Idaho State Police
Forensic Services

Toxicology Discipline Training Plan

Section One – New Analyst Training

Detection of Drugs in Blood and Urine

Trainee: _____

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1.0 TABLE OF CONTENTS

Section One – New Analyst Training

Detection of Drugs in Blood and Urine

1.1 TRAINING OBJECTIVES

1.1.1 Introduction

This section of the Idaho State Police Forensic Services (ISP-FS) toxicology training plan is designed as a guide to provide a forensic analyst Trainee with the background necessary to process blood and urine specimens to detect and confirm the presence of impairing drug compounds other than ethanol and other volatiles. Ethanol and other volatiles training is addressed separately. The analyst is first tasked with review of the ISP Employee Handbook, ISP-FS ISO/IEC 17025:2005 Compliant Quality/Procedure Manual and the ISP-FS Health and Safety Manual. The analyst is then responsible to review and gain an understanding of the ASCLD/LAB Guiding Principles of Professional Responsibility for Crime Laboratories and Forensic Scientists and successfully complete the currently approved ethics course.

This plan addresses each of the various stages of sample processing, from initial sample checkout to the processes involved in screening, confirmation and report generation. To properly analyze and interpret the results of analysis, the Trainee must possess a working knowledge of drug metabolism and a fundamental understanding of the pharmacology of psychoactive compounds. In order to understand agency incident reports, the analyst must have an understanding of the tools used by law enforcement to detect impaired driving. For effective expert witness testimony, the analyst must have a working knowledge of our criminal justice system, including applicable Idaho Code. All of the covered topics are then applied for the proper preparation and presentation of courtroom testimony as demonstrated by mock courtroom testimony. In addition to discipline specific training, the new analyst must obtain a general knowledge of forensic science as a whole. When the trainee has established competence by successfully completing training plan elements, supervised performance of analysis on case material completes the training process.

1.1.2 Approach to Training

1.1.2.1 In order to address the training plan questions, The *Recommended Background Reading* cited, or equivalent, must be consulted if the Trainee is not familiar with the subject matter.

1.1.2.2 For the background reading, the edition listed or a newer version should be consulted.

1.1.2.3 Both the education and work experience of the Trainee must be considered; however, at least a verbal review of material for the trainer must be done to the satisfaction of the Trainer.

1.1.2.4 To establish the competency of the analyst, answers to training plan questions may be provided verbally and/or in written form. This choice is at the discretion of the trainer.

1.1.2.5 Sign-off for training plan topics that involve more than one toxicology subdiscipline (urine and blood toxicology) and/or alcohol/volatiles, need not be repeated. These

sections only need to be signed-off once; notation on the check list where the training sign-off is located should be made.

1.1.2.6 Although all training does not have to proceed in the order used in this training plan, Section 1.2 must be signed-off prior to additional sections.

1.1.2.7 It is not necessary to complete the entire training manual at one time, only the sections that apply to a particular Analytical Method.

1.1.2.8 Training for all Analytical Methods does not have to be pursued concurrently. Some Analytical Methods are utilized infrequently; therefore training can be completed prior to sign-off on all listed analytical methods. However, the Trainee must complete the training for a particular analytical method before that method can be used for casework by the Trainee.

1.1.3 Additional Training for Experienced/Signed-off Analyst

1.1.3.1 For training of an experienced analyst (Forensic Scientist II or III) in a new or updated technique or instrument, the training is to be commensurate with the magnitude of changes and with consideration of the analyst's existing background. The extent of training to be required will be agreed upon by the discipline leader and quality manager with input from the analyst.

1.1.3.2 If a separate training plan section has been created for the training topic and/or analytical method then it must be utilized, otherwise the appropriate portions of this training plan section must be used.

1.1.4 Continual Awareness of Relevant Literature

The new or experienced analyst is reminded that this training plan only addresses the core of training for toxicological analysis. After the completion of training, the analyst is responsible for keeping their knowledge current through continual literature review. This must include relevant journals, newsletters and textbooks.

1.2 ADMINISTRATIVE ISSUES

1.2.1 The Analyst in Training must be familiar with relevant sections of the **Idaho State Police Employee Handbook.**

1.2.2 The Analyst in Training must complete the **Idaho State Police Forensic Services General Training** plan. This core training plan covers the Idaho State Police Forensic Services ISO/IEC 17025:2005 Compliant Quality/Procedure Manual, the Idaho State Police Forensic Services Health and Safety Manual, the ASCLD/LAB Guiding Principles of Professional Responsibility

for Crime Laboratories and Forensic Scientists, the currently approved ethics course, and basic training in other forensic science disciplines.

1.2.3 Recommended Background Reading

1. Idaho State Police Employee Handbook (http://intranet/.htm or equivalent)
2. Idaho State Police Forensic Services ISO/IEC 17025:2005 Compliant Quality/Procedure Manual (Documents Section of ILIMS)
3. Idaho State Police Forensic Services Health and Safety Manual. (Documents section of ILIMS)

1.3 EVIDENCE HANDLING

1.3.1 The Trainee must describe the procedures followed for the intake of toxicology specimen collection kits, transfer of samples, required paperwork, and subsequent specimen handling considerations.

1.3.2 The Trainee must describe the types and applications of the toxicology collection kits distributed by ISP-FS.

1.3.3 The Trainee must describe the agencies served by their laboratory and the programs involved.

1.3.4 The Trainee must describe the barrier protection measures required when handling biological samples.

1.3.5 Recommended Background Reading

1. Idaho State Police Forensic Services Health and Safety Manual (Documents section of ILIMS)\

1.4 BALANCE OPERATION

1.4.1 The trainee must be familiar with the operation of any analytical or top-loading balances used to prepare toxicology solutions and reference material.

1.4.2 The trainee must be able to describe the basic steps involved in obtaining the weight of a material.

1.4.3 Recommended Background Reading

1. Manufacturer manual for all balances to be used by the Trainee.

1.5 PIPETTE INTERMEDIATE CHECK THEORY AND OPERATION

1.5.1 ARTEL PCS 2™ Pipette Calibration System

1.5.1.1 The Analyst in Training must have a working knowledge of how to prepare the ARTEL PCS 2™ Pipette Calibration System to perform an intermediate check of the status of a POVA's (piston operated volumetric apparatus) calibration.

1.5.1.2 The Analyst in Training must describe the operating principle of the PCS 2™ Pipette Calibration System.

1.5.1.3 The Analyst in Training must demonstrate their ability to operate the PCS 2™ Pipette Calibration System through completing an intermediate check on a POVA.

1.5.1.4 The Analyst in Training must explain the routine maintenance performed on the PCS 2™ Pipette Calibration System.

1.5.1.5 Recommended Background Reading

1. Analytical Method 5.1.1, PCS 2 Pipette Calibration.

2. Standard Operating Procedure for the PCS 2™ Pipette Calibration System, Artel Document #310A2715A, April 1997.

3. PCS 2™ Pipette Calibration System Procedure Guide, Artel Document # 15A2135, Version 5.1, 03-28-1997.

4. College Chemistry/Biochemistry Text, chapter(s) discussing Absorption Spectrophotometry.

5. Curtis, R.H., *Performance Verification of Manual Action Pipets: Part I,* Am. Clin. Lab. 12(7):8-9; 1994.

6. Curtis, R.H., *Performance Verification of Manual Action Pipets: Part II,* Am. Clin. Lab. 12(9):16-17; 1994.

1.5.2 Gravimetric Pipette Intermediate Checks

1.5.2.1 The Analyst in Training must describe the principle, equipment and calculations involved when using the gravimetric method to perform an intermediate check of a POVA.

1.5.2.2 The Analyst in Training must demonstrate their ability to perform an intermediate check on a POVA.

1.5.2.3 Recommended Background Reading

1. ISO 8655-6:2002, Piston-operated volumetric apparatus – Part 6: Gravimetric method for the determination of measurement error.

1.6 SOLUTION PREPARATION

1.6.1 Basic Chemical Calculations and Nomenclature

The analyst must be able to define the following terms and address the questions.

1.6.1.1 *Solvent*
1.6.1.2 *Molarity (M)*
1.6.1.3 *How many moles per liter are in a 2M solution?*
1.6.1.4 *Normality (N)*
1.6.1.5 *How may equivalents in a 2N solution?*
1.6.1.6 *Weight per Volume Percent (%w/v)*
1.6.1.7 *Weight per Weight Percent (%w/w)*

1.6.2 The trainee must be familiar with solution preparation and documentation. This must include the preparation of hydrolysis agents, buffers and extraction solvents used in all stages of specimen preparation for analysis.

1.6.3 The trainee must have a working knowledge of pH meter operation and documentation. The trainee must standardize a series of pH buffers and perform a pH check during the preparation of a buffer solution for the trainer.

1.6.4 Recommended Background Reading

1. College Chemistry Text, chapter(s) discussing the properties of solutions.

2. Seamonds, B. and Byrne, E.A. *Basic Laboratory Principles and Techniques* pp. 3 - 43. *in:* Clinical Chemistry: Theory, Analysis, Correlation. Mosby, 2003.

3. Shugar, G.J., Shugar, R.A. and Bauman, L. *Grades of Purity of Chemicals* pp. 145-154, *pH Measurement*. pp. 232-234. *in:* Chemical Technicians' Ready Reference Handbook, McGraw Hill: New York, 1973.

4. Habben, K.H. *Basic Analytical Reference – Chapter 19.* pp. 1-9, *in*: Current Approaches in Forensic Toxicology. Presented by the Forensic Toxicologist Certification Board, Inc. at SOFT meeting, 1994.

5. Operation Manual for pH Meter.

1.7 PRINCIPLE: IMMUNOASSAY

1.7.1 Describe the competitive binding process as it applies to immunoassay.

1.7.2 The trainee must define and discuss the following terms as they relate to Enzyme Immunoassay (EIA):

- 1.7.2.1 *Enzyme*
- 1.7.2.2 *Antigen*
- 1.7.2.3 *Antibody*
- 1.7.2.4 *Hapten*
- 1.7.2.5 *Cross-reactivity/analytical specificity*
- 1.7.2.6 *Antigenic Determinant*
- 1.7.2.7 *Cut-off*

1.7.3 Discuss specificity versus sensitivity as it applies to EIA.

1.7.4 Discuss the major differences between homogeneous and heterogeneous enzyme immunoassays.

1.7.5 The trainee must demonstrate a working knowledge of theory and application of enzyme-multiplied immunoassay technique (EMIT).

- 1.7.5.1 Describe the basic EMIT process.
- 1.7.5.2 Discuss the attributes and limitations of EMIT.
- 1.7.5.3 Describe the basic ELISA process.
- 1.7.5.4 Describe the attributes and limitations of ELISA.

1.7.6 <u>Recommended Background Reading</u>

1. Thompson, S.G., *Principles for Competitive Binding Assays*. pp. 246 – 264. *in:* Clinical Chemistry: Theory, Analysis, Correlation. Mosby, 2003 or more recent version.

2. Sections Covering *Immunoassay and EMIT*. refer to index for pages, *in:* Principles of Forensic Toxicology, Second Edition, Levine, B. ed., AACC, 2003 or more recent version.

3. Analytical Methods 1.1 and 1.0: Enzyme Immunoassay Screening for Drugs of Abuse.

4. Spiehler, V., *Immunoassays in Toxicology*. pp. 55-98, *in:* California Association of Toxicologists (CAT) Manual for Analytical Toxicology, 1994.

5. Liu, R.H., *Evaluation of Commercial Immunoassay Kits for Effective Workplace Drug Testing.* pp.67-130, *in*: Handbook of workplace Drug Testing. Liu, R.H. and Goldberger, B.A. eds., Washington D.C.:AACC Press, 1995.

6. Hearn, W.L. and Walls, H.C., Common Methods in Post-Mortem Toxicology. pp. 995-998, *in:* Drug Abuse Handbook, Second Edition, Karch, S.B. ed., Boca Raton: CRC Press, 2007 or more recent version.

1.8 INSTRUMENTATION:

1.8.1 Viva Automatic Chemistry Analyzer (if applicable)

1.8.1.1 The Trainee must demonstrate their ability to apply the Viva system software to operate the analyzer.

1.8.1.2 The Trainee must demonstrate a thorough understanding of the required periodic and as needed maintenance for the Viva analyzer.

1.8.1.3 The Trainee must demonstrate a thorough understanding of troubleshooting techniques for the Viva analyzer.

1.8.1.4 Recommended Background Reading: Viva Junior™ Operation and Maintenance

1. Viva-Jr™ Operator's Manual, Article No.: 6002-940-410, Version number: 01/04-06.

2. Viva-Jr™ System Operations Guide, T268, 6/25/07, D01373.

1.8.1.5 Recommended Background Reading: Viva-E™ Operation and Maintenance

1. Viva-E™ Operator's Manual, Article No.: 6002-380-410-01, Version number: 1.0/08-04.

2. Viva-E™ System Operations Guide, T216, 6/4/07, D01320.

1.8.2 DSX Automatic Chemistry Analyzer (if applicable)

1.8.2.1 The Trainee must demonstrate their ability to apply the DSX system software to operate the analyzer.

1.8.2.2 The Trainee must demonstrate a thorough understanding of the required periodic and as needed maintenance for the DSX analyzer.

1.8.2.3 The Trainee must demonstrate a thorough understanding of troubleshooting techniques for the DSX analyzer.

1.8.2.4 Recommended Background Reading: DSX Automated ELISA System™ User's Manual, REV.04-20-05, 2005

1.9 PRINCIPLE: LIQUID-LIQUID EXTRACTION

1.9.1 The trainee must be well versed in the principles involved with liquid-liquid extraction.

1.9.2 Describe the properties that are involved in a solvent's ability to extract a particular analyte.

1.9.3 Describe the following processes as they relate to liquid-liquid extraction:
1.10.3.1 *Basic Extraction*
1.10.3.2 *Acidic Extraction*
1.10.3.3 *Back Extraction*
1.10.3.4 *Buffering – Why are different pHs required for different methods?*

1.9.4 Explain how the Henderson-Hasselbach equation applies to liquid-liquid extraction.

1.9.5 Recommended Background Reading

1. Sections Covering *Liquid-liquid Extraction.* Refer to index for page numbers, *in:* Principles of Forensic Toxicology. Second Edition, Levine, B. ed., AACC, 2003 or more recent version.

2. Stafford, David T., *Liquid/Liquid Extraction in Toxicology –Chapter 14.* pp. 1-13, *in*: Current Approaches in Forensic Toxicology. Presented by the Forensic Toxicologist Certification Board, Inc. at SOFT meeting, 1994.

3. Hearn, W.L. and Walls, H.C., Common Methods in Post-Mortem Toxicology. pp. 1005-1007, *in:* Drug Abuse Handbook. Second Edition, Karch, S.B. ed., Boca Raton: CRC Press, 2007 or more recent version.

1.10 PRINCIPLE: SOLID PHASE EXTRACTION (SPE)

1.10.1 The trainee must be knowledgeable about the principles involved with solid phase extraction (SPE).

1.10.2 Describe the advantages of SPE over liquid-liquid extraction methods.

1.10.3 Discuss Van der Waal Forces as they relate to SPE.

1.10.4 Discuss the sorbent options for SPE columns in regards to the types available, their target compounds and the interactions which they participate in.

1.10.5 Discuss the six typical steps involved in a SPE procedure.

1.10.6 Discuss how to prepare the sample for optimum analyte retention on a particular SPE column.

1.10.7 Recommended Background Reading

1. Sections Covering *Solid Phase Extraction.* Refer to index for page numbers, *in:* Principles of Forensic Toxicology. Second Edition, Levine, B. ed., AACC, 2003 or more recent version.

2. Sears, R.M., *Liquid/Solid Extraction in Toxicology – Chapter 15.* pp. 1-51, *in*: Current Approaches in Forensic Toxicology. Presented by the Forensic Toxicologist Certification Board, Inc. at SOFT meeting. 1994.

3. Platoff, G.E. and Gere, J.A., *Solid Phase Extraction of Abused Drugs from Urine.* Forensic Science Review. **3(2):**119-132. 1991.

4. Chen, X.H., Franke, J.P. and Zeeuw, R.A., *Principles of Solid-Phase Extraction.* pp. 1-22, *in:* Handbook of Workplace Drug Testing. Washington, D.C.:AACC Press, 1995.

5. Gere, J.A. and Platoff, G.E., *Solid-Phase Extraction of Abused Drugs in Urine.* pp. 23-44, *in:* Handbook of Workplace Drug Testing. Washington, D.C.:AACC Press, 1995.

6. Hearne, G.M and Hall, D.O., *Advances in Solid-Phase Extraction Technology*. American Laboratory, January 1993.

7. Hearn, W.L. and Walls, H.C., Common Methods in Post-Mortem Toxicology. pp. 1006-1007, *in:* Drug Abuse Handbook. Second Edition, Karch, S.B. ed., Boca Raton: CRC Press, 2007 or more recent version.

1.11 PRINCIPLE: GAS CHROMATOGRAPHY (GC)

1.11.1 The trainee must have comprehensive background in the principles of GC.

1.11.2 Describe the influence carrier gas flow has on the efficiency of a GC.

1.11.3 Define the following terms as they relate to GC.
1.12.3.1 *Resolution*
1.12.3.2 *Area Under the Curve*
1.12.3.3 *HETP*
1.12.3.4 *Signal to Noise Ratio*

1.11.4 Discuss which GC parameters affect resolution. Describe how to approach a lack of resolution.

1.11.5 Discuss how to alleviate peak tailing.

1.11.6 The trainee must possess an understanding of the principles and application of quantitative analysis.

1.11.7 Describe the major advantages of using an internal standard.

1.11.8 Recommended Background Reading

1. Sections Covering *Gas Chromatography*. refer to index for page numbers, *in:* Principles of Forensic Toxicology. Second Edition, Levine, B. ed., AACC, 2003 or more recent version.

2. Stafford, David T. *Introduction to Chromatography – Chapter 2*. pp. 1-39, *in*: Current Approaches in Forensic Toxicology. Presented by the Forensic Toxicologist Certification Board, Inc. at SOFT meeting, 1994.

3. Dawling, S. *Gas Chromatography*. pp. 425-499, *in*: Clarke's Analysis of Drugs and Poisons. Third Ed. Moffat, A.C., Ed, London: The Pharmaceutical Press, 2004 or more recent version.

4. Hearn, W.L. and Walls, H.C. Common Methods in Post-Mortem Toxicology. pp. 1000-1001, *in:* Drug Abuse Handbook. Second Edition, Karch, S.B. ed., Boca Raton: CRC Press, 2007 or more recent version.

1.12 PRINCIPLE: MASS SELECTIVE DETECTOR (MSD)

1.12.1 The trainee must have a working knowledge of the theory of mass spectrometry and the application of a mass selective detector.

1.12.2 Describe the ionization process.

1.12.3 Discuss the differences between SIM and Full-scan acquisition of data.

1.12.4 Discuss the advantages of derivatizing drug compounds.

1.12.5 Evaluate an Autotune report.

1.12.6 Recommended Background Reading

1. Sections Covering *Mass Spectrometry*. refer to index for page numbers, *in:* Principles of Forensic Toxicology. Second Edition, Levine, B. ed., AACC, 2003 or more recent version.

2. Stafford, David T. *Introduction to Chromatography – Chapter 2*. pp. 1-39, *in*: Current Approaches in Forensic Toxicology. Presented by the Forensic Toxicologist Certification Board, Inc. at SOFT meeting. 1994.

3. Foltz, R.L. *Mass Spectrometry*. pp. 159-190, *in:* California Association of Toxicologists (CAT) Manual for Analytical Toxicology Training. 1994.

4. Smith, R.M. *Understanding Mass Spectra*. New York: John Wiley & Sons, Inc., 1998 (or newer version).

5. Watson, D. *Mass Spectrometry*. pp. 379-391, *in*: Clarke's Analysis of Drugs and Poisons. Third Ed. Moffat, A.C., Ed, London: The Pharmaceutical Press, 2004.

6. Hearn, W.L. and Walls, H.C. *Common Methods in Post-Mortem Toxicology*. pp. 1002-1003, *in:* Drug Abuse Handbook. Second Edition, Karch, S.B. ed., Boca Raton: CRC Press, 2007.

7. Hearn, W.L. and Druid, H. *Strategies for Post-mortem Toxicology Investigation*, pp. 1033-1042, *in:* Drug Abuse Handbook. Second Edition, Karch, S.B. ed., Boca Raton: CRC Press, 2007.

1.13 INSTRUMENTATION: GC-MASS SELECTIVE DETECTOR

1.13.1 The trainee must demonstrate their ability to operate a GC equipped with a Mass Selective Detector.

1.13.2 The Trainee must demonstrate a thorough understanding of the system's software, troubleshooting techniques, and the maintenance that is to be performed on the GC/MSD including the injection port, ion source, vacuum pump, and column.

1.13.3 Recommended Background Reading

1. Current instrument manuals (hardcopy and/or electronic) for each GC-MSD in use.

1.14 PRINCIPLE: LCMS QQQ

1.14.1 The trainee must have a working knowledge of the theory of HPLC and the application of a triple quad mass selective detector.

1.14.2 Required Background Reading

1. Agilent 6400 Series QQQ LC/MS Techniques and Operation, Course Number R1893A Volume 1 Student Manual, Agilent 2010
2. Agilent 6400 Series QQQ LC/MS Techniques and Operation, Course Number R1893A Volume 2 Student Manual, Agilent 2010

1.14.3 Explain how the following terms define or affect the performance of the instrument.

1.14.3.1 *Resolution*
1.14.3.2 *Eddy diffusion*
1.14.3.3 *Capacity*

1.14.4 Determine what type of column is currently installed on the LCMS QQQ in your laboratory.
- 1.14.4.1 *What is the column packing material?*
- 1.14.4.2 *What is the total particle size of the packing material?*
- 1.14.4.3 *What is the inner diameter of the column?*
- 1.14.4.4 *What is the length of the column?*
- 1.14.4.5 *What pH range can this column accommodate?*
- 1.14.4.6 *What is the maximum operating pressure for this column?*

1.14.5 Describe the difference between a gradient and an isocratic elution.

1.14.6 Discuss ways to reduce carryover.

1.14.7 What does the term data rate mean and how can that affect resolution and capacity?

1.14.8 Describe the difference between electrospray ionization and atmospheric pressure chemical ionization. What are the pros and cons of each ionization technique?

1.14.9 What is ion suppression? How is it evaluated and what can be done to reduce it?

1.14.10 What occurs in the first quadrapule of the instrument, the hexapule, and the final quadrapule?

1.14.11 Give a basic explanation of the following acquisition parameters:
- 1.14.11.1 *ms2scan*
- 1.14.11.2 *ms2sim*
- 1.14.11.3 *MRM*
- 1.14.11.4 *Dynamic MRM*
- 1.14.11.5 *Product Ion*
- 1.14.11.6 *Neutral Loss*
- 1.14.11.7 *Neutral Gain*

1.14.12 Recommended Background reading

1. Agilent 1260 Infinity Binary LC Optimization Guide

1.15 INSTRUMENTATION: LCMS QQQ

1.15.1 The trainee must demonstrate their ability to operate a LC equipped with a triple quadrapule Mass Selective Detector.

1.15.2 The Trainee must demonstrate an understanding of the system's software, troubleshooting techniques, and the maintenance that is to be performed on the LCMS/QQQ.

1.15.3 The Trainee must demonstrate to the trainer the ability to pull up the instrument manuals online.

1.15.4 References

http://www.chem.agilent.com/en-US/Technical-Support/Instruments-Systems/Mass-Spectrometry/6400-Series-Triple-Quadrupole-LC-MS/Pages/default.aspx

http://www.chem.agilent.com/en-US/Technical-Support/Instruments-Systems/Liquid-Chromatography/1260-Infinity-Binary-LC/Pages/default.aspx

1.16 CONTENT AND APPLICATION OF ANALYTICAL METHODS

Refer to method sign-off section for specific urine or blood analytical methods. To assess the understanding of each method, each of the following must be addressed:

1.16.1 The trainee must fully describe the steps involved in each analysis procedure.

1.16.2 Trainee must describe the quality assurance requirements described in each Analytical Method.

1.16.3 Trainee must describe the acceptance criteria for an analysis run.

1.16.4 The trainee must possess a thorough understanding of the criteria used for the qualitative identification and/or quantitative level of a compound(s) of interest by each analytical method.

1.16.5 Trainee must describe how quality assurance data is monitored and where it must be stored.

1.16.6 Trainee must describe the authentication process for reference material.

1.17 CASEFILE/NOTES PACKET PREPARATION

1.17.1 The Trainee must describe which documents and data are required to be included in urine or blood toxicology analysis casefile/notes packets.

1.17.2 The Trainee must describe what is to be included in the centrally stored QA file for each analysis run.

1.17.3 The Trainee must describe requirements for administrative and technical review of casefile/notes packets and analysis reports.

1.18 BASIC PHARMACOLOGY AND DRUG METABOLISM

1.18.1 The trainee must possess a basic understanding of the principles of pharmacology as they relate to drugs-of-abuse and drug compounds which impair driving ability.

1.18.2 Define the following terms:
- 1.17.2.1 *Pharmacology*
- 1.17.2.2 *Pharmacokinetics*
- 1.17.2.3 *Pharmacodynamics*

1.18.3 Discuss the factors that influence the metabolism of drugs.

1.18.4 List the major metabolites for the following representative compounds. Indicate which metabolites are psychoactive.
- 1.17.4.1 *Methamphetamine.*
- 1.17.4.2 *Cocaine alone and in combination with alcohol.*
- 1.17.4.3 *Diazepam*
- 1.17.4.4 *Clonazepam*
- 1.17.4.5 *Alprazolam*
- 1.17.4.6 *Flunitrazepam*
- 1.17.4.7 *Carisoprodol*
- 1.17.4.8 *Heroin*
- 1.17.4.9 *Codeine*
- 1.17.4.10 *Δ^9-THC*
- 1.17.4.11 *Imipramine*
- 1.17.4.12 *Amitriptyline*
- 1.17.4.13 *Propoxyphene*
- 1.17.4.14 *Tramadol*

1.18.5 Characterize phase I and II drug metabolism.

1.18.6 The metabolism of the 1,4-Benzodiazepine, Diazepam, yields several metabolites which in turn undergo biotransformation. Indicate which compounds result in each case:
- 1.17.6.1 *N-dealkylation (P450 mediated)*
- 1.17.6.2 *Hydroxylation (P450)*
- 1.17.6.3 *Glucuronidation*

1.18.7 The metabolism of Codeine yields several metabolites. Indicate which compounds result in each case:
- 1.17.7.1 *O-dealkylation (P450 mediated)*
- 1.17.7.2 *N-dealkylation (P450)*
- 1.17.7.3 *Glucuronidation*

1.18.8 The metabolism of Methamphetamine yields several metabolites. Indicate which compounds result in each case:
- 1.17.8.1 *N-Dealkylation (P450)*
- 1.17.8.2 *Oxidative Deamination (P450)*
- 1.17.8.3 *Aromatic Hydroxylation (P450)*

1.18.9 List compounds that yield methamphetamine as a metabolite.

1.18.10 The metabolism of Cocaine yields several metabolites. Indicate which compounds result in each case:
- 1.17.10.1 *N-dealkylation (P450)*
- 1.17.10.2 *Transesterification with alcohol (Esterase)*
- 1.17.10.3 *Ester Hydrolysis mediated by Esterases (two compounds)*
- 1.17.10.4 *Aromatic Hydroxylation (P450)*

1.18.11 Define the following terms in regard to drug metabolism:
- 1.17.11.1 *First pass effect*
- 1.17.11.2 *Half-life*
- 1.17.11.3 *Zero and first-order reactions*

1.18.12 Give two examples of commonly encountered compounds that form glucuronide conjugates in phase II.

1.18.13 Describe the potential modes of excretion for drug compounds.

1.18.14 Describe how urinary pH will affect urinary methamphetamine concentration.

1.18.15 <u>Recommended Background Reading</u>

1. Spiehler, V. and Levine, B., *Pharmacokinetics and Pharmacodynamics*. refer to index for page numbers, *in:* Principles of Forensic Toxicology, Second Edition, edited by Barry Levine, AACC, 2003 or more recent version.

2. Isenschmid, D.S. *Cocaine.* Refer to index for page numbers, *in:* Principles of Forensic Toxicology, Second Edition, Levine, B. ed., AACC, 2003 or more recent version.

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3. Huestis, M.A. *Marijuana.* refer to index for page numbers, *in:* Principles of Forensic Toxicology, Second Edition, edited by Barry Levine, AACC, 2003 or more recent version.

4. Moore, Karla. *Amphetamine/Sympathomimetic Amines.* refer to index for page numbers, *in:* Principles of Forensic Toxicology, Second Edition, edited by Barry Levine, AACC, 2003 or more recent version.

5. Kerrigan, S. and Goldberger, B.A. *Opioids.* refer to index for page numbers, *in:* Principles of Forensic Toxicology, Second Edition, edited by Barry Levine, AACC, 2003 or more recent version.

6. Clarke's Analysis of Drugs and Poisons. Third Edition. Moffat, A.C., Ed, London: The Pharmaceutical Press. 2004 or more recent version.
7. Julien,R.M., *Principles of Drug Action. in:* Primer of Drug Action, pp. 1-39, Freeman-New York, 1998 or more recent version.

8. Benet, L.Z., Kroetz, D.L. and Sheiner, L.B.., *Pharmacokinetics: The Dynamics of Drug Absorption, Distribution and Elimination.* pp. refer to index, *in:* Goodman and Gilman's The Pharmacological Basis of Therapeutics, New York:McGraw-Hill, Most current edition available.

9. Baselt, R.C., *Disposition of Toxic Drugs and Chemicals in Man*. Seventh Edition. Foster City:Biomedical Publications, 2004 or more recent version.

10. Baselt, R.C., *Drug Effects on Psychomotor Performance.* Foster City:Biomedical Publications, 2001 or more recent version.

1.19 CRIMINAL JUSTICE SYSTEM FUNDAMENTALS

1.19.1 The trainee must possess a practical understanding of the major branches of US federal and state government.

1.19.2 The trainee must describe which two branches of the US government have the authority to define what a crime is. Describe how the processes for each branch differ.

1.19.3 The trainee must be aware of which branch of US government law enforcement falls under.

1.19.4 The trainee must possess a practical understanding of the organizational structure of the criminal justice system.

1.19.5 Describe the difference between being charged with an infraction, misdemeanor, or felony type offense.

1.19.6 Describe the differences between criminal and civil proceedings, including how the evidence is evaluated.

1.19.7 What are the three ways that a person can be charged with a criminal offense? Discuss the differences.

1.19.8 Describe the subpoena process. What is the purpose of a subpoena? What do the words "*duces tecum*" mean when added to the subpoena?

1.19.9 Describe the Discovery Process. What does the Discovery Process hope to prevent?

1.19.10 Define the following terms:
- 1.19.10.1 *Plaintiff*
- 1.19.10.2 *Defendant*
- 1.19.10.3 *Counsel*

1.19.11 Discuss who has the burden of proof: the plaintiff or defendant.

1.19.12 Describe the role and functions of the following criminal justice system components:
- 1.19.12.1 *Judge*
- 1.19.12.2 *Prosecutor*
- 1.19.10.3 *Defense Attorney*
- 1.19.10.4 *Expert Witness*
- 1.19.10.5 *Jury*
- 1.19.10.6 *Bailiff*
- 1.19.10.7 *Court Reporter*

1.19.13 Discuss the following questions:
- 1.19.13.1 *What is a deposition?*
- 1.19.13.2 *What are the key differences between a bench versus a jury trial?*

1.19.14 Describe the steps or events that take place in the course of a trial.

1.19.15 Discuss the difference between direct, cross and rebuttal testimony.

1.19.16 Answer the following questions:
- 1.19.16.1 *What does it mean when the analyst's qualifications are stipulated to?*
- 1.19.16.2 *What objections are made by attorneys during a trial?*
- 1.19.16.3 *What is the difference between an objection being sustained versus overruled?*

1.19.17 Describe how an analyst is qualified to testify as an expert witness. What is *voir dire* as it relates to the testimony of an expert witness?

1.19.18 Describe possible outcomes of the trial process.

1.19.19 Discuss the ramifications of *Daubert v. Merrell Dow Pharmaceutical* and *Frye v. United States.*

1.19.20 List the factors that help assure a scientific testing procedure is established as reliable.

1.19.21 Recommended Background Reading

1. Schmalleger, F.J., *Criminal Justice: A Brief Introduction.* Ninth Edition, Prentice Hall:New Jersey, 2011 (paperback).
2. Matson, J.V., Effective Expert Witnessing. Second Edition, Lewis Publishers:Boca Raton, 1994.
3. Kurmack, N.T., *Legal Aspects of Forensic Science – Chapter 1*, pp. 1-27. *in:* Forensic Science Handbook, Volume I, Saferstein, R. ed, Prentice-Hall:New Jersey, 1982.
4. Freckelton, I., Legal Aspects of Forensic Science. pp. 1099 – 1102. *in*: Encyclopedia of Forensic Sciences, Volume 4, Siegel, J.A., Saukko, P.J. and Knupfer, G.C. editors, Academic Press: San Diego, 2000.

1.20 DRUGGED DRIVING LAWS IN IDAHO

1.20.1 For Idaho Code §18-8002A, Define the following terms and answer the question:

1. "Actual physical control"
2. "Administrative hearing"
3. "Evidentiary testing"
4. What happens if evidentiary testing is refused or not properly completed?
5. What is the role of the administrative hearing officer?

1.20.2 For Idaho Code §18-8004, answer the following:

1. Describe what the code defines as unlawful.
2. What additional information does the code allow to be considered when a person's ethanol concentration is less than 0.08 (g/100cc blood, g/210L breath or 67mL urine).

1.20.3 For Idaho Code §18-8006, what does it describe as "aggravated driving while under the influence of alcohol, drugs or any other intoxicating substances"?

1.20.4 References

1. Idaho Code §18-8002, §18-8004 and §18-8006.

1.21 FUNDAMENTALS OF STANDARDIZED FIELD SOBRIETY TESTS (SFSTs)

1.21.1 Describe the origins of the Standardized Field Sobriety Testing (SFSTs).

1.21.2 What are the phases of Standardized Field Sobriety Tests? What information does each phase provide? Describe what driving behaviors may indicate impaired driving.

1.21.3 Describe the process for administering the last phase of SFSTs.

1.22 FUNDAMENTALS OF THE DRUG EVALUATION AND CLASSIFICATION PROGRAM

1.22.1 Describe the origins of the Drug Evaluation and Classification (DEC) Program.

1.22.2 Describe each step of the physiological and psychomotor test protocols that an officer trained in the DEC program administers to a person suspected of driving impaired. What is this officer referred to as?

1.22.3 Describe each of the DEC program drug categories. What is the basis of these categories?

1.22.4 Provide examples of the major types of drugs that fall under each of the DEC program categories.

1.22.5 Describe the physiological responses consistent with each of the drug categories.

1.22.6 Describe the psychomotor test performance consistent with each of the drug categories.

1.22.7 Can the DEC Program differentiate between methamphetamine and cocaine use? Do methamphetamine and marijuana abuse share any physiological indicators?

1.22.8 What is a "Medical Rule Out"? What does it hope to prevent?

1.22.9 Describe the four types of poly-drug use considered by the DEC Program.

1.22.10 What are the three "S's" used by the DEC program to illustrate how effects of a particular drug category can vary? Describe the factors that influence each "S."

1.22.11 References

1. Kunsman, G.W. *Human Performance Toxicology*. pp. 15 - 30, *in:* Principles of Forensic Toxicology, Second Edition, edited by Barry Levine, AACC, 2003 or more recent version.

2. Page, T.E., *The Classification of Drugs by Category*. pp. 1 - 12, *in:* Medical-Legal Aspects of Drugs, Second Edition, Burns, M. ed., Tucson: Lawyers & Judges Publishing Co., Inc., 2007.

1.23 GENERAL PREPARATION AND PRESENTATION OF COURTROOM TESTIMONY

1.23.1 The Trainee must discuss proper demeanor and body language while testifying in court.

1.23.2 The Trainee must describe proper attire for court.

1.23.3 The Trainee must discuss ways to deal with nervousness while testifying.

1.23.4 The Trainee must describe how a casefile must be reviewed in preparation for testimony.

1.23.5 Recommended Background Reading

1. Weingarten, H. *The Expert Witness: the Toxicologist in Court.* pp. 225- 242, *in:* California Association of Toxicologists (CAT) Manual for Analytical Toxicology Training, 1994.

2. Sannito, T. *Nonverbal Communication in the Courtroom*. Champion, Sept.-Oct., 1985.

1.24 MOCK COURTROOM TESTIMONY

1.24.1 A mock court must be conducted to provide testimony for a minimum of one DUID case with pharmacology questions.

1.24.2 During the mock court, a minimum of the following will be addressed during direct testimony. The Trainee will be asked to describe how they would explain each of the following processes or definitions to a jury:

- Our laboratory accreditation
- How a sample is received
- How the sample is initially examined
- EIA Screen
- Sample Preparation
- Instrumentation used for confirmatory testing
- The review process
- Quantitation and the uncertainty associated with the values
- The intended use of the drug(s) detected
- The side effects of the drug(s) detected
- DEC/DRE categories and Indicators
- Neurotransmission
- Pharmacology
- Pharmacodynamics
- Pharmacokinetics
- Half-life
- Onset of action
- Duration of action
- Types of Tolerance

1.25 ANALYSIS OF PRACTICE SAMPLES

1.25.1 To develop their expertise in using analytical methods, the Trainee will apply them to the analysis of control samples, old proficiency test samples, and/or training samples. These training samples may be obtained in the following way: A forensic scientist assigned to a case may take an additional sample from casework that the trainee may analyze for training purposes. The sample may only be taken if the reserve after removing the training sample is greater than ½ (½ meaning: ½ of the total sample of that type submitted. If two grey top blood tubes are submitted it would be half of the total blood in the two tubes. If a purple and a grey top tube are submitted, it would be the ½ of the volume of the blood in each of the tube types submitted). In addition the trainee may, under the direct observation of a competent analyst, handle case samples. The trainer will make all conclusions and must be present and observe all aspects of the work (the trainee works as the "hands of the trainer"). All evidence in the "hands of the trainer" process will be checked out by the trainer and the chain of custody shall be maintained in the name of the trainer/trained analyst. Examination reports shall be based solely on examinations performed by or directly observed by approved analysts. The report will be issued by the trainer/trained analyst. The trainee must initial the examination record for the work performed and the trainer/trained analyst must confirm observations and conclusions by initialing or signing each page of the examination records. The number and type of practice samples will be at the discretion of the trainer and the trainee. When both parties are comfortable with the trainee's proficiency and understanding of the methods, this section can be signed off. Appendix A provides general guidance for applying and evaluating this section.

1.25.2 Prior to the analysis of control material and "old" proficiency tests, the Trainee must have sections 1.2 and 1.3 completed.

1.26 COMPETENCY TESTING FOR DRUG TOXICOLOGY

Upon the completion of training plan sections, the trainee must complete a competency test consisting of ≥10 specimens. The specimens must contain representative commonly encountered parent drug and drug metabolites. The competency test samples will be logged in and handled like regular evidence. Reports and restitution requests will be prepared just as a regular case would be handled. Competency tests logged into ILIMS will be handled like a regular case, administrative and technical review will be completed. The trainer will evaluate all aspects of how the case is handled and reported, not only that the appropriated answers were obtained.

1.27 TECHNICAL and ADMINISTRATIVE REVIEW

1.27.1 After the analyst has completed training in blood or urine toxicology they may begin training for:

Technical and administrative review sign off in the appropriate discipline.

1.27.2 The trainer will demonstrate for the trainee how the technical and administrative review is done and what documents must be reviewed. It is recommended that the trainee develop a checklist to use when first starting technical and administrative review.

1.27.3 The trainee will perform technical and administrative review on a minimum of 50 cases. The cases will then be reviewed by an approved reviewer.

Section One – New Analyst Training

Detection of Drugs in Blood and Urine

TRAINING PLAN TOPIC COMPLETION SIGN-OFF *Topics may not be listed in order*

Training Plan Sections Applied to Both Urine and Blood Toxicology

1.2 ADMINISTRATIVE ISSUES

1.2.1 Read and understood relevant sections of **Idaho State Police Employee Handbook**. This step is fulfilled with a verbal examination.

_____ _____
Date of Completion Trainee

_____
Trainer

1.2.2 Complete the **Idaho State Police Forensic Services General Training**. Verification of this is noted in this sign-off section. A copy of the training sign-off is to be included in the analyst's toxicology training file.

_____ _____
Date of Completion Trainee

_____
Trainer

1.3 EVIDENCE HANDLING ISSUES

Competency Verified by: ❒ Verbal or Written Examination

_____ _____
Date of Completion Trainee

_____
Trainer

1.4 BALANCE OPERATION

Competency Verified by: ❒ Verbal or Written Examination

_____ _____
Date of Completion Trainee

_____
Trainer

Section One – New Analyst Training

Detection of Drugs in Blood and Urine

TRAINING PLAN TOPIC COMPLETION SIGN-OFF *Topics may not be listed in order*

Training Plan Sections Applied to Both Urine and Blood Toxicology

1.5 PIPETTE INTERMEDIATE CHECK THEORY AND OPERATION

Competency Verified by: ❒ Verbal or Written Examination

_____ _____
Date of Completion Trainee

_____
Trainer

1.6 SOLUTION PREPARATION

Competency Verified by: ❒ Verbal or Written Examination

_____ _____
Date of Completion Trainee

_____
Trainer

1.7 PRINCIPLE: ENZYME IMMUNOASSAY

Competency Verified by: ❒ Verbal or Written Examination

_____ _____
Date of Completion Trainee

_____
Trainer

1.8.1 INSTRUMENTATION: VIVA AUTOMATIC CHEMISTRY ANALYZER

Competency Verified by: ❒ Verbal or Written Examination

_____ _____
Date of Completion Trainee

_____
Trainer

Section One – New Analyst Training

Detection of Drugs in Blood and Urine

TRAINING PLAN TOPIC COMPLETION SIGN-OFF *Topics may not be listed in order*

Training Plan Sections Applied to Both Urine and Blood Toxicology

1.8.2 INSTRUMENTATION: DSX AUTOMATIC CHEMISTRY ANALYZER

Competency Verified by: ❒ Verbal or Written Examination

_____ _____
Date of Completion Trainee

_____
Trainer

1.9 PRINCIPLE: LIQUID-LIQUID EXTRACTION

Competency Verified by: ❒ Verbal or Written Examination

_____ _____
Date of Completion Trainee

_____
Trainer

1.10 PRINCIPLE: SOLID PHASE EXTRACTION

Competency Verified by: ❒ Verbal or Written Examination

_____ _____
Date of Completion Trainee

_____
Trainer

1.11 PRINCIPLE: GAS CHROMATOGRAPHY (GC)

Competency Verified by: ❒ Verbal or Written Examination

_____ _____
Date of Completion Trainee

_____
Trainer

Section One – New Analyst Training

Detection of Drugs in Blood and Urine

TRAINING PLAN TOPIC COMPLETION SIGN-OFF *Topics may not be listed in order*

Training Plan Sections Applied to Both Urine and Blood Toxicology

1.12 PRINCIPLE: MASS SELECTIVE DETECTOR (MSD)

Competency Verified by: ❒ Verbal or Written Examination

_____ _____
Date of Completion Trainee

_____
Trainer

1.13 INSTRUMENTATION: GC-MASS SELECTIVE DETECTOR

Competency Verified by: ❒ Verbal or Written Examination

_____ _____
Date of Completion Trainee

_____
Trainer

1.14 PRINCIPLE LCMS-QQQ

Competency Verified by: ❒ Verbal or Written Examination

_____ _____
Date of Completion Trainee

_____
Trainer

1.15 INSTRUMENTATION: LCMS-QQQ

Competency Verified by: ❒ Verbal or Written Examination

_____ _____
Date of Completion Trainee

_____
Trainer

Section One – New Analyst Training

Detection of Drugs in Blood and Urine

TRAINING PLAN TOPIC COMPLETION SIGN-OFF

Training Plan Sections Applied to Both Urine and Blood Toxicology

1.17 CASEFILE PREPARATION

Competency Verified by: ❒ Verbal or Written Examination

_____ _____
Date of Completion Trainee

_____
Trainer

1.18 BASIC PHARMACOLOGY AND DRUG METABOLISM

Competency Verified by: ❒ Verbal or Written Examination

_____ _____
Date of Completion Trainee

_____
Trainer

1.19 FUNDAMENTALS OF CRIMINAL JUSTICE

Competency Verified by: ❒ Verbal or Written Examination

_____ _____
Date of Completion Trainee

_____
Trainer

Section One – New Analyst Training

Detection of Drugs in Blood and Urine

TRAINING PLAN TOPIC COMPLETION SIGN-OFF

Training Plan Sections Applied to Both Urine and Blood Toxicology

1.20 DRUGGED DRIVING LAWS IN IDAHO

Competency Verified by: ❒ Verbal or Written Examination

_____ _____
Date of Completion Trainee

_____
Trainer

1.21 FUNDAMENTALS OF STANDARDIZED FIELD SOBRIETY TESTS

Competency Verified by: ❒ Verbal or Written Examination

_____ _____
Date of Completion Trainee

_____
Trainer

1.22 FUNDAMENTALS OF THE DRUG EVALUATION AND CLASSIFICATION PROGRAM

Competency Verified by: ❒ Verbal or Written Examination

_____ _____
Date of Completion Trainee

_____
Trainer

1.23 GENERAL PREPARATION AND PRESENTATION OF COURTOOM TESTIMONY

Competency Verified by: ❒ Verbal or Written Examination

_____ _____
Date of Completion Trainee

_____
Trainer

Section One – New Analyst Training
Detection of Drugs in Blood and Urine

TRAINING PLAN TOPIC COMPLETION SIGN-OFF *Topics may not be listed in order*

Training Plan Sections Applied to Urine Toxicology

1.24 MOCK COURTROOM TESTIMONY - URINE

Competency Verified by: Successful Completion

_____ _____
Date of Completion Trainee

_____
Trainer

1.25 ANALYSIS OF PRACTICE SAMPLES-URINE

Competency Verified by: Observation and examination of data

_____ _____
Date of Completion Trainee

_____
Trainer

1.26 COMPETENCY TESTING - URINE

Competency Verified by: Successful Completion

_____ _____
Date of Completion Trainee

_____
Trainer

1.27 URINE - TECHNICAL AND ADMINISTRATIVE REVIEW

Competency Verified by: Successful Completion
Attach List of Laboratory Numbers

_____ _____
Date of Completion Trainee

_____
Trainer

Section One – New Analyst Training
Detection of Drugs in Blood and Urine

TRAINING PLAN TOPIC COMPLETION SIGN-OFF *Topics may not be listed in order*

Training Plan Sections Applied to Blood Toxicology

1.24 MOCK COURTROOM TESTIMONY – BLOOD TOXICOLOGY

Competency Verified by: Successful Completion

_____ _____
Date of Completion Trainee

_____
Trainer

1.25 ANALYSIS OF PRACTICE SAMPLES - BLOOD

Competency Verified by: Observation and examination of data

_____ _____
Date of Completion Trainee

_____
Trainer

1.26 COMPETENCY TESTING - BLOOD TOXICOLOGY

Competency Verified by: Successful Completion

_____ _____
Date of Completion Trainee

_____
Trainer

Training Plan Sections Applied to Blood Toxicology

1.27 BLOOD TECHNICAL AND ADMINISTRATIVE REVIEW

Competency Verified by: Successful Completion
Attach List of Laboratory Numbers

_____ _____
Date of Completion Trainee

_____
Trainer

Section One – New Analyst Training

Detection of Drugs in Blood and Urine

ANALYTICAL METHOD (AM) SIGN-OFF SECTION 1.16

Method content will be completed by the trainee, either verbally or in written form, successfully completing the steps in section 1.16.

Practical samples will be completed by the trainee successfully performing independent analysis on both positive and negative practice samples (when applicable).

Analytical Method	Completion Date Method Content	Trainee/Trainer Initials	Practice Sample Completion Date	Trainee/Trainer Initials
1.0 - Enzyme Immunoassay				
1.1 - Enzyme Immunoassay Screening for Drugs-of-Abuse in Urine				
1.0 ELISA Immunoassay screening for Drugs in blood and urine				
2.3 - Solid Phase Extraction – Qualitative Urine				
2.3.6 - Cocaine and Cocaine Metabolite				
2.4 - Liquid-Liquid Extraction – Qualitative Urine				
2.4.1 - TOXI-A and TOXI-B				
2.4.2 - GHB				
2.4.3 - Benzodiazepines				
2.4.4 - Carboxy-THC				
2.5 - Identification of Compounds in Urine				
2.5.2 - Criteria for Identification of Compounds				

Section One – New Analyst Training

Detection of Drugs in Blood and Urine

Analytical Method	Completion Date Method Content	Trainee/Trainer Initials	Completion Date Practical Samples	Trainee/Trainer Initials
3.3 - Gas Chromatographic Blood Screening				
3.3.1 - Basic and Neutral Drug Compounds				
3.3.2 - Strongly Basic Drug Compounds				
3.3.3 - Acidic and Neutral Drug Compounds				
3.6.1 - Basic and Neutral Drugs				
3.6.2 - Acidic and Neutral Drugs				
3.6.7 - High pKa Drugs				
3.9 - Liquid-liquid Extraction Methods for Quantitative GC				
3.9.2 - High pKa Drugs				
3.9.3 - Basic and Neutral Drugs				
3.10 - Solid Phase Extraction Methods for Quantitative GC/MSD Confirmation				
3.10.1 - THC and Carboxy-THC				
3.10.2 - Methamphetamine and Amphetamine				
3.10.3 - Free (Unbound) Codeine and Morphine				
3.10.4 - Cocaine and Cocaine Metabolites				
6.1 - Confirmation by LCMS-QQQ				

Section One – New Analyst Training

Detection of Drugs in Blood and Urine

Analytical Method	Completion Date Method Content	Trainee/Trainer Initials	Completion Date Practical Samples	Trainee/Trainer Initials
6.1.1 Benzodiazepines and Z-drugs in urine and blood				

QUALITY ASSURANCE

Analytical Method	Completion Date Method Content	Trainee/Trainer Initials	Completion Date Practical Samples	Trainee/Trainer Initials
5.1.1 - Artel Pipette Calibration System for Intermediate Checks				
5.1.2 - Gravimetric Pipette Intermediate Checks				
5.2 - Verification of Balance Calibration				
5.7 - Review of Toxicology Proficiency and Competency Tests			NA	
5.8 - Quality Assurance Measures – Urine and Blood Toxicology				
5.9 - Testing Guidelines				
5.10 - Authentication of Reference Materials – Urine and Blood Toxicology				
5.11 - Key Ions for Commonly Encountered Compounds			NA	
5.12 - Solution Preparation				

APPENDIX A

Guide for evaluating completion of practice casework

It is expected that analysts will progress at different rates based on past experience; education and that people learn and retain skills differently. The following are general guidelines for the trainer to consider when assigning, evaluating and signing off on the practice casework section of the toxicology training manual.

We anticipate the trainees will practice each extraction method on controls, old proficiency tests and aliquots taken from casework, when feasible.

The trainee will generally practice with samples to learn the extraction process, and then the trainee will do practice runs that consist of multiple extraction processes. The trainee will most likely need to run between 50 and 100 samples to demonstrate competence.
In addition the trainee should perform data analysis on past runs that are still stored on the computers.

The trainer should observe the trainee preparing multiple runs. During this observation the trainer will confirm that the trainee is:

- Handling the samples with care and in a way that ensures the samples don't get placed in the wrong tube at any time during the examination process.
- Using appropriate techniques to prevent contamination.

The trainee should act as the hands of the analyst for at least one run and demonstrate that: they are checking the names on the sample container(s) to make sure they match the name entered into the ILIMS system, they are correctly labeling the container(s), they understand how to document the condition of the evidence and describe it in notes, store evidence during the examination process, and seal it after analysis.

The trainee will demonstrate that they store and handle controls and standards appropriately.

The trainee will be able to perform the routine maintenance, and perform and evaluate the quality checks that are required for all of the instrumentation he or she is approved to use.

The trainee will demonstrate that he or she is comfortable operating the instrumentation and can do basic trouble shooting.

The trainee will demonstrate a solid understanding and comfort level determining when a weak analyte meets the criteria for identification.

The trainee will demonstrate performance on multiple runs with no need for assistance from the trainer, and with expected efficiencies on the extractions.

The trainee will demonstrate the understanding and the ability to hydrolyze samples, what may prevent this process from working, and how to determine this part of the analysis worked.

The trainee will demonstrate the ability to derivatize samples, understand what problems may occur and how to evaluate that in an analysis run.

The trainee will demonstrate the understanding of which extraction process to run first on samples, and which detected analytes should be confirmed.

The trainee will demonstrate the understanding of when the officer or prosecutor should be consulted on casework decisions.

Revision History

Revision #	Issue Date	History
0	12-31-1999	Original Issue
1	05-30-2000	Reformatted
2	05-24-2007	Updated nomenclature, additional Analytical Methods added, Check-off format added.
3	02-05-2009	Updated immunoassay section, updated training objectives, defined hands-on analysis requirements, updated references, reformatted plan and sign-off.
4	03-24-2011	Added new quality requirements which require that each training plan include sections on ethics, general knowledge of "other" areas of forensic science, criminal justice, Idaho Code, SSFTs and DEC/DRE program. Removed no longer needed sections involving FID and NPD. Reformatting for clarity. Note: Reassigned numbering for some sections.
5	08-15-2011	Revised section on practice samples, allowed for hands of the analyst and removed supervised casework requirement. Added section on training in technical and administrative review. Removed requirement for comprehensive course on drugs and driving. Added appendix A.
6	4/10/12	Added sections to training and methods to include ELISA screening and DSX instrument operation
7	01/07/2013	Removed sections on TLC, added sections for LCMS-QQQ
8	04/22/2015	Updated competency test and the location of controlled documents to reflect the use of the LIMS system. Formatting and grammar corrections. Added Henderson-Hasselbach question to LLE section.