

COMMUNITY UNIT SCHOOL DISTRICT 200

Science Curriculum Philosophy

Science instruction focuses on the development of inquiry, process and application skills across the grade levels. As the grade levels increase, the student will encounter ascending levels of difficulty and complexity. Students will additionally experience the variety of scientific disciplines as they progress through the secondary grades

PHYSICS/CHEMISTRY NINTH GRADE - “A” LEVEL

1. Subject Expectation (State Goal 11) **The student will understand the processes of scientific inquiry and technological design, investigate questions, conduct experiments, and solve problems.**

Essential Learning 1 (Learning Standard A)	Know and apply the concepts, principles, and processes of scientific inquiry (all units)
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| Critical Content | 11.A.4a
11.A.4b
11.A.4c

11.A.4d

11.A.4e
11.A.4f | <ul style="list-style-type: none"> a. formulate hypothesis referencing prior research and knowledge b. conduct controlled experiments or simulations to test hypothesis c. collect, organize, and analyze data accurately and precisely (metric system) d. apply statistical methods and analysis to the data to reach and support conclusions in a qualitative and quantitative manner using algebra, some geometry, graphical techniques and graph analysis e. formulate alternative hypothesis to explain results f. use available technology to report, display, and defend conclusions drawn from investigations <ul style="list-style-type: none"> • scientific calculators • lab equipment • presentation tools • research resources • computers |
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Essential Learning 2 (Learning Standard B)	Know and apply the concepts, principles, and processes of technological design (all units)
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| Critical Content | 11.B.4a

11.B.4b

11.B.4c | <ul style="list-style-type: none"> a. identify a technological design problem inherent in a commonly used product <ul style="list-style-type: none"> • design and analyze a lab experiment using technological tools b. propose and compare different solution designs to the design problem based upon given constraints including available tools, materials and time <ul style="list-style-type: none"> • use interactive software to investigate different simulations • explain lab data through group presentation c. develop working visualizations of the proposed solution designs (e.g., blueprints, schematics, flowcharts, cad-cam, animation) <ul style="list-style-type: none"> • concept mapping, white board presentations, presentation software and oral presentations |
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- 11.B.4d d. develop and test a prototype or simulation of the solution design using available materials, instruments and technology
- use interactive software to investigate different simulations
 - explain lab data through group presentation
- 11.B.4e e. evaluate the test results based on established criteria, note sources of error and recommend improvements
- use interactive software to investigate different simulations
 - explain lab data through group presentation
- 11.B.4f f. using available technology, report to an audience the relative success of the design based on the test results and criteria

**2. Subject Expectation
(State Goal 12)**

The student will understand the fundamental concepts, principles, and interconnections of life sciences, physical and earth/space sciences.

**Essential Learning 1
(Learning Standard C)**

**Know and apply concepts that describe properties of matter and energy and the interactions between them
(chemistry unit)**

- Critical Content 12.C.4a a. use kinetic theory and wave theory to explain energy transformations including:
- a range from qualitative up to quantitative studies
 - motion within solids, liquids and gases
- 12.C.4b b. analyze and explain the atomic and nuclear structure of matter using:
- atomic model
 - nuclear chemistry, including:
 - radioactive sources
 - transmutations
 - fission and fusion
 - periodic table and patterns within it
 - ions and valence electrons, including:
 - introduction to s, p, and d orbital shapes
 - isotopes
 - inner shell shielding
 - ionization energy
 - ionic and covalent naming
 - chemical interactions/solubility including
 - writing reactions, balancing equations and conservation of mass, including:
 - - atom inventory of formulas and equations
 - - recognize balanced and unbalanced equations
 - - balance simple equations
 - - change word equations to balanced chemical formulas
 - - use flow charts to identify one or more unknowns
 - qualitative and quantitative characteristics of acids and bases
 - introduction of pH scale and methods of pH measurement

Essential Learning 2 (Learning Standard D)	Know and apply concepts that describe force and motion and the principles that explain them (physics unit)
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- Critical Content 12.D.4a
- solve algebraically, and explain the motions in inertial and accelerated frames of reference
 - motion-displacement, speed, velocity, acceleration, free fall
 - solve algebraically, and explain the effect of force on motion in terms of inertia, unbalanced forces and opposing forces
 - Newton's three laws
 - projectile motion
 - circular motion
 - solve algebraically, and explain the effect of gravitational forces on objects
 - solve algebraically, and explain the conservation of momentum and impulse

Essential Learning 3	Investigate and predict concepts relating to energy including kinds of energy, energy transformations and conservation of energy. (physics unit)
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- Critical Content
- identify the different types of energy such as mechanical, nuclear, electrical and chemical
 - calculate and explain the relationship between kinetic and potential energy by identifying the variables that affect each
 - identify and explain energy transformations such as the relationship between kinetic and potential energy
 - solve algebraically, and explain the relationship between work and change in energy
 - analyze the conservation of energy within a system

Essential Learning 4	Investigate basic wave behavior and light (physics unit)
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- Critical Content
- predict and differentiate between transverse and compressional waves
 - define and calculate wavelength, frequency and amplitude of a given wave
 - recognize the electromagnetic spectrum and differentiate between frequency regions within the spectrum
 - investigate light properties including reflection, refraction, diffraction and interference
 - define and explain the properties of light that determine opaque, translucent, and transparent objects
 - predict, investigate and analyze the effect of light on color
 - distinguish between primary and secondary colors of light mixing versus pigment mixing

**3. Subject Expectation
(State Goal 13)**

The student will understand the relationships among science, technology, and society in historical and contemporary contexts.

Essential Learning 1 (Learning Standard A)	Know and apply the accepted practices of science (all units)
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| Critical Content | 13.A.4a | a. estimate and suggest ways to reduce the degree of risk involved in science activities <i>such as</i> <ul style="list-style-type: none">• safety contract• safety instruction• safety assessment |
| | 13.A.4b | b. assess the validity of lab results including sample size and potential sources of error as related to technology <i>such as</i> <ul style="list-style-type: none">• sample size• class sets of data• numbers of trials• awareness of limitations of measurement tools |
| | 13.A.4c | c. recognize that scientific knowledge may change with new information over time <ul style="list-style-type: none">• investigate the development of any scientific model |
| | 13.A.4d | d. explain how peer review helps to assure the accurate use of data and improves the scientific process <ul style="list-style-type: none">• homework groups• discuss, present, or debate a problem or question |

Essential Learning 2 (Learning Standard B)	Know and apply concepts that describe the interaction between science, technology, and society (all units)
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| Critical Content | 13.B.4a | a. recognize the impact of science and technology on society |
| | | b. recognize the contributions made by diverse people in science |
| | 13.B.4b | c. integrate scientific and technological career awareness throughout the units |