

# CLINICAL CHEMISTRY

February 11, 2022 | Kerfelcel B. Retoriano, RMT, MT (ASCP) SC, MPH, MSMT

## OUTLINE

- I. INTRODUCTION
- II. SPECIMEN COLLECTION AND PROCESSING
- III. QUALITY ASSESSMENT
- IV. KIDNEY FUNCTION
- V. CARBOHYDRATES
- VI. PROTEINS AND ELECTROPHORESIS

## INTRODUCTION

### LABORATORY ANALYSIS

The goal of the lab analysis is to provide reliable lab data to the health care provider in order to assist in clinical decision making.

- **End User** - Patient, whatever the decision of the doctor based on the results the user will be patient
- **Primary Goal:** Accurate and precise lab result
  - Combination of quality control and constant monitoring
- **Accuracy** - nearness to the true value
  - E.g: FBS of 100 mg/dl that's the true value of the pen analyte
  - Increase accuracy = decrease systematic error
- **Precision** - repeatability of the test
  - eg: BUN of a patient, whatever result we will get will be the same result of the patient when repeat
  - Increase precision = decreased random error
- Systematic error and random error comprise the **TOTAL ERROR**.
- The total error (TE) of the analyzer should be less than the allowable error (AE) ( $TE < AE$ )
  - Eg: Fluorimetry: for every analyte, the total error is being measured.
  - When computing the TE, always compare to AE before using the analyzer.
  - Eg: 10% AE of BUN, TC is 8%: this is less than the AE, hence the machine can be used.
  - The moment the TE becomes higher than AE, you cannot use the machine because it is not accurate and precise.
  - This is applied to all analyzers in the laboratory (regardless of the section)

## CHEMISTRY METHOD

### WET CHEMISTRY

**Wet Chemistry** utilizes liquid reagent.

1. Liquid Reagent
  2. Lyophilized Reagent (powder) in composition and added with distilled water to reconstitute the powder.
- Most common specimen in CC: **Serum**
  - Most common process: Serum + Reagent = colored solution (measured in spectrophotometer to get the absorbance)

## PREPARATION OF LYOPHILIZED REAGENT

- Lyophilized reagent + Distilled water → Reconstituted Reagent

**Reconstitution:** process of adding distilled water into lyophilized reagent.

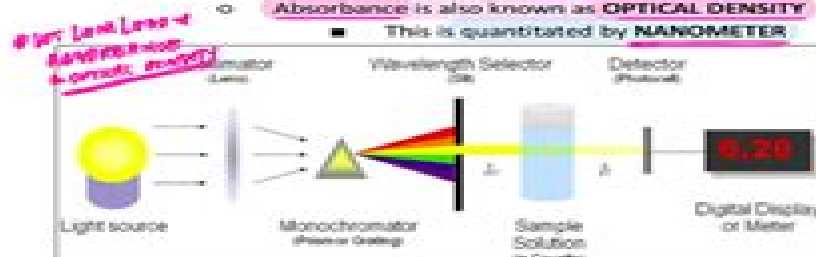
- eg: drinking of 3-in-1 powder coffee by adding water

## LYOPHILIZATION

- Entail **freezing** a material at  $-40^{\circ}\text{C}$  or less and then subjecting it to a **high vacuum**. Very low temp causes the ice to **sublimate** to a vapor state. The solid non sublimable material remains behind a dried state. (Tietz, Chapter 8, p.120)
- The main reason why reagents are lyophilized is to **extend their shelf life**.
- Lyophilized reagent according to CLSI tends to have more or longer shelf life and is more stable
  - Liquid tends to deteriorate easily hence decreased quality of results

## SPECTROPHOTOMETRY

- Measures the **light transmitted/radiant energy (electromagnetic radiation)** absorbed by a solution to determine the concentration of a substance in solution.
- Absorbance is computed, while concentration is determined.
- In spectrophotometry, the relationship of **absorbance and concentration** of solution is directly proportional whereas absorbance and concentration of the solution is inversely proportional to % transmittance.
  - eg: 100 %T = 0 Absorbance
  - Formula to convert T to ABS:  $A = 2 - \log \%T$
  - Absorbance is also known as **OPTICAL DENSITY**
- This is quantitated by **NANOMETER**



Note: MEMORIZE THE SEQUENCE

- **Light Source**
- **Collimator/Entrance Slit**
- **Monochromator**: isolates the specific wavelength of interest
- **Wavelength Selector/Exit Slit**
  - the isolated light exits the exit slit/wv selector
- **Sample Solution (in Cuvette)**

*LS - LENS - WS - WAVELENGTH SELECTOR - SS - SPLIT - SPLIT*

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