TRAINING OUTLINE

for

DATAMASTER

INFRARED BREATH TEST INSTRUMENT

DATAMASTER TECHNICIAN

Date Approved: 3-14-08

Approved By: _____

Fiona Couper, Ph.D.
Washington State Toxicologist

Prepared By

Washington State Patrol Breath Test Program

Washington State Patrol
Breath Test Section

LESSON PLAN

Datamaster Technician Training Outline

Date August 14, 1995 Prepared by Sergeant R. G. Gullberg

Training in Operation, Theory, Maintenance, and Testing of Datamasters
To be presented in 128 50-minute periods.

INSTRUCTIONAL OBJECTIVES:

1. The student will be a qualified operator of the Datamaster.

2. The student will be familiar with the policies and procedures of the Breath Test Section and be issued a manual.

3. The student will be knowledgeable of the nomenclature of the Datamaster.

4. The student will know the major laws and case law related to breath testing and DUI enforcement.

5. The student will know the WAC rules of importance to breath alcohol testing.

6. The student will know the simulator nomenclature.

7. The student will be familiar with the applications of mathematics, metrics, and statistics to the breath test theory and physiology of alcohol.

8. The student will be familiar with the basic principles of organic chemistry relevant to breath alcohol analysis.

9. The student will have some relevant knowledge of the metabolism process of alcohol in the body.

10. The student will understand the basic biochemistry and anatomy involved in alcohol metabolism.

11. The student will understand the important aspects of testifying as an expert witness on breath alcohol testing from a forensic perspective.

12. The student will understand the basic methodology and principles of measurement.

13. The student will understand the theoretical and practical basis for Henry's Law.

14. The student will understand the Beer-Lambert Law as it relates to the Datamaster.

15. The student will become a qualified instructor.

16. The student will understand the theoretical and practical basis for infrared spectroscopy and how it relates in the Datamaster.

17. The student will become familiar with the PBT and its testing procedures and paperwork.

18. The student will become familiar with the use and application of the computer for use in the breath test program.

19. The student will have a basic understanding of electronic theory and application relevant to the Datamaster.

20. The student will know how to properly use the digital multi-meter in troubleshooting and testing the Datamaster.

21. The student will understand the theory and application of simulators in testing breath test instruments.

22. The student will be able to prepare ethanol simulator solutions.

23. The student will be able to complete the Datamaster calibration procedures.

24. The student will know how and be able to repair certain parts of the Datamaster.

25. The student will understand the role of the prosecutor in DUI prosecution.

26. The student will be knowledgeable in the court procedures for testifying in and prosecuting DUI cases.

27. The student will know the defense attorney's role in DUI defense.

28. The student will understand the role of the defense expert witness.

29. The student will participate in a mock trial.

30. The student will understand the accountability and flow of paperwork in the breath test program.

31. The student will be familiar with and able to apply Widmark's Equation.

32. The student will become a qualified PBT instructor.

33. The student will understand the role of the State Toxicologist and his authority.

34. The student will understand the basic function and responsibility of the State Toxicology Laboratory.

35. The student will be a qualified solution changer.

36. The student will successfully complete examinations on legal, math, nomenclature, and maintenance aspects of the breath test program. An 80% score must be obtained on all exams. If not, then the material will be reviewed with the student and the exam retaken.

Visual Aids

1. Slides on nomenclature and measurement principles.
2. Overhead projector.
3. Chalkboard.
4. BAC Verifier Datamaster and 949000 series Datamaster.
5. Slide projector.
6. Digital multimeters.
7. Computers.
8. Oscilloscope.
9. X-Y recorder.
10. Assigned tool kit.

Study Assignments

As requested by individual instructors.

Qualified Instructors

1. Dr. Barry K. Logan, State Toxicologist
2. Sgt. Rod Gullberg
3. Tpr. Barry Bartram
4. Mr. Bill Bogen
5. Tpr. Rich Bosman
6. Tpr. Dan Burns
7. Tpr. Gene McDaniel
8. Mrs. Ruth Cramer
9. Tpr. James Elenbaas
10. Tpr. Craig Storey
11. Tpr. Mike Wunsch
12. Tpr. Dale Johnson
13. Tpr. Jon Martin
14. Tpr. Tony McElroy
15. Mr. Mark Stone

Written and Practical Examinations

Written exams on legal, math, nomenclature, and a final.

A score of 80% must be received on all examinations. If not, the material will be reviewed with the student and an exam retake will be allowed.

Datamaster Technician Training

I. Introduction

A. Review course curriculum and expectations.

B. Professionalism.

1. Your role as a professional.

2. The importance of integrity.

3. The professional as an objective, unbiased witness.

C. The nature of forensic science.

D. The scientific method and its role in forensic breath alcohol analysis.

E. Breath testing history in Washington State.

1. Breathalyzer.

2. BAC Verifier Datamaster, Datamaster II, 949000 series Datamaster.

II. Legal Aspects of Breath Testing.

A. Legislated Laws.

1. RCW.

2. WAC.

B. Case Law.

1. Criminal issues.

2. Implied consent issues.

3. Relevant decisions.

C. Resources for remaining current on legal issues.

III. Instrumental Nomenclature.

A. BAC Verifier Datamaster and 949000 series Datamaster

1. Schematics.

2. Slide program.

3. Wiring diagrams.

4. Printed circuit boards.

B. Simulators.

1. Guth Model 34 C simulator.

2. Handout on nomenclature.

IV. Mathematical Principles and Applications

A. Algebra review / Metric review.

B. Graph and functions review.

1. Linear, quadratic, exponential, logarithmic.

2. Applications to breath test data.

3. Handout problems.

C. Statistics.

1. Descriptive statistics.

2. Inferential statistics (hypothesis testing).

3. Applications to breath test data.

4. Handout problems.

D. Widmark's equation.

1. r and β factors.

2. Practice problems.

E. Extrapolation.

1. Different perspectives.

2. Assumptions.

F. Experimental design - evaluation of scientific literature.

G. Principles of measurement.

1. Accuracy.

2. Precision.

3. Linearity.

4. Level of detection and quantitation.

5. Specificity.

V. Organic Chemistry Review

A. Basic topics:

1. Nomenclature.

2. Functional groups.

3. Alcohols, ketones, and aldehydes.

4. Oxidation and reduction.

5. Spectroscopic identification.

6. Biochemistry review.

VI. Physiology of Alcohol

A. Absorption pathways.

B. Alcohol distribution throughout the body.

C. Metabolism pathways in hepatocytes.

1. ADH pathway.

2. MEOS pathway.

3. Catalase pathway.

4. TCA (KREBS) cycle.

5. Electron transport system.

6. Michaelies-Menten Kinetics.

D. Detrimental effects.

E. Neurological effects of alcohol.

1. Nerve impulse transmission.

2. EEG responses.

F. Pulmonary physiology (Henry's Law).

1. Breath exhalation profiles.

2. Data acquisition.

3. Respiratory dynamics.

G. Basic histology.

1. Handouts or slides.

H. Physiology of alcohol - Dr. Barry K. Logan.

VII. Infrared Theory and Application

A. Dipole moment and discrete energy levels.

B. Modes of molecular vibration.

C. Infrared absorption of typical functional groups.

D. Infrared absorption of ethanol molecule.

E. Beer-Lambert Law and its application in infrared breath testing.

F. Infrared sources, filters, and detectors.

VIII. Safety Concerns within the Breath Testing Program

A. Commonly used chemicals.

B. Eyewash equipment.

C. Mercury spills and clean up.

D. High voltage electrical points in instrument.

E. Fusing of calibration cords.

F. Proper lifting of instrument.

G. Manufacturer Safety Data Sheets (MSDS).

IX. Electronics Theory and Application

A. Basic circuits.

B. OHMS Law.

C. Alternating and direct current.

D. Transformers and power supplies.

E. Semiconductor devices.

1. Diodes.

2. Transistors (NPN and PNP).

3. Transducers.

4. Basic physics of operation.

F. Digital multimeter.

1. Theory and operation.

2. Practical experience.

3. Use in trouble-shooting.

G. Signal analysis.

1. Noise.

2. Signal to noise ratio.

3. Wave forms.

H. Circuitry in DataMaster.

1. Detector signal processing.

2. Analog to digital conversion.

3. Microprocessor basics.

I. Radio Frequency Interference

1. Sources of RFI and EMI.

2. Hardware protection against RFI.

3. Procedural protection against RFI.

X. Simulators

A. Theory of operation.

B. Electronic circuitry.

C. Solution preparation.

1. Mathematical calculation.

2. Practical experience.

D. Application of simulators in Quality Assurance Procedure.

XI. Breath Test Section Policy and Procedure Manual

A. Handout and review.

B. Flow of paperwork.

C. File policy.

XII. Quality Assurance Procedure

A. Written policy.

B. Review procedure in detail.

C. Practical experience.

D. Paperwork and its distribution.

XIII. Instrument Maintenance Lab

A. Parts replacement.

B. DataMaster trouble-shooting and maintenance.

C. Common problems encountered.

D. Use of multimeter.

XIV. Mock Trial

A. Predicate questions and suggested answers.

B. Each student participates as witness.

XV. Controlled Drinking Lab (If possible)

A. Possible items to evaluate:

1. Weight vs. BAC.

2. Metabolism rate.

3. Physical sobriety tests.

4. Nystagmus tests.

5. Plotting BAC curve.

6. Instrumental precision.

7. Blood/breath correlation.

8. Mouth alcohol.

9. Exhalation profiles.

10. Replicate BrAC tests.

Datamaster Technician Training

XVI. PBT Operator and Instructor Training

A. Qualify student as operator and instructor.

B. PBT calibration, certification and maintenance.

XVII. Datamaster Instructor Training

A. Eight hours to be allowed since much of outline already covered in this course.

B. Review exams and course outline.

C. Computerized Training Record System.

D. Practical experience.

XVIII. State Toxicology Lab

A. Responsibility of the lab.

B. Instrumentation used and methodology.

C. Paperwork relevant to breath test program.

XIX. Computer

A. Polling.

B. Access.

C. Solution checks.

D. Database.

XX. Examinations

A. Legal (80%).

B. Math (80%).

C. Nomenclature (80%).

D. Comprehensive Datamaster Exam (80%).

E. Several quizzes - throughout the training to evaluate progress.