Course Title: Academic chemistry

Topic/Concept: Chapter 1

Time Allotment: 11 day

Unit Sequence: 1

Major Concepts to be learned:

1. Nature of chemistry
2. Nature of measurement

Expected Skills to be demonstrated:

1. Identify laboratory equipment found in the lab drawer
2. Use and apply the scientific method
3. Identify the nature of chemistry
4. Become familiar with the periodic table in terms of structure and organization

PA Standards/Anchors:

S11.A.1.1
S11.A.2.1
S11.A.2.2
S11.C.1.1

Eligible Content:

- S11.A.1.1.1-5
- S11.C.1.1.1,2
- S11.A.2.1.1,2
- S11.A.2.1.4,5
- S11.A.2.2.1

Instructional Strategies:

Coooperative groups
Problem solving activities
Lecture
Written work
Hands-on activity
Graphic organizers
Evaluating
Group discussion
Note Taking
Charting
Summarizing
Outlining
Graphic Calculators

Assessments:

- Test
- Labs
- Homework
- Quiz

Course Title: Academic chemistry

Topic/Concept: Chapter 2

Time Allotment: 5 days

Unit Sequence: 2

Major Concepts to be learned:

1. Factor label
2. Scientific notation calculations
3. Significant figure calculations

Expected Skills to be demonstrated:

1. Factor label
2. Scientific notation
3. Significant figures calculations

PA Standards/Anchors:

S11.A.2.1
S11.A.2.2

Eligible Content:

- S11.A.2.1.1
- S11.A.2.1.3
- S11.A.2.1.5
- S11.A.2.2.1

Instructional Strategies:

Coooperative groups
Lecture
Performance task
Written work
Note Taking
Charting
Outlining
Graphic Calculators
Problem solving activities
Group discussion
Research
Hands-on activity
Graphic organizers
Summarizing
Evaluating

Assessments:

- Test
- Lab

Course Title: Academic Chemistry

Topic/Concept: Chapter 3

Time Allotment: 11 days

Unit Sequence: 3

Major Concepts to be learned:

1. Atomic theory
2. Mole concept

Expected Skills to be demonstrated:

1. Conduct and interpret experiment dealing with physical properties.
2. Conduct and interpret experiment dealing with percent abundance.
3. Designate isotopes using both hyphen notation and nuclear symbol.
4. Define an atom according to various atomic theories.
5. Explain how atomic number and mass number apply to isotopes.
6. Define the mole using Avogadro's number, molar mass, volume and molarity.
7. Solve problems involving mass, volume, molarity, amount in moles, and number of atoms in an element or compound.
8. Compare the law of conservation of mass, law of definite proportions, and law of multiple proportions.
9. Give properties of electron, proton, and neutron.
10. Calculate the average atomic mass of an element.
11. Explain the five ideas of Dalton's atomic theory.

PA Standards/Anchors:

S11.A.1.1
S11.A.1.2
S11.A.2.1
S11.A.3.2
S11.A.3.3
S11.C.1.1

Eligible Content:

- S11.A.1.1.1,2
- S11.A.2.1.1-5
- S11.C.1.1.4
- S11.A.1.1.4,5
- S11.A.3.2.1-3
- S11.A.1.2.1
- S11.C.1.1.1,2

Instructional Strategies:

Coooperative groups
Evaluating
Performance task
Hands-on activity
Note Taking
Summarizing
Problem solving activities
Group discussion
Student Journals
Written work
Graphic organizers
Graphic Calculators
Charting
Lecture
Outlining

Assessments:

- Tests
- Labs

Course Title: Academic Chemistry

Topic/Concept: Chapter 22

Time Allotment: 10 days

Unit Sequence: 4

Major Concepts to be learned:

1. Nuclear Chemistry

Expected Skills to be demonstrated:

1. Calculate an element's binding energy when given its mass defect.
2. Explain how the number of nucleons in an atom affects its stability.
3. Identify the different kinds of nuclear decay and how they affect the nucleus
4. Define the terms half-life, decay series, parent nuclide, and daughter nuclide
5. Compare the penetrating ability of alpha, beta, and gamma particles
6. Distinguish between the terms roentgen and rem, and define each of them
7. Explain the factors affecting radiation dosage and relate radiation dosage to its effects on the human body
8. Define nuclear fission, chain reaction, and nuclear fusion and distinguish between them
9. Explain why nuclear reactions occur and know how to balance a nuclear equation
10. Conduct and interpret experiment dealing with percent abundance

PA Standards/Anchors:

S11.A.1.1	S11.A.3.2	S11.C.2.2
S11.A.1.3	S11.C.1.1	
S11.A.2.1	S11.C.2.1	

Eligible Content:

- S11.A.1.1.1-2,5
- S11.A.1.3.2
- S11.A.2.1.1-5
- S11.A.3.2.1
- S11.C.1.1-2
- S11.C.2.1.1
- S11.C.2.2.1
- S11.C.2.2.2
- S11.C.2.2.3

Instructional Strategies:

Coooperative groups	Problem solving activities
Lecture	Group discussion
Performance task	Written work
Hands-on activity	Note Taking
Graphic organizers	Charting
Summarizing	Outlining
Evaluating	Graphic Calculators

Assessments:

- Test
- Homework
- Lab
- Activities

Course Title: Academic Chemistry

Topic/Concept: Chapter 4

Time Allotment: 10 days

Unit Sequence: 5

Major Concepts to be learned:

1. Electron theory

Expected Skills to be demonstrated:

1. Discuss the mathematical relationship between the speed, wavelength, frequency and energy of electromagnetic radiation.
2. Discuss the dual wave-particle nature of light.
3. Trace the development of the quantum model of the atom.
4. List the four quantum numbers and describe their significance.
5. Relate quantum numbers to shell, sub-shell, orbital and suborbital (spin).
6. Write the electron configuration of given atoms in the following notations: Dot Diagrams, Electron configurations, orbital notations.
7. Identify the relationship of physical properties to electron configuration.

PA Standards/Anchors:

S11.A.1.1
S11.A.1.2
S11.A.2.1
S11.A.2.2
S11.A.3.2
S11.A.3.3
S11.C.1.1
S11.C.2.1

Eligible Content:

- S11.A.1.1.1-5
- S11.A.3.2.1-3
- S11.C.2.1.1
- S11.A.1.2.1
- S11.A.3.3.1-3
- S11.A.2.1.1-5
- S11.C.1.1.1,2
- S11.A.2.2.2
- S11.C.1.1.4

Instructional Strategies:

Coooperative groups
Lecture
Performance task
Hands-on activity
Note Taking
Charting
Outlining
Graphic Calculators
Problem solving activities
Group discussion
Written work
Oral presentation
Graphic organizers
Summarizing
Evaluating

Assessments:

- Test
- Labs

Course Title: Academic Chemistry

Topic/Concept: Chapter 5

Time Allotment: 7 days

Unit Sequence: 6

Major Concepts to be learned:

1. Periodic Table

Expected Skills to be demonstrated:

1. Explain the roles of Mendeleev and Mosely in thedevelopment of the periodic table.
2. Classify compounds into categories based on similar properties.
3. Demonstrate how the periodic law can be used to predict the physical and chemical properties of elements.
4. Describe the locations in the periodic table and the general properties of the alkali metals, alkaline-earth metals, the halogens, chalcogens and noble gases.
5. Define atomic and ionic radius, ionization energy, electron affinity, and electronegativity.
6. Compare and explain the periodic trends of atomic and ionic radii, ionization energy, electron affinity, and electronegativity.

PA Standards/Anchors:

S11.A.1.1
S11.A.2.1
S11.A.2.2
S11.A.3.2
S11.A.3.3
S11.C.1.1
S11.C.2.1

Eligible Content:

- S11.A.1.1.1,2
- S11.A.3.2.1-3
- S11.C.2.1.2,3
- S11.A.1.1.4
- S11.A.3.3.1,2
- S11.A.2.1.1-5
- S11.C.1.1.1,2
- S11.A.2.2.1
- S11.C.1.1.4

Instructional Strategies:

Coooperative groups
Lecture
Performance task
Written work
Oral presentation
Graphic organizers
Summarizing
Evaluating
Problem solving activities
Group discussion
Research
Hands-on activity
Note Taking
Charting
Outlining
Graphic Calculators

Assessments:

- Test
- Lab
- Activities

Course Title: Academic Chemistry

Topic/Concept: Chapter 6a

Time Allotment: 4days

Unit Sequence: 7

Major Concepts to be learned:

1. bonding

Expected Skills to be demonstrated:

1. Calculate the % ionic character of the bond using electronegativity differences between the atoms.
2. Explain why metals are good electrical conductors, malleable, ductile, and shiny.
3. Compare and contrast a chemical formula for a molecular compound with one for an ionic compound.
4. Define crystal lattice and lattice energy.
5. Describe the octet rule.
6. Explain the relationship between potential energy, distance between approaching atoms, bond length, and bond energy.
7. Write the dot diagrams and Lewis structure for compounds.
8. Explain why multiple covalent bonds occur.

PA Standards/Anchors:	Eligible Content:
S11.A.3.2 S11.C.1.1 S11.C.2.1	• S11.A.3.2.1-3 • S11.C.2.1.1-2 • S11.C.1.1.1-4

Instructional Strategies:		Assessments:
Coooperative groups	Problem solving activities	• Test • Lab
Lecture	Group discussion	
Performance task	Written work	
Hands-on activity	Note Taking	
Graphic organizer	Charting	
Summarizing	Outlining	
Evaluating	Graphic Calculators	

Course Title: Academic Chemistry

Topic/Concept: Chapter 6b

Time Allotment: 9 days

Unit Sequence: 8

Major Concepts to be learned:

1. Molecular Geometry
2. VSEPR
3. Hybridization

Expected Skills to be demonstrated:

1. Explain VSEPR theory.
2. Predict the shapes of molecules using VSEPR theory.
3. Explain how the shapes of molecules are described using hybridization theory.
4. Predict the shapes of molecules using hybridization theory
5. Describe dipole-dipole forces, hydrogen bonding, induced dipoles, and London dispersion forces.
6. Explain and predict molecular polarity.

PA Standards/Anchors:	Eligible Content:
S11.A.1.1 S11.A.3.2 S11.C.1.1	• S11.A.1.1.1,2 • S11.A.3.2.1-3 • S11.C.1.1.1-4

Instructional Strategies:		Assessments:
Coooperative groups	Problem solving activities	• Test
Lecture	Group discussion	• Labs
Performance task	Written work	• Activities
Hands-on activity	Note Taking	
Graphic organizers	Charting	
Summarizing	Outlining	
Evaluating	Graphic Calculators	

Course Title: Academic Chemistry

Topic/Concept: Chapter 7

Time Allotment: 9 days

Unit Sequence: 9

Major Concepts to be learned:

1. Ionic formulas
2. Binary covalent formulas
3. Formulas of acids
4. Nomenclature
5. Formula mass and mole concept

Expected Skills to be demonstrated:

1. Determine the formula of binary compounds.
2. Name binary compounds correctly.
3. Calculate the formula mass or molar mass for any given compound.
4. Use the mole concept to perform calculations dealing with mass, number of particles and volume.
5. Calculate the percent composition of a given chemical compound.
6. Determine the molecular formula from an empirical formula.
7. Determine the empirical formula for a compound from either a percent composition or mass composition.
8. Determine percent composition experimentally.

PA Standards/Anchors:	Eligible Content:
S11.A.2.1 S11.C.1.1	• S11.A.2.1.1-5 • S11.C.1.1.1-3

Instructional Strategies:		Assessments:
Coooperative groups Lecture Student Journals Hands-on activity Note Taking Charting Outlining Graphic Calculators	Problem solving activities Group discussion Written work Role Play Graphic organizers Summarizing Evaluating	• Test • Labs

Course Title: Academic Chemistry

Topic/Concept: Chapter 8

Time Allotment: 13 days

Unit Sequence: 10

Major Concepts to be learned:

1. Balancing chemical equations
2. Reaction types

Expected Skills to be demonstrated:

1. List five observations that suggest a chemical reaction has taken place.
2. Write a word equation and a formula equation for a given chemical reaction.
3. Balance a formula equation by inspection.
4. Define and give general equations for synthesis, decomposition, single-replacement, double-replacement, combustion reactions.
5. Classify a reaction as synthesis, decomposition, single-replacement, double-replacement or combustion.
6. List 3 types of synthesis, 6 types of decomposition, 4 types of single-replacement and 3 types of double replacement reactions.
7. Predict the products of simple reactions given the reactants.
8. Use the activity series to predict whether a given reaction will occur and what the products will be.
9. Identify and demonstrate various reaction types in a lab setting.

PA Standards/Anchors:

S11.A.1.1	S11.C.1.1
S11.A.2.1	S11.C.2.1
S11.A.3.3	

Eligible Content:

- S11.A.1.1.4
- S11.A.2.1.1-5
- S11.A.3.3.1
- S11.C.1.1.2
- S11.C.2.1.2

Instructional Strategies:

Coooperative groups	Problem solving activities
Lecture	Group discussion
Performance task	Written work
Hands-on activity	Note Taking
Graphic organizers	Charting
Summarizing	Outlining
Evaluating	Graphic Calculators

Assessments:

- Test
- Reaction
- Quizzes
- Labs

Course Title: Academic Chemistry

Topic/Concept: Chapter 9

Time Allotment: 12 days

Unit Sequence: 11

Major Concepts to be learned:

1. Stoichiometry
2. Limiting reactant
3. Percent yield

Expected Skills to be demonstrated:

1. Define stoichiometry.
2. Describe the importance of the mole ratio in stoichiometric calculations.
3. Write the mole ratio relating two substances in a chemical equation.
4. Calculate the amount in moles of a reactant or product from the amount of moles (or mass, volume or number of particles) of a different reactant or product.
5. Calculate the mass, volume or number of particles of a reactant or product from the amount in moles (or mass, volume or number of particles) of a different reactant or product.
6. Describe the method for determining which of two reactants is a limiting reactant.
7. Calculate the amount in moles, mass or volume of a product, given the amounts of two reactants, one of which is in excess.
8. Distinguish between theoretical yield, actual yield, and percent yield.
9. Calculate percent yield, given the actual yield and quantity of a reactant.
10. Demonstrate stoichiometric concepts in a lab setting.

PA Standards/Anchors:

S11.A.1.1
S11.A.1.3
S11.A.2.1
S11.C.1.1

Eligible Content:

- S11.A.1.1.4
- S11.A.2.1.1-5
- S11.A.1.3.2
- S11.C.1.1.2

Instructional Strategies:

Coooperative groups
Lecture
Performance task
Hands-on activity
Note Taking
Charting
Outlining
Graphic Calculators
Problem solving activities
Group discussion
Written work
Role Play
Graphic organizers
Summarizing
Evaluating

Assessments:

- Test
- Lab
- Activity

Course Title: Academic Chemistry

Topic/Concept: Chapters 10 and 11

Time Allotment: 12 days

Unit Sequence: 12

Major Concepts to be learned:

1. Kinetic Molecular Theory and gas laws
2. Ideal gas law
3. Ideal gas law and stoichiometry

Expected Skills to be demonstrated:

1. Define the kinetic molecular theory.
2. List the six components of the kinetic molecular theory of gases.
3. Explain the properties of gases in terms of the kinetic molecular theory of gases.
4. Contrast real and ideal gases.
5. Tell what causes pressure to be exerted on the earth.
6. Convert between different units of pressure.
7. Define standard temperature and pressure.
8. Use the gas laws to calculate missing information about a gas.
9. Solve problems involving collection of a gas over water and partial pressures.
10. Use the ideal gas law equation to predict changes in a gaseous system.
11. Apply stoichiometry and gas laws to chemical reactions involving gases.
12. Calculate density and formula mass of a gas given temperature, pressure, volume.
13. Experimentally calculate the universal gas constant R.

PA Standards/Anchors:

S11.A.1.1
S11.A.1.3
S11.A.2.1
S11.A.3.2
S11.C.1.1

Eligible Content:

- S11.A.1.1.4
- S11.A.1.3.1-2
- S11.A.2.1.1-5
- S11.A.3.2.1
- S11.C.1.1.5
- S11.C.1.1.2-5

Instructional Strategies:

Coooperative groups
Lecture
Performance task
Hands-on activity
Graphic organizers
Summarizing
Evaluating
Problem solving activities
Group discussion
Written work
Note Taking
Charting
Outlining
Graphic Calculators

Assessments:

- Test
- Labs

Course Title: Academic Chemistry

Topic/Concept: Chapter 17

Time Allotment: 7 days

Unit Sequence: 13

Major Concepts to be learned:

1. Thermodynamics

Expected Skills to be demonstrated:

1. Understand and work with enthalpy
2. q=mcT & calorimetry
3. Entropy
4. Free Energy
5. Hess Law
6. Collision theory

PA Standards/Anchors:

S11.A.1.3
S11.A.2.1
S11.A.2.2
S11.C.1.1
S11.C.2.1

Eligible Content:

- S11.A.1.3.1-2
- S11.A.2.1.1-5
- S11.A.2.2.1-2
- S11.C.1.1.6
- S11.C.2.1.2

Instructional Strategies:

Coooperative groups
Lecture
Performance task
Hands-on activity
Graphic organizers
Summarizing
Evaluating
Problem solving activities
Group discussion
Written work
Note Taking
Charting
Outlining
Graphic Calculators

Assessments:

- Tests
- Homework
- Labs
- Activities

Course Title: Academic Chemistry

Topic/Concept: Chapters 12, 13, 14 +

Time Allotment: 14 days

Unit Sequence: 14

Major Concepts to be learned:

1. Phase changes
2. Describing solutions
3. Properties and applications of solutions

Expected Skills to be demonstrated:

1. Interpret a phase diagram and identify characteristics such as phase changes triple point, critical pressure and critical temperature.
2. Define boiling point and freezing point.
3. Explain how we can get water to boil at room temperature.
4. Calculate the amount of heat energy absorbed or released when a substance changes state.
5. List and explain three factors that affect the rate at which a solid solute dissolves in a liquid solvent.
6. Explain solution equilibrium, and distinguish among saturated, unsaturated and supersaturated solutions.
7. Compare the affects of temperature and pressure on solubility.
8. Given concentrations of solutions, calculate the amount of solute in the solution.
9. Write equations for the dissolution of soluble ionic compounds in water.
10. Predict whether a precipitate will form when solutions of soluble ionic compounds are combined.
11. Distinguish between strong electrolytes and weak electrolytes.
12. Calculate freezing point depression and boiling point elevation of nonelectrolytic and electrolytic solutions.
13. Calculate formula mass using freezing point depression and boiling point evelations equations
14. Prepare a series of solutions and determine their absorbance of visible light.
15. Explain the meaning of like dissolves like.
16. Calculate molarity and molality.
17. Given volumes and concentrations, perform dilutions.
18. Write net ionic equations for precipitation reactions.

PA Standards/Anchors:

S11.A.1.3
S11.A.2.1
S11.A.2.2
S11.A.3.3
S11.C.1.1
S11.C.2.1

Eligible Content:

- S11.A.1.3.1-2
- S11.A.2.1.1-5
- S11.A.2.2.1-2
- S11.A.3.3.3
- S11.C.1.1.1-3
- S11.C.1.1.5
- S11.C.1.1.6
- S11.C.2.1.2

Instructional Strategies:

Coooperative groups
Lecture
Performance task
Hands-on activity
Graphic organizers
Summarizing
Evaluating
Problem solving activities
Group discussion
Written work
Note Taking
Charting
Outlining
Graphic Calculators

Assessments:

- Test
- Labs
- Activities

Course Title: Academic Chemistry

Topic/Concept: Chapters 15 & 16

Time Allotment: 7 days

Unit Sequence: 15

Major Concepts to be learned:

1. Acids and Bases

Expected Skills to be demonstrated:

1. Give properties of acids and bases
2. Name acids and bases
3. Explain the different theories of acids and bases
4. Define and relate conjugate acids and bases
5. Explain, balance and perform neutralization titrations
6. Explain and calculate pH for acids and bases and in titrations

PA Standards/Anchors:

S11.A.1.3
S11.A.2.1
S11.A.2.2
S11.A.3.3
S11.C.1.1

Eligible Content:

- S11.A.1.3.2
- S11.A.2.1.1-5
- S11.A.2.2.2
- S11.A.3.3.1,2
- S11.C.1.1.2,3

Instructional Strategies:

Coooperative groups
Lecture
Performance task
Note Taking
Charting
Outlining
Graphic Calculators
Problem solving activities
Group discussion
Hands-on activity
Graphic organizers
Summarizing
Evaluating

Assessments:

- Tests
- Worksheets
- Labs
- Activities

Course Title: Academic Chemistry

Topic/Concept: Chapter 18

Time Allotment: 8 days

Unit Sequence: 16

Major Concepts to be learned:

1. Equilibrium

Expected Skills to be demonstrated:

1. Define equilibrium constant and explain the nature of the equilibrium constant.
2. Write chemical equilibrium expressions and carry out calculations involving them.
3. Discuss the factors that disturb equilibrium.
4. Describe the common ion effect.
5. Explain the concept of acid-ionization constants and write equilibrium expressions using them.
6. Compare cation and anion hydrolysis.
7. Calculate solubility using solubility-product constants.
8. Demonstrate equilibrium concepts in a lab setting.

PA Standards/Anchors:	Eligible Content:
S11.A.2.1 S11.A.3.1 S11.C.1.1	• S11.A.2.1.1-5 • S11.A.3.1.2-3 • S11.C.1.1.2,6

Instructional Strategies:		Assessments:
Coooperative groups	Problem solving activities	• Test
Lecture	Group discussion	• Labs
Performance task	Written work	• Homework
Hands-on activity	Note Taking	• Activities
Graphic organizers	Charting	
Summarizing	Outlining	
Evaluating	Graphic Calculators	

Course Title: Academic Chemistry **Topic/Concept:** Chapter 19

Time Allotment: 8 days **Unit Sequence:** 17

Major Concepts to be learned:

1. Redox
2. Electrochemistry

Expected Skills to be demonstrated:

1. Assign oxidation numbers to all species in a chemical formula.
2. Define oxidation and reduction.
3. Identify oxidation and reduction reactions as well as oxidizing and reducing agents.
4. Balance redox equations.
5. Describe the nature of voltaic cells and electrolytic cells.
6. Calculate cell potentials from a table of standard electrode potentials.
7. Demonstrate various types of electrochemical cells in a lab setting.

PA Standards/Anchors:

S11.A.1.3
S11.A.2.1
S11.C.1.1
S11.C.2.1

Eligible Content:

- S11.A.1.3.1-2
- S11.A.2.1.1-5
- S11.C.1.1.1-3
- S11.C.2.1.2

Instructional Strategies:

Coooperative groups
Lecture
Performance task
Note Taking
Charting
Outlining
Graphic Calculators
Problem solving activities
Group discussion
Hands-on activity
Graphic organizers
Summarizing
Evaluating

Assessments:

- Test
- Homework
- Labs
- Activities

Course Title: Academic Chemistry

Topic/Concept: Chapters 20 and 21

Time Allotment: 5 days

Unit Sequence: 18

Major Concepts to be learned:

1. Organic Chemistry

Expected Skills to be demonstrated:

1. Explain how the structure and bonding of carbon atoms lead to the diversity and number of organic compounds.
2. Construct structural and molecular formulas for organic compounds
3. Compare structural and geometric isomers
4. Name and write formulas for saturated and unsaturated hydrocarbons and explain how the structure of these compounds is related to their properties.
5. Define, identify and name functional groups and compounds that contain functional groups.
6. Relate the properties of compound to its functional groups.
7. Distinguish between the different types of organic reactions.
8. Explain the relationship between monomers and polymers.

PA Standards/Anchors:	Eligible Content:
S11.A.2.1 S11.C.1.1	• S11.A.2.1.1-5 • S11.C.1.1.1-4

Instructional Strategies:		Assessments:
Coooperative groups	Problem solving activities	• Test
Lecture	Group discussion	• Homework
Performance task	Written work	• Labs
Hands-on activity	Note Taking	• Activities
Graphic organizers	Charting	
Summarizing	Outlining	
Evaluating	Graphic Calculators	