S. Department of Commerce
Malcolm Baldrige
Secretary

National Bureau of Standards
Ernest Ambler, Director

National Bureau of Standards

Certificate

Standard Reference Material 17c

Sucrose

This Standard Reference Material is intended for use as a saccharimetry standard in calibrating polarimetric systems. Certified values for the optical rotation, index of refraction, density, and their associated standard errors of a "normal solution" of SRM 17c Sucrose at 20.00 ± 0.01 °C are given below:

Wavelength (in vacuo)	Optical Rotation		Standard Error
546.2271 nm	711.657 mrad	(40.7749 °)	0.035 mrad
589.4400	604.292*	(34.6234)	
632.9914	519.213	(29.7487)	0.019

*Calculated value - see text.

Wavelength (in vacuo)	Index of Refraction	Standard Error
546.227	1.371664	0.000011
589.440	1.370066	0.000011

Density	Standard Error
1097.684 $mg \cdot cm^{-3}$	0.021 $mg \cdot cm^{-3}$

The standard errors include measurement error as well as errors due to heterogeneity in the material. On the assumption that the user of this SRM makes measurements with precision comparable to that of NBS, and that he makes duplicate measurements on a single cell, the maximum differences to be expected between his result and the certified value (at an approximately 95% confidence level) are as follows:

	Maximum Difference
Optical Rotation at 546.2271 nm	0.17 mrad
Optical Rotation at 632.9914 nm	0.09 mrad
Refractive Index at 546.227 or 589.440 nm	0.000055
Density	0.10 $mg \cdot cm^{-3}$

The initiation and overall direction of technical measurements leading to certification were performed by A. L. Cummings while general coordination was provided by R. A. Velapoldi of the Center for Analytical Chemistry.

The technical and support aspects concerning the preparation, certification and issuance of this Standard Reference Material were coordinated through the Office of Standard Reference Materials by R. K. Kirby.

Washington, D.C. 20234
April 1, 1981

George A. Uriano, Chief
Office of Standard Reference Materials

(over)

A value for the optical rotation at 632.9914 nm as calculated from the certified value at 546.2271 nm using the equation given by the International Commission for Uniform Methods of Sugar Analysis (ICUMSA) (1) agrees with the certified value within its standard error. The certified value of the optical rotation at 589.4400 nm is the average value calculated with this ICUMSA equation from the certified values at 546.2271 nm and 632.9914 nm.

The optical rotation of a normal solution of SRM 17c at 546.2271 nm corresponds to 100.024 ± 0.005 °S of the International Sugar Scale adopted in 1970 (2). Consult future ICUMSA reports as they are published to keep abreast of any redefinition of this scale which might alter this sugar value. At this time the International Sugar Scale (100 °S) is based on the optical rotation caused by the normal sugar solution in a 200-mm polariscope tube. The normal sugar solution is defined as 26.0160 g of "pure" sucrose weighed in vacuum and dissolved in pure water and diluted to 100.000 cm^3 at 20.00 °C. This corresponds to 23.7017 g of sucrose per 100.000 g of aqueous solution (3,4).

Measurements of dilutions of the normal solution of SRM 17c indicate that the refractive index and density can be calculated from published equations (5,6) for concentrations other than normal within the standard errors given for the normal solution.

This SRM has been analyzed for impurities and the results tabulated below are not certified but are given for information only:

	Concentration, μg/g
Moisture	(200 ± 18)
Glucose	(40 ± 3)
Fructose	(34 ± 3)
Ash	(46 ± 3)
Raffinose	(87 ± 5)
Other Oligosaccharides	(44 ± 12)
Polysaccharides	(205 ± 30)
Other Large Molecules	(63 ± 17)
Microbial Contamination	none

The uncertainties given above are the standard deviations based on 3 to 8 measurements. The impurity content should be stable unless the material is exposed to moisture or microbes.

For very accurate measurements, the solutions should be freshly prepared under sterile conditions using sterile water.

Measurements of optical rotation were made by D. K. Hancock and R. V. Bostelman, measurements of refractive index by M. J. Dodge, measurements of density by J. F. Hauser, and other analyses by A. L. Cummings, S. A. Margolis, D. J. Reeder, L. T. Sniegoski, J. W. Stolz (all of the National Bureau of Standards) and F. G. Carpenter (of the U.S. Department of Agriculture, New Orleans). Statistical analyses were made by J. Mandel (of the National Bureau of Standards).

References

(1) Proceedings 16th Session ICUMSA, 56 (1974).

(2) Proceedings 15th Session ICUMSA, 42 (1970).

(3) Proceedings 16th Session ICUMSA, 52-74 (1974).

(4) Cummings, A.L., Coxon, B., Layer, H.P., and Hocken, R.J., Proceedings of the 1978 Technical Session on Cane Sugar Refining Research, Sept. 17-19, 1978, Washington, D.C., U.S. Dept. of Agriculture, P.O. Box 19687, New Orleans, LA 70129, pp 191-204 (1979).

(5) Proceedings 16th Session ICUMSA, 151-152 (1974).

(6) Zander, K., Seiler, W., and Bunnagel, R., Zucker 27 (12) 642-647 (1974).