

Table of Contents

| | |
|----------------------------------------------------------------------|---------|
| Introduction to the Laying the Foundation Series | 7 |
| Overview of Laying the Foundation in Biology | 8 |
| Process Skills Progression Chart | |
| The Chart | 10-11 |
| Foundation Lessons | |
| Foundation Lesson I: The Scientific Method..... | 14 |
| Exploring Experimental Design | |
| Foundation Lesson II: Numbers in Science | 44 |
| Exploring Measurements, Significant Digits, and Dimensional Analysis | |
| Foundation Lesson III: Literal Equations | 63 |
| Manipulating Variables and Constants | |
| Foundation Lesson IV: Graphing Skills | 78 |
| Reading, Constructing, and Analyzing Graphs | |
| Foundation Lesson V: Microsoft Excel | 115 |
| Using Excel in the Science Classroom | |
| Foundation Lesson VI: Graphing Calculator | 138 |
| Using the TI-83+ in the Science Classroom | |
| Foundation Lesson VII: Data Collection Devices | 163 |
| Determining the Amount of Energy Found in Food | |
| Foundation Lesson VIII: Computer Graphing Software | 184 |
| Using Graphical Analysis [®] 3 or Logger Pro [®] 3 | |
| Foundation Lesson IX: Essay Writing Skills..... | 203 |
| Developing a Free Response | |
| Biology Content Skills Chart | |
| The Chart | 218-222 |
| National Standards | |
| National Standards Codes List..... | 224 |
| Syllabi | |
| Constructing a Syllabus | 226 |
| Sample Teacher Syllabi | 228-259 |
| Lessons | |
| Lesson 1: Green Beans the Wonderful Fruit..... | 262 |
| Using Scientific Measurement | |
| Lesson 2: <i>Vitruvian Man</i> Meets the Scientific Method | 274 |
| Writing and Testing Appropriate Hypotheses | |
| Lesson 3: Seed Germination | 282 |
| Examining the Effects of Acid Rain | |
| Lesson 4: Write It Up..... | 294 |
| Preparing Formal Lab Reports | |
| Lesson 5: McMush Lab | 302 |
| Testing for the Presence of Macromolecules | |
| Lesson 6: Enzyme Activity | 312 |
| Measuring the Effect of Enzyme Concentration | |

| | |
|-------------------------------------------------------------------|-----|
| Lesson 7: The Hydrogen Peroxide Breakdown | 324 |
| Examining Factors that Affect the Reaction Rate of Enzymes | |
| Lesson 8: Microscopic Measurement..... | 346 |
| Using a Light Microscope to Determine an Object's Size | |
| Lesson 9: Larger Is Not Always Better..... | 366 |
| Examining Cell Size and Rates of Diffusion | |
| Lesson 10: The Fluid Mosaic Membrane | 378 |
| Modeling Membrane Structure and Osmosis | |
| Lesson 11: Plasmolysis | 394 |
| Comparing <i>Elodea</i> and Onion Cell Plasmolysis | |
| Lesson 12: The Gate Keepers | 404 |
| Examining Osmosis and Selective Diffusion | |
| Lesson 13: Chromosome Manipulative | 426 |
| Demonstrating Mitosis | |
| Lesson 14: Cell Division..... | 438 |
| Observing Mitosis in a Root Tip | |
| Lesson 15: Yeast and Molasses | 448 |
| Examining the Effect of Food Concentration on Fermentation | |
| Lesson 16: Picking out the Pigments | 474 |
| Isolating and Comparing Plant Pigments | |
| Lesson 17: Light, Dark, Does It Really Matter? | 486 |
| Examining the Factors of the Light Reaction | |
| Lesson 18: Lights Out | 496 |
| Demonstrating Dark Reactions | |
| Lesson 19: Numbers Do Indeed Make a Difference..... | 514 |
| Investigating the Importance of Sample Size | |
| Lesson 20: Mendel and His Peas | 526 |
| Investigating Monohybrid Crosses Using the Graphing Calculator | |
| Lesson 21: The Amazing Maize | 538 |
| Investigating Dihybrid Crosses | |
| Lesson 22: Proteins, the Essence of Life | 548 |
| Simulating the Process of Protein Synthesis | |
| Lesson 23: The <i>trp</i> Operon | 572 |
| Modeling Gene Regulation | |
| Lesson 24: Protein Properties | 588 |
| Using Electrophoresis to Determine Net Charge | |
| Lesson 25: Bacterial Transformation..... | 604 |
| Simulating the Production of Recombinant DNA | |
| Lesson 26: Quackers | 622 |
| Simulating Natural Selection | |
| Lesson 27: Life in the Cold..... | 632 |
| Investigating Survival Strategies and Adaptations | |
| Lesson 28: Classification Webquest | 654 |
| Surveying Animalia Attributes | |
| Lesson 29: “Killer” Defects | 666 |
| Exploring the Impact of Bacteria on Integrated Circuits | |
| Lesson 30: Monocots and Dicots, Two Plants with Differences | 676 |
| Examining Stem Structure | |
| Lesson 31: “Hole-y” Moley | 686 |
| Examining Stomates | |

| | |
|--------------------------------------------------------------------------|-----|
| Lesson 32: Transpiration..... | 702 |
| Investigating Water Movement and Evaporation in Monocot and Dicot Plants | |
| Lesson 33: Those “Foolish” Plant Hormones | 716 |
| Investigating the Effects of Gibberellin and Auxin | |
| Lesson 34: Plant Wars | 728 |
| Investigating Allelopathic Interactions | |
| Lesson 35: Yeast Cells and Digestion of Nutrients | 738 |
| Examining Enzyme Specificity | |
| Lesson 36: Circulatory System | 762 |
| Structure & Function of Vessels, Blood and Heart | |
| Lesson 37: Urinalysis..... | 776 |
| Investigating the Structures and Functions of the Excretory System | |
| Lesson 38: Chicken Leg Dissection..... | 786 |
| Observing Structure and Function | |
| Lesson 39: Kermit Versus Mickey Mouse..... | 794 |
| Determining the Q_{10} of an Endothermic and Exothermic Organism | |
| Lesson 40: Specific Immune Response | 816 |
| Modeling the Immune System | |
| Lesson 41: Making Sense of It All | 856 |
| Exploring the Nervous System and Senses | |
| Lesson 42: Planarian Behaviors..... | 872 |
| Investigating Geotaxis, Chemotaxis, and Phototaxis in Planaria | |
| Lesson 43: Wonderful Pond Water..... | 886 |
| Measuring the Impact of Organisms on Their Environment | |
| Lesson 44: Ecotones | 896 |
| Investigating Ecosystems using CBLs | |

Assessment

| | |
|----------------------------------------------------|-----|
| Assessment Foreword | 914 |
| AP* Test Strategies and Information..... | 915 |
| AP* Biology Exam Overview | 916 |
| Strategies for Developing Test Taking Skills | 917 |
| Scoring Student Work on Pre-AP* Assessments..... | 919 |
| Multiple Choice | 921 |
| Free Response | 924 |
| Sample Unit Test | |
| Major Test: Photosynthesis..... | 929 |
| Lab Set Questions for Selected Activities | |
| Data Collection Devices | 941 |
| Larger is Not Always Better | 943 |
| McMush Lab..... | 945 |
| Plasmolysis | 947 |
| Proteins, the Essence of Life..... | 949 |
| Transpiration | 951 |
| Circulation System..... | 953 |
| Kermit vs. Mickey Mouse..... | 955 |

Appendixes

| | |
|---------------------------------------------|-----|
| Appendix A: A Brief History of Science..... | 960 |
| Appendix B: Graph Paper..... | 979 |