AMPICILLIN
Sigma Prod. No. A6140, A9393, and A9518
Storage Temperature 2-8°C

SYNONYMS: D[-]-a-aminobenzylpenicillin;
6-[D(-)-a-aminophenylacetamido]penicillanic acid (and others¹)

STRUCTURE: Shown for Ampicillin Trihydrate

PHYSICAL DESCRIPTION:

<table>
<thead>
<tr>
<th>PRODUCT NUMBER</th>
<th>A6140</th>
<th>A9393</th>
<th>A9518</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAS NUMBER</td>
<td>7177-48-2</td>
<td>69-53-4</td>
<td>69-52-3</td>
</tr>
<tr>
<td>APPEARANCE</td>
<td>Powder</td>
<td>Powder</td>
<td>Powder</td>
</tr>
<tr>
<td>MOLECULAR FORMULA</td>
<td>C₁₆H₁₉N₃O₄S·3H₂O</td>
<td>C₁₆H₁₈N₃O₄</td>
<td>C₁₆H₁₈N₃O₄Na</td>
</tr>
<tr>
<td>MOLECULAR WEIGHT</td>
<td>403.4</td>
<td>349.4</td>
<td>371.4</td>
</tr>
<tr>
<td>MELTING RANGE¹²</td>
<td>199-202°C</td>
<td>208-222°C</td>
<td>236-239°C</td>
</tr>
</tbody>
</table>
| pKa Values     | pKa = 2.5 (-COOH)  
                pKa = 7.3 (-NH₂) at 25°C¹² | pKa = 2.5 (-COOH)  
                pKa = 7.3 (-NH₂) at 25°C¹² | pKa = 2.5 (-COOH)  
                pKa = 7.3 (-NH₂) at 25°C¹² |
| STABILITY AS SUPPLIED¹⁴ | non-hygroscopic | hygroscopic | hygroscopic |
| SOLUBILITY²    | 50 mg/mL in 1 M HCl  
                10 mg/mL (H₂O) | 50 mg/mL in 1 M NH₄OH | 50 mg/mL in water |
STABILITY / STORAGE AS SUPPLIED:

A6140 was reported as stable at 25°C at 43% and 81% relative humidity for six weeks, with little change in either moisture content or activity.³

SOLUBILITY / SOLUTION STABILITY:

Generally reported as slightly soluble in water, practically insoluble in alcohol, chloroform, ether and fixed oils, but soluble in dilute acids or bases.³

A number of studies, including an excellent review article (ref. 5), have indicated that the stability of ampicillin in solution appears to be a function of pH, temperature, and even the identity of the buffer. Although ampicillin in any form is more readily soluble in base, it rapidly loses activity when stored above pH 7.0.⁵,⁶,⁷ Optimal conditions for storage were suggested as 2-8°C, pH 3.8 to 5, retaining more than 90% activity for a week. Another review noted that the buffer used can also affect stability - at pH 7, Tris is "highly deleterious to the stability...but not so at pH 5...." Citrate is fine at pH 7 but not at pH 5. Acetate buffer seems best at pH 6.⁵,⁶

Ampicillin in solution is not very stable at pH above 7. Any of the three products can be used, but the pH should be adjusted to 7 or lower for solution stability.

Solution should not be autoclaved; a stock solution of 50 mg/mL should be sterilized by filtration through a 0.22µm filter and stored frozen. Frozen aliquots are expected to be stable for months.² This stock can be added to agars or culture media after they have been auto claved and cooled to 45-50°C. A final concentration of 20-60 µg/mL has been recommended. Culture plates with ampicillin can be stored at 2-8°C for up to two weeks before use.⁸,⁹

GENERAL REMARKS:

Ampicillin is a semi-synthetic derivative of penicillin, active as a broad-spectrum antibiotic. Its spectrum of action is broader than that of benzylpenicillin, especially against gram-negative bacilli. It is inactivated by beta lactamases and for this reason is often administered with a beta lactamase inhibitor. It is similar to benzylpenicillin in its action against gram-positive bacteria; its action is similar to that of the tetracyclines and chloramphenicol against gram-negative bacteria. Minimum inhibitory concentrations for gram-positive organisms have been reported to range from 0.02 to 1.5 µg/mL and for gram-negative organisms from 0.03 to 3 µg/mL.³
REFERENCES:

2. Sigma data.
4. Supplier information.

ADDITIONAL REFERENCES:


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