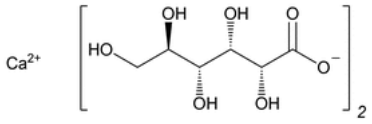
Status: Currently Official on 14-Feb-2025
Official Date: Official as of 01-Jun-2023
Document Type: USP Monographs
DocId: GUID-BB296AB1-9B85-4CC4-9C2F-F7BD4A67D114_4_en-US
DOI: https://doi.org/10.31003/USPNF_M11660_04_01
DOI Ref: ca1n2

© 2025 USPC
Do not distribute

Calcium Gluconate



$C_{12}H_{22}CaO_{14}$ 430.37
$C_{12}H_{22}CaO_{14} \cdot H_2O$ 448.39
D-Gluconic acid, calcium salt (2:1);
Calcium D-gluconate (1:2) CAS RN®: 299-28-5; UNII: SQE6VB453K.
Monohydrate CAS RN®: 66905-23-5; UNII: CZN0MI5R31.

DEFINITION

Calcium Gluconate is anhydrous or contains one molecule of water of hydration. The anhydrous form contains NLT 98.0% and NMT 102.0% of calcium gluconate ($C_{12}H_{22}CaO_{14}$), calculated on the dried basis. The monohydrate form contains NLT 99.0% and NMT 101.0% of calcium gluconate monohydrate ($C_{12}H_{22}CaO_{14} \cdot H_2O$) where labeled as intended for use in preparing injectable dosage forms, and NLT 98.5% and NMT 102.0% of calcium gluconate monohydrate ($C_{12}H_{22}CaO_{14} \cdot H_2O$) where labeled as not intended for use in preparing injectable dosage forms.

IDENTIFICATION

- **A. Identification Tests—General ⟨191⟩, *Calcium***

  Sample solution: 20 mg/mL

  Acceptance criteria: Meets the requirements

- **B. Infrared Absorption**

  Standard preparation: Prepare USP Calcium Gluconate Anhydrous RS or USP Calcium Gluconate Monohydrate RS in the form of a potassium bromide pellet.

  Sample preparation: Prepare calcium gluconate anhydrous or calcium gluconate monohydrate in the form of a potassium bromide pellet.

  Analysis

  Samples: *Standard preparation* and *Sample preparation*

  Record the spectra over the range from about 2.6 to 15 µm (3800–650 cm^{-1}).

  Acceptance criteria: The spectrum of Calcium Gluconate labeled as anhydrous exhibits the differential maxima at the wavenumbers in *Table 1* that are consistent with those of the spectrum of USP Calcium Gluconate Anhydrous RS. The spectrum of Calcium Gluconate labeled as monohydrate exhibits the differential maxima at the wavenumbers in *Table 1* that are consistent with those of the spectrum of USP Calcium Gluconate Monohydrate RS.

Table 1

Spectral Region	Wavenumber (cm^{-1}) of Characteristic Absorptions for Anhydrous	Wavenumber (cm^{-1}) of Characteristic Absorptions for Monohydrate
O-H stretching	No sharp band at about 3485, only broad absorption	At about 3485 (medium sharp over broad absorption)
C=O stretching	1618 (strong)	1595 (strong)
Fingerprint	1329 (medium)	Not observed
	Not observed	1305 (medium)
	1263–1250 (strong, two fused bands)	Not observed
	Not observed	1236 (medium)

OFFICIAL
AVA Documents Document Sharing Hub
Full document details: Calcium Gluconate

Spectral Region	Wavenumber (cm^{-1}) of Characteristic Absorptions for Anhydrous	Wavenumber (cm^{-1}) of Characteristic Absorptions for Monohydrate
	1007 (medium)	Not observed
	Not observed	1045 (medium)
	948 (duplet, medium)	Not observed
	Not observed	972 (weak)
	865 (weak)	Not observed
	Not observed	878 (weak)
	766 (medium)	Not observed

ASSAY

• **Procedure**

Sample: 800 mg of calcium gluconate anhydrous or calcium gluconate monohydrate

Blank: 150 mL of water containing 2 mL of 3 N hydrochloric acid

Titrimetric system

(See *Titrimetry ⟨541⟩*.)

Mode: Direct titration

Titrant: 0.05 M edetate disodium VS

Endpoint detection: Visual

Analysis: Dissolve the *Sample* in 150 mL of water containing 2 mL of 3 N hydrochloric acid. While stirring, add 30 mL of *Titrant* from the titration buret. Add 15 mL of 1 N sodium hydroxide and 300 mg of hydroxy naphthol blue, and continue the titration to a blue endpoint. Perform the *Blank* determination.

Calculate the percentage of calcium gluconate ($C_{12}H_{22}CaO_{14}$) or calcium gluconate monohydrate ($C_{12}H_{22}CaO_{14} \cdot H_2O$) in the *Sample* taken:

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

$$\text{Result (monohydrate form)} = \{[(V_S - V_B) \times M \times F]/W\} \times (M_{r2}/M_{r1}) \times 100$$

V_S = *Titrant* volume consumed by the *Sample* (mL)

V_B = *Titrant* volume consumed by the *Blank* (mL)

M = *Titrant* molarity (mmol/mL)

F = equivalency factor, 430.4 mg/mmol

W = *Sample* weight (mg)

M_{r2} = molecular weight of calcium gluconate monohydrate, 448.4

M_{r1} = molecular weight of calcium gluconate anhydrous, 430.4

Acceptance criteria

Anhydrous: 98.0%–102.0% on the dried basis

Monohydrate: 99.0%–101.0% where labeled as intended for use in preparing injectable dosage forms; 98.5%–102.0% where labeled as not intended for use in preparing injectable dosage forms

IMPURITIES

Change to read:

• ▲**Arsenic ⟨211⟩, *Procedures, Procedure 1*** ▲(CN 1-Jun-2023)

Test preparation: Dissolve 1.0 g in a mixture of 10 mL of hydrochloric acid and 20 mL of water, and dilute with water to 55 mL.

Analysis: Proceed as directed in the chapter, except to omit the addition of 20 mL of 7 N sulfuric acid.

Acceptance criteria: NMT 3 ppm

• **Chloride and Sulfate ⟨221⟩, *Chloride*:** A 1.0-g portion shows no more chloride than corresponds to 0.07 mL of 0.020 N hydrochloric acid (0.005%). Where it is labeled as not intended for use in the preparation of injectable dosage forms, a 1.0-g portion shows no more chloride than corresponds to 1 mL of 0.020 N hydrochloric acid (0.07%).

OFFICIAL

AVA Documents Document Sharing Hub