Unit 1

| **UNIT Title/Focus** | **Introduction and Review** | | **TIME OF YEAR/LENGTH**  *(E.G. Oct-Nov/3 weeks)* | **September/ 1-1.5 weeks** | |
| --- | --- | --- | --- | --- | --- |
| **DRIVING QUESTION(S)** | **What are the rules for covalent bonding in molecules? How can we determine the formula of a compound from empirical data?**  **How do molecules share electrons in covalent bonds? What are the different types of acids and what are their characteristics?**  **How can we draw accurate structures of covalently bonded molecules?** | | | | |
| **CONTENT VOCABULARY** | **Organic, vitalism, isotopes, orbitals, electron density, valence electrons, Hund’s rule, octet rule, ionic bond, covalent bonding, Lewis structures, lone pair, single bond, double bond, triple bond, valence, nonpolar covalent bond, polar covalent bond, dipole moment, electronegativity, resonance structures, structural formula, line angle formula, empirical and molecular formula, acid, base, Arrhenius theory, Bronsted-Lowry theory, conjugate acid and base, Lewis Acid, Lewis Base, electrophile, nucleophile, curved arrow formalism** | | | | |
| **TOPIC** | **ELIGIBLE CONTENT/**  **STANDARDS** | **OBJECTIVES** | | **ASSESSMENT** | **RESOURCES** |
| Lewis structures and Bonding Concepts | Core  CHEM.B.1.4.2  CHEM.B.1.3.3  CHEM.B.1.3.2  Reading/Writing  R: CC.3.5.11-12.I.  R: CC.3.5.11-12.D | Students will be able to:   * Define and differentiate between ionic and covalent bonds * Classify Bonds according to electronegativity differences * State the octet rule and use it to write Lewis Structures * Draw Lewis structures for polyatomic ions or molecules containing single or multiple bonds | | Chapter Exam  Quiz | Textbook  Projector |
| Acids and Bases | R: CC.3.5.11-12.I.  CC.3.5.11-12.D.  CC.3.5.11-12.C. | Students will be able to:   * Define and give examples of a traditional acid and base, a Bronsted-Lowry acid and base, and a Lewis acid and base * Explain the difference between strong and weak acids and strong and weak bases, and give an example of each * Define and recognize traditional, Bronsted-Lowry, and Lewis acid-base reactions | | Chapter Exam  Quiz | Textbook  Projector |

Unit 2

| **UNIT Title/Focus** | **Structure and Properties of Organic Molecules** | | **TIME OF YEAR/LENGTH**  *(E.G. Oct-Nov/3 weeks)* | **September/ 1-1.5 weeks** | |
| --- | --- | --- | --- | --- | --- |
| **DRIVING QUESTION(S)** | **What are the structural elements of organic compounds that contribute to their properties**  **What are the common organic functional groups?** | | | | |
| **CONTENT VOCABULARY** | **Wave function, node, molecular orbitals, hybrid atomic orbitals, bonding molecular orbital, sigma bond, antibonding molecular orbital, double bond, VSEPR theory, triple bond, constitutional isomers, stereoisomers, stereochemistry, cis-trans isomers, geometric isomers, bond dipole moment, molecular dipole momemt, dipole-dipole force, London dispersion force, hydrogen bonding, hydrocarbons, alkanes, cycloalkanes, functional group, alkyl group, alkenes, alkynes, aromatic hydrocarbons, alcohols, hydroxyl group, ethers, aldehydes, ketones, carbonyl group, carboxylic acids, carboxyl group, acid chlorides, esters, amides, amines, nitriles, cyano group** | | | | |
| **TOPIC** | **ELIGIBLE CONTENT/**  **STANDARDS** | **OBJECTIVES** | | **ASSESSMENT** | **RESOURCES** |
| VSEPR and bonding theory | C: CHEM.A.1.2.5:  R:CC.3.5.11-12.I.  R: CC.3.5.11-12.D | Students will be able to:   * Explain the postulates of VSEPR theory * Predict the shapes and geometries of molecules and polyatomic ions using VSEPR theory * Explain how molecular shape is accounted for by hybridization * Determine if a molecule is polar or nonpolar | | Chapter Exam  Quiz  Lab | Textbook  Projector  Molecular Models |
| Intermolecular forces | R: CC.3.5.11-12.D  CC.3.5.11-12.C. | Students will be able to:   * Describe dispersion forces, dipole forces, and hydrogen bonding * Explain the effects of intermolecular forces based on their relative strengths * Use intermolecular forces to explain observable phenomenon in various atoms and molecules | | Chapter Exam  Quiz | Textbook  Projector |
| Functional groups | R: CC.3.5.11-12.D | Students will be able to:   * Write the name of common organic functional groups from their formulas and the formulas of common functional groups from their names * Draw molecules with specified numbers of atoms and functional groups | | Chapter Exam  Quiz | Textbook  Projector |

Unit 3

| **UNIT Title/Focus** | Alkanes: Structure and Properties | | **TIME OF YEAR/LENGTH**  *(E.G. Oct-Nov/3 weeks)* | **September-October/ 1-1.5 weeks** | |
| --- | --- | --- | --- | --- | --- |
| **DRIVING QUESTION(S)** | **How are alkanes named from their formulas? How are they given formulas from their names**  **What are some common alkanes?**  **What are the mechanisms by which alkanes are synthesized and how do they participate in reactions?** | | | | |
| **CONTENT VOCABULARY** | **Alkanes, saturated, homologs, common names, IUPAC names, substituents, degree of alkyl substitution, hydrophobic, octane number, kerosene, catalytic cracking, paraffins, combustion, halogenation, conformations, Newman projections, dihedral angle, eclipsed conformation, staggered conformation, skew conformation, torsional strain, torsional energy, totally eclipsed, anti, gauche, steric hindrance, cycloalkanes, , ci, trans, geometric isomers, angle strain, ring strain, torsional strain, chair conformation, boat conformation, twist-boat, half-chair, axial bonds, equatorial bonds, chair-chair interconversion, fused rings, bridged rings, spirocyclic compounds,** | | | | |
| **TOPIC** | **ELIGIBLE CONTENT/**  **STANDARDS** | **OBJECTIVES** | | **ASSESSMENT** | **RESOURCES** |
| Nomenclature , structure, and properties of alkanes | Core  Reading/Writing  R: CC.3.5.11-12.D | Students will be able to write names of alkanes from their formulas and formulas from their names  Students will be able to describe the basic structure of alkanes  Students will be able to identify common properties of alkanes | | Quiz  Test | Textbook  Molecular Models |
| Reactions of alkanes | R: CC.3.5.11-12.D  W: CC.3.6.11-12.B: | Students will be able to describe mechanisms for the formation of alkanes  Students will be able to devise synthesis processes for alkane formation | | Quiz  Test  Lab | Textbook  Molecular Models |
| Structure and conformations of alkanes and cycloialkanes | R: CC.3.5.11-12.D | Students will be able to draw different structures of alkanes and cyclo alkanes  Students will be able to explain the different structures of cycloalkanes in terms of energy, conformation, and structural strain | | Quiz  Test | Textbook  Molecular models |

Unit 4

| **UNIT Title/Focus** | Organic Chemical Reactions | | **TIME OF YEAR/LENGTH**  *(E.G. Oct-Nov/3 weeks)* | **October/ 1.5-2 weeks** | |
| --- | --- | --- | --- | --- | --- |
| **DRIVING QUESTION(S)** | **What are the general rules for determining the steps in which a chemical reaction takes place?**  **How can the rate of a chemical reaction be expressed?**  **What is a free radical reaction mechanism and how is it initiated, propagated, and terminated?** | | | | |
| **CONTENT VOCABULARY** | **Mechanism, chain reaction, reactive intermediate, free radicals, termination reaction, equilibrium, equilibrium constant, Gibbs free energy, change in enthalpy, exothermic, endothermic, entropy, bond dissociation enthalpy, homolytically, heterolytically, hemolytic cleavage, heterolytic cleavage, rate law, rate constant, order, activation energy, transition state, intermediate, catalyst, reaction coordinate, rate-determining step, Hammond postulate, carbocation, resonance stabilization, carbanion, carbenes,** | | | | |
| **TOPIC** | **ELIGIBLE CONTENT/**  **STANDARDS** | **OBJECTIVES** | | **ASSESSMENT** | **RESOURCES** |
| Chain reactions | Core  Reading/Writing  R: CC.3.5.11-12.D  W: CC.3.6.11-12.B:  **** | Students will be able to  - Identify the initiation, propagation, and termination  steps of chain reactions   * Write mechanisms for simple chain reactions | | Chapter Exam  Quiz | Textbook  Projector |
| Rates and mechanisms | R: CC.3.5.11-12.D  W: CC.3.6.11-12.B: | Students will be able to:   * Describe chemical reactions in terms of rate and energy requirements * Interpret reaction profile graphs * Apply resonance stabilization concepts to reaction mechanisms | | Chapter Exam  Quiz | Textbook  Projector |

Unit 5:

| **UNIT Title/Focus** | Stereochemistry | | **TIME OF YEAR/LENGTH**  *(E.G. Oct-Nov/3 weeks)* | **October-November/ 2-2.5 weeks** | |
| --- | --- | --- | --- | --- | --- |
| **DRIVING QUESTION(S)** | **What is stereochemistry and how is it important to organic chemistry?**  **How are sterochemical properties measured?**  **What do stereochemical properties tell is about similarities, differences, and reactivity of organic compounds?** | | | | |
| **CONTENT VOCABULARY** | **Absolute configuration, achiral, allenes, chiral carbon atom, chiral, chirality center, chiral probe, cis, cis-trans isomers, configurations, configurational isomers, conformaers, constitutional isomers, dextrorotory, diastereomers, enantiomeric excess, fischer projection, internal mirror plane, isomers, levorotatory, meso compound, optical isomers, optical activity, optical purity, plane-polarized light, polarimeter, racemic mixture, relative configuration, resolution, resolving agent, 2n rule, specific rotation, stereocenter, stereochemistry, stereoisomers, structural isomers, superimposable, trans** | | | | |
| **TOPIC** | **ELIGIBLE CONTENT/**  **STANDARDS** | **OBJECTIVES** | | **ASSESSMENT** | **RESOURCES** |
| Stereochemical configurations | Core  CHEM.3.1.12.A5  Reading/Writing  R: CC.3.5.11-12.D | Students will be able to   * Define common stereochemical terms * Apply stereochemical concepts to common structures * Explain optical isomers and optical purity and use laboratory equipment to analyze optical properties of organic compounds | | Chapter Exam  Quiz | Textbook  Projector  Molecular Models |
| Light and stereoisomers | R: CC.3.5.11-12.D | Students will be able to:   * Identify stereocenters in organic compounds * Identify and draw structures for stereoisomers of organic compounds * Discuss similarities and differences of optical isomers | | Chapter Exam  Quiz | Textbook  Projector  Molecular Models |

Unit 6:

| **UNIT Title/Focus** | Alkyl Halides | **TIME OF YEAR/LENGTH**  *(E.G. Oct-Nov/3 weeks)* | **November/ 2 weeks** | |
| --- | --- | --- | --- | --- |
| **DRIVING QUESTION(S)** | **How are alkyl halides named from their formulas? How are they given formulas from their names**  **What are some common alkyl halides?**  **What are the mechanisms by which alkyl halides are synthesized and how do they participate in reactions?** | | | |
| **CONTENT VOCABULARY** | **Acid, alkyl halide, allylic, allylic halogenation, allylic shift, anti, anti-coplanar, syn-coplanar, aprotic solvent, aryl halide, base, concerted reaction, dehydrohalogenation, electrophile, electrophilicity, elimination, E1 reaction, E2 reaction, freons, germinal dihalide, halogen exchange reaction, hydride shift, hydroxylic solvent, Walden inversion, back-side attack, leaving group, methyl shift, nucleophile, nucleophilic substitution, organic synthesis, polarizable, primary, secondary,tertiary halide, protic solvent, racemization, reagent, rearrangement, retention of configuration, solvolysis, stereocenter, stereospecific reaction,, steric hindrance, substitution, SN2, SN1, substrate, syn, transition state, vicinal dihalide, vinyl halide, Walden inversion, Zaitsev’s rule** | | | |
| **TOPIC** | **ELIGIBLE CONTENT/**  **STANDARDS** | **OBJECTIVES** | **ASSESSMENT** | **RESOURCES** |
| Nomenclature, uses, structure, and properties of alkyl halides | Core  CHEM.3.1.12.A5  Reading/Writing  R: CC.3.5.11-12.D | Students will be able to   * Name alkyl halides given their formulas * Write formulas of alkyl halides given their names. * Discuss properties of common alkyl halides in terms of usefulness and in comparison to other compounds | Chapter Exam  Quiz | Textbook  Projector  Molecular Models |
| Types of reaction mechanism and reactions of alkyl halides | C: CHEM.3.1.12.A5  R: CC.3.5.11-12.D  W: CC.3.6.11-12.B: | Students will be able to   * List and describe the general format of typical reaction mechanisms * Draw reaction mechanisms for the formation and reaction of alkyl halides | Chapter Exam  Quiz  Lab | Textbook  Projector  Molecular Models |
| Stereochemistry and alkyl halides | C: CHEM.3.1.12.A5  R: CC.3.5.11-12.D | Students will be able to   * Describe alkyl halide properties in terms of their stereochemistry * Explain stereochemical effects on structure of alkyl halides | Chapter Exam  Quiz | Textbook  Projector  Molecular Models |

Unit 7:

| **UNIT Title/Focus** | Alkenes: Structure, Synthesis, and Reactions | | **TIME OF YEAR/LENGTH**  *(E.G. Oct-Nov/3 weeks)* | **November-December/ 2 weeks** | |
| --- | --- | --- | --- | --- | --- |
| **DRIVING QUESTION(S)** | **How are alkenes named from their formulas? How are they given formulas from their names**  **What are some common alkenes?**  **What are the mechanisms by which alkenes are synthesized and how do they participate in reactions?** | | | | |
| **CONTENT VOCABULARY** | **Alkene, olefin, allyl group, Bredt’s rule, bicyclic, bridged bicyclic, bridgehead carbons, catalytic cracking, cis-trans isomers, Z, E, dehalogenation, dehydration, dehydrogenation, dehydrohalogenation, double-bond isomers, element of unsaturation, germinal dihalide, heteroatom, Hofmann product, hydrogenation, polymer, monomer, addition polymer, saturated, stereospecific reaction, trans-diaxial, unsaturated, vicinal dihalide, vinyl group, Zaitsev elimination, Zaitsev product,addition, anti-addition, addition polymer, alkoxy group, alkoxymercuration, alpha elimination, anionic polymerization, asymmetric induction, beta elimination, carbine, cationic polymerization, demercuration, epoxide, glycol, halogenation, homo/heterogeneous catalysts, hydration, Markovnikov’s rule, monomer, oxidative cleavage, oxymercuration, polymer, stereospecific reaction** | | | | |
| **TOPIC** | **ELIGIBLE CONTENT/**  **STANDARDS** | **OBJECTIVES** | | **ASSESSMENT** | **RESOURCES** |
| Nomenclature and properties of alkenes | Core  CHEM.3.1.12.A5  Reading/Writing  R: CC.3.5.11-12.D | Students will be able to   * Name alkenes given their formulas * Write formulas of alkenes given their names. * Discuss properties of common alkenes in terms of real world applications and in relation to other compounds | | Chapter Exam  Quiz | Textbook  Projector  Molecular Models |
| Reactions of alkenes | C: CHEM.3.1.12.A5  R: CC.3.5.11-12.D  W: CC.3.6.11-12.B: | Students will be able to   * Identify the reagent required to perform common synthetic reactions involving alkenes * Write detailed mechanisms for reactions involving alkenes * Write multi-setp synthesis processes involving alkenes * Explain how certain reagents can be used to test for the presence of alkenes | | Chapter Exam  Quiz | Textbook  Projector  Molecular Models |

Unit 8:

| **UNIT Title/Focus** | **Alkynes** | | **TIME OF YEAR/LENGTH**  *(E.G. Oct-Nov/3 weeks)* | **December/ 1-1.5 weeks** | |
| --- | --- | --- | --- | --- | --- |
| **DRIVING QUESTION(S)** | **How are alkynes named from their formulas? How are they given formulas from their names**  **What are some common alkynes?**  **What are the mechanisms by which alkynes are synthesized and how do they participate in reactions?** | | | | |
| **CONTENT VOCABULARY** | **Acetylene, alkyne, terminal/internal alkyne, amyl, enol, Lindlar’s catalyst, s character, siamyl group, tautomers, keto-enol tautomerism, vinyl cation** | | | | |
| **TOPIC** | **ELIGIBLE CONTENT/**  **STANDARDS** | **OBJECTIVES** | | **ASSESSMENT** | **RESOURCES** |
| Nomenclature and propertiesof alkynes | Core  CHEM.3.1.12.A5  Reading/Writing  R: CC.3.5.11-12.D | Students will be able to   * Name alkynes given their formulas * Write formulas of alkynes given their names. * Discuss properties of common alkynes in terms of real world applications and in relation to other compounds | | Chapter Exam  Quiz | Textbook  Projector  Molecular Models |
| Reactions of alkynes | C: CHEM.3.1.12.A5  R: CC.3.5.11-12.D W: CC.3.6.11-12.B: | Students will be able to   * Identify the reagent required to perform common synthetic reactions involving alkynes * Write detailed mechanisms for reactions involving alkynes * Write multi-step synthesis processes involving alkynes * Explain how certain reagents can be used to test for the presence of alkynes | | Chapter Exam  Quiz | Textbook  Projector  Molecular Models |

Unit 9:

| **UNIT Title/Focus** | Alcohols: Structure, Synthesis, and Reactions | | **TIME OF YEAR/LENGTH**  *(E.G. Oct-Nov/3 weeks)* | **December/ 2 weeks** | |
| --- | --- | --- | --- | --- | --- |
| **DRIVING QUESTION(S)** | **How are alcohols named from their formulas? How are they given formulas from their names**  **What are some common alcohols?**  **What are the mechanisms by which alcohols are synthesized and how do they participate in reactions?** | | | | |
| **CONTENT VOCABULARY** | **Acid derivatives, alcohol, aldehyde, Formaldehyde, alkoxide ion, azeotrope, carbinol carbon atom, denatured alcohol, diol, disulfide, epoxides, glycol, Grignard reagent, hydrophilic, hydrophobic, hydroxy group, ketone, mercaptan(thiol), miscible, organolithium reagent, organometallic compounds, phenol, Raney nickel, rubbing alcohol, skunk, sulfonic acid, thiolate ion, chromic acid test, Collins reagent, ester, Fischer esterification, Jones reagent, Lucas test, oxidation, pinacol rearrangement, reduction, tosylate ester, Williamson ether synthesis** | | | | |
| **TOPIC** | **ELIGIBLE CONTENT/**  **STANDARDS** | **OBJECTIVES** | | **ASSESSMENT** | **RESOURCES** |
| Nomenclature and properties of alcohols | Core  CHEM.3.1.12.A5  Reading/Writing  R: CC.3.5.11-12.D | Students will be able to   * Name alcohols given their formulas * Write formulas of alcohols given their names. * Discuss properties of common alcohols in terms of real world applications and in relation to other compounds * Discuss stereochemical and isomeric considerations in alcohol structure and synthesis | | Chapter Exam  Quiz | Textbook  Projector  Molecular Models |
| Reactions of alcohols | C: CHEM.3.1.12.A5  R: CC.3.5.11-12.D W: CC.3.6.11-12.B:  **** | Students will be able to   * Identify the reagent required to perform common synthetic reactions involving alcohols * Explain how certain reagents can be used to test for the presence of alcohols * Write detailed mechanisms for reactions involving alcohols * Write multi-setp synthesis processes involving alcohols | | Chapter Exam  Quiz  Lab | Textbook  Projector  Molecular Models |

Unit 10:

| **UNIT Title/Focus** | Infrared Spectroscopy and Mass Spectrometry | | **TIME OF YEAR/LENGTH**  *(E.G. Oct-Nov/3 weeks)* | **January/ 2.5-3 weeks** | |
| --- | --- | --- | --- | --- | --- |
| **DRIVING QUESTION(S)** | **What is infrared spectroscopy and what is it used for?**  **How should an infrared spectrum be interpreted to give useful information for a compound?**  **What is mass spectrometry and what is it used for?**  **How should a mass spectrum be interpreted to give useful information for a compound?** | | | | |
| **CONTENT VOCABULARY** | **Absorption spectroscopy, base peak, conjugated double bonds, fingerprint region, FT-IR, fragmentation, frequency, gas chromatograph, high-resolution mass spectrometer, infrared spectrometer, interferometer, mass spectrum, m/z, molecular ion, photon, radical cation, wavenumber** | | | | |
| **TOPIC** | **ELIGIBLE CONTENT/**  **STANDARDS** | **OBJECTIVES** | | **ASSESSMENT** | **RESOURCES** |
| Infrared Spectroscopy | Core  CHEM.3.2.12.A6  CHEM.3.1.12.A9  Reading/Writing  CC.3.5.11-12.C  CC.3.5.11-12.D****  W: CC.3.6.11-12.H | Students will be able to   * Identify the parts of an infrared spectrum * Explain absorption and emission of light and their relevance to an infrared spectrum * Explain the function of an infrared spectrometer * Correctly interpret infrared spectra and use them to identify unknown compounds | | Chapter Exam  Quiz  Lab | Textbook  Projector |
| Mass Spectrometry | C: CHEM.3.2.12.A6  CHEM.3.1.12.A9  R: CC.3.5.11-12.C  R: CC.3.5.11-12.D****  W: CC.3.6.11-12.H | Students will be able to   * Identify the parts of a mass spectrum * Explain ionization and mass and their relevance to a mass spectrum * Explain the function of a mass spectrometer * Correctly interpret mass spectra and use them to identify unknown compounds | | Chapter Exam  Quiz  Lab | Textbook  Projector |

Unit 11:

| **UNIT Title/Focus** | NMR Spectroscopy | | **TIME OF YEAR/LENGTH**  *(E.G. Oct-Nov/3 weeks)* | **January-February/ 3 weeks** | |
| --- | --- | --- | --- | --- | --- |
| **DRIVING QUESTION(S)** | **What is Nuclear Magnetic Resonance Spectroscopy**  **How does an NMR spectrometer function**  **How are NMR Spectra interpreted and used?** | | | | |
| **CONTENT VOCABULARY** | **Accidentally equivalent nuclei, chemically equivalent atoms, chemical shift, complex splitting, coupling constants, deshielded, diastereotropic atoms, downfield, gyromagnetic ratio, induced magnetic field, magnetically coupled, magnetic moment, MRI, multiplet, N+1 rule, NMR, relaxation time, shielded, spin decoupling, spin-spin splitting, TMS** | | | | |
| **TOPIC** | **ELIGIBLE CONTENT/**  **STANDARDS** | **OBJECTIVES** | | **ASSESSMENT** | **RESOURCES** |
| Terminology | Core  Reading/Writing  R: CC.3.5.11-12.D  W: CC.3.6.11-12.H | Students will be able to   * Explain the purpose and function of an NMR spectrometer in their own terms * Identify the parts of an NMR spectrometer * Explain the theory of the NMR spectrum * Discuss the relevance and need for proper solvents in NMR | | Chapter Exam  Quiz | Textbook  Projector |
| Chemical shifts | R: CC.3.5.11-12.D  W: CC.3.6.11-12.H | Students will be able to   * Identify common chemical shift regions on an NMR spectrum * Explain radiation absorption and emission behavior in the NMR process * Explain why zeroing and calibration of the instrument are necessary and how they are conducted | | Chapter Exam  Quiz | Textbook  Projector |
| Interpreting Spectra | C: CHEM.3.2.12.A6  CHEM.3.1.12.A9  R: CC.3.5.11-12.C****  R: CC.3.5.11-12.D  W: CC.3.6.11-12.H | Students will be able to   * Correctly interpret NMR spectra and use them to identify an unknown from a list of possibilities * Explain how to differentiate similar reading in an NMR spectrum using relevant data and theory | | Chapter Exam  Quiz  Lab | Textbook  Projector |

Unit 12:

| **UNIT Title/Focus** | Ethers, Epoxides, and Sulfides | | **TIME OF YEAR/LENGTH**  *(E.G. Oct-Nov/3 weeks)* | **February/ 2 weeks** | |
| --- | --- | --- | --- | --- | --- |
| **DRIVING QUESTION(S)** | **How are ethers epoxides, and sulfides named from their formulas? How are they given formulas from their names**  **What are some common ethers, epoxides, and sulfides?**  **What are the mechanisms by which ethers, epoxides, and sulfides are synthesized and how do they participate in reactions?** | | | | |
| **CONTENT VOCABULARY** | **Alpha cleavage, autooxidation, crown ether, dioxane, epoxidation, epoxide, epoxy resins, ether, furan, heterocyclic compound, peroxide, peroxyacid, pyran, sulfide (thioether), sulfoxide, Williamson ether synthesis** | | | | |
| **TOPIC** | **ELIGIBLE CONTENT/**  **STANDARDS** | **OBJECTIVES** | | **ASSESSMENT** | **RESOURCES** |
| Nomenclature and properties of ethers, epoxides, and sulfides | Core  CHEM.3.1.12.A5  Reading/Writing  CC.3.5.11-12.D | Students will be able to   * Name ethers, epoxides, and sulfides given their formulas * Write formulas of ethers, epoxides, and sulfides given their names. * Discuss properties of common ethers, epoxides, and sulfides in terms of real world applications and in relation to other compounds * Discuss stereochemical and isomeric considerations in ether, epoxide, and sulfide structure and synthesis | | Chapter Exam  Quiz | Textbook  Projector  Molecular Models |
| Reactions of ethers, epoxides, and sulfides | C: CHEM.3.1.12.A5  R: CC.3.5.11-12.D  W: CC.3.6.11-12.B: | Students will be able to   * Identify the reagent required to perform common synthetic reactions involving ethers, epoxides, and sulfides * Explain how certain reagents can be used to test for the presence of ethers, epoxides, and sulfides * Write detailed mechanisms for reactions involving ethers, epoxides, and sulfides * Write multi-setp synthesis processes involving ethers, epoxides, and sulfides | | Chapter Exam  Quiz | Textbook  Projector  Molecular Models |

Unit 13:

| **UNIT Title/Focus** | **Aromatic Compounds and Conjugated Systems** | | **TIME OF YEAR/LENGTH**  *(E.G. Oct-Nov/3 weeks)* | **February-March/ 3 weeks** | |
| --- | --- | --- | --- | --- | --- |
| **DRIVING QUESTION(S)** | **How are aromatic compounds named from their formulas? How are they given formulas from their names**  **What are some common aromatic compounds?**  **What are the mechanisms by which aromatic compounds are synthesized and how do they participate in reactions?** | | | | |
| **CONTENT VOCABULARY** | **1,2 addition, 1,4 addition, allyl group, allylic shift, conjugated double bonds, conservation of orbital symmetry, constructive overlap, cycloaddition, delocalized orbital, destructive overlap, Diels-Alder reaction, dieneophile, endo rule, secondary overlap, heat of hydrogenation, kinetic control, kinetic product, aliphatic compound, allotropes, annulenes, aromatic compound, arenes, aryl group, benzyl group, fullerenes, heterocyclic compounds, Huckel’s Rule, Kekule structure, nanotubes, ortho, mets, para, phenyl group, polygon rule, activating group, acyl group, benzylic position, benzyne, Birch reduction, Clemmensen reduction, deactivating group, electrophilic aromatic substitution, Friedel-Crafts acylation, Friedel-Crafts alkylation, Gatterman-Koch synthesis, meta-director, nucleophilic aromatic substitution, ortho, para director** | | | | |
| **TOPIC** | **ELIGIBLE CONTENT/**  **STANDARDS** | **OBJECTIVES** | | **ASSESSMENT** | **RESOURCES** |
| Nomenclature of aromatic compounds | Core  CHEM.3.1.12.A5  Reading/Writing  R: CC.3.5.11-12.D | Students will be able to   * Name aromatics given their formulas * Write formulas of aromatics given their names. * Discuss properties of common aromatics in terms of applications and in relation to other compounds * Discuss stereochemical and isomeric considerations in aromatic structure and synthesis | | Chapter Exam  Quiz | Textbook  Projector  Molecular Models |
| Reactions of aromatic compounds | C: CHEM.3.1.12.A5  R: CC.3.5.11-12.D W: CC.3.6.11-12.B: | Students will be able to   * Identify the reagent required to perform common synthetic reactions involving aromatics * Explain how certain reagents can be used to test for the presence of aromatics * Write detailed mechanisms for reactions involving aromatics * Write multi-setp synthesis processes involving aromatics | | Chapter Exam  Quiz  Lab | Textbook  Projector  Molecular Models |

Unit 14:

| **UNIT Title/Focus** | **Ketones and Aldehydes** | | **TIME OF YEAR/LENGTH**  *(E.G. Oct-Nov/3 weeks)* | **March-April/ 2 weeks** | |
| --- | --- | --- | --- | --- | --- |
| **DRIVING QUESTION(S)** | **How are ketones and aldehydes named from their formulas? How are they given formulas from their names**  **What are some common ketones and aldehydes?**  **What are the mechanisms by which ketones and aldehydes are synthesized and how do they participate in reactions?** | | | | |
| **CONTENT VOCABULARY** | **Acetal, ketal, aldehyde, carbinolamine, carbonyl group, Clemmensen reduction, condensation, cyanohydrin, dithiane, enol, hemiacetal, hydrate, hydrazine, imine, ketone, Gilman reagent, McLafferty rearrangement, nitrile, nuclephilic addition, oxime, protecting group, Raney nickel, semicarbazone, Tollens test, Wittig reaction, ylide, Wolf-Kishner reduction** | | | | |
| **TOPIC** | **ELIGIBLE CONTENT/**  **STANDARDS** | **OBJECTIVES** | | **ASSESSMENT** | **RESOURCES** |
| Nomenclature of ketones and aldehydes | Core  CHEM.3.1.12.A5  Reading/Writing  R: CC.3.5.11-12.D | Students will be able to   * Name ketones and aldehydes given their formulas * Write formulas of ketones and aldehydes given names. * Discuss properties of common ketones and aldehydes in terms of their commercial applications and in relation to other compounds * Discuss stereochemical and isomeric considerations in ketone and aldehydestructure and synthesis | | Chapter Exam  Quiz | Textbook  Projector  Molecular Models |
| Reactions of Ketones and Aldehydes | C: CHEM.3.1.12.A5  R: CC.3.5.11-12.D W: CC.3.6.11-12.B: | Students will be able to   * Identify the reagent required to perform common synthetic reactions involving ketones and aldehydes * Explain how certain reagents can be used to test for the presence of ketones and aldehydes * Write detailed mechanisms for reactions involving ketones and aldehydes * Write multi-setp synthesis processes involving ketones and aldehydes | | Chapter Exam  Quiz  Lab | Textbook  Projector  Molecular Models |

Unit 15

| **UNIT Title/Focus** | **Amines** | | **TIME OF YEAR/LENGTH**  *(E.G. Oct-Nov/3 weeks)* | **April/ 2 weeks** | |
| --- | --- | --- | --- | --- | --- |
| **DRIVING QUESTION(S)** | **How are amines named from their formulas? How are they given formulas from their names**  **What are some common amines?**  **What are the mechanisms by which amines are synthesized and how do they participate in reactions?** | | | | |
| **CONTENT VOCABULARY** | **Acylation, acetylation, amine, ammonium salt, azide, base-dissociation constant, cope elimination, diazo coupling, eexhaustive alkylation, Hoffman elimination, Hoffman rearrangement of amides, hydroxyl amine, nitrile, nitrogen inversions, phase-transfer catalyst, reductive amination, sulfonamide** | | | | |
| **TOPIC** | **ELIGIBLE CONTENT/**  **STANDARDS** | **OBJECTIVES** | | **ASSESSMENT** | **RESOURCES** |
| Nomenclature of amines | Core  CHEM.3.1.12.A5  Reading/Writing  R: CC.3.5.11-12.D | Students will be able to   * Name amines given their formulas * Write formulas of amines given their names. * Discuss properties of common amine in terms of applications and in relation to other compounds * Discuss stereochemical and isomeric considerations in amine structure and synthesis | | Chapter Exam  Quiz | Textbook  Projector  Molecular Models |
| Reactions of Amines | C: CHEM.3.1.12.A5  R: CC.3.5.11-12.D  W: CC.3.6.11-12.B: | Students will be able to   * Identify the reagent required to perform common synthetic reactions involving amines * Explain how certain reagents can be used to test for the presence of amines * Write detailed mechanisms for reactions involving amines * Write multi-setp synthesis processes involving amines | | Chapter Exam  Quiz  Lab | Textbook  Projector  Molecular Models |

Unit 16 :

| **UNIT Title/Focus** | **Carboxyllic Acids** | | **TIME OF YEAR/LENGTH**  *(E.G. Oct-Nov/3 weeks)* | **April-May/2 weeks** | |
| --- | --- | --- | --- | --- | --- |
| **DRIVING QUESTION(S)** | **How are caboxyllic acids named from their formulas? How are they given formulas from their names**  **What are some common carboxylic acids?**  **What are the mechanisms by which carboxylic acids are synthesized and how do they participate in reactions?** | | | | |
| **CONTENT VOCABULARY** | **Acid chloride, anhydride, carboxyl group, carboxylate ion, carboxylation, carboxylic acid, fatty acid, Fischer esterification, molecular sieves, nucleophilic acyl substitution, phthalic acids, carboxylic acid salt, acyl transfer, amide, anhydride, carbonic acid, ester, isocyanate, nucleophilic acyl substitution, addition-elimination mechanism, polymer, thioester, transesterification, urea, urethane** | | | | |
| **TOPIC** | **ELIGIBLE CONTENT/**  **STANDARDS** | **OBJECTIVES** | | **ASSESSMENT** | **RESOURCES** |
| Nomenclature of carboxylic acids | Core  CHEM.3.1.12.A5  Reading/Writing  R: CC.3.5.11-12.D  CC.3.5.11-12.J | Students will be able to   * Name carboxylic acids given their formulas * Write formulas of carboxylic acids given their names. * Discuss properties of common carboxylic acids in terms of applications and in relation to other compounds * Discuss stereochemical and isomeric considerations in carboxylic acid structure and synthesis | | Chapter Exam  Quiz | Textbook  Projector  Molecular Models |
| Reactions of Carboxyllic Acids | C: CHEM.3.1.12.A5  R: CC.3.5.11-12.D  CC.3.5.11-12.J  W: CC.3.6.11-12.B:  **** | Students will be able to   * Identify the reagent required to perform common synthetic reactions involving carboxylic acids * Explain how certain reagents can be used to test for the presence of carboxylic acids * Write detailed mechanisms for reactions involving carboxylic acids * Write multi-setp synthesis processes involving carboxylic acids | | Chapter Exam  Quiz | Textbook  Projector  Molecular Models |

Unit 17:

| **UNIT Title/Focus** | **Biological Molecules** | | **TIME OF YEAR/LENGTH**  *(E.G. Oct-Nov/3 weeks)* | **May/ 2-2.5 Weeks** | |
| --- | --- | --- | --- | --- | --- |
| **DRIVING QUESTION(S)** | **What are the structures of some common biological molecules?**  **How are these molecules synthesized and what are some reactions they participate in?** | | | | |
| **CONTENT VOCABULARY** | **Carbohydrate, sugar, monosaccharides, aldoses, ketoses, disaccharide, polysaccharides, cellulose, D series, L series, erythro, threo, sugar alcohols, cellulose, rayon, glycogen, chitin, RNA, DNA, nucleotides, amino acids, peptide bonds, complete proteins, incomplete proteins, peptide, proteins, disulfide bridges, lipids, complex lipids, simple lipids, glycerides, triglycerides, fatty acids, saponification, soap, micelles, emulsion, hard water, steroids, prostaglandins,** | | | | |
| **TOPIC** | **ELIGIBLE CONTENT/**  **STANDARDS** | **OBJECTIVES** | | **ASSESSMENT** | **RESOURCES** |
| Nomenclature, reactions, and properties of carbohydrates | Core  CHEM.3.1.12.A5  CHEM.3.1.12.B5:  Reading/Writing  R: CC.3.5.11-12.D  W: CC.3.6.11-12.B: | Students will be able to   * Identify functional groups in carbohydrates * Name and write formulas of simple carbohydrates * Identify and write simple reactions of carbohydrates * List and discuss properties of common carbohydrates | | Chapter Exam  Quiz | Textbook  Projector  Molecular Models |
| Nomenclature, properties, and reactions of proteins | C: CHEM.3.1.12.A5  CHEM.3.1.12.B5:  R: CC.3.5.11-12.D  R: CC.3.5.11-12.J  W: CC.3.6.11-12.B: | Students will be able to   * Identify functional groups in proteins * Name and write formulas of simple proteins * Identify and write simple reactions of proteins * List and discuss properties of common proteins | | Chapter Exam  Quiz | Textbook  Projector  Molecular Models |
| Nomenclature, properties, and reactions of lipids | C: CHEM.3.1.12.A5  CHEM.3.1.12.B5:  R: CC.3.5.11-12.D  R: CC.3.5.11-12.J  W: CC.3.6.11-12.B: | Students will be able to   * Identify functional groups in lipids * Name and write formulas of simple lipids * Identify and write simple reactions of lipids * List and discuss properties of common lipids | | Chapter Exam  Quiz | Textbook  Projector  Molecular Models |

Unit 18:

| **UNIT Title/Focus** | **Polymers** | | **TIME OF YEAR/LENGTH**  *(E.G. Oct-Nov/3 weeks)* | **May-June/ 1-1.5 weeks** | |
| --- | --- | --- | --- | --- | --- |
| **DRIVING QUESTION(S)** | **What are the types of polymers?**  **What are the mechanisms by which some common polymers are formed and how do they work in detail?**  **What are some familiar substances made of polymers?** | | | | |
| **CONTENT VOCABULARY** | **Polymer, monomer, polymerization, addition polymers, chain-growth polymers, step growth polymers, free-radical polymerization, cationic polymerization, anionic polymerization, isotactic, syndiotactic, atactic, latex, rubber, vulcanization, copolymers, step-growth polymerization, nylon, polymaides, polyesters, crystallinity, glass transition temperature, thermoplastic, plasticizers** | | | | |
| **TOPIC** | **ELIGIBLE CONTENT/**  **STANDARDS** | **OBJECTIVES** | | **ASSESSMENT** | **RESOURCES** |
| Nomenclature and types of polymers | Core  CHEM.3.1.12.A5  CHEM.3.1.12.B5:  Reading/Writing  R: CC.3.5.11-12.D | Students will be able to:   * Name common polymers based on their structure * Write representative formulas of common polymers based on their names | | Chapter Exam  Quiz | Textbook  Projector  Molecular Models |
| Types of polymerization reactions | C: CHEM.3.1.12.A5  CHEM.3.1.12.B5:  R: CC.3.5.11-12.D  W: CC.3.6.11-12.B: | Students will be able to:   * Define and gives examples of common types of polymerization reactions * Write out mechanisms for simple polymerization reactions | | Chapter Exam  Quiz | Textbook  Projector  Molecular Models |
| Characteristics of polymers | C: CHEM.3.1.12.A5  CHEM.3.1.12.B5:  R: CC.3.5.11-12.D | Students will be able to:   * Differentiate common polymers based on their characteristics * List common properties of polymers | | Chapter Exam  Quiz | Textbook  Projector  Molecular Models |