Malabsorption
Analysis of Serum Amylase

Q.1 What is amylase, and what are its sources in human body?

Answer: Amylase are a group of proteins found in saliva and pancreatic juice. They help to convert starch into oligo- and di-saccharides.

Q. 2 What is the physiological action of amylase?

Answer: Amylase hydrolyzes (breakdown) the dietary starch and glycogen into:

- Short, branched oligosaccharides (e.g. maltotriose)
- Disaccharides (maltose and iso-maltose).

Q. 3 Would you expect a high level of amylase in blood under a normal condition?

Answer: No

Q. 4 –a: What are the uses of amylase measurement in clinical practice?

Answer: Acute Pancreatitis

Q. 4 –b: What other diagnostic marker that can be measured in this clinical condition?

Answer: Serum lipase

Serum amylase vs. lipase for acute pancreatitis

	Serum amylase	Serum Lipase
Levels start rising	2-12 hrs	4-8 hrs
Levels peak	12-72 hrs	24 hrs
Levels return to normal	One week	8-14 days
Normal range: adults < 60yrs	25-125 IU/L	10-140IU/L
Adults > 60 yrs	24-151 IU/L	18-181 IU/L

• Values more than three times the normal range along with the clinical picture is considered positive for acute pancreatitis.

•Even though the specificity and sensitivity of serum amylase are lower than those of serum lipase, serum amylase is widely used for diagnosing pancreatitis because it is relatively inexpensive.

Q. 4 –c:If a patient has an elevated amylase levels, does this always mean that he has a pancreatic condition?

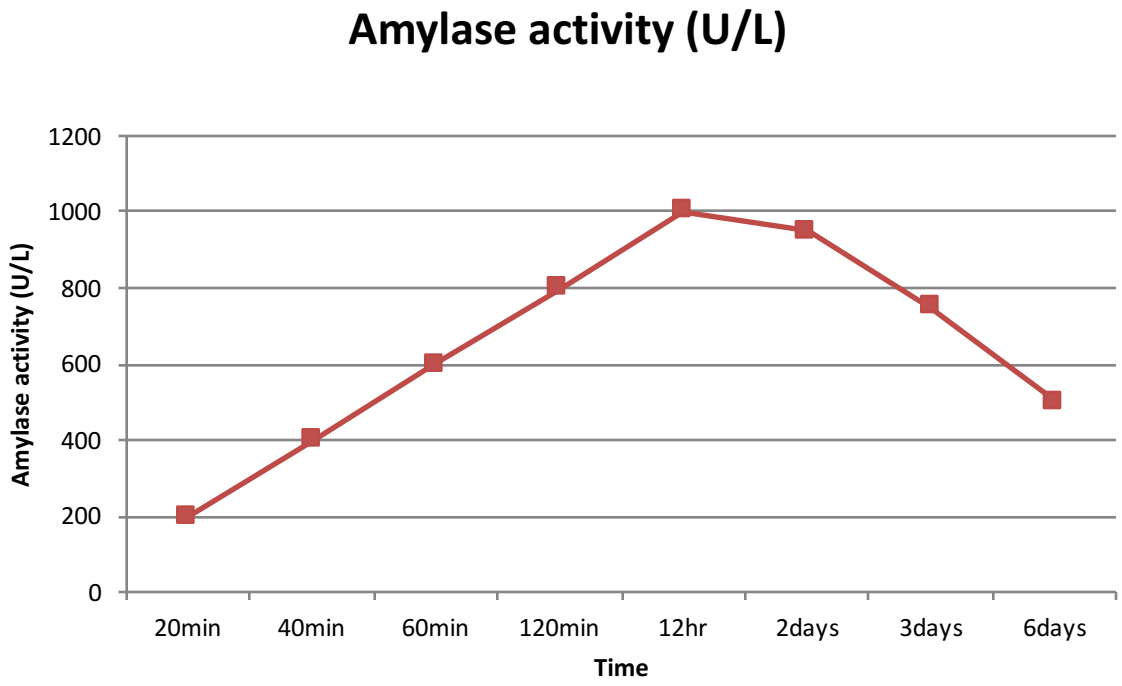
Answer:

No, Amylase levels may also be significantly increased in patients having conditions other than pancreatic disease.

Example:

- Gallbladder diseases
- Acute appendicitis
- Intestinal obstruction
- Perforated intestinal ulcer

Q. 5 Changes in serum amylase activity during course of an injury (time course)



Amylase levels will be increasing over time, and will reach a peak within 12-72 hours. It will return to normal in few days (~ a week).

Q5-a What are the possible factors responsible for these changes in the curve?

Answer:

Why does amylase level increase?

Acute pancreatitis → damage of the exocrine part of the pancreas → release of the pancreatic enzymes into the circulation (α-Amylase is one of the pancreatic enzymes released).

Why does it decrease?

1. The condition is self-limiting
2. The circulating amylase will be excreted in urine
3. The circulating amylase will be degraded (protein turnover)

Q5-b With knowledge about amylase activity overtime, what is the clinical application?

Answer: Three points can be derived from such a curve:

1.Measurement of α-amylase in the serum is limited by the time elapsed since the initiation of acute inflammation of the pancreas. If the patient presented late, and the condition was self limited, the diagnosis of acute pancreatitis based on the enzyme level at time of presentation could be missed.

2.The measurement of α-amylase in serum should not be interpreted on its own; it has to be evaluated in association with the clinical picture (e.g. the nature of abdominal pain).

3.The rising trend of the levels of serum α-amylase as the acute inflammation is taking place is more clinically significant than one single high reading.

SOURCES OF VARIATION IN TEST RESULTS

For adequate interpretation of laboratory test results, you have to completely understand different reasons for variation in test results:

- Analytical factors: e.g., accuracy (reliability) and precision (reproducibility)
- Biological factors: e.g., sex, age, diet, drugs ..
- Pathological factors: e.g., progression of the disease, complications

Accuracy

- The reliability of the method in determining the true value of the analyte
- The extent to which the mean measurement is close to the true value
- It is useful for comparison of original, gold standard method with other methods

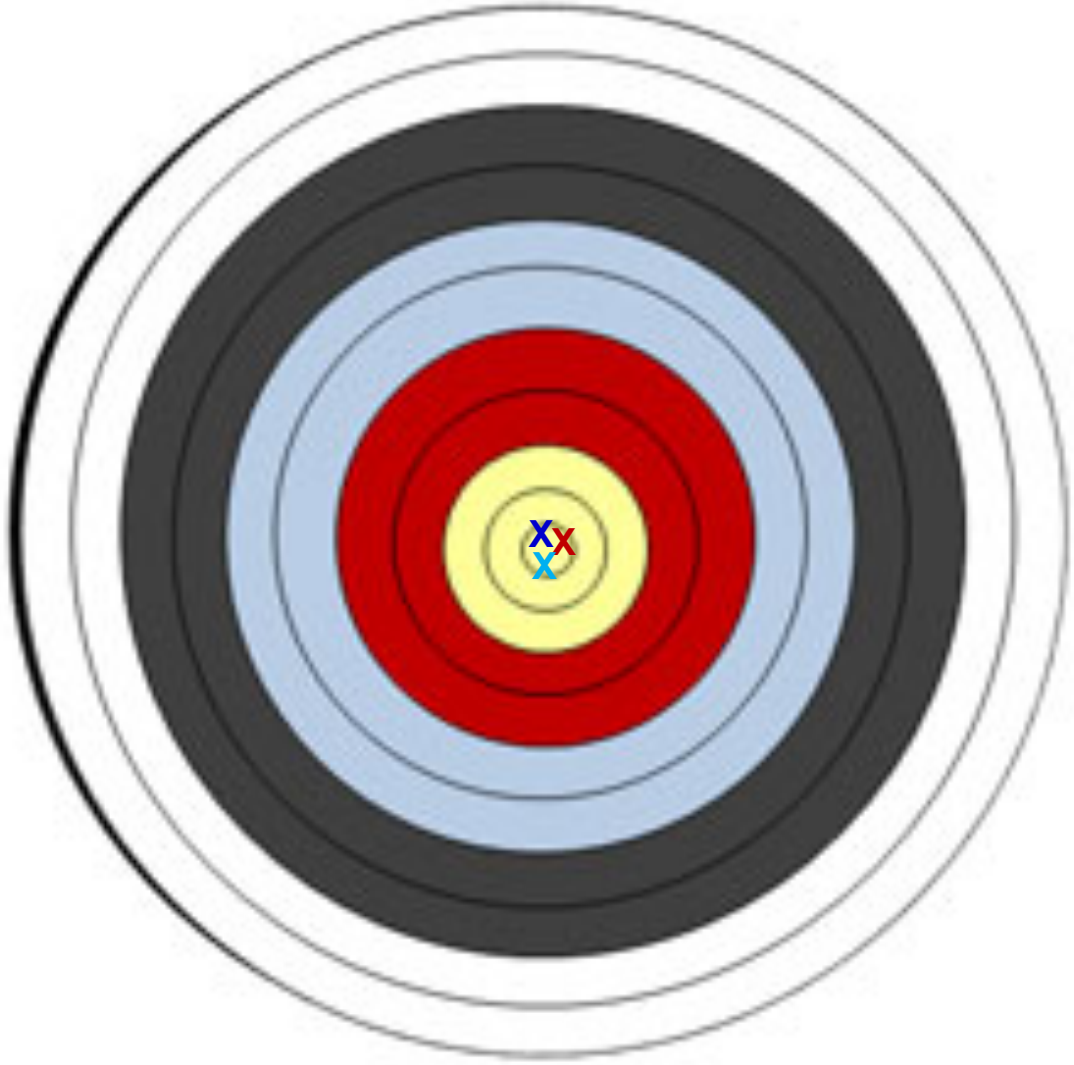
Precision

- The reproducibility of the method when it is run **repeatedly** under identical conditions

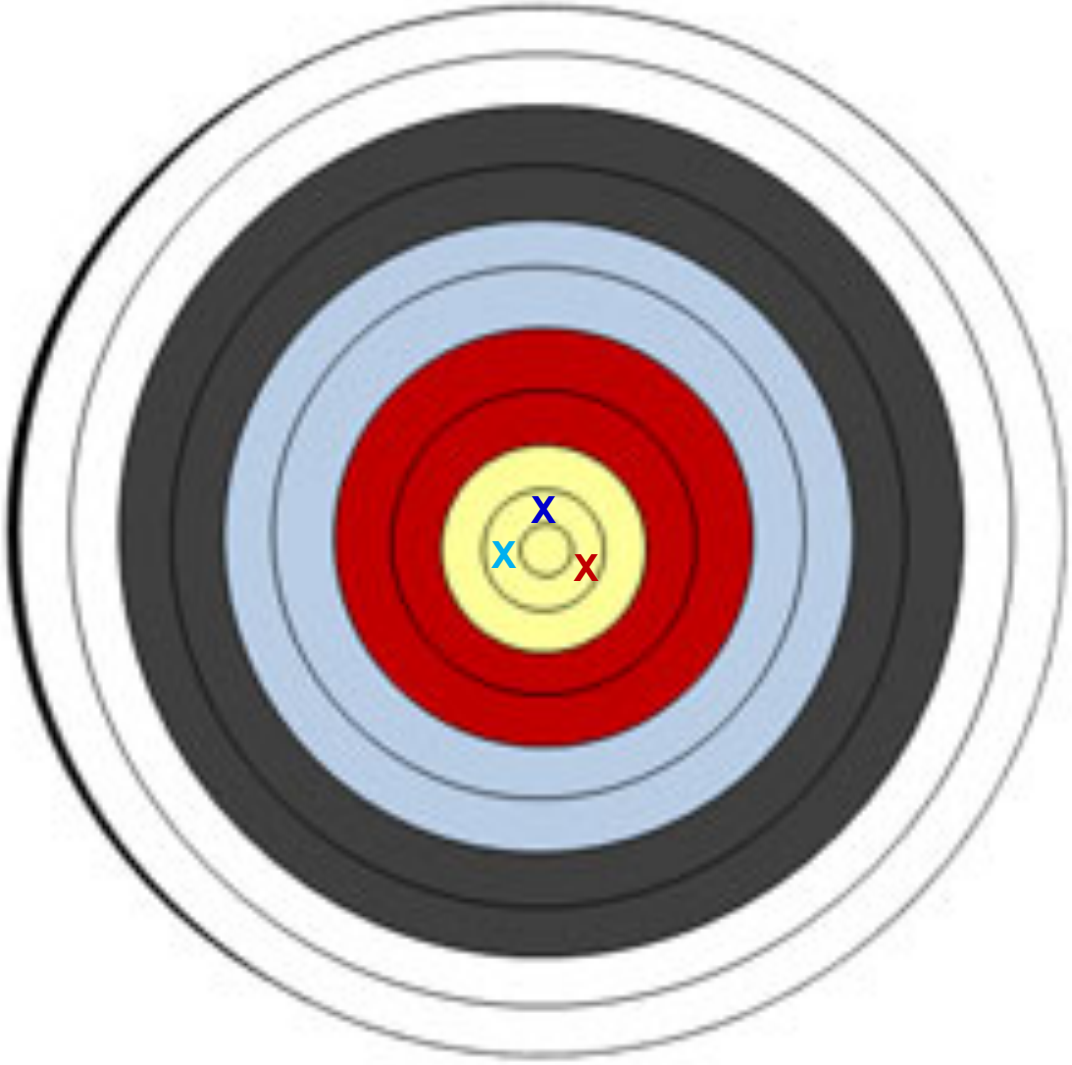
Accuracy Vs Precision

- They are independent, e.g., an inaccurate result can be extremely precise
- The relation between accuracy and precision can be easily illustrated by its analogy to shooting at a target or ‘dartboard’

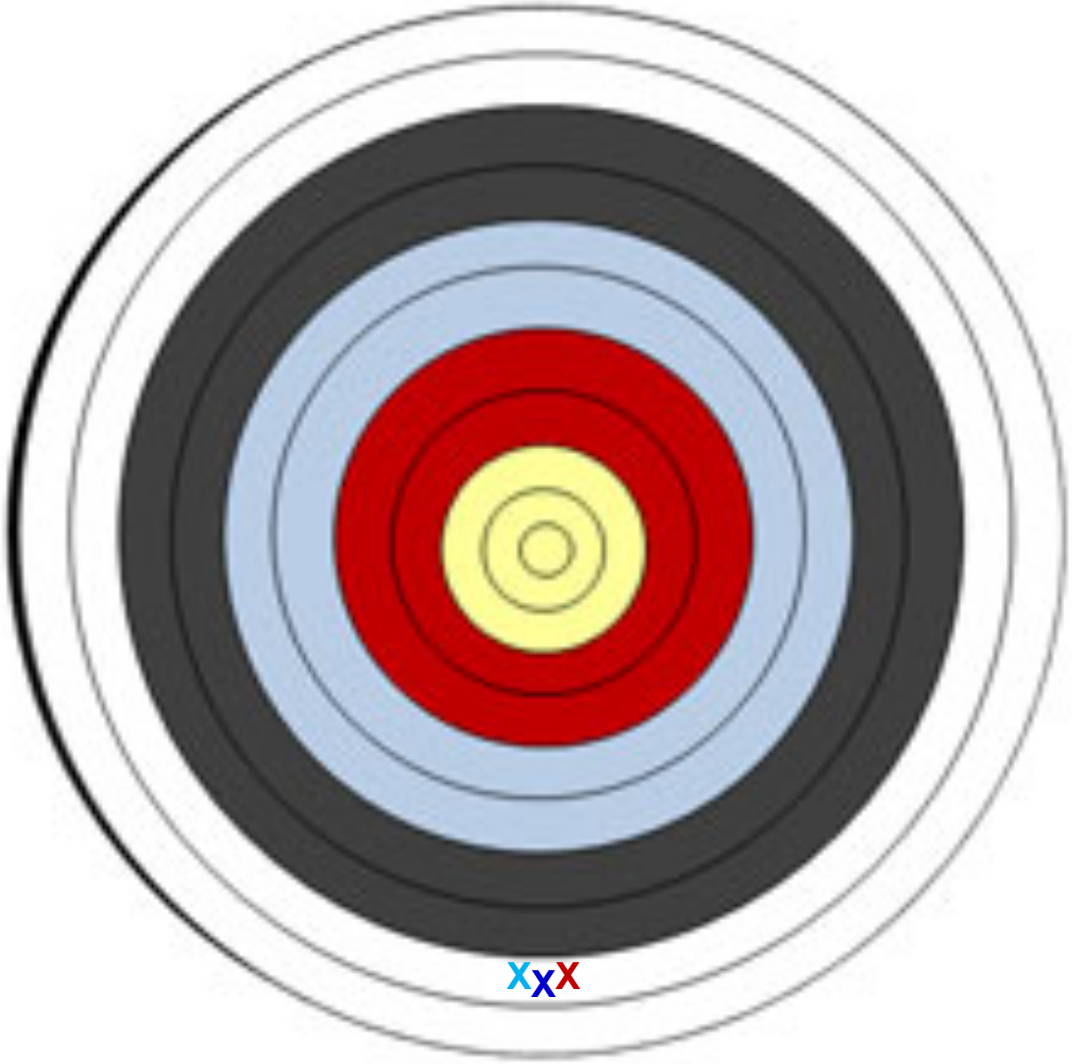
Accurate and Precise



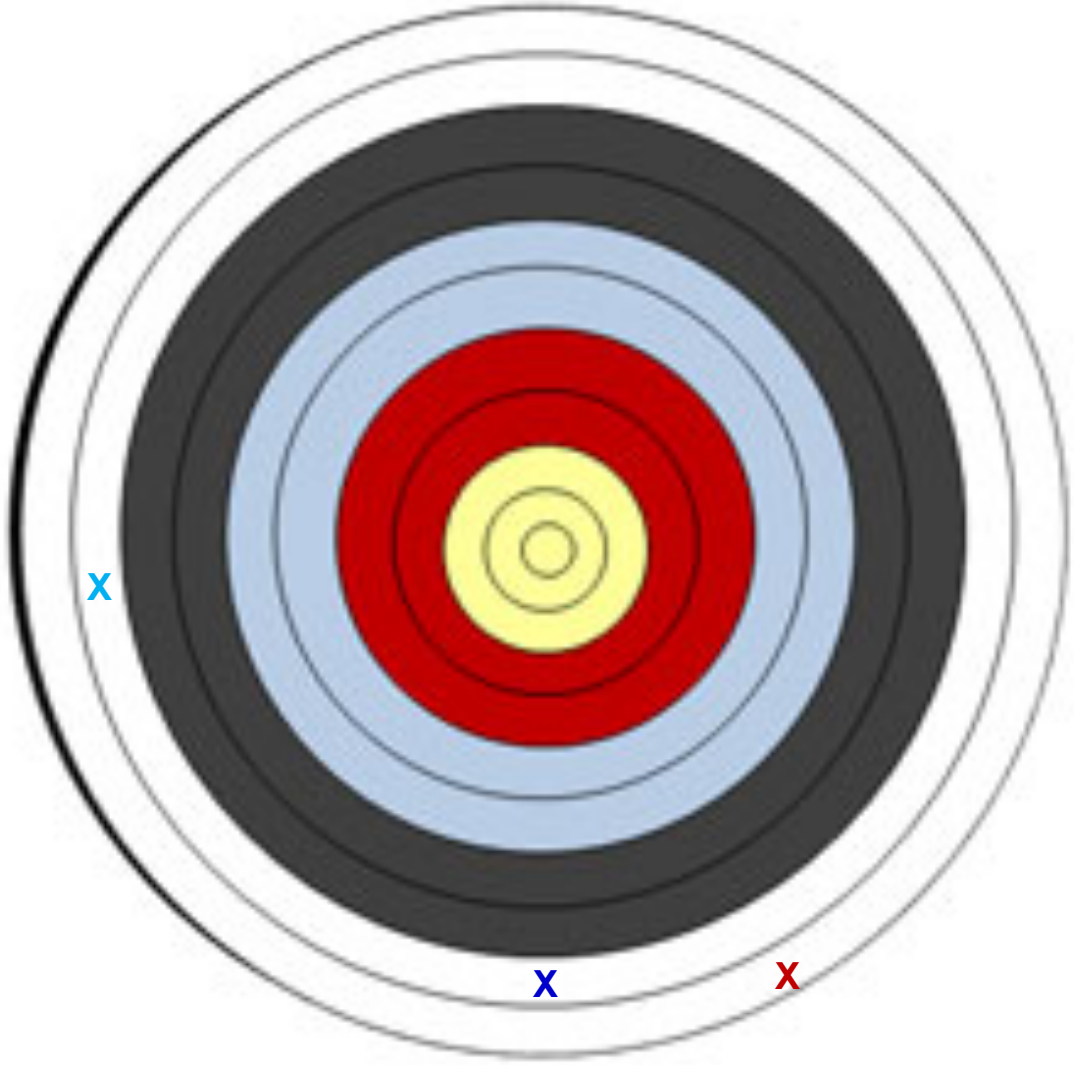
Accurate but not Precise



Inaccurate but Precise



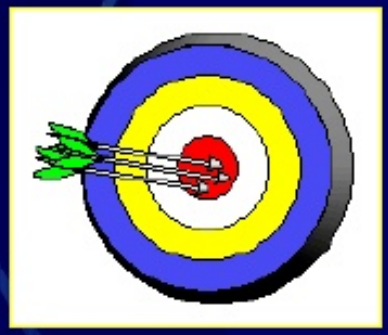
Both inaccurate and imprecise



Precision and Accuracy

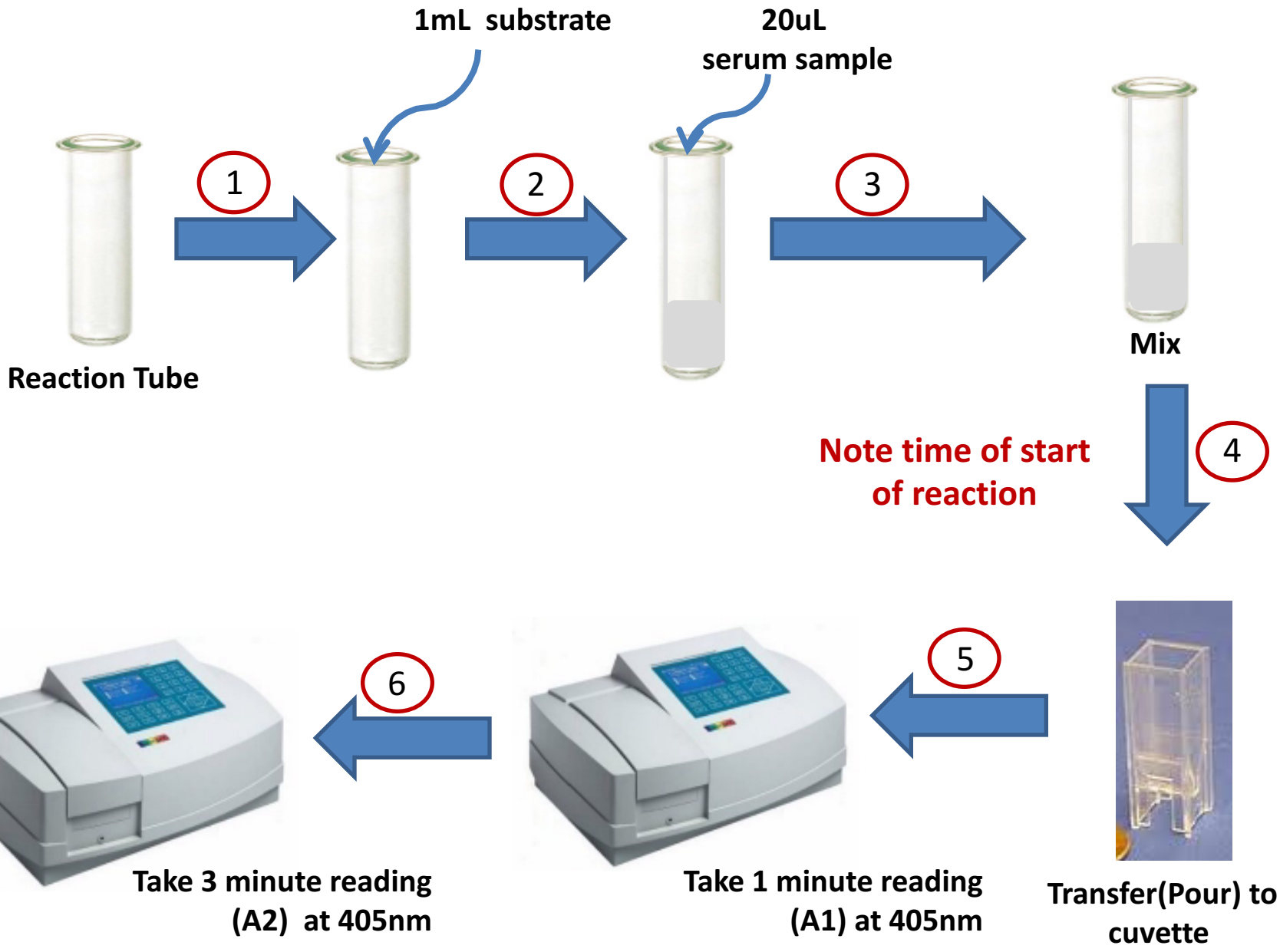
Neither accurate nor precise

Precise, but not accurate



Precise AND accurate

Measurement of Serum Amylase



Calculation & Interpretation

$$\Delta A = \frac{A2 - A1}{3}$$

$$\text{Serum Amylase (U/L)} = 4712 \times \Delta A$$

Results: …… **U/L**

Normal reference values:

Serum: up to 125 U/L (at room temperature)

Normal **range** 25-125 U/L