Updated October 2015

Prep 7
Earth Science Scope and Sequence

Textbook:
To be determined

Prerequisites:
Acceptance into the 7th grade at Covington Latin School

Course Description:
This is a course in general earth science. The course covers the basics of geology, oceanography, meteorology, and astronomy. The course meets five times a week, one period each day.

Course Goals:
1. To develop a basic understanding of science as a process.
2. To understand the origin of the earth and geologic time.
3. To understand the delicate interactions of the ocean, the earth's surface, and climate, and how these interactions shape the earth.
4. To examine how human interactions with the four spheres of the earth affect earth processes.
5. To examine the historical development of earth science and how those concepts relate to society and technology.

Course Objectives:
1. Students will demonstrate their ability to gather, analyze and present data in laboratory exercises.
2. Students will demonstrate knowledge of all basic earth process.

Course Sequence:
1. Science Basics
    a. Introduction to Earth Science
    b. Models of Earth (Latitude/Longitude, Topographic Maps, GPS Receivers)

2. Geology
    a. Geologic Time
    b. Relative and Radiometric Dating
    c. Plate Tectonics (Seafloor Spreading, Plate Boundary Features, Plate Motions)
    d. Rocks (Rock Cycle, Igneous, Sedimentary and Metamorphic Rocks)
    e. Earthquakes (Seismic Waves, Causes, California Hazards)
    f. Volcanoes (Types of Volcanoes and Magma)

3. Oceanography
    a. Ocean Water (Salinity and Density)
    b. Movements of the Ocean (Currents and Upwelling)

4. Atmosphere
    a. Meteorology
    b. Atmosphere (Composition/Structure, Movement of Energy)
    c. Climate (Causes of Changes, Greenhouse Effect)
    d. Biogeochemical Cycles (Water Cycle, Carbon Cycle)

5. Astronomy
    a. Studying Space (Electromagnetic Spectrum,)
    b. Our Solar System (Formation, Terrestrial Planets, Gas Giant Planets)
    c. Minor Bodies of the Solar System (Satellites, Asteroids, Meteors)
    d. The Sun (Solar Energy, Stellar Evolution)
    e. Stars, Galaxies and the Universe (Milky Way Galaxy, Types of Galaxies)

Evaluation:

Projects, presentations, homework, tests, and quizzes, will be evaluated on the basis of a point system. Each will be designated a point value according to the length and difficulty of the task. Students will be told the point value of each assignment when it is assigned.

Exams are given at the end of the semester and account for 200 points of the semester grade.

Supplemental Materials

Worksheets, videos, animations from various websites, webquests, and laboratory work.

Updated October 2015

Prep7 Physical Education

Textbook: None

Course Decription: This course is designed to enhance the student's knowledge and capabilities in the area of physical education through cardiovascular, strength and flexibility training. Games and activities are used to demonstrate their knowledge and capabilities.

Course Goals:

1. To develop an understanding of the concepts of cardiovascular endurance, muscle strength and joint flexibility.
2. To improve or maintain endurance, strength and flexibility.
3. To develop a personal understanding of their needs in endurance, strength and flexibility.
4. To build knowledge of rules and techniques and skills in various games and activities.

Course Objectives:

1. To develop an understanding of cardiovascular endurance and how it is related to pulse rate.
2. To examine personal flexibility and compare to average flexibility.
3. To understand the need to warm up and safety requirements in various sports and activities.
4. To improve knowledge and skill in the lead up activities for the sports of soccer, baseball/softball, floor hockey, basketball, tumbling, hantis, body weight exercises, captain ball, volleyball.
5. To develop an appreciation for difficulties of various sports and activities.
6. To apply sportsmanship and Christian behavior in sports activities.
7. To learn basic knowledge of the ballroom dance. To develop the sense of rhythm and coordination of movement. To learn the different styles of the dances.

Updated October 2015

Course Sequence:

First Semester

- Cardiovascular/coordination
  - Soccer
  - Captain ball
  - Kickball
  - Volleyball
  - Track and field exercises
  - Body weight exercises

Second Semester

- Flexibility
  - Tumbling
  - Stretching
- Muscular Strength
  - Tumbling
- Games unit
  - Hantis
  - Floor Hockey
  - Softball/baseball
  - Wiffleball
  - Double kickball
  - Fuzzy ball

Updated October 2015

Prep8 Physical Education

Textbook: None

Course Decription: This course is designed to enhance the student's knowledge and capabilities in the area of physical education through cardiovascular, strength and flexibility training. Games and activities are used to demonstrate their knowledge and capabilities.

Course Goals:

5. To develop an understanding of the concepts of cardiovascular endurance, muscle strength and joint flexibility.
6. To improve or maintain endurance, strength and flexibility.
7. To develop a personal understanding of their needs in endurance, strength and flexibility.
8. To build knowledge of rules and techniques and skills in various games and activities.

Course Objectives:

8. To develop an understanding of cardiovascular endurance and how it is related to pulse rate.
9. To examine personal flexibility and compare to average flexibility.
10. To understand the need to warm up and safety requirements in various sports and activities.
11. To improve knowledge and skill in the lead up activities for the sports of soccer, baseball/softball, floor hockey, basketball, tumbling, weight training and ping pong.
12. To develop an appreciation for difficulties of various sports and activities.
13. To apply sportsmanship and Christian behavior in sports activities.
14. To learn basic knowledge of the ballroom dance. To develop the sense of rhythm and coordination of movement. To learn the different styles of the dances.

Updated October 2015

Course Sequence:

First Semester

- Cardiovascular
  - Soccer
  - Basketball
  - Valleyball
  - Dancing (2nd semester)

Second Semester

- Flexibility
  - Tumbling
  - Stretching
- Muscular Strength
  - Tumbling
- Games unit
  - Ping Pong
  - Floor Hockey
  - Dodgeball
  - Wiffleball

Updated October 2015

Prep 8 Health

Textbook: Glenco Health
Mary Bronson Merki, Ph.D.
Glencoe/McGraw-Hill
Copyright 2009

Course Decription:

This course is designed to give the students a basic understanding of how the body works. Examine mental, social and physical progression from childhood to adulthood. Help students understand protection of the body including eyes, ears, teeth, diet, cardiovascular and emergency care. This will provide the students with a foundation for making appropriate choices to maintain their health.

Course Goals:

1. to develop a understanding of the basic workings of the human body.
2. to develop an understanding of outline note taking skills.
3. to examine how we grow and develop and the variations in development.
4. to examine how our care of the body and choices affect our long term health.

Course Objectives:

1. to understand the basic parts of these systems: digestive, respiratory, circulatory and reproductive.
2. to improve the students ability to order information through outline note taking.
3. to understand healthy and unhealthy behavior and choices including: risk behaviors, alcohol and tobacco use, eating disorders, lack of exercise, food choices and sense organs.
4. to order the parts involved in how breathing occurs, blood flow direction, and digestion process.
5. to demonstrate an understanding of human growth and development, care of emergency situation and sense organs and .
6. to challenge students to use their values as related to classroom topics.

Course Sequence:

First Semester

Overview of systems and organization
Adolescence and Puberty
Eye, Ear, Teeth, Skin and their care
Drug, Alcohol and Tobacco concerns
Respiratory and Circulatory System

Second Semester

Safety and accidents
Digestive System and Nutrition
Reproductive System and parenting
Health Care and Careers

Evaluation:

Tests at the end of each unit, quizzes and/or homework with each unit.

Updated October 2015

Prep8 – Physical Science Curriculum

Textbook: Physical Science, Dobson, Holman and Roberts, Holt, Rinehart and Winston, 2008

Course Description:
The course will lead students through introductions of the basic concepts of Chemistry and Physics, in a study of matter and energy. This will be accomplished via learning the Scientific Method, investigations into the phenomena of chemistry and physics and the development of laboratory skills. Lecture format, video presentations and hands-on laboratory work will be used to achieve these skills. While the basic concepts of these areas will be stressed, further applications to everyday life will be highlighted.

Course Goals:
- Examine the scientific method to investigate the concepts of physical science.
- Develop scientific skills to solve problems and answer questions.
- Discover how important physical science is to everyday life.

Course Objectives:
- Understand the differences between the Sciences and what each entails.
- Become knowledgeable of the different Systems of Measurement.
- Become proficient in obtaining data in scientific investigations for various quantities such as length, mass, time, force, density, ph.
- Understanding the different classifications of matter.
- Examine the various ways matter reacts.
- Examine Motion, different forms, causes.
- Study the Laws of motion, momentum.
- Understand the different forms of energy.
- Examine the difference between heat and Temperature
- Uncover the characteristics of Waves (Light and Sound)
- Discover the relation between Electricity and Magnetism and how they affect the world around us.

Course Sequence:
1. Introduction to Science
    a. The Nature of Science
    b. The Way Science Works
    c. Organizing Data
2. Matter
    a. What is Matter
    b. Properties of Matter
    c. Changes of Matter
3. States of Matter
    a. Matter and Energy
    b. Fluids

    c. Behavior of Gases
4. Atoms and the Periodic Table
    a. Atomic Structure
    b. Periodic Table
    c. Families of Elements
    d. Using Moles to Count Atoms
5. The Structure of Matter
    a. Compounds and Molecules
    b. Ionic and Covalent Bonds
    c. Compound Names and Formulas
    d. Organic and Biochemical Compounds
6. Chemical Reactions
    a. The Nature of Chemical Reactions
    b. Reaction Types
    c. Balancing Chemical Equations
    d. Rate of Change
7. Solutions
    a. Solutions and Other Mixtures
    b. How Substances Dissolve
    c. Solubility and Concentration
8. Acids, Bases and Salts
    a. Acids and Bases
    b. Reactions of Acids with Bases
    c. Acids, Bases, Salts in the Home
9. Motion
    a. Measuring Motion
    b. Acceleration
    c. Motion and Force
10. Forces
    a. Laws of Motion
    b. Gravity
    c. Newton's Third Law
11. Work and Energy
    a. Work, Power and Machines
    b. Simple Machines
    c. What is Energy
    d. Conservation of Energy
12. Heat and Temperature
    a. Temperature
    b. Energy Transfer
    c. Using Heat
13. Waves
    a. Types of Waves
    b. Characteristics of Waves

   c. Wave Interactions
14. Sound and Light
   a. Sound
   b. The Nature of Light
   c. Reflection and Color
   d. Refraction, Lenses, and Prisms
15. Electricity
   a. Electric Charge and Force
   b. Current
   c. Circuits
16. Magnetism
   a. Magnets and Manetic Fields
   b. Magnetism from Electric Currents
   c. Electric Currents from Magnetism

Evaluation:

Projects, presentations, lab reports homework, tests, and quizzes, will be evaluated on the basis of a point system. Each will be designated a point value according to the length and difficulty of the task. Students will be told the point value of each assignment when it is assigned. Class participation is expected

Exams are given at the end of the semester.

Supplemental Materials

Worksheets, videos, animations and simulations from various websites

Updated October 2015

Freshman Physical Education

Textbook: None

Course Decription: This course is designed to introduce and enhance the student's knowledge of rules, skills and techniques of various sports and activities. Through participation in these games and activities the students will improve or maintain their coordination, flexibility, strength and endurance.

Course Goals:

1. To develop an understanding of the basic rules of soccer, volleyball, basketball, speedball, floor hockey, ping pong and dodgeball.
2. To develop, improve or maintain activity skills in soccer, volleyball, basketball, speedball, floor hockey, ping pong and dodgeball.
3. To understand the value of teamwork.
4. To build confidence in improved game skills.
5. To apply skills in a low stress game environment.
6. To develop and improve/maintain strength, flexibility and endurance.

Course Objectives:

1. To develop soccer skills including inside foot pass and trap, instep pass, chest trap, thigh trap, legal throw in and goalie skills.
2. To develop volleyball skills of bumping, setting and underhand service.
3. To develop basketball skills of dribbling, passing and shooting lay ups and short shots.
4. To develop speedball skills of passing, catching and shooting.
5. To develop ping pong skills of forehand hits, backhand hits and service hits.
6. To develop dodgeball skills of throwing, catching/fielding, evading.
7. To apply sport skills in game situation.
8. To show an understanding of rules of various sports in game situation.
9. To understand the need to warm up and safety requirement in various sports and activities.
10. To develop or improve/maintain strength and flexibility during tumbling.
11. To apply sportsmanship and Christian behavior in sports activities.
12. To learn basic knowledge of the ballroom dance. To develop the sense of rhythm and coordination of movement. To learn the different styles of the dances.

Course Sequence:

Updated October 2015

First Semester

Soccer
Volleyball
Basketball
Dodgeball (continue in the spring)

Second Semester

Tumbling
Ping Pong
Floor Hockey
Speedball
Dodgeball
Dancing

Updated October 2015

Freshman Health

Textbook: Glencoe Health
Mary Bronson Merki, Ph.D.
Glencoe/McGraw-Hill; Copyright 2009

Course Decription:

This course is designed to give the students a basic understanding of how the body works, how the parts interact with other parts and how outside influences can cause problems. This will provide the students with the ability to actively make choices about their present and future health.

Course Goals:

1. Develop an understanding of the basic workings in the systems of the human body.
2. Develop outline note taking skills.
3. Examine how we interact and are affected by our environment.
4. Examine how our behavior and choices affect our long term health.
5. Perform selected science labs and develop lab report writing skills

Course Objectives:

Course Objectives:

1. To understand the basic parts of these systems: nervous, digestive, skeletal, muscular, immune, respiratory, circulatory and reproductive.
2. To improve the students ability to order information through outline note taking.
3. To understand healthy and unhealthy behavior and choices including: lifestyle factors, risk behaviors, alcohol and tobacco use, eating disorders, lack of exercise, food choices and the spread of disease.
4. To describe various human body processes, including breathing, blood flow, menstrual cycle, oxygen debt, digestion, infectious diseases and blood typing process.
5. To demonstrate an understanding of various mental problems and physical injuries and methods for help and treatment.
6. To develop basic science lab skills and lab report writing skills
7. To challenge students to use their values as related to classroom topics.

What You Need:

- Textbook
- A three ring binder or folder for handouts
- A notebook
- Blue or black pen, red pen, and pencil
- Access to the internet

Updated October 2015

Course Sequence:

First Semester

Aug. 17- Sept. 5	Overview of human body systems, communication and health factors
Sept. 7- Oct. 16	Nervous System, brain anatomy and vision
Oct. 19- Oct. 30	Neurological disorders, drug, alcohol and tobacco concerns
Nov. 2 - Nov. 13	Nutrition
Nov. 16 – Dec. 4	Digestive System and enzymes
Dec. 7- Dec. 15	Urinary System

Second Semester

Jan.4- Jan. 15	Skeletal System
Jan. 18- Jan. 29	Muscular System
Feb. 1- Feb. 19	Respiratory System and Asthma
Feb. 22- Mar. 11	Circulatory System and Cardiovascular fitness
Mar. 14- Ap. 8	Immune System
Apr. 11- Apr. 22	Infectious Diseases
Apr. 25- May 6	Importance of genetics and environment to health
May 9-May 24	Reproductive System

Evaluation:

Homework and quizzes will be assigned for each chapter, and tests will be given at the end of each unit. Other assignments include projects, lab reports and papers.

A Semester exam over the entire first semester material occurs in Dec. and a Final exam over second semesters materials and general terms used throughout the year occurs in May.

Updated October 2015

Biology

Textbook:

BSCS Biology, An Ecological Approach 9th ed. 2002. Kendal / Hunt.

Prerequisites:

Acceptance into the Sophomore year at Covington Latin School

Course Description:

This is a course in general biology with ecological interactions as its organizing theme. The course covers the biological basics, ecology, the cell, basic biochemistry, bioenergetics, genetics, evolution, and the three domains of life. The course meets six times a week, with a double period for laboratory work which is heavily stressed.

Course Goals:

6. To develop a basic understanding of science as a process.
7. To understand the continuity of life on earth.
8. To understand evolution as the organizing principle of biology
9. To examine biology's connection to medicine, public health, agriculture, conservation, and other social issues
10. To examine the historical development of biological concepts and how those concepts relate to society and technology

Course Objectives:

3. Students will demonstrate their ability to gather, analyze and present data in formal laboratory exercises.
4. Students will demonstrate knowledge of basic biological process; ie light and dark reactions of photosynthesis.

Course Sequence:

1. Basic Ecology
    a. Flow of matter and energy
    b. Producer, Consumer
    c. Biosphere as a concept

2. Basic Population Biology
    a. Rates of increase and decrease
    b. Determining Rates
    c. Limiting Factors – density
    d. Carrying capacity
    e. Lab: Study of a population -- yeast

3. The Ecosystem
    a. The biotic community and the abiotic environment
    b. Basic Relationships within the biotic community
    c. Structure of the ecosystem in space and time
    d. Energy structure of the ecosystem
    e. Lab: Biomagnification demonstration
4. Basic Biochemistry
    a. Chemistry basics

   b. Biological molecules
   c. Labs: Biology and pH
      i. Rate of enzymatically driven reactions

5. The Cell – Eukaryotic
   a. Cell structure
   b. Cell transport
   c. Cell division
   d. Labs: Observing plant and animal cells
      i. Observation of plant and animal mitosis
      ii. Egg osmosis

6. Bioenergetics – Photosynthesis
   a. History
   b. Light reactions
   c. Calvin Cycle
   d. Photorespiration
   e. C4 and CAM photosynthesis
   f. Lab: Paper chromatography

7. Bioenergetics – Cellular Respiration
   a. History
   b. Glycolysis
   c. Krebs Cycle
   d. Electron transport and the structure of the mitochondrion
   e. Fermentation

Semester Break

8. Reproduction
   a. Asexual Reproduction
   b. Sexual Reproduction
   c. Meiosis
   d. Human reproduction
   e. Lab: Meiosis modeling

9. Development
   a. Life cycles
   b. Phases of mammalian development
   c. Human development

10. Genetics
   a. Mendelian inheritance
   b. Non-Mendelian inheritance
   c. Human genetics
   d. Pedigrees
   e. Race for the structure of DNA
   f. DNA as genetic material
   g. DNA replication
   h. Protein synthesis

i. Labs: Probability and Mendel
    i. DNA Extraction

11. Evolution
    a. Short history of the idea
    b. Darwin and Natural Selection
    c. Microevolution and speciation
    d. 1920-1970 – The Synthesis
    e. Hardy-Weinberg Equilibrium
    f. Punctuated Equilibrium
    g. Lab: Hardy-Weinberg Goldfish

12. Taxonomy and Systematics
    a. Carolus Linnaeus
        i. Bionomial System
    b. Systematics
        i. Quick trip through three domains
    c. Origin of Life
    d. Major landmarks in earth's development
    e. Lab: Forming coacervates

13. Prokaryotes and Virus
    a. Basic prokaryotic cell
    b. Archea
    c. Eubacteria
    d. Nitrogen cycle
    e. Bacterial Pathogens
    f. Viruses
        i. Structure
        ii. Viral pathogens

14. Protists and Fungi
    a. Origin of the eukaryotic cell
    b. Protists
    c. Fungi
        i. Basic groups
    d. Lab: Life in a drop of pond water

15. Plants
    a. Origin of plants
    b. Bryophytes
    c. Ferns and fern allies
    d. Seed plants
    e. Flowering plants
    f. Function of flowers
    g. Moncots and dicots
    h. Lab: Flower dissection

16. Animals
    a. Origin of the Animal Kingdom
    b. Basic animal organization
    c. Major phyla of the Animal Kingdom

Evaluation:

Projects, presentations, tests, and homework, will be evaluated on the basis of a point system. Each will be designated a point value according to the length and difficulty of the task. Students will be told the point value of each assignment when it is assigned.

Exams are given at the end of the semester and account for 200 points of the semester grade.

Schoology is an online tool that students are required to use to access videos, important resources, and assignments. Instructions on how to use Schoology are provided in class. All assignment due dates are posted on the Schoology calendar.

Nightly homework assignments will be completed on Schoology or in the students' binder. Any assignment not completed by the due date and time (usually the beginning of class the day that it is due) will be counted late.

Lab reports and projects are submitted to Trunitin.com for a grade (usually 100 pts). All lab reports or projects that are not turned in by the deadline are considered to be late and will have ten percent deducted from their final grade for each day that they are late. Not all labs in this class will require the writing of a lab report.

Supplemental Materials

Worksheets, videos from www.unitedstreaming.com, Bozeman Science videos, Crash Course videos, animations from various websites including PBS.com, NOVA videos, Dr. Art's Bio-songs, and The Howard Hughes Medical Institute website.

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Chemistry

Textbook:

Malone, Leo J., and Theodore O. Dolter.Basic Concepts of Chemistry.8th Edition. Hoboken: John Wiley & Sons, 2010.

Prerequisites:

Algebra I and Geometry.

Course Description:

Junior Chemistry is an introductory course that will give students a general overview of the composition, structure, properties and change of matter and cultivate students' appreciation of the everyday chemical processes. The course is designed to serve as a firm foundation for science classes students will take in college and prepare the students for Advanced Placement college level chemistry course offered at Covington Latin School during senior year.This course meets four times per week for a single period for lecture and problem solving sessions, and additional (fifth day) for a double period for practical lab work. Junior chemistry class will introduce the basics of the following sixbig ideas as described in the AP Chemistry curriculum framework by College Board:

Big Ideas (BI)	
BI-1	The chemical **elements** are fundamental building materials of matter, and all matter can be understood in terms of **arrangements of atoms**. These atoms retain their identity in chemical reactions.
BI-2	Chemical and physical **properties** of materialscan be explained by the **structure** and the arrangement ofatoms, ions, or molecules and the **forces between** them.
BI-3	Changes in matter involve the **rearrangement** and/or **reorganization** of **atoms** and/or the **transfer** of **electrons**
BI-4	**Rates** of chemical reactions are determined by details of the molecular collisions
BI-5	The laws of **thermodynamics** describe the essential role of energy and explain and predict the direction of changes in matter
BI-6	Any **bond** or **intermolecular attraction** that can be formed can also bebroken. These two processes are in a dynamic competition, and are sensitive toinitial conditions and external perturbations.

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At the end of this course students will:

1. Learn the inquiry process through laboratory investigations.
2. Apply mathematical and scientific knowledge and skills to solve quantitative, qualitative, spatial, and analytic problems.
3. Apply basic arithmetic, algebraic, and geometric concepts.
4. Formulate strategies for the development and testing of hypotheses.
5. Use basic statistical concepts to draw both inferences and conclusions from data.
6. Identify implications and consequences of drawn conclusions.
7. Use manipulative and technological tools including the Texas Instruments Nspire CAS CX Handhelds, Vernier LabQuests, Vernier Probes, and Vernier's LoggerPro software.
8. Measure, compare, order, scale, locate, and code accurately.
9. Do scientific research and report and display the results of this research.
10. Learn to think critically in order to solve problems.

Course Sequence:

Semester 1/Quarter 1

1. **Measurements in Chemistry**
   - Classifications of matter
   - Properties of matter
   - Significant figures
   - Units of measurement
2. **Elements and Compounds**
   - The elements and their composition
   - Compounds and their composition
3. **Matter and Energy**
   - The properties of matter
   - The properties of energy
4. **Periodic Table and Chemical Nomenclature**
   - Relationships among the elements and the periodic table
   - The formulas and names of compounds
5. **Chemical Reactions**
   - The representation of chemical changes and three types of changes
   - Ions in water and how they react
6. **Quantities in Chemistry**
   - Measurement of masses of elements and compounds
   - Component elements of compounds

Quarter 2

7. **Stoichiometry**
   - Mass relationships in chemical reactions
   - Energy relationships in chemical reactions
   - Chemical reactivity
   - Avogadro's number

- Empirical formulas
- Limiting reactants

8. Atomic Theory

- The energy of the electron in the atom
- Electron configuration

9. The Chemical Bond

- Chemical bonds and the nature of ionic compounds
- Chemical bonds and the nature of molecular compounds
- Distribution of charge in chemical bonds

10. The Gaseous State

- The nature of the gaseous state and the effects of conditions
- Relationships among quantities of gases, conditions, and chemical reactions

11. Aqueous Solutions

- Solutions and the quantities involved
- The effects of solutes on the properties of water

Semester 2/Quarter 3

12. Acids, Bases, and Salts

- Acids, bases, and the formation of salts
- The measurement of acid strength
- Salts and oxides as acids and bases

13. Oxidation-Reduction Reactions

- Redox reactions-the exchange of electrons
- Spontaneous and nonspontaneous redox reactions

14. Reaction Rates and Equilibrium

- Collisions of molecules and reactions at equilibrium
- The quantitative aspects of reactions at equilibrium

15. Nuclear Chemistry

- Naturally occurring radioactivity
- Induced nuclear changes and their uses

16. The Solid and Liquid States

- The properties of condensed states and the forces involved
- The liquid state and changes in state

Quarter 4

17. Organic Chemistry

- Hydrocarbons
- Other classes of organic compounds

18. Biochemistry

- The building blocks of life
- Amino acids
- Proteins and Enzymes
- Carbohydrates
- Lipids
- Nucleic acids (DNA, RNA, etc.)
- Catalytic RNA

Evaluation:

Homework, Laboratory Reports, Quizzes, Tests, Exams

Updated October 2015

Honors Physics

Course Description:
This course is designed to introduce the student to the major ideas in the science of physics from its beginning in the 7th century B.C. Greece to the present. In the course students will read classics in physics, study Newtonian mechanics, and problem solve and do basic labs in physics.

Course Goals:
1. Students will understand basic physics concepts with an emphasis on Newtonian Mechanics.
2. Students will read and analyze writings of the physicists Aristotle to Einstein
3. Students will become familiar with the relationship of the Church and science.

Course Objectives:
1. Students will understand as a process designed to understand the world.
2. Students will be able to solve problems in Newtonian Mechanics using algebra.
3. Students will have a basic understanding of special and general relativity.
4. Students will have a basic knowledge of Quantum Mechanics.

Sequence

1. The Science of Physics

2. Mathematical Tools

3. Describing Motion and vector addition
    a. Picturing Motion
    b. Velocity and acceleration
    c. Properties and components of vectors

Aristotle

Baglow, Christopher T. Faith, Science and Reason (Excerpts)

4. Mathematical model of motion
    a. Graphing motion and velocity in one dimension
    b. Acceleration
    c. Free Fall

5. Forces
    a. Force and Motion
    b. Newton's laws
    c. Interaction forces

6. Forces and Motion in Dimensions
    a. Forces in 2 dimensions
    b. Projectile Motion

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c. Circular Motion

Cohen - The Birth of a New Physics - Copernicus, Kepler, Brahe, Galileo, Newton

7. Universal Gravitation
    a. Motion in the heavens and on earth
    b. Using the law of universal gravitation

8. Woods, Thomas E. How the Catholic Church Built Western Civilization (Excerpts)

9. Momentum and Conversation Impulse and momentum
    a. The conservation of momentum

10. Energy, Work and Simple Machines

11. Energy
    a. The many forms of Energy
    b. Conservation of Energy

12. Thermal energy
    a. Temperature and thermal energy
    b. Change of state and Thermodynamics

13. States of Matter
    a. Fluid States
    b. Solid State

14. Waves and Energy Transfer
    a. Wave properties
    b. Wave behavior

15. Sound
    a. Properties of sound
    b. Physics of Music

16. Light
    a. Light Fundamentals
    b. Light and Matter

Einstein - Relativity: The Special and General Theory

17. Electric fields, electrical energy and current

18. Magnetism

19. Electromagnetic induction and Electromagnetism

Gribbin, - In Search of Schrodinger's Cat

20. Atomic Physics

a. Quantum Theory
b. The Atom

21. Sub-atomic Physics
    a. The Nucleus
    b. Nuclear applications

Texts:

1. Physics: Principles and Problems. Glencoe MC G
2. Cohen, Bernard. The Birth of a New Physics
3. Einstein, Albert. Relativity: The Special and General Theory
4. Gribbin, John. In Search of Schrodinger's Cat
5. Woods, Thomas E. How the Catholic Church Built Western Civilization (Excerpts)
6. Baglow, Christopher T. Faith, Science and Reason (Excerpts)

Evaluation:

Projects, presentations, lab reports homework, tests, and quizzes, will be evaluated on the basis of a point system. Each will be designated a point value according to the length and difficulty of the task. Students will be told the point value of each assignment when it is assigned. Class participation is expected

Exams are given at the end of the semester.

Supplemental Materials

Worksheets, videos, animations and simulations from various websites

Updated October 2015

AP Biology

Textbook:
Campbell, Reece et al., *Biology* 6th ed. 2002. Pearson Benjamin Cummings.

Prerequisites:
Students should have completed one year of biology and one year of chemistry, prior to enrolling in AP Biology. However, students without the suggested pre-requisites may be admitted by instructor permission.

Course Description:
This AP Biology course is designed to offer students a solid foundation in introductory college-level biology. By structuring the course around the four Big Ideas, Enduring Understandings and Science Practices, the students will be assisted in developing an appreciation for the study of life and helped to identify and understand unifying principles within a diversified biological world.

The Big Ideas:
Big Idea 1: The process of evolution drives the diversity and unity of life.

Big Idea 2: Biological systems utilize fee energy and molecular building blocks to grow, to reproduce and to maintain dynamic homeostasis.

Big Idea 3: Living systems store, retrieve, transmit and respond to information essential to life processes.

Big Idea 4: Biological systems interact and these systems and their interactions posses complex properties.

Science is a way of knowing. Therefore, knowing about Biology requires that students learn the process of inquiry and develop critical thinking skills. The course will focus not only on knowing science content, but also learning skills to analyze and interpret data, and to communicate information in a meaningful way to others.

At the end of the course, students will have an awareness of the integration of other sciences into the study of Biology and become knowledgeable and responsible citizens in understanding biological issues that could potentially impact their lives.

Course Goals:
1. To familiarize students with the terminology and concepts of Biology using a theme-oriented approach that emphasizes concepts and science as a process over knowledge of facts.
2. To enhance problem-solving skills of students using hands-on labs, readings, collections, independent projects, and class discussions.
3. To strengthen students' communication skills with the use of written assignments, essays, abstracts, and lab reports.
4. To prepare students for further study in the Biological Sciences.
5. To acquire necessary content and analytical skills for the AP Exam.

Course Objectives:

1. To be able to use representations and models to communicate scientific phenomena and solve scientific problems.
2. To use mathematics appropriately.
3. To engage in scientific questioning to extend thinking or to guide investigations within the context of the AP course.
4. To plan and implement data collection strategies appropriate to a particular scientific question.
5. To perform data analysis and evaluation of evidence.
6. To be able to work with scientific explanations and theories.
7. To connect and relate knowledge across various scales, concepts and representations in and across fields of study.

Course Sequence:

The course content has been divided into eight instructional units. An attempt has been made to "chunk" chapters into related units. Four units will be presented each semester. The Four Big Ideas will be interwoven within the units.

Unit 1 – Introduction and Biochemistry 1 – Introduction to AP Biology 2 – Chemistry of Life (self-study and recap in class) 3 – Water 4 – Carbon and Molecular Diversity 5 – Macromolecules	**Possible Labs** Introduction to Inquiry Labs, Graphing Artificial Selection – predator/prey selection simulation Macromolecules – testing and model making Essay Writing, Rubric Setting and Practice Grading
Unit 2 – Cells and Cell Cycle 7 – Membrane Structure and Function 6 – Tour of a Cell 12 – Cell Cycle 44 – Osmoregulation and Excretion (self-study)	**Possible Labs** Cell observations with a Microscope Osmosis – dialysis tubing, potatoes Mitosis
Unit 3 – Cellular Energy 8 – Introduction to Metabolism 9 – Cellular Respiration 10 – Photosynthesis	**Possible Labs** Enzymes – computer probe lab Respiration – pea respiration Photosynthesis – computer probe lab
Unit 4 – Organism Form and Function 11 – Cell Communication 45 – Hormones and the Endocrine System 48 – Neurons, Synapses and Signaling 43 – Immune System 40 – Basic Principles of Animal Form and Function (self-study)	**Poosible Labs** Cell Communication – simulation or website investigation Hormones – project (Endocrine diseases) Nerve signaling – simulation or website investigation
Semester Break	

Unit 5 – Genetic Basis of Life 13 – Meiosis and Sexual Life Cycles 14 – Mendel and the Gene Idea 15 – Chromosome Basis of Inheritance 21 – Genomes and their Evolution	**Possible Labs** Meiosis simulation Fast Plant – who's the daddy? Fruit Fly Genetics Human Genetic Diseases
Unit 6 – Gene Activity and Biotechnology 16 – Molecular Basis of Heredity 17 – From Gene to Protein 18 – Regulation of Gene Expression 20 – Biotechnology 19 – Viruses (self-study)	**Possible Labs** DNA Isolation Transformation using pGLO Restriction Enzymes and Gel Electrophoresis
Unit 7 – Evolution and Phylogeny 22 – Descent with Modification: Darwin 23 – Evolution of Populations 24 – Origin of Species 25 – History of Life on Earth 26 – Phylogeny and the Tree of Life	**Possible Labs** Population Genetics Evo-Devo – videos from HHMI Blast Lab
Unit 8 – Ecology 52 – Introduction to Ecology 53 – Population Ecology 54 – Community Ecology 55 – Ecosystems 56 – Conservation Biology 51 – Animal Behavior (self-study)	**Possible Labs** Animal Behavior – red worms or pillbugs Transpiration – whole plant method Conservation of a species

Additional labs will be conducted to deepen students' conceptual understanding and to reinforce the application of science practices within a hands-on, discoverer based environment. Directed Inquiry will be the most common method of lab instruction used. The course will provide opportunities for students to develop, record, and communicate the results of their laboratory investigations. Lab report format will vary and may include the following: formal lab report, PowerPoint presentation, poster board presentation, oral presentation, response to directed questions on the lab or other format. Students will be required to maintain a portfolio of their lab activities on a flash drive or other storage device to take with them to college.

Evaluation:

Grades will be assessed based on homework, book critiques, tests, quizzes, lab reports, and presentations.

Supplemental Materials

1. *AP Biology Investigative Labs: an Inquiry Based Approach*
2. Darwin, C., & Burrow, J. W. (1985). *The origin of species by means of natural selection, or, the preservation of favoured races in the struggle for life*. ePenguin.
3. Watson, J. (1968). *The Double Helix.* Atheneum.
4. Google Docs – used for posting documents and receiving assignments.
5. Software – Excel and Word (for processing data and writing lab reports).

6. The Web – various web sites (The Biology Project, The Biology Place, NCIM etc.) are used to expand topics, provide reading documents or for searching out answers to questions raised in class.
7. Turnitin.com – all written assignments must be submitted to turnitin.com by 11:59 PM on the day that the assignment is due. Failure to do so will result in a zero for the assignment until it is submitted to Turnitin.
8. Schoology is an online tool that students will be required to use to access videos, important resources, and assignments. Instructions on how to use Schoology will be given in class. All assignment due dates will be posted to the Schoology calendar.

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AP Chemistry
SCOPE AND SEQUENCE

Textbook:

Brown, Theodore L., LeMay, H. Eugene JR., Bursten, Bruce E., Murphy, Catherine J., and Patrick M. Woodward. Chemistry: The Central Science. AP Edition.12th Edition. Boston: Prentice Hall, 2012.

Prerequisites:

Form III Chemistry, Algebra I, and Geometry.

Course Description:

The purpose of Advanced Placement Chemistry is to provide a college level course in chemistry and to prepare the student to seek credit and/or appropriate placement in college chemistry courses.

This course is structured around the six big ideas articulated in the AP Chemistry curriculum framework provided by the College Board:

Table 2. Big Ideas (BI)	
BI-1	The chemical **elements** are fundamental building materials of matter, and all matter can be understood in terms of **arrangements of atoms**. These atoms retain their identity in chemical reactions.
BI-2	Chemical and physical **properties** of materialscan be explained by the **structure** and the arrangement ofatoms, ions, or molecules and the **forces between** them.
BI-3	Changes in matter involve the **rearrangement** and/or **reorganization** of **atoms** and/or the **transfer** of **electrons**
BI-4	**Rates** of chemical reactions are determined by details of the molecular collisions
BI-5	The laws of **thermodynamics** describe the essential role of energy and explain and predict the direction of changes in matter
BI-6	Any **bond** or **intermolecular attraction** that can be formed can also bebroken. These two processes are in a dynamic competition, and are sensitive toinitial conditions and external perturbations.

This course meets four times per week for a single period for lecture and problem solving sessions, and additional (fifth day) for a double period for practical lab work. There will be total 16 laboratory periods each school year.

Course Sequence:

Semester 1/Quarter 1

1. **Matter and Measurement**

- Classifications of matter
- Properties of matter
- Significant figures
- Units of measurement

2. Atoms, Molecules, and Ions

- Atomic structure: Discovery and modern view
- Atomic weights
- The periodic table
- Molecular compounds
- Naming inorganic compounds
- Introduction to organic compounds

3. Stoichiometry

- Chemical equations and balancing
- Chemical reactivity
- Avogadro's number
- Empirical formulas
- Limiting reactants

4. Solution Stoichiometry

- Precipitation reactions
- Oxidation-reduction reactions
- Aqueous solutions
- Acids and bases
- Concentrations of solutions

5. Gases and Gaseous Equilibrium

- Pressure
- The gas laws
- Ideal gas equation
- Kinetic-molecular theory of gases
- Effusion and diffusion
- Real gases

6. Thermochemistry

- Laws of thermodynamics
- Enthalpy
- Calorimetry
- Hess's Law
- Enthalpies of reaction
- Enthalpies of formation
- Fuels and food

Quarter 2

7. **Electronic Structure of Atoms, Periodicity**

- Wave nature of light
- Line spectra
- Quantized energy and photons
- Quantum mechanics and atomic orbitals

- Many-electron atoms
- Electron configurations
- Effective nuclear charge
- Sizes of atoms and ions
- Ionization energy
- Electron affinities
- Trends of the periodic table

8. Chemical Bonding

- Ionic bonding
- Bond polarity and electronegativity
- Covalent bonds
- Lewis symbols and octet rule

9. Molecular Geometry/Bonding Theories

- Molecular shapes
- VSEPR model
- Molecular polarity
- Multiple bonds
- Period 2 diatomic molecules

10. Liquids and Intermolecular Forces

- Intermolecular forces
- Phase changes
- Vapor pressure
- Phase diagrams
- Liquid crystals

Semester 2/Quarter 3

11. Properties of Solutions

- Solution process
- Factors affecting solubility
- Colligative properties

12. Chemical Kinetics

- Reaction rates
- Change of concentration with time
- Temperature and rate
- Catalysis
- Reaction mechanisms

13. Chemical Equilibrium

- Concept of equilibrium
- La Châtelier's Principle
- Calculating equilibrium constants
- Heterogeneous equilibria

14. Acid-Base Equilibrium

- Brønsted-Lowry Acids and Bases
- The pH scale
- Weak acids
- Weak bases
- Relationship between K_a and K_b

- Acid-base behavior and chemical structure

15. Aqueous Equilibria: Additional Aspects

- Buffered solutions
- The common-ion effect
- Acid-base titrations
- Solubility Equilibria
- Qualitative analysis for metallic elements

16. Chemical Thermodynamics

- Spontaneous processes
- Molecular interpretation of entropy
- Entropy changes in chemical reactions
- Gibbs free energy

17. Electrochemistry

- Voltaic cells
- Cell potentials under standard conditions
- Batteries and fuel cells
- Corrosion
- Electrolysis
- Balancing redox equations

18. Nuclear Chemistry

- Patterns of nuclear stability
- Energy changes in nuclear reactions
- Fission
- Radioactivity
- Rates of radioactive decay

19. Solids

- Metallic solids
- Metallic bonding
- Ionic solids
- Covalent-Network solids
- Polymeric solids

Quarter 4

20. Chemistry of the Nonmetals

- Periodic trends and chemical reactions
- The Noble Gases
- The Halogens
- Other group 5A elements

21. Transition Metals

- Transition metal complexes
- Common ligands in coordination chemistry
- Nomenclature and isomerism in coordination chemistry
- Crystal-Field Theory

22. Organic Chemistry

- General characteristics of organic molecules
- Introduction to hydrocarbons
- Alkenes, alkynes, and aromatic hydrocarbons

- Chirality in organic chemistry
- Bonding in organic compounds
- Organic synthesis reactions (synthesis of aspirin)
- Spectroscopy of organic compounds

23. Biochemistry

- The building blocks of life
- Amino acids
- Proteins and Enzymes
- Carbohydrates
- Lipids
- Nucleic acids (DNA, RNA, etc.)
- Catalytic RNA
- Chemical basis for diseases (focus on prions, cancer from genetic mutations, and neurodegenerative diseases)
- Chromatography

Evaluation:

Homework, Laboratory Reports, Quizzes, Tests, Exams

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AP Physics 1

Textbook

- *Holt Physics*
- by Serway, Faughn
- Holt, Rhinehart, Winston
- 2009

Prerequisites:

- Completion of Algebra II, Biology and Chemistry

Course Description:

This course will prepare a student for College Level Physics classes, whether as a major, or as a corequisite for a major in a related discipline (Chemistry, Biology, Math, etc.). Physics deals with matter and energy (every natural, created thing). This course will limit itself to the study of Classical (Newtonian) Mechanics (motion, forces & energy), basic Fluid Mechanics, basic Vibrations and Waves, and Electro-Magnetic Energy. If time allows, Optics, Atomic Physics and basic Relativity will also be considered. A large component of this course will be thinking about the world from a mathematical perspective and gaining facility in doing so. Thus, mathematical problem solving is emphasized over verbal conceptualization.

Course Goals:

1. Help students to gain an in-depth understanding of how thing work and how they work together.
2. Help students understand that how things work is basically guided by mathematical principles that can be discovered through research, effort and practice.
3. Enable students to successfully complete a college course in Physics.

Course Objectives:

The students will be able to:

1. Describe and predict the motion of an object given certain initial conditions.
2. Analyze the forces acting on an object in order to describe and predict its motion (or lack thereof).
3. Analyze the forces acting in a fluid in order to describe and predict its motion (or lack thereof).
4. Analyze the forces acting in an object (heat) in order to describe and predict its behavior.
5. Analyze and describe the nature and behavior of electromagnetic energy and its effect on things.
6. Understand that all is not as it appears, and that there is much yet to be discovered about the nature of matter.

Course sequence

- Kinematics
- Dynamics: Newton's Laws
- Impulse, Momentum and Conservation of momentum
- Work, Energy and Conservation of Energy

(Semester Exam)

- Circular Motion and Universal Law of gravitation
- Rotational Motion
  - Torque

  - Rotational Kinematics
  - Rotational Energy
  - Rotational dynamics
  - Conservation of angular momentum
- Simple Harmonic Motion
- Mechanical Waves and Sound
- Electrostatics
  - Electric Charge
  - Electric Force
  - Electric Fields
- DC circuits

(End ofAP Requirements. If time allows,)

- Light and Optics
- Fluid Mechanics,
- Thermodynamics
- Optics
- Atomic Physics
- Basic Relativity

Evaluation:

Each assignment will be given a point value. For example, an exam might be 200 points while a test might be 100 points. Homework or quizzes are usually 5-25 points. A student's quarter grade will be calculated by dividing the points earned by the points available to have been earned.

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Supplementary Materials:

Occasional Youtube videos will supplement class instruction.