Organic Chemistry

Unit 1 – Saturated and Unsaturated Compounds: Alkanes, Alkenes and Alkynes

Big Ideas	Essential Question	Concepts	Competencies	Vocabulary	PA Keystone Standard	Suggested Lessons & Activities
Chemistry is the study of matter and the changes it undergoes.	What are the differences between pure substances and mixtures?	Different compounds can be formed from different combinations of the same elements according to the law of multiple proportions. Observations of matter can be qualitative, quantitative, direct or indirect. Physical properties of matter can be classified as intensive or extensive. Formula writing and naming of compounds follows a systematic set of rules.	Identify general structure and formula of alkanes Identify trends in physical properties of alkanes. Use IUPAC naming rules for alkanes Identify organic trivia groups and name compounds using those trivial names. Identify and draw isomers for alkanes. Identify general structure and formula of cycloalkanes	Nomenclature Saturated Alkanes Condensed structural formula Structural Formula Parent Substituent Cycloalkanes	A.1.1.1 A.1.1.4 A.1.1.5 B.1.4.1 B.1.2.1	Organic Nomenclature: Alkanes and Alkyl groups notes and examples packet Alkanes Worksheets Articles with questions from Chem Matters • Why has a Pennsylvania Town been burning for 60 years? (Centralia) • Tanking Up with Cooking Oil

Chemistry is the study of matter and the changes it undergoes.	What are the differences between pure substances and mixtures?	Different compounds can be formed from different combinations of the same elements according to the law of multiple proportions. Observations of matter can be qualitative, quantitative, direct or indirect. Physical properties of matter can be classified as intensive or extensive. Formula writing and naming of compounds follows a systematic set of rules.	Identify general structure and formula of alkenes and cycloalkenes. Identify trends in physical properties of alkenes. Use IUPAC naming rules for alkenes Identify and draw cis-and trans- isomers for alkenes. Identify general structure and formula of alkynes and cycloalkynes. Identify trends in physical properties of alkynes. Use IUPAC naming rules for alkynes and cycloalkynes. Use IUPAC naming rules for alkenynes.	Unsaturated Alkenes Cycloalkenes Cis- isomers Trans- isomers Alkynes Alkenynes	A.1.1.1 A.1.1.4 A.1.1.5 B.1.4.1 B.1.2.1	Organic Nomenclature: Alkenes and Alkynes notes and examples packet Alkenes and Alkynes Worksheet Articles with questions from Chem Matters • Hot Peppers: Muy Caliente (Capsaicin)

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Unit 2 – Aromatics: Benzene, Toluene, Styrene and Naphthalene

Big Ideas	Essential Question	Concepts	Competencies	Vocabulary	PA Keystone Standard	Suggested Lessons & Activities
Chemistry is the study of matter and the changes it undergoes.	What are the differences between pure substances and mixtures?	Different compounds can be formed from different combinations of the same elements according to the law of multiple proportions. Observations of matter can be qualitative, quantitative, direct or indirect. Physical properties of matter can be classified as intensive or extensive. Formula writing and naming of compounds follows a	Identify general structure and formula of benzene. Identify trends in physical properties of benzene. Use IUPAC naming rules for benzene. Name using ortho, meta and para for substituent numbering. Identify and draw isomers for benzene. Name substituted benzenes when appropriate with trivial names of toluene and styrene. Name substituted toluene and styrene with alpha and beta notation when appropriate.	Aromatic Benzene Phenyl Ortho- Meta- Para- Toluene Alpha- Beta- Styrene Naphthalene Cyano- Nitro- Nitroso-	A.1.1.1 A.1.1.4 A.1.1.5 B.1.4.1 B.1.2.1	Organic Nomenclature: Aromatic Hydrocarbons (Arenes) notes and examples packet. Aromatics Worksheet Substituted Aromatics Worksheet Articles with questions from Chem Matters • How Safe are Hair Dyes? • How Sticky Innovations Changed the World. • What is Hand Sanitizer and does it Keep your hands germ-free? • Why Avocados are so Appealing

		systematic set of rules.	Number and name substituents according to IUPAC rules.			

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Unit 3 – Alcohols and Ethers

Big Ideas	Essential Question	Concepts	Competencies	Vocabulary	PA Keystone Standard	Suggested Lessons & Activities
Chemistry is the study of matter and the changes it undergoes.	What are the differences between pure substances and mixtures?	Different compounds can be formed from different combinations of the same elements according to the law of multiple proportions. Observations of matter can be qualitative, quantitative, direct or indirect. Physical properties of matter can be classified as intensive or extensive. Formula writing and naming of compounds follows a systematic set of rules.	Identify general structure and formula of alcohol. Identify trends in physical properties of alcohols. Use IUPAC naming rules for alcohols. Name using –diols and –triols following IUPAC naming rules. Identify, name and draw structures for alcohols using the functional class naming system. Distinguish between primary, secondary and tertiary alcohols.	Alcohol Hydroxy Diol Triol Glycol Primary Secondary Tertiary Phenol Thiols	A.1.1.1 A.1.1.4 A.1.1.5 B.1.4.1 B.1.2.1	Organic Nomenclature: Alcohols notes and examples packet. Alcohol Worksheet
Chemistry is the study of matter	What are the differences between pure	Different compounds can be formed from	Identify general structure and formula of ether.	Ether -oxy	A.1.1.1 A.1.1.4	Organic Nomenclature: Ethers notes and examples packet.

and the changes it undergoes.	substances and mixtures?	different combinations of the same elements according to the law of multiple proportions. Observations of matter can be qualitative, quantitative, direct or indirect. Physical properties of matter can be classified as intensive or extensive. Formula writing and naming of compounds follows a systematic set of rules.	Identify trends in physical properties of ethers. Use IUPAC naming rules for ethers. Name using replacement names for multi-substituted ethers following IUPAC naming rules. Identify, name and draw structures for ethers using the functional class naming system.	-Thia -Oxa -Aza -Sili	A.1.1.5 B.1.4.1 B.1.2.1	Ether Worksheet Articles with questions from Chem Matters • Chemistry in the Operating Room • You're Getting Sleepy Scream! History of Ethers used as Anesthetics – Documentary

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Unit 4 –Acids and Acid Derivatives (Anhydrides and Esters)

Big Ideas	Essential Question	Concepts	Competency	Vocabulary	PA Keystone Standard	Suggested Lessons & Activities
Chemistry is the study of matter and the changes it undergoes.	What are the differences between pure substances and mixtures?	Different compounds can be formed from different combinations of the same elements according to the law of multiple proportions. Formula writing and naming of compounds follows a systematic set of rules.	Identify general structure and formula of an acid. Use IUPAC naming rules for acids. Identify, name and draw structures for acids using the functional class and trivial naming systems.	Carboxylic Acid Cyclic Acyclic Formic acid Ethanoic acid Propionic Acid Butyric Acid Valeric Acid	A.1.1.5 B.1.4.1	Organic Nomenclature: Acids notes and examples packet. Carboxylic Acids Worksheet Articles with questions from Chem Matters • Alice Ball: Young Chemist Gave Hope to Millions
Chemistry is the study of matter and the changes it undergoes.	What are the differences between pure substances and mixtures?	Different compounds can be formed from different combinations of the same elements according to the	Identify general structure and formula of an acid derivatives. Use IUPAC naming rules for acid derivatives.	Acid Anhydride Acyl Halides Esters	A.1.1.5 B.1.4.1	Organic Nomenclature: Acids notes and examples packet. Carboxylic Acids Worksheets Articles with questions from Chem Matters • Drugs Down the Drain

		law of multiple proportions. Formula writing and naming of compounds follows a systematic set of rules.	Identify, name and draw structures for acid derivatives using the functional class naming system.			• Vanilla It's Everywhere A Civil Action (Movie) with questions Esters Lab

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Unit 5 – Aldehydes, Ketones, Amines and Bicyclos

Big Ideas	Essential Question	Concepts	Competency	Vocabulary	PA Keystone Standard	Suggested Lessons & Activities
Chemistry is the study of matter and the changes it undergoes.	What are the differences between pure substances and mixtures?	Different compounds can be formed from different combinations of the same elements according to the law of multiple proportions. Formula writing and naming of compounds follows a systematic set of rules.	Identify general structure and formula of an aldehyde & ketones. Use IUPAC naming rules an aldehyde & ketones. Identify, name and draw structures for an aldehyde and ketone using the functional class naming system.	Aldehyde Carbonyl Group Carbaldehyde	A.1.1.5 B.1.4.1	Organic Nomenclature: Aldehyde and Ketone notes and examples packet. Aldehydes and Ketones Worksheets
Chemistry is the study of matter and the changes it undergoes.	What are the differences between pure substances and mixtures?	Different compounds can be formed from different combinations of the same elements according to the law of multiple proportions. Formula writing and naming of	Identify general structure and formula of amines, aminos, ammonium, aminium and zwitterions. Use IUPAC naming rules for amines, aminos, ammonium, aminium and zwitterions.	Amine Amino Ammonium Aminium Zwitter ions	A.1.1.5 B.1.4.1	Organic Nomenclature: Amines and related cations notes and examples packet. Amines group Worksheets

		compounds follows a systematic set of rules.				
Chemistry is the study of matter and the changes it undergoes.	What are the differences between pure substances and mixtures?	Different compounds can be formed from different combinations of the same elements according to the law of multiple proportions. Formula writing and naming of compounds follows a systematic set of rules.	Identify general structure and formula of a bridged ring system. Use IUPAC naming rules an bicyclos. Identify, name and draw structures for bicyclos using the functional class naming system.	Bridged Rings Bridgehead Bicyclo Norbornane	A.1.1.5 B.1.4.1	Organic Nomenclature: Bridged Ring System notes and examples packet. Bicylo Worksheets Articles with questions from Chem Matters • Chocolate: The new health food or is it? • Espresso, Café Latte, Cappuccino…A complex brew

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Unit 6 – Organic Compounds all Around Us

Big Ideas	Essential Question	Concepts	Competency	Vocabulary	PA Keystone Standard	Suggested Lessons & Activities
Chemical Reactions are predictable.	What factors identify the types of chemical reactions?	Predict products of simple organic chemical reactions.	Identify sources of alkanes & their physical properties Predict products and identify Combustion Reactions Predict products and identify Halogenation Reactions Classify Halides as primary, secondary, tertiary or quaternary	Combustion Halogenation Saturated Unsaturated	B.2.1.2 B.2.1.3 B.2.1.4 B.2.1.5	Balancing Combustion Reactions Calculations on Fuel Consumption for Combustion Engines
Chemical Reactions are predictable.	What factors identify the types of chemical reactions?	Predict products of simple organic chemical reactions.	Identify sources of alkenes & alkynes & their physical properties Predict Products and identify Hydrogenation Reactions Predict Products and identify Hydration Reactions Predict Products and identify Hydrohalogenation Reactions Predict Products and identify aryl halides	Cis vs. Trans Fats Hydrogenation Hydration Hydrohalogenation	B.2.1.2 B.2.1.3 B.2.1.4 B.2.1.5	Articles with questions from Chem Matters • The Solid Facts About Trans Fats • Olestra Article Erin Brockovich (Movie) with questions
Chemical Reactions are predictable.	What factors identify the types of chemical reactions?	Predict products of simple organic chemical reactions.	Identify sources of alcohols & ethers & their physical properties	Fermentation Markovnikov's Rule	B.2.1.2 B.2.1.3 B.2.1.4 B.2.1.5	Prohibition and the Distillation of Alcohol – Video Clips Set up Distillation Apparatus

			Discuss ethanol production involving fermentation Discuss relevance of various alcohols in gasoline and alternative fuel sources Predict products for Hydration of alkenes using Markovnikov's Rule Predict products for Dehydration of alcohols Predict products for Oxidation of alcohols to either aldehydes or ketones and relevance to biological processes Discuss biological and industrial uses for phenol compounds Discuss history of ethers and current concerns	Dehydration Oxidation Reactions Thiols		Distill Cherry Coke Lab Articles on Alcohol and the Body Blood Alcohol Concentration (BAC) calculation activity Articles with questions from Chem Matters • Thiols-Skunk Scents Poisoner's Handbook (Documentary)