make any necessary correction. Each mL of 0.1 N perchloric acid is equivalent to 31.81 mg of $C_{14}H_{10}Cl_2NNaO_2$.

Diclofenac Sodium Delayed-Release Tablets

DEFINITION

Diclofenac Sodium Delayed-Release Tablets contain NLT 90.0% and NMT 110.0% of the labeled amount of diclofenac sodium ($C_{14}H_{10}Cl_2NNaO_2$).

IDENTIFICATION

- **A.** The retention time of the diclofenac peak of the *Sample solution* corresponds to that of the *Standard solution*, as obtained in the *Assay*.
- **B. IDENTIFICATION TESTS—GENERAL,** *Sodium* ⟨**191**⟩**:** It meets the requirements of the flame test.

ASSAY

- **PROCEDURE**

Solution A: Mix equal volumes of 0.01 M phosphoric acid and 0.01 M monobasic sodium phosphate. If necessary, adjust with additional portions of the appropriate component to a pH of 2.5 ± 0.2.

Mobile phase: Methanol and *Solution A* (7:3)

[NOTE—Increasing the proportion of buffer increases resolution.]

Diluent: Methanol and water (7:3)

System suitability solution: 20 µg/mL of diethyl phthalate, 7.5 µg/mL of USP Diclofenac Related Compound A RS, and 0.75 mg/mL of USP Diclofenac Sodium RS in *Diluent*

Standard solution: 0.75 mg/mL of USP Diclofenac Sodium RS in *Diluent*

Sample solution: Transfer 20 Tablets to a volumetric flask of such capacity that when filled to volume, a concentration of 0.75 mg/mL of diclofenac sodium is obtained. Add *Diluent* to about 70% of the capacity of the flask, and shake by mechanical means for NLT 30 min to disintegrate the Tablets. Cool to room temperature, and dilute with *Diluent* to volume. Pass a portion of the solution through a filter of 0.5-µm or finer pore size, and use the filtrate as the *Sample solution*.

Chromatographic system

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

Mode: LC

Detector: UV 254 nm

Column: 4.6-mm × 25-cm; packing L7 (end-capped)

Flow rate: 1 mL/min

Injection size: 10 µL

System suitability

Samples: *System suitability solution* and *Standard solution*

[NOTE—The relative retention times for diethyl phthalate, diclofenac related compound A, and diclofenac are 0.5, 0.6, and 1.0, respectively.]

Suitability requirements

Resolution: NLT 2.2 between the diethyl phthalate and diclofenac related compound A peaks; NLT 6.5 between the diclofenac related compound A and diclofenac peaks, *System suitability solution*

Relative standard deviation: NMT 2.0%, *Standard solution*

Analysis

Samples: *Standard solution* and *Sample solution*

Calculate the percentage of $C_{14}H_{10}Cl_2NNaO_2$ in the portion of Tablets taken:

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

r_S = peak response of diclofenac from the *Standard solution*

C_S = concentration of USP Diclofenac Sodium RS in the *Standard solution* (mg/mL)

C_U = nominal concentration of diclofenac sodium in the *Sample solution* (mg/mL)

Acceptance criteria: 90.0%–110.0%

PERFORMANCE TESTS

- **DISSOLUTION** ⟨**711**⟩**:** Proceed as directed for *Procedure*, *Apparatus 1 and Apparatus 2*, *Delayed-Release Dosage Forms*, *Method B* to determine the amount of $C_{14}H_{10}Cl_2NNaO_2$ dissolved.

Acid stage

Medium: 0.1 N hydrochloric acid; 900 mL

Apparatus 2: 50 rpm, paddles constructed of (or coated with) polytef being used

Time: 2 h

Detector: UV maxima at about 276 nm

Standard solution: Transfer 68 mg of USP Diclofenac Sodium RS to a 100-mL volumetric flask, add 10.0 mL of 0.1 N sodium hydroxide, and dilute with water to volume. Transfer 2.0 mL of this solution to a second 100-mL volumetric flask, dilute with a mixture of 0.1 N hydrochloric acid and 5 N sodium hydroxide (900:20) to volume, and mix. This *Standard solution* contains 13.6 µg/mL of USP Diclofenac Sodium RS.

Sample solution: At the end of 2 h, remove each Tablet, or the major portion thereof if the Tablet is not intact, from the individual vessels, and subject them to the test under *Buffer stage*. To the 0.1 N hydrochloric acid remaining in each vessel, add 20.0 mL of 5 N sodium hydroxide, and stir for 5 min.

Buffer stage

Medium: pH 6.8 phosphate buffer; 900 mL

Apparatus 2: 50 rpm

Time: 45 min

Detector: UV maxima at about 276 nm

Solution A: 76 mg/mL of tribasic sodium phosphate

pH 6.8 phosphate buffer: *Solution A* and 0.1 N hydrochloric acid (1:3), adjusted with 2 N hydrochloric acid or 2 N sodium hydroxide to a pH of 6.8 ± 0.05, if necessary

Standard solution: Transfer 68 mg of USP Diclofenac Sodium RS to a 100-mL volumetric flask. Add 10.0 mL of 0.1 N sodium hydroxide, dilute with water to volume, and mix. Transfer 3.0 mL of this solution to a 100-mL volumetric flask, dilute with *Buffer stage Medium* to volume, and mix. The final concentration is about 0.0204 mg/mL of diclofenac sodium.

Sample solution: Sample per *Dissolution* ⟨711⟩. Dilute with *Medium* to a concentration similar to that of the *Standard solution*.

Tolerances: NLT 75% (Q) of the labeled amount of $C_{14}H_{10}Cl_2NNaO_2$ is dissolved.

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

IMPURITIES

Organic Impurities

- **PROCEDURE**

Solution A, Mobile phase, Diluent, System suitability solution, Sample solution, Chromatographic system, and **System suitability:** Proceed as directed in the *Assay*.

Standard stock solution: 0.8 mg/mL of USP Diclofenac Related Compound A RS in methanol

Standard solution: 4 µg/mL of USP Diclofenac Related Compound A RS from the *Standard stock solution* in *Diluent*

Analysis: Measure the peak responses over a period of 40 min.

USP Monographs

Calculate the percentage of diclofenac related compound A in relation to the quantity of diclofenac sodium in the portion of Tablets taken:

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

r_U = peak response of diclofenac related compound A from the *Sample solution*
r_S = peak response of diclofenac related compound A from the *Standard solution*
C_S = concentration of USP Diclofenac Related Compound A RS in the *Standard solution* (mg/mL)
C_U = nominal concentration of diclofenac sodium in the *Sample solution* (mg/mL)

Calculate the percentage of each impurity other than diethyl phthalate, if present, in relation to the diclofenac sodium in the portion of Tablets taken:

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

r_U = peak response for each impurity from the *Sample solution*
r_S = peak response of diclofenac related compound A from the *Standard solution*
C_S = concentration of USP Diclofenac Related Compound A RS in the *Standard solution* (mg/mL)
C_U = nominal concentration of diclofenac sodium in the *Sample solution* (mg/mL)

Acceptance criteria
Individual impurities: NMT 0.5% of diclofenac related compound A; NMT 1.0% of any other individual impurity
Total impurities: NMT 1.5%

ADDITIONAL REQUIREMENTS

- **Packaging and Storage:** Preserve in tight, light-resistant containers.
- **USP Reference Standards** ⟨11⟩
  USP Diclofenac Sodium RS
  USP Diclofenac Related Compound A RS
  N-(2,6-Dichlorophenyl)indolin-2-one.
  $C_{14}H_9Cl_2NO$ 278.14

Diclofenac Sodium Extended-Release Tablets

DEFINITION

Diclofenac Sodium Extended-Release Tablets contain NLT 90.0% and NMT 110.0% of the labeled amount of diclofenac sodium ($C_{14}H_{10}Cl_2NNaO_2$).

IDENTIFICATION

- **A.** The retention time of the *Sample solution* corresponds to that of the *Standard solution*, as obtained in the *Assay*.
- **B. Thin-Layer Chromatographic Identification Test** ⟨201⟩
  Standard solution: 2.0 mg/mL of USP Diclofenac Sodium RS in methanol. [Note—Shake by mechanical means for 10 min before makeup to final volume.]
  Sample solution: Equivalent to 2.0 mg/mL of diclofenac sodium from a portion of the powder (NLT 10 Tablets) in methanol. [Note—Sonicate for 10 min, and shake by mechanical means for 10 min before makeup to final volume. Centrifuge this solution, and use the clear supernatant.]
  Developing solvent system: Methanol, toluene, and glacial acetic acid (8:12:0.1)

ASSAY

- **Procedure**
  [Note—Protect the *Standard solution*, *System suitability solution*, and *Sample solution* from light.]
  Diluent: Methanol and water (7:3)
  Buffer: 0.01 M phosphoric acid and 0.01 M monobasic sodium phosphate. Adjust with appropriate component to a pH of 2.5.
  Mobile phase: Methanol and *Buffer* (7:3)
  Standard solution: 0.5 mg/mL of USP Diclofenac Sodium RS in *Diluent*
  Resolution solution: 20 µg/mL of diethyl phthalate, 7.5 µg/mL of USP Diclofenac Related Compound A RS, and 0.75 mg/mL of USP Diclofenac Sodium RS in *Diluent*
  Sample solution: Powder NLT 20 Tablets, and transfer a weighed portion of the powder, equivalent to 100 mg of diclofenac sodium, to a 200-mL volumetric flask, and add 150 mL of *Diluent*. Heat on a steam bath for 3–5 min, and sonicate for 20 min. Cool to room temperature, and dilute with *Diluent* to volume. Place the flask in an ice bath for 45 min, shaking occasionally to precipitate out any undissolved waxy material. Pass a portion of the chilled solution through a filter of 0.45-µm or finer pore size. Allow the filtrate to reach room temperature before using.
  Chromatographic system
  (See *Chromatography* ⟨621⟩, *System Suitability*.)
  Mode: LC
  Detector: UV 254 nm
  Column: 4.6-mm × 25-cm; packing L7
  Flow rate: 1 mL/min
  Injection size: 10 µL
  System suitability
  Samples: *Standard solution* and *Resolution solution*
  [Note—The relative retention times for diethyl phthalate, diclofenac related compound A, and diclofenac are 0.5, 0.6, and 1.0, respectively.]
  Suitability requirements
  Resolution: NLT 2.2 between the diethyl phthalate and diclofenac related compound A peaks, and NLT 3.8 between the diclofenac related compound A and diclofenac peaks, *Resolution solution*
  Relative standard deviation: NMT 2.0% for diclofenac, *Standard solution*
  Analysis
  Samples: *Standard solution* and *Sample solution*
  Calculate the percentage of $C_{14}H_{10}Cl_2NNaO_2$ in the portion of Tablets taken:

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

r_U = peak response of diclofenac from the *Sample solution*
r_S = peak response of diclofenac from the *Standard solution*
C_S = concentration of USP Diclofenac Sodium RS in the *Standard solution* (mg/mL)
C_U = nominal concentration of diclofenac sodium in the *Sample solution* (mg/mL)

Acceptance criteria: 90.0%–110.0%

PERFORMANCE TESTS

- **Dissolution** ⟨711⟩
  Test 1
  Medium: 0.05 M phosphate buffer, pH 7.5; 900 mL
  Apparatus 2: 50 rpm; use wire sinkers.
  Times: 1, 5, 10, 16, and 24 h
  Detector: UV 276 nm
  Standard solution: USP Diclofenac Sodium RS in *Medium*
  Analysis: Pass portions of the solution under test through a suitable filter. Dilute with *Medium*, if necessary, to a concentration similar to that of the *Standard*

USP Monographs