

Strand 1 – Thinking and Practice – **SCIENTIFIC METHOD**

Essential Question: How do we find out about everything in the universe?

Category	Biology	End Learning Mastery	Assessment(s)	Resources
<p>Strand I THINKING & PRACTICE Process of Investigation SCIENTIFIC METHOD</p> <p>Standard I: Understand the processes of scientific investigations and use inquiry and scientific ways of observing, experimenting, predicting, and validating to think critically.</p> <p>Benchmark I: Use accepted scientific methods to collect, analyze, and interpret data and observations and to design and conduct scientific investigations and communicate results</p>	<p>1. Describe the essential components of an investigation, including appropriate methodologies, proper equipment, and safety precautions.</p> <p>2. Design and conduct scientific investigations that include:</p> <ul style="list-style-type: none"> • testable hypotheses • controls and variables • methods to collect, analyze, and interpret data • results that address hypotheses being investigated • predictions based on results • re-evaluation of hypotheses and additional experimentation as necessary • error analysis. <p>3. Use appropriate technologies to collect, analyze, and communicate scientific data (e.g., computers, calculators, balances, microscopes).</p> <p>4. Convey results of investigations using scientific concepts, methodologies, and expressions, including:</p> <ul style="list-style-type: none"> • scientific language and symbols • diagrams, charts, and other data displays • mathematical expressions and processes (e.g., mean, median, slope, proportionality) • clear, logical, and concise communication • reasoned arguments. <p>5. Understand how scientific theories are used to explain and predict natural phenomena (e.g., plate tectonics, ocean currents, structure of atom).</p>	<p>Critical evaluation of an issue.</p> <p>Analyze, interpret, communicate and share results.</p>		<p>11-18,24-25,30</p> <p>58-59,164-165,330-331,496-497,522-523,570-571,734-735,756-757,834-835,910-911,964-965</p> <p>14-15,24-25,58-59,67,73,84-85,104-105,173,188-189,209,214-215,274-275,436-537,476,496,497,522-523,544-545,626-627,658-659,686-687,714-715,734-735,834-835,874-875,964-965</p> <p>16 21,25,59,85,105,127,165,189,215,239,275,303,331,355,387,415,437,461,497,523,545,571,599,627,659,687,715,735,757,777,811,853,875,911,937,965,989,1017,1043,1099-1101</p> <p>18,30,141-151,369,376-377,379,392-415,1060-1061 Lab: 1-1 How can Scientific Methods Be Used to Solve a</p>

				<p>Problem LAB: Using SI Units</p> <p>Connection To Math Solution from Ratios</p>
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Strand 1 - Thinking and Practice – SCIENTIFIC THINKING

Essential Question: How do we find out about things and agree on an answer?

Category	Biology	End Learning Mastery	Assessment(s)	Resources
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<p>Strand 1 THINKING & PRACTICE Process of Investigation SCIENTIFIC THINKING</p> <p>Standard I: Understand the processes of scientific investigations and use inquiry and scientific ways of observing, experimenting, predicting, and validating to think critically.</p> <p>Benchmark II: Understand that scientific processes produce scientific knowledge that is continually evaluated, validated, revised, or rejected.</p>	<p>1. Understand how scientific processes produce valid, reliable results, including:</p> <ul style="list-style-type: none"> • consistency of explanations with data and observations • openness to peer review • full disclosure and examination of assumptions • testability of hypotheses • repeatability of experiments and reproducibility of results. <p>2. Use scientific reasoning and valid logic to recognize:</p> <ul style="list-style-type: none"> • faulty logic • cause and effect • the difference between observation & unsubstantiated inferences and conclusions • potential bias. <p>3. Understand how new data and observations can result in new scientific knowledge.</p> <p>4. Critically analyze an accepted explanation by reviewing current scientific knowledge.</p> <p>5. Examine investigations of current interest in science (e.g., superconductivity, molecular machines, age of the universe).</p> <p>6. Examine the scientific processes and logic used in investigations of past events (e.g., using data from crime scenes, fossils), investigations that can be planned in advance but are only done once (e.g., expensive or time-consuming experiments such as medical clinical trials), and investigations of phenomena that can be repeated easily and frequently.</p>	<p>Understand and report the importance of peer review.</p>		<p>12,16,18,25,30,127,275,415,545, 627,687,1043</p> <p>21,26,85,165,303,911,927,938</p> <p>16,18,25,29,59,127,165,275,331,415,523,545,627,687,757,835,875,965,1043,1060-1061</p> <p>17,18,21-23,26,388</p> <p>1,28,341 – 348,349,353,354,355,356,358,363,660,688</p> <p>11-18,19-23,104-105,351,370-375,386-387,399-400,1060-1061</p>
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Strand 1 – Thinking and Practice – MATH SKILLS

Essential Question: What skills and tools do we need to find out about our universe?

Category	Biology	End Learning Mastery	Assessment(s)	Resources
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<p>Strand 1 THINKING & PRACTICE Process of Investigation MATH SKILLS</p> <p>Standard I: Understand the processes of scientific investigations and use inquiry and scientific ways of observing, experimenting, predicting, and validating to think critically.</p> <p>Benchmark III: Use mathematical concepts, principles, and expressions to analyze data, develop models, understand patterns and relationships, evaluate findings, and draw conclusions.</p>	<ol style="list-style-type: none"> 1. Create multiple displays of data to analyze and explain the relationships in scientific investigations. 2. Use mathematical models to describe, explain, and predict natural phenomena. 3. Use technologies to quantify relationships in scientific hypotheses (e.g., calculators, computer spreadsheets and databases, graphing software, simulations, modeling). 4. Identify and apply measurement techniques and consider possible effects of measurement errors. 	<p>Evaluate data displayed in graphs.</p> <p>Understand and use the rules of probability as they apply to genetics.</p> <p>Understand the mathematical concepts behind radioactive dating.</p>		<p>24- 25,59,85,105,127,188,215, 239,275,331,387,415,437, 461,523,545,599,626,687, 776,853,875,936,988- 989,1017,1043</p> <p>95-102,104- 105,203,276,291,350,384, 386-387,414-416,426</p> <p>24,-25,104, 105,127,239,274- 285,415-416,544,545,599, 627,687,853</p> <p>58-59,84-85,173,188- 189,24-215,239,274- 275,436- 437,476,545,627,989</p> <p>92,102,154- 155,173,212,276,350,397, 416,746,9-03,928,1097</p> <p>Problem Solving Lab 10.1</p>
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Strand II Content of Science – PHYSICAL SCIENCE – Forms of Matter

Essential Question: What is the universe made of?

Category	Biology	End Learning Mastery	Assessment(s)	Resources
Strand II: Content of Science PHYSICAL SCIENCE Forms of Matter Standard I): Understand the structure and properties of	15. Describe how the rate of chemical reactions depends on many factors that include temperature, concentration, and the presence of catalysts.	Understand different trophic levels.		

<p>matter, the characteristics of energy, and the interactions between matter and energy.</p> <p>Benchmark I: Understand the properties, underlying structure, and reactions of matter.</p>				
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Strand II Content of Science – **PHYSICAL SCIENCE – Properties of Matter**

Essential Question: How does the universe work?

Category	Biology	End Learning Mastery	Assessment(s)	Resources
<p>Strand II: Content of Science</p> <p>PHYSICAL SCIENCE Properties of Matter</p> <p>Standard I): Understand the structure and properties of</p>	<p>9. Know that each kind of atom or molecule can gain or lose energy only in discrete amounts.</p>	<p>Understand Geochemical cycles, Photosynthesis, and other Biochemical cycles.</p>		<p>50,134,48-52,133-134, 225-230,2247,559,</p> <p>CD ROM Problem Solving Lab 2.2</p> <p>Foldables page 225</p> <p>Mini-lab 9.1 Problem Solving Lab 9.2</p> <p>Internet Lab What Factors Influence Photosynthesis?</p>

matter, the characteristics of energy, and the interactions between matter and energy. Benchmark II: Understand the transformation and transmission of energy and how energy and matter interact				
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Strand II Content of Science – LIFE SCIENCE Forms & Structure

Essential Question: How do living things in the universe interact?

Category	Biology	End Learning Mastery	Assessment(s)	Resources
Strand II: Content of Science LIFE SCIENCE Forms & Structure Standard II (Life Science): Understand the properties, structures, and	Ecosystems 1. Know that an ecosystem is complex and may exhibit fluctuations around a steady state or may evolve over time. 2. Describe how organisms cooperate and compete in ecosystems (e.g., producers, decomposers, herbivores, carnivores, omnivores, predator-prey, symbiosis, mutualism). 3. Understand and describe how available resources limit the amount of life an ecosystem can	Understanding of biodiversity and it's relationship to ecosystem stability.		65-69,84-85,88-89,135 44-45,62-63,132-133,136-137 37-38,42-43,58-59,62-63,93-94,109,134

<p>processes of living things and the interdependence of living things and their environments.</p> <p>Benchmark I: Understand how the survival of species depends on biodiversity and on complex interactions, including the cycling of matter and the flow of energy.</p>	<p>support (e.g., energy, water, oxygen, nutrients).</p> <p>4. Critically analyze how humans modify and change ecosystems (e.g., harvesting, pollution, population growth, technology).</p> <p>Energy Flow in the Environment</p> <p>5. Explain how matter and energy flow through biological systems (e.g., organisms, communities, ecosystems), and how the total amount of matter and energy is conserved but some energy is always released as heat to the environment.</p> <p>6. Describe how energy flows from the sun through plants to herbivores to carnivores and decomposers.</p> <p>7. Understand and explain the principles of photosynthesis (i.e., chloroplasts in plants convert light energy, carbon dioxide, and water into chemical energy).</p> <p>Biodiversity</p> <p>8. Understand and explain the hierarchical classification scheme (i.e., domain, kingdom, phylum, class, order, family, genus, species), including:</p> <ul style="list-style-type: none"> • classification of an organism into a category • similarity inferred from molecular structure (DNA) closely matching classification based on anatomical similarities 			<p>Exploration The Lesson of the Kaibab Investigation How Does the Environment Affect an Eagle Population?</p> <p>23,26,54-57,60,62,119-120,128,348</p> <p>46-57,62-63,133-134</p> <p>46-53,62-63,133,220-221</p> <p>225-230,237-240,242-243,247,559</p> <p>443-461,464-465,469,1070-1071</p> <p>Lab 17-1 How Can a Key Be Used to Identify Organisms?</p>
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	<ul style="list-style-type: none"> • similarities of organisms reflecting evolutionary relationships. <p>9. Understand variation within and among species, including:</p> <ul style="list-style-type: none"> • mutations and genetic drift factors affecting the survival of an organism • natural selection. 			<p>Exploration Comparing Characteristics of Organisms 17-2</p> <p>Mini Lab 15.1 Detecting a Variation</p> <p>Problem Solving Lab 15-1 How Can Natural Selection be Observed</p> <p>397-399,404-415,418-419,468</p>
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Strand II Content of Science – LIFE SCIENCE – Life Forms in the Environment

Essential Question: Why do you look like you do?

Category	Biology	End Learning Mastery	Assessment(s)	Resources
Strand II: Content of Science LIFE SCIENCE Life Forms in the Environment Standard II (Life Science): Understand the properties, structures, and processes of living things and the	Genetics 1. Know how DNA carries all genetic information in the units of heredity called genes, including: <ul style="list-style-type: none"> the structure of DNA (e.g., subunits A, G, C, T) information-preserving replication of DNA alteration of genes by inserting, deleting, or substituting parts of DNA. 2. Use appropriate vocabulary to describe inheritable traits (i.e., genotype, phenotype).	Understand Mendelian Genetics as it relates to heredity and evolution.		281-295,306-307,341- 348,354-355,358- 359,362,404 Problem Solving Lab 11.1 Internet Lab How Can Phenotypes and Genotypes of Plants be Determined? 258-261,274-

<p>interdependence of living things and their environments.</p> <p>Benchmark II: Understand the genetic basis for inheritance and the basic concepts of biological evolution.</p>	<p>3. Explain the concepts of segregation, independent assortment, and dominant/recessive alleles.</p> <p>4. Identify traits that can and cannot be inherited.</p> <p>5. Know how genetic variability results from the recombination and mutation of genes, including:</p> <ul style="list-style-type: none"> • sorting and recombination of genes in sexual reproduction result in a change in DNA that is passed on to offspring • radiation or chemical substances can cause mutations in cells, resulting in a permanent change in DNA. <p>6. Understand the principles of sexual and asexual reproduction, including meiosis and mitosis.</p> <p>7. Know that most cells in the human body contain 23 pairs of chromosomes including one pair that determines sex, and that human females have two X chromosomes and human males have an X and a Y chromosome.</p> <p>Biological Evolution</p> <p>8. Describe the evidence for the first appearance of life on Earth as one-celled organisms, over 3.5 billion years ago, and for the later appearance of a diversity of multicellular organisms over millions of years.</p>			<p>275,278,339-340,404-405</p> <p>253-263,278-279,309-314,334-335,360-365</p> <p>321-322</p> <p>265-266,273,279,296-301,306-307</p> <p>Exploration Meiosis 10-1</p> <p>203-210,214-215,218-219,263-270,278-279,505</p> <p>263-266,318-319,326-329,334-335 Demo of Pasteur's Expt.</p> <p>369-385,388,390-391,467</p>
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	<p>9. Critically analyze the data and observations supporting the conclusion that the species living on Earth today are related by descent from the ancestral one-celled organisms.</p> <p>10. Understand the data, observations, and logic supporting the conclusion that species today evolved from earlier, distinctly different species, originating from the ancestral one-celled organisms.</p> <p>11. Understand that evolution is a consequence of many factors, including the ability of organisms to reproduce, genetic variability, the effect of limited resources, and natural selection.</p> <p>12. Explain how natural selection favors individuals who are better able to survive, reproduce, and leave offspring.</p> <p>13. Analyze how evolution by natural selection and other mechanisms explains many phenomena including the fossil record of ancient life forms and similarities (both physical and molecular) among different species.</p>			<p>388,390,396-403</p> <p>253-262,393-403,418-419</p> <p>369385,388,390-416,418-419,467-468</p> <p>395-396,407-409,414-415,418-419,468,860-861</p> <p>370-375,390-391,393,399-400,418-419,468</p>
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Essential Question: What are living things in the universe made of?

Category	Biology	End Learning Mastery	Assessment(s)	Resources
<p>Strand II: Content of Science</p> <p>LIFE SCIENCE Life Forms in the Environment</p> <p>Standard II (Life Science): Understand the properties, structures, and processes of living things and the interdependence of living things and their environments.</p> <p>Benchmark III: Understand the characteristics, structures, and functions of cells.</p>	<p>Structure and Function</p> <p>1. Know that cells are made of proteins composed of combinations of amino acids.</p> <p>2. Know that specialized structures inside cells in most organisms carry out different functions, including:</p> <ul style="list-style-type: none"> parts of a cell and their functions (e.g., nucleus, chromosomes, plasma, and mitochondria) storage of genetic material in DNA similarities and differences between plant and animal cells prokaryotic and eukaryotic cells. <p>3. Describe the mechanisms for cellular processes (e.g., energy production and storage, transport of molecules, waste disposal, synthesis of new molecules).</p> <p>4. Know how the cell membrane controls which ions and molecules enter and leave the cell based on membrane permeability and transport (i.e., osmosis,</p>	<p>Comprehend how a cell's structure relates to its function.</p>		<p>160-161,168,932-933</p> <p>173-174.180187,190,192-193,245,932-933</p> <p>Models of Plant and Animal Cells Problem Solving Lab 7.2 Mini Lab 7.2 Investigative BioLab</p> <p>Problem Solving Lab 7.1</p> <p>175-178,180-187,192,203-210,218-219,932-933</p> <p>175-179,192-193,195-</p>

	<p>diffusion, active transport, passive transport).</p> <p>5. Explain how cells differentiate and specialize during the growth of an organism, including:</p> <ul style="list-style-type: none"> • differentiation, regulated through the selected expression of different genes • specialized cells, response to stimuli (e.g., nerve cells, sense organs). <p>6. Know that DNA directs protein building (e.g., role of RNA).</p> <p>Biochemical Mechanisms</p> <p>7. Describe how most cell functions involve chemical reactions, including:</p> <ul style="list-style-type: none"> • promotion or inhibition of biochemical reactions by enzymes • processes of respiration (e.g., energy production, ATP) • communication from cell to cell by secretion of a variety of chemicals (e.g., hormones). 			<p>200,245,933</p> <p>Problem Solving Lab 7.3</p> <p>6-7,30,205-210.265-268,278-279,676-679,688,690,951-955,968-969,1005-1011,1048</p> <p>Video Protein Synthesis Foldables Protein Synthesis Problem Solving Lab 11.2 How Many Nitrogenous Bases Determine an Amino Acid</p> <p>Mini Lab 11.1 Transcribe and Translate BioLab Does Temperature Affect an Enzyme Reaction?</p> <p>288-295,302-303,206</p> <p>221-237,242-243,247-249,929-935,940-941</p>
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Strand II Content of Science – EARTH AND SPACE SCIENCE Universe/Solar System

Essential Question: Where did the universe come from and where is it going?

Category	Biology	End Learning Mastery	Assessment(s)	Resources
Strand II: Content of Science EARTH & SPACE	4. Describe the key observations that led to the acceptance of the Big Bang theory and that the age of the universe is over 10	Describe origin of the Universe and Earth.		369,380-383,467 Problem Solving Lab 14.2BioLab Determining a Rock's Age

SCIENCE Universe/Solar System Standard III (Earth and Space Science): Understand the structure of Earth, the solar system, and the universe, the interconnections among them, and the processes and interactions of Earth's systems. Benchmark I: Examine the scientific theories of the origin, structure, contents, and evolution of the solar system and the universe, and their interconnections.	billion years.			
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Strand II Content of Science – EARTH & SPACE SCIENCE Earth

Essential Question: Why, of all places in the universe, is the Earth the best place to live?

Category	Biology	End Learning Mastery	Assessment(s)	Resources
Strand II: Content of Science EARTH & SPACE	Characteristics and Evolution of Earth 1. Describe the characteristics and the evolution of Earth in terms of the geosphere, the	Understand how inorganic interacts with organic.		

<p>SCIENCE Earth</p> <p>Standard III (Earth and Space Science): Understand the structure of Earth, the solar system, and the universe, the interconnections among them, and the processes and interactions of Earth's systems.</p> <p>Benchmark II: Examine the scientific theories of the origin, structure, energy, and evolution of Earth and its atmosphere, and their interconnections.</p>	<p>hydrosphere, the atmosphere, and the biosphere.</p> <p>3. Describe the internal structure of Earth (e.g., core, mantle, crust) and the structure of Earth's plates.</p> <p>4. Understand the changes in Earth's past and the investigative methods used to determine geologic time, including:</p> <ul style="list-style-type: none"> • rock sequences, relative dating, fossil correlation, and radiometric dating • geologic time scales, historic changes in life forms, and the evidence for absolute ages (e.g., radiometric methods, tree rings, paleomagnetism). <p>Geochemical Cycles</p> <p>9. Know that Earth's system contains a fixed amount of natural resources that cycle among land, water, the atmosphere, and living things (e.g., carbon and nitrogen cycles, rock cycle, water cycle, ground water, aquifers).</p>			
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Strand III Science & Society – DISCOVER / INVENT Scientific Influence

Essential Question: How do we minimize the human footprint on the universe?

Category	Biology	End Learning Mastery	Assessment(s)	Resources
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<p>Strand III: Science and Society</p> <p>Discover / Invent Scientific Influence</p> <p>Standard I: Understand how scientific discoveries, inventions, practices, and knowledge influence, and are influenced by, individuals and societies.</p> <p>Benchmark I: Examine and analyze how scientific discoveries and their applications affect the world, and explain how societies</p>	<p>Science and Technology</p> <p>1, Know how science enables technology but also constrains it, and recognize the difference between real technology and science fiction (e.g., rockets vs. antigravity machines; nuclear reactors vs. perpetual-motion machines; medical X-rays vs. Star-Trek tricorders).</p> <p>2. Understand how advances in technology enable further advances in science (e.g., microscopes and cellular structure; telescopes and understanding of the universe).</p> <p>3. Evaluate the influences of technology on society (e.g., communications, petroleum, transportation, nuclear energy, computers, medicine, genetic engineering) including both desired and undesired effects, and including some historical examples (e.g., the wheel, the plow, the printing press, the lightning rod).</p> <p>4. Understand the scientific foundations of common technologies (e.g., kitchen appliances, radio, television, aircraft,</p>	<p>Understand DNA fingerprinting, HGP, Electrophoresis and Genetic Engineering.</p>		<p>22-23,171-173,341-343</p> <p>22-23,171-173,304,876,966,1064-1065</p> <p>Exploration Use of the Compound Light Microscope</p> <p>Investigation How Can a Microscope Be Used in the Laboratory?</p> <p>1,28,166,251,341-353,356,358,363,657,660 688</p>
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	<p>rockets, computers, medical X-rays, selective breeding, fertilizers and pesticides, agricultural equipment).</p> <p>5. Understand that applications of genetics can meet human needs and can create new problems (e.g., agriculture, medicine, cloning).</p> <p>Science and Society</p> <p>9. Describe how scientific knowledge helps decision makers with local, national, and global challenges (e.g., Waste Isolation Pilot Project [WIPP], mining, drought, population growth, alternative energy, climate change).</p> <p>10. Describe major historical changes in scientific perspectives (e.g., atomic theory, germs, cosmology, relativity, plate tectonics, evolution) and the experimental observations that triggered them.</p> <p>11. Know that societal factors can promote or constrain scientific discovery (e.g., government funding, laws and regulations about human cloning and</p>			<p>337-338,356,660,876,966,1018,1066-1067</p> <p>Video</p> <p>336-340,341-353,356,358-359</p> <p>111-128,130-131</p> <p>171-174,393-403,1064-1065</p> <p>21-23,28-</p>
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