



ROHINI

COLLEGE OF ENGINEERING AND TECHNOLOGY

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DEPARTMENT OF BIOMEDICAL ENGINEERING

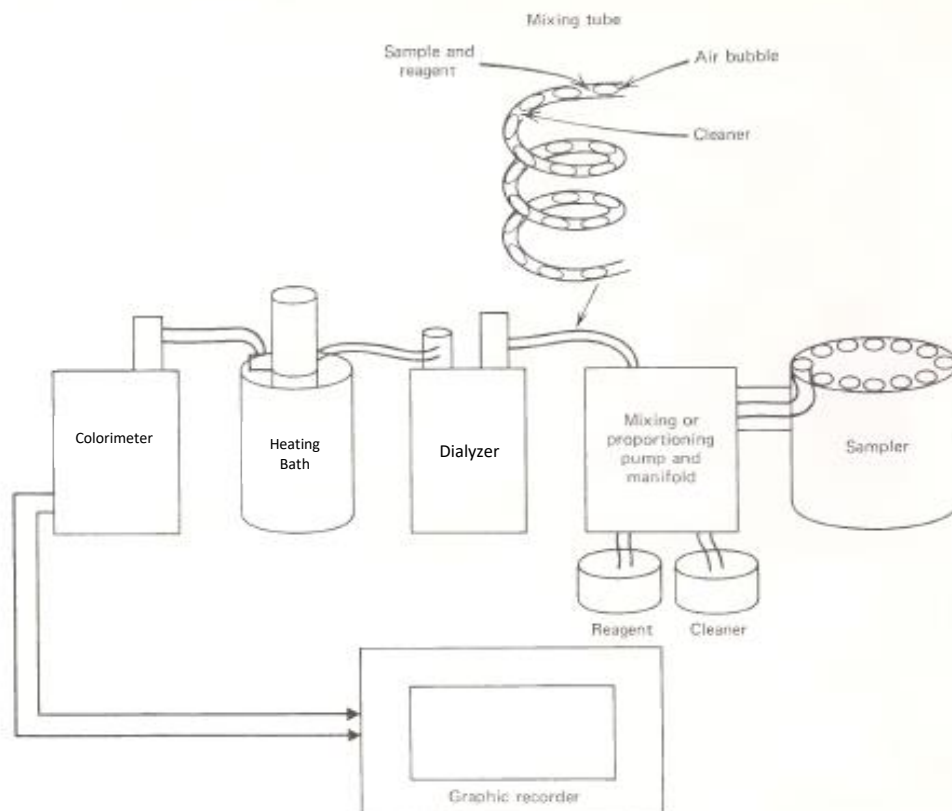
BM3491 Biomedical Instrumentation

UNIT- V BIOCHEMICAL MEASUREMENTS

5.9 Autoanalyzer

An autoanalyzer, also known as an automated analyzer, is a laboratory instrument used for the automatic analysis of chemical or biological samples. These devices are widely used in various fields, including medical diagnostics, environmental monitoring, food and beverage testing, and pharmaceutical research.

The autoanalyzer sequentially measures blood chemistry and displays this on a graphical readout. As shown in Figure 5.9.1, this is accomplished by mixing, reagent reaction, and colorimetric measurement in a continuous stream. The system includes the following elements:



1. Sampler—aspirates samples, _ standards, and wash solutions to the autoanalyzer system.

2. Proportioning pump and manifold

introduces (mixes) samples with reagents to effect the proper chemical color reaction to be read by the colorimeter. It also pumps fluids at precise flow rates to other modules, as proper color development depends on re-action time and temperature.

3. Dialyzer—separates interfacing sub-stances from the sample material by permitting selective passage of sample components through a semipermeable membrane.

4. Heating bath—heats fluids continuously to exact temperature (typically 37°C incubation equivalent to body temperature). Temperature is critical to color development.

5. Colorimeter—monitors the changes in optical density of the fluid stream flowing through a tubular flow cell. Color intensities (optical densities) proportional to substance concentrations, are converted to equivalent electrical voltages.

6. Recorder—converts optical density electrical signal from the colorimeter into a graphic display on a moving chart. The heart of the autoanalyzer system is the proportioning pump. This consists of a peristaltic (occluding or roller) pump. Air segmentation in the mixing tube separates the sample/reagent mixture from the cleaning fluid and other samples. As these air-separated fluids traverse the coil of the mixing tube, effective mixing action is achieved. The Technicon SMA 12/60, shown in Figure 16-20, is a sequential multiple analyzer that performs 12 different tests on 60 samples per hour. It is a continuous flow process that produces a chemical profile read on a graphic chart. Tests accomplished include most of those shown in Table 16-1.

- ✓ A later computerized version is developed.
- ✓ This is the Technicon SMAC. Up to 40 different tests can be performed on an individual serum sample.

- ✓ One problem with automatic analyzers is certain identification of samples. Patient data can be intermixed with other patients if care is not taken. Sterilization is also needed for samples, glassware, and equipment parts that are contaminated with disease. Diseases
- ✓ such as hepatitis or other communicable infections can be spread to equipment operators.
- ✓ Figure shows an autoclave unit used to sterilize small and large items. It operates at saturated steam pressures and temperatures of 120°C for 20 min to one hour. Maintenance on autoanalyzers include frequent calibration adjustment. Most problems are mechanical (tubes, moving pump parts) and electrical (switches, motors).
- ✓ Electronic failures are few. Sophisticated autoanalyzer system maintenance and repair requires that the BMET have gone through manufacturer's schools. Operation and service manuals must always be consulted. A patient's life may hinge on accurate measurement results obtained by clinical instrumentation.

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Benefits:

- **Efficiency:** Reduces turnaround time for test results.
- **Consistency:** Minimizes variability in results due to human factors.
- **Cost-Effectiveness:** Decreases labor costs and reagent use through optimized processes.
- **Safety:** Reduces the handling of hazardous substances by laboratory personnel.

Applications:

- **Medical Diagnostics:** Routine blood tests, metabolic panels, hormone levels, etc.
- **Pharmaceuticals:** Drug development and quality control.
- **Environmental Monitoring:** Detection of pollutants and toxins.
- **Food and Beverage Industry:** Ensuring safety and quality of products.

