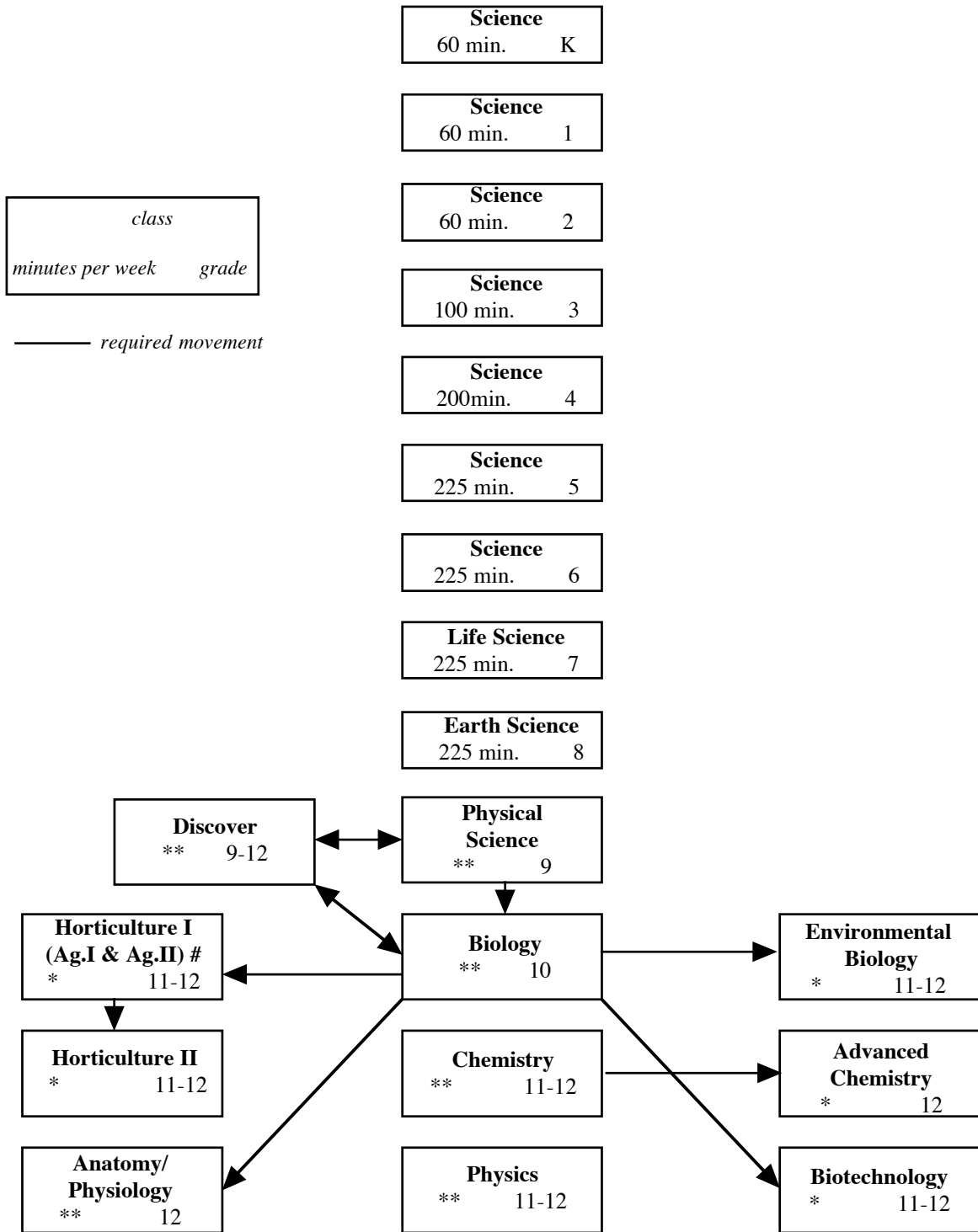


# Science Curriculum Program Structure



\* one term course - standard high school block length  
 \*\* two term course - standard high school block length  
 # Students may take Ag. I & Ag. II in place of Hort. I for one science credit.

# Science Curriculum

## *Kindergarten*

### Standard

#### Benchmark

- 1 Understands the basic features & processes of the Earth
  - 1 Understands how weather, climate and atmosphere affect the Earth
  - 5 Understands & appreciates the importance of conserving Earth's natural resources.
- 2 Understand essential ideas about the composition and structure of the Earth , and its place in the universe
  - 1 Understands the basic concepts that relate the solar system to stars, galaxies & the universe
- 3 Knows about the diversity and unity of living organisms & their interactions within the environment.
  - 1 Knows different ways & purposes in which living things can be grouped
  - 2 Understands how species depend on one another & on the environment for survival
- 4 Knows the general structure and functions of cells in organisms
  - 5 Understands the importance of health & hygiene
  - 8 Understands how their senses are used to observe and describe the world around them.
- 9 Uses complex thinking skills in (science) processes to make decisions and solve problems.
  - 2 Understands that scientific methods are used to solve practical problems

## *First Grade*

### Standard

#### Benchmark

- 1 Understands the basic features & processes of the Earth
  - 1 Understands how weather, climate and atmosphere affect the Earth
  - 4 Understands that Earth has changed over time
  - 5 Understands & appreciates the importance of conserving Earth's natural resources.
- 2 Understand essential ideas about the composition and structure of the Earth , and its place in the universe
  - 1 Understands the basic concepts that relate the solar system to stars, galaxies & the universe
- 3 Knows about the diversity and unity of living organisms & their interactions within the environment.
  - 1 Knows different ways & purposes in which living things can be grouped
  - 2 Understands how species depend on one another & on the environment for survival
- 4 Knows the general structure and functions of cells in organisms
  - 1 Knows that all living organisms are made of cells
  - 5 Understands the importance of health & hygiene
- 6 Understands the principal of motion and the forces that exists between objects
  - 1 Knows that all objects exert forces on each other
  - 2 Knows that an object's motion can be changed
- 8 Understands the nature of scientific procedure & inquiry as it pertains to science, technology & society.
  - 1 Designs & conducts scientific investigations
  - 2 Use appropriate tools to gather, analyze, and interpret scientific data
- 9 Uses complex thinking skills in (science) processes to make decisions and solve problems.
  - 1 Understands that scientific knowledge can be used to describe things in the real world.
  - 2 Understands that scientific methods are used to solve practical problems

# Science Curriculum

## *Second Grade*

### Standard

#### Benchmark

- 1 Understands the basic features & processes of the Earth
  - 1 Understands how weather, climate and atmosphere affect the Earth
  - 5 Understands & appreciates the importance of conserving Earth's natural resources.
- 3 Knows about the diversity and unity of living organisms & their interactions within the environment.
  - 1 Knows different ways & purposes in which living things can be grouped
- 4 Knows the general structure and functions of cells in organisms
  - 5 Understands the importance of health & hygiene
- 5 Understands basic concepts about the structure & properties of matter
  - 1 Knows that all substances can be described & classified by their composition & properties
- 6 Understands the principal of motion and the forces that exists between objects
  - 1 Knows that all objects exert forces on each other
- 8 Understands the nature of scientific procedure & inquiry as it pertains to science, technology & society.
  - 1 Designs & conducts scientific investigations
  - 2 Use appropriate tools to gather, analyze, and interpret scientific data
- 9 Uses complex thinking skills in (science) processes to make decisions and solve problems.
  - 2 Understands that scientific methods are used to solve practical problems

## *Third Grade*

### Standard

#### Benchmark

- 1 Understands the basic features & processes of the Earth
  - 4 Understands that Earth has changed over time
  - 5 Understands & appreciates the importance of conserving Earth's natural resources.
- 2 Understand essential ideas about the composition and structure of the Earth , and its place in the universe
  - 1 Understands the basic concepts that relate the solar system to stars, galaxies & the universe
- 3 Knows about the diversity and unity of living organisms & their interactions within the environment.
  - 1 Knows different ways & purposes in which living things can be grouped
- 4 Knows the general structure and functions of cells in organisms
  - 1 Knows that all living organisms are made of cells
  - 2 Knows that the human body is formed from cells
- 6 Understands the principal of motion and the forces that exists between objects
  - 1 Knows that all objects exert forces on each other
- 7 Understands types, sources and conversions of energy.
  - 3 Knows concepts involved in electricity and magnetism
- 8 Understands the nature of scientific procedure & inquiry as it pertains to science, technology & society.
  - 1 Designs & conducts scientific investigations
- 9 Uses complex thinking skills (science) processes to make decisions and solve problems.
  - 1 Understands that scientific knowledge can be used to describe things in the real world.
  - 2 Understands that scientific methods are used to solve practical problems
  - 3 Understands that science often stimulates innovations in technology

# Science Curriculum

## *Fourth Grade*

### Standard

#### Benchmark

- 1 Understands the basic features & processes of the Earth
  - 1 Understands how weather, climate and atmosphere affect the Earth
  - 2 Knows the composition of the Earth
  - 4 Understands that Earth has changed over time
  - 5 Understands & appreciates the importance of conserving Earth's natural resources.
- 3 Knows about the diversity and unity of living organisms & their interactions within the environment.
  - 2 Understands how species depend on one another & on the environment for survival
- 4 Knows the general structure and functions of cells in organisms
  - 3 Knows that cells carry on the many functions to sustain life.
  - 5 Understands the importance of health & hygiene
  - 6 Know that disease represents a breakdown in structure & functions of an organism
- 7 Understands types, sources and conversions of energy.
  - 2 Knows that energy waves can be changed into other forms of energy.
- 8 Understands the nature of scientific procedure & inquiry as it pertains to science, technology & society.
  - 1 Designs & conducts scientific investigations
  - 2 Use appropriate tools to gather, analyze, and interpret scientific data
- 9 Uses complex thinking skills in (science) processes to make decisions and solve problems.
  - 1 Understands that scientific knowledge can be used to describe things in the real world.
  - 2 Understands that scientific methods are used to solve practical problems
  - 3 Understands that science often stimulates innovations in technology.

## *Fifth Grade*

### Standard

#### Benchmark

- 1 Understands the basic features & processes of the Earth
  - 1 Understands how weather, climate and atmosphere affect the Earth
  - 5 Understands & appreciates the importance of conserving Earth's natural resources.
- 3 Knows about the diversity and unity of living organisms & their interactions within the environment.
  - 1 Knows different ways & purposes in which living things can be grouped
  - 2 Understands how species depend on one another & on the environment for survival
- 4 Knows the general structure and functions of cells in organisms
  - 3 Knows that cells carry on the many functions to sustain life.
  - 4 Knows that cells perform specialized functions in multicellular organisms
  - 5 Understands the importance of health & hygiene
- 5 Understands basic concepts about the structure & properties of matter
  - 1 Knows that all substances can be described & classified by their composition & properties
- 8 Understands the nature of scientific procedure & inquiry as it pertains to science, technology & society.
  - 1 Designs & conducts scientific investigations
  - 2 Use appropriate tools to gather, analyze, and interpret scientific data
- 9 Uses complex thinking skills in (science) processes to make decisions and solve problems.
  - 1 Understands that scientific knowledge can be used to describe things in the real world.

# Science Curriculum

## *Sixth Grade*

Standard

Benchmark

- 3 Knows about the diversity and unity of living organisms & their interactions within the environment.
  - 1 Knows different ways & purposes in which living things can be grouped
  - 2 Understands how species depend on one another & on the environment for survival
- 4 Knows the general structure and functions of cells in organisms
  - 4 Knows that cells perform specialized functions in multicellular organisms
- 6 Understands the principal of motion and the forces tht exists between objects
  - 1 Knows that all objects exert forces on each other
  - 2 Knows that an object's motion can be changed
- 7 Understands types, sources and conversions of energy.
  - 1 Knows that waves carry energy
  - 2 Knows that energy waves can be changed into other forms of energy.
- 8 Understands the nature of scientific procedure & inquiry as it pertains to science, technology & society.
  - 1 Designs & conducts scientific investigations
  - 2 Use appropriate tools to gather, analyze, and interpret scientific data
- 9 Uses complex thinking skills in (science) processes to make decisions and solve problems.
  - 1 Understands that scientific knowledge can be used to describe things in the real world.

## *Seventh Grade*

Standard

Benchmark

- 1 Understands the basic features & processes of the Earth
  - 5 Understands & appreciates the importance of conserving Earth's natural resources.
- 3 Knows about the diversity and unity of living organisms & their interactions within the environment.
  - 1 Knows different ways & purposes in which living things can be grouped
  - 2 Understands how species depend on one another & on the environment for survival
- 4 Knows the general structure and functions of cells in organisms
  - 1 Knows that all living organisms are made of cells
  - 4 Knows that cells perform specialized functions in multicellular organisms
  - 6 Know that disease represents a breakdown in structure & functions of an organism
  - 9 Know that living systems at all levels of organization demonstrate complementary of structure and function
- 5 Understands basic concepts about the structure & properties of matter
  - 1 Knows that all substances can be described & classified by their composition & properties
  - 2 Knows that substances react chemically with other substances by transferring and sharing electrons
- 8 Understands the nature of scientific procedure & inquiry as it pertains to science, technology & society.
  - 1 Designs & conducts scientific investigations
- 9 Uses complex thinking skills in (science) processes to make decisions and solve problems.
  - 1 Understands that scientific knowledge can be used to describe things in the real world

# Science Curriculum

## *Eighth Grade*

### Standard

#### Benchmark

- 1 Understands the basic features & processes of the Earth
  - 1 Understands how weather, climate and atmosphere affect the Earth
  - 2 Knows the composition of the Earth
  - 3 Knows the Earth's surfaces changes
  - 4 Understands that Earth has changed over time
  
- 2 Understand essential ideas about the composition and structure of the Earth , and its place in the universe
  - 1 Understands the basic concepts that relate the solar system to stars, galaxies & the universe
  - 2 Knows that chunks of rocks come in all sizes, from boulders to grains of sand and even smaller
  - 3 Knows that thousands of layers of sedimentary rock confirm the long history of the Earth and the long history of changing life forms whose remains are found in successive layers of sedimentary rock; the newest layers may not always be found on top
  - 4 Knows that fossils provide important evidence of how life and environmental conditions have changed on the Earth over time.
  
- 3 Knows about the diversity and unity of living organisms & their interactions within the environment.
  - 2 Understands how species depend on one another & on the environment for survival
  
- 5 Understands basic concepts about the structure & properties of matter
  - 1 Knows that all substances can be described & classified by their composition & properties
  - 2 Knows that substances react chemically with other substances by transferring and sharing electrons
  
- 8 Understands the nature of scientific procedure & inquiry as it pertains to science, technology & society.
  - 1 Designs & conducts scientific investigations
  
- 9 Uses complex thinking skills in (science) processes to make decisions and solve problems.
  - 1 Understands that scientific knowledge can be used to describe things in the real world

## *High School Classes*

### **DISCOVER RATIONALE**

Discover is a course that provides the student a hands-on approach to science. Independent science projects and solving a murder mystery by carrying out investigations to evaluate crime scene evidence give the student experience at developing and using the scientific method. The student will investigate current science issues through various activities.

### **COURSE DESCRIPTION**

Discover is a 2-term co-educational, two-credit, elective course available to all students. Through instruction in this course, the student will study the scientific method and investigate current science issues in the news. The importance of team building is stressed.

### **STUDENT ACHIEVEMENT GOALS**

#### AFFECTIVE DOMAIN:

The student will learn to appreciate current events that involve all areas of science.

#### COGNITIVE DOMAIN:

The student will gain knowledge about the scientific method, forensic science, current science events , and team building skills.

#### PSYCHOMOTOR DOMAIN:

The student will investigate through laboratory experiments many concepts in earth science, life science, and physical science.

# Science Curriculum

## COURSE OUTLINE/TIMELINE

	<i>TIME ESTIMATE</i>
I. ORIENTATION	
A. Class Description	
B. Class Rules	
C. Expectations	
D. Safety	
II. MURDER MYSTERY	28 Days
A. Crime Scene	
1. Secure Crime Scene - Guest Speaker Michael Herbert	
2. Processing the Crime Scene	
3. Crime Sketching	
4. Evidence Collection	
B. Suspect Identification	
1. Suspect Description	
2. Suspect Interview	
3. Witness Interview	
C. Forensic Investigations	
1. Fingerprints	
2. Hair Samples	
3. Black Ink Chromatography	
4. Bite Mark Molds	
5. Footprint Molds	
6. Unknown White Powders	
7. DNA Extraction	
8. DNA Electrophoresis	
9. DNA Sentencing	
D. Drawing Conclusions	
E. Possible Related Careers	
III. SCIENCE PROJECT (Independent)	21 Days
A. Select Topic	
B. Develop a Research Question	
C. Library Research	
D. Bibliography	
E. Hypothesis	
F. Procedure & Supplies	
G. Collecting Data	
H. Organize Data (computer)	
1. Graphs	
2. Tables	
I. Analyze Data	
J. Conclusion	
K. Application	
L. Suggestions	
M. Paper	
N. Display Board	
O. Oral Presentation	
IV. CURRENT EVENTS	30 Days
A. News Clipping & Summary - Portfolio	Throughout each te
B. "Discovery News" - (T.V. weekly news)	
C. "Science World" Magazine	

# Science Curriculum

## V. TEAM BUILDING SKILLS

5 Days

- A. Ski Patrol
- B. Square Rope Exercise
- C. Brain Teasers
- D. Bumper Stickers
- E. Earthquake
- F. Four Things Proud
- G. Magic Stones
- H. Trust Walk

### *Discover*

Standard

Benchmark

- 3 Knows about the diversity and unity of living organisms & their interactions within the environment.
  - 1 Knows different ways & purposes in which living things can be grouped
- 4 Knows the general structure and functions of cells in organisms
  - 1 Knows that all living organisms are made of cells
  - 3 Knows that cells carry on the many functions to sustain life.
  - 4 Knows that cells perform specialized functions in multicellular organisms
  - 6 Know that disease represents a breakdown in structure & functions of an organism
- 5 Understands basic concepts about the structure & properties of matter
  - 1 Knows that all substances can be described & classified by their composition & properties
- 8 Understands the nature of scientific procedure & inquiry as it pertains to science, technology & society.
  - 1 Designs & conducts scientific investigations
  - 2 Use appropriate tools to gather, analyze, and interpret scientific data
- 9 Uses complex thinking skills in (science) processes to make decisions and solve problems.
  - 2 Understands that scientific methods are used to solve practical problems
- 9 Uses complex thinking skills in (science) processes to make decisions and solve problems.
  - 3 Understands that science often stimulates innovations in technology

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## PHYSICAL SCIENCE RATIONALE

The purpose of Physical Science is to provide a practical study of the relationship between matter and energy and to allow the students to experience a relevant and basic introduction to physical laws and chemical processes. Through this course the students will realize that most of the technological advances they have taken for granted are merely applications of physical science principles.

### COURSE DESCRIPTION

Grade Level-9

Prerequisite-None

Physical Science is a year-long, co-educational, two-credit, required course available to freshmen. Through instruction in this course, the student will develop a knowledge of non living things and how their properties and behavior affect the environment and man's life. The students will receive a general background, serving as preparation for taking upper level science classes. Laboratory techniques, procedures and skills are also introduced with emphasis on the investigation process. the measurement of matter and the metric system are studied. Worksheets introduce students to using and forming chemical symbols, formulas, and equations. The student will be expected to, during semester one, learn and understand the concepts about the nature of various properties, structures and behavior of A) matter and atoms, B) different kinds of liquids, solids and gases, C) carbon compounds and, D) nuclear particles and energy. During semester two, learn and understand concepts about the behavior of energy in the forms of A) mechanical forces and motions, B) waves and wave motions and , c) electricity and magnetism.

# Science Curriculum

## STUDENT ACHIEVEMENT GOALS

The Physical Science Course offers the student opportunities to appreciate (affective), to gain knowledge of (cognitive), and to investigate (psychomotor) the laws, theories and concepts of science as it applies to their future need for science knowledge and to their everyday lives.

1. The student will learn basic Physical Science Fundamentals, such as: scientific methods, scientific theories vs. laws, scientific measurement, and the scientific tools of problem solving and experimentation. The student will experience these essential basics of knowledge to more fully develop their understanding of science and technology.
2. The student will develop an understanding of the interaction of Forces and Energy and of Forces and Motion through the concepts of Newtons' Laws, thermal and heat energy, and simple machines.
3. The student will learn and understand the Nature of Matter through and study of the Kinetic Theory of Matter, the Atomic Theory of Matter, the Periodic Table, and the Chemical Language of symbols, formulas and equations.
4. The student will develop a knowledge of the "Interaction of Matter" through the study of solution particles, such as, polar molecules and ions, their characteristics and behavior; the study of the various kinds of interaction groups; the study of the equation symbol representation of these interactions; and the study of conservation of matter relationships of matter and solution interactions.
5. The student will learn the scientific characteristics of, the scientific behavior of, the scientific ethical values of, and the science behind how man has utilized current and newly discovered alternative forms of Energy Resources. Examples of studies the student will experience are: electrical, nuclear, solar, laser, and geologic energies.

### COURSE OUTLINE/TIMELINE

	Chapter	Time Estimate
<b>I. PHYSICAL SCIENCE</b>		
A. Course Description and Teacher Expectations		1/2 day
B. The Nature of Science	1	3 days
1. Problems and Exercises		
2. Solving Problems		
3. Technology and Movie Special Effects		
C. Physical Science Methods	2	5 days
1. Standards of Measurement		
2. SI Units		
3. Graphs		
D. Light a Match Lab		
<b>II. ENERGY AND MOTION</b>		
A. Exploring Motion and Forces	3	3 days
1. Motion and Speed		
2. Velocity and Acceleration		
3. Connecting Motion with Forces		
B. Acceleration and Momentum	4	4 days
1. Force, Mass, and Acceleration		
2. Straight Line vs. Circular Motion		
3. Action and Reaction Forces		
4. Satellites		
C. Student Generated Lab		2 days
D. Energy	5	5 days
1. Kinetic and Potential Energy		
2. Heat and Temperature		
3. Causes and Effects of Thermal Pollution		
4. Energy Conversions Lab		
E. Machines - Making Work Easier	7	4 days
1. How Machines Make Work Easier		
2. simple Machines		
3. Work, Power, and Time		
4. Simple Machines Diagram		

## Science Curriculum

III. THE NATURE OF MATTER		
A. Solids, Liquids, Gases	8	5 days
1. Matter and Temperature		
2. Changes in State		
3. Behavior of Gases		
4. Fluids		
B. Atomic Structure and the Periodic Table	10	6 days
1. Present Model of the Atom		
2. Atomic mass and Mass Number of an Atom		
3. Periodic Table of Elements		
C. Chemical Bonds	11	6 days
1. Why Atoms Combine		
2. Chemical Bonds		
3. Formulas and Names of Compounds		
IV. SUBSTANCES		
A. Organic Compounds	13	5 days
1. Simple Organic Compounds		
2. Other Organic Compounds		
3. Biological Compounds		
V. INTERACTIONS OF MATTER		
A. Solutions	15	5 days
1. How Solutions Form		
2. Solubility and Concentration		
3. Particles in a Solution		
4. Bubble Lab		
B. Chemical Reactions	16 & 17	6 days
1. Chemical Changes in Matter		
2. Chemical Equations		
3. Types of Chemical Reactions		
4. Making Soap		
VI. WAVES, LIGHT, AND SOUND		
A. Waves and Sound	18	5 days
1. Wavelength, Frequency and Velocity		
2. Sounds		
3. Ultrasound in Medicine		
B. Light	19	5 days
1. Light and Color		
2. Wave Properties of Light		
C. Mirrors and Lenses	20	5 days
1. Optics of Mirrors		
2. Convex and Concave Lenses		
3. Refracting and Reflecting Telescopes		
VII. ELECTRICITY AND ENERGY RESOURCES		
A. Electricity	21	5 days
1. Static Electricity		
2. Current		
3. Circuits		
4. Circuit board Quiz Box Lab		
B. Magnetism	22	5 days
1. Magnets		
2. Alternating Current and Direct Current		
C. Energy Sources	25	5 days
1. Energy Conservation		
2. Nuclear Energy		
3. Alternative Energy Sources		
VIII. SEMESTER TEST AND FINAL LAB		

# Science Curriculum

## COURSE RESOURCES

Focus on Physical Science,  
“Science General Resources”-  
World Magazine,  
Star Lab,

Merrill,  
On pg. 4 of Green Booklet  
Scholastic 365 Starry Night.  
Heartland AEA

1989

### *Physical Science*

Standard

Benchmark

- 5 Understands basic concepts about the structure & properties of matter
  - 1 Knows that all substances can be described & classified by their composition & properties
  - 2 Knows that substances react chemically with other substances by transferring and sharing electrons
- 6 Understands the principal of motion and the forces tht exists between objects
  - 1 Knows that all objects exert forces on each other
  - 2 Knows that an object's motion can be changed
- 7 Understands types, sources and conversions of energy.
  - 1 Knows that waves carry energy
  - 2 Knows that energy waves can be changed into other forms of energy.
  - 3 Knows concepts involved in electricity and magnetism
- 8 Understands the nature of scientific procedure & inquiry as it pertains to science, technology & society.
  - 1 Designs & conducts scientific investigations
  - 2 Use appropriate tools to gather, analyze, and interpret scientific data
- 9 Uses complex thinking skills in (science) processes to make decisions in solving problems.
  - 1 Understands that scientific knowledge can be used to describe things in the real world.
  - 2 Understands that scientific methods are used to solve practical problems
  - 3 Understands that science often stimulates innovations in technology

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## BIOLOGY RATIONALE

This course provides the student with a basic background that will allow him/her to understand the key concepts concerning living organisms. It will give the student a fundamental knowledge that will be a building block as he/she continues to advance his/her biological science studies.

### COURSE DESCRIPTION

Biology is a semester, co-educational, 1 credit, required course available to sophomores OR students of grade 10.

Through instruction in this course, the student will:

- recognize the major process of life
- gain an understanding in the five kingdom classification system
- see both similarities and diversities among organisms
- use skills of experimentation to understand basic biological concepts

Students will:

- work safely in the laboratory
- demonstrate a working knowledge of biological concepts and put forth their best effort

### STUDENT ACHIEVEMENT GOALS

AFFECTIVE DOMAIN:

The student will learn to appreciate and respect the living world they are a part of.

COGNITIVE DOMAIN:

The student will gain understanding about organisms, their interdependency, how the natural world works, and how humans fit into the picture.

PSYCHOMOTOR DOMAIN:

The student will work through many of the concepts of biology through laboratory activities.

# Science Curriculum

## COURSE OUTLINE/TIMELINE

	<i>Chapter</i>	<i>Time Estimate</i>
I. ORIENTATION		1/2 Day
A. Course Description		
B. Teacher Expectations		
II. CHARACTERISTICS OF LIFE		
A. Biology as a Science	1 & 2	7 Days
1. Zebra Mussels		
2. Community misfits		
3. Ecosystem adaptations		
4. Methods of Science		
5. Science and Measurements		
B. Cell Structure and Function	4 & 5	8 Days
1. Membrane Structure and Function		
2. Structure of Cells		
3. Functions and Interactions of Cell Parts		
III. HEREDITY		
A. Cellular Basics of Heredity	7	7 days
1. Life from Life		
2. Reproduction in Cells		
B. Principles of Heredity	8	5 days
1. Origin of Genetics		
2. solving Genetic Problems		
3. Chromosome Theory of Heredity		
C. The Genetic Code	9	6 days
1. Structure of DNA		
2. The Role of DNA		
D. Genes and Chromosomes	11	8 days
1. Chromosome Theory of Heredity		
2. Other Genetic Concepts		
3. Human Genetic Diseases		
IV. CAREER PROJECT		
A. Research		
B. Write a paper on a Science related career		3-4 days
V. LIFE ORIGINS AND CHANGES	13 & 14	7 days
A. Adaptations and Speciation		
1. Adaptation		
2. Origin of Species		
B. Classifications		
1. Theory of Classification		
2. System of Classification		
VI. ORGANISMS AND INTERACTIONS		7 days
A. Organism Research		
1. Research a particular specie according to rubrics questions		
2. Type a pamphlet ( for younger audience ) and prepare a visual		
3. Present the information to the rest of the class		
B. Social Behavior		3 days
How does this apply to your specie and/or to yourself?		
C. Zoo Design- ICN session and actually designing your species model		5 days
Work in groups to design a zoo		
VII. HEALTH - MINI MED SCHOOL		
A. Nutrition chapter and food	20	3 days
B. Immune System	23	4 days

# Science Curriculum

C. 10 Body systems- independent work

15 days

1. Diseases and disorders
2. Anatomy
3. Physiology
4. Vocabulary
5. Concept Maps

D. Mini Med School Exam

## RESOURCES

MAJOR TEXT BOOK:

Biology: Living Systems

LAB BOOK:

Biology Lab Book

SUPPLEMENTARY BOOKS:

Biology Cell, Wolfe  
Genetics, Winchester  
Biology of Plants, Raven  
Invertebrate Zoology, Barnes  
Zoology, Boolootian  
Biology Today, CRM Books  
Current Health II  
When You Were Formed in Sacred

## *Biology*

Standard

Benchmark

- 3 Knows about the diversity and unity of living organisms & their interactions within the environment.
  - 1 Knows different ways & purposes in which living things can be grouped
  - 2 Understands how species depend on one another & on the environment for survival
- 4 Knows the general structure and functions of cells in organisms
  - 1 Knows that all living organisms are made of cells
  - 2 Knows that the human body is formed from cells
  - 4 Knows that cells perform specialized functions in multicellular organisms
  - 5 Understands the importance of health & hygiene
  - 6 Know that disease represents a breakdown in structure & functions of an organism
- 9 Uses complex thinking skills in (science) processes to make decisions and solve problems.
  - 1 Understands that scientific knowledge can be used to describe things in the real world.
  - 2 Understands that scientific methods are used to solve practical problems
- 9 Uses complex thinking skills in (science) processes to make decisions and solve problems.
  - 3 Understands that science often stimulates innovations in technology

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## ENVIRONMENTAL BIOLOGY

### RATIONALE

Environmental Biology causes awareness about the natural world in which we live. It includes the use of basic taxonomy to gain a closer understanding of the organisms that make up the environment around us. The importance of our environment and the need for conservation are stressed.

### COURSE DESCRIPTION

Environmental Biology is a one-semester, co-educational, one-credit, elective course available to juniors and seniors. Through instruction in this course, the student will learn more about the world around them. The topics covered will include conservation, behavior of organisms, ecology, community studies and the human responsibility to the environment. The student will do many outdoor activities and lab experiments.

### STUDENT ACHIEVEMENT GOALS

AFFECTIVE DOMAIN:

The student will learn to value the world in which we live and demonstrate a conservation ethic.

COGNITIVE DOMAIN:

The student will learn about how the ecosystem works and how we must preserve it for the future.

PSYCHOMOTOR DOMAIN:

The student will learn how to practice skills of conservation in their own lives and use skills learned in lecture to perform laboratory experiments and projects.

# Science Curriculum

## COURSE OUTLINE/TIMELINE

	CHAPTER	TIME ESTI
I. ORIENTATION		1/2 Day
A. Course Description		
B. Teacher Expectations		
II. INTERACTIONS IN THE ENVIRONMENT		
A. Populaton Biology	27	5 days
1. Growth of Populations		
2. Regulation of Populations Size		
B. Ecosystems	28	5 days
1. Interactions Among Organisms		
2. Abiotic Factors of the Environment		
C. Origin and Distribution of Communities	29	5 days
1. Ecological Succession		
2. Biomes		
D. Humans and the Environment	30	5 days
1. The Pesticide Dilemma		
2. Pollution of Air and Water		
3. Conservation of Resources		
III. ACTIVE PARTICIPATION IN THE COMMUNITY AND IOWA BIOMES		
A. Outdoor Activities		Scattered throughout
1. Outdoor classroom		
2. Water Testing		
B. Wetlands		5 days
1. Learn About Organisms and Relationships in a Wetland.		
2. Group Presentation		
C. Woodlands		5 days
1. Learn About Organisms and Relationships in a Woodland.		
2. Group Presentation		
D. Prairies		5 days
1. Characteristics		
2. Student Assessment Project		
IV. FEEDING A WORLD IN A CHANGING CLIMATE		

## RESOURCES

TEXTBOOKS:     Biology Living Systems  
                     A Textbook of Enthomology  
                     Insects in The Classroom  
                     How to Know the Insects  
                     How Plants Get Their Names  
                     Many Taxonomic Keys for Insects & Plants

### *Enviromental Biology*

Standard

Benchmark

- 1 Understands the basic features & processes of the Earth
  - 5 Understands & appreciates the importance of conserving Earth's natural resources.
- 3 Knows about the diversity and unity of living organisms & their interactions within the environment.
  - 2 Understands how species depend on one another & on the environment for survival
- 8 Understands the nature of scientific procedure & inquiry as it pertains to science, technology & society.
  - 1 Designs & conducts scientific investigations
  - 2 Use appropriate tools to gather, analyze, and interpret scientific data
- 9 Uses complex thinking skills in (science) processes to make decisions and solve problems.
  - 2 Understands that scientific methods are used to solve practical problems

# Science Curriculum

## HORTICULTURE 1&2

### RATIONALE

Horticulture causes awareness about the plant world in which we live. It includes the use of basic taxonomy to gain a closer understanding of the plants that make up the environment around us. The interaction and landscaping of our environment are stressed.

### COURSE DESCRIPTION

Horticulture is a one-semester, co-educational, one-credit, elective course available to juniors and seniors. Through instruction in this course, the student will learn more about plants. The topics covered will include plant taxonomy, landscaping, shrubs, trees, flowers, and lawn care. The student will do many outdoor activities and lab experiments.

### STUDENT ACHIEVEMENT GOALS

**AFFECTIVE DOMAIN:**

The student will learn to care for plants and the processes involved in landscaping.

**COGNITIVE DOMAIN:**

The student will learn how plants interact in our environment, and how they affect us.

**PSYCHOMOTOR DOMAIN:**

The student will learn how to practice skills of conservation in their own lives and use skills learned in lecture to perform laboratory experiments and projects.

### COURSE OUTLINE/TIMELINE

	TIME ESTIMATE
I. UNITS 1 & 2 - HORTICULTURE AND PLANT TAXONOMY	4 days
A. Overview of Horticulture Industry, Jobs, Careers	
B. Nomenclature and Scientific and Common Plant Names	
II. UNITS 3 & 4- PLANT PARTS AND ENVIRONMENT	4 days
A. Plant Part and their Functions	
B. Basic Needs of Plants and Their Functions	
III. UNITS 6 & 9 - SEEDS AND DIVISION	3 days
A. Plant Propagation	
B. Plant Separation/ Division for Propagation	
IV. UNITS 34,24,27,28,29,30 - SHRUBS AND TREES	6 days
A. Container Plant Care	
B. Narrow leaf Evergreen Identification	
C. Broadleaf Evergreen Identification and Care	
D. Deciduous Tree and Shrub Care and Placement	
V.UNITS 25, 26, 32, & 31 - FLOWERS AND GROUND COVERS	5 days
A. Annual & Perennial Planting and Maintenance	
B. Using Bulbs in a Landscape	
C. Selection & Maintenance of Ground Covers	
VI. UNITS 35, 36, 37 - LAWN CARE	4 days
A. Different Methods of Starting a Lawn	
B. Lawn Maintenance & Renovation	
VII. UNITS 38, 39, 40, 41 - VEGETABLE GARDEN	4 days
A. Selection and Preparation of Garden Site	
B. Planting, Care, Cultivation Techniques	
VIII. LANDSCAPE DESIGN	10 days
A. The Class Will be Finishing a Landscape Project at the 802 Grand Construction Class Project.	
B. Fair Grounds Project ?????	

STUDENTS WILL BE COMPILING A PORTFOLIO OF VARIOUS SPECIES OF PLANTS TO BE INCORPORATED INTO A GARDEN, WHICH WILL CULMINATE AS THE SEMESTER PROJECT.

# Science Curriculum

## RESOURCES

Introductory Horticulture.

Reiley and Shry, (Delmar)

1983

### *Horticulture 1*

Standard

Benchmark

- 1 Understands the basic features & processes of the Earth
  - 5 Understands & appreciates the importance of conserving Earth's natural resources.
- 3 Knows about the diversity and unity of living organisms & their interactions within the environment.
  - 2 Understands how species depend on one another & on the environment for survival
- 9 Uses complex thinking skills in (science) processes to make decisions and solve problems.
  - 2 Understands that scientific methods are used to solve practical problems

### *Horticulture 2*

Standard

Benchmark

- 1 Understands the basic features & processes of the Earth
  - 5 Understands & appreciates the importance of conserving Earth's natural resources.
- 3 Knows about the diversity and unity of living organisms & their interactions within the environment.
  - 2 Understands how species depend on one another & on the environment for survival
- 8 Understands the nature of scientific procedure & inquiry as it pertains to science, technology & society.
  - 2 Use appropriate tools to gather, analyze, and interpret scientific data

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## CHEMISTRY

### RATIONALE

Chemistry is a course designed to provide the student with a general introduction into the area of physical science involving the chemical aspects of our universe. It allows the student to investigate the elements that make up the universe and what properties they possess. They will begin to understand the fundamental ideas of scientific measurement and how chemistry is a part of our lives.

### COURSE DESCRIPTION

Chemistry is a two term, co-educational, two-credit, elective course available to juniors and seniors. Through instruction in this course, the student will study the properties and structures of materials. This course stresses the analysis of chemical characteristics and builds on the concept of atomic structure and chemical reactivity. When students unify these two concepts, they will understand the "how's" and "why's" of the world around us. This is a good course to have if students plan to attend college. A firm foundation in Algebra is necessary. Students will be using basic algebra and problem solving techniques throughout the year. Physical Science will help students prepare for chemistry.

### STUDENT ACHIEVEMENT GOALS

AFFECTIVE DOMAIN:

The student will learn to appreciate the aspects of our physical world that involves chemistry.

COGNITIVE DOMAIN:

The student will gain knowledge about the physical world in areas involving chemistry.

PSYCHOMOTOR DOMAIN:

The student will investigate through laboratory experiments many concepts within chemistry principles.

### COURSE OUTLINE/TIMELINE

- I. ORIENTATION
  - A. Class Description
  - B. Class Rules
  - C. Expectations
  - D. Safety

TIME ]  
2 Days

## Science Curriculum

II.	ACTIVITIES OF SCIENCE	3 Days
	A. Scientific Method	
	1. Steps to Solutions	
	2. Theory vs. Law	
	B. Laboratory Techniques	
	1. Centigram & Electronic Balances	
	2. Burner	
	3. Volume Measurement	
	4. Decanting & Filtering	
III	FINDING OUT ABOUT MATTER	5 Days
	A. Properties of Matter	
	1. Chemical Properties	
	2. Physical Properties	
	3. States of Matter	
	4. Chemical & Physical Changes in Reactions	
	5. Conservation of Mass	
	B. Classification of Matter	
	1. Mixtures	
	2. Elements and Compounds	
IV.	SCIENTIFIC MEASUREMENT	8 Days
	A. International System of Units	
	1. Length	
	2. Volume	
	3. Mass	
	4. Density	
	5. Specific Gravity	
	6. Temperature	
	B. Uncertainty in Measured Numbers	
	1. Accuracy and Precision	
	2. Significant Digits	
	3. Scientific Notation	
	C. Evaluating Measurements	
	1. Graphs and Tables	
	2. Percent Error	
	D. Decimeter Cube	
	1. Construction	
	2. Testing	
V.	BASIC PROBLEM SOLVING SKILLS	6 Days
	A. Steps to solve a problem	
	1. Identify Unknown	
	2. Identify Known	
	3. Plan Solution	
	4. Do Calculations	
	5. Finish Up	
	B. Setting Up of Problem	
	1. Conversion Factors in Dimensional Analysis	
	2. Converting Between Units	
	3. Multi-step Problems	
VI.	COMPOSITION OF THE ATOM	10 Days
	A. Early Theory and Models	
	1. Dalton	
	2. Thomson	
	3. Millikan	
	4. Chadwick	
	5. Rutherford	

## Science Curriculum

- B. Specific Information about Atoms
  - 1. Atomic Number
  - 2. Mass Number
  - 3. Isotopes
  - 4. Atomic Mass
- C. Electrons in Atoms
  - 1. Atomic Models
  - 2. Atomic Orbitals
  - 3. Electron Configurations
  - 4. Light and Atomic Spectra
- D. Poster - Atomic Timeline
  - 1. Dates, Name, Scientist Contribution
  - 2. Creative Design
- E. Atomic Ball
  - 1. Select Element
  - 2. Research Chemical & Physical
  - 3. Construct Model
- VII. THE LANGUAGE OF CHEMISTRY 8 Days
  - A. Predicting Chemical Formulas
    - 1. Periodic Table (chemical symbols)
    - 2. Atoms and Ions
    - 3. Compounds
  - B. Ionic Charges
    - 1. Monoatomic Ions
    - 2. Polyatomic Ions
  - C. Writing Chemical Names and Formulas
    - 1. Binary Ionic Compounds
    - 2. Ternary Ionic Compounds
    - 3. Binary Molecular Compounds
    - 4. Common Acids
- VIII. THE MOLE 8 Days
  - A. Mass Relationships and Avogadro's Number
    - 1. Gram Molecular Mass
    - 2. Molar Mass
    - 3. Gas Volume
  - B. Mole Relationships
    - 1. Mole - Mass
    - 2. Converting Between Units
  - C. Formula Calculations
    - 1. Empirical Formula
    - 2. Molecular Formulas
    - 3. Percent Composition
  - D. Stoichiometry
    - 1. Mole - Mole Calculations
    - 2. Mass - Mass Calculations
    - 3. Limiting Reagents
    - 4. Percent Yield
- IX. CHEMICAL REACTIONS 10 Days
  - A. Equations
    - 1. Writing Equations
    - 2. Balancing Equations

# Science Curriculum

- B. Reaction Types
  - 1. Combination
  - 2. Single Replacement
  - 3. Double Replacement
  - 4. Combustion
  - 5. Decomposition
- C. Flow of Energy during a Reaction
  - 1. Endothermic
  - 2. Exothermic
- D. Tie - Dye
  - 1. Day 1 - Double Replacement Reaction
  - 2. Day 2 - Heat Applied
- X. STATES OF MATTER 5 Days
  - A. Kinetic Theory
    - 1. Gas Pressure
    - 2. Kelvin Temperature
  - B. Properties of Phases
    - 1. Solids
    - 2. Liquids
    - 3. Gases
    - 4. Plasma
- XI. GASES 6 Days
  - A. Properties of Gases
  - B. Behavior of Gases
    - 1. Charles's Law
    - 2. Boyle's Law
    - 3. Combined Gas Laws
    - 4. Ideal Gas Law
    - 5. Dalton's Law of Partial Pressure
- XII. THERMODYNAMICS 8 DAYS
  - A. Heat
    - 1. Heat Capacity
    - 2. Specific Heat Capacity
  - B. Measuring Heat
    - 1. Endothermic & Exothermic
    - 2. Calorimetry
  - C. Heat of Reaction
    - 1. Changes of State
    - 2. Thermochemical Equation
- XVIII. SCIENCE CAREERS 5 Days
  - A. Science in the Community - Guthrie Center
    - 1. Career Shadow
    - 2. Paper
    - 3. Presentation
  - B. Explore Beyond Guthrie Center
    - 1. ISU Poster Series
    - 2. Student Presentations
    - 3. Guest Speakers

## RESOURCES

TEXT BOOKS:	Chemistry	Addison Wesley	1996
SUPPLEMENTAL TEXTBOOKS:	Chemistry Lab Manual	Addison Wesley	1996
	Chemistry at Work (laser disc)		
OTHER:		Tie-dye Packet	
		Transparencies	

# Science Curriculum

## Chemistry

### Standard

#### Benchmark

- 5 Understands basic concepts about the structure & properties of matter
  - 1 Knows that all substances can be described & classified by their composition & properties
  - 2 Knows that substances react chemically with other substances by transferring and sharing electrons
- 7 Understands types, sources and conversions of energy.
  - 2 Knows that energy waves can be changed into other forms of energy.
- 8 Understands the nature of scientific procedure & inquiry as it pertains to science, technology & society.
  - 1 Designs & conducts scientific investigations
  - 2 Use appropriate tools to gather, analyze, and interpret scientific data
- 9 Uses complex thinking skills in (science) processes to make decisions and solve problems.
  - 1 Understands that scientific knowledge can be used to describe things in the real world
  - 2 Understands that scientific methods are used to solve practical problems
  - 3 Understands that science often stimulates innovations in technology

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## ADVANCED CHEMISTRY RATIONALE

Advanced Chemistry provides the student with a deeper understanding of basic chemistry principles. It is designed to allow the student to build on the concepts learned in General Chemistry.

### COURSE DESCRIPTION

Advanced Chemistry is a one-term, co-educational, one-credit, elective course available to seniors. Through instruction in this course, the student will prepare for college by completing his/her high school chemistry background. This course includes more advanced topics in Chemistry. It is recommended for those students who may choose a science related field as a career. General Chemistry is a prerequisite.

### STUDENT ACHIEVEMENT GOALS

#### AFFECTIVE DOMAIN:

The student will gain a greater appreciation for the discipline of chemistry and value the skills necessary to be a good chemist.

#### COGNITIVE DOMAIN:

The student will increase in the level of knowledge they possess about chemistry and laboratory techniques.

#### PSYCHOMOTOR DOMAIN:

The student will apply skills and knowledge in a laboratory situation to more fully understand chemistry principles.

### COURSE OUTLINE/TIMELINE

	<i>TIME</i>	<i>ESTIMATE</i>
I. ORIENTATION		1 Day
A. Description of Course		
B. Expectations		
C. Safety Procedures		
D. Lab Technique		
II. REVIEW OF GENERAL CHEMISTRY		5 Days
A. Systems (Metric/English/SI)		
B. Instruments of Measure		
C. Correct Reporting of Data		
D. Problem Solving		
E. Scientific Method		
F. Review Term I Exam		
G. Review Term II Exam		

# Science Curriculum

III. SOLUTIONS	5 Days
A. Characteristics of Solutions	
1. Formation	
2. Solubility	
3. Miscibility	
4. Solvation	
5. Molarity vs. Molality	
6. Colligative Properties	
IV. CHEMICAL BONDING	6 Days
A. Electrons	
1. Valence	
2. Electron	
B. Ionic Bonding	
1. Properties of Ionic Substances	
2. Metallic Bonds	
C. Covalent Bonding	
1. Single Bonds	
2. Double & Triple Bonds	
3. Coordinate Covalent Bonds	
4. Resonance	
D. Shape and Behavior of Molecules	
1. Molecular Orbitals	
2. Hybrid Orbitals	
3. Polar Bonds	
4. Polar Molecules	
5. Intermolecular Attractions	
6. Properties of Molecular Substances	
V. REACTION RATES	5 Days
A. Collision Theory and Factors Affecting Rates	
1. Surface Area	
2. Temperature	
3. Activation Energy	
4. Catalysts and Inhibitors	
B. Rate Relationships	
1. Rate Laws	
2. Reaction Mechanisms	
3. Rate Equations and Rate Constants	
VI. EQUILIBRIUM AND KINETICS	5 Days
A. Quantitative Determination	
1. Entropy, Heat, and Free Energy Calculations	
2. Equilibrium Constants	
B. Le Chatelier's Principle	
1. Factor's Affecting Equilibrium	
2. Reversible Reactions	
VII. REACTION EQUILIBRIUM	5 Days
A. Oxidation - Reduction Reactions	
1. Redox Reactions	
2. Oxidation Numbers	
3. Balancing Redox Equations	
B. Electrochemistry	
1. Voltaic Cells	
2. Dry Cells	
3. Fuel Cells	
4. Half Cells	
5. Electrolytic Cells	

# Science Curriculum

## VIII. ACID-BASE REACTIONS

6 Days

### A. Identifying Characteristics of Acids and Bases

1. Properties
2. Naming and Formulas

### B. Typical Reactions

1. Indicators
2. pH
3. Titration

### C. Strengths of Acids and Bases

1. Arrhenius Acids and Bases
2. Bronsted - Lowry Acids and Bases
3. Lewis Acids and Bases
4. Dissociation Constants

### D. Salts

1. Formation Through Neutralization
2. Normality

## REFERENCES

TEXT BOOKS:	Chemistry	Addison-Wesley	1996
SUPPLEMENTAL TEXTBOOKS:	Chemistry	Addison-Wesley	1996
	Lab Manual	Addison-Wesley	
	Chemistry at Work (laser disc)		

## *Advanced Chemistry*

Standard

Benchmark

- 5 Understands basic concepts about the structure & properties of matter
  - 1 Knows that all substances can be described & classified by their composition & properties
  - 2 Knows that substances react chemically with other substances by transferring and sharing electrons
- 7 Understands types, sources and conversions of energy.
  - 1 Knows that waves carry energy
- 8 Understands the nature of scientific procedure & inquiry as it pertains to science, technology & society.
  - 1 Designs & conducts scientific investigations
  - 2 Use appropriate tools to gather, analyze, and interpret scientific data

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## PHYSICS

### RATIONALE

The reason Physics is studied is to investigate scientific laws and theories. The purpose problem solving techniques are used is to ensure preparation of students for college science classes. The purpose experimentation and experiences are used is to give students a better understanding and awareness of the scientific laws. Students need to realize that the world is so dependent on science and its applications through engineering.

### COURSE DESCRIPTION

Physics is a year-long, co-educational, two-credit, elective course available to seniors. Through instruction in this course, the student will develop an awareness of what a scientist is and what he does. The material studied includes the metric system of measurement, kinematics and dynamics (the study of motion and its causes), heat, light, wave motion and optics, electricity, magnetism, application of laws that govern and explain physical phenomena, scientific manner of thinking, and procedures involved in problem solving. Vocational and avocational interest in the field of science is encourage and developed. Students will be expected to apply the scientific laws in problem solving. The students will be expected to use and/or verify the scientific laws in laboratory experiments.

# Science Curriculum

## STUDENT ACHIEVEMENT GOALS

**AFFECTIVE DOMAIN:**

The student appreciates the complexity of science and the rigorous thinking a scientist must be trained to do.

**COGNITIVE DOMAIN:**

The student understands the scientific laws that govern our world but also recognizes that new discoveries and their effect on our lives are in constant need of review.

**PSYCHOMOTOR DOMAIN:**

The student uses the scientific method in all aspects of education and can apply the basic principles of physics to different technology and engineering.

### COURSE OUTLINE/TIMELINE

		<i>TIM</i>
I. ORIENTATION	1 Day	
A. Course Rationale and Content Overview		
B. Teacher Expectations and Student Outcomes		
C. Classroom Rules and Grading Procedures		
II. MATTER AND ENERGY	5 Days	
III. MEASUREMENT AND PROBLEM SOLVING	12 Days	
A. Units of Measurement		
B. Making and Recording Measurements		
C. Solving Problems		
IV. MOTION-ITS NATURE AND CAUSES OF	11 Days	
A. Velocity		
B. Acceleration		
C. Newton's Laws of Motion		
D. Projectile Motion		
V. FORCES	12 Days	
A. Resolution of Forces		
B. Composition of Forces		
C. Gravitation		
D. Friction		
E. Parallel Forces		
VI. CURVILINEAR AND HARMONIC MOTION	7 Days	
A. Circular Motion		
B. Rotary Motion		
C. Simple Harmonic Motion		
VII. CONSERVATION OF ENERGY AND MOMENTUM	16 Days	
A. Work		
B. Power		
C. Machines		
D. Kinetic Energy		
E. Potential Energy		
F. Momentum		
VIII. PHASES OF MATTER	6 Days	
A. Molecules and Atoms		
B. Solids		
C. Liquids		
D. Gases		
IX. THERMAL EFFECTS	17 Days	
A. Temperature		
B. Thermal Expansion of Solids		
C. Thermal Expansion of Liquids		
D. General Gas Law		
E. Universal Gas Constant		
F. Law of Heat Exchange		
G. Change of Phase		

## Science Curriculum

X. RELATIONSHIPS BETWEEN HEAT AND WORK	3 Days
XI. WAVES	14 Days
A. Properties of Waves	
B. Wave Interactions	
C. Sound Waves	
XII. REFLECTION	9 Days
XIII. REFRACTION	12 Days
A. Optical Refraction	
B. Lens Optics	
C. Dispersion	
XIV. ELECTROSTATICS	10 Days
A. Electric Charge	
B. Potential Difference	
C. Capacitors	
XV. DIRECT CURRENT CIRCUITS	15 Days
A. Sources of Direct Current	
B. Series Circuits	
C. Parallel Circuits	
D. Combination Circuits	
XVI. HEATING AND CHEMICAL EFFECTS	6 Days
A. Joule's Law	
B. Power	
C. Electrolysis	
XVII. MAGNETISM	6 Days
XVIII. ELECTROMAGNETIC INDUCTION	8 Days
A. Induced Currents	
B. Generators and Motors	
C. Inductance	
XIX. NUCLEAR ENERGY	4 Days

### RESOURCES

<u>Modern Physics Text,</u>	Williams, Trinklein, and Metcalfe
<u>Modern Physics Lab Manual,</u>	Williams, Trinklein, and Metcalfe
<u>Physics Principles and Problems,</u>	Zitzewitz and Murphy
<u>Physics Principles and Problems Lab Manual,</u>	Zitzewitz and Murphy
<u>Science World</u>	

### *Physics*

#### Standard

#### Benchmark

- 2 Understand essential ideas about the composition and structure of the Earth , and its place in the universe
  - 1 Understands the basic concepts that relate the solar system to stars, galaxies & the universe
- 5 Understands basic concepts about the structure & properties of matter
  - 1 Knows that all substances can be described & classified by their composition & properties
- 6 Understands the principal of motion and the forces tht exists between objects
  - 1 Knows that all objects exert forces on each other
  - 2 Knows that an object's motion can be changed
- 7 Understands types, sources and conversions of energy.
  - 1 Knows that waves carry energy
  - 2 Knows that energy waves can be changed into other forms of energy.
  - 3 Knows concepts involved in electricity and magnetism
- 8 Understands the nature of scientific procedure & inquiry as it pertains to science, technology & society.
  - 2 Use appropriate tools to gather, analyze, and interpret scientific data

# Science Curriculum

## ANATOMY - PHYSIOLOGY

### RATIONALE

Anatomy-Physiology is a course that will give the student the basic concepts involved in the study of the human body. It is a starting point for students that may go on to more advanced and specific areas of anatomy and/or physiology.

### COURSE DESCRIPTION

Anatomy and Physiology is a year-long, co-educational, elective two-credit course available to seniors. Through instruction in this course, the student will learn about the anatomy and how the structure of our bodies work together to maintain life. This course is an advanced study of the human body and is good for anyone planning on a career in any field that is science or health related. Be prepared to work hard. This course is designed to challenge and prepare you for your future at the collegiate level.

### STUDENT ACHIEVEMENT GOALS

#### AFFECTIVE DOMAIN:

The student will begin to appreciate the human body.

#### COGNITIVE DOMAIN:

The student will gain knowledge about how the human body works in order to maintain a healthy living organism.

#### PSYCHOMOTOR DOMAIN:

The student will learn to apply the concepts learned in hands on experiments.

### COURSE OUTLINE/TIMELINE

	CHAPTER	TIME ESTIMATE
I. ANATOMY - PHYSIOLOGY BASICS		1/2 day
A. Course Description and Teacher Expectations		
B. Introduction to the Human Body	1	4 days
1. Structural Levels		
2. Body Plan		
3. Characteristics of Life		
C. Chemical Basis	2	3 days
1. Composition of Matter		
2. Chemical Bonds		
3. Chemical Reactions		
4. Chemical Compounds of the Cell		
D. Cells: The Basis of Life	3	3 days
1. Environment of the Cell		
2. Cell Structure and Function		
3. Cell Division		
II. SYSTEMS THAT COVER, SUPPORT OR MOVE THE BODY		
A. Integumentary System	6	3 days
1. The Skin		
2. Accessory Organs		
B. Skeletal System	7	9 days
1. Bone Structure		
2. Bone Development and Growth		
3. Bone Remodeling		
4. Organization of the Skeleton		
5. Joints		
C. Muscular System	8	9 days
1. Muscle Structure		
2. Physiology of Muscle		
3. Muscular Responses		
4. Production of Movement		
5. Major Muscles of the Body		
D. Fetal Pig Dissection		1 day

# Science Curriculum

III. SYSTEMS THAT CONTROL BY COMMUNICATION		
A. Nervous System	9	5 days
1. Nervous Tissue		
2. Central Nervous System		
3. Peripheral Nervous System		
B. Special Senses	10	3 days
1. Sensory and Integrative Functions		
2. Motor Functions		
C. Endocrine System	11	5 days
1. Hormones		
2. Endocrine Glands		
IV. SYSTEMS THAT TRANSPORT AND PROTECT		
A. Blood	12	3 days
1. Characteristics of Blood		
2. Plasma		
3. Formed Elements		
4. Hemostats		
5. Blood Groups		
B. Cardiovascular System	13	10 days
1. The Heart		
2. Heart Physiology		
3. Blood Vessels		
4. Circulatory Pathways		
V. METABOLIC PROCESSING SYSTEMS		
A. Respiratory System	15	4 days
1. Organs of the Respiratory System		
2. Mechanics of Breathing		
3. Exchange of Gases		
4. Control of Breathing		
B. Digestive System	16	5 days
1. Function		
2. Special Features		
3. Digestive Organs		
C. Urinary System	18	3 days
1. Kidney Structure		
2. Kidney Functions		
VI. CYCLE OF LIFE		
A. Reproductive System	19	5 days
1. Organs of Male Reproduction		
2. Physiology of Male Reproduction		
3. Organs of Female Reproduction		
VII. CAT DISSECTION		5 days
1. Skinning		
2. External Anatomy		
3. Muscular System		
4. Internal Anatomy		
5. Circulatory System		

# Science Curriculum

## RESOURCES

MAJOR TEXT:	Anatomy and Physiology,	Evans
LAB BOOK:	Experiments in Physiology,	Thays
SUPPLEMENTARY BOOKS:	Biology of the Cell,	Wolfe
	Textbook of Anatomy and Physiology,	Reith
	Gray's Pocket Anatomy,	Leonard
	Human Physiology,	Holt
	Textbook of Anatomy & Physiology,	Anthony
	Animal Physiology,	Eckert
	Photo Manual and Dissection Guide of the Cat,	Bohensky

### *Anatomy & Physiology*

Standard

Benchmark

- 4 Knows the general structure and functions of cells in organisms
  - 3 Knows that cells carry on the many functions to sustain life.
  - 4 Knows that cells perform specialized functions in multicellular organisms
  - 5 Understands the importance of health & hygiene
  - 6 Know that disease represents a breakdown in structure & functions of an organism
  - 7 Understands cell differentiation
- 6 Understands the principal of motion and the forces tht exists between objects
  - 2 Knows that an object's motion can be changed
- 8 Understands the nature of scientific procedure & inquiry as it pertains to science, technology & society.
  - 1 Designs & conducts scientific investigations
  - 2 Use appropriate tools to gather, analyze, and interpret scientific data

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## INVESTIGATING BIOTECHNOLOGY

### RATIONALE

Biotechnology is course designed to provide the student with information and laboratory experience involving a new and laboratory experience involving a new and exciting area of science. It allows the student on opportunity to explore possible applications to the real world including career possibilities.

### COURSE DESCRIPTION

Biotechnology is a 1-term co-educational, one-credit elective course available to juniors and senior through instruction in this course, the student will perform many biotechnology protocols including DNA fingerprinting, DNA extraction and bacterial transformation. Discussions on the bioethics of biotechnology provide the student an opportunity to debate many current issues. Only the completion of Physical Science and Biology is required before taking this course.

### STUDENT ACHIEVEMENT GOALS

#### AFFECTIVE DOMAIN:

The student will learn to appreciate the many possibilities that biotechnology has to offer our society currently and in the future.

#### COGNITIVE DOMAIN:

The student will gain knowledge about the biotechnology procedures and their uses in our society.

#### PSYCHOMOTOR DOMAIN:

The student will investigate through laboratory experiments (protocols) many concepts in biotechnology principles.

### COURSE OUTLINE/TIMELINE

#### I. ORIENTATION

- A. Class Description
- B. Class Rules
- C. Expectations
- D. Safety

TIME ESTIMATE

1 Day

## Science Curriculum

<ul style="list-style-type: none"> <li>II. BIOLOGY</li> <li style="padding-left: 20px;">A. Cell Structure</li> <li style="padding-left: 20px;">B. DNA Structure</li> <li style="padding-left: 20px;">C. DNA Replication               <ul style="list-style-type: none"> <li>1. Transcription</li> <li>2. Translation</li> </ul> </li> <li style="padding-left: 20px;">D. Protein Synthesis</li> <li style="padding-left: 20px;">E. Gary Garton Activity</li> </ul>	3 Days
<ul style="list-style-type: none"> <li>III. ASEPTIC TECHNIQUE</li> <li style="padding-left: 20px;">A. Characteristics of Solutions</li> <li style="padding-left: 20px;">B. Wash Thoroughly (Hands)</li> <li style="padding-left: 20px;">C. Latex Gloves</li> <li style="padding-left: 20px;">D. Sterile Equipment</li> <li style="padding-left: 20px;">E. Sterilize Supplies</li> <li style="padding-left: 20px;">F. Clean Counters</li> </ul>	1 Day
<ul style="list-style-type: none"> <li>IV. DNA EXTRACTION</li> <li style="padding-left: 20px;">A. Prelab - Kiwi</li> <li style="padding-left: 20px;">B. Lab</li> <li style="padding-left: 20px;">C. Postlab</li> </ul>	1 Day
<ul style="list-style-type: none"> <li>V. TRANSFORMATION PROTOCOLS</li> <li style="padding-left: 20px;">A. Recombinant DNA Transformation</li> <li style="padding-left: 20px;">B. DNA Transformation of Bacteria</li> <li style="padding-left: 20px;">C. Red Colony Transformation</li> <li style="padding-left: 20px;">D. pLUX Transformation</li> </ul>	10 Days
<ul style="list-style-type: none"> <li>VI. DNA FINGERPRINTING</li> <li style="padding-left: 20px;">A. Micropipettor Use</li> <li style="padding-left: 20px;">B. Electrophoresis Gel Loading</li> <li style="padding-left: 20px;">C. Running the Gel</li> </ul>	4 Days
<ul style="list-style-type: none"> <li>VII. BT CORN</li> <li style="padding-left: 20px;">A. Grow Corn</li> <li style="padding-left: 20px;">B. Introduce European Corn Borer</li> <li style="padding-left: 20px;">C. Post lab</li> </ul>	4 Days
<ul style="list-style-type: none"> <li>VIII. CHYMOSIN</li> <li style="padding-left: 20px;">A. Paper Activity</li> <li style="padding-left: 20px;">B. Make Ice Cream</li> </ul>	2 Days
<ul style="list-style-type: none"> <li>IX. PLANT MICROPROPAGATION</li> <li style="padding-left: 20px;">A. Prelab</li> <li style="padding-left: 20px;">B. Lab</li> <li style="padding-left: 20px;">C. Post lab</li> </ul>	3 Days
<ul style="list-style-type: none"> <li>X. GNEETIC COUNSELING</li> <li style="padding-left: 20px;">A. Internet</li> <li style="padding-left: 20px;">B. Huntington's Simulation</li> <li style="padding-left: 20px;">C. Movie - "Gattaca"</li> </ul>	5 Days
<ul style="list-style-type: none"> <li>XI. BIOETHICS</li> <li style="padding-left: 20px;">A. Dilemma Cards</li> <li style="padding-left: 20px;">B. Debate</li> </ul>	2 Days
<ul style="list-style-type: none"> <li>XII. POLYERMASE CHAIN REACTION</li> <li style="padding-left: 20px;">A. Day 1 - ISU (Gary Polking)</li> <li style="padding-left: 20px;">B. Day 2 - Run Gels at GCHS</li> </ul>	2 Days
<ul style="list-style-type: none"> <li>XIII. BIOTECHNOLOGY CAREERS</li> <li style="padding-left: 20px;">A. Handouts (ISU, Indian Hills, DMACC)</li> <li style="padding-left: 20px;">B. Internet</li> <li style="padding-left: 20px;">C. Occupational Outlook Handbook</li> <li style="padding-left: 20px;">D. Occupational Program</li> </ul>	3 Days
<ul style="list-style-type: none"> <li>XIV. FINAL - ESSAY</li> </ul>	