Inorganic chemistry deals with the synthesis and behavior of inorganic and organometallic compounds. This field covers all chemical compounds except the myriad organic compounds (carbon based compounds, usually containing C-H bonds), which are the subjects of organic chemistry.

1: Basic Concepts: Atoms
   - 1.1: Introduction
   - 1.2: Fundamental Particles of an Atom
     - Pskskbdhj
     - sole
   - 1.3: Atomic Number, Mass Number and Isotopes
     - 1.3A: Nuclides, Atomic Number and Mass Number
     - 1.3B: Relative Atomic Mass
     - 1.3C: Isotopes
   - 1.4: Successes in Early Quantum Theory
     - 1.4A: Some Important Successes of Classical Quantum Theory
     - 1.4B: Bohr's Theory of the Atomic Spectrum of Hydrogen
   - 1.5: An Introduction to Wave Mechanics
     - 1.5A: Wave Mechanics of Electrons
     - 1.5B: The Uncertainty Principle
     - 1.5C: The Schrödinger Wave Equation
   - 1.6: Atomic Orbitals
     - 1.6A: Electronic Quantum Numbers
     - 1.6B: The Radial Part of the Wave Function
     - 1.6C: The Radial Distribution Function
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     - 1.6E: Orbital Energies in a Hydrogen-like Species
     - 1.6F: Size of Orbitals
     - 1.6G: The Spin and Magnetic Spin Quantum Number's
     - 1.6H: The ground state of Hydrogen
   - 1.7: Many Electron Atoms
     - 1.7A: The Helium Atom - Two Electrons
     - 1.7B: Ground State Electronic Configurations - Experimental Data
     - 1.7C: Penetration and Shielding
   - 1.8: The Periodic Table
   - 1.9: The Aufbau Principle
     - 1.9A: Ground state electronic Configuration
     - 1.9B: Valence and Core Electrons
• 1.9C: Diagrammatic Representations of Electronic Configurations
• 1.10: Ionization Energies and Electron Affinities

2: Basic Concepts: Molecules

• 2.1: Bonding Models - An Introduction
  • 2.1A: A Historical Overview
  • 2.1B: Lewis Structures

• 2.2: Homonuclear Diatomic Molecules - Valence Bond Theory
  • 2.2A: Uses of the term Homonuclear
  • 2.2B: Covalent Bond Distance, Covalent Radius, and van der Waals radius
  • 2.2C: Valence Bond model of Bonding in \( \text{H}_2 \)

• 2.3: Homonuclear Diatomic Molecules - Molecular Orbital (MO) Theory
  • 2.3A: An Overview of the MO Model
  • 2.3C: MO Applied to \( \text{He}_2 \), \( \text{Li}_2 \), and \( \text{Be}_2 \)
  • 2.3D: MO Applied to \( \text{F}_2 \) and \( \text{O}_2 \)
  • 2.3E: What happens if s-p separation is small?
  • 2.3b: MO theory of bonding in \( \text{H}_2^+ \)

• 2.4: The Octet Rule and Isoelectronic Species
  • 2.4A: The Octet Rule - First Row p-block Elements
  • 2.4B: Isoelectronic Molecules
  • 2.4C: The Octet Rule - Heavier p-block Elements
  • 2.4D: Periodic Trends

• 2.5: Electronegativity Values
  • 2.5A: Pauling Electronegativity Values
  • 2.5B: Mulliken Electronegativity Values
  • 2.5C: Allred-Rochow Electronegativity Values
  • 2.5D: Electronegativity - final comments

• 2.6: Dipole Moments
  • 2.6A: Polar Diatomic Molecules
  • 2.6B: Molecular Dipole Moments

• 2.7: MO Theory - Heteronuclear Diatomic Molecules
  • 2.7A: MO Theory: Orbital Interactions
  • 2.7B: Hydrogen Fluoride
  • 2.7C: Carbon Monoxide

• 2.8: Molecular Shape and the VSEPR Model
  • 2.8A: Valence-Shell Electron-Pair Repulsion Model
3: Introduction to Molecular Symmetry

- 3.1: Introduction
- 3.2: Symmetry Operations and Elements
- 3.3: Successive Operations
- 3.4: Point Groups
- 3.5: Character Tables - An Introduction
- 3.6: Significance of Recognizing Symmetry Elements
- 3.7: Vibrational Spectroscopy
  - 3.7A: Vibrational Spectroscopy
  - 3.7C: Vibrational Spectroscopy of Linear and Bent triatomic Molecules
- 3.8: Chiral Molecules

4: Experimental Techniques

- 4.1: Introduction
- 4.2: Separation and Purification Techniques
  - 4.2A: Gas Chromatography (GC)
  - 4.2B: Liquid Chromatography (LC)
  - 4.2C: High-Performance Liquid Chromatography (HPLC)
  - 4.2D: Recrystallization
- 4.3: Elemental Analysis
  - 4.3A: CHN Analysis by Combustion
  - 4.3B: Atomic Absorption Spectroscopy (AAS)
- 4.4: Computational Analysis - Thermogravimetry (TG)
- 4.5: Mass Spectrometry
  - 4.5A: Electron Ionization (EI)
  - 4.5B: Fast Atom Bombardment (FAB)
4.5C: Matrix-Assisted Laser Desorption Ionization Time-of-Flight (MALDI-TOF)
4.5D: Electrospray Ionization (ESI)

4.6: Infrared and Raman Spectroscopies
4.6A: Energies and Wavenumbers of Molecular Vibrations
4.6B: The Fourier Transform Infrared (FT-IR) Spectrometer and Sample Preparation
4.6C: Diagnostic Absorptions
4.6D: Deuterium/Hydrogen Exchange
4.6E: Raman Spectroscopy

4.7: Electronic Spectroscopy
4.7A: UV-VIS Absorption Spectroscopy
4.7B: Types of Absorption
4.7C: Absorbance and the Beer-Lambert Law
4.7D: Emission Spectroscopy

4.8: Nuclear Magnetic Resonance (NMR) Spectroscopy
4.8A: NMR Active Nuclei and Isotope Abundance
4.8B: Which Nuclei are Suitable for NMR Spectroscopic Studies
4.8C: Resonance Frequencies and Chemical Shifts
4.8D: Chemical Shift Ranges
4.8E: Solvents for Solution Studies
4.8F: Integration of Signals and Signal Broadening
4.8G: Homonuclear spin-spin coupling - \(^1H-^1H\)
4.8H: Heteronuclear spin-spin coupling - \(^{13}C-^1H\)
4.8I: Case Studies
4.8J: Stereochemically Non-Rigid Species
4.8K: Exchange Processes in Solution

4.9: Electron Paramagnetic Resonance (EPR) Spectroscopy
4.9A: What is EPR Spectroscopy?
4.9B: The Zeeman Electronic Effect
4.9C: EPR Spectra

4.10: Mossbauer Spectroscopy
4.10A: The Technique of Mossbauer Spectroscopy
4.10B: What Can Isomer Shift Data Tell Us?

4.11: Structure Determination - Diffraction Methods
4.11A: X-Ray Diffraction (XRD)
4.11B: Single Crystal X-Ray Diffraction
4.11C: Powder X-Ray Diffraction
4.11D: Single Crystal Neutron Diffraction
4.11E: Electron Diffraction
• **4.11F:** Low-Energy Electron Diffraction (LEED)
• **4.11G:** Structural Databases
• **4.12:** Photoelectron Spectroscopy (PES, UPS, XPS, ESCA)
• **4.13:** Computational Methods
  • **4.13A:** Hartree-Fock Theory
  • **4.13B:** Density Functional Theory
  • **4.13C:** Hückel MO Theory
  • **4.13D:** Molecular Mechanisms (MM)
• **4.14:** Magnetism
  • Magnetic Moments
  • Magnetic Moments 1
  • Magnetic Susceptibility Measurements
  • Magnetism
  • example magnetic moment data and their interpretation

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**5: Bonding in Polyatomic Molecules**

• **5.1:** Introduction
• **5.2:** Valence Bond Theory - Hybridization of Atomic Orbitals
  • **5.2A:** What is Orbital Hybridization?
  • **5.2B:** sp Hybridization
  • **5.2C:** sp² Hybridization
  • **5.2D:** sp³ Hybridization
  • **5.2E:** Other Hybridization Schemes
• **5.3:** Valence Bond Theory - Multiple Bonding in Polyatomic Molecules
  • **5.3A:** Introduction
  • **5.3B:** \( C_2H_4 \)
  • **5.3C:** \( HCN \)
• **5.4:** MO Theory - The Ligand Group Orbital (LGO) Approach and Application to Triatomic Molecules
  • **5.4A:** MO Diagrams - Moving from Diatomic to Polyatomic Species
  • **5.4B:** MO Approach to Bonding in Linear \( (XH_2) \) - Symmetry Matching by Inspection
  • **5.4C:** MO Approach to Bonding in Linear \( (XH_2) \) - Working from Molecular Symmetry
  • **5.4D:** A Bent Triatomic - \( (H_2O) \)
• **5.5:** MO Theory Applied to Polyatomic Molecules \( (BH_3), (NH_3), \) and \( (CH_4) \)
  • **5.5A:** \( (BH_3) \)
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5.5D: A Comparison of MO and VB Bonding Models

5.6: MO Theory - Bonding Analyses Soon Become Complicated

5.7: MO Theory - Learning to Use the Theory Objectively
  - 5.7A: $\pi$-Bonding in \(CO_2\)
  - 5.7B: $[NO_3]^-$
  - 5.7C: \((SF_6)\)
  - 5.7D: Three-Center Two-Electron Interactions
  - 5.7E: A More Advanced Problem - \(B_2H_6\)

6: Structures and Energetics of Metallic and Ionic solids

6.1: Introduction

6.2: Packing of Spheres
  - 6.2A: Cubic and Hexagonal Closed Packing
  - 6.2B: The Unit Cell of HPC and CCP
    - 5.2B: The Unit Cell
  - 6.2C: Interstitial Holes in HCP and CCP
  - 6.2D: Non-closed Packing: Simple Cubic and Body Centered Cubic

6.3: The Packing of Spheres Model Applied to the Structures of Elements
  - 6.3A: Group 18 Elements in the Solid State
  - 6.3B: \(H_2\) and \(F_2\) Solids
  - 6.3C: Solid Metallic Elements

6.4: Polymorphism in Metals
  - 6.4A: Polymorphism - Phase Changes in the Solid State
  - 6.4B: Phase Diagrams

6.5: Metallic Radii

6.6: Melting Points and Standard Enthalpies of Atomization of Metals

6.7: Alloys and Intermetallic Compounds
  - 6.7A: Substitutional Alloys
  - 6.7B: Interstitial Alloys
  - 6.7C: Intermetallic Compounds

6.8: Bonding in Metals and Semiconductors
  - 6.8A: Electrical Conductivity and Resistivity
  - 6.8B: Band Theory of Metals and Insulators
  - 6.8C: The Fermi Level
  - 6.8D: Band Theory of Semiconductors

6.9: Semiconductors
  - 6.9A: Intrinsic Semiconductors
7: Acids, bases and ions in aqueous solution

- **7.1: Introduction**
  - 7.1A: Acid-Base theories and concepts

- **7.2: Properties of Water**
  - 7.2A: Structure and Hydrogen Bonding
  - 7.2B: The Self Ionization of Water
  - 7.2C: Water as a Brønsted Acid or Base

- **7.3: Definitions and Units in Aqueous Solution**
  - 7.3A: Molarity and Molality
  - 7.3B: Standard State
  - 7.3C: Activity

- **7.4: Some Bronstead Acids and Bases**
  - 7.4A: Carboxylic Acids - Examples of Mono-, Di-, and Polybasic Acids
  - 7.4B: Inorganic Acids
  - 7.4C: Inorganic Bases - Hydroxides
  - 7.4D: Inorganic Bases - Nitrogen Bases

- **7.5: The Energetics of Acid Dissociation in Aqueous Solution**
  - 7.5A: Hydrogen Halides
  - 7.5B: \(H_2S\), \(H_2Se\), and \(H_2Te\)

- **7.6: Trends within a Series of Oxoacids \((EO_n(OH)_m)\)**

- **7.7: Aquated Cations - Formation and Acidic Properties**
  - 7.7A: Water as a Lewis Base
  - 7.7B: Aquated Cations as Bronstead Acids

- **7.8: Amphoteric Oxides and Hydroxides**
  - 7.8A: Amphoteric Behavior
  - 7.8B: Periodic Trends in Amphoteric Properties

- **7.9: Solubilities of Ionic Salts**
  - 7.9A: Solubility and Saturated Solutions
  - 7.9B: Sparingly Soluble Salts and Solubility Products
  - 7.9C: The Energetics of the Dissolution of an Ionic Salt - \(\Delta_{sol} G^\circ\)
  - 7.9D: The Energetics of the Dissolution of an Ionic Salt - Hydration of Ions
  - 7.9E: Solubilities - Some Concluding Remarks

- **7.10: Common-Ion Effect**

- **7.11: Coordination Complexes - An Introduction**
  - 7.11A: Definitions and Terminology
  - 7.11B: Investigating Coordination Complex Formation

- **7.12: Stability Constants of Coordination Complexes**
8: Reduction and Oxidation

- 8.1: Introduction
  - 8.1A: Oxidation and Reduction
  - 8.1B: Oxidation States
  - 8.1C: Stock Nomenclature
- 8.2: Standard Reduction Potentials, E°, and the Relationship Between E°, ΔG°, and K
  - 8.2A: Half-Cells and Galvanic Cells
  - 8.2B: Defining and Using Standard Reduction Potentials - E°
  - 8.2C: Dependence of Reduction Potentials on Cell Conditions
- 8.3: The Effect of Complex Formation or Precipitation on Reduction Potentials
  - 8.3A: Half-Cells Involving Silver Halides
  - 8.3B: Modifying the Relative Stabilities of Different Oxidation States of a Metal
- 8.4: Disproportionation Reactions
  - 8.4A: Disproportionation
  - 8.4B: Stabilizing Species Against Disproportionation
- 8.5: Potential Diagrams
- 8.6: Frost-Ebsworth Diagrams
  - 8.6A: Frost-Ebsworth Diagrams and their Relationship to Potential Diagrams
  - 8.6B: Interpretation of Frost-Ebsworth Diagrams
- 8.7: The Relationships Between Standard Reduction Potentials and Some Other Quantities
  - 8.7A: Factors Influencing the Magnitudes of Standard Reduction Potentials
  - 8.7B: Values of \(\Delta_f G^\circ\) for Aqueous Ions
- 8.8: Applications of Redox Reactions to the Extraction of Elements from their Ores
  - 8.8A: Ellingham Diagrams

9: Non-aqueous Media

An inorganic nonaqueous solvent is a solvent other than water, that is not an organic compound. These solvents are used in chemical research and industry for reactions that cannot occur in aqueous solutions or require a special environment.

- 9.1: Introduction to Non-aqueous Media
9.2: Relative Permittivity
9.3: Energetics of Ionic Salt Transfer from Water to an Organic Solvent
9.4: Acid-Base Behaviour in Non-Aqueous Solvents
  9.4A: Strengths of Acids and Bases
  9.4B: Levelling and Differentiating Effects
  9.4C: ‘Acids’ in Acidic Solvents
  9.4D: Acids and Bases - A Solvent-Oriented Definition
  9.4E: Protic and Aprotic Solvents
9.5: Liquid Sulfur Dioxide
9.6: Liquid Ammonia
  9.6A: Physical Properties
  9.6B: Self-Ionization of Ammonia
  9.6C: Reactions in Liquid NH₃
  9.6D: Solutions of s-block Metals in Liquid NH₃
  9.6E: Redox Reactions in Liquid NH₃
9.7: Liquid Hydrogen Fluoride
  9.7A: Physical Properties
  9.7B: Acid-Base Behavior in Liquid HF
  9.7C: Electrolysis in Liquid HF
9.8: Sulfuric Acid and Fluorosulfonic Acid
  9.8A: Physical Properties of Sulfuric Acid
  9.8B: Acid-Base Behaviour in Liquid \( H_2 SO_4 \)
  9.8C: Physical Properties of Fluorosulfonic Acid
9.9: Superacids
9.10: Bromine Trifluoride
  9.10A: Physical Properties
  9.10B: Fluoride Salts and Molecular Fluorides in BrF₃
  9.10C: Reactions in BrF₃
9.11: Dinitrogen Tetraoxide
  9.11A: Physical Properties of N₂O₄
  9.11B: Reactions in N₂O₄
9.12: Ionic Liquids
  9.12A: Molten Salt Solvent Systems
  9.12B: Ionic Liquids at Ambient Temperatures
9.13: Supercritical Fluids
  9.13A: Properties of Supercritical Fluids and Their Uses as Solvents
  9.13B: Supercritical Fluids as Media for Inorganic Chemistry
10: Hydrogen

- 10.1: Hydrogen - The Simplest Atom
- 10.2: The \(H^+\) and \(H^-\) Ions
  - 10.2A: The Hydrogen Ion (Proton)
  - 10.2B: The Hydride Ion
- 10.3: Isotopes of Hydrogen
  - 10.3A: Protium and Deuterium
  - 10.3B: Kinetic Isotope Effects
  - 10.3C: Deuterated Compounds
  - 10.3D: Tritium
- 10.4: Dihydrogen
  - 10.4A: Occurrence
  - 10.4B: Physical Properties
  - 10.4C: Synthesis and Uses
  - 10.4D: Reactivity
- 10.5: Polar and Non-Polar E-H Bonds
- 10.6: Hydrogen Bonding
  - 10.6A: The Hydrogen Bond
  - 10.6B: Trends in Boiling Points, Melting Points, and Enthalpies of Vaporization for p-block Binary Hydrides
  - 10.6C: Infrared Spectroscopy
  - 10.6D: Solid State Structures
  - 10.6E: Hydrogen Bonding in Biological Systems
- 10.7: Binary Hydrides - Classification and General Properties
  - 10.7A: Classification
  - 10.7B: Metallic Hydrides
  - 10.7C: Saline Hydrides
  - 10.7D: Molecular Hydrides and Complexes Derived from them
  - 10.7E: Covalent Hydrides with Extended Structures

11: Group 1 - Alkali Metals

The alkali metals make up Group 1 of the periodic table. This family consists of the elements lithium, sodium, potassium, rubidium, cesium, and francium (Li, Na, K, Rb, Cs, and Fr, respectively). Group one elements share common characteristics. They are all soft, silver metals. Due to their low ionization energy, these metals have low melting points and are highly reactive. The reactivity of this family increases as you move down the table.

- 11.1: Introduction
- 11.2: Occurrence, Extraction, and Uses
  - 11.2A: Occurrence
12: Group 2: Alkaline Earth Metals

- 12.1: Introduction
- 12.2: Occurrence, Extraction, and Uses
  - 12.2A: Occurrence
  - 12.2B: Extraction
  - 12.2C: Major Uses of Group 2 Metals and their Compounds
- 12.3: Physical Properties
  - 12.3A: General Properties
  - 12.3B: Flame Tests
  - 12.3C: Radioactive Isotopes
- 12.4: The Metals
  - 12.4A: Appearance
  - 12.4B: Reactivity
- 12.5: Halides
  - 12.5A: Beryllium Halides
  - 12.5B: Halides of Mg, Ca, Sr, and Ba
- 12.6: Oxides and Hydroxides
13: The Group 13 Elements

Group 13 is sometimes referred to as the boron group, named for the first element in the family. These elements are—not surprisingly—not located in column 13 of the periodic table. This group includes boron, aluminum, gallium, indium, thallium, and ununtrium (B, Al, Ga, In, Tl, and Uut, respectively). These elements all have three valence electrons. Boron is the only metalloid in this family. The rest of the elements are considered to be poor metals.

- 13.1: Introduction to Group 13 Elements
- 13.2: Occurrence, Extraction, and Uses
  - 13.2A: Occurrence
  - 13.2B: Extraction
  - 13.2C: Major Uses of the Group 13 Elements and their Compounds
- 13.3: Physical Properties
  - 13.3A: Electronic Configurations and Oxidation States
  - 13.3B: NMR Active Nuclei
- 13.4: The Elements
  - 13.4A: Appearance
  - 13.4B: Structures of the Elements
  - 13.4C: Reactivity
- 13.5: Simple Hydrides
  - 13.5A: Neutral Hydrides
  - 13.5B: The (\(\text{MH}_4\)^-\) Ions
- 13.6: Halides and Complex Halides
  - 13.6A: Boron Halides - (\(\text{BX}_3\)) and (\(\text{B}_{2}\text{X}_4\))
  - 13.6B: Al(III), Ga(III), In(III), and Tl(III) Halides and their Complexes
  - 13.6C: Lower Oxidation State Al, Ga, In, and Tl Halides
- 13.7: Oxides, Oxoacids, Oxoanions, and Hydroxides
  - 13.7A: Boron Oxoacids, Oxoanions, and Oxoanions
14: The Group 14 Elements

Group 14 of the periodic table is often referred to as the carbon group. It is located in column 14 of the periodic table and houses the elements carbon, silicon, germanium, tin, lead, and ununquadium (C, Si, Ge, Sn, Pb, and Uuq, respectively). Each element in this group contains four valence electrons. A unique feature of this group is that the elements can form different anions and cations. Carbon forms a 4- anion whereas silicon and germanium form 4+ cations. Tin and lead can even form 2+ cations.
The nitrogen family includes the following compounds: nitrogen (N), phosphorus (P), arsenic (As), antimony (Sb), and bismuth (Bi). All Group 15 elements have the electron configuration ns2np3 in their outer shell, where n is the principal quantum number.

- **15.1: Introduction**
- **15.2: Occurrence, Extraction, and Uses**
  - **15.2A: Occurrence**
  - **15.2B: Extraction**
  - **15.2C: Uses**
- **15.3: Physical Properties**
  - **15.3A: Bonding Considerations**
  - **15.3B: NMR Active Nuclei**
15.3C: Radioactive Isotopes

15.4: The Elements
   ▪ 15.4A: Nitrogen
   ▪ 15.4B: Phosphorus
   ▪ 15.4C: Arsenic, Antimony, and Bismuth

15.5: Hydrides
   ▪ 15.5A: Trihydrides, \((E \_H \_3)\) (E = N, P, As, Sb, and Bi)
   ▪ 15.5B: Hydrides, \((E \_2H \_4)\) (E = N, P, As)
   ▪ 15.5C: Chloramine and Hydroxylamine
   ▪ 15.5D: Hydrogen Azide and Azide Salts

15.6: Nitrides, Phosphides, Arsenides, Antimonides, and Bismuthides
   ▪ 15.6A: Nitrides
   ▪ 15.6B: Phosphides
   ▪ 15.6C: Arsenides, Antimonides, and Bismuthides

15.7: Halides, Oxohalides, and Complex Halides
   ▪ 15.7A: Nitrogen Halides
   ▪ 15.7B: Oxofluorides and Oxochlorides of Nitrogen
   ▪ 15.7C: Phosphorus Halides
   ▪ 15.7D: Phosphoryl Trichloride, \((POCI \_3)\)
   ▪ 15.7E: Arsenic and Antimony Halides
   ▪ 15.7F: Bismuth Halides

15.8: Oxides of Nitrogen
   ▪ 15.8A: Dinitrogen Monoxide, \((N \_2O)\)
   ▪ 15.8B: Nitrogen Monoxide, \((NO)\)
   ▪ 15.8C: Dinitrogen Trioxide, \((N \_2O \_3)\)
   ▪ 15.8D: Dinitrogen Tetraoxide, \((N \_2O \_4)\), and Nitrogen Dioxide, \((NO \_2)\)
   ▪ 15.8E: Dinitrogen Pentaoxide, \((N \_2O \_5)\)

15.9: Oxoacids of Nitrogen
   ▪ 15.9A: Isomers of \((H \_2N \_2O \_2)\)
   ▪ 15.9B: Nitrous Acid, \((HNO \_2)\)
   ▪ 15.9C: Nitric Acid, \((HNO \_3)\), and its Derivatives

15.10: Oxides of Phosphorous, Arsenic, Antimony, and Bismuth
   ▪ 15.10A: Oxides of Phosphorous
   ▪ 15.10B: Oxides of Arsenic, Antimony, and Bismuth

15.11: Oxoacids of Phosphorous
   ▪ 15.11A: Phosphinic Acid, \((H \_3PO \_2)\)
   ▪ 15.11B: Phosphonic Acid, \((H \_3PO \_3)\)
   ▪ 15.11C: Hypodiphosphoric Acid, \((H \_4P \_2O \_6)\)
16: The Group 16 Elements

16.1: Introduction
16.2: Occurrence, Extraction, and Uses
  16.2A: Occurrence
  16.2B: Extraction
  16.2C: Uses
16.3: Physical Properties and Bonding Considerations
  16.3A: NMR Active Nuclei and Isotopes as Tracers
16.4: The Elements
  16.4A: Dioxygen
  16.4B: Ozone
  16.4C: Sulfur - Allotropes
  16.4D: Sulfur - Reactivity
  16.4E: Selenium and Tellurium
16.5: Hydrides
  16.5A: Water, \(H_2O\)
  16.5B: Hydrogen Peroxide, \(H_2O_2\)
  16.5C: Hydrides, \(H_2E\) (E = S, Se, Te)
  16.5D: Polysulfanes
16.6: Metal Sulfides, Polysulfides, Polyselenides, and Polytellurides
  16.6A: Sulfides
  16.6B: Polysulfides
  16.6C: Polyselenides, and Polytellurides
16.7: Halides, Oxohalides, and Complex Halides
  16.7A: Oxygen Fluorides
  16.7B: Sulfur Fluorides and Oxofluorides
  16.7C: Sulfur Chlorides and Oxochlorides
  16.7D: Halides of Selenium and Tellurium
16.8: Oxides
- 16.8A: Oxides of Sulfur
- 16.8B: Oxides of Selenium and Tellurium

16.9: Oxoacids and their Salts
- 16.9A: Dithionous Acid, \( H_2S_2O_4 \)
- 16.9B: Sulfurous and Disulfurous Acids, \( H_2SO_3 \) and \( H_2S_2O_5 \)
- 16.9C: Dithionic Acid, \( H_2S_2O_6 \)
- 16.9D: Sulfuric Acid, \( H_2SO_4 \)
- 16.9E: Fluoro- and Chlorosulfonic Acids, \( HSO_3F \) and \( HSO_3Cl \)
- 16.9F: Polyoxoacids with S-O-S Units
- 16.9G: Peroxysulfuric Acids, \( H_2S_2O_8 \) and \( H_2SO_5 \)
- 16.9H: Thiosulfuric Acid, \( H_2S_2O_3 \), and Polythionates
- 16.9I: Oxoacids of Selenium and Tellurium

16.10: Compounds of Sulfur and Selenium with Nitrogen
- 16.10A: Sulfur-Nitrogen Compounds
- 16.10B: Tetraselenium Tetranitride

16.11: Aqueous Solution Chemistry of Sulfur, Selenium, and Tellurium

17: The Group 17 Elements
- 17.1: Introduction
- 17.2: Occurrence, Extraction, and Uses
  - 17.2A: Occurrence
  - 17.2B: Extraction
  - 17.2C: Uses
- 17.3: Physical Properties and Bonding Considerations
  - 17.3A: NMR Active Nuclei and Isotopes as Tracers
- 17.4: The Elements
  - 17.4A: Difluorine
  - 17.4B: Dichlorine, Dibromine, and Diiodine
  - 17.4C: Charge Transfer Complexes
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The study of Organometallic chemistry has been important in the growth of chemistry ever since the first compound was synthesized in 1827. Organometallic compounds can be defined as a compound that contains at least one metal-carbon bond, not including cyanide. Organometallic compounds are used in numerous reactions, including but not limited to, the Grignard reaction, and the Simmons-Smith reaction.

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