Module 1: Introduction

Objectives:

- To train analysts/analysts to examine evidence for the presence of controlled substances, the presence of alcohol in blood/beverages, and the presence of drugs in blood/urine.
- To ensure analysts/analysts meet minimum standards before working independently.
- To train analysts to defend their casework and findings in judicial proceedings (Courtroom Testimony).
- This training course is designed to provide each trainee with the needed skills to safely examine evidence submitted to the lab.

Requirements:

The minimum qualifications for an analyst are detailed in Maine Revised Statute (MRS), and DHHS rules. This information is also contained within the Quality Manual, available on SharePoint.

Seized Drug Testing	
MRS Title 17-A, Chapter 45. DRUGS	Title 17-A, Chapter 45
Analysis of scheduled drugs	Chapter 45 §1112
Certification Standards for Persons Conducting Chemical Analysis for Detection / Identification of Drugs	DHHS Rules 10-144 Chapter 266
Toxicology	
MRS Title 29-A, Chapter 23. MAJOR OFFENSES - SUSPENSION AND REVOCATION	Title 29-A, Chapter 23
Certification Standards for Persons Conducting Blood / Breath Test to determine Alcohol Level	DHHS Rules 10-144 Chapter 267
Rules Governing Self-contained Breath Alcohol Testing Equipment	DHHS Rules 10-144 Chapter 269
Rules for Sample Collection and Drug Testing in Suspected O. U. I. Cases	DHHS Rules 10-144 Chapter 270
HETL	
MRS Title 22, §565. HEALTH AND ENVIRONMENTAL TESTING LABORATORY	Title 22, Chapter 157-A

Schedule of Charges for Testing and Services Provided by the Maine Health and Environmental Testing Laboratory	DHHS Rules 10-144 Chapter 257

Coordinator:

An experienced and fully qualified, certified, and authorized analyst in the disciple shall coordinate this program. Although the coordinator may delegate some training activities to other certified analysts working within the lab system, the coordinator has the responsibility to ensure the trainee achieves the desired objectives before working independently.

Training Period:

This program is designed to ensure that all appropriate areas of study are included. The estimated time required to complete each unit of instruction will vary depending on the abilities and previous experience of the individual trainee. Following the completion of all appropriate training modules in this manual, each analyst must demonstrate competency by successfully completing an initial written exam (minimum passing grade 80%), successfully completing a mock trial, and successfully completing a practical competency test(minimum passing grade 100%) with the minimum amount of samples required for State Certification for the relevant disciple, before being certified by DHHS and authorized by the Forensic Laboratory Director to work independently.

The trainee may work on multiple modules concurrently, but each module must be completed by the trainee and so documented by the assigned coordinator before the trainee can be certified and authorized to begin independent casework.

Responsibilities:

During the training period the following shall be adhered to:

1. The trainee shall **NOT** maintain the physical custody of the evidence as a case is being worked. The Trainee MAY work with another analyst who has physical custody of the evidence and may assist (train) by examining samples in the presence of the analyst who has physical custody of the evidence, and when so directed by the analyst working the case.

2. Initially, the trainee shall observe each test being conducted by the Coordinator. As the trainee gains confidence, understanding, and experience, the Coordinator may assign specific tasks within the case they are working on to the trainee and

allow the trainee to complete those tasks/examinations under the watch of the Coordinator. The trainee shall initial all work completed, but the Coordinator shall take ownership of all work within the case. Under no circumstance may the trainee work independently until certified by DHHS and authorized to do so by the Forensic Laboratory Director. Ideally the Coordinator shall use mock samples when possible.

3. The trainee may **NOT** sign reports during the training period.

Documentation:

The Trainee and the Coordinator will review the training program to ensure the trainee understands the overall program, expectations, and has the opportunity to ask questions before detailed, section specific training commences.

This review, and the completion of all subsequent modules referenced in this manual shall be recorded on the checklist at the end of each module.

The trainee will prepare a 'training binder' that will hold a copy of this training manual, and all associated pages discussed in the next paragraphs.

Throughout this manual, references are made that the trainee shall retain specific items in the training binder (GC/MS data for example). Most reading materials can be found digitally here: K:\Forensic Training\Required Reading or in books found in the library. The trainee should clearly label what these pages are, initial, and then place them within the appropriate section of the binder.

The checklist, and the completed training binder with all associated pages, will be presented to the Forensic Laboratory Manager / Quality Manager when all items are completed and before the trainee is fully certified and authorized to work independently. Knowledge check questions shall be answered on a separate document, submitted to the training coordinator and/or Quality Manager for review and discussion, and stored in the training binder. The trainee may utilize any training materials to answer the questions and answers will be reviewed and discussed with the trainee after submission, prior to final completion and sign-off of the module. The questions found within each module will not be graded and will only be used for the training coordinator/Quality Manager to judge the trainees understanding of each module during training and to assess if further training or retraining is required.

Retraining:

If a trainee's performance is unacceptable in any specific section, the Training Coordinator shall:

- Notify the trainee and Forensic Laboratory Director/Quality Manager that performance is/was unacceptable. Notification of the unacceptable performance may be made by either email or personal communication, but a record will be retained in the training binder along with all documentation indicating the trainee successfully repeated the section and any additional work as determined by the Forensic Laboratory Director.

- The Forensic Laboratory Director may require the trainee to simply repeat the failed module or may augment the training material in the specific module, and/or take other appropriate action as management deems necessary (i.e., disciplinary, remedial/additional training). Appropriate documentation will be retained in the training binder.

Specific Criteria for acceptable performance are detailed within each specific module of the training.

Module 1: Introduction Checklist and Review

Trainee and Coordinator have met to discuss training program, expectations, and answer all questions from trainee.

Trainee has received a training binder that includes a copy of this training manual

Date Completed	Trainee	Coordinator (s)

Module 2: Laboratory Orientation and Reading

New Hire Laboratory Orientation: The Trainee will gain an understanding of the laboratory's physical layout, including which rooms are used for what purpose, who has access to the various rooms, where files are retained, who within the laboratory has responsibility for various tasks, where various pieces of safety equipment are stored, what to do and where to meet in case of fire (or fire drill), etc.

The trainee will also begin to familiarize themselves with the various manuals that detail policy and procedures within the laboratory. During this time the trainee will read, study, and understand each of the following manuals, all of which are available from the Forensic Laboratory Director/Quality Manager, and are on SharePoint, the laboratory's home for documents, manuals, and forms.

- HETL new hire checklist and orientation
- Safety training checklist

Forensic Chemical Section Orientation: The trainee with gain and understand of the safety concerns and associated risk in the forensic chemistry section.

- Seized Drug Safety Training (See forensic training folder on the K drive for links)
- Narcan Training (See forensic training folder on the K drive for links)
- Forensic Standard Operating Procedure Manual (SOP)

Aside from formal manuals, the laboratory offers various sources of outside reference material that can be useful in daily casework, including the below list. If the Trainee is unfamiliar with these items, the training coordinator shall spend time with the trainee showing them where these are stored in laboratory, and what types of references are available online. Some of these references may be found in the forensic training folder on the K drive.

- Clarke's Analysis of Drugs Poisons
- The Physician's Desk Reference (PDR)
- Drug Identification Bible
- The Journal of Forensic Sciences
- SWGDRUG/Microgram/JCLIC/ASB/ASTM

Once the trainee has completed the new hire checklist, completed reading all policies listed in this section, and completed any required trainings, this section may be marked as "COMPLETE"

on the Checklist. It is encouraged that the trainee revisit each of these manuals as training progresses and questions regarding laboratory policy arise.

Module 2: Laboratory Orientation and Reading Checklist and Review

Training Requirement:	**Trainee Initials:**	**Date:**
New hire checklist (include copy of form in binder)		
Seized Drug Safety Training		
Narcan Training		
Forensic Standing Operating Procedure Manual (SOP)		

Module 2: Laboratory Orientation and Reading Knowledge Check Questions

1. Describe the evacuation procedure for HETL.
2. List the location and general purpose of the following safety equipment located in the lab: fire extinguisher, chemical/biological spill kits, flammable cabinet/refrigerator/freezer, eye wash/safety shower, oxygen monitors, fume hoods and monitors, and biosafety cabinet.
3. Describe the process in the Chemical Hygiene Plan for purchasing a new chemical.
4. Describe the storage requirements for chemical SDS.
5. How can you determine if a chemical is being stored correctly and ensure it is not being stored with incompatible chemicals?
6. Explain the requirements associated with DEA exempt standards and DEA non-exempt standards.
7. Explain the different waste streams that may be used in the relevant forensic chemistry Module (biological, chemical, chemically contaminated sharps, and dual waste) and the process to dispose of something is not included in the associated waste profiles.
8. What is the record retention requirement for any records created in the Forensic Module?
9. What safety precautions should be used when handling seized drug samples, especially powders? What are some options to clean up/decontaminate an area after working with controlled substances?
10. What safety precautions should be used when handling biological samples, especially blood? What are some options to clean up/decontaminate an area after working with biological samples?

Module 2: Laboratory Orientation and Reading Training Coordinator Review

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Date:**
Trainee understands the general layout of the laboratory			
Trainee understands evacuation procedures			
Trainee understands chemical, biological and drug safety			
Trainee understands various waste streams at HETL and how to determine the appropriate waste stream for chemicals used in testing			
Trainee is familiar with the location of SDS in the lab and on the shared drive, and requirements related to SDS retention and review			
Trainee is familiar with process for procuring new chemicals			
Trainee understands requirements related to storage and handling of controlled substance standards, including standards that are DEA non-exempt			
Trainee understands the review and approval process for standards used in testing			
Trainee understands the record retention policy			
Trainee has gained access to SharePoint and is able to navigate the system			

Module 2 Laboratory Orientation and Reading: Completed and Reviewed:

Date Completed	Trainee	Coordinator(s)

Module 3: Evidence Intake-Storage-LIMS

Objectives:

- The trainee will gain an understanding of how evidence for analysis arrives at the laboratory, how a Receipt/Contract for Examination form is completed between the laboratory and the customer. Trainee will also learn what a chain of custody document is, how it is filled out, and the importance of completing this document correctly. Trainee will learn what is meant by 'sealed' when referring to the condition of evidence. Trainee will learn how to properly seal evidence upon completion of examination.
- Trainee will gain an understanding of recording information and document notes in a permanent manner. Trainee with gain an understanding of handling corrections, redactions, and insertions while taking notes.
- Trainee will gain an understanding of the proper way to document evidence with a photograph.
- Trainee will gain an understanding of how evidence is stored. Trainee will understand what security measures are in place to ensure evidence integrity. Trainee will gain an understanding of final evidence disposition and evidence return/destruction.
- Trainee will gain an understanding and master creating cases in the LIMS system (StarLIMS), adding samples to the newly created case, printing evidence labels, and applying labels to evidence.
- Compliance with Forensic Chemistry Laboratory policies regarding security, handling, packaging, labeling, and preservation of evidence to prevent loss, deterioration, or cross-contamination, including:
    - Security systems in place
    - Verification and documentation of evidence received
    - Sealing of evidence
    - Procedures in the event of receiving unsealed evidence
    - Procedures in the event of receiving an expired blood kit
    - Marking of evidence
    - Evidence storage
    - Final disposition of evidence

- Examination documentation to include:
  - Initials or signature of analyst and toxicology laboratory case number
  - Procedures for strikethrough and interlineation
  - Detailed information on condition and description of the evidence
  - Analyses/examinations performed
  - Composition and disposition of case files

Module 3: Evidence Intake-Storage-LIMS Checklist and Review

Trainee has read the following manuals or received the below training (initial and date next to each when complete):

Required Reading/Tasks:	**Trainee Initials:**	**Date:**
StarLIMS User Guide		
Evidence Manual		
Security Measures in Quality Manual		
Approved Abbreviations list		
Observe forensic intake of various evidence		
Observe the contract for analysis being completed, and the chain of custody signed/dated.		
Observe the system by which evidence is stored		
Observe staff input information into LIMS system, resulting in the creation of a case, and samples assigned to the newly created case, and the printing of labels related to the evidence for that newly created case		
When the Trainee feels they understand how the contract and chain are completed, the Coordinator will pretend to be a customer submitting evidence, and the trainee shall receive said evidence, completing the contract and chain of custody documents. There will be no labels printed, and this pretend		

case will NOT be entered into the LIMS system. The completed Receipt/Contract for Examination form and Chain of Custody shall be retained within the trainees training binder.		

Module 3: Evidence Intake-Storage-LIMS Knowledge Check Questions

1. Describe the process relating to access control of Forensic areas of the laboratory and list security measures in place to protect the integrity of the evidence and standards
2. Describe requirements for a proper seal and ways to document how the evidence is received.
3. What is the importance of a proper seal? Describe potential issues if only one seal is marked.
4. Describe how to proceed when evidence arrives improperly sealed:
    a. Evidence is mailed without initials?
    b. Evidence is submitted in person without a seal?
    c. Evidence is submitted in person and is compromised (leaking or a tear in the envelope)?
5. Describe the proper way to reseal evidence and three items that should be avoided, if possible.
6. Describe the proper way to photograph evidence
7. Explain where to properly store different types of evidence.
8. Explain how to create an invoice in LIMS.
9. List the information entered into LIMS during evidence intake.
10. Describe evidence return/destruction procedures.

Module 3: Evidence Intake-Storage-LIMS Training Coordinator Review

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Date:**
Trainee understands access control and security measures in place to ensure the integrity of the evidence			
Trainee has viewed the process by which is submitted to the lab			

Trainee has viewed the completion of the Contract for Analysis and Chain of Custody document			
Trainee has been shown the evidence storage system in both the drug safe and basement			
Trainee has viewed staff enter evidence into LIMS system			
Trainee has demonstrated an understanding of the abbreviations used in testing			
Trainee and Coordinator have completed a mock Contract for Analysis and Chain of Custody document			
Trainee will take pictures of mock evidence and print photos for retention in the training binder			

Module 3 Evidence Intake-Storage-LIMS Training Completed and Reviewed:

Date Completed	Trainee	Coordinator(s)

After the completion of introductory, laboratory orientation, evidence, and quality modules the trainee **MAY** be authorized to accept evidence from customers, if recommended to the Forensic Lab Director by the Training Coordinator. If so authorized, the Forensic Lab Director will complete the appropriate Authorization and retain such documentation.

Module 4: Laboratory Pipetting

Objectives:
After completion of all sections of this module, the trainee with have the requisite knowledge, skills, and abilities involved in:

- The appropriate tasks and use for disposable/transfer pipets, single-channel pipets, the dilutor, and repeat pipets.

- ❖ Understand the difference between forward technique and reverse technique for single-channel pipets
- ❖ Be comfortable and familiar pipetting stocks and other liquids
- ❖ As relevant, preparation of Internal Standard, Working Stocks, and extraction reagents

Required Tasks:

1. The trainee shall practice pipetting using each of the different relevant pipets until the trainee feels comfortable using the device.
2. The Trainee shall perform a mock quarterly pipet check using the below listed pipets. The results of each shall be recorded on quarterly pipet forms and stored in training binder.

    - A 1000uL single-channel pipet set to 100uL dispensation
    - A 100uL or 200uL single-channel pipet set to 10ul or 20ul dispensation
    - A repeat pipet using a 50uL syringe set to 25uL dispensation.

Module 4: Laboratory Pipetting Checklist and Review
Trainee has read the following manuals or received the below training (initial and date next to each when complete):

Required Reading/Tasks:	Trainee Initials:	Date:
Proper Pipetting Technique-Improve Your Results with Proper Technique		
"Improve Accuracy with 10 Proven Steps" excerpts from Thermo Scientific Pipetting for a Lifetime Guide		

Module 4: Laboratory Pipette Knowledge Check:

1. Explain the difference between forward and reverse pipetting techniques.

2. Explain when you would use a single channel, repeat pipet, plastic transfer pipet and glass Pasteur pipet.
3. Explain the purpose for the quarterly and annual pipet checks.
4. How do you determine the lowest volume the pipet is rated to accurately dispense?
5. Is it appropriate to pipet 5uL using a 100uL pipe? Explain why or why not.

Module 4: Laboratory Pipetting Training Coordinator Review

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Date:**
Trainee demonstrated understanding of different pipets and when to use each one			
Understands the different between forward and reverse pipetting techniques			
Understands how to prepare reagents/stocks			
Mock quarterly pipet check			

Module 4: Laboratory Pipetting Training Completed and Reviewed:

Date Completed	**Trainee**	**Coordinator(s)**

Module 5: Urine Toxicology

Module 5A: Opening Submitted Urine Collection Kits

Objectives:
After completion of this module, the trainee will have the requisite knowledge, skills, and abilities involved in:

- ❖ Preservation of hard copy chain-of-custody for physical evidence
- ❖ Opening of submitted urine collection kits

- ❖ Verification of case information and use of the Urine Kit Inventory Form
- ❖ Use of the laboratory LIMS system to document case information
- ❖ Triaging samples upon opening urine collection kits (SAK and QNS samples)

Module 5A: Opening Submitted Urine Collection Kits Checklist and Review

Required Tasks:	**Trainee Initials:**	**Date:**
The coordinator will discuss the topics listed in the objectives as they relate to evidence handling, opening urine collection kits, verifying submitted information, labeling, chain of custody, and sample triaging.		
The coordinator will discuss the different types of cases that may be received with associated special considerations (QNS samples, sexual assault samples)		
The trainee will observe the coordinator perform the task of opening urine collection kits		
The trainee will observe the marking or labeling of physical evidence.		
The trainee will observe the coordinator verify submitted information from the urine collection kits to the urine cups and submitted documentation.		
The trainee will observe the utilization of the laboratory LIMS system to input submitted case information.		

Module 5A: Opening Submitted Urine Collection Kits Knowledge Check Questions:

1. Explain the chain of custody system.
2. Discuss the proper marking/labeling of evidence
3. Discuss how samples are handled and what to do if you receive a low volume sample
4. Explain what to do if during the verification process you find that the submitted information does not match.
5. If there is no DRE involved as indicated on the submission paperwork, what do you do?

6. Discuss the special considerations associated with sexual assault samples.
7. How are samples checked to ensure accuracy once they are received within the lab?

Module 5A: Opening Submitted Urine Collection Kits: Training Coordinator Review

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Date:**
Trainee demonstrates understanding of evidence handling, opening urine collection kits, verifying submitted information, labeling, chain of custody, and sample triaging.			
Understands the different types of cases that may be received with associated special considerations (drug facilitated crimes, beverages, fatal/near fatal motor vehicle crashes, postmortems)			
Proficient in the utilization of the laboratory LIMS system to input submitted case information.			

Module 5A: Opening Submitted Urine Collection Kits Completed and Reviewed:

Date Completed	**Trainee**	**Coordinator(s)**

Module 5B: Randox Evidence Investigator-Screening

Objectives:
After completion of all sections of this module, the trainee with have the requisite knowledge, skills, and abilities involved in:

- ❖ Initial screening of urine samples for drugs using the Randox Evidence Investigator
- ❖ Preparation of calibrators, quality controls, and samples (house-made)
- ❖ Sample preparation

- How the Randox Evidence Investigator and sample preparation process works to detect drugs

Module 5B Randox Evidence Investigator-Screening Checklist and Review

Required Tasks:	**Trainee Initials:**	**Date:**
Read portions of Baselt, R., *Drug Effects on Psychomotor Performance*.		
Read portions of Fenton, J., *Toxicology A Case-Orientated Approach*.		
Read portions of Randall, B., *Disposition of Toxic Drugs and Chemicals in Man*.		
Read Urine Drug Procedure Section: Screening by Immunoassay-Randox Evidence Investigator		
Read Randox Evidence Investigator DOA Ultra Urine Assay brochure		
Read ANSI/ASB Standard for the Analytical Scope and Sensitivity of Forensic Toxicological Testing in Impaired Driving Investigations		
Read Verstraete, A. (2004), Detection Times of Drugs of Abuse in Blood, Urine, and Oral Fluid. The Journal of Therapeutic Drug Monitoring, 2004; 26: 22		
Read the following chapter in Clarke's Analysis of Drugs and Poisons in Pharmaceuticals, Body Fluids, and Postmortem Material (most recent edition available at HETL): Chapter 31: Immunoassays		
The coordinator will discuss the topics listed in the objectives as they relate to the screening for drugs in urine.		
The trainee will observe the entire screen process as it is performed by the coordinator.		

After watching the coordinator complete the sample preparation and screen analysis process, the trainee will successfully complete the sample preparation and screen analysis process, under direct observation by the coordinator, of the appropriate positive and negative quality controls. Trainee will successfully complete **at least 2 observed** batches, complete all paperwork / forms, and submit to Coordinator for review. One of these batches must contain calibrators and a new calibration curve must be run on the Randox.	**Observed:**	**Observed:**
	Batch 1:	**Batch 1:**
	Batch 2:	**Batch 2:**
Independently, without observation by the coordinator, the trainee will successfully complete the sample preparation and screen analysis process, of the appropriate positive and negative quality controls and unknown samples. Trainee will successfully complete **at least 2 independent** batches, complete all paperwork / forms, and submit to Coordinator for review. If independent runs do not meet acceptability requirements, then the training coordinator will evaluate need for further training.	**Batch 1:**	**Batch 1:**
	Batch 2:	**Batch 2:**

Module 5B Randox Evidence Investigator-Screening: Knowledge Check

1. What is the difference between a screening test and a confirmation test?
2. Explain how the Randox Evidence Investigator and sample preparation process works to detect drugs in urine?
3. What purpose does the Positive control serve?
4. What purpose does the Negative control serve?
5. List the drug categories that the Randox screens for but there are no GCMS confirmation methods?
6. How frequently does the calibration curve need to be run?
7. You put your sample through the entire sample preparation process, but the Randox indicates that all of your positive controls do not pass, what could be a reason for this? Describe a particular step in the procedure that, if done incorrectly or outside the time window would result in all compounds failing?
8. Describe how the Randox Biochip analyzer works.

9. Explain the process of calibration and sample screening used with the Randox Biochip analyzer.
10. Describe the process of creating a sequence and running samples on the Randox.
11. Describe the requirements a calibration curve (Randox) must meet before being used for casework.

Module 5B Randox Evidence Investigator-Screening Training Coordinator Review

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Date:**
Trainee successfully completed all observed and independent batches			
Trainee understands the difference between a screen and confirmation test, the reason each is performed, and the limitations associated with the screen test			
Trainee understands how the Randox analyzer works			

Module 5B Randox Evidence Investigator-Screening Completed and Reviewed:

Date Completed	**Trainee**	**Coordinator(s)**

Module 5C: GC/MS Instrument

Objectives:
After completion of all sections of this module, the trainee with have the requisite knowledge, skills, and abilities involved in:

- ❖ GC/MS maintenance and preparation of analyzer for analysis
- ❖ Developing an instrument sequence and running samples
- ❖ Understand how the instrument works and basic troubleshooting.

Module 5C GC/MS Instrument Checklist and Review

Required Tasks:	**Trainee Initials:**	**Date:**
Read Urine Drug Procedures: GC/MS Operation and Procedures		
The Trainee shall observe the coordinator perform daily instrument maintenance.		
The Trainee shall review the Monthly maintenance log with the coordinator and discuss each component that is being monitored/maintained and how it relates to optimal instrument performance.		
The coordinator shall review common instrument troubleshooting with the trainee.		
Read the following chapter in Clarke's Analysis of Drugs and Poisons in Pharmaceuticals, Body Fluids, and Postmortem Material (most recent edition available at HETL): Chapter 37: Mass Spectrometry		
The Trainee shall observe the coordinator perform the following maintenance tasks: a. Cleaning a GCMS source		
b. Installing a GCMS column or GCM column guard		
c. Trimming a GCMS column guard		
d. Cleaning the Autosampler needle		
e. Performing GC inlet Maintenance		
After the Trainee has observed the coordinator perform the maintenance task the trainee shall perform the following tasks observed by the coordinator:		

a. Trimming a GCMS column guard b. Cleaning the Autosampler needle c. Performing GC inlet Maintenance d. Perform an autotune or checktune e. Perform an air and water check		

Module 5C GC/MS Instrument Knowledge Check-GCMS instrument

1. Describe how the GCMS analyzer works?
2. Explain the process and reasoning behind the GCMS maintenance, including frequency?
3. Give an example of what could cause increased Nitrogen on the tune and an example of what could cause increased water on the tune?
4. Explain how SIM is different than SCAN. Include at least one pro and one con for each.
5. How does a spectra collected using SIM differ from a spectra collected using SCAN?
6. Explain the difference between and Autotune and a checktune (tune report).
7. Performing column maintenance, you accidently break the column transfer line going into the MS, what do you do? Please detail step by step.
8. Describe some examples of inacceptable chromatography integration.

Module 5C GC/MS Instrument Training Coordinator Review:

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Date:**
Trainee successfully completed all observed and independent tasks			
Trainee understands the various parts and functions of GC/MS and the role each plays in obtaining results.			
Trainee understands the difference between SIM and SCAN data, and the pros and cons of each.			

Module 5C Completed and Reviewed:

Date Completed	Trainee	Coordinator(s)

Module 5D Data Analysis Batch Review:

Objectives:
After completion of all sections of this module, the trainee with have the requisite knowledge, skills, and abilities involved in:

- Data analysis of batches
- Use of Agilent Masshunter Quantitative Data Analysis software
- Analyzing the data generated and completing associated forms
- Proper chromatogram integration and manual integration of data

Module 5D Data Analysis Batch Review Checklist and Review:

Required Tasks:	Trainee Initials:	Date:
Read Urine Drug Procedure: Screening and/or Confirmation by GC/MS-Operation		
Read Urine Drug Procedure: Appendix-Chromatography Integration Parameters & Examples		
Read ASB Standard 098, First Edition. 2020. Standard for Mass Spectral Data Acceptance in Forensic Toxicology		
Read ASB Standard 113, First Edition. 2020. Standard for Identification Criteria in Forensic Toxicology		
Watch continuing education webinars from Agilent regarding the use of Masshunter Data Analysis software: This may include the following depending on availability:		

a. The Power of MS and MassHunter Software for GCMS b. Migrating from GCMS Chemstation to Masshunter Software c. An Introduction to Masshunter Quantitative Analysis Software d. Advanced Masshunter Quantitative Analysis Software if the current webinar is not available a suitable replacement will be found		
The Trainee shall observe the Coordinator perform data analysis on a batch using Agilent Masshunter Quantitative Data Analysis software	**Observed 1:**	**Observed 1:**
	Observed 2:	**Observed 2:**
The Trainee shall perform data analysis on each of the methods using Agilent Masshunter Quantitative Data Analysis, these batches shall be created from previously run calibrators and controls and shall be saved as "BatchDateTRAINING". Once the data analysis is complete the trainee shall generate Masshunter reports and submit to the Coordinator for review.	**Narcotics:**	**Narcotics:**
	Cocaine:	**Cocaine:**
	Amines:	**Amines:**
	Carboxy-THC:	**Carboxy-THC:**
	Benzodiazepines:	**Benzodiazepines:**
	Base:	**Base:**

Module 5D Data Analysis Batch Review Knowledge Check:

1. How do you tell if you have updated your retention times and ion ratios in a batch?
2. What are the two ways to assign sample types and levels?
3. Describe how you update retention times and ion ratios in a batch?
4. How do you tell if you have used the wrong peak to update a retention time for a compound?
5. You see the following results in a sample that you ran on a GCM confirmation method: qualifier ion ratios out, response significantly greater than the positive control, qualifier ion ratios out, chromatography that exhibits tailing, or chromatography that appears to be saturating the detector (flat topped/plateau peaks). What is your course of action for this sample?

Module 5D Data Analysis Batch Review Training Coordinator Review:

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Date:**
Trainee successfully completed all observed and independent tasks			
Trainee is able to use Agilent Masshunter Quantitative Data Analysis software to analyze generated data			
Trainee understands what different chromatogram peak shapes look like and what causes them.			

Module 5D Data Analysis Batch Review Completed and Reviewed:

Date Completed	**Trainee**	**Coordinator(s)**

Module 5E Confirmation Using Liquid/Liquid and Solid Phase Extractions and GCMS Instrumentation (Carboxy-THC, Narcotics, Benzodiazepines, Cocaine, Amines, & Base)

Objectives:
After completion of all sections of this module, the trainee with have the requisite knowledge, skills, and abilities involved in:

- ❖ Liquid/liquid and solid phase extractions
- ❖ Confirmation testing of urine samples for drugs
- ❖ Preparation of quality controls and samples (house-made)

Module 5E Confirmation Using Liquid/Liquid and Solid Phase Extractions and GCMS Instrumentation Checklist and Review:

Required Tasks:	**Trainee Initials:**	**Date:**
Read portions of Baselt, R., *Drug Effects on Psychomotor Performance*.		
Read portions of Fenton, J., *Toxicology A Case-Orientated Approach*.		
Read portions of Randall, B., *Disposition of Toxic Drugs and Chemicals in Man*.		
Read Urine Drug Procedures: Screening and/or confirmation by GC/MS		
Read Urine Drug Procedures: Specific Extraction Procedures (all)		
Read ANSI/ASB Standard for the Analytical Scope and Sensitivity of Forensic Toxicological Testing in Impaired Driving Investigations (most recent edition available at HETL)		
Read Jones, A. (2019) *Forensic Drug Profile: Cocaethylene*. Journal of Analytical Toxicology 2019; 43: 155-160.		
Read the following chapters in Clarke's Analysis of Drugs and Poisons in Pharmaceuticals, Body Fluids, and Postmortem Material (most recent edition available at HETL): 1. Chapter 9: Forensic Toxicology 2. Chapter 11: Drugs of Abuse 3. Chapter 24: Pharmacokinetics and Metabolism 4. Chapter 29: Extraction		

The trainee will observe the Coordinator make a QC stock and then make a QC stock and run it unextracted on the GCMS to confirm it contains all the compounds of interest.	**Observed:**	**Observed:**
	Performed:	**Performed:**
The trainee will observe the entire sample extraction process as it is performed by the Coordinator.	**Narcotics:**	**Narcotics:**
	Cocaine:	**Cocaine:**
	Amines:	**Amines:**
	Carboxy-THC:	**Carboxy-THC:**
	Benzodiazepines:	**Benzodiazepines:**
	Base:	**Base:**
After watching the Coordinator complete the extraction, instrument run, and data analysis process, the trainee will successfully complete the entire process, extracting, running, and analyzing the quality controls, under direct observation by the Coordinator. Trainee will successfully complete **at least 2 observed** batches, complete all paperwork / forms, and submit to Coordinator for review.	**Narcotics 1:**	**Narcotics 1:**
	Narcotics 2:	**Narcotics 2:**
	Cocaine 1:	**Cocaine 1:**
	Cocaine 2:	**Cocaine 2:**
	Amines 1:	**Amines 1:**
	Amines 2:	**Amines 2:**
	Carboxy-THC 1:	**Carboxy-THC 1:**
	Carboxy-THC 2:	**Carboxy-THC 2:**
	Benzodiazepines 1:	**Benzodiazepines 1:**
	Benzodiazepines 2:	**Benzodiazepines 2:**
	Base 1:	**Base 1:**

	Base 2:	**Base 2:**
Independently without observation by the Coordinator the trainee will successfully complete the entire process, extracting, running, and analyzing the quality controls. Trainee will successfully complete **at least 2** batches, complete all paperwork / forms, and submit to Coordinator for review. If independent run does not meet acceptability requirements, then the training coordinator will evaluate need for further training.	**Narcotics 1:**	**Narcotics 1:**
	Narcotics 2:	**Narcotics 2:**
	Cocaine 1:	**Cocaine 1:**
	Cocaine 2:	**Cocaine 2:**
	Amines 1:	**Amines 1:**
	Amines 2:	**Amines 2:**
	Carboxy-THC 1:	**Carboxy-THC 1:**
	Carboxy-THC 2:	**Carboxy-THC 2:**
	Benzodiazepines 1:	**Benzodiazepines 1:**
	Benzodiazepines 2:	**Benzodiazepines 2:**
	Base 1:	**Base 1:**
	Base 2:	**Base 2:**

Module 5E Confirmation Using Liquid/Liquid and Solid Phase Extractions and GCMS

Instrumentation Knowledge Check: All GCMS methods

1. What purpose does the Unextracted control serve?
2. How is concentration calculated? Why is concentration calculated?
3. What purpose does the batch negative control serve?
4. What purpose does the sample negative control serve?
5. What purpose does the positive controls serve?
6. What purpose does the hydrolysis control serve?
7. What purpose does the internal standard/surrogate compound serve?
8. Explain why it would not matter if you added twice the amount of internal standard to your entire batch?

9. Explain why it would matter if you added twice the amount of internal standard to just your controls?
10. What are you doing to a compound when you derivatize it?
11. What are you doing to a compound when you put is through hydrolysis?
12. Why must a low volume sample be brought up to the full volume needed to perform the extraction? What could occur if this is not done?
13. Describe the process of creating a batch list and running samples in the LC-MS/MS computer software.
14. Describe the requirements the positive control must meet meet before being used for casework.
15. Describe the requirements the negative quality controls must meet before being used for casework?
16. Describe how pH of a sample may or may not affect the extraction of specific compounds.
17. Select ONE GCMS extraction method and describe in detail what each step during the extraction does/why we are doing each particular step?

Module 5E Confirmation Using Liquid/Liquid and Solid Phase Extractions and GCMS Instrumentation Knowledge Check: Carboxy-THC

1. What is Carboxy-THC? Is it a psychoactive compound?
2. Explain how the liquid/liquid extraction works to extract Carboxy-THC?
3. Discuss the difference in cannabinoid routes of administration and how that may impact detection windows?
4. Discuss some general effects of cannabinoids on the human body?
5. Are there any cannabinoid method limitations? If so describe them?

Module 5E Confirmation Using Liquid/Liquid and Solid Phase Extractions and GCMS Instrumentation Knowledge Check: Narcotics

1. Discuss some general effects of narcotic analgesics on the human body?
2. Indicate which compounds are drugs, prodrugs, and/or metabolites?
3. Why is retention time separation so important for the detection of hydromorphone and morphine?
4. What two drugs MUST be diluted if you see them with the following: qualifier ion ratios out, response significantly greater than the positive control, chromatography that

exhibits tailing, or chromatography that appears to be saturating the detector (flat topped/plateau peaks).

5. Are there any narcotic method limitations? If so describe them?

Module 5E Confirmation Using Liquid/Liquid and Solid Phase Extractions and GCMS Instrumentation Knowledge Check: Benzodiazepines

1. Discuss some general effects of CNS Depressants on the human body?
2. What do you do if the Randox screens positive for only BENZ2 or BENZ3?
3. Are there any Benzodiazepine method limitations? If so describe them?
4. What compound in the Benzodiazepine method is not screened for on the Randox?

Module 5E Confirmation Using Liquid/Liquid and Solid Phase Extractions and GCMS Instrumentation Knowledge Check: Cocaine

1. Discuss some general effects of CNS stimulants on the human body?
2. Why is cocaethylene such an interesting metabolite?
3. Are there any cocaine method limitations? If so describe them?

Module 5E Confirmation Using Liquid/Liquid and Solid Phase Extractions and GCMS Instrumentation Knowledge Check: Amines

1. Discuss some general effects of CNS stimulants and hallucinogens on the human body?
2. What derivatizing agent is used for the Amine extraction?
3. Are there any amine method limitations? If so describe them?

Module 5E Confirmation Using Liquid/Liquid and Solid Phase Extractions and GCMS Instrumentation Knowledge Check: Base

1. What compounds in the Base method are not screened for on the Randox
2. What do you do when one of the compounds in a sample is not screened for on the Randox?
3. Are there any base method limitations? If so describe them?

Module 5E Confirmation Using Liquid/Liquid and Solid Phase Extractions and GCMS Instrumentation Training Coordinator Review:

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Date:**

Trainee successfully completed all observed and independent tasks			
Trainee understands the limitations of each method			
Trainee understands the difference between a screening testing method and a confirmation testing method			

Module 5E Confirmation Using Liquid/Liquid and Solid Phase Extractions and GCMS Instrumentation Completed and Reviewed:

Date Completed	Trainee	Coordinator(s)

Module 6: Blood Toxicology

Module 6A: Blood Collection Tubes and Laboratory Specimens

Objectives:
After completion of all sections of this module, the trainee with have the requisite knowledge, skills, and abilities involved in:

- DHHS-HETL blood collection kit components and uses
- The DHHS-HETL blood collection kit approval process
- Common hospital collection tubes/containers, chemical additives, sample types, and generic uses.
- Understand some conventional hospital laboratory tests and the specimen left over after these tests.
- Selecting the most appropriate blood collection tube for HETL blood drug testing.
- Entry of metadata into LIMs system

Module 6A: Blood Collection Tubes and Laboratory Specimens Checklist and Review

Required Tasks:	**Trainee Initials:**	**Date:**
The Trainee shall read the specimen requirement sections of the Blood Drug Procedures and BAC-PE Procedures		
The Trainee shall read and review the following literature and documents regarding conventional blood collection tubes, compound stability, and hospital specimens: a. BD Vacutainer Venous Blood Collection Tube Guide (See following page) b. Sorensen, L. Hasselstrom, J. Stability of Drugs in Whole Blood- From Sampling to Testing Poster Presented at: The International Association of Forensic Toxicologists 51st Annual Meeting. September 2-6, 2013. Funchal, Madeira-Portugal. c. Cara L Shepard, Liora Bliumkin, Adsorption of Therapeutic and Recreational Drugs During Prolonged Storage of Plasma Samples in Gel Separator Tubes, Journal of Analytical Toxicology, 2021;, bkab118, https://doi.org/10.1093/jat/bkab118 d. CHI Health Laboratory. Microbiology Device Wall Chart. June 2019. https://www.chihealth.com/content/dam/chi-health/website/documents/lab/microbiology/Microbiology_Device_Wall_Chart.pdf e. The sample stability studies performed as part of the HETL validations for all of the blood alcohol and drug testing panels.		
The Trainee shall watch the following videos regarding conventional blood collection tubes and hospital laboratory tests: a. Phlebotomy & Laboratory Blood Tubes Explained: https://www.youtube.com/watch?v=BqGFnk1SkMI0 b. Hematology, Coagulation, & Blood Banking: https://www.youtube.com/watch?v=5JF2q3b9ZUs		

if the current webinars are not available a suitable replacement will be found		
The Coordinator and trainee shall discuss the blood collection tubes received by the laboratory and how to select the most appropriate blood collection tube for HETL blood drug testing.		
The trainee shall observe the Coordinator open a blood collection kit, fill out the necessary documentation, select the most appropriate sample for testing, assign appropriate test codes in LIMs system, and enter metadata into LIMs system.		

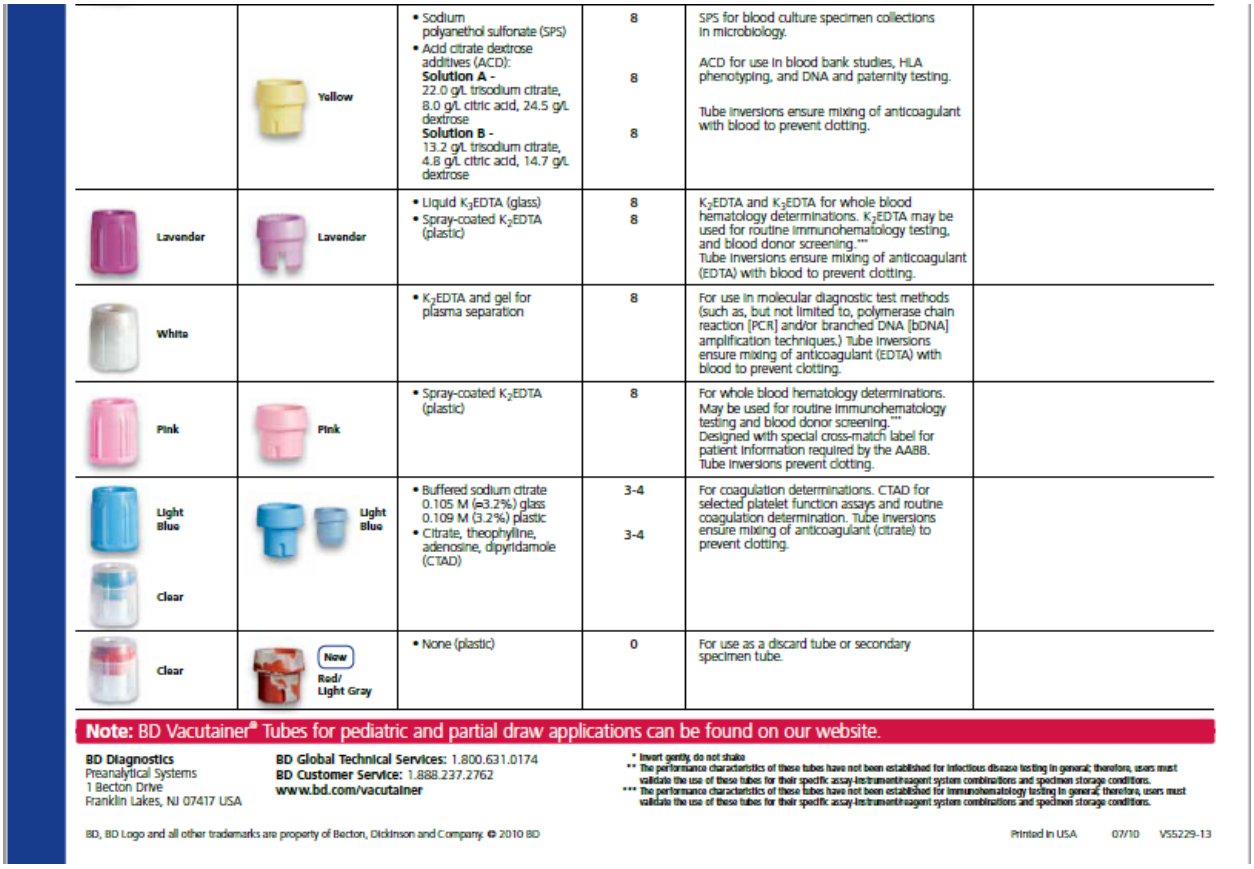
BD Helping all people live healthy lives

BD Vacutainer® Venous Blood Collection

Tube Guide

For the full array of BD Vacutainer® Blood Collection Tubes, visit www.bd.com/vacutainer.
Many are available in a variety of sizes and draw volumes (for pediatric applications). Refer to our website for full descriptions.

BD Vacutainer® Tubes with BD Hemogard™ Closure	BD Vacutainer® Tubes with Conventional Stopper	Additive	Inversions at Blood Collection*	Laboratory Use	Your Lab's Draw Volume/Remarks
Gold	Red/ Gray	• Clot activator and gel for serum separation	5	For serum determinations in chemistry. May be used for routine blood donor screening and diagnostic testing of serum for infectious disease.** Tube inversions ensure mixing of clot activator with blood. Blood clotting time: 30 minutes.	
Light Green	Green/ Gray	• Lithium heparin and gel for plasma separation	8	For plasma determinations in chemistry. Tube inversions ensure mixing of anticoagulant (heparin) with blood to prevent clotting.	
Red	Red	• Silicone coated (glass) • Clot activator, Silicone coated (plastic)	0 5	For serum determinations in chemistry. May be used for routine blood donor screening and diagnostic testing of serum for infectious disease.** Tube inversions ensure mixing of clot activator with blood. Blood clotting time: 60 minutes.	
Orange		• Thrombin-based clot activator with gel for serum separation	5 to 6	For stat serum determinations in chemistry. Tube inversions ensure mixing of clot activator with blood. Blood clotting time: 5 minutes.	
Orange		• Thrombin-based clot activator	8	For stat serum determinations in chemistry. Tube inversions ensure mixing of clot activator with blood. Blood clotting time: 5 minutes.	
Royal Blue		• Clot activator (plastic serum) • K_2EDTA (plastic)	8 8	For trace-element, toxicology, and nutritional-chemistry determinations. Special stopper formulation provides low levels of trace elements (see package insert). Tube inversions ensure mixing of either clot activator or anticoagulant (EDTA) with blood.	
Green	Green	• Sodium heparin • Lithium heparin	8 8	For plasma determinations in chemistry. Tube inversions ensure mixing of anticoagulant (heparin) with blood to prevent clotting.	
Gray	Gray	• Potassium oxalate/ sodium fluoride • Sodium fluoride/Na_2 EDTA • Sodium fluoride (serum tube)	8 8 8	For glucose determinations. Oxalate and EDTA anticoagulants will give plasma samples. Sodium fluoride is the antiglycolytic agent. Tube inversions ensure proper mixing of additive with blood.	
Tan		• K_2EDTA (plastic)	8	For lead determinations. This tube is certified to contain less than .01 µg/mL(ppm) lead. Tube inversions prevent clotting.	



	Yellow	• Sodium polyanethol sulfonate (SPS) • Acid citrate dextrose additives (ACD): **Solution A -** 22.0 g/L trisodium citrate, 8.0 g/L citric acid, 24.5 g/L dextrose **Solution B -** 13.2 g/L trisodium citrate, 4.8 g/L citric acid, 14.7 g/L dextrose	8 8 8	SPS for blood culture specimen collections in microbiology. ACD for use in blood bank studies, HLA phenotyping, and DNA and paternity testing. Tube inversions ensure mixing of anticoagulant with blood to prevent clotting.	
Lavender	Lavender	• Liquid K_3EDTA (glass) • Spray-coated K_2EDTA (plastic)	8 8	K_2EDTA and K_3EDTA for whole blood hematology determinations. K_2EDTA may be used for routine immunohematology testing, and blood donor screening.*** Tube inversions ensure mixing of anticoagulant (EDTA) with blood to prevent clotting.	
White		• K_3EDTA and gel for plasma separation	8	For use in molecular diagnostic test methods (such as, but not limited to, polymerase chain reaction [PCR] and/or branched DNA [bDNA] amplification techniques.) Tube inversions ensure mixing of anticoagulant (EDTA) with blood to prevent clotting.	
Pink	Pink	• Spray-coated K_2EDTA (plastic)	8	For whole blood hematology determinations. May be used for routine immunohematology testing and blood donor screening.*** Designed with special cross-match label for patient information required by the AABB. Tube inversions prevent clotting.	
Light Blue Clear	Light Blue	• Buffered sodium citrate 0.105 M (=3.2%) glass 0.109 M (3.2%) plastic • Citrate, theophylline, adenosine, dipyridamole (CTAD)	3-4 3-4	For coagulation determinations. CTAD for selected platelet function assays and routine coagulation determination. Tube inversions ensure mixing of anticoagulant (citrate) to prevent clotting.	
Clear	New Red/ Light Gray	• None (plastic)	0	For use as a discard tube or secondary specimen tube.	

Note: BD Vacutainer® Tubes for pediatric and partial draw applications can be found on our website.

BD Diagnostics
Preanalytical Systems
1 Becton Drive
Franklin Lakes, NJ 07417 USA

BD Global Technical Services: 1.800.631.0174
BD Customer Service: 1.888.237.2762
www.bd.com/vacutainer

* Invert gently, do not shake
** The performance characteristics of these tubes have not been established for infectious disease testing in general; therefore, users must validate the use of these tubes for their specific assay-instrument/reagent system combinations and specimen storage conditions.
*** The performance characteristics of these tubes have not been established for immunohematology testing in general; therefore, users must validate the use of these tubes for their specific assay-instrument/reagent system combinations and specimen storage conditions.

Printed in USA 07/10 VS5229-13

Module 6A: Blood Collection Tubes and Laboratory Specimens Knowledge check:

1. What are the chemical additives in the gray topped tubes and what do they do?
2. When selecting hospital tubes what types of tubes would be best for alcohol testing? What type of tubes would be best for drug testing?
3. You receive a whole blood sample in a tube that does not contain any chemical additives, describe what this lack of chemical additives would do to the sample? How would this impact alcohol results? How would this impact drug results?
4. What is the main special consideration that you must have an awareness of regarding all hospital tubes?
5. Expired blood collection tube, what does it mean/impact results

Module 6A: Blood Collection Tubes and Laboratory Specimens Training Coordinator Review:

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Date:**
Trainee successfully completed all observed and independent tasks			
Trainee understands the different chemical additives in common blood collection tubes and what impact they may have on testing			

Module 6A Blood Collection Tubes and Laboratory Specimens Completed and Reviewed:

Date Completed	**Trainee**	**Coordinator(s)**

Module 6B: Opening submitted blood collection kits

Objectives:

After completion of this module, the trainee will have the requisite knowledge, skills, and abilities involved in:

- Preservation of hard copy chain-of-custody for physical evidence
- Opening of submitted blood collection kits
- Verification of case information and use of the Blood Kit Inventory Form
- Use of the laboratory LIMS system to document case information
- Triaging samples upon opening blood collection kits

Module 6B: Opening submitted blood collection kits Checklist and Review

Required Tasks:	**Trainee Initials:**	**Date:**
The Coordinator will discuss the topics listed in the objectives as they relate to evidence handling, opening blood collection kits, verifying submitted information, labeling, chain of custody, and		

sample triaging.		
The Coordinator will discuss the different types of cases that may be received with associated special considerations (drug facilitated crimes, beverages, fatal/near fatal motor vehicle crashes, postmortems)		
The trainee will observe the Coordinator perform the task of opening blood collection kits		
The trainee will observe the marking or labeling of physical evidence.		
The trainee will observe the Coordinator verify submitted information from the blood collection kits to the blood tubes and submitted documentation.		
The trainee will observe the utilization of the laboratory LIMS system to input submitted case information.		

Module 6B Opening submitted blood collection kits Knowledge Check:

1. Explain the chain of custody system.
2. Discuss the proper marking/labeling of evidence
3. Discuss how samples are handled depending on the different type of testing that may be requested.
4. Explain what to do if during the verification process you find that the submitted information does not match.
5. If there is no test requested by the submitted agency, what do you do?
6. Discuss the special considerations associated with each of the following: drug facilitated crimes, beverages, fatal/near fatal motor vehicle crashes, and postmortem samples.

Module 6B Opening submitted blood collection kits Training Coordinator Review:

Objectives	**Trainee Initials:**	**Coordinator Initials:**	**Date:**
Trainee demonstrates understanding of evidence handling, opening blood collection kits, verifying submitted information, labeling, chain of custody, and sample triaging.			
Understands the different types of cases that may be received with associated special considerations (drug facilitated crimes, beverages, fatal/near fatal motor vehicle crashes, postmortems)			

Proficient in the utilization of the laboratory LIMS system to input submitted case information.			

Module 6B Opening submitted blood collection kits Completed and Reviewed:

Date Completed	Trainee	Coordinator(s)

Module 6.1: Blood Alcohol

Module 6.1A Blood Alcohol Pharmacology Objectives:

After completion of this Blood Alcohol module, the trainee will have the requisite knowledge, skills, and abilities involved in:

- Pharmacodynamics and pharmacokinetics of ethanol

Module 6.1A Blood Alcohol Pharmacology Checklist and Review

Required Tasks:	Trainee Initials:	Date:
The Effect of Temperature on the Formation of Ethanol by *Candida Albicans* in Blood. Chang, Joyce., and Kollman, S. Elliot. Journal of Forensic Sciences, Vol 34, No. 1, Jan. 1989, pp.105-109.		
Stability of Ethanol in Blood and Urine Samples: Slavka Mandic-Radic, Gordana Dzingalasevic, Nevena Lukovic. Journal of Molecular Biology, 2007: 26 (3)		
Stability of Ethanol in Human Whole Blood Controls: An Interlaboratory Evaluation. Dubowski, Kurt M., Gadsden,		

Sr., Richard H., Poklis, Alphonse. Journal of Analytical Toxicology, Vol. 21, October 1997.		
Long-Term Blood Alcohol Stability in Forensic Antemortem Whole Blood Samples. Tiscione, Nicholas B., Vacha, Ruth E., Alford, Ilene., Yeatman, Dustin Tate, and Shan, Xiaoqin. Journal of Analytical Toxicology, 2015;39: 419-425.		
Read the following chapters in Clarke's Analysis of Drugs and Poisons in Pharmaceuticals, Body Fluids, and Postmortem Material (most recent edition available at HETL): a. Chapter 4: Driving Under the Influence of Alcohol		
Portions of Garriott's Medicolegal Aspects of Alcohol, (5th Edition or later).		
State of Maine law: Title 29-A: Motor Vehicles and Traffic, Chapter 23: Major Offenses-Suspension and Revocation, Subchapter4: Implied Consent: §2521. Implied consent to chemical tests		

Module 6.1A Blood Alcohol Pharmacology: Knowledge Check

1. How could an expired blood collection tube impact blood alcohol result?
2. How are the results from a plasma/serum sample different from a whole blood sample?
3. What are some possible interferences that may impact blood ethanol?
4. What could lead to blood ethanol inconclusive results?
5. How could clotted blood impact ethanol results?
6. List the range of elimination rates and what we use as an average.
7. Discuss why the distribution factor "r" is important in determining alcohol concentrations. State the average "r" factor for males and for females.

Module 6.1A Blood Alcohol Pharmacology Training Coordinator Review:

Objectives:	Trainee Initials:	Coordinator Initials:	Date:
Trainee successfully completed all observed and independent tasks			
Trainee understands how expired blood collection tubes may impact ethanol results			

Module 6.1A Completed and Reviewed:

Date Completed	Trainee	Coordinator(s)

Module 6.1B: GC-FID/Hydrogen Generator

Module 6.1B GC-FID/Hydrogen Generator Objectives:

After completion of this Blood Alcohol module, the trainee will have the requisite knowledge, skills, and abilities involved in:

- GC Headspace maintenance and preparation for the run
- Developing a sequence list and running samples

Module 6.1B GC-FID/Hydrogen Generator Checklist and Review

Required Tasks:	Trainee Initials:	Date:
Will review with Coordinator the blood alcohol validation conclusions		
Familiarize yourself with the hydrogen generator manual		
Familiarize yourself with the GC-FID (headspace) manual(s)		

The Trainee with discuss PerkinElmer instrument maintenance requirements and observe how to perform maintenance tasks.		
The Trainee shall observe the coordinator perform daily instrument maintenance and creation of instrument sequence		
The Trainee shall review the Monthly maintenance log with the coordinator and discuss each component that is being monitored/maintained and how it relates to optimal instrument performance.		
The coordinator shall review common instrument troubleshooting with the trainee.		

Module 6.1B GC-FID/Hydrogen Generator Knowledge check:

1. Explain how the GC-FID works.
2. Explain the process of GC-FID (headspace) maintenance, including frequency.
3. Explain how the hydrogen generator works.
4. Explain what maintenance is done for the hydrogen generator, including frequency.
5. What is the purpose of two columns?
6. What do you do if you have a needle jam error?
7. Are there any method limitations? If so, please describe.

Module 6.1B GC-FID/Hydrogen Generator Training Coordinator Review:

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Date:**
Trainee successfully completed all observed and independent tasks			
Trainee understands the various parts and functions of GC-FID and the role each plays in obtaining results.			

Trainee understands the need for the hydrogen generator and how it works			
Trainee understands and is able to explain the purpose of two columns.			

Module 6.1B Completed and Reviewed:

Date Completed	Trainee	Coordinator(s)

Module 6.1C Sample prep & running

Module 6.1C Sample prep & running Objectives:

After completion of this Blood Alcohol module, the trainee will have the requisite knowledge, skills, and abilities involved in:

- Prepare Internal Standard Solution used in Blood Alcohol assay
- Prepare Calibration curve and completing associated forms
- Sample, standard and control preparation
- Developing a sequence list and running samples
- Analyzing the data generated and completing associated forms

Module 6.1C Sample prep & running Checklist and Review

Required Tasks/Readings:	Trainee Initials:	Date:
Read the BAC-PE Procedures		
The trainee will observe the entire process as it is performed by the Coordinator (calibration, case preparation and analysis, completion of all associated forms.		
The Trainee will prepare a lot of Internal Standard Solution with the Coordinator and test that it is suitable for use.		
The Trainee will practice pipetting using the Hamilton Diluter until trainee feels comfortable using the device.		

After watching the calibration procedure, the Trainee will prepare and successfully complete a **minimum of 5** Calibration Curves with minimal assistance from the Coordinator. Trainee will complete all paperwork / forms and submit to Coordinator for review.	**Batch 1:**	**Batch 1:**
	Batch 2:	**Batch 2:**
	Batch 3:	**Batch 3:**
	Batch 4:	**Batch 4:**
	Batch 5:	**Batch 5:**
The Trainee will observe the Coordinator and then prepare and successfully complete a full volatiles calibration curve, complete all paperwork/forms, and submit to Coordinator for review.	**Observed:**	**Observed:**
	Performed:	**Performed:**
The trainee will watch the Coordinator complete the process of sample preparation and analysis, including all associated QC samples (standards, whole blood and serum controls), completion of all paperwork and forms.		
After watching the Coordinator complete the analysis process, the Trainee will successfully complete the process of sample preparation and analysis using mock samples. Trainee will successfully complete **at least 3** batches (each batch having a minimum of 36 samples/controls), with all associated QC samples, complete all paperwork/forms, and submit to Coordinator for review. The first batch performed by the Trainee will be observed by the Coordinator, and the remaining subsequent batches will be performed independently.	**Batch 1:**	**Batch 1:**
	Batch 2:	**Batch 2:**

	Batch 3:	**Batch 3:**

Module 6.1C Sample prep & running Knowledge Check:

1. Describe the pipetting process and the use of the Hamilton Diluter.
2. Explain the reasoning for two independent aliquots being prepared.
3. Describe the purpose of the sequence check done prior to the start of analysis.
4. Describe the process of creating a sequence and running samples.
5. Explain all controls required for each batch and the purpose for each.
6. Describe the requirements a calibration curve must meet before being used for casework.
7. Describe the requirements/acceptance criteria for duplicates and replicates of casework samples.
8. Explain how data is reviewed and results are calculated.
9. Explain the process if the data does not meet the acceptance criteria.

Module 6.1C Sample prep & running Training Coordinator Review:

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Date:**
Trainee demonstrates understand of sample preparation process			
Trainee demonstrates understand of requirement of two independent aliquots			
Trainee demonstrates knowledge of control and the purpose of each control			

Module 6.1C Sample prep & running Completed and Reviewed:

Date Completed	Trainee	Coordinator(s)

Module 6.1D Uncertainty of Measurement & Mathematical Calculations

Module 6.1D Uncertainty of Measurement & Mathematical Calculations Objectives:

After completion of this Blood Alcohol module, the trainee will have the requisite knowledge, skills, and abilities involved in:

- Uncertainty of measurement as it pertains to ethanol results
- Blood alcohol conversions calculations (plasma/serum to whole blood)
- Blood alcohol evaluation using Widmark's formula
- Please note the formulas included below are some of the available options for these calculations however this list is not to be considered all inclusive, just a sample representation of calculations. Only widely accepted, peer reviewed formulas may be used, by trained and experienced analysts, for these opinions.

Module 6.1D Uncertainty of Measurement & Mathematical Calculations Checklist and Review

Required Tasks:	Trainee Initials:	Date:
Read Blood Alcohol Procedures: Quality Assurance-Estimation of Uncertainty of Measurement		
Review with Coordinator the most recent uncertainty of measurement calculation and discuss each factor that goes into the calculation		
Read the following chapter in Clarke's Analysis of Drugs and Poisons in Pharmaceuticals, Body Fluids, and Postmortem Material (most recent edition available at HETL): Chapter 22: Quality Control and Accreditation in the Toxicology Laboratory and Chapter 23: Measuring and Reporting Uncertainty		

Read Evidence-based survey of the elimination rates of ethanol from blood with applications in forensic casework, Alan Wayne Jones. Forensic Science International 200 (2010) 1–20		
Read: Comparison Among Plasma, Serum, and Whole Blood Ethanol Concentrations: Impact of Storage Conditions and Collection Tubes. Penetar, David M., McMeil, Jane F., Ryan, Elizabeth, and Lukas, Scott. Journal of Analytical Toxicology, Vol. 32, Sept. 2008.		
Read: The Estimation of Widmark's Factor, ARW Forrest, Journal of Forensic Science Society 1986; 26: 249-252		
Read The calculation of blood ethanol concentrations in males and females, S. Seidl · U. Jensen · A. Alt. Int J Legal Med (2000) 114 :71–77		
Read The Estimation of Blood Alcohol Concentration Widmark Revisited, Douglas Posey1 and Ashraf Mozayani2, Journal of *Forensic Science, Medicine, and Pathology 2006:3:1:33)*		
Read ASB 122 Best Practice Recommendation for Performing Alcohol Calculations in Forensic Toxicology		
Garriott's Medicolegal Aspects of Alcohol, (5th Edition or later), Chapter 3		
Review blood alcohol serum/plasma to whole blood conversion calculation with Coordinator and complete three practice scenarios	**Scenario 1:**	**Scenario 1:**
	Scenario 2:	**Scenario 2:**
	Scenario 3:	**Scenario 3:**
Review blood alcohol evaluation using Widmark's formula with Coordinator and complete three practice scenarios	**Scenario 1:**	**Scenario 1:**

AC=D/(Vd*w) AC = alcohol concentration (g/L) D = dose (g) (alcohol consumed) Vd = volume of distribution (L/kg) (rho) w = weight (kg) (body weight)	**Scenario 2:** **Scenario 3:**	**Scenario 2:** **Scenario 3:**
Review blood alcohol retrograde extrapolation with Coordinator and complete three practice scenarios $AC_{inc}=AC_{test}+(RxT)$ ACinc = estimated alcohol concentration at the time of the incident (g/dL) ACtest = measured alcohol concentration (g/dL) R = elimination rate (g/dL/hour) T = time between incident and time of breath test/blood draw (hours)	**Scenario 1:** **Scenario 2:** **Scenario 3:**	**Scenario 1:** **Scenario 2:** **Scenario 3:**

Module 6.1D Uncertainty of Measurement & Mathematical Calculations Knowledge Check:

1. Describe the theory of uncertainty of measurement, and the specific uncertainty of measurement that is applied to blood alcohol samples.
2. If your blood alcohol result is 0.15 g/100mL calculate your uncertainty of measurement.
3. If your blood alcohol result is 0.05 g/100mL calculate your uncertainty of measurement.
4. Explain the rounding rules pertaining to the blood alcohol results.
5. Explain the rounding rules pertaining to the uncertainty of measurement.
6. Describe the components that factor into the uncertainty of measurement calculation.
7. Explain what the 95.45% confidence interval means in relation to the result and uncertainty of measurement.
8. You have a serum result of 0.08g/dL calculate the whole blood result?
9. Using the following information (show all calculations):

A male subject was pulled over. He had a blood alcohol result of 0.20g/dL. He stated he had been at a bar for the last 3 hours and only had 2 pints of beer (Alcohol content of beer ~4.3%) with dinner.

The subject is 6'0", 240 lbs, 32 years old blood alcohol result of: 0.20g/dL

- What is the minimum number of drinks needed to reach a 0.20g/210L alcohol concentration?
  - Calculate with a fixed Vd range
  - Calculate with an individualized Vd
- What is maximum AC that could be reached from 2 pints of beer?
  - Calculate with a fixed Vd range
  - Calculate with an individualized Vd
- Is the drinking history consistent with the AC result?

10. Using the following information (show all calculations):

A woman was drinking wine at the bar. She left the bar at 5:00 pm. At approximately 9:00 pm she crossed over the center line and crashed into an oncoming vehicle. She was injured and transported to the hospital; a blood kit was collected at 11:50 pm. The result of the blood test was 0.071g/dL. There were no alcoholic beverages in the vehicle. She stated she had not had anything to drink since leaving the bar.

The subject is 5'1", 135 lbs, 45 years old blood alcohol: 0.071g/dL

- What can we assume from this scenario?
- Was she above the 0.08 legal limit at the time of the crash?

11. Using the following information (show all calculations):

A female subject was drinking at a bar. She stopped drinking around 10:30pm. Before she left the bar, she consumed one shot (80 proof = 40% alcohol concentration) and immediately left the at ~11:30 pm. She crashed her car while trying to leave the parking lot. Her blood was drawn at 01:30 am.

The subject is 5'6", 160 lbs, 25 years old Blood alcohol content: 0.083 g/dL.

- What can we assume from this scenario?
- Could the subject's AC have been under 0.08g/dL at the time of the crash?

12. Describe when you should and should not perform retrograde extrapolation calculations?

Module 6.1D Uncertainty of Measurement & Mathematical Calculations Training Coordinator Review:

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Date:**

Trainee successfully completed all observed and independent tasks			
Trainee demonstrates applications of uncertainty of measurement			
Training understands rounding rules pertaining to blood alcohol results and uncertainty of measurements			
Trainee demonstrates application of blood alcohol conversion			
Trainee demonstrates application of evaluation of blood alcohol using Widmark's formula and retrograde extrapolation.			

Module 6.1D Uncertainty of Measurement & Mathematical Calculations Completed and Reviewed:

Date Completed	Trainee	Coordinator(s)

Module 6.2: Blood Drugs

Module 6.2A Blood Drug LC-MS/MS Instrument

Module 6.2A Blood Drug LC-MS/MS Instrument Objectives:

After completion of all sections of this module, the trainee with have the requisite knowledge, skills, and abilities involved in:

- LC-MS/MS maintenance and preparation of analyzer for analysis
- Developing an instrument sequence and running samples
- Understand how the instrument works and basic troubleshooting.

Module 6.2A Blood Drug LC-MS/MS Instrument Checklist and Review:

Required Tasks:	**Trainee Initials:**	**Date:**
Read Blood Drug Procedures: LC-MS/MS Instrument Maintenance and Use		
The Trainee shall observe the coordinator perform daily instrument maintenance and creation of instrument sequence		
The Trainee shall review the Monthly maintenance log with the coordinator and discuss each component that is being monitored/maintained and how it relates to optimal instrument performance.		
The coordinator shall review common instrument troubleshooting with the trainee.		
Read the following chapters in Clarke's Analysis of Drugs and Poisons in Pharmaceuticals, Body Fluids, and Postmortem Material (most recent edition available at HETL): b. Chapter 38: Liquid Chromatography-Mass Spectrometry c. Chapter 41: High Performance Liquid Chromatography		

The Trainee shall observe the coordinator perform the following maintenance tasks: a. Changing a C-18 guard column		
b. Changing a Biphenyl guard column		
c. Installing a LC column		
d. Changing a mobile phase		
e. Performing a pump purge		
f. Cleaning the ESI chamber		
g. Perform autotune/checktune		
After the Trainee has observed the coordinator perform the maintenance task the trainee shall perform the following tasks observed by the coordinator: a. Changing a C-18 guard column		
b. Changing a Biphenyl guard column		
c. Changing a mobile phase		
d. Performing a pump purge		
e. Cleaning the ESI chamber		
f. Perform autotune/checktune		

Module 6.2A Blood Drug LC-MS/MS Instrument Knowledge Check-GCMS instrument

1. Describe how the LC-MS/MS analyzer works?
2. Explain the process and reasoning behind the instrument maintenance, including frequency?

3. Explain how MRM transitions and SIM are different than SCAN. Include at least one pro and one con for each?
4. Explain the difference between and Autotune and a checktune (tune report).
5. Give an example of what could cause increased pump pressure on the LC-MS/MS
6. Give an example of what could cause decreased pump pressure on the LC-MS/MS?
7. The response of your tune rapidly drops a significant amount, what could be two causes of this and how would you go about troubleshooting?

Module 6.2A Blood Drug LC-MS/MS Instrument Training Coordinator Review:

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Date:**
Trainee successfully completed all observed and independent tasks			
Trainee understands the various parts and functions of LC-MS/MS and the role each plays in obtaining results.			
Trainee understands the difference between MRM transitions, SIM, and SCAN data, and the pros and cons of each.			

Module 6.2A Blood Drug LC-MS/MS Instrument Completed and Reviewed:

Date Completed	**Trainee**	**Coordinator(s)**

Module 6.2B Blood Drug Data Analysis Batch Review:

Module 6.2B Blood Drug Data Analysis Batch Review Objectives:
After completion of all sections of this module, the trainee with have the requisite knowledge, skills, and abilities involved in:

- ❖ Data analysis of batches

- Use of Agilent Masshunter Quantitative Data Analysis software and Shimadzu Insight Data Analysis software
- Analyzing the data generated and completing associated forms
- Proper chromatogram integration and manual integration of data

Module 6.2B Blood Drug Data Analysis Batch Review Checklist and Review:

Required Tasks:	**Trainee Initials:**	**Date:**
Read Blood Drug Procedure: Screening and/or confirmation by LC-MS/MS		
Read Blood Drug Procedure: Appendix-Chromatogram Integration		
Read ASB Standard 098, First Edition. 2020. Standard for Mass Spectral Data Acceptance in Forensic Toxicology		
Read ASB Standard 113, First Edition. 2020. Standard for Identification Criteria in Forensic Toxicology		
Watch continuing education webinars from Agilent regarding the use of Masshunter Data Analysis software: This may include the following depending on availability: a. The Power of MS and MassHunter Software for GCMS b. Migrating from GCMS Chemstation to Masshunter Software c. An Introduction to Masshunter Quantitative Analysis Software d. Advanced Masshunter Quantitative Analysis Software		

if the current webinars are not available a suitable replacement will be found		
The Trainee shall observe the Coordinator perform data analysis on a **Qualitative** batch using Agilent Masshunter Quantitative Data Analysis software	**Observed 1:**	**Observed 1:**
	Observed 2:	**Observed 2:**
The Trainee shall observe the Coordinator perform data analysis on a **Quantitative** batch using Agilent Masshunter Quantitative Data Analysis software	**Observed 1:**	**Observed 1:**
	Observed 2:	**Observed 2:**
The Trainee shall perform data analysis on each of the methods using Agilent Masshunter Quantitative Data Analysis, these batches shall be created from previously run calibrators and controls and shall be saved as "BatchDateTRAINING". Once the data analysis is complete the trainee shall generate Masshunter reports and submit to the Coordinator for review.	**Qualitative A:**	**Qualitative A:**
	Qualitative B:	**Qualitative B:**
	Qualitative C:	**Qualitative C:**
	THC:	**THC:**
	Benzodiazepines:	**Benzodiazepines:**
	Buprenorphine:	**Buprenorphine:**
	Stimulants:	**Stimulants:**
	Narcotics:	**Narcotics:**

Module 6.2B Blood Drug Data Analysis Batch Review Knowledge Check:

1. How do you update your retention times and ion ratios in a batch?
2. What are the two ways to assign sample types and levels?

3. Describe the process of creating a batch list and running samples in the LC-MS/MS computer software.
4. Describe the requirements a LC-MS/MS quantitative calibration curve and associate QC must meet before being used for casework.
5. Describe the requirements the LC-MS/MS qualitative quality controls must meet before being used for casework.
6. Describe the sample requirements/acceptance criteria for LC-MS/MS quantitative confirmation: Specifically, detailing retention time, S/N ratio, and chromatography appearance.
7. Describe some examples of inacceptable chromatography integration.

Module 6.2B Blood Drug Data Analysis Batch Review Training Coordinator Review:

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Date:**
Trainee successfully completed all observed and independent tasks			
Trainee is able to use Agilent Masshunter Quantitative Data Analysis and Shimadzu Insight Data Analysis software to analyze generated data			
Trainee understands what different chromatogram peak shapes look like and what causes them.			

Module 6.2B Blood Drug Data Analysis Batch Review Completed and Reviewed:

Date Completed	**Trainee**	**Coordinator(s)**

Module 6.2C Blood Drug Screening and Qualitative Testing Panel Extractions (Qualitative A, B, &C)

Module 6.2C Blood Drug Screening and Qualitative Testing Panel Extractions Objectives:

After completion of all sections of this module, the trainee with have the requisite knowledge, skills, and abilities involved in:

- ❖ Initial screening of blood samples for drugs
- ❖ Preparation of quality controls
- ❖ Sample preparation and extraction

Module 6.2C Blood Drug Screening and Qualitative Testing Panel Extractions Checklist and Review:

Required Tasks:	**Trainee Initials:**	**Date:**
Read portions of Baselt, R., *Drug Effects on Psychomotor Performance*.		
Read portions of Fenton, J., *Toxicology A Case-Orientated Approach*.		
Read portions of Randall, B., *Disposition of Toxic Drugs and Chemicals in Man*.		
Review with Coordinator HETL Determination of Qualitative Drugs in Blood by LC-MS/MS Analysis Validation Plan Conclusions.		
Read Blood Drug Procedure-Qualitative ABC Specific Extraction Procedures		
Read ANSI/ASB Standard for the Analytical Scope and Sensitivity of Forensic Toxicological Testing of Blood in Impaired Driving Investigations (most recent edition available at HETL)		
Read Verstraete, A. (2004), Detection Times of Drugs of Abuse in Blood, Urine, and Oral Fluid. The Journal of Therapeutic Drug Monitoring, 2004; 26: 22		
The trainee will observe the entire sample extraction process as it is performed by the Coordinator.	**Qualitative A:**	**Qualitative A:**
	Qualitative B:	**Qualitative B:**

	Qualitative C:	**Qualitative C:**
After watching the Coordinator complete the extraction, instrument run, and data analysis process, the trainee will successfully complete the entire process, extracting, running, and analyzing the quality controls, under direct observation by the Coordinator. Trainee will successfully complete **at least 2 observed** batches, complete all paperwork / forms, and submit to Coordinator for review.	**Qualitative A 1:**	**Qualitative A 1:**
	Qualitative A 2:	**Qualitative A 2:**
	Qualitative B 1:	**Qualitative B 1:**
	Qualitative B 2:	**Qualitative B 2:**
	Qualitative C 1:	**Qualitative C 1:**
	Qualitative C 2:	**Qualitative C 2:**
Independently without observation by the Coordinator the trainee will successfully complete the entire process, extracting, running, and analyzing the quality controls. Trainee will successfully complete **at least 2** batches, complete all paperwork / forms, and submit to Coordinator for review. If independent run does not meet acceptability requirements, then the training coordinator will evaluate need for further training.	**Qualitative A 1:**	**Qualitative A 1:**
	Qualitative A 2:	**Qualitative A 2:**
	Qualitative B 1:	**Qualitative B 1:**
	Qualitative B 2:	**Qualitative B 2:**
	Qualitative C 1:	**Qualitative C 1:**
	Qualitative C 2:	**Qualitative C 2:**

Module 6.2C Blood Drug Screening and Qualitative Testing Panel Extractions Knowledge Check:

1. What is the difference between a screening test and a confirmation test?
2. Explain what would you do if you had a low volume sample (<1mL)
3. Describe any Qualitative A, B, and C method limitations.
4. Explain the difference between the two MS/MS detection methods that are utilized for these methods?
5. What purpose does the Mix control serve?
6. What purpose does the Negative control serve?
7. What purpose does the Recovery compound serve?
8. Why are the Qualitative A and B data acquisition methods not combined into one?

Module 6.2C Blood Drug Screening and Qualitative Testing Panel Extractions Training Coordinator Review:

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Date:**
Trainee successfully completed all observed and independent tasks			
Trainee understands the limitations of each method.			
Trainee understands the difference between screening test and confirmation test.			

Module 6.2C Blood Drug Screening and Qualitative Testing Panel Extractions Completed and Reviewed:

Date Completed	**Trainee**	**Coordinator(s)**

Module 6.2D Blood Drug Confirmation and Quantitative Testing Panel Extractions (Cannabinoids, Narcotics, Benzodiazepines, Stimulants, & Buprenorphine)

Module 6.2D Objectives:
After completion of all sections of this module, the trainee with have the requisite knowledge, skills, and abilities involved in:

- Confirmation and quantitative testing of blood samples for drugs
- Preparation of calibration curve and associated quality controls
- Sample preparation and extraction

Module 6.2D Blood Drug Confirmation and Quantitative Testing Panel Extractions Required Tasks:

Required Tasks:	**Trainee Initials:**	**Date:**
Read portions of Baselt, R., *Drug Effects on Psychomotor Performance*.		
Read portions of Fenton, J., *Toxicology A Case-Orientated Approach*.		
Read portions of Randall, B., *Disposition of Toxic Drugs and Chemicals in Man*.		
Read Blood Drug Procedures: Screening and/or confirmation by LC-MS/MS		
Read Blood Drug Procedures: Specific Extraction Procedures (all)		
Read ANSI/ASB Standard for the Analytical Scope and Sensitivity of Forensic Toxicological Testing of Blood in Impaired Driving Investigations (most recent edition available at HETL)		
Read the following chapters in Clarke's Analysis of Drugs and Poisons in Pharmaceuticals, Body Fluids, and Postmortem Material (most recent edition available at HETL): 5. Chapter 9: Forensic Toxicology 6. Chapter 10: Postmortem Toxicology 7. Chapter 11: Drugs of Abuse 8. Chapter 24: Pharmacokinetics and Metabolism 9. Chapter 29: Extraction		
Hartman, R. & Huestis, M. (2013). Cannabis Effects on Driving Skills. *Clinical Chemistry,* Vol. 59(3) 478-492.		
Desrosiers, Ramaekers, Chauchard, Gorelick, & Huestis (2015) Smoked Cannabis' Psychomotor and Neurocognitive Effects in Occasional and Frequent Smokers. *Journal of Analytical Toxicology*, Vol.39 251-261.		

Jones, A. (2019) *Forensic Drug Profile: Cocaethylene*. Journal of Analytical Toxicology 2019; 43: 155-160.		
World Health Organization (2018). WHO Expert Committee on Drug Dependence Critical Review: THC Isomers.		
Review with Coordinator HETL Determination of drugs in blood Validation Conclusions		
The trainee will observe the Coordinator make a QC stock and then make a QC stock and run it unextracted on the GCMS to confirm it contains all the compounds of interest.	**Observed:**	**Observed:**
	Performed:	**Performed:**
The trainee will observe the entire sample extraction process as it is performed by the Coordinator.	**THC:**	**THC:**
	Benzodiazepines:	**Benzodiazepines:**
	Buprenorphine:	**Buprenorphine:**
	Stimulants:	**Stimulants:**
	Narcotics:	**Narcotics:**
After watching the Coordinator complete the extraction, instrument run, and data analysis process, the trainee will successfully complete the entire process, extracting, running, and analyzing the quality controls, under direct observation by the Coordinator. Trainee will successfully complete **at least 2 observed** batches, complete all paperwork / forms, and submit to Coordinator for review.	**THC 1:**	**THC 1:**
	THC 2:	**THC 2:**
	Benzodiazepines 1:	**Benzodiazepines 1:**
	Benzodiazepines 2:	**Benzodiazepines 2:**
	Buprenorphine 1:	**Buprenorphine 1:**
	Buprenorphine 2:	**Buprenorphine 2:**
	Stimulants 1:	**Stimulants 1:**
	Stimulants 2:	**Stimulants 2:**

	Narcotics 1:	**Narcotics 1:**
	Narcotics 2:	**Narcotics 2:**
Independently without observation by the Coordinator the trainee will successfully complete the entire process, extracting, running, and analyzing the quality controls. Trainee will successfully complete **at least 2** batches, complete all paperwork / forms, and submit to Coordinator for review. If independent run does not meet acceptability requirements, then the training coordinator will evaluate need for further training.	**THC 1:**	**THC 1:**
	THC 2:	**THC 2:**
	Benzodiazepines 1:	**Benzodiazepines 1:**
	Benzodiazepines 2:	**Benzodiazepines 2:**
	Buprenorphine 1:	**Buprenorphine 1:**
	Buprenorphine 2:	**Buprenorphine 2:**
	Stimulants 1:	**Stimulants 1:**
	Stimulants 2:	**Stimulants 2:**
	Narcotics 1:	**Narcotics 1:**
	Narcotics 2:	**Narcotics 2:**

Module 6.2D Blood Drug Confirmation and Quantitative Testing Panel Extractions Knowledge Check: All Quantitative methods

1. How is concentration calculated for calibrators? How is that then used to determine concentration in unknown samples?
2. What purpose does the negative control serve?
3. Why is the negative control always run after the highest calibrator?
4. What purpose do the positive controls serve?
5. Why are the positive controls at different concentration levels in relation to the calibration range?
6. What would you do if your highest two calibrators failed?
7. What would you do if your lowest two calibrators failed?
8. Explain why it would not matter if you added twice the amount of internal standard to your entire batch?

9. Explain why it would matter if you added twice the amount of internal standard to just your controls?
10. You are testing out a new lot of stock and you find that your highest and middle calibrators meet all acceptance parameters, but your lower calibrators are failing for concentration, what could be the cause of this?
11. Describe what is happening when a protein precipitate extraction is performed?

Module 6.2D Blood Drug Confirmation and Quantitative Testing Panel Extractions Knowledge Check: Cannabinoids

1. What are THC isomers?
2. Explain how the liquid/liquid extraction works to extract cannabinoids?
3. Discuss the difference in cannabinoid routes of administration and how that may impact detection windows?
4. Discuss some general effects of cannabinoids on the human body?
5. What are two differences between Delta-9-THC and Delta-9, 11-THC?
6. Indicate which ones are and are not psychoactive: THC, OHTHC, THCCOOH?
7. Are there any cannabinoid method limitations?
8. What dilutions have been approved for this method?
9. What is delta-8-THC? Is it naturally occurring or synthetically created? Is it psychoactive?
10. What screening method is used for these compounds?

Module 6.2D Blood Drug Confirmation and Quantitative Testing Panel Extractions Knowledge Check: Narcotics

1. Discuss some general effects of narcotic analgesics on the human body?
2. Indicate which compounds are drugs, prodrugs, and/or metabolites?
3. Why is retention time separation so important for the detection of hydromorphone and morphine?
4. Are there any Narcotics method limitations?
5. What dilutions have been approved for this method?
6. Explain why seeing Heroin in a sample will be unlikely and what do we test for instead?
7. What screening method is used for these compounds?
8. What compound is stable in extracted samples for less than 24 hours? How long is it stable?

Module 6.2D Blood Drug Confirmation and Quantitative Testing Panel Extractions Knowledge Check: Benzodiazepines

1. Discuss some general effects of CNS Depressants on the human body?
2. Are there any Benzodiazepine method limitations?
3. What dilutions have been approved for this method?
4. What compound do you need to pay special attention to the retention time when performing data analysis?
5. What screening method is used for these compounds?
6. Is there a way to tell if a benzodiazepine is a metabolite or a drug in of itself from the testing results?

Module 6.2D Blood Drug Confirmation and Quantitative Testing Panel Extractions Knowledge Check: Stimulants

1. Discuss some general effects of CNS Stimulants on the human body?
2. Are there any Stimulants method limitations?
3. What dilutions have been approved for this method?
4. What makes Cocaethylene such a unique metabolite? And what can we tell about what was in the human body from its presence?
5. What screening method is used for these compounds?
6. You screen a sample and see benzoylecgonine with a very large peak with the top cut off, what do you do?

Module 6.2D Blood Drug Confirmation and Quantitative Testing Panel Extractions Knowledge Check: Buprenorphine

1. What does Suboxone do when given to an individual who has overdosed on an opioid?
2. Are there any Buprenophine method limitations?
3. What dilutions have been approved for this method?
4. What screening method is used for these compounds?
5. Why is this confirmation test so difficult when you have a low volume sample?
6. Is there a way to tell if the Buprenorphine seen in a sample was taken by the subject or administered by the hospital following a motor vehicle crash?

Module 6.2D Blood Drug Confirmation and Quantitative Testing Panel Extractions Training Coordinator Review:

Objectives:	Trainee Initials:	Coordinator Initials:	Date:
Trainee successfully completed all observed and independent tasks			
Trainee understands the limitations of each method			
Trainee understands the difference between a screening testing method and a confirmation testing method			

Module 6.2D Blood Drug Confirmation and Quantitative Testing Panel Extractions Completed and Reviewed:

Date Completed	Trainee	Coordinator(s)

Module 6.2E Blood Drug Uncertainty of Measurement

Module 6.2E Blood Drug Uncertainty of Measurement Objectives:
After completion of all sections of this module, the trainee with have the requisite knowledge, skills, and abilities involved in:

- Initial screening of blood samples for drugs
- Preparation of quality controls
- Sample preparation and extraction

Module 6.2E Blood Drug Uncertainty of Measurement Checklist and Review

Required Tasks:	Trainee Initials:	Date:
Blood Drug Procedures: Quality Assurance-Estimation of Uncertainty of Measurement		
Review with Coordinator the most recent uncertainty of measurement calculation		

and discuss each factor that goes into the calculation		
Read the following chapter in Clarke's Analysis of Drugs and Poisons in Pharmaceuticals, Body Fluids, and Postmortem Material (most recent edition available at HETL): Chapter 22: Quality Control and Accreditation in the Toxicology Laboratory		
State of Maine law: Title 29-A: Motor Vehicles and Traffic, Chapter 23: Major Offenses-Suspension and Revocation, Subchapter4: Implied Consent: §2521. Implied consent to chemical tests		

Module 6.2E Blood Drug Uncertainty of Measurement Knowledge Check:

1. Describe the theory of uncertainty of measurement, and the specific uncertainty of measurement that is applied to blood drug samples?
2. Explain the rounding rules pertaining to the blood drug results
3. Explain the rounding rules pertaining to the uncertainty of measurement
4. Describe the components that factor into the uncertainty of measurement calculation.
5. Explain what the 95.45% confidence interval means in relation to the result and uncertainty of measurement.

Module 6.2E Blood Drug Uncertainty of Measurement Training Coordinator Review:

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Date:**
Trainee successfully completed all observed and independent tasks			
Trainee demonstrates understanding of uncertainty of measurement			
Training understands rounding rules pertaining to blood drug results and uncertainty of measurements			

Module 6.2E Blood Drug Uncertainty of Measurement Completed and Reviewed:

Date Completed	Trainee	Coordinator(s)

Module 7: Seized Drug Analysis

Module 7A: Evidence Processing and Sampling

Module 7A Evidence Processing and Sampling Objectives:

- Trainee will gain understanding of how to properly process evidence and the importance of sampling (determining the most probative piece of evidence, appropriate sampling amount, duplicate sampling).
- Trainee will gain understanding as to what comprises a homogenous population.
- Trainee will gain understanding and master use of the sampling program(s) as detailed in the procedure manual.
- Trainee will gain understanding of how sampling plan is recorded in case notes, and final report to the customer.

Module 7A: Evidence Processing and Sampling Checklist and Review

Trainee has read the following manuals or received the below training (initial and date next to each when complete):

Required Tasks:	Trainee Initials:	Date:
Trainee will review the following: o Sampling and Reporting sections of SDD SOP o UNDOC ENFSI Guide to Sampling o Guidelines on Sampling of Illicit Drugs for Qualitative Analysis o SWGDRUG Recommendations v8, PART III A o SWGDRUG Analytical Scheme Supplemental Document 7		

Trainee will learn how to properly prepare the lab space for analysis of each piece of evidence, and additional safety precautions available depending upon what evidence is found within the packaging.		
Trainee will learn how to inventory the items within the evidence.		
Trainee will learn how to determine which piece of evidence is the most probative to the case and how to select the correct sampling plan.		
Trainee will gain an understanding of the appropriate amount to sample for testing, depending on the evidence, and how to handle evidence where there is not enough substance present for a second sample.		
Trainee will gain an understanding of the analytical scheme for typical evidence submissions.		
Trainee will gain an understanding of the importance of duplicate sampling, why it is required, and how the results are used for interpretation.		
Trainee will be presented with various grouping of similar items. Trainee will divide groups into 'homogenous populations'.		
Trainee will learn how to handle evidence if population was determined to be heterogenous following analysis.		
Trainee will discuss hypergeometric sampling plans and gain an understanding of the options and how they relate to the entire population.		
Trainee, Training Coordinator, and Quality Manager will meet to discuss the sampling plan(s). Including evidence reduction-administrative sampling and how statistically valid samplings are used in normal casework. Also covered will be how to correctly word reports such that it is clear what was sampled.		

Module 7A: Evidence Processing and Sampling Knowledge Check Questions

1. Describe how to process evidence with multiple items and subitems.
2. Describe the importance of testing two aliquots of each item tested. What information is obtained from duplicate testing. What information can be gained if the duplicates have inconsistent results.

3. Describe how the analyst determines which piece of evidence is most probative and which sampling plan shall be selected.
4. Describe what can happen if you over sample an item. Describe what can happen if you under sample an item.
5. How do you proceed when an item does not have enough volume for two samplings?
6. Describe the analytical scheme that would be used for a white crystalline material. Describe the analytical scheme that would be used for a tan powder.
7. Describe how to separate items into populations. Describe the process if the items are found to not be the same population after analysis.
8. Describe the sampling plans available and give an example of when each one would be used.
9. Describe how a hyper geometric sampling plan works.

Module 7A: Evidence Processing and Sampling Training Coordinator Review

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Dates:**
Trainee has reviewed required materials.			
Trainee has demonstrated an understanding of how to process, inventory and sample evidence.			
Trainee has demonstrated an understanding of how to separate items into populations and how to handle analysis if the population is found to be different.			
Trainee has demonstrated an understanding of the various sampling plans and common analytical schemes used during analysis.			
Trainee has demonstrated an understanding of hypergeometric sampling and when that plan would be used.			

Module 7A Evidence Processing and Sampling Completed and Reviewed:

Date Completed	**Trainee**	**Coordinator (s)**

Module 7B: TLC - Thin Layer Chromatography

Module 7B TLC Objectives:

- Trainee will gain an understanding of how and why TLC works.
- Trainee will learn of various solvent systems and review the reagent sheets to gain an understanding of how to prepare each.
- Trainee will gain understanding regarding how compounds are detected.
- Trainee will gain understanding regarding movement of compounds on plate
- Trainee will gain understanding regarding TLC and its comparison with other chromatographic techniques.
- Trainee will gain understanding regarding the importance of using traceable standards and properly recording data on both the TLC form and plate.
- Trainee will gain understanding regarding the preservation of TLC data for the case file.

Module 7B: TLC – Thin Layer Chromatography Checklist and Review

Trainee has read the following manuals or received the below training (initial and date next to each when complete):

Required Tasks:	**Trainee Initials:**	**Date:**
Trainee will review the following: o TLC section of SDD SOP o TLC validation write up o Criminalistics – An Introduction to Forensic Science – Saferstein pp. 121-131 o Forensic Science Handbook Vol. 2 – pp 82-83 o Clarke's Identification of Drugs, 4th Edition, Volume 1, Ch. 39		
Trainee will watch coordinator prepare TLC plate and associated paperwork (TLC Form, Reagent log for Spray).		
Trainee will prepare the commonly used systems while being observed by the Training Coordinator.		

Trainee will prepare and conduct TLC analysis of at least 10 standards, documenting the work on the appropriate TLC form, and preserving the findings to mimic the documentation retained for casework.		

- Trainee will review the following:
  - TLC section of SDD SOP
  - TLC validation write up
  - Criminalistics – An Introduction to Forensic Science – Saferstein pp. 121-131
  - Forensic Science Handbook Vol. 2 – pp 82-83
  - Clarke's Identification of Drugs, 4th Edition, Volume 1, Ch. 39
- Trainee will watch coordinator prepare TLC plate and associated paperwork (TLC Form, Reagent log for Spray)
- Trainee will prepare the commonly used systems while being observed by the Training Coordinator
- Trainee will prepare and conduct TLC analysis of at least 10 standards, documenting the work on the appropriate TLC form, and preserving the findings to mimic the documentation retained for casework

Module 7B: TLC – Thin Layer Chromatography Knowledge Check Questions

1. Describe how TLC works.
2. Provide an analogy for TLC testing that could be used to explain the process to a jury.
3. Describe which SWDRUG category TLC falls under and how is used in forensic casework. Can TLC alone be used to make a confirmation? Why or why not?
4. Describe situations where TLC may be useful as an aid to GC/MS.

Module 7B: TLC – Thin Layer Chromatography Training Coordinator Review

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Dates:**
Trainee has reviewed reference material and validation write up.			
Trainee has viewed coordinator prepare TLC forms.			
Trainee has prepared a system and spray			

Trainee has successfully tested 10 standards by TLC and completed TLC form.			
Documentation placed in training binder			

Module 7B TLC Completed and Reviewed:

Date Completed	Trainee	Coordinator (s)

Module 7C: Balances

Module 7C Balances Objectives:

- Trainee will learn the 'name' of each balance within the lab.
- Trainee will gain an understanding of the daily and weekly balance checks.
- Trainee will gain an understanding of when balances and weights are 'calibrated' by approved vendor.
- Trainee will gain an understanding of what uncertainty of measurement (UoM) is, to the level that they can explain in trial.
- Trainee will learn and understand the different classes of weights, including how and when to use.
- Trainee will gain an understanding of the daily/weekly balance checks that are conducted with in the lab, and where such records are maintained.
- Trainee will gain an understanding of the number of weighing events and how they factor into the uncertainty of measurement reported with each weight.
- Trainee will gain an understanding of the gross, net and reserve weight, which are reported to the customer, and the purpose of each weighing event.

Module 7C: Balances Checklist and Review

Trainee has read the following manuals or received the below training (initial and date next to each when complete):

Required Tasks:	Trainee Initials:	Date:
Trainee will review the following: o Weighing section of SDD SOP		

○ SDD uncertainty of measurement procedure ○ Most recent balance and weight set calibration certificates ○ Clarke's Identification of Drugs, 4th Edition, Volume 1, Ch. 23		
Trainee will discuss the UoM calculation with the coordinator and/or Quality Manager to understand the factors that are accounted for in the UoM calculation and the purpose of estimating a UoM.		
Trainee will assist other chemists as directed with weighing exhibits from cases. As noted in Module 2, trainee will only complete specific tasks when in the presence of other staff. Trainee will not take possession of evidence. It is the responsibility of the training coordinator to accomplish the tasks in this Module, but still preserve the integrity of the case(s) the coordinator is working.		
Once the trainee is comfortable using the balance and the coordinator is confident in the trainee's ability to use the balance correctly to obtain an accurate weight, the trainee will perform 10 sets of weekly weight checks to provide data for updating uncertainty of measurement calculations.		

Module 7C: Balances Knowledge Check Questions

1. Describe the procedure of obtaining a weight for a tied bag corner of powder.
2. Describe how weighing events are counted. Give an example of a weight obtained with two weighing events and a weight obtained with three weighing events.
3. Describe the purpose of estimation of UoM, specifically pertaining to SDD testing.
4. Name the factors included in the SDD UoM calculation and explain each one.
5. Explain what giving a net weight with a 95% degree of confidence means. Provide an analogy that could be used during testimony to help the jury understand.

Module 7C: Balances Training Coordinator Review

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Dates:**

Trainee has reviewed the required materials.			
Trainee has received training on using the balances and understands the purpose of the daily/weekly checks.			
Trainee has gained understanding of how to properly weigh items.			
Trainee has received training on UoM and understands the purpose of the UoM estimation and how it is applied in SDD testing.			
Trainee has assisted coordinator with weighing items as directed by the coordinator.			
Trainee has completed 10 weekly balance checks.			
Documentation placed in training binder.			

Module 7C Balances Completed and Reviewed:

Date Completed	Trainee	Coordinator (s)

Module 7D: Microscopic Identification of Marijuana

Module 7D Microscopic Identification of Marijuana Objectives:

- Trainee will gain understanding of the botanical classification (taxonomy) of marijuana.
- Trainee will gain understanding of the chemical constituents of marijuana.
- Trainee will gain understanding of the unique botanical characteristics of marijuana.
- Trainee will be able to conclusively identify of marijuana from other botanicals.
- Trainee will gain understanding of hemp and marijuana and what is required to identify each.
- Trainee will understand the differences between felony and misdemeanor criminal charges in relation to marijuana.
- Trainee will gain an understanding of novel cannabinoids and limitations with current testing procedures.

Module 7D: Microscopic Identification of Marijuana Checklist and Review

Trainee has read the following manuals or received the below training (initial and date next to each when complete):

Required Tasks:	**Trainee Initials:**	**Date:**
Trainee will review the following: ○ Marijuana section of SDD SOP ○ USDA Farm Bill legalizing hemp ○ Maine statute relating to marijuana and hemp ○ Clark's Identification of Drugs ○ Forensic Science Handbook – Vol. 2 – Saferstein – pp 87-92		
Trainee will participate in lecture/discussion with training coordinator as needed.		
Trainee will microscopically view known samples of marijuana and compare to various other botanicals that are not marijuana.		
Trainee will review literature relating to other cannabinoids (delta-8 THC, exo-THC) and discuss testing limitations with coordinator/Quality Manager.		

Module 7D: Microscopic Identification of Marijuana Knowledge Check Questions

1. Describe the requirements to identify marijuana. With HETL's current testing abilities, can HETL make a confirmation of marijuana?
2. Discuss challenges with identification of delta-9 THC, considering the rise of alternative cannabinoids.

Module 7D: Microscopic Identification of Marijuana Training Coordinator Review

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Dates:**
Trainee has reviewed required materials.			

Trainee and coordinator have discussed the analysis of plant material, specifically marijuana.			
Trainee has microscopically viewed marijuana and other botanicals to differentiate the differences.			

Module 7D Microscopic Identification of Marijuana Completed and Reviewed:

Date Completed	Trainee	Coordinator (s)

Module 7E: Extractions

Module 7E Extractions Objectives:

- Trainee will gain understanding of acidic, basic and neutral drug groups.
- Trainee will gain understanding regarding principles of extraction for different drug groups.
- Trainee will gain understanding of why different solvents-pH's are utilized in the analysis of items suspected to contain controlled substances.
- Trainee will gain understanding of procedural blanks.

Module 7E: Extractions Checklist and Review
Trainee has read the following manuals or received the below training (initial and date next to each when complete):

Required Tasks:	Trainee Initials:	Date:
Trainee will review the following: o Extraction section of SDD SOP o DEA Training Manual o Forensic Science Handbook – Chapter 3, Volume II – Saferstein pp 69-78 and 92-129		

○ Clarke's Identification of Drugs, 4th Edition, Volume 1, Ch. 29		
Trainee will participate in lecture/discussion with training coordinator as needed.		
Training Coordinator shall choose at least 2 drugs that require a basic extraction or chlorinated solvent, and trainee will extract and examine via GCMS		

Module 7E: Extractions Knowledge Check Questions

1. Describe the reasons why an acid/base/neutral extraction procedure may be required while processing SDD samples.
2. Describe the process for performing an acid/base/neutral extraction, including which controls are required, and how you would determine which type of extraction to perform.
3. Describe how the appropriate solvents are selected for an extraction.
4. Describe the purpose of a process blank while performing extractions.

Module 7E: Extractions Training Coordinator Review

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Dates:**
Trainee has reviewed required materials.			
Trainee and coordinator have discussed when extractions may be needed and how to determine which extraction to perform.			
Trainee has completed 2 extractions which consisted of a basic extraction or a chlorinated solvent extraction and included GC/MS data in binder.			

Module 7E Extractions Completed and Reviewed:

Date Completed	**Trainee**	**Coordinator (s)**

Module 7F: Instrumentation (GCMS/FTIR)

Module 7Fa-Gas Chromatograph Mass Spectrometry

Module 7Fa GCMS Objectives:

- Trainee will gain understanding of GC/MS theory.
- Trainee will gain understanding major instrument components (injector, column, transfer line, MS, filament, data handling, etc).
- Trainee will gain understanding as to capabilities and limitations of GC/MS
- Trainee will gain an understanding of how to conduct and evaluate a tune.
- Trainee will gain an understanding of how to evaluate samples for suitability prior to comparing unknowns to a known standard.
- Trainee will gain understanding regarding how to compare sample spectra to known spectra within various approved libraries.
- Trainee will gain understanding regarding the interpretation of chromatograms and mass spectrums, including decision points for accepting and rejecting spectral matches.

Module 7Fa-Gas Chromatograph Mass Spectrometry Checklist and Review
Trainee has read the following manuals or received the below training (initial and date next to each when complete):

Required Tasks:	**Trainee Initials:**	**Date:**
Trainee will review the following: o GC/MS sections of SDD SOP o GC/MS validation write up o Forensic Science Handbook - Vol. 2 – Saferstein – Chapter 2 o Clarke's Identification of Drugs, 4th Edition, Volume 1, Ch. 40		

Trainee will participate in discussion/lecture with training coordinator relating to the use of standards in GC/MS testing and the process of determining a sample is suitable for comparison prior to evaluation of unknown compounds and comparison to a library		
Trainee will discuss limitations of GC/MS testing, specifically relating to SDD samples		
Trainee will complete 2 tunes on different days and gain an understanding of the acceptance criteria for the tune. The Training Coordinator will review and approve (initial) printouts. Retain in training binder.		
Trainee will observe daily/weekly/monthly instrument maintenance Trainee will observe the process of updating a reference standard and how to determine if a standard is acceptable		
Trainee will observe the weekly GC/MS check and discuss the purpose of the check with the Training Coordinator/Quality Manager		
Trainee will analyze 5 different samples (unknowns or standards), comparing the spectra of these unknowns to libraries to determine the identity of the unknown. Printouts indicating the spectra and library match will be retained in the training binder.		

Module 7Fa-Gas Chromatograph Mass Spectrometry Check Questions

1. Describe the process of GC/MS and explain how the instrument is used for SDD testing.
2. Provide an analogy for GC/MS testing that could be used to explain the process to a jury.
3. Describe which SWDRUG category GC/MS falls under and how is used in forensic casework. Can GC/MS alone be used to make a confirmation? Why or why not?
4. Describe the process for reviewing controls prior to evaluation of unknown compounds in a sample. What is the purpose of performing the steps in this order and why is this important when relating to forensic work?
5. Describe how to evaluate a tune to determine if it is acceptable. What happens if a tune is found to be unacceptable?
6. Describe the acceptance criteria required for a confirmation of a compound.
7. Describe some limitations with GC/MS testing and how this can be a challenge for SDD testing.
8. Please list required maintenance and the purpose of each process.

9. Describe how a standard is updated in the Quant QEdit list and library. Why is it important to track this process?
10. Describe why an outdated standard could be an issue for SDD testing and the importance of running standards and samples within a reasonable amount of time if they are being used for comparison.

Module 7Fa-Gas Chromatograph Mass Spectrometry Training Coordinator Review

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Dates:**
Trainee has met with training coordinator to discuss GC/MS instruments major components, and general use.			
Trainee has demonstrated an understanding of how GC/MS works and how it is used in confirmatory testing within SDD.			
Trainee has reviewed required resources and GCMS validation write Up.			
Trainee has completed 2 tunes on different days under the guidance of the Coordinator.			
Trainee has completed analysis of 5 samples (known or unknown) to confirm identity by library searches. Printouts included in binder.			
Trainee has demonstrated understanding of requirements to determine if a sample is suitable for comparison.			
Trainee has demonstrated understanding of using reference material for comparison and acceptance criteria required for confirmation.			
Trainee has demonstrated understanding of instrument maintenance and how to determine that maintenance is required.			

Module 7Fa GCMS Completed and Reviewed:

Date Completed	**Trainee**	**Coordinator (s)**

Module Fb-Fourier transformed Infrared Spectroscopy (FTIR)

Module Fb FTIR Objectives:

- Trainee will gain understanding as to the theory of FTIR.
- Trainee will gain understanding as to the basic operation of the instrument.
- Trainee will gain understanding and requirements for weekly/monthly maintenance.
- Trainee will gain understanding of background collection and blank collection prior to examining sample.
- Trainee will gain understanding of how to compare unknown spectra to spectral libraries.
- Trainee will gain understanding how to print and preserve spectra and library match information for case folders.

Module 7Fb-Fourier transformed Infrared Spectroscopy Checklist and Review
Trainee has read the following manuals or received the below training (initial and date next to each when complete):

Required Tasks:	**Trainee Initials:**	**Date:**
Trainee will review the following: ○ FTIR sections of SDD SOP ○ FTIR validation write up ○ Handbook of Forensic Science–Vol. 2–Saferstein – Ch. 3 – FTIR ○ Clarke's Identification of Drugs, 4th Edition, Volume 1, Ch. 33		
Trainee will participate in discussion/lecture with training coordinator relating to the use of standards in FTIR testing and the process of determining a sample is suitable for comparison prior to evaluation of unknown compounds and comparison to a library		
Trainee will discuss limitations of FTIR testing, specifically relating to SDD samples		

Trainee will observe and then perform weekly/monthly instrument maintenance and gain an understanding of the acceptance criteria for the maintenance. The Training Coordinator will review and approve (initial) printouts. Retain in training binder.		
Trainee will observe the process of updating a reference standard and how to determine if a standard is acceptable		
Trainee will analyze 5 different samples (unknowns or standards), comparing the spectra of these unknowns to libraries to determine the identity of the unknown. Printouts indicating the spectra and library match will be retained in the training binder.		

Module 7Fb-Fourier transformed Infrared Spectroscopy Check Questions

1. Describe the process of FTIR and explain how the instrument is used for SDD testing.
2. Provide an analogy for FTIR testing that could be used to explain the process to a jury.
3. Describe which SWDRUG category FTIR falls under and how is used in forensic casework. Can FTIR alone be used to make a confirmation? Why or why not?
4. Describe the process of reviewing controls prior to evaluation of unknown compounds in a sample. What is the purpose of performing the steps in this order and why is this important when relating to forensic work?
5. Describe how to evaluate a weekly and monthly maintenance checks to determine if they are acceptable. What happens if a maintenance check is found to be unacceptable?
6. Describe the acceptance criteria required for a confirmation of a compound.
7. Describe some limitations with FTIR testing and how this can be a challenge for SDD testing.
8. Please list required maintenance and the purpose of each process.
9. Describe how a standard is updated in the FTIR library. Why is it important to track this process?

Module 7Fb-Fourier transformed Infrared Spectroscopy Training Coordinator Review

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Dates:**
Trainee has demonstrated an understanding of how FTIR works and how it is used in confirmatory testing within SDD.			

Trainee has met with training coordinator to discuss FTIR instruments major components, and general use.			
Trainee has reviewed required resources and FTIR validation write up.			
Trainee has performed weekly/monthly maintenance under the guidance of the Coordinator.			
Trainee has completed analysis of 5 samples (known or unknown) to confirm identity by library searches. Printouts included in binder. Trainee has demonstrated understanding of requirements to determine if a sample is suitable for comparison.			
Trainee has demonstrated understanding of using reference material for comparison and acceptance criteria required for confirmation.			
Trainee has demonstrated understanding of instrument maintenance and how to determine that maintenance is required.			

Module 7Fb FTIR Completed and Reviewed:

Date Completed	Trainee	Coordinator (s)

Module 7G: Tablets and Capsules

Module 7G Tablets and Capsules Objectives:

- Trainee will gain understanding of the resources available for physical identification of tablets and capsules.
- Trainee will gain understanding of terminology used to describe tablets/capsules.
- Trainee will gain understanding of criteria for identification of tablets/capsules and why obtaining the weight or a tablet/capsule is necessary.
- Trainee will gain understanding of physical/chemical identification methods when physical identification is inadequate.

- ❖ Trainee will gain understanding of counterfeit tablets and learn the process to identify tablets when they are found to be counterfeit.

Module 7G: Tablets and Capsules Checklist and Review

Trainee has read the following manuals or received the below training (initial and date next to each when complete):

Required Tasks:	**Trainee Initials:**	**Date:**
Trainee will review the following: ○ Tablets section of SDD SOP ○ Physician's Desk Reference (PDR) ○ Drug Identification Bible ○ Drugs.com ○ Clarke's Identification of Drugs, 4th Edition, Volume 1, Ch. 13		
Trainee will participate in lecture/discussion with training coordinator to review terminology used in identifying tablets/capsules.		
Trainee will either assist training coordinator or independently identify a minimum of 3 tablets based on visual identity. Visual identity will be confirmed by either GCMS or FTIR. Instrument printouts and corresponding notes regarding the visual identity shall be retained in the training binder by the trainee.		
Trainee has discussed the requirement for obtaining a weight on a tablet/capsule and understands why a weight is necessary.		

Module 7G: Tablets and Capsules Knowledge Check Questions

1. Describe how visual identification is used in conjunction with other test methods for confirmatory testing.
2. Describe the process required to process tablet/capsule evidence.
3. Describe the process taken if the visual identification does not match the analysis results.

4. Describe why a weight is required for a tablet/capsule.

Module 7G: Tablets and Capsules Training Coordinator Review

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Dates:**
Trainee has reviewed required materials			
Trainee has identified 3 tablets based on visual markings, and then confirmed identification via instrumental analysis (GC/MS or FTIR). Documentation placed in training binder.			
Trainee has demonstrated understanding about the limitations of visual identification and how to handle tablets/capsules that are counterfeit.			

Module 7G Tablets and Capsules Completed and Reviewed:

Date Completed	**Trainee**	**Coordinator (s)**

Module 7H: Mushrooms

Module 7H Mushrooms Objectives:

- Trainee will gain an understanding of the chemical structure(s) associated with drugs typically found in 'mushrooms'.
- Trainee will gain understanding of proper storage and processing procedures related to mushroom cases.
- Trainee will gain understanding of extraction techniques and confirmation with cases involving suspected mushrooms.

Module 7H: Mushrooms Checklist and Review

Trainee has read the following manuals or received the below training (initial and date next to each when complete):

Required Tasks:	**Trainee Initials:**	**Date:**
Trainee will review the following: o Mushrooms section of SDD SOP o Clarke's Identification of Drugs, 4th Edition, Volume 2, psilocin and psilocybin		
Trainee and Coordinator will discuss common compound(s) found in mushroom samples		
Trainee and Coordinator will discuss the challenges of examining suspected mushroom cases (storage, extraction, stability)		
Trainee will analyze a 'mushroom' sample using both extraction techniques in the SDD SOP, and confirm using GC/MS. Retain instrumental printouts of chromatogram, mass spectra, and suggested library matches in training binder necessary. o **NOTE**: Mushroom samples used for training purposes will only be adjudicated samples and used with the permission of the submitter. If there are no samples available for training, then coordinator shall obtain any mushroom (wild or purchased), spike the sample with appropriate substances (unknown to the trainee) and present to trainee for extraction.		

Module 7H: Mushrooms Knowledge Check Questions

1. Describe the storage requirements for mushroom samples and explain why these are required.
2. Name the common compound(s) found in mushroom samples and some challenges associated with testing these compound(s).
3. Explain why psilocybin is not detected in the analysis of mushroom samples.
4. If a mushroom sample is tested using the SDD C extraction and psilocin is not confirmed during analysis, explain how the analyst should proceed.

Module 7H: Mushrooms Training Coordinator Review

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Dates:**

Trainee has reviewed required materials.			
Trainee has discussed with the coordinator storage requirements, methods of extraction and processing, and analysis challenges associated with mushroom samples.			
Trainee has performed both extraction techniques on a mushroom sample and achieved the expected results.			

Module 7H Mushrooms Completed and Reviewed:

Date Completed	Trainee	Coordinator (s)

Module 7I: Steroids

Module 7I Steroids Objectives:

- Trainee will gain understanding of the chemical structures associated with steroids.
- Trainee will gain and understanding related to the appearance of how steroids are typically sold/found in drug related cases.
- Trainee will gain an understanding of the methods of analysis and challenges typically associated with exhibits of suspected steroids (i.e., matrix and extended chromatographic run times).

Module 7I: Steroids Checklist and Review

Trainee has read the following manuals or received the below training (initial and date next to each when complete):

Required Tasks:	Trainee Initials:	Date:
Trainee will review the following: ○ Liquids section of SDD SOP ○ Forensic Science Handbook – Ch. 3, Vol II – Saferstein ○ Clarke's Identification of Drugs, 4th Edition, Vol 2, various steroid drugs		

Trainee and Coordinator will discuss common compound(s) found in steroid samples.		
Trainee and Coordinator will discuss the challenges of examining suspected steroid cases (storage, extraction, stability, chromatographic run time).		
Extract one sample reported containing a steroid and confirm using GC/MS. ○ **NOTE**: Steroids suspected case samples used for training purposes will only be adjudicated samples and used with the permission of the submitter. If there are no samples available, then coordinator may substitute the analysis of steroid standards to meet this portion of training manual.		

Module 7I: Steroids Knowledge Check Questions

1. Name the common compound(s) found in steroid samples and some challenges associated with testing these compound(s).

Module 7I: Steroids Training Coordinator Review

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Dates:**
Trainee has reviewed required materials			
Trainee has discussed with the coordinator storage requirements, methods of extraction and processing, and analysis challenges associated with steroid samples.			
Trainee has analyzed steroid samples successfully.			

Module 7I Steroids Completed and Reviewed:

Date Completed	**Trainee**	**Coordinator (s)**

Module 7J: LSD

Module 7J LSD Objectives:

- Trainee will gain understanding of the chemical structures associated with LSD and LAMPA
- Trainee will gain and understanding related to the appearance of how LSD is typically sold/found in drug related cases (i.e., blotter papers).
- Trainee will gain an understanding of the methods of analysis and challenges typically associated with exhibits of suspected LSD (i.e., low concentration, heat degradation).
- Trainee will gain an understanding of other psychedelic compounds commonly seen.

Module 7J: LSD Checklist and Review

Trainee has read the following manuals or received the below training (initial and date next to each when complete):

Required Tasks:	**Trainee Initials:**	**Date:**
Trainee will review the following: o LSD section of SDD SOP o Forensic Science Handbook – Chapter 3, Volume II – Saferstein o Clarke's Identification of Drugs, 4th Edition, Volume 2, LSD, LSA and LAMPA		
Trainee and Coordinator will discuss the process and challenges of examining suspected LSD cases (storage, extraction, stability, analysis method, using alternate light source (ALS) during exam)		
Trainee and Coordinator will discuss other psychedelic compounds that are commonly submitted for analysis		
Trainee will analyze an 'LSD' sample using the extraction technique in the SDD SOP, and confirm using GC/MS. Retain instrumental printouts of chromatogram, mass spectra, and suggested library matches in training binder necessary. o **NOTE**: LSD samples used for training purposes will only be adjudicated samples and used with the permission of the submitter. If there are no samples available for training, then coordinator may substitute the analysis of LSD standards to meet this portion of training manual.		

Module 7J: LSD Knowledge Check Questions

1. Describe LSD and LAMPA, including chemical properties and challenges associated with these compounds.
2. Describe the GC/MS analysis method used for testing.
3. Give examples of evidence that may contain LSD/LAMPA and describe a method of evidence examination that may provide additional information prior to chemical analysis.

Module 7J: LSD Training Coordinator Review

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Dates:**
Trainee has reviewed required materials.			
Trainee has discussed with the coordinator evidence presentation of LSD and similar samples, storage requirements, methods of evidence examination and analysis, and challenges associated with LSD samples.			
Trainee has analyzed one LSD sample using GC/MS analysis.			

Module 7J LSD Completed and Reviewed:

Date Completed	**Trainee**	**Coordinator (s)**

Module 7K: Clandestine Laboratory Testing and Safety

Note: This module may be completed at a later time and is not required for completion of the training manual and performing routine solid dose drug casework.

Module 7K Clandestine Laboratory Testing and Safety Objectives:

- ❖ Trainee will gain understanding of additional safety risks, storage considerations and processing procedures associated with clandestine laboratory samples
- ❖ Trainee will gain understanding of the requirements for testing clandestine lab samples (proof of manufacturing and proof of final product)
- ❖ Trainee will gain an understanding of how to properly process commonly submitted evidence to meet the proof requirements

Module 7K: Clandestine Laboratory Testing and Safety Checklist and Review

Trainee has read the following manuals or received the below training (initial and date next to each when complete):

Required Tasks:	**Trainee Initials:**	**Date:**
Trainee will review the following: o DEA Training Materials o SWGDRUG Recommendations v8, PART III C		
Trainee and Coordinator will discuss typical evidence submitted and the goal of evidence examination. Items should be selected for analysis, based on jurisdictional requirements, and which are likely to contain: o finished product o intermediates o precursors o key reagents o reaction mixtures		
Trainee and Coordinator will discuss the process and challenges of examining suspected clandestine laboratory cases (storage, extraction, low concentrations, stability, analysis method, safety)		
Trainee and Coordinator will discuss the proper way to analyze evidence.		
Trainee and Coordinator will discuss common methods of methamphetamine production and other common clandestinely produced drugs and the evidence associated with each method.		
Coordinator will prepare mock evidence to use for training purposes. Trainee will analyze samples and confirm using GC/MS. Retain instrumental printouts of chromatogram,		

mass spectra, and suggested library matches in training binder necessary.		

Module 7K: Clandestine Laboratory Testing and Safety Knowledge Check Questions

1. Describe additional safety concerns associated with clandestine laboratory samples.
2. Describe the goal of processing clandestine lab evidence.
3. Describe challenges associated with clandestine lab samples.
4. Describe proper storage of liquid evidence.
5. Describe one method of clandestine methamphetamine production and the expected evidence to be submitted with that method.

Module 7K: Clandestine Laboratory Testing and Safety Training Coordinator Review

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Dates:**
Trainee has reviewed required materials.			
Trainee has discussed with the coordinator the goals of processing evidence related to clandestine lab, additional safety considerations, proper evidence storage associated with clandestine lab samples, and common methods of production.			
Trainee has processed mock evidence relating to a clandestine lab.			

Module 7K Clandestine Laboratory Testing and Safety Completed and Reviewed:

Date Completed	**Trainee**	**Coordinator (s)**

Module 7L: Mock Casework

Module 7L: Mock Casework Objective

- Trainee will demonstrate the mastery of the discipline's material covered in this training manual

Module 7L: Mock Casework Checklist and Review

Required Tasks:	**Trainee Initials:**	**Date:**
The trainee shall be assigned (at least 5) unknown samples by the Coordinator with all submission paperwork (contract for analysis and Chain of Custody) included with the samples. The trainee shall perform screening and confirmation testing as if the samples were casework and will be deemed complete when a report is prepared, technically and administratively reviewed. Trainee may seek guidance during processing from training Coordinator.		
The trainee shall submit the results of their testing to the Coordinator to be compared to expected results and values.		

Module 7L: Mock Casework Coordinator Review

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Dates:**
Trainee has successfully worked 5 mock cases and received feedback regarding each case from the Training Coordinator and the Forensic Lab Director/Quality Manager. Feedback will be provided and discussion of how the trainee worked each case, or each exhibit within the case, shall be completed.			

Module 7L: Mock Casework Completed and Reviewed:

Date Completed	Trainee	Coordinator(s)

Module 8: Quality Assurance/Quality Control

Module 8 QA/QC Objectives:

- To gain an understanding of the QA/QC policies and procedures in place in the Forensic Chemistry section and how they relate to accreditation requirements.

Module 8 QA/QC Checklist and Review

Required Tasks:	Trainee Initials:	Date:
The trainee will review the Quality Manual and Clarke's Fourth Ed. Volume 1 Chapter 22.		
The trainee will review ISO 17025 and AR 3125 with the Quality Manager to understand the standard requirements and how they are met by the various policies in the lab.		
The trainee will gain an understanding of authorization requirements prior to testing, and ongoing requirements to maintain authorization.		
Trainee will gain and understanding of confidentiality and impartiality requirements, as described in the Quality Manual		
Trainee will discuss with the training coordinator and Quality Manager: a. use of control charts b. corrective actions and quality issue reporting		

c. deviations d. proficiency test program and monitoring e. testimony monitoring f. internal audit and risk evaluations g. reagent and consumables purchasing and approval process h. requirements for each page of a case file i. procedure for handling corrections, redactions, insertions		
Trainee will gain an understanding of the use of reference materials, limitations, storage, and the purpose of a Certificate of Analysis (quantitative testing vs qualitative testing)		
Trainee will gain an understanding of document control and the purpose and requirements of method validation.		
Read ANSI/ASB Practices for Method Validation		
Review and discuss with Coordinator: a. Most recent internal and external audit reports b. Examples of recent CAR, QIRF and deviations c. Testimony Monitoring Form and PT Evaluation Form		

Module 8 QA/QC: Knowledge Check

1. Describe confidentiality requirements in the Forensic section of the lab relating to information that can be shared
2. Describe the process for authorization for testing casework and how authorization is maintained.
3. Describe the purpose of a validation and some requirements for a qualitative test method and a quantitative test method.
4. Describe the process when an issue is identified. What is the first step taken and how are the issues evaluated for risk/severity.
5. Describe the procedure used when a method is not followed as written. What forms need to be completed and how is the issue communicated to the customer?
6. Describe document control and how documents are controlled in the Forensic Chemistry Section.

7. Describe the internal and external audit schedule and explain the purpose of these processes.
8. Describe how a proficiency test is reviewed. If a PT is found to be unsatisfactory, explain the next steps that would occur.
9. Describe the purpose of any blanks run with a batch (if applicable to training section)
10. Describe the purpose of an extraction blank and list what is being checked by this blank. (if applicable to training section)
11. Describe the purpose of the internal standard added to each sample. (if applicable to training section)
12. Describe what the reanalysis program consists of and what it checks. (if applicable to training section)

Module 8 QA/QC: Training Coordinator Review

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Dates:**
Trainee understands the purpose of all QA/QC procedures within the Forensic section			
The trainee understands the review and approval process for standards used in testing			
The trainee understands the scope of testing offered by HETL and the process for updating the scope			
The trainee understands the purpose of document control and the practice of using only approved documents directly from SharePoint			
Trainee demonstrate understanding of the purpose and requirements of method validation			
Trainee understands monitoring programs in place			

Trainee understands the training program, competency requirements, and authorization prior to testing casework samples. Trainee understands requirements for ongoing authorization.			
Trainee understands internal and external audit requirements.			

Module 8 QA/QC Completed and Reviewed:

Date Completed	Trainee	Coordinator(s)

Module 9: Report Writing & Creation of Certificates of Analysis

(Since the data entry and report writing is different for each discipline in the labs LIMS system (StarLIMS) this section must be performed individually for each discipline that the analyst is trained in (Urine Drug, Blood Alcohol, Blood Drug or Seized Drug)).

Module 9 Report Writing & Creation of Certificates of Analysis Objectives:

- Trainee will learn how to create reports using the labs LIMS system (StarLIMS) for the section that they are being trained in (Urine Drug, Blood Alcohol, Blood Drug or Seized Drug).
- Trainee will learn how to phrase report such that it is clear and understandable to the customer
- Trainee will learn how to add appropriate comments to reports
- Trainee will learn how to express results on reports using appropriate UoM values. (when applicable)
- Trainee will learn how to phrase report when all items in case submission are not examined, and a sampling plan is used. (when applicable)
- Entry of sample results into LIMS System
- Creating a final report for the customer

- ❖ Submitting all work within the 'batch' for technical and administrative review
- ❖ Signing the final report and sending report to customer

Module 9 Report Writing & Creation of Certificates of Analysis Required Tasks:

Required Tasks:	**Trainee Initials:**	**Date:**
Read and review with Coordinator o StarLIMS SOP o Reporting criteria section of the procedure for the discipline they are training		
Trainee will work with the Coordinator and other lab staff during the training program watching how reports are created, and how they are worded.		
Trainee will work with the Coordinator to understand how a run is created in LIMS, how results are added, how reports are generated for review, and how runs are released following review.		
Trainee will read lab reports from cases that have been used in the training process to see examples of various items received and results.		
The trainee is required to review all batch documentation with the Coordinator		
The trainee is required to review all sample casefile documentation with the Coordinator.		
The trainee is required to watch and assist in the creation of reports using the LIMS system. There is no minimum established as it is recognized that mastering the LIMS software package may be quick, or lengthy depending on the computer literacy of the trainee.		

Trainee will work with the Coordinator to understand how a new external client is added in LIMS		

Module 9 Report Writing & Creation of Certificates of Analysis Knowledge Check:

1. How is data reviewed and then how are results entered into the LIMS system?
2. Explain the process for technical review. What needs to be included within the case folder before submitting it for technical review?
3. What is the purpose of technical review and what is the purpose of administrative review?

Module 9 Report Writing & Creation of Certificates of Analysis Training Coordinator Review

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Dates:**
Trainee has demonstrated an understanding of entering data into StarLIMS and generating reports using StarLIMS.			

Module 9 Report Writing & Creation of Certificates of Analysis Completed and Reviewed:

Date Completed	**Trainee**	**Coordinator(s)**

Module 10: Legal/Ethics/Testimony

(Since Legal/Testimony is different for each discipline this section must be performed individually for each discipline that the analyst is trained in (Urine Drug, Blood Alcohol, Blood Drug or Seized Drug)).

Module 10A: Legal/Ethics

Module 10A Legal/Ethics Objectives:

- Trainee will gain an understanding of the Controlled Substances Act (if applicable to section)
- Trainee will gain an understanding of Temporary Scheduling (if applicable to section)

- ❖ Trainee will gain an understanding of Maine State Drug Laws/Maine Implied Consent Laws
- ❖ Trainee will gain an understanding of the differences between scheduled and non-scheduled substances (if applicable to section)
- ❖ Trainee will gain an understanding for the potential of abuse, likelihood of dependency, and currently accepted medical use for drugs that are commonly seen in samples
- ❖ Trainee will gain an understanding of HETL's Laboratory Ethics Policy and Training
- ❖ Trainee will gain an understanding of the ethics as it pertains to forensic examinations: Why it's needed-how it is accomplished daily
- ❖ Trainee will gain an understanding of human factors and bias as it pertains to forensic testing

Module 10A Legal/Ethics Required Tasks:

Required Tasks:	**Trainee Initials:**	**Date:**
Trainee will read the following: o HETL's Ethics Policy and Training o ANAB Guiding Principles o AAFS Ethics o Controlled Substances Act including the provisions dealing with temporary scheduling o Maine State Drug Laws 17A Ch 45 o Maine State OUI and Implied Consent Laws o Relevant human factors and bias journal articles o Forensic Science Handbook – Saferstein – pp. 70-76 o Criminalistics – An Introduction to Forensic Science – Saferstein – pp. 228-248		
Trainee reviewed drug families, pharmacology, the potential of abuse, likelihood of dependency, and currently accepted medical use for drugs commonly seen in samples		
Trainee will discuss the controlled substances act (if applicable to section), Maine State Drug Laws (if applicable to section), Maine Implied Consent Laws (if applicable to section), and basic pharmacology topics with training coordinator.		

Trainee will discuss legal ethics/human factors/bias with Forensic Lab Director, including how ethics is part of laboratory accreditation and how it must be incorporated into daily casework.		

Module 10A Legal/Ethics Knowledge Check:

1. Describe some examples of human factors or bias that could influence how cases are processed.
2. For 10 of the most commonly seen drugs in samples, provide a brief description of pharmacology, potential for abuse/overdose, and any acceptable medical uses.
3. Describe using the Maine Statute to determine a sampling plan for evidence exam. (if applicable to section)
4. Describe the process if an ethical issue arises and must be reported.

Module 10A Legal/Ethics Training Coordinator Review

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Dates:**
Trainee demonstrates an understanding of human factors, bias, and legal ethics relating to forensics.			
Trainee understands how human factors and bias could influence testing and ways to mitigate that influence.			
Trainee demonstrates understanding of classification, pharmacology, and acceptable medical uses for various controlled substances.			
Trainee has successfully reviewed the Controlled Substances Act, including the portions dealing with Temporary Scheduling.			
Trainee demonstrates understanding of the Maine Controlled Substance statute and how it works with the federal CSA.			

Module 10A Legal/Ethics Completed and Reviewed:

Date Completed	Trainee	Coordinator(s)

Module 10B: Courtroom Testimony

Module 10B Courtroom Testimony Objectives:

- Trainee will gain an understanding of general Courtroom procedures
- Trainee will gain an understanding of the rules of evidence
- Trainee will gain an understanding as to the role of both fact witnesses and expert witnesses
- Trainee will gain an understanding of a Giglio Request vs Discovery Request vs FOAA Request and how to handle each
- Trainee will understand the Brady Rule, a Brady violation, and the process of a discovery request
- Trainee will gain an understanding of how to testify such that he/she can be easily heard and understood
- Trainee will gain understanding how to testify in such a manner that their testimony can successfully be captured by the court reporter.

Module 10B Courtroom Testimony Required Tasks:

Required Tasks:	Trainee Initials:	Date:
Trainee will review the following: o SOP Manual sections pertaining to discovery and FOAA o Read relevant caselaw regarding Forensic Chemistry cases o Read Frye v. United States o Read Daubert vs Merrell Dow o Read Daubert vs Frye o Read Giglio vs US o Brady vs Maryland o Maine Rules of Evidence		

Trainee will prepare a CV or Resume in preparation for Court.		
Observing the testimony of at least one experienced Forensic Scientist in court, and after watching, discuss the event with either the training coordinator and/or Forensic Lab Director		
Trainee will understand Frye vs Daubert, and how they apply to Maine		
Trainee will prepare written responses to the Module 10B Qualifying Questions and Case Specific Questions (below) and submit them to the coordinator for review and discussion:		

Qualifying Questions

- Could you please introduce yourself to the jury?
- How are you currently employed?
- How long have you been employed by the State of Maine as a Chemist in the Forensic Chemistry section?
- How were you employed before this position?
- Can you tell us a little about your educational background?
- Are you a member of any professional societies?
- What are your duties/responsibilities as a Chemist?
- Can you tell us about that training? Who provided it and what did it cover?
- Are you certified by the State of Maine, Dept of Health and Human services (DHHS) as a TOX/SDD chemist?
- What exactly does that mean, and how do you gain such certification?
- Can anyone gain this certification?
- Did you have to complete any training before getting this certification?
- How do you maintain your certification?
- What is a 'proficiency test'?
- Are you required to work 'proficiency tests'?
- How often?
- Are results from proficiency tests reviewed? By whom?
- What happens if you 'fail' a proficiency test?
- Is your laboratory accredited? By whom?
- What does it mean to be accredited?

- You already described your basic duties/responsibilities a Chemist in the TOX/SDD section, but can you elaborate on the type of testing that is conducted with the section? How does the lab receive samples? From whom? How do they get to the lab and how do they move thru the lab?
- Can you please explain the difference between a presumptive test and confirmatory test?
- Does the lab use any presumptive tests to analyze samples?
- Could you please explain, in lay terms, what a Randox Evidence Invesigator Immunoassy is? (if applicable to section)
- Could you please explain, in lay terms, what a TLC is? (if applicable to section)
- What instrument(s) does your laboratory use to perform confirmatory tests on samples of suspected controlled substances?
- Can you explain (in lay-terms) what is a GC/MS? How is that used in the identification of a drug in a sample? (if applicable to section)
- Can you explain (in lay-terms) what is a LC-MS/MS? How is that used in the identification of a drug in a sample? (if applicable to section)
- Can you explain (in lay-terms) what is an FTIR? How is it used in the identification of a sample that is suspected to contain a controlled substance? (if applicable to section)
- If both these types of instruments (FTIR and GC/MS) are used to 'confirm' the presence of a controlled substance, what the difference? Meaning, when would you use an FTIR as opposed to a GC/MS? (if applicable to section)
- Do all samples submitted to the lab contain controlled substances/drugs?
- How do you know the result are what you say they are?
- What happens if you examine samples that are suspected of containing a controlled substance and you don't find a controlled substance present? Let's say you find….Tylenol….what do you do then? (if applicable to section)
- What happens if your sample screens positive but you do not detect anything during confirmation testing?
- And you, on behalf of the laboratory, issue a report that details your findings?
- Does anyone in the lab review your findings before they are released? Who and how is that accomplished?
- What do you do with the sample after testing has been completed?

Analyst is accepted as expert witness

Case Specific Questions

Case and/or COA is entered into evidence

- Let me show you State's Exhibit #___, a Certificate of Analysis [by SUBJECT]. Do you recognize it? What is it?
- Is there a date and time on the certificate indicating when the sample was submitted to the laboratory? And where does that date and time come from?
- Who provided the sample?
- How many samples did you receive?
- Was the sample sealed when it arrived at the laboratory? How do you know?
- Sometime in (Month/Year), did you perform an analysis of a sample in relation to (SUBJECT)?
- BAC/Blood Drugs
    - According to the report the blood collection kit was expired, what is the impact this could have on the results?
- Seized Drugs
    - Let's start with item 1. Can you please describe what item 1 was and how you sampled it?
    - Did you use a statistical sampling plan?
- Which instrument did you use to test the samples?
- Was the instrument working properly on the date the samples were analyzed?
- How do you know?
- Was a computer printout generated indicating the results of the analysis of the sample?
- And what did you do with that print out?
- As a result of your analysis, were any controlled substances/drugs detected?
- Seized Drugs
    - And what was the net weight of item 1?
    - Is that weight including any packaging?
- Seized Drugs/BAC/Blood Drugs
    - And you stated a plus or minus for that result. Could you please explain what that means?
    - Is that the same as an error rate?
    - The report also states a 95.45% coverage probability. Could you please explain what that means?
    - So the true result of the (drug) detected should fall somewhere within the window you just described?
- Seized Drugs
    - (If statistical sampling plan was used) You stated earlier that a 95/50 or 95/90 sampling plan was used. Could you please explain what that means? What does that mean specifically for item 1?
- And once testing was completed, what happened to the samples from this case?

Note to Trainee: To facilitate the completion of this task, these questions may be pasted into a new word document to prepare answers for the training binder.

Module 10B Courtroom Testimony: Training Coordinator Review

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Dates:**
Trainee has prepared a CV			
Trainee has observed at least 1 other Forensic Scientist testify in Criminal court			
Trainee understands Frye vs Daubert vs Maine's Evidence Standard			
Trainee has prepared written answers to questions.			
Trainee understands discovery requests, FOAA requests, the Brady rule and Giglio requests.			

Module 10B Courtroom Testimony: Completed and Reviewed:

Date Completed	**Trainee**	**Coordinator(s)**

Module 11: Cometency and State Certification

Successful completion of the relevent training program and competency exams must be completed prior to authorization and certification to perform casework.

Module 11A: Urine Competency and State Certification

Module 11A: Urine Objectives:

- Trainee will demonstrate their competency of the specific testing discipline material covered in this training manual.

Module 11A: Urine Required Tasks:

Required Tasks:	**Trainee Initials:**	**Date:**
The trainee shall be assigned (at least 5) unknown samples by the Coordinator with all submission paperwork (contract for analysis and Chain of Custody) included with the samples. The trainee shall independently perform testing as if the samples were casework and complete a report for each sample tested. The report shall be technically and administratively reviewed.		
The trainee shall submit the results of their testing to the Coordinator to be compared to expected results and values. (100% passing score required)		
One of the mock cases completed by the trainee will be selected for use in the mock trail. Case will be selected by the training coordinator in conjunction with the Forensic Lab Director / Quality Manager.		
Once all relevant Modules within a discipline are completed, the analyst must complete a written open-book competency exam (≥80% passing grade).		

Module 11A: Urine Training Coordinator Review

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Dates:**
Trainee has successfully independently worked 5 mock cases and achieved the correct results for all samples.			
Trainee has successfully passed the written open-book competency exam with a grade of ≥80%			

Trainee has successfully completed a mock court training, which will be documented using the testimony review form.			
Upon successful completion of the first three objectives, a State Certification for the specific discipline and an official authorization to perform casework will be issued.			

Module 11A: Urine Completed and Reviewed:

Date Completed	Trainee	Coordinator(s)

Urine Drug Training and Competency Completed and Reviewed

_____ _____ _____

Trainee Training Coordinator Date

To perform urine drug casework modules 1-5, 8-10, and 11A must be completed.

Module 11B: Blood Alcohol Competency and State Certification

Module 11B: Blood Alcohol Objectives

- Trainee will demonstrate their competency of the specific testing discipline material covered in this training manual.

Module 11B: Blood Alcohol Required Tasks

Required Tasks:	**Trainee Initials:**	**Date:**
The trainee shall be assigned (at least 5) unknown samples by the Coordinator with all submission paperwork (contract for analysis and Chain of Custody) included with the samples. The trainee shall independently perform testing as if the samples were casework and complete a report for each sample tested. The report shall be technically and administratively reviewed.		
The trainee shall submit the results of their testing to the Coordinator to be compared to expected results and values. (100% passing score required)		
One of the mock cases completed by the trainee will be selected for use in the mock trail. Case will be selected by the training coordinator in conjunction with the Forensic Lab Director / Quality Manager.		
Once all relevant Modules within a discipline are completed, the analyst must complete a written open-book competency exam (≥80% passing grade).		

Module 11B: Blood Alcohol Training Coordinator Review

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Dates:**
Trainee has successfully independently worked 5 mock cases and achieved the correct results for all samples.			
Trainee has successfully passed the written open-book competency exam with a grade of ≥80%			
Trainee has successfully completed a mock court training, which will be documented using the testimony review form.			
Upon successful completion of the first three objectives, a State Certification for the specific			

discipline and an official authorization to perform casework will be issued.			

Module 11B: Blood Alcohol Completed and Reviewed:

Date Completed	Trainee	Coordinator(s)

Blood Alcohol training and competency completed and reviewed:

_____ _____ _____

Trainee Training Coordinator Date

To perform blood alcohol casework modules 1-4, 6A, 6B, 6.1, 8-10, and 11B must be completed.

Module 11C: Blood Drug Competency and State Certification

Module 11C: Blood Drug Objectives

- Trainee will demonstrate their competency of the specific testing discipline material covered in this training manual.

Module 11C: Blood Drug Required Tasks

Required Tasks:	Trainee Initials:	Date:
The trainee shall be assigned (at least 5) unknown samples by the Coordinator with all submission paperwork (contract for analysis and Chain of Custody) included with the samples. The trainee shall independently perform testing as if the samples		

were casework and complete a report for each sample tested. The report shall be technically and administratively reviewed.		
The trainee shall submit the results of their testing to the Coordinator to be compared to expected results and values. (100% passing score required)		
One of the mock cases completed by the trainee will be selected for use in the mock trail. Case will be selected by the training coordinator in conjunction with the Forensic Lab Director / Quality Manager.		
Once all relevant Modules within a discipline are completed, the analyst must complete a written open-book competency exam (≥80% passing grade).		

Module 11C: Blood Drug Training Coordinator Review

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Dates:**
Trainee has successfully independently worked 5 mock cases and achieved the correct results for all samples.			
Trainee has successfully passed the written open-book competency exam with a grade of ≥80%			
Trainee has successfully completed a mock court training, which will be documented using the testimony review form.			
Upon successful completion of the first three objectives, a State Certification for the specific discipline and an official authorization to perform casework will be issued.			

Module 11C: Blood Drug Completed and Reviewed

Date Completed	Trainee	Coordinator(s)

Detection of Drugs in Blood training and competency completed and reviewed:

_____ _____ _____

Trainee Training Coordinator Date

To perform blood drug casework modules 1-4, 6A, 6B, 6.2, 8-10, and 11C must be completed.

Module 11D: Analysis of Seized Drugs Competency and State Certification

Module 11D: Analysis of Seized Drugs Objectives

- Trainee will demonstrate their competency of the specific testing discipline material covered in this training manual.

Module 11D: Analysis of Seized Drugs Required Tasks

Required Tasks:	Trainee Initials:	Date:
The trainee shall be assigned (at least 5) unknown samples by the Coordinator with all submission paperwork (contract for analysis and Chain of Custody) included with the samples. The trainee shall independently perform testing as if the samples were casework and complete a report for each sample tested. The report shall be technically and administratively reviewed.		
The trainee shall submit the results of their testing to the Coordinator to be compared to expected results and values. (100% passing score required)		

One of the mock cases completed by the trainee will be selected for use in the mock trail. Case will be selected by the training coordinator in conjunction with the Forensic Lab Director / Quality Manager.		
Once all relevant Modules within a discipline are completed, the analyst must complete a written open-book competency exam (≥80% passing grade).		

Module 11D: Analysis of Seized Drugs Training Coordinator Review

Objectives:	**Trainee Initials:**	**Coordinator Initials:**	**Dates:**
Trainee has successfully independently worked 5 mock cases and achieved the correct results for all samples.			
Trainee has successfully passed the written open-book competency exam with a grade of ≥80%			
Trainee has successfully completed a mock court training, which will be documented using the testimony review form.			
Upon successful completion of the first three objectives, a State Certification for the specific discipline and an official authorization to perform casework will be issued.			

Module 11D: Analysis of Seized Drugs Completed and Reviewed:

Date Completed	**Trainee**	**Coordinator(s)**

Analysis of Seized Drugs training and competency completed and reviewed:

_____ _____ _____

Trainee Training Coordinator Date

To perform seized drug casework modules 1-4, 7-10, and 11D must be completed.

Revision Table

REVISED BY	REV#	DATE	Revisions
LN	1	11Jan23	Initial version of this document. All discipline training manuals were merged into one document. For revisions to previous training programs, see individual documents in SharePoint.