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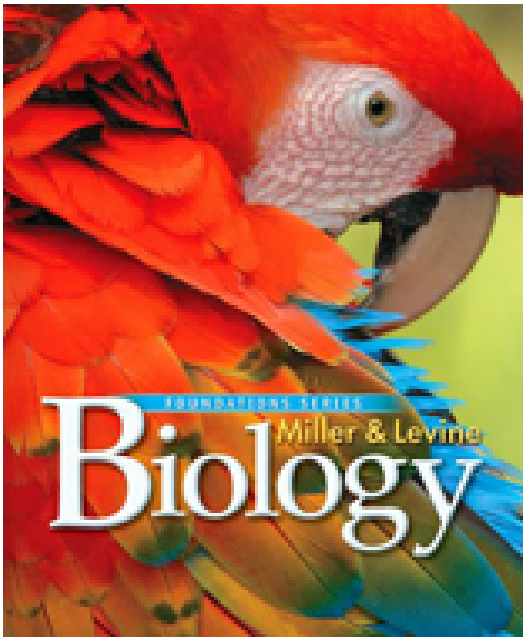

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- Course-Level Expectations –
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INTRODUCTION

This document demonstrates how Prentice Hall's ***Biology: Foundation Edition (Miller/Levine) © 2010*** meets the objectives of the Missouri Course-Level Expectations for Biology. Correlation page references are to the Student and Teacher's Editions and are cited at the page level. References also include the Laboratory Manual, Technology Resources, and other ancillaries. As page citations to the expectations are lengthy, in an effort to make this document most meaningful and workable, no more than fifteen references are provided for most standards.

This program is a great option for low-level and inclusion classrooms, with digital support on Biology.com. Authors Ken Miller and Joe Levine deliver the same trusted, relevant content in more accessible ways. Written at a lower grade level with a reduced page count, the text offers additional embedded reading support to make biology come alive for struggling learners. Foundations for Learning reading strategies provide the tools to make content accessible for all your students.

Resources

Study Workbook A and Study Workbook B: Reading Foundations offer leveled resources for students of varying abilities.

- Section Summaries help students prepare for tests.
- Study Worksheets make students active and engaged readers.
- Note taking skills development helps students build understanding.
- Vocabulary Reviews with graphic organizers help students master key terminology.

Laboratory Manual A and Laboratory Manual B: Skill Foundations offer leveled activities for students of varying abilities. Teachers can choose to differentiate activities within a classroom or select from various labs to choose one that best fits the whole class profile.

Biology.com, the latest in digital instruction technology, provides a pedagogically relevant interface for your biology classroom.

- Complete Student Edition online with audio
- Complete Teacher's Edition
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- Lesson review presentations
- Editable worksheets
- Test preparation, online assessments, and remediation
- Games, animals, and simulations
- Chapter mysteries from the textbook
- Interactive study guides

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Strand 1: Properties and Principles of Matter and Energy	
1. Changes in properties and states of matter provide evidence of the atomic theory of matter.	
Concepts	
I. Mass is conserved during any physical or chemical change	
a. Compare the mass of the reactants to the mass of the products in a chemical reaction or physical change (e.g., biochemical processes, carbon dioxide-oxygen cycle, nitrogen cycle, decomposition and synthesis reactions involved in a food web) as support for the Law of Conservation of Mass. DOK: 2	**SE/TE:** 63-65, 69-71, 136, 141, 199, 215, 517 **TR:** Study Workbook B: 34-40, 42, 120, 127, 130, 134 **TECH:** Biology.com: Art in Motion: Opposite Processes: Respiration and Photosynthesis
2. Energy has a source, can be stored, and can be transferred but is conserved within a system.	
Concepts	
F. Energy can be transferred within a system as the total amount of energy remains constant (i.e., Law of Conservation of Energy).	
a. Classify the different ways to store energy (i.e., chemical, nuclear, thermal, mechanical, electromagnetic) and describe the transfer of energy as it changes from kinetic to potential, while the total amount of energy remains constant, within a system (e.g., biochemical processes, carbon dioxide-oxygen cycle, nitrogen cycle, food web). DOK: 2	**SE/TE:** 43, 63-65, 192-193, 222 **TECH:** Biology.com: Visual Analogy: ATP as a Charged Battery; Transparency: 39, 40
Strand 3: Characteristic and Interactions of Living Organisms	
1. There is a fundamental unity underlying the diversity of all living organisms.	
Concepts	
A. Organisms have basic needs for survival.	
Not assessed at this level.	
B. Organisms progress through life cycles unique to different types of organisms.	
a. Recognize cells both increase in number and differentiate, becoming specialized in structure and function, during and after embryonic development. DOK: 1	**SE/TE:** 161, 182, 234-247, 248-251, 256, 323, 825, 828 **TR:** Study Workbook B: 140-141, 144-148, 150-154 **TECH:** Transparency: 134
b. Identify factors (e.g., biochemical, temperature) that may affect the differentiation of cells and the development of an organism. DOK: 1	**SE/TE:** 182, 248-251, 256, 323, 324, 555, 825, 828 **TR:** Study Workbook B: 149-152

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C. Cells are the fundamental units of structure and function of all living things	
a. Recognize all organisms are composed of cells, the fundamental units of structure and function. DOK: 1	**SE/TE:** 15, 16, 160, 714, 715 **TR:** Study Workbook B: 8-9, 12, 92-93
b. Describe the structure of cell parts (e.g., cell wall, cell membrane, cytoplasm, nucleus, chloroplast, mitochondrion, ribosome, vacuole) found in different types of cells (e.g., bacterial, plant, skin, nerve, blood, muscle) and the functions they perform (e.g., structural support, transport of materials, storage of genetic information, photosynthesis and respiration, synthesis of new molecules, waste disposal) that are necessary to the survival of the cell and organism. DOK: 2	**SE/TE:** 164-175, 182, 195, 323, 438-439, 714, 743, 757, 767, 770, 776, 790, 791 **TR:** Study Workbook B: 95-108, 115-116, 118-119, 121, 126-127, 129-132, 138 **TECH:** Biology.com: Art Review: Plant and Animal Cells, Visual Analogy: A Cell as a Living Factory; Transparency: 83, 86, 104, 106, 246
D. Plants and animals have different structures that serve similar functions necessary for the survival of the organism.	
Not assessed at this level.	
E. Biological classifications are based on how organisms are related.	
a. Explain how similarities used to group taxa might reflect evolutionary relationships (e.g., similarities in DNA and protein structures, internal anatomical features, patterns of development). DOK: 2	**SE/TE:** DOL 4-5, 430, 434, 436, 437, 440, 441, 457, 459, 465 **TR:** Lab Manual: 97-102; Study Workbook B: 267, 271-280
b. Explain how and why the classification of any taxon might change as more is learned about the organisms assigned to that taxon. DOK: 2	**SE/TE:** DOL 4-5, 430, 433, 434, 436, 437, 440, 441, 457, 459, 465 **TR:** Lab Manual: 299-300; Study Workbook B: 280 **TECH:** Transparency: 222
2. Living organisms carry out life processes in order to survive.	
Concepts	
A. The cell contains a set of structures called organelles that interact to carry out life processes through physical and chemical means.	
a. Compare and contrast the structure and function of mitochondria and chloroplasts. DOK: 2	**SE/TE:** 170, 182, 195, 196, 210, 211, 214, 218, 464 **TR:** Study Workbook B: 97-98, 100, 106, 127 **TECH:** Biology.com: Tutor Tube: Plants Have Mitochondria Too; Transparency: 85, 88, 89, 90, 104, 114

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b. Compare and contrast the structure and function of cell wall and cell membranes. DOK: 2	**SE/TE:** 39, 171, 172, 173, 175, 720 **TR:** Lab Manual: 45-48; Study Workbook B: 97-98, 100, 106 **TECH:** Biology.com: Interactive Art: Diffusion and Osmosis, Art In Motion: Active Transport; Transparency: 86, 92, 93, 94, 95, 98
c. Explain physical and chemical interactions that occur between organelles (e.g. nucleus, cell membrane, chloroplast, mitochondrion, ribosome) as they carry out life processes. DOK: 2	**SE/TE:** 165-173, 175, 177-179 **TR:** Study Workbook B: 97-99, 101-103, 106 **TECH:** Biology.com: Visual Analogy: A Cell as a Living Factory's Transparency: 84, 85
B. Photosynthesis and cellular respiration are complementary processes necessary to the survival of most organisms on Earth.	
a. Explain the interrelationship between the processes of photosynthesis and cellular respiration (e.g., recycling of oxygen and carbon dioxide), comparing and contrasting photosynthesis and cellular respiration reactions (Do NOT assess intermediate reactions). DOK: 2	**SE/TE:** 61, 196, 213, 215 **TR:** Study Workbook B: 127 **TECH:** Biology.com: Art in Motion: Opposite Processes: Respiration and Photosynthesis Transparency: 39, 106, 113, 118
b. Determine what factors affect the processes of photosynthesis and cellular respiration (i.e., light intensity, availability of reactants, temperature). DOK: 2	**SE/TE:** 61, 192, 197, 202, 213, 215 **TR:** Lab Manual: 251-252; Study Workbook B: 119, 123, 130 **TECH:** Biology.com: Art in Motion: Opposite Processes: Respiration and Photosynthesis; Transparency: 106, 108, 109, 113
C. Complex multicellular organisms have systems that interact to carry out life processes through physical and chemical means.	
Not assessed at this level.	
D. Cells carry out chemical transformations that use energy for the synthesis or breakdown of organic compounds.	
a. Summarize how energy transfer occurs during photosynthesis and cellular respiration as energy is stored in and released from the bonds of chemical compounds (i.e. ATP). DOK: 2	**SE/TE:** 60, 192, 193, 196, 200, 214, 216, 218, 220, 224 **TR:** Study Workbook B: 119-120 **TECH:** Transparency: 30, 101, 102, 113, 118
b. Relate the structure of organic compounds (e.g., proteins, nucleic acids, lipids, carbohydrates) to their role in living systems. DOK: 2	**SE/TE:** 38, 39, 40, 41, 172, 213, 290, 292, 308-314, 326, 720, 721 **TR:** Study Workbook B: 19-20, 121, 175-178, 189 **TECH:** Biology.com: Visual Analogy: Master Plans and Blueprints; Transparency: 20
c. Recognize energy is absorbed or released in the breakdown and/or synthesis of organic compounds. DOK: 1	**SE/TE:** 28-45, 51, 68, 739 **TR:** Study Workbook B: 111, 119-120, 123, 126, 131

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d. Explain how protein enzymes affect chemical reactions (e.g., the breakdown of food molecules, growth and repair, regulation). DOK: 2	**SE/TE:** 42-46, 297, 342, 357, 648, 724, 725 **TR:** Lab Manual: 301-302; Study Workbook B: 22-24, 26, 180, 466-467 **TECH:** Transparency: 23
e. Interpret a data table showing the effects of an enzyme on a biochemical reaction. DOK: 2	**SE/TE:** 44, 51, 739 **TR:** Lab Manual: 21-24
E. Protein structure and function are coded by the DNA (Deoxyribonucleic acid) molecule.	
a. Explain how the DNA code determines the sequence of amino acids necessary for protein synthesis. DOK: 2	**SE/TE:** 292, 309, 311-314, 326 **TR:** Lab Manual: 78-81 **TECH:** Transparency: 150, 166, 169
b. Recognize the function of protein in cell structure and function (i.e., enzyme action, growth and repair of body parts, regulation of cell division and differentiation). DOK: 1	**SE/TE:** 40-41, 44-46, 71, 297, 311, 342, 357, 648, 724, 725 **TR:** Study Workbook B: 20, 22-24, 26, 180, 466-467 **TECH:** Biology.com: Tutor Tube: Why Are Proteins So Important?; Transparency: 161, 162
F. Cellular activities and responses can maintain stability internally while external conditions are changing (homeostasis).	
a. Explain the significance of the selectively permeable membrane to the transport of molecules. DOK: 2	**SE/TE:** 176-180, 184, 193, 529, 533, 554, 558-559, 567-569, 650, 656 **TR:** Lab Manual: 45-48; Study Workbook B: 101-103 **TECH:** Transparency: 86
b. Predict the movement of molecules across a selectively permeable membrane (i.e., diffusion, osmosis, active transport) needed for a cell to maintain homeostasis given concentration gradients and different sizes of molecules. DOK: 2	**SE/TE:** 176-180, 184, 193, 529, 533, 554, 558-559, 567-569, 650, 656 **TR:** Lab Manual: 47; Study Workbook B: 101-103 **TECH:** Transparency: 123, 324
c. Explain how water is important to cells (e.g., is a buffer for body temperature, provides soluble environment for chemical reactions, serves as a reactant in chemical reactions, provides hydration that maintains cell turgidity, maintains protein shape). DOK: 2	**SE/TE:** 30, 33, 34, 568 **TR:** Lab Manual: 48; Study Workbook B: 17-18

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G. Life processes can be disrupted by disease (intrinsic failures of the organ systems or by infection due to other organisms).	
Not assessed at this level.	
3. There is a genetic basis for the transfer of biological characteristics from one generation to the next through reproductive processes.	
Concepts	
A. Reproduction can occur asexually or sexually.	
a. Distinguish between asexual (i.e., binary fission, budding, cloning) and sexual reproduction. DOK: 1	**SE/TE:** 15, 236, 237, 240, 361, 407, 412, 464, 465, 487, 507, 508, 516, 583, 584, 610, 678, 679, 824 **TR:** Study Workbook B: 140-141, 146, 441 **TECH:** Transparency: 127, 188, 283, 321
B. All living organisms have genetic material (DNA) that carries hereditary information.	
a. Describe the chemical and structural properties of DNA (e.g., DNA is a large polymer formed from linked subunits of four kinds of nitrogen bases; genetic information is encoded in genes based on the sequence of subunits; each DNA molecule in a cell forms a single chromosome) (Assess the concepts – NOT memorization of nitrogen base pairs). DOK: 1	**SE/TE:** 14, 16, 18, 40, 162, 239, 242, 290-299, 342-345, 463 **TR:** Lab Manual: 73-76; Study Workbook B: 174-178, 184-185 **TECH:** Transparency: 143, 151, 152, 162, 163, 164, 165, 166
b. Recognize that DNA codes for proteins, which are expressed as the heritable characteristics of an organism. DOK: 1	**SE/TE:** 296-299, 308-315, 326, 463 **TR:** Lab Manual: 77-82; Study Workbook B: 191-192 **TECH:** Transparency: 150
c. Recognize that degree of relatedness can be determined by comparing DNA sequences. DOK: 1	**SE/TE:** 342-345, 365, 366, 395, 417-419, 436, 437, 463, 464, 503 **TR:** Lab Manual: 83-89; Study Workbook B: 262-263 **TECH:** Transparency: 153, 154
d. Explain how an error in the DNA molecule (mutation) can be transferred during replication. DOK: 2	**SE/TE:** 316-319, 355, 356, 407, 412, 417, 418, 463, 487 **TR:** Study Workbook B: 195-197, 202, 204 **TECH:** Biology.com: Art Review: Types of Mutations; Transparency: 166, 168, 169
e. Identify possible external causes (e.g., heat, radiation, certain chemicals) and effects of DNA mutations (e.g., altered proteins which may affect chemical reactions and structural development). DOK: 2	**SE/TE:** 316-319, 355, 356, 407, 412, 417, 418, 487, 463 **TR:** Study Workbook B: 195-197, 204 **TECH:** Transparency: 166, 168, 169

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C. Chromosomes are components of cells that occur in pairs and carry hereditary information from one cell to daughter cells and from parent to offspring during reproduction.	
a. Recognize the chromosomes of daughter cells, formed through the processes of asexual reproduction and mitosis, the formation of somatic (body) cells in multicellular organisms, are identical to the chromosomes of the parent cell. DOK: 1	**SE/TE:** 239, 241, 241, 275-277, 279, 335 **TR:** Study Workbook B: 148 **TECH:** Transparency: 129, 130, 131, 150
b. Recognize that during meiosis, the formation of sex cells, chromosomes are reduced to half the number present in the parent cell. DOK: 1	**SE/TE:** 276-279, 334-338, 341, 366 **TR:** Lab Manual: 67-72; Study Workbook B: 165-166, 169 **TECH:** Transparency: 143, 144, 145
c. Explain how fertilization restores the diploid number of chromosomes. DOK: 2	**SE/TE:** 275-279, 530-531 **TR:** Lab Manual: 67-72; Study Workbook B: 165-166
d. Identify the implications of human sex chromosomes for sex determination. DOK: 1	**SE/TE:** 334-336, 338, 341, 366 **TR:** Study Workbook B: 206 **TECH:** Transparency: 175
D. There is heritable variation within every species of organism.	
a. Describe the advantages and disadvantages of asexual and sexual reproduction with regard to variation within a population. DOK: 2	**SE/TE:** 15, 236, 237, 240, 355, 356, 387, 388, 390, 406-408, 412, 464, 465, 507, 508, 516, 583, 584, 610, 678, 679 **TR:** Study Workbook B: 141 **TECH:** Biology.com: Art Review: Frequency and Dominance
b. Describe how genes can be altered and combined to create genetic variation within a species (e.g., mutation, recombination of genes). DOK: 2	**SE/TE:** 355, 356, 387, 388, 390, 406-408 **TR:** Study Workbook B: 221-224, 251-253 **TECH:** Transparency: 151, 166, 168, 169
c. Recognize that new heritable characteristics can only result from new combinations of existing genes or from mutations of genes in an organism's sex cells. DOK: 1	**SE/TE:** 42, 316-319 **TR:** Study Workbook B: 195-197 **TECH:** Transparency: 151, 166, 168, 169, 173
E. The pattern of inheritance for many traits can be predicted by using the principles of Mendelian genetics.	
a. Explain how genotypes (heterozygous and homozygous) contribute to phenotypic variation within a species. DOK: 2	**SE/TE:** 262-271, 336, 337, 339-341 **TR:** Study Workbook B: 159-164, 167-169
b. Predict the probability of the occurrence of specific traits, including sex-linked traits, in an offspring by using a monohybrid cross. DOK: 2	**SE/TE:** 262-271, 336, 337 **TR:** Study Workbook B: 160-161, 163, 167-169 **TECH:** Biology.com: Interactive Art: Punnett Squares; Transparency: 138, 139, 140, 141

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c. Explain how sex-linked traits may or may not result in the expression of a genetic disorder (e.g., hemophilia, muscular dystrophy, color blindness) depending on gender. DOK: 2	**SE/TE:** 272, 336, 337, 339-341 **TR:** 210-212; Study Workbook B: 210-212, 215-217 **TECH:** Biology.com: Art In Motion: Nondisjunctive Disorders
Strand 4: Changes in Ecosystems and Interactions of Organisms with their Environments	
1. Organisms are interdependent with one another and with their environment.	
Concepts	
A. All populations living together within a community interact with one another and with their environment in order to survive and maintain a balanced ecosystem.	
a. Explain the nature of interactions between organisms in predator/prey relationships and different symbiotic relationships (i.e., mutualism, commensalisms, parasitism). DOK: 1	**SE/TE:** 86, 87, 112-115, 484, 511, 512, 517-519, 528, 646, 839 **TR:** Lab Manual: 235-236; Study Workbook B: 46-48, 58, 60, 322-323, 326-328, 332, 335 **TECH:** Biology.com: Art Review: Limiting Factors; Transparency: 47
b. Explain how cooperative (e.g., symbiotic) and competitive (e.g., predator/prey) relationships help maintain balance within an ecosystem. DOK: 2	**SE/TE:** 85-87, 112, 114, 138, 484, 511, 512, 517-519, 528, 646, 839 **TR:** Study Workbook B: 46-48, 323, 332 **TECH:** Biology.com: Interactive Art: Moose-Wolf Populations on Isle Royal
c. Explain why no two species can occupy the same niche in a community. DOK: 2 (The functional role of a species is not limited to its placement along a food pyramid; it also includes the interactions of a species with other organisms while obtaining food. For example, the methods used to tolerate the physical factors of its environment, such as climate, water, nutrients, soils, and parasites, are all part of its functional role. In other words, the ecological niche of an organism is its natural history: all the interactions and interrelationships of the species with other organisms and the environment.)	**SE/TE:** 85, 86, 112-115 **TR:** Study Workbook B: 46, 48, 60
B. Living organisms have the capacity to produce populations of infinite size, but environments and resources are finite.	
a. Identify and explain the limiting factors (biotic and abiotic) that may affect the carrying capacity of a population within an ecosystem. DOK: 2	**SE/TE:** 112-116, 128, 129, 132-137 **TR:** Study Workbook B: 65-67, 70-72 **TECH:** Transparency: 28, 57, 59, 60
b. Predict how populations within an ecosystem may change in number and/or structure in response to hypothesized changes in biotic and/or abiotic factors. DOK: 2	**SE/TE:** 113, 115, 129 **TR:** Study Workbook B: 65-67, 70, 72 **TECH:** Transparency: 2, 56

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C. All organisms, including humans, and their activities cause changes in their environment that affect the ecosystem.	
a. Devise a multi-step plan to restore the stability and/or biodiversity of an ecosystem when given a scenario describing the possible adverse effects of human interactions with that ecosystem (e.g., destruction caused by direct harvesting, pollution, atmospheric changes). DOK: 3	**SE/TE:** 137, 140, 142 **TR:** Study Workbook B: 75-76, 78-79, 84 **TECH:** Transparency: 70
b. Predict and explain how natural or human caused changes (biological, chemical and/or physical) in one ecosystem may affect other ecosystems due to natural mechanisms (e.g., global wind patterns, water cycle, ocean currents). DOK: 2	**SE/TE:** 140-141 **TR:** Study Workbook B: 83 **TECH:** Transparency: 36, 38, 52, 107
a. Predict the impact (beneficial or harmful) a natural or human caused environmental event (e.g., forest fire, flood, volcanic eruption, avalanche, acid rain, global warming, pollution, deforestation, introduction of an exotic species) may have on the diversity of different species in an ecosystem. DOK: 2	**SE/TE:** 133, 137 **TR:** Study Workbook B: 81, 83 **TECH:** Transparency: 48, 56, 107
b. Describe possible causes of extinction of a population. DOK: 1	**SE/TE:** 140-141, 456-457, 632 **TR:** Study Workbook B: 287, 293, 295, 297 **TECH:** Transparency: 57
2. Matter and energy flow through the ecosystem.	
Concepts	
A. As energy flows through the ecosystem, all organisms capture a portion of that energy and transform it to a form they can use.	
a. Illustrate and describe the flow of energy within a food web. DOK: 2	**SE/TE:** 63-65 **TR:** Study Workbook B: 35, 37, 40 **TECH:** Transparency: 34
b. Explain why there are generally more producers than consumers in an energy pyramid. DOK: 2	**SE/TE:** 66-67 **TR:** Lab Manual: 231-234; Study Workbook B: 36 **TECH:** Transparency: 29, 35
c. Predict how the use and flow of energy will be altered due to changes in a food web. DOK: 2	**SE/TE:** 64-65 **TR:** Study Workbook B: 35
B. Matter is recycled through an ecosystem.	
a. Explain the processes involved in the recycling of nitrogen, oxygen, and carbon through an ecosystem. DOK: 2	**SE/TE:** 70-71 **TR:** Study Workbook B: 38-39, 42 **TECH:** Transparency: 39, 40

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b. Explain the importance of the recycling of nitrogen, oxygen, and carbon within an ecosystem. DOK: 1	**SE/TE:** 68-69 **TR:** Study Workbook B: 42 **TECH:** Transparency: 19, 39
3. Genetic variation sorted by the natural selection process explains evidence of biological evolution.	
Concepts	
A. Evidence for the nature and rates of evolution can be found in anatomical and molecular characteristics of organisms and in the fossil record.	
a. Interpret fossil evidence to explain the relatedness of organisms using the principles of superposition and fossil correlation. DOK: 2	**SE/TE:** 450-451, 470 **TR:** Lab Manual: 117-126; Study Workbook B: 282-284 **TECH:** Transparency: 7
b. Evaluate the evidence that supports the theory of biological evolution (e.g., fossil records, similarities between DNA and protein structures, similarities between developmental stages of organisms, homologous and vestigial structures). DOK: 3	**SE/TE:** 398, 456-461, 462-469 **TR:** Lab Manual: 97-102; Study Workbook B: 242-245, 290, 298, 411 **TECH:** Transparency: 149
B. Reproduction is essential to the continuation of every species.	
a. Define a species in terms of the ability to mate and produce fertile offspring. DOK: 1	**SE/TE:** 427
b. Explain the importance of reproduction to the survival of a species (i.e., the failure of a species to reproduce will lead to extinction of that species). DOK: 2	**SE/TE:** 141, 391
C. Natural selection is the process of sorting individuals based on their ability to survive and reproduce within their ecosystem.	
a. Identify examples of adaptations that may have resulted from variations favored by natural selection (e.g., long-necked giraffes, long-eared jack rabbits) and describe how that variation may have provided populations an advantage for survival. DOK: 2	**SE/TE:** 388-391, 396 **TR:** Lab Manual: 269-271; Study Workbook B: 240-241, 245, 261, 412 **TECH:** Biology.com: Visual Analogy: Finch Beak Tools; Transparency: 195, 196, 197, 201
b. Explain how genetic homogeneity may cause a population to be more susceptible to extinction (e.g., succumbing to a disease for which there is no natural resistance). DOK: 2	**SE/TE:** 138, 390, 679
c. Explain how environmental factors (e.g., habitat loss, climate change, pollution, introduction of non-native species) can be agents of natural selection. DOK: 2	**SE/TE:** 134, 388-390 **TR:** Study Workbook B: 241

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d. Given a scenario describing an environmental change, hypothesize why a given species was unable to survive. DOK: 2	**SE/TE:** 134, 148, 150, 457 **TR:** Lab Manual: 247-248
Strand 5: Processes and Interactions of the Earth's Systems (Geosphere, Atmosphere, and Hydrosphere)	
3. Human activity is dependent upon and affects Earth's resources and systems.	
Concepts	
A. Earth's materials are limited natural resources affected by human activity	
a. Predict local and/or global effects of environmental changes when given a scenario describing how the composition of the geosphere, hydrosphere, or atmosphere is altered by natural phenomena or human activities. DOK: 2	**SE/TE:** 132-135 **TR:** Study Workbook B: 78 **TECH:** Transparency: 107
b. Recognize how the geomorphology of Missouri (i.e., different types of Missouri soil and rock materials such as limestone, granite, clay, loam; land formations such as Karst (cave) formations, glaciated plains, river channels) affects the survival of organisms. DOK: 3	**SE/TE:** Can Be Developed From: 388-390
Strand 6: Composition and Structure of the Universe and the Motion of the Objects Within It	
1. The universe has observable properties and structure.	
Concepts	
B. The Earth has a composition and location suitable to sustain life	
a. Explain how Earth's environmental characteristics and location in the universe (e.g., atmosphere, temperature, orbital path, magnetic field, mass-gravity, location in solar system) provide a life-supporting environment. DOK: 2	**SE/TE:** 454-455

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Strand 7: Scientific Inquiry	
1. Science understanding is developed through the use of science process skills, scientific knowledge, scientific investigation, reasoning, and critical thinking.	
Concepts	
A. Scientific inquiry includes the ability of students to formulate a testable question and explanation, and to select appropriate investigative methods in order to obtain evidence relevant to the explanation.	
a. Formulate testable questions and hypotheses. DOK: 3	**SE/TE:** 46, 252, 520, 688, 802 **TR:** Lab Manual: 16, 23, 41, 63, 135, 143, 147, 193, 206-207; Study Workbook B: 2-3, 399 **TECH:** Transparency: 3
b. Analyzing an experiment, identify the components (i.e., independent variable, dependent variables, control of constants, multiple trials) and explain their importance to the design of a valid experiment. DOK: 3	**SE/TE:** Can Be Developed From: 46, 150, 252, 442, 520, 570, 705, 802 **TR:** Lab Manual: Representative Pages: 22, 26, 33, 41, 50, 62, 92, 135, 148, 214; Study Workbook B: Representative Pages: 6
c. Design and conduct a valid experiment. DOK: 4	**SE/TE:** 46, 150, 252, 442, 520, 570, 705, 802 **TR:** Lab Manual: Representative Pages: 4, 8, 23, 26, 38, 50, 101, 130, 135, 143; Study Workbook B: Representative Pages: 6, 399
d. Recognize it is not always possible, for practical or ethical reasons, to control some conditions (e.g., when sampling or testing humans, when observing animal behaviors in nature). DOK: 2	**SE/TE:** 8
e. Acknowledge some scientific explanations (e.g., explanations of astronomical or meteorological phenomena) cannot be tested using a controlled laboratory experiment, but instead by using a model, due to the limits of the laboratory environment, resources, and/or technologies. DOK: 1	**SE/TE:** 8, 59 **TR:** Lab Manual: 162-165, 325, 329, 337, 351, 353, 361, 379; Study Workbook B: 16, 143, 182
f. Acknowledge there is no fixed procedure called "the scientific method", but that some investigations involve systematic observations, carefully collected and relevant evidence, logical reasoning, and some imagination in developing hypotheses and other explanations. DOK: 2	**SE/TE:** 5-8 **TR:** Study Workbook B: 3 **TECH:** Transparency: 8
g. Evaluate the design of an experiment and make suggestions for reasonable improvements. DOK: 3	**SE/TE:** 11 **TR:** Lab Manual: 8, 43; Study Workbook B: 6 **TECH:** Probeware Lab: 5, 9, 14

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B. Scientific inquiry relies upon gathering evidence from qualitative and quantitative observations.	
a. Make qualitative and quantitative observations using the appropriate senses, tools and equipment to gather data (e.g., microscopes, thermometers, analog and digital meters, computers, spring scales, balances, metric rulers, graduated cylinders). DOK: 2	**SE/TE:** Representative Pages: 20, 46, 74, 150, 300, 398, 494, 596, 734, 802 **TR:** Lab Manual: Representative Pages: 1, 65, 130, 133, 137, 158, 159, 170-173, 196-197, 198-199; Study Workbook B: 37, 96, 117, 143, 246, 258, 286, 381, 399, 455 **TECH:** Probeware Lab: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15
b. Measure length to the nearest millimeter, mass to the nearest gram, volume to the nearest milliliter, force (weight) to the nearest Newton, temperature to the nearest degree Celsius, time to the nearest second. DOK: 1	**SE/TE:** Can Be Developed From: 18-19 **TR:** Lab Manual: 17-20; Study Workbook B: 37, 117, 143, 381, 455 **TECH:** Probeware Lab: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15
c. Determine the appropriate tools and techniques to collect, analyze, and interpret data. DOK: 2	**SE/TE:** 46, 150, 252, 442, 520, 570, 705, 802 **TR:** Lab Manual: 4; Study Workbook B: 3-4, 6 **TECH:** Probeware Lab: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15; Transparency: 5
d. Judge whether measurements and computation of quantities are reasonable. DOK: 2	**SE/TE:** 46, 150, 252, 442, 520, 570, 705, 802 **TECH:** Probeware Lab: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15
e. Calculate the range, average/mean, percent, and ratios for sets of data. DOK: 1	**SE/TE:** 66, 413 **TR:** Lab Manual: 149; Study Workbook B: 55, 229, 253
f. Recognize observation is biased by the experiences and knowledge of the observer (e.g., strong beliefs about what should happen in particular circumstances can prevent the detection of other results). DOK: 2	**SE/TE:** 12
C. Scientific inquiry includes evaluation of explanations (laws/principles, theories/models) light of evidence (data) and scientific principle(understandings).	
a. Use quantitative and qualitative data as support for reasonable explanations (conclusions). DOK: 3	**SE/TE:** 184, 252, 705 **TR:** Lab Manual: Representative Pages: 24, 27, 59, 66, 88, 96, 101, 114, 122, 130; Study Workbook B: 37, 67, 117, 208, 258, 286, 317, 350, 381, 399, 412, 430, 445, 455 **TECH:** Probeware Lab: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15

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b. Analyze experimental data to determine patterns, relationships, perspectives, and credibility of explanations, (e.g., predict/extrapolate data, explain the relationship between the independent and dependent variable). DOK: 3	**SE/TE:** Representative Pages: 20, 46, 74, 120, 204, 280, 326, 570, 596, 734 **TR:** Lab Manual: 18, 24, 66, 96, 121; Study Workbook B: 55, 67, 86, 229, 253, 309, 472, 489 **TECH:** Probeware Lab: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15
c. Identify the possible effects of errors in observations, measurements, and calculations, on the validity and reliability of data and resultant explanations (conclusions) DOK: 3	**SE/TE:** 7 **TR:** Lab Manual: 38, 47, 72, 138, 208 **TECH:** Can Be Developed From: Probeware Lab: 1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15
d. Analyze whether evidence (data) and scientific principles support proposed explanations (laws/principles, theories/models). DOK: 3	**SE/TE:** 100, 184, 204, 226, 398, 570, 638, 758 **TR:** Lab Manual: 43, 76, 101; Study Workbook B: 243-244 **TECH:** Probeware Lab: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15
D. The nature of science relies upon communication of results and justification of explanations.	
a. Communicate the procedures and results of investigations and explanations through:	
* oral presentations	**SE/TE:** Can Be Developed From: Representative Pages: 20, 46, 74, 150, 300, 398, 494, 596, 734, 802 **TECH:** Can Be Developed From: Probeware Lab: 1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15
* drawings and maps	**SE/TE:** Can Be Developed From: Representative Pages: 20, 46, 74, 120, 204, 280, 326, 570, 596, 734 **TR:** Lab Manual: 69
* data tables (allowing for the recording and analysis of data relevant to the experiment such as independent and dependent variables, multiple trials, beginning and ending times or temperatures, derived quantities)	**SE/TE:** 20, 46, 74, 120, 204, 280, 326, 570, 596, 734 **TR:** Lab Manual: Representative Pages: 19, 23, 27, 41, 59, 65, 105, 121, 136, 149; Study Workbook B: 472, 489 **TECH:** Probeware Lab: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15
* graphs (bar, single, and multiple line)	**SE/TE:** 46, 120, 150, 802 **TR:** Lab Manual: 24, 38, 43; Study Workbook B: 472, 479 **TECH:** Probeware Lab: 1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15

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* equations and writings	**SE/TE:** 66, 413 **TR:** Lab Manual: 101, 143, 153, 243; Study Workbook B: 37, 55, 117, 143, 182, 246, 258, 286, 381, 399, 455 **TECH:** Probeware Lab: 1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15
DOK: 3	
b. Communicate and defend a scientific argument. DOK: 3	**SE/TE:** Can be developed from the following representative pages: 20, 46, 74, 120, 204, 280, 326, 570, 596, 734 **TR:** Study Workbook B: 231 **TECH:** Can be developed from: Probeware Lab: 1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15
c. Explain the importance of the public presentation of scientific work and supporting evidence to the scientific community (e.g., work and evidence must be critiqued, reviewed, and validated by peers; needed for subsequent investigations by peers; results can influence the decisions regarding future scientific work). DOK: 2	**SE/TE:** 9, 10 **TR:** Study Workbook B: 6 **TECH:** Transparency: 9
Strand 8: Impact of Science, Technology and Human Activity	
1. The nature of technology can advance, and is advanced by, science as it seeks to apply scientific knowledge in ways that meet human needs.	
Concepts	
A. Designed objects are used to do things better or more easily and to do some things that could not otherwise be done at all.	
Not assessed at this level.	
B. Advances in technology often result in improved data collection and an increase in scientific information.	
a. Recognize the relationships linking technology and science (e.g., how technological problems may create a demand for new science knowledge, how new technologies make it possible for scientists to extend research and advance science). DOK: 2	**SE/TE:** 12

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2. Historical and cultural perspectives of scientific explanations help to improve understanding of the nature of science and how science knowledge and technology evolve over time.	
Concepts	
A. People of different gender and ethnicity have contributed to scientific discoveries and the invention of technological innovations.	
a. Recognize contributions to science are not limited to the work of one particular group, but are made by a diverse group of scientists representing various ethnic and gender groups. DOK: 1	**SE/TE:** 17, 59, 90, 141
b. Recognize gender and ethnicity of scientists often influence the questions asked and/or the methods used in scientific research and may limit or advance science knowledge and/or technology. DOK: 1	**SE/TE:** Can be developed from: 17, 59, 90, 141
B. Scientific theories are developed based on the body of knowledge that exists at any particular time and must be rigorously questioned and tested for validity.	
a. Identify and describe how explanations (laws/principles, theories/models) of scientific phenomena have changed over time as a result of new evidence (e.g., cell theory, theories of spontaneous generation and biogenesis, theories of extinction, evolution theory, structure of the cell membrane, genetic theory of inheritance). DOK: 2	**SE/TE:** 11, 262-265, 293, 295, 433 **TR:** Study Workbook B: 240-241 **TECH:** Transparency: 79, 86
b. Identify and analyze current theories that are being questioned, and compare them to new theories that have emerged to challenge older ones (e.g., theories of evolution, extinction, global warming). DOK: 3	**SE/TE:** 147-149, 384-387, 615, 625-627, 628-629,632- 633, 634-638 **TR:** Study Workbook B: 238-240 **TECH:** Transparency: 74, 75, 76, 193, 194, 195

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2. Science and technology affect, and are affected by, society.	
Concepts	
A. People, alone or in groups, are always making discoveries about nature and inventing new ways to solve problems and get work done.	
Not assessed at this level.	
B. Social, political, economic, ethical and environmental factors strongly influence, and are influenced by, the direction of progress of science and technology.	
a. Analyze the roles of science and society as they interact to determine the direction of scientific and technological progress (e.g., prioritization of and funding for new scientific research and technological development is determined on the basis of individual, political and social values and needs; understanding basic concepts and principles of science and technology influences debate about the economics, policies, politics, and ethics of various scientific and technological challenges). DOK: 3	**SE/TE:** 12, 251, 367-369 **TR:** Study Workbook B: 230-231 **TECH:** Transparency: 191, 193
b. Identify and describe major scientific and technological challenges to society and their ramifications for public policy (e.g., global warming, limitations to fossil fuels, genetic engineering of plants, space and/or medical research). DOK: 3	**SE/TE:** 147, 354-362, 365-366, 360-361 **TR:** Study Workbook B: 230-231 **TECH:** Transparency: 179, 180, 182, 188, 189, 190
c. Analyze and evaluate the drawbacks (e.g., design constraints, unintended consequences, risks), benefits, and factors (i.e., social, political, economic, ethical, and environmental) affecting progress toward meeting major scientific and technological challenges (e.g., limitations placed on stem-cell research or genetic engineering, introduction of alien species, deforestation, bioterrorism, nuclear energy, genetic counseling, use of alternative energies for carbon fuels, use of pesticides. DOK: 3	**SE/TE:** 133, 134, 147, 251, 354-362, 365-366, 360-361, 491, 594 **TR:** Study Workbook B: 225-228, 230-231 **TECH:** Transparency: 182
C. Scientific ethics require that scientists must not knowingly subject people or the community to health or property risks without their knowledge and consent.	
a. Identify and evaluate the need for informed consent in experimentation. DOK: 1	**SE/TE:** Can Be Developed From: 8, 367-369
b. Identify the ethical issues involved in experimentation (i.e., risks to organisms or environment). DOK: 1	**SE/TE:** 12, 251, 367-369

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c. Identify and evaluate the role of models as an ethical alternative to direct experimentation (e.g., using a model for a stream rather than pouring oil in an existing stream when studying the effects of oil pollution on aquatic plants). DOK: 1	**SE/TE:** 59 **TR:** Lab Manual: 40, 67, 329
D. Scientific information is presented through a number of credible sources, but is at times influenced in such a way to become non-credible.	
a. Evaluate a given source for its scientific credibility (e.g., articles in a new periodical quoting an "eye witness", a scientist speaking within or outside his/her area of expertise). DOK: 3	**SE/TE:** 147
b. Explain why accurate record-keeping, openness, and replication are essential for maintaining an investigator's credibility with other scientists and society. DOK: 1	**SE/TE:** 10-11