

Pharmaceutical analysis- BP102T

UNIT: 1 (Pharmaceutical analysis, its definition and scope, methods expressing techniques)

CLASS:6

TOPIC: CLASSIFICATION OF ERRORS

The numerous uncertainties usually encountered in a chemical analysis give rise to a host of 'errors' that may be broadly categorised into two heads, namely :

- (i) Determinate (systematic) Errors
- (ii) Indeterminate (random) Errors.

It is pertinent to mention here that it becomes rather difficult at times to place a particular 'error' into one of the above mentioned categories however, the classification may prove to be beneficial with regard to study of the various analytical errors that crop up in the course of routine analysis.

1. DETERMINATE (SYSTEMATIC) ERRORS

These are errors that possess a definite value together with a reasonable assignable cause; however, in principle these avoidable errors may be measured and accounted for conveniently. The most important errors belonging to this particular class are :

(a) **Personal Errors** : They are exclusively caused due to 'personal equation' of an analyst and have no bearing whatsoever either on the prescribed procedure or methodology involved.

(b) **Instrumental Errors** : These are invariably caused due to faulty and uncalibrated instruments, such as : pH meters, single pan electric balances, uv-spectrophotometers, potentiometers etc.

(c) **Reagent Errors** : The errors that are solely introduced by virtue of the individual reagents, for instance : impurities inherently present in reagents ; high temperature volatilization of platinum (Pt) ; unwanted introduction of 'foreign substances' caused by the action of reagents on either porcelain or glass apparatus.

(d) **Constant Errors** : They are observed to be rather independent of the magnitude of the measured amount ; and turn out to be relatively less significant as the magnitude enhances.

Example : Assuming a constant equivalence—point error of 0.10 ml is introduced in a series of titrations, hence for a specific titration needing only 10.0 ml of titrant shall represent a relative error of 1% and only 0.2% for a corresponding 50 ml of titrant consumed.

(e) **Proportional Errors** : The absolute value of this kind of error changes with the size of the sample in such a fashion that the relative error remains constant. It is usually incorporated by a material that directly interferes in an analytical procedure.

Example : Estimation of 'chlorate'—an oxidant by iodometric determination. In this particular instance two things may happen, namely :

(i) Presence of 'Bromate'—another oxidizing agent would give rise to positively higher results, and hence, it must be duly corrected for, and

(iii) Absolute error might increase while dealing with large samples, whereas the relative error would remain more or less constant if the sample is perfectly homogenous,

(f) **Errors due to Methodology** : Both improper (incorrect) sampling and incompleteness of a reaction often lead to serious errors. A few typical examples invariably encountered in titrimetric and gravimetric analysis

(g) **Additive Errors** : It has been observed that the additive errors are independent of the quantum of the substances actually present in the assay.

Examples : (i) Errors caused due to weights, and

(ii) Loss in weight of a crucible in which a precipitate is incinerated.

Detection of this error is ascertained by taking samples of different weights.

INDETERMINATE (RANDOM) ERRORS

As the name suggests, indeterminate errors cannot be pin-pointed to any specific well-defined reasons. They are usually manifested due to the minute variations which take place inadvertently in several successive measurements performed by the same analyst, using utmost care, under almost identical experimental parameters. These errors are mostly random in nature and ultimately give rise to high as well as low results with equal probability. They can neither be corrected nor eliminated, and therefore, form the '**ultimate limitation**' on the specific measurements. It has been observed that by performing repeated measurement of the same variable, the subsequent statistical treatment of the results would have a positive impact of '**reducing their importance**' to a considerable extent.

Very short Questions:

1. Define error
2. What is systemic error and its type
3. Write a note on Random error

Short answer Questions:

1. Explain in briefly about Systemic errors

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