1.0 Purpose - This procedure specifies the required elements for the identification of controlled substances.

2.0 Scope - This procedure applies to general casework samples in the Drug Chemistry section of the Pitt County Sheriff's Office Forensic Services Unit.

3.0 Definitions

- **Homogenous** – Uniform.
- **Residue** – An amount of material which cannot be readily removed from the container in which it was submitted.

4.0 Equipment, Materials and Reagents – See technical procedures.

5.0 Procedure

5.1 Examination Documentation

5.1.1 Chemists shall record notes on a worksheet which will allow another chemist to repeat the analysis under conditions as close as possible to the original, evaluate the data, interpret the results, and form an independent conclusion.

5.1.2 Worksheets shall include a complete description of all layers of packaging (and seal status) of items received. Only a description of the inner package and contents is required for inclusion on the laboratory report.

5.1.3 The worksheet shall be used for explanation of tests, and detailed descriptions of evidence, if needed. Excel spreadsheets are an acceptable format to record and add lists of weights or to organize data. These shall be imported into Document Management (DM).

5.1.4 Date of examination shall be noted as "Date started." The completion date reflects the date when all data has been incorporated into a recorded conclusion.

5.2 Laboratory facilities provide sufficient environmental conditions to conduct all tests included in the technical procedures with no further consideration required.

5.3 Standards and Controls

5.3.1 Chemists are responsible for using documented technical and administrative procedures outlined for the identification of controlled substances.

5.3.2 Two samples shall be removed from each exhibit (when exhibit size allows) and these samples shall be analyzed independently.

5.3.3 Only one item of evidence shall be opened/analyzed at one time to avoid cross contamination.

5.4 Application of Procedure on Evidence

5.4.1 Analytical Schemes

5.4.1.1 There are four general analytical schemes to be used for controlled substances after the physical examination of the drug form is conducted.

5.4.1.1.1 Pharmaceutical Preparation (see below for scheme)

5.4.1.1.2 Residue/Paraphernalia/Liquids (see below for scheme)

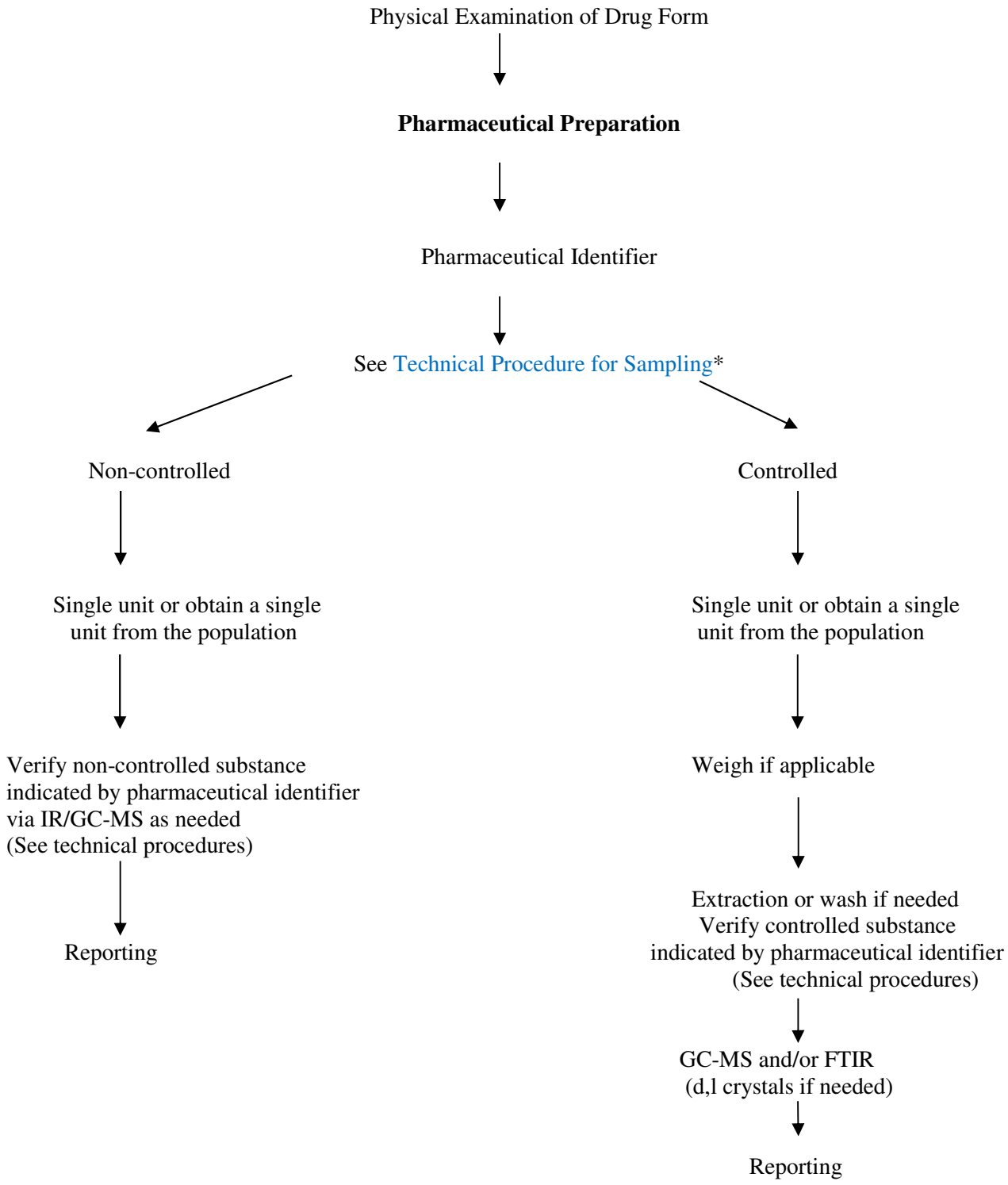
5.4.1.1.3 General Unknowns/Powders/Clandestine Tablets (See below for scheme)

5.4.1.1.4 Plant material (See below for scheme)

5.4.1.2 It should be noted that sample size or other circumstances may require a rearrangement or modification of one or more steps.

5.4.1.3 A chemist may encounter exhibits that require specialized analysis. For these cases the flowchart for general unknowns shall be followed and any deviations from the technical procedures shall be approved by the Technical Leader or his/her designee in accordance with the Laboratory Procedure for Authorizing Deviations.

(ANALYTICAL SCHEMES FOLLOW)



* Sample size or other circumstances may require rearrangement or modification of one or more steps.

Physical Examination of Drug Form

↓

Residue/Paraphernalia*/Liquids#

↓

Obtain portion for analysis
(Physically remove or wash – See technical procedures)

↓

Color Tests and/or Microcrystal Tests

↓

Extraction/wash if needed (See technical procedures)

↓

MS/GC-MS and/or FTIR or (d,l crystals if needed)

↓

Reporting

* Sample size or other circumstances may require rearrangement or modification of one or more steps.
#Refer to Technical Procedure for Sampling if applicable when exhibit is a liquid pharmaceutical preparation.

Physical Examination of Drug Form

↓

General Unknowns/Powders/Clandestine Tablets

↓

See Technical Procedure for Sampling, then for each unit *

↓

Powders/Clandestine tablets & other unknowns

↓

Weigh if applicable

↓

Obtain portion for analysis

↓

Color Tests and/or Microcrystal Tests

↓

Extraction/wash if needed (See technical procedures)

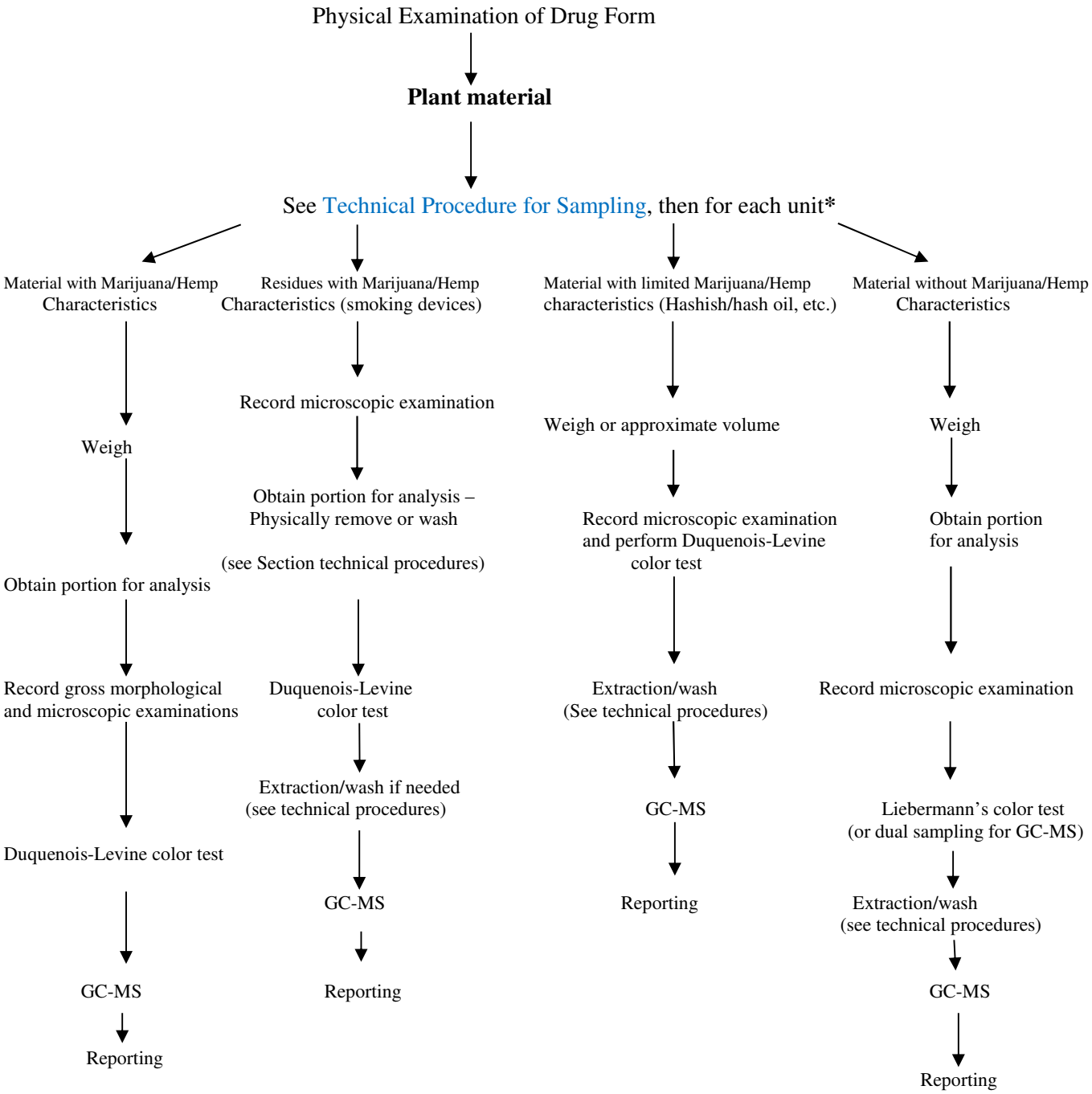
↓

GC-MS and/or FTIR or (d,l crystals if needed)

↓

Reporting

* Sample size or other circumstances may require rearrangement or modification of one or more steps.



* Sample size or other circumstances may require rearrangement or modification of one or more steps.

5.4.2 **Preliminary Color Tests** are used to screen evidence to determine if a controlled substance may be present. (See the Technical Procedure for Preliminary Color Tests.)

5.4.2.1 A screening test shall be chosen based on its usefulness (i.e., microcrystalline test for cocaine, Marquis for heroin).

5.4.3 **Microcrystalline tests** may be used to screen evidence or to help identify a controlled substance when used in conjunction with other technical procedures. (See the Technical Procedure for Polarized Light Microscopy.)

5.4.3.1 When a microcrystalline test is used in conjunction with a confirmatory test (Category A), documented descriptions of the crystals shall be included in the case notes for peer review. When this method is employed, the microcrystalline test will be considered a Category C test.

5.4.3.2 When a microcrystalline test is used as a confirmatory test (Category B), (i.e., not in conjunction with a Category A test), the crystals shall be contemporaneously peer reviewed and documented in the casefile.

5.4.4 **Pharmaceutical Identifiers -** Chemists shall use the markings and characteristics of pharmaceutical preparations to determine the consistency of the units and as a preliminary examination only.

5.4.4.1 Complete markings shall be required for identification. Tablets must be intact or complete markings must be physically matched back together if broken tablets are present.

5.4.4.2 Information obtained from partial imprints may not be used as a preliminary examination. This type of information may be included in the casefile for information purposes only.

5.4.4.3 These identifications shall be made by using credible reference materials (e.g., *The Physician's Desk Reference, The Logo for Tablets and Capsules*, manufacturer's published data, and/or internet sources such as Drugs.com and Pharmer.org).

5.4.5 **Extractions/washes -** Non-controlled substances are often mixed with controlled substances and interfere with results. It may be necessary to remove them before proceeding with analysis. (See the Technical Procedure for Extractions and Separations.)

5.4.6 **Infrared (IR) Spectroscopy (FTIR)** may be used to screen a sample, or it may be used to identify a controlled substance when used in conjunction with preliminary tests. (See the Technical Procedure for Infrared Spectroscopy.)

5.4.6.1 FTIR is used for identification when the controlled substance is not mixed with other substances, or is mixed with other substances in a ratio such that the FTIR spectrum of

the mixture does not interfere with a favorable comparison to the known reference material.

5.4.7 **Gas Chromatography Mass Spectrometry (GC-MS)** may be used to screen evidence or to identify controlled substances when used in conjunction with preliminary tests. (See the Technical Procedure for Gas Chromatograph-Mass Spectrometry.)

5.4.7.1 If the controlled substance is mixed with other substances, or in a form that is not compatible with the instrument, refer to the Technical Procedure for Extractions and Separations, and the Technical Procedure for Gas Chromatograph-Mass Spectrometry (GC-MS) for suggested sample preparation.

5.4.8 **Gas chromatography (GC)** may be used to identify controlled substances when used in conjunction with other preliminary tests listed below.

5.4.9 **Sampling -** See the Technical Procedure for Sampling to determine sampling selection or sampling plan and population(s).

5.4.10 **Categories of Analytical Techniques**

Listed in order of decreasing discriminatory power from A to C:

Category A	**Category B**	**Category C**
Infrared Spectroscopy	Gas Chromatography	Color Tests
Mass Spectrometry	Microcrystalline Tests (Not used in conjunction with a Category A Test)	Microcrystalline Tests (Used in conjunction with a Category A Test)
	Cannabis Only: Macroscopic Examination Microscopic Examination (Counts as one each)	Pharmaceutical Identifiers

5.4.11 When a Category A technique is incorporated into an analytical scheme, then at least one other technique (from either Category A, B, or C) shall be used.

5.4.11.1 This combination must identify the specific drug(s) present.

5.4.11.2 When sample size allows, the second technique shall be applied on a separate sampling.

5.4.11.3 All Category A techniques shall have reviewable data.

5.4.12 When a Category A technique is not used, then at least three different validated techniques shall be used.

5.4.12.1 This combination shall identify the specific drug(s) present and shall preclude a false positive identification. Two of the three methods shall be based on uncorrelated techniques from Category B.

5.4.12.2 A minimum of two separate samplings shall be used in these three tests.

5.4.12.3 All Category B techniques shall have reviewable data.

5.4.13 Reviewable data includes:

5.4.13.1 Printed spectra and chromatograms.

5.4.13.2 Reference to published data for pharmaceutical identifiers.

5.4.13.3 Contemporaneous documented peer review, photographs, or digital images of microcrystalline tests if used without a Category A Test.

5.4.13.4 Descriptions of microcrystalline test results, if used in conjunction with a Category A Test.

5.4.13.5 For cannabis and botanical materials only: recording of detailed descriptions of morphological characteristics. (See the Technical Procedure for the Identification of Plant Material for descriptions used in conjunction with the case notes worksheet.)

5.4.14 For the use of any method to be considered of value in the identification of the controlled substance, the test shall be considered positive.

5.4.14.1 While negative tests provide useful information for ruling out the presence of a particular drug or drug class, these results have no value toward establishing the positive identification of a drug.

5.4.15 In cases where hyphenated techniques are used (e.g., GC-MS), they will be considered as separate techniques provided that the results from each are used.

5.4.16 Cannabis exhibits tend to have characteristics that are visually recognizable; therefore, macroscopic and microscopic examination of cannabis shall be considered as two separate Category B techniques when observations include documented botanical features as described in the Technical Procedure for Identification of Plant Material.

5.4.16.1 Additional testing shall follow the analytical schemes outlined above.

5.4.17 On rare occasions, a category "A" technique may be used by itself for identification of a newly encountered analyte if data from reference material is not available. A written verification review from the Technical Leader in the case file shall be required to document approval for these instances.

- Data obtained from the analyte shall be compared to published reference data from a credible source recognized in the forensic community. The published reference data shall be included in the case file.
- An analyte in this instance shall be defined as an unusual steroid, a new designer drug, or an analog of an existing drug.

5.4.18 **Weights -** (received and returned) of solids, powders, opiate tablet preparations, amphetamine tablets, and plant material shall be recorded in the case notes. (See the Technical Procedure for Balances.)

5.5 **Reporting** (See the Technical Procedure for Sampling for the format to report identified substances for exhibits where sampling or sample selection has occurred. Variations from the templates may be needed for unusual cases or circumstances. These are allowed with Technical Leader approval, documented in the casefile.)

5.5.1 The results for identified substances from a single unit exhibit shall be reported with the name of the substance, the Schedule, and the net weight of the material with associated uncertainty. (See the Technical Procedure for Balances regarding the recording and reporting of gross weights.)

5.5.2 When the sample size of an exhibit prohibits complete analysis, the reported results shall be recorded as "Insufficient sample for analysis."

5.5.3 The results for non-controlled substances shall be reported as "No controlled substances identified" and the net weight of the material with associated uncertainty shall be reported if a net weight was recorded.

5.5.4 The number of tablets, capsules, or other dosage units containing controlled substances shall be reported. The number returned shall be included in the case notes and reported as provided in the Technical Procedure for Sampling.

5.5.5 Liquids containing controlled substances shall be measured by weights or volumes. The amount of the received liquids shall be reported. The amount of the returned liquids shall be included in the case notes.

5.6 **Calculations** - See technical procedures.

5.7 **Uncertainty of Measurement -** See the Technical Procedure for Measurement Assurance.

6.0 **Limitations -** See technical procedures.

7.0 **Safety -** See Pitt County Forensic Services Safety Manual.

8.0 **References**

ASTM Standard E2329-17. "Identification of Seized Drugs." ASTM International: West Conshohocken, PA, 2017, www.astm.org.

Scientific Working Group for the Analysis of Seized Drugs (SWGDRUG) Recommendations. 8th Edition. June 13, 2019.

9.0 Records

- Case files

REVISION HISTORY		
CURRENT VERSION	**EFFECTIVE DATE**	**SUMMARY OF CHANGES**
1	2017/11/14	Original Document.
2	2018/04/01	**Entire document** – Updated "Illicit Drugs" to "Drug Chemistry" section
3	2020/01/15	**Header** – Updated "Instruments" to "Drug Chemistry" **5.3** – Added additional quality control measures. **5.4.1** – Updated to match new Technical Procedure for Plant Material. **5.4.10** - Moved Pharmaceutical Identifiers from Category B to Category C. **References** – Updated ASTM Standard E2329 and SWGDRUG Recommendations to new editions.