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PHARMACEUTICAL ANALYSIS I

UNIT 1

TOPIC :

- **Errors :** Sources of errors, types of errors, methods of minimizing errors, accuracy, precision and significant figures

ERRORS

→ Error is a mistake but rather a difference between a computed / estimated measured value and the accepted true / specified / theoretically correct value

Classification of error

- ❖ Systematic / Determinate / Non random errors
- ❖ Non systematic / Indeterminate / Random / Accidental errors
- ❖ Gross error

1) Systemic error :- The error is constant or changes slightly bu consistent fault during the analysis. **Eg : -** error in titration

- **Instrumental error :-** Error occurs due to faulty instrument or reagent containing impurities
- **Operational / Personal :-** When error occur during operation or carryout the experiment is calles as operational error
- **Methological error :-** These error are most serious errorr of analysis most of above error can be minimized or corrected but errors that are not changeable unless the condition of the determinations are alterted. **Eg :** Errors occer due to co-precipitation of impurities

2) Non-systematic error :- The error unpredictable and difficult to identify Source

- Presence of bubbles in burette
- Sample handling improperly

3) Gross error :- These error are a combination of both systematic and non-systematic error They are the result of big mistake made during analysis and can be identified easily Gross error is also known as Avoidable mistake

Source

- Calculation error
- Wrong sample sizes
- Mix up of samole / reagent

Sources of errors :-

- ❖ Error can be occured due to improper Sampling or sample preparation
- ❖ It can be occured by analyst, due to lack of knowledge and focus.
- ❖ Due to improper calibration in equipments.
- ❖ Due to incorrect observation and data.
- ❖ Due to wrong calculation.
- ❖ Due to any type of impurities present in sample.
- ❖ Due to wrong method selection.
- ❖ During transport and storage
- ❖ Due to improper handling.

METHODS OF MINIMIZING ERRORS

Errors can be minimized by following methods

- **Calibration of Instruments/apparatus :** Calibration is the process by which we check the correctness of instruments and apparatus by using Standard reading and value. By using Calibration, we minimised those determinants errors which occurs due to instruments or apparatus (glasswares etc.).
- **Blank determination :** In this, analysis is performed with or without sample to identify impurities in reagents and solvents and minimize them.
- **Control determination :** In this, standard solution are used for analysis and compared with the normal determination.
- **Independent methods :** In this, we perform the analysis of any substances by two or more different methods and then compare to find error and minimize them.
- **Parallel determination :** In this, we perform the analysis of any substances more than two times and then compare to find errors and minimize them.

Accuracy and Precision

→ Accuracy :- It can be said that the difference between calculated value and accepted real value is known as accuracy

→ Precision :- Reproducibility or Repeatability can be defined as the precision of measurement system in which the degree of repeated measurement is considered under the static condition given the same result

- Repeatability :- It is the variation which arise in spite of all the efforts made to keep the condition constant wheather relased to instrument and repeating in short term span
- Reproducibility :- It is the variation which arise by applying the same process for the measurement by using different instrument and operators over a longer time span

Significant figure

- These are those numbers or digits which are used to express the observation and results.
- It is mainly based on decimal system and used to define the degree of accuracy.

Rules for significant figure

- Non – zero digits are significant
  Eg : 89, 56,78,etc
- Zero between two non – zero digits are significant
  Eg : 108, 805 etc
- Leading zero are consider insignificant
  Eg : 0.00098, 0.000643 etc
- Trailing zeros after a decimal point are significant
  Eg : 12.7900, 6.900 etc