

Belmont High School

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Science, Health, and Technology Department Courses

- Advanced Placement Biology
- Advanced Placement Chemistry
- Advanced Placement Environmental Science
- Advanced Placement Physics B
- Advanced Placement Psychology and Neuroanatomy Honors
- Anatomy and Physiology
- Astronomy
- Biology
- Chemistry
- Disease, Forensics and Technology
- Engineering Design and Technology
- Freshman Physics
- Honors Biology
- Honors Chemistry
- Honors Freshman Physics
- Honors Physics II
- Science Skills
- Wellness I
- Wellness II
- Zoology of Aquatic and Terrestrial Organisms

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Belmont High School Course Outline

Course Title: Advanced Placement Biology

Course Number: 546

Credits: 6

Course Type: Year

Department: Science

Course Description:

AP biology can be taken as a first year biology course. It covers all the topics taught in a one-year college general biology course. AP biology is taught at an accelerated pace, where the student is expected to be an independent learner and have excellent organizational skills. There is a major lab component requiring extensive lab reports and the maintenance of a student lab research notebook. All labs required by The College Board for an AP Biology course will be performed, as well as many other labs. This course has an extensive summer requirement including field research/lab report, reading and other assignments. Work will generally be assigned over most vacations.

Prerequisite: Chemistry & teacher recommendation

Resources:

Text: *Biology: The Unity and Diversity of Life*, Starr and Taggart, Thomson Brooks/Cole, 2006, Eleventh Edition.

Lab Manual: *The College Board AP Program Biology Lab Manual*, 2001

Topics:

Biochemistry
Cell Structure and Function
Photosynthesis and Cellular Respiration
Mitosis and Meiosis
Heredity
Molecular Genetics and Biotechnology
Evolution
Classification
Plant and Animal Diversity
Structure and Function of Plants and Animals
Ecology

Assessments:

Students will be assessed on their knowledge of biology concepts expected in the AP biology curriculum accepted by The College Board

Students will be assessed on their ability to:

Analyze information (CT)

Apply learning to new situations (CT)

Make connections between their learning, human society and the world (CZ)

Produce lab reports showing learning and applications of concepts (CT, CS)

Show intellectual rigor in pursuit of knowledge (RS)

Integrate concepts across the curriculum ((CT)

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Belmont High School Course Outline

Course Title: Advanced Placement Chemistry

Course Number: 524

Credits: 6

Course Type: Year

Department: Science

Course Description:

This is a second-year chemistry course designed to be equivalent of the general chemistry course usually taken during the first year of college. Students will be required to complete an extensive summer reading assignment, solve intense problems that combine multiple concepts, perform the rigorous laboratory experiments required by the College Board, keep a detailed laboratory notebook, and write college-level laboratory reports. This course is also designed to prepare students to take the AP Chemistry Exam, which is given by the College Board in May.

Prerequisites: Algebra 2 (past or concurrent) Strong performance in Chemistry or Honors Chemistry, and teacher recommendation

Resources:

Textbook: *Chemistry: the central science*, Theodore L. Brown, H. Eugene LeMay, Jr., Bruce E. Bursten, 7th ed. (1997); ISBN 0-13-533480-2; Library of Congress cat. QD31.2.B78 (1997)

Recommended: *Laboratory Experiments* (companion book to textbook), John H. Nelson, Kenneth C. Kemp.; ISBN 0-13-578360-7.

Recommended: *Pearson Education AP Test Prep Series: AP Chemistry*, Edward L. Waterman, to accompany *Chemistry: the Central Science*; ISBN 0-13-236721-1

Required purchase by student: Bound laboratory notebook with numbered duplicate pages

Topics:

- Atoms, Molecules & Ions, Stoichiometry: Calculations with Chemical Formulas and Eqs.
- Aqueous Reactions and Solution Stoichiometry
- Thermochemistry and Thermodynamics
- Electronic Structures of Atoms
- Periodic Properties of the Elements
- Chemical Bonding, Molecular Geometry and Bonding Theories
- Gases
- Intermolecular Forces, Liquids, and Solids
- Properties of Solutions
- Chemical Kinetics
- Chemical Equilibrium, Acid-Base Equilibrium, Aqueous Equilibrium
- Redox Reactions and Electrochemistry
- Nuclear Chemistry
- Organic Chemistry

Assessments:

- Students will be able to able to synthesize multiple topics from the above list to solve complex problems and complete labs. (CT, CS)
- Students will produce college level lab work and perform basic lab skills (RS, CS)
- Students will take the AP Chemistry exam

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Belmont High School Course Outline

Course Title: Advanced Placement Environmental Science

Course Number: 556

Credits: 6

Course Type: Year

Department: Science

Course Description:

The AP Environmental Science course is designed to be the equivalent of a one-semester, introductory college course in environmental science. This course offers a rigorous scientific approach to issues in environmental science. A strong lab component will be included. Clay Pit pond and many local environments will be studied. Topics of study include: interdependence of Earth's systems; fundamental principles of ecology; human population dynamics; renewable and nonrenewable resources; environmental quality and degradation; environment and society; trade-offs and decision making. Students will be expected to be independent learners, complete a summer text reading assignment, book review, and project work. Students will be prepared for the AP Environmental Science exam.

Prerequisites: Physics, Chemistry & Biology

Resources:

Text:

Miller, G. Tyler, Jr. Living in the Environment: Principles, Connections, and Solutions, 13th Edition. Thompson, Brooks/Cole

Supplemental Readings:

Pond and Brook: A guide to Nature in Freshwater Environments, Michael J. Caduto, Prentice – Hall

The Nature of Life: Readings in Biology, Published by the Great Books Foundation with support from the College of Humanities and Sciences

The Forgiving Air: Understanding Environmental Change, Richard C.J. Somerville, University of California Press

Environmental Issue: An Introduction to Sustainability, Robert L. McConnell and Daniel C. Abel, Prentice Hall.

Topics:

I EARTH SYSTEMS AND RESOURCES

II THE LIVING WORLD

III POPULATION

IV LAND AND WATER USE

V ENERGY RESOURCES AND CONSUMPTION

VI POLLUTION

VII GLOBAL CHANGE

Assessments:

- **Students are required to take the AP Exam in May.**
- **Students will be assessed on their knowledge of the application of biology, chemistry and physics principles to environmental issues.** (CS, CT)
- **Students will be assessed on their ability to:**

-Conduct and analyze the results from lab experiments (CT, RS)

-Communicate and debate ideas related to current environmental issues (CS)

-Recognize the roles of economics, politics, and society in environmental change (CZ)

-Integrate fields of physics, chemistry, and biology to understand the impact of humans on the environment (CZ)

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Belmont High School Course Outline

Course Title: Advanced Placement Physics B

Course Number: 538

Credits: 6

Course Type: Year

Department: Science

Course Description:

This course is designed for sophomores, juniors and seniors who have previously taken Physics. The course content follows the Advanced Placement guidelines and is structured to cover the topics addressed in a one semester introductory college physics course. Students who select this course should have advanced mathematical skills, independent learning habits, strong organizational skills and be prepared to work at an accelerated pace. Students will be prepared to take the AP Physics B Exam in May.

Prerequisite: Honors Freshman Physics and Teacher Recommendation

Resources:

PHYSICS: Principles with Applications (6th edition) by Douglas C. Giancoli. Prentice Hall, 2004.
HOLT PHYSICS by Raymond A. Serway & Jerry S. Faughn. Holt, Rhinehart and Winston, 1999

Topics:

AP Physics is a second year physics course structured to provide instruction in each of the five content areas outlined by the College Board for the physics B curriculum. Those five areas are:

- Newtonian Mechanics
- Fluid Mechanics and Thermal Physics
- Electricity and Magnetism
- Waves and Optics
- Atomic and Nuclear Physics

Since AP physics is a second year course, incoming students have had a solid introduction to most of Newtonian Mechanics and Electricity & Magnetism. Using this as a starting point, class begins by going through these two major topic areas in detail to review basic concepts and add more complex ones. Labs are chosen to supplement the lab work done the year before with follow up questions being the starting point for inquiry-based labs. The next content area is Fluids and Thermal Physics, followed by Waves and Optics. The course finishes with Atomic and Nuclear Physics.

Assessments:

Daily homework assignments are assigned and reviewed at the beginning of class most days. The development of critical thinking skills is stressed and homework is checked for completion and effort, with the focus on problem solving methods and conceptual understanding. Homework may consist of reading in the textbook, problems from the textbook, problems posted online or photocopied handouts. Students are encouraged to work in groups on their homework assignments outside of class so that peer teaching and peer coaching can occur. Occasionally a problem set consisting of previously released AP exam problems will be assigned, collected, and graded by the teacher. Only for these assessments is peer collaboration not allowed. Grades are determined by the total number of points accumulated by tests, quizzes, lab reports and homework assignments.

Upon completion of AP physics, students will be able to:

- Draw, interpret, calculate slopes, and explain data graphs from all the AP physics topics. (CT)
- Solve AP level physics problems using algebra and trigonometry. (CT)
- Solve AP level physics problems using equations, symbols, and constants (without numbers). (CT)
- Perform laboratory experiments, record data, and explain the results in written form. (CS, CT)
- Answer conceptual physics questions from all the AP physics topics. (CT)
- Perform well on the Advanced Placement Physics B test.
- Perform well on the SAT II subject exam in physics.

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Belmont High School Course Outline

Course Title: Advanced Placement Psychology and Neuroanatomy Honors

Course Number: 554

Credits: 10

Course Type: Year

Department: Science

Course Description:

This course is a collaborative effort between the social studies and science departments. Students are simultaneously enrolled in the two courses. This course is designed to be the equivalent of a one-semester, introductory college course in laboratory - based psychology. In the science course, students study the anatomical and physiological basis of behavior. This includes a comprehensive study of the anatomy and physiology of the human brain and nervous system. Students are prepared to successfully complete the AP Psychology exam.

Prerequisites: Chemistry & Biology

Resources:

Neuroscience: Exploring The Brain, Mark Bear et al., 2007, Lippincott Publishing.

Psychology in Action, K. Huffman, 2007, John Wiley & Sons, Inc.

Articles, podcasts, websites, labs, group projects provided by teacher

Topics:

- I. History of the Biological Approach to Neurobiology
- II. Research Methods in Neurobiology and Psychology
- III. Biological Basis of Behavior
- IV. Sensation and Perception
- V. Biological Basis of Motivation and Emotion
- VI. Physical Development of the Nervous System
- VII. Psychological Testing and Individual Differences
- VIII. Biological Treatment of Psychological Disorders

Assessments:

- Students will be assessed on their knowledge of Neurobiology concepts (CT)
- Students' critical thinking and communication skills are assessed through oral presentations, research projects and class discussions. (CT, CS)
- Students' problem solving skills are assessed through laboratory exercises, exam questions..... (CT)
- Students' citizenship is assessed through group projects and class participation. (CZ)

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Belmont High School Course Outline

Course Title: Honors Anatomy and Physiology

Course Number: 552

Credits: 6

Course Type: Year

Department: Science

Course Description:

This course is designed to cover the structure and function of the human body in depth. Both gross anatomy and microscopic anatomy are studied in detail. Dissections and hands-on based laboratory experiments are an integral part of the course. Students will not only gain an understanding of the organ systems of the human body but will also study diseases and disorders, preparing them for careers in health and medical fields. This class should prepare students to take an introductory college level anatomy and physiology course.

Prerequisite: Biology

Resources:

Human Anatomy and Physiology, Elaine Marieb et al., Pearson Publishing, 2007

Topics:

Overview to Anatomy and Physiology
Integumentary System
Skeletal System
Muscular System
Nervous System
Cardiovascular System
Digestive System
Respiratory System
Urinary System

Assessments:

Grades will be assessed by the following:
Homework and Classwork
Unit Tests and Quizzes
Projects (Ex. PowerPoint presentations, Case studies)
Midyear Exam
Final Exam

Students will be assessed on their ability to:

- Read and comprehend anatomical and physiological concepts by completing Homework and Classwork and by taking Chapter and Unit Tests. (CT)
- Learn and recall anatomical terminology pertinent to each organ system by completing in class dissections, homework, quizzes, and unit tests. (RS)
- Communicate anatomical and physiological information in a clear and concise manner either written or orally in the form of Projects and PowerPoint presentations. (CS)
- Research and report on diseases and disorders of the body in the form of research papers or poster presentations. (RS, CS)

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Belmont High School Course Outline

Course Title: Astronomy

Course Number: 539

Credits: 6

Course Type: Year

Department: Science

Course Description:

Astronomy is a science elective open to juniors and seniors that focuses on gaining an appreciation for the structure of the cosmos through direct observation, web resources, planetarium experiences, and classroom discussion. Topics include our view of the night sky, motions of heavenly bodies, the planets and moons of our solar system, views of the origin and evolution of the universe (cosmology), historical views of the cosmos, the search for extra solar planets, the possibility of extraterrestrial life, and the life cycles of stars, including black holes and supernovae. Students taking astronomy will learn how to use a telescope, how to locate objects in the sky, and may learn simple scotch mount astrophotography.

Prerequisite: Physics or Chemistry

Resources:

Text: Seeds, Michael A. Foundations of Astronomy: Eighth Edition

Other resources: Websites, planetarium, direct observations (naked eye, binoculars, telescope), physics and chemistry equipment

Topics:

- I. The Scale of the Cosmos
- II. Constellations
- III. The Earth-Moon-Sun System
- IV. Telescopes (Light and Optics)
- V. The Solar System
- VI. Properties of the Sun and Other Stars
- VII. The Interstellar Medium: Stellar birth
- VIII. Stellar Evolution
- IX. Special Cases: Neutron Stars and Black Holes
- X. Properties of the Milky Way and Other Galaxies
- XI. Special Cases: Active Galaxies and Quasars
- XII. Cosmology
- XIII. Life in the Universe and SETI?

Assessments:

Students will be assessed on their ability to:

Identify objects in the night sky (stars, constellations, planets, telescopic objects) (CT)

Use equipment (telescopes, binoculars) to make observations (RS)

Present and discuss current astronomical events and discoveries (CS)

Analyze real astronomical data to explain various phenomena (moon phases, expansion of the universe, orbits of planets, life cycles of stars)

Explain the relationships between planets, stars, galaxies, and the universe

Describe the major characteristics of each of the above items and describe how they were/are created, how they evolve, and what will happen to them in the future (CS)

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Belmont High School Course Outline

Course Title: Biology

Course Number: 540

Credits: 6

Course Type: Year

Department: Science

Course Description:

This biology survey course introduces students to basic biological concepts. Laboratories focus on basic skills such as microscopy, data collection, graphing and data interpretation. Knowledge of simple chemistry is assumed. Students will be prepared to successfully complete the Biology MCAS test.

Prerequisite: Physics and Chemistry

Resources:

textbook: Biology, Miller and Levine, Prentice-Hall, 2002

Topics:

Ecology
Biochemistry and Nutrition
Cell Structure
Cell Membranes and Cell Division
Photosynthesis and Cellular Respiration
Circulation
Excretion and the Respiratory System
DNA and Protein Synthesis
Genetics
Evolution

Assessments:

Students will be assessed on their ability to:

Describe and define biological terms and information (CS)

Apply new knowledge to novel situations (CT)

Interpret information in graphs, tables, and other visuals (CT)

Demonstrate correct use of laboratory equipment (CS)

Formulate conclusions based on laboratory data (CT)

Write clear responses to prompts (CS)

Understand how their new knowledge has relevance to human society and the world (CZ)

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Belmont High School Course Outline

Course Title:

Course Number:

Credits:

Course Type: Year

Department: Science

Course Description:

Students will learn about physical and chemical changes that occur in matter. Students will develop strong problem solving skills, be asked to think analytically and perform a variety of laboratory experiments. Topics covered include: matter, measurement, atomic structure, bonding, reactions and stoichiometry, periodicity, gases, solutions, acids and bases. Students will be prepared to successfully complete the Chemistry MCAS test.

Prerequisite: Physics

Resources:

Chemistry: Matter and Change. Thandi Buthelezi et al., Glencoe Publishing Co., 2008

Topics:

Unit 1: Scientific Method; Lab Safety; Measurement; Temperature; Matter; Mixtures;
Unit 2: Atomic Structure; Radioactivity; Electron Configurations; Periodic Table;
Unit 3: Chemical Formulae & Bonding; Molecular Shape & Polarity; Chemical Reactions & Equations;
Unit 4: The Mole & Stoichiometry;
Unit 5: Gases & Laws; Solids & Liquids;
Unit 6: Solutions; Chemical Equilibrium; Intro to reaction rates & Thermodynamics
Unit 7: Acids, Bases & Salts & their reactions;
Unit 8: Intro to Redox;

Assessments:

Students will be able to:

- take precise measurements, use scientific notation, perform math using dimensional analysis, (CS, CT)
- describe matter, its forms & parts, (CS)
- describe history of atomic theory, describe radioactivity, (CS)
- classify and write balanced nuclear and chemical equations, (CT)
- describe the set-up of an atom qualitatively and quantitatively, (CT)
- use the periodic table to identify, describe and predict properties of the elements, (CT)
- name, write formulae, determine shape and polarity of small inorganic compounds (CT)
- calculate % yield, limiting reactant and formulae using stoichiometry (CT)
- Describe, predict and calculate ideal gas behavior (CT)
- Describe solutions and chemical equilibrium, including LeChatelier's principle (CT)
- Differentiate between acid & base quantitatively and qualitatively (CT)
- Describe a redox process (CT)

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Belmont High School Course Outline

Course Title: Disease, Forensics and Technology

Course Number: 599

Credits: 6

Course Type: Year

Department: Science

Course Description:

This is a college preparatory course primarily for seniors and a limited number of eligible juniors. Students will learn about the nature, treatment and spread of diseases during the first semester. Publications, examples and simulations will be used to illustrate the principles. The second semester will concentrate on the study of forensics. A variety of investigative methods will be studied involving biological, chemical and physical principles. Student project work will be encouraged in the course. Students electing this course should have successfully completed one year of biology or with permission of the instructor if room permits.

Prerequisites: Biology or permission of the instructor

Resources:

Virus X Tracking the New Killer Plagues by Frank Ryan, M.D.

SHOOFLY PIE by Tim Downs

Topics:

1st Semester: Infectious Diseases

Viruses and Bacteria

History of Medicine

Blood and Immunity

2nd Semester: Forensics

Collecting evidence

Perform various lab tests (blood type, hair, finger prints, fibers, DNA, etc.)

Present crime scene evidence to class

Assessments:

Reading Journal

Video Journal

Homework and Classwork

Quizzes and Tests

Projects (Power Point Presentations and Case Studies)

Students should be able to:

Demonstrate science reading comprehension of the two resource books through Journal writing. (CS)

Improve their problem solving skills by analyzing case studies and solving a simulated crime. (CT)

Demonstrate clear and concise communication through: oral summary of current news articles, PowerPoints on Infectious Disease and the Simulated Crime Scene. (CS)

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Belmont High School Course Outline

Course Title: Engineering Design and Technology

Course Number: 739

Credits: 6

Course Type: Year

Department: Science

Course Description:

This course provides students with an introduction to Engineering and Technical fields. Students investigate various technologies through a series of hands-on investigations and building exercises. Completion of a major design/build project is required. Projects are structured around the Engineering Design Process for solving open-ended problems. Students learn about and use a wide variety of materials, tools, and technologies. Spatial skills, technical communication, creative design, building and drawing by hand, rather than through computer technologies, are areas of focus.

Units include: Technical drawing (in both 2D and 3D), mechanisms and electro-mechanical systems culminating in a class-wide "battling machine" competition, electricity and electronic circuits (practical wiring and components, not theory), renewable energy technologies (including solar cells, solar thermal, wind and fuel cells). Careers in design/engineering fields are explored as well as great inventors/inventions of the past.

Prerequisite: None

Resources:

Engineering the Future: Designing the World of the 21st Century,
National Center for Technological Literacy, Museum of Science,
Boston, 2006

Teacher developed materials

Topics:

- Introduction to Engineering Design
- Technical Drawing
- The Engineering Design Process and Manufacturing Processes
- History of Technology and Inventions
- Engineering and Technical Careers
- Mechanisms and Machines (Remotely Operated Vehicle Competition)
- Electricity and electronics basics
- Renewable Energy Technologies

Assessments:

Student assessments:

- Drawings and design documentation will be analyzed to assess a student's ability to communicate technical ideas in a creative and clear manner. (CS)
- Design prototypes will be assessed for precision, effectiveness and development of building skills and tool usage. (CT)
- A range of homework, projects, and quizzes, both objective and performance based, will be assessed for theoretical and practical understanding of the engineering/design process, problem solving ability, product research skills, (CT, RS)
- Contributions to collaborative discussions about the design process and technical careers will be assessed to determine student understanding. (CS, CZ)

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Belmont High School Course Outline

Course Title: Freshman Physics

Course Number: 531

Credits: 6

Course Type: Year

Department: Science

Course Description:

This is a conceptual Physics course that emphasizes concepts in physics which are seen in everyday life. One of the primary goals of the course is to help students understand the application of these concepts to problem-solving. A significant portion of the course will stress the development of conceptual understandings of physical laws and relationships. Topics addressed in this course include: mechanics, electricity, magnetism, heat, and waves. Students will be prepared to demonstrate proficiency on the Introductory Physics MCAS test.

Resources:

Conceptual Physics, by Paul Hewitt, Prentice Hall, 2002
Teacher developed material

Topics:

I. Mechanics

- Measurement and Scientific Method
- One-Dimensional Motion
- Two-Dimensional Motion
- Forces and Newton's Laws
- Circular Motion
- Momentum
- Energy & Power
- Heat

II. Electricity and Magnetism

- Electrostatics
- Electric Circuits
- Magnetism

III. Waves

- Vibrations and Periodic Motion
- Sound
- Electromagnetic Radiation and Light

Assessments:

- Students will be able to draw, interpret, and calculate the slopes of data graphs in the above topics (CT)
- Students will be able to solve problems using algebra in the above topics (CT)
- Students will be able to perform laboratory experiments, record data, and explain the results in written form. (RS, CS, CT)
- Students will be able to answer conceptual physics questions in the above topics (CS)
- Students will be take the state standardized Physics MCAS test. (CT)

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Belmont High School Course Outline

Course Title: Honors Biology

Course Number: 542

Credits: 6

Course Type: Year

Department: Science

Course Description:

The Honors Biology course is a comprehensive and in-depth study of Biology. Students are expected to have highly developed reading comprehension, organizational and study skills, and to work independently. Honors Biology includes the study of ecology, biochemistry, cell structure and function, photosynthesis and cellular respiration, genetics, evolution, and human organ systems. With some additional preparation, students should be prepared to take the SAT II Biology subject test. This course is for students in grade 11.

Prerequisite: Physics, Chemistry & Teacher Recommendation

Resources:

Biology: Concepts and Connections, Neil Campbell et al., Pearson Publishing Co., 2009.

Topics:

Biochemistry: Proteins, Nucleic Acids, Lipids, Carbohydrates

Cell Structure and Function

Photosynthesis and Cellular Respiration

Mitosis and Meiosis

Genetics: Inheritance, Chromosomes and Genes, Human Genetics, DNA, Gene Activity

Evolution: Darwin, Origin of Life, Human Evolution

Ecology: Populations, Communities, Ecosystems and Biospheres

Assessments:

Grades will be assessed by the following:

Homework and class work

Quizzes

Tests

Projects and Lab reports

Midyear Exam and Final Exam

Students will be assessed on their ability to:

Read and comprehend biological concepts by completing Homework and Class work and by taking Chapter and Unit Tests (CT)

Design and critically analyze the steps of a valid scientific experiment and present information in the form of Formal and Informal Lab Report.(CT, RS)

Communicate biological information in a clear and concise manner either written or orally in the form of Projects and presentations. (CS)

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Belmont High School Course Outline

Course Title: Honors Chemistry

Course Number: 522

Credits: 6

Course Type: Year

Department: Science

Course Description:

Students will learn about physical and chemical changes that occur in matter. Students will strengthen problem solving skills, be asked to think analytically and perform a variety of laboratory experiments. A strong mathematical preparation, good organizational skills, and the ability to work independently and proactively is recommended for the pace and intensity of problem solving in this course. Topics covered include: matter, measurement, atomic structure, bonding, reactions and stoichiometry, periodicity, gases, solutions, equilibrium, acids and bases, and electrochemistry. Students will be prepared to successfully complete the Chemistry MCAS test.

Prerequisites: Physics and Teacher Recommendation

Resources:

Chemistry: Matter and Change, Thandi Buthelezi, Glencoe Publishing Co., 2008

Topics:

Unit 1: Scientific Method; Lab Safety; Measurement; Temperature; Matter; Mixtures;
Unit 2: Atomic Structure; Radioactivity; Electron Configurations; Periodic Table;
Unit 3: Chemical Formulae & Bonding; Molecular Shape & Polarity; Chemical Reactions & Equations;
Unit 4: The Mole & Stoichiometry;
Unit 5: Gases & Laws; Solids & Liquids;
Unit 6: Solutions; Chemical Equilibrium; Intro to reaction rates & Thermodynamics
Unit 7: Acids, Bases & Salts & their reactions;
Unit 8: Intro to Redox;

Assessments:

Students will be able to:

- explain what causes uncertainty in measurements, use significant digits and scientific notation, perform math using dimensional analysis, (CT)
- describe matter, its forms & parts, (CT, CS)
- describe history of atomic theory, describe radioactivity, (CT, CS)
- classify and write balanced nuclear and chemical equations, predict products of chemical reactions (CT)
- describe the set-up of an atom qualitatively and quantitatively, ((CT, CS)
- use the periodic table to identify, describe and predict properties of the elements, (CT)
- name, write formulae, determine shape and polarity of small inorganic compounds (CT)
- Predict and calculate % yield, limiting reactant and formulae using stoichiometry (CT)
- Describe, predict and calculate ideal gas behavior (CS, CT)
- Differentiate, identify & describe intra- vs. intermolecular forces (CT)
- Describe solutions, concentration, colligative properties & chemical equilibrium, including LeChatelier's principle
- Differentiate between acid & base quantitatively and qualitatively (CT)
- Identify and describe a redox process (CT, CS)

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Belmont High School Course Outline

Course Title: Honors Freshman Physics

Course Number: 530

Credits: 6

Course Type: Year

Department: Science

Course Description:

This is an honors level course for ninth grade students with a strong interest and ability in science and mathematics. Most assignments, tests, and class work deal with problem solving using mathematical relationships and conceptual understanding. Students are expected to be comfortable with using algebra to solve problems and to work independently and be self motivated. The trigonometry needed to solve problems will be taught in the course. Topics include: mechanics, electricity, magnetism, heat, and waves. Students will be prepared to demonstrate proficiency on the Introductory Physics MCAS test.

Prerequisite: 8th Grade Teacher's Recommendation based on Science, Math and work skill readiness.

Resources:

Conceptual Physics, by Paul Hewitt, Prentice Hall, 2002
Teacher developed material

Topics:

I. Mechanics

- Measurement and Scientific Method
- One-Dimensional Motion
- Two-Dimensional Motion
- Forces and Newton's Laws
- Circular Motion
- Momentum
- Energy & Power
- Heat

II. Electricity and Magnetism

- Electrostatics
- Electric Circuits
- Magnetism

III. Waves

- Vibrations and Periodic Motion
- Sound
- Electromagnetic Radiation and Light

Assessments:

- Students will be able to draw, interpret, and calculate the slopes of data graphs in the above topics (CT)
- Students will be able to solve challenging problems using algebra and trigonometry in the above topics (CT)
- Students will be able to perform laboratory experiments, record data, and explain the results in written form. (CT, RS, CS)
- Students will be able to answer conceptual physics questions in the above topics (CS)
- Students will take the state standardized Physics MCAS test.

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Belmont High School Course Outline

Course Title: Honors Physics II

Course Number: 536

Credits: 6

Course Type: Year

Department: Science

Course Description:

This course includes a range of topics in physics. Selected first year topics are covered at a more complex level, and others physics topics are new. Some topics covered are static equilibrium, structures, advanced rotational motion, fluids, quantum mechanics and relativity. A key component of the course is that students are expected to be able to design and build objects that demonstrate an understanding of physics.

Prerequisite: First year physics and teacher recommendation

Resources:

PHYSICS: Principles with Applications (6th edition) by Douglas C. Giancoli. Prentice Hall, 2004.
HOLT PHYSICS by Raymond A. Serway & Jerry S. Faughn. Holt, Rhinehart and Winston, 1999

Topics:

- Forces (review)
 - Vectors, Newton's Laws, Pulleys
- Static Equilibrium (straw boom)
 - Equilibrium, Torque, Center of mass
- Structures (popsicle stick bridge)
 - Tension, Compression
 - Material science, Stress & strain
- Rotational Motion (trebuchet)
 - Angular variables, Rotational inertia
 - Conservation of energy
- Fluids (floating barge)
 - Density and pressure
 - Fluids and motion
- Modern Physics (research project)
 - Special Relativity
 - Quantum Mechanics
 - Nuclear Physics

Assessments:

- Students will be able to draw, interpret, and calculate the slopes of data graphs in the above topics. (CT, CS)
- Students will be able to solve problems using algebra and trigonometry in the above topics (CT)
- Students will be able to perform laboratory experiments, record data, and explain the results in written form. (CT, RS, CS)
- Students will be able to answer conceptual physics questions in the above topics (CT)
- Students will be able to design and build projects that reflect their understanding of the topics that they have studied. (CS, CT, RS)

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Belmont High School Course Outline

Course Title: Science Skills

Course Number: 533

Credits: 2

Course Type: Year

Department: Science

Course Description:

The MA Department of Education requires that students in the class of 2010 and after must pass one science MCAS exam in order to graduate from BHS. Students who receive a failing score on their Science MCAS exam in spring of any given year (Physics, Chemistry, Biology, or Technology Engineering), or who by other indicators present a high risk of not passing their science MCAS test, will be placed in this skills class to review and better prepare for the MCAS exam which will occur the following spring, barring other unavoidable schedule conflicts with required courses. Students will not enroll in this class on their own. They will be placed in it by the Science Director.

Prerequisite: Failing Science MCAS score and/or recommendation of Science Director

Resources:

Varies - former texts and review books

Topics:

Review of MCAS topics

Assessments:

Regular progress toward MCAS remediation (CT)

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Belmont High School

Course Outline

Course Title: Zoology of Aquatic and Terrestrial Organisms

Course Number: 548

Credits: 6

Course Type: Year

Department: Science

Course Description:

It is important to understand some fundamental differences between various animal groups. These differences govern the forms and life styles of animals, in water and on land. There are fundamental differences in how they capture energy, why and how they move, and how their bodies are shaped and grow. This course provides a general introduction to the evolutionary biology of aquatic and terrestrial animals. Students will study these animals in class, lab, and in the field. Students are expected to complete several dissections as a requirement for the course or a comparable experience

Prerequisite: Biology

Resources:

Text: Biology, by Sylvia S. Mader, 2004, 8th ed.

Additional Text Resources: The Diversity of Life, by E.O. Wilson, Wonderful Life by Stephen Jay Gould and Galapagos by Kurt Vonnegut.

Topics:

Introduction. What is an animal? How many kinds of animals are there? How did multicellular organisms evolve from unicellular organisms?

Phyla Porifera and Cnidaria. What were the first animals? How do simple muscles and nerves work?

Phyla Platyhelminthes, Nematoda and Annelida. What is bilateral symmetry? What are senses? How are tissue layers organized in animal bodies?

Overarching Theme: How can we compare and contrast "simple" animals to see how animal bodies are built?

Phylum Mollusca. Why are there so many kinds of mollusks? What are some 'firsts' that mollusks invented? What is animal intelligence?

Phylum Arthropoda. How did animal bodies change to adapt to the land? Why are arthropods so successful? How do social insect societies work?

Overarching Theme: How did these two groups become so successful? What role does body armor and appendage specialization play?

Phylum Echinodermata, and Invertebrate chordates. Why are echinoderms so closely related to chordates? What are invertebrate chordates?

Phylum Vertebrata: What are vertebrates and how did they get to land? How does an 'all-or-nothing' adaptation like flight evolve? Why are most mammals placentals?

Overarching Theme: How did vertebrates get to be so successful, when they basically followed the same pattern as the invertebrates?

Assessments:

Students will be assessed using a variety of traditional tools such as tests and quizzes, as well as more open-ended assignments and dissections. Students should demonstrate the ability to

- compare and contrast various forms of life (CT)
- identify patterns in evolutionary history (CT)
- design and perform a lab using the scientific method (CT, RS)
- write a concise and informative lab report communicating the results of a lab (CS)
- make careful observations of organism specimens and represent them in a drawing (CT, RS)
- apply the theory of evolution to explain the adaptations of animals (CT)
- plan a long term project, set benchmarks and meet these benchmarks in a timely fashion
- present the results or product of a project in public (CS)

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