Sorbitol Solution

» Sorbitol Solution is an aqueous solution containing not less than 64.0 percent of D-sorbitol ($C_6H_{14}O_6$). The amounts of total sugars, other polyhydric alcohols, and any hexitol anhydrides, if detected, are not included in the requirements nor in the calculated amount under *Other Impurities.*

Packaging and storage—Preserve in well-closed containers. No storage requirements specified.

Change to read:

USP Reference standards ⟨11⟩**—***USP Sorbitol RS.* •*USP Diethylene Glycol RS. USP Ethylene Glycol RS.*• (RB 1-Feb-2010)

Change to read:

Identification—

A: Dissolve 1.4 g of Sorbitol Solution in 75 mL of water. Transfer 3 mL of this solution to a 15-cm test tube, add 3 mL of freshly prepared catechol solution (1 in 10), mix, add 6 mL of sulfuric acid, mix again, and gently heat the tube in a flame for about 30 seconds: a deep pink or wine color appears.

B: The retention time of the major peak in the chromatogram of the *Assay preparation* corresponds to that in the chromatogram of the *Standard preparation,* as obtained in the *Assay.*

•C: Limit of Diethylene Glycol and Ethylene Glycol

Diluent: Acetone and water (96 : 4)

Standard solution: 0.08 mg/mL of USP Diethylene Glycol RS and 0.08 mg/mL of USP Ethylene Glycol RS in *Diluent*.

Sample solution: Transfer 2.0 g of Sorbitol Solution to a 25-mL volumetric flask. Add 1.0 mL of *Diluent* to the flask, and vortex the flask for 3 minutes. Add the remaining *Diluent* to the flask to volume in three equal portions. Vortex the flask for about 3 minutes after each addition of *Diluent*. Pass a portion of the supernatant layer obtained through a 0.45-µm nylon filter. Discard the first 2 mL of the filtrate, and collect the rest of the filtrate for analysis. [NOTE—Acetone is used to precipitate sorbitol.]

Chromatographic system
(See *Chromatography* ⟨621⟩, *System Suitability*.)

Mode: GC

Detector: Flame ionization

Column: 0.32-mm × 15-m fused-silica capillary column; 0.25-µm layer of phase G46

Temperature

Detector: 300°

Injection port: 240°

Column: See the temperature program table below.

Initial Temperature (°)	Temperature Ramp (°/min)	Final Temperature (°)	Hold Time at Final Temperature (min)
70	—	70	2
70	50	300	5

Carrier gas: Helium

Flow rate: 3.0 mL/minute

Injection size: 1.0 µL

Injection type: Split injection. The split ratio is about 10 : 1. [NOTE—A split liner, deactivated with glass wool, is used.]

System suitability

Sample: *Standard solution*

[NOTE—Diethylene glycol elutes after ethylene glycol in the chromatogram.]

Suitability requirements

Resolution: Not less than 30 between ethylene glycol and diethylene glycol

Analysis

Samples: *Standard solution* and *Sample solution*

Based on the *Standard solution*, identify the peaks of ethylene glycol and diethylene glycol. Compare peak areas of ethylene glycol and diethylene glycol in the *Standard solution* and the *Sample solution.*

Acceptance criteria

Diethylene glycol: The peak area of diethylene glycol in the *Sample solution* is not more than the peak area of diethylene glycol in the *Standard solution*, corresponding to not more than 0.10% of diethylene glycol in Sorbitol Solution.

Ethylene glycol: The peak area of ethylene glycol in the *Sample solution* is not more than the peak area of ethylene glycol in the *Standard solution*, corresponding to not more than 0.10% of ethylene glycol in Sorbitol Solution.

• (RB 1-Feb-2010)

pH ⟨791⟩**:** between 5.0 and 7.5, in a 14% (w/w) solution of Sorbitol Solution in carbon dioxide-free water.

Water, *Method I* ⟨921⟩**:** between 28.5% and 31.5%.

Residue on ignition ⟨281⟩**:** not more than 0.1%, calculated on the anhydrous basis, determined on a 2-g portion, accurately weighed.

Reducing sugars—To an amount of Sorbitol Solution, equivalent to 3.3 g on the anhydrous basis, add 3 mL of water, 20.0 mL of cupric citrate TS, and a few glass beads. Heat so that boiling begins after 4 minutes, and maintain boiling for 3 minutes. Cool rapidly, and add 40 mL of diluted acetic acid, 60 mL of water, and 20.0 mL of 0.05 N iodine VS. With continuous shaking, add 25 mL of a mixture of 6 mL of hydrochloric acid and 94 mL of water. When the precipitate has dissolved, titrate the excess of iodine with 0.05 N sodium thiosulfate VS using 2 mL of starch TS, added towards the end of the titration, as an indicator. Not less than 12.8 mL of 0.05 N sodium thiosulfate VS is required, corresponding to not more than 0.3% of reducing sugars, on the anhydrous basis, as glucose. The amount determined in this test is not included in the calculated amount under *Other Impurities.*

Limit of nickel—

Test solution—Dissolve 20.0 g of Sorbitol Solution in diluted acetic acid, and dilute with diluted acetic acid to 100.0 mL. Add 2.0 mL of a saturated ammonium pyrrolidine dithiocarbamate solution (containing about 10 g of ammonium pyrrolidine dithiocarbamate per L) and 10.0 mL of methyl isobutyl ketone, and shake for 30 seconds. Protect from bright light. Allow the two layers to separate, and use the methyl isobutyl ketone layer.

Blank solution—Prepare as directed for *Test solution,* except to omit the use of the Sorbitol Solution.

Standard solutions—Prepare as directed for *Test solution,* except to prepare three solutions by adding 0.5 mL, 1.0 mL, and 1.5 mL of nickel standard solution TS.

Procedure—Set the instrument to zero using the *Blank solution.* Concomitantly determine the absorbances of the *Standard solutions* and the *Test solution* at least three times each, at the wavelength of maximum absorbance at 232.0 nm, with a suitable atomic absorption spectrophotometer (see *Spectrophotometry and Light-Scatter-*

ing ⟨851⟩) equipped with a nickel hollow-cathode lamp and an air–acetylene flame. Record the average of the steady readings for each of the *Standard solutions* and the *Test solution.* Between each measurement, aspirate the *Blank solution,* and ascertain that the reading returns to zero. Plot the absorbances of the *Standard solutions* and the *Test solution* versus the added quantity of nickel. Extrapolate the line joining the points on the graph until it meets the concentration axis. The distance between this point and the intersection of the axes represents the concentration of nickel in the *Test solution.* Not more than 1 µg per g, calculated on the anhydrous basis, is found.

Assay—

Mobile phase, Resolution solution, Standard preparation, and *Chromatographic system*—Proceed as directed in the *Assay* under *Sorbitol*.

Assay preparation—Accurately weigh about 0.12 g of Sorbitol Solution, and dissolve in and dilute with water to about 20 g. Accurately record the final solution weight, and mix thoroughly.

Procedure—Proceed as directed in the *Assay* under *Sorbitol.* Calculate the percentage of D-sorbitol ($C_6H_{14}O_6$) in the portion of Sorbitol Solution taken by the formula:

$$100(C_S / C_U)(r_U / r_S)$$

in which C_S is the concentration, in mg per g, of USP Sorbitol RS in the *Standard preparation;* C_U is the concentration, in mg per g, of Sorbitol Solution in the *Assay preparation;* and r_U and r_S are the peak responses obtained from the *Assay preparation* and the *Standard preparation,* respectively.