Contents

Chapter 1 Gas Chromatography 1
Chapter 2 High-Performance Liquid Chromatography111
Chapter 3 Thin-Layer Chromatography
Chapter 4 Supercritical Fluid Extraction and Chromatography213
Chapter 5 Electrophoresis
Chapter 6 Electroanalytical Methods
Chapter 7 Ultraviolet Spectrophotometry
Chapter 8 Infrared Spectrophotometry
Chapter 9 Nuclear Magnetic Resonance Spectroscopy407
Chapter 10 Mass Spectrometry
Chapter 11 Atomic Absorption Spectrometry
Chapter 12 Qualitative Tests
Chapter 13 Solution Properties
Chapter 14 Tables for Laboratory Safety
Chapter 15 Miscellaneous Tables
Indexes

Gas Chromatography

Carrier Gas Properties	
Carrier Gas Viscosity	5
Gas Chromatographic Support Materials for Packed Columns	10
Mesh Sizes and Particle Diameters	
Packed Column Support Modifiers	15
Properties of Chromatographic Column Materials	16
Properties of Some Liquid Phases for Packed Columns	19
Stationary Phases for Packed Column Gas Chromatography	31
Adsorbents for Gas-Solid Chromatography	34
Porous Polymer Phases	
Relative Retention on Some Haysep Porous Polymers	42
Silicone Liquid Phases	
Mesogenic Stationary Phases	50
Trapping Sorbents	73
Sorbents for the Separation of Volatile Inorganic Species	75
Activated Carbon as a Trapping Sorbent for Trace Metals	76
Reagent Impregnated Resins as Trapping Sorbents for Trace Minerals	7 7
Reagent Impregnated Foams as Trapping Sorbents for Inorganic Species	
Chelating Agents for the Analysis of Inorganics by Gas Chromatography	79
Bonded Phase Modified Silica Substrates for Solid Phase Extraction	
Solid Phase Microextraction Sorbents	
Extraction Capability of Solid Phase Microextraction Sorbents	
Salting Out Reagents for Headspace Analysis	85
Partition Coefficients of Common Fluids in Air-Water Systems	
Vapor Pressure and Density of Saturated Water Vapor	87
Derivatizing Reagents for Gas Chromatography	88
Detectors for Gas Chromatography	
Recommended Operating Ranges for Hot Wire Thermal Conductivity Detectors	102
Chemical Compatibility of Thermal Conductivity Detector Wires	103
Data for the Operation of Gas Density Detectors	
Phase Ratio for Capillary Columns	
Martin-James Compressibility Factor and Giddings Plate Height Correction Factor	
Cryogens for Subambient Temperature Gas Chromatography	
Dew Point-Moisture Content	110

High-Performance Liquid Chromatography

Modes of Liquid Chromatography	
Solvents for Liquid Chromatography	
Instability of HPLC Solvents	
Ultraviolet Absorbance of Reverse Phase Mobile Phases	
Ultraviolet Absorbance of Normal Phase Mobile Phases	120
Some Useful Ion-Pairing Agents	
Materials Compatible with and Resistant to 72% Perchloric Acid	
More Common HPLC Stationary Phases	
Eluotropic Values of Solvents on Octadecylsilane	
Mesh-Size Relationships	
Efficiency of HPLC Columns	
Column Failure Parameters	131
Specialized Stationary Phases for Liquid Chromatography	
Chiral Stationary Phases for Liquid Chromatography	
Detectors for Liquid Chromatography	
Ultraviolet Detection of Chromophoric Groups	
Derivatizing Reagents for HPLC	

Thin-Layer Chromatography

Strength of Common TLC Solvents	
Modification of the Activity of Alumina by Addition of Water	181
Stationary and Mobile Phases	
Typical Stationary and Mobile Phase Systems Used	
in the Separation of Various Inorganic Ions	192
Spray Reagents in Thin-Layer Chromatography	
Protocol for Reagent Preparation	

Supercritical Fluid Extraction and Chromatography

Some Useful Fluids for Supercritical Fluid Extraction and Chromatography	215
P-p-T Table for Carbon Dioxide	218
Solubility Parameters of the Most Common Fluids for Supercritical	
Fluid Extraction and Chromatography	262
Solubility Parameters of Supercritical Fluids	
Solubility Parameters of Liquid Solvents	
Instability of Modifiers Used with Supercritical Fluids	

Electrophoresis

Separation Ranges of Polyacrylamide Gels	267
Preparation of Polyacrylamide Gels	
Buffer Mixtures Commonly Used for Polyacrylamide Gel Electrophoresis	
Proteins for Internal Standardization of Polyacrylamide Gel Electrophoresis	
Chromogenic Stains for Gels	
Fluorescent Stains for Gels	

Electroanalytical Methods

Detection Limits for Various Electrochemical Techniques	
Values of (2.3026 RT/F) (in mV) at Different Temperatures	
Potential of Zero Charge (E ^{ecm}) for Various Electrode Materials in Aqueous Solutions	
at Room Temperature	
Variation of Reference Electrode Potentials with Temperature	
pH Values of Standard Solutions Used in the Calibration of Glass Electrodes	279
Temperature vs. pH Correlation of Standard Solutions Used	
for the Calibration of Electrodes	
Solid Membrane Electrodes	281
Liquid Membrane Electrodes	282
Standard Reduction Electrode Potentials for Inorganic Systems	
in Aqueous Solutions at 25°C	283
Standard Reduction Electrode Potentials for Inorganic Systems	
in Nonaqueous Solutions at 25°C	
Redox Potentials for Some Biological Half Reactions	
Standard emf Values for the Cell H ₂ /HCl/AgCl, Ag in Various Aqueous Solutions	
of Organic Solvents at Various Temperatures	288
Temperature Dependence of the Standard Potential of the Silver Chloride Electrode	
Standard Electrode Potentials of Electrodes of the First Kind	290
Standard Electrode Potentials of Electrodes of the Second Kind	291
Polarographic Half-Wave Potentials (E ₁₀) of Inorganic Cations	292
Polarographic E _{1/2} Ranges (in V vs. SCE) for the Reduction of Benzene Derivatives	295
Vapor Pressure of Mercury	296
Organic Functional Group Analysis of Nonpolarographic Active Groups	297
Coulometric Titrations	299

Ultraviolet Spectrophotometry

Solvents for Ultraviolet Spectrophotometry	
Ultraviolet Spectra of Common Liquids	
Transmittance-Absorbance Conversion	
Correlation Table of Ultraviolet Active Functionalities	
Woodward's Rules for Bathochromic Shifts	

Infrared Spectrophotometry

Infrared Optics Materials	
Internal Reflectance Element Characteristics	
Water Solubility of Infrared Optics Materials	
Wavelength-Wavenumber Conversion Table	
Useful Solvents for Infrared Spectrophotometry	
Polystyrene Wavenumber Calibration	
Infrared Absorption Correlation Charts	
Mid-Range Infrared Absorptions of Major Chemical Families	
Common Spurious Infrared Absorption Bands	

Nuclear Magnetic Resonance Spectroscopy

Properties of Important NMR Nuclei	
Gyromagnetic Ratio of Some Important Nuclei	
Classification of Important Quadrupolar Nuclei According to Natural Abundance	
and Magnetic Strength	
Chemical Shift Ranges of Some Nuclei	413
Reference Standards for Selected Nuclei	414
¹ H and ¹³ C Chemical Shifts of Useful Solvents for NMR Measurements	415
Proton NMR Absorption of Major Chemical Families	
Organic Nitrogen Compounds	
Some Useful ¹ H Coupling Constants	
Additivity Rules in ¹³ C NMR Correlation Tables	
¹³ C NMR Absorptions of Major Functional Groups	
¹³ C NMR Chemical Shifts of Organic Families	
¹⁵ N Chemical Shifts for Common Standards	
¹⁵ N Chemical Shifts of Major Chemical Families	437
Spin–Spin Coupling to ¹⁵ N	440
¹⁹ F Chemical Shift Ranges	
¹⁹ F Chemical Shifts of Some Fluorine-Containing Compounds	
Fluorine Coupling Constants	
Residual Peaks Observed in the 'H NMR Spectra of Common	
Deuterated Organic Solvents	

Mass Spectrometry

Natural Abundance of Important Isotopes
Rules for Determination of Molecular Formula
Neutral Moieties Ejected from Substituted Benzene Ring Compounds
Order of Fragmentation Initiated by the Presence of a Substituent
on a Benzene Ring
Chlorine-Bromine Combination Isotope Intensities
Reference Compounds under Electron Impact Conditions in Mass Spectrometry
Major Reference Masses in the Spectrum of Heptacosafluorotributylamine
(Perfluorotributylamine)
Common Fragmentation Patterns of Families of Organic Compounds464
Common Fragments Lost
Important Peaks in the Mass Spectra of Common Solvents
Reagent Gases for Chemical Ionization Mass Spectrometry469
Proton Affinities of Some Simple Molecules
Proton Affinities of Some Anions
Detection of Leaks in Mass Spectrometer Systems
Mass Resolution Required to Resolve Common Spectral Interferences Encountered
in Inductively Coupled Plasma Mass Spectrometry

Atomic Absorption Spectrometry

Introduction for Atomic Spectrometric Tables	479
Standard Solutions: Selected Compounds and Procedures	
Limits of Detection Tables for Common Analytical Transitions in AES and AAS	
Detection Limits by Hydride Generation and Cold Vapor AAS	
Spectral Overlaps	
Relative Intensities of Elemental Transitions from Hollow Cathode Lamps	
Inert Gases	
Close Lines for Background Correction	
Beta Values for the Air-Acetylene and Nitrous Oxide-Acetylene Flames	
Lower-Energy-Level Populations (in Percent) as a Function of Temperature	
Critical Optimization Parameters for AES/AAS Methods	
Flame Temperatures and References on Temperature Measurements	
Fundamental Data for the Common Transitions	
Activated Carbon as a Trapping Sorbent for Trace Metals	
Reagent-Impregnated Resins as Trapping Sorbents for Trace Minerals	
Reagent-Impregnated Foams as Trapping Sorbents for Inorganic Species	

Qualitative Tests

Organic Group Qualitative Tests	529
Protocol for Chemical Tests	530
Organic Families and Chemical Tests	
Inorganic Group Qualitative Tests	
Tests for Anions	
Tests for Cations	549
Organic Precipitation Reagents for Inorganic Ions	

Solution Properties

Physical Properties of Liquid Water	
Refractive Index of Water	54
Approximate pK Values of Compounds Useful in Buffer Systems	55
Preparation of Buffers	
Dielectric Constants of Inorganic Solvents	
Dielectric Constants of Methanol-Water Mixtures from 5 to 55°C	
Common Drying Agents for Organic Liquids	
Common Recrystallization Solvents	

Tables for Laboratory Safety

Major Chemical Incompatibilities	587
Properties of Hazardous Solids	589
Compounds that Are Reactive with Water	592
Pyrophoric Compounds: Compounds that Are Reactive with Air	
Vapor Pressure of Mercury	
Flammability Hazards of Common Liquids	
Abbreviations Used in the Assessment and Presentation of Laboratory Hazards	
Chemical Carcinogens	
Organic Peroxides	607
Testing Requirements of Peroxidizable Compounds	
Tests for the Presence of Peroxides	
Characteristics of Chemical-Resistant Materials	
Selection of Protective Laboratory Garments	612
Protective Clothing Levels	
Selection of Laboratory Gloves	
Selection of Respirator Cartridges and Filters	
Effects of Electrical Current on the Human Body	
Electrical Requirements of Common Laboratory Devices	

Miscellaneous Tables

Unit Conversions	621
Mass and Volume-Based Concentration Units	627
Concentration Units Nomenclature	628
Molar-Based Concentration Units	629
Recommended Values of Selected Physical Constants	630
Standards for Laboratory Weights	631
Thermocouple Reference Voltages	635
Standard CGA Fittings for Compressed Gas Cylinders	637
Gas Cylinder Stamped Markings	
Plug and Outlet Configurations for Common Laboratory Devices	