SNS COLLEGE OF PHARMACY AND HEALTH SCIENCES

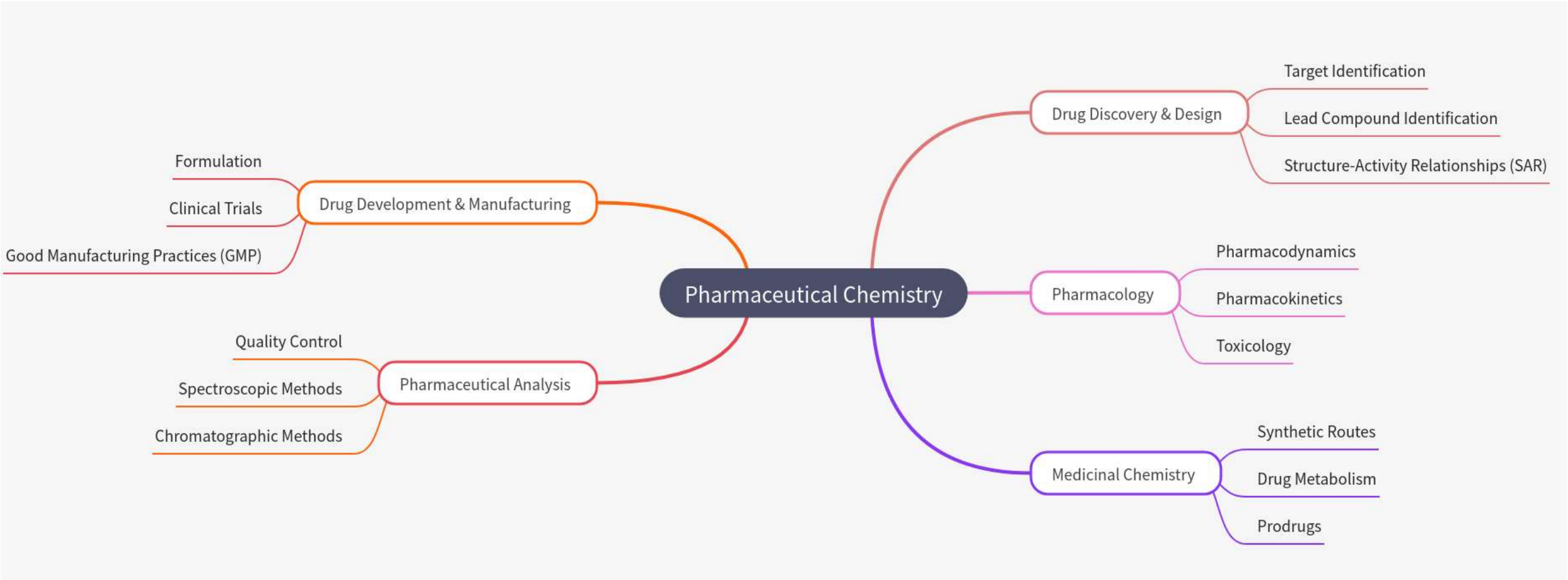
Affiliated To The Tamil Nadu Dr. MGR Medical University, Chennai
Approved by Pharmacy Council of India, New Delhi.
Coimbatore -641035

COURSE NAME:PHARMACEUTICAL CHEMISTRY

I YEAR D PHARM

TOPIC 1: ERRORS, PRECISION AND ACCURACY

Mind Map


Pharmaceutical Chemistry
Drug Development & Manufacturing
Formulation
Clinical Trials
Good Manufacturing Practices (GMP)
Pharmaceutical Analysis
Quality Control
Spectroscopic Methods
Chromatographic Methods
Drug Discovery & Design
Target Identification
Lead Compound Identification
Structure-Activity Relationships (SAR)
Pharmacology
Pharmacodynamics
Pharmacokinetics
Toxicology
Medicinal Chemistry
Synthetic Routes
Drug Metabolism
Prodrugs

INTRODUCTION OF ERRORS

Error is the difference between the true result (or accepted true result) and the measured result.

- **Relative Error = $\frac{\text{Measured Mean Value – True Value}}{\text{True Value}}$**

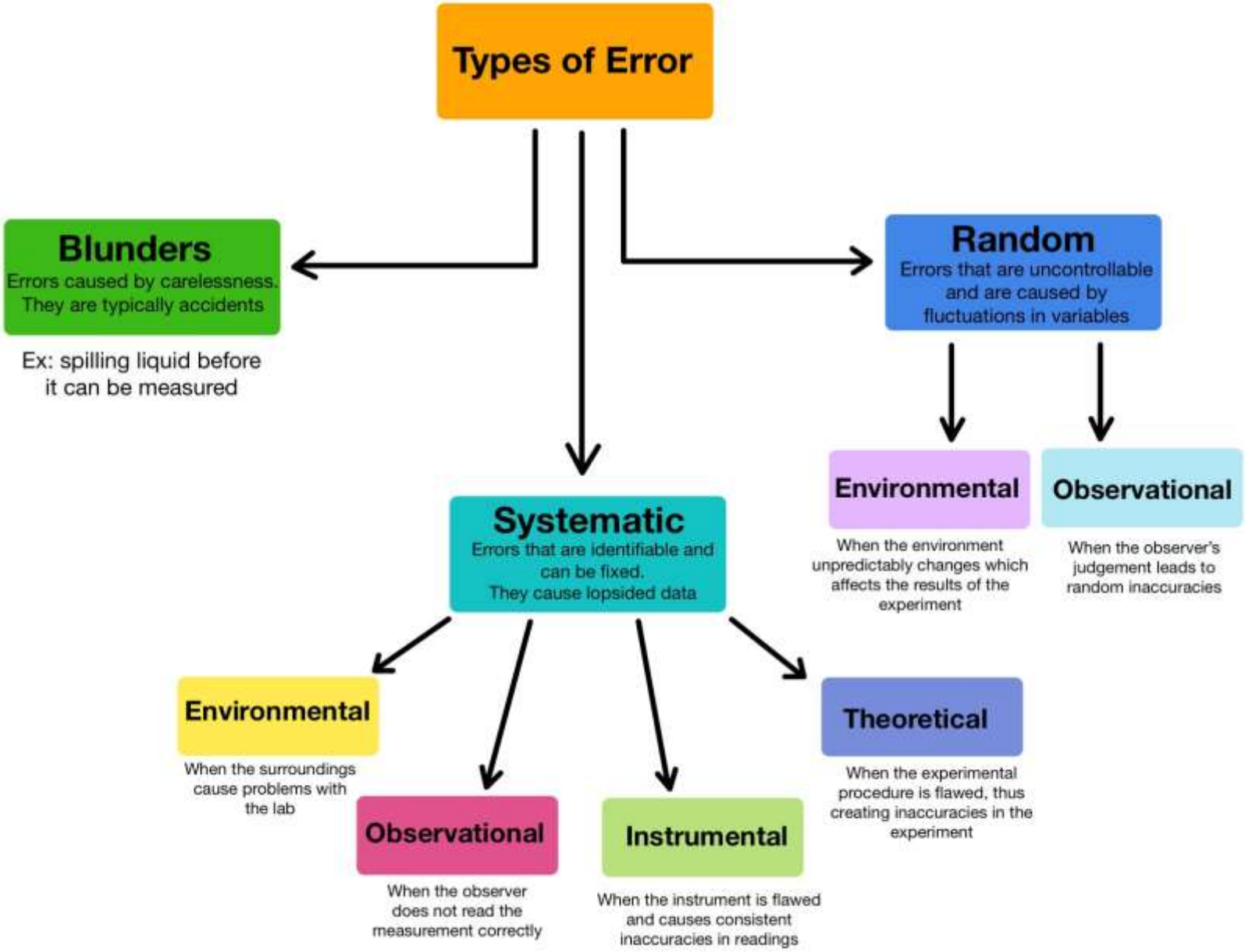
- And the difference between the experimental value and true value is termed as Absolute Error.
- Absolute error may be negative or positive.

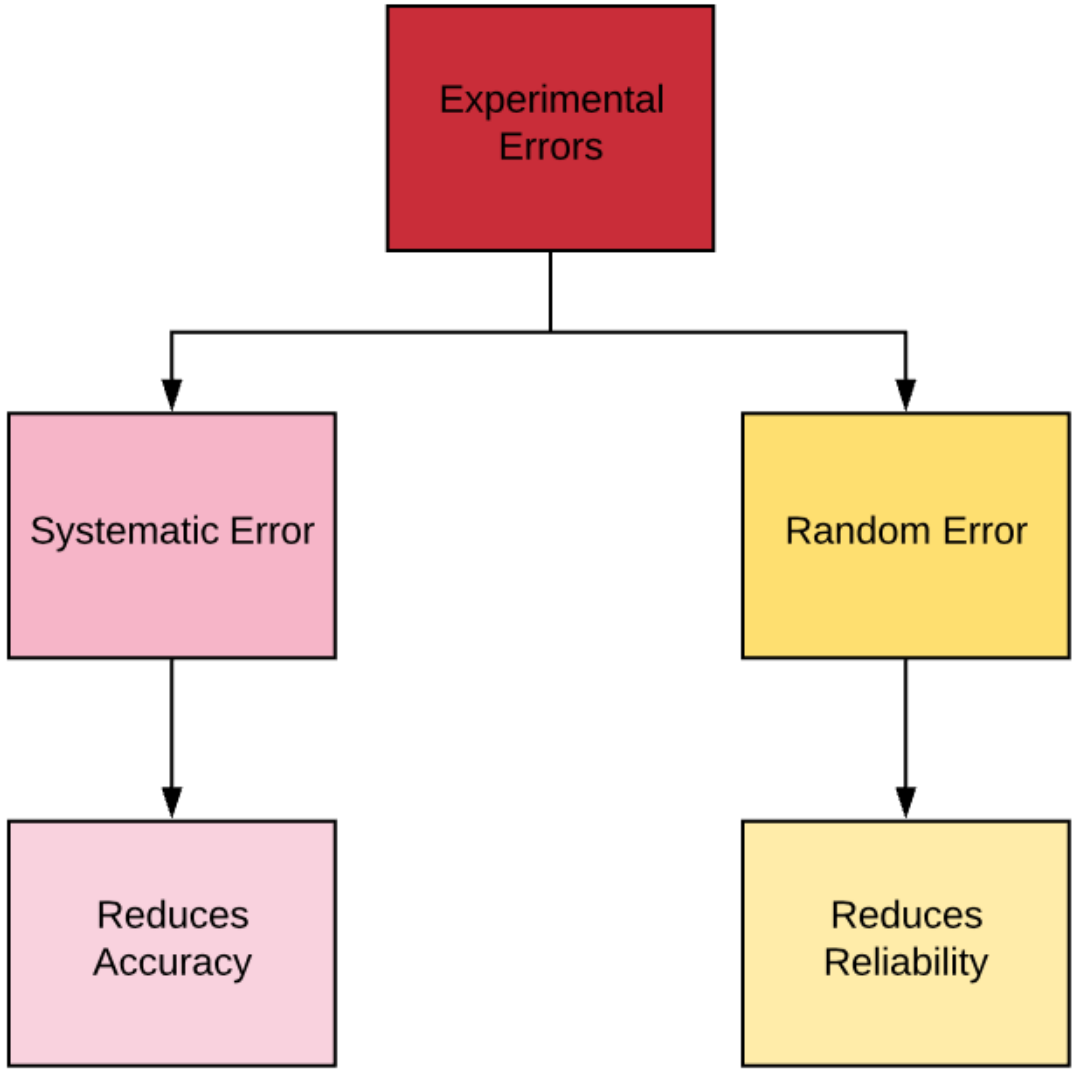
Error

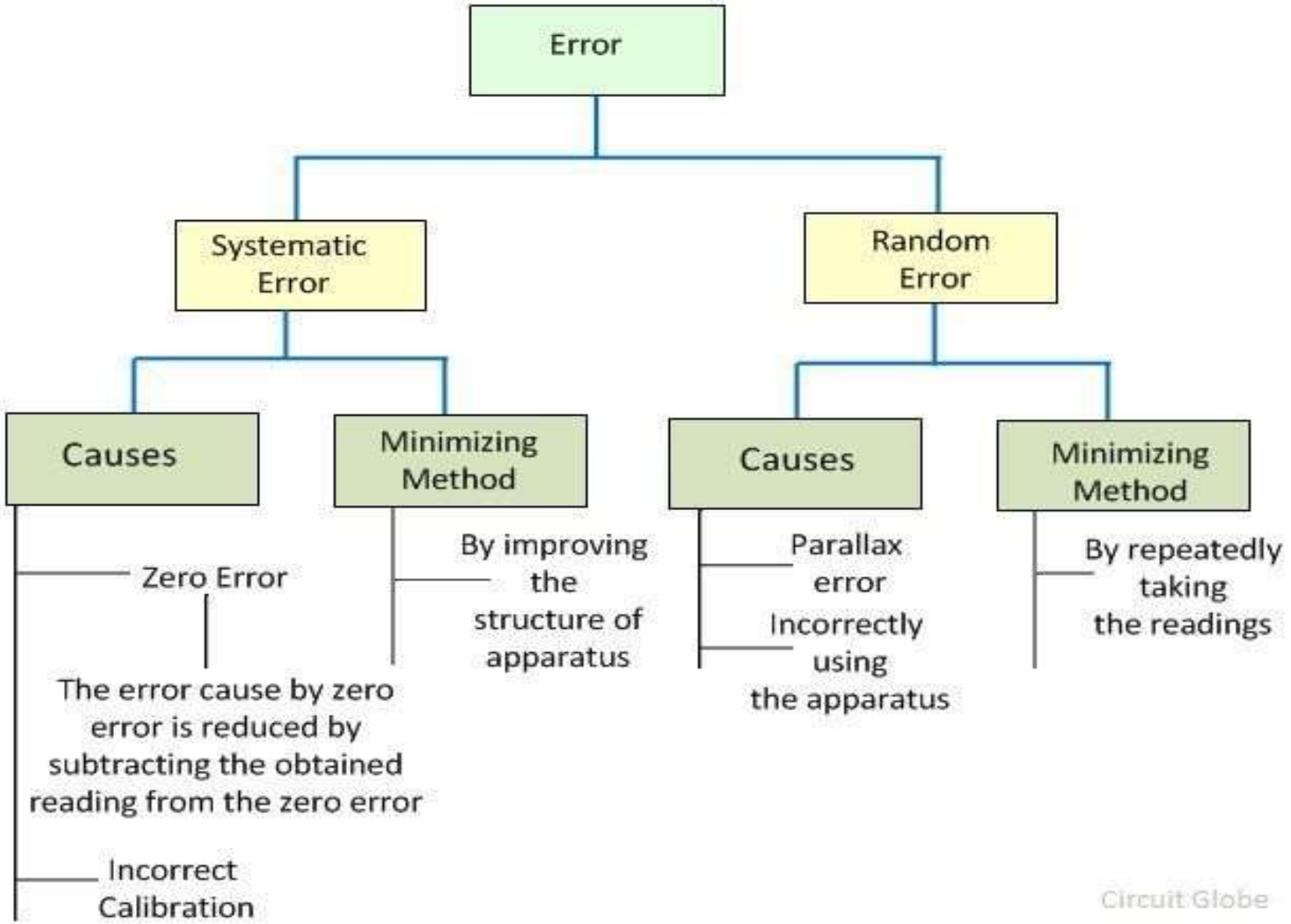
Error = True error – Measured value

Types of Error

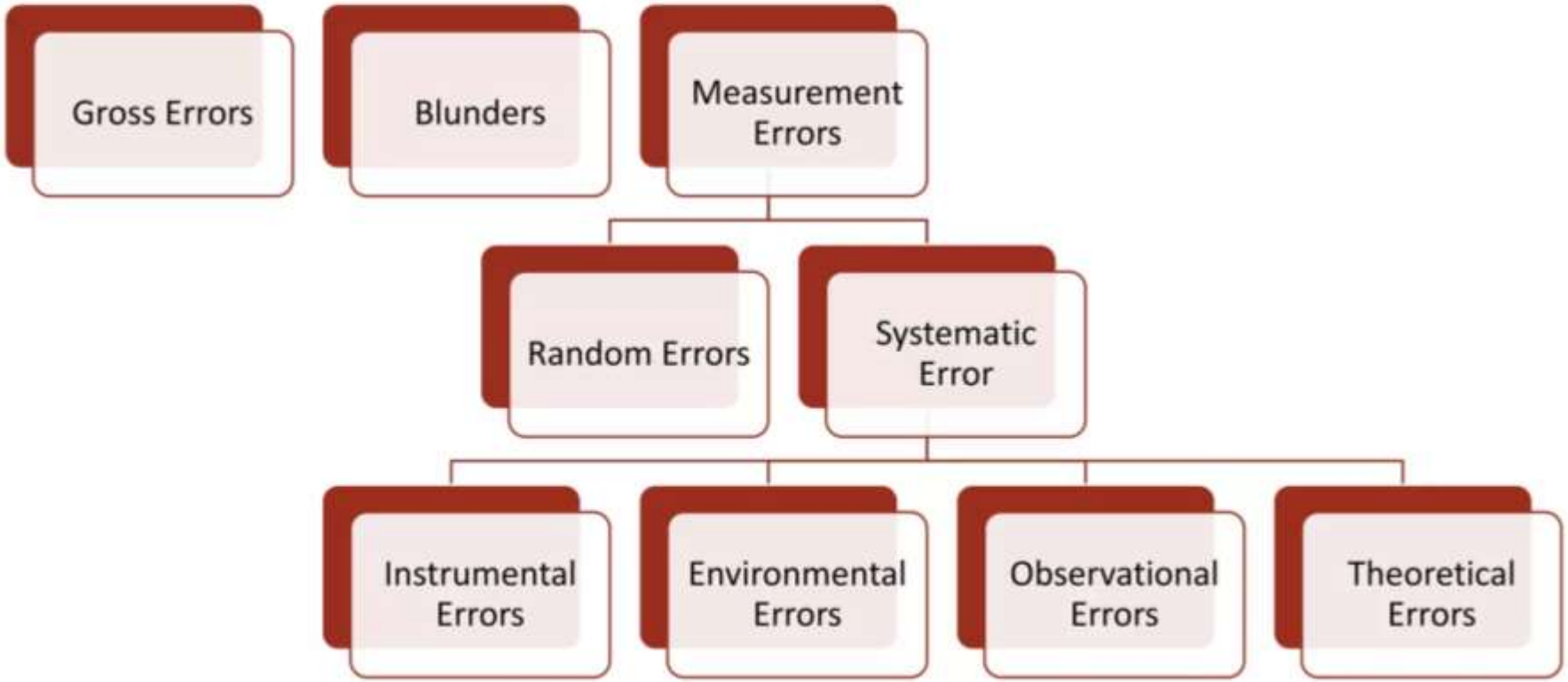
- **Determine error**
  - Systematic error
  - Constant error
- **Indetermine error**
  - Random error
  - Systematic error


Types of Error
Blunders
Errors caused by carelessness. They are typically accidents
Ex: spilling liquid before it can be measured
Random
Errors that are uncontrollable and are caused by fluctuations in variables
Environmental
When the environment unpredictably changes which affects the results of the experiment
Observational
When the observer's judgement leads to random inaccuracies
Systematic
Errors that are identifiable and can be fixed. They cause lopsided data
Environmental
When the surroundings cause problems with the lab
Observational
When the observer does not read the measurement correctly
Instrumental
When the instrument is flawed and causes consistent inaccuracies in readings
Theoretical
When the experimental procedure is flawed, thus creating inaccuracies in the experiment


Experimental Errors
Systematic Error
Random Error
Reduces Accuracy
Reduces Reliability


Error
Systematic Error
Random Error
Causes
Minimizing Method
Causes
Minimizing Method
Zero Error
The error cause by zero error is reduced by subtracting the obtained reading from the zero error
Incorrect Calibration
By improving the structure of apparatus
Parallax error
Incorrectly using the apparatus
By repeatedly taking the readings
Circuit Globe

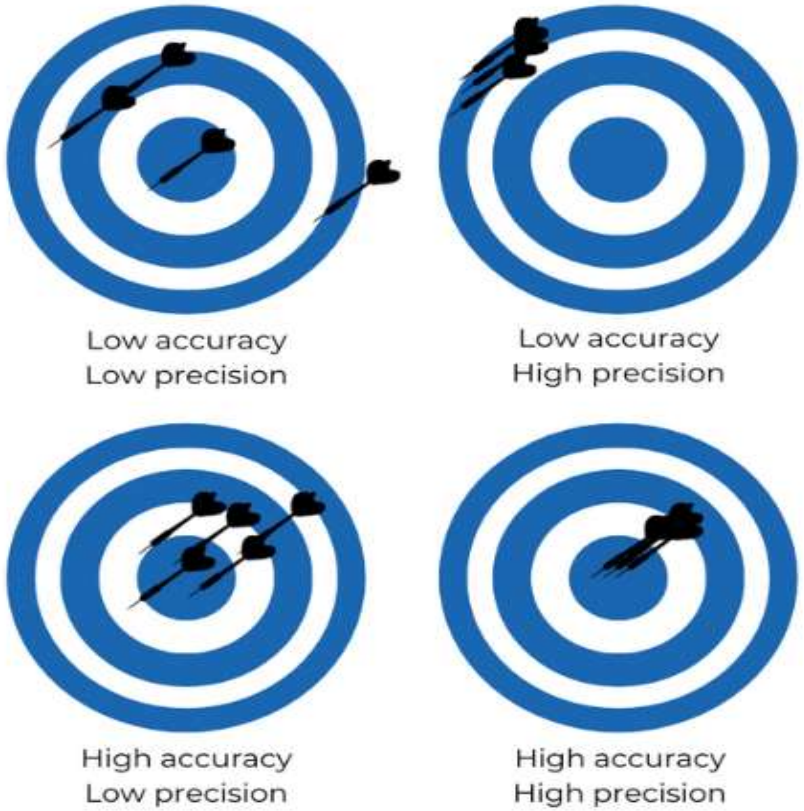
A. Types of Errors in Instrumentation and Measurements



Biased personal error

- Reading of meniscus.
- In weighing
- In matching colours
- In calculation

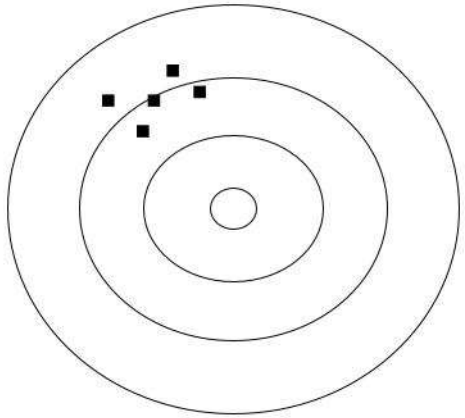
ACCURACY AND PRECISION


Low accuracy
Low precision
Low accuracy
High precision
High accuracy
Low precision
High accuracy
High precision

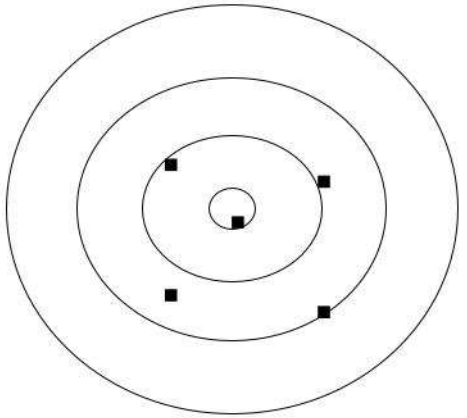
DIFFERENCE BETWEEN ACCURACY AND PRECISION

Accuracy	Precision
Accuracy refers to the level of agreement between the actual measurement and the absolute measurement.	Precision implies the level of variation that lies in the values of several measurements of the same factor.
Represents how closely the results agree with the standard value	Represents how closely results agree with one another
Single-factor or measurement	multiple measurements or factors are needed
it is possible for a measurement to be accurate on occasion as a fluke. For a measurement to be consistently accurate, it should also be precise.	Results can be precise without being accurate. Alternatively, the results can be precise and accurate.

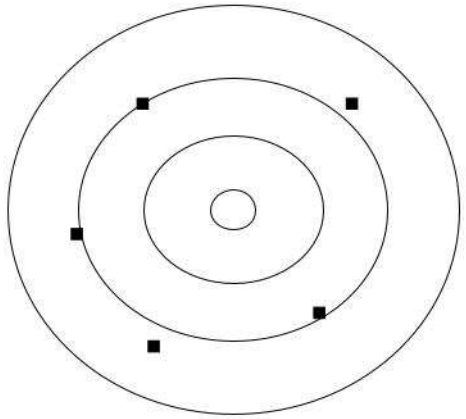
Different scenarios of accuracy and precision



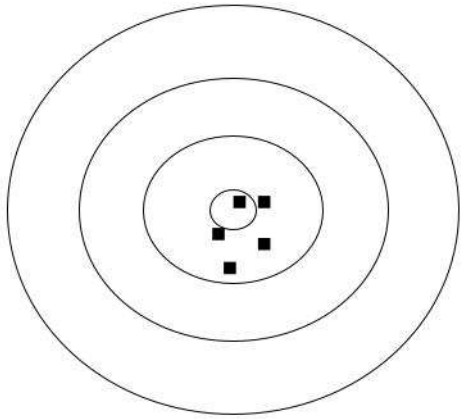
High precision, low accuracy



Low precision, high accuracy

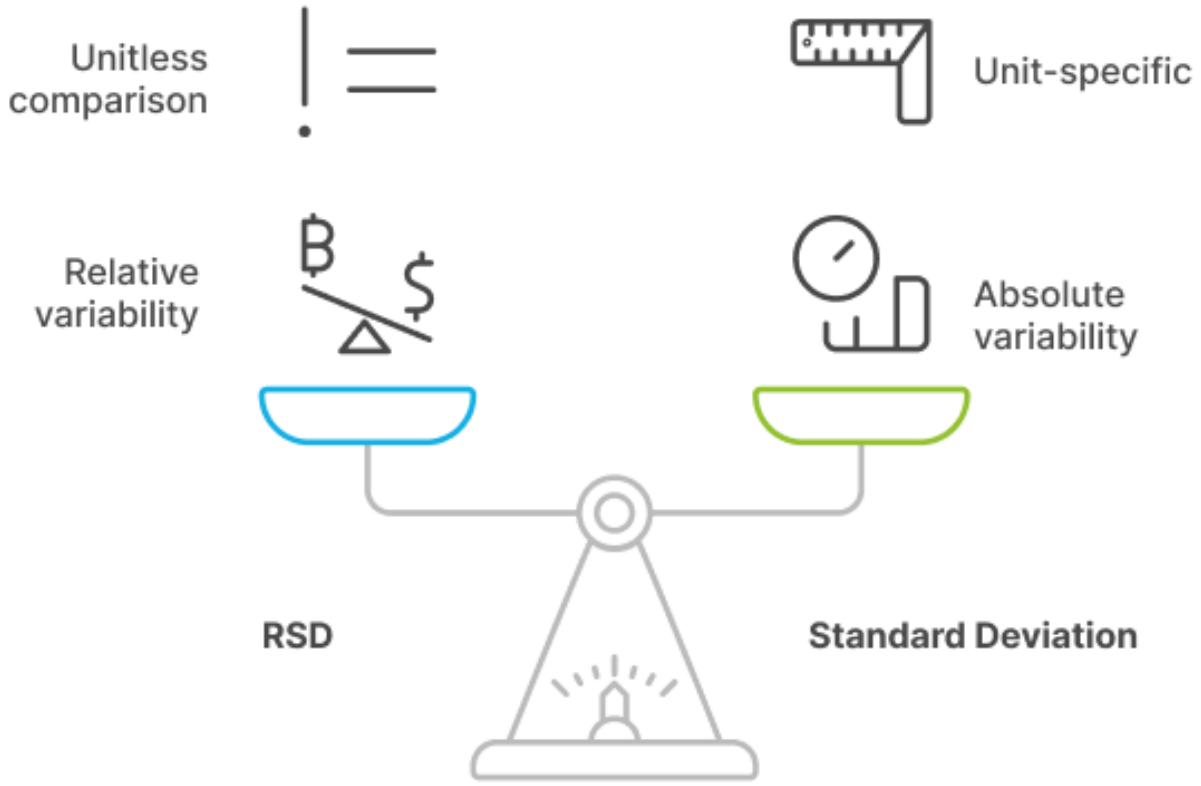


Low precision, low accuracy



High precision, high accuracy

RSD vs Standard Deviation

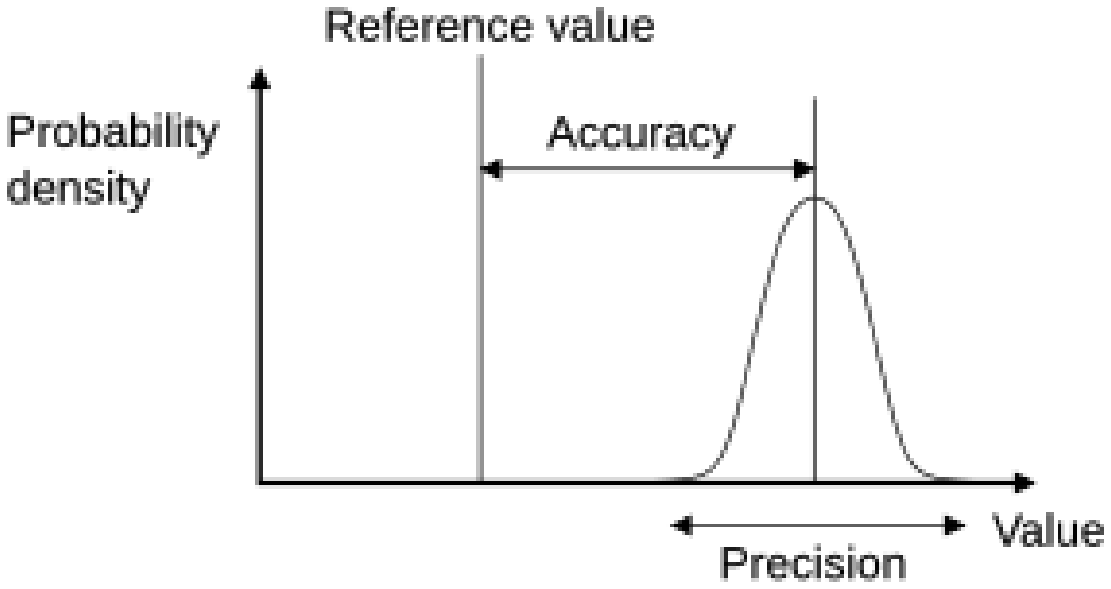


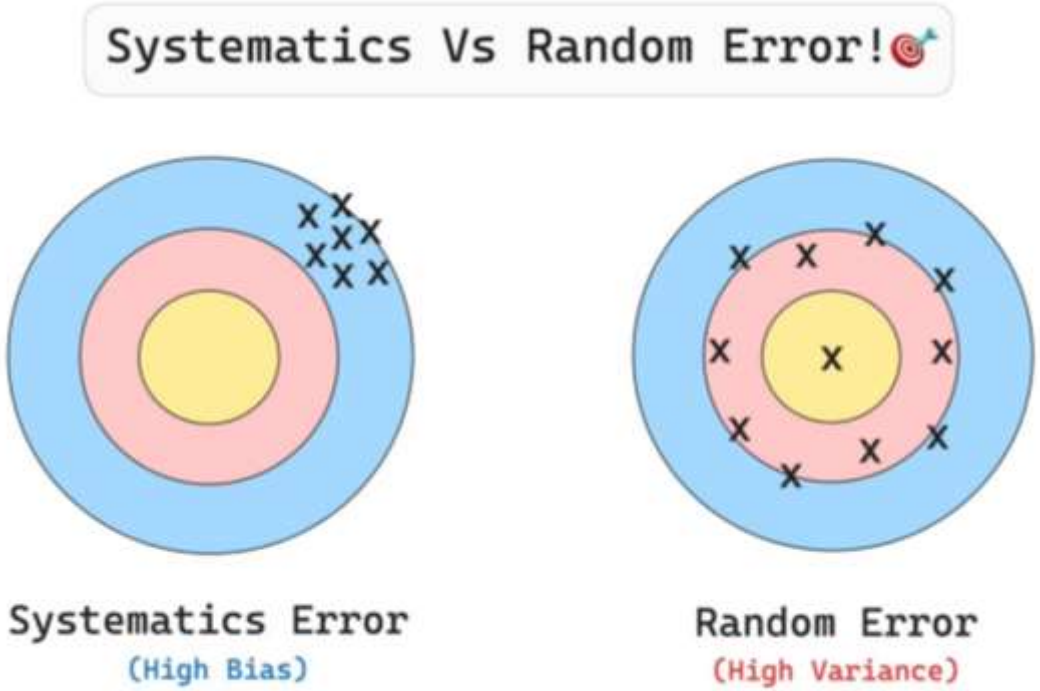
Choosing the right measure of variability.


Regulated products
How reliable is your analytical method? Is it meeting the performance criteria?
Method validation, verification, and transfer
Containers used to distribute the products
Ingredients used in the regulated products

Step I - Method Design	•Develop Analytical Target Profile (ATP) •Method Development •Method Understanding
Step 2 - Procedure Performance Qualification	•Development Protocol •Qualification experiments •Qualification report
Step 3 - Continued Performance Verification	•Change Control Approach •Lifecycle (based on information from Steps 1 and 2)

SUMMARY

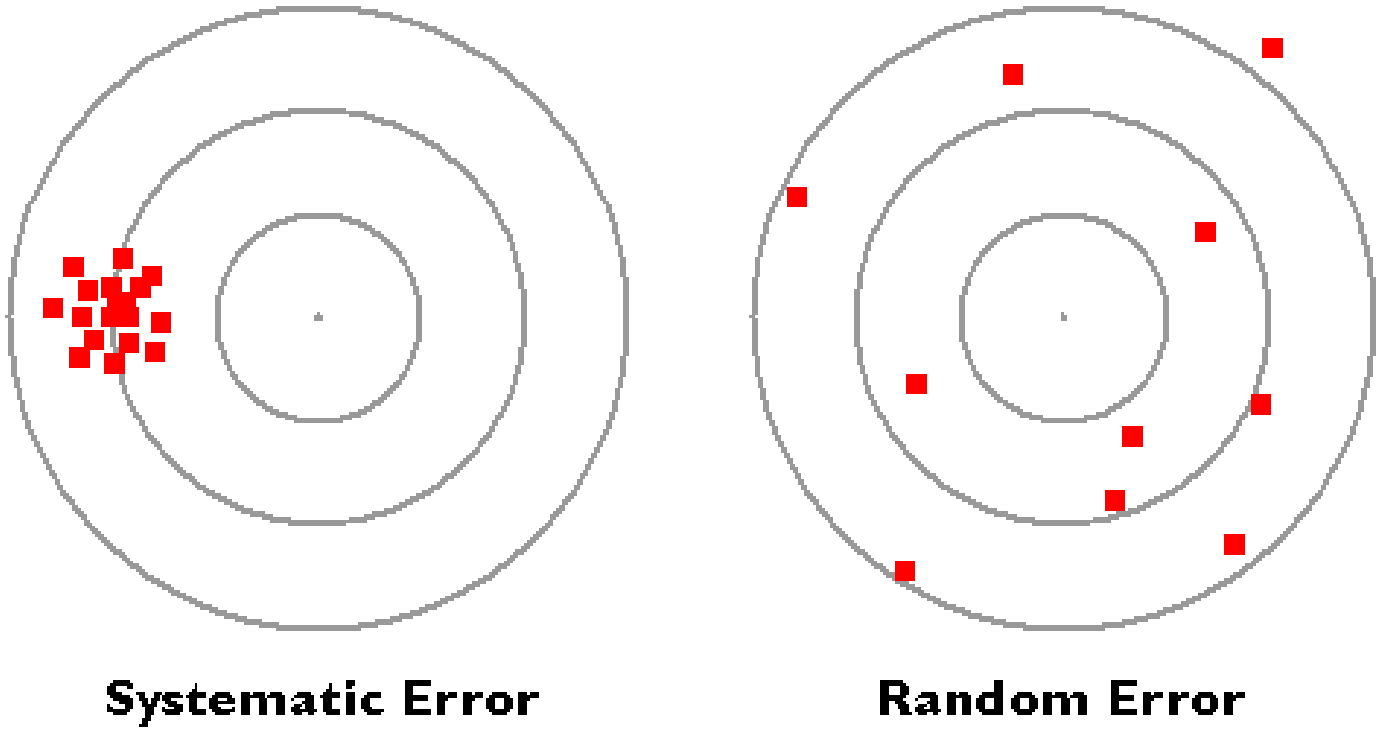

Reference value
Probability density
Accuracy
Value
Precision


Systematics Vs Random Error!
Systematics Error
(High Bias)
Random Error
(High Variance)

ASSESMENTS

1. Define precision?

2. What is the difference between systematic error and random error?



3. Define the below given statement?

$$Accuracy\ (\%) = \frac{Observed\ value - Theoritical\ value}{Theoritical\ value}$$

REFERENCES

•**General Analytical Chemistry Resources:** By authors well-known in the field of analytical chemistry. For example, concepts from **David Harvey**'s works (like the *Analytical Chemistry*

• For more advanced evaluation of measurement accuracy, Semyon G. Rabinovich has authored the book *Evaluating Measurement Accuracy: A Practical Approach*.


Thank you