

# Fundamentals of HPLC and HPLC-MS

## (2 Day On-Site Short Course)

### Course Outline

**Goal:** To provide a fundamental overview of modern high performance liquid chromatography and its uses in combination with mass spectrometry. The basic course outline is presented below.

**Offering:** Because of time limitations this two day on-site short course will be taught as a balanced treatment of the topics outlined below. Emphasis will be placed on developing and using reliable and rugged HPLC and HPLC-MS methods including the effective use of electrospray ionization.

- A. High Performance Liquid Chromatography
  1. Basic Theory
    - a. Band Migration
    - b. Band Broadening
  2. Columns
    - a. Fundamental Considerations
    - b. Column/Phase Selection/Stability
    - c. Eluent and Additive Selection
  3. Instrumentation
    - a. Sample Introduction
    - b. Pumping Systems
    - c. Column Temperature Control
    - d. General and Specialty Detectors
    - e. Routine Maintenance
  4. Separation Design
    - a. Choosing Conditions
    - b. Optimizing Performance
    - c. Recognizing and Minimizing Problems
- B. Basics of Mass Spectrometry
  1. Basic Theory
    - a. Ionization Mechanisms
    - b. Ion Separation Mechanisms
    - c. Detection
  2. Instrumentation
    - a. Spectrometer Configurations
    - b. Ionization Sources
    - c. Analyzer Designs
    - d. Interfaces and Solute Transfer
    - e. Detection
    - f. Spectrometer Design vs. Performance
  3. Optimizing and Maintaining Performance
    - a. Ionization Techniques
    - b. Tuning and Calibration
    - c. Qualitative vs. Quantitative Information
  4. Routine Maintenance
- C. Problem Solving and Troubleshooting
  1. Methods Development
  2. Equipment Performance
  3. Miscellaneous Topics

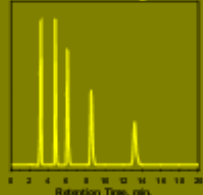
### Course Instructors

**Roger K. Gilpin** is the Mead Distinguished Professor and Executive Director of Brehm Research Laboratories, Wright State University. Prior to this, he was Dean of the College of Science and Mathematics at WSU. He also is Director of the Consortium for Environmental and Process Technologies and President and a Co-Founder of Select-O-Sep, LLC.

Dr. Gilpin received his B.S. degree in Chemistry from Indiana State University in 1969 and his Ph.D. degree in Analytical Chemistry from the University of Arizona in 1973. From 1973 to 1978 he was employed as Senior Scientist and then as Group Leader of Analytical Chemistry in the Research Division of McNeil Laboratories. In 1978, Dr. Gilpin joined the faculty of Kent State University and was Professor and Chairman of the Department from 1985 to 1996.

Professor Gilpin's research interests are in fundamental and applied aspects of gas and liquid chromatography, environmental, pharmaceutical, and biomedical analysis of physiologically important compounds, chromatographic and spectrometric studies of chemically modified surfaces, characterization of the interfacial properties of materials, fundamental and applied aspects of electrospray and other mass spectrometric ionization techniques, and other liquid based capillary separation techniques.

He has published about 200 papers and presented over 450 talks at national and international scientific conferences, is Associate Editor of the *Journal of Chromatographic Science* and serves on its Editorial Advisory Board, was Section Editor for the Pharmaceutical Analysis Section of the Encyclopedia of Analytical Chemistry and is a member of the Special Emphasis Panel for NIH



# Fundamentals of HPLC and HPLC-MS

## (2 Day On-Site Short Course)

related to technology transfer where he has served for 22 years. He has been the principle author on the annual reviews of "Pharmaceutical and Related Drugs," published in Analytical Chemistry on a continuous basis since 1973.

**Joseph G. Solch** is Laboratory Manager of Brehm Research Laboratory, Wright State University and a technical consultant to the Terran Corporation and Analytical Innovations, Inc. Likewise, he is Vice-President and a Co-Founder of Select-O-Sep, LLC.

Prior to this he earned his undergraduate degree in Chemistry and his graduate degree in Analytical Chemistry from Wright State University in 1974 and 1979, respectively. He has over 25 years of experience in the operation, maintenance, and application of high resolution gas chromatograph, published approximately 70 manuscripts, and presented a similar number talks at scientific conferences.

His research interests are in fundamental and applied aspects of gas chromatography and mass spectrometry, the utilization of high resolution GC/MS techniques for assaying physiologically important compounds, the automation and remote access/operation of laboratory instrumentation, and the development of virtual laboratories for remote measurements of analytes and teaching purposes.

### Suggested Scheduling

- A. Day One
1. First Session (80 min., lectures)
  2. Morning Break (15-20 min.)
  3. Second Session (80 min., lectures)
  4. Lunch (60 min.)
  5. Third Session (80 min., lectures)
  6. Afternoon Break (15-20 min.)
  7. Fourth Session (40 min., lectures)
  8. Fifth Session (40 min., open discussions)
- B. Day Two
1. First Session (80 min., lectures)
  2. Morning Break (15-20 min.)
  3. Second Session (80 min.)
  4. Lunch (60 min.)
  5. Third Session (80 min.)
  6. Afternoon Break (15-20 min.)
  7. Fourth Session (40 min.)

8. Fifth Session (40 min., open discussions)

or

- A. Day One
1. First Session (60 min., lectures)
  2. Break (7-10 min.)
  3. Second Session (60 min., lectures)
  4. Break (7-10 min.)
  5. Third Session (60 min., lectures)
  6. Lunch (60 min.)
  7. Forth Session (60 min., lectures)
  8. Break (7-10 min.)
  9. Fifth Session (40 min., lectures)
  10. Sixth Session (40 min., open discussions)
- B. Day Two
1. First Session (60 min., lectures)
  2. Break (7-10 min.)
  3. Second Session (60 min., lectures)
  4. Break (7-10 min.)
  5. Third Session (60 min., lectures)
  6. Lunch (60 min.)
  7. Forth Session (60 min., lectures)
  8. Break (7-10 min.)
  9. Fifth Session (40 min., lectures)
  10. Sixth Session (40 min., open discussions)

### Logistics/Site Preparation

All local site preparation and associated site costs are the responsibility of the course purchaser. The course instructors will provide their own computer/digital projection equipment. However, the purchaser will need to arrange for a projection screen or usable white or nearly white wall surface and if necessary audio equipment (the latter typically is not required in a small room setting). Prior to arrival the course material (i.e., copies of the power point slides) will be shipped in electronic printable format. Unless otherwise specified, it is the responsibility of the purchaser to prepare hardcopies of the electronic materials and distribute them to their employees. However, if bound hardcopy manuals are preferred, these can be supplied at a cost of \$19.35/copy plus shipping.