Designation: D 3648 – 03

An American National Standard

Standard Practices for the Measurement of Radioactivity[1]

This standard is issued under the fixed designation D 3648; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 These practices cover a review of the accepted counting practices currently used in radiochemical analyses. The practices are divided into four sections:

	Section
General Information	6 to 11
Alpha Counting	12 to 22
Beta Counting	23 to 33
Gamma Counting	34 to 41

1.2 The general information sections contain information applicable to all types of radioactive measurements, while each of the other sections is specific for a particular type of radiation.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

D 1066 Practice for Sampling Steam [2]

D 1129 Terminology Relating to Water [2]

D 1943 Test Method for Alpha Particle Radioactivity of Water [3]

D 2459 Test Method for Gamma Spectrometry of Water [4]

D 3084 Practice for Alpha Spectrometry of Water [3]

D 3085 Practice for Measurement of Low-Level Activity in Water [3]

D 3370 Practices for Sampling Water from Closed Conduits [2]

D 3649 Test Method for High-Resolution Gamma-Ray Spectrometry of Water [3]

E 380 Practice for Use of the International System of Units (SI) (the Modernized Metric System) [5]

2.2 *ANSI/ISO Standards:*[6]

ANSI N42.14 Calibration and Use of Germanium Spectrometers for the Measurement of Gamma-Ray Emission Rates of Radionuclides

ISO Guide to the Expression of Uncertainty in Measurement, 1993

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in these practices, refer to Terminology D 1129. For an explanation of the metric system, including units, symbols, and conversion factors, see Practice E 380.

4. Summary of Practices

4.1 The practices are a compilation of the various counting techniques employed in the measurement of radioactivity. The important variables that affect the accuracy or precision of counting data are presented. Because a wide variety of instruments and techniques are available for radiochemical laboratories, the types of instruments and techniques to be selected will be determined by the information desired. In a simple tracer application using a single radioactive isotope having favorable properties of high purity, energy, and ample activity, a simple detector will probably be sufficient and techniques may offer no problems other than those related to reproducibility. The other extreme would be a laboratory requiring quantitative identification of a variety of radionuclides, preparation of standards, or studies of the characteristic radiation from radionuclides. For the latter, a variety of specialized instruments are required. Most radiochemical laboratories require a level of information between these two extremes.

4.2 A basic requirement for accurate measurements is the use of accurate standards for instrument calibration. With the present availability of good standards, only the highly diverse radiochemistry laboratories require instrumentation suitable for producing their own radioactive standards. However, it is advisable to compare each new standard received against the previous standard.

[1] These practices are under the jurisdiction of ASTM Committee D19 on Water and are the direct responsibility of D19.04 on Methods of Radiochemical Analysis.

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[2] *Annual Book of ASTM Standards*, Vol 11.01.

[3] *Annual Book of ASTM Standards*, Vol 11.02.

[4] Discontinued—See 1987 *Annual Book of ASTM Standards*, Vol 12.01.

[5] *Annual Book of ASTM Standards*, Vol 14.02 (Excerpts in Vol 11.02).

[6] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

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