

### 18.3.2 General terms

#### **Sample**

A portion of material selected from a larger quantity of material.

Note: The term "sample" implies the existence of a sampling error, i.e., the results obtained on the portions taken are only estimates of the concentration of a constituent or the quantity of a property present in the parent material. If there is no or negligible sampling error, the portion removed is a test portion, aliquot, or specimen. The term "specimen" is used to denote a portion taken under conditions such that the sampling variability cannot be assessed (usually because the population is changing), and is assumed, for convenience, to be zero. The manner of selection of the sample should be prescribed in a *sampling plan*.

#### **Sampling plan**

A predetermined procedure for the selection, withdrawal, preservation, transportation, and preparation of the portions to be removed from a population as samples.

Note: Summarizing the test values or observations from the selected portions yields an estimate for the concentration of an analyte or a value for a property determined with a calculable degree of uncertainty at a specified confidence level. A sampling plan includes the designation of the number, location, and size of the portions, and instructions for the extent of compositing and for the reduction (in amount and fineness) of the portions to a laboratory sample and to test portions. It may also contain acceptance criteria. Some sampling plans do not include more than instructions for the statistical selection of portions to be removed. Such plans should properly be designated as "statistical sampling plans."

#### **Characteristic**

A property or attribute of a material that is measured, compared, or noted.

#### Notes:

- (1) Attributes are ordinarily qualitative characteristics, but quantitative characteristics (variables) may be converted into attributes by assigning items to certain categories on the basis of the measured values.
- (2) The value of the characteristic determined as a result of an observation or test is the observed value; when determined by a specified test method, it is called the test result.

- (3) The concentration or quantity of an analyte as estimated by use of a sample is usually the characteristic of interest in analytical chemistry.

### **Homogeneity, heterogeneity**

The degree to which a property or a constituent is uniformly distributed throughout a quantity of material.

#### Notes:

- (1) A material may be homogeneous with respect to one analyte or property but heterogeneous with respect to another.
- (2) The degree of heterogeneity (the opposite of homogeneity) is the determining factor of *sampling error*.

### **Sampling error**

That part of the total error (the estimate from a sample minus the population value) associated with using only a fraction of the population and extrapolating to the whole, as distinct from analytical or test error. It arises from a lack of homogeneity in the parent population.

#### Notes:

- (1) In chemical analysis, the final test result reflects the value only as it exists in the test portion. It is usually assumed that no sampling error is introduced in preparing the test sample from the laboratory sample. Therefore, the sampling error is usually associated exclusively with the variability of the laboratory sample.
- (2) Sampling error is determined by replication of the laboratory samples and their multiple analyses. Since sampling error is always associated with analytical error, it must be isolated by the statistical procedure of analysis of variance.