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| <p>4. Life Science</p> <p>1. Structure and Function in Living Systems</p> <p>1. Organisms use the interaction of cellular processes as well as tissues and organ systems to maintain homeostasis.</p>                 |  |
| <p>9.4.1.1.1 Explain how cell processes are influenced by internal and external factors, such as pH and temperature, and how cells and organisms respond to changes in their environment to maintain homeostasis.</p> | <p><b>Student Edition:</b><br/>160, 165, 187, 205-206<br/><i>BioLab: Design Your Own</i> 173<br/><i>Data Analysis Lab</i> 164</p> <p><b>Teacher Wraparound Edition:</b><br/>CT 165; FA 160</p> |

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| 9.4.1.1.2 Describe how the functions of individual organ systems are integrated to maintain homeostasis in an organism.  | <b>Student Edition:</b><br>10, 938, 968-970, 1002, 1005-1007, 1031-1037<br><i>MiniLab</i> 1035<br><b>Teacher Wraparound Edition:</b><br>RS 10; SP 1032                             |
| <b>2. Cells and cell structures have specific functions that allow an organism to grow, survive and reproduce.</b>   |  |
| 9.4.1.2.1 Recognize that cells are composed primarily of a few elements (carbon, hydrogen, oxygen, nitrogen, phosphorus, and sulfur), and describe the basic molecular structures and the primary functions of carbohydrates, lipids, proteins and nucleic acids.  | <b>Student Edition:</b><br>166-171<br><i>Launch Lab</i> 146<br><b>Teacher Wraparound Edition:</b><br>DC 171; FA 171; LL 146; SP 167  |
| 9.4.1.2.2 Recognize that the work of the cell is carried out primarily by proteins, most of which are enzymes, and that protein function depends on the amino acid sequence and the shape it takes as a consequence of the interactions between those amino acids. | <b>Student Edition:</b><br>159-160, 170, 336, 338, 341<br><i>BioLab: Design Your Own</i> 173<br><i>MiniLab</i> 159<br><b>Teacher Wraparound Edition:</b><br>DC 159; FA 160; RS 171 |
| 9.4.1.2.3 Describe how viruses, prokaryotic cells and eukaryotic cells differ in relative size, complexity and general structure.  | <b>Student Edition:</b><br>185-186, 192, 518, 525-527<br><i>Launch Lab</i> 514<br><b>Teacher Wraparound Edition:</b><br>BI 515; LL 514; SP 185                                     |
| 9.4.1.2.4 Explain the function and importance of cell organelles for prokaryotic and/or eukaryotic cells as related to the basic cell processes of respiration, photosynthesis, protein synthesis and cell reproduction.   | <b>Student Edition:</b><br>191-200, 222-225, 228-231, 246-247, 248-252, 333-335, 520<br><i>MiniLab</i> 223<br><b>Teacher Wraparound Edition:</b><br>SP 192                         |
| 9.4.1.2.5 Compare and contrast passive transport (including osmosis and facilitated transport) with active transport, such as endocytosis and exocytosis.  | <b>Student Edition:</b><br>201-207<br><i>BioLab</i> 209<br><i>MiniLab</i> 203<br><b>Teacher Wraparound Edition:</b><br>DC 201, 206; DE 203; SP 207                                 |
| 9.4.1.2.6 Explain the process of mitosis in the formation of identical new cells and maintaining chromosome number during asexual reproduction.  | <b>Student Edition:</b><br>248-252, 276<br><i>Data Analysis Lab</i> 251<br><b>Teacher Wraparound Edition:</b><br>DC 250, 276; DE 249   |

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| <b>2. Interdependence Among Living Systems</b>  |   |
| <b>1. The interrelationship and interdependence of organisms generate dynamic biological communities in ecosystems.</b>   |   |
| 9.4.2.1.1 Describe factors that affect the carrying capacity of an ecosystem and relate these to population growth.   | <b>Student Edition:</b><br>97, 98, 105<br><b>Teacher Wraparound Edition:</b><br>FA 99, 105; SP 98   |
| 9.4.2.1.2 Explain how ecosystems can change as a result of the introduction of one or more new species.<br><i>For example:</i> The effect of migration, localized evolution or disease organisms. | <b>Student Edition:</b><br>63-64, 95-96, 128<br><i>Biology &amp; Society</i> 870<br><i>Data Analysis Lab</i> 63<br><b>Teacher Wraparound Edition:</b><br>AG 870 |
| <b>2. Matter cycles and energy flows through different levels of organization of living systems and the physical environment, as chemical elements are combined in different ways.</b>            |   |
| 9.4.2.2.1 Use words and equations to differentiate between the processes of photosynthesis and respiration in terms of energy flow, beginning reactants and end products.                         | <b>Student Edition:</b><br>41, 197, 220, 222-227, 228-233<br><i>MiniLab</i> 220<br><b>Teacher Wraparound Edition:</b><br>FA 227, 233                            |
| 9.4.2.2.2 Explain how matter and energy is transformed and transferred among organisms in an ecosystem, and how energy is dissipated as heat into the environment.                                | <b>Student Edition:</b><br>41-44, 45-49, 218-221<br><i>MiniLab</i> 42<br><b>Teacher Wraparound Edition:</b><br>DC 43, 45, 46; MI 45; SP 44                      |
| <b>3. Evolution in Living Systems</b>   |   |
| <b>1. Genetic information found in the cell provides information for assembling proteins, which dictate the expression of traits in an individual.</b>  |   |
| 9.4.3.1.1 Explain the relationships among DNA, genes and chromosomes.   | <b>Student Edition:</b><br>247, 270, 278, 283, 332, 336<br><b>Teacher Wraparound Edition:</b><br>APK 270  |
| 9.4.3.1.2 In the context of a monohybrid cross, apply the terms phenotype, genotype, allele, homozygous and heterozygous.   | <b>Student Edition:</b><br>277-280, 281-282<br><i>BioLab: Design Your Own</i> 287<br><i>MiniLab</i> 281<br><b>Teacher Wraparound Edition:</b><br>RS 279; SP 279 |

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| 9.4.3.1.3 Describe the process of DNA replication and the role of DNA and RNA in assembling protein molecules.   | <b>Student Edition:</b><br>333-335, 336-341<br><i>MiniLab</i> 334<br><b>Teacher Wraparound Edition:</b><br>AC 335; DC 335, 340; DE 339; WS 336  |
| <b>2. Variation within a species is the natural result of new inheritable characteristics occurring from new combinations of existing genes or from mutations of genes in reproductive cells.</b>  |   |
| 9.4.3.2.1 Use concepts from Mendel’s Laws of Segregation and Independent Assortment to explain how sorting and recombination (crossing over) of genes during sexual reproduction (meiosis) increases the occurrence of variation in a species. | <b>Student Edition:</b><br>275-276, 277-280, 283<br><b>Teacher Wraparound Edition:</b><br>DC 279; RS 283  |
| 9.4.3.2.2 Use the processes of mitosis and meiosis to explain the advantages and disadvantages of asexual and sexual reproduction.   | <b>Student Edition:</b><br>248-252, 271-276<br><b>Teacher Wraparound Edition:</b><br>DC 272, 276  |
| 9.4.3.2.3 Explain how mutations like deletions, insertions, rearrangements or substitutions of DNA segments in gametes may have no effect, may harm, or rarely may be beneficial, and can result in genetic variation within a species.        | <b>Student Edition:</b><br>345-349, 434<br><b>Teacher Wraparound Edition:</b><br>CT 349; DC 347, 434  |
| <b>3. Evolution by natural selection is a scientific explanation for the history and diversity of life on Earth.</b>   |   |
| 9.4.3.3.1 Describe how evidence led Darwin to develop the theory of natural selection and common descent to explain evolution.   | <b>Student Edition:</b><br>418-422<br><b>Teacher Wraparound Edition:</b><br>DE 420; RS 419  |
| 9.4.3.3.2 Use scientific evidence, including the fossil record, homologous structures, and genetic and/or biochemical similarities, to show evolutionary relationships among species.  | <b>Student Edition:</b><br>423-428, 458-460, 461-466, 467-473, 491-498<br><i>BioLab</i> 505<br><i>Data Analysis Lab</i> 459, 494<br><b>Teacher Wraparound Edition:</b><br>DC 493; SP 423, 427, 458, 461 |
| 9.4.3.3.3 Recognize that artificial selection has led to offspring through successive generations that can be very different in appearance and behavior from their distant ancestors.  | <b>Student Edition:</b><br>360-362, 419<br><i>Data Analysis Lab</i> 420<br><i>Launch Lab</i> 358<br><i>MiniLab</i> 361<br><b>Teacher Wraparound Edition:</b><br>LL 358                                  |

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| <p>9.4.3.3.4 Explain why genetic variation within a population is essential for evolution to occur.</p>  | <p><b>Student Edition:</b><br/>420, 421, 431-435</p> <p><b>Teacher Wraparound Edition:</b><br/>DC 434</p>  |
| <p>9.4.3.3.5 Explain how competition for finite resources and the changing environment promotes natural selection on offspring survival, depending on whether the offspring have characteristics that are advantageous or disadvantageous in the new environment.</p>  | <p><b>Student Edition:</b><br/>420, 421, 434-436</p> <p><i>BioLab</i> 443<br/><i>Data Analysis Lab</i> 435</p> <p><b>Teacher Wraparound Edition:</b><br/>DC 421; FA 422</p>  |
| <p>9.4.3.3.6 Explain how genetic variation between two populations of a given species is due, in part, to different selective pressures acting independently on each population and how, over time, these differences can lead to the development of new species.</p>  | <p><b>Student Edition:</b><br/>437-439</p> <p><b>Teacher Wraparound Edition:</b><br/>DC 438; SP 437</p>  |
| <p><b>4. Human Interactions with Living Systems</b></p>  |  |
| <p><b>1. Human activity has consequences on living organisms and ecosystems.</b></p>   |  |
| <p>9.4.4.1.1 Describe the social, economic and ecological risks and benefits of biotechnology in agriculture and medicine.<br/><i>For example:</i> Selective breeding, genetic engineering, and antibiotic development and use.</p>  | <p><b>Student Edition:</b><br/>119, 370-371, 374, 378-379</p> <p><i>BioLab: Forensics</i> 381<br/><i>Biology &amp; Society</i> 350, 680<br/><i>Cutting-Edge Biology</i> 1010</p> <p><b>Teacher Wraparound Edition:</b><br/>AG 680; DC 370; DIB 680; RS 370</p>       |
| <p>9.4.4.1.2 Describe the social, economic and ecological risks and benefits of changing a natural ecosystem as a result of human activity.<br/><i>For example:</i> Changing the temperature or composition of water, air or soil; altering populations and communities; developing artificial ecosystems; or changing the use of land or water.</p> | <p><b>Student Edition:</b><br/>123-128, 134-135</p> <p><i>Biology &amp; Society</i> 50, 680, 716, 870<br/><i>MiniLab</i> 120</p> <p><b>Teacher Wraparound Edition:</b><br/>AG 680; DC 125, 370; DIB 50; RS 123</p>   |
| <p>9.4.4.1.3 Describe contributions from diverse cultures, including Minnesota American Indian tribes and communities, to the understanding of interactions among humans and living systems.<br/><i>For example:</i> American Indian understanding of sustainable land use practices.</p>  | <p>The following references can be expanded in classroom discussion to meet this objective.</p> <p><b>Student Edition:</b><br/>119, 130</p> <p><i>Biology &amp; Society</i> 592<br/><i>In the Field</i> 136</p> <p><b>Teacher Wraparound Edition:</b><br/>DI 136</p> |

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| <p><b>2. Personal and community health can be affected by the environment, body functions and human behavior.</b></p>   |  |
| <p>9.4.4.2.1 Describe how some diseases can sometimes be predicted by genetic testing and how this affects parental and community decisions.</p>  | <p><b>Student Edition:</b><br/>209-301, 313, 314-315, 1060-1061, 1092<br/><i>In the Field</i> 316<br/><i>MiniLab</i> 300, 314<br/><b>Teacher Wraparound Edition:</b><br/>AG 316; WS 313</p>                    |
| <p>9.4.4.2.2 Explain how the body produces antibodies to fight disease and how vaccines assist this process.</p>  | <p><b>Student Edition:</b><br/>1086-1088, 1089-1090<br/><b>Teacher Wraparound Edition:</b><br/>FA 1091; RS 1089</p>  |
| <p>9.4.4.1.3 Describe how the immune system sometimes attacks some of the body's own cells and how some allergic reactions are caused by the body's immune responses to usually harmless environmental substances.</p>                      | <p><b>Student Edition:</b><br/>1094-1095<br/><i>Cutting-Edge Biology</i> 1096<br/><b>Teacher Wraparound Edition:</b><br/>DC 1094; RS 1094; WS 1095</p>   |
| <p>9.4.4.2.3 Explain how environmental factors and personal decisions, such as water quality, air quality and smoking affect personal and community health.</p>   | <p><b>Student Edition:</b><br/>940, 978-981, 1004<br/><i>BioLab: Internet</i> 1011<br/><i>Biology &amp; Society</i> 952<br/><i>Data Analysis Lab</i> 980<br/><b>Teacher Wraparound Edition:</b><br/>DC 979</p> |
| <p>9.4.4.2.4 Recognize that a gene mutation in a cell can result in uncontrolled cell division called cancer, and how exposure of cells to certain chemicals and radiation increases mutations and thus increases the chance of cancer.</p> | <p><b>Student Edition:</b><br/>254-255, 311, 348-349, 940, 1093<br/><i>MiniLab</i> 1093<br/><b>Teacher Wraparound Edition:</b><br/>CT 254, 348</p>   |