

CHEMISTRY (continued)

Students will:

- Write and name ionic and molecular compounds using the Stock system
- Balance chemical equations and identify five types of chemical reactions
- Convert moles to grams, particles and volume (gases at STP) and the reverse
- Calculate stoichiometric relationships
- Calculate energies of reaction and solution
- Calculate actual, theoretical and percent yield
- Solve Charles', Boyle's combined and ideal gas law problems
- Explain the behavior of solids, liquids and gases using kinetic theory
- Calculate solution concentrations through molarity, molality and percent solution
- Calculate equilibrium constants (K_{eq}) and apply LeChatelier's Principle to equilibria *
- Explain the different acid-base theories
- Calculate pH and pOH of aqueous solutions
- Use K_a and K_b equilibrium constants to calculate pH of aqueous solutions*
- Explain activation energy and the factors that affect reaction rate
- Explain, identify and balance oxidation-reduction reactions*
- Contrast and construct voltaic and electrolytic cells*
- Calculate voltaic cell voltage using half cell potentials*

*Denotes Honors Chemistry



OUR MISSION

The Pentucket Regional School District seeks to inspire its students with a love of learning and to enable them to develop their academic potential and individual talents in an atmosphere that cultivates independent thinking. We will prepare our students to develop respect for others and to be responsible citizens of a global society.

OUR VALUES

Respect
Accountability
Integrity
Opportunity

Schools in the Pentucket Regional School District are dedicated to providing an up-to-date and challenging curriculum at each grade level. These curriculum brochures represent an overview of the comprehensive competencies at each grade level and in each subject and/or specialist area. Students and parents are able to review the rich curriculum offered in our District.

Pentucket Regional School District does not discriminate on the basis of race, color, religion, national origin, gender, sexual orientation, disability, or age.



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104 Church Street
Merrimac, MA 01860
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Grades Pre K-2

Helen R. Donaghue School
2 Union Street Extension
Merrimac, MA 01860
Tel: 978-346-8921/Fax: 978-346-7839
Grades 3-6

Dr. Elmer S. Bagnall School
253 School Street
Groveland, MA 01834
Tel: 978-372-8856/Fax: 978-521-8956
Grades Pre K-6

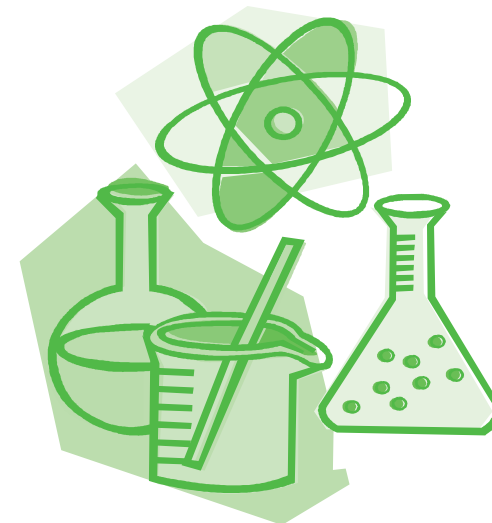
Dr. John C. Page School
694 Main Street
West Newbury, MA 01985
Tel: 978-363-2671/Fax: 978-363-2234
Grades Pre K-6

Pentucket Regional Middle School
20 Main Street
West Newbury, MA 01985
Tel: 978-363-2957/Fax: 978-363-2720
Grades 7-8

Pentucket Regional High School
24 Main Street
West Newbury, MA 01985
Tel: 978-363-5507/Fax: 978-363-2730
Grades 9-12

Central Services
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Visit us online @ www.prsd.org



SCIENCE CURRICULUM GRADES 9-12



PENTUCKET REGIONAL SCHOOL DISTRICT

Groveland
Merrimac
West Newbury

Pentucket ... a culture of continuous learning

INTEGRATED SCIENCE

Students will:

- Demonstrate an understanding of the difference among controls, independent variables and dependent variables
- Design labs to test Newton's laws
- Recognize that total momentum is conserved in collisions
- Distinguish among displacement, distance, velocity, speed, and acceleration
- Solve problems involving displacement, distance, velocity, speed, and constant acceleration
- Understand the conservation laws of physics
- Explain and calculate thermal energy
- Understand the relationship between temperature, volume and pressure of a gas
- Describe the periodic table of elements and use it to find information about an element
- Identify trends in the periodic table
- Explain how atoms combine to form compounds through both ionic and covalent bonding. Predict chemical formulas based on the number of valence electrons
- Know types of solutions, what affects the concentration of solutions, and why an understanding of solutions is important
- Identify and explain the factors that affect the rate of dissolving, such as, temperature, concentration, surface area, pressure, and mixing
- Distinguish between exothermic and endothermic reactions
- Describe how the chemical and physical properties of water are important to life
- Characterize and identify five types of chemical reactions using generalized formulas



INTEGRATED SCIENCE

(continued)

Students will:

- Relate hydrogen ion concentrations to the pH scale, and to acidic, basic, and neutral solutions
- Compare and contrast the strength of various common acids and bases such as vinegar, baking soda, soap, and citrus juice
- Investigate the role of carbon in the molecular diversity of compounds, distinguish between saturated and unsaturated hydrocarbons, and describe functional groups
- Compare and contrast the molecular structure of proteins, nucleic acids, carbohydrates and lipids, and describe their functions
- Trace the flow of energy through living systems
- Use a food web to identify and distinguish producers, consumers, and decomposers, and explain the transfer of energy through trophic levels
- Describe biotic and abiotic factors in an ecosystem
- Explain how compounds and nutrients cycle in ecosystems
- Compare ecological succession and climax
- Analyze changes in population size and identify current threats to biodiversity
- Use a food web to identify and distinguish producers, consumers, and decomposers, and explain the transfer of energy through trophic levels
- Explain how biotic and abiotic factors cycle through an ecosystem
- Examine a local ecosystem for changes that occur and analyze those changes



BIOLOGY

Students will:

- Demonstrate an understanding of the difference among controls, independent variables and dependent variables
- Use mathematical skills to measure with accuracy and precision, to use and make conversions with the metric system, and to report and analyze data
- Describe the basic molecular structures and primary functions of the four major categories of organic molecules
- Explain the role of enzymes in biochemical reactions
- Discuss the properties of water and the formation and breakdown of organic compounds
- Discuss the cell organelles and their functions
- Compare and contrast prokaryotic cells with eukaryotic cells, and animal cells with plant cells, viruses, and bacteria
- Explain the importance of photosynthesis and cellular respiration, including their formulas and relationship to each other
- Describe the processes of mitosis and meiosis, and their role in the cell cycle
- Analyze the structure and function of DNA and RNA
- Discuss the processes of replication, transcription, and translation
- Differentiate between dominant, recessive, co-dominant, incomplete dominant, polygenic, and sex-linked traits
- State Mendel's Laws of Segregation and Independent Assortment and apply them using Punnett Squares
- Explain the structure and functions of the major body systems
- Recognize that the body's systems interact to maintain homeostasis



BIOLOGY (continued)

Students will:

- Explore Darwin's Theory of Evolution by Natural Selection and discuss the supporting evidence
- Discuss the evolution of populations and describe the classification system used today



CHEMISTRY

Students will:

- Learn to work safely with chemicals and understand the MSDS (Material Safety Data Sheet)
- Explain molecular behavior of the four states of matter
- Know the properties and locations of the proton, neutron and electron
- Know the properties of alpha and beta particles and gamma rays and how to detect these forms of ionizing radiation
- Balance nuclear equations
- Explain how electron levels relate to spectra
- Write the electron configurations for the first 30 elements listed on the periodic table
- Explain how atomic number is used to sequence elements on the periodic table
- Locate metals, non-metals and metalloids on the periodic table
- Explain the periodic trends of elemental properties including electro negativity, ionization energy and electron affinity
- Explain bond types and their effect on the properties of simple substances

