



## Topic 19.1: Organic chemistry – Fundamentals of organic chemistry

Organic chemistry focuses on the chemistry of compounds containing carbon.

• **Understanding:** A homologous series is a series of compounds of the same family, with the same general formula, which differ from each other by a common structural unit.

- **Homologous series:** series of compound of the same family, with the same general formula, which differ by a common structural unit
  - Common structure unit: often  $\text{CH}_2$  (methylene) group
  - Same family: has the same functional group
  - Properties: homologous series has similar physical and chemical properties

• **Understanding:** Structural formulas can be represented in full and condensed format.

	Full structural formula	Condensed structural formula	Skeletal structural formula
Example		$\text{CH}_3\text{—CH}_2\text{—CH}_2\text{—CH}_3$  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$	
Description	Two-dimensional representation showing all atoms, their relative positions and bonds	Two-dimensional representation showing all atoms and their relative position.	Two dimensional representation of a compound where each vertex and end of line represent a carbon atom, and functional group is added

• **Understanding:** Structural isomers are compounds with the same molecular formula but different arrangements of atoms.

- **Structural isomers:** compounds with same molecular formula with different arrangement of atoms
  - Properties: structural isomers have different chemical and physical properties (melting point, boiling point etc.)

• **Understanding:** Functional groups are the reactive parts of molecules.

- **Functional groups:** reactive parts of a molecule that is responsible for the molecule's chemical property
  - Naming: the position of the function group is identified by the number of carbon to which it is attached

• **Understanding:** Saturated compounds contain single bonds only and unsaturated compounds contain double or triple bonds.

- **Saturated compounds:** organic compounds in which all the carbon-carbon bonds are single (e.g. **alkanes**)
- **Unsaturated compounds:** organic compound in which there is at least one carbon-carbon bond that is double or triple (e.g. **alkenes**)

• **Understanding:** Benzene is an aromatic, unsaturated hydrocarbon.

- **Aliphatic:** characterized by a straight, branched or cyclic structure
- **Aromatic:** characterized by presence of benzene ring
- **Benzene:** aromatic, unsaturated hydrocarbon in which six carbons bonds into a ring
  - **Sigma ( $\sigma$ ) bond in benzene:** benzene contains six  $\text{sp}^2$  hybridized carbon atoms bond to one other by sigma bonds
  - **Pi ( $\pi$ ) bond in benzene:** p-orbitals in carbon overlap to form a continuous  $\pi$  bond above and below the plane of carbons

• **Applications and skills:** Explanation of the trends in boiling points of members of a homologous series.

Name	Formula	Structural formula (condensed)	Boiling point ( $^{\circ}\text{C}$ )
Methane	$\text{CH}_4$	$\text{CH}_4$	-161
Ethane	$\text{C}_2\text{H}_6$	$\text{CH}_3\text{CH}_3$	-89
Propane	$\text{C}_3\text{H}_8$	$\text{CH}_3\text{CH}_2\text{CH}_3$	-42
Butane	$\text{C}_4\text{H}_{10}$	$\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$	-0.5
Pentane	$\text{C}_5\text{H}_{12}$	$\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$	36
Hexane	$\text{C}_6\text{H}_{14}$	$\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$	69

- **Trend in boiling points:** boiling points increases as the carbon chain increases by a common structural unit
  - Trends arise from increasing intermolecular (dispersion forces) with increased chain lengths

• **Applications and skills:** Distinction between empirical, molecular and structural formulas.

- **Empirical formula:** simplest ratio of atoms (of an element) in a molecule
- **Molecular formula:** actual number of atoms (of each element) in a molecule
- **Structural formula:** representation of the type of atoms and their position relative to one other

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scarcity side it is now appreciated that in large areas of the open ocean Fe is a key limiting nutrient thus a great deal of research is going into understanding the strategies microbial cells principally phytoplankton use to acquire iron and how the iron cycle may impact other nutrient cycles Finally due to its abundance iron has played an important role in the evolution of Earth's primary biogeochemical cycles through time The aim of this Research Topic is to gather contributions from scientists working in diverse disciplines who have common interests in iron cycling at the process level and at the organismal level both from the perspective of Fe as an energy source or as a limiting nutrient for primary productivity in the ocean The range of disciplines may include geomicrobiologists microbial ecologists microbial physiologists biological oceanographers and biogeochemists Articles can be original research techniques reviews or synthesis papers An overarching goal is to demonstrate the environmental breadth of the iron cycle and foster understanding between different scientific communities who may not always be aware of one another's work

*Encyclopedia of Analytical Science*, 2019-04-02 The third edition of the Encyclopedia of Analytical Science Ten Volume Set is a definitive collection of articles covering the latest technologies in application areas such as medicine environmental science food science and geology Meticulously organized clearly written and fully interdisciplinary the Encyclopedia of Analytical Science Ten Volume Set provides foundational knowledge across the scope of modern analytical chemistry linking fundamental topics with the latest methodologies Articles will cover three broad areas analytical techniques e.g. mass spectrometry liquid chromatography atomic spectrometry areas of application e.g. forensic environmental and clinical and analytes e.g. arsenic nucleic acids and polycyclic aromatic hydrocarbons providing a one stop resource for analytical scientists Offers readers a one stop resource with access to information across the entire scope of modern analytical science Presents articles split into three broad areas analytical techniques areas of application and analytes creating an ideal resource for students researchers and professionals Provides concise and accessible information that is ideal for non specialists and readers from undergraduate levels and higher

**Coffee** Adriana Farah, 2019-01-11 Coffee is one of the most popular drinks in the world but how does the production influence chemistry and quality This book covers coffee production quality and chemistry from the plant to the cup Written by an international collection of contributors in the field who concentrate on coffee research it is edited expertly to ensure quality of content consistency and organization across the chapters Aimed at advanced undergraduates postgraduates and researchers and accompanied by a sister volume covering how health is influenced by the consumption of coffee these titles provide an impactful and accessible guide to the current research in the field

*Handbook of Heterocyclic Corrosion Inhibitors* Chandrabhan Verma, 2023-12-21 Handbook of Heterocyclic Corrosion Inhibitors presents a comprehensive overview of corrosion inhibition using heterocyclic compounds It covers numerous emerging heterocyclic compound based industrial corrosion inhibitors that are oriented toward minimizing corrosive damages and prevention methods Describing the fundamentals of heterocycles corrosion and corrosion inhibition the book considers the potential of different series of N

heterocycles such as acridine and acridone based carbazole based imidazole and imidazoline based indole and indoline based melamine based etc It presents the corrosion inhibition potential of oxygen and sulfur based heterocycles compounds The book also explores issues with corrosion as a result of improper design with descaling acidification refinery and transport processes The book will be of interest to researchers and graduate students studying corrosion science heterocyclic chemistry material science and engineering energy chemistry and colloid science It will also be a valuable reference for corrosion scientists and R D engineers working in industrial corrosion and industrial based corrosion protection systems

**Tietz Textbook of Clinical Chemistry and Molecular Diagnostics - E-Book** Nader Rifai, 2017-01-16 The Tietz Textbook of Clinical Chemistry and Molecular Diagnostics 6th Edition provides the most current and authoritative guidance on selecting performing and evaluating the results of new and established laboratory tests This classic clinical chemistry reference offers encyclopedic coverage detailing everything you need to know including analytical criteria for the medical usefulness of laboratory tests variables that affect tests and results laboratory medicine applications of statistical methods and most importantly clinical utility and interpretation of laboratory tests It is THE definitive reference in clinical chemistry and molecular diagnostics now fully searchable and with quarterly content updates podcasts clinical cases animations and extended content online through Expert Consult Analytical criteria focus on the medical usefulness of laboratory procedures Reference ranges show new approaches for establishing these ranges and provide the latest information on this topic Lab management and costs gives students and chemists the practical information they need to assess costs allowing them to do their job more efficiently and effectively Statistical methods coverage provides you with information critical to the practice of clinical chemistry Internationally recognized chapter authors are considered among the best in their field Two color design highlights important features illustrations and content to help you find information easier and faster NEW Internationally recognized chapter authors are considered among the best in their field NEW Expert Consult features fully searchable text quarterly content updates clinical case studies animations podcasts atlases biochemical calculations multiple choice questions links to Medline an image collection and audio interviews You will now enjoy an online version making utility of this book even greater UPDATED Expanded Molecular Diagnostics section with 12 chapters that focus on emerging issues and techniques in the rapidly evolving and important field of molecular diagnostics and genetics ensures this text is on the cutting edge and of the most value NEW Comprehensive list of Reference Intervals for children and adults with graphic displays developed using contemporary instrumentation NEW Standard and international units of measure make this text appropriate for any user anywhere in the world NEW 22 new chapters that focus on applications of mass spectrometry hematology transfusion medicine microbiology biobanking biomarker utility in the pharmaceutical industry and more NEW Expert senior editors Nader Rifai Carl Wittwer and Rita Horvath bring fresh perspectives and help ensure the most current information is presented UPDATED Thoroughly revised and peer reviewed chapters provide you with the most current

information possible      *Proceedings of the 3rd Pan American Materials Congress* Marc André Meyers, Hector Alfredo Calderon Benavides, Sonia P Brühl, Henry A Colorado, Elvi Dalgaard, Carlos Nelson Elias, Roberto B Figueiredo, Omar Garcia-Rincon, Megumi Kawasaki, Terence G. Langdon, R.V. Mangalaraja, Mery Cecilia Gomez Marroquin, Adriana da Cunha Rocha, Julie M Schoenung, Andre Costa e Silva, Mary Wells, Wen Yang, 2017-02-07 This collection covers a variety of materials science topics and has contributions from leading scientists and engineers representing 8 countries and 9 international materials metals and minerals societies Papers are organized into the following sections Advanced Biomaterials Advanced Manufacturing Materials for Green Energy Materials for Infrastructure Materials for the Oil and Gas Industry Materials for Transportation and Lightweighting Minerals Extraction and Processing Nanocrystalline and Ultra fine Grain Materials and Bulk Metallic Glasses Steels      **Polymeric Corrosion Inhibitors for Greening the Chemical and Petrochemical Industry**

Mohammad Abu Jafar Mazumder, Mumtaz A. Quraishi, Amir Al-Ahmed, 2022-09-27 Polymeric Corrosion Inhibitors for Greening the Chemical and Petrochemical Industry Primary reference on polymeric corrosion inhibitors for researchers and professionals in the chemical and petrochemical industries Polymeric Corrosion Inhibitors for Greening the Chemical and Petrochemical Industry provides an extensive overview of polymeric corrosion inhibitors for chemical and petrochemical industry from design synthesis and characterization to applications The text discusses the different media in which corrosion is observed and enables readers to minimize prevent pipes and other plant systems failures by adequately dealing with corrosion Considering the high importance of corrosion inhibitors development for the chemical and petrochemical industries this book aims to provide fundamental and current practice with comprehensive coverage of the recent advancements of green polymeric corrosion inhibitors that could be used The text systematically presents fundamentals up to date development and industrial applications of polymeric corrosion inhibitors In Polymeric Corrosion Inhibitors for Greening the Chemical and Petrochemical Industry readers can expect to find specific information on Water and oil soluble polymeric corrosion inhibitors plus polymeric corrosion inhibitors for acid CO<sub>2</sub> sweet H<sub>2</sub>S sour cooling water and basic media Polymers as kinetic hydrate inhibitors high temperature polymeric corrosion inhibitors and polymeric inhibitors for microbiologically influenced corrosion Surface characterization techniques in corrosion inhibition research and guidelines for designing corrosion inhibitors for oil and gas production The impact of corrosion inhibitors as green polymeric materials and what they mean for the future of the field Polymeric Corrosion Inhibitors for Greening the Chemical and Petrochemical Industry is a primary reference for researchers and professionals in the material science chemistry and electrochemistry chemical mechanical and metallurgical engineering industries who wish to counter the economic and environmental consequences of corrosion in various plant systems      *Creative Resistance* Sabine Damir-Geilsdorf, Stephan Milich, 2020-04-02 During the uprisings of the Arab Spring between 2010 and 2012 oppositional movements used political humor to criticize political leaders or to expose the absurdities of the socio political conditions These humorous expressions in various art forms such as

poetry stand up comedy street art music caricatures cartoons comics and puppet shows were further distributed in the social media This first comprehensive study of political humor in the uprisings explores the varieties and functions of political humor as a creative tool for resistance It analyzes humorous forms of cultural expression and their impact on socio political developments in different countries of the Middle East and North Africa with a special focus on the changing modes of humor

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Agricultural Development (BIFAD),International Food Policy Research Institute (IFPRI),Association of Public and Land-Grant  
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