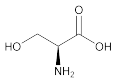
• **UNIFORMITY OF DOSAGE UNITS ⟨905⟩:** Meet the requirements

ADDITIONAL REQUIREMENTS
• **PACKAGING AND STORAGE:** Preserve in well-closed containers.
• **USP REFERENCE STANDARDS ⟨11⟩**
USP Sennosides RS

Serine



$C_3H_7NO_3$ 105.09
L-Serine [56-45-1].

DEFINITION
Serine contains NLT 98.5% and NMT 101.5% of L-serine ($C_3H_7NO_3$), calculated on the dried basis.

IDENTIFICATION
• **A. INFRARED ABSORPTION ⟨197K⟩**

ASSAY
• **PROCEDURE**
Sample: 100 mg of Serine
Blank: Mix 3 mL of formic acid and 50 mL of glacial acetic acid.
Titrimetric system
(See *Titrimetry* ⟨541⟩.)
Mode: Direct titration
Titrant: 0.1 N perchloric acid VS
Endpoint detection: Potentiometric
Analysis: Dissolve the *Sample* in 3 mL of formic acid and 50 mL of glacial acetic acid. Titrate with the *Titrant*. Perform the *Blank* determination.
Calculate the percentage of serine ($C_3H_7NO_3$) in the *Sample* taken:

$$\text{Result} = \{[(V_S - V_B) \times N \times F]/W\} \times 100$$

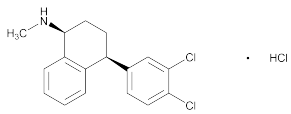
V_S = *Titrant* volume consumed by the *Sample* (mL)
V_B = *Titrant* volume consumed by the *Blank* (mL)
N = actual normality of the *Titrant* (mEq/mL)
F = equivalency factor, 105.1 mg/mEq
W = *Sample* weight (mg)
Acceptance criteria: 98.5%–101.5% on the dried basis

IMPURITIES
• **RESIDUE ON IGNITION ⟨281⟩:** NMT 0.1%
• **CHLORIDE AND SULFATE,** *Chloride* ⟨**221**⟩
Standard solution: 0.50 mL of 0.020 N hydrochloric acid
Sample: 0.73 g of Serine
Acceptance criteria: NMT 0.05%
• **CHLORIDE AND SULFATE,** *Sulfate* ⟨**221**⟩
Standard solution: 0.10 mL of 0.020 N sulfuric acid
Sample: 0.33 g of Serine
Acceptance criteria: NMT 0.03%
• **IRON ⟨241⟩:** NMT 30 ppm
• **HEAVY METALS,** *Method I* ⟨**231**⟩**:** NMT 15 ppm
• **RELATED COMPOUNDS**
System suitability solution: 0.4 mg/mL each of USP L-Serine RS and USP L-Methionine RS in 0.1 N hydrochloric acid
Standard solution: 0.05 mg/mL of USP L-Serine RS in 0.1 N hydrochloric acid. [NOTE—This solution has a concentration equivalent to about 0.5% of that of the *Sample solution*.]
Sample solution: 10 mg/mL of Serine in 0.1 N hydrochloric acid
Chromatographic system
(See *Chromatography* ⟨621⟩, *Thin-Layer Chromatography*.)
Mode: TLC
Adsorbent: 0.25-mm layer of chromatographic silica gel mixture
Application volume: 5 µL
Developing solvent system: Butyl alcohol, glacial acetic acid, and water (3:1:1)
Spray reagent: 2 mg/mL of ninhydrin in a mixture of butyl alcohol and 2 N acetic acid (95:5)
System suitability
Suitability requirements: The chromatogram of the *System suitability solution* exhibits two clearly separated spots.
Analysis
Samples: *System suitability solution*, *Standard solution*, and *Sample solution*.
After air-drying the plate, spray with *Spray reagent*, and heat between 100° and 105° for 15 min. Examine the plate under white light.
Acceptance criteria: Any secondary spot of the *Sample solution* is not larger or more intense than the principal spot of the *Standard solution*.
Individual impurities: NMT 0.5%
Total impurities: NMT 2.0%

SPECIFIC TESTS
• **OPTICAL ROTATION,** *Specific Rotation* ⟨**781S**⟩
Sample solution: 100 mg/mL in 2 N hydrochloric acid
Acceptance criteria: +14.0° to +15.6°
• **LOSS ON DRYING ⟨731⟩:** Dry a sample at 105° for 3 h: it loses NMT 0.2% of its weight.

ADDITIONAL REQUIREMENTS
• **PACKAGING AND STORAGE:** Preserve in well-closed containers.
• **USP REFERENCE STANDARDS ⟨11⟩**
USP L-Methionine RS
USP L-Serine RS

Sertraline Hydrochloride



$C_{17}H_{17}Cl_2N \cdot HCl$ 342.69
1-Naphthalenamine, 4-(3,4-dichlorophenyl)-1,2,3,4-tetrahydro-*N*-methyl-, hydrochloride, (1*S*-*cis*);
(1*S*,4*S*)-4-(3,4-Dichlorophenyl)-1,2,3,4-tetrahydro-*N*-methyl-1-naphthylamine hydrochloride [79559-97-0].

DEFINITION
Sertraline Hydrochloride contains NLT 97.0% and NMT 102.0% of $C_{17}H_{17}Cl_2N \cdot HCl$, calculated on the anhydrous basis.

IDENTIFICATION
• **A. INFRARED ABSORPTION ⟨197M⟩**
• **B.** The retention time of the major peak of the *Sample solution* corresponds to that of sertraline hydrochloride from the *System suitability solution*, as obtained in the test for *Limit of (R,R) sertraline hydrochloride*.
• **C. IDENTIFICATION TESTS—GENERAL,** *Chloride* ⟨**191**⟩**:** Meets the requirements
Sample solution: A solution (1 in 10) in a mixture of alcohol and water (1:1)

ASSAY
• **PROCEDURE**
Buffer: 5.75 g/L of monobasic ammonium phosphate in water. Adjust with phosphoric acid to a pH 4.2.

Mobile phase: Methanol and *Buffer* (12:13)
Standard solution: 0.04 mg/mL of USP Sertraline Hydrochloride RS in *Mobile phase*
Sample solution: 0.04 mg/mL of Sertraline Hydrochloride in *Mobile phase*
Chromatographic system
(See *Chromatography* ⟨621⟩, *System Suitability*.)
Mode: LC
Detector: UV 220 nm
Column: 4.0-mm × 25-cm; 5-µm packing L45
Column temperature: 30°
Flow rate: 1 mL/min
Injection size: 20 µL
System suitability
Sample: *Standard solution*
Suitability requirements
Tailing factor: NMT 1.3
Relative standard deviation: NMT 2.0%
Analysis
Samples: *Standard solution* and *Sample solution*
Calculate the percentage of $C_{17}H_{17}Cl_2N \cdot HCl$ in the portion of Sertraline Hydrochloride taken:

$$\text{Result} = (r_U/r_S) \times (C_S/C_U) \times 100$$

r_U = peak response from the *Sample solution*
r_S = peak response from the *Standard solution*
C_S = concentration of USP Sertraline Hydrochloride RS in the *Standard solution* (mg/mL)
C_U = concentration of Sertraline Hydrochloride in the *Sample solution* (mg/mL)
Acceptance criteria: 97.0%–102.0% on the anydrous basis

IMPURITIES

Inorganic Impurities

- **RESIDUE ON IGNITION ⟨281⟩:** NMT 0.3%
- **HEAVY METALS,** *Method II* **⟨231⟩:** 30 ppm

SPECIFIC TESTS

- **WATER DETERMINATION,** *Method Ia* **⟨921⟩:** NMT 0.50%
- **LIMIT OF (*R,R*) SERTRALINE HYDROCHLORIDE**

Mobile phase: Hexane, 2-propanol, and diethylamine (960:40:1.5)
System suitability solution: Transfer 10 mg of USP Sertraline Hydrochloride Racemic Mixture RS into a 20-mL volumetric flask. Add 4 mL of diluted ammonia water (1 in 10) and 10 mL of hexane. Shake well until the organic phase is clear. Wait for phase separation, transfer about 2.0 mL from the top layer into a 20-mL volumetric flask, and dilute with hexane to volume.
Standard solution: Transfer 10 mg of USP Sertraline Hydrochloride RS into a 20-mL volumetric flask. Add 4 mL of diluted ammonia water (1 in 10) and 10 mL of hexane. Shake well until the organic phase is clear. Wait for phase separation, transfer 1.0 mL from the top layer into a 10-mL volumetric flask, and dilute with hexane to volume. Further dilute quantitatively and stepwise, if necessary, to obtain a solution having a known concentration of 0.01 mg/mL.
Sample solution: Transfer 20 mg of Sertraline Hydrochloride to a 20-mL volumetric flask. Add 4 mL of diluted ammonia water (1 in 10) and 10 mL of hexane. Shake well until the organic phase is clear. Wait for phase separation, and use the top layer.
Chromatographic system
(See *Chromatography* ⟨621⟩, *System Suitability*.)
Mode: LC
Detector: UV 235 nm
Column: 4.6-mm × 25-cm; 5-µm packing L40
Column temperature: 5°
Flow rate: 1 mL/min
Injection size: 20 µL
System suitability
Sample: *System suitability solution*
[NOTE—The relative retention times for (*R,R*) sertraline hydrochloride and sertraline hydrochloride are about 1.16 and 1.0, respectively.]
Suitability requirements
Resolution: NLT 2.8 between sertraline hydrochloride and (*R,R*) sertraline hydrochloride
Relative standard deviation: NMT 10.0%
Analysis
Samples: *Standard solution* and *Sample solution*
Calculate the percentage of (*R,R*) sertraline hydrochloride in the portion of Sertraline Hydrochloride taken:

$$\text{Result} = (r_U/r_S) \times (C_S/C_U) \times 100$$

r_U = peak response for (*R,R*) sertraline hydrochloride from the *Sample solution*
r_S = peak response for Sertraline Hydrochloride from the *Standard solution*
C_S = concentration of USP Sertraline Hydrochloride RS in the *Standard solution* (mg/mL)
C_U = concentration of Sertraline Hydrochloride in the *Sample solution* (mg/mL)
Acceptance criteria: NMT 1.5%

ADDITIONAL REQUIREMENTS

- **PACKAGING AND STORAGE:** Preserve in tight, light-resistant containers at a temperature not exceeding 40°.
- **USP REFERENCE STANDARDS ⟨11⟩**
USP Sertraline Hydrochloride RS
USP Sertraline Hydrochloride Racemic Mixture RS
(1*RS*,4*RS*)-4-(3,4-Dichlorophenyl)-*N*-methyl-1,2,3,4-tetrahydro-1-naphthylamine hydrochloride.
$C_{17}H_{17}Cl_2N \cdot HCl$ 342.69

Sertraline Tablets

DEFINITION

Sertraline Tablets contain an amount of sertraline hydrochloride equivalent to NLT 90.0% and NMT 110.0% of the labeled amount of sertraline free base ($C_{17}H_{17}Cl_2N$).

IDENTIFICATION

A. The retention time of the major peak in the *Sample solution* corresponds to that in the *Standard solution*, as obtained in the *Assay*.

ASSAY

- **PROCEDURE**

Mobile phase: Methanol and 0.1% (v/v) phosphoric acid (1:1)
Standard solution: 0.05 mg/mL of USP Sertraline Hydrochloride RS in *Mobile phase*
Sample stock solution: 0.5 mg/mL prepared as follows. Transfer NLT 10 Tablets to a suitable volumetric flask. Dissolve in 0.1% phosphoric acid equivalent to 50% of the volume of the flask. Sonicate for 15 min with intermittent shaking to disperse the Tablets. Add an amount of methanol equivalent to 40% of the volume of the flask, and continue to sonicate for an additional 10 min. Cool the solution, and dilute with methanol to volume.
Sample solution: 0.05 mg/mL in *Mobile phase* from the *Sample stock solution*. Pass a portion of this solution through a nylon filter of 0.45-µm or finer pore size, discard the first few mL, and collect the rest of the filtrate.