

# Title

## DEFINITION

[Drug] Oral Solution contains NLT [\_. \_]% and NMT [\_. \_]% of CmHn\_p

## IDENTIFICATION

- **A. INFRARED ABSORPTION <197K>** [or <197M> or <197F>]

**or**

### INFRARED ABSORPTION <197S>

**Analytical wavelength:** {if more than a single wavelength, use **Wavelength range** as the subsection head}

**Cell:** {if other than 0.1-mm cell is used}

**Standard solution:** [ ] (g/mL in [solvent])

**Sample solution:** [ ] (g/mL in [solvent])

- **B. Ultraviolet Absorption <197U>**

**Analytical wavelength:** {if more than a single wavelength, use **Wavelength range** as the subsection head}

**Sample solution:** [ ] (g/mL in [solvent {if water, no need to state; in General Notices}])

**Acceptance criteria:** Absorptivities, calculated on the [dried][anhydrous] basis, do not differ by more than \_0%.

**Ratio:** Ax/Ay, [ ]-[ ]

- **C. Thin-Layer Chromatographic Identification Test <201>**

**Adsorbent:**

**Standard solution:** [ ] (g/mL in [solvent])

**Sample solution:** [ ] (g/mL in [solvent])

**Application volume:** [ ] (L)

**Developing solvent system:**

**Spray reagent:**

**Analysis**

- **D.** The retention time of the major peak of the *Sample solution* corresponds to that of the *Standard solution*, as obtained in the **Assay**.
- **E.** A solution of [ ] μg/mL (or mg/mL) meets the requirements of the [flame] test[s] for [sodium, calcium, etc.] [<191>].

## ASSAY {Chromatographic Assay}

### PROCEDURE

**Mobile phase:** Solvent 1, solvent 2, and solvent 3 ([ ]:[ ]:[ ]). {Solvents should be in the order of Organic:Aqueous. If more than one organic constituent, then list them in the order of prevalence.}

**System suitability solution:** [ ] mg/mL of [drug {usually a USP Reference Standard}] and [ ] mg/mL of related compound [ ] in [{if water, no need to state; per General Notices}]

**Quantitative limit solution:** [ ] mg/mL of USP [ ] RS in [ ]

**or**

**Quantitative limit solution:** [ ] mL/mL of *System suitability solution* in [ ]

**Standard solution:** [ ] mg/mL of USP [ ] RS in [ ]

**Sample solution:** equivalent to [ ] mg/mL of [ ], from [Oral Solution] in [ ]

### Chromatographic system

(See *Chromatography* <621>, *System Suitability*.)

**Mode:** LC or GC

**Detector:** [detector type] [ ] nm

**Column:** [ ]-mm × [ ]-cm; packing L[ ]

**Temperature:** [ ]° **or** [See the temperature program table.](#)

**Flow rate:** [ ] mL/min

**Injection size:** [ ] μL

**Injection type:** {for GC}

### System suitability

**Sample:** *System suitability solution and Standard solution* [sometimes *Internal standard solution*]

**Suitability requirements**

**Resolution:** NLT [ ] between \_\_\_ and \_\_\_

**Column efficiency:** NLT [ ] theoretical plates

**Tailing factor:** NMT [ ]

**Relative standard deviation:** NMT \_\_\_% for [{number of} replicate injections]

**Analysis**

**Samples:** *Standard solution and Sample solution*

Calculate the percentage of [drug] in the portion of [ ] taken:

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

$r_U$  = peak response from the *Sample solution*

$r_S$  = peak response from the *Standard solution*

$C_S$  = concentration of the *Standard solution* (mg/mL)

$C_U$  = nominal concentration of the *Sample solution* (mg/mL)

$F$  = any monograph correction factor when a value is provided, such as a unit conversion

**Acceptance criteria:** [\_\_\_]%-[\_\_\_]% on the [ ] basis

**ASSAY {Titration Assay}**

• PROCEDURE

**Sample solution:**

**Titrimetric system**

(See *Titrimetry* <541>.)

**Mode:** Direct titration or residual titration

**Titrant:**

**Back-titrant:**

**Endpoint detection:** Potentiometric, colorimetric, or coulometric

**Analysis**

**Samples:**

Each mL of [ ] N titrant is equivalent to [\_\_\_] mg of [ ] {insert Drug chemical formula}.

Or

Calculate the percentage of the [drug substance] in the portion taken {equations for titrations are not needed if "Each mL [ ] N titrant is equivalent to [\_\_\_] mg of ..." is written into the text}:

$$\text{Result} = [(V - B) \times N \times F \times 100] / [TN \times W \times (100 - A)/100]$$

$V$  = sample titrant volume (mL)

$B$  = blank titrant volume (mL)

$N$  = titrant normality {units}

$F$  = equivalence factor (mg sample/mL of TN)

$TN$  = theoretical normality

$W$  = sample weight (mg)

$A$  = assay correction for LOD

**Acceptance Criteria:** [\_\_\_]%-[\_\_\_]% on the [ ] basis

**ASSAY {Microbiological Assay}**

• PROCEDURE

**Sample solution:** {Describe as required. Use template for the HPLC Assay above, but specify the appropriate buffer as directed in *Antibiotics—Microbial Assays* <81>.}

**Analysis:** Proceed as directed for [ ] under *Antibiotics—Microbial Assays* <81>. Use a volume of *Assay Preparation* diluted quantitatively to yield a *Sample solution* having a concentration assumed to be equal to the median dose level of the Standard.

**OTHER COMPONENTS** {may not be in all monographs; included in those monographs that have *Content of... tests*}

- **CONTENT OF [ ]**: [NLT \_\_\_\_%] [between \_\_% and \_\_%]
- **CONTENT OF CHLORIDE**: [NLT \_\_\_\_%] [\_\_\_\_%– \_\_\_\_%]
- **NITROGEN DETERMINATION, Method [I] [II] <461>**: [Proceed as directed, starting with \_\_\_\_ [m]g of [drug]: [NLT \_\_\_\_%] [Between \_\_% and \_\_%, ] is found.]
- **ALCOHOL DETERMINATION [ Method [I][II] <611> {if present}]**: [Between \_\_% and \_\_% is found] [Between \_\_% and \_\_% of the labeled amount of C<sub>2</sub>H<sub>5</sub>OH is found].

**PERFORMANCE TESTS**

- **UNIFORMITY OF DOSAGE UNITS <905>**: For [Oral Solution] [Oral Suspension] packaged in [ ] containers, meets the requirements {OR if no package is specified then indicate: meets the requirements.}
- **DELIVERABLE VOLUME <698>**: For oral solution packaged in [package type] containers: meets the requirements. {OR if no package is specified then specification might say: Meets the requirements.}

**IMPURITIES**

**Inorganic Impurities**

- **RESIDUE ON IGNITION <281>**: NMT [ ]%
- **METAL PARTICLES**: Meets the requirements of the test for *Metal Particles in Ophthalmic Ointments <751>*
- **CHLORIDE AND SULFATE, Chloride <221>**: A [ ]-g portion shows no more chloride than corresponds to [ ] mL of 0.020 N hydrochloric acid ([ ]%).
- **CHLORIDE AND SULFATE, Sulfate <221>**: A [ ]-g portion shows no more sulfate than corresponds to [ ] mL of 0.020 N sulfuric acid ([ ]%).
- **SELENIUM <291>**: [\_\_\_\_%].[\_\_\_\_%, a \_\_\_\_-mg specimen mixed with \_\_\_\_ mg of magnesium oxide being used.]
- **ARSENIC, Method [ ] <211>**: [ ] ppm
- **LEAD <251>**: [ppm]
- **HEAVY METALS, Method [I] [II] <231>**: [ppm]

**Organic Impurities** {include only degradation products and product specific impurities}

• **PROCEDURE 1**

**Mobile phase**: Solvent 1, solvent 2, and solvent 3 ([ ]:[ ]:[ ])

**System suitability solution**: [ ] mg/mL of [drug {usually a USP Reference Standard}] and [ ] mg/mL of related compound [ ] in [ ]

**Quantitative limit solution**: [ ] mg/mL of USP [ ] RS in [ ]

or

**Quantitative limit solution**: [ ] mL/mL of *System suitability solution* in [ ]

**Standard solution**: [ ] mg/mL of USP [ ] RS in [ ]

**Sample solution**: equivalent to [ ] mg/mL of [ ], from [Oral Solution] in [ ]

**Chromatographic system**

(See *Chromatography <621>*, *System Suitability*.)

**Mode**: LC or GC

**Detector**: [detector type] [ ] nm

**Column**: [ ]-mm × [ ]-cm; packing L[ ]

**Temperature**: [ ]° or [See the temperature program table](#) [for GC].

**Flow rate**: [ ] mL/min

**Injection size**: [ ] μL

**Injection type**: [for GC]

**System suitability**

**Sample**: *System suitability solution* or *Standard solution*

**Suitability requirements**

**Resolution**: NLT [ ] between \_\_\_\_ and \_\_\_\_

**Column efficiency**: NLT [ ] theoretical plates

**Tailing factor**: NMT [ ]

**Relative standard deviation**: NMT\_\_\_\_.\_\_\_\_%

**Analysis**

**Samples**: *Standard solution* and *Sample solution*

Calculate the percentage of [limited substance] in the portion of [Drug] taken:

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

$r_U$  = peak response of [limited substance] from the *Sample solution*  
 $r_S$  = peak response from the *Standard solution*  
 $C_S$  = concentration of the *Standard solution* (mg/mL)  
 $C_U$  = concentration of the *Sample solution* (mg/mL)

**Acceptance criteria**

**Individual impurities:** See *Impurity Table 1*. {Create an impurity table if there are more than three named impurities. A table will be numbered "1", even if only 1 impurity table is in the document.}

**Total impurities:** NMT [ ]%

**Impurity Table 1**

Name	Relative Retention Time	Relative Response Factor	Acceptance Criteria, NMT (%)
[Drug] related compound ___ <sup>a</sup>	—	—	[.]
{All identified impurities should be listed. If possible, provide a short name for an impurity when no USP Reference standard is available, for example: [Drug] Z-isomer, <sup>b</sup> [Drug] Butyl analog, <sup>c</sup> [Drug] 3-ketone. <sup>d</sup> Give full chemical names as footnotes.}	—	{two decimal places if less than 1.0; one decimal place if more than 1.0}	[.]
[Drug]	1.0	1.0	—
Any other individual, unidentified impurity	—	1.0	[.]

<sup>a</sup> Chemical name.  
<sup>b</sup> Chemical name.  
<sup>c</sup> Chemical name.  
<sup>d</sup> Chemical name.

**or**

**Solution A:** Solvent 1, solvent 2, and solvent 3 ([ ]:[ ]:[ ]). Adjust with [ ] to a pH of [ ].

**Solution B:** Solvent 1, solvent 2, and solvent 3 ([ ]:[ ]:[ ]). Adjust with [ ] to a pH of [ ].

**Mobile phase:** See the gradient table below.

Time (min)	Solution A (%)	Solution B (%)
0	A1	B1
T1	A1	B1
T2	A2	B2

**Example of GC Temperature program table**

Initial Temperature (°)	Temperature Ramp (°/min)	Final Temperature (°)	Hold Time at Final Temperature (min)
40	0	40	6
40	30	80	14
80	30	200	3

**Chromatographic system**

(See *Chromatography <621>*, *System Suitability*.)

**Mode:** LC or GC

**Detector:** [detector type] [ ] nm

**Column:** [ ]-mm × [ ]-cm; packing L[ ]

**Temperature:** [ ]° **or** See the temperature program table {for GC}.

**Flow rate:** [ ] mL/min

**Injection size:** [ ] (L)

**Injection type:** {for GC}

**System suitability**

**Sample:** System suitability solution or Standard solution

### Suitability requirements

**Resolution:** NLT [ . ] between \_\_\_ and \_\_\_

**Column efficiency:** NLT [ ] theoretical plates

**Tailing factor:** NMT [ ]

**Relative standard deviation:** [ ], NMT [ . . %]

### Analysis

**Samples:** Standard solution and Sample solution

Calculate the percentage of [limited substance] in the portion of [Drug] taken:

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

$r_U$  = peak response of [limited substance] from the *Sample solution*

$r_S$  = peak response from the *Standard solution*

$C_S$  = concentration of the *Standard solution* (mg/mL)

$C_U$  = concentration of the *Sample solution* (mg/mL)

### Acceptance criteria

**Individual impurities:** See *Impurity Table 1*. {The table will be numbered with "1", even if only one table.}

**Total impurities:** NMT [ ]%

**Impurity Table 1**

Name	Relative Retention Time	Relative Response Factor	Acceptance Criteria, NMT %
[Drug] related compound ___ <sup>a</sup>	—	—	[ . ]
{All identified impurities should be listed. If possible, provide a short name for an impurity when no USP Reference standard is available, for example: [Drug] Z-isomer, <sup>b</sup> [Drug] Butyl analog, <sup>c</sup> [Drug] 3-ketone. <sup>d</sup> Give full chemical names as footnotes.}	—	{two decimal places if less than 1.0; one decimal place if more than 1.0}	[ . ]
[Drug]	1.0	1.0	—
Any other individual, unidentified impurity	—	1.0	[ . ]

<sup>a</sup> Chemical name.

<sup>b</sup> Chemical name.

<sup>c</sup> Chemical name.

<sup>d</sup> Chemical name.

### IMPURITIES {TLC Impurities procedure}

Organic Impurities

#### • [Test]

**Standard solution:**

**Sample solution:**

**Adsorbent:** {e.g., 0.25-mm layer of chromatographic silica gel mixture. We have to specify it here but not in the ID test. Chapter <201> mentions it, but <621> does not.}

**Application volume:** [ ]  $\mu$ L

**Developing solvent system:** Solvent 1, Solvent 2, and Solvent 3 ([ ]:[ ]:[ ])

**Spray reagent:**

**Analysis:** Proceed as directed for *Chromatography <621>*, *Thin-Layer Chromatography*.

[Spray the plate with \_\_\_\_]. Examine the plate under [short-wavelength UV light] [and then under] [long-wavelength UV light].

{When listing several spots on a TLC plate, cite in the order of increasing  $R_F$  value.}

{When stating a quantitative result, indicate:}

Any spot obtained from [ ], except for the principal spot, is not more intense than the spot of the *Standard solution* [ ]: NMT 0. . % of any individual impurity is found.

### SPECIFIC TESTS

• **BACTERIAL ENDOTOXINS TEST <85>**: Contains NMT [ ] USP Endotoxin Unit/mg of [ ]

• **STERILITY TESTS <71>**: Meets the requirements

{This test applies to Ophthalmic Ointments only.}

• **ANTIMICROBIAL PRESERVATIVE <341>**: {If present in original monographs.} Proceed as directed for [name of the antimicrobial agent] under *Antimicrobial Agent Content* -<341>: NMT [\_.\_] % is found.

• **PARTICULATE MATTER IN INJECTIONS<788>**: Meets the requirements for small-volume injections

• **INJECTIONS <1>**: Meets the requirements

#### ADDITIONAL REQUIREMENTS

• **PACKAGING AND STORAGE**: Preserve in [well-closed] [tight] [light-resistant] containers [, and store at \_\_\_\_].

• **LABELING**:

• **USP REFERENCE STANDARDS <11>** {ALPHABETICAL ORDER}

USP [Drug] RS

USP [Drug] Related Compound [ \_\_ ] RS