

# Practical Manual of Food Standards and Quality Control

Course No. FSN-233  
II Year III Semester  
B.Sc. (Hons.) Community Science



By

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Parbhani - 431 402 (MS)

# **Practical Manual**

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**CERTIFICATE**

*Certified that this is Bonafide Record of the work done in the laboratory  
during the year \_\_\_\_\_ by \_\_\_\_\_  
Reg.No. \_\_\_\_\_ in the course Food Standards and Quality Control,  
Course No. FSN-233 during III semester B. Sc. (Hons.) Community Science.*

Course Professor

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## Determination of Sensory, Threshold level of Panel Member

Sensitivity tests are to measure the ability of an individual to smell, taste or feel, specific characteristics in food and beverages or pure substances are used frequently in selecting for evaluation in product research and development. Also, they are used to establish intensity of sensory response of a food or food components.

**Sensory Threshold :** It is defined as the minimum concentration at which person can respond to the change in particular taste.

**Threshold Test :** Threshold is defined a statistically determined point on the stimulus scale at which a transition in a series of sensations or judgments occur.

There are mainly three types of threshold as described below :

1. Stimulus Detection threshold
2. Recognition identification threshold
3. Terminal/ saturation threshold



1. **Stimulus Detection threshold:** It is that magnitude of stimulus at which a transition occurs from no sensation to sensation.
2. **Recognition Identification threshold:** It is minimum concentration at which a stimulus is correctly identified.
3. **Terminal/ Saturation threshold:** It is the magnitude of a stimulus above which there is no increase in the perceived intensity of the stimulus.

These tests are most commonly used for selection of panel members and material such as spices for assessing the intensity of odour or flavor as the main threshold value by a trained panel.

### Procedure :

1. Prepare the solutions containing varying molar concentrations of sucrose, sodium chloride, citric acid and caffeine ( Table 1).
2. The series of beaker with increasing concentration of the four taste quality (sweet, sour, salty and bitter) are given.
3. Identify the threshold of all the given solutions .
4. Start the identification of concentration from beaker one and continue to last beaker.
5. Retesting of already tested solution is not permitted.

**Table 1. Solutions containing varying molar concentrations**

<b>Sucrose (Molar conc. )</b>	<b>Nacl (Molar conc. )</b>	<b>Citric acid (Molar conc. )</b>	<b>Caffeine (Molar conc. )</b>
0.0002	0.0002	0.00005	0.00005
0.0004	0.0004	0.0001	0.0001
0.0008	0.0008	0.0002	0.0002
0.0016	0.0016	0.0004	0.0004
0.0032	0.0032	0.0006	0.0006
0.0064	0.0064	0.0008	0.0008
0.0128	0.0128	0.0010	0.0010
0.0256	0.0256	0.0012	0.0012
0.0512	0.0512	0.0014	0.0014

**Procedure for preparation of solutions containing varying molar concentration**

- 1. Sucrose (Sweet) :** Preparation of stock solution
  - i) Take 34.23 g of sucrose and dissolve it in 1 litre of water
  - ii) Take 2 ml from stock solution and dilute it to 1 litre (0.0002 M conc.)
  - iii) Similarly take 4,8, 16,32,64 ,128 and 256 ml of stock solution and dilute to 1 litre to obtain respective concentrations.
  - iv) To obtain 0.0512 M. concentration dissolve 17.526 g /lit
- 2. Nacl (Salty) :** Preparation of stock solution
  - i) Take 5 g of Nacl and dissolve it in 1 litre of water
  - ii) Take 2 ml from stock solution and dilute it to 1 litre (0.0002 M conc.)
  - iii) Similarly take 4,8, 16,32,64 ,128 and 256 ml of stock solution and dilute to 1 litre to obtain respective concentrations.
  - iv) To obtain 0.0512 M. concentration dissolve 2.994 g /lit
- 3. Citric acid (Sour) :** Preparation of stock solution
  - i) Take 21.59 g of citric acid and dissolve it in 1 litre of water
  - ii) Take 0.5 ml from stock solution and dilute it to 1 litre (0.00005 M conc.)
  - iii) Similarly take 1,2,4,6,8,10,12 and 14 ml of stock solution and dilute to 1 litre to obtain respective concentrations.
- 4. Caffeine (Bitter) :** Preparation of stock solution
  - i) Take 19.41 g of caffeine and dissolve it in 1 litre of water

ii) Take 0.5 ml from stock solution and dilute it to 1 litre (0.00005 M conc.)

iii) Similarly take 1,2,4,6,8,10,12 and 14 ml of stock solution and dilute to 1 litre to obtain respective concentrations.

**Prepare any five concentrations and record the observations after testing the solutions**

**Table 2 . Observation**

Beaker no.	Sucrose	Nacl	Citric acid	Caffeine
1				
2				
3				
4				
5				

Describe the taste of given solutions in the following number form.

0 = None or pure water taste

? = Different from water but taste quality is not identified.

x = Threshold very weak.

1 = Weak threshold

2 = Medium threshold

3 = Strong threshold

4 = Very strong threshold

5 = Extremely strong threshold

**Signature**

1) Compare the observations with original values and justify the intensity of threshold of panel member.

**Conclusion:** \_\_\_\_\_ panel members have successfully determined the sensory threshold level.

Hence these panel members can be selected for sensory evaluation of developed products.

## Sensory Evaluation

Sensory evaluation consists of judging the quality of food by panel of judges. The evaluation deals with measuring , analyzing and interpreting the qualities of food as they are provided by the senses of sight, taste, touch and hearing etc.

**Definition:** When the quality of food product is assessed by the means of human sensory organs, the evaluation is said to be sensory or subjective or organoleptic evaluation.

Sensory quality is a combination of different senses of perception coming into play in choosing and eating a food, appearance, flavor and mouth feel decides the acceptance of the food.

Scientific methods of sensory analysis are becoming increasingly important in assessing the acceptability of food products. There are two main groups of methods of sensory evaluation

(A) Analytical or objective methods ( Difference, ranking and quality tests ) and

(B) Hedonic or subjective methods ( Preference, consumer and market tests ). The different methods of sensory analysis are given in Table 1.

**Table 1. Main methods of sensory evaluation**

A. Analytical or objective methods	B. Hedonic or subjective methods
I. Difference tests:	I. Preference tests
1. Single sample test (A, or not-A test)	1. Paired preference test
2. Paired difference test	2. Triangle preference test
3. Triangle difference test	
4. Duo-trio test	
II. Ranking test	II. Hedonic scale
III. Quality tests	
1. Scoring tests	
2. Descriptive tests	
Flavour profile method	
Dilution flavor profile method	

Sensory evaluation is applicable to a variety of areas such as product development, produce improvement, quality control, storage studies and process development. Sensory evaluation component is very essential to study any 'food' and there is no one instrument that can replicate or replace the



human response. Sensory analysis is a multidisciplinary science. The sense of sight, smell, taste, touch and hearing are used to measure the sensory characteristics and acceptability of food products.

A sensory panel must be treated as a scientific instrument to produce reliable and valid results. Tests using sensory panels must be conducted under controlled conditions, using appropriate experimental designs, test methods and statistical analysis.

### **Selection of judges / panel members for sensory evaluation.**

#### **1. Identification of basic tastes:**

Testing the sensitivity of the individual for the '4' primary tastes is important in the selection of judges / panel members for sensory evaluation. To test this, prepare solutions of sweet, salt, sour and bitter using sugar, salt, citric acid and Caffeine. Ask the judges / panel members to identify the taste.

#### **2. Effect of interactions:**

The impact of any task is dependent on the simultaneous responses of other stimuli in a product. Such change in the impact are the interactions which are due to combinations of stimuli and may be due to other physical, psychological and physiological factors. Interactions occur between different modalities and different quantities with in one modality. Such interactions either suppress or enhance the sensory response to odour, aroma and taste. Flavour in natural foods are mainly due to these interactions.

For testing an individual's sensitivity to interactions, prepare any beverage and divide in to 5 or 6 equal portions and add different levels of sugar (0, 0.5, 1.0, 1.5, 2.0, 2.5 g). Ask the individual to taste samples one by one in any order. Then ask the individual to arrange the samples in the decreasing order of intensity of sweetness.

#### **3. Intensity / Hedonic rating experiments:**

The objective of quality testing is to compare different samples with respect to one or more characteristics. Rating is used to determine how several samples differ on the basis of a single characteristic. A group of samples which may contain a control or standard are presented simultaneously and the judge is asked to rank them in order of the intensity of a specified characteristic. Samples may be ranked in order of degree of acceptability or in order of general quality or by specific attributes of colour, texture, flavour, taste and viscosity. The judges should be thoroughly familiar with all aspects of the sample characterization under consideration. For rating the food product, prepare any food product by adding any flavour / colour in increasing order. Ask the individual to taste them in the order given and record the degree of liking for flavour / colour by adopting the following scale.

#### **4. Testing palatability of a food product using triangle test:**

In this test '3' samples are presented, two of which are duplicates. The judge is asked whether there is any difference among the samples and if so, to identify the duplicate samples. Sometimes the individual is asked whether each sample is acceptable and which sample is preferred or whether

the odd or duplicate samples have the distinguished characteristic to the more pronounced degree. This test is useful when differences between the samples are small.

**5. Score card for sensory evaluation of a Food Product:**

The quality characteristics such as colour, appearance, flavour, taste, texture, after taste and overall acceptability of a food product can be tested by using appropriate score card for sensory evaluation. In this the samples to be tested for sensory quality characteristics have to be scored by the judges by adopting the five point scale as given below.

**Score card for organoleptic evaluation**

Name of the recipe : \_\_\_\_\_

Name of the panel member \_\_\_\_\_

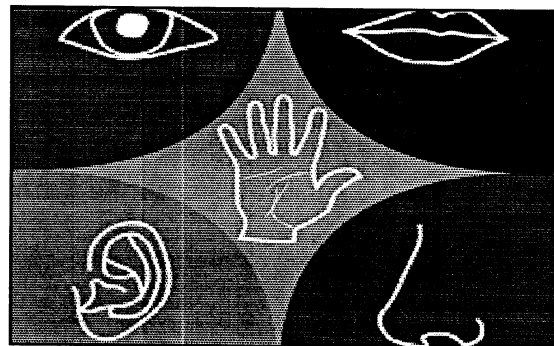
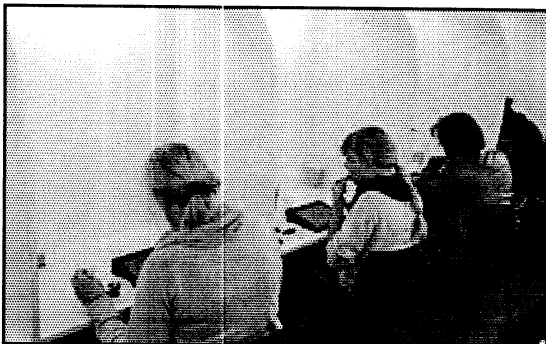
Date of evaluation \_\_\_\_\_

S. No.	Variations	Colour	Texture	Taste	Flavour	Overall acceptability
1.	A1					
2.	A2					
3.	A3					
4.	A4					
5.	A5					

**Signature**

5 – Excellent ,      4 – Very good,      3 – Good,      2 – Fair,      1 – Poor

Then the average scores obtained for each of the sensory attributes such as colour, appearance, flavour, taste, after taste, texture and overall quality of the given food products have to be calculated, to judge the sensory quality characteristics of a given food product.



**Sensory Evaluation**

## Sensory evaluation of finished products

### A. Sensory evaluation by Duo-Trio and Triangle method

**Triangle method :** In case of triangle method each panelist is given three sample. Two of which are alike. They have asked to find out the odd sample. Panelist are asked to taste from left to right. Rinse or take a bite of bread or cracker in between two sample. Panelist are asked to make a round to the code number which is odd one.

**Dio-Trio method :** In dio –trio method each panelist is given a reference sample and two other sample. They are asked to taste reference sample first and then asked to taste coded samples from left to right and asked to circle the code number which is similar to reference sample.

#### Observation:

#### 1. Triangle method

Code (1) \_\_\_\_\_ Code (2) \_\_\_\_\_ Code (3) ) \_\_\_\_\_

From the above given samples find out odd sample(code) \_\_\_\_\_

#### 2. Duo –Trio method

Reference sample (R) \_\_\_\_\_ Code( 1) \_\_\_\_\_ code(2) \_\_\_\_\_ code(3) \_\_\_\_\_

From the above given samples evaluate from left to right and circle the code number which is similar to Reference sample.

The sample similar to reference sample is \_\_\_\_\_

#### Result :

The sensory evaluation by Duo-trio and Triangle method has been carried out successfully and the result of Triangle method i.e odd sample is \_\_\_\_\_.

Result of Duo-Trio method is \_\_\_\_\_ code is similar to reference sample.

### B. Sensory evaluation of biscuits using hedonic scale

Name of sample :

Code no. of sample:

1. Parle G

310

2. Tiger

450

3. Sun feast

530

**Observation Table**

S. No.	Code no. of sample	Colour	Texture	Taste	Flavour	Overall acceptability
1.	310					
2.	450					
3.	530					

**Signature**

- 9. Like extremely
- 8. Like very much
- 7. Like moderately
- 6. Like slightly
- 5. Neither like nor dislike
- 4. Dislike slightly
- 3. Dislike moderately
- 2. Dislike very much
- 1. Dislike extremely

**Result :**

- 1. Evaluate by 10 panel member and take the average of each characteristic.
- 3. Conclude the sensory quality of evaluated biscuits with respect to sensory Parameters \_\_\_\_\_.

## Nutritional evaluation of finished products

Analysis of food and drink is very important part of product development, as the foods differ widely in their contents of various nutrients. Nutritional quality frequently can be assessed by chemical or instrumental analysis for specific nutrients. Nutritional quality is required for checking shelf-life and authenticity assuring legal compliance. Analysis of food meets statutory and voluntary obligations and gives the quality assurance.

Scientifically the overall quality refers to technological, physical, chemical, microbiological, nutritional and sensory parameters to achieve the wholesome food .The reason for analyzing food is to ensure that they are safe and nutritious. Food Analysis serves as a unique and invaluable tool for all food scientists, technologists and regulatory authorities for quality assurance and control of food products, to study the different aspects of food products. Depending upon the food stuffs used in the development of products they vary in concentration of nutrients

### Evaluation Of Nutritional Quality of Value added Nankhatai

**Table: 1 Preparation of Nankhatai (Basic)**

Sr.No.	Ingredients	Amount (g)
1.	Refined wheat flour	125
2.	Fat	75
3.	Sugar (Powder)	75
4.	Ammonium Biocarbonate	1 t.sp.
5.	Baking powder	½ t.sp.
6.	Cardamom powder	½ t.sp.

**Procedure:**

1. Sift the flour.
2. Cream the fat and sugar till light and fluffy.
3. Add ammonium bicarbonate, crushed cardamoms and baking powder to the creamed mixture of sugar.

4. Add the flour and mix it with a fork to obtain stiff dough.
5. Divide the dough into small portion and make them into Nankhatai and place them on a greased baking tray each piece two inch separate.
6. Bake at 350°F for 20-25 minutes.

**Table: 2 Preparation of Value added Nankhatai**

Ingredients	Refined wheat flour (g)	Soya flour (g)	Fat (g)	Sugar (Powder) (g)	Ammonium Biocarbonate	Baking powder	Cardamom powder (g)
<b>Basic</b>	125	-	75	75	1 t.sp.	½ t.sp.	½ t.sp. <sup>2</sup>
<b>Variation I (5%)</b>	118.75	6.25	75	75	1 t.sp.	½ t.sp.	½ t.sp. <sup>2</sup>
<b>Variation II (10%)</b>	112.5	12.5	75	75	1 t.sp.	½ t.sp.	½ t.sp. <sup>2</sup>
<b>Variation III (15%)</b>	106.25	18.75	75	75	1 t.sp.	½ t.sp.	½ t.sp. <sup>2</sup>

**Procedure**

- ❖ Prepare Nankhatai following the standard procedure.
- ❖ Prepare value added Nankhatai with 5 percent, 10 per cent & 15 per cent addition of Soya flour.
- ❖ Evaluate the nutritional quality.
- ❖ Calculate nutritive value of standard Nankhatai.
- ❖ Calculate nutritive value of value added Nankhatai.
- ❖ Compare the nutrient with the standard recipes .
- ❖ Assess the product with respect to nutrient content.

**Observation : Nutritive value of prepared Nankhatai**

Nutrient (Kcal)	Energy (gm)	Protein (gm)	Fat (mg)	Calcium (mg)	Iron
<b>Basic</b>					
<b>Variation I (5%)</b>					
<b>Variation II (10%)</b>					
<b>Variation III (15%)</b>					

**Result :** It was found that among the developed variation of Nankhatai the addition of \_\_\_\_\_ Per cent Soya flour increased the highest nutrient content . Thus the incorporation of \_\_\_\_\_ per cent of Soya flour in the preparation of Nankhatai can be recommended. Further it was found that the developed product contained more amount of \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_ nutrient compared to basic recipe.

## Detection of Adulterants in the Products

### Criteria for selection of food

Selection of wholesome and non adulterated food is essential for daily life to make sure that such foods do not cause any health hazard. Although it is not possible to ensure wholesome food only on visual examination when the toxic contaminants are present in ppm / ppb level. However, visual examination of food before purchase makes sure to ensure absence of insects, visual fungus, foreign matters etc. Therefore, due care taken by the consumer at the time of purchase of food after thoroughly examining can be of great help. Secondly, label declaration on packed food is very important for knowing the ingredients and nutritional value. It also helps in checking the freshness of the food and the period of best before use. The consumer should avoid taking food from an unhygienic place and food being prepared under unhygienic conditions should be avoided. It is always better to buy certified food from reputed shop.

### Simple screening test for Detecting Adulteration in Common Food

S. No.	Food article	Adulterant	Test applied
1.	Tur dhal	Lakh dhal	Lakh dhal is irregular in shape and of lighter colour than tur dhal .
		Metanil	Add conc.HCl to moisten dhal, yellow colour will turn into magenta red if metanil yellow is present.
2.	Rawa	Iron filling to add the weight	Pass the magnet through the rawa, iron fillings will clean to it.
3.	Pulses	Kesari dhal (Lathyrus sativus)	Add 50 ml of dil. HCl to a small quantity of dhal and keep on simmering water for about 15 minutes. The pink colour is developed indicates the presence of Kesari dhal.
4.	Rice	Marble or stones	A simple test is to place a small quantity of rice on the palm of the hand and gradually immerse the same in water. The stone chips will sink.
5.	Sago	Sand and Talcum	Pure sago swells and on burning it leaves hardly any ash.

S. No.	Food article	Adulterant	Test applied
6.	Bajara	Fungus	Immerse in the salt water. Fungi will come on top.
7.	Wheat flour	Maida	When dough is prepared from resultant wheat flour more water has to be used and chapatti is prepared out. The normal taste of chapatti prepared is some more sweetish where as those prepared out of adulterate wheat flour will taste insipid.
		Excessive sand & dirt	Shake a little quantity of sample about 10 ml. of Carbon tetra chloride and allow to stand . Grit and sandy matter will collect at the bottom.
		Excessive bran Chalk powder	Sprinkle on water surface .Bran will float on the surface Shake sample with dilute HCl. Effervescence indicate chalk
8.	Jaggery	Metanil yellow	HCl added to Jaggery solution turns magenta colour.
9.	Bura sugar	Washing soda	Grives effervescence with HCl if washing soda is present . If dissolve in water washing soda will turns red litmus blue.
10.	Ghee	Mashed Potato, sweet potato etc.	Boil 5 ml. of the sample in the test tube. Cool and a drop of iodine solution. Blue colour indicates presence of Starch, colour disappears on boiling and reappears on cooling.
		Vanspati	Dissolve 1 tsp of sugar in to 10 ml of HCl. Add 10 ml of melted ghee , shake thoroughly for 1 minute. Allow it to stand for 10 minutes if Vanaspati has been added the aqueous larger will be red. Take 5 ml. of the sample in a taste tube. Add 5 ml. of HCl and 0.4 ml of 2 % furfural or sugar crystals. Insert the glass stopper and shake for 2 minutes. Development of a pink or red colour indicates presence of Vanspati in Ghee.
		Rancid stuff (old ghee)	Take 1 teaspoon of melted sample and 5 ml of HCl in a stopper glass tube. Shake vigorously for 30 seconds and allow to stand for 10 minutes. A pink or red colour in the lower (acid layer) indicates rancidity.



S. No.	Food article	Adulterant	Test applied
		Synthetic colouring matter	Pour 2 g of filtered fat dissolved in ether. Divide into 2 portions. Add 1 ml of Hcl to one tube. Add 1 ml of 10 % NaoH to the other tube. Shake well and allow to stand. Presence of pink colour in acidic solution or yellow colour in alkaline solution indicate added coloring matter
11.	Vegetable oil	Castor oil	Take 1 ml of oil in a clean dry test tube. Add 10 ml of acidified petroleum ether. Shake vigorously for 2 minutes. Add 1 drop of Ammonium Molybdate reagent. The formation of turbidity indicates presence of Castor oil in the sample.
12.	Edible oil	Argemone oil	On treatment with Nitric acid, it will give red colour in acid layer, indicating the presence of argimone oil.
13.	Coconut oil	Any other oil	Place a small quantity of oil in refrigerator; coconut oil will solidify leaving the adulterant as a separate layer.
14.	Milk	Water	Measure specific gravity with lactometer, normal reading 1.1030 to 1.0304.
		Starch , cereal flours or arrowroot	It is added to make up the density of milk and to prevent the detection of added water. <b>Test :</b> It is detected by starch iodide test. Take 3 ml of well mixed sample in a test tube. Heat to boil over flame, cool to room temperature. Add a drop of 1 % iodine solution. Appearance of blue colour indicates the presence of starch, which disappears on boiling and appears on cooling.
		Cane sugar in milk	It is added to raise the density and to prevent the detection of added water. <b>Test :</b> Take 10 ml of milk in a test tube. Add 1 ml of conc. Hcl and 0.1 g Resorcinol & mix. Place the test tube in boiling water bath for 5 min. Presence of cane sugar (Sucrose), develops red colour.
		Sodium chloride	It is added to make up the density of watered milk. <b>Test :</b> Take 2 ml of milk. Add 0.1 ml of 5 % Potassium chromate and 2 ml of 0.1 N Silver nitrate . Appearance of yellow precipitate indicates the presence of sodium chloride.

S. No.	Food article	Adulterant	Test applied
		Ammonium sulphate	It is added to make up the density of watered milk. <b>Test</b> : Take 2 ml of milk in a test tube. Add 0.5 ml of 2% NaOH, 0.5 ml of 2% Sodium Hydrochloride and add 0.5 ml of 5% Phenol. Heat it in boiling water bath for 20 second, develops of blue colour.
		Urea in milk	The average content of urea in cow milk is above 50 mg/100 ml. Buffalo milk-35 mg/100 ml. The feeding of urea as protein supplement in the ration of dairy animal does not help to increase the urea content of milk substantially. <b>Test</b> : Take 5 ml of milk. Add equal volume of 24% Trichloro acetic acid. Allow to precipitate fat and protein of milk and filter. Take 1 ml filtrate, 0.5 ml of 2% Sodium Hypochlorite, 0.5 ml 2% Sodium Hydroxide and 0.5 ml of 5% Phenol. Development of blue or bluish green colour indicates presence of urea.
		Detergent in milk	Take 5 ml of milk in a test tube, add 0.1 ml 0.5% Bromocresol purple solution. Appearance of violet colour indicates the presence of detergent.
15.	Tea powder	Exhausted tea powder, dried powder and artificially coloured.	Sprinkle the powder on a wet white blotting paper. Spots of yellow and red colours appearing on paper indicate that tea is artificialy coloured
16.	Coffee	Chicori	Shake a small portion in cold water. Coffee will Float while chicory will sink retaining the water brownish red.
17.	Cardamom	Oil is removed and pods are coated with talcum powder	On rubbing, talcum will stick to the finger, on testing if there is hardly any aromatic flavours.
18.	Black pepper	Papaya seeds / Light berries	Papaya seeds are shrunken, oval and grayish brown. Pour the seeds in a beaker containing carbon tetra chloride. Black papaya seeds float on the top while pure black pepper seeds settle down.
19.	Asafoetida	Resin or gum (Scented & coloured)	Pure Asafoetida dissolves in water to form milky white solution. Pure Asafoetida burns with flame on being ignited.
		Soap, stone, other earthy matter	Shake a little quantity of powder sample with water, soap, stone and earthy material settled at the bottom.

S. No.	Food article	Adulterant	Test applied
20.	Cinnamon	Wood bark	It is far harder than cinnamon and may not have aroma and smell of cinnamon.
21.	Cloves	Oil may be removed	If so, cloves appear, shrunken, nakesar will not give the taste of cloves.
22.	Cumin seed	May contain grass seeds coloured with charcoal dust	If rubbed in hand fingers will be black.
23.	Mustard seeds	Argimone seed	Argimone seeds has no round structure, they are pointed and more blackish than mustard seeds.
24.	Chilli powder	Saw dust and red colour	Sprinkle on the surface of water, saw dust float. Added colours will colour the water.
25.	Turmeric	Lead chromate	Ash the sample. Dissolve it in 1:7 Sulphuric acid and filter. Add 1 or 2 drops of 0.1 % dipenylcarbazide. A pink colour indicates presence of lead chromate.
		Metanil yellow	Add few drops of conc. Hcl to sample. Instant appearance of violet colour, which disappears on dilution with water, indicates pure turmeric. If colour persists metanil yellow is present.
26.	Coriander powder	Dung powder	Soak in water. Dung will float and can be easily detected by its foul smell.
		Common salt	To 5 ml of sample, add a few drops of silver nitrate. White precipitate indicates adulteration.
27.	Common salt	White powdered stone or chalk	Stir a teaspoonful of salt in water. The presence of chalk make the solution white and other insoluble impurities settle down.
28.	Honey	Molases (sugar water)	A cotton swab / wick dipped in pure honey when lighted it burns otherwise produces irritating smell.

**Observation Table**

<b>Sr. No</b>	<b>Name of the food stuff</b>	<b>Adulterant Observed</b>

## Sampling of milk and milk products for different tests

**Objective :** To be familiar with different procedures of collecting representative sample of milk and milk products for evaluation of analysis.

**Relevant information:**

Correct sampling of milk and its products in dairy industry is important. The error in sampling will lead to have erroneous results. The sample may be required for chemical, bacteriological and physical examination. The basic principles of sampling of milk are same in all cases. Various factors interplay to have faulty sampling. For example, lack of thorough mixing of milk before the samples are drawn, lack of hygienic conditions, use of unsterilized equipment, utensils and glass wares.

**Precautions while sampling of milk:**

- i) Make sure that all the glasswares, equipments and instruments are cleaned sterilized and dry.
- ii) Sampling of milk should be done at 90 °F to 104 °F

**Material required:**

- i) Milk
- ii) Preservatives (Formalin, Mercuric chloride, Dichromate of potash, Hydrogen peroxide)

**Apparatus :**

Milk can

Plunger ISI specification, 1 meter long with a disc having diameter of 150 mm and six holes in the disc.

Long handle dipper ISI specification. Dipper is fitted with solid handle at least 150 mm long and capacity shall not be less than 80 ml.

Sample bottle. Capacity of sample bottle shall be 100, 150, 250 ml for collecting the samples for chemical analysis. Plastic bottles may also be used.

Hot water bath

Containers

**Procedure :**

Sampling of milk and milk products carried out by the following procedures.

**A) Fresh Milk**

Freshly drawn milk contains air and gases. For correct sampling, one should wait until milk is at least one hour old.

**Sampling from individual container :**

Mix thoroughly the milk from one container to another container for five times to ensure uniformity of milk.

Do not allow the milk to stand for longer than five minutes after mixing and take required quantity of milk with the help of dipper.

**Sampling from several container :**

Mix the milk thoroughly with plunger.

Take proportionate quantity of milk in a separate vessel.

Repeat this procedure for all cans.

Mix the milk from separate vessels in one from which proportionate quantity of milk samples from different cans are taken.

Take final sample from vessel with the help of dipper.

**Care of sample :**

- i) Label the sample properly.
- ii) During transportation, sample should not be exposed to sunlight or not to be exposed to near volatile odours as milk picks them up immediately.
- iii) Use an air tight container, it should have 100-250 ml capacity and should be rubber stoppered.
- iv) Keep the sample in a cool place at 45 °F to 60 °F.

**Observations:**

Student should collect the milk sample for analysis purposes.

- i) Sampling from individual container \_\_\_\_\_ quantity.
- ii) Sampling from several container \_\_\_\_\_ quantity.
- iii) Temperature of milk \_\_\_\_\_ °C.
- iv) Quantity of sample collected \_\_\_\_\_.
- v) Labeling of sample in milk bottle \_\_\_\_\_.

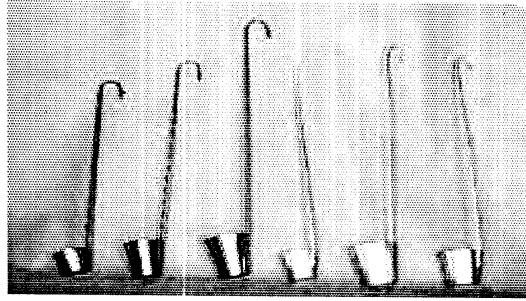
**Questions:**

- i) What is sample?
- ii) What are the purposes of sampling?
- iii) What is a composite milk sample?
- iv) Write the precautions you will take while sampling.
- v) Draw the figure/ diagram of various equipment used in sampling process and name them.

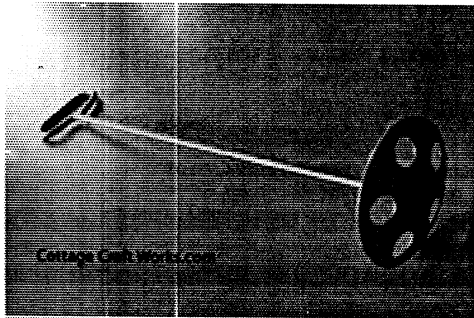
## DAIRY EQUIPMENTS



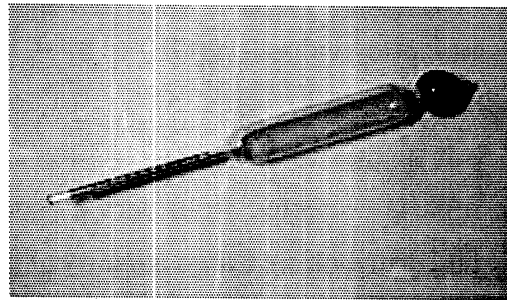
Milk container



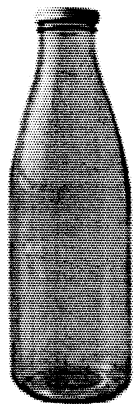
Long handle dipper



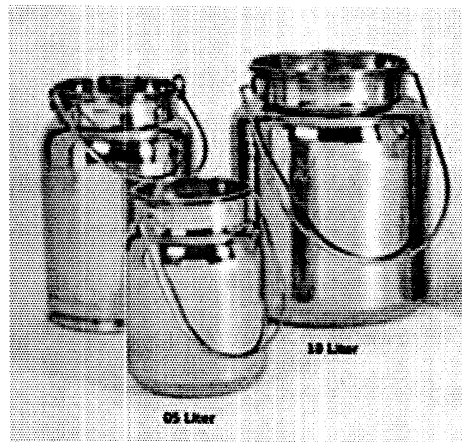
Plunger



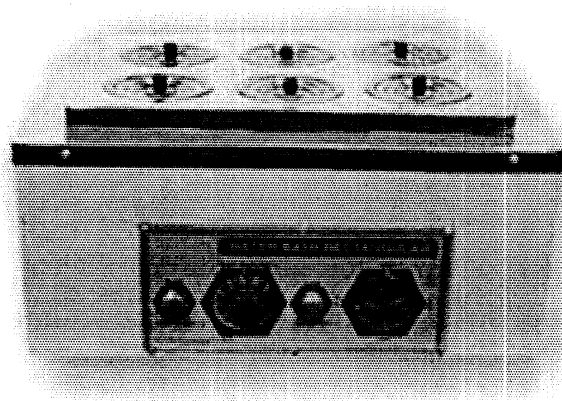
Lactometer



Sample bottle



Milk can



Water bath

## Platform tests

**Objectives :** For examination of milk by adopting rapid test for acceptance / rejection of incoming milk.

**Relevant information :**

Platform tests include the tests for judging the quality of the raw milk. These are as follows

- a) Organoleptic evaluation (OE)    b) Clot on boiling (COB)    c) Alcohol test (AT)  
d) Sediment test (ST)    e) Resazurin test (RT).

**Organoleptic evaluation**

The milk is collected from various sources and transported to milk scheme for processing, marketing and distribution. Large quantity of milk is supplied to the plant : Through different agencies, so that is subjected to check for its suitability. Hence it is essential to examine the milk by using different platform tests.

**Precautions :**

- Raw milk should be tested
- Curdled / spoiled milk should be separated.
- Temperature of milk while receiving at milk plant should be 5 °C.

**Material required :** Milk cans or containers.

**Apparatus :**

- i) Thermometer    ii) Dipper    iii) Plunger

**Procedure :**

Examine the given sample of milk and record your observations on the following aspects.

**i) Odour / smell :** It can be judged within few seconds.

- Remove the lid of can, hold it inverted and raised to the nose and inhaled the smell.
- Record the odour / smell as normal or abnormal.
- Milk should be free from any off flavour like feed, fishy, burny etc.

**ii) General appearance :**

Note whether the milk is clear or any visible dirt or foreign matter present in it. If so describe its nature for detecting the amount of dirt in the milk. Conduct the sediment test, if necessary.



**iii) Colour:**

Observe the colour of milk as white, light yellow. Record whether colour of milk is normal or abnormal. (Abnormal colours are reddish, bloody, bluish etc).

**iv) Consistency :**

Record the consistency of milk as normal, watery, thick, ropy, slimy.

**v) Temperature:**

Note down the temperature of milk at the time of receiving. It should be below 50 °F.

**Observations:**

Sr.No.	Characteristics	Sample 'A'	Sample 'B'	Sample 'C'
1.	Odour / smell			
2.	General appearance			
3.	Colour			
4.	Consistency			
5.	Temperature			

**Questions :**

- i) Write the characters of normal milk.
- ii) Narrate the reasons for spoilage of milk.

## Clot on boiling test (COB) Test

**Objective :** To determine the stability of milk for heat processing.

**Relevant information:**

If milk is kept as such at room temperature, there will be increase in the acidity which is called as developed acidity. If acidity is increased to more than 0.2 per cent, there is coagulation due to heat treatment, which is the result of dissociation of calcium caseinate salt. Hence, it is essential to know the heat stability of incoming raw milk for further processing.

**Precautions:**

- Avoid direct heating of milk.
- Use hot water bath.

**Material required:**

- Milk and milk container

**Apparatus :**

- i) Test tube 20 ml capacity.
- ii) Hot water bath
- ii) Test tube stand
- iv) Heating arrangement (Electrical connection).

**Procedure :**

- Take 5 ml of milk in the test tube.
- Put this on boiling water bath for 5 minutes.
- Remove the tube from water bath without shaking.
- Note any acid smell or precipitated particles on the sides of the test tube.
- Sample showing precipitated particles are recorded as positive C.O.B. test. Such milk is rejected on the platform,

**8. Observations :**

Sample No.	COB		Acidic smell	
	+ve	-ve	+ve	-ve
1				
2				
3				
4				

## Alcohol Test

**Objective :** To detect abnormal milk such as colostrum / mastitis milk.

**Relevant information :**

The alcohol test is used for rapid assessment of stability of milk for processing particularly for condensing and sterilization. The alcohol test is useful as an indication of mineral balance of milk and not as an index of developed acidity. The test aids in detecting abnormal milk such as colostrum, milk from animals in late lactation, milk from animals suffering from mastitis and milk in which mineral balance has been disturbed

**Precautions :** Avoid direct heating of milk.

**Material required**

- i) Milk sample.
- ii) 68% Ethyl alcohol by weight (Density 0.8675g/ml at 27 °C).

**Apparatus :**

- iii) Test tube 15 x 1.9 cm preferably with graduation mark at 5 and 10 ml.
- iv) Measure 5 ml alcohol.
- v) Test tube stand.

**Procedure :**

- Take 5 ml of milk in test tube.
  - Add equal quantity of 68 % Ethyl alcohol.
  - Mix the contents of the test tube by inverting several times.
  - Examine the tube and note any coagulation.
  - If coagulation has occurred fine particles of curd will be visible on the inside surface.
- Presence of flake or curd denotes positive alcohol test. Such samples are rejected.

**Observations :**

Sample No.	Alcohol Test	
	+ve	-ve
1		
2		
3		

**9. Questions :**

- i) What is significance of alcohol test ?
- ii) How this test differs from C.O.B. Test ?

## Sediment test

**Objectives :** To know the extent of visible dirt present in the milk as a mark of clean milk production.

**Relevant information :**

Sediment test of raw milk will reveal the extent to which the visible insoluble matter has entered in the milk. It is a rapid test indicating quantitative measure carelessness in handling the milk and lack of sanitation. But in milk that appears as visible or insoluble sediment is always associated with relative amount of microbes. The test is carried out by allowing a measured quantity of milk to pass through a fixed area of a filter disc and comparing the sediment with the prescribed standards.

**Precautions :**

- i) Raw milk should be tested.
- ii) Curdled milk should be separated.
- iii) Temperature of milk while receiving at milk plant should be 5 °C.

**5. Material required : Milk**

**Apparatus :**

- i) **Sediment tester** : This apparatus consists of a bottle open at both ends. To the neck of which is fastened a clip and wire gauge. This inverted neck is kept downwards in stand. Small cotton discs are used to retain the dirt.
- ii) Lintine disc 32 mm in diameter.
- iii) Sampling dipper of 500 ml capacity.
- iv) Sediment disc ratings 0.0, 0.2, 0.5, 1.0, 2.0 mg sediment per 500 ml of milk.
- v) Sieves.

**Procedure :**

- Take a milk sample from well stirred can of milk with the help of sampling dipper.
- Filter the milk through properly adjusted firm lint disc held in the sediment tester, so that a filtration area of 28 mm in diameter is exposed.
- Remove the cotton disc from sediment tester after filtration.

**Observations :**

Compare the lintine cotton disc with the standard disc as indicated below :

Disc.No.	Amount of sediment (mg)	Gradation of milk	Score/500 ml of sample (mg)
1	0.0	Excellent	
2	0.2	Good	
3	0.5	Fair	
4	1.0	Bad	
5	2.0	Very bad	

**Question :**

Why sediment test is conducted ?

## Two minutes Resazurin Test

**Objectives: To determine extent of bacteriological quality of milk**

**Relevant information :**

The majority of the organisms in milk are capable of reducing and decolourizing the resazurin dye. When bacteria grow in the milk they utilize oxygen. The rate of removal or reduction is proportional to the keeping quality. This test is also based on the same principles as M.B.R. (Methylene Blue Reduction Test). But dye is resazurin which is much more sensitive than the methylene blue. For this reason this test provides a rapid measure of the keeping quality of milk.

During incubation, the dye undergoes reduction very largely through the metabolic activity of the organisms present. The greater the number of organisms present in milk, the more quickly the dye is reduced. The reduction takes place in two distinct stages. Resazurin is blue at the reaction of milk. In the first stage dye is changed to pink and in second stage pink colour is changed to colourless. The cells present in the milk may also influence the reduction of resazurin and for that reason, the test may also measure physiologically or pathologically abnormal milk.

**Precautions:**

- i) The test should be carried out aseptically.

**Material required :**

- i) Milk sample
- ii) Resazurin colour / solution 0.05 %.

**Apparatus :**

- i) All purpose lovibond comparator.
- ii) One resazurin colour disc from blue to white.
- iii) Water bath, thermostatically controlled to maintain a temperature of 37 °C.
- iv) Test tube 10ml.
- v) Pipette 10 ml and 1 ml.

**Procedure :**

- Mix the sample thoroughly by inverting from one to another container.
- Pour 10 ml of milk sample in to previously sterilized test tube.
- Add quickly 1 ml of resazurin solution in the test tube.
- Mix the milk and dye thoroughly by inverting 2-3 times.

- Place the tubes in the water bath at the temperature of 37.5 °C only for two minutes.
- The tubes are then removed from the water bath.
- Compare the colour of test tube with standard disc until the colours are matched under comparator
- Record the number of disc / colour of disc. If colour falls between two disc numbers record half value.
- The quality of milk is judged as follows :

Resazurin Disc No.	Colour after two minutes incubation at 37 °C	Quality of milk
6	Blue	Excellent
5	Lilac	Very Good
4	Mauve	Good
3	Pink mauve	Fair
2	Pink	Poor
1	Deep pink	Bad
0	White	Very bad

**Observation of 2 minutes test :** Disc reading is less than 4, then milk is of poor quality.

**Observations :**

Sample No.	Colour after two minutes	Compared resazurin disc No.	Quality of Milk
1			
2			
3			
4			
5			

**Questions :**

- What is practical utility of Resazurin Test ?
- What is the quality of milk when the disc reading is above 4 ?
- What are the advantages of this test ?

## Determination of Fat of milk

**Objectives :** i) The price of milk is fixed on its fat content.

ii) To determine the fat level in milk by Gerber Method.

**Relevant information :**

Fat is the most important constituent of milk as it is used as a basis for fixing the purchase and sale price of milk. It helps to detect adulteration like watering. Gerber's Method is commonly used in Europe and in India.

Dr. N. Gerber of Zurich, Switzerland invented this method in the year 1892 - 1895. In this test  $H_2SO_4$  is used to increase specific gravity of milk serum which makes greater difference between milk serum and fat globules. It also destroys stickiness of milk by dissolving all the SNF. The free fat globules rise to the surface by subsequent on of centrifugal force to this mixture and heat produced due to mixing of acid and milk, causing melting of fat. It facilitates the fat particles to come to the surface freely. The specific gravity of fat is 0.9 and that of acid milk mixtures is 1.43. This situation promotes complete separation of fat when proper centrifugal force is applied.

Due to application of centrifugal force lighter substances (Butter fat) are thrown towards the centre and rest of serum portion that is heavier is thrown towards periphery.

Addition of amyl alcohol helps for separation of fat from the milk acid mixture and also prevent the sharing of fat and sugar by the  $H_2SO_4$ .

**Precautions :**

- i) Carryout thorough mixing of milk before testing.
- ii) Amyl alcohol must be pure.
- iii) Sulphuric acid is to be added gently by the sides of the butyrometer without wetting the neck of the butyrometer. Avoid direct pouring of milk on acid.
- iv) The three fluids viz. Sulphuric acid, milk and Amyl alcohol should be added gently so that they form three distinct layers.
- v) Rubber stopper should be dry clean and without crack.
- vi) Before centrifuging the butyrometer, see that there is no curdly white material left undissolved.
- vii) The centrifuge machine must be properly balanced.
- viii) Always carry out the test in duplicate.
- ix) Butyrometer should be free from  $Na_2CO_3$  (Soda ash) if cleaned by  $Na_2CO_3$ , otherwise it lowers the specific gravity and strength of sulphuric acid.
- x) Use butyrometer stand for shaking of butyrometer contents to dissolve the SNF content of milk.

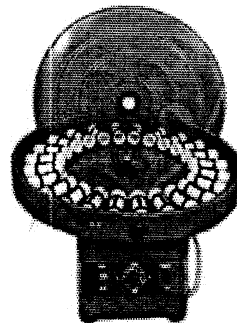
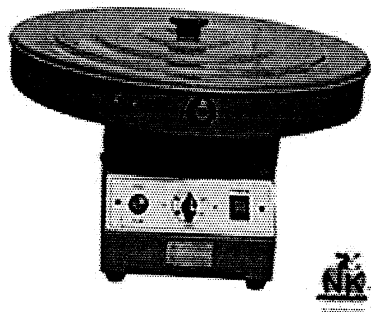


**Material required :**

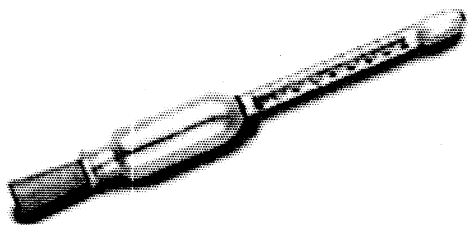
- i) Milk
- ii) Sulphuric acid (Specific gravity 1.82 to 1.84).
- iii) Amyl alcohol (specific gravity 0.82 to 0.83).

**Apparatus**

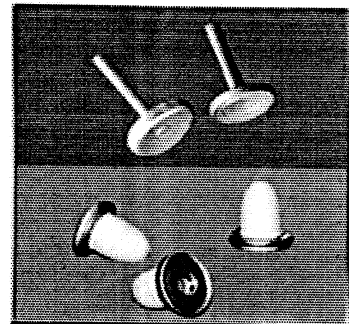
- i) Milk sample bottle
- ii) 10 ml pipette for  $H_2SO_4$ .
- iii) 1 ml pipette for Amyl alcohol.
- iv) 10.75 ml capacity milk pipette.
- v) Dairy floating thermometer. vi) Hot water bath.
- vii) Gerber's centrifuge machine (1100 rpm)
- viii) Gerber's butyrometer plain neck with graduations from 0-10 %
- ix) Butyrometer stand
- x) Rubber stopper
- xi) Guiding pin or key.



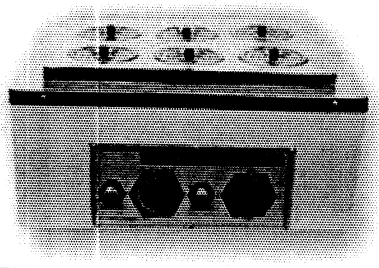
**Gerber's centrifuge machine**



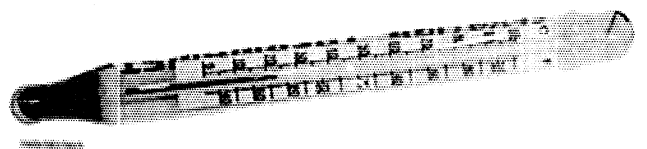
**Butyrometer**



**Rubber stopper**



**Hot water bath**



**Dairy floating thermometer**

**Procedure :**

- i) Put the clean and dry butyrometer in a butyrometer stand with open mouth upwards.
- ii) Run 10 ml of sulphuric acid with the tilt measure in the butyrometer.
- iii) Pipette out 10.75 ml of milk sample gently by the side of butyrometer, whose temperature is about 60 -70 °F. i Pour 1ml of amyl alcohol with pipette.
- iv) Stopper the butyrometers with the help of lock stopper using regulating pin / guiding pin.
- v) The tube is well (mixed) shaken till Mahogany red colour is obtained. Keep the butyrometers in hot water bath till it attains 60 -70 °F and the butyrometers are placed in the centrifuged machine that is revolved at 1100 rpm for 4 minutes.
- vi) Take out the butyrometers in an upright position with the stopper end downwards.
- vii) Keep the butyrometers in hot water bath at 140 °F (60 °C) for some time.
- viii) Adjust the fat column which will appear clear and yellowish within the graduation with the help of key.
- x) Note the reading. Reading should be taken from bottom of the fat column to lower border of meniscus on the scale.

**Observations :**

Sr. No.	Sample	Fat percentage		Average Fat %
		I	II	
1	Cow milk			
2	Buffalo milk			
3	Goat milk			
4	Skim milk			
5	Adultrated with water			

**Questions:**

- i) What is the importance of estimation of fat ?
- ii) What is the function of  $H_2SO_4$  ?
- iii) What precaution would you take while conducting the fat test ?

## Determination of acidity of milk

**Objectives** :To determine the titratable acidity

**Relevant Information :**

Milk is amphoteric which turns blue litmus to Red and Red litmus to blue. The acidity of milk is of two kinds :

- i) Apparent or natural acidity which is due to citrates and phosphates present in milk and dissolved  $\text{CO}_2$  during the process of milking and thereafter.
- ii) Real acidity or developed acidity which is due to the lactic acid produced by the action of bacteria on lactose in milk.

Generally the acidity of milk means the total acidity (Natural + developed) or titratable acidity. It is determined by titrating a known volume of milk with standard alkali to the point of an indicator like phenolphthalein.

Acidity is expressed as per cent lactic acid. Since, 1 ml of 0.1 N lactic acid contains 0.009 grams of lactic acid, the number of ml. of 0.1 N NaOH required to neutralize the lactic acid in the sample, multiplied by 0.009, will give the amount of lactic acid (in grams) in the sample. When the result is divided by weight of milk sample and multiplied by 100, the per cent lactic acid will be obtained.

**. Precautions :**

Use fresh N/10 NaOH solution.

**. Material required :**

- i) Milk sample      ii) N/10 NaOH solution      iii) Phenolphthalein indicator

**Apparatus :**

- i) 10 ml capacity pipette
- ii) 100 ml conical flask or porcelain dish
- iii) 50 ml capacity burette with stand
- iv) Porcelain tile
- v) Glass rod

**Procedure :**

- Fill the burette with N/10 NaOH solution.
- Mix the milk sample thoroughly by avoiding incorporation of air.
- Transfer 10 ml milk with the pipette in porcelain dish.

- Add equal quantity of glass distilled water.
- Add 3-4 drops of phenolphthalein indicator and stir with glass rod.
- Take the initial reading of the alkali in the burette at the lowest point of meniscus.
- Rapidly titrate the contents with N/10 NaOH solution continue to add alkali drop by drop and stirring the content with glass rod till first definite change to pink colour which remains constant for 10 to 15 seconds.
- Complete the titration within 20 seconds.
- Note down the final burette reading.

**Observations :**

Sr. No.	Sample	Initial reading	Final reading	Actual reading	Average % Lactic acid
1.	Buffalo milk	1			
		2			

**. Calculations :**

No. of ml of 0.1 N NaOH solution required for neutralization x 0.009

$$\% \text{ Lactic acid} = \frac{\text{No. of ml of 0.1 N NaOH solution required for neutralization} \times 0.009}{\text{Weight of sample}} \times 100$$

(Weight of sample = Volume of milk x Specific gravity)

**Questions :**

- Which substances are responsible for the titrable acidity of milk ?
- What will happen if milk is kept at room temperature for longer period ?
- Explain the amphoteric nature of milk ?

## Determination of Specific Gravity of milk

- Objectives**
- 1 To determine the basic nature of milk
  - 2 To decide the nature of adulteration of milk.

**Relevant information :**

Lactometers are used for rapid determination of specific gravity. The method is based on law of floatation.

Following types of Lactometer are generally used :

**a) Quevenne's type :**

- This is calibrated at 15.5 °C or 60 °F. It gives accurate reading in the temperature ranges of 60 ± 6 °F subject to temperature correction factor. The correction factor is calculated as below
- For every 10 °F change in temperature, there is corresponding change of 0.1 in lactometer reading. After correction factor the reading is known as 'corrected lactometer reading'.

**b) ISI Lactometer :**

- This new lactometer recommended by Indian Standard Institution is calibrated at 27 °C.
- Milk sample is kept at 27 °C and reading of this lactometer is noted.

**Precautions :**

- The milk to be tested should be 2-3 hours old after milking. This will allow air and gases to escape from this sample.
- The temperature of the sample should be adjusted between 50-80 °F for accurate reading.
- Sample should be thoroughly mixed by pouring it from the sides of the container.
- Use standard lactometer Quevenne's or ISI.
- Do not allow the lactometer to remain in milk longer.
- Read lactometer reading in 1/2 to 1 minute.
- Lactometer should not touch to the sides of jar / cylinder.

**Material required :**

- Whole milk, skim milk, partially adulterated milk

**Apparatus :**

- i) Lactometer
- (ii) Jar
- (iii) Petridish
- iv) Beakers
- iv) Dairy floating thermometer

**Procedure :**

- Adjust the temperature of milk sample at 50 - 80 °F.
- Fill the clean, dry glass jar about 2/3 rd volume of it with milk. Pour the milk down along the sides of the jar to avoid the incorporation of air.
- Lower the lactometer gently in the milk making sure that the lactometer floats freely without touching the sides of the jar.
- Add milk to the brim of the jar.
- Read the lactometer reading at the top of the meniscus within one minute.
- Record the temperature of milk.

**Observations and calculations :**

Sr. No.	Sample	Temperature of milk	Lactometer reading	Correction factor (CF)	Corrected lactometer reading (CLR)	Specific gravity
1.	Buffalo Milk					
2.	Cow _ / Milk					
3	Partially adulterated milk					

- . **Calculations :** Specific gravity of milk can be calculated by the following formula (for all types of lactometer).

$$\text{Specific gravity} = \frac{\text{Corrected lactometer reading}}{1000} + 1$$

$$\text{Corrected lactometer reading} = \text{LR} \pm \text{CF}$$

Where, CF for Quevennes lactometer

CF (+) = 0.1 x difference in temperature above 60 °F.

CF (-) = 0.1 x difference in temperature below 60 °F.

**Questions :**

- i) Explain the importance of specific gravity of milk ?
- ii) Which are the factors that affect the specific gravity of milk ?
- iii) Why the lactometer is used for determination of specific gravity of milk?
- iv) What is the principle of lactometer ?
- v) Which precautions should be taken to determine the specific gravity ?

## Visit to milk processing plant

**Objectives :** To study various operations of milk processing in the plant

**Relevant information :**

The modern concept of Dairying denotes an organised way of producing, processing and marketing of milk and milk products. Dairying is an industry in India and its growth started from the plan periods. During the last two or three decades Govt. of India have established milk schemes in urban areas. Milk is collected from rural areas and transported to city milk plants quickly under hygienic conditions. It is then subjected to different process like filtration, clarification, standardisation, homogenization, pasteurization and packing before its distribution to consumers. To know the organizations and operational structures of these processes are the aspects of study visit to Dairy plant.

**Precautions :**

- The parts of machine should not be touched without knowing their know-how.
- Be aware from electrical circuit and connections.
- Be careful about points of steam leakages and open points.
- While handling the machine consult / take the help of Operator.
- Protect yourself from conveyor chain or machinery chain. Do not be over enthusiastic.
- Avoid accident.

**Materials required :**

- Milk and machneries of milk plant

**Procedure :**

- Observe, record in your note book the activities and schedule at Dairy plant:
- Location
- Water
- Road
- Premises
- Reception of milk in cans or tankers, by road or rail.
- Unloading plant from mechanical, manually, tipping, weighing milk tank.
- Assembling of milk cans for grading temperature, odour, appearance, acidity and sediment

**Report writing(Dairy plant visit)**



