Criteria for the Analysis and Identification of Controlled Substances

The Procedures listed are used to analyze evidence and identify controlled substances.

1. <u>**Screening Tests**</u>

Screening tests are used to evaluate evidence in determining the possible presence of controlled substances and to classify these controlled substances into general categories. These general categories include: opium alkaloids, synthetic opiates, cocaine, indole alkaloids, benzodiazepines, barbiturates, sedatives, hypnotics, anesthetics, marijuana, and phenalkylamines.

Color tests, ultraviolet (UV) spectroscopy, microscopic examinations, and immunoassay techniques are used to screen evidence. Thin layer chromatography (TLC), infrared (IR) spectroscopy, microcrystalline tests, or other technical procedures can also be used to screen evidence to determine the presence of controlled substances or to classify controlled substances into the general categories.

A screening test used in the sampling process should be chosen based on its usefulness (i.e. microcrystalline test for cocaine).

2. <u>**Confirmatory Tests**</u>

Confirmatory tests are used to conclusively identify the identity of a controlled substance. They may be comprised of a single technical procedure or a combination of two or more technical procedures.

   a. **Fourier Transform Infrared (IR) Spectroscopy**.
      •Infrared (IR) spectroscopy is a confirmatory test for a controlled substance when the controlled substance is not mixed with other substances, or is mixed with other substances in a ratio such that the IR spectrum of the mixture is not significantly different from that of a known reference standard.
      •If the spectrum of the controlled substance is significantly altered due to the presence of other substances in the mixture, the controlled substance must be separated from the mixture and an IR spectrum obtained of the isolated controlled substance.
      •A known impurity within a mixture containing a controlled substance can also be subtracted from the IR spectrum by using the   difference   function of the FTIR. An IR spectrum of a controlled substance must be substantially comparable (i.e., equivalent) to the IR spectrum of a known reference standard before an identification is confirmed.

b. **Gas Chromatography Mass Spectrometry (GC-MS)**.
•MS is used as a confirmatory test for a controlled substance. If the controlled substance is mixed with another substance that is not a known reference standard, the controlled substance must first be separated from the mixture and then a mass spectrum obtained of the controlled substance.
•This separation is usually accomplished by the use of a gas chromatograph (GC) connected directly to the MS instrument. A mass spectrum of a controlled substance must be compared to and found to be substantially the same (i.e., equivalent) as a mass spectrum of the known reference standard before an identification is confirmed.

c. **Gas chromatography (GC) and high performance liquid chromatography (HPLC)**.
•GC and HPLC are confirmatory tests when used in conjunction with other technical preliminary test procedures such as: ultraviolet (UV) spectroscopy, infrared (IR) spectroscopy (of a mixture), microcrystalline tests, microscopic examinations, and thin layer chromatography (TLC). The chromatogram of a controlled substance must be compared to that of a known reference standard and found to be substantially the same (i.e., equivalent) before an identification is confirmed.

•When using GC retention time data in a case file, include the following from the standard run: blank, the Total Ion Chromatogram (TIC) (with identified/integrated peaks of interest), and the MS of the standard. Retention time data will be included in methamphetamine cases. In drug cases, retention times should be within $\pm$2% of the standard.

d. **Thin layer chromatography (TLC)**.
TLC utilizes three developing solvent systems (one developing solvent system for marijuana and derivatives of marijuana) is a confirmatory test when used in conjunction with other technical preliminary test procedures such as: ultraviolet (UV) spectroscopy, infrared (IR) spectroscopy (of a mixture), microcrystalline tests, microscopic examinations, gas chromatography (GC), and high performance liquid chromatography (HPLC). The chromatograms of a controlled substance must be compared to that of a reference standard and found to be substantially the same (i.e., equivalent) before an identification is confirmed.

Minimum Criteria for the Identification of a Controlled Substance

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 Spectroscopy	Liquid Chromatography	Immunoassay
	Microcrystalline Tests	Ultraviolet Spectroscopy
	Pharmaceutical Identifiers	
	Thin Layer Chromatography	
	Cannabis Only: Macroscopic Examination Microscopic Examination (Counts as one each)	

a. When a Category A technique is incorporated into an analytical scheme, then at least one other technique (from either Category A, B, or C) must be used. This combination must identify the specific drug(s) present and must preclude a false positive identification. When sample size allows, the second technique should be applied on a separate sampling. If sample size is limited, additional measures should be taken to assure the results correspond to the correct sample. All Category A techniques must have reviewable data.

b. When a Category A technique is not used, then at least three different validated methods must be used. This combination must identify the specific drug(s) present and must preclude a false positive identification. Two of the three methods must be based on uncorrelated techniques from Category B. A minimum of two separate samplings should be used in these three tests. When sample size is limited, additional measures should be taken to assure that the results correspond to the correct sample. All Category B techniques must have reviewable data.

Some examples of reviewable data include printed spectra, chromatograms and printed Micromedex data. With regard to microcrystalline tests, a sketch and/or description of the crystal can be reviewed. Regarding TLC, a match with a standard, Rf values, solvent systems and developing agent may be reviewed.

c. For the use of any method to be considered of value, the test must be considered positive. 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 identification of a drug.

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

e. Cannabis exhibits tend to have characteristics that are visually recognizable; therefore, macroscopic and microscopic examination of cannabis will be considered as Category B techniques when observations include documented botanical features as described in the Chemist Training Program. Additional testing must follow the scheme outlined in sections (a) and (b) of "**Minimum Criteria for the Identification of a Controlled Substance"** set forth in this policy.

   For exhibits that lack sufficient observable macroscopic and microscopic botanical detail (i.e. extracts and residues), tetrahydrocannabinol (THC) must be identified utilizing the principles in sections (a) and (b) of "**Minimum Criteria for the Identification of a Controlled Substance"** set forth in this policy.

f. A category "A" technique can be used by itself, with SAC or ASAC approval, for an identification of a controlled analyte, if no other standard or data can be obtained for that analyte. An analyte will be defined as an unusual steroid or designer drug.