THIS HANDBOOK IS FOR THE IMPLEMENTATION OF THE LIVING ENVIRONMENT ® CURRICULUM IN MOUNT VERNON. THIS PROVIDES AN OUTLINE OF THE DISTRICT’S EXPECTATIONS.

2015-16
Mount Vernon City School District

Board of Education

Adriane Saunders
Presidential

Serigne Gningue
Vice President

Board Trustees
Charmaine Fearon
Rosemarie Jarosz
Micah J.B. McOwen
Omar McDowell
Darcy Miller
Wanda White
Lesly Zamor

Superintendent of Schools
Dr. Kenneth Hamilton

Deputy Superintendent
Dr. Jeff Gorman

Assistant Superintendent of Business
Ken Silver

Assistant Superintendent of Human Resources
Denise Gagne-Kurpiewski

Administrator of Mathematics and Science (K-12)
Dr. Satish Jagnandan
ACKNOWLEDGEMENTS

The Department of Curriculum and Instruction and Secondary Science Articulation Committee embarked upon a long range plan of curriculum development for the high schools. Teachers of every subject area from Mount Vernon and Nellie Thornton High School’s were joined by district administrator in the curriculum revision process. The educators gave many personal hours and demonstrated exceptional commitment to this critical task.

The New York State Learning Standards and, in some cases, the Core Curriculum formed the basis for decisions regarding the identification of grade level objectives, learning activities and assessments. Each set of performance objectives describes what a student should be able to do or understand by the end of the year, with a particular focus or the development of critical thinking ability and problem solving skills.

This document is by no means completed; the modifications will depend upon its use. We hope that during the next year the school staff will explore, develop, and record the strategies deemed most successful in helping students meet the grade level objectives. Also, the order of units and their time frames should be revisited after a year of implementation.

Much credit goes to school leaders who organized the efforts of the teachers who collaborated on this project.

Thank you.

Dr. Satish Jagnandan

Administrator for Mathematics and Science (K-12)
**TABLE OF CONTENTS**

I. COVER ........................................................................................................ 1

II. MVCSD BOARD OF EDUCATION ............................................................... 2

III. ACKNOWLEDGEMENTS ....................................................................... 3

IV. TABLE OF CONTENTS .......................................................................... 4

V. IMPORTANT DATES ............................................................................... 5

VI. VISION STATEMENT ........................................................................... 6

VII. ATTRIBUTES OF AN EXEMPLARY SCIENCE PROGRAM ....................... 7

VIII. PREFACE ............................................................................................ 8

IX. REGENTS CURRICULUM ....................................................................... 9

X. LIVING ENVIRONMENT ® CORE CURRICULUM MAP ............................ 10

XI. LIVING ENVIRONMENT ® PACING GUIDE ........................................... 27

XII. SYSTEMATIC DESIGN OF A SCIENCE LESSON ................................. 73

XIII. SCIENCE GRADING POLICY .............................................................. 76

XIV. SETUP OF THE SCIENCE CLASSROOM ........................................... 77

XV. WORD WALLS ARE DESIGNED .......................................................... 78

XVI. SCIENCE CLASSROOM AESTHETICS .............................................. 79

XVII. FORMAL LAB REPORT FORMAT ..................................................... 80

*This document was prepared by the Mount Vernon City School District Curriculum and Instruction Department in conjunction with the Secondary Science Articulation Committee.*
IMPORTANT DATES 2015-16

REPORT CARD – 10 WEEK PERIOD

<table>
<thead>
<tr>
<th>MARKING PERIOD</th>
<th>MARKING PERIOD BEGINS</th>
<th>INTERIM PROGRESS REPORTS</th>
<th>MARKING PERIOD ENDS</th>
<th>DURATION</th>
<th>REPORT CARD DISTRIBUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP 1</td>
<td>September 8, 2015</td>
<td>October 9, 2015</td>
<td>November 13, 2015</td>
<td>10 weeks</td>
<td>Week of Nov. 23, 2015</td>
</tr>
<tr>
<td>MP 3</td>
<td>February 1, 2016</td>
<td>March 11, 2016</td>
<td>April 15, 2016</td>
<td>9 weeks</td>
<td>Week of April 25, 2016</td>
</tr>
<tr>
<td>MP 4</td>
<td>April 18, 2016</td>
<td>May 20, 2016</td>
<td>June 23, 2016</td>
<td>10 weeks</td>
<td>Last Day of School</td>
</tr>
</tbody>
</table>

The Parent Notification Policy states “Parent(s) / guardian(s) or adult students are to be notified, in writing, at any time during a grading period when it is apparent - that the student may fail or is performing unsatisfactorily in any course or grade level. Parent(s) / guardian(s) are also to be notified, in writing, at any time during the grading period when it becomes evident that the student's conduct or effort grades are unsatisfactory.”
VISION STATEMENT

True success comes from co-accountability and co-responsibility. In a coherent instructional system, everyone is responsible for student learning and student achievement. The question we need to constantly ask ourselves is, "How are our students doing?"

The starting point for an accountability system is a set of standards and benchmarks for student achievement. Standards work best when they are well defined and clearly communicated to students, teachers, administrators, and parents. The focus of a standards-based education system is to provide common goals and a shared vision of what it means to be educated. The purposes of a periodic assessment system are to diagnose student learning needs, guide instruction and align professional development at all levels of the system.

The primary purpose of this Instructional Guide is to provide teachers and administrators with a tool for determining what to teach and assess. More specifically, the Instructional Guide provides a "road map" and timeline for teaching and assessing the NYS Science Content Standards.

I ask for your support in ensuring that this tool is utilized so students are able to benefit from a standards-based system where curriculum, instruction, and assessment are aligned. In this system, curriculum, instruction, and assessment are tightly interwoven to support student learning and ensure ALL students have equal access to a rigorous curriculum.

We must all accept responsibility for closing the achievement gap and improving student achievement for all of our students.

Dr. Satish Jagnandan

Administrator for Mathematics and Science (K-12)
ATTRIBUTES OF AN EXEMPLARY SCIENCE PROGRAM

1. The standards-based science program must ensure equity and excellence for all students.

2. It is essential that the science program focus on understanding important relationships, processes, mechanisms, and applications of concepts that connect mathematics, science and technology.

3. The science program must emphasize a hands-on and minds-on approach to learning. Experiences must provide students with opportunities to interact with the natural world in order to construct explanations about their world.

4. The science program must emphasize the skills necessary to allow students to construct and test their proposed explanations of natural phenomena by using the conventional techniques and procedures of scientists.

5. The science program must provide students with the opportunity to dialog and debate current scientific issues related to the course of study.

6. The science program must provide opportunities for students to make connections between their prior knowledge and past experiences to the new information being taught. Student learning needs to be built upon prior knowledge.

7. The science program must incorporate laboratory investigations that allow students to use scientific inquiry to develop explanations of natural phenomena. These skills must include, but are not limited to, interpreting, analyzing, evaluating, synthesizing, applying, and creating as learners actively construct their understanding.

8. The science program must assess students’ ability to explain, analyze, and interpret scientific processes and their phenomena and the student performance data generated by theses assessments must be used to focus instructional strategies to meet the needs of all students.

9. The science program must be responsive to the demands of the 21st century by providing learning opportunities for students to apply the knowledge and thinking skills of mathematics, science and technology to address real-life problems and make informed decisions.
PREFACE

This curriculum for *Living Environment* is organized into instructional units based on the key ideas and major understandings of the New York State curriculum. These are further organized into specific objectives for lessons and laboratory activities to be completed throughout the year.

This *Living Environment Core Curriculum* was written to assist teachers and supervisors as they prepare curriculum, instruction, and assessment for the Living Environment content and process skills of the New York State *Learning Standards for Mathematics, Science, and Technology*. The Core Curriculum is part of a continuum that elaborates the science content of Standard 4, which identifies Key Ideas and Performance Indicators. Key Ideas are broad, unifying, general statements of what students need to know. The Performance Indicators for each Key Idea are statements of what students should be able to do to provide evidence that they understand the Key Idea. As part of this continuum, this Core Curriculum presents Major Understandings that give more specific detail to the concepts underlying each Performance Indicator.

The topic content, skills, and major understandings address the content and process skills as applied to the rigor and relevancy to be assessed by the Regents examination in Living Environment. Focus will also be on application skills related to real-world situations. Assessments will test students’ ability to explain, analyze, and interpret Earth science processes and phenomena, and generate science inquiry.*

*from *New York State Core Curriculum: Living Environment*
REGENTS CURRICULUM

The Mount Vernon City School District recognizes that the understanding of science is necessary for students to compete in today’s technological society. The study of science encourages students to examine the world around them. As individuals, they will use scientific processes and principles to make informed personal and public decisions. Students will become scientifically literate and apply scientific thinking, reasoning, and knowledge throughout their lives.

All Regents science courses culminate in a NY State Regent's examination. All students enrolled in science Regents courses MUST take the June Examination. According to the State Education Department regulations, all students must successfully complete the laboratory component of the course in order to be admitted to the Regent's examination.

In order to satisfy this requirement each student must:
1. Complete at least 30 full laboratory periods (1200 minutes)
2. Complete a satisfactory written report for each laboratory experience
3. Demonstrate proficiency in laboratory skills.

The current format of the Regents Examination in Living Environment/Biology will remain unchanged. Part D, using multiple choice and open-ended questions, will continue to assess the concepts, content, and process skills associated with laboratory experiences in Living Environment that are aligned to the New York State Learning Standards for Mathematics, Science, and Technology and The Living Environment Core Curriculum. Items assessing the concepts, content, and process skills associated with laboratory experiences will be referenced to The Living Environment Core Curriculum, not to specific laboratory activities.

The current four required laboratory activities (Relationships and Biodiversity, Making Connections, The Beaks of Finches, and Diffusion Through a Membrane) will continue to be included in the Part D component of the Regents Examination in Living Environment. Additional laboratory activities will be developed and implemented for use during the regular course of instruction. These laboratory activities, as well as, the original four required laboratory activities will align to the concepts, content, and process skills included in The Living Environment Core Curriculum.
UNIT: CHARACTERISTICS OF LIFE

1. Cells: The Basic Structure of Life
2. Scientific Method and Lab Skills
3. Microscope
4. Biological Classification

CRITICAL TERMS

<table>
<thead>
<tr>
<th>concentration gradient</th>
<th>metabolism</th>
<th>reproduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>control</td>
<td>nutrition</td>
<td>respiration</td>
</tr>
<tr>
<td>data</td>
<td>observation</td>
<td>synthesis</td>
</tr>
<tr>
<td>diffusion</td>
<td>organ</td>
<td>theory</td>
</tr>
<tr>
<td>excretion</td>
<td>organelles</td>
<td>tissue</td>
</tr>
<tr>
<td>homeostasis</td>
<td>organism</td>
<td>transport</td>
</tr>
<tr>
<td>hypothesis</td>
<td>osmosis</td>
<td></td>
</tr>
<tr>
<td>independent/dependent variable</td>
<td>passive/active transport</td>
<td></td>
</tr>
<tr>
<td>inference</td>
<td>regulation</td>
<td></td>
</tr>
</tbody>
</table>

CORE CURRICULUM / MAJOR UNDERSTANDINGS

1.2a Important levels of organization for structure and function include organelles, cells, tissues, organs, organ systems, and whole organisms.

1.2b Humans are complex organisms. They require multiple systems for digestion, respiration, reproduction, circulation, and immunity. The systems interact to perform the life function.

1.2e The organs and systems of the body help to provide all the cells with their basic needs. The cells of the body are of different kinds and are grouped in ways that enhance how they function together.

1.2f Cells have particular structures that perform specific jobs. These structures perform the actual work of the cell. Just as systems are coordinated and work together, cell parts must also be coordinated and work together.

1.2i Inside the cell a variety of specialized structure, formed from many different molecules, carry out the transport of materials (cytoplasm), extraction of energy from nutrients (mitochondria), protein building (ribosomes), waste disposal (cell membrane), storage (vacuole), and information storage (nucleus).

1.3a The structures present in some single-celled organisms act in a manner similar to the tissues and systems found in multi-cellular organisms, thus enabling them to perform all of the life processes needed to maintain homeostasis.

1.2g Each cell is covered by a membrane that performs a number of important functions for the cell. These include: separation from its outside environment, controlling which molecules enter and leave the cell, and recognition of chemical signals. The processes of
diffusion and active transport are important in the movement of materials in and out of the cells.

1.1a Scientific explanations are built by combining evidence that can be observed with what people already know about the world.

1.1b Learning about the historical development of scientific concepts or about individuals who have contributed to scientific knowledge provides a better understanding of scientific inquiry and the relationship between science and society.

1.1c Science provides knowledge, but values are also essential to making effective and ethical decisions about the application of scientific knowledge.

1.2a Inquiry involves asking questions and locating, interpreting, and processing information from a variety of sources.

1.2b Inquiry involves making judgments about the reliability of the sources and relevance of information.

1.3a Scientific explanations are accepted when they are consistent with experimental and observational evidence and when they lead to accurate predictions.

1.3b All scientific explanations are tentative and subject to change or improvement. Each new bit of evidence can create more questions than it answers. This leads to increasingly better understanding of how things work in the living world.

1.4a Well-accepted theories are ones that are supported by different kinds of scientific investigations often involving the contributions of individuals from different disciplines.

2.2a Development of a research plan involves researching background information and understanding the major concepts in the area being investigated. Recommendations for methodologies, use of technologies, proper equipment, and safety precautions should also be included.

2.3a Hypotheses are predictions based upon both research and observation.

2.3b Hypotheses are widely used in science for determining what data to collect and as a guide for interpreting the data.

2.3c Development of a research plan for testing a hypothesis requires planning to avoid bias (e.g., repeated trials, large sample size, and objective data-collection techniques).

3.1a Interpretation of data leads to development of additional hypotheses, the formulation of generalizations, or explanations of natural phenomena.

3.4a Hypotheses are valuable, even if they turn out not to be true, because they may lead to further investigation.

3.4b Claims should be questioned if the data are based on samples that are very small, biased, or inadequately controlled or if the conclusions are based on the faulty, incomplete, or misleading use of numbers.

3.4c Claims should be questioned if fact and opinion are intermingled, if adequate evidence is not cited, or if the conclusions do not follow logically from the evidence given.

3.5a One assumption of science is that other individuals could arrive at the same explanation if they had access to similar evidence. Scientists make the results of their investigations public; they should describe the investigations in ways that enable others to repeat the investigations.

3.5b Scientists use peer review to evaluate the results of scientific investigations and the explanations proposed by other scientists. They analyze the experimental procedures, examine the evidence, identify faulty reasoning, point out statements that go beyond the evidence, and suggest alternative explanations for the same observations.
SKILLS: “STUDENTS WILL BE ABLE TO...”

- Describe and explain the structures and functions of the human body at different organizational levels (e.g., systems, tissues, cells, organelles).
- Explain how a one-celled organism is able to function despite lacking the levels of organization present in more complex organisms.
- Design and carry out a controlled, scientific experiment based on biological processes.
- State an appropriate hypothesis.
- Differentiate between independent and dependent variables.
- Identify the control group and/or controlled variables.
- Collect, organizes, and analyze data, using a computer and/or other laboratory equipment.
- Organize data through the use of data tables and graphs.
- Analyze results from observations/expressed data.
- Formulate an appropriate conclusion or generalization from the results of an experiment.
- Recognize assumption and limitations of the experiment.
- Describe the nine characteristics that distinguish living from non-living things.
- Explain metabolism and homeostasis.
- Follow safety rules in the laboratory.
- Select and use correct instruments
  - Uses graduated cylinders to measure volume
  - Uses metric ruler to measure length
  - Uses thermometer to measure temperature
  - Uses triple-beam or electronic balance to measure mass
- Describe the structure and functions of cell organelles.
- Explain the role of the selectively permeable cell membrane in passive and active transport.
- Uses a compound microscope/stereoscope effectively to see specimens clearly, using different magnifications
  - Identifies and compares parts of a variety of cells
  - Compares relative sizes of cells and organelles
  - Prepares wet-mount slides and uses appropriate staining techniques
- Describe and compare the levels of organization and specialization in unicellular, colonial, and multi-cellular organisms.
- Designs and uses dichotomous keys to identify specimens.
UNIT: BIOCHEMISTRY

TOPIC CONTENT: BIOCHEMISTRY
1. Basic Biochemical
3. Feedback and Homeostasis.
4. Enzymes

CRITICAL TERMS

<table>
<thead>
<tr>
<th>CRITICAL TERMS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>amino acid</td>
<td>enzyme</td>
</tr>
<tr>
<td>catalyst</td>
<td>glucose</td>
</tr>
<tr>
<td>diffusion</td>
<td>homeostasis</td>
</tr>
<tr>
<td>dynamic equilibrium</td>
<td>inorganic</td>
</tr>
</tbody>
</table>

CORE CURRICULUM / MAJOR UNDERSTANDINGS

1.2c The components of the human body, from organ systems to cell organelles, interact to maintain a balanced internal environment. To successfully accomplish this, organisms possess a diversity of control mechanisms that detect deviations and make corrective actions.

1.2d If there is a disruption in any human system, there may be a corresponding imbalance in homeostasis.

1.2h Many organic and inorganic substances dissolved in cells allow necessary chemical reactions to take place in order to maintain life. Large organic food molecules such as proteins and starches, must initially be broken down (digested to amino acids and simple sugars respectively), in order to enter cells. Once nutrients enter a cell, the cell will use them as building blocks in the synthesis of compounds necessary for life.

5.1c In all organisms, organic compounds can be used to assemble other molecules such as proteins, DNA, starch, and fats. The chemical energy stored in bonds can be used as a source of energy for life processes.

5.1d In all organisms, the energy stored in organic molecules may be released during cellular respiration. This energy is temporarily stored in ATP molecules. In many organisms, the process of cellular respiration is concluded in mitochondria, in which ATP is produced more efficiently, oxygen is used, and carbon dioxide and water are released as wastes.

5.1e The energy from ATP is used by the organism to obtain, transform and transport materials and to eliminate wastes.

5.1f Biochemical processes, both breakdown and synthesis are made possible by a large set of protein catalysts called enzymes. Enzymes can affect the rates of chemical changes. The rate at which enzymes work can be influenced by internal environmental factors such as pH and temperature.

5.1g Enzymes and other molecules, such as hormones, receptor molecules, and antibodies, have specific shapes that influence both how they function and how they interact with other molecules.

SKILLS: “STUDENTS WILL BE ABLE TO…”

- Explain the basic biochemical processes in living organisms and their importance in maintaining dynamic equilibrium.
- Describe and explain the structures and functions of the human body at different organizational levels (e.g., systems, tissues, cells, organelles).
- Follow safety rules in the laboratory.
- Select and use correct instruments
  - Use graduated cylinders to measure volume
  - Use metric ruler to measure length
  - Use thermometer to measure temperature
  - Use triple-beam or electronic balance to measure mass
- Design and carry out a controlled, scientific experiment based on biological processes.
UNIT: ECOLOGY

TOPIC CONTENT: ECOLOGY
1. Organisms and Their Environment
2. Population Interactions
3. Energy Flow Through
4. An Ecosystem
5. Diversity Benefits
6. Species and Habitats
7. Environmental Changes

CRITICAL TERMS

<table>
<thead>
<tr>
<th>abiotic</th>
<th>ecology</th>
<th>niche</th>
</tr>
</thead>
<tbody>
<tr>
<td>autotroph</td>
<td>ecosystem</td>
<td>population</td>
</tr>
<tr>
<td>biodiversity</td>
<td>energy pyramid</td>
<td>predator</td>
</tr>
<tr>
<td>biotic</td>
<td>food chain/web</td>
<td>prey</td>
</tr>
<tr>
<td>carrying capacity</td>
<td>heterotroph</td>
<td>succession</td>
</tr>
<tr>
<td>community</td>
<td>limiting factors</td>
<td>symbiosis</td>
</tr>
</tbody>
</table>

CORE CURRICULUM / MAJOR UNDERSTANDINGS

1.1a Populations can be categorized by the function they serve. Food webs identify relationships among producers, consumers, and decomposers carrying out either autotrophic or heterotrophic nutrition.

1.1b An ecosystem is shaped by the non-living environment as well as its interacting species. The world contains a wide diversity of physical conditions, which creates a variety of environments.

1.1c In all these environments, organisms compete for vital resources. The linked and changing interactions of populations and the environment compose the total ecosystem.

1.1d The interdependence of organisms in an established ecosystem often results in inappropriate stability over hundreds and thousands of years. For example, as one population increases, it is held in check by one or more environmental factors or another species.

1.1e Ecosystems, like many complex systems, tend to show cyclic changes around a state of approximate equilibrium.

1.1f Every population is linked, directly or indirectly with many others in an ecosystem. Disruptions in the numbers and types of species and environmental changes can upset ecosystem stability.

5.1a The energy of life comes primarily from the Sun. Photosynthesis provides a vital connection between the Sun and the energy needs of living systems.

5.1b Plant cells and some one-celled organisms contain chloroplasts, the site of photosynthesis. The process of photosynthesis uses solar energy to combine the inorganic molecules carbon dioxide and water into energy-rich organic compounds (e.g. glucose) and release oxygen to the environment.

6.1a Energy flows through ecosystems in one direction, typically from the sun, through photosynthetic organisms including green plants and algae, to herbivores to carnivores and decomposers.

6.1b The atoms and molecules on the earth cycle among the living and nonliving components of the biosphere. For example, carbon dioxide and water molecules used in photosynthesis to
form energy-rich organic compounds are returned to the environment when the energy in these compounds is eventually released by cells. Continual input of energy from sunlight keeps the process going. This concept may be illustrated with an energy pyramid.

6.1c The chemical elements that make up the molecules of living things pass through food webs and are combined and recombined in different ways. At each link in a food web, some energy is stored in newly made structures but much is dissipated into the environment as heat.

6.1d The number of organisms any habitat can support (carrying capacity) is limited by the available energy, water, oxygen, and minerals, and by the ability of ecosystems to recycle wastes and the residue of dead organisms through the activities of bacteria and fungi.

6.1e In any particular environment, the growth and survival of organisms depend on the physical conditions including light intensity, temperature range, mineral availability, soil/rock type, and relative acidity (pH).

6.1f Living organisms have the capacity to produce populations of infinite size, but environments and resources are finite. This has profound effects on the interactions between organisms.

6.1g Relationships between organisms may be negative, neutral, or positive. Some organisms may interact with one another in several ways: They may be in producer/consumer, predator/prey, or parasite/host relationships. Or one organisms may cause disease in, scavenge, or decompose another.

6.3a The interrelationships and interdependencies of organisms affect the development of stable ecosystems.

6.3b Through ecological succession, all ecosystems progress through a sequence of changes during which one ecological community modifies the environment, making it more suitable for another community. These long-term gradual changes result in the community reaching a point of stability that can last for hundreds or thousands of years.

6.3c A stable ecosystem can be altered, either rapidly or slowly, through the activities of organisms (including humans), or through climatic changes or natural disasters. The altered ecosystem can usually recover through gradual changes back to a point of long-term stability.

SKILLS: “STUDENTS WILL BE ABLE TO…”

- Discuss how intraspecific and interspecific competition for habitats and niches shapes ecosystems.
- Describe the different types of symbiotic relationships
- Explain the relationship between community, ecosystem, and biosphere.
- Explain the roles producers (autotrophs), the different types of consumers (heterotrophs), and the decomposers in an ecosystem.
- Design and interpret Food Chains, Food Webs and pyramids of energy and biomass.
- Describe materials such as water, oxygen, carbon dioxide and nitrogen cycle through an ecosystem.
- Explain how succession occurs resulting in a stable ecosystem.
- Explain the significance of limiting factors and carrying capacity.
- Explain factors that limit growth of individuals and populations.
- Explain how diversity of populations within ecosystems relates to the stability of ecosystems.
- Explain how the living and nonliving environments change over time and respond to disturbances.
UNIT: ENERGETICS

TOPIC CONTENT: ENERGETICS (FLOW OF ENERGY)
1. Photosynthesis
2. Respiration
3. ATP

CRITICAL TERMS

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>aerobic</td>
<td>chloroplast</td>
</tr>
<tr>
<td>anaerobic</td>
<td>mitochondria</td>
</tr>
<tr>
<td>ATP</td>
<td>photosynthesis</td>
</tr>
<tr>
<td>autorph</td>
<td>respiration</td>
</tr>
<tr>
<td>biochemistry</td>
<td>transpiration</td>
</tr>
<tr>
<td>chlorophyll</td>
<td></td>
</tr>
</tbody>
</table>

CORE CURRICULUM / MAJOR UNDERSTANDINGS

5.1a The energy for life comes primarily from the Sun. Photosynthesis provides a vital connection between the Sun and the energy needs of living systems.
5.1b Plant cells and some one-celled organisms contain chloroplasts, the site of photosynthesis. The process of photosynthesis uses solar energy to combine the inorganic molecules carbon dioxide and water into energy-rich compounds (e.g. glucose) and release oxygen to the environment.
5.1c In all organisms, organic compounds can be used to assemble other molecules such as proteins, DNA, starch and fats. The chemical energy stored in bonds can be used as a source of energy for life processes.
5.1d In all organisms, the energy stored in organic molecules may be released during cellular respiration. This energy is temporarily stored in ATP molecules. In many organisms the process of cellular respiration is concluded in mitochondria, in which ATP is produced more efficiently, oxygen is used and carbon dioxide and water are released as wastes.
5.1e The energy from ATP is then used by the organism to obtain transform and transport materials, and to eliminate wastes.
5.1f Biochemical processes, both breakdowns and synthesis are made possible by a large set of protein catalysts called enzymes. Enzymes can affect the rates of chemical changes. The rate at which enzymes work can be influenced by internal environmental factors such as pH and temperature.

SKILLS: “STUDENTS WILL BE ABLE TO…”

- Relate the structure and function of organic compounds to their formation and use as sources of energy.
- Discuss the events associated with strenuous physical activity and how that relates to the chemical process of cellular respiration.
- Describe the structure in plants that support the process of photosynthesis.
- Discuss the importance of energy to living things.
- Discuss the role of ATP and its importance in the storage and transfer of energy.
- Discuss the importance of mitochondria and their role in the production of ATP.
- Explain the role of oxygen.
- Describe the early experiments that provided the basic fact about the process of photosynthesis.
- Discuss the nature of light and how it interacts with the pigment chlorophyll.
- Explain and diagram the chemistry of photosynthesis.
- Discuss the factors that control the rate of photosynthesis.
- Use chromatography to separate molecules.
UNIT: HUMAN ANATOMY AND PHYSIOLOGY

TOPIC CONTENT: HUMAN ANATOMY AND PHYSIOLOGY
1. Connections to major understandings
2. Body Systems

CRITICAL TERMS

<table>
<thead>
<tr>
<th>diffusion</th>
<th>hydrolysis</th>
<th>regulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>digestion</td>
<td>insulin</td>
<td>respiration</td>
</tr>
<tr>
<td>endocrine</td>
<td>metabolism</td>
<td>thyroxin</td>
</tr>
<tr>
<td>excretion</td>
<td>neuron</td>
<td>transport</td>
</tr>
<tr>
<td>homeostasis</td>
<td>nutrition</td>
<td></td>
</tr>
<tr>
<td>hormone</td>
<td></td>
<td>positive/negative feedback</td>
</tr>
</tbody>
</table>

CORE CURRICULUM / MAJOR UNDERSTANDINGS

1.2c The Components of the human body, from organ systems to cell organelles, interact to maintain a balanced internal environment. To successfully accomplish this, organisms possess a diversity of control mechanisms that detect deviations and make corrective actions.

1.2j Receptor molecules play an important role in the interactions between cells. Two primary agents of cellular communication are hormones and chemicals produced by nerve cells. If nerve or hormone signals are blocked, cellular communication is disrupted and the organism’s stability is affected.

5.3a Dynamic equilibrium results from detection of and response to stimuli. Organisms detect and respond to change in a variety of ways both at the cellular level and at the organismal level.

5.3b Feedback mechanisms help to maintain homeostasis. Examples include the changes in heart rate or respiratory rate in response to increased activity in muscle cells, the maintenance of blood sugar levels by insulin from the pancreas, and the changes in the openings in the leaves of plants by guard cells to regulate water loss and gas exchange.

SKILLS: “STUDENTS WILL BE ABLE TO…”

- Discuss the structure and function of the human nervous system.
- Compare the mechanisms of chemical and nervous regulation.
- Describe the mechanisms of hormone action.
- Discuss the structure and function of the human endocrine system.
- Give examples of feedback mechanisms.
- Discuss the role of excretion in maintaining homeostasis.
- Name the major metabolic wastes produced?
- Discuss the characteristics of a respiratory surface.
- Describe the structures and functions of the Human respiratory system.
- Describe the transport of oxygen and carbon dioxide in the blood.
- Describe the structures and functions of the organs important in excretion in humans.
- Discuss the structures and mechanisms associated with nerve transmission.
- Describe the different parts of the blood and explain the functions of each.
- Dissects plant and/or animal specimens to expose and identify internal structures.
UNIT: DISEASE

TOPIC CONTENT: DISEASE
1. Blood
2. Disease and the failure of homeostasis
3. Immunity

CRITICAL TERMS

<table>
<thead>
<tr>
<th>antibody</th>
<th>immune response</th>
<th>vaccination</th>
</tr>
</thead>
<tbody>
<tr>
<td>antigen</td>
<td>immune system</td>
<td>virus</td>
</tr>
<tr>
<td>disease</td>
<td>microbe</td>
<td>white blood cell</td>
</tr>
<tr>
<td>homeostasis</td>
<td>pathogen</td>
<td></td>
</tr>
</tbody>
</table>

CORE CURRICULUM / MAJOR UNDERSTANDINGS

1.2d If there is a disruption in any human system, there may be a corresponding imbalance in homeostasis.
5.2h Disease may also be caused by inheritance, toxic substances, poor nutrition organ malfunction, and/or some personal behavior. Some effects show up right away, others may not show up for many years.
1.2e The organs and systems of the body help to provide all the cells with their basic needs. The cells of the body are of different kinds and are grouped in ways that enhance how they function together.
1.2j Receptor molecules play an important role in the interactions between cells. Two primary methods of cellular communication are hormones and chemicals produced by nerve cells. If nerve or hormone signals are blocked, this disrupts cellular communication and affects the organism’s stability.
5.2a Homeostasis in an organism is constantly threatened. Failure to respond effectively can result in disease or death.
5.2b Viruses, bacteria, fungi, and other parasites may infect plants and animals and interfere with normal life functions.
5.2c The immune system protects against antigens associated with pathogenic organisms or foreign substances and some cancer cells.
5.2d Some white blood cells engulf invaders. Others produce antibodies that attack them or mark them for killing. Some specialized white blood cells will remain, able to fight off subsequent invaders of the same kind.
5.2e Vaccinations use weakened microbes (or parts of them) to stimulate the immune system to react. This reaction prepares the body to fight subsequent invasions by the same microbes.
5.2f Some viral diseases, such as AIDS, damage the immune system, leaving the body unable to deal with multiple infectious agents and cancerous cells.
5.2g Some allergic reactions are caused by the body’s immune responses to usually harmless environmental substances. Sometimes the immune system may attack some the body’s own cells or transplanted organs.
5.2i Gene mutations in a cell can result in uncontrolled cell division, called cancer. Exposure of cells to certain chemicals and radiation increases mutations and thus increases the chance of cancer.

5.2j Biological research generates knowledge used to design ways of diagnosing, preventing, treating, controlling, or curing diseases of plants and animals.

5.3a Dynamic equilibrium results from detection of and response to stimuli. Organisms detect and respond to change in a variety of ways both at the cellular level and at the organismal level.

SKILLS: “STUDENTS WILL BE ABLE TO…”
- Explain the mechanisms involved in immunity. Compare inborn, acquires, active and passive immunity.
- Describe the immune systems role in autoimmune diseases, allergies and transplant rejection.
- Discuss the biochemical basis of human blood groups and its relation to the antigen/antibody/response.
- Explain the significance of the ABO blood group and Rh factors in transfusions and pregnancy.
- Discuss diseases of the excretory system.
- Discuss diseases of the respiratory system.
- Discuss diseases of the blood.
- Relate immunology to evidence of evolutionary relationships.
- Discuss diseases of the digestive system.
UNIT: REPRODUCTION & DEVELOPMENT

TOPIC CONTENT: REPRODUCTION & DEVELOPMENT
1. Types of Reproduction
2. Cell Division
3. Human Reproduction and Development
4. Applications of Reproductive Technology

CRITICAL TERMS

<table>
<thead>
<tr>
<th>asexual</th>
<th>fetus</th>
<th>pollination</th>
</tr>
</thead>
<tbody>
<tr>
<td>chromosome</td>
<td>gamete</td>
<td>progesterone</td>
</tr>
<tr>
<td>cleavage</td>
<td>hormone</td>
<td>sexual</td>
</tr>
<tr>
<td>differentiation</td>
<td>implantation</td>
<td>sperm</td>
</tr>
<tr>
<td>egg</td>
<td>meiosis</td>
<td>testis</td>
</tr>
<tr>
<td>embryo</td>
<td>menstrual cycle</td>
<td>zygote</td>
</tr>
<tr>
<td>estrogen</td>
<td>mitosis</td>
<td></td>
</tr>
<tr>
<td>fertilization</td>
<td>ovary</td>
<td></td>
</tr>
</tbody>
</table>

CORE CURRICULUM / MAJOR UNDERSTANDINGS

2.1d In asexually reproducing organisms, all the genes come from a single parent. Asexually produced offspring are normally genetically identical to the parent.

2.1e In asexually reproducing organisms, the new individual receives half of the genetic information from its mother (via the egg) and half from its father (via the sperm). Sexually produced offspring often resemble, but are not identical to, either of their parents.

3.1c Mutation and the sorting and recombining of genes during meiosis and fertilization result in a great variety of possible gene combinations.

3.1d Mutations occur as random chance events. Gene mutations can also be caused by such agents as radiation and chemicals. When they occur in sex cells, the mutations can be passed on to offspring; if they occur in other cells, they can be passed on to other body cells only.

4.1a Reproduction and development are necessary for the continuation of any species.

4.1b Some organisms reproduce asexually with all the genetic information coming from one parent. Other organisms reproduce sexually with half the genetic information typically contributed by each parent. Cloning is the production of identical genetic copies.

4.1c The processes of meiosis and fertilization are keys to sexual reproduction in a wide variety of organisms. The process of meiosis results in the production of eggs and sperm which each contain half of the genetic information. During fertilization, gametes unite to form a zygote, which contains the complete genetic information for the offspring.

4.1d The zygote may divide by mitosis and differentiate to form the specialized cells, tissues, and organs of multi-cellular organisms.

4.1e Human reproduction and development are influenced by factors such as gene expression, hormones, and the environment. The reproductive cycle in both males and females is regulated by hormones such as testosterone, estrogen, and progesterone.
The structures and functions of the human female reproductive system, as in almost all other mammals, are designed to produce gametes in ovaries, allow for internal fertilization, support the internal development of the embryo and fetus in the uterus, and provide essential materials through the placenta, and nutrition through milk for the newborn.

The structures and functions of the human male reproductive system, as in other mammals, are designed to produce gametes in testes and make possible the delivery of these gametes for fertilization.

In humans, the embryonic development of essential organs occurs in early stages of pregnancy. The embryo may encounter risks from faults in its genes and from its mother’s exposure to environmental factors such as inadequate diet, use of alcohol/drugs/tobacco, other toxins, or infections throughout her pregnancy.

SKILLS: “STUDENTS WILL BE ABLE TO…”
- Compare the two types of reproduction.
- Discuss the importance of maintaining chromosome number.
- Describe how the process of mitosis in plants and animals insures the transmission of genetic information.
- Describe various processes of asexual reproduction such as binary fission, budding sporulation, regeneration and vegetative propagation.
- Compare and contrast asexual and sexual reproduction.
- Discuss the significance of reducing the chromosome number.
- Compare and contrast the processes of mitosis and meiosis.
- Compare and contrast the processes and products of gametogenesis in males and females.
- Discuss the process of fertilization, internal and external.
- Describe the structure and function of the male and female reproductive system.
- Discuss the stages of the menstrual cycle and the hormonal feedback mechanisms that regulate it.
- Describe the stages in human reproduction from fertilization, implantation, and development of the embryo to birth.
- Describe the events that occur during cleavage and embryonic development.
- Discuss the process of differentiation and the role of the nucleus and cytoplasm in directing development.
- Discuss the adaptations for development on land from external development in specialized eggs to internal development in mammals.
UNIT: GENETIC CONTINUITY

TOPIC CONTENT: GENETIC CONTINUITY
1. Heredity and Genes
2. The Genetic Code
3. Genetic Engineering

CRITICAL TERMS
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>allele</td>
<td>genetic code</td>
</tr>
<tr>
<td>bases (A, T, G, C, and U)</td>
<td>genetic engineering</td>
</tr>
<tr>
<td>chromosome</td>
<td>gene expression</td>
</tr>
<tr>
<td>cloning</td>
<td>mutation</td>
</tr>
<tr>
<td>DNA/RNA</td>
<td>protein synthesis</td>
</tr>
<tr>
<td>gene</td>
<td>recombinant DNA</td>
</tr>
</tbody>
</table>

CORE CURRICULUM / MAJOR UNDERSTANDINGS
2.1a Genes are inherited, but their expression can be modified by interactions with the environment.
2.1b Every organism requires a set of coded instructions for specifying its traits. For offspring to resemble their parents, there must be a reliable way to transfer information from one generation to the next. Heredity is the passage of these instructions from one generation to another.
2.1c Hereditary information is contained in genes located in the chromosomes of each cell. Each gene carries a separate piece of information. An inherited trait of an individual can be determined by one or by many genes, and a single gene can influence more than one trait. A human cell contains many thousands of different genes in its nucleus.
2.1d In asexually reproducing organisms, all the genes come from a single parent. Asexually produced offspring are normally genetically identical to the parent.
2.1e In asexually reproducing organisms, the new individual receives half of the genetic information from its mother (via the egg) and half from its father (via the sperm). Sexually produced offspring resemble but are not identical to either of their parents.
2.1f Genes are segments of DNA molecules. Random alteration of DNA can cause mutations. An altered gene may be passed on to every cell that develops from it.
2.1g In all organisms, the coded instructions for specifying the characteristics of the organism are carried in DNA. A large molecule formed from subunits arranged in a sequence with bases of four kinds (represented by A, G, C, and T). The chemical and structural properties of DNA are the basis for how the genetic information that underlies heredity is both encoded in genes (as a string of molecular bases) and replicated by means of a template.
2.1h Cells store and use coded information. The genetic information stored in DNA is used to direct the synthesis of the thousands of proteins that each cell requires.
2.1i The work of the cell is carried out by the many different types of molecules it assembles, mostly proteins. Protein molecules are long, usually folded chains made from 20 different kinds of amino acids in a specific sequence influences the shape of the protein. The shape of the protein, in turn, determines its function.
2.1j Offspring resemble their parents because they inherit similar genes that code for the production of proteins that form similar structures and perform similar functions.
2.1k The many body cells in an individual can be very different from one another even though they are all descended from a single cell and thus have essentially identical genetic instructions. This is because different parts of these instructions are used in different types of cells, influenced by the cell’s environment and past history.

2.2a For thousands of years new varieties of cultivated plants and domestic animals have resulted from selective breeding for particular traits.

2.2b In recent years new varieties of plants and animals have been genetically engineered by manipulating their DNA instructions to produce new characteristics.

2.2c Different enzymes can be used to cut, copy and move segments of DNA. Characteristics produced by the segments of DNA may be expressed when these segments are inserted into new organisms, such as bacteria.

2.2d Inserting, deleting, or substituting DNA segments can alter genes. An altered gene may then be passed on to subsequent cells through cell division.

2.2e Knowledge of genetics is making possible new fields of health care. For example, mapping of genetic instructions in cells makes it possible to detect and perhaps correct defective genes that may lead to poor health. Substances, such as some hormones and enzymes from genetically engineered organisms, may reduce the cost and side effects of replacing missing body chemicals.

3.1b New inheritable characteristics can result from new combinations of existing genes or from mutations of genes in reproductive cells.

3.1c Mutation and the sorting and recombining of genes during meiosis and fertilization result in a great variety of possible gene combinations.

3.1d Mutations occur as random chance events. Gene mutations can also be caused by such agents as radiation and chemicals. When they occur in sex cells, the mutations can be passed on to offspring; if they occur in other cells, they can be passed on to other body cells only.

4.1b Some organisms reproduce asexually with all the genetic information coming from one parent. Other organisms reproduce sexually with half the genetic information typically contributed by each parent. Cloning is the production of identical genetic copies.

5.2i Gene mutation in a cell can result in uncontrolled cell division called cancer. Exposure of cells to certain chemicals and radiation increases mutations and thus increases the chance of cancer.

5.2j Biological research generated knowledge used to design ways of diagnosing, preventing, treating, controlling or during diseases of plants and animals.

SKILLS: “STUDENTS WILL BE ABLE TO…”

- Discuss the expression of traits resulting from patterns of inheritance such as sex-linkage, crossing over, gene linkage and multiple gene inheritance.
- Discuss the chromosome theory.
- Explain the role of environment on gene expression.
- Discuss the effects of mutation.
- Discuss human inheritance and genetic disease.
- Describe the structure and behavior of the Watson-Crick model of DNA.
- Describe the role of DNA in controlling cell activity.
- Explain how the structure and replication of genetic material result in offspring that resemble their parents.
- Explain how the technology of genetic engineering allows humans to alter genetic makeup of organisms.
UNIT: EVOLUTION

TOPIC CONTENT: EVOLUTION
1. Modern Theory of Evolution
2. Evidence of Evolution

CRITICAL TERMS

<table>
<thead>
<tr>
<th>adaptation</th>
<th>fossil</th>
<th>sedimentary rock</th>
<th>relative dating</th>
</tr>
</thead>
<tbody>
<tr>
<td>diversity</td>
<td>gradualism</td>
<td>speciation</td>
<td></td>
</tr>
<tr>
<td>embryology</td>
<td>homologous</td>
<td>species</td>
<td></td>
</tr>
<tr>
<td>evolution</td>
<td>natural selection</td>
<td>variation</td>
<td></td>
</tr>
<tr>
<td>extinction</td>
<td>punctuated equilibrium</td>
<td>vestigial structure</td>
<td></td>
</tr>
</tbody>
</table>

CORE CURRICULUM / MAJOR UNDERSTANDINGS

3.1a The basic theory of biological evolution is that the earth’s present day species developed from earlier, distinctly different species.

3.1b New inheritable characteristics can result from new combinations of existing genes or from mutations of genes in reproductive cells.

3.1c Mutation and the sorting and recombining of genes during meiosis and fertilization result in a great variety of possible gene combinations.

3.1d Mutations occur as random chance events. Gene mutations can also be caused by such agents as radiation and chemicals. When they occur in sex cells, the mutations can be passed on to offspring; if they occur in other cells, they can be passed on to other body cells only.

3.1e Natural selection and its evolutionary consequences provide a scientific explanation for the fossil record of ancient life-forms, as well as for the molecular and structural similarities observed among the diverse species of living organisms.

3.1f Species evolve over time. Evolution is the consequence of the interactions of (1) the potential for a species to increase its numbers, (2) the genetic variability of offspring due to mutation and recombination of genes, (3) a finite supply of the resources required for life, and (4) the ensuing selection by the environment of those offspring better able to survive and leave offspring.

3.1g Some characteristics give individuals an advantage over others in surviving and reproducing, and the advantaged offspring, in turn, are more likely than others to survive and reproduce. The proportion of individuals that have advantageous characteristics will increase.

3.1h The variation of organisms within a species increases the likelihood that at least some members of the species will survive under changed environmental conditions.

3.1i Behaviors have evolved through natural selection. The broad patterns of behavior exhibited by organisms are those that have resulted in greater reproductive success.

3.1j Billions of years ago, life on Earth is thought by many scientists to have begun as simple, single-celled organisms. About a billion years ago, increasingly complex multi-cellular organisms began to evolve.

3.1k Evolution does not necessitate long-term progress in some set direction. Evolutionary changes appear to be like the growth of a bush: Some branches survive from the
beginning with little or no change, many die out altogether and others branch repeatedly, sometimes giving rise to more complex organisms.

3.1l Extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient to allow its survival. Fossils indicate that many organisms that lived long ago are extinct. Extinction of a species is common; most of the species that have lived on Earth no longer exist.

6.2a As a result of evolutionary processes, there is a diversity of organisms and roles in ecosystems. This diversity of species increases the chance that at least some will survive in the face of large environmental changes. Biodiversity increases the stability of the ecosystem.

6.2b Biodiversity also ensures the availability of a rich variety of genetic material that may lead to future agricultural or medical discoveries with significant value to humankind. As diversity is lost, potential sources of these materials may be lost with it.

SKILLS: “STUDENTS WILL BE ABLE TO…”

- Discuss how adaptation can lead to speciation.
- Discuss the theories that explain the origin of life on earth.
- Compare gradualism and punctuated equilibrium and the pattern of evolution that results from each.
- Discuss the nature and significance of mutations.
- Discuss how mutations and genetic recombinations serve as the source of variations that result in evolution.
- Discuss fossils, comparative, anatomy, embryology, biochemistry and immunology, provide evidence for evolution?
- Explain Darwin’s theory of natural selection explain the process of evolution?
- Explain the mechanisms and patterns of evolution.
UNIT: HUMAN IMPACT ON ECOLOGY

TOPIC CONTENT: HUMAN IMPACT ON ECOSYSTEMS
1. Need for awareness and understanding
2. People and the environment impact of technology and industrialization

CRITICAL TERMS
<table>
<thead>
<tr>
<th>acid rain</th>
<th>greenhouse effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>biological magnification</td>
<td>pollution</td>
</tr>
<tr>
<td>fossil fuels</td>
<td>renewable/nonrenewable resources</td>
</tr>
<tr>
<td>global warming</td>
<td></td>
</tr>
</tbody>
</table>

CORE CURRICULUM / MAJOR UNDERSTANDINGS
7.1a The earth has finite resources: increasing human consumption of resources places stress on the natural processes that renew some resources that cannot be renewed.
7.1b Natural ecosystems provide an array of basic processes that affect humans. Those processes include but are not limited to: maintenance of the quality of the atmosphere, generation of soils, control of the water cycle, removal of wastes, energy flow, and recycling of nutrients. Humans are changing many of these basic processes and the changes may be detrimental.
7.1c Human beings are part of the Earth's ecosystems. Human activities can deliberately or inadvertently, alter the equilibrium in ecosystem. Humans modify ecosystems as a result of population growth, consumption, and technology. Human destruction of habitats through direct harvesting, pollution, atmospheric changes, and other factors is threatening current global stability, and if not addressed, ecosystems will be irreversibly affected.
7.2a Human activities that degrade ecosystems result in a loss of diversity of the living and nonliving environment. For example, the influence of humans on other organisms occurs through land use and pollution. Land use decreases the space and resources available to other species. Pollution changes the chemical composition of air, soil and water.
7.2b When humans alter ecosystems either by adding or removing specific organisms, serious consequences may result. For example, planting large expanses with one crop reduces the biodiversity of the area.
7.2c Industrialization brings an increased demand for and use of energy and other resources including fossil and nuclear fuels. This usage can have positive and negative effects on humans and ecosystems.
7.3a Societies must decide on proposals which involve the introduction of new technologies.Individuals need to make decisions which will assess risks, costs, benefits and tradeoffs.
7.3b The decisions of one generation both provide and limit the range of possibilities open to the next generation.

SKILLS: “STUDENTS WILL BE ABLE TO…”
- Discuss the methods for maintaining and restoring the environment.
- Discuss how human urbanization, farming practices, water, air and land pollution impact on the environment.
- Describe how human population growth impacts on the environment.
- Explain how individual choices and societal actions can contribute to improving the environment.
- Explain the impact of technological development and growth in the human population on the living and nonliving environment.
- Describe the range of interrelationships of humans with the living and nonliving environment.
This guide using *NY Living Environment, Biology Miller & Levine ©2010* was created to provide teachers with a time frame to complete the New York State Living Environment Curriculum.

<table>
<thead>
<tr>
<th>Major Understanding</th>
<th>Aim</th>
<th>Objectives</th>
<th>Vocabulary</th>
<th>Graphic Organizer</th>
<th>Textbook</th>
<th>Activity / Experiment</th>
<th>Date</th>
</tr>
</thead>
</table>
| 1.1.2a, 1.1.3b, 1.2.1, 1.2.3a, 1.2.3b, 1.2.4, 1.3.1a, 1.3.3, 1.3.4b | #1: What is science? | • Define science.  
• Differentiate between observation and inference. | Science observation inference | T-Chart | 1.1: What is Science pp. 4-9 | Notebook: What is the difference between an observation and an inference? List three examples of each. 
Notebook: Explain in your own words why there is uncertainty in science. | Week 1 |
| 1.1.2a, 1.1.3b, 1.2.1, 1.2.3a, 1.2.3b, 1.2.4, 1.3.1a, 1.3.3, 1.3.4b | #2: What safety procedures do scientists use when conducting an experiment? | Identify proper safety techniques | Ensure, efficient, procedure, infer | T-chart to describe each laboratory symbols | Lab Skills 1 Lab Manual B 2002 | Lab Skill 1: Recognizing Laboratory Safety | Week 2 |
| 1.1.2a, 1.1.3b, 1.2.1, 1.2.3a, 1.2.3b, 1.2.4, 1.3.1a, 1.3.3, 1.3.4b | #3: What equipment do scientists use when conducting an experiment? | Identify various pieces of laboratory equipment stating their function. | Probe, scalpel, tripod, Bunsen burner, tongs, medicine dropper, test tube holder, test tube, Erlenmeyer flask, graduated cylinder, reagent bottle, flask, beaker, safety goggles, Petri dish | Use the drawings of laboratory equipment to identify its name and write its use. | Lab Skills 2 Lab Manual B 2002 | Lab Skills 2: Identifying Laboratory Equipment | Week 2 |
| 1.1.2a, 1.1.3b, 1.2.1, 1.2.3a, 1.2.3b, 1.2.4, 1.3.1a, 1.3.3, 1.3.4b | #4: How do we use metric measurements in the laboratory? | • Identify the units of measure within the metric system.  
• Measure length, volume and mass of various items/objects. | International System of Units (SI)  
Mass  
Volume | Lab Table Measurements; Test Tube Measurement  
Measurement of Volume  
Measurement of Mass | Lab Skill 3: Making Metric Measurements | Week 2 |
## The Nature of Life

<table>
<thead>
<tr>
<th>Major Understanding</th>
<th>Aim</th>
<th>Objectives</th>
<th>Vocabulary</th>
<th>Graphic Organizer</th>
<th>Textbook</th>
<th>Activity / Experiment</th>
<th>Date</th>
</tr>
</thead>
</table>
| 1.1.2a, 1.1.3b, 1.2.1, 1.2.3a, 1.2.3b, 1.2.4, 1.3.1a, 1.3.3, 1.3.4b | #5: What is the scientific method? | • Name the steps in the scientific method.  
• Differentiate between a theory and a law. | Problem, Hypothesis, Data, Procedure, Conclusion, Law, Theory | Flow chart Concept mapping | Lab Manual B 2002 | Notebook: Use a flowchart to organize information about performing an experiment.  
Lab Skill 4: Applying the Scientific method | Week 2 |
| 1.1.2a, 1.1.3b, 1.2.1, 1.2.3a, 1.2.3b, 1.2.4, 1.3.1a, 1.3.3, 1.3.4b | #6: How do we use a microscope? | • Discuss the history and important developments in microscopes.  
• Identify and name the parts of a compound microscope.  
• Identify and name other relevant types of microscopes. | Anton van Leeuwenhoek, Robert Hooke, Robert Brown, Matthias Schleiden, Theodor Schwann, Rudolf Virchow, eyepiece, body tube, coarse adjustment, fine adjustment clip, arm, base, diaphragm, stage, low-power objective, high power objective, nosepiece, dissecting microscope, centrifuge, electron microscope, chromatography, electrophoresis | Two-Column Chart of the parts and the use of each part of a microscope | Lab Manual B 2002 | Lab Skill 5: Using a Compound Light Microscope | Week 2 |
| 1.1.2a, 1.1.3b, 1.2.1, 1.2.3a, 1.2.3b, 1.2.4, 1.3.1a, 1.3.3, 1.3.4b | #7: How do we design an experiment? | Identify the independent and dependent variables in an experiment. | Independent variable, dependant variable, control, controlled experiment | Line graphs, tables, charts | Lab Manual B 2002 | Lab Skill 7: Preparing Laboratory Solutions  
Lab Skill 8: Using Graphing Skills  
Lab 1: Using a Microscope to Estimate Size (Lab Manual B NY Living Environment Biology Miller & Levine, Copyright 2010)  
Lab: Hot Solutions | Week 3 |

### Project #1

Common Assessment #1

Week 3
<table>
<thead>
<tr>
<th>Major Understanding</th>
<th>Aim</th>
<th>Objectives</th>
<th>Vocabulary</th>
<th>Graphic Organizer</th>
<th>Textbook</th>
<th>Activity / Experiment</th>
<th>Date</th>
</tr>
</thead>
</table>
| 1.2.2a, 4.2.1d, 4.2.1f, 4.3.1a, 4.5.2a, 4.5.3a, 4.7.2b | #8: What characteristics do all living things share? | • Describe the nine characteristics that distinguish living from non-living things.  
• Name and define basic life processes common to living organisms.  
• Define what a cell is and demonstrate an understanding of cell theory. | Metabolism, Homeostasis, Reproduction, Respiration, Excretion, Cell theory, Life processes, sexual reproduction, asexual reproduction, DNA, Stimulus | Compare and Contrast | 1.3: Studying Life pp. 17-25 | Compare and contrast How are the apple tree and the grass similar? | Week 3 |
<p>| 4.1.2h | #9: What subatomic particles make up an atom? | Identify the three subatomic particles found in an atom. | Atom, Nucleus, Electron, Isotope, Compound, Ionic bond, Ion, Covalent bond, Molecule, Van der Waals forces | Concept Map Create a concept map that relates the following concepts: atom, proton, neutron, electron, element, isotope, compound, ionic bond, ion, covalent bond, and molecule. | 2.1: The Nature of Matter pp. 34-40 | Notebook: Draw a diagram of a helium atom, which has an atomic number of 2. | Week 4 |
| 4.1.2h | #10: How do we compare isotopes of an element? | Explain how all of the isotopes of an element are similar and how are they different. | Isotopes element | Carbon Isotopes Chart | 2.1 The Nature of Matter p. 35 | Notebook: Compare and contrast the structure of Carbon-12 and Carbon-14. | Week 4 |</p>
<table>
<thead>
<tr>
<th>Major Understanding</th>
<th>Aim</th>
<th>Objectives</th>
<th>Vocabulary</th>
<th>Graphic Organizer</th>
<th>Textbook</th>
<th>Activity / Experiment</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1.2h</td>
<td>#11: How are compounds differ from their component elements?</td>
<td>Explain how compounds are different from their component elements.</td>
<td>compounds, elements</td>
<td>Compare and contrast water (H₂O) and hydrogen peroxide (H₂O₂) as to their physical and chemical properties</td>
<td>2.1 The Nature of Matter p. 36</td>
<td>Notebook: In your own words, describe the differences between ionic and covalent bonds.</td>
<td>Week 4</td>
</tr>
<tr>
<td>4.1.2h</td>
<td>#12: What are the main types of chemical bonds?</td>
<td>Describe the two main types of chemical bonds.</td>
<td>chemical bonds ionic covalent Van der Waals forces</td>
<td>Compare and contrast ionic and covalent bonds.</td>
<td>2.1 The Nature of Matter pp. 36-38</td>
<td>Quick Lab: Make an ionic compound using popcorn kernels to represent electrons, p.36</td>
<td>Week 4</td>
</tr>
</tbody>
</table>
| 1.3.3, 4.1.2c       | #13: What are the properties of water? | • Discuss the unique properties of water.  
• Differentiate between solutions and suspensions.  
• Explain what acidic solutions and basic solutions. | hydrogen bond, cohesion, adhesion, mixture, solution, solute, solvent, suspension, pH scale, acid, base, buffer | Venn Diagram: Solutions and Suspensions | 2.2 Properties of Water p. 42 | Notebook: Draw a diagram of a meniscus. Label where cohesion and adhesion occur.  
Notebook: Order these items in order of increasing acidity: soap, lemon, juice, milk, acid rain. | Week 5 |
<p>| 1.3.3, 4.1.2c       | #14: What is an amino acid? | Discuss and identify the properties of an amino acid. | protein, amino acid, glucose, nucleotides | Compare and Contrast Carbohydrates, lipids, nucleic acids, and proteins | 2.3 Carbon Compounds pp. 45-49 | What is an amino acid? | Week 5 |</p>
<table>
<thead>
<tr>
<th>Major Understanding</th>
<th>Aim</th>
<th>Objectives</th>
<th>Vocabulary</th>
<th>Graphic Organizer</th>
<th>Textbook</th>
<th>Activity / Experiment</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.3.3, 4.1.2c</td>
<td>#15: What is pH?</td>
<td>Discuss the pH scale and its importance in chemical reactions.</td>
<td>acid, base, pH scale, enzyme, catalyst, lipid, starch</td>
<td>Order these items in order of increasing acidity: soap, lemon juice, milk, and acid rain</td>
<td>2.2 Properties of Water p. 43</td>
<td>Lab: pH of Common Foods</td>
<td>Week 5</td>
</tr>
<tr>
<td>1.3.3, 4.1.2c</td>
<td>#16: What are enzymes and how do they work?</td>
<td>Discuss the properties and functions of enzymes.</td>
<td>Enzymes Activation energy Catalysts Chemical reaction Products Reactants substrate</td>
<td>Concept Map showing the relationship between the vocabulary terms</td>
<td>2.4 Chemical Reactions and Enzymes pp. 50-53</td>
<td>Lock and Key Analogy</td>
<td>Week 5</td>
</tr>
<tr>
<td>1.3.3, 4.1.2c</td>
<td>#17: What affects rates of enzyme reaction?</td>
<td>Identify the influences on enzyme functioning.</td>
<td>Temperature Ph Regulatory molecules</td>
<td>Compare and contrast: Reactions that spontaneously and those that do not</td>
<td>2.4 Chemical Reactions and Enzymes pp. 50-53</td>
<td>Use analogy to explain how a change in pH can change the shape of a protein</td>
<td>Week 5</td>
</tr>
</tbody>
</table>

**Project #2**

**Common Assessment #2**
<table>
<thead>
<tr>
<th>Major Understanding</th>
<th>Aim</th>
<th>Objectives</th>
<th>Vocabulary</th>
<th>Graphic Organizer</th>
<th>Textbook</th>
<th>Activity / Experiment</th>
<th>Date</th>
</tr>
</thead>
</table>
| 1.1.1a, 1.2.2.2a, 4.1.1b, 4.1.1c, 4.6.1e, 4.7.1c | #18: What is ecology? | • Describe the study of ecology.  
• Explain how biotic and abiotic factors influence an ecosystem.  
• Explain the relationship between community, ecosystem, and biosphere. | Biosphere  
Species  
Population  
Community  
Ecology  
Ecosystem  
Biome  
Biotic factor  
Abiotic factor | Diagram | 3.1 What is Ecology?  
pp. 64-68 | Notebook: Draw a circle and label it “Me.” Then, draw five concentric circles and label each of them with the appropriate level of organization. Each circle should contain a description along with the appropriate label. | Week 6 |
| 4.1.1a, 4.1.1f, 4.5.1a, 4.6.1a, 4.6.1b, 4.6.1c | #19: How is energy transferred from one organism to another? | • Define primary producers.  
• Describe how consumers obtain energy and nutrients. | Autotroph  
Primary producer  
Photosynthesis  
Chemosynthesis  
Heterotrophy  
Consumer  
Carnivore  
Herbivore  
Scavenger  
Omnivore  
Decomposer  
Detrivore | Concept Map | 3.2: Energy, Producers, and Consumers  
pp. 69-72 | Concept Map to show the relationships between different types of organisms in this lesson, p.33 | Study Workbook B | Week 6 |
| 4.1.1a, 4.1.1f, 4.5.1a, 4.6.1a, 4.6.1b, 4.6.1c | #20: How does energy flow through the ecosystem? | • Trace the flow of energy through the living system.  
• Explain how the living and nonliving environments change over time and respond to disturbances. | Niche  
Food chain  
Phytoplankton  
Food web  
Zooplankton  
Trophic level  
Ecological pyramid  
Biomass | Two-Column Chart | 3.1: Energy Flow in Ecosystems  
pp. 73-78 | Notebook: List the three types of pyramids in the left column and facts about each type in the right column. | Week 6 |
<table>
<thead>
<tr>
<th>Major Understanding</th>
<th>Aim</th>
<th>Objectives</th>
<th>Vocabulary</th>
<th>Graphic Organizer</th>
<th>Textbook</th>
<th>Activity / Experiment</th>
<th>Date</th>
</tr>
</thead>
</table>
| 4.6.1a, 4.6.1b, 4.6.1c, 4.6.1d, 4.7.1b | #21: How does matter move through the biosphere? | ● Describe how matter cycles among the living and nonliving parts of an ecosystem.  
● Describe how water cycles through the biosphere.  
● Explain why nutrients are important in living systems. | Water cycle  
Nitrogen cycle  
Carbon cycle | Label parts of the Water Cycle | 3.4: Cycles of Matter  
Pages 79-86 | Notebook: Main Idea and Detail Chart  
Main Ideas; Recycling in the biosphere, The Water Cycle, Nutrient Cycles, Nutrient Limitations  
Write details about each main idea. | Week 7 |
| 4.6.1a, 4.6.1b, 4.6.1c, 4.6.1d, 4.7.1b | #22: What factors affect ecosystems? | ● Discuss how intraspecific competition for habitats and niches shapes ecosystems.  
● Explain how succession occurs resulting in a stable ecosystem  
● Explain the significance of limiting factors and carrying capacity.  
● Name the factors that limit growth of individuals and populations. | Community  
Competition  
Limiting factors  
Predators  
Prey  
Carrying Capacity  
Succession  
Ecological Succession  
Dominant species  
Climax community  
Primary succession  
Secondary succession | Concept Map | 4.1 Climate  
Pages 96-104 | Notebook: Compare and contrast table between primary succession and secondary succession. | Week 7 |

**Project #3**  
Week 7

**Common Assessment #3**
<table>
<thead>
<tr>
<th>Major Understanding</th>
<th>Aim</th>
<th>Objectives</th>
<th>Vocabulary</th>
<th>Graphic Organizer</th>
<th>Textbook</th>
<th>Activity / Experiment</th>
<th>Date</th>
</tr>
</thead>
</table>
| 1.1.4a, 4.1.2g      | #23: What is the structure of a cell? | • Identify the basic cell organelles and their functions.  
• Describe and explain the structures and functions of the human body at different organizational levels (e.g., systems, tissues, cells, organelles)  
• Differentiate between Prokaryotic and Eukaryotic cells.  
• Identify the difference between plant and animal cells.  
• Describe and compare the levels of organization and specialization in unicellular, colonial, and multi-cellular organisms. | Prokaryotic Eukaryotic Nucleus Mitochondria Vacuole Ribosome Nucleolus Golgi body Endoplasmic Reticulum Cell membrane Cell wall cytoplasm centriole | Diagrams of cell labeling organelles Summarize Flowchart | 7.1: Cell Structure and Function, pp.190-214 | Notebook: Summarize What is the main difference between prokaryotes and eukaryotes?  
Notebook: Describe the structure of the nucleus. Include the words nuclear envelope, nuclear pore, chromatin, chromosomes, and nucleolus in the description.  
Notebook: Make a flowchart that shows how proteins are assembled in a cell. | Week 7 |
<table>
<thead>
<tr>
<th>Major Understanding</th>
<th>Aim</th>
<th>Objectives</th>
<th>Vocabulary</th>
<th>Graphic Organizer</th>
<th>Textbook</th>
<th>Activity / Experiment</th>
<th>Date</th>
</tr>
</thead>
</table>
| 4.1.2c, 4.1.2g | #24: What is the difference between active transport and passive transport? | • Discuss the selective permeability of a cell membrane.  
• Explain the role of the selectively permeable cell membrane in passive and active transport.  
• Differentiate between active and passive transport.  
• Discuss and identify the process of diffusion.  
• Discuss and identify the process of osmosis.  
• Discuss and identify the process of plasmolysis.  
• Identify the role of diffusion, osmosis and plasmolysis in maintaining homeostasis.  
• Explain the basic biochemical processes in living organisms and their importance in maintaining equilibrium. | Diffusion  
Facilitated diffusion  
Aquaporin  
Osmosis  
Isotonic  
Hypertonic  
Hypotonic  
Osmotic pressure | Venn Diagram  
Active vs. passive transport  
T-chart on diffusion and osmosis | 7.3: Cell Transport, pp.208-213 | Notebook: Explain how you can demonstrate diffusion by spraying air freshener in a large room.  
Notebook: Explain why osmosis is really just a special case of facilitated diffusion. | Week 7 |

NYS Lab: Diffusion through a Membrane | Week 8 |
## Cells

<table>
<thead>
<tr>
<th>Major Understanding</th>
<th>Aim</th>
<th>Objectives</th>
<th>Vocabulary</th>
<th>Graphic Organizer</th>
<th>Textbook</th>
<th>Activity / Experiment</th>
<th>Date</th>
</tr>
</thead>
</table>
| 4.5.1a, 4.5.1c, 4.5.1e, 4.6.1b | #25: How do individual cells create energy? | ● Describe the role of light and pigments in photosynthesis.  
● Explain the role of electron carrier molecules in photosynthesis.  
● State the overall equation for photosynthesis. | Biochemistry  
Pigments  
Chlorophyll  
Thylakoids  
Stroma  
NADP  
Light-Dependent reactions  
Light-independent reactions | Compare and Contrast Two-Column Chart | 8: Photosynthesis Pages 226-235 | Notebook: With respect to energy, how are ATP and glucose similar?  
How are they different?  
Notebook: Create a two-column compare and contrast table that show the similarities and differences between the light-dependent and light – independent reactions of photosynthesis.  
Quick Lab: What waste material is produced during photosynthesis? | Week 8 |
| 4.5.1a, 4.5.1c, 4.5.1e, 4.6.1b | #26: What is cellular respiration and what is its relationship to photosynthesis? | ● Discuss the events associated with strenuous physical activity and how that relates to the chemical process of cellular respiration.  
● Discuss the importance of mitochondria and their role in the production of ATP.  
● Explain the role of oxygen in the electron transport chain.  
● Compare photosynthesis and cellular respiration. | Mitochondria  
Glucose  
ATP  
Aerobic  
Anaerobic | Cellular respiration diagram  
Venn diagram  
Alcoholic Fermentation and Lactic Acid Fermentation | 9: Cellular Respiration and Fermentation Pages 250-262 | Label the diagram of cellular respiration.  
Compare photosynthesis and cellular respiration. | Week 8 |

### NYS Lab: Making Connections

- **Week 8**

### Project #4

- **Week 9**

### Common Assessment #4
<table>
<thead>
<tr>
<th>Major Understanding</th>
<th>Aim</th>
<th>Objectives</th>
<th>Vocabulary</th>
<th>Graphic Organizer</th>
<th>Textbook</th>
<th>Activity / Experiment</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1.1a, 1.1.1b, 1.1.2a, 1.2.3a, 1.2.4, 1.3.1a, 4.2.1a, 4.2.1b, 4.2.1c, 4.2.1e, 4.3.1c, 4.4.1c</td>
<td>#27: Where does an organism get its unique characteristics?</td>
<td>• Describe Mendel’s studies and conclusions about inheritance.</td>
<td>Genetics Fertilization Trait Hybrid Gene Allele Principle of Dominance</td>
<td>Two-Column Chart: On the left side, write the main ideas; on the right side, write the details and examples that support each of those ideas.</td>
<td>11: Introduction to Genetics Pages 308-335</td>
<td>Notebook; Explain, in your own words, what fertilization is. Guided Inquiry: Trait Survey Notebook: make a diagram that explains Mendel’s Principle of Dominance.</td>
<td>Week 9</td>
</tr>
<tr>
<td>1.1.1a, 1.1.1b, 1.1.2a, 1.2.3a, 1.2.4, 1.3.1a, 4.2.1a, 4.2.1b, 4.2.1c, 4.2.1e, 4.3.1c, 4.4.1c</td>
<td>#28: How are different forms of a gene distributed to offspring?</td>
<td>• Describe what happens during segregation.</td>
<td>Segregation Gamete</td>
<td>Diagram to illustrate Mendel’s Principles of Dominance and Segregation</td>
<td>11: Introduction to Genetics Pages 308-335</td>
<td>Segregation and Probability Activity</td>
<td>Week 9</td>
</tr>
<tr>
<td>1.1.1a, 1.1.1b, 1.1.4a, 1.2.4, 1.3.1a, 1.3.3, 4.2.1a, 4.2.1b, 4.2.1c, 4.2.1e</td>
<td>#29: How can we use probability to predict traits?</td>
<td>• Explain how geneticists use the principles of probability to make Punnett squares.</td>
<td>Probability Homozygous Heterozygous Phenotype Genotype Punnett Square</td>
<td>Draw a Punnett Square to determine the allele combinations that might result from a genetic cross.</td>
<td>11: Introduction to Genetics Pages 308-335</td>
<td>Notebook: In your own words, write definitions for the terms - Homozygous, heterozygous, phenotype, and genotype. Experiment: How are dimples inherited?</td>
<td>Week 9</td>
</tr>
<tr>
<td>1.1.1a, 1.1.1b, 1.1.4a, 1.2.4, 1.3.1a, 1.3.3, 4.2.1a, 4.2.1b, 4.2.1c, 4.2.1e</td>
<td>#30: How do alleles segregate when more than one gene is involved?</td>
<td>• Explain the principle of independent assortment.</td>
<td>Independent assortment</td>
<td>Two-Factor Cross Chart: F₁</td>
<td>11: Introduction to Genetics Pages 308-335</td>
<td></td>
<td>Week 10</td>
</tr>
<tr>
<td>1.1.1a, 1.1.1b, 1.1.4a, 1.2.4, 1.3.1a, 1.3.3, 4.2.1a, 4.2.1b, 4.2.1c, 4.2.1e</td>
<td>#31: What did Mendel contribute to our understanding of genetics?</td>
<td>• Explain how Mendel’s principles apply to all organisms.</td>
<td>offspring</td>
<td>Summarize</td>
<td>11: Introduction to Genetics Pages 308-335</td>
<td>Notebook: A Summary of Mendel’s Principles</td>
<td>Week 10</td>
</tr>
<tr>
<td>Major Understanding</td>
<td>Aim</td>
<td>Objectives</td>
<td>Vocabulary</td>
<td>Graphic Organizer</td>
<td>Textbook</td>
<td>Activity / Experiment</td>
<td>Date</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----</td>
<td>------------</td>
<td>------------</td>
<td>-------------------</td>
<td>----------</td>
<td>----------------------</td>
<td>------</td>
</tr>
</tbody>
</table>
| 1.2.1, 1.2.3a, 1.3.1a, 4.2.1a, 4.2.1c, 4.3.1c | #32: What are some exceptions to Mendel’s principles? | • The students will be able to:  
  - Describe the other inheritance patterns. | incomplete dominance  
  codominance  
  multiple allele  
  polygenic trait | Outline | 11: Introduction to Genetics, pp. 308-335 | Notebook: In your own words, describe multiple alleles and polygenic traits. How are they similar? How are they different?  
Analyzing Data: Human Blood Types | Week 10 |
| 1.2.1, 1.2.3a, 1.3.1a, 4.2.1a, 4.2.1c, 4.3.1c | #33: Does the environment have a role in how genes determine traits? | • Explain the relationship between genes and the environment. | Genes  
  environment | Main Idea and Details Chart | 11: Introduction to Genetics, pp. 308-335 | Notebook: Organize information using main idea and details chart to illustrate codominance and incomplete dominance. | Week 10 |
| 1.1.1b, 1.3.1a, 1.3.3, 4.2.1c, 4.2.1e, 4.3.1c, 4.41b, 4.41c, 4.41d | #34: How many sets of genes are found in most adult organisms? | • Contrast the number of chromosomes in body cells and in gametes. | homologous  
  diploid  
  haploid | Compare and contrast | 11: Introduction to Genetics, pp. 308-335 | Analyzing Data: Calculating Haploid and Diploid numbers | Week 10 |
| 1.1.1b, 1.3.1a, 1.3.3, 4.2.1c, 4.2.1e, 4.3.1c, 4.41b, 4.41c, 4.41d | #35: What events occur during each phase of meiosis? | • Summarize the events of meiosis. | meiosis  
  tetrad  
  crossing over  
  zygote | Draw meiosis I and meiosis II | 11: Introduction to Genetics, pp. 308-335 | Notebook: Describe the difference between meiosis I and meiosis II. How are the end results different? | Week 11 |
| 1.1.1b, 1.3.1a, 1.3.3, 4.2.1c, 4.2.1e, 4.3.1c, 4.41b, 4.41c, 4.41d | #36: How is meiosis different from mitosis? | • Contrast mitosis and meiosis. | Mitosis  
  Meiosis  
  Body cells  
  Diploid cells  
  Gametes  
  Haploid cells  
  Tetrad  
  Crossing over | Compare and contrast table between meiosis and mitosis | 11: Introduction to Genetics, pp. 308-335 | Experiment: Modeling Meiosis Lab Manual B, pp.67-72 | Week 11 |
<table>
<thead>
<tr>
<th>Major Understanding</th>
<th>Aim</th>
<th>Objectives</th>
<th>Vocabulary</th>
<th>Graphic Organizer</th>
<th>Textbook</th>
<th>Activity / Experiment</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1.1b, 1.3.1a, 1.3.3, 4.2.1c, 4.2.1e, 4.3.1c, 4.41b, 4.41c, 4.41d</td>
<td>#37: How can two alleles from different genes be inherited together?</td>
<td>Describe how alleles from different genes can be inherited together.</td>
<td>Gene linkage Gene maps</td>
<td>Summarize</td>
<td>11: Introduction to Genetics, pp. 308-335</td>
<td>Notebook: Write a description of gene linkage and gene maps.</td>
<td>Week 11</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Project #5</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Week 11</td>
</tr>
<tr>
<td><strong>Common Assessment #5</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major Understanding</td>
<td>Aim</td>
<td>Objectives</td>
<td>Vocabulary</td>
<td>Graphic Organizer</td>
<td>Textbook</td>
<td>Activity / Experiment</td>
<td>Date</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----</td>
<td>------------</td>
<td>------------</td>
<td>-------------------</td>
<td>----------</td>
<td>-----------------------</td>
<td>------</td>
</tr>
<tr>
<td>1.1.1a, 1.1.1b, 1.1.4a, 1.3.1a, 1.3.4a, 1.3.5a, 1.3.5b, 4.2.1b, 4.2.1c, 4.2.1f</td>
<td>#38: What role did bacterial viruses play in identifying genetic material?</td>
<td>● Describe the role of bacteriophages in identifying genetic material.</td>
<td>Bacteriophage</td>
<td>12: DNA pp. 336-359</td>
<td>Notebook: Identify the independent and dependent variables in the Hershey-Chase’s experiment with bacteriophages, and list some possible control variables.</td>
<td>Week 12</td>
<td></td>
</tr>
<tr>
<td>1.1.1a, 1.1.1b, 1.1.4a, 1.3.1a, 1.3.4a, 1.3.5a, 1.3.5b, 4.2.1b</td>
<td>#39: What is the role of DNA in heredity?</td>
<td>● Identify the role of DNA in heredity.</td>
<td>DNA heredity</td>
<td>Visual Analogy: Compare DNA to a book to identify and describe the three functions of DNA.</td>
<td>12: DNA pp. 336-359</td>
<td>Make a list of six things about a dog that is controlled by its DNA.</td>
<td>Week 12</td>
</tr>
<tr>
<td>1.1.1a, 1.1.1b, 1.1.2a, 1.1.3a, 1.1.3b, 1.1.4a, 1.2.2a, 1.3.1a, 1.3.3, 1.3.5b, 4.2.1f</td>
<td>#40: What are the chemical components of DNA?</td>
<td>● Identify the chemical components of DNA.</td>
<td>base pairing</td>
<td>Outline: Find the key ideas for the text. Write down a few key words from each main idea. Then, use these key words to summarize the information about DNA.</td>
<td>12: DNA pp. 336-359</td>
<td>T-chart Main idea and details and examples chart</td>
<td>Week 12</td>
</tr>
<tr>
<td>1.1.1a, 1.1.1b, 1.1.2a, 1.1.3a, 1.1.3b, 1.1.4a, 1.2.2a, 1.3.1a, 1.3.3, 1.3.5b, 4.2.1f</td>
<td>#41: What clues helped scientists solve the structure of DNA?</td>
<td>● Discuss the experiments leading to the identification of DNA as the molecule that carries the genetic code.</td>
<td>Chargaff’s Rule Helix Base-pairing</td>
<td>Venn Diagram: Solving the Structure of DNA</td>
<td>12: DNA pp. 336-359</td>
<td>Analyzing Data: Base Percentages</td>
<td>Week 13</td>
</tr>
<tr>
<td>Major Understanding</td>
<td>Aim</td>
<td>Objectives</td>
<td>Vocabulary</td>
<td>Graphic Organizer</td>
<td>Textbook</td>
<td>Activity / Experiment</td>
<td>Date</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----</td>
<td>------------</td>
<td>------------</td>
<td>------------------</td>
<td>----------</td>
<td>-----------------------</td>
<td>------</td>
</tr>
<tr>
<td>1.1.1a, 1.1.1b, 1.1.2a, 1.1.3a, 1.1.3b, 1.1.4a, 1.2.2a, 1.3.1a, 1.3.3, 1.3.5b, 4.2.1f</td>
<td>#42: What does the double-helix model tell us about DNA?</td>
<td>• Describe the steps leading to the development of the double-helix model of DNA.</td>
<td>Double-Helix Model</td>
<td>Base pairings Model of a DNA</td>
<td>12: DNA pp. 336-359</td>
<td>Notebook: Draw and label your own model of the DNA double-helix structure. Experiment: Extracting DNA Lab Manual B, pp.73-76</td>
<td>Week 13</td>
</tr>
<tr>
<td>1.2.4, 1.3.5b, 4.2.1i, 4.2.1c, 4.2.1h, 4.5.1f</td>
<td>#43: What role does DNA polymerase play in copying DNA?</td>
<td>• Summarize the events of DNA replication.</td>
<td>replication DNA polymerase telomere</td>
<td>Two-column chart</td>
<td>12: DNA pp. 336-359</td>
<td>Notebook: In your own words, describe the process of DNA replication. Experiment: Modeling DNA Replication</td>
<td>Week 13</td>
</tr>
<tr>
<td>1.2.4, 1.3.5b, 4.2.1i, 4.2.1c, 4.2.1h, 4.5.1f</td>
<td>#44: How does DNA replication differ in prokaryotic cells and eukaryotic cells?</td>
<td>• Compare DNA replication in prokaryotes with that of eukaryotes.</td>
<td>Prokaryotic DNA Eukaryotic DNA</td>
<td>Make a Venn diagram That compares the process of DNA replication in prokaryotes and eukaryotes. Compare the location, steps, and end products of the process in each kind of cell.</td>
<td>12: DNA pp. 336-359</td>
<td>Prokaryotic DNA diagram Eukaryotic DNA diagram Draw and label parts</td>
<td>Week 13</td>
</tr>
<tr>
<td>4.2.1f, 4.2.1g, 4.2.1i, 4.5.1f, 4.5.1g</td>
<td>#45: How does RNA differ from DNA?</td>
<td>• Contrast RNA and DNA.</td>
<td>RNA Messenger RNA Ribosomal RNA Transfer RNA polymerase</td>
<td>Compare and contrast the different roles of DNA and RNA</td>
<td>13: RNA and Protein Synthesis Build vocabulary</td>
<td>Week 13</td>
<td></td>
</tr>
<tr>
<td>Major Understanding</td>
<td>Aim</td>
<td>Objectives</td>
<td>Vocabulary</td>
<td>Graphic Organizer</td>
<td>Textbook</td>
<td>Activity / Experiment</td>
<td>Date</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----</td>
<td>------------</td>
<td>------------</td>
<td>-------------------</td>
<td>----------</td>
<td>-----------------------</td>
<td>------</td>
</tr>
<tr>
<td>4.2.1f, 4.2.1g, 4.2.1i, 4.5.1f, 4.5.1g</td>
<td>#46: How does the cell make RNA?</td>
<td>Explain the process of transcription.</td>
<td>transcription</td>
<td>The Genetic Code Cart Activity</td>
<td>13: RNA and Protein Synthesis</td>
<td>Activity Sheet: RNA synthesis</td>
<td>Week 14</td>
</tr>
<tr>
<td>1.2.3b, 4.1.2i, 4.2.1f, 4.2.1g, 4.2.1j, 4.5.1g</td>
<td>#47: What is the genetic code, and how it is read?</td>
<td>Identify the genetic code and explain how it is read.</td>
<td>Anticodon Codon Gene expression Genetic code polypeptide</td>
<td>Two-column Table</td>
<td>13: RNA and Protein Synthesis</td>
<td>Experiment: How does a cell interpret codons?</td>
<td>Week 14</td>
</tr>
<tr>
<td>1.2.3b, 4.1.2i, 4.2.1f, 4.2.1g, 4.2.1j, 4.5.1g</td>
<td>#48: What role does the ribosome play in assembling proteins?</td>
<td>Summarize the process of translation.</td>
<td>translation</td>
<td>Translation Chart</td>
<td>13: RNA and Protein Synthesis</td>
<td>Notebook: Briefly summarize the three steps in translation. Lab: From DNA to Protein Synthesis Lab Manual B, pp.77-82</td>
<td>Week 14</td>
</tr>
<tr>
<td>1.2.3b, 4.1.2i, 4.2.1f, 4.2.1g, 4.2.1j, 4.5.1g</td>
<td>#49: What is the “central dogma” of molecular biology?</td>
<td>Describe the “central dogma” of molecular biology.</td>
<td>Gene expression</td>
<td>Gene Expression Visual Summary</td>
<td>13: RNA and Protein Synthesis</td>
<td>Notebook: Write a brief description of how gene expression takes place.</td>
<td>Week 14</td>
</tr>
<tr>
<td>1.2.1, 4.2.1h, 4.2.2d, 4.3.1b, 4.3.1c, 4.3.1d, 4.3.1g</td>
<td>#50: What are mutations?</td>
<td>Define mutations and describe the different types of mutations.</td>
<td>Mutation Point mutation Frameshift mutation</td>
<td>Cause and Effect Diagram</td>
<td>13: RNA and Protein Synthesis</td>
<td>Notebook: Use a cause and effect diagram to describe the different types of gene mutations.</td>
<td>Week 14</td>
</tr>
<tr>
<td>1.2.1, 4.2.1h, 4.2.2d, 4.3.1b, 4.3.1c, 4.3.1d, 4.3.1g</td>
<td>#51: How do mutations affect genes?</td>
<td>Describe the effects of mutations can have on genes.</td>
<td>Mutagen polyploidy</td>
<td>Types of Mutation Chart</td>
<td>13: RNA and Protein Synthesis</td>
<td>Notebook: Make a table to keep track of both helpful and harmful results of mutations. Experiment: Modeling Mutations</td>
<td>Week 15</td>
</tr>
<tr>
<td>1.2.1, 4.2.1h, 4.2.2d, 4.3.1b, 4.3.1c, 4.3.1d, 4.3.1g</td>
<td>#52: How are prokaryotic genes regulated?</td>
<td>Describe gene regulation in prokaryotes.</td>
<td>Operon Operator RNA interference</td>
<td>Concept Map Build vocabulary</td>
<td>13: RNA and Protein Synthesis</td>
<td>Prokaryotic Gene Regulation Activity Sheet</td>
<td>Week 15</td>
</tr>
<tr>
<td>Major Understanding</td>
<td>Aim</td>
<td>Objectives</td>
<td>Vocabulary</td>
<td>Graphic Organizer</td>
<td>Textbook</td>
<td>Activity / Experiment</td>
<td>Date</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----</td>
<td>------------</td>
<td>------------</td>
<td>------------------</td>
<td>---------</td>
<td>----------------------</td>
<td>------</td>
</tr>
<tr>
<td>1.2.1, 4.2.1h, 4.2.2d, 4.3.1b, 4.3.1c, 4.3.1d, 4.3.1g</td>
<td>#53: How are genes regulated in eukaryotic cells?</td>
<td>• Explain how most eukaryotic genes are regulated.</td>
<td>RNA interference</td>
<td>Compare and contrast</td>
<td>Chapter 13: RNA and Protein Synthesis</td>
<td>Notebook: Compare gene regulation in single-celled organisms and multi-cellular organisms.</td>
<td>Week 15</td>
</tr>
<tr>
<td>1.2.1, 4.2.1h, 4.2.2d, 4.3.1b, 4.3.1c, 4.3.1d, 4.3.1g</td>
<td>#54 What controls the development of cells and tissues in multi-cellular organisms?</td>
<td>• Relate gene regulation to development in multi-cellular organisms.</td>
<td>Differentiation, Homeotic gene, Homeobox gene, Hox gene</td>
<td>Compare and contrast</td>
<td>Chapter 13: RNA and Protein Synthesis</td>
<td>Experiment: From DNA to Protein Synthesis</td>
<td>Week 15</td>
</tr>
<tr>
<td>1.2.3a, 1.2.4, 1.3.1a, 1.3.3, 4.1.2, 4.2.1a, 4.2.1c, 4.2.1e, 4.4.1c, 4.5.2g</td>
<td>#55: What is a karyotype?</td>
<td>• Identify the types of human chromosomes in a karyotype.</td>
<td>Genome, Karyotype, sex chromosome, autosome</td>
<td>Human Karyotype Diagram</td>
<td>Chapter 14: Human Chromosomes pp. 392-415</td>
<td>Notebook: Describe what makes up a human karyotype. Guided Inquiry: How is Colorblindness Transmitted?</td>
<td>Week 15</td>
</tr>
<tr>
<td>1.2.3a, 1.2.4, 1.3.1a, 1.3.3, 4.1.2, 4.2.1a, 4.2.1c, 4.2.1e, 4.4.1c, 4.5.2g</td>
<td>#56: What patterns of inheritance do human traits follow?</td>
<td>• Describe the patterns of the inheritance of human traits.</td>
<td>sex-linked gene</td>
<td>X and Y Chromosome Analysis</td>
<td>Chapter 14: Human Chromosomes pp. 392-415</td>
<td>Notebook: Write three quiz questions about the transmission of human traits and answer them.</td>
<td>Week 16</td>
</tr>
<tr>
<td>1.2.3a, 1.2.4, 1.3.1a, 1.3.3, 4.1.2, 4.2.1a, 4.2.1c, 4.2.1e, 4.4.1c, 4.5.2g</td>
<td>#57: How can pedigrees be used to analyze human inheritance?</td>
<td>• Explain how pedigrees are used to study human traits.</td>
<td>Pedigree</td>
<td>Pedigree Sample Diagram</td>
<td>Chapter 14: Human Chromosomes pp. 392-415</td>
<td>Pedigree Example to analyze human inheritance</td>
<td>Week 16</td>
</tr>
<tr>
<td>Major Understanding</td>
<td>Aim</td>
<td>Objectives</td>
<td>Vocabulary</td>
<td>Graphic Organizer</td>
<td>Textbook</td>
<td>Activity / Experiment</td>
<td>Date</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----</td>
<td>------------</td>
<td>------------</td>
<td>------------------</td>
<td>---------</td>
<td>-----------------------</td>
<td>------</td>
</tr>
<tr>
<td>1.12a, 1.3.1a, 4.2.1a, 4.2.1i, 4.3.1g, 4.5.2h</td>
<td>#58: How do small changes in DNA molecules affect human traits?</td>
<td>Explain how small changes in DNA cause genetic disorders.</td>
<td>Sickle-cell disease</td>
<td>Two-Column Chart: Write three questions about genetic disorders in the first column. Fill in answers to the questions in the second column.</td>
<td>Chapter 14: Human Chromosomes pp. 392-415</td>
<td>Analyzing Data: The Geography of Malaria</td>
<td>Week 16</td>
</tr>
<tr>
<td>1.12a, 1.3.1a, 4.2.1a, 4.2.1i, 4.3.1g, 4.5.2h</td>
<td>#59: What are the effects of errors in meiosis?</td>
<td>Summarize the problems caused by nondisjunction.</td>
<td>Nondisjunction</td>
<td>Flowchart: Create a flowchart that shows the steps in the process of nondisjunction.</td>
<td>Chapter 14: Human Chromosomes pp. 392-415</td>
<td>Notebook: Write a paragraph explaining the process of nondisjunction.</td>
<td>Week 16</td>
</tr>
<tr>
<td>1.1.1a, 1.1.1c, 1.1.3b, 1.2.4, 1.3.1a, 1.3.3, 1.3.5a, 4.2.1f, 4.2.2c, 4.2.2e, 4.7.3b</td>
<td>#60: What techniques are used to study human DNA?</td>
<td>Summarize the methods of DNA analysis.</td>
<td>Restriction enzyme Gel electrophoresis Bioinformatics genomics</td>
<td>Flowchart: Make a flowchart that shows the processes scientists use to analyze DNA</td>
<td>Chapter 14: Human Chromosomes pp. 392-415</td>
<td>Guided Inquiry: Modeling Restriction Enzymes.</td>
<td>Week 16</td>
</tr>
<tr>
<td>1.1.1a, 1.1.1c, 1.1.3b, 1.2.4, 1.3.1a, 1.3.3, 1.3.5a, 4.2.1f, 4.2.2c, 4.2.2e, 4.7.3b</td>
<td>#61: What were the goals of the Human Genome Project, and what have we learned so far?</td>
<td>State the goals of the Human Genome Project and explain what we have learned so far.</td>
<td>DNA sequencing</td>
<td>Comparing sequences</td>
<td>Chapter 14: Human Chromosomes pp. 392-415</td>
<td>Write a persuasive paragraph expressing your opinion about scientists being able to alter a child’s inherited traits by using genomics and molecular biology.</td>
<td>Week 17</td>
</tr>
<tr>
<td>4.2.2a, 4.2.2b, 4.3.1b, 4.3.1c, 4.3.1d</td>
<td>#62: What is selective breeding used for?</td>
<td>Explain the purpose of selective breeding.</td>
<td>selective breeding hybridization inbreeding biotechnology</td>
<td>Compare and contrast hybridization and inbreeding.</td>
<td>Chapter 15: Genetic Engineering pp. 418-445</td>
<td></td>
<td>Week 17</td>
</tr>
<tr>
<td>Major Understanding</td>
<td>Aim</td>
<td>Objectives</td>
<td>Vocabulary</td>
<td>Graphic Organizer</td>
<td>Textbook</td>
<td>Activity / Experiment</td>
<td>Date</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----</td>
<td>------------</td>
<td>------------</td>
<td>-------------------</td>
<td>----------</td>
<td>-----------------------</td>
<td>------</td>
</tr>
<tr>
<td>4.2.2a, 4.2.2b, 4.3.1b, 4.3.1c, 4.3.1d</td>
<td>#63: How do people increase genetic variation?</td>
<td>• Explain how people increase genetic variation.</td>
<td>Biotechnology Genetic variation</td>
<td>Compare and contrast</td>
<td>Chapter 15: Genetic Engineering pp.418-445</td>
<td>Write a paragraph in which you suggest ways that plants could be genetically altered to improve the world’s food supply.</td>
<td>Week 17</td>
</tr>
<tr>
<td>1.1.1a, 1.1.1b, 1.2.2a, 1.3.1a, 4.2.1f, 4.2.2b, 4.2.2c, 4.2.2d, 4.41b, 4.6.2b</td>
<td>#64: How do scientists copy the DNA of living organisms?</td>
<td>• Explain how scientists manipulate DNA.</td>
<td>polymerase chain reaction plasmid genetic marker transgenic clone</td>
<td>Note taking</td>
<td>Chapter 15: Genetic Engineering pp.418-445</td>
<td>Notebook: List the steps in the PCR method.</td>
<td>Week 18</td>
</tr>
<tr>
<td>1.1.1a, 1.1.1b, 1.2.2a, 1.3.1a, 4.2.1f, 4.2.2b, 4.2.2c, 4.2.2d, 4.41b, 4.6.2b</td>
<td>#65: How is recombinant DNA used?</td>
<td>• Describe the importance of recombinant DNA.</td>
<td>recombinant DNA plasmids</td>
<td>Summarize</td>
<td>Chapter 15: Genetic Engineering pp.418-445</td>
<td>Notebook: Write a summary of the process of plasmid DNA transformation.</td>
<td>Week 18</td>
</tr>
<tr>
<td>1.1.1a, 1.1.1b, 1.2.2a, 1.3.1a, 4.2.1f, 4.2.2b, 4.2.2c, 4.2.2d, 4.41b, 4.6.2b</td>
<td>#66: How can genes from one organism be inserted into another organism?</td>
<td>• Define transgenic and describe the usefulness of some transgenic organisms to humans.</td>
<td>Transgenic clone</td>
<td>Compare and contrast</td>
<td>Chapter 15: Genetic Engineering pp.418-445</td>
<td>Compare the transformation of a plant cell with the transformation of an animal cell.</td>
<td>Week 18</td>
</tr>
<tr>
<td>1.1.2a, 1.2.2a, 1.2.3a, 1.3.1a, 4.2.1k, 4.2.2b, 4.2.2c, 4.2.2d, 4.2.2e, 4.5.2i</td>
<td>#67: How can genetic engineering benefit agriculture and industry?</td>
<td>• Describe the benefits of genetic engineering as they relate to agriculture and industry.</td>
<td>DNA microarray DNA fingerprinting forensics</td>
<td>Outline</td>
<td>Chapter 15: Genetic Engineering pp.418-445</td>
<td>Outline: Different applications of genetic engineering</td>
<td>Week 18</td>
</tr>
<tr>
<td>1.1.2a, 1.2.2a, 1.2.3a, 1.3.1a, 4.2.1k, 4.2.2b, 4.2.2c, 4.2.2d, 4.2.2e, 4.5.2i</td>
<td>#68: How can recombinant DNA technology improve human health?</td>
<td>• Explain how recombinant DNA technology can improve human health.</td>
<td>gene therapy</td>
<td>Summarize</td>
<td>Chapter 15: Genetic Engineering pp.418-445</td>
<td>Write a description of how recombinant DNA technology improve human health.</td>
<td>Week 18</td>
</tr>
<tr>
<td>Major Understanding</td>
<td>Aim</td>
<td>Objectives</td>
<td>Vocabulary</td>
<td>Graphic Organizer</td>
<td>Textbook</td>
<td>Activity / Experiment</td>
<td>Date</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----</td>
<td>------------</td>
<td>------------</td>
<td>-------------------</td>
<td>---------</td>
<td>-----------------------</td>
<td>------</td>
</tr>
<tr>
<td>1.1.1c, 1.1.2a, 1.2.1, 1.3.1a, 1.3.4b, 1.3.4c, 1.3.5b, 4.2.2c, 4.2.2d, 4.7.3a, 4.7.3b</td>
<td>#69: How is DNA used to identify individuals?</td>
<td>● Summarize the process of DNA fingerprinting and explain its uses.</td>
<td>DNA fingerprinting</td>
<td>Summarize</td>
<td>Chapter 15: Genetic Engineering, pp.418-445</td>
<td>Notebook: Describe the process of DNA fingerprinting.</td>
<td>Week 20</td>
</tr>
<tr>
<td>1.1.1c, 1.1.2a, 1.2.1, 1.3.1a, 1.3.4b, 1.3.4c, 1.3.5b, 4.2.2c, 4.2.2d, 4.7.3a, 4.7.3b</td>
<td>#70: What privacy issues does biotechnology raise?</td>
<td>● Describe some of the issues that relate to biotechnology.</td>
<td>Patenting life Genetic ownership</td>
<td>Two-Column Chart; Write down the opposing viewpoints on each ethical issue.</td>
<td>Chapter 15: Genetic Engineering, pp.418-445</td>
<td></td>
<td>Week 20</td>
</tr>
<tr>
<td>1.1.1c, 1.1.2a, 1.2.1, 1.3.1a, 1.3.4b, 1.3.4c, 1.3.5b, 4.2.2c, 4.2.2d, 4.7.3a, 4.7.3b</td>
<td>#71: Are GM foods safe?</td>
<td>● Identify some of the pros and cons of genetically modified food.</td>
<td>GM foods transgenic</td>
<td>Tabulate pros and cons</td>
<td>Chapter 15: Genetic Engineering, pp.418-445</td>
<td>Notebook: List the pros and cons of GM foods.</td>
<td>Week 20</td>
</tr>
<tr>
<td>1.1.1c, 1.1.2a, 1.2.1, 1.3.1a, 1.3.4b, 1.3.4c, 1.3.5b, 4.2.2c, 4.2.2d, 4.7.3a, 4.7.3b</td>
<td>#72: Should genetic modifications to humans and other organisms be closely regulated?</td>
<td>● Describe some of the ethical issues relating to biotechnology.</td>
<td>GFP technology</td>
<td>Form an opinion</td>
<td>Chapter 15: Genetic Engineering, pp.418-445</td>
<td>Write an opinion why genetic modifications to humans must be closely regulated.</td>
<td>Week 20</td>
</tr>
</tbody>
</table>

**Project #6**

**Common Assessment #6**
<table>
<thead>
<tr>
<th>Major Understanding</th>
<th>Aim</th>
<th>Objectives</th>
<th>Vocabulary</th>
<th>Graphic Organizer</th>
<th>Textbook</th>
<th>Activity / Experiment</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1.1a, 1.1.1b, 1.1.2a, 1.1.2b, 4.1.1b, 4.3.1a</td>
<td>#73: What was Charles Darwin’s contribution to science?</td>
<td>● State Charles Darwin’s contribution to science.</td>
<td>Evolution Fossil</td>
<td>Summarize</td>
<td>16.1: Darwin’s Voyage of Discovery pp.450-453</td>
<td>Notebook: Explain how the ideas of a changing Earth and evolving life forms might be related.</td>
<td>Week 21</td>
</tr>
<tr>
<td>1.1.1a, 1.1.1b, 1.1.2a, 1.1.2b, 4.1.1b, 4.3.1a</td>
<td>#74: What three patterns of biodiversity did Darwin note?</td>
<td>● Describe the three patterns of biodiversity noted by Darwin.</td>
<td>Biodiversity pattern</td>
<td>Compare and contrast the similarities and differences do you see between the armadillo and glyptodont.</td>
<td>16.1: Darwin’s Voyage of Discovery pp.450-453</td>
<td>Notebook: What three kinds of variations among organisms did Darwin observe during the voyage of the Beagle?</td>
<td>Week 21</td>
</tr>
<tr>
<td>1.1.1a, 1.1.1b, 1.2.2a, 1.1.2b, 1.1.3b, 1.1.3b, 1.2.4, 1.3.4c, 4.2.1b, 4.2.2a, 4.3.1f</td>
<td>#75: What did Hutton and Lyell conclude about Earth’s history?</td>
<td>● Identify the conclusions drawn by Hutton and Lyell about Earth’s History.</td>
<td>Evolution Fossil</td>
<td>Outline</td>
<td>16.2: Ideas That Shaped Darwin’s Thinking pp.454-458</td>
<td>Notebook: Explain how the ideas of a changing Earth and evolving life forms might be related.</td>
<td>Week 21</td>
</tr>
<tr>
<td>1.1.1a, 1.1.1b, 1.2.2a, 1.1.2b, 1.1.3b, 1.1.3b, 1.2.4, 1.3.4c, 4.2.1b, 4.2.2a, 4.3.1f</td>
<td>#76: How did Lamarck propose that species evolve?</td>
<td>● Describe Lamarck’s hypothesis of evolution.</td>
<td>Hypothesis</td>
<td>Compare and contrast the similarities and differences do you see between the armadillo and glyptodont.</td>
<td>16.2: Ideas That Shaped Darwin’s Thinking pp.454-458</td>
<td>Notebook: What three kinds of variations among organisms did Darwin observe during the voyage of the Beagle?</td>
<td>Week 21</td>
</tr>
<tr>
<td>1.1.1a, 1.1.1b, 1.2.2a, 1.1.2b, 1.1.3b, 1.1.3b, 1.2.4, 1.3.4c, 4.2.1b, 4.2.2a, 4.3.1f</td>
<td>#77: What was Malthus’s view of population growth?</td>
<td>● Describe Malthus’s view of population growth</td>
<td>Population growth</td>
<td>Draw conclusions</td>
<td>16.2: Ideas That Shaped Darwin’s Thinking pp.454-458</td>
<td>Explain how Malthus influenced Darwin.</td>
<td>Week 21</td>
</tr>
<tr>
<td>1.1.1a, 1.1.1b, 1.2.2a, 1.1.2b, 1.1.3b, 1.1.3b, 1.2.4, 1.3.4c, 4.2.1b, 4.2.2a, 4.3.1f</td>
<td>#78 How is inherited variation used in artificial selection?</td>
<td>● The students will be able to:</td>
<td>artificial selection</td>
<td>Inference</td>
<td>16.2: Ideas That Shaped Darwin’s Thinking pp.454-458</td>
<td>Explain if artificial selection could occur without inherited variation.</td>
<td>Week 22</td>
</tr>
<tr>
<td>Major Understanding</td>
<td>Aim</td>
<td>Objectives</td>
<td>Vocabulary</td>
<td>Graphic Organizer</td>
<td>Textbook</td>
<td>Activity / Experiment</td>
<td>Date</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----</td>
<td>------------</td>
<td>------------</td>
<td>-------------------</td>
<td>----------</td>
<td>-----------------------</td>
<td>------</td>
</tr>
<tr>
<td>1.3.5a, 4.3.1f, 4.3.1g, 4.3.1i</td>
<td>#79: Under what conditions does natural selection occur?</td>
<td>● Describe the conditions under which natural selection occurs.</td>
<td>Adaptation, Fitness, Natural selection</td>
<td>Take Notes, Preview visuals</td>
<td>16.3: Darwin Presents His Case pp.460-464</td>
<td>Explain how adaptations take many forms.</td>
<td>Week 22</td>
</tr>
<tr>
<td>4.3.1a, 4.3.1e, 4.3.1f, 4.3.1k</td>
<td>#80: What does Darwin’s mechanism for evolution suggest about living and extinct species?</td>
<td>● Explain the principle of common descent.</td>
<td>Common descent</td>
<td>Apply concepts</td>
<td>16.3: Darwin Presents His Case pp.460-464</td>
<td>Notebook: Give at least two reasons why the following statement is not true: “The goal of natural selection is to produce perfect organisms.”</td>
<td>Week 22</td>
</tr>
<tr>
<td>1.1.4a, 4.3.1e</td>
<td>#81: How does the geographic distribution of species today relate to their evolutionary history?</td>
<td>● Explain how geologic distribution of species relates to their evolutionary history.</td>
<td>Biogeography</td>
<td>Concept Map: Construct a concept map that shows the kinds of evidence that support the theory of evolution.</td>
<td>16.4: Evidence of Evolution, pp.465-474</td>
<td>Vocabulary, Development, Taking Notes</td>
<td>Week 22</td>
</tr>
<tr>
<td>1.1.4a, 4.3.1e</td>
<td>#82: How do fossils help to document the descent of modern species from ancient ancestors?</td>
<td>● Explain how fossils and the fossil record document the descent of modern species from ancient ancestors.</td>
<td>Homologous structure, Analogous structure, Vestigial structure</td>
<td>Visual Summary</td>
<td>16.4: Evidence of Evolution, pp.465-474</td>
<td>Notebook: Do you think the shell of a clam and the shell of a lobster are homologous or analogous structures? Explain Analyzing data: Molecular Homology in Hoxc8</td>
<td>Week 22</td>
</tr>
<tr>
<td>Evolution</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major Understanding</td>
<td>Aim</td>
<td>Objectives</td>
<td>Vocabulary</td>
<td>Graphic Organizer</td>
<td>Textbook</td>
<td>Activity / Experiment</td>
<td>Date</td>
</tr>
<tr>
<td>4.3.1e</td>
<td>#83: What do homologous structures and similarities in embryonic development suggest about the process of evolutionary change?</td>
<td>• Describe what homologous structures and embryology suggest about the process of evolution change.</td>
<td>Homologous Embryology evolution</td>
<td>Concept map</td>
<td>16.4: Evidence of Evolution, pp.465-474</td>
<td>Build vocabulary Build understanding</td>
<td>Week 23</td>
</tr>
<tr>
<td>1.1.1b, 1.1.3a, 1.1.4a, 4.3.1b, 4.3.1e, 4.3.1f, 4.3.1g.</td>
<td>#84: How can molecular biology be used to trace the process of evolution?</td>
<td>• Explain how molecular evidence can be used to trace the process of evolution.</td>
<td>Genetics Embryological development</td>
<td>Draw conclusions</td>
<td>16.4: Evidence of Evolution, pp.465-474</td>
<td>Explain life’s common genetic code.</td>
<td>Week 23</td>
</tr>
<tr>
<td>1.1.3a, 1.3.5b</td>
<td>#85: What does recent research on the Galapagos finches show about natural selection?</td>
<td>• Explain the results of the Grant’s investigation of adaptation in Galapagos finches.</td>
<td>Galapagos Finches Natural selection research</td>
<td>Build connections</td>
<td>16.4: Evidence of Evolution, pp.465-474</td>
<td>Experiment: Amino Acid Sequences: Indicators of Evolution Lab Manual B, pp.97-102</td>
<td>Week 23</td>
</tr>
<tr>
<td>1.1.3b, 4.2.1a, 4.2.1c, 4.2.1d, 4.2.1e, 4.3.1b, 4.3.1c, 4.3.1d, 4.3.1f, 4.3.1g</td>
<td>#86: How is evolution defined in genetic term?</td>
<td>• Define evolution in genetic terms.</td>
<td>Gene pool Allele frequency trait</td>
<td>Concept Map: Construct a concept map to describe the sources of genetic variation.</td>
<td>17.1: Genes and Variation, pp.482-486</td>
<td>Notebook: Describe how natural selection affects genotypes.</td>
<td>Week 23</td>
</tr>
<tr>
<td>1.1.3b, 4.2.1a, 4.2.1c, 4.2.1d, 4.2.1e, 4.3.1b, 4.3.1c, 4.3.1d, 4.3.1f, 4.3.1g</td>
<td>#87: What are the sources of genetic variation?</td>
<td>• Identify the main sources of genetic variation in a population.</td>
<td>Genetic variation Mutation Genetic recombination</td>
<td>Compare and contrast</td>
<td>17.1: Genes and Variation, pp.482-486</td>
<td>Notebook: Which source of variation brings more diversity into a gene pool – mutation or sexual reproduction? Explain.</td>
<td>Week 23</td>
</tr>
<tr>
<td>Major Understanding</td>
<td>Aim</td>
<td>Objectives</td>
<td>Vocabulary</td>
<td>Graphic Organizer</td>
<td>Textbook</td>
<td>Activity / Experiment</td>
<td>Date</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----</td>
<td>------------</td>
<td>------------</td>
<td>------------------</td>
<td>----------</td>
<td>-----------------------</td>
<td>------</td>
</tr>
<tr>
<td>1.1.3b, 4.2.1a, 4.2.1c, 4.2.1d, 4.2.1e, 4.3.1b, 4.3.1c, 4.3.1d, 4.3.1f, 4.3.1g</td>
<td>#88: What determines the number of phenotypes for a given trait?</td>
<td>• State what determines the number of phenotypes for a trait.</td>
<td>Single-gene trait Polygenic</td>
<td>Compare and contrast</td>
<td>17.1: Genes and Variation, pp.482-486</td>
<td>Infer: A black guinea pig and a white guinea pig mate and have offspring. All the offspring are black. Is the trait of coat color probably a single-gene trait or a polygenic trait? Explain.</td>
<td>Week 24</td>
</tr>
<tr>
<td>1.3.1A, 4.3.1B, 4.3.1F, 4.3.1G</td>
<td>#89: How does natural selection affect single-gene and polygenic traits?</td>
<td>• Explain how natural selection affects single gene and polygenic traits.</td>
<td>Directional selection Stabilizing selection Disruptive selection</td>
<td>Summarize</td>
<td>17.2: Evolution as Genetic Change in Population, pp.487-492</td>
<td>Notebook: Summarize each type of selection.</td>
<td>Week 24</td>
</tr>
<tr>
<td>1.3.1A, 4.3.1B, 4.3.1F, 4.3.1G</td>
<td>#90: What conditions are required to maintain genetic equilibrium?</td>
<td>• Explain how different factors affect genetic equilibrium.</td>
<td>Genetic equilibrium Hardy-Weinberg principle Sexual selection</td>
<td>Summarize</td>
<td>17.2: Evolution as Genetic Change in Population, pp.487-492</td>
<td>Notebook: Name and explain the five conditions that can disturb genetic equilibrium and cause evolution to occur.</td>
<td>Week 24</td>
</tr>
<tr>
<td>1.1.3B, 4.3.1F, 4.3.1G</td>
<td>#91: What types of isolation lead to the formation of new species?</td>
<td>• Identify the types of isolation that can lead to the formation of new species.</td>
<td>Species Speciation Reproductive isolation Behavioral isolation Geographic isolation Temporal isolation</td>
<td>Compare/Contrast Table: Describe the three mechanisms of reproductive isolation.</td>
<td>17.3: The Process of Speciation, pp.494-497</td>
<td>Notebook: Explain how temporal isolation can lead to speciation.</td>
<td>Week 24</td>
</tr>
<tr>
<td>Major Understanding</td>
<td>Aim</td>
<td>Objectives</td>
<td>Vocabulary</td>
<td>Graphic Organizer</td>
<td>Textbook</td>
<td>Activity / Experiment</td>
<td>Date</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----</td>
<td>------------</td>
<td>------------</td>
<td>------------------</td>
<td>----------</td>
<td>----------------------</td>
<td>------</td>
</tr>
<tr>
<td>1.1.3B, 4.3.1F, 4.3.1G</td>
<td>#92: What is a current hypothesis about Galapagos finch speciation?</td>
<td>• Describe the current hypothesis about Galapagos finch speciation.</td>
<td>Genetic drift, Bottleneck effect, Founder effect</td>
<td>Cause and Effect: How can the founder effect lead to changes in the gene pool?</td>
<td>17.3: The Process of Speciation, pp.494-497</td>
<td>Notebook: Explain how natural selection and behavioral isolation may have lead to reproductive isolation.</td>
<td>Week 25</td>
</tr>
<tr>
<td>4.2.1h</td>
<td>#93: What are molecular clocks?</td>
<td>• Explain how molecular clocks are used.</td>
<td>Molecular clock</td>
<td>Think-Pair-Share: Ask students to think about why negative and positive mutations do not tend to accumulate at a constant rate in organisms.</td>
<td>17.4: Molecular Evolution, pp.498-501</td>
<td>Notebook: What kind of mutation –neutral or negative – will most likely persist in a population over time? Explain.</td>
<td>Week 25</td>
</tr>
<tr>
<td>1.1.3b, 4.3.1e</td>
<td>#94: Where do genes come from?</td>
<td>• Explain how new genes evolve.</td>
<td>Duplication, Modification, Copying genes</td>
<td>Think-Pair-Share: Pair two students to understand how genes become duplicated and then evolve into genes with new functions.</td>
<td>17.4: Molecular Evolution, pp.498-501</td>
<td>Analyzing Data: Fishes in Two Lakes</td>
<td>Week 25</td>
</tr>
<tr>
<td>1.1.3b, 4.3.1e</td>
<td>#95: How many Hox genes be involved in evolutionary change?</td>
<td>• Describe how Hox genes may be involved in evolutionary change.</td>
<td>Hox genes</td>
<td>Inference</td>
<td>17.4: Molecular Evolution, pp.498-501</td>
<td>Notebook: Use the evolution of the insect body plan to explain the significance of Hox genes in evolution.</td>
<td>Week 25</td>
</tr>
<tr>
<td>Major Understanding</td>
<td>Aim</td>
<td>Objectives</td>
<td>Vocabulary</td>
<td>Graphic Organizer</td>
<td>Textbook</td>
<td>Activity / Experiment</td>
<td>Date</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----</td>
<td>------------</td>
<td>------------</td>
<td>-------------------</td>
<td>----------</td>
<td>-----------------------</td>
<td>------</td>
</tr>
<tr>
<td>1.1.1b</td>
<td>#96: What are the goals of binomial nomenclature and systematic?</td>
<td>• Describe the goals of binomial nomenclature and systematic.</td>
<td>Binomial nomenclature Genus Systematic Taxon</td>
<td>Visuals Dichotomous Key</td>
<td>18.1: Finding Order in Diversity, pp.510-515</td>
<td>Notebooks: The word binomial means “having two names.” How does this meaning apply to binomial nomenclature? Notebooks: Use visuals to explore a dichotomous key. Guided Inquiry: Classifying Fruits</td>
<td>Week 25</td>
</tr>
<tr>
<td>1.1.1b</td>
<td>#97: How did Linnaeus group species into larger taxa?</td>
<td>• Identify the taxa in the classification system devised by Linnaeus.</td>
<td>Family Order Class Phylum kingdom</td>
<td>Classify</td>
<td>18.1: Finding Order in Diversity, pp.510-515</td>
<td>Notebooks: Create a hierarchical classification system using a collection of different clips and pins.</td>
<td>Week 26</td>
</tr>
<tr>
<td>4.3.1k</td>
<td>#98: What is the good of evolutionary classification?</td>
<td>• Explain the difference between evolutionary classification and Linnaean classification</td>
<td>Phylogeny Clade Monophyletic group</td>
<td>Interpret diagrams</td>
<td>18.2: Modern Evolutionary Classification, pp.516-522</td>
<td>Notebooks: In your own words, explain what makes a clade monophyletic or paraphyletic.</td>
<td>Week 26</td>
</tr>
<tr>
<td>4.3.1k, 1.1.3b</td>
<td>#99: What is a cladogram?</td>
<td>• Describe how to make and interpret a cladogram.</td>
<td>Cladogram Derived character</td>
<td>Interpreting cladograms Visual Summary.</td>
<td>18.2: Modern Evolutionary Classification, pp.516-522</td>
<td>Guided Inquiry: Constructing a Cladogram</td>
<td>Week 26</td>
</tr>
<tr>
<td>1.1.3b, 4.3.1e, 1.1.3b, 4.3.1k</td>
<td>#100: How are DNA sequences used in classification?</td>
<td>• Explain the use of DNA sequence in classification</td>
<td>DNA sequence classification</td>
<td>Cause and Effect</td>
<td>18.2: Modern Evolutionary Classification, pp.516-522</td>
<td>Notebooks: Relate Cause and Effect Explain why the classification of American vultures has changed.</td>
<td>Week 26</td>
</tr>
<tr>
<td>Major Understanding</td>
<td>Aim</td>
<td>Objectives</td>
<td>Vocabulary</td>
<td>Graphic Organizer</td>
<td>Textbook</td>
<td>Activity / Experiment</td>
<td>Date</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----</td>
<td>------------</td>
<td>------------</td>
<td>-------------------</td>
<td>----------</td>
<td>-----------------------</td>
<td>------</td>
</tr>
<tr>
<td>1.1.3b, 1.1.1b, 4.3.1e</td>
<td>#101: What are the six kingdoms of life as they now are identified?</td>
<td>• Name the six kingdoms of life.</td>
<td>Domain</td>
<td>Concept Map</td>
<td>18.3: Building the Tree of Life pp. 523-528</td>
<td>Notebook: Construct a concept map describing the characteristics of the three domains.</td>
<td>Week 27</td>
</tr>
<tr>
<td>1.1.3b, 1.1.1b, 4.3.1e, 4.3.1k</td>
<td>#102: What does the tree of life show?</td>
<td>• Explain what the tree of life represents.</td>
<td>Bacteria Archaea Eukarya</td>
<td>Interpret and analyze data</td>
<td>18.3: Building the Tree of Life pp. 523-528</td>
<td>Notebook: Explain why kingdom Protista is not valid under evolutionary classification. Pre-Lab: Dichotomous Keys Lab: Dichotomous Keys Lab Manual B, pp.109-116</td>
<td>Week 27</td>
</tr>
<tr>
<td>Major Understanding</td>
<td>Aim</td>
<td>Objectives</td>
<td>Vocabulary</td>
<td>Graphic Organizer</td>
<td>Textbook</td>
<td>Activity / Experiment</td>
<td>Date</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----</td>
<td>---------------------------------------------------------------------------</td>
<td>------------</td>
<td>-----------------------</td>
<td>----------</td>
<td>---------------------------------------------------------------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>1.2.4, 1.3.1a</td>
<td>#104: How do we date events in the Earth’s history?</td>
<td>• Differentiate between relative dating and radiometric dating.</td>
<td>Relative dating</td>
<td>Index Fossils Visual analysis</td>
<td>19.1: The Fossil Record, pp.538-545</td>
<td>Notebook: Explain why carbon-14 can’t be used to estimate the age of very old fossils. Worksheet: Dating Earth’s history Study Workbook B, p.284 Worksheet: Modeling Half-Life Study Workbook B, p.286</td>
<td>Week 27</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.3.1j</td>
<td>#105: How was the geologic time scale established, and what are in the major divisions?</td>
<td>• Identify the divisions of the geologic scale.</td>
<td>Geologic time scale Era Period</td>
<td>Visual analogy</td>
<td>19.1: The Fossil Record, pp.538-545</td>
<td>Notebook: Visual Analogy Geologic Time as a Clock Worksheet: Geologic Time Scale Follow the directions to make a timeline of the geologic time scale. Study Workbook B, p.285</td>
<td>Week 27</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>#106: How have our planet’s environment and living things affected each other to shape the history of life on Earth?</td>
<td>• Describe how environmental processes and living things have shaped life on Earth.</td>
<td>Plate tectonics</td>
<td>Relating cause and effect</td>
<td>19.1: The Fossil Record, pp.538-545</td>
<td>Notebook: Relate Cause and Effect Describe two ways in which continental drift has affected organisms.</td>
<td>Week 28</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major Understanding</td>
<td>Aim</td>
<td>Objectives</td>
<td>Vocabulary</td>
<td>Graphic Organizer</td>
<td>Textbook</td>
<td>Activity / Experiment</td>
<td>Date</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----</td>
<td>------------</td>
<td>------------</td>
<td>-------------------</td>
<td>---------</td>
<td>----------------------</td>
<td>------</td>
</tr>
<tr>
<td>4.3.1l, 4.3.1a, 4.3.1e, 4.3.1k</td>
<td>#107: What processes influence whether species and clades survive or become extinct?</td>
<td>• Identify the processes that influence survival or extinction of a species or clade.</td>
<td>Macroevolution pattern Background extinction Mass extinction</td>
<td>Concept Map</td>
<td>19.2: Patterns and Processes of Evolution, pp.546-552</td>
<td>Notebook: Build Vocabulary Construct a chart that shows the key terms and their definitions. Worksheet: Construct a concept map that includes the patterns of macroevolution. Study Workbook B, p.288 Notebook: Explain what macroevolution is and how fossils can show macro evolutionary trends. Notebook: Use visuals to explore a dichotomous key. Guided Inquiry: Classifying Fruits</td>
<td>Week 28</td>
</tr>
<tr>
<td>1.1.1b, 1.1.3b, 4.3.1k</td>
<td>#108: How fast does evolution take place?</td>
<td>• Contrast gradualism and punctuated equilibrium.</td>
<td>Gradualism Punctuated equilibrium</td>
<td>Compare and contrast</td>
<td>19.2: Patterns and Processes of Evolution, pp.546-552</td>
<td>Notebook: In your own words, describe gradualism and punctuated equilibrium. Worksheet: Rate of Evolution Study Workbook B, p.289</td>
<td>Week 28</td>
</tr>
<tr>
<td>Major Understanding</td>
<td>Aim</td>
<td>Objectives</td>
<td>Vocabulary</td>
<td>Graphic Organizer</td>
<td>Textbook</td>
<td>Activity / Experiment</td>
<td>Date</td>
</tr>
<tr>
<td>---------------------</td>
<td>------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
<td>-----------------------------</td>
<td>-------------------</td>
<td>---------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>4.3.1k, 4.3.1e, 4.6.1g</td>
<td>#109: What evolutionary characteristics are typical of coevolving species?</td>
<td>● Name two important patterns in microevolution.</td>
<td>Adaptive radiation</td>
<td>Compare and contrast</td>
<td>19.2: Patterns and Processes of Evolution, pp.546-552</td>
<td>Worksheet: Adaptive Radiation and Convergent Evolution Study Workbook B, p. 290</td>
<td>Week 28</td>
</tr>
<tr>
<td>1.1.3a, 4.3.1g</td>
<td>#109: What evolutionary characteristics are typical of coevolving species?</td>
<td>● Explain the evolutionary characteristics of coevolving organisms.</td>
<td>coevolving</td>
<td>Apply concepts</td>
<td>19.2: Patterns and Processes of Evolution, pp.546-552</td>
<td>Describe an example of coevolution.</td>
<td>Week 28</td>
</tr>
<tr>
<td>1.1.3b, 1.1.1b, 1.1.3b, 4.3.1j</td>
<td>#110: What do scientists hypothesize about early Earth and the origin of life?</td>
<td>● Identify some of the hypotheses about early Earth and the origin of life.</td>
<td>origin</td>
<td>Flow chart</td>
<td>19.3: Earth’s Early History pp.553-558</td>
<td>Notebook: Construct a flowchart that shows what scientists hypothesize are the major steps from the origin of Earth to the appearance of eukaryotic cells. Worksheet Study workbook, p.291</td>
<td>Week 29</td>
</tr>
<tr>
<td>Major Understanding</td>
<td>Aim</td>
<td>Objectives</td>
<td>Vocabulary</td>
<td>Graphic Organizer</td>
<td>Textbook</td>
<td>Activity / Experiment</td>
<td>Date</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----</td>
<td>-----------</td>
<td>------------</td>
<td>-------------------</td>
<td>----------</td>
<td>-----------------------</td>
<td>------</td>
</tr>
<tr>
<td>4.3.1a, 4.3.1j, 1.1.1.b, 4.3.1e</td>
<td>#111: What theory explains the origin of eukaryotic cells?</td>
<td>• Explain the endosymbiotic theory.</td>
<td>Endosymbiotic theory</td>
<td>Chart</td>
<td>19.3: Earth’s Early History pp.553-558</td>
<td>Worksheet and worksheet about the Earth’s Early History p.293 Notebook: Describe two hypotheses relating to the endosymbiotic theory. Endosymbiotic Theory Worksheet: Origins of Eukaryotic Cells Study Workbook B, p.294</td>
<td>Week 29</td>
</tr>
<tr>
<td>4.2.1d, 4.2.1e, 4.3.1f</td>
<td>#112: What is the evolutionary significance of sexual reproduction?</td>
<td>• Students will be able to: • Explain the significance of sexual reproduction in evolution.</td>
<td>Cause and Effect Chart</td>
<td>19.3: Earth’s Early History pp.553-558</td>
<td>Worksheet and worksheet about the Earth’s Early History p.293</td>
<td>NYS Lab: The Beaks of Finches</td>
<td>Week 29</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NYS Lab: Relationships and Biodiversity</td>
<td>Week 30</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Project #7</td>
<td>Week 30</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Common Assessment # 7</td>
<td></td>
</tr>
<tr>
<td>Major Understanding</td>
<td>Aim</td>
<td>Objectives</td>
<td>Vocabulary</td>
<td>Graphic Organizer</td>
<td>Textbook</td>
<td>Activity / Experiment</td>
<td>Date</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----</td>
<td>------------</td>
<td>------------</td>
<td>-------------------</td>
<td>---------</td>
<td>-----------------------</td>
<td>------</td>
</tr>
<tr>
<td>4.1.2b, 4.1.2a, 4.2.1c</td>
<td>#113: How is the human body organized?</td>
<td>• Describe how the human body is organized.</td>
<td>Epithelial tissue&lt;br&gt;Connective tissue&lt;br&gt;Nervous tissue&lt;br&gt;Muscle tissue&lt;br&gt;Homeostasis&lt;br&gt;Feedback inhibition</td>
<td>Complete a chart of the body’s level of organization, describe each level, and give an example of each.</td>
<td>35-1 Human Body Systems, pp.890-896</td>
<td>Class Activity: Give each student four index cards and have students label the cards, “cells”, “tissues”, “organs”, and “organ systems.” On the back of each card, ask students to write a brief description of the term and give one or two examples from the human body. Then have them arrange the cards in a way that shows how the human body is organized.</td>
<td>Week 30</td>
</tr>
<tr>
<td>4.5.2a, 4.1.2c, 4.1.2c, 4.5.2a, 4.5.3b</td>
<td>#114: What is homeostasis?</td>
<td>• Explain homeostasis.</td>
<td>Construct a cycle diagram of feedback inhibition.</td>
<td>30.1: Organization of the Human Body pp.862-867</td>
<td>Notebook: Apply Concepts&lt;br&gt;Do you think that feelings hunger and fullness are example of feedback inhibition? Explain.</td>
<td>Week 31</td>
<td></td>
</tr>
<tr>
<td>Major Understanding</td>
<td>Aim</td>
<td>Objectives</td>
<td>Vocabulary</td>
<td>Graphic Organizer</td>
<td>Textbook</td>
<td>Activity / Experiment</td>
<td>Date</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----</td>
<td>------------</td>
<td>------------</td>
<td>-------------------</td>
<td>----------</td>
<td>-----------------------</td>
<td>------</td>
</tr>
<tr>
<td>4.5.1d, 4.1.2h, 4.5.1c, 4.5.2a</td>
<td>#115: Why do we need to eat?</td>
<td>• Explain how food provides energy.</td>
<td>Calorie Carbohydrate Fat Protein Vitamin mineral</td>
<td>Compare and contrast</td>
<td>30.2: Food and Nutrition pp.868-873</td>
<td>Notebook: What are the two reasons humans need to eat?</td>
<td>Week 31</td>
</tr>
<tr>
<td>4.1.2h, 4.5.2a, 4.5.2h</td>
<td>#116: What nutrition does your body need?</td>
<td>• Identify the essential nutrients your body needs and tell how each is important to the body. • Explain how to plan a balanced diet.</td>
<td>Balanced diet Healthful weight</td>
<td>Compare and contrast</td>
<td>30.2: Food and Nutrition pp.868-873</td>
<td>Notebook: Prepare a table to fill in with information about the nutrients. For each nutrient, include foods in which it is found and describe its role in the body. Notebook: List seven types of information you can learn about a food from its food label.</td>
<td>Week 31</td>
</tr>
<tr>
<td>Major Understanding</td>
<td>Aim</td>
<td>Objectives</td>
<td>Vocabulary</td>
<td>Graphic Organizer</td>
<td>Textbook</td>
<td>Activity / Experiment</td>
<td>Date</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----</td>
<td>------------</td>
<td>------------</td>
<td>-------------------</td>
<td>----------</td>
<td>-----------------------</td>
<td>------</td>
</tr>
</tbody>
</table>
| 4.1.2b, 4.1.2h, 4.1.2e, 4.1.2h, 4.5.1f, 4.5.2h, 1.3.1a. | #117: What are the functions of the digestive system? | • Describe the organs of the digestive system and explain their functions.  
• Explain what happens during digestion. | Mechanical digestion  
Chemical digestion  
Amylase  
Esophagus  
Peristalsis  
Stomach  
Pepsin  
Chyme  
Small intestine  
Villus  
Large intestine | Compare and Contrast Flowchart | 30.3: The Digestive System pp. 587-593 | Notebook: What is the difference between mechanical digestion and chemical digestion?  
Notebook: Make a flowchart that shows the route food takes through the digestive system.  
Notebook: Explain in your own words two protective functions of the mouth and throat.  
Notebook: Summarize the two roles of the pancreas in fat digestion. | Week 31 |
| #118: How are nutrients absorbed and wastes eliminated? | • Describe how nutrients are absorbed into the blood stream and wastes are eliminated from the body. | Nutrients  
Absorb  
Blood  
Wastes  
eliminate | Apply concepts | 30.3: The Digestive System pp. 587-593 | Notebook: Explain how nutrients are absorbed.  
Notebook: What impact do the folds and villi of the small intestine have on absorption? | Week 31 |
# The Human Body

<table>
<thead>
<tr>
<th>Major Understanding</th>
<th>Aim</th>
<th>Objectives</th>
<th>Vocabulary</th>
<th>Graphic Organizer</th>
<th>Textbook</th>
<th>Activity / Experiment</th>
<th>Date</th>
</tr>
</thead>
</table>
| 4.1.2b, 4.1.2c, 4.5.3a, 4.5.2h | #119: What is the principal role of the structure of the excretory system? | • Describe the structures of the excretory system and explain their functions.  
• Explain how the kidneys clean the blood.  
• Describe how the kidneys maintain homeostasis. | Excretion  
Ureter  
Urinary bladder  
Urethra  
Nephron  
Filtration  
Glomerulus  
Bowman’s capsule  
Reabsorption  
Loop of Henle | Two- Column Table | 30.4 The Excretory System pp.594-599 | Notebook: Make a two-column table that lists the organs of excretion in the first column and their function in the second column.  
Notebook: Explain what happens during filtration, re-absorption, and urine excretion.  
Notebook: Explain in your own words why urine can reveal a lot about a person’s health. | Week 32 |
| 4.1.2b, 4.5.3a, 4.1.2f | #120: What are the functions of the nervous system? | • Identify the functions of the nervous system.  
• Describe the functions of neurons. | Peripheral nervous system  
Central nervous system  
Cell body  
Dendrite  
Axon  
Myelin sheath  
Resting potential  
Action potential  
Threshold | Two- Column Table | 31.1: The Neuron pp.896-900 | Notebook: Describe the functions of the nervous system.  
Notebook: Make a two-column table that lists the structures of a neuron in one column and their functions in the next column. | Week 32 |
| 4.1.2b, 4.1.2c | #121: Where does processing of information occur in the nervous system? | • Discuss the functions of the brain and spinal cord. | Reflex  
Cerebrum  
Cerebral cortex  
Thalamus  
Hypothalamus  
Cerebellum  
Brain stem  
dopamine | Three–Column Table | 31.2: The Central Nervous System pp.901-905 | Notebook: Make a three-column table that lists the major structures of the brain, their functions, and how they interact with at least one other brain structure. | Week 32 |
<table>
<thead>
<tr>
<th>Major Understanding</th>
<th>Aim</th>
<th>Objectives</th>
<th>Vocabulary</th>
<th>Graphic Organizer</th>
<th>Textbook</th>
<th>Activity / Experiment</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1.2b, 4.1.2c</td>
<td>#122: How do the drugs change the brain and lead to addiction?</td>
<td>• Describe the effects of drugs on the brain.</td>
<td>Drugs Brain</td>
<td>Flowchart</td>
<td>31.2: The Central Nervous System pp.901-905</td>
<td>Notebook: Make a flowchart that shows the sequence of how light and nerve impulses travel from the outside environment to the brain.</td>
<td>Week 32</td>
</tr>
</tbody>
</table>
| 1.3.1a, 4.1.2b, 4.1.2c, 4.5.3a | #123: How does the central nervous system receive sensory information? | • Describe the functions of the sensory division of the peripheral nervous system.  
• Describe the functions of the motor division of the peripheral nervous system. | Somatic nervous system  
Reflex arc  
Autonomic nervous system | Flowchart | 31.3: The Peripheral Nervous System pp.906-908 | Describe how a reflex arc works. | Week 32 |
| 4.5.2h, 4.5.3a      | #124: How does the body sense touch, temperature, and pain? | • Discuss the sense of touch and identify the various types of sensory receptors in the skin.  
• Explain the relationship between smell and taste. | Touch  
Temperature  
pain | Summarize | 31.4: Senses pp.909-913 | Notebook: Explain the relationship between smell and taste. | Week 32 |
<table>
<thead>
<tr>
<th>Major Understanding</th>
<th>Aim</th>
<th>Objectives</th>
<th>Vocabulary</th>
<th>Graphic Organizer</th>
<th>Textbook</th>
<th>Activity / Experiment</th>
<th>Date</th>
</tr>
</thead>
</table>
| 4.5.2h, 4.5.3a       | #124: How do the ears and brain process sounds and maintain balance? How do the eyes and brain produce vision? | • Identify the parts of the ears that make hearing and balance possible.  
• Describe the major parts of the eye and explain how the eye enables us to see. | Hearing  
Balance  
Cochlea  
Semicircular canal | Apply concepts | 31.4: Senses pp.909-913 | Notebook: Make a flowchart that shows the sequence of how light and nerve impulses travel from the outside environment to the brain.  
Lab Manual B  
Testing Sensory Receptors for Touch  
Data Analysis: Sound Intensity  
Hands-on Activity: Responding to External Stimuli | Week 33 |
| 4.1.2b               | #125: What are the functions of the skeletal system? | • List the structures and functions of the skeletal system. | Axial skeleton  
Appendicular skeleton | Two-Column Table  
T-chart | 32.1: The Skeletal System pp.922-927 | Notebook: Use a two-column table to list the roles of the skeletal system and an example of each role.  
Worksheet  
T-chart of Questions and Answers about the Skeletal System  
Study Workbook B, 495  
Worksheet  
Label the parts of a skeleton  
Study Workbook B, p. 496 | Week 33 |
<table>
<thead>
<tr>
<th>Major Understanding</th>
<th>Aim</th>
<th>Objectives</th>
<th>Vocabulary</th>
<th>Graphic Organizer</th>
<th>Textbook</th>
<th>Activity / Experiment</th>
<th>Date</th>
</tr>
</thead>
</table>
| 4.1.2b, 4.1.2j, 4.5.1f | #126: What are the principal types of muscle tissue? | • Describe the structure and function of each of the three types of muscle tissue.  
• Describe the mechanism of muscle contraction.  
• Describe the interaction of muscles, bones, and tendons to produce movement. | Actin  
Muscle fiber  
Myofibril  
Myosin | Two-Column Chart  
Concept Map | 32.2: The Muscular System, pp.928-933 | Notebook: Use a two-column chart to describe the three types of muscle tissue. Label the first column Type and the second column Function.  
Worksheet Linear Concept Map about the Types of Muscle Tissue  
Study Workbook B, p.499  
Worksheet Muscle and Movement Study Workbook B, p. 500  
Worksheet Cause and Effect Chart What do tendons do? Study Workbook b, p.501 | Week 33 |
### The Human Body

<table>
<thead>
<tr>
<th>Major Understanding</th>
<th>Aim</th>
<th>Objectives</th>
<th>Vocabulary</th>
<th>Graphic Organizer</th>
<th>Textbook</th>
<th>Activity / Experiment</th>
<th>Date</th>
</tr>
</thead>
</table>
| 4.1.2b, 4.1.2c, 4.5.2i. | #127: What are the principal functions and structures of the integumentary system? | • State the functions of the integumentary system.  
• Identify the structures of the integumentary system.  
• Describe some of the problems that affect the skin | Dermis  
Epidermis  
Keratin  
Melanocyte  
Sebaceous glands  
Hair follicle  
Acne  
Hives  
Skin cancer | Two-Column Chart  
Word Web | 32.3: Skin-the Integumentary System  
pp.935-939 | Notebook: Build Understanding  
Construct a two-column chart. Under structure list some skin structures. Write the functions of each structure on the right column.  
Worksheet: Use the clues to help complete the word web with the phrases in the box. Study Workbook B, p.503  
Notebook: In your notebook, explain whether the epidermis, the dermis, or both layers are involved in the protection and temperature regulation.  
Analyzing data: The Rising Rate of Melanoma  
Notebook: Summarize the steps that can take to protect your skin from sun damage.  
Lab Manual B; Comparing Limbs  
Data Analysis: The Rising Rate of Melanoma | Week 33 |
<table>
<thead>
<tr>
<th>Major Understanding</th>
<th>Aim</th>
<th>Objectives</th>
<th>Vocabulary</th>
<th>Graphic Organizer</th>
<th>Textbook</th>
<th>Activity / Experiment</th>
<th>Date</th>
</tr>
</thead>
</table>
| 1.3.3, 4.1.2b, 4.1.2d, 4.1.2e, 4.1.2j | #128: What are the functions and structure of the circulatory system? | • Identify the functions of the human circulatory system.  
• Describe the structure of the heart and explain how it pumps blood through the body.  
• Name three types of blood vessels in the circulatory system. | Myocardium  
Atrium  
Ventricle  
Valve  
Pulmonary circulation  
Systemic circulation  
Pacemaker  
Artery  
Capillary  
Vein | Two-Column Chart | 33.1: The Circulatory System, pp.948-953 | Notebook: Build Vocabulary - Construct a two-column chart. Under Term list key terms. Write the definition of each term under the column definition.  
Worksheet: Preview Visuals  
Write the parts of the heart and the function of each part.  
Study Workbook B, p.511  
Notebook: An Olympic pool contains about 2,000,000 liters of water. In one year, could an average heart pump enough blood to fill an Olympic pool? Explain your answer.  
Notebook: Draw a cycle diagram that represents both pulmonary and systemic circulation.  
Worksheet: The Heart  
Study Workbook B, p. 512 | Week 33 |
| 1.3.1a, 4.1.2b, 4.1.2c, 4.1.2d, 4.5.2h | #129: What is the function of each component in the blood? | • Explain the function of blood plasma, red blood cells, white blood cells, and platelets. | Plasma  
Red blood cell  
Hemoglobin  
White blood cell  
Platelet  
Lymph  
Atherosclerosis | Two-Column Chart  
Notebook: Make a flowchart that describes the blood-clotting process.  
Complete the concept map.  
Study Workbook B, p.514 | Week 34 |
<table>
<thead>
<tr>
<th>Major Understanding</th>
<th>Aim</th>
<th>Objectives</th>
<th>Vocabulary</th>
<th>Graphic Organizer</th>
<th>Textbook</th>
<th>Activity / Experiment</th>
<th>Date</th>
</tr>
</thead>
</table>
| 1.3.3, 4.1.2b, 4.1.2d, 4.1.2e, 4.1.2j | #130: What is the function of the lymphatic system? | • Describe the role of the lymphatic system.  
• Name the three common circulatory diseases.  
• Explain the connection between cholesterol and circulatory disease? | Lymphatic system  
Cholesterol | Compare and contrast | 33.2: The Blood and the Lymphatic System, pp.954-961 | Notebook: Compare and contrast the functions of the circulatory system and the lymphatic system.  
Notebook: Make a feedback loop to demonstrate the relationship between blood cholesterol levels and healthy liver cells. | Week 34 |
| 4.1.2b, 4.1.2c, 4.1.2d, 4.5.2h, 4.5.2i, 4.5.3a, 4.5.3b | #131: What is the function of the respiratory system? | • Identify the structures of the respiratory system and describe their functions. | Pharynx  
Trachea  
Larynx  
Bronchus  
Alveolus  
Diaphragm | Compare and Contrast Concept Map | 33.3 The Respiratory System pp.963-971 | Notebook: In your own words, compare and contrast cellular respiration and respiration at the organism’s level.  
Notebook: Make a flowchart that describes the blood-clotting process.  
Complete the concept map. Study Workbook B, p.514 | Week 34 |
<table>
<thead>
<tr>
<th>Major Understanding</th>
<th>Aim</th>
<th>Objectives</th>
<th>Vocabulary</th>
<th>Graphic Organizer</th>
<th>Textbook</th>
<th>Activity / Experiment</th>
<th>Date</th>
</tr>
</thead>
</table>
| 4.1.2b, 4.1.2c, 4.1.2d, 4.5.2h, 4.5.2i, 4.5.3a, 4.5.3b | #132: How are oxygen and carbon dioxide exchanged and transported throughout the body? | • Describe gas exchange.  
• Describe how breathing is controlled?  
• Describe the effect of smoking on the respiratory system. | Breathing  
Gas exchange  
Respiratory system | Flowchart | 33.3 The Respiratory System  
pp.963-971 | Worksheet: Flowchart of the Steps Involved in Respiratory Gas Exchange  
Study Book B, p. 517 | Week 34 |
| 4.1.2b, 4.1.2c, 4.1.2g, 4.1.2j, 4.5.3b | #133: What are the components of the endocrine system? | • Describe the structure and function of the endocrine system.  
• Explain how hormones work. | Calcitonin  
Corticosteroid  
Epinephrine  
Norepinephrine  
Parathyroid hormone  
Pituitary gland Releasing hormone  
Thyroxine | Compare and Contrast  
Concept Map  
Three-Column Table  
Compare and Contrast | 34.1: The Endocrine System  
pp. 963-969 | Notebook: In your own words, compare and contrast steroid hormones and nonsteroid hormones.  
Notebook: Make a three-column table. Label the columns Glands, Hormones, and Functions. Fill in the table with the needed information.  
Notebook: Use a compare and contrast table to see the similarities between steroid hormones and nonsteroid hormones | Week 34 |
<table>
<thead>
<tr>
<th>Major Understanding</th>
<th>Aim</th>
<th>Objectives</th>
<th>Vocabulary</th>
<th>Graphic Organizer</th>
<th>Textbook</th>
<th>Activity / Experiment</th>
<th>Date</th>
</tr>
</thead>
</table>
| 4.1.2b, 4.1.2c, 4.1.2d, 4.1.2j, 4.5.2a, 4.5.2g, 4.5.2h, 4.5.3b | #134: What are the functions of the major endocrine glands? | • Name the functions of the major endocrine glands.  
• Explain how endocrine glands are controlled. | Calcitonin  
Corticosteroid  
Epinephrine  
Norepinephrine  
Parathyroid hormone  
Pituitary gland  
Releasing hormone  
thyroxine | Concept Map  
Summarize | 34.2: Glands of the Endocrine System  
pp. 982-987 | Notebook: Complete a concept map about the endocrine glands.  
Study Workbook B, pp.527-528  
Notebook: Summarize how blood-calcium levels are regulated. | Week 35 |
| 4.1.2b, 4.1.2c, 4.1.2i, 4.4.1a, 4.4.1c, 4.4.1d, 4.4.1e, 4.4.1f, 4.4.1g, 4.5.2b, 4.5.2h, 4.5.2j | #135: What effects do estrogens and testosterone have on females and males? | • Describe the effects the sex hormones have on development.  
• Name and discuss the structures of the male reproductive system.  
• Name and discuss the structures of the female reproductive system.  
• Describe some of the most common sexually transmitted diseases. | Corpus luteum  
Epididymis  
Menstrual cycle  
Menstruation  
Ovary  
Ovulation  
Puberty  
Scrotum  
Semen  
Seminiferous tubule  
Sexually transmitted diseases  
Testis  
Vas deferens | Summarize | 34.3: The Reproductive System  
pp. 988-994 | Notebook: Summarize the effects of estrogens on females and testosterone on males.  
Notebook: Make a flowchart that shows the path of developing sperm through the male reproductive system.  
Notebook: Draw a cycle diagram to represent the phases and days of the menstrual cycle. | Week 35 |
<table>
<thead>
<tr>
<th>Major Understanding</th>
<th>Aim</th>
<th>Objectives</th>
<th>Vocabulary</th>
<th>Graphic Organizer</th>
<th>Textbook</th>
<th>Activity / Experiment</th>
<th>Date</th>
</tr>
</thead>
</table>
| 1.3.1a, 4.1.2b, 4.1.2j, 4.2.1e, 4.4.1c, 4.4.1d, 4.4.1e, 4.4.1f, 4.4.1h, 4.5.1f, 4.5.2h | #136: What takes place during fertilization and the early stages of human development? | • Describe fertilization and the early stages of development.  
• Identify the major events of later stages of development. | Blastocyst  
Fetus  
Gastrulation  
Implantation  
Neurulation  
Placenta  
zygote | Flowchart | 34.4: Fertilization and Development  
pp. 995-1001 | Notebook: Draw a flowchart that shows the steps from fertilized egg to newborn baby.  
Notebook: Explain in your own words what occurs during neurulation.  
Notebook: Explain in your own words the role of the placenta in human development.  
Lab Manual B: Diagnosing Endocrine Disorders  
Data Analysis: Menstrual Cycle  
Hands-on Activity: Growing Up | Week 35 |
| 4.5.2b, 4.5.2j, 4.6.1g | #137: What causes infectious disease? | • Identify the causes of infectious diseases.  
• Explain how infectious diseases spread. | Infectious disease | Two-Column Chart  
Venn Diagram | 35.1: Infectious Diseases,  
pp. 1010-1013 | Notebook: Complete a two-column chart of why disease is spread and how each disease is spread.  
Complete a Venn diagram to compare and contrast symbionts and pathogens. | Week 35 |
<table>
<thead>
<tr>
<th>Major Understanding</th>
<th>Aim</th>
<th>Objectives</th>
<th>Vocabulary</th>
<th>Graphic Organizer</th>
<th>Textbook</th>
<th>Activity / Experiment</th>
<th>Date</th>
</tr>
</thead>
</table>
| 4.1.2b, 4/5/1g, 4/5/2c, 4.5.2d, 4.5.2f, 4.5.2g | #138: What are the body's nonspecific defenses against pathogens? | • Describe the body's nonspecific defenses against invading pathogens.  
• Describe the functions of the immune system’s specific defenses  
• List the body’s specific defenses against pathogens. | Antibody  
Antigen  
Immune response  
Inflammatory response | Concept Map  
Two-Column Chart | 35.2: Defense against Infection. pp.1014-1019 | Use a concept map to organize information about defenses against infection.  
Notebook: Name the nonspecific defenses and their role in the human body. | Week 36 |
| 1.1.1a, 1.1.1b, 1.2b, 1.3.1a, 4.5.2c, 4.5.2d, 4.5.2e | #139: How do vaccines and externally produced antibodies fight disease? | • Distinguish between active immunity and passive immunity.  
• Describe how public health measures and medications fight disease.  
• Describe why patterns of infectious disease have changed. | Active immunity  
Passive immunity vaccination | Venn Diagram | 35.3: Fighting Infectious Disease pp. 1020-1022 | Notebook: Use a Venn diagram to compare and contrast active immunity and passive immunity. | Week 36 |
### The Human Body

<table>
<thead>
<tr>
<th>Major Understanding</th>
<th>Aim</th>
<th>Objectives</th>
<th>Vocabulary</th>
<th>Graphic Organizer</th>
<th>Textbook</th>
<th>Activity / Experiment</th>
<th>Date</th>
</tr>
</thead>
</table>
| 1.2.3a, 4.5.2b, 4.5.2f, 4.5.2g, 4.5.2h | #140: How can misguided immune responses cause problems? | • Students will be able to:  
• Explain what happens when the immune system overreacts to harmless pathogens.  
• Describe how HIV is transmitted and how it affects the immune system. | Allergy asthma | | 35.4: Immune System Disorders pp. 1024-1027 | Notebook: Make a three-column chart to label them to name immune response, description of each immune response. And treatments for each immune response.  
Notebook: describe what happens when HIV infects a cell.  
Lab Manual B Detecting Lyme Disease Data Analysis:  
Immune System Memory  
Hands-on Activity: How do Diseases Spread?  
Data Analysis: Food Allergies | Week 36 |

### Project #8

<table>
<thead>
<tr>
<th>Common Assessment #8:</th>
<th></th>
</tr>
</thead>
</table>

Based on the formative and summative assessments, teachers should focus on the major understandings where students’ performances were at levels 1 and 2.  

**JUNE – NYSED LIVING ENVIRONMENT REGENTS**
## SYSTEMATIC DESIGN OF A SCIENCE LESSON

### What are the components of a Science Lesson?

<table>
<thead>
<tr>
<th>Standards-Based Science Lesson Plan Format Using the Workshop Model</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AIM: Goal of the Day</strong></td>
<td></td>
</tr>
<tr>
<td>- Written in Question Form</td>
<td></td>
</tr>
<tr>
<td>- Concept to be Learned</td>
<td></td>
</tr>
<tr>
<td>- Linked to Closure of the lesson</td>
<td></td>
</tr>
<tr>
<td>- Written in student friendly language</td>
<td></td>
</tr>
<tr>
<td>- Can be elicited from the students</td>
<td></td>
</tr>
<tr>
<td><strong>Learning Objective(s): Standards-Based</strong></td>
<td></td>
</tr>
<tr>
<td>- A precise way of stating an outcome or goal (refer to Bloom's Taxonomy)</td>
<td></td>
</tr>
<tr>
<td>- Describes what a student should be able to do (a road map)</td>
<td></td>
</tr>
<tr>
<td>- Can be measured for achievability (attainable)</td>
<td></td>
</tr>
<tr>
<td>- Getting started activities serve as prerequisite skills in preparation for undertaking new objectives</td>
<td></td>
</tr>
<tr>
<td><strong>Key Idea(s): NYS Performance Standards</strong></td>
<td></td>
</tr>
<tr>
<td>- Specific skills and concepts students should master</td>
<td></td>
</tr>
<tr>
<td><strong>Key Words: Interactive Word Wall</strong></td>
<td></td>
</tr>
<tr>
<td>- Identify, define words relevant to the lesson, topic, concept, skill</td>
<td></td>
</tr>
<tr>
<td>- Operational definitions of terms, concepts</td>
<td></td>
</tr>
<tr>
<td>- Use of roots and prefixes for literary understanding</td>
<td></td>
</tr>
<tr>
<td>- Display on the Science Word Wall and use for vocabulary development</td>
<td></td>
</tr>
<tr>
<td><strong>Materials: Creative and Varied</strong></td>
<td></td>
</tr>
<tr>
<td>- Items needed to facilitate the implementation of the lesson</td>
<td></td>
</tr>
<tr>
<td>- Use to enhance/differentiate lesson (i.e. teacher-made, manipulatives, text, calculators, technology)</td>
<td></td>
</tr>
<tr>
<td>- Organized and accessible to students</td>
<td></td>
</tr>
<tr>
<td><strong>Problem of the Day / Do Now: Opening</strong> - Whole Group</td>
<td>5 min</td>
</tr>
<tr>
<td>- This can be considered the motivation or Do Now of the lesson</td>
<td></td>
</tr>
<tr>
<td>- It should set the stage for the day's lesson</td>
<td></td>
</tr>
<tr>
<td>- Skills review</td>
<td></td>
</tr>
<tr>
<td>- Introduction of a new concept, built on prior knowledge</td>
<td></td>
</tr>
<tr>
<td>- Open-ended problems</td>
<td></td>
</tr>
<tr>
<td><strong>Mini Lesson: Guided Practice</strong> - Whole Group (Teacher Directed, Student Centered)</td>
<td>10 – 15 min</td>
</tr>
<tr>
<td>- Inform students of what they are going to do. Refer to Objectives. Refer to the Key Words (Word Wall)</td>
<td></td>
</tr>
<tr>
<td>- Define the expectations for the work to be done</td>
<td></td>
</tr>
<tr>
<td>- Provide various demonstrations using modeling and multiple representations (i.e. model a strategy and your thinking for problem solving, model how to use a ruler to measure items)</td>
<td></td>
</tr>
<tr>
<td>- Relate to previous work</td>
<td></td>
</tr>
<tr>
<td>- Provide logical sequence and clear explanations</td>
<td></td>
</tr>
<tr>
<td>- Provide medial summary</td>
<td></td>
</tr>
</tbody>
</table>
Standards-Based Science Lesson Plan Format Using the Workshop Model

<table>
<thead>
<tr>
<th>Component</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exploration/Investigation: Independent Practice - Cooperative Groups, Pairs, Individuals, (Student Interaction &amp; Engagement, Teacher Facilitated)</td>
<td>20 – 25 min</td>
</tr>
<tr>
<td>- Students try out the skill or concept learned in the mini-lesson</td>
<td></td>
</tr>
<tr>
<td>- Teachers circulate the room, conferences with the students and assesses student work (i.e. teacher asks questions to raise the level of student thinking)</td>
<td></td>
</tr>
<tr>
<td>- Students construct knowledge around the key idea or content standard through the use of problem solving strategies, manipulatives, accountable/quality talk, writing, modeling, technology applied learning</td>
<td></td>
</tr>
<tr>
<td>Share Out: Reflective Practice - Whole Group (Teacher Directed, Student Centered)</td>
<td>5 – 10 min</td>
</tr>
<tr>
<td>- Students discuss their work and explain their thinking</td>
<td></td>
</tr>
<tr>
<td>- Teacher asks questions to help students draw conclusions and make references</td>
<td></td>
</tr>
<tr>
<td>Journal Writing: Independent Reflections - Individuals (Teacher Facilitated, Student Centered)</td>
<td>5 – 10 min</td>
</tr>
<tr>
<td>- Reflect thinking in writing</td>
<td></td>
</tr>
<tr>
<td>- Use writing &quot;prompts&quot; if needed (i.e. &quot;I tried to solve this problem by __________ but it did not work because ______________.&quot;)</td>
<td></td>
</tr>
<tr>
<td>- Answer question (i.e. What did I do in Science today?, What science words did I learn or review? What science did I learn or review?)</td>
<td></td>
</tr>
<tr>
<td>- Pose creative assignments (i.e. Use tangrams to create a character. Give a description and details about your character.)</td>
<td></td>
</tr>
<tr>
<td>Final Summary: (Closing) - Whole Group (Teacher Directed, Student Centered)</td>
<td>5 min</td>
</tr>
<tr>
<td>- Determine if aim/objective(s) were achieved</td>
<td></td>
</tr>
<tr>
<td>- Students summarize what was learned</td>
<td></td>
</tr>
<tr>
<td>- Allow students to reflect, share (i.e. read from journal)</td>
<td></td>
</tr>
<tr>
<td>- Homework is a follow-up to the lesson which may involve skill practice, problem solving and writing</td>
<td></td>
</tr>
<tr>
<td>Homework/Enrichment - Whole Group (Teacher Directed, Student Centered)</td>
<td></td>
</tr>
<tr>
<td>- Homework is a follow-up to the lesson which may involve skill practice, problem solving and writing</td>
<td></td>
</tr>
<tr>
<td>- Homework, projects or enrichment activities should be assigned on a daily basis.</td>
<td></td>
</tr>
<tr>
<td>- SPIRALLING OF HOMEWORK - Teacher will also assign problems / questions pertaining to lessons taught in the past</td>
<td></td>
</tr>
</tbody>
</table>

Remember: Assessments are on-going based on students’ responses.

Assessment: Independent Practice (It is on-going! Provide formal assessment when necessary / appropriate) | |
| - Always write, use and allow students to generate **Effective Questions** for optimal learning |
| - Based on assessment(s), **Re-teach** the skill, concept or content using alternative strategies and approaches |
**IMPORTANT NOTICE**

- All aims must be **numbered** with corresponding homework. For example, Aim #7 will correspond to homework #7 and so on.
- Writing assignments at the end of the lesson (closure) bring great benefits. Not only do they enhance students' general writing ability, but they also increase both the understanding of content while learning the specific vocabulary of the disciplines.

**AIM #7: What is matter?**

**NYS PERFORMANCE INDICATOR:**

3.1q  Matter is classified as a pure substance or as a mixture of substances.

**Do Now (5 minutes):**

- Classify the following items based on their properties/characteristics.

**Writing Exercise / Closure:**

- What are some properties of matter?

**Homework #7**

- Page 34 #5, 7, 9, 11
- Page 28 #4, 13
- Page 15 #21, 33
- Page 8 #40
- Study for Quiz #2 on September 23, 2010

- Demonstration (using manipulatives) must be incorporated in all lessons. With students actively involved in manipulating materials, interest in science will be aroused. Using manipulative materials in teaching science will help students learn:
  a. to relate real world situations to science symbolism.
  b. to work together cooperatively in solving problems.
  c. to discuss scientific ideas and concepts.
  d. to verbalize their scientific thinking.
  e. to make presentations in front of a large group.
  f. that there are many different ways to solve problems.
  g. that problems can be symbolized in many different ways.
  h. that they can solve problems without just following teachers' directions.
HIGH SCHOOL LEVEL SCIENCE GRADING POLICY

This course of study includes different components, each of which are assigned the following percentages to comprise a final grade. I want you--the student--to understand that your grades are not something that I give you, but rather, a reflection of the work that you give to me.

1. Common Assessments → 35%
2. Quizzes → 20%
3. Laboratory (with Written Lab Reports) → 15%
4. Homeworaks → 15%
5. Notebooks → 5%
6. Research Projects / Class Participation → 10%
   ○ Class participation will play a significant part in the determination of your grade. Class participation will include the following: attendance, punctuality to class, contributions to the instructional process, effort, work in the laboratory, contributions during small group activities and attentiveness in class.

Important Notice

As per MVCSD Board Resolution 06-71, the Parent Notification Policy states “Parent(s) / guardian(s) or adult students are to be notified, in writing, at any time during a grading period when it is apparent - that the student may fail or is performing unsatisfactorily in any course or grade level. Parent(s) / guardian(s) are also to be notified, in writing, at any time during the grading period when it becomes evident that the student's conduct or effort grades are unsatisfactory.
SETUP OF THE SCIENCE CLASSROOM

I. Prerequisites for a Science Classroom
A Bulletin Board is meant to display necessary information related to the class itself. Displayed on the Bulletin Boards should be the following:

- Teacher Schedule
- Class List
- Seating Chart
- Code of Conduct / Discipline
- School Policies – dress code, attendance, important dates, etc.
- Grading Policy
- Safety and Laboratory Procedures
- Science Diagrams
- Extra Help Schedule

II. Updated Student Work
A section of the classroom must display recent student work. This can be of any type of assessment, graphic organizer, and writing activity. Teacher feedback must be included on student’s work.

III. Board Set-Up
Every day, teachers must display the NYS Standard (Performance Indicator), Aim, Do Now and Homework. At the start of the class, students are to copy this information and immediately begin on the Do Now.

<table>
<thead>
<tr>
<th>Student’s Name:</th>
<th>School:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher’s Name:</td>
<td>Date:</td>
</tr>
</tbody>
</table>

Aim #:
NYS Performance Indicator:
Do Now:

IV. Spiraling Homework
Homework is used to reinforce daily learning objectives. The secondary purpose of homework is to reinforce objectives learned earlier in the year. The assessments are cumulative, spiraling homework requires students to review coursework throughout the year.
WORD WALLS ARE DESIGNED …

- to promote group learning.
- to support the teaching of important general principles about words and how they work.
- to foster reading and writing in content area.
- to provide reference support for children during their reading and writing.
- to promote independence on the part of young students as they work with words.
- to provide a visual map to help children remember connections between words and the characteristics that will help them form categories.
- to develop a growing core of words that become part of their vocabulary.

IMPORTANT NOTICE

- A science word wall must be present in every science classroom.

Sample Science Word Wall

<table>
<thead>
<tr>
<th>Process Skills</th>
<th>Plants</th>
<th>Soils</th>
<th>Animals</th>
</tr>
</thead>
<tbody>
<tr>
<td>classify</td>
<td>root</td>
<td>soil</td>
<td>inherit</td>
</tr>
<tr>
<td>measure</td>
<td>stem</td>
<td>humus</td>
<td>trait</td>
</tr>
<tr>
<td>predict</td>
<td>leaf</td>
<td>topsoil</td>
<td>mammal</td>
</tr>
<tr>
<td>observe</td>
<td>seed</td>
<td>clay</td>
<td>bird</td>
</tr>
<tr>
<td>record</td>
<td>germinate</td>
<td>loam</td>
<td>amphibian</td>
</tr>
<tr>
<td>infer</td>
<td>seedling</td>
<td>resource</td>
<td>gills</td>
</tr>
<tr>
<td>variable</td>
<td>photosynthesis</td>
<td>conservation</td>
<td>fish</td>
</tr>
<tr>
<td>compare</td>
<td>chlorophyll</td>
<td>strip cropping</td>
<td>scales</td>
</tr>
<tr>
<td></td>
<td>cotyledon</td>
<td>contour plowing</td>
<td>reptile</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>metamorphosis</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>cycle</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Habitats</th>
<th>Food Chains</th>
<th>Rocks and Minerals</th>
</tr>
</thead>
<tbody>
<tr>
<td>environment</td>
<td>interact</td>
<td>mineral</td>
</tr>
<tr>
<td>ecosystem</td>
<td>producer</td>
<td>rock</td>
</tr>
<tr>
<td>population</td>
<td>consumer</td>
<td>crust</td>
</tr>
<tr>
<td>community</td>
<td>decomposer</td>
<td>mantle</td>
</tr>
<tr>
<td>habitat</td>
<td>food chain</td>
<td>core</td>
</tr>
<tr>
<td>forest</td>
<td>energy pyramid</td>
<td>igneous rock</td>
</tr>
<tr>
<td>deciduous forest</td>
<td>food web</td>
<td>sedimentary rock</td>
</tr>
<tr>
<td>tropical rain forest</td>
<td>predator</td>
<td>metamorphic rock</td>
</tr>
<tr>
<td>coastal forest</td>
<td>prey</td>
<td>rock cycle</td>
</tr>
<tr>
<td>coniferous forest</td>
<td></td>
<td>fossil</td>
</tr>
<tr>
<td>desert</td>
<td></td>
<td>geologist</td>
</tr>
<tr>
<td>salt water</td>
<td></td>
<td>landform</td>
</tr>
<tr>
<td>fresh water</td>
<td></td>
<td>mountain</td>
</tr>
</tbody>
</table>
## SCIENCE CLASSROOM AESTHETICS

“PRINT–RICH” ENVIRONMENT CONDUCIVE TO LEARNING

**TEACHER NAME:** _________________________________________________________

**PERIOD:** _________________________________________________________

**ROOM:** _________________________________________________________

### CHECKLIST

<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher Schedule</td>
<td>[ ]</td>
</tr>
<tr>
<td>Class List</td>
<td>[ ]</td>
</tr>
<tr>
<td>Seating Chart</td>
<td>[ ]</td>
</tr>
<tr>
<td>Code of Conduct / Discipline</td>
<td>[ ]</td>
</tr>
<tr>
<td>Grading Policy</td>
<td>[ ]</td>
</tr>
<tr>
<td>List of Core Laboratories</td>
<td>[ ]</td>
</tr>
<tr>
<td>Safety and Laboratory Procedures</td>
<td>[ ]</td>
</tr>
<tr>
<td>Science Diagrams, Posters, Displays</td>
<td>[ ]</td>
</tr>
<tr>
<td><strong>Updated</strong> Student Work (Projects, Assessments, Writing, etc.)</td>
<td>[ ]</td>
</tr>
<tr>
<td><strong>Updated</strong> Student Portfolios</td>
<td>[ ]</td>
</tr>
<tr>
<td><strong>Updated</strong> Word-Wall</td>
<td>[ ]</td>
</tr>
<tr>
<td><strong>Updated</strong> Lab Folder</td>
<td>[ ]</td>
</tr>
<tr>
<td>Organization of Materials</td>
<td>[ ]</td>
</tr>
<tr>
<td>Cleanliness</td>
<td>[ ]</td>
</tr>
</tbody>
</table>

**Principal Signature:** __________________________________________________ Date: __________

**Administrator Signature:** ____________________________________________ Date: __________
Laboratory reports are the vehicle in which scientific information is passed on from the experimenter to others who have an interest in the scientific study. It is therefore very important that each student enrolled in a science class at University High School learn the proper format and procedure for writing a scientific report.

The following is a brief summary of what information is to be included in an acceptable laboratory report. **Not all experiments will include all of the sections shown below.** If your experiment (or your teacher) does not call for certain parts of the report format simply leave that section out.

Formal lab reports should always be word-processed or at least written neatly in ink. Never write any section in pencil. Graphs should be hand drawn or done by a computer-graphing program. The report does not necessarily have to be lengthy or elaborate. Scientific writing should be clear, concise and accurate. Correct spelling and grammar is always important and will have an impact on the evaluation of your report. Unless your teacher informs you that this will be a group report, each student in the lab group will be responsible for completing his/her own report. The report may include:

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title Page</td>
<td>This section includes your name, title of the lab and the names of all lab partners. The page should also include the course title, instructor, period and the date the lab was conducted.</td>
</tr>
<tr>
<td>Title</td>
<td>The title of the report must clearly reflect what the experiment was all about. This is not an appropriate place for creative or ambiguous titles.</td>
</tr>
<tr>
<td>Purpose</td>
<td>This section of the report clearly states in one or two sentences what is to be studied in this experiment. What are you trying to find out in this experiment?</td>
</tr>
<tr>
<td>Hypothesis</td>
<td>Write a brief statement outlining your specific expected outcomes of the experiment. The hypothesis is what you think will happen during the experiment. It differs from a guess in that it is based upon prior knowledge or evidence.</td>
</tr>
<tr>
<td>Materials</td>
<td>List what equipment was used in your experimental setup. In many</td>
</tr>
</tbody>
</table>
experiments, it may be helpful to include a detailed and labeled diagram of how the equipment is set up. Experiments involving measurements of electrical circuits must include a circuit diagram.

| **Procedure** | If you are reporting on an experiment with a written procedure, summarize briefly how the experiment was performed. Include only the basic elements the will give the reader an understanding of how the data was collected. Please do not include small details such as size of beakers, specific times, computer commands, or how specific equipment is to be connected together, etc. Do NOT just recopy the procedure from the lab book or hand out. Write the procedure as if you were describing the experiment to an interested friend. If you are writing a report on an experiment of your own design, list the numbered steps of the procedure you followed. This should look a lot like the procedure section of your lab book |
| **Safety** | Write a short statement outlining whatever safety precautions might apply to the experiment. Consider the potential dangers of flammables, corrosives, toxins, sharps, heat or cold, among others. Eye protection is required for experiments involving the use of chemicals, boiling water, dissections or the possibility of flying projectiles |
| **Experimental Data** | This section of the report will contain the raw data collected during the experiment. Experimental data may take the form of qualitative observations made during the experiment. Observations may include color changes, new products formed, phase changes, sounds, lights, positions or other non-measurement observations. This type of information is often best given in paragraph form where you describe your observations during a particular step. Include in your description what you did and what happened when you did it. Do not attempt to include interpretations of what happened at this time. This section is for raw data only. Data may also take the form of numerical measurements collected during the experiment. Quantitative Data should be included in a data table with clearly labeled headings that include the units used. Do not ignore suspected faulty data but include it you report. Later, in your CONCLUSIONS, you will have the opportunity to explain why you have decided not to include the suspected errors in your analysis. |
| **Charts and Graphs** | To look for relationships in the data it is often of benefit to graph the data collected. Make sure all graphs and charts are fully titled and labeled. See handout on how to construct a scientific graph for format instructions. |
| **Sample Calculations** | Every time that you perform a new calculation for data analysis, show a sample calculation of how it was done in this section of your report. Show a sample for each type of calculation done in the experiment, no matter how trivial it seems. Use data from your experiment in your sample calculation, not made up numbers. Fully label each calculation so that the reader understands what you are calculating. Show the equation used for each calculation. Make sure that each measurement has the proper units and that |
each calculated result is given the correct number of significant digits. If a calculation is repeated in the experiment, there is no need to show it more than once.

%Error: calculation which determines how close your experimental value is to the accepted value (as always, show your work)

\[
\% \text{ Error} = \left| \frac{\text{accepted value} - \text{your value}}{\text{accepted value}} \right| \]

If one of the analysis questions below asks for a calculation, show the work in the Questions section not Sample Calculations.

Questions

All analysis questions found at the end of the experiment are to be answered in **complete sentences** (except calculations, where you need to show your work). One or two word answers are never acceptable. Do not rewrite the original question; instead, word your answer such that the question is obvious from the wording of your answer.

Conclusions

This is the most important part of your lab report. It is here that you answer the questions asked in the purpose. Your conclusion should always be stated in terms of what you said your purpose was. Did the experiment verify your hypothesis? How do you know?

Begin your conclusion by restating your purpose and/or hypothesis. In a sentence or two, indicate how the experiment was conducted. State whether the results verified or refuted your hypothesis. List the evidence or logic from your experimental results that lead you to that conclusion. Be specific. If your results did not agree with the expected results, how far off were you from the accepted value? A percent error might be appropriate here. Is this error significant? Looking back on how the experiment was conducted, identify several sources of error. "Experimental error", "measurement error", "human error" and "calculation error" are not acceptable statements of error. Be much more specific! Your discussion of error should include the effects of each source with regard to both magnitude and direction. If you were to do this experiment again, how could you modify this experiment to improve your results?

Many of the points made above may have been previously discussed elsewhere in the report. **Do not leave them out of your conclusion!** Your conclusion should be able to stand alone without the rest of the report.

All reports should be signed and dated by the author at the bottom of the report. The date should reflect the date that the report is submitted.