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ERRORS IN PHARMACEUTICAL ANALYSIS

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ERROR refers to the difference in the standard values and the true value.

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Errors that may be broadly divided into two heads, namely :

(i) Determinate (systematic) Errors

(ii) Indeterminate (random) Errors

1. DETERMINATE (SYSTEMATIC) ERRORS -These are errors that possess a definite value with a reasonable cause and these avoidable errors may be measured and accounted for rectification. 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 do not due to either on the prescribed procedure or methodology involved.



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(b) Instrumental Errors : These are invariably caused due to faulty and uncalibrated instruments, such as : pH meters, 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.



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- **Example :** 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.
- **(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



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(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 incenerated.

2. INDETERMINATE (RANDOM) ERRORS- As the name suggests, indeterminate errors cannot be pin-pointed to any specific well-defined reasons.. 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.



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Salient Features of Indeterminate Errors-

- **(1) Repeated measurement of the same variable several times and subsequent refinement to the extent where it is simply a coincidence if the corresponding replicates eventually agree to the last digit,**
- **(2) Both unpredictable and imperceptible factors are unavoidably incorporated in the results what generally appear to be ‘random fluctuations’ in the measured quantity.**
- **(3) Recognition of specific definite variables which are beyond anyone’s control lying very close to the performance limit of an instrument, such as : temperature variations, noise as well as drift from an electronic circuit, and vibrations caused to a building by heavy vehicular-traffic.**



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