add 50.0 mL of Titrant, and reflux for 5 h. Cool, observing precautions to prevent atmospheric moisture from entering the condenser, and rinse the condenser with glacial acetic acid, collecting the rinsings in the flask. To the flask add 5 drops of crystal violet TS, and titrate with the Back-titrant to a blue-green endpoint. Perform the Blank determination. Calculate the percentage of panthenol (C$_{16}$H$_{14}$F$_{2}$N$_{3}$NaO$_{4}$S $\cdot$ 1.5 H$_{2}$O in the Volume of Oral Suspension taken:

$$\text{Result} = \left(\frac{(V_B - V_S) \times M \times F/W}{W}\right) \times 100$$

- $V_B$ = Back-titrant volume consumed by the Blank (mL)
- $V_S$ = Back-titrant volume consumed by the Sample (mL)
- $M$ = actual molarity of the Back-titrant (mM/mL)
- $F$ = equivalency factor, 205.3 mg/M
- $W$ = Sample weight (mg)

Acceptance criteria: 99.0%—102.0% on the dried basis

**IMPURITIES**
- **Residue on Ignition (281):** NMT 0.1%
- **Limit of Aminopropanol:**
  - **Sample:** 10 g of Panthenol
  - **Blank:** 25 mL of water
  - **Titrimetric system** (See Titrimetry (541).)
  - **Mode:** Direct titration
  - **Titrant:** 0.01 N sulfuric acid VS
  - **Endpoint Detection:** Visual
  - **Analysis:** Dissolve the Sample in 25 mL of water, and add bromothymol blue TS. Titrate with the Titrant to a yellow endpoint. Perform the Blank determination. Calculate the percentage of aminopropanol in the Sample taken:

$$\text{Result} = \left(\frac{(V_S - V_B) \times M \times F/W}{W}\right) \times 100$$

- $V_S$ = Titration volume consumed by the Sample (mL)
- $V_B$ = Titration volume consumed by the Blank (mL)
- $M$ = actual normality of the Titrant (mEq/mL)
- $F$ = equivalency factor, 75.11 mg/mEq
- $W$ = Sample weight (mg)

Acceptance criteria: NMT 0.10%

**SPECIFIC TESTS**
- **Melting Range, Class I (741):** 64.5°–68.5°
- **Optical Rotation, Specific Rotation (781S):**
  - **Sample solution:** 50 mg/mL in water
  - **Acceptance criteria:** −0.05° to +0.05°
- **Loss on Drying (731):** Dry a sample in a vacuum over phosphorus pentoxide at 56° for 4 h; it loses NMT 0.5% of its weight.

**ADDITIONAL REQUIREMENTS**
- **Packaging and Storage:** Preserve in tight containers.
- **USP Reference Standards (11):**
  - USP Racemic Panthenol RS

## Pantoprazole Oral Suspension

**Definition**
Pantoprazole Oral Suspension contains NLT 90.0% and NMT 110.0% of the labeled content of pantoprazole sodium. Prepare Pantoprazole Oral Suspension, 2 mg/mL, as follows (see Pharmaceutical Compounding—Nonsterile Preparations (795)).

<table>
<thead>
<tr>
<th>Pantoprazole Sodium</th>
<th>200 mg</th>
</tr>
</thead>
</table>

1 This formula is frequently used for home health patients with feeding tubes who have been discharged from hospitals. The goal of the drug is to neutralize the acidity of the stomach.
**Beyond-use date**: NMT 14 days after the date on which it was compounded when stored at controlled cold temperature

**USP Reference Standards (11)**

USP Pantoprazole Sodium RS

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**Pantoprazole Sodium**

C_{16}H_{14}F_{2}N_{3}NaO_{4}S \cdot 1.5H_{2}O \ 432.37

1H-Benzimidazole, 5-(difluoromethoxy)-2-[[3(4-dimethoxy-2-pyridyl)methyl]sulfonyl]-, sodium salt, hydrate (2:3);

>Pantoprazole Sodium contains not less than 98.0 percent and not more than 102.0 percent of 

C_{16}H_{14}F_{2}N_{3}NaO_{4}S, calculated on the anhydrous basis.

**Packaging and storage**—Preserve in well-closed, light-resistant containers. Store at room temperature.

**Labeling**—If a test for Related compounds other than Test 1 is used, then the labeling states the test with which the article complies.

**USP Reference standards (11)**—

USP Pantoprazole Sodium RS

USP Pantoprazole Related Compound A RS

5-(Difluoromethoxy)-2-[[3(4-dimethoxy-2-pyridyl)methyl]sulfonyl]-1H-benzimidazole.

C_{16}H_{14}F_{2}N_{3}NaO_{4}S \ 399.37

USP Pantoprazole Related Compound B RS

5-(Difluoromethoxy)-2-[[3(4-dimethoxy-2-pyridyl)methyl]sulfinyl]-1H-benzimidazole.

C_{16}H_{14}F_{2}N_{3}O_{4}S \ 367.37

USP Pantoprazole Related Compound C RS

5-(Difluoromethoxy)-1H-benzimidazole-2-thiol.

C_{16}H_{14}F_{2}N_{3}O_{3}S \ 216.21

USP Pantoprazole Related Compound D and F Mixture RS

A mixture of 5-(difluoromethoxy)-2-[[3(4-dimethoxypyridin-2-yl)methyl]sulfinyl]-1H-benzimidazole and 6-(difluoromethoxy)-2-[[3(4-dimethoxypyridin-2-yl)methyl]sulfinyl]-1H-benzimidazole.

C_{17}H_{17}F_{2}N_{3}O_{4}S \ 398.40

USP Pantoprazole Related Compound E RS

A mixture of the stereoisomers of 6,6'-bis(difluoromethoxy)-2,2'-bis[[3(4-dimethoxypyridin-2-yl)methyl]sulfinyl]-1H,1H'-5,5'-bienzimidazolyl.

C_{32}H_{28}F_{4}N_{6}O_{8}S_{2} \ 764.74

**Identification**—

A: 

Absorption (197K).

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: It meets the requirements of the pyroantimonate precipitate test for Sodium (191).

**Water**, Method I (921); between 5.0% and 8.0%.

**Heavy metals**, Method II (231); not more than 0.002%.

**Related compounds**—[NOTE—On the basis of the synthetic route, perform either Test 1 or Test 2. Test 2 is recommended when impurities C, D, E, and F are potential related compounds.]

**Test 1**—[NOTE—Protect all solutions from light, and use amber autosampler vials and low-actinic glassware.]

Diluent, Mobile phase, System suitability preparation, and Chromatographic system—Proceed as directed in the Assay.

**Standard solution**—Transfer about 20 mg of USP Pantoprazole Sodium RS, accurately weighed, to a 50-mL volumetric flask, dilute in water to 10 mL, and mix.

**Test solution**—Transfer about 20 mg of Pantoprazole Sodium, accurately weighed, to a 50-mL volumetric flask, dilute in water to 10 mL, and mix.

Chromatographic system (see Chromatography (621))—Prepare as directed in the Assay. Chromatograph the System suitability preparation, and record the peak responses as directed for Procedure. Identify the components on the basis of their relative retention times (Table 1): the resolution, \( R \), between the pantoprazole related compound A and pantoprazole peaks is not less than 10.0.

| Table 1 |
|-----------------------------|-----------------------------|-----------------------------|
| **Name** | **Relative Retention** | **Limit (%)** |
| Pantoprazole related compound A | 0.52 | 0.20 |
| Pantoprazole sodium | 1.0 | N/A |
| Pantoprazole related compound B | 1.7 | 0.15 |
| Any other individual impurity | — | 0.10 |
| Total impurities | — | 0.5 |

\[ R = \frac{t_C - t_R}{t_R} \]  

in which \( t_C \) and \( t_R \) are the concentrations, in mg per mL, of pantoprazole sodium in the Standard solution and the Test solution, respectively; \( r \) is the peak response of each impurity obtained from the Test solution; and \( r_i \) is the peak response obtained from the Standard solution. The reporting level for impurities is 0.05%.

**Test 2**—Diluent—Prepare a mixture of 0.001 N sodium hydroxide solution (50:50).

**Standard solution**—Dissolve an accurately weighed quantity of USP Pantoprazole Sodium RS in Diluent, and dilute quantitatively to obtain a solution having a known concentration of about 0.03 mg per mL.

**Test solution**—Prepare a solution of Pantoprazole Sodium in Diluent having a known concentration of about 0.46 mg per mL.

**System suitability solution**—Dissolve suitable amounts of USP Pantoprazole Sodium RS, USP Pantoprazole Related Compound A RS, USP Pantoprazole Related Compound B RS, USP Pantoprazole Related Compound C RS, USP Pantoprazole Related Compound D and F Mixture RS, and USP Pantoprazole Related Compound E RS in Diluent to obtain a solution containing about 0.46 mg of pantoprazole sodium per mL and about 1.3 \( \mu \)g each of related compounds A, B, C, and E per mL, and about 1.3 \( \mu \)g of the D and F mixture per mL.

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