SFL7

Method: MTPA LTM

Separation of Controlled and Non-controlled Substances by Gas Chromatography

Scope: Limited purpose (MPTA derivatized substances, e.g., chiral amines)

Sample Preparation:

Samples are typically prepared at a concentration of approximately 2 mg/mL, and are base extracted into methylene chloride. It is recommended that the sample be passed through sodium sulfate prior to analysis to remove residual water. A few drops (~50 µL) of the MTPA ((R)-(-)-α-methoxy-α-(trifluoromethyl)phenylacetyl chloride) reagent solution, prepared at approximately 0.1 M, are added to approximately 1 mL of the sample solution prior to analysis.

Note: If insufficient sample is available, smaller volumes of the sample solution and MTPA reagent solution may be used.

Method Parameters:

Instrument: Agilent, 7890B (or equivalent) GC with Low Thermal Mass (LTM) Module,
Column Type and Dimensions: Guard Column: DB-5, 1.0 m x 0.18 m x 0.18 µm
LTM Column: DB-5, 15 m x 0.25 mm x 0.25 µm
Inlet Temperature: 270 °C
Minimum Injection Volume: 1 µL
Injection Mode: split
Maximum Split Ratio: 30:1
Carrier Gas and Flow: H_2 column flow = 2.8 mL/minute
Make-up Gas: N_2
Control Mode: System operated at constant flow.
Oven Program Set Points: 195 °C
LTM Program Set Points: 195 °C, hold 5 minutes
Minimum Run Time: 5.0 minutes
Detector Temperature: 300 °C

Limitations: See individual instrument validation reports.

Acceptance Criteria:

Selectivity: Target compounds are visually separated and observed as a single peak with a clear, non-splitting apex. Peak fronting/tailing, if observed, does not preclude the detection of closely eluting peaks. A minimum $S/N_{pk\text{-}pk}$ =3 is observed. The earliest eluting compound was within the minimum acceptable retention time for the method (k=1) and/or fulfilled the repeatability and reproducibility acceptance criteria.

Repeatability: Individual retention times measured for representative compounds are within 0.1 minutes of the average of 30 injections, and/or the individual relative retention times are within 1% of the average of 30 injections.

Reproducibility: Individual retention times measured for representative compounds during six weeks are within 0.1 minutes of the values measured on week one, and/or the individual relative retention times during six weeks are within 1% of the values measured on week one.

SFL7

Method: MTPA

Separation of Controlled and Non-controlled Substances by Gas Chromatography

Scope: Limited purpose (MPTA derivatized substances, e.g., chiral amines)

Sample Preparation:

Samples are typically prepared at a concentration of approximately 2 mg/mL, and are base extracted into methylene chloride. It is recommended that the sample be passed through sodium sulfate prior to analysis to remove residual water. A few drops (~50 µL) of the MTPA ((R)-(-)-α-methoxy-α-(trifluoromethyl)phenylacetyl chloride) reagent solution, prepared at approximately 0.1 M, are added to approximately 1 mL of the sample solution prior to analysis.

Note: If insufficient sample is available, smaller volumes of the sample solution and MTPA reagent solution may be used.

Method Parameters:

Instrument: Agilent, 7890B (or equivalent) GC
Column Type and Dimensions: HP-5, 30 m x 0.32 m x 0.25 µm
Inlet Temperature: 260 °C
Minimum Injection Volume: 1 µL
Injection Mode: split
Maximum Split Ratio: 30:1
Carrier Gas and Flow: H_2 column flow = 1.5 mL/minute
Make-up Gas: N_2
Control Mode: System operated at constant flow.
Oven Program Set Points: 220 °C for 6.5 minutes
Minimum Run Time: 6.5 minutes
Detector Temperature: 300 °C

Limitations: See individual instrument validation reports.

Acceptance Criteria:

Selectivity: Target compounds are visually separated and observed as a single peak with a clear, non-splitting apex. Peak fronting/tailing, if observed, does not preclude the detection of closely eluting peaks. A minimum $S/N_{pk\text{-}pk}$ =3 is observed. The earliest eluting compound was within the minimum acceptable retention time for the method (k=1) and/or fulfilled the repeatability and reproducibility acceptance criteria.

Repeatability: Individual retention times measured for representative compounds are within 0.1 minutes of the average of 30 injections, and/or the individual relative retention times are within 1% of the average of 30 injections.

Reproducibility: Individual retention times measured for representative compounds during six weeks are within 0.1 minutes of the values measured on week one, and/or the individual relative retention times during six weeks are within 1% of the values measured on week one.

SFL7

Method: SCREEN_LTM

Separation of Controlled and Non-Controlled Substances by Gas Chromatography

Scope: General purpose

Sample Preparation:

Samples are typically prepared in the 1-10 mg/mL range in a variety of organic solvents, such as methylene chloride (Me_2Cl_2), methanol (MeOH), chloroform, hexane, petroleum ether, and combinations of the above (such as 9:1 Me_2Cl_2:MeOH). It is recommended that samples are filtered through a cotton-plugged or Kim-wipe® plugged pipet prior to analysis to remove any insoluble material.

Samples may also be base-extracted into an organic solvent. It is recommended that base-extracted samples are either centrifuged or passed through sodium sulfate prior to analysis to remove residual water.

Method Parameters:

Instrument: Agilent, 7890B (or equivalent) GC with Low Thermal Mass (LTM) Module
Column Type and Dimensions: Guard Column: DB-5, 1.0 m x 0.18 mm x 0.18 µm
LTM Column: DB-5, 15 m x 0.25 m x 0.25 µm
Inlet Temperature: 280 °C
Minimum Injection Volume: 1 µL
Injection Mode: split
Maximum Split Ratio: 25:1
Carrier Gas and Flow: H_2 column flow = 3.25 mL/minute
Make-up Gas: N_2
Control Mode: System operated at constant flow.
Oven Program Set Points: 300 °C
LTM Program Set Points: 100 °C, no hold, 80 °C/minute ramp to 300 °C, hold 2 minutes
Minimum Run Time: 4.5 minutes
Detector Temperature: 300 °C

Limitations: See individual instrument validation reports.

Acceptance Criteria:

Selectivity: Target compounds are visually separated and observed as a single peak with a clear, non-splitting apex. Peak fronting/tailing, if observed, does not preclude the detection of closely eluting peaks. A minimum $S/N_{pk\text{-}pk}$ =3 is observed, including a low-level (0.5%) marker compound. The earliest eluting compound was within the minimum acceptable retention time for the method ($k=2t_0$) and/or fulfilled the repeatability and reproducibility acceptance criteria.

Repeatability: Individual retention times measured for representative compounds are within 0.1 minutes of the average of 30 injections, and/or the individual relative retention times are within 1% of the average of 30 injections.

Reproducibility: Individual retention times measured for representative compounds during six weeks are within 0.1 minutes of the values measured on week one, and/or the individual relative retention times during six weeks are within 1% of the values measured on week one.

SFL7

Method: SCREEN

Separation of Controlled and Non-controlled Substances by Gas Chromatography

Scope: General purpose

Sample Preparation:

Samples are typically prepared in the 1-10 mg/mL range in a variety of organic solvents, such as methylene chloride (Me_2Cl_2), methanol (MeOH), chloroform, hexane, petroleum ether, and combinations of the above (such as 9:1 Me_2Cl_2:MeOH). It is recommended that samples are filtered through a cotton-plugged or Kim-wipe® plugged pipet prior to analysis to remove any insoluble material.

Samples may also be base-extracted into an organic solvent. It is recommended that base-extracted samples are either centrifuged or passed through sodium sulfate prior to analysis to remove residual water.

Method Parameters:

Instrument: Agilent, 7890B (or equivalent) GC
Column Type and Dimensions: HP-5, 30 m x 0.32 m x 0.25 µm
Inlet Temperature: 260 °C
Minimum Injection Volume: 1 µL
Injection Mode: split
Maximum Split Ratio: 30:1
Carrier Gas and Flow: H_2 column flow = 3.0 mL/minute.
Make-up Gas: N_2
Control Mode: System operated at constant flow.
Oven Program Set Points: 100 °C for 1.0 minute, then 15 °C/minute ram to 270 °C, hold for 3.67 minutes.
Minimum Run Time: 16.0 minutes
Detector Temperature: 300 °C

Limitations: See individual instrument validation reports.

Acceptance Criteria:

Selectivity: Target compounds are visually separated and observed as a single peak with a clear, non-splitting apex. Peak fronting/tailing, if observed, does not preclude the detection of closely eluting peaks. A minimum $S/N_{pk\text{-}pk}$ =3 is observed, including a low-level (0.5%) marker compound. The earliest eluting compound was within the minimum acceptable retention time for the method ($k=2t_0$) and/or fulfilled the repeatability and reproducibility acceptance criteria.

Repeatability: Individual retention times measured for representative compounds are within 0.1 minutes of the average of 30 injections, and/or the individual relative retention times are within 1% of the average of 30 injections.

Reproducibility: Individual retention times measured for representative compounds during six weeks are within 0.1 minutes of the values measured on week one, and/or the individual relative retention times during six weeks are within 1% of the values measured on week one.

SFL7

Method: AUTO100_Split

Separation of Controlled and Non-controlled Substances by Gas Chromatography

Scope: General purpose

Sample Preparation:

Samples are typically prepared in the 5-15 mg/mL range in a variety of organic solvents, such as methylene chloride (Me_2Cl_2), methanol (MeOH), chloroform, hexane, petroleum ether, and combinations of the above (such as 9:1 Me_2Cl_2:MeOH). It is recommended that samples are filtered through a cotton-plugged or Kim-wipe® plugged pipet prior to analysis to remove any insoluble material.

Samples may also be base-extracted into an organic solvent. It is recommended that base-extracted samples are either centrifuged or passed through sodium sulfate prior to analysis to remove residual water.

Method Parameters:

Instrument: Agilent, 7890B (or equivalent) GC, Analytical Solutions and Providers, IRD3
Column Type and Dimensions: HP-5, 25 m x 320 µm x 0.52 µm
Inlet Temperature: 250 °C
Minimum Injection Volume: 1 µL
Injection Mode: split (Note: This method can also be run as AUTO100, in splitless mode.)
Maximum Split Ratio: 10:1
Carrier Gas and Flow: He column flow, 2.0 mL/minute
Control Mode: System operated at constant flow.
Oven Program Set Points: 100 °C for 2.0 minutes, then 25 °C/minute ramp to 270 °C, hold for 12.2 minutes
Minimum Run Time: 21.0 minutes
Detector: See IRD1 Vapor Phase Infrared Spectroscopy Method Parameters

Limitations: See individual instrument validation reports.

Acceptance Criteria:

Selectivity: Target compounds are visually separated and observed as a single peak with a clear, non-splitting apex. Peak fronting/tailing, if observed, does not preclude the detection of closely eluting peaks. A minimum S/N =$3_{pk=pk}$ is observed, including a low level (0.5%) marker compound. The earliest eluting compound was within the minimum acceptable retention time for the method ($k=2t_0$) and/or fulfilled the repeatability and reproducibility acceptance criteria.

Repeatability: Individual retention times measured for representative compounds are within 0.1 minutes of the average of 30 injections, and/or the individual relative retention times are within 1% of the average of 30 injections.

Reproducibility: Individual retention times measured for representative compounds during six weeks are within 0.1 minutes of the values measured on week one, and/or the individual relative retention times during six weeks are within 1% of the values measured on week one.

SFL7

Method: IRD1

Identification of Controlled and Non-controlled Substances by Vapor Phase Infrared Spectroscopy

Scope: General purpose

Sample Preparation:

GC effluent

Method Parameters:

Instrument: Agilent, 7890B (or equivalent) GC, Analytical Solutions and Providers, IRD3
Scan Range: 550 – 4000 wavenumbers
Resolution: 8 cm^{-1}
Transfer Line Temperature: Transfer Line A: 280 °C, Transfer Line B: 280 °C
Light Pipe Temperature: 280 °C

Limitations: See individual instrument validation reports.

Acceptance Criteria:

Accuracy: Analyte spectra are compared to a verified reference database, commercial library, published spectra or spectra from another ISO/IEC 17025 accredited laboratory. The overall sample spectral pattern corresponds to that of the reference spectrum and the prominent, well-defined, measured signals in the sample spectra were all within 4 cm^{-1} of those in the reference spectrum. No prominent extraneous signals are observed in the sample spectrum.

Repeatability and Reproducibility: The repeatability and reproducibility of confirmatory methods is established via evaluation of system-wide historical spectral data.

SFL7

Method: AUTO70

Separation of Controlled and Non-controlled Substances by Gas Chromatography

Scope: General purpose

Sample Preparation:

Samples are typically prepared in the 1-10 mg/mL range in a variety of organic solvents, such as methylene chloride (Me_2Cl_2), methanol (MeOH), chloroform, hexane, petroleum ether, and combinations of the above (such as 9:1 Me_2Cl_2:MeOH). It is recommended that samples are filtered through a cotton-plugged or Kim-wipe® plugged pipet prior to analysis to remove any insoluble material.

Samples may also be base-extracted into an organic solvent. It is recommended that base-extracted samples are either centrifuged or passed through sodium sulfate prior to analysis to remove residual water.

Method Parameters:

Instrument: Agilent, 7890A/7890B (or equivalent) GC, 5975C/5977A/5977B (or equivalent) MSD
Column Type and Dimensions: HP-1, 12 m x 200 µm x 0.33 µm
Inlet Temperature: 250 °C
Minimum Injection Volume: 1.0 µL injection
Injection Mode: split
Maximum Split Ratio: 225:1 (Note: parameter is instrument-specific)
Carrier Gas and Flow: He column flow, 1.0 mL/minute
Control Mode: System operated at constant flow.
Oven Program Set Points: 70 °C for 1.2 minutes, then 25 °C/minute ramp to 280 °C, hold for 2.5 minutes
Minimum Run Time: 12.1 minutes
Detector: See MS1 Mass Spectrometry Method Parameters

Limitations: See individual instrument validation reports.

Acceptance Criteria:

Selectivity: Target compounds are visually separated and observed as a single peak with a clear, non-splitting apex. Peak fronting/tailing, if observed, does not preclude the detection of closely eluting peaks. A minimum S/N $=3_{pk=pk}$ is observed, including a low level (0.5%) marker compound. The earliest eluting compound was within the minimum acceptable retention time for the method ($k=2t_0$) and/or fulfilled the repeatability and reproducibility acceptance criteria.

Repeatability: Individual retention times measured for representative compounds are within 0.1 minutes of the average of 30 injections, and/or the individual relative retention times are within 1% of the average of 30 injections.

Reproducibility: Individual retention times measured for representative compounds during six weeks are within 0.1 minutes of the values measured on week one, and/or the individual relative retention times during six weeks are within 1% of the values measured on week one.

SFL7

Method: AUTO180

Separation of Controlled and Non-controlled Substances by Gas Chromatography

Scope: General purpose

Sample Preparation:

Samples are typically prepared in the 1-10 mg/mL range in a variety of organic solvents, such as methylene chloride (Me_2Cl_2), methanol (MeOH), chloroform, hexane, petroleum ether, and combinations of the above (such as 9:1 Me_2Cl_2:MeOH). It is recommended that samples are filtered through a cotton-plugged or Kim-wipe® plugged pipet prior to analysis to remove any insoluble material.

Samples may also be base-extracted into an organic solvent. It is recommended that base-extracted samples are either centrifuged or passed through sodium sulfate prior to analysis to remove residual water.

Method Parameters:

Instrument: Agilent, 7890A/7890B (or equivalent) GC, 5975C/5977A/5977B (or equivalent) MSD
Column Type and Dimensions: HP-1, 12 m x 200 µm x 0.33 µm
Inlet Temperature: 250 °C
Minimum Injection Volume: 1.0 µL injection
Injection Mode: split
Maximum Split Ratio: 225:1 (Note: parameter is instrument-specific)
Carrier Gas and Flow: He column flow, 1.0 mL/minute
Control Mode: System operated at constant flow.
Oven Program Set Points: 180 °C for 1.2 minutes, then 25 °C/minute ramp to 280 °C, hold for 4.5 minutes
Minimum Run Time: 9.7 minutes
Detector: See MS1 Mass Spectrometry Method Parameters

Limitations: See individual instrument validation reports.

Acceptance Criteria:

Selectivity: Target compounds are visually separated and observed as a single peak with a clear, non-splitting apex. Peak fronting/tailing, if observed, does not preclude the detection of closely eluting peaks. A minimum S/N $=3_{pk=pk}$ is observed, including a low level (0.5%) marker compound. The earliest eluting compound was within the minimum acceptable retention time for the method ($k=2t_0$) and/or fulfilled the repeatability and reproducibility acceptance criteria.

Repeatability: Individual retention times measured for representative compounds are within 0.1 minutes of the average of 30 injections, and/or the individual relative retention times are within 1% of the average of 30 injections.

Reproducibility: Individual retention times measured for representative compounds during six weeks are within 0.1 minutes of the values measured on week one, and/or the individual relative retention times during six weeks are within 1% of the values measured on week one.

SFL7

Method: AUTO180_S

Separation of Controlled and Non-controlled Substances by Gas Chromatography

Scope: General purpose

Sample Preparation:

Samples are typically prepared in the 1-10 mg/mL range in a variety of organic solvents, such as methylene chloride (Me_2Cl_2), methanol (MeOH), chloroform, hexane, petroleum ether, and combinations of the above (such as 9:1 Me_2Cl_2:MeOH). It is recommended that samples are filtered through a cotton-plugged or Kim-wipe® plugged pipet prior to analysis to remove any insoluble material.

Samples may also be base-extracted into an organic solvent. It is recommended that base-extracted samples are either centrifuged or passed through sodium sulfate prior to analysis to remove residual water.

Method Parameters:

Instrument: Agilent, 7890A/7890B (or equivalent) GC, 5975C/5977A/5977B (or equivalent) MSD
Column Type and Dimensions: HP-1, 12 m x 200 µm x 0.33 µm
Inlet Temperature: 250 °C
Minimum Injection Volume: 1.0 µL injection
Injection Mode: split
Maximum Split Ratio: 225:1 (Note: parameter is instrument-specific)
Carrier Gas and Flow: He column flow, 1.0 mL/minute
Control Mode: System operated at constant flow.
Oven Program Set Points: 180 °C for 0 minutes, then 25 °C/minute ramp to 280 °C, hold for 0 minutes
Minimum Run Time: 4.0 minutes
Detector: See MS1 Mass Spectrometry Method Parameters

Limitations: See individual instrument validation reports.

Acceptance Criteria:

Selectivity: Target compounds are visually separated and observed as a single peak with a clear, non-splitting apex. Peak fronting/tailing, if observed, does not preclude the detection of closely eluting peaks. A minimum $S/N = 3_{pk=pk}$ is observed, including a low level (0.5%) marker compound. The earliest eluting compound was within the minimum acceptable retention time for the method ($k=2t_0$) and/or fulfilled the repeatability and reproducibility acceptance criteria.

Repeatability: Individual retention times measured for representative compounds are within 0.1 minutes of the average of 30 injections, and/or the individual relative retention times are within 1% of the average of 30 injections.

Reproducibility: Individual retention times measured for representative compounds during six weeks are within 0.1 minutes of the values measured on week one, and/or the individual relative retention times during six weeks are within 1% of the values measured on week one.

SFL7

Method: AUTOSTER

Separation of Controlled and Non-controlled Substances by Gas Chromatography

Scope: General purpose

Sample Preparation:

Samples are typically prepared in the 1-10 mg/mL range in a variety of organic solvents, such as methylene chloride (Me_2Cl_2), methanol (MeOH), chloroform, hexane, petroleum ether, and combinations of the above (such as 9:1 Me_2Cl_2:MeOH). It is recommended that samples are filtered through a cotton-plugged or Kim-wipe® plugged pipet prior to analysis to remove any insoluble material.

Samples may also be base-extracted into an organic solvent. It is recommended that base-extracted samples are either centrifuged or passed through sodium sulfate prior to analysis to remove residual water.

Method Parameters:

Instrument: Agilent, 7890A/7890B (or equivalent) GC, 5975C/5977A/5977B (or equivalent) MSD
Column Type and Dimensions: HP-1, 12 m x 200 µm x 0.33 µm
Inlet Temperature: 250 °C
Minimum Injection Volume: 1.0 µL injection
Injection Mode: split
Maximum Split Ratio: 225:1 (Note: parameter is instrument-specific)
Carrier Gas and Flow: He column flow, 1.0 mL/minute
Control Mode: System operated at constant flow.
Oven Program Set Points: 180 °C for 1.2 minutes, then 25 °C/minute ramp to 280 °C, hold for 7 minutes
Minimum Run Time: 9.7 minutes
Detector: See MS1 Mass Spectrometry Method Parameters

Limitations: See individual instrument validation reports.

Acceptance Criteria:

Selectivity: Target compounds are visually separated and observed as a single peak with a clear, non-splitting apex. Peak fronting/tailing, if observed, does not preclude the detection of closely eluting peaks. A minimum S/N $=3_{pk=pk}$ is observed, including a low level (0.5%) marker compound. The earliest eluting compound was within the minimum acceptable retention time for the method ($k=2t_0$) and/or fulfilled the repeatability and reproducibility acceptance criteria.

Repeatability: Individual retention times measured for representative compounds are within 0.1 minutes of the average of 30 injections, and/or the individual relative retention times are within 1% of the average of 30 injections.

Reproducibility: Individual retention times measured for representative compounds during six weeks are within 0.1 minutes of the values measured on week one, and/or the individual relative retention times during six weeks are within 1% of the values measured on week one.

SFL7

Method: MS1

Identification of Controlled and Non-controlled Substances by Mass Spectrometry (EI)

Scope: General purpose

Sample Preparation:

GC effluent

Method Parameters:

Instrument: Agilent, 7890A/7890B (or equivalent) GC, 5975C/5977A/5977B (or equivalent) MSD
Mass Analyzer: Quadrapole
Ionization Mode: Electron ionization, 70eV
Scan Range: 35-550 amu
Scan Rate: N=2
Quad Temperature: 150 °C
Source Temperature: 230 °C
Transfer Line Temperature: 280 °C
Tune Type: stune.u

Limitations: See individual instrument validation reports.

Acceptance Criteria:

Accuracy: Analyte spectra are compared to a verified reference database, commercial library, published literature spectra or spectra from another ISO/IEC 17025 accredited laboratory. The overall sample spectral pattern corresponds to that of the reference spectrum. The measured m/z values for prominent ions in the sample spectrum are of the same nominal mass as those in the reference spectrum. The molecular ion is present in the sample spectrum if it is present in the reference spectrum. No prominent unexplainable extraneous ions are observed in the sample spectrum.

Repeatability and Reproducibility: The repeatability and reproducibility of confirmatory methods is established via evaluation of system-wide historical spectral data.

SFL7

Method: LTMSCREEN

Separation of Controlled and Non-controlled Substances by Gas Chromatography (with LTM unit)

Scope: General purpose

Sample Preparation:

Samples are typically prepared in the 1-10 mg/mL range in a variety of organic solvents, such as methylene chloride (Me_2Cl_2), methanol (MeOH), chloroform, hexane, petroleum ether, and combinations of the above (such as 9:1 Me_2Cl_2:MeOH). It is recommended that samples are filtered through a cotton-plugged or Kim-wipe® plugged pipet prior to analysis to remove any insoluble material.

Samples may also be base-extracted into an organic solvent. It is recommended that base-extracted samples are either centrifuged or passed through sodium sulfate prior to analysis to remove residual water.

Method Parameters:

Instrument: Agilent, 7890A/7890B (or equivalent) GC, 5975C/5977A/5977B (or equivalent) MSD
Column Type and Dimensions: Pre-column: DB-5MS 0.3 m x 0.18 mm x 0.18 µm; purged ultimate union joint; Analytical Column: DB-5MS 15 m x 0.25 mm x 0.25 µm
Minimum Injection Volume: 1.0 µL injection
Inlet Temperature: 280 °C
Injection Mode: split
Maximum Split Ratio: 100:1 (Note: parameter is instrument-specific)
Carrier Gas and Flow: He column flow, 3.25 mL/minute
Control Mode: System operated at constant flow.
Oven Program Set Points: LTM at 100 °C then 80 °C/minute ramp to 300 °C, hold at 300 °C; main oven at 300 °C for 4.0 minutes
Minimum Run Time: 4.0 minutes
Detector: See LTMMS1 Mass Spectrometry Method Parameters

Limitations: See individual instrument validation reports.

Acceptance Criteria:

Selectivity: Target compounds are visually separated and observed as a single peak with a clear, non-splitting apex. Peak fronting/tailing, if observed, does not preclude the detection of closely eluting peaks. A minimum S/N $=3_{pk=pk}$ is observed, including a low level (0.5%) marker compound. The earliest eluting compound was within the minimum acceptable retention time for the method ($k=2t_0$) and/or fulfilled the repeatability and reproducibility acceptance criteria.

Repeatability: Individual retention times measured for representative compounds are within 0.1 minutes of the average of 30 injections, and/or the individual relative retention times are with 1% of the average of 30 injections.

Reproducibility: Individual retention times measured for representative compounds during six weeks are within 0.1 minutes of the values measured on week one, and/or the individual relative retention times during six weeks are with 1% of the values measured on week one.

SFL7

Method: LTMMS1

Identification of Controlled and Non-controlled Substances by Mass Spectrometry (EI with LTM unit)

Scope: General purpose

Sample Preparation:

GC effluent

Method Parameters:

Instrument: Agilent 7890A/7890B (or equivalent) GC, 5975C/5977A/5977B (or equivalent) MSD
Mass Analyzer: Quadrapole
Ionization Mode: Electron ionization, 70eV
Scan Range: 34-550 amu
Scan Rate: N=1
Quad Temperature: 150 °C
Source Temperature: 230 °C
Transfer Line Temperature: 280 °C
Tune Type: stune.u

Limitations: See individual instrument validation reports.

Acceptance Criteria:

Accuracy: Analyte spectra are compared to a verified reference database, commercial library, published literature spectra or spectra from another ISO/IEC 17025 accredited laboratory. The overall sample spectral pattern corresponds to that of the reference spectrum. The measured m/z values for prominent ions in the sample spectrum are of the same nominal mass as those in the reference spectrum. The molecular ion is present in the sample spectrum if it is present in the reference spectrum. No prominent unexplainable extraneous ions are observed in the sample spectrum.

Repeatability and Reproducibility: The repeatability and reproducibility of confirmatory methods is established via evaluation of system-wide historical spectral data.

SFL7

Method: FTIR-ATR Single Bounce

Identification of Controlled and Non-controlled Substances by Solid-Phase Infrared Spectroscopy

Scope: General purpose

Sample Preparation:

Samples will be analyzed either by direct analysis or via extraction with any appropriate solvent, including, but not limited to methanol, chloroform, acetone, petroleum ether, ethyl ether, methylene chloride, ethyl acetate, xylene, and hexane, or any combination thereof.

Method Parameters:

Instrument: Thermo Scientific Nicolet iS10
Number of Background Scans: 16 Scans
Minimum Number of Sample Scans: 16 Scans
Scan Range: 540-4000 cm^{-1}
Sample Gain: 2.0
Resolution: 4.000 cm^{-1}
Optical Velocity: 0.4747 cm/s
Aperture: 80.00
Accessory: Smart iTR, Smart Golden Gate MKII (or equivalent)

Limitations: See individual instrument validation reports.

Acceptance Criteria:

Accuracy: Analyte spectra are compared to a verified reference database, commercial library, published spectra or spectra from another ISO/IEC 17025 accredited laboratory. The overall sample spectral pattern corresponds to that of the reference spectrum and the prominent, well-defined, measured signals in the sample spectrum were all within 4 cm^{-1} of those in the reference spectrum. No prominent extraneous signals are observed in the sample spectrum.

Repeatability and Reproducibility: The repeatability and reproducibility of confirmatory methods is established via evaluation of system-wide historical spectral data.

SFL7

Method: NMR Maleic/D2O

Identification of Controlled and Non-controlled Substances by Nuclear Resonance Spectroscopy

Scope: General purpose (Proton)

Procedure:

Samples are typically prepared in the 30-50 mg/mL range by dissolving the sample in a prepared solution of maleic acid internal standard in D_2O with TSP reference. Vortex or sonicate until the sample is dissolved. Filter through a cotton-plugged or kim-wipe plugged pipet into an NMR tube.

Note: The sample and standard ***must*** be prepared in the same solvent (e.g., maleic acid/D_2O).

Method Parameters:

Instrument:	400 MHz Agilent/Varian NMR Specgtrometer with and indirect detection probe
Minimum Spectral Range (ppm):	-3 ppm – 13 ppm
Minimum Delay between Pulses (seconds):	45 seconds (or 5* maximum T1 relaxation rate))
Minimum Pulse Width (degrees):	90 and less than 10 microseconds
Minimum Number of Scans:	1 (lower S/N will require additional scans)
Minimum Acquisition Time:	3 minutes (dependent on the number of scans)

Limitations: See individual instrument validation reports.

Acceptance Criteria (unless otherwise noted in individual validation report):

Accuracy: Analyte spectra are compared to a verified reference database, commercial library, published literature spectra, or spectra from another ISO/IEC 17025. Overall sample spectral pattern corresponds to that of the reference spectrum acquired using the same solvent. All signals in the sample spectra were within 0.2ppm (^{1}H-NMR), or 2 ppm (^{13}C-NMR) of those in the reference spectrum. No unexplainable extraneous signals are observed in the sample spectrum.

Repeatability and Reproducibility: The repeatability and reproducibility of confirmatory methods is established via evaluation of system-wide historical spectral data.

7-AMPGC1 – Quantitation of Amphetamine by Gas Chromatography

Scope

Samples containing amphetamine hydrochloride and/or amphetamine sulfate

Procedure:

Accurately pipette an aliquot of internal standard stock solution into each of four test tubes. Then:

- Accurately pipette an aliquot of standard stock solution into the first tube.
- Accurately pipette an aliquot of sample stock solution into the second test tube.
- Accurately pipette an aliquot of QC high stock solution into the third test tube.
- Accurately pipette an aliquot of QC low stock solution into the fourth test tube.

Note: The aliquot must be of the same volume for each solution.
To each test tube add 1 mL of basing solution. Cap tightly and shake for 30 seconds. Allow layers to separate and dry several mL of the organic layer through anhydrous sodium sulfate.

Internal Standard Stock Solution:

Approximately 0.7 mg/mL tridecane in methylene chloride.

Standard Stock Solution:

Approximately 1mg/mL amphetamine sulfate in deionized water (accurately weighed and diluted to volume)

Sample Stock Solution:

Accurately weigh the sample into a volumetric flask and dilute to volume with deionized water so that the final amphetamine concentration is approximately 1mg/mL.

Quality Control Solutions:

Prepare two QC solutions for use as positive controls during quantitative analysis. These two solutions are prepared such that their target analyte concentrations represent the low and high ends of the method's working range.

Basing Solution:

10% sodium hydroxide in H_2O

Chromatographic System:

Instrument: Gas Chromatograph HP/Agilent 7890 equipped with an FID detector (or equivalent)
Column: HP-1 12 m × 0.20 mm × 0.33 µm cross-linked methyl siloxane
Inlet Temperature: 180 °C
Mode: Split
Split Ratio: 30:1
Carrier Gas: H_2
Carrier Gas Flow Rate: 2.0 mL/minute
Control Mode: System operated at constant flow.
Make-up Gas: He or N_2
Oven Program: Isothermal, 120 °C – 135 °C (Adjust to elute amphetamine between 0.5 and 1.5 minutes)
Total Run Time: 2.5 – 3.0 minutes
Detector Temperature: 300 °C
Injection Volume: 1.0 µL injection
Injection Solvent: methylene chloride (base extracted)

Limitations:

If phenyl-2-propanone is present in the sample, lower the initial temperature sufficiently and increase the initial time to achieve baseline separation. Phenylpropanolamine co-elutes with the internal standard tridecane.

Acceptance Criteria:

Selectivity: Amphetamine and tridecane resolved (R ≥1.5) from each compound tested (note limitation above).
Linearity: The calculated correlation coefficient for at least seven compounds tested is 0.9999.
Repeatability: Relative Standard Deviation (RSD) for each concentration tested was less than 2%.
Accuracy: Experimentally measured purity (expressed in % w/w) within ± 5% relative to the known prepared purity.

Working Range:

0.50 – 2.0 mg/mL Amphetamine

Notes:

The conversion factor from amphetamine sulfate to amphetamine hydrochloride is 0.9317.

7-BZPGC1 – Quantitation of 1-Benzylpiperazine (BZP) by Gas Chromatography

Scope

Samples containing 1-benzylpiperazine hydrochloride

Procedure:

Accurately pipette an aliquot of internal standard stock solution into each of four test tubes. Then:

- Accurately pipette an aliquot of standard stock solution into the first tube.
- Accurately pipette an aliquot of sample stock solution into the second test tube.
- Accurately pipette an aliquot of QC high stock solution into the third test tube.
- Accurately pipette an aliquot of QC low stock solution into the fourth test tube.

Note: The aliquot must be of the same volume for each solution.

To each test tube add 1 mL of basing solution. Cap tightly and shake for 30 seconds. Allow layers to separate and dry several mL of the organic layer through anhydrous sodium sulfate.

Internal Standard Stock Solution:

Approximately 0.6 mg/mL hexadecane in methylene chloride.

Standard Stock Solution:

Approximately 1mg/mL BZP dihydrochloride in deionized water (accurately weighed and diluted to volume).

Sample Stock Solution:

Accurately weigh the sample into a volumetric flask and dilute to volume with deionized water so that the final BZP concentration is approximately 1mg/mL.

Quality Control Solutions:

Prepare two QC solutions for use as positive controls during quantitative analysis. These two solutions are prepared such that their target analyte concentrations represent the low and high ends of the method's working range.

Basing Solution:

10% sodium hydroxide in H_2O

Chromatographic System:

Instrument: Gas Chromatograph HP/Agilent 7890 equipped with an FID detector (or equivalent)
Column: HP-1 12 m × 0.20 mm × 0.33 µm cross-linked methyl siloxane
Inlet Temperature: 180 °C
Mode: Split
Split Ratio: 30:1
Carrier Gas: H_2
Carrier Gas Flow Rate: 2.0 mL/minute
Control Mode: System operated at constant flow.
Make-up Gas: He or N_2
Oven Program: Isothermal, 140 °C
Total Run Time: 4.0 minutes
Detector Temperature: 300 °C
Injection Volume: 1.0 µL injection
Injection Solvent: methylene chloride (base extracted)

Limitations:

This method is not suitable for the quantitation of 1-benzylpiperazine base in solution.

Acceptance Criteria:

Selectivity: BZP and hexadecane resolved (R ≥1.5) from each compound tested.
Linearity: The calculated correlation coefficient for at least seven compounds tested is 0.9998.
Repeatability: Relative Standard Deviation (RSD) for each concentration tested was less than 2%.
Accuracy: Experimentally measured purity (expressed in % w/w) within ± 5% relative to the known prepared purity.

Working Range:

0.26 – 2.07 mg/mL BZP

Notes:

The quantitation standard is 1-benzylpiperazine dihydrochloride. The conversion factor for the dihydrochloride salt to the monohydrochloride salt is 0.853.

7-EPHGC1 – Quantitation of Ephedrine or Pseudoephedrine by Gas Chromatography

Scope

Samples containing ephedrine or pseudoephedrine hydrochloride

Procedure:

Accurately pipette an aliquot of internal standard stock solution into each of four test tubes. Then:

- Accurately pipette an aliquot of standard stock solution into the first tube.
- Accurately pipette an aliquot of sample stock solution into the second test tube.
- Accurately pipette an aliquot of QC high stock solution into the third test tube.
- Accurately pipette an aliquot of QC low stock solution into the fourth test tube.

Note: The aliquot must be of the same volume for each solution.

To each test tube add 1 mL of basing solution. Cap tightly and shake for 30 seconds. Allow layers to separate and dry several mL of the organic layer through anhydrous sodium sulfate.

Internal Standard Stock Solution:

Approximately 0.6 mg/mL pentadecane in methylene chloride.

Standard Stock Solution:

Approximately 1mg/mL (pseudo)ephedrine hydrochloride in 9:1 methylene chloride:methamol (accurately weighed and diluted to volume).

Sample Stock Solution:

Accurately weigh the sample into a volumetric flask and dilute to volume with 9:1 methylene chloride:methanol so that the final (pseudo)ephedrine concentration is approximately 1mg/mL.

Quality Control Solutions:

Prepare two QC solutions for use as positive controls during quantitative analysis. These two solutions are prepared such that their target analyte concentrations represent the low and high ends of the method's working range.

Basing Solution:

10% sodium hydroxide in H_2O

Chromatographic System:

Instrument: Gas Chromatograph HP/Agilent 7890 equipped with an FID detector (or equivalent)
Column: HP-1 12 m × 0.20 mm × 0.33 µm cross-linked methyl siloxane
Inlet Temperature: 180 °C
Mode: Split
Split Ratio: 30:1
Carrier Gas: H_2
Carrier Gas Flow Rate: 2.0 mL/minute
Control Mode: System operated at constant flow.
Make-up Gas: He or N_2
Oven Program: Isothermal, 150 °C (Adjust to elute (pseudo)ephedrine between 0.5 and 1.5 minutes.
Total Run Time: 2.5 - 4.0 minutes
Detector Temperature: 300 °C
Injection Volume: 1.0 µL injection
Injection Solvent: 9:1 methylene chloride:methanol (base extracted)

Limitations:

This method does not distinguish between pseudoephedrine and ephedrine. The standard must correspond to the sample compound.

Acceptance Criteria:

Selectivity: (Pseudo)ephedrine and pentadecane resolved (R ≥1.5) from each compound tested.
Linearity: The calculated correlation coefficient for at least seven compounds tested is 0.9998.
Repeatability: Relative Standard Deviation (RSD) for each concentration tested was less than 2%.
Accuracy: Experimentally measured purity (expressed in % w/w) within ± 5% relative to the known prepared purity.

Working Range:

0.50 – 1.50 mg/mL (Pseudo)ephedrine

Notes:

7-EPHLC2 – Quantitation of Ephedrine by High performance Liquid Chromatography

Scope

Samples containing ephedrine hydrochloride

Procedure:

Inject between 2 µL and 7 µL of standard, sample, and QC solutions (described below).

Buffer Preparation:

To 4000 mL HPLC grade water, add 30 mL conc. H_3PO_4, 10g NaOH, 8 mL hexylamine, and 100 mg NaN_3.

Standard Stock Solution:

Accurately weigh ephedrine hydrochloride and dilute to volume with water to achieve a target concentration of approximately 0.2 mg/mL ephedrine hydrochloride. Filter through a 0.45 µm filter.

Sample Stock Solution:

Accurately weigh the sample and dilute to volume with water so that the final concentration is approximately 0.2mg/mL ephedrine hydrochloride. Filter through a 0.45 µm filter.

Quality Control Solutions:

Prepare two QC solutions for use as positive controls during quantitative analysis. These two solutions are prepared such that their target analyte concentrations represent the low and high ends of the method's working range. Filter through 0.45 µm filter.

Chromatographic System:

Instrument: Liquid Chromatograph HP/Agilent 1100/1200 series, equipped with a diode array detector (or equivalent)
Column: Phenomenex Aqua (or equivalent) 5 µm C18, 150mm x 4.6 mm
Column Temperature: 35 °C
Mobile Phase: NaHAP: ACN (95.5:4.5)
Flow Rate: 1.5 mL/minute
Minimum Run Time: 7.0 minutes
Injection Volume: 2.0 – 7.0 µL injection
Detector: UV, diode array or 210 nm

Limitations: N/A

Acceptance Criteria:

Selectivity: Ephedrine resolved (R ≥1.5) from each compound tested.
Linearity: The calculated correlation coefficient for at least seven compounds tested is 0.9996.
Repeatability: Relative Standard Deviation (RSD) for each concentration tested was less than 2.5%.
Accuracy: Experimentally measured purity (expressed in % w/w) within ± 5% relative to the known prepared purity.

Working Range:

0.10 – 0.40 mg/mL Ephedrine

Notes:

Incorporate any injection volume changes into the final purity calculation.

7-HDCGC1 – Quantitation of Hydrocodone by Gas Chromatography

Scope

Samples containing hydrocodone bitartrate and/or hydrocodone hydrochloride

Procedure:

Accurately pipette an aliquot of internal standard stock solution into each of four test tubes. Then:

- Accurately pipette an aliquot of standard stock solution into the first tube.
- Accurately pipette an aliquot of sample stock solution into the second test tube.
- Accurately pipette an aliquot of QC high stock solution into the third test tube.
- Accurately pipette an aliquot of QC low stock solution into the fourth test tube.

Note: The aliquot must be of the same volume for each solution.

To each test tube add 1 mL of basing solution. Cap tightly and shake for 30 seconds. Allow layers to separate and dry several mL of the organic layer through anhydrous sodium sulfate.

Internal Standard Stock Solution:

Approximately 0.6 mg/mL octacosane in methylene chloride.

Standard Stock Solution:

Approximately 1mg/mL hydrocodone bitartrate in deionized water (accurately weighed and diluted to volume)

Sample Stock Solution:

Accurately weigh the sample into a volumetric flask and dilute to volume with deionized water so that the final hydrocodone concentration is approximately 1mg/mL.

Quality Control Solutions:

Prepare two QC solutions for use as positive controls during quantitative analysis. These two solutions are prepared such that their target analyte concentrations represent the low and high ends of the method's working range.

Basing Solution:

10% sodium hydroxide in H_2O

Chromatographic System:

Instrument: Gas Chromatograph HP/Agilent 7890 equipped with an FID detector (or equivalent)
Column: HP-1 12 m × 0.20 mm × 0.33 µm cross-linked methyl siloxane
Inlet Temperature: 270 °C
Mode: Split
Split Ratio: 30:1
Carrier Gas: H_2
Carrier Gas Flow Rate: 2.0 mL/minute
Control Mode: System operated at constant flow.
Make-up Gas: He or N_2
Oven Program: Isothermal, 260 °C (Adjust to elute hydrocodone between 0.5 and 1.5 minutes.)
Total Run Time: 2.5 - 3.0 minutes
Detector Temperature: 300 °C
Injection Volume: 1.0 µL injection
Injection Solvent: methylene chloride (base extracted)

Limitations:

For pharmaceutical preparations with a relatively low dosage of hydrocodone within a tablet matrix, utilize the alternate low-purity sample preparation modification to ensure complete hydrocodone recovery.

Acceptance Criteria:

Selectivity: Hydrocodone and octacosane resolved ($R \geq 1.5$) from each compound tested.
Linearity: The calculated correlation coefficient for at least seven compounds tested is 0.9999.
Repeatability: Relative Standard Deviation (RSD) for each concentration tested was less than 3%.
Accuracy: Experimentally measured purity (expressed in % w/w) within ± 5% relative to the known prepared purity.

Working Range:

0.10 – 2.0 mg/mL Hydrocodone

Notes:

The conversion factor from hydrocodone bitartrate to hydrochloride hydrochloride is 0.7163.

Low-Purity Modification for Solid Samples of Purity >5%

Procedure:

Prepare the standard solution as described above.

For the sample solution, accurately weigh the sample into a screw-cap test tube so that the actual hydrocodone concentration is approximately 1 mg/mL (within a 4.0 or 5.0 mL volume). Accurately pipette an aliquot of water into the test tube.

Accurately pipette an aliquot of internal standard stock solution into the sample test tube. The aliquot (4.00 or 5.00 mL) must be of the same volume for both the sample and internal standard stock solution.

To each test tube add 1mL basing solution. Cap tightly and shake very well for 30 seconds. Allow the layers to separate and dry several mL of the organic layer through anhydrous sodium sulfate.

7-KETGC1 – Quantitation of Ketamine by Gas Chromatography

Scope

Samples containing ketamine hydrochloride or ketamine base

Procedure (solids):

Accurately pipette an aliquot of internal standard stock solution into each of four test tubes. Then:

- Accurately pipette an aliquot of standard stock solution into the first tube.
- Accurately pipette an aliquot of sample stock solution into the second test tube.
- Accurately pipette an aliquot of QC high stock solution into the third test tube.
- Accurately pipette an aliquot of QC low stock solution into the fourth test tube.

Note: The aliquot must be of the same volume for each solution.

To each test tube add 1 mL of basing solution. Cap tightly and shake for 30 seconds. Allow layers to separate and dry several mL of the organic layer through anhydrous sodium sulfate.

Internal Standard Stock Solution:

Approximately 0.6 mg/mL eicosane in methylene chloride.

Standard Stock Solution:

Approximately 1mg/mL ketamine hydrochloride in 9:1 methylene chloride:methanol (accurately weighed and diluted to volume).

Sample Stock Solution:

Accurately weigh the sample into a volumetric flask and dilute to volume with methylene chloride so that the final ketamine concentration is approximately 1mg/mL.

Quality Control Solutions:

Prepare two QC solutions for use as positive controls during quantitative analysis. These two solutions are prepared such that their target analyte concentrations represent the low and high ends of the method's working range.

Basing Solution:

Prepare a saturated solution of sodium bicarbonate.

Chromatographic System:

Instrument: Gas Chromatograph HP/Agilent 7890 equipped with an FID detector (or equivalent)
Column: HP-1 12 m × 0.20 mm × 0.33 µm cross-linked methyl siloxane
Inlet Temperature: 180 °C
Mode: Split
Split Ratio: 30:1
Carrier Gas: H_2
Carrier Gas Flow Rate: 2.0 mL/minute
Control Mode: System operated at constant flow.
Make-up Gas: He or N_2
Oven Program: Isothermal, 240 °C (Adjust to elute ketamine between 0.5 and 1.5 minutes.)
Total Run Time: 2.5 - 3.0 minutes
Detector Temperature: 280 °C
Injection Volume: 1.0 µL injection
Injection Solvent: methylene chloride (base extracted)

Limitations: N/A

Acceptance Criteria:

Selectivity: Ketamine and eicosane resolved (R ≥1.5) from each compound tested.
Linearity: The calculated correlation coefficient for at least seven compounds tested is 0.9999.
Repeatability: Relative Standard Deviation (RSD) for each concentration tested was less than 2%.
Accuracy: Experimentally measured purity (expressed in % w/w) within ± 5% relative to the known prepared purity.

Working Range:

0.10 – 2.0 mg/mL ketamine

Notes:

The conversion factor for ketamine hydrochloride to ketamine base is 0.8661.

Procedure (aqueous solutions):

Prepare the internal standard stock and basing solutions as above. Prepare standard, sample, and QC solutions as follows:

Sample Stock Solution:

Accurately weight and dilute the sample so that the final ketamine concentration is approximately 1 mg/mL in water.

Standard Solution:

Combine within a screw-cap test tube:

- 3.00 mL of the standard stock solution
- 3.00 mL of the internal standard stock solution
- 3.00 mL of water
- 1.0 mL of the basing solution

Sample Solution:

Combine within a screw-cap test tube:

- 3.00 mL of the standard stock solution
- 3.00 mL of the internal standard stock solution
- 3.00 mL of water
- 1.0 mL of the basing solution

QC Sample Solution:

Combine within a screw-cap test tube (one each for QC high and low):

- 3.00 mL of the standard stock solution
- 3.00 mL of the internal standard stock solution
- 3.00 mL of water
- 1.0 mL of the basing solution

Cover each test tube tightly and shake 30 seconds. Allow the layers to separate. Dry several mL of the organic layer through anhydrous sodium sulfate.

7-MDALC2 – Quantitation of 3,4-Methylenedioxyamphetamine (MDA) by High Performance Liquid Chromatography

Scope

Samples containing MDA hydrochloride

Procedure:

Inject between 2 µL and 7 µL of standard, sample, and QC solutions (described below).

Buffer Preparation:

To 4000 mL HPLC grade water, add 30 mL conc. H_3PO_4, 10g NaOH, 8 mL hexylamine, and 100 mg NaN_3.

Standard Stock Solution:

Accurately weigh MDA hydrochloride and dilute to volume with water to achieve a target concentration of approximately 0.2 mg/mL MDA hydrochloride. Filter through a 0.45 µm filter.

Sample Stock Solution:

Accurately weigh the sample and dilute to volume with water so that the final concentration is approximately 0.2mg/mL MDA hydrochloride. Filter through a 0.45 µm filter.

Quality Control Solutions:

Prepare two QC solutions for use as positive controls during quantitative analysis. These two solutions are prepared such that their target analyte concentrations represent the low and high ends of the method's working range. Filter through 0.45 µm filter.

Chromatographic System:

Instrument: Liquid Chromatograph HP/Agilent 1100/1200 series, equipped with a diode array detector (or equivalent)
Column: Phenomenex Aqua (or equivalent) 5 µm C18, 150mm x 4.6 mm
Column Temperature: 35 °C
Mobile Phase: NaHAP: CAN (95.5:4.5)
Flow Rate: 1.5 mL/minute
Minimum Run Time: 4.0 minutes
Injection Volume: 2.0 – 7.0 µL injection
Detector: UV, diode array or 210 nm

Limitations: N/A

Acceptance Criteria:

Selectivity: MDA resolved (R ≥1.5) from each compound tested.
Linearity: The calculated correlation coefficient for at least seven compounds tested is 0.9997.
Repeatability: Relative Standard Deviation (RSD) for each concentration tested was less than 2.5%.
Accuracy: Experimentally measured purity (expressed in % w/w) within ± 5% relative to the known prepared purity.

Working Range:

0.10 – 0.4 mg/mL MDA

Notes:

Incorporate any injection volume changes into the final purity calculation.

7-MDMAGC1 – Quantitation of 3,4-Methylenedioxymethamphetamine (MDMA) by Gas Chromatography

Scope

Samples containing MDMA hydrochloride in powders, solid dosage forms, and aqueous solutions.

Procedure:

Accurately pipette an aliquot of internal standard stock solution into each of four test tubes. Then:

- Accurately pipette an aliquot of standard stock solution into the first tube.
- Accurately pipette an aliquot of sample stock solution into the second test tube.
- Accurately pipette an aliquot of QC high stock solution into the third test tube.
- Accurately pipette an aliquot of QC low stock solution into the fourth test tube.

Note: The aliquot must be of the same volume for each solution.

To each test tube add 1 mL of basing solution. Cap tightly and shake for 30 seconds. Allow layers to separate and dry several mL of the organic layer through anhydrous sodium sulfate.

Internal Standard Stock Solution:

Approximately 0.6 mg/mL heptadecane in methylene chloride.

Standard Stock Solution:

Approximately 1mg/mL MDMA hydrochloride in deionized water (accurately weighed and diluted to volume).

Sample Stock Solution:

Accurately weigh the sample into a volumetric flask and dilute to volume with deionized water so that the final MDMA concentration is approximately 1mg/mL.

Quality Control Solutions:

Prepare two QC solutions for use as positive controls during quantitative analysis. These two solutions are prepared such that their target analyte concentrations represent the low and high ends of the method's working range.

Basing Solution:

10% sodium hydroxide in H_2O

Chromatographic System:

Instrument: Gas Chromatograph HP/Agilent 7890 equipped with an FID detector (or equivalent)
Column: HP-1 12 m × 0.20 mm × 0.33 µm cross-linked methyl siloxane
Inlet Temperature: 180 °C
Mode: Split
Split Ratio: 30:1
Carrier Gas: H_2
Carrier Gas Flow Rate: 2.0 mL/minute
Control Mode: System operated at constant flow.
Make-up Gas: He or N_2
Oven Program: Isothermal, 160 °C (Adjust to elute MDMA between 1.0 and 1.5 minutes.)
Total Run Time: 2.5 - 3.0 minutes
Detector Temperature: 300 °C
Injection Volume: 1.0 µL injection
Injection Solvent: methylene chloride (base extracted)

Limitations:

MDMA may not be sufficiently resolved if 1-(3-trifluoromethylphenyl)-piperazine (TFMPP) is present in the sample.

Acceptance Criteria:

Selectivity: MDMA and heptadecane resolved (R ≥1.5) from each compound tested.
Linearity: The calculated correlation coefficient for at least seven compounds tested is 0.9999.
Repeatability: Relative Standard Deviation (RSD) for each concentration tested was less than 2%.
Accuracy: Experimentally measured purity (expressed in % w/w) within ± 5% relative to the known prepared purity.

Working Range:

0.20 – 2.0 mg/mL MDMA

Notes:

7-MDMALC2 – Quantitation of 3,4-Methylenedioxymethamphetamine (MDMA) by High Performance Liquid Chromatography

Scope

Samples containing MDMA hydrochloride

Procedure:

Inject between 2 µL and 7 µL of standard, sample, and QC solutions (described below).

Buffer Preparation:

To 4000 mL HPLC grade water, add 30 mL conc. H_3PO_4, 10g NaOH, 8 mL hexylamine, and 100 mg NaN_3.

Standard Stock Solution:

Accurately weigh MDMA hydrochloride and dilute to volume with water to achieve a target concentration of approximately 0.2 mg/mL MDMA hydrochloride. Filter through a 0.45 µm filter.

Sample Stock Solution:

Accurately weigh the sample and dilute to volume with water so that the final concentration is approximately 0.2mg/mL ephedrine hydrochloride. Filter through a 0.45 µm filter.

Quality Control Solutions:

Prepare two QC solutions for use as positive controls during quantitative analysis. These two solutions are prepared such that their target analyte concentrations represent the low and high ends of the method's working range. Filter through 0.45 µm filter.

Chromatographic System:

Instrument: Liquid Chromatograph HP/Agilent 1100/1200 series, equipped with a diode array detector (or equivalent)
Column: Phenomenex Aqua (or equivalent) 5 µm C18, 150mm x 4.6 mm
Column Temperature: 35 °C
Mobile Phase: NaHAP: ACN (95.5:4.5)
Flow Rate: 1.5 mL/minute
Minimum Run Time: 8.0 minutes
Injection Volume: 2.0 – 7.0 µL injection
Detector: UV, diode array or 210 nm

Limitations: N/A

Acceptance Criteria:

Selectivity: MDMA resolved (R ≥1.5) from each compound tested.
Linearity: The calculated correlation coefficient for at least seven compounds tested is 0.9999.
Repeatability: Relative Standard Deviation (RSD) for each concentration tested was less than 2.0%.
Accuracy: Experimentally measured purity (expressed in % w/w) within ± 5% relative to the known prepared purity.

Working Range:

0.10 – 0.4 mg/mL MDMA

Notes:

Incorporate any injection volume changes into the final purity calculation.

7-METHGC1 – Quantitation of Methamphetamine by Gas Chromatography

Scope

Samples containing salts of methamphetamine

Procedure:

Accurately pipette an aliquot of internal standard stock solution into each of four test tubes. Then:

- Accurately pipette an aliquot of standard stock solution into the first tube.
- Accurately pipette an aliquot of sample stock solution into the second test tube.
- Accurately pipette an aliquot of QC high stock solution into the third test tube.
- Accurately pipette an aliquot of QC low stock solution into the fourth test tube.

Note: The aliquot must be of the same volume for each solution.

To each test tube add 1 mL of basing solution. Cap tightly and shake for 30 seconds. Allow layers to separate and dry several mL of the organic layer through anhydrous sodium sulfate.

Internal Standard Stock Solution:

Approximately 0.6 mg/mL tridecane in methylene chloride.

Standard Stock Solution:

Approximately 1mg/mL methamphetamine in deionized water (accurately weighed and diluted to volume)

Sample Stock Solution:

Accurately weigh the sample into a volumetric flask and dilute to volume with deionized water so that the final methamphetamine concentration is approximately 1mg/mL.

Quality Control Solutions:

Prepare two QC solutions for use as positive controls during quantitative analysis. These two solutions are prepared such that their target analyte concentrations represent the low and high ends of the method's working range.

Basing Solution:

10% sodium hydroxide in H_2O

Chromatographic System:

Instrument: Gas Chromatograph HP/Agilent 7890 equipped with an FID detector (or equivalent)
Column: HP-1 12 m × 0.20 mm × 0.33 µm cross-linked methyl siloxane
Inlet Temperature: 180 °C
Mode: Split
Split Ratio: 30:1 or 50:1
Carrier Gas: H_2
Carrier Gas Flow Rate: 2.0 mL/minute
Control Mode: System operated at constant flow.
Make-up Gas: He or N_2
Oven Program: Isothermal, 110 °C – 125 °C (Adjust to elute methamphetamine between 1.0 and 1.5 minutes)
Total Run Time: 2.5 – 3.0 minutes
Detector Temperature: 300 °C
Injection Volume: 1.0 µL injection
Injection Solvent: methylene chloride (base extracted)

Limitations:

If sample components are present that elute after tridecane, a post run may be necessary to elute the substances prior to the next injection.

Acceptance Criteria:

Selectivity: Methamphetamine and tridecane resolved (R ≥1.5) from all compounds run.
Linearity: The calculated correlation coefficient for at least seven compounds tested is 0.9999.
Repeatability: Relative Standard Deviation (RSD) for each concentration tested was less than 2%.
Accuracy: Experimentally measured purity (expressed in % w/w) within ± 5% relative to the known prepared purity.

Working Range:

0.2 – 2.0 mg/mL Methamphetamine

7-METHLC2 – Quantitation of Methamphetamine by High Performance Liquid Chromatography

Scope

Samples containing methamphetamine hydrochloride

Procedure:

Inject between 2 µL and 7 µL of standard, sample, and QC solutions (described below).

Buffer Preparation:

To 4000 mL HPLC grade water, add 30 mL conc. H_3PO_4, 10g NaOH, 8 mL hexylamine, and 100 mg NaN_3.

Standard Stock Solution:

Accurately weigh methamphetamine hydrochloride and dilute to volume with water to achieve a target concentration of approximately 0.2 mg/mL methamphetamine hydrochloride. Filter through a 0.45 µm filter.

Sample Stock Solution:

Accurately weigh the sample and dilute to volume with water so that the final concentration is approximately 0.2mg/mL ephedrine hydrochloride. Filter through a 0.45 µm filter.

Quality Control Solutions:

Prepare two QC solutions for use as positive controls during quantitative analysis. These two solutions are prepared such that their target analyte concentrations represent the low and high ends of the method's working range. Filter through 0.45 µm filter.

Chromatographic System:

Instrument: Liquid Chromatograph HP/Agilent 1100/1200 series, equipped with a diode array detector (or equivalent)
Column: Phenomenex Aqua (or equivalent) 5 µm C18, 150mm x 4.6 mm
Column Temperature: 35 °C
Mobile Phase: NaHAP: ACN (95.5:4.5)
Flow Rate: 1.5 mL/minute
Minimum Run Time: \6.0 minutes
Injection Volume: 2.0 – 7.0 µL injection
Detector: UV, diode array or 210 nm

Limitations: N/A

Acceptance Criteria:

Selectivity: Methamphetamine resolved (R ≥1.5) from each compound tested.
Linearity: The calculated correlation coefficient for at least seven compounds tested is 0.9999.
Repeatability: Relative Standard Deviation (RSD) for each concentration tested was less than 2.0%.
Accuracy: Experimentally measured purity (expressed in % w/w) within ± 5% relative to the known prepared purity.

Working Range:

0.10 – 0.4 mg/mL methamphetamine

Notes:

Incorporate any injection volume changes into the final purity calculation.

7-OXYGC1 – Quantitation of Oxycodone by Gas Chromatography

Scope

Samples containing oxycodone hydrochloride in powders and other solid dosage forms

Procedure:

Accurately pipette an aliquot of internal standard stock solution into each of four test tubes. Then:

- Accurately pipette an aliquot of standard stock solution into the first tube.
- Accurately pipette an aliquot of sample stock solution into the second test tube.
- Accurately pipette an aliquot of QC high stock solution into the third test tube.
- Accurately pipette an aliquot of QC low stock solution into the fourth test tube.

Note: The aliquot must be of the same volume for each solution.

Cap tightly and shake for 30 seconds. Allow layers to separate and dry several mL of the organic layer through anhydrous sodium sulfate.

Internal Standard Stock Solution:

Approximately 0.6 mg/mL octacosane in methylene chloride.

Standard Stock Solution:

Approximately 1mg/mL oxycodone bitartrate in methanol (accurately weighed and diluted to volume)

Sample Stock Solution:

Accurately weigh the sample into a volumetric flask and dilute to volume with methanol so that the final oxycodone concentration is approximately 1mg/mL.

Quality Control Solutions:

Prepare two QC solutions for use as positive controls during quantitative analysis. These two solutions are prepared such that their target analyte concentrations represent the low and high ends of the method's working range.

Basing Solution:

10% sodium hydroxide in H_2O

Chromatographic System:

Instrument: Gas Chromatograph HP/Agilent 7890 equipped with an FID detector (or equivalent)
Column: HP-1 12 m × 0.20 mm × 0.33 µm cross-linked methyl siloxane
Inlet Temperature: 270 °C
Mode: Split
Split Ratio: 30:1
Carrier Gas: H_2
Carrier Gas Flow Rate: 2.0 mL/minute
Control Mode: System operated at constant flow.
Make-up Gas: He or N_2
Oven Program: Isothermal, 260 °C (Adjust to elute oxycodone between 0.5 and 1.5 minutes.)
Total Run Time: 2.5 - 3.0 minutes
Detector Temperature: 300 °C
Injection Volume: 1.0 µL injection
Injection Solvent: methylene chloride (base extracted)

Limitations:

For pharmaceutical preparations with a relatively low dosage of oxycodone within a tablet matrix, utilize the alternate low-purity sample preparation modification to ensure complete oxycodone recovery.

Acceptance Criteria:

Selectivity: oxycodone and octacosane resolved (R ≥1.5) from each compound tested.
Linearity: The calculated correlation coefficient for at least seven compounds tested is 0.9999.
Repeatability: Relative Standard Deviation (RSD) for each concentration tested was less than 3%.
Accuracy: Experimentally measured purity (expressed in % w/w) within ± 5% relative to the known prepared purity.

Working Range:

0.10 – 2.0 mg/mL oxycodone

Notes:

Low-Purity Modification for Solid Samples of Purity >5%

Procedure:

Prepare the standard and QC solutions as described above, using 9:1 methylene chloride:methanol as the solvent..

For the sample solution, accurately weigh the sample into a screw-cap test tube so that the actual oxycodone concentration is approximately 1 mg/mL (within a 4.0 or 5.0 mL volume). Accurately pipette an aliquot of 9:1 methylene chloride:methanol into the test tube.

Accurately pipette an aliquot of internal standard stock solution into the sample test tube. The aliquot (4.00 or 5.00 mL) must be of the same volume for both the sample and internal standard stock solution.

To each test tube add 1mL basing solution. Cap tightly and shake very well for 30 seconds. Allow the layers to separate and dry several mL of the organic layer through anhydrous sodium sulfate.

7-PCPGC1 – Quantitation of Phencyclidine by Gas Chromatography

Scope

Samples containing phencyclidine (PCP) hydrochloride or base in powders or other solid dosage forms and samples containing PCP base in solution with organic solvent

Procedure:

Accurately pipette an aliquot of internal standard stock solution into each of four test tubes. Then:

- Accurately pipette an aliquot of standard stock solution into the first tube.
- Accurately pipette an aliquot of sample stock solution into the second test tube.
- Accurately pipette an aliquot of QC high stock solution into the third test tube.
- Accurately pipette an aliquot of QC low stock solution into the fourth test tube.

Note: The aliquot must be of the same volume for each solution.

To each test tube add 1 mL of basing solution. Cap tightly and shake for 30 seconds. Allow layers to separate and dry several mL of the organic layer through anhydrous sodium sulfate.

Internal Standard Stock Solution:

Approximately 0.6 mg/mL eicosane in methylene chloride.

Standard Stock Solution:

Approximately 1mg/mL phencyclidine hydrochloride in methylene chloride (accurately weighed and diluted to volume).

Sample Stock Solution:

Accurately weigh the sample into a volumetric flask and dilute to volume with methylene chloride so that the final concentration is approximately 1mg/mL phencyclidine.

Quality Control Solutions:

Prepare two QC solutions for use as positive controls during quantitative analysis. These two solutions are prepared such that their target analyte concentrations represent the low and high ends of the method's working range.

Basing Solution:

10% sodium hydroxide in H_2O

Chromatographic System:

Instrument: Gas Chromatograph HP/Agilent 7890 equipped with an FID detector (or equivalent)
Column: HP-1 12 m × 0.20 mm × 0.33 µm cross-linked methyl siloxane
Inlet Temperature: 240 °C
Mode: Split
Split Ratio: 30:1
Carrier Gas: H_2
Carrier Gas Flow Rate: 2.0 mL/minute
Control Mode: System operated at constant flow.
Make-up Gas: He or N_2
Oven Program: Isothermal, 220 °C (Adjust to elute phencyclidine between 0.5 and 1.5 minutes.)
Total Run Time: 2.5 - 3.0 minutes
Detector Temperature: 280 °C
Injection Volume: 1.0 µL injection
Injection Solvent: methylene chloride (base extracted)

Limitations: N/A

Acceptance Criteria:

Selectivity: Phencyclidine and eicosane resolved (R ≥1.5) from each compound tested.
Linearity: The calculated correlation coefficient for at least seven compounds tested is 0.9999.
Repeatability: Relative Standard Deviation (RSD) for each concentration tested was less than 2%.
Accuracy: Experimentally measured purity (expressed in % w/w) within ± 5% relative to the known prepared purity.

Working Range:

0.50 – 2.0 mg/mL phencyclidine

Notes:

The conversion factor for phencyclidine hydrochloride to phencyclidine base is 0.8697.

7-PSEUDOGC1 – Quantitation of Pseudoephedrine or Ephedrine by Gas Chromatography

Scope

Samples containing pseudoephedrine or ephedrine hydrochloride

Procedure:

Accurately pipette an aliquot of internal standard stock solution into each of four test tubes. Then:

- Accurately pipette an aliquot of standard stock solution into the first tube.
- Accurately pipette an aliquot of sample stock solution into the second test tube.
- Accurately pipette an aliquot of QC high stock solution into the third test tube.
- Accurately pipette an aliquot of QC low stock solution into the fourth test tube.

Note: The aliquot must be of the same volume for each solution.

To each test tube add 1 mL of basing solution. Cap tightly and shake for 30 seconds. Allow layers to separate and dry several mL of the organic layer through anhydrous sodium sulfate.

Internal Standard Stock Solution:

Approximately 0.6 mg/mL pentadecane in methylene chloride.

Standard Stock Solution:

Approximately 1mg/mL (pseudo)ephedrine hydrochloride in 9:1 methylene chloride:methamol (accurately weighed and diluted to volume).

Sample Stock Solution:

Accurately weigh the sample into a volumetric flask and dilute to volume with 9:1 methylene chloride:methanol so that the final concentration is approximately 1mg/mL (pseudo)ephedrine.

Quality Control Solutions:

Prepare two QC solutions for use as positive controls during quantitative analysis. These two solutions are prepared such that their target analyte concentrations represent the low and high ends of the method's working range.

Basing Solution:

10% sodium hydroxide in H_2O

Chromatographic System:

Instrument: Gas Chromatograph HP/Agilent 7890 equipped with an FID detector (or equivalent)
Column: HP-1 12 m × 0.20 mm × 0.33 µm cross-linked methyl siloxane
Inlet Temperature: 180 °C
Mode: Split
Split Ratio: 30:1
Carrier Gas: H_2
Carrier Gas Flow Rate: 2.0 mL/minute
Control Mode: System operated at constant flow.
Make-up Gas: He or N_2
Oven Program: Isothermal, 150 °C (Adjust to elute (pseudo)ephedrine between 0.5 and 1.5 minutes.)
Total Run Time: 2.5 - 4.0 minutes
Detector Temperature: 300 °C
Injection Volume: 1.0 µL injection
Injection Solvent: 9:1 methylene chloride:methanol (base extracted)

Limitations:

This method does not distinguish between pseudoephedrine and ephedrine. The standard must correspond to the sample compound.

Acceptance Criteria:

Selectivity: (Pseudo)ephedrine and pentadecane resolved (R ≥1.5) from each compound tested.
Linearity: The calculated correlation coefficient for at least seven compounds tested is 0.9998.
Repeatability: Relative Standard Deviation (RSD) for each concentration tested was less than 2%.
Accuracy: Experimentally measured purity (expressed in % w/w) within ± 5% relative to the known prepared purity.

Working Range:

0.50 – 1.50 mg/mL (Pseudo)ephedrine

Notes:

7-PSEULC2 – Quantitation of Pseudoephedrine by High Performance Liquid Chromatography

Scope

Samples containing pseudoephedrine hydrochloride

Procedure:

Inject between 2 µL and 7 µL of standard, sample, and QC solutions (described below).

Buffer Preparation:

To 4000 mL HPLC grade water, add 30 mL conc. H_3PO_4, 10g NaOH, 8 mL hexylamine, and 100 mg NaN_3.

Standard Stock Solution:

Accurately weigh pseudoephedrine hydrochloride and dilute to volume with water to achieve a target concentration of approximately 0.2 mg/mL pseudoephedrine hydrochloride. Filter through a 0.45 µm filter.

Sample Stock Solution:

Accurately weigh the sample and dilute to volume with water so that the final concentration is approximately 0.2mg/mL pseudoephedrine hydrochloride. Filter through a 0.45 µm filter.

Quality Control Solutions:

Prepare two QC solutions for use as positive controls during quantitative analysis. These two solutions are prepared such that their target analyte concentrations represent the low and high ends of the method's working range. Filter through 0.45 µm filter.

Chromatographic System:

Instrument: Liquid Chromatograph HP/Agilent 1100/1200 series, equipped with a diode array detector (or equivalent)
Column: Phenomenex Aqua (or equivalent) 5 µm C18, 150mm x 4.6 mm
Column Temperature: 35 °C
Mobile Phase: NaHAP: ACN (95.5:4.5)
Flow Rate: 1.5 mL/minute
Minimum Run Time: 4.0 minutes
Injection Volume: 2.0 – 7.0 µL injection
Detector: UV, diode array or 210 nm

Limitations: N/A

Acceptance Criteria:

Selectivity: Pseudoephedrine resolved (R ≥1.5) from each compound tested.
Linearity: The calculated correlation coefficient for at least seven compounds tested is 0.9999.
Repeatability: Relative Standard Deviation (RSD) for each concentration tested was less than 2.0%.
Accuracy: Experimentally measured purity (expressed in % w/w) within ± 5% relative to the known prepared purity.

Working Range:

0.10 – 0.40 mg/mL Pseudoephedrine

Notes:

Incorporate any injection volume changes into the final purity calculation.