

L-Glutamate Determination

I. Introduction

L-Glutamate concentrations in complex matrices can be measured directly and quickly using the YSI 2700 SELECT Biochemistry Analyzer. YSI's unique enzyme technology provides for specific L-glutamate measurement. Measurements are virtually unaffected by color, turbidity, density, pH, or the presence of reducing substances.

When a sample is injected into the sample chamber, the glutamate diffuses into the membrane containing glutamate oxidase. The glutamate is immediately oxidized to hydrogen peroxide, α -ketoglutarate, and ammonia. The hydrogen peroxide is detected amperometrically at the platinum electrode surface. The current flow at the electrode is directly proportional to the hydrogen peroxide concentration, and hence to glutamate concentration.

II. Materials and Setup

- YSI 2700 SELECT Biochemistry Analyzer - equipped with a 2754 Glutamate Membrane and 2357 Buffer.
- L-Glutamate standards (5.00 mmol/L, 10.0 mmol/L). Place the 5.00 mmol/L solution at Cal Station #1.
- Connect the 2700 SELECT to a suitable power source.
- Perform the instrument and membrane check described in the Operations Manual (Section 3).
- Volumetric glassware (Class A recommended).
- The following instrument setup is recommended.

Sample size:	25 μ L
Sample Station #	2
CalMethod	One Station

Black Probe Parameters

Chemistry	Glutamate
Unit	mmol/L
Calibrator	5.00 mmol/L
End Point	30 Sec
CalStation#	1

White Probe Parameters

Single Channel 2700	N/A
Dual Channel 2700	None

Autocal Parameters

Sample Error	ON
Temperature	1°C
Time	15 Min
Sample	2 Sam
Cal Shift	2%

III. Method

- Total glutamate concentration should not exceed 10.0 mmol/L, as determined in Part D below; otherwise the sample will require further dilution. Use volumetric glassware for all dilutions.
- Calibrate the 2700 SELECT with a 5.00 mmol/L L-Glutamate Calibration Standard.
- Check the linearity of the membrane at least once a day by injection of a glutamate linearity check solution (10.0 mmol/L). Refer to the Operators Manual (Section 3) for specifications.
- Assay the sample by aspiration into the 2700 SELECT. The linear range of the system is 0 to 10.0 mmol/L glutamate. If the value reported exceeds this, further dilution is required.
- Calibrate frequently as described in the Operations Manual (Section 6).

IV. Calculations

To calculate % glutamate, multiply the reported value by the appropriate dilution factor.

For the examples, glutamate concentrations are expressed as monosodium glutamate. The molecular weight of monosodium glutamate (MSG) is 187.13 g/mole or 0.18713 g/mmol.

Example: The contents of a can of soup were blended in a blender on medium speed for about 3 minutes. 10.09 g of blended soup was diluted to 100 mL in a Class A volumetric flask with water. When assayed, the value reported was 1.42 mmol/L glutamate.

% Glutamate:

$$1.42 \text{ mmol/L} \times 0.100\text{L}/10.09\text{g} \times 0.18713 \text{ g/mmol MSG} \\ = 0.0027 \text{ g MSG/g soup} \\ = 0.27\% \text{ (w/w)}$$

Example: 2.50 grams of a dry powder seasoning mix was diluted to 100 mL in a Class a volumetric flask with water. The mixture was stirred for 5 minutes. When assayed, the value reported was 6.85 mmol/L glutamate.

$$6.85 \text{ mmol/L} \times 0.100\text{L}/2.50\text{g} \times 0.18713 \text{ g/mmol MSG} \\ = 0.0512 \text{ g MSG/g seasoning mix} \\ = 5.12\% \text{ (w/w)}$$

V. Ordering Information

YSI No.

2700	Biochemistry Analyzer
2754	Glutamate Oxidase Membrane Kit
2755	L-Glutamate Standard Solution (5.00 mmol/ L)
2756	L-Glutamate Standard Solution (10.0 mmol/ L)
2357	Buffer Kit
2363	Potassium Ferrocyanide Test Solution
2392	NaCl Solution (for membrane installation)

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1725 Brannum Lane
PO Box 279
Yellow Springs, Ohio 45387 USA
937-767-7241 • 800-765-4974

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