

**URBANDALE COMMUNITY SCHOOL DISTRICT
CURRICULUM FRAMEWORK OUTLINE**

SUBJECT: Science
COURSE TITLE: College AP Chemistry **2 Credits / 4 DMACC**
PREREQUISITES: B+ or better in both semesters of Algebra

COURSE DESCRIPTION:

Advanced Chemistry is a two-semester course with an emphasis on laboratory work and is designed for students who might be considering majoring in a science field. Some topics investigated include atomic structure, electron configuration of the atom, periodic law, chemical bonds, chemical composition, chemical equations, gas laws, solution process, ionization, acid-base reactions, salts, and hydrocarbons. A student must pass the 1st semester to enroll in the 2nd semester.

CONTENT STANDARDS:

In order that our students may achieve the maximum benefit from their talents and abilities, the students of Urbandale Community School District's Advanced Chemistry should be able to . . .

Content Standard I. Understand and apply the concepts of life science.

Not addressed in this course

Content Standard II. Understand and apply the concepts of earth and space science.

Not addressed in this course

Content Standard III. Understand and apply the concepts of physical science.

Benchmarks:

Investigate the methodology, problem solving and measurement skills of chemistry.
Investigate the inception, usefulness, classification and trends/patterns of the periodic table.
Distinguish the interaction of ions/atoms in the various types of bonding mechanisms.
Explain the interaction of elements and compounds with each other in chemical reactions to form new products.
Investigate the mole concept.
Summarize the stoichiometry of balanced chemical equations.
Investigate the stoichiometry of heat exchange in chemical reactions called thermochemistry.
Investigates the three gas laws and how they combine into the Ideal Gas Law.
Distinguish between the families of compounds called acids and bases.
Explain the importance of the element carbon and the study of organic Chemistry.
Investigate the decay of matter in nuclear chemistry.

Content Standard IV. Understand and apply the concepts of health science.

Not addressed in this course

Content Standard V. Understand and apply scientific method.

Benchmark:

Apply creative scientific thought processes.



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CURRICULUM FRAMEWORK OUTLINE**

SUBJECT: Science
COURSE TITLE: Advanced Chemistry
PREREQUISITES: B+ or better in both semesters of Algebra

**CONTENT STANDARDS AND COURSE BENCHMARKS WITH INDICATORS FOR:
ADVANCED CHEMISTRY:**

Standard I. Understand and apply the concepts of life science.
Not addressed in this course

Standard II. Understand and apply the concepts of earth and space science.
Not addressed in this course

**Standard III: Understands and applies the concepts of physical science. The students in
Advanced Chemistry should be able too...**

**Benchmark: Investigate the methodology, problem solving and measurement skills of
chemistry.**

Indicators: Define chemistry and differentiate among its traditional divisions. (D)
Describe the steps involved in the scientific method. (D)
Distinguish between a theory and a scientific law. (D)
Identify the characteristics of matter and substances and classifies matter as
homogeneous or heterogeneous. (A)
Differentiate among the three states of matter. (A)
Define physical properties and use to characterize substances. (D)
Explain the differences between elements and compounds. (A)
Identify chemical symbols of common elements. (A)
Differentiate between physical and chemical changes in matter. (D)
Apply the law of conservation of mass. (D)
Convert measurements to scientific notation. (A)
Determine the percent error of a measurement. (D)
Determine the number of significant figures in a measurement and in the result of
a calculation. (A)
List SI units of measurement and common SI prefixes. (A)
Calculate and understand a measurement of density by use of a graphing program.
(D)
Apply the techniques of dimensional analysis to a variety of conversion problems.
(A)

Assessments: District Assessment
Online problem set



CemPOMS
Dimensional analysis e-Lab
Safety quiz
Quiz 1-1 : Matter
Quiz 1-2 : Measurement
Quiz 1-3 : Dimensional Analysis
Written exam
Group lab practical : CSI 1
Semester exam

Benchmark: Investigate the inception, usefulness, classification and trends/patterns of the periodic table.

Indicators: Distinguish among protons, electrons, and neutrons in terms of relative mass and charge. (A)
Describe the structure of an atom, including the location of subatomic particles with respect to the nucleus. (A)
Use the atomic number and mass number of an element to find the numbers of protons, electrons and neutrons. (A)
Explain how isotopes differ and why the atomic masses of elements are not whole numbers. (D)
Calculate the average atomic mass of an element from isotopic data. (D)
Describe the origins of the periodic table. (A)
Identify the position of groups, periods and the transition metals in the periodic table. (A)
Summarize the development of atomic theory. (D)
Apply the aufbau principle, the Pauli exclusion principle and Hund's rule in writing electron configurations of elements. (A)
Explain the elements that are exceptions to the aufbau principle. (D)
Interpret periodic trends in atomic radii, ionic radii, ionization energies and electronegativities. (D)

Assessments: District Assessment
Online problem set
ChemPOMS
Online Mendeleev Project
Quiz 2-1 : Atomic Structure
Quiz 2-2 : Electron Configuration
Written exam
Group lab practical : CSI 2
Semester exam

Benchmark: Distinguish the interaction of ions/atoms in the various types of bonding mechanisms.

Indicators: Distinguish between ionic and molecular compounds. (A)



Define cations and anions and relates them to metals and nonmetals. (A)
Distinguish among chemical formulas, molecular formulas and formula units. (D)
Use the periodic table as a tool to determine ionic charges. (A)
Define a polyatomic ion and commits to memory a list of names, formulas and charges of 20 common polyatomic ions. (D)
Apply the rules for naming and writing formulas for binary and ternary ionic and molecular compounds. (A)
Use the periodic table to infer the number of valence electrons and draw its electron dot structure. (A)
Use electronegativities to classify a bond as nonpolar covalent, polar covalent or ionic. (D)

Assessments: District Assessment
Online problem set
ChemPOMS
Formulas and nomenclature e-Lab
Quiz 3-1 : Ionic Bonding
Quiz 3-2 : Covalent Bonding
Quiz 3-3 : Nomenclature
Polyatomic ion quiz
Written exam
Group lab practical : CSI 2
Semester exam

Benchmark: Explain the interaction of elements and compounds with each other in chemical reactions to form new products.

Indicators: Write balanced chemical equations describing chemical reactions using appropriate symbols. (A)
Identify and classifies reactions as one of the major five types and predicts products when only given the reactants. (A)
Write and balances net ionic equations. (D)
Use solubility rules to predict precipitate formation in double-replacement reactions. (D)

Assessments: District Assessment
Online problem set
ChemPOMS
Balancing equations e-Lab
Quiz 4-1 : Equations
Written exam
Group lab practical : CSI 2
Semester exam

Benchmark: Investigate the mole concept.



Indicators: Describe how Avogadro's number is related to a mole of any substance. (A)
Calculate the mass of a mole of any substance. (A)
Use the molar mass to convert between mass and moles of a substance. (A)
Use the mole to convert among measurements of mass, volume, and number of particles. (D)
Calculate the percent composition of a substance from its chemical formula. (D)
Derive the empirical formula and the molecular formula of a compound from experimental data. (D)

Assessments: District Assessment
Online problem set
ChemPOMS
Mole math e-Lab
Quiz 5-1 : The Mole
Written exam
Group lab practical : CSI 3
Semester exam

Benchmark: Summarize the stoichiometry of balanced chemical equations.

Indicators: Interpret balanced chemical equations in terms of interacting moles, representative particles, masses and gas volume at STP. (D)
Identify and use the limiting reagent in a reaction to calculate the maximum amount of product(s) produced and the amount of excess reagent. (A)
Calculate theoretical yield, actual yield, or percent yield given appropriate information. (D)

Assessments: District Assessment
Online problem set
ChemPOMS
Stoichiometry e-Lab
Quiz 6-1 : Stoichiometry
Written exam
Group lab practical : CSI 3
Semester exam

Benchmark: Investigate the stoichiometry of heat exchange in chemical reactions called thermochemistry.

Indicators: Describe the motion of gas particles according to the kinetic theory. (D)
Interpret gas pressure in terms of kinetic theory. (D)
Differentiate between the three states of matter. (D)
Understand and explain the heat exchanges in the five types of state changes. (A)
Distinguish between heat capacity and specific heat. (D)



Calculate heat changes in chemical and physical processes. (D)
Apply Hess's law of heat summation to find heat changes for chemical and physical processes. (D)
Calculate heat changes using standard heats of formation. (D)

Assessments: District Assessment
Online problem set
ChemPOMS
Thermochemistry-Lab
Quiz 7-1 : Heat Exchange
Written exam
Group lab practical : CSI 4
Semester exam

Benchmark: Investigates the three gas laws and how they combine into the Ideal Gas Law.

Indicators: Describe the properties of gases. (D)
Distinguish between the gas laws. (A)
Describe factors affecting gas pressure. (D)
Solve Ideal Gas Law problems. (A)

Assessments: District Assessment
Online problem set
ChemPOMS
Quiz 8-1 : Gas Laws
Written exam
Group lab practical : CSI 4
Semester exam

Benchmark: Distinguish between the families of compounds called acids and bases.

Indicators: List properties of acids and bases. (A)
Name acid and base from their formulas. (A)
Classify a solution's acidity or basicity based on its hydrogen-ion or hydroxide-ion concentration and converts these into values of pH or pOH. (A)
Understand the three classification theories of Arrhenius, Bronsted-Lowry, and Lewis. (D)
Calculate an acid dissociation constant from concentration and pH measurements. (D)
Perform acid-base titrations to calculate the concentration of an acid or a base. (D)

Assessments: District Assessment
Online problem set
ChemPOMS
Quiz 10-1 : Acids and Bases



Quiz 10-2 : Titrations
Written exam
Group lab practical : CSI 4
Semester exam

Benchmark: Explain the importance of the element carbon and the study of organic Chemistry.

Indicators: Describe the bonding in hydrocarbons. (A)
Distinguish between straight-chain and branched-chain alkanes. (A)
Distinguish between unsaturated and saturated hydrocarbons. (A)
Differentiate between the structures of alkanes, alkenes and alkynes. (A)
Identify common cyclic ring structures. (D)
Define a functional group and can list several examples. (A)
Understand and perform the nomenclature of organic compounds. (A)

Assessments: District Assessment
Online problem set
ChemPOMS
Quiz 11-1 : Hydrocarbons
Quiz 11-2 : Functional Groups
Written exam
Group lab practical : CSI 4
Semester exam

Benchmark: Investigate the decay of matter in nuclear chemistry.

Indicators: Understand the processes of radioactivity and radioactive decay. (A)
Characterize alpha, beta and gamma radiation in terms of composition and penetrating power. (A)
Use half-life information to determine the amount of radioisotope remaining. (A)
Distinguish between nuclear fusion and nuclear fission. (A)

Assessments: District Assessment
Online problem set
ChemPOMS
Quiz 12-1 : Nuclear
Written exam
Group lab practical : CSI 4
Semester exam

Standard IV. Understand and apply the concepts of health science.

Not addressed in this course

Standard V: Understand and apply the concepts of science inquiry. The students in



Advanced Chemistry should be able too...

Benchmark: Apply creative scientific thought processes.

Indicators: Ask questions and understands failure is necessary. (A)
Strategize independently and as a research team. (A)
Perform various chemical tests to determine unknowns given throughout the school year. (A)
Apply chemistry concepts to real world problems. (A)

Assessments: District Assessment
Mendeleev Project
SRR/DRR labs
Mole rocket construction
CSI 1-4

No student enrolled in the Urbandale Community School District shall be excluded from participation in, be denied the benefits of, or be subjected to discrimination in the District's programs on the basis of race, color, creed, sex, religion, marital status, ethnic background, national origin, disability, sexual orientation, gender identity, or socioeconomic background. The policy of the District shall be to provide educational programs and opportunities for students as needed on the basis of individual interests, values, abilities and potential.

