
EXPERIMENT 1 FAMILIARIZATION WITH LABORATORY EQUIPMENTS AND INSTRUMENTS

Structure

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1.1 INTRODUCTION

Laboratory equipments and instruments play an important role in quality control of milk and milk products. They are important with regards to judging the quality of raw milk and other ingredients used in the manufacturing of different milk products and also evaluating the quality of the finished products with respect to the presence of toxicants and adulterants and determining the physico-chemical and theological properties of the finished products and their keeping quality.

While working in a chemical and microbiological laboratory we use different equipments either made of glass or metals (preferably stainless steel) and instruments. A brief description of these items is given below.

1.2 OBJECTIVES

- 1 to learn about different equipments and instruments used in the chemical and microbiological laboratory.

1.3 EQUIPMENTS AND INSTRUMENTS

1. **Pipette:** It is used to take known volume of a solution. Pipettes are of two types volumetric and graduated and these are either of 1, 2, 5, 10, 25 and 50 ml capacity. For measuring milk during estimation of fat by Gerber method a special volumetric pipette of 10.75 ml is used.
2. **Burette:** It is used to titrate a sample of unknown concentration against a standard solution (the concentration of which is known). For example 10 ml of milk is titrated against N/9 solution of NaOH taken in the burette. Burettes are of 25, 50 and 100 ml capacity. Microburette of 1, 2 or 5 ml are also available.
3. **Volumetric Flask:** Volumetric flasks are generally 25, 50, 100, 250, 500 and 1000ml capacity and are used to prepare a solution of known concentration (standard solution).
4. **Measuring Cylinder:** It is cylinder of glass having graduated mark on it. Cylinders are generally 10, 50, 100, 500 or 1000 ml capacity. They are used to take a known volume of solution.

5. **Thermometer:** Thermometers are used to measure the temperature of a solution or sample. These are made up of glass and are graduated at 0.1°C intervals and are marked from 0°C- 50°C, 0°C- 100°C, 0°C- 200°C etc.
6. **Lactometer:** these are cylindrical glass apparatus, which are used to determine the specific gravity of milk to check its purity. Zeal, Quevone or ISI marked lactometers are available in the market.
7. **Butyrometer:** It is made of glass and is cylindrical in shape having a graduated or marked stem. It is used to determine the fat content of milk, skimmed milk or milk products. Butyrometers of milk, skim milk, cheese, cream or butter are available in the market.
8. **Pycnometer/Density Bottle:** Made of glass these are used for the determination of density or specific gravity.
9. **Viscometer:** Viscometer are either made of glass (ostwald viscometer) or metal (Brookfield viscometer) these are used to determine the viscosity of a liquid (milk etc) or semi liquid (condensed milk etc).
10. **Stelgmometer:** Stelgmometer is a glass capillary tube used to measure the surface tension of liquids.
11. **Rose Gottlieb Tube:** Rose Gottlieb tube is a glass tube having a bark cork with 2 holes to insert two siphon tubes and is used to determine the fat content of milk and milk product gravimetrically through extraction of fat with solvents.
12. **Kjeldahal Apparatus:** It is used to determine the protein content of a food sample.
13. **Gerber Centrifuge:** This centrifuge machine is different from other centrifuges. The centrifuge is a metal tray with arrangement for fixing butyrometer and a cover. The centrifuge rotates at a constant speed and the fat in the sample is separated through centrifugal force.
14. **Water Bath:** It is used to heat the sample up to a specific temperature. It should be equipped with a digital temperature display and a temperature range of up to 100°C or higher.
15. **Analytical Balance:** It is generally used to weigh the chemicals and/or sample etc. Nowadays single pan electronic balances are available in the market.
16. **Oven:** It is made of stainless steel and is used for heating the samples and other substances. Temperature range up 0°C to 250°C is generally kept. The temperature is controlled thermostatically.
17. **Muffle Furnace:** This is required to determine the ash content of a food sample, which gives an idea about the mineral content in the food. The temperature range of the furnace is between 50-1200°C.
18. **Butyro Refractometer:** It is used to determine the butyrorefractometer reading (B.R. reading) of ghee and other fats and oils to judge their purity.
19. **Infrared Moisture Balance:** This is used to determine the moisture content of a sample while its chemical structure remains intact.

- 20. Freeze Drier:** It is called a lyophilizer and is used to preserve the biological samples like milk, blood, vitamins, hormones, antibiotics etc without damaging their cell structure.
- 21. BOD Incubator:** It is used for storage study of samples at low temperature, which range between 5-50°C.
- 22. Cryscope:** It is used to determine the freezing point of a liquid like milk.
- 23. Colony Counter:** It is used to count the microbial colonies directly in the petridish. A fluorescent light is provided for the uniform light illumination.
- 24. Autoclave:** It is used to sterilize the food and also the media and glassware in the microbiology laboratory to make them free from microorganisms.
- 25. Microscope:** It is used to determine the bacterial count in food products to determine its freshness and contamination or fermentation in it.
- 26. pH Meter:** It is used to determine the pH of a food product through potential difference between a glass and calomel electrode.
- 27. Flame Photometer and Atomic Absorption Spectrophotometer:** The instruments are used to determine the mineral and metal content including heavy metals (toxic metals) in the food products.
- 28. Colourimeter:** It is used to determine different components in food products through measurement of colour intensity.
- 29. HPLC : LCMS:** High-pressure liquid chromatography (HPLC) is a sophisticated instrument, which is used to determine the vitamins, amino acids and antibiotics etc. Liquid Chromatograph massspectrophotometer (LCMS) is generally used to determine very low level of a substance in the sample. For example it can determine the very low level of animal drugs residue or antibiotic residue in milk and meat.
- 30. Gas Liquid Chromatography (GLC) and Gas Chromatograph Masspectro-Photometer (GCMS):** Gas liquid chromatography and gas chromatograph massspectrophotometer (GCMS) are used to determine fatty acid profile of a food sample and also to determine the pesticide residue in food. GCMS is able to determine the very low levels of pesticides.