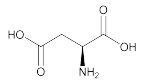
# Aspartic Acid



$C_4H_7NO_4$ 133.10
L-Aspartic acid [56-84-8].

## DEFINITION
Aspartic Acid contains NLT 98.5% and NMT 101.5% of aspartic acid ($C_4H_7NO_4$), calculated on the dried basis.

## IDENTIFICATION
- **A. INFRARED ABSORPTION ⟨197K⟩**

## ASSAY
- **PROCEDURE**

**Sample:** 100 mg of Aspartic Acid

**Titrimetric system**
(See *Titrimetry* ⟨541⟩.)
**Mode:** Direct titration
**Titrant:** 0.1 N sodium hydroxide VS
**Endpoint detection:** Visual
**Blank:** 50 mL of carbon dioxide-free water. Add 0.1 mL of bromothymol blue TS.

**Analysis:** Transfer the *Sample* to a 125-mL flask, and dissolve in 50 mL of carbon dioxide-free water. Heat slightly if necessary. Cool, add 0.1 mL of bromothymol blue TS, and titrate with *Titrant* until the color changes from yellow to blue. Perform the blank determination. Calculate the percentage of aspartic acid ($C_4H_7NO_4$) in the portion of Aspartic Acid taken:

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

$V_S$ = *Titrant* volume consumed by the *Sample* (mL)
$V_B$ = *Titrant* volume consumed by the *Blank* (mL)
$N_A$ = actual normality of the *Titrant* (mEq/mL)
$F$ = equivalency factor, 133.1 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 ⟨221⟩,** *Chloride*

**Sample solution:** Dissolve 0.7 g of Aspartic Acid in 10 mL of diluted nitric acid, and dilute with water to 15 mL.

**Acceptance criteria:** The *Sample solution* shows no more chloride than corresponds to 0.20 mL of 0.020 N hydrochloric acid (NMT 0.02%).

- **CHLORIDE AND SULFATE ⟨221⟩,** *Sulfate*

**Sample solution:** Dissolve 0.8 g of Aspartic Acid in 4 mL of hydrochloric acid, and dilute with water to 15 mL.

**Acceptance criteria:** The *Sample solution* shows no more sulfate than corresponds to 0.25 mL of 0.020 N sulfuric acid (NMT 0.03%).

- **IRON ⟨241⟩:** NMT 10 ppm

***Delete the following:***
- **HEAVY METALS ⟨231⟩,** *Method II*: NMT 10 ppm (Official 1-Jan-2018)

***Change to read:***

- **RELATED COMPOUNDS**

**Mobile phase:** 0.008 N sulfuric acid
**System suitability solution:** A mixture of 0.1 mg/mL of USP Fumaric Acid RS, 0.05 mg/mL of USP Maleic Acid RS, and 1.5 mg/mL of USP Malic Acid RS in water
**Fumaric acid standard solution:** 0.1 mg/mL of USP Fumaric Acid RS in water
**Maleic acid standard solution:** 0.05 mg/mL of USP Maleic Acid RS in water
**Malic acid standard solution:** 1.5 mg/mL of USP Malic Acid RS in water
**Sample solution:** Transfer 10 g of Aspartic Acid to a 100-mL volumetric flask, add 15–20 mL of 6 N hydrochloric acid, and mix to dissolve. (IRA 1-Sep-2016) Dilute with water to volume.
**Chromatographic system**
(See *Chromatography* ⟨621⟩, *System Suitability*.)
**Mode:** LC
**Detector:** UV 214 nm
**Column:** 7.8-mm × 30-cm; 9-µm packing L17
**Column temperature:** 30°
**Flow rate:** 0.6 mL/min
**Injection volume:** 10 µL
**System suitability**
**Sample:** *System suitability solution*
[NOTE—See *Table 1* for the relative retention times.]
**Suitability requirements**
**Resolution:** NLT 1.5 between maleic acid and malic acid
**Relative standard deviation:** NMT 10.0% each for maleic acid, malic acid, and fumaric acid
**Analysis**
**Samples:** *Standard solutions* and *Sample solution*
[NOTE—A hydrochloric acid peak at around 6–7 min may be observed in the chromatogram of the *Sample solution*. Disregard this peak in the calculation of the impurity.] (IRA 1-Sep-2016)

Calculate the percentage of each specified acid in the portion of Aspartic Acid taken:

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

$r_U$ = peak response of maleic acid, malic acid, or fumaric acid from the *Sample solution*
$r_S$ = peak response of maleic acid, malic acid, or fumaric acid from the corresponding *Standard solution*
$C_S$ = concentration of USP Maleic Acid RS, USP Malic Acid RS, or USP Fumaric Acid RS in the corresponding *Standard solution* (mg/mL)
$C_U$ = concentration of Aspartic Acid in the *Sample solution* (mg/mL)

Calculate the percentage of any unspecified impurity in the portion of Aspartic Acid taken:

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

$r_U$ = peak response of any unspecified impurity from the *Sample solution*
$r_S$ = peak response of fumaric acid from the *Fumaric acid standard solution*
$C_S$ = concentration of USP Fumaric Acid RS in the *Fumaric acid standard solution* (mg/mL)
$C_U$ = concentration of Aspartic Acid in the *Sample solution* (mg/mL)

**Acceptance criteria:** See *Table 1*.

**Table 1**

| Name | Relative Retention Time | Acceptance Criteria, NMT (%) |
|---|---|---|
| Maleic acid | 0.5 | 0.05 |
| Malic acid | 0.6 | 0.20 |
| Fumaric acid | 1.0 | 0.10 |
| Aspartic acid | Not observed | — |
| Any unspecified impurity | — | 0.05 |
| Total unspecified impurities | — | 0.10 |

## SPECIFIC TESTS

- **OPTICAL ROTATION** ⟨**781S**⟩**,** *Procedures***,** *Specific Rotation*
  **Sample solution:** 80 mg/mL in 6 N hydrochloric acid
  **Acceptance criteria:** +24.0° to +26.0°, at 20°
- **LOSS ON DRYING** ⟨**731**⟩
  **Analysis:** Dry at 105° for 3 h.
  **Acceptance criteria:** NMT 0.5%

## ADDITIONAL REQUIREMENTS

- **PACKAGING AND STORAGE:** Preserve in well-closed containers, and store protected from light.

- **USP REFERENCE STANDARDS** ⟨**11**⟩
  USP Aspartic Acid RS
  USP Fumaric Acid RS
  USP Maleic Acid RS
  USP Malic Acid RS