, 131, 138 NAT 4, 8, 9, 59, 63, 64, 71, 86, 92, 94, 96, 126, 159, 167 SMT 4, 21, 60, 68, 162, 212 WWM 4, 8, 18, 30, 75, 90, 103, 106, 143, 162, 168, 187, 193, 200, 201
<ul style="list-style-type: none"> Create multiple representations of the same data using a variety of symbols, 	CML 32, 80, 88, 94, 120, 150-151

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descriptive languages, mathematical concepts, and graphic techniques.	COL 34, 79, 91, 119, 149, 179 ALP 43, 51, 55-56, 98, 131 MCR 64, 103, 146-147 DAW 32-34, 41-42, 85-86, 90-91, 171-172 PLN 105-107, 113-114 NUT 78, 113-116 WAT 71-72, 114-115, 120, 123-125 AIR 35-36, 42-43, 112-114 NAT 25-26, 54-56, 83, 106-108, 112-113 SMT 42-43, 49, 146-147
<ul style="list-style-type: none"> Generate testable hypotheses for observations of complex systems and interactions. 	CML 24, 50, 72, 84, 90, 117, 145 COL 29, 35, 77, 85, 115, 142 ALP 40, 46, 52, 94, 127 MCR 42, 48, 99, 132, 141, 176 DAW 28, 34, 79, 87, 166 PLN 46, 56, 100, 108, 150, 225 NUT 25, 31, 74, 80, 110 WAT 66, 105, 109, 116, 121 AIR 29, 37, 76, 109 NAT 22, 49, 79, 102, 109, 150 SMT 38, 44, 81, 88, 141, 148 WWM 38, 44, 81, 118
Scientific Knowledge	
The learner will:	
<ul style="list-style-type: none"> Formulate descriptions of the impacts of various forms of mechanical and 	

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electromagnetic waves on various organisms and objects.	
<ul style="list-style-type: none"> Formulate models and hypotheses for patterns in the natural world (e.g., earth structures, transportation systems, migrations, communications, constellations). 	CML 16, 56, 112, 139 COL 152, 204-208 MCR 75, 81, 84, 87 DAW 100-102, 107-108 NUT 20, 132 WAT 42-47, 77-78 AIR 22-25 NAT 61-66 SMT 18-20, 117 WWM 16-17, 22-23
<ul style="list-style-type: none"> Formulate explanations for the influences of objects and organisms on each other over time. 	CML 7, 56, 177 COL 204-208 MCR 61-63, 94 DAW 61-63, 87-91 PLN 68-69, 122 NUT 127-128 WAT 56-60 AIR 140-143 NAT 102-108, 131, 160-165 WWM 28-30
<ul style="list-style-type: none"> Formulate and interpret explanations for change phenomena (e.g., mass extinctions, stellar evolution, punctuated equilibrium, molecular synthesis). 	COL 153-164 SMT 67-77, 129-136, 213-223
<ul style="list-style-type: none"> Formulate and interpret explanations for the magnitudes of diversity at different periods of geologic time (e.g., mutation, global cataclysms, 	COL 153-164

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continental drift, competition, mass extinctions).	
<ul style="list-style-type: none"> Formulate interpretations of the structure, function and diversity in a variety of organisms and physical systems. (e.g., DNA and RNA variants, nucleons, interaction particles). 	COL 12-28, 121-122, 198-204 MCR 109-116, 132-140
<ul style="list-style-type: none"> Formulate understandings of geologic time (e.g., millennia, periods, epochs). 	
<ul style="list-style-type: none"> Formulate an understanding of the historical development of the model of the universe (e.g., Aristotle, Ptolemy, Copernicus, Brahe, Kepler, Galileo, Newton, Einstein). 	
<ul style="list-style-type: none"> Formulate explanations and representations of the production, transmission, and conservation of energy in biological and physical systems (e.g., weather, volcanism, earthquake, electricity, magnetism, cellular respiration). 	CML 7, 177, 184 COL 6 ALP 67-77, 79-81 MCR 68-71 DAW 144-145, 166-172 PLN 17-18 NUT 7-12, 66-68 WAT 178-179 AIR 61-65, 96-98 NAT 6-7, 38, 49-56 SMT 35 WWM 16-17, 22-23
Conditions for Learning Science	

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The learner will be:	
<ul style="list-style-type: none"> Investigating social issues with a scientific perspective (e.g., human rights, wellness, economics, futurism, environmental ethics). 	CML 13, 16, 19, 61, 106,,109, 135 COL 55, 61, 66, 156-157 ALP 153, 223 MCR 13, 89, 92, 107 DAW 15, 47, 115, 138 PLN 79, 137, 139, 162 NUT 15, 17, 19, 56, 66, 137 WAT 5, 10, 11, 59, 83, 133 AIR 24, 50, 53, 59, 87, 89, 102, 136 NAT 10, 17, 29, 38, 72, 74, 139 SMT 107, 110, 133-134, 184 WWM 12, 22, 61, 71, 97
<ul style="list-style-type: none"> Keeping journals of observations and inferences made over an extended period of time and reflecting upon the impact of these recorded ideas on their thinking and actions. 	CML 19, 69, 112, 141, 193 COL 24, 72, 109, 170, 209 ALP 36, 90, 124, 155, 191, 240 MCR 37, 95, 129, 172, 211 DAW 24, 73, 120, 161, 211 PLN 43, 96, 140, 183, 216 NUT 20, 69, 106, 149, 194 WAT 28, 61, 101, 199, 213 AIR 25, 66, 105, 144 NAT 17, 45, 75, 98, 140, 179 SMT 35, 78, 138, 192, 240

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<ul style="list-style-type: none"> Examining the intellect, perspectives, and ethics of notable scientists. 	
<ul style="list-style-type: none"> Collecting and analyzing observations made over extended periods of time and comparing these to scientific theories. 	CML 27, 32, 80, 88, 121 COL 34, 40, 84, 119, 149, 180 ALP 45, 51, 55, 56, 97, 98 MCR 47-48, 64, 104, 140, 146 DAW 32-34, 42, 86, 91, 172 PLN 55, 63, 107, 114, 155 NUT 30, 35, 116, 158 WAT 72, 115, 120, 124 AIR 36, 43, 114 NAT 26, 56, 83, 108, 113 SMT 42-43, 49, 146-147 WWM 43, 49, 87, 123
<ul style="list-style-type: none"> Creating presentations of scientific understandings using diverse modes of expression. 	CML 32, 80, 88, 94, 120, 150-151 COL 34, 79, 91, 119, 149, 179 ALP 43, 51, 55-56, 98, 131 MCR 64, 103, 146-147 DAW 32-34, 41-42, 85-86, 171-172 PLN 105-107, 113-114 NUT 78, 113-116 WAT 71-72, 114-115, 120 AIR 35-36, 42-43, 112-114 NAT 25-26, 54-56, 83

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STRANDS	PAGE REFERENCES
<ul style="list-style-type: none"> Conducting formal scientific debates in the classroom. 	<p>SMT 42-43, 49, 146-147</p> <p>CML 19, 69, 112, 141, 193</p> <p>COL 24, 72, 109, 170, 209</p> <p>ALP 36, 90, 124, 155, 191, 240</p> <p>MCR 37, 95, 129, 172, 211</p> <p>DAW 24, 73, 120, 161, 211</p> <p>PLN 43, 96, 140, 183, 216</p> <p>NUT 20, 69, 106, 149, 194</p> <p>WAT 28, 61, 101, 149, 213</p> <p>AIR 25, 66, 105, 144</p> <p>NAT 17, 45, 75, 98, 140, 179</p> <p>SMT 35, 78, 138, 192, 240</p> <p>WWM 34, 78, 115, 171, 213</p>
<ul style="list-style-type: none"> Formulating processes for determining when questions are appropriate for scientific investigation. 	<p>CML 24, 72, 84, 90, 117, 145</p> <p>COL 29, 35, 72, 85, 115, 142</p> <p>ALP 43, 46, 52, 94, 127</p> <p>MCR 42, 49, 99, 132, 141, 176</p> <p>DAW 28, 34, 79, 87, 166</p> <p>PLN 46, 56, 100, 108, 150, 225</p> <p>NUT 25, 31, 74, 80, 110</p> <p>WAT 66, 105, 109, 116, 121</p> <p>AIR 29, 37, 76, 109</p>

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	NAT 22, 49, 79, 102, 109, 150 SMT 38, 44, 81, 88, 141, 148 WWM 38, 44, 81, 118
<ul style="list-style-type: none"> Wondering about the likelihood of events that may occur by chance or coincidence. 	CML 13, 16, 106, 135 COL 55, 61, 156-157 ALP 153, 223 MCR 13, 89, 92, 107 DAW 15, 47, 115 PLN 79, 139, 162 NUT 15, 19, 66, 137 WAT 5, 10, 59, 133 AIR 24, 53, 87, 99 NAT 10, 17, 72, 74, 139 SMT 107, 110, 184 WWM 12, 22, 61, 71, 97
<ul style="list-style-type: none"> Planning and conducting field trips and experiences for small and large groups. 	CML 134, 183, 190 COL 15, 96, 102, 107, 128 ALP 7, 19, 216 MCR 119, 128 DAW 4, 6, 49, 63, 135 PLN 164 NUT 55, 100

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STRANDS	PAGE REFERENCES
	WAT 13, 18, 57, 82 AIR 6, 13, 127, 142 NAT 39, 97, 127 SMT 7, 12, 66, 135 WWM 32, 67, 93, 100
<ul style="list-style-type: none"> Analyzing the historical context which leads to and has lead to scientific theories. 	CML 37, 112 COL 174-181, 204-208 MCR 103, 182-187, 191-193, 202-203 DAW 149 AIR 22-25, 85-86 NAT 124-125
<ul style="list-style-type: none"> Seeking information on topics of personal scientific interest from a variety of sources. 	CML 13, 16, 106, 135 COL 55, 61, 156 ALP 153 MCR 13, 89, 92, 107 DAW 15, 47, 115 PLN 79, 139, 162 NUT 15, 19, 66, 137 WAT 5, 10, 59, 133 AIR 24, 53, 87, 99
<ul style="list-style-type: none"> Seeking information on topics of personal scientific interest from a variety of sources. <i>continued</i> 	NAT 10, 17, 72, 74, 139 SMT 107, 110 WWM 12, 22, 61, 97
<ul style="list-style-type: none"> Conducting learner-developed investigations independently and collaboratively over periods of weeks and months. 	CML 134, 190 COL 102, 107

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	ALP 7, 19, 216 MCR 119, 128 DAW 6, 63, 95 PLN 164 NUT 100 WAT 18, 57 AIR 6, 13, 142 NAT 39, 127 SMT 58, 66, 135 WWM 32, 73, 93
<ul style="list-style-type: none"> Listening attentively and critically to presentations of scientific information made by others. 	CML 19, 112, 141 COL 24, 109, 209 ALP 36, 124, 191 MCR 37, 129 DAW 24, 73, 211 PLN 43, 140, 216 NUT 20, 69, 106 WAT 28, 61, 149 AIR 25, 66, 105 NAT 17, 45, 98 SMT 35, 78, 138 WWM 34, 115, 171
<ul style="list-style-type: none"> Conducting analyses of propaganda related to scientific issues. 	CML 19, 112, 141 COL 24, 109, 209 ALP 36, 124, 191

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	MCR 37, 129 DAW 24, 73, 211 PLN 43, 140, 216 NUT 20, 69, 106 WAT 28, 61, 149 AIR 25, 66, 105 NAT 17, 45, 98 SMT 35, 78, 138 WWM 34, 115, 171
Applications for Science Learning	
The learner will be:	
<ul style="list-style-type: none"> Making decisions regarding personal and public health. 	CML 13, 16, 61, 106 COL 55, 61, 66, 156 ALP 153, 223 MCR 13, 89, 92, 107 DAW 15, 47, 115 PLN 79, 137, 139 NUT 15, 19, 66, 137 WAT 10, 59, 83, 133 AIR 24, 50, 87, 102 NAT 17, 29, 72, 139 SMT 107, 184 WWM 12, 22, 61, 71, 97
<ul style="list-style-type: none"> Evaluating the social and ecological risks and benefits resulting from the use of various consumer products. 	CML 19, 61, 106, 109

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	COL 55, 61, 66, 156 ALP 153, 223 MCR 13, 89, 92, 107 DAW 15, 47, 115 PLN 79, 137, 162 NUT 19, 56, 66, 137 WAT 5, 59, 83, 133 AIR 53, 59, 87, 136 NAT 10, 29, 72, 139 SMT 107, 110, 133, 184 WWM 12, 22, 61, 71, 97
<ul style="list-style-type: none"> Analyzing the contributions of advances in technology through history to his/her everyday life. 	CML 20-21, 70-71, 114-115, 194-195 COL 26-27, 110-111 ALP 38-39, 125-127 MCR 38-40, 96-98 DAW 25-27, 74-75, 121-125 PLN 44-45, 141-142 NUT 23-24, 108-109 WAT 30-31, 62-63, 102-103 AIR 26-27, 106-107 NAT 18-20, 100-101, 141-142 SMT 36-37, 79-80 WWM 35-36, 79-80

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<ul style="list-style-type: none"> Identifying and reducing risks and threats to a sustainable environment. 	CML 13, 16, 106, 109, 135 COL 55, 61, 66 ALP 153, 223 MCR 13, 8, 92, 107 DAW 15, 47, 115, 138 PLN 79, 137, 139 NUT 15, 17, 56, 66, 137 WAT 10, 59, 83, 133 AIR 24, 50, 59, 87, 136 NAT 17, 29, 39, 72, 74 SMT 107, 110, 133-134 WWM 12, 22, 61, 71, 97
<ul style="list-style-type: none"> Extending the limits of human capabilities using technological enhancements. 	CML 19, 69, 141 COL 24, 72, 109, 209 ALP 36, 90, 124, 191 MCR 37, 95, 172, 211 DAW 24, 120, 161 PLN 43, 96, 183, 216 NUT 20, 69, 149 WAT 28, 61, 101, 213 AIR 25, 66, 105, 144 NAT 17, 45, 75, 140 SMT 35, 78, 192, 240 WWM 34, 78, 115, 213

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<ul style="list-style-type: none"> Using and recognizing various propaganda techniques. 	
<ul style="list-style-type: none"> Solving unique problems using the results of systematic analyses. 	CML 23, 28, 72, 81, 89, 144 COL 29, 35, 77, 85, 182, 190 ALP 40, 46, 52, 94, 128 MCR 42, 49, 99, 141, 222 DAW 34, 79, 126 PLN 46, 56, 108 NUT 25, 61, 110, 117 WAT 121, 153, 217 AIR 37, 76 NAT 49, 79, 182 SMT 38, 44, 81 WWM 38, 131, 222
<ul style="list-style-type: none"> Choosing everyday consumer products that utilize recent innovative and pass appropriate performance criteria. 	CML 13, 16, 19, 61, 109, 135 COL 55, 61, 66, 156 ALP 153, 223 MCR 13, 89, 92, 107 DAW 15, 47, 115, 138 PLN 78, 137, 139, 162 NUT 15, 17, 19, 56, 66, 137 WAT 5, 10, 59, 83, 133 AIR 24, 50, 53, 87, 102 NAT 10, 17, 38, 74, 139 SMT 107, 110, 184

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	WWM 16, 61, 71, 97
<ul style="list-style-type: none"> Refining personal career interests through investigations of the diversity of manufacturing, research, service, and invention processes. 	CML 20-22, 114-115, 194-195 COL 26-27, 73-75, 110-111 ALP 38-39, 125-127 MCR 38-40, 96-98 DAW 74-75, 121-125 PLN 44-45, 141-142 NUT 23-24, 108-109 WAT 30-31, 102-103 AIR 26-27, 67-68, 146-147 NAT 18-20, 100-101, 141-142 SMT 9, 16, 36-37, 139-140 WWM 35-36, 79-80, 116-117
<ul style="list-style-type: none"> Predicting and investigating the operation of toys and tools while controlling and manipulating variables (e.g., friction, gravity, forces). 	CML 31, 50, 85, 119 COL 32, 82, 91, 149 ALP 43, 56, 130 MCR 45, 57, 135, 143 DAW 83, 171 PLN 49, 51, 59 NUT 156, 162 WAT 70, 107, 114 AIR 33, 41, 111

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STRANDS	PAGE REFERENCES
	NAT 53, 81, 104 SMT 41, 48, 84, 196 WWM 42, 47, 85, 128
Performance Objectives	
1. Presented with data representing the change over a period of time (e.g., earth spin changes and equinox procession, pendulum motion, stream bed and delta building, thermal cooling and heating, influences on life cycles) the learner will construct a testable hypothesis regarding the nature of the change and conduct an experiment to test it.	COL 154, 155, 158, 160, 166 WAT 17, 18, 42, 44, 46, 49, 53
2. The learner will identify and discuss structure/function relationships in complex systems (e.g., physiological systems, biotechnological systems, aeronautical systems, energy production and transmission systems, communications systems, transportation systems, waste management systems) with appropriate community and field experts.	CML 14, 18, 49, 52-55, 98-100, 131-136 MCR 13, 16, 20, 72, 79, 83, 160, 186-190 AIR 18, 53, 56, 92, 93 WWM 8, 12, 13, 22, 27, 71, 73, 93, 95, 146, 154, 161, 202
3. Provided with data (e.g., liner motion, population fluctuations, solubility, pH, diversity of life over geologic time, inverse square law, rates of reactions) in graphic form, the learner will transform the data into another form that is useful in understanding the phenomenon.	COL 14-15, 20-23, 51-55, 98, 126 ALP 34, 63, 88, 108, 153, 183, 216 WAT 21-24, 53, 57, 89, 92, 129, 141
4. Given performance data on several consumer products, the learner will analyze the effectiveness and efficiency of the products and recommend improvements to the manufacturer.	SMT 58, 66, 107, 159, 182, 223, 232 WWM 32, 56, 65, 73, 97, 145, 161, 191
5. The learner will demonstrate skill in the use and interpretation of data from various technologies (e.g., blood pressure apparatus, graphing calculators, high-power microscopy, computer-based interfaced sensors and software, telescopes, weather instruments, satellite telemetry, Vernier scale instruments, oscilloscopes).	COL 18, 57, 98, 133, 154, 202 DAW 49, 67, 105, 140, 158, 192, 195 NUT 17, 19, 60, 65, 126, 138, 184

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6. The student will demonstrate an understanding of the kinetic model of matter by describing its effects on the interactions and transformations in living and nonliving systems (e.g., adiabatic changes, endothermic and exothermic processes and organisms, diffusion and osmosis, changes of phase, water, carbon and nitrogen cycles).	COL 15, 69, 107, 134, 160, 202 ALP 63, 109, 118, 172, 183, 216, 228 WAT 21, 23, 44, 77, 93, 133, 140, 186 NAT 30, 34, 42, 62, 73, 95, 127, 159, 175
7. Given a set of data on the behavior of mechanical and electromagnetic waves and their interactions with matter (e.g., absorption, transmission, reflection, refraction, diffusion, polarization), the learner will prepare and present an evaluation of the strengths and limitations of the wave and particle models to explain these behaviors and interactions.	WAT 46, 49, 85, 87
GRADE LEVEL ELEVEN	
Scientific Inquiry	
The learner will:	
<ul style="list-style-type: none"> Document potentially hazardous conditions and associated risks in selected homes and public areas. 	CML 13, 16, 19, 61, 106, 109, 135 COL 55, 61, 66, 156-157 ALP 153, 223 MCR 13, 89, 92, 107 DAW 15, 47, 105, 138 PLN 79, 137, 139, 162 NUT 15, 17, 19, 56, 66, 137 WAT 5, 10, 11, 59, 83, 133 AIR 24, 50, 53, 59, 87, 99, 102, 136 NAT 10, 17, 29, 38, 72, 74, 139 SMT 107, 110, 133-134, 184 WWM 12, 22, 61, 71, 97
<ul style="list-style-type: none"> Participate in public debates, relying on documented and verified data to construct and represent a position on scientific issues. 	CML 134, 183, 190 COL 15, 96, 102, 107, 128

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	ALP 7, 19, 216 MCR 119, 128 DAW 4, 6, 49, 63, 73, 95, 135 PLN 164 NUT 55, 100 WAT 13, 18, 57, 80, 85, 89 AIR 6, 13, 56, 127, 142 NAT 39, 97, 127m 129 SMT 7, 12, 58, 66, 76, 135
<ul style="list-style-type: none"> Participate in public debates, relying on documented and verified data to construct and represent a position on scientific issues. <i>continued</i> 	WWM 32, 67, 73, 93, 100
<ul style="list-style-type: none"> Construct and test models of physical, biological, social and geological systems. 	CML 24-27, 84-88, 145-151 COL 29-34, 77-84, 115-119 ALP 40-45, 52-57, 127-132 MCR 42-48, 99-104 DAW 34-42, 87-91 PLN 56-63, 108-114, 225-230 NUT 25-30, 74-79, 110-116 WAT 66-72, 109-115, 121-124 AIR 29-36, 76-81, 109-114 NAT 38-43, 81-87, 118-123 SMT 22-26, 49-56, 109-114 WWM 38-43, 81-87, 141-147
<ul style="list-style-type: none"> Read, verify, debate and, where necessary, refute research published in popular or technical journals of science (e.g., <i>Discover</i>, <i>Omni</i>, <i>Popular Mechanics</i>). 	CML 14, 16, 106, 129, 137, 178 COL 98, 158, 216

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	ALP 18, 155 MCR 75, 126, 196 DAW 15, 47, 73, 105, 115, 138 PLN 87, 94, 139, 204 NUT 19, 60 AIR 53, 124, 131, 136 NAT 15, 61, 73, 175 WWM 65, 67, 71, 110
<ul style="list-style-type: none"> Explore discrepant events and develop and test explanations of what was observed. 	CML 13, 16, 19, 61 COL 55, 61, 66 ALP 153, 223 MCR 13, 89, 92, 107 DAW 15, 47, 115, 138 PLN 79, 137, 139, 162 NUT 15, 17, 19, 56, 66 WAT 5, 10, 11, 59, 83, 133 AIR 24, 50, 53, 59, 102, 136 NAT 10, 17, 29, 38, 72 SMT 107, 110, 133-134 WWM 12, 22, 61, 71, 97
<ul style="list-style-type: none"> Conduct theory-based research using surveys, observational instruments and other methods. 	CML 24-27, 84-88, 145-151 COL 29-34, 77-84, 115-119

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	ALP 40-45, 52-57, 127-132 MCR 42-48, 99-104 DAW 34-42, 87-91 PLN 56-63, 108-114, 225-230 NUT 25-30, 74-79, 110-116 WAT 66-72, 109-115, 121-124 AIR 29-36, 76-81, 109-114 NAT 38-43, 81-87, 118-123 SMT 22-26, 49-56, 109-114 WWM 38-43, 81-87, 141-147
<ul style="list-style-type: none"> Modify personal opinions, interpretations, explanations, and conclusions based on new information. 	CML 33, 80, 94, 120, 150 COL 34-35, 40, 84, 91, 119, 149, 180 ALP 43, 51, 55, 132 MCR 48, 64, 103-104, 146-147 DAW 32-34, 41-42, 85-86, 171-172 NUT 30, 35, 115-116 WAT 71-72, 120 AIR 74-75, 112-114 NAT 25-26, 56, 108 SMT 42, 43, 49, 91 WWM 43, 49, 87, 103
<ul style="list-style-type: none"> Analyze error and develop explanations in various domains. 	CML 27, 32, 80, 88, 94, 121

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	COL 34, 40, 84, 119, 149 ALP 45, 51, 56, 98, 132 MCR 48, 64, 104, 140, 147 DAW 34, 42, 85-86, 90-91 PLN 54-55, 113-114 NUT 30, 35, 157-158 WAT 71-72, 114-115, 123 AIR 35-36, 112-114 NAT 25-26, 83, 107, 112 SMT 42-43, 49, 146-147 WWM 42-43, 48-49, 86-87
<ul style="list-style-type: none"> Formulate taxonomic schemes based upon multivariate models that help to explain similarities and differences in form, distribution, behavior, survival, and origin of objects and organisms. 	CML 7, 56, 177 COL 204-208 MCR 61-63, 94 DAW 62-66, 87-91
<ul style="list-style-type: none"> Formulate taxonomic schemes based upon multivariate models that help to explain similarities and differences in form, distribution, behavior, survival, and origin of objects and organisms. <i>continued</i> 	PLN 68-69, 122 NUT 127-128 WAT 56-60 AIR 140-143 NAT 31, 102-108, 160-165 WWM 28-30
<ul style="list-style-type: none"> Formulate estimations for extremely small increments of time (e.g., milliseconds, microseconds, nanoseconds, picoseconds). 	
<ul style="list-style-type: none"> Formulate interpretations of and hypothesis for further investigation from representations of the same data in a variety of forms (e.g., symbols, descriptive languages, mathematical concepts, graphic formats). 	CML 32, 80, 88, 94, 120 COL 79, 91, 119, 179

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	ALP 43, 51, 98, 131 MCR 64, 103 DAW 32-34, 41-42, 85-86 PLN 62-63, 105-107 NUT 30, 35, 157-158 WAT 71-72, 120, 123-124 AIR 35-36, 42-43 NAT 25-26, 83, 106-108 SMT 42-43, 49 WWM 42-43, 122-123
Scientific Knowledge	
The learner will:	
<ul style="list-style-type: none"> Formulate models and hypotheses about patterns in the natural world (e.g., social behavior, molecular structure, energy transformation, entropy, randomness, aging, chaos, hormonal cycles). 	CML 4, 7, 13, 14, 37, 56, 68, 89, 112 COL 56-57, 174-181 ALP 14-16, 19-20, 114-121 MCR 85-87, 94 DAW 6-7
<ul style="list-style-type: none"> Formulate models and hypotheses about patterns in the natural world (e.g., social behavior, molecular structure, energy transformation, entropy, randomness, aging, chaos, hormonal cycles). <i>continued</i> 	NUT 104-105, 178-181 AIR 46-50 NAT 9-10, 87-88, 166, 170, 176-179 SMT 18-20, 95-98, 115 WWM 16-18, 29-30, 54-57, 139, 141
<ul style="list-style-type: none"> Formulate interpretations of the relationship between energy exchange and the interfaces between components within systems. 	CML 7, 177, 184 COL 6, 9 ALP 67-77, 79-81

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	MCR 68-71 DAW 144-145, 166-172 PLN 17-18 NUT 7-12, 66-68 WAT 178-179 AIR 61-65, 96-98 NAT 6-7, 38, 49-56 SMT 35 WWM 57, 166-167
<ul style="list-style-type: none"> Formulate estimations for the range of energies within and between various phenomena (e.g., thermal, electromagnetic, thermonuclear, chemical, electrical). 	CML 7, 177, 184 COL 6, 9 ALP 67-77, 79-81 MCR 68-71 DAW 144-145, 166-172 PLN 17-18 NUT 7-12, 66-68 WAT 178-179 AIR 61-65, 96-98 NAT 6-7, 38, 49-56
<ul style="list-style-type: none"> Formulate estimations for the range of energies within and between various phenomena (e.g., thermal, electromagnetic, thermonuclear, chemical, electrical). <i>continued</i> 	SMT 35 WWM 57, 166-167
<ul style="list-style-type: none"> Formulate explanations for the historical development of descriptions of motions, interactions, and transformations of matter and energy (e.g., classical Newtonian mechanics, special and general relativity, chaos). 	CML 4, 7, 13, 37, 56, 68, 89, 112, 139, 165 COL 56-57, 174-181 ALP 14-16, 19-20, 114-121 MCR 85-87, 94

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	DAW 6-7 NUT 104-105, 178-181 AIR 46-50 NAT 9-10, 87-88, 166, 170, 176-179 SMT 18-20, 95-98, 115 WWM 16-18, 29-30, 54-57, 139, 141
<ul style="list-style-type: none"> Formulate models that can be used to describe fundamental molecular interactions in living and non-living systems (e.g., cell membranes, semiconductors). 	CML 4, 7, 13, 37, 56, 68, 89, 112, 139, 165 COL 56-57, 174-181 ALP 14-16, 19-20, 114-121 MCR 85-87, 94 DAW 6-7 NUT 104-105, 178-181 AIR 46-50 NAT 9-10, 87-88, 166, 170, 176-179 SMT 18-20, 95-98, 115 WWM 16-18, 29-30, 54-57, 139, 141
<ul style="list-style-type: none"> Formulate an understanding of the degree of relationship among organisms and objects based on molecular structure (e.g., proteins, nucleic acids). 	CML 16, 56, 112, 132, 139 COL 152, 204-208 MCR 75, 81, 84, 87 DAW 100-102, 107-108 NUT 20, 132

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STRANDS	PAGE REFERENCES
	WAT 42-47, 77-78 AIR 22-25 NAT 61-66 SMT 18-20, 117 WWM 16-17, 22-23
<ul style="list-style-type: none"> Formulate hypotheses and models that may account for observable events (e.g., electricity and magnetism, gravitation, atoms, bonding, chemical reactions, quantum effects, energy flow on biological systems, predator-prey relationships). 	CML 7, 177, 184 COL 6 ALP 67-77, 79-81 MCR 68-71 DAW 144-145, 166-172 PLN 17-18 NUT 7-12, 66-68 WAT 178-179 AIR 61-65, 96-98 NAT 6-7, 38, 49-56 SMT 35 WWM 57, 166-167
<ul style="list-style-type: none"> Formulate models and hypotheses about change over time (e.g., natural selection, speciation, punctuated equilibrium, phyletic gradualism, stellar evolution, plate tectonics, radioactive decay, quantum mechanical theory). 	CML 37, 42 COL 174-181, 204-208 MCR 103, 182-187, 191-193

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	DAW 149 AIR 22-25, 85-86 NAT 124-125
Conditions for Learning Science	
The learner will be:	
<ul style="list-style-type: none"> • Performing investigations that require observations over varying periods of time. 	CML 134, 183, 190 COL 15, 96, 102, 107, 128 ALP 7, 19, 216 MCR 119, 128 DAW 4, 6, 49, 63, 73, 95, 135 PLN 164 NUT 55, 100 WAT 13, 18, 57, 80, 85, 89 AIR 6, 13, 56, 127, 142 NAT 39, 97, 127, 129 SMT 7, 12, 58, 66, 73, 135 WWM 32, 67, 73, 93, 100
<ul style="list-style-type: none"> • Experiencing scientific concepts as interpreted by other cultures through multimedia and local and global specialists. 	CML T11-T14 COL T12-T16 ALP T12-T17 MCR T10-T13 DAW T13-T16 PLN T11-T14 NUT T11-T13
<ul style="list-style-type: none"> • Experiencing scientific concepts as interpreted by other cultures through 	WAT T11-T15

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multimedia and local and global specialists. <i>continued</i>	AIR T9-T13 NAT T11-T19 SMT T11-T14 WWM T11-T13
<ul style="list-style-type: none"> Accessing appropriate technology to perform complicated, time-consuming tasks. 	CML 32, 80, 88, 120 COL 34, 79, 91, 179 ALP 43, 51, 98, 131 MCR 64, 103 DAW 32, 41, 85, 90 PLN 105, 113 NUT 78, 113 WAT 71, 111, 120 AIR 35, 42, 112 NAT 22, 49, 79 SMT 25, 54, 83, 106 WWM 42, 49, 146
<ul style="list-style-type: none"> Relating historical accounts of science to the cultural context in which they were written. 	CML 37, 112 COL 174-181, 204-208 MCR 103, 182-187, 191-193, 202-203 DAW 149 AIR 22-25, 85-86 NAT 124-125

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<ul style="list-style-type: none"> Working as a contributing member of a collaborative research group. 	CML 134, 183, 190 COL 15, 96, 102, 107, 128 ALP 7, 19, 216 MCR 119, 128 DAW 4, 6, 49, 63, 73, 95, 135 PLN 164 NUT 55, 100 WAT 13, 18, 57, 80, 85, 89 AIR 6, 13, 56, 127, 142 NAT 39, 97, 127, 129 SMT 7, 12, 58, 66, 73, 135 WWM 32, 67, 73, 93, 100
<ul style="list-style-type: none"> Examining the influences of social and political structures and realities that contribute to inquiry about scientific issues. 	CML 17, 36, 56, 98, 162 COL 16, 19, 43, 60, 196 ALP 24, 60, 77, 100, 173 MCR 12, 67, 84, 89, 196, 200 DAW 15, 21, 49, 68, 117 PLN 36, 117, 211 NUT 13, 39, 93, 141, 186 WAT 3, 34, 59, 177, 200, 211 AIR 13, 94, 123, 138 NAT 9, 29, 60, 63, 93 SMT 4, 21, 212 WWM 15, 21, 76, 187, 197
<ul style="list-style-type: none"> Using technology (e.g., desktop publishing, teleconferencing, networking) to 	

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communicate scientific ideas.	
<ul style="list-style-type: none"> Exploring and analyzing a variety of perspectives on science (e.g., works by men and women of many racial, ethnic, and cultural groups). 	CML 5, 63, 135, 167 COL 4, 64, 161 ALP 20, 27, 35, 80 MCR 6, 154 DAW 15, 23, 62, 103, 156 PLN 20, 26, 80, 82, 125 NUT 15, 102, 129, 147, 189 WAT 44, 48, 50, 93, 142 AIR 20, 22, 47, 84, 95, 103 NAT 7, 13, 35, 42, 167 SMT 9, 16, 52, 64, 95, 186 WWM 27, 52
<ul style="list-style-type: none"> Leading groups of learners of various ages in designing, planning, and conducting science activities. 	CML 134, 183, 190 COL 15, 96, 107, 128 ALP 7, 19, 216 MCR 119, 128 DAW 4, 6, 49, 95, 135 PLN 164 NUT 55, 100 WAT 13, 18, 57, 89 AIR 6, 13, 56, 127, 142 NAT 39, 97, 127, 129 SMT 7, 12, 58, 66, 135 WWM 32, 67, 73, 100

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<ul style="list-style-type: none"> Respecting the scientific thinking of others and self. 	CML 19, 112, 193 COL 24, 109, 209 ALP 36, 124, 191 MCR 37, 129, 211 DAW 24, 120, 211 PLN 43, 140, 216 NUT 20, 106, 149 WAT 28, 101, 213 AIR 25, 105 NAT 17, 75, 140 SMT 35, 138, 240 WWM 34, 115, 213
<ul style="list-style-type: none"> Recognizing and contrasting different epistemologies. 	CML 69, 141 COL 72, 109 ALP 90, 155, 240 MCR 95, 172 DAW 73, 120, 161 PLN 96, 140, 216 NUT 69, 149 WAT 61, 149, 213 AIR 66, 144 NAT 45, 98, 179

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	SMT 78, 192, 240 WWM 78, 171
<ul style="list-style-type: none"> Developing possible courses of action in response to scientific issues of local and global concern. 	CML 19, 61, 106 COL 61, 66, 157 ALP 153, 223 MCR 13, 89, 92, 107 DAW 47, 115, 138 PLN 79, 139 NUT 19, 56, 137 WAT 10, 59, 83 AIR 50, 87, 102 NAT 29, 38, 74, 139 SMT 107, 110, 184 WWM 22, 61, 97
<ul style="list-style-type: none"> Determining the validity of research conclusions in relations to the design, performance, and results. 	CML 106, 129, 178 COL 98, 216 ALP 18, 155 MCR 75, 126, 196 DAW 47, 105, 115 PLN 87, 94, 204 NUT 19, 60 AIR 53, 131

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	NAT 15, 61, 175 WWM 65, 71, 110
Applications for Science Learning	
The learner will be:	
<ul style="list-style-type: none"> Writing, following, modifying and extending instructions (e.g., equations, algorithms, formulas, flow diagrams, illustrations). 	CML 28-35, 50, 84, 117 COL 34, 79, 91 ALP 44, 49, 55, 131
<ul style="list-style-type: none"> Writing, following, modifying and extending instructions (e.g., equations, algorithms, formulas, flow diagrams, illustrations). <i>continued</i> 	MCR 103-104 DAW 41-42, 171-172 PLN 105, 114, 153 NUT 84-85, 157-158 WAT 71-72, 123-124 AIR 113 NAT 54-55, 106 SMT 42, 87, 147
<ul style="list-style-type: none"> Creating products, making inferences, and drawing conclusions using databases, spreadsheets, and other technologies. 	CML 32, 80, 94, 120 COL 34, 79, 91, 149, 179 ALP 43, 98, 131 MCR 64, 103 DAW 41-42, 85-86 PLN 105-107, 113-114 NUT 78, 113-116 WAT 71-72, 120, 124 AIR 35-36, 112 NAT 25, 56, 83, 112

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	SMT 42-43, 146-147
<ul style="list-style-type: none"> Predicting various scenarios and proposing solutions to community issues using scientific information (e.g., actuarial tables, census data, topographic maps, incidence data, climatic data). 	CML 16, 19, 61, 135 COL 61, 66, 156-157 ALP 153, 223 MCR 13, 91, 107 DAW 15, 47, 115 PLN 79, 139 NUT 17, 19, 56 WAT 10, 59, 83, 133
<ul style="list-style-type: none"> Predicting various scenarios and proposing solutions to community issues using scientific information (e.g., actuarial tables, census data, topographic maps, incidence data, climatic data). <i>continued</i> 	AIR 24, 53, 87, 102 NAT 17, 38, 72 SMT 110, 184 WWM 22, 61, 71
<ul style="list-style-type: none"> Using scientific evidence to consider options and formulating positions about the health and safety of others and themselves. 	CML 16, 19, 61, 135 COL 61, 66, 156-157 ALP 153, 223 MCR 13, 91, 107 DAW 15, 47, 115 PLN 79, 139 NUT 17, 19, 56 WAT 10, 59, 83, 133 AIR 24, 53, 87, 102 NAT 17, 38, 72 SMT 110, 184 WWM 22, 61, 71

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<ul style="list-style-type: none"> Searching for, using, creating and storing objects and information using various strategies and methods of organization and access. 	CML 14, 16, 106, 129, 178 COL 98, 158, 216 ALP 18, 155 MCR 75, 126, 196 DAW 15, 47, 73, 115 PLN 87, 94, 139 NUT 19, 60 WAT 11, 59, 63 AIR 53, 124, 131, 136 NAT 15, 61, 73, 175 SMT 110, 133
<ul style="list-style-type: none"> Searching for, using, creating and storing objects and information using various strategies and methods of organization and access. <i>continued</i> 	WWM 65, 67, 71, 110
<ul style="list-style-type: none"> Researching and writing environmental impact statements of their own design. 	CML 14, 16, 106, 129, 178 COL 98, 158, 216 ALP 18, 155 MCR 75, 126, 196 DAW 15, 47, 73, 115 PLN 87, 94, 139 NUT 19, 60 WAT 11, 59, 63 AIR 53, 124, 131, 136 NAT 15, 61, 73, 175 SMT 110, 133 WWM 65, 67, 71, 110

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<ul style="list-style-type: none"> Comparing school-based science perspectives with those gained through cutting-edge technological applications. 	CML 23, 28, 81, 89, 152 COL 29, 35, 77, 85, 174 ALP 46, 52, 158 MCR 42, 59, 99, 215 DAW 28, 87, 166, 173 PLN 56, 108, 150, 187 NUT 31, 80, 117, 198 WAT 66, 116, 164 AIR 37, 76, 115, 148 NAT 22, 49, 109, 150 SMT 44, 88, 195, 206 WWM 38, 81, 118, 124
<ul style="list-style-type: none"> Designing management plans for natural and human-altered environments (e.g., woodlots, patios, lots, lawns, farmlands, forests). 	CML 112, 137, 190 PLN 174 WAT 184, 192 NAT 207 WWM 65, 71, 142, 202, 204
<ul style="list-style-type: none"> Refining personal career interests. 	CML 20-22, 70-71, 114-115, 194-195 COL 26-27, 73-75 ALP 91-92, 125-127 MCR 38-40, 96-98 DAW 22-27, 121-125 PLN 44-45, 141-142 NUT 23-24, 108-109 WAT 30-31, 102-103

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	AIR 26-27, 106-107 NAT 46-47, 141-142 SMT 36-37, 139-140 WWM 79-80, 116-117
Performance Objectives	
1. The learner will collect and interpret data utilizing various sources and techniques on an event or phenomenon that occurs over a period of time (e.g., continental drift, mountain building, weather patterns, radioactive dating, Doppler shift of stellar emissions, structural fatigue in physical systems, population shifts).	CML 79, 87, 93, 120 COL 90, 145, 147, 149 ALP 43, 55, 98, 131 MCR 47, 103, 146 DAW 32, 41, 85, 90 PLN 53, 61, 105 NUT 29, 34, 84 WAT 71, 108, 114, 120, 123 AIR 35, 42, 80, 112
1. The learner will collect and interpret data utilizing various sources and techniques on an event or phenomenon that occurs over a period of time (e.g., continental drift, mountain building, weather patterns, radioactive dating, Doppler shift of stellar emissions, structural fatigue in physical systems, population shifts). <i>continued</i>	NAT 26, 56, 83, 149 SMT 43, 49, 87, 92, 147 WWM 43, 49, 87, 123, 130, 180
2. Given a collection of data (e.g., motion of objects, populations of organisms, observed characteristics of objects and organisms, astronomical data, behavioral patterns, environmental and habitat changes) the learner will propose an organizational structure for a database of the information that is useable by other learners.	CML 32, 80, 94, 120 COL 34, 79, 91, 119 ALP 43, 51, 56, 98 MCR 64, 103, 146 DAW 32-34, 85-86, 171-172 PLN 105-107, 113-114 NUT 78, 113-116

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	WAT 71-72, 120, 123-124 AIR 35-36, 112-114 NAT 25-26, 54-56, 83 SMT 42-43, 49
3. Given a set of learner-collected data concerning the transformations of matter and energy (e.g., thermoelectric effect, heat pumps and refrigeration, energy and materials transport in cell processes, matter to energy transformation through nuclear radiation, rock cycle, consumer uses of electricity), the learner will construct a model which adequately represents the transformation.	CML 89-95 ALP 195-200 MCR 42-48 DAW 224-229 AIR 70-75, 76-81 NAT 49-56
5. The learner will design an investigation of a natural phenomenon (e.g., soil structure, curvilinear motion, competition among living things, reproductive strategies in various organisms) and organize a research team to perform, summarize, and present the results of the investigation to an appropriate audience.	CML 134, 183, 190 COL 15, 102, 128 ALP 19, 216 MCR 119, 128 DAW 49, 63, 73, 135 PLN 164
5. The learner will design an investigation of a natural phenomenon (e.g., soil structure, curvilinear motion, competition among living things, reproductive strategies in various organisms) and organize a research team to perform, summarize, and present the results of the investigation to an appropriate audience. <i>continued</i>	WAT 18, 57, 80 AIR 13, 56, 127 NAT 97, 127 SMT 12, 58, 66, 73 WWM 67, 73, 93, 100
6. Provided with an example of a living area or workplace, the learner will propose practices to minimize potential hazards and risks to inhabitants.	CML 13, 16, 19, 61, 106, 109, 135 COL 55, 61, 66 ALP 153, 223 MCR 13, 89, 92, 107

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	DAW 15, 47, 105, 138 PLN 79, 137, 139, 162 NUT 15, 17, 19, 56, 66, 137 WAT 5, 10, 11, 59, 83, 133 AIR 24, 50, 53, 59, 87, 89, 102 NAT 10, 17, 29, 38, 72, 74, 139 SMT 107, 110, 133, 184 WWM 12, 22, 61, 71, 97
7. The learner will develop an evidence-based position regarding a scientific issue (e.g., genetic engineering, communicable diseases, resource management, funding for cutting-edge technology) and present a persuasive argument in a written or oral format.	CML 16, 106, 129 COL 98, 158, 216 ALP 18, 155 MCR 75, 126, 196 DAW 15, 47, 105 PLN 87, 94, 139 NUT 19, 60 AIR 53, 124, 136 NAT 15, 61, 73 WWM 65, 71, 110
8. The student will demonstrate an understanding of the concept of entropy by applying the concept to describe the effects of interactions and transformations on the structure and function of living and nonliving systems.	
GRADE LEVEL TWELVE	
Scientific Inquiry	
The learner will:	
<ul style="list-style-type: none"> Demonstrate various logical connections between related concepts (e.g., entropy, conservation of energy). 	CML 7, 177, 184

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	COL 6 ALP 67-77, 77-81 MCR 68-71 DAW 144-145, 166-172 PLN 17-18 NUT 7-12, 66-68 WAT 178-179 AIR 61-65, 96-98 NAT 6-9, 38, 49-56 SMT 35 WWM 57, 166-167
<ul style="list-style-type: none"> Account for discrepancies between theories and observations. 	CML 69, 112, 141 COL 24, 72, 170 ALP 36, 90, 155, 240 MCR 37, 129, 211 DAW 24, 73, 161, 211 PLN 43, 140, 216 NUT 20, 69, 106 WAT 28, 61, 149, 213
<ul style="list-style-type: none"> Account for discrepancies between theories and observations. <i>continued</i> 	AIR 25, 16, 105 NAT 17, 45, 75, 140 SMT 35, 79, 138, 192 WWM 34, 78, 115, 213
<ul style="list-style-type: none"> Analyze the changes within a system when inputs, outputs, and interactions are altered. 	CML 56, 175-177 COL 9

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	ALP 12, 67-77, 79-81 MCR 77-79, 150-152 DAW 138 PLN 76-78 NUT 42-43 AIR 61-65, 96-98 NAT 6-7, 31-35 SMT 12-13, 32-35, 54-55 WWM 26-27, 63-64
<ul style="list-style-type: none"> • Create, standardize, and document procedures. 	CML 24-27, 117-121, 145-151 COL 35-40, 85-92, 142-149 ALP 46-51, 94-98, 127-132 MCR 49-64, 99-104, 141-148 DAW 28-33, 79-86, 166-172 PLN 56-63, 108-114, 225-230 NUT 31-35, 74-79, 110-116 WAT 66-72, 109-115, 121-124 AIR 29-36, 76-81 NAT 22-26, 79-83 SMT 44-49, 81-87 WWM 44-49, 118-123
<ul style="list-style-type: none"> • Determine the sources of significant disparities between the predicted and recorded results and change research procedures to minimize disparities. 	CML 33, 80, 120, 151 COL 40, 84, 119, 180 ALP 49-51, 131-132 MCR 47-48, 103-104

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	DAW 85-86, 171-172 PLN 62-63, 105-107 NUT 30, 35, 113-116 WAT 71-72, 120 AIR 74-75, 112-114 NAT 25-26, 106-107 SMT 42-43, 49, 71 WWM 43, 49, 87, 103
<ul style="list-style-type: none"> Research, locate, and propose applications for abstract patterns (e.g., fractals, fibonacci, sequences, string theory, orbitals). 	CML 14, 16, 106, 129, 178 COL 98, 158, 216 ALP 18, 155 MCR 75, 126, 196 DAW 15, 47, 73, 105, 138 PLN 87, 94, 139 NUT 19, 60 AIR 53, 124 NAT 15, 61, 73 WWM 65, 71, 110
<ul style="list-style-type: none"> Recognize and utilize classification systems for particles, elements, compounds, phenomena, organisms, and others for exploring and predicting properties and behaviors. 	CML 7, 13, 37, 68, 89 COL 56-57, 174-181

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	ALP 19-20, 114-121 MCR 85-87 DAW 6-7 NUT 104-105, 178-181 AIR 46-50 NAT 9-10, 87-88, 176-179 SMT 18-20, 95-98, 115 WWM 16-18, 54-57, 139
<ul style="list-style-type: none"> Suggest and defend alternative experimental designs and data explanations (e.g., sampling, controls, safeguards). 	CML 27, 32, 80, 88, 121 COL 34, 84, 149 ALP 45, 55, 98 MCR 64, 104, 140 DAW 42, 86, 91 PLN 55, 63, 107, 155 NUT 30, 35, 116, 158 WAT 72, 115, 120 AIR 36, 43, 114 NAT 26, 56, 83, 113 SMT 49, 146-147 WWM 43, 49, 87, 123

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<ul style="list-style-type: none">Recognize and communicate differences between questions that can be investigated in a scientific way and those that rely on other ways of knowing.	CML 20, 69, 112, 141, 193 COL 24, 71, 109, 136 ALP 36, 89, 124, 191 MCR 37, 95, 129, 211 DAW 24, 73, 161 PLN 43, 96, 183 NUT 69, 106, 194 WAT 28, 101, 212 AIR 25, 105 NAT 45, 75, 98 SMT 35, 138, 192 WWM 34, 115, 171
<ul style="list-style-type: none">Draw conclusions based on the relationships among data analysis, experimental design, and possible models and theories.	CML 27, 32, 80 COL 34, 84, 149 ALP 45, 55-56, 132 MCR 47-48, 64, 140 DAW 32-34, 85-86, 171-172 PLN 53-55, 105-107 NUT 30, 113-116 WAT 71-72, 120 AIR 35-36, 42-43, 112-114 NAT 42-43, 86-87 SMT 25-26, 54-56, 83 WWM 42-43, 49, 146-147

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STRANDS	PAGE REFERENCES
<ul style="list-style-type: none"> Suggest new questions as a result of reflection on and discussions about their own scientific investigations. 	CML 84, 121, 151 COL 40, 119, 180 ALP 51, 97-98, 199 MCR 103-104, 146-147 DAW 41-42, 90-91 PLN 62-63, 113-114, 155 NUT 35, 157-158 WAT 114-115, 123-124 AIR 35-36, 42-43, 112-114 NAT 48-49, 122-123 SMT 83, 106-108, 112-113 WWM 42-43, 49, 146-147
<ul style="list-style-type: none"> Investigate, assess, and comment on strengths and weakness of the descriptive and predictive powers of science. 	CML 27, 32, 80, 84, 151 COL 34, 40, 119, 149 ALP 45, 51, 132, 199 MCR 47-48, 103-104 DAW 32-34, 41-42, 171-172 PLN 53-55, 113-114, 135 NUT 30, 35, 157-158 WAT 71-72, 114-115, 120 AIR 35-36, 42-43, 112-114 NAT 42-43, 48-49, 122-123 SMT 25-26, 83 WWM 42-43, 49, 146

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<ul style="list-style-type: none"> Create new information from representations of data in a variety of forms (e.g., symbols, descriptive languages, graphic formats) utilizing a variety of techniques (e.g., interpolations, extrapolations, linear regressions, central tendencies, correlations). 	CML 32, 80, 88, 94, 120 COL 34, 79, 119 ALP 43, 51, 98 MCR 64, 103, 147 DAW 32-34, 85-86, 171-172 PLN 105-107, 113-114 NUT 78, 113-116 WAT 71-72, 120 AIR 35-36, 42-43 SMT 25-26, 83, 106-108 WWM 42-43, 49, 146-147
Scientific Knowledge	
The learner will:	
<ul style="list-style-type: none"> Formulate limitations and refinements of standard classification systems (e.g., periodic table, IUPAC, Linnean, standard model). 	CML 13, 37, 56, 112, 139, 165 COL 56-57, 174-181 ALP 14-16, 19-20, 114-121 MCR 85-87, 94 DAW 6-7 NUT 104-105, 178-181 AIR 46-50 NAT 9-10, 87-88, 176-179 SMT 18-20, 95-98, 115

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	WWM 16-18, 29-30, 54-57
<ul style="list-style-type: none"> Formulate specific cases of limitations and possible exceptions of theories and principles regarding the interactions of moving objects and organisms (e.g., fluid flow in vessels, motion near the speed of light, Heisenberg uncertainty principle, meteorological prediction, local variation and diversity, predicting earthquakes, energy transport in cellular respiration). 	CML 7, 177, 184 COL 6 ALP 69-77, 79-81 MCR 68-91 DAW 144-145, 166-172 PLN 17-18 NUT 7-12, 66-68 WAT 178-179 AIR 61-65, 96-98 NAT 6-7, 38, 49-56 SMT 35 WWM 57, 116, 167
<ul style="list-style-type: none"> Formulate plans and contingencies that can be used to accommodate for changes to and stresses on systems (e.g., wildlife and habitat management, corrosion prevention, noise abatement, structure design). 	CML 4, 7, 14, 37, 56, 89, 112 COL 56-57, 174-181 ALP 14-16, 19-20, 114-121 MCR 85-87, 94 DAW 6-7 NUT 104-105, 178-181 AIR 46-50 NAT 9-10, 87-88, 176-179 SMT 18-20, 95-98, 115

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	WWM 16-18, 29-30, 54-57, 139, 141
<ul style="list-style-type: none"> Formulate models of molecular, atomic, ionic, and subatomic structures and the physical and biological implications of these structures (e.g., genes, nucleons, quarks). 	CML 44 COL 18, 20 MCR 16, 75-77 DAW 61 PLN 199 NUT 128 WAT 53, 54, 85 AIR 13, 56
<ul style="list-style-type: none"> Formulate estimates for a wide range of measurements and scales (i.e., angstroms to light years). 	CML 136 COL 136 ALP 25, 108, 188 MCR 163 DAW 186, 192 PLN 23, 86 NUT 9-11 WAT 17, 21, 23-24, 53 AIR 91, 127, 138 NAT 64, 131 SMT 12

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	WWM 76, 95
<ul style="list-style-type: none"> Formulate and interpret representations of time from origin to present accounting for phenomena of scale (e.g., smoothness, punctuations, chaos). 	CML 125 COL 131, 158 PLN 199
<ul style="list-style-type: none"> Formulate interpretations of the historical development of various theories of possible causes of diversity among physical and biological phenomena (e.g., the works of Aristotle, Mendel, Darwin, McClintock). 	CML 133, 135 COL 5 ALP 86, 109 WAT 23-24
<ul style="list-style-type: none"> Formulate models and hypotheses that can be used to explain the interactions of components within technological, and ecological systems. 	CML 7 COL 49, 60 ALP 65, 187, 212 MCR 163, 166 DAW 15 PLN 86, 136 NUT 89 WAT 23-24, 53-54 NAT 35 SMT 12, 158 WWM 22, 76
Conditions for Learning Science	
The learner will be:	
<ul style="list-style-type: none"> Developing multimedia presentations of group and individual research projects and investigations appropriate for a variety of audiences and forums. 	CML 134, 183, 190 COL 15, 96, 102, 107, 128 ALP 7, 19, 216 MCR 119, 128

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	DAW 4, 49, 63, 73, 95, 135 PLN 164 WAT 13, 18, 57, 80, 89 AIR 6, 13, 56, 127 NAT 39, 97, 129 SMT 12, 58, 66, 73, 135 WWM 32, 67, 73, 93
<ul style="list-style-type: none"> Producing interesting and scientifically correct stories and presenting them using various modes of expression. 	CML 7, 14, 19, 56, 98 COL 16, 19, 43, 60, 196 ALP 24, 60, 77, 100, 173 MCR 12, 67, 84 DAW 15, 21, 68 PLN 36, 117, 211 NUT 13, 19, 141 WAT 3, 34, 177, 211 AIR 13, 94, 123 NAT 29, 63, 93 SMT 4, 21, 212 WWM 15, 21, 187
<ul style="list-style-type: none"> Reflecting on the ideas and content found in their own journal records. 	CML 19, 69, 112, 141, 193 COL 24, 72, 109, 170 ALP 36, 90, 124, 191

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	MCR 37, 95, 129, 211 DAW 24, 73, 120, 161 PLN 43, 96, 140 NUT 69, 106, 149 WAT 28, 61, 101, 149 AIR 25, 66, 105 NAT 45, 75, 140, 179 SMT 35, 78, 138, 240 WWM 34, 78, 171, 213
<ul style="list-style-type: none"> Examining ambiguous results and formulating explanations. 	CML 20, 112, 141 COL 24, 71, 136 ALP 89, 124, 191 MCR 95, 129, 211 DAW 24, 73, 161 PLN 43, 96, 183 NUT 69, 106, 194 WAT 28, 101, 212 AIR 25, 105 NAT 45, 75, 98 SMT 35, 138, 192 WWM 34, 115, 171
<ul style="list-style-type: none"> Recognizing, and synthesizing the contributions to scientific thought of 	CML 20, 70, 114, 194

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<p>individuals from many cultures.</p>	<p>COL 26, 73, 171 ALP 37, 91, 156 MCR 38, 96, 213 DAW 25, 74, 211 PLN 44, 97, 184 NUT 70, 107, 195 WAT 29, 62, 102 AIR 67, 106, 146 NAT 18, 46, 180 SMT 79, 139, 193 WWM 35, 79, 172</p>
<ul style="list-style-type: none"> Constructing models and simulations of the component structures and functions of living and non-living entities. 	<p>CML 56, 68, 89, 112, 139 COL 56-57, 174-181 ALP 14-16, 19-20, 114-121 MCR 85-87, 94 DAW 6-7 NUT 104-105, 178-181 AIR 46-50 NAT 9-10, 87-88, 176-179 SMT 18-20, 95-98, 115 WWM 16-18, 29-30, 54-57</p>
<ul style="list-style-type: none"> Leading multi-age groups in the examination of and planned resolution for 	<p>CML 134, 183, 190</p>

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scientific issues.	COL 15, 96, 102, 107, 128 ALP 7, 19, 216 MCR 119, 128 DAW 4, 49, 63, 73, 95, 135 PLN 164 WAT 13, 18, 57, 80, 89 AIR 6, 13, 56, 127 NAT 39, 97, 129 SMT 12, 58, 66, 73, 135 WWM 32, 67, 73, 93
<ul style="list-style-type: none"> Recognizing and choosing members of research teams based upon the merit of their ideas and skills. 	CML 134, 183, 190 COL 15, 96, 102, 107, 128 ALP 7, 19, 216 MCR 119, 128 DAW 4, 49, 63, 73, 95, 135 PLN 164 WAT 13, 18, 57, 80, 89 AIR 6, 13, 56, 127 NAT 39, 97, 129

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	SMT 12, 58, 66, 73, 135 WWM 32, 67, 73, 93
<ul style="list-style-type: none"> Constructing a portfolio of products, documentation, and self-evaluations of his/her own abilities, skills, and experiences. 	CML 3, 35, 97, 123, 161 COL 3, 42, 94, 196 ALP 3, 59, 100, 165 MCR 3, 66, 148, 181 DAW 3, 44, 93, 133, 183 PLN 3, 65, 116, 157 NUT 3, 37, 88, 124 WAT 3, 33, 74, 126 AIR 3, 45, 83 NAT 3, 28, 58 SMT 3, 51, 94, 155, 212 WWM 3, 51, 89, 138, 186
<ul style="list-style-type: none"> Synthesizing scientific information from variety of sources. 	CML 32, 80, 94, 120 COL 34, 79, 119, 179 ALP 43, 51, 98 MCR 64, 103, 146-147 DAW 32-34, 85-86, 172 PLN 105-107, 113-114 NUT 78, 113-116 WAT 71-72, 120

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	AIR 35-36, 42-43 NAT 48-49, 86, 123 SMT 25-26, 83, 106-108 WWM 42-43, 49
<ul style="list-style-type: none"> Evaluating and prioritizing scientific issues based upon risk-benefit analyses. 	CML 7, 14, 19, 56, 98 COL 16, 19, 43, 60, 196 ALP 24, 60, 77, 100, 173 MCR 12, 67, 84 DAW 15, 21, 68 PLN 36, 117, 211 NUT 13, 19, 141 WAT 3, 34, 177, 211 AIR 13, 94, 123 NAT 29, 63, 93 SMT 4, 21, 212 WWM 15, 21, 187
<ul style="list-style-type: none"> Refining scientific skills from a variety of experiences. 	CML 72-80, 117-121, 145-151 COL 29-34, 77-84, 115-119 ALP 40-45, 52-57, 127-132 MCR 49-64, 132-140 DAW 34-42, 79-86, 166-172 PLN 46-55, 100-107, 150-155

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	NUT 25-30, 74-79, 110-116 WAT 66-72, 109-115, 121-124 AIR 37-44, 76-81, 109-114 NAT 44-49, 81-87, 118-123 SMT 49-56, 79-83, 109-114 WWM 44-49, 88-92, 148-153
Applications for Science Learning	
The learner will be:	
<ul style="list-style-type: none"> Promoting public awareness of the interaction of technology with social issues. 	CML 13, 16, 19, 61, 106, 109, 135 COL 55, 61, 66, 156-157 ALP 153, 223 MCR 13, 89, 92, 107 DAW 15, 47, 105, 138 PLN 79, 137, 139, 162 NUT 15, 17, 19, 56, 66, 137 WAT 5, 10, 11, 59, 83, 133 AIR 24, 50, 53, 58, 87, 99, 102 NAT 10, 17, 29, 38, 72, 74, 139 SMT 107, 110, 133, 184 WWM 12, 22, 61, 71, 97
<ul style="list-style-type: none"> Advocating and proposing courses of action for local and global scientific issues using global networks. 	CML 13, 16, 19, 61, 106, 109, 135 COL 55, 61, 66, 156-157 ALP 153, 223 MCR 13, 89, 92, 107

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	DAW 15, 47, 105, 138 PLN 79, 137, 139, 162 NUT 15, 17, 19, 56, 66, 137 WAT 5, 10, 11, 59, 83, 133 AIR 24, 50, 53, 58, 87, 99, 102 NAT 10, 17, 29, 38, 72, 74, 139 SMT 107, 110, 133, 184 WWM 12, 22, 61, 71, 97
<ul style="list-style-type: none"> Using appropriate technologies to prepare and present the findings of investigations incorporating tables, graphs, diagrams and text. 	CML 120, 147, 158 COL 90, 179, 192 ALP 55, 131, 162 MCR 103 DAW 171, 180, 222 PLN 53, 61, 104-105 NUT 78, 84, 115 WAT 71, 108, 157 AIR 42, 80, 112 NAT 25, 54, 112 SMT 42, 49, 92 WWM 86, 129, 220
<ul style="list-style-type: none"> Making informed consumer choices by evaluating and prioritizing information, evidence, and strategies. 	CML 13, 16, 19, 61, 106, 109, 135 COL 55, 61, 66, 156-157

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	ALP 153, 223 MCR 13, 89, 92, 107 DAW 15, 47, 105, 138 PLN 79, 137, 139, 162 NUT 15, 17, 19, 56, 66, 137 WAT 5, 10, 11, 59, 83, 133 AIR 24, 50, 53, 58, 87, 99, 102 NAT 10, 17, 29, 38, 72, 74, 139 SMT 107, 110, 133, 184 WWM 12, 22, 61, 71, 97
<ul style="list-style-type: none"> Developing an informed point of view that allows for validation or refutation of the scientific statements and claims of advocates before pursuing courses of action, (e.g., contributing support, signing petitions, casting votes). 	CML 19, 69, 112, 141, 193 COL 24, 71, 109, 136, 169 ALP 36, 89, 124, 155, 191, 240 MCR 37, 95, 129, 172, 211 DAW 24, 73, 120, 161, 211 PLN 43, 63, 140, 183, 216 NUT 20, 69, 106, 149, 194 WAT 28, 61, 101, 149, 212 AIR 25, 66, 105, 144 NAT 17, 45, 75, 98, 140 SMT 35, 78, 138, 192, 240 WWM 34, 78, 115, 171, 213

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<ul style="list-style-type: none"> Differentiating between observations and inferences in the exploration of evidence related to personal, scientific, and community issues. 	CML 19, 69, 112, 141, 193 COL 24, 71, 109, 136, 169 ALP 36, 89, 124, 155, 191, 240 MCR 37, 95, 129, 172, 211 DAW 24, 73, 120, 161, 211 PLN 43, 63, 140, 183, 216 NUT 20, 69, 106, 149, 194 WAT 28, 61, 101, 149, 212 AIR 25, 66, 105, 144 NAT 17, 45, 75, 98, 140 SMT 35, 78, 138, 192, 240 WWM 34, 78, 115, 171, 213
<ul style="list-style-type: none"> Developing and writing environmental impact, and safety and hygiene management plans. 	CML 13, 16, 19, 61, 106, 109, 135 COL 55, 61, 66, 156-157 ALP 153, 223 MCR 13, 89, 92, 107 DAW 15, 47, 105, 138 PLN 79, 137, 139, 162 NUT 15, 17, 19, 56, 66, 137 WAT 5, 10, 11, 59, 83, 133 AIR 24, 50, 53, 58, 87, 99, 102 NAT 10, 17, 29, 38, 72, 74, 139 SMT 107, 110, 133, 184 WWM 12, 22, 61, 71, 97

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<ul style="list-style-type: none"> Using technology to collect, analyze and communicate information (e.g., electronic networks, desktop publishing, remote sensing, graphing calculators, satellite telemetry, and others). 	CML 31, 118, 180, 196 COL 82, 186 ALP 183 MCR 51, 135, 159 DAW 103, 221 WAT 160, 203 AIR 41, 87, 111 NAT 81 WWM 204
<ul style="list-style-type: none"> Designing, constructing, and marketing inventions. 	COL 14, 155 ALP 216 MCR 25, 110 DAW 58, 197, 209 PLN 94, 174 WAT 198 WWM 93
Performance Objectives:	
1. Given contradictory observations of a phenomenon (e.g., diversity of plant coloration in a local area, analysis of collision events, micromechanics of corrosion, patterns of ocean tides, energy flows in an electrochemical system, energy relationships in cells), the learner will present a complete proposal for testing an hypothesis including clear statement of the problem, appropriate hypotheses complete scientific procedures, data collection methods, analysis protocols and communication plans as a member.	CML 89-85 MCR 42-48 PLN 46-55

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<p>2. Demonstrate understanding of a model of a concept of phenomenon (e.g., micromolecular structure of DNA, speciation, the photoelectric effect, quantum-mechanical model of matter, and energy, genetics and growth, interactions in fault structures, the special and general theory of relativity) by translating between physical, verbal, and mathematical presentations, expressing the essential components of the models, interactions between components, and limitations of the model.</p>	<p>COL 35-40, 141-149, 174-181 MCR 132-140</p>
<p>3. The learner will demonstrate the use of a standard classification system to accurately predict properties, interactions, and analyze data (e.g., use the Standard Model to predict allowable interactions and observable properties of fundamental particles, use the IUPAC system to analyze the structure of organic crystals, use the H-R Diagram to analyze the relative age of observed stars, use the periodic table to predict properties and interactions among and between various elements, use a biological classification system to predict the genetic correlation between groups of organisms, use EM spectra to predict levels of hazard associated with exposure to various EM regions over time).</p>	<p>MCR 132-140</p>
<p>4. The learner will construct and present a summary of human impacts on the environment when provided with data collected from the area.</p>	<p>NAT 22-26, 188-194</p>
<p>5. The learner will implement a plan for the management of a system over a period of one month or more (e.g., a solar powered structure, a marine aquarium, a robot, his/her body, an automobile, a compost system, a swimming pool) that is based upon learner-collected information and data.</p>	<p>WWM 81-87, 131-136, 216-221</p>
<p>6. The learner will relate the impact of historical scientific discoveries to the issues confronting contemporary society (e.g., vaccinations, plastics, xerography, polarizing filters, military technologies, nuclear energy, earthquakes, anesthesia, antiseptics) using a persuasive presentation of a fully-developed position.</p>	<p>DAW 34-42, 79-86</p>
<p>7. The learner will demonstrate an understanding of the overarching organization in the universe (e.g., relativity, entropy, chaos, grand unification theories) by applying an organizer to describe interactions and transformations in living and</p>	<p>CML 196-202 COL 174-181</p>

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applying an organizer to describe interactions and transformations in living and nonliving systems.	AIR 70-75