RADIOIMMUNOASSAY

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IMMUNOASSAY

- A biochemical test that detects the presence or concentration of macromolecules in a solution using an antibody or antigen.

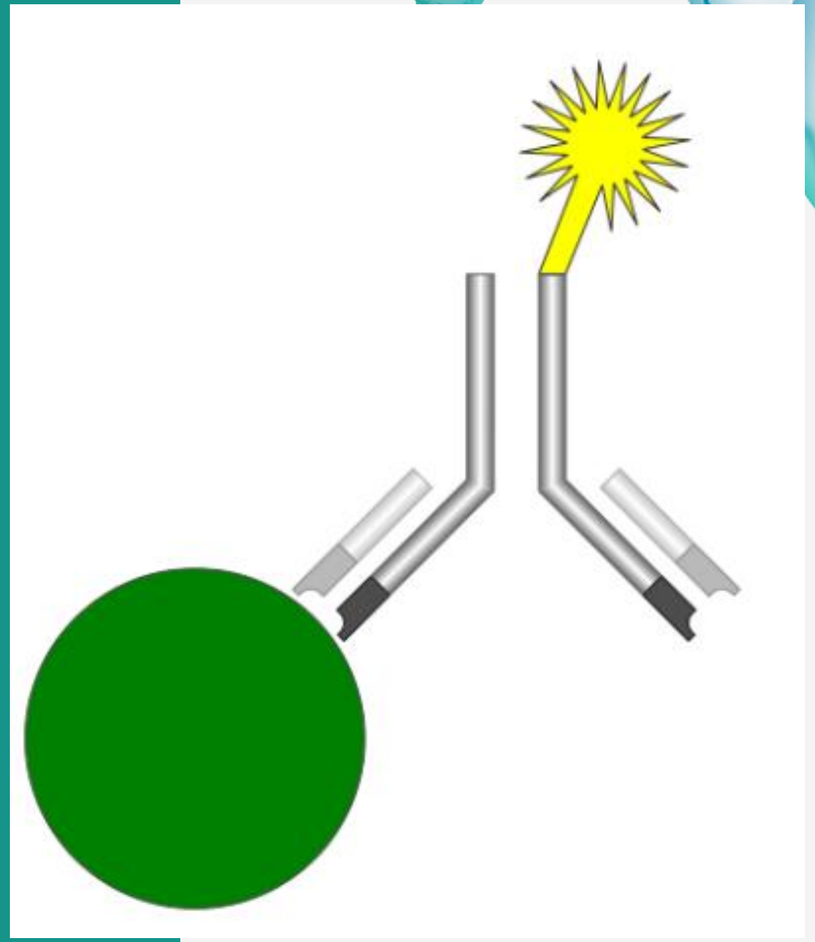
- Fluorescent and radioactive antibodies are used .

- At present, highly sensitive techniques such as radioimmunoassay and immunoradiometric assays are used for the measurement of drugs, tumor markers, and hormones.

Contents

RADIOIMMUNOASSAY

- Developed by Solomon Berson and Rosalyn Sussman Yalow at the Veterans Administration Hospital in the Bronx, New York , Nobel Prize for Medicine in 1977
- uses radioactive isotopes as labels or tracers.
- known for its high sensitivity and accuracy
- widely used in clinical laboratories
- requires special safety precautions and equipment



RADIOIMMUNOASSAY

Ag-Ab Binding

relies on specific binding affinity between an Antigen and an Antibody

This interaction forms the foundation of the assay.

Competition Assay

uses a competitive assay format.

A fixed amount of non-radioactive antigen, often in the patient's sample, competes with the radioactive tracer for binding to a limited number of Antibody binding sites.

Radioactive Tracers

A known amount of the antigen, often labeled with a radioactive isotope is introduced into the sample.

This labeled antigen is referred to as the "TRACER".

Equilibrium Reached

As the labeled and unlabeled antigens compete for binding sites on the antibodies, and equilibrium is reached.

RADIOIMMUNOASSAY

Bound & Unbound Separation

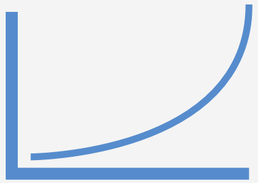
After allowing the competition to reach equilibrium, the unbound labeled antigen is separated from the bound Ag-Ab complexes.

This separation step is crucial for accurate measurement.

Radioactivity Detection

The radioactivity associated with the bound Ag-Ab complexes is measured by a gamma counter.

The level of radioactivity is inversely proportional to the concentration of the unlabeled antigen in the sample.



Calibration Curve

A series of standards with known antigen concentrations are also assayed.

These standards create a calibration curve, which relates the measured radioactivity to the antigen concentration.

Quantification

The concentration of the unknown antigen in the sample is determined by comparing the sample's radioactivity to the calibration curve.

This allows for the precise measurement of the antigen concentration.

IMMUNORADIOMETRIC ASSAY

- converts the unknown antigen into a traceable radioactive product.
- Introduced by Miles and Hales in 1968
- uses radioactive antibodies, fluorophores as labels
- commonly used in medical diagnostics, research, and biotechnology
- versatility and ability to perform high-throughput testing

IMMUNORADIOMETRIC ASSAY

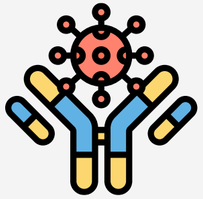
Ag-Ab Binding

relies on specific binding affinity between an Antigen and an Antibody

The antibody is often labeled with a radioactive isotope or a radiolabeled molecule.

Ag-Ab Complexes Formation

When the sample containing the antigen is introduced, the antigen molecules in the sample will bind to the radiolabeled antibodies, forming the complexes.



Complex Separation

Typically done using a solid-phase, such as beads or a membrane, coated with antibodies that can bind the antibody component of the complex.

Any unbound components are then washed away.

IMMUNORADIOMETRIC ASSAY

Radioactive Detection

As the labeled and unlabeled antigens compete for binding sites on the antibodies, and equilibrium is reached.

Quantification

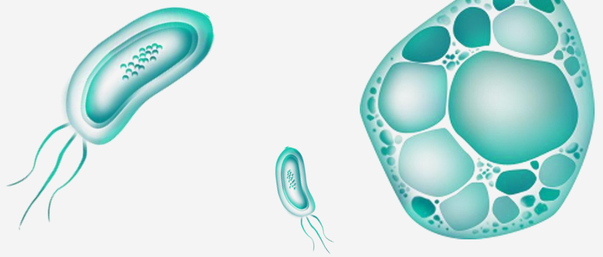
The amount of radiation detected is directly proportional to the amount of bound antigen in the sample.

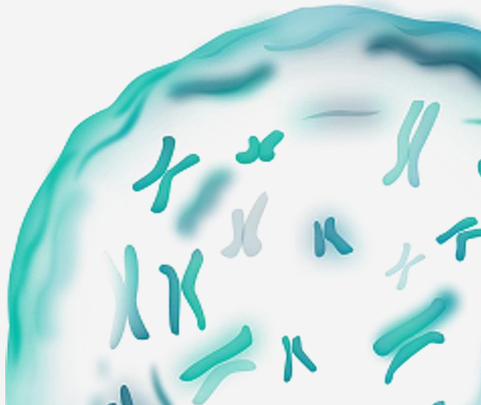
RIA and IRMA

RIA and IRMA are both valuable techniques for quantifying specific molecules in biological samples.

RIA and IRMA offers extremely high sensitivity but requiring additional safety precautions due to its use of radioactive tracers

They form an antigen-antibody complex.





RADIOIMMUNOASSAY

Materials:

- Solid-Phase Material (Tubes)
- Radiolabeled Antigen (Tracer)
- Buffer (washing, blocking)
- Calibrators
- Quality Control Samples
- Reagent for Standard Curve Generation
- Gamma Counter

Methodology –RIA

01

Preparation of Reagents and Materials

Prepare radiolabeled antigen (tracer): This involves labeling the antigen of interest with a radioactive isotope, typically iodine-125 or iodine-131.

02

Sample Preparation and Incubation

Collect biological samples (e.g., serum, plasma, urine) containing the antigen of interest. Incubate the mixture to allow the formation of antigen-antibody complexes.

03

Separation of Bound and Free Antigen

After incubation, separate the bound antigen-antibody complexes from the free antigen.

04

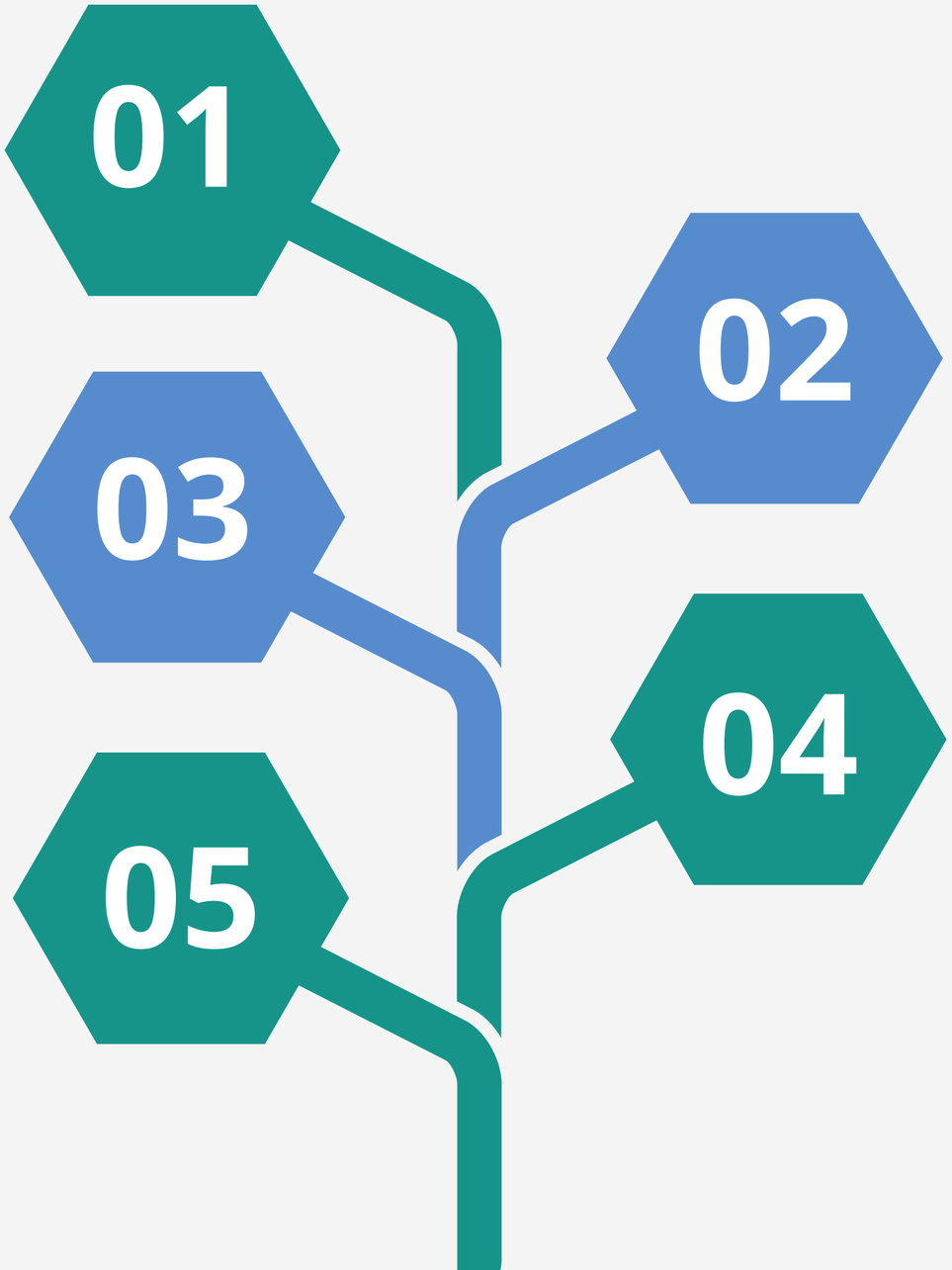
Radioactivity Measurement

Measure the radioactivity of the separated fractions. This is usually done using a gamma counter or scintillation counter.

05

Quantification

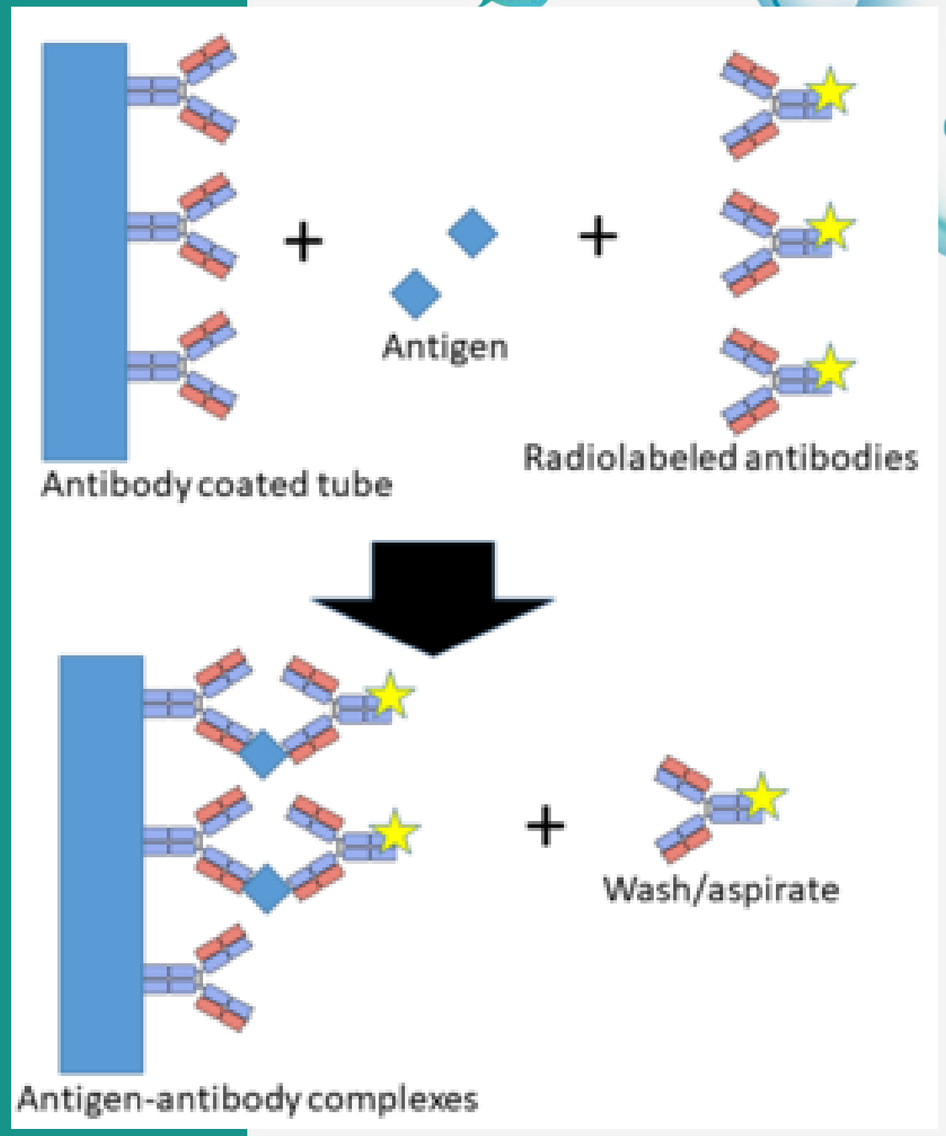
Determine the concentration of the antigen in the unknown samples by comparing their B/F ratios to the standard curve.



IMMUNORADIOMETRIC ASSAY

Materials:

- Radiolabeled Antibody
- Solid-Phase Material
- Unlabeled Antibodies
- Sample or standard solutions
- Wash buffer
- Detection Equipment



Methodology –IRMA

01

Preparation of Solid-Phase Materials

Coat the solid-phase material with unlabeled antibodies specific to the substance of interest. These antibodies will capture the substance from the sample.

02

Prepare Radiolabeled Antibody and Sample

Add the diluted radiolabeled antibody and the sample or standard solutions to separate wells or tubes containing the coated solid-phase material.

03

Incubation

During this incubation, the amount of radioactivity bound to the solid phase will depend on the concentration of the substance in the sample or standard.

04

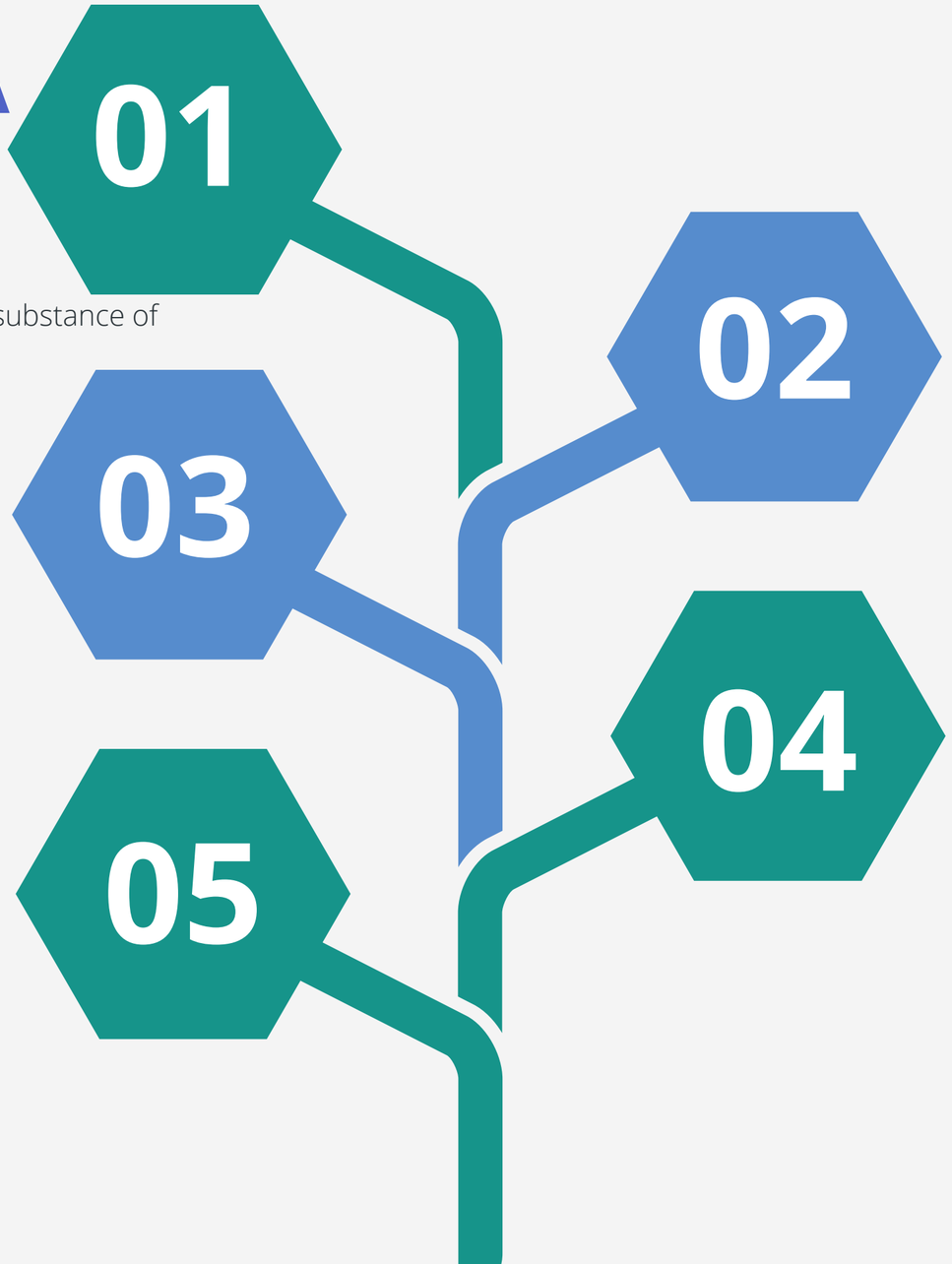
Separation of Bound and Free Components

After incubation, remove the unbound radiolabeled antibody and any other unbound components from the solid-phase material.

05

Radioactivity Measurement

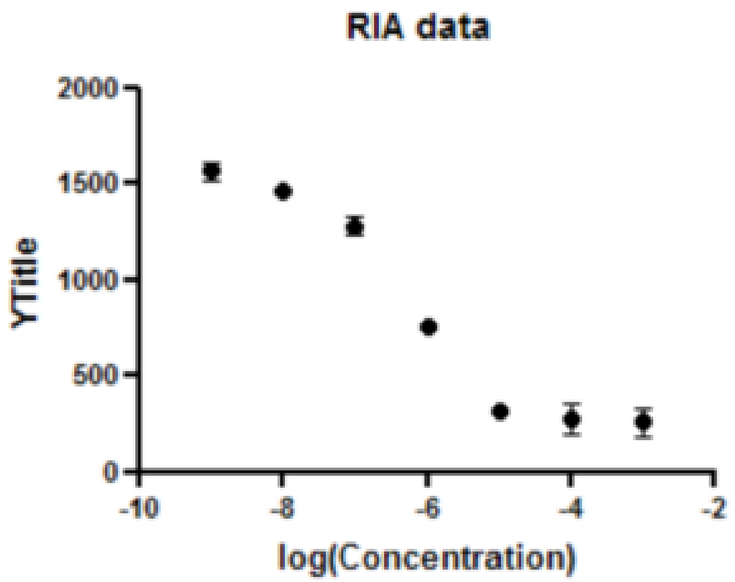
The radioactivity is directly proportional to the amount of radiolabeled antibody bound, which is in turn related to the concentration of the substance in the sample.



INTERPRETATION OF RESULTS

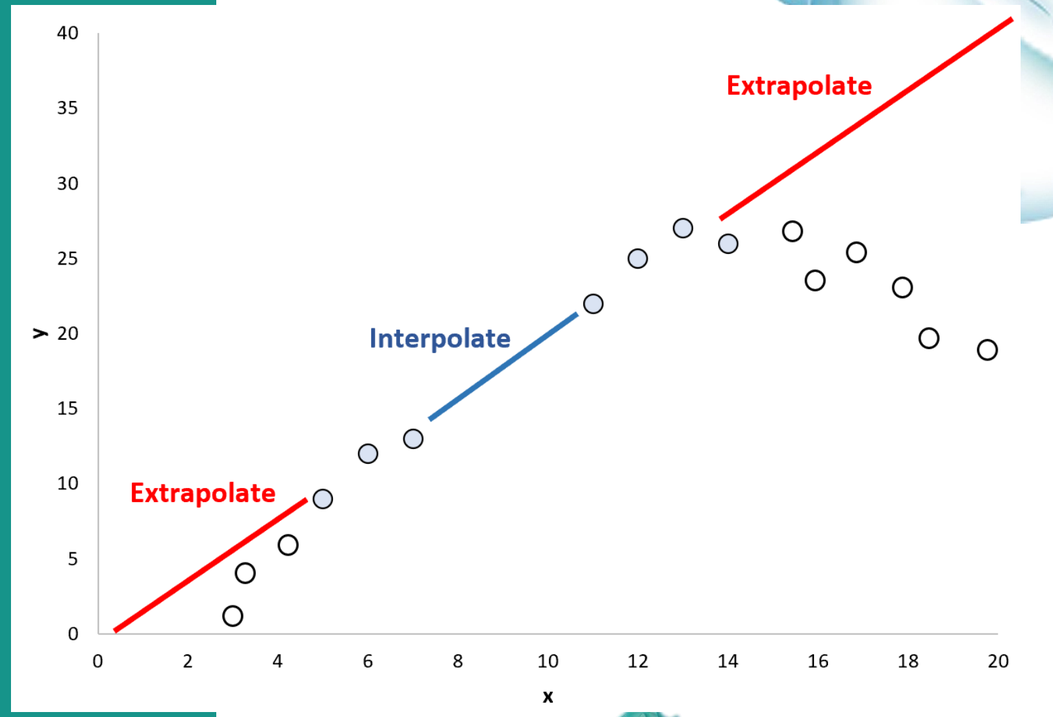
INTERPOLATION

- provides highly accurate predictions
- enhances the visual representation of data
- used in various fields where precise estimates of values between measured and data points are required

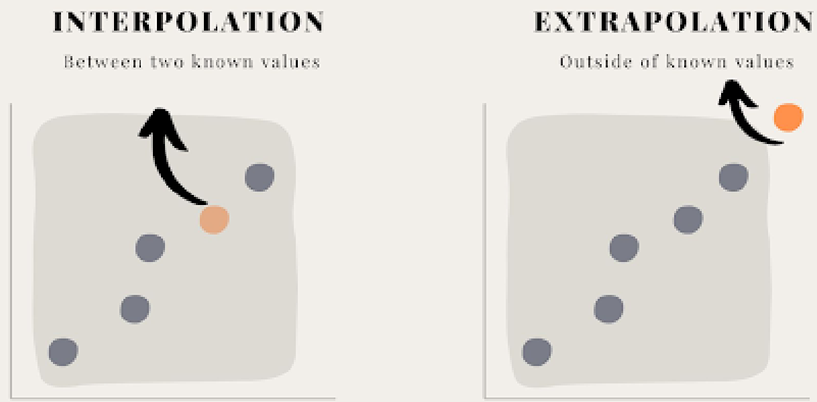


EXTRAPOLATION

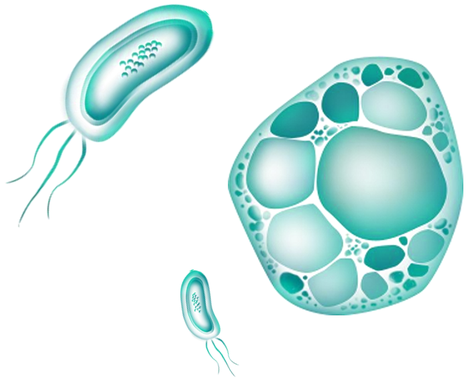
- extends the usefulness of data by estimating values outside the range of known data points .
- used for forecasting future trends
- Predictions can become less accurate as you move away from the known data range.

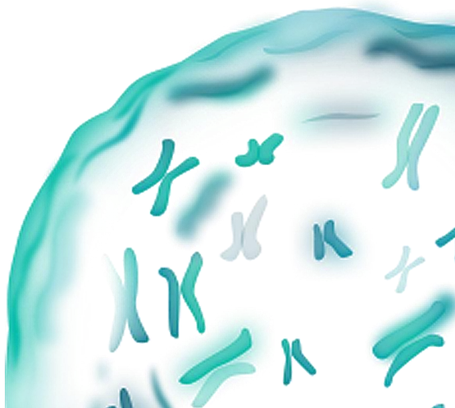


INTERPOLATION and EXTRAPOLATION

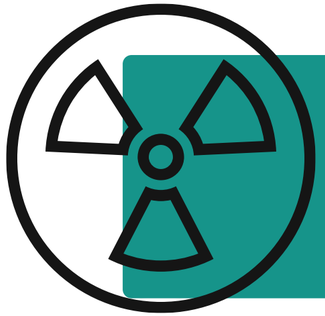


Proper data analysis, understanding the underlying phenomena, and careful consideration of the context are crucial for minimizing errors and making accurate predictions using these techniques.





INTERPRETATION

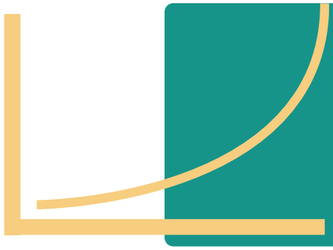


Radioactivity Measurement

This measurement quantifies the amount of radiolabeled antibody bound to the solid phase, which is related to the concentration of the target substance in the sample.

Data Calculation

Calculate the ratio of bound radioactivity (B) to total radioactivity (bound + free, F) for each sample and standard. This ratio is often represented as a percentage: B/(B+F) x 100%.



Standard Curve

The standard curve helps establish a linear relationship between radioactivity and concentration.

INTERPRETATION

Compare the B/(B+F) ratio of each sample to the standard curve.

Typically, the lower the B/(B+F) ratio, the higher the concentration of the target substance in the sample.

The concentration of the substance in the sample can be read off the standard curve or calculated using regression analysis based on the standard curve.

Reporting Results

Report the concentration of the target substance in the sample in appropriate units (e.g., ng/mL, pg/mL) based on the standard curve.

QC and Validation

This includes running control samples with known concentrations and comparing their results to expected values.
CV validation

Clinical Correlation

Abnormal results may indicate a medical condition that requires further evaluation and may inform treatment decisions.

Coefficient of Variation

Can also be used in the context of Radioimmunoassay (RIA) or Immunoradiometric Assay (IRMA) to assess the precision or variability of assay measurements.

In the context of RIA or IRMA, the CV is used to evaluate the reliability of the assay results and to determine the precision of the measurements.

Calculation of CV

- Perform the RIA or IRMA assay multiple times (e.g., replicate measurements of the same sample).
- Calculate the mean (average) and the standard deviation of the results from these replicate measurements.
- Expressed in percentage.

$$CV(\%) = \left(\frac{Standard\ Deviation}{Mean}\right) \times 100$$

- Standard Deviation
- This is a measure of the spread or dispersion of data points from the mean. A higher standard deviation indicates greater variability.
- Mean:
- This is the average of the data points in the dataset.

Coefficient of Variation

- A lower CV percentage indicates that the measurements obtained from the RIA or IRMA assay are relatively consistent and precise.
- A higher CV percentage suggests that the measurements are more variable and less precise.
- When assessing the reliability of an RIA or IRMA assay, it's generally desirable to have a lower CV, indicating higher precision and consistency of measurements.
- Laboratories that perform RIA or IRMA routinely use the CV as a quality control metric to monitor the performance of the assay.

Coefficient of Variation

- Acceptance criteria for CV may vary depending on the specific assay and its intended clinical or research use.
- If the CV for a RIA or IRMA assay is too high, it may indicate issues with assay precision or variability.
- In such cases, laboratories may need to optimize the assay conditions, reagents, or procedures to reduce variability and improve precision.
- Majority of the laboratories uses 5-10% CV as a metric.

Pipetting and Dilution

PIPETTES

- Pipettes are essential laboratory tools for dispensing measured volumes of liquids from one container to another.
- It most commonly works by creating a partial vacuum above the chamber holding the liquid and selectively releasing the vacuum to draw up and dispense according to the volume preferred.
- There are five widely used grades of pipettes within pipette calibration with all having specific guidelines and requirements regarding use, testing, maintenance, and measurement.

PIPETTES

- The five grades of pipettes include disposable/transfer, graduated/serological, single channel, multichannel, and repeat pipette.
- The manner in which any of these equipment is handled always impacts the accuracy of the test results from the most basic transfer pipette dropper to the advanced repeat dispensing pipette.
- It is highly imperative to know how to use pipettes in order to ensure that your experiments provide the most precise results with the smallest margin of error.

PIPETTES

- **Disposable/Transfer Pipette**: The most basic type of pipette, it is not a sophisticated piece of lab equipment and used for rough measurements only.
- It is also known as Pasteur's pipette, it is essential to follow a standard pipetting technique when using one.
- Aspirate liquid at a 90˚ angle and dispense at a 45˚ angle.
- Touch off to make sure all the liquid is dispensed and always use a new pipette and dispose of after testing.

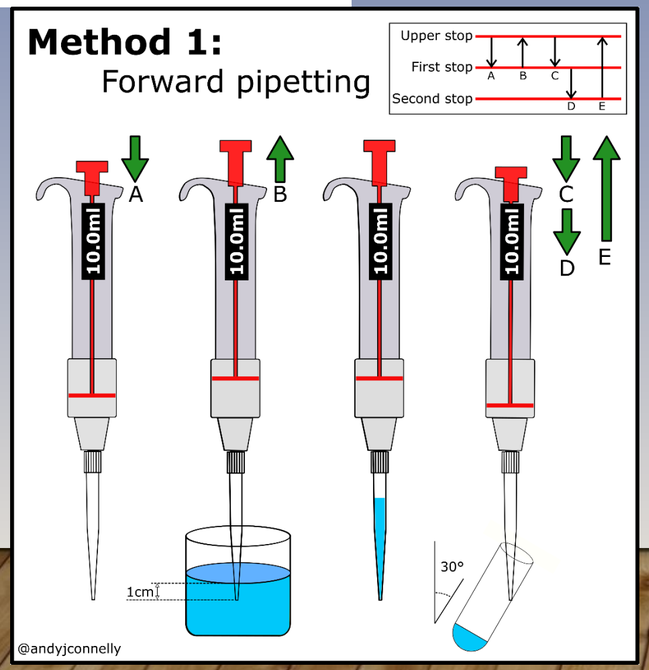
PIPETTES

- **Graduated/Serological Pipette**: Final volume gotten by calculating the difference of the liquid level before and after dispensing. The standard technique for using a graduated pipette are:

- Hold pipette in solution, don’t touch the bottom, squeeze bulb and attach to top of the pipette. Use the forefinger to control volume aspiration by placing on top of pipette.

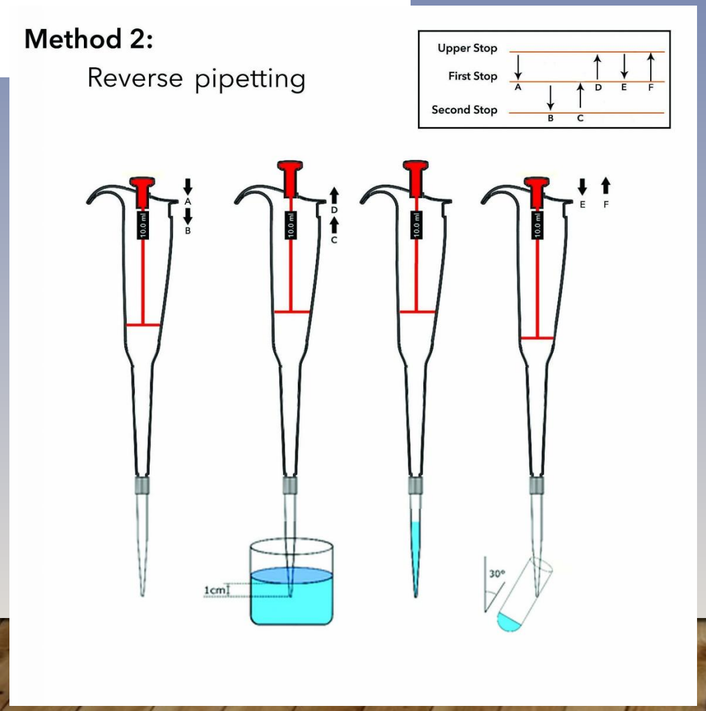
PIPETTES

- Dispense the amount needed into appropriate container while maintaining eye level to assure proper measurement.
- Measure solution from bottom of the meniscuses; the crescent shaped surface of liquid that is visible in the pipette.
- Subtract the needed volume from the initial volume and find the dispensing volume in order to get the desired amount.



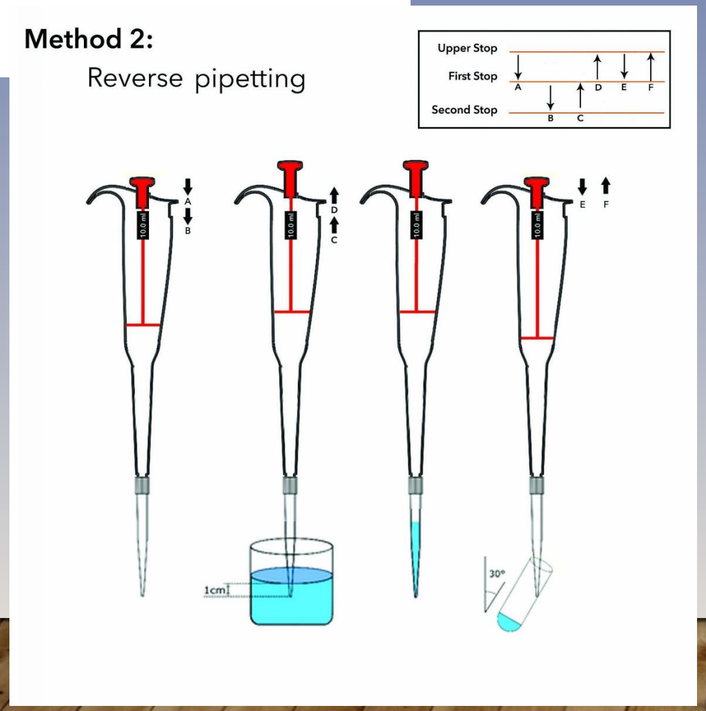
PIPETTES

- **Single-Channel Pipette**: Also known as automatic pipette, it is a non-disposable instrument usually of an air-displacement design which produces an accurate measurement results with the use of one disposable tip. The two common techniques are:
- **Forward Technique** is the intended function and most common technique for pipette measurements.
- Involves pressing the plunger to first stop and slightly submerging the pipette tip into the liquid to aspirate the measured volume by releasing the plunger slowly to prevent bubbles.
- The tip of the filled pipette is held against the side of the receptacle to dispense the liquid content
- The plunger is slowly pressed through the first stop to the final blow out position while ‘touching off’ the last drop from the tip.



PIPETTES

- **Reverse Technique** is most effective when working with viscous solutions or solutions prone to bubbles, it minimizes interference from air bubbles.
- Press plunger all the way down to the third stop position, slightly submerge into liquid and slowly release the plunger back to the top to aspirate the liquid into the tip.
- Place the pipette tip against the receptacle wall and press plunger to the first stop to empty the content and remove the tip from the receptacle.
- There will be a sample of liquid remaining in the tip, but is not part of the measurement.



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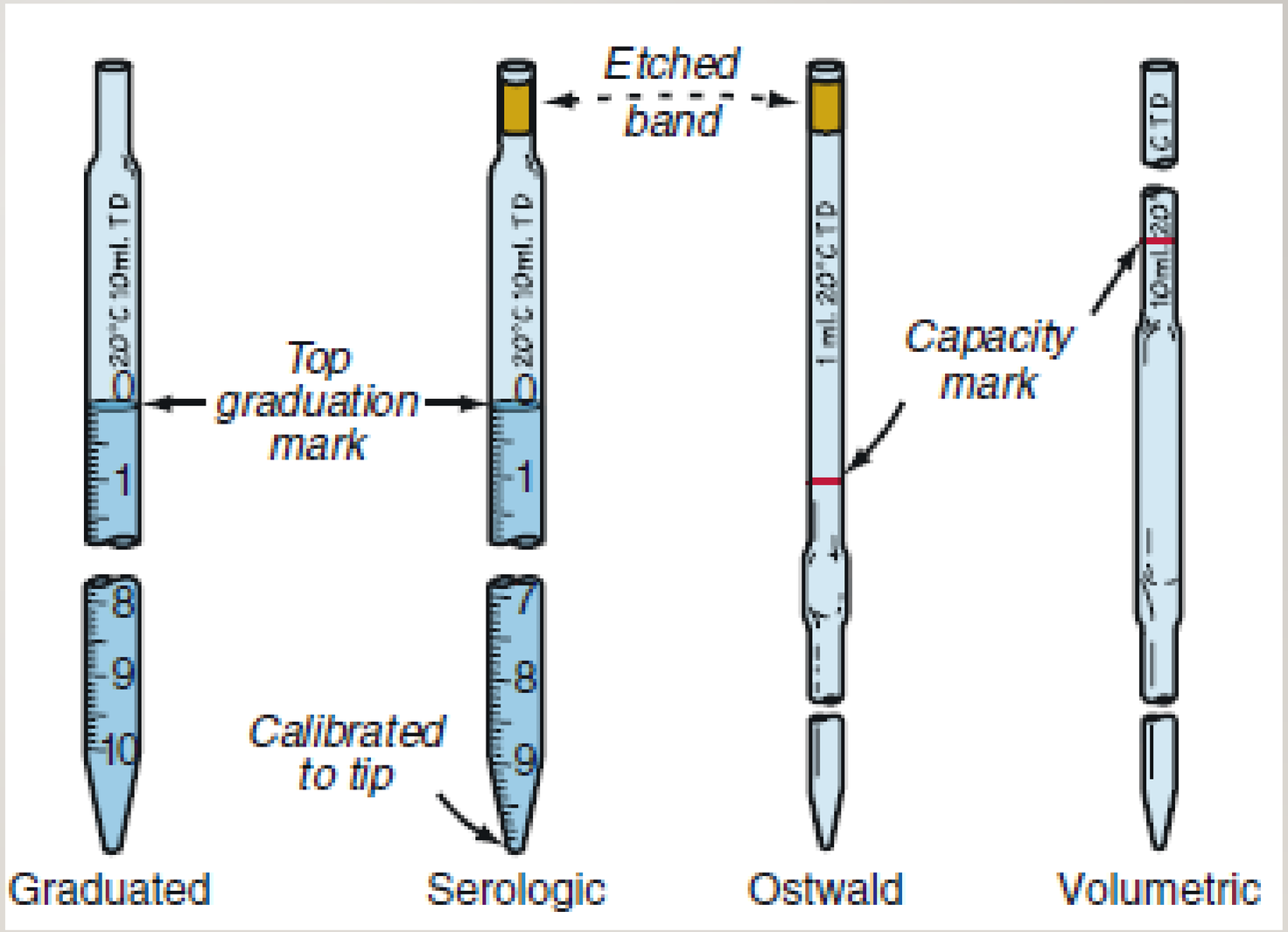
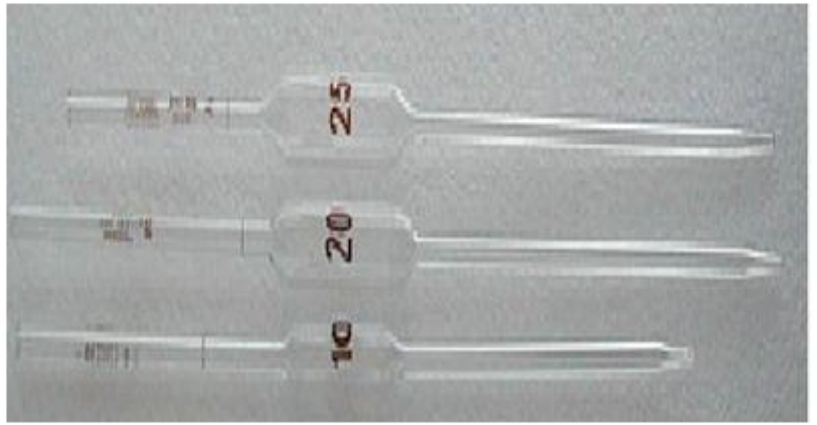
Plunger button
Plunger rod
Tip ejector mechanism
Friction ring
Micrometer
Digitol Volume Indicator
Piston assembly
Piston
Springs
Shaft coupling
Seal, O-ring
Tip ejector
Shaft

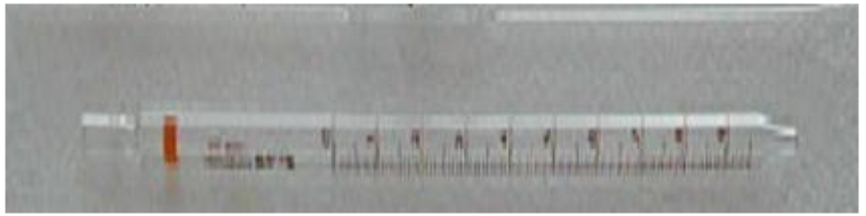

Etched band
Top graduation mark
Capacity mark
Calibrated to tip
Graduated
Serologic
Ostwald
Volumetric

Volumentric Glassware and Other Devices Intended "to Deliver" TD

- **Volumetric Pipets**
- They are normally used for the accurate transfer of 1.0, 2.0, 5.0, 10.0, and 25.0 ml of liquid.
- **Mohr pipette**
- The Mohr, or graduate multiple volume pipet, is graduated from a point near the tip to the nominal capacity of the pipet. Thus, it can delivery multiple volumes of liquid with good volumetric precision.



Volumetric Pipets



Mohr pipette

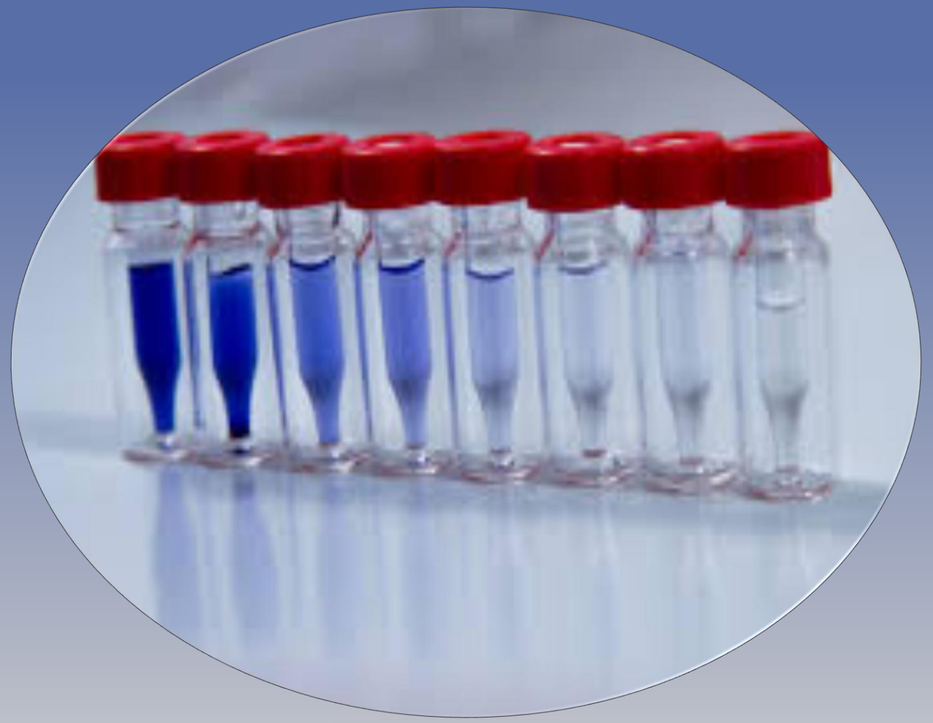
PIPETTES

- **Multichannel Pipette**: Similar technology to that of a single-channel pipette, except with multiple tips at a time and much different outcome.
- Always ensure the aspirated liquid levels are equivalent since the liquid is aspirated at the same time from the same well into multiple channels and dispensed into set of tubes or plate wells.
- Proper tips should be installed to each channel and the desired volume set, the pipette should be held in a vertical position and the plunger depressed to the first stop.
- The tip should be immersed in the liquid and the plunger released back to the rest position.

PIPETTES

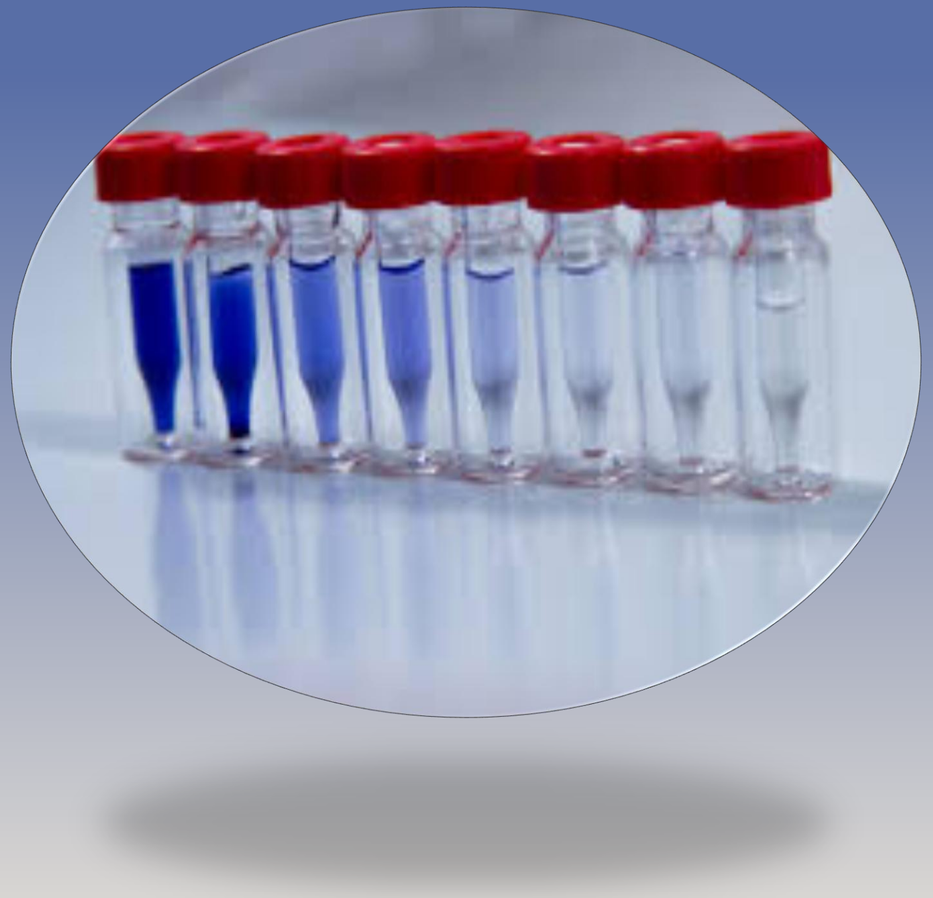
- Place the tip 45 degrees against the wall of the vessel receiving the liquid and depress the plunger to the first stop.
- Press the plunger to the second stop after waiting a second and expel all the liquid while ‘touching off’ the last drop.
- Move the end of the tip away from the liquid and release the plunger to the rest position.

DILUTION



- In ratio form
- Indication of relative concentration
- Making weaker solutions from stronger solutions in various laboratory procedures.

DILUTION FACTOR



- Used to correct for having used a diluted sample in a determination rather than the undiluted sample.
- General formula:

$$C1\ V1 = C2\ V2$$

DILUTION FACTOR

For example, a dilution factor by which all determination answers are multiplied to give the concentration per 100 mL of sample (blood) may be calculated as follows.

First, determine the volume of blood that is actually analyzed in the procedure. Using a simple proportion, it is evident that 0.5 mL of blood diluted to 10 mL is equivalent to 1 mL of blood diluted to 20 mL:

$$\frac{0.5\ \text{mL blood}}{10\ \text{mL solution}} = \frac{1\ \text{mL blood}}{x\ \text{mL solution}}$$

$$x = \frac{1\ \text{mL blood} \times 10\ \text{mL}}{0.5\ \text{mL}} = 20\ \text{mL}$$

DILUTION FACTOR

Because 1 mL of the 1:20 dilution of blood is analyzed in the remaining steps of the procedure, 0.05 mL of blood is actually analyzed (1 mL of the dilution used × 0.05 mL/mL = 0.05 mL of blood analyzed).

To relate the concentration of the substance measured in the procedure to the concentration in 100 mL of blood (the units in which the result is to be expressed), another proportion may be used:

$$\frac{\begin{array}{c}100\ \text{mL}\\(\text{volume of blood desired})\end{array}}{\begin{array}{c}0.05\ \text{mL}\\(\text{volume of blood used})\end{array}} = \frac{\text{concentration desired}}{\begin{array}{c}\text{concentration used}\\\text{or determined}\end{array}}$$

$$\text{Concentration desired} = \frac{\begin{array}{c}100\ \text{mL} \times \text{concentration}\\\text{determined}\end{array}}{0.05\ \text{mL}}$$

$$\text{Concentration desired} = 2000 \times \text{value determined}$$

SERIAL DILUTION

Dilutions can also be made in series, in which the original solution is further diluted.

A general rule for calculating the concentrations of solutions obtained by dilution in series is to multiply the original concentration by the first dilution (expressed as a fraction),this by the second dilution, and so on, until the desired concentration is known

Table 8-1 Example of Preparation of a Serial Dilution

	Tube									
	1	2	3	4	5	6	7	8	9	10
Saline (mL)	1	1	1	1	1	1	1	1	1	1
Patient serum or preceding dilution (mL)	1	1 of 1:2	1 of 1:4	1 of 1:8	1 of 1:16	1 of 1:32	1 of 1:64	1 of 1:128	1 of 1:256	1 of 1:512
Final dilution	1:2	1:4	1:8	1:16	1:32	1:64	1:128	1:256	1:512	1:1024

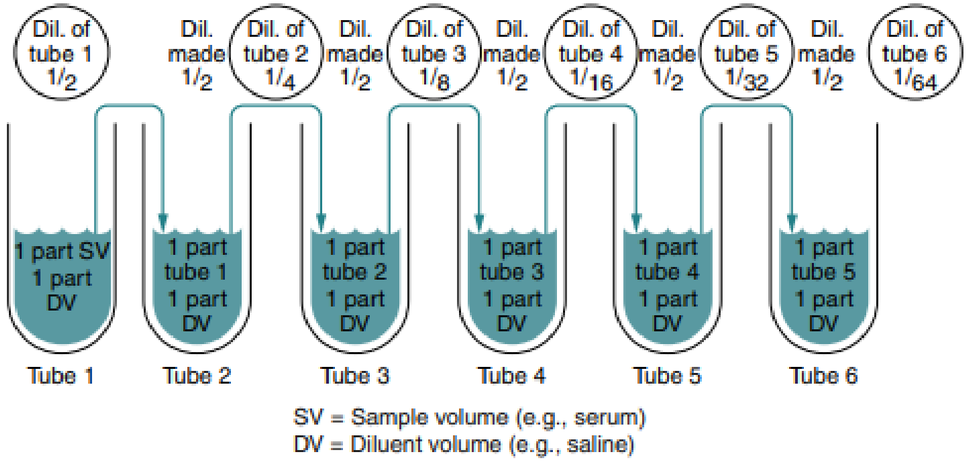


Figure 8-5 Schematic of a twofold serial dilution. *(From Turgeon ML: Linné & Ringsrud's clinical laboratory science: the basics and routine techniques, ed 6, St Louis, 2012, Mosby, p. 166.)*

DILUTION SAMPLE PROBLEM

1. 5 ml sample added to 95 ml diluent
2. 20 ml sample added to 180 ml diluent
3. 40 ml sample added to 200 ml diluent
4. 2 ml sample added to 10 ml diluent

FORMULA : DILUTION = Sample + Total Volume

DILUTION ANSWERS

1. 5 ml sample added to 95 ml diluent = 1/20 or DF=20
2. 20 ml sample added to 180 ml diluent = 1/10 or DF=10
3. 40 ml sample added to 200 ml diluent= 1/6 or DF=6
4. 2 ml sample added to 10 ml diluent = = 1/6 or DF=6

SERIAL DILUTION

A multiple dilution is performed on a sample to check the pipetting skills of a student. Five tubes are used in the dilution. The concentration of the sample is 1800 mg/dl.

The sample is diluted as of the following: Tube 1 – 1/5; Tube 2 – ½; Tube 3 – ¼, Tube 4 – 1/5, Tube 5 – 1/10.

After the student performed the dilution, the diluted specimen will be analyzed, and the student will be graded for precision for pipetting. What will be the diluted concentration in each tube?

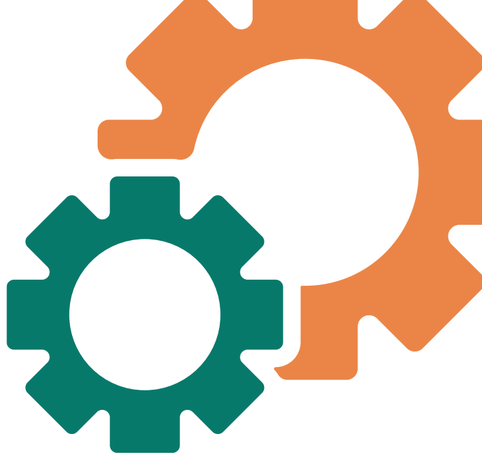
SERIAL DILUTION

Tube 1 = 1800 x 1/5 = 360 mg/dl
Tube 2 = 1800 x 1/2 = 180 mg/dl
Tube 3 = 1800 x ¼ = 45 mg/dl
Tube 4 = 1800 x 1/5 = 9 mg/dl
Tube 5 = 1800 x 1/10 = 0.9 mg/dl

MULTIHOLE WELL COUNTERS

INSTRUMENTATION

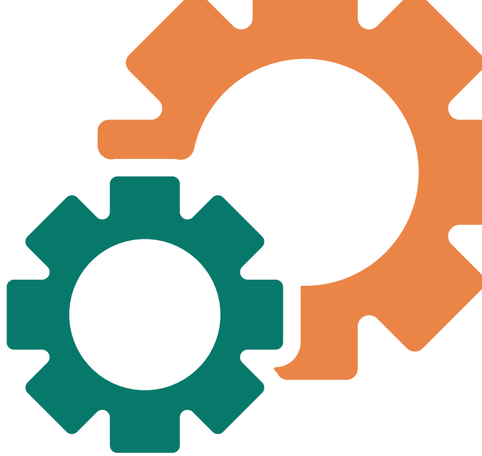
GAMMA COUNTERS



Gamma counters detect and quantify gamma-ray emissions produced by radioactive isotopes.

They play a crucial role in assessing the distribution and concentration of radioactivity in various samples.

GAMMA COUNTERS



In a typical system, a number of samples are placed in sealed vials or test tubes, and moved along a track.

One at a time, they move down inside a shielded detector, set to measure specific energy windows characteristic of the particular isotope. Within this shielded detector there is a scintillation crystal that surrounds the radioactive sample.

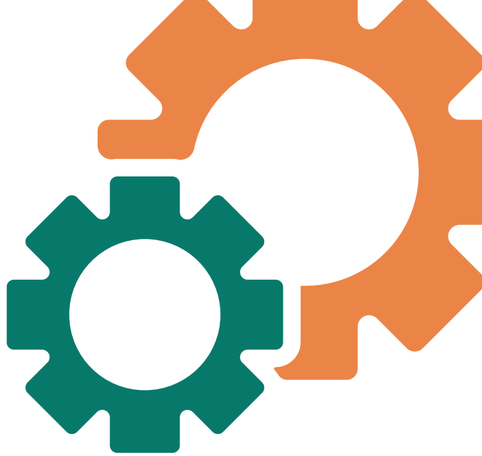
GAMMA COUNTERS

Gamma rays emitted from the radioactive sample interact with the crystal, are absorbed, and light is emitted.

A detector, such as a photomultiplier tube converts the visible light to an electrical signal.

Depending on the half-life and concentration of the sample, measurement times may vary from 0.02 minutes to several hours.

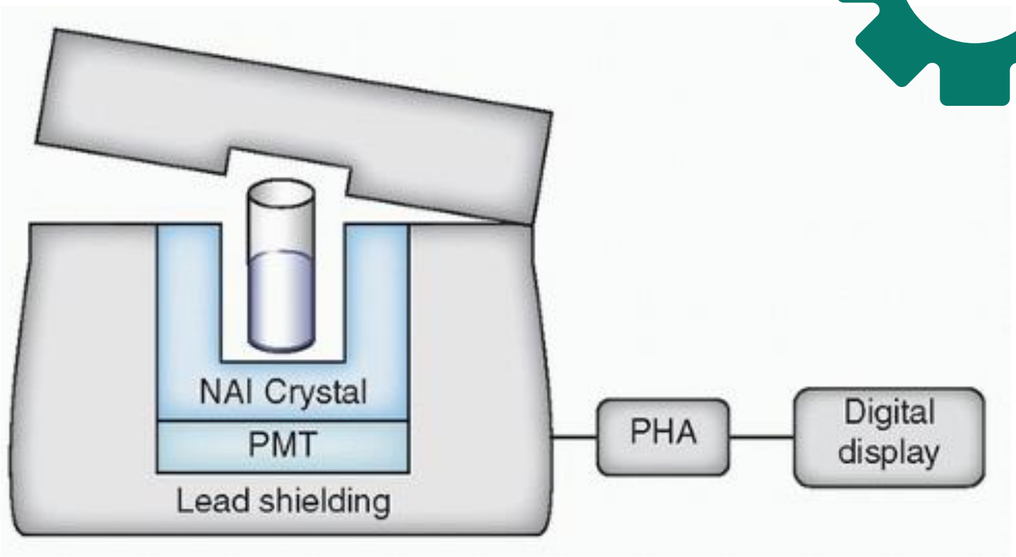
GAMMA COUNTERS



If the photon has too low of an energy level it will be absorbed into the scintillation crystal and never be detected. If the photon has too high of an energy level the photons may just pass right through the crystal without any interaction.

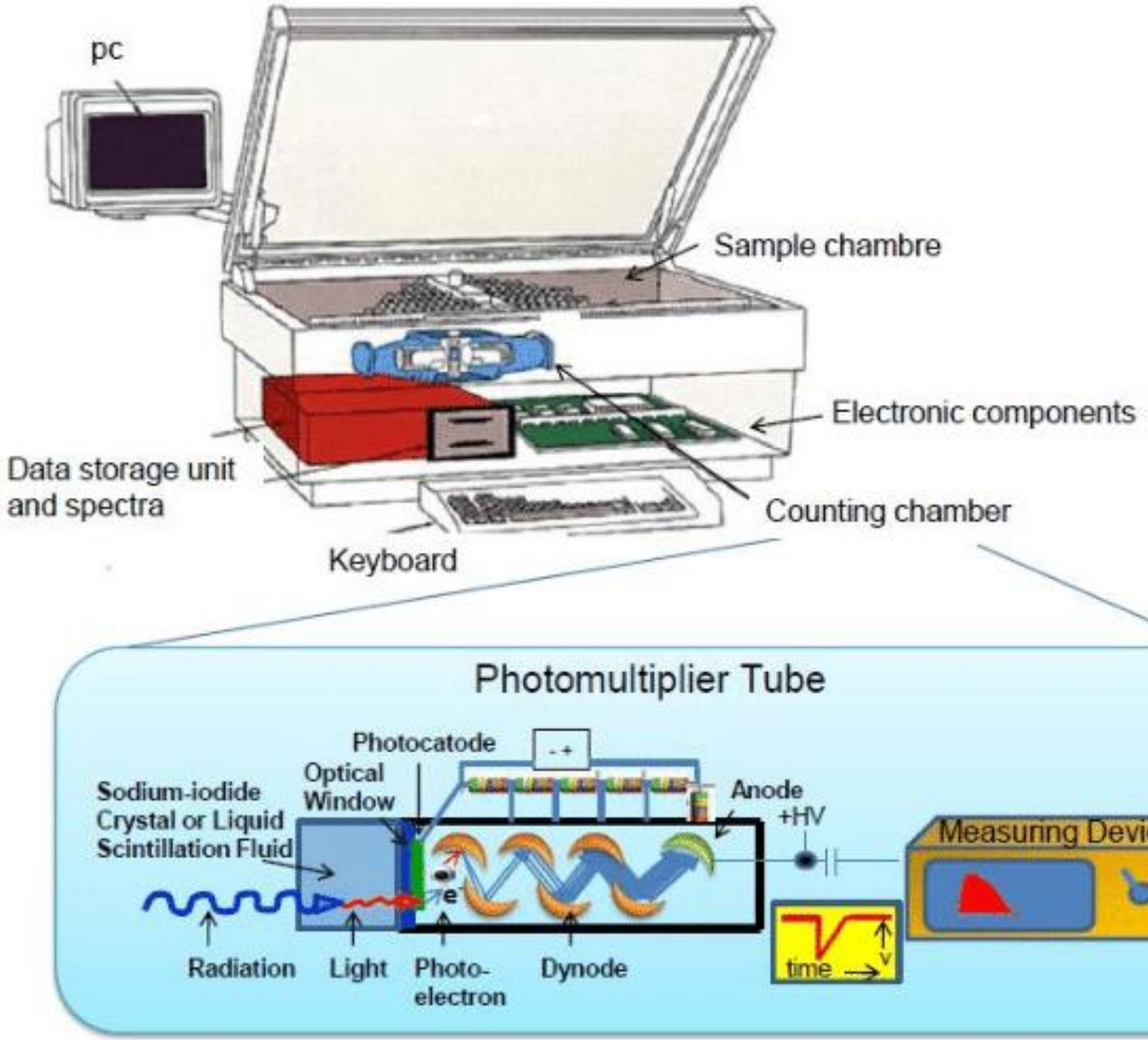
Thus, the thickness of the crystal is very important when sampling radioactive materials using the Gamma Counter

WELL COUNTERS



These instruments typically consist of a scintillation detector, which captures gamma rays, and a counting system that records the number of gamma-ray events.

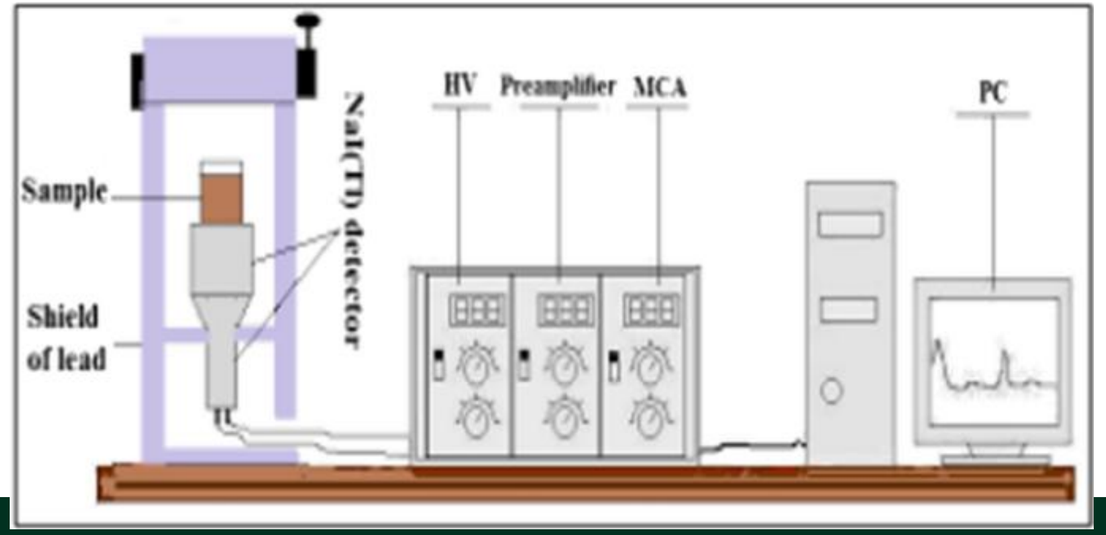
COMPONENTS OF GAMMA COUNTER



COMPONENTS OF GAMMA COUNTERS

Scintillation Detector

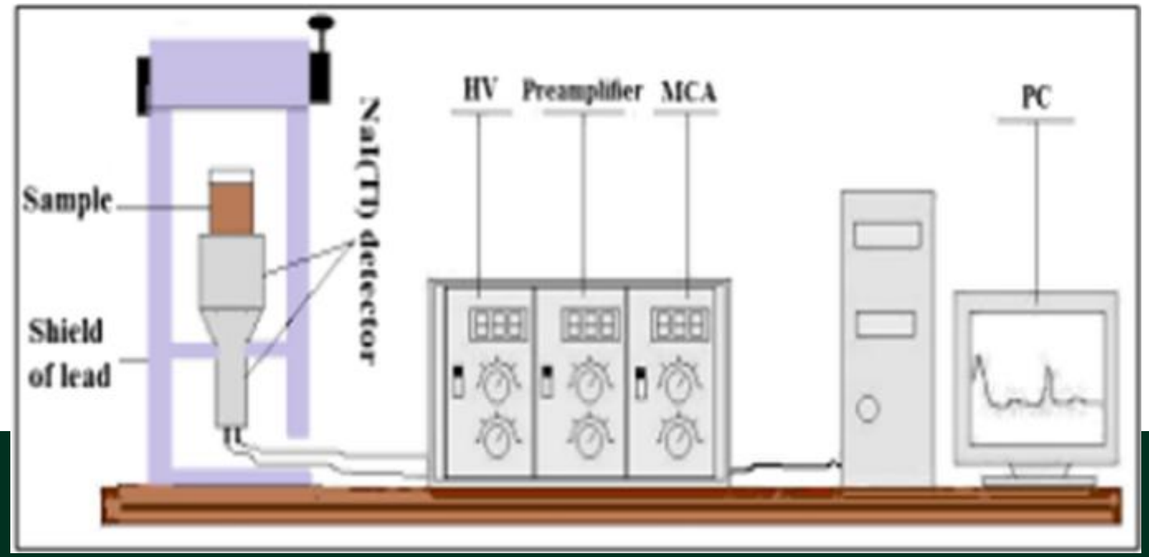
- The scintillation detector is a crucial component that converts gamma-ray energy into flashes of light. This process occurs in a scintillation crystal or material, which emits photons when exposed to gamma radiation.



COMPONENTS OF GAMMA COUNTERS

Photomultiplier Tube (PMT):

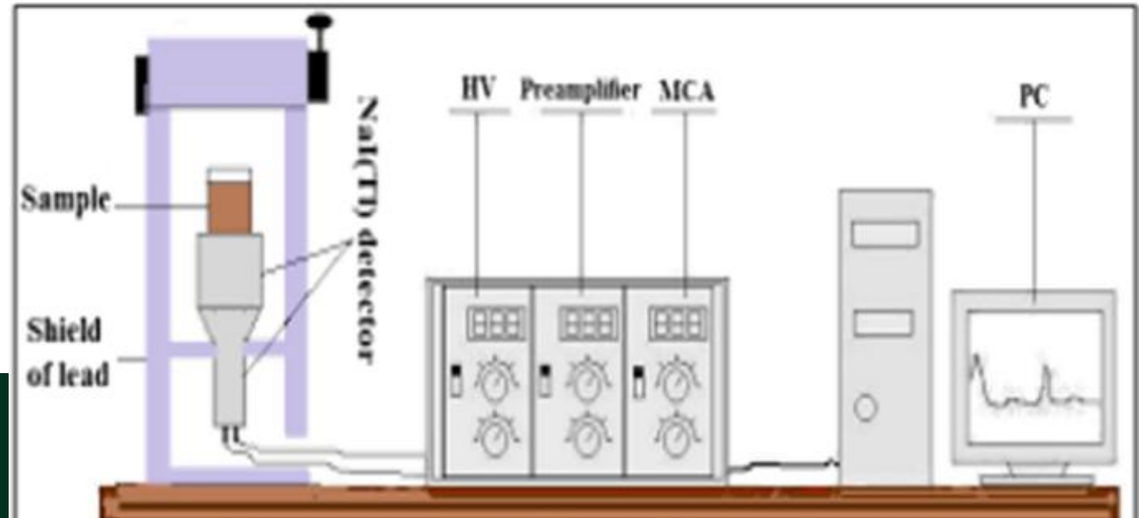
- The photomultiplier tube amplifies the weak flashes of light produced by the scintillation detector. It consists of a series of dynodes that multiply the number of electrons, resulting in a measurable electrical pulse.



COMPONENTS OF GAMMA COUNTERS

Pulse Height Analyzer

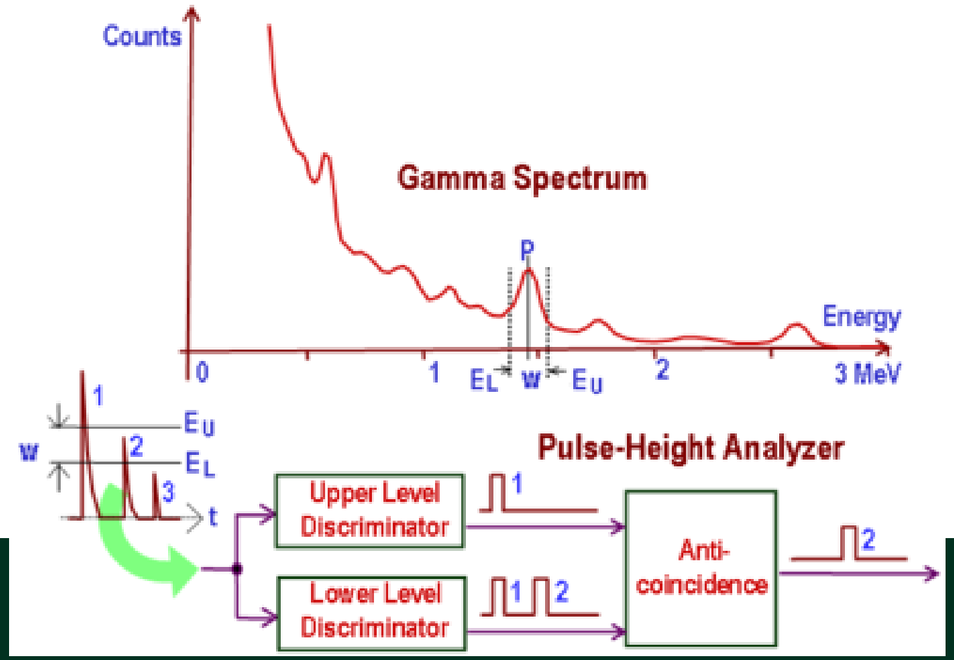
- The pulse height analyzer is responsible for sorting and analyzing the pulses generated by the photomultiplier tube. It categorizes pulses based on their energy levels, allowing for the identification and quantification of specific gamma-ray energies.

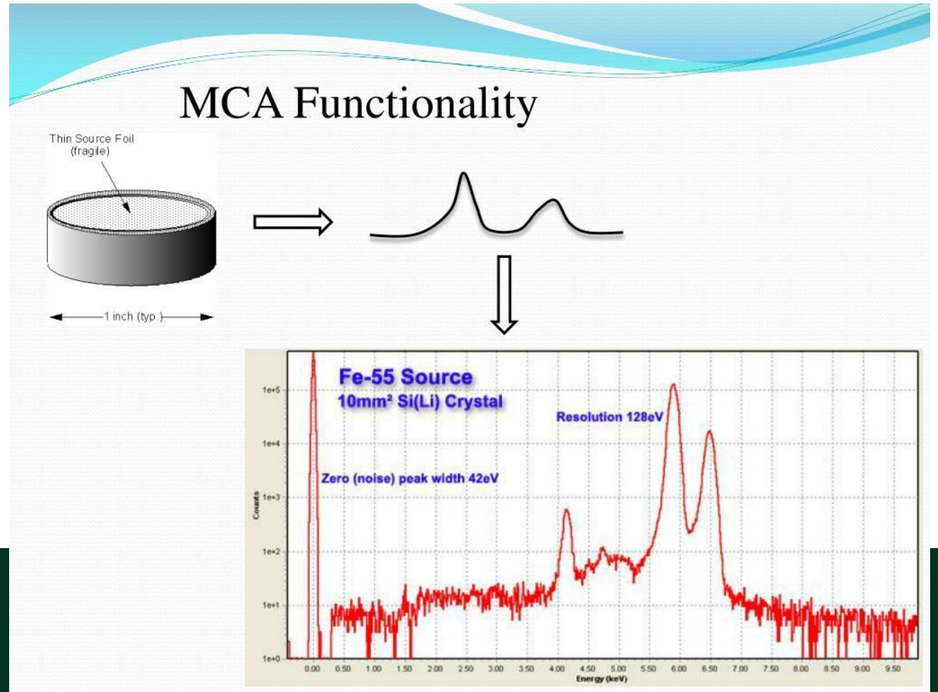


COMPONENTS OF GAMMA COUNTERS

Multichannel Analyzer (MCA)

- The multichannel analyzer is a digital instrument that records and displays the distribution of gamma-ray energies detected by the scintillation detector. It helps create a spectrum, showing the intensity of gamma rays at different energy levels.

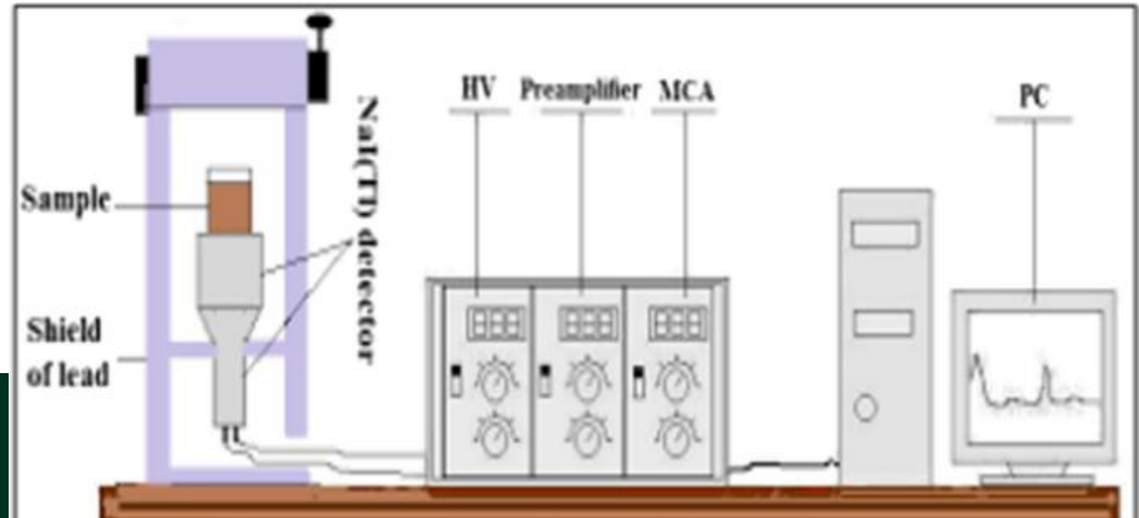




COMPONENTS OF GAMMA COUNTERS

Sample Chamber or Well

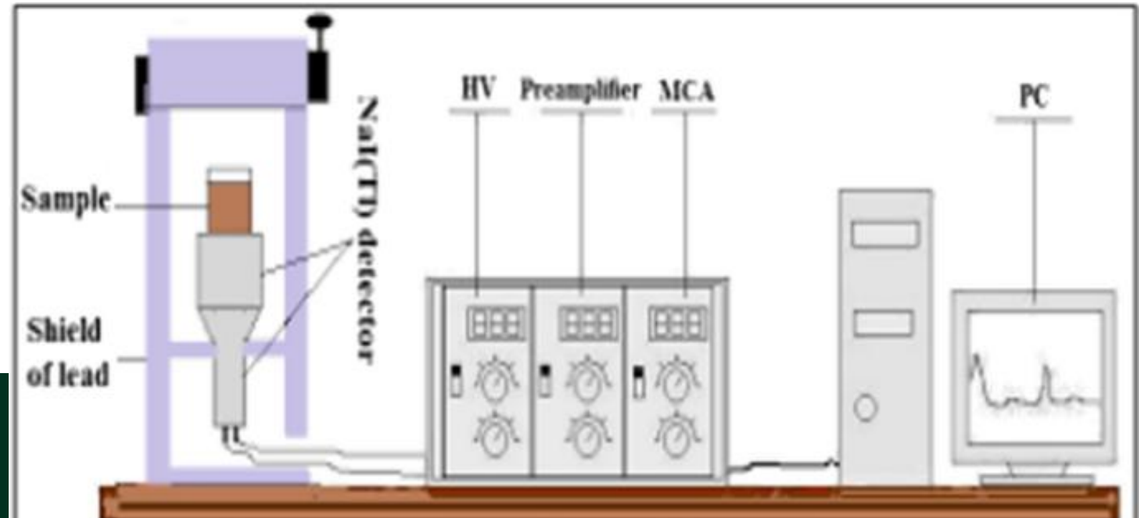
- The sample chamber or well is where the radioactive sample, often in the form of a liquid or solid, is placed for analysis. It ensures that the sample is properly positioned for accurate gamma-ray detection.



COMPONENTS OF GAMMA COUNTERS

Lead Collimator:

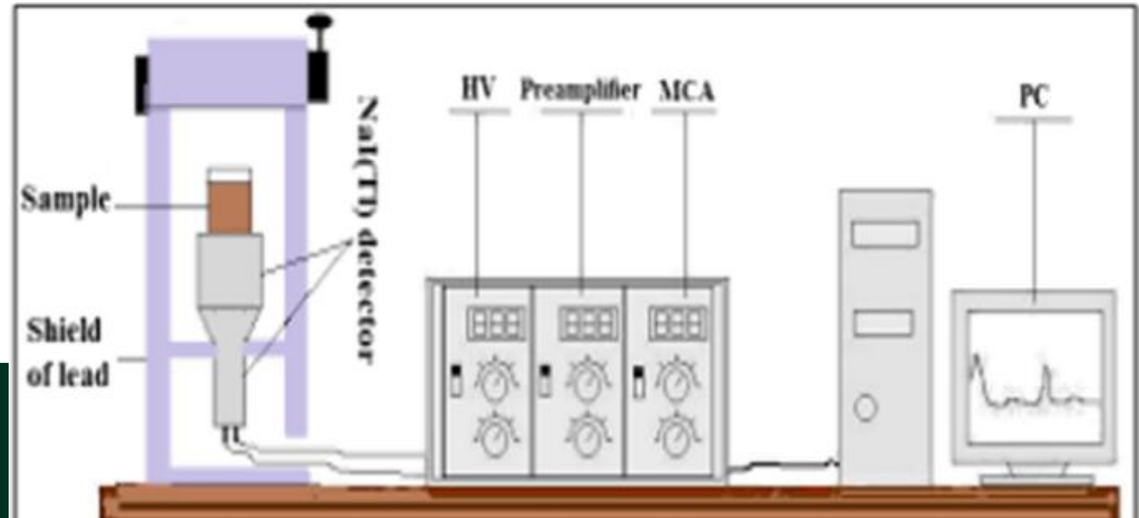
- A lead collimator is a shielding device with multiple holes that helps direct gamma rays from the sample to the scintillation detector. It ensures that only gamma rays traveling in a specific direction are detected, improving spatial resolution.



COMPONENTS OF GAMMA COUNTERS

Data Display and Analysis System

- The data display and analysis system presents the results obtained from the gamma counting process. It may include software for data interpretation, spectrum analysis, and reporting.



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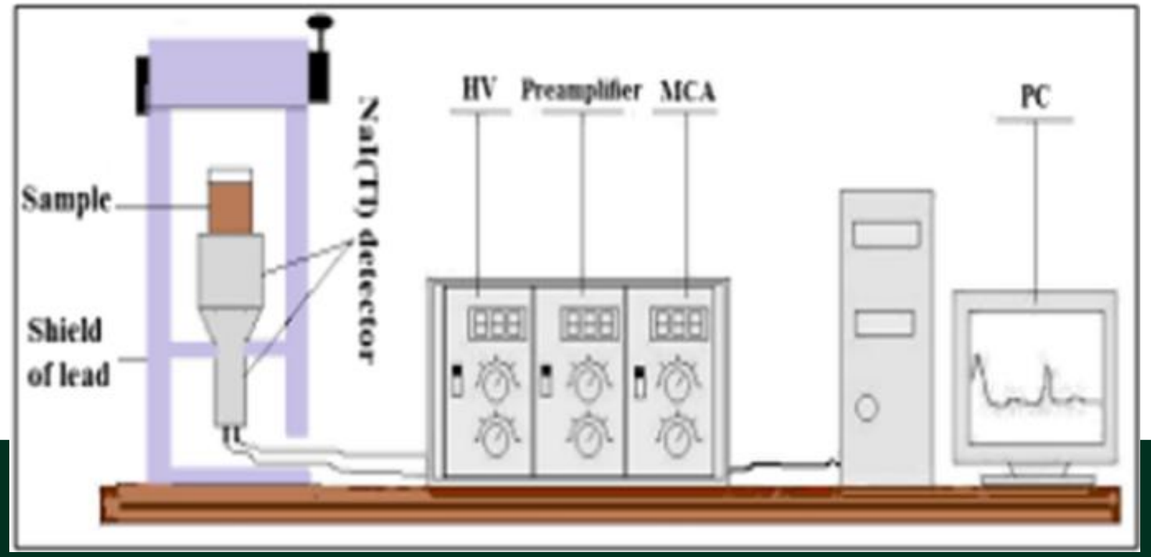
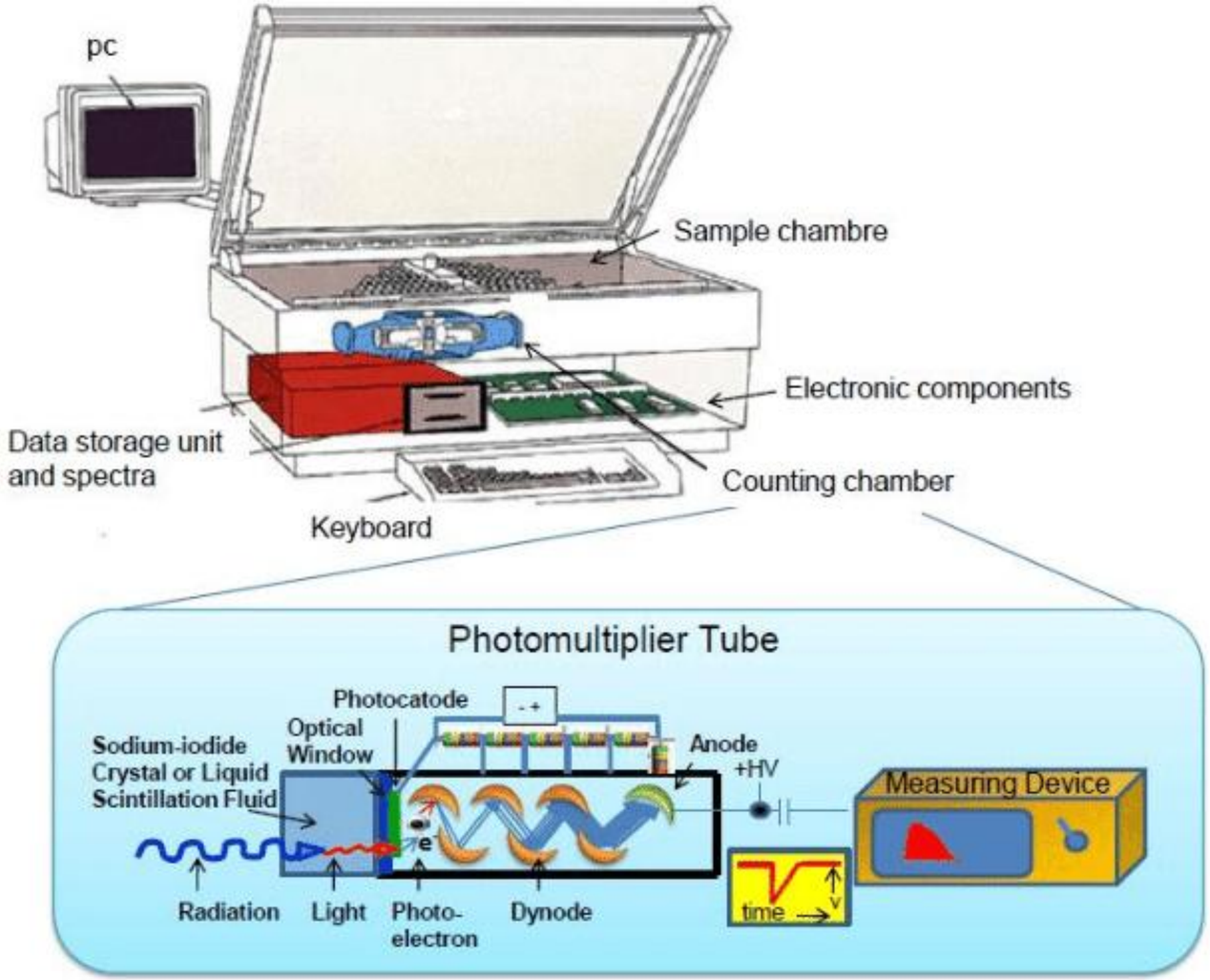


DETECTION AND QUANTIFICATION OF GAMMA RAY

EMISSIONS

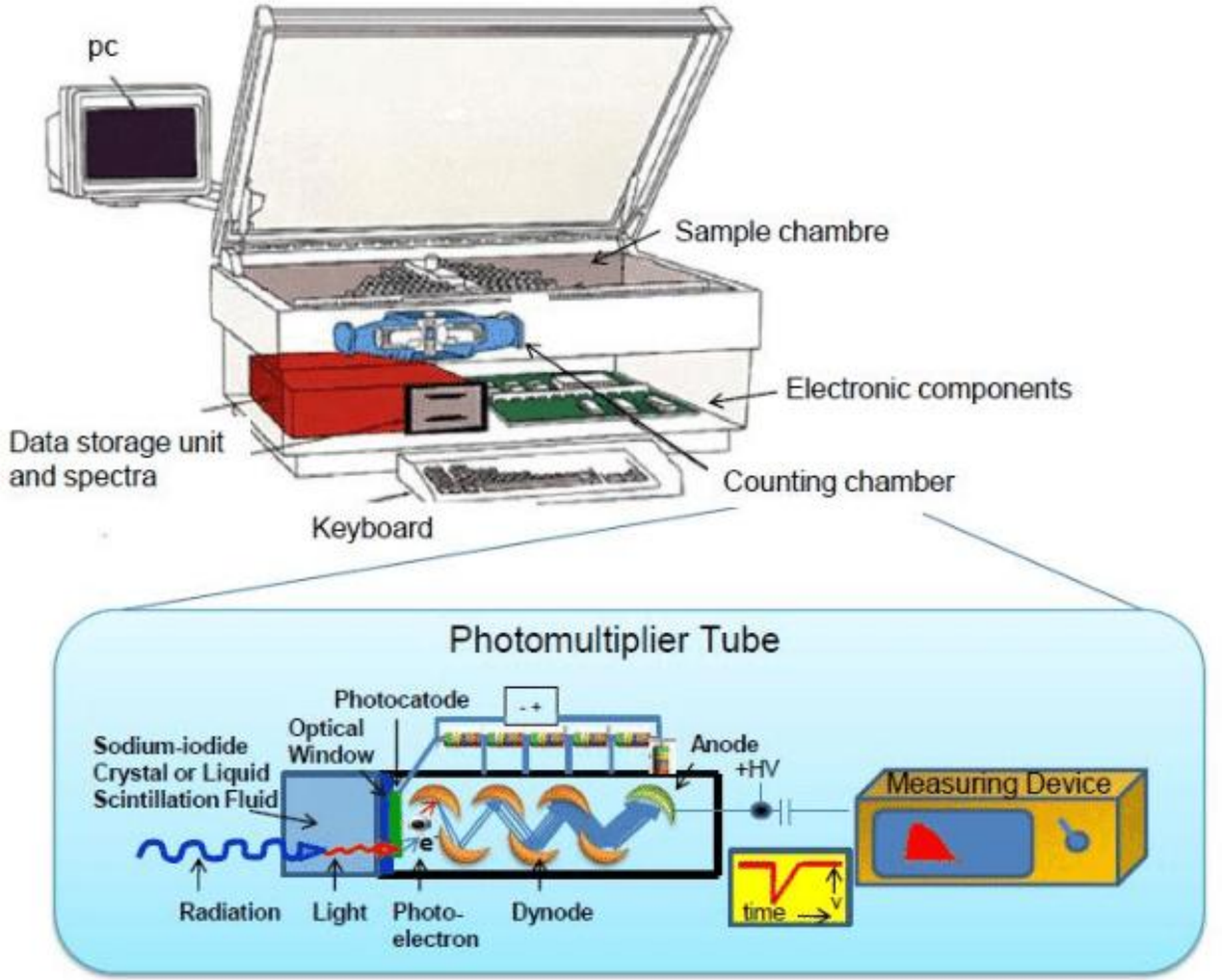


Scintillation Detector

When gamma rays interact with the scintillation crystal, they cause the atoms in the crystal to become excited. This excitation results in the emission of flashes of light

DETECTION AND QUANTIFICATION OF GAMMA RAY

EMISSIONS



Photomultiplier Tube (PMT)

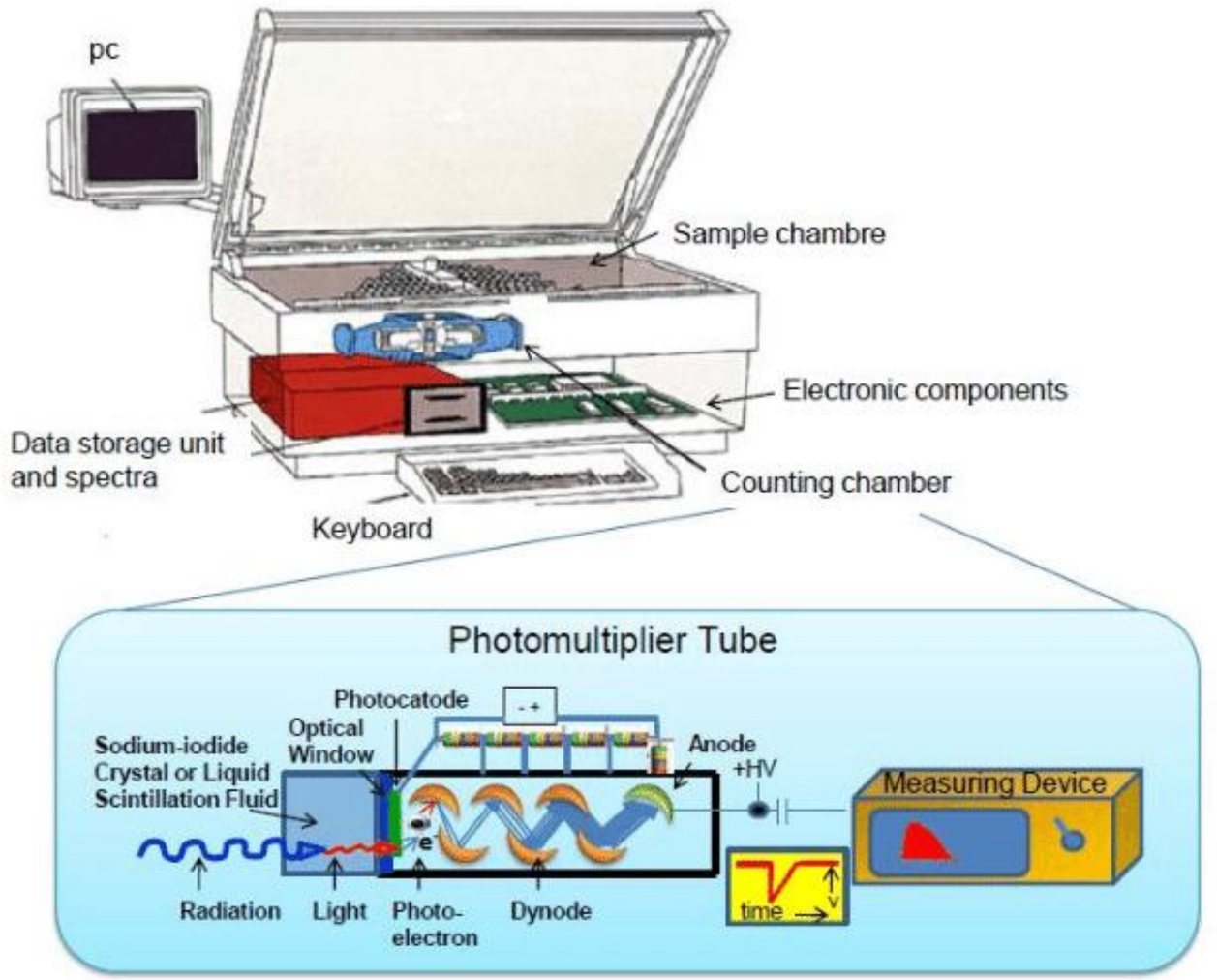
-Light Amplification

The flashes of light from the scintillation crystal enter the photomultiplier tube .

The PMT contains dynodes that amplify the weak flashes of light, producing a measurable electrical pulse

DETECTION AND QUANTIFICATION OF GAMMA RAY

EMISSIONS

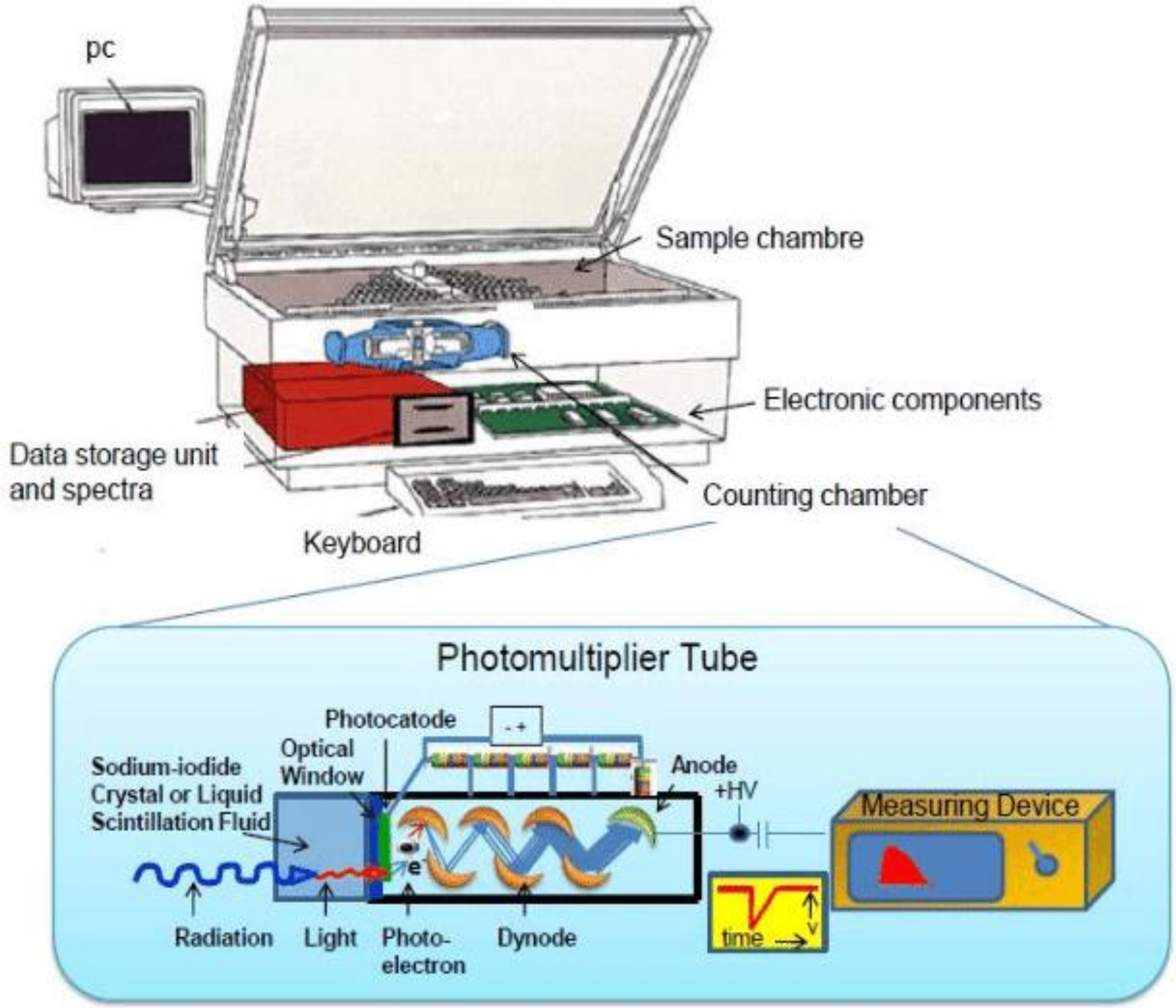


Pulse Height Analyzer

The electrical pulses generated by the PMT are sent to the pulse height analyzer. This component sorts and categorizes the pulses based on their energy levels.

DETECTION AND QUANTIFICATION OF GAMMA RAY

EMISSIONS



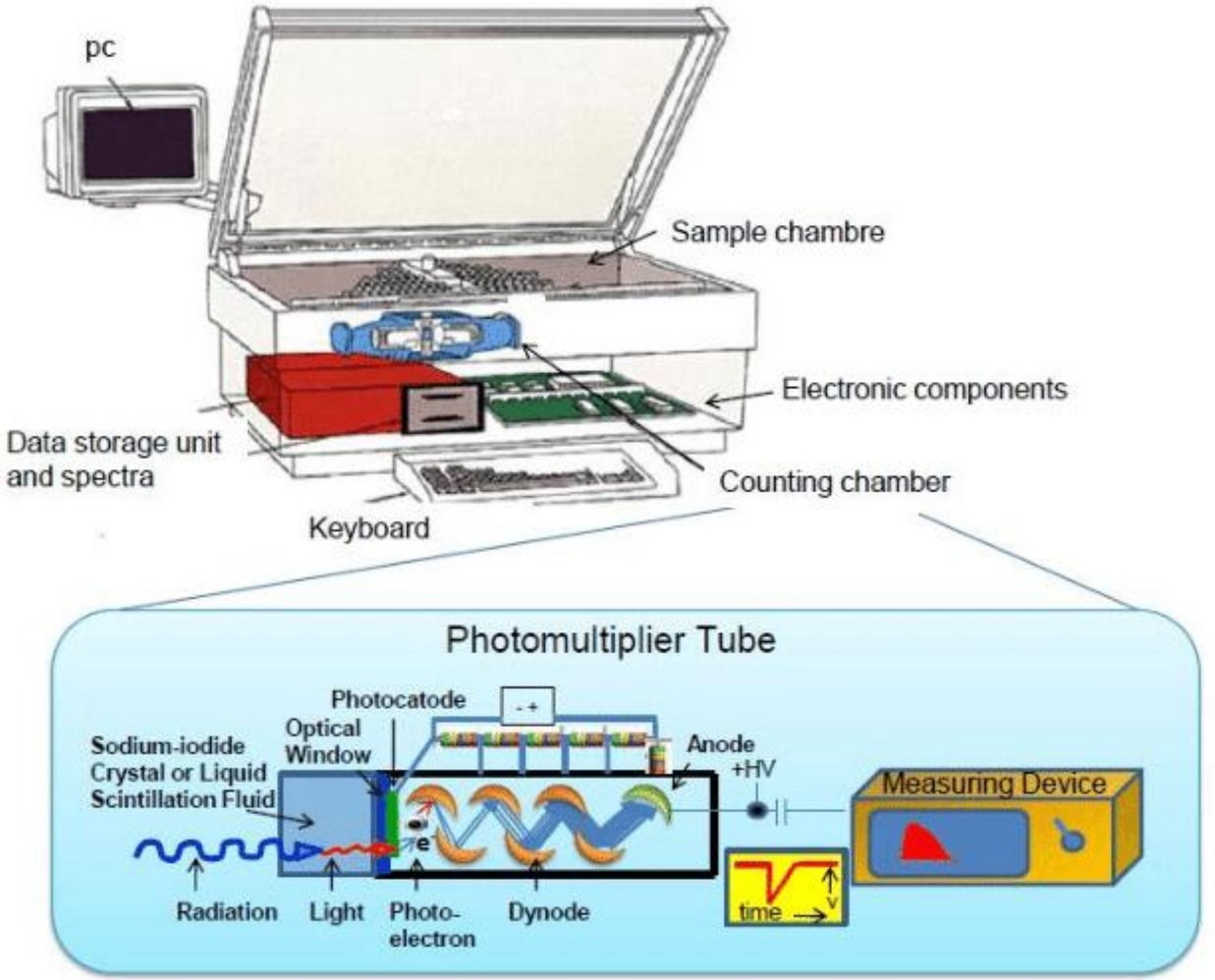
Multichannel Analyzer (MCA)

Energy Spectrum:

The multichannel analyzer records the number of pulses at different energy levels, creating an energy spectrum. Each peak in the spectrum corresponds to a specific gamma-ray energy.

DETECTION AND QUANTIFICATION OF GAMMA RAY

EMISSIONS



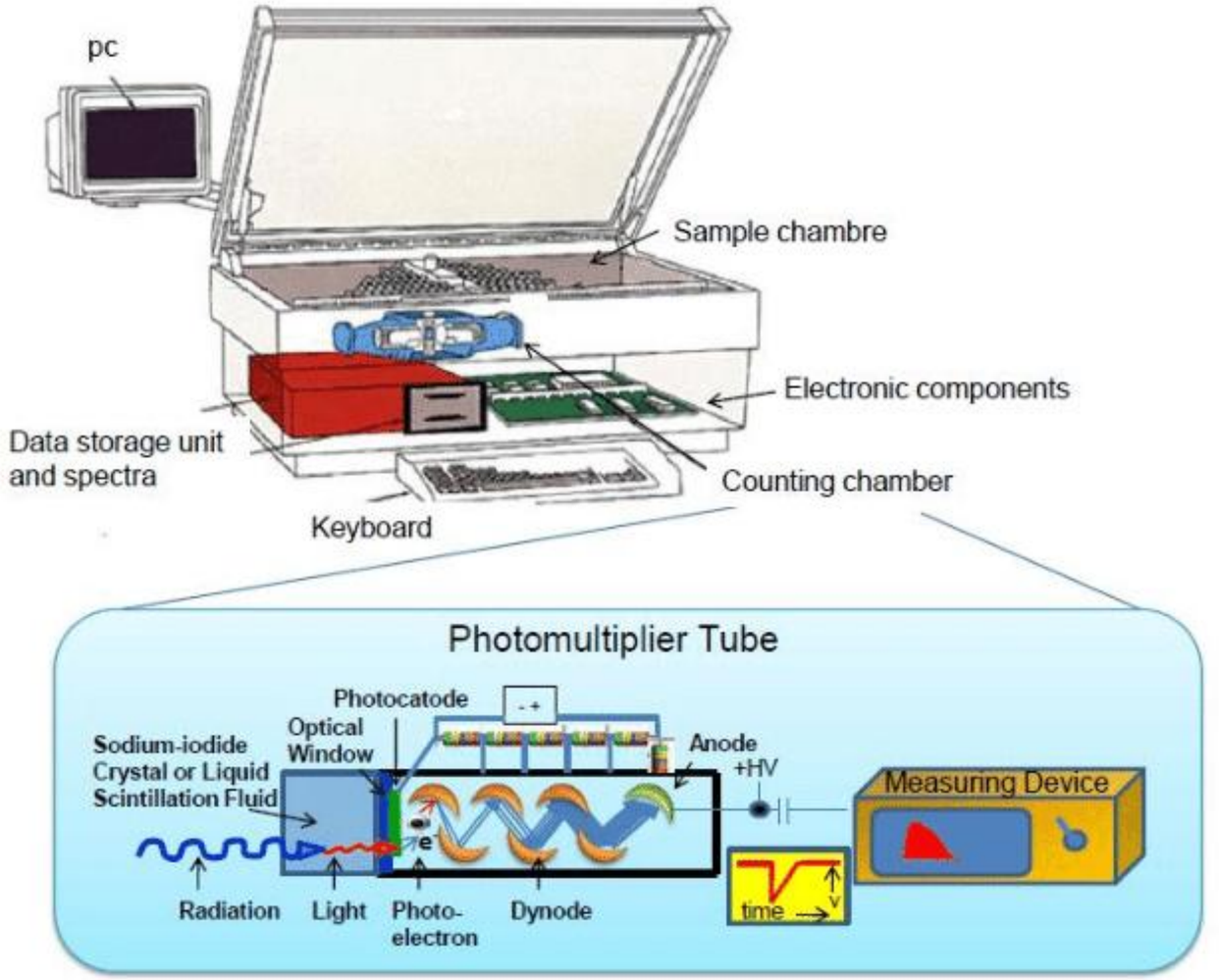
Quantification:

Peak Area Calculation:

The area under each peak in the spectrum is proportional to the number of gamma rays at that energy level. The software in the MCA calculates the peak areas, allowing for the quantification of radioactivity in the sample.

DETECTION AND QUANTIFICATION OF GAMMA RAY

EMISSIONS



Display and Analysis

Data Output:

The results, including the energy spectrum and quantification data, are displayed on a computer or monitor. Researchers or technicians can analyze this information for research, diagnostic, or treatment monitoring purposes.

ADVANTAGES

High Sensitivity and Precision:

Gamma counters exhibit high sensitivity, allowing for the detection of even low levels of radioactivity in samples.

The precision of gamma counters enables accurate measurements of gamma-ray emissions, crucial for quantitative analysis in nuclear medicine and research.

ADVANTAGES

Rapid Measurements:

- Gamma counters provide fast and efficient measurements, allowing for the quick assessment of radioactivity in samples.

- Rapid data acquisition is particularly beneficial in clinical settings, where timely diagnostic information is essential.

ADVANTAGES

Non-Destructive Nature of the Analysis:

- Gamma counting is a non-destructive analytical technique, meaning that the sample remains intact after measurement.
- This non-destructive nature is advantageous in scenarios where further analyses or additional testing of the sample may be required.

CHALLENGES

Potential Interference or Background Noise:

Sources of Interference:

External factors or contaminants may contribute to background noise, affecting the accuracy of measurements. Common sources include environmental radiation and nearby radioactive materials.

CHALLENGES

Potential Interference or Background Noise:

Shielding:

Proper shielding measures are essential to minimize interference and enhance the signal-to-noise ratio.

CHALLENGES

Calibration and Maintenance Requirements:

Calibration Challenges

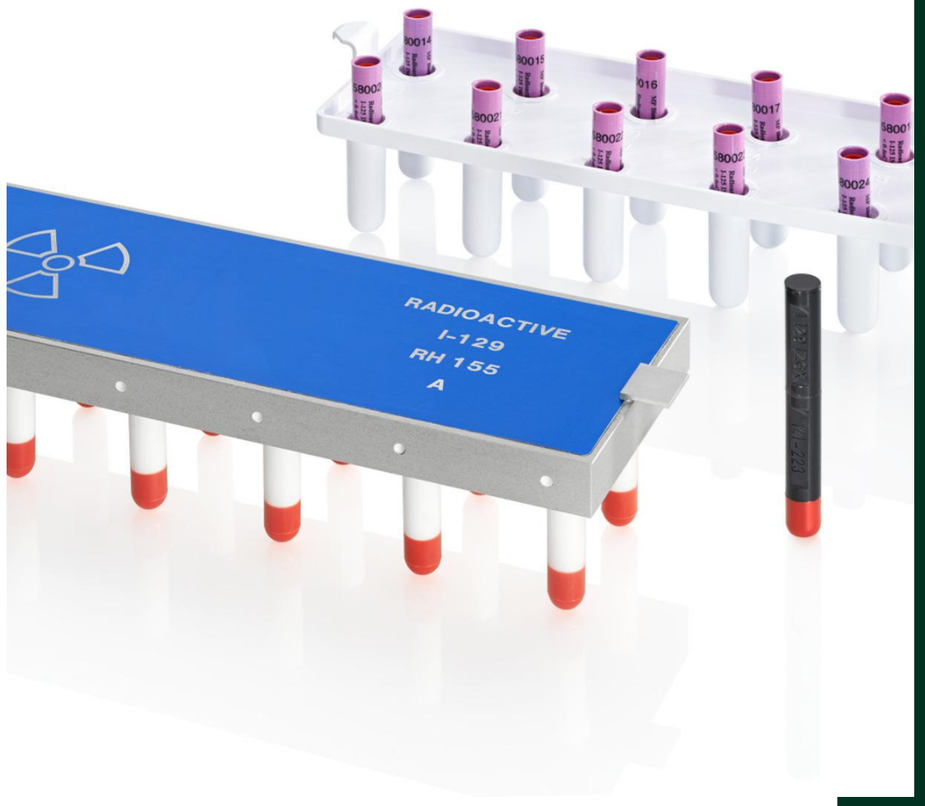
Regular calibration is necessary to maintain the accuracy of gamma counters. Changes in detector efficiency or electronic components over time can impact calibration.

CHALLENGES

Quality Control

Routine quality control measures, including phantom studies and standard source calibrations, are crucial to ensure the reliability of measurements.

Uses ^{129}I or ^{57}Co sources of 2 KBq/tube



QA / QC

Routine test	Purpose	Frequency	Comments
AGC1. Energy window calibration	To ensure that the window settings of the pulse height analyser are set appropriately	Three-monthly	This should be checked for the radionuclide(s) to be measured
AGC2. Background count rate	To measure the count rate without radioactivity; to detect contamination	Before use	Background should be stable under constant operating conditions; the background measurement also forms an integral part of a clinical measurement
AGC3. Sensitivity	To test the constancy of the instrument and settings	Before use	Use a long half-life radioactive source; be aware of high count rate (pile-up) effects
AGC4. Stability	To check the short term counting precision	Six-monthly	Counting precision is a measure of the stability of the whole system, and is measured by repeated measurements and application of the chi-squared test

THANK YOU

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