ERRORS

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INTRODUCTION

- The numerical difference between a measured value and the absolute or true value of an analytical determination.
- The error in a measured quantity may be represented either as absolute error or as relative error.

1.Absolute error(E)

$$E=Xi-Xt$$

Xi=measured value

Xt=true value

2. Relative error (Er)

$$Er=(Xi-Xt/Xt)\ 100\ \%$$

Types of Errors

No analysis is free of error or “uncertainty”

1.Systematic Error (determinate error)

The error is reproducible and can be discovered and corrected.

2.Random Error (indeterminate error) Caused by uncontrollable variables, which can not be defined/eliminated

Systematic (determinate)

1. Instrumental errors

failure to calibrate, degradation of parts in the
instrument, power fluctuations, variation in temperature, etc.
Can be corrected by calibration or proper instrumentation maintenance.

2. Method errors

- errors due to no ideal physical or chemical behavior
- completeness and speed of reaction, interfering side reactions, sampling problems

Can be corrected with proper method development.

3. Personal errors

- Occur where measurements require judgment, result from prejudice, color acuity problems.

- Can be minimized or eliminated with proper training and experience.

Correction of Determinant Errors

- Periodic calibration of the instruments (Instrumental)
- Personal by care and self discipline (Personal errors)

Identification and compensation of method errors by the following procedures.

Detection of Systematic Errors

1. Analysis of standard samples
2. Independent Analysis: Analysis using a "Reference Method" or "Reference Lab"
3. Blank determinations
4. Variation in sample size: detects constant error only.

Random (indeterminate) Error

No identifiable cause; Always present, cannot be eliminated;

the ultimate imitation on the determination of a quantity.

- Eg. reading a scale on an instrument caused by the finite thickness of the lines on the scale; electrical noise

Accuracy and Precision:

- Accuracy refers to the closeness of a measured value to a standard or known value.
- For example, if in lab one obtain a weight measurement of 3.2 kg for a given substance, but the actual or known weight is 10 kg, then the measurement is not accurate. In this case, the measurement is not close to the known value.

Precision refers to the closeness of two or more measurements to each other.

Using the example above, if one weigh a given substance five times, and get 3.2 kg each time, then the measurement is very precise. Precision is independent of accuracy

REFERENCES

- B.R Puri,L.R Sharma & K C Kalia – Principles of Inorganic Chemistry
- J D Lee ,Concise Inorganic Chemistry.

THANK YOU