Department of Forensic Science

BREATH ALCOHOL TRAINING MANUAL

TABLE OF CONTENTS

1 Introduction

- **1.1 Purpose and Scope**
- **1.2 Coordination of the Program**
- **1.3 Training Period**
- **1.4 Instructions to the Trainee**
- **1.5 Instructions to the Training Coordinator**
- **1.6 Preparation for Mock Trial**
- **1.7 Guidelines for Technical Final, Practical Test, and Mock Trial**
- **1.8 Transition from Trainee to Forensic Scientist / Forensic Laboratory Specialist**

2 Orientation

- **2.1 Estimated Time**
- **2.2 Introduction to Local Operating Facilities and Personnel**
- **2.3 Assignment of Work Area (Stock Room)**
- **2.4 Coverage of Personnel, Physical and IT, and Manuals and Policies**
- **2.5 Organizational Structure of the Department of Forensic Science**
- **2.6 Introduction to the Technical Capabilities of Regional Laboratories**
- **2.7 Explanation of the Training Program**
- **2.8 Explanation of the Operation of Law Enforcement Agencies and Court Systems**
- **2.9 Clarification of Duties**
- **2.10 Introduction to the BrAD System and BA-Shared**

3 Operator

- **3.1 Objectives**
- **3.2 Estimated Time**
- **3.3 Methods of Instruction**
- **3.4 Evaluation**

4 Instructor

- **4.1 Objectives**
- **4.2 Estimated Time**
- **4.3 Methods of Instruction**
- **4.4 Evaluation**

5 Instrument

- **5.1 Objectives**
- **5.2 Estimated Time**
- **5.3 Methods of Instruction**
- **5.4 Resources**
- **5.5 Evaluation**
- **5.6 Examination Questions**
- **5.7 Practical Testing for Intox EC/IR II**

6 Legal Aspects and Testimony

- **6.1 Legal Aspects (Overview of Judicial System)**
- **6.2 Pertinent Legal Cases**
- **6.3 Testimony**

7 Alcohol Pharmacology, Impairment, and Courtroom Testimony

7.1 Objectives
7.2 Required Reading
7.3 Study Questions
7.4 Practical Examination
7.5 Technical Examination
7.6 Mock Trial

8 Uncertainty of Measurement

8.1 Objectives
8.2 Readings and Presentations
8.3 Study Questions
8.4 Evaluation

1 INTRODUCTION

1.1 Purpose and Scope

1.1.1 The purpose of this manual is to define the training program for Forensic Scientists (FSs) and Forensic Laboratory Specialists (FLSs) working in the Breath Alcohol Section (the Section). This manual is intended to be used in a formal training program that will establish the knowledge, skills and abilities necessary to perform job functions within the Section.

1.1.2 The manual is organized into modules (chapters); each module outlines the objectives, time expected to complete training in the module's content, methods of instruction, modes of evaluation, and review questions (if applicable).

1.1.3 The program evaluates the progress and performance of the trainee at appropriate intervals. Evaluation is conducted as described in each module.

1.1.4 The sequence in which the modules are presented should not necessarily be considered the mandatory order of instruction.

1.1.5 The program culminates in technical presentations and a mock trial.

1.1.6 FLSs will not complete Chapters 4 and 7 and some portions of Chapter 6 (as specified). Additionally, they will demonstrate competency with the procedures in the Breath Alcohol Procedures Manual.

1.2 Coordination of the Program

1.2.1 The training coordinator (TC) is usually the immediate supervisor of the trainee.

1.2.2 The TC will be responsible for the overall training, but may delegate certain duties to other individuals.

1.3 Training Period

The length of the training period is a highly variable matter and will be left to the determination of the Toxicology Program Manager (the Program Manager). Certain individuals may require less time than others, depending on experience, education, or learning ability. However, the training period is usually completed within 12 months for FSs and eight months for FLSs.

1.4 Instructions to the Trainee

1.4.1 The trainee is expected to document all their training activity and to provide a weekly progress report to the TC.

1.4.2 The trainee will assist with operator training and instrument maintenance, repair and certification throughout the training period, under the direct supervision of a qualified individual once the trainee has demonstrated their competency to perform particular tasks.

1.5 Instructions to the Training Coordinator

1.5.1 As previously stated, the intent of the training manual is to define a program that will ensure each and every trainee receives certain basic principles and fundamentals necessary to the complete education of FSs and FLSs within the Section. All of the listed topics must be incorporated into the program for FSs.

1.5.2 The TC is responsible for generating and maintaining program documentation during the training period. Each section of the Training Worksheet must be dated and initialed upon completion of the specified task. If any task is not completed, for any reason, this must be explained in the training file and approved by the Program Manager.

1.5.3 Once the trainee has satisfactorily completed the program, the Program Manager shall forward a written recommendation for certification to the Department Director.

1.5.3.1 The trainee may be qualified to perform certain duties after successful completion of the appropriate module(s) or portions thereof. This may be done at the recommendation of the TC and approval by the Program Manager.

1.5.4 If the trainee does not meet expectations during the training period, the TC will inform the Program Manager in a timely manner.

1.6 Preparation for Mock Trial

1.6.1 The training coordinator is responsible for ensuring that the trainee is thoroughly prepared for legal questioning. This can be done by a combination of practice mock trials, prearranged as well as impromptu question and answer sessions, and observation of courtroom testimony given by experienced individuals.

1.6.2 The scheduling of practice mock trials is to be done by the training coordinator. These are to be conducted throughout the training period.

1.7 Guidelines for Technical Final, Practical Test, and Mock Trial

1.7.1 Technical final

1.7.1.1 Prior to the mock trial, a technical oral examination of the trainee will be conducted to ascertain the technical knowledge of the individual. This will be limited to 2 hours.

1.7.1.2 After the examination, the attendees will discuss the trainee's performance.

1.7.1.2.1 The outcome of the examination will be satisfactory or not satisfactory.

1.7.1.2.2 If the trainee's performance was not satisfactory, steps must be taken to effect the appropriate action.

1.7.2 Practical test

1.7.2.1 For module 5, the trainee will be given a practical test for each portion of maintenance. Successful completion of a particular module or portions therein will demonstrate competence on the procedure/equipment and the trainee may then be authorized to perform that procedure. Upon successful completion of each practical test, the trainee may be authorized to perform the same duties in the laboratory.

1.7.2.2 Following successful completion of module 4, the FS trainee will be given a practical test.

1.7.2.2.1 The practical test will generally consist of the trainee providing instruction to classes or portions thereof while being observed by the Supervisor.

1.7.3 Mock trial

1.7.3.1 A recorded final mock trial will be conducted with a pre-distributed scenario.

1.7.3.2 The atmosphere will be formal, that is, it will be conducted in the same manner as a real courtroom situation. This includes dress, conduct, protocol and all other aspects. Answers and explanations are to be directed as to a lay jury or judge.

1.7.3.3 The mock trial will not exceed 3 hours.

1.7.3.4 The role of the prosecutor will be assumed by the training coordinator or designee.

1.7.3.5 The mock trial may be stopped at any time upon request of any of the involved parties.

1.7.3.6 After the court, attendees will assess the trainee's performance.

1.7.3.6.1 The outcome of the mock trial will be satisfactory or not satisfactory.

1.7.3.6.2 If the trainee's performance was not satisfactory, steps must be taken to effect the appropriate action.

1.7.3.7 This assessment will be immediately followed by a short performance critique.

1.7.3.8 The training coordinator will review the video of the trial with the trainee as soon as possible. Other attendees should provide comments to the training coordinator as soon as possible.

1.8 Transition from Trainee to Forensic Scientist / Forensic Laboratory Specialist

1.8.1 After the new FS/FLS has successfully completed this training, the TC is to ensure that the transition from training to independent work takes place as smoothly as possible.

1.8.2 Classes/Instrument assignments will be introduced under the guidance of the Supervisor.

1.8.3 The supervisor, training coordinator, or designee will monitor the newly qualified individual to court for at least their first testimony.

2 ORIENTATION

2.1 Estimated Time

First week of employment, revisit information as necessary or requested.

2.2 Introduction to Local Operating Facilities and Personnel

Tour

2.3 Assignment of Work Area (Stock Room)

2.4 Coverage of Personnel, Physical and IT, and Manuals and Policies

2.4.1 Personnel

2.4.1.1 Human Resources-related DFS websites (i.e., Cardinal, Ideagen/Qualtrax)

2.4.1.2 Hours of work policy

2.4.1.3 Human Resources paperwork/documentation

2.4.2 Physical and Information Technology

2.4.2.1 Building security

2.4.2.2 Access badge/ID card

2.4.2.3 Computer access

2.4.2.4 Required online training(s)

2.4.2.5 Pool vehicles

2.4.3 Manuals and Policies

2.4.3.1 DFS Quality Manual (QM)

2.4.3.2 DFS Safety Manual

2.4.3.3 Breath Alcohol Procedures Manual

2.4.3.4 Regional Operating Procedures (ROPs)

2.5 Organizational Structure of the Department of Forensic Science

2.6 Introduction to the Technical Capabilities of Regional Laboratories

2.7 Explanation of the Training Program

Explanation of the purpose of the training program including an insight into the course of events and what the trainee is expected to accomplish

2.8 Explanation of the Operation of Law Enforcement Agencies and Court Systems

2.9 Clarification of Duties

Explanation of the duties of all personnel within the Section

2.10 Introduction to the BrAD system and BA-Shared

3 OPERATOR

3.1 Objectives

3.1.1 To familiarize the trainee with the basic theory of breath testing.

3.1.2 To familiarize the trainee with the duties of an operator licensed in Virginia.

3.1.3 To learn the proper protocol for conducting an evidential breath test.

3.1.4 To have the trainee successfully pass the initial licensing course and become licensed as an operator.

3.2 Estimated Time

One week.

3.3 Methods of Instruction

3.3.1 Attend initial course for licensure.

3.3.2 Resources

3.3.2.1 Breath Test Operator Instructional Manual

3.3.2.2 Additional reading material assigned by the TC, course director, instructor, or supervisor

3.4 Evaluation

3.4.1 Initial Course written exam - trainee must obtain a score of 90% or greater.

3.4.2 Additional written exam to include current retraining exam.

4 INSTRUCTOR

4.1 Objectives

4.1.1 To familiarize the trainee with the course content and logistics of training.

4.1.2 To ensure the trainee is knowledgeable about applicable sections within the Code of Virginia, Virginia Register of Regulations, Federal Register, and all DFS policies and procedures governing breath alcohol testing.

4.1.3 To familiarize the trainee with the proper procedure for handling an initial course of licensure for law enforcement officers from set up through final paperwork.

4.1.4 To familiarize the trainee with the proper procedure for handling a retraining course for law enforcement officers from set up through final paperwork.

4.1.5 To ensure that the trainee is able to convey all course materials in an accurate, timely and professional manner.

4.2 Estimated Time

Two months - time dependent upon trainee successfully completing this module as well as parts of instrumentation module.

4.3 Methods of Instruction

4.3.1 Observation of initial and retraining course from instructor viewpoint.

4.3.2 Resources

4.3.2.1 Breath Test Operator Instructor's Manual

4.3.2.2 Breath Test Operator Instructional Manual

4.3.2.3 Code of Virginia

4.3.2.4 Virginia Register of Regulations

4.3.2.5 Federal Register

4.3.2.6 Medical-Legal Aspects of Alcohol, 4th ed., J.C. Garriott Chapters 1-4, 7,8,13

4.4 Evaluation

4.4.1 Written quiz (not open notes) on Code, Regulations and policies.

4.4.2 Presentation of segment of initial course to supervisor and other breath alcohol personnel.

4.4.3 Demonstration of ability to take initial and retraining courses from assembly to completion.

4.4.4 Written Instructor's test.

4.4.5 Supervised presentation of retraining course.

5 INSTRUMENT

5.1 Objectives

5.1.1 To familiarize the trainee with the basic theory of breath testing instrumentation.

5.1.2 To ensure that the trainee understands the role and location of components in the current evidential instrument.

5.1.3 To familiarize the trainee with maintenance performed by authorized personnel and the corresponding documentation.

5.1.4 To familiarize the trainee with the password enabled functions of the instrument.

5.1.5 To ensure the trainee can perform troubleshooting and maintenance.

5.1.6 To ensure trainee is familiar with the maintenance and use of preliminary breath testing devices (PBTs).

5.2 Estimated Time

5.2.1 One month to attain basic knowledge necessary for conducting remote classes.

5.2.2 Three months for total understanding necessary for testimony and limited repair of training instruments.

5.2.3 Six to nine months for mastery of maintenance and basic troubleshooting.

5.3 Methods of Instruction

5.3.1 Read applicable portions of QM and Section Procedure Manual to familiarize trainee with expectations.

5.3.2 Observe FLS and FS personnel in laboratory and remote settings performing troubleshooting, repair procedures, and accompanying documentation.

5.3.3 Observe calibration and certification process, complete paperwork and understand QA trail of all documentation.

5.3.4 Perform maintenance on training instruments with qualified personnel overseeing process so trainee is able to have “hands on” experience and gain valuable feedback.

5.3.5 Attend the manufacturer’s course on the instrumentation (funding dependent).

5.3.6 Attend the Robert F. Borkenstein Alcohol and Highway Safety Course. This is considered mandatory contingent on resources (funding, availability).

5.4 Resources

5.4.1 Breath Test Operator Instructional Manual

5.4.2 Manufacturer websites and published materials

5.4.3 FLS and FS personnel

5.4.4 Medical-Legal Aspects of Alcohol, 4th ed., J.C. Garriott Chapters 7,8,10, and 12

5.4.5 Mason, M.F. and Dubowski, K.M. "Breath-Alcohol Analysis: Uses, Methods, and Some Forensic Problems"

5.4.6 Dubowski, Kurt M. "Quality Assurance in Breath-Alcohol Analysis"

5.4.7 Department of Forensic Science Quality Manual

5.4.8 Breath Alcohol Procedures Manual

5.5 Evaluation

5.5.1 Locate, label, and define purpose of instrument components.

5.5.2 Explain theory behind systems within the instrument.

5.5.3 Explain theory behind the use of dry gas as a standard.

5.5.4 Define quality assurance, accuracy and precision and explain processes followed to ensure each.

5.5.5 Understand and articulate causes and responses to instrument messages.

5.5.6 Demonstrate ability to navigate password enabled functions.

5.5.7 Successfully calibrate and certify training instrument and complete paperwork according to all DFS policies/procedures.

5.5.8 Successfully perform all portions of maintenance outlined in Breath Alcohol SOP’s, with proper documentation.

5.5.9 Under the supervision of the Training Coordinator, perform at least one certification; properly completing paperwork.

5.6 Examination Questions

5.6.1 Define and explain Henry's law and its application(s) to breath testing.

5.6.2 Define and explain quality assurance and quality control.

5.6.3 Define and explain accuracy and precision.

5.6.4 Define and explain calibration and certification.

5.6.5 Define and explain the fuel cell and its theory.

5.6.5.1 Components

5.6.5.2 Chemical reaction

5.6.5.3 Reactants

5.6.5.4 Calibration

5.6.6 Define and explain the infrared system and its theory.

5.6.7 Define and explain the flow detector system and its theory.

5.6.8 Dry gas

5.6.8.1 Define and explain the applicable gas laws.

5.6.8.2 Explain and define importance of traceability with standards.

5.6.9 Define the following instrument messages/situations

5.6.9.1 No Sample Given

5.6.9.2 Deficient Sample

5.6.9.3 Operator Abort

5.6.9.4 Evidential test vs F2 test

5.6.9.5 Invalid Sample

5.6.9.6 Interferent Detected

5.6.9.7 Ambient/RFI Detected

5.6.9.8 ABA vs. ACABABA (BA)

5.6.9.9 Sample Over Range and Test Result Over Range

5.6.9.10 Out of Tolerance

5.6.9.11 Solenoid Error

5.6.10 Discuss each of these instruments

5.6.10.1 Intoxilyzer 5000 and 8000

5.6.10.2 National Patent Datamaster

5.6.10.3 Draeger Alcotest 7110 and 9510

5.7 Practical Testing for Intox EC/IR II

5.7.1 Initial instructions

5.7.1.1 Retain all printouts.

5.7.1.2 All documentation in this section will be labeled with the trainee's signature or initials (following QM 18.2.2).

5.7.1.3 Print out a hard copy of this section, as you complete each item, initial next to the specification number. Alternatively, the completed units can be recorded on the Training Modules Worksheet.

5.7.2 On an Intox EC/IR II with the current firmware/software version, perform the following tasks

5.7.2.1 Calibration (section 5 of the Breath Alcohol Procedures Manual).

5.7.2.2 Certification (section 6 of the Breath Alcohol Procedures Manual, omit 6.6).

5.7.2.3 Obtain unknown solution from TC.

5.7.2.4 Allow solution to come to proper temperature (minimum 30 minutes).

5.7.2.4.1 Through the quick test (F2) blow through the simulator into the breath tube. Repeat 4 more times.

5.7.2.4.1.1 Simulators should be primed (blown through) for 1-2 seconds immediately prior to use.

5.7.2.4.2 Average readings 2-5.

5.7.2.4.3 Test the solution on the instrument certified in 5.7.2.2 by conducting 4 accuracy checks on the simulator. Target value is the average value from 5.7.2.4.2.

5.7.2.5 Turn in all paperwork (instrument printouts, QA sheet) to TC for review.

5.7.3 The trainee will be given a practical test for each portion of maintenance. Upon successful completion of each practical test, the trainee may be instructed by the training coordinator to perform the same duties in the laboratory under the supervision of a qualified person. Successful completion of a particular portion will prove competence on the procedure/equipment and the trainee may then be authorized to perform that procedure.

5.7.4 The trainee shall perform and document the technical review of at least five certifications on the appropriate Technical Review Form- Breath Alcohol (TRF-BA). The results of their reviews shall be compared to those of the non-training reviews and discussed with the TC. TRF-BAs generated for training purposes shall be marked as “Training” and retained in the trainee’s training file.

6 LEGAL ASPECTS AND TESTIMONY

6.1 Legal Aspects (Overview of Judicial System)

6.1.1 Objectives

6.1.1.1 To familiarize personnel with the functions of a criminal courtroom proceedings.

6.1.1.2 To familiarize personnel with the legal function of the Department of Forensic Science and the Breath Alcohol Section.

6.1.2 Required Reading

6.1.2.1 The Code of Virginia

6.1.2.1.1 § 9.1-1101 DFS duties

6.1.2.1.2 § 18.2-266 through 18.2-269

6.1.2.2 Mission Statement of DFS

6.1.2.3 Examples of Subpoena *Duces Tecum* letters and Freedom of Information Act (FOIA) requests and subsequent response.

6.1.3 Examination Questions

6.1.3.1 Explain the following courtroom procedures

6.1.3.1.1 Oath

6.1.3.1.2 Sequestering of witnesses

6.1.3.1.3 Types of examination

6.1.3.1.3.1 Direct examination

6.1.3.1.3.2 Cross examination

6.1.3.1.4 Qualifying Questions

6.1.3.1.5 Court acceptance as qualified expert

6.1.3.1.6 Use of reference materials, articles

6.1.3.1.7 Objections (overruled vs. sustained)

6.1.3.1.8 Use of opposing witnesses

6.1.3.2 Explain the role of the following

6.1.3.2.1 Judge

6.1.3.2.2 Jury

6.1.3.2.3 Commonwealth's Attorney

6.1.3.2.4 Defense counsel

6.1.3.2.5 Expert vs. factual witness

6.1.3.3 Explain what is accessible through the Breath Alcohol Database, what is provided as a "standard" response to requests for information and the time limitations for all such responses.

6.1.4 Evaluation

Written answers to exam questions completed and reviewed by trainee with supervisor to ensure objectives have been met.

6.2 Pertinent Legal Cases

6.2.1 Objectives

Trainee should be familiar with pertinent legal cases associated with DUI laws and breath alcohol testing.

6.2.2 Required Reading

6.2.2.1 Robert Gary Nelson V. Commonwealth of Virginia (1993)

6.2.2.2 Karen Sue Lemond V. Commonwealth of Virginia (1995)

6.2.2.3 Mark Algie Reynolds V. Commonwealth of Virginia (1999)

6.2.2.4 Calvin L. Woolridge V. Commonwealth of Virginia (1999)

6.2.2.5 George Lamay V. Commonwealth of Virginia (1999)

6.2.2.6 David T. Rasmussen V. Commonwealth of Virginia (1999)

6.2.2.7 Philip Butler Groggins V. Commonwealth of Virginia (2000)

6.2.2.8 John H. Rollins V. Commonwealth of Virginia (2001)

6.2.2.9 Brooks V. Commonwealth of Virginia (2005)

6.2.2.10 Select transcripts from cases with defense witnesses

6.2.3 Evaluation

A test will be conducted at the end of this module to ensure objectives have been met.

6.3 Testimony

6.3.1 Objectives

6.3.1.1 To familiarize trainee with the proper methods of presenting expert testimony applicable to his/her level of expertise.

6.3.1.2 To have trainee prepare a CV and develop answers to courtroom Voir Dire questioning.

6.3.1.3 To familiarize trainee with possible courtroom challenges.

6.3.2 Required Reading

6.3.2.1 Garriott, Medical-Legal Aspects of Alcohol, 4th edition, 2003 Chapters: 16 through 19 (6th edition, Medico-Legal Aspects of Alcohol, Chapter 6)

6.3.2.2 APRI resources (www.ndaa.org)

6.3.2.2.1 Toxicology for Prosecutors

6.3.2.2.2 Breath Alcohol Testing

6.3.2.3 Kogan, J. *Being a Good Expert Witness in a Criminal Case*. J For Sci 23(1): 190-200, 1978.

6.3.2.4 Tanton, R.L., *Jury Preconceptions and Their Effect on Expert Scientific Testimony*, J For Sci 24 : 681-691, 1979

6.3.2.5 Kuzmack, Nicholas T., "Legal Aspects of Forensic Science", Forensic Science Handbook, Saferstein, Richard, ed., Prentice-Hall NY, NY, 1982, pp. 1-27.

6.3.3 Technical Sessions

6.3.3.1 Informal sessions of increasing difficulty to assess verbal responses to technical questioning.

6.3.3.2 Final session of technical questioning with Supervisor, Program Manager, and possibly peers present.

6.3.4 Practical Exercises

6.3.4.1 Informal sessions graduating to formal sessions of increasing difficulty to assess responses and demeanor to judge/jury.

6.3.4.2 Trainee should observe examiner testimony whenever possible.

6.3.4.3 Trainee should be prepared to verbally answer the following qualification (Voir Dire) questions.

6.3.4.3.1 State and spell your name for the record?

6.3.4.3.2 How are you employed / What is your occupation?

6.3.4.3.3 How long have you been in this position?

6.3.4.3.4 What are your duties in this position?

6.3.4.3.5 What education and training do you possess that qualifies you to perform these duties?

6.3.4.3.6 What specific courses have you taken that are related to breath alcohol?

6.3.4.3.7 Do you consider yourself to be an expert witness?

6.3.4.3.8 What literature do you read relating to your job?

6.3.4.3.9 Do you belong to any professional organizations?

6.3.4.3.10 Have you conducted any research in the area of breath alcohol?

6.3.4.3.11 Have you ever been published in the area of breath alcohol?

6.3.4.3.12 Have you had any training on courtroom testimony?

6.3.4.4 Trainee should be able to demonstrate knowledge or practical skill for

6.3.4.4.1 Proper preparation for court appearance.

6.3.4.4.2 Understanding protocol for pre-trial conferences w/ attorneys.

6.3.4.4.3 Appropriate dress.

6.3.4.4.4 Appropriate courtroom demeanor.

6.3.4.4.5 Maintain composure.

6.3.4.4.6 Monitoring verbal inflection and body language.

6.3.4.4.7 Clear, concise, accurate response to queries.

6.3.4.4.8 Unbiased response to questions.

6.3.4.4.9 Maintain unquestionable ethical standards and conduct.

6.3.5 Possible Courtroom Challenges

6.3.5.1 Trainee should be prepared for questions regarding both traditional and novel challenges that can occur during a trial.

6.3.5.2 Challenges can include:

6.3.5.2.1 The ratio of 1:2100 is an average, the subject could just as easily be below that, which would effect the final BAC how? (FS only)

6.3.5.2.2 The subject used illicit drugs, OTC drugs, asthma inhalers, gum, dip, etc., before the test, or during the 20 min. observation period. (FS only)

6.3.5.2.3 The subject had a tongue piercing or dentures. (FS only)

6.3.5.2.4 The instrument wasn't working at the time of the test, as is evidenced by the downloads.

6.3.5.2.5 The subject has a medical condition (i.e., diabetes, GERD, gastric bypass surgery, etc.) (FS only)

6.3.5.2.6 After X repair why didn't you calibrate/certify the instrument?

6.3.6 Evaluation

6.3.6.1 Successfully complete Voir Dire examination and prepare CV.

6.3.6.2 Complete technical sessions.

6.3.6.3 Satisfactory performance as an expert witness in at least one formal, comprehensive mock trial to be determined by Supervisor with recommendations and critiques from a panel appointed by the same.

7 ALCOHOL PHARMACOLOGY, IMPAIRMENT, AND COURTROOM TESTIMONY

7.1 Objectives

7.1.1 Individuals eligible to begin this module include Forensic Scientists with a Master's degree in a natural science, toxicology, forensic science or closely related field or a Bachelor's degree in a natural science, toxicology, forensic science or closely related field and personal certification in forensic alcohol toxicology by an appropriate entity.

7.1.2 To familiarize the trainee with alcohol pharmacology (pharmacokinetics and pharmacodynamics)

7.1.3 To familiarize the trainee with retrograde extrapolation and the use of the Widmark's equation

7.1.4 To familiarize the trainee with testimony regarding ethanol effects and calculations

7.1.5 Successful completion of a practical examination, a technical examination, and a mock trial

7.2 Required Reading

7.2.1 Goodman and Gilman's *The Pharmacological Basis of Therapeutics*, ethanol specific chapter (edition dependent).

7.2.2 Garriott *Medicolegal Aspects of Alcohol*, Ch 2-4 (pharmacology), 13-15 (impairment), 17-19 (testimony) (edition dependent).

7.2.3 Dubowski, K.M. (1985) Absorption, Distribution, and Elimination of Alcohol: Highway Safety Aspects. Journal of Studies on Alcohol, Supplement No. 10.

7.2.4 Winek, C.L. et al (1996) Determination of absorption time of ethanol in social drinkers. Forensic Science International, 77, 196-177.

7.2.5 Jones, A.W. (1993) Disappearance Rate of Ethanol from the Blood of Human Subjects: Implications in Forensic Toxicology. Journal of Forensic Science, 38 (1), 104-118.

7.2.6 Jones, A.W. and Anderson, L. (1996) Influence of Age, Gender, and Blood-Alcohol Concentration on the Disappearance Rate of Alcohol from Blood in Drinking Drivers. Journal of Forensic Science, 41(6), 922-926.

7.2.7 Stowell, A.R. and Stowell, L.I. (1998) Estimation of blood alcohol concentrations after social drinking. Journal of Forensic Science, 43(1), 14-21.

7.2.8 Gullberg, R.G. and Predmore, D.B. (1982) Variation in blood alcohol concentration following the last drink. Journal of Police Science Administration, 10(3), 289-296.

7.2.9 Jones, A.W. and Jonsson, K.A. (1994) Food-induced lowering of blood-ethanol profiles and increased rate of elimination immediately after a meal. Journal of Forensic Science, 39(4), 1084-1093.

7.2.10 Jakus, J.T., Shajani, N.K., Image, B.A. (1992) Consumption of a large dose of alcohol in a short time span. Forensic Science International, 56(2), 113-125.

7.2.11 Jones, A.W., Jonsson, K.A., Neri, A. (1991) Peak blood-ethanol concentration and the time of its occurrence after rapid drinking on an empty stomach. Journal of Forensic Science, 36(2), 376-385.

7.2.12 Watkins, R.L. and Adler, E.V. (1993) The effect of food on alcohol absorption and elimination patterns. Journal of Forensic Science, 38(2), 285-291.

7.2.13 Moskowitz, H., Burns, M., Fiorentino, D., Smiley, A., Zador, P. (2000) Driver characteristics and impairment at various BACs. DOT Technical Document.

7.2.14 Moskowitz, H., Burns, M., Williams, A. (1985) Skills performance at low blood alcohol levels. Journal of Studies on Alcohol, 46(6), 482-485.

7.3 Study Questions

7.3.1 Mr. Jones was in an accident at 0015 hrs. He admitted to drinking 3 beers rapidly at 2330 hrs. He submitted to a breath test at 0200 hrs and the result was 0.20 g/210L. What could his blood alcohol concentration have been at the time of the accident?

7.3.1.1 Further investigation revealed that he had his last drink at 2200 hrs, but the accident still occurred at 0015 hrs. Estimate his blood alcohol concentration at 0015 hrs.

7.3.1.2 At trial, Mr. Jones claimed that after the accident, but before the officers arrived at the scene, he had consumed an unknown quantity of whiskey that he kept in his car. Estimate his blood alcohol concentration at 0015 hrs.

7.3.2 How many beers would Mr. Jones (Height: 5’10”, Weight: 170 lb, Age: 45, known alcoholic) have had to consume to reach 0.20 g/210L? Assume two scenarios: 1) very rapid consumption (within 30 minutes) and 2) consumption over three hours.

7.3.3 Describe the effects of alcohol on human performance and how that correlates to driving skills.

7.3.4 Approximately how long would it take someone with a BAC of 0.31 g/210L to metabolize all the alcohol in the body?

7.3.5 Mrs. Brown (Age: 29, Height: 5’3”, Weight: 214 lbs) was stopped at 2335 hrs for weaving in her lane. Upon investigation, the officer charged her with DUI and conducted a breath alcohol analysis at 0017 hrs with a result of 0.23 g/210L. Mrs. Brown stated that she stopped drinking during happy hour which was at approximately 1800 hrs and only consumed three glasses of wine.

7.3.5.1 How many standard drinks would Mrs. Brown had to have consumed at happy hour (assume all drinks consumed from 1700-1800 hours) to produce a result of 0.23 g/210L approximately six hours later.

7.3.5.2 Is the scenario provided by the defendant consistent with the information provided by the officer and the blood alcohol measurement? Please explain.

7.4 Practical Examination

7.4.1 This written examination will be conducted at the end of the training to ensure the trainee can perform retrograde extrapolation and Widmark’s calculations and articulate the effects of alcohol on human performance and behavior.

7.4.2 The scenario presented should simulate an “average” case in difficulty (QM 19.5.3.2).

7.5 Technical Examination

This examination may be combined with the technical sessions (1.7.1 and 6.3.6.2) if the trainee has not already completed that examination.

7.6 Mock Trial

This mock trial may be combined with the formal mock trial (1.7.3 and 6.3.6.3) if the trainee has not already completed that requirement.

8 UNCERTAINTY OF MEASUREMENT

8.1 Objectives

8.1.1 To familiarize the trainee with traceability and its associated concepts.

8.1.2 To familiarize the trainee with concepts of uncertainty of measurement.

8.2 Readings and Presentations

8.2.1 Required

8.2.1.1 ASCLD/LAB Policy on Measurement Traceability (AL-PD-3057).

8.2.1.2 ASCLD/LAB Guidance on Measurement Traceability (AL-PD-3058).

8.2.1.3 ASCLD/LAB Guidance on Measurement Traceability – Measurement Assurance (AL-PD-3059).

8.2.1.4 ASCLD/LAB Policy on Measurement Uncertainty (AL-PD-3060).

8.2.1.5 ASCLD/LAB Guidance on Estimation of Measurement Uncertainty – Overview (AL-PD-3061).

8.2.1.6 ASCLD/LAB Guidance on Estimation of Measurement Uncertainty – ANNEX A: Details on the NIST 8 Step Process (AL-PD-3062).

8.2.1.7 Garriott *Medico-Legal Aspects of Alcohol*, 6th Edition, Chapter 19.

8.2.2 Additional Resources

8.2.2.1 What's new at DFS? Reporting of Uncertainty of Measurement Implementation PowerPoint.

8.2.2.2 Presentations prepared by Dr. Wagner, available on the intranet.

8.2.2.3 Introducing the Concept of Uncertainty of Measurement in Testing in Association with the Application of the Standard ISO/IEC 17025 (ILAC-G17:2002).

8.2.2.4 Bell, S. A Beginner's Guide to Uncertainty of Measurement, Measurement Good Practice Guide No. 11 (Issue 2), ISSN 1368-6550.

8.3 Study Questions

8.3.1 Define the following terms:

- Mean
- Range
- Accuracy
- Precision
- Gaussian distribution
- Confidence interval
- Measurement
- Measurand
- Type A evaluation
- Type B evaluation

8.3.2 Draw and explain a Gaussian distribution and how it relates to measurement uncertainty. Demonstrate two Gaussian distributions where one has high variability and one has low variability.

8.3.3 Obtain an uncertainty budget used in your section. Define the elements and from where the information is obtained.

8.4 Evaluation

8.4.1 Within the trainee's section, find a calibrated item that is traceable to NIST. Write a brief description of the traceability of that item.

8.4.2 Utilize the following information (Table 1) to calculate the expanded uncertainty and reported uncertainty at k=3. Report the values and uncertainty as they would appear on a Certificate of Instrument Accuracy.

Table 1

Measurement Uncertainty Estimation Form

Measurement:		Concentration of Ethanol in Compressed Dry Gas (Certification concentrations > 0.100g/210L)							
Range of Measurement Values:		0.006-0.500g/210L							
Procedure name and revision:		Intox EC/IR II Certification (VDFS BA SOP Rev 27)							
Estimation prepared by:		Sally Smith, Program Manager					Date Prepared:		4/19/2016
Line Item	Uncertainty Component	Values	Units	Distribution	Type	Divisor	Degrees of Freedom (n-1)	Standard Uncertainty	% Component Contribution
1	Measurement Process Reproducibility	0.0021	g/210L	normal	A	1.00	1323	0.0021	75
2	Reference Material Uncertainty	0.0014	g/210L	normal	B	2.00	∞	0.0007	25
	Combined Standard Uncertainty							0.002213594	100
	Expanded Uncertainty	k=3							
	Reported Uncertainty			k=3	99.73% confidence level				