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# UNIT 14 SENSORY EVALUATION OF FOOD PRODUCTS

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## 14.0 OBJECTIVES

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After reading this unit, you would be able to:

- underline the importance and significance of sensory evaluation;
- enlist quality control aspects of sensory evaluation;
- Evaluate and assess the quality of food products based on the sensory parameters; and
- know the relevance and significance of sensory evaluation of food products and use sensory evaluation as a tool for improvements in quality of food products besides creating the consumer acceptance.

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## 14.1 INTRODUCTION

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As we all know, the sensory behavior of food products is the ultimate criterion for the acceptability of any product by the consumer. Unless the food products meet the desired standards of taste, flavor, texture, etc., the consumer will not accept the products. In other words, quality of food products to a consumer means the sensory behavior of products. Overall quality of food products depends on factors such as quantity, nutritional parameters, physico-chemical and physico-mechanical parameters, several other hidden attributes and sensory properties. At the time of buying any food product, we should look for nutritional parameters, like calories, the vitamins, the minerals, the proteins, and other ingredients, etc. At the same time, we also remain concerned with the presence of undesirable substances in the food products, for example, all the toxic and allergic ingredients. Since the undesirable constituents in food products may cause serious health hazards, usually, these parameters are regulated by stringent government guidelines and norms. Labelling of nutritional parameters is required by law in most countries.

The most important parameter for both the processors and consumers is the sensory quality. As the name suggests, the term 'sensory' is related to senses of the human being. Sensory quality is important to processor, since it attracts consumers but it is equally important to the consumers, since it satisfies their aesthetic and gustatory senses.

Keeping in view, the importance of the sensory quality, the sensory attributes needs to be evaluated. Evaluation of sensory quality has been defined as “*a scientific discipline used to evoke, measure, analyze and interpret reactions to those characteristics of foods and materials as they are perceived by the senses of sight, taste, touch and hearing*”.

Sensory evaluation of products is assuming increasing significance, as it provides information for several purposes i.e. quality control, assessment of process variation, cost reduction, product improvement, shelf-life, new product development and analysis of market.

To derive maximum benefits out of sensory evaluation, it is necessary to follow the methodology in its full scientific perspective. The basic steps to perform the sensory analysis are:

- a) Selection of the proper panel;
- b) Maintaining suitable environmental conditions and use of standard equipment for the test;
- c) Obtaining representative samples;
- d) Preparation and presentation of samples for evaluation in a manner that ensures the uniformity and representation of the samples; and
- e) Selection of the proper methods and statistical techniques.

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## 14.2 SELECTION OF PANEL

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Sensory evaluation is normally carried out by designed experiments under proper environmental conditions by both trained and untrained panels. The experts who have acquired the product-specific skills are not appropriate for the general evaluation because of the risk of being biased.

Panels with different degree of training are required for different types of sensory analysis. The degree of training required depends on a number of considerations, such as degree of differences to be detected, number of panelists required for the tests and time and value of the analysis to the product type. Training is also necessary for descriptive and profile panels using special procedures for specific products and situations.

For any sensory evaluation test, at least ten members should be selected in a panel. The panel members should be recruited based on various criteria such as:

### **a) Interest and motivation**

Candidates who are interested in sensory analysis and who have the liking for the test product or products to be investigated are likely to be more motivated

and hence, such kind of people are likely to become better assessors than those who are without such essential interest and motivation.

**b) Attitude**

Candidates who are quite flexible in their eating habits should be considered. Those with rigid attitudes with strong dislikes and likes towards food products may not be suitable to become a member of the panel.

**c) Knowledge and aptitude**

Candidates having capacity to concentrate and those who can remain unaffected from all the external influences and those having adequate knowledge of all aspects of the product should be considered as panelists.

**d) Health**

The candidates must have good general health and should not have any disabilities, which may affect their senses.

**e) Ability to communicate/Personality characteristics**

The candidates must have ability to communicate and describe the sensations they have perceived while assessing a product. The candidates should be reliable and honest in their approach.

### **14.2.1 Types of Panel**

**A) Trained Panel (Laboratory Panel)**

The candidates should be carefully selected and trained and it need not be an expert panel. Trained panels provide answers to two general questions relating to the sensory properties of foods:

- Is there a difference between or among stimuli?, and
- What are the direction and the intensity of differences?

The trained panels should ideally have 5 to 10 members and the same should be used in all developmental and processing studies. The panel should be able to establish the intensity of a sensory characters of overall quality of a food. The panel for flavor profile studies should have a higher degree of training for detailed analysis of the flavor spectrum of complex processed foods.

**B) Discriminative and Communicative (also known as D and C) Panel (Semi-Trained Panel)**

This type of panel should be constituted of people familiar with quality of different classes of foods and thus is capable of discriminating differences and communicating their reactions. The panelists may not be trained formally but they should be capable of following instructions given at the evaluation session. The panel should consist of about 25 to 30 members and should be used to find the acceptability of preference of final products as a preliminary screening programme to select a few for large scale consumer trials.

### **C) Untrained Panel (Consumer Panel)**

The members of the untrained panel should be selected at random from the potential consumers in a market area. The number of panelists should be large enough to ensure due representation of different age, sex, race and income level group in the population of potential consumers. The findings should be based on at least 100 independent judgements.

### **D. Qualifications for Panelists**

The panelists particularly for the trained and Discriminative and Communicative (D&C) panels should have the following qualifications:

- a) Sound health without any defects affecting sensory perception;
- b) Average sensitivity;
- c) Capability of independent judgement;
- d) Ability to concentrate, train and learn;
- e) Intellectual curiosity and interest in quality evaluation work;
- f) Willingness to spend time in evaluation and submission to periodic tests;
- g) Freedom from prejudices in respect of a particular food product; and
- h) Food enthusiast having the liking for trying different types of foods.

## **14.2.2 Methodology for Sensory Evaluation**

Prior to the start of the sensory evaluation process, the following steps needs to be accomplished:

### **a) Screening**

The panel members should be selected keeping in view the products to be evaluated. The prospective members should appear for a test designed so as to pick the members of desired level of sensitivity.

### **b) Training**

The panel members should undergo a period of training in the type of work they shall be doing later. The members should be educated in special vocabulary and they should be taught to be able to appropriately perceive and express the sensory reactions. Testing sessions should be preceded by a few informal orientation sessions in which the type of sample is introduced and discussed and tentative decisions made about testing conditions, temperature, quantity, mode of presentation, etc. Further, the language used to describe the character notes of aroma, taste and overall quality should be developed and tested. Reference standards for expressing amplitudes should also be discussed in these orientation sessions.

c) Briefing of Panel

The panel members should be given clear and precise instructions before they start testing. When a quality attribute is evaluated, the instructions should be given in the scorecard. In case of rating tests, the panelist should be given clear and precise instructions in respect of scale used to help anchor judgements in respect of degree and direction of quality attributes and grade specification. The instructions should not lead the panel to the identity of particular samples or induce errors of anticipation.



Check Your Progress Exercise 1

- Note:** a) Use the space below for your answers.  
b) Check your answers with those given at the end of the unit.

1) Describe Sensory Evaluation?

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2) What is a sensory panel?

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3) List the types of sensory panel?

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## 14.3 MAINTAINING SUITABLE ENVIRONMENTAL CONDITIONS

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### 14.3.1 Laboratory Set-up and Equipment

Fig.14.1 shows a typical layout of the sensory laboratory.

#### a) General

Environmental factors, where the sensory evaluation is to be done and samples which need to be evaluated, should be suitably controlled. Sensory evaluation should be conducted in quiet and well-lit rooms, free from any odors. The rooms should be constructed to have comfort for concentrated prolonged testing and ease of cleaning. Pleasing neutral shades and maintenance of comfortable temperature and humidity conditions of the whole area or at least the room where panel members are going to sit and discuss are desirable and appealing. All these are essential to help the panel members develop interest for carrying out the test. The testing area where booths are located should be separated from sample preparation and wash rooms.

#### b) Reception and Briefing Room

As the name suggests, the reception and briefing room is the place where the panel members are entertained first. This room should be well maintained and equipped with comfortable chairs. It should be designed to ensure maintenance of pleasant attitudes and it should minimize the congestion to the booths. Panel members should assemble here and to start with, the panel members should be briefed about the test, etc. here.

#### c) Panel Booths

These areas are the actual places for the tests. The booths should be located between or adjacent to the reception and preparation rooms and should consist of test booths of identical design, a separate table having natural daylight or illuminated with special daylight bulbs for evaluation of colors of samples and a table. The entry and exit to the panel booth area through independent doors is often useful to avoid any communication between panel members, which may lead to any bias while assessing the sample.

#### d) Preparation Room

The preparation room should be suitably separated from the testing room and it should be equipped for preparing and serving samples. The room should have facilities for cooking of samples with additional facilities for prepared food storage cabinets -hot and cold. The kitchen ventilation should be such that cooking odors are expelled from the laboratory and should not penetrate the panel-booth area.

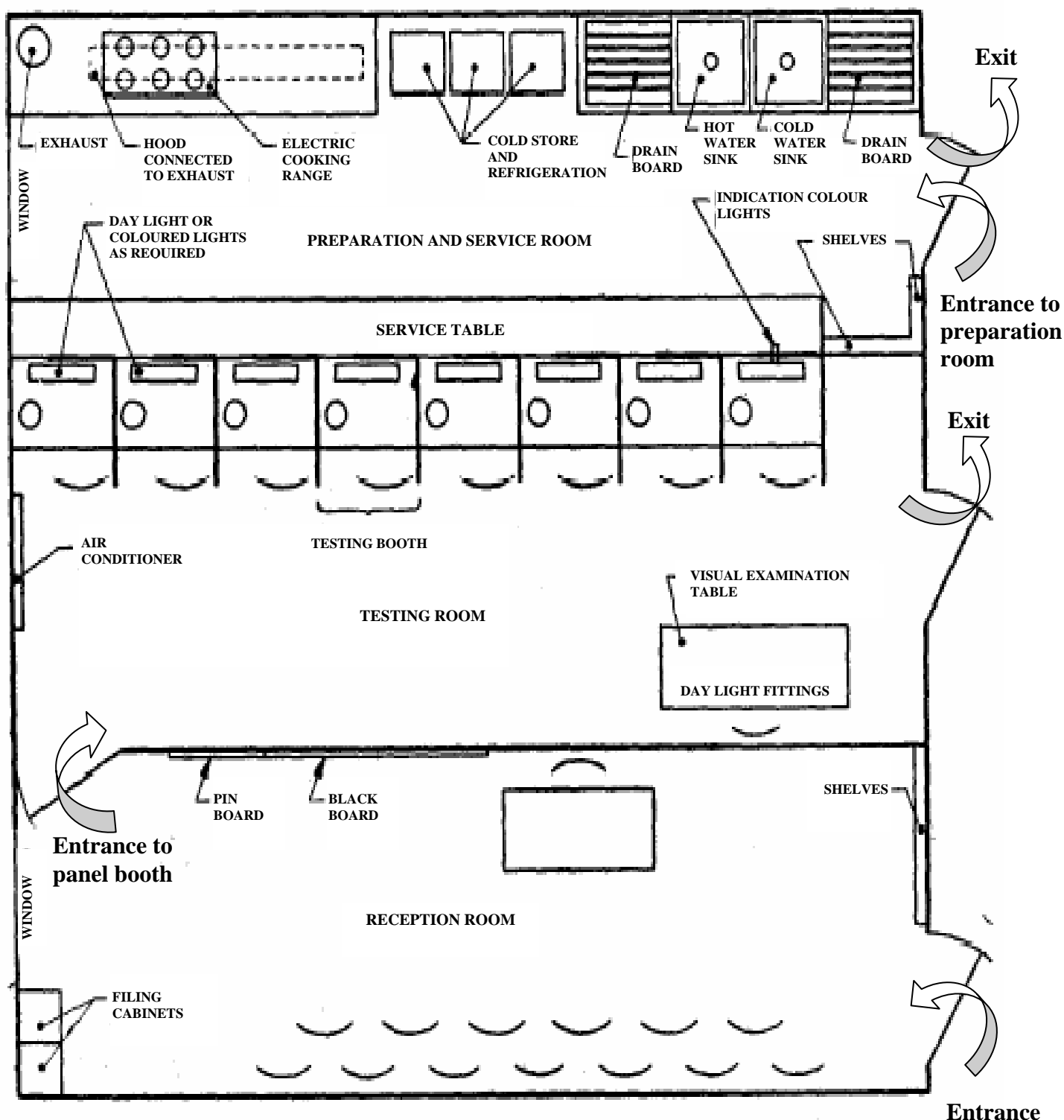


Fig. 14.1: Layout of a typical sensory laboratory

## 14.4 SAMPLE PREPARATION

Samples should be prepared in a way to bring out the difference in a particular quality attribute under evaluation. All variables like temperature, time of boiling, quantity and composition of water, blending, etc., should be controlled to ensure identical method of preparation for all samples. Care should be taken that no loss of flavor occurs and no foreign tastes or odors are imparted by the procedure during preparation, storage, serving, etc.

## 14.5 TYPES OF TESTS

The sensory tests may be broadly classified into two major categories i.e.:

- 1) **Analytical tests:** Analytical tests are based on the evaluation of differences in clarity, quality and/or quantity of sensory characteristics of a product. The panelists for carrying out the analytical tests are screened for interest, ability to discriminate differences and reproduce results. They are trained to function as a human analytical instrument
- 2) **Affective tests:** Affective tests are based on the evaluation preferences and/or acceptance and/or opinions of product.

Both these categories have been summarized in Table 14.1

### 14.5.1 Analytical Tests

Analytical tests are used for laboratory evaluation of products in terms of differences or similarities and for identification of sensory characteristics. There are two major types of analytical tests – discriminative and descriptive. Both the tests employ experienced and/or trained panelists. Potential panelists are screened for selected personal traits, interests and ability to discriminate differences and generate reproducible results.

Table 14.1: Types of Tests for Sensory Evaluation

Classification of methods by function	Appropriate methods	Type and No. of panelists
<b>A. ANALYTICAL TESTS</b>		
<b>(a) Discriminative</b>		
<b>(i) Difference test:</b> Measures simply the difference between the methods.	<ul style="list-style-type: none"> <li>• Paired-comparison</li> <li>• Duo-trio</li> <li>• Triangle</li> <li>• Ranking</li> <li>• Rating difference/scalar difference from control</li> </ul>	<ul style="list-style-type: none"> <li>• Normal sensory acuity.</li> <li>• Panel size depends on product variability and judgement reproducibility.</li> <li>• A recommended minimum number is generally 5, since any fewer could represent too much dependence upon one individual's responses.</li> </ul>
<b>(ii) Sensitivity test:</b> Measures the ability of individuals to detect sensory characteristics	<ul style="list-style-type: none"> <li>• Threshold</li> <li>• Dilution</li> <li>• Rating difference/scalar difference from Control</li> </ul>	
<b>(b) Descriptive</b> Measures qualitative and/ or quantitative characteristics	<b>Attribute rating</b> <ul style="list-style-type: none"> <li>• Category scaling</li> <li>• Ratio scaling (Magnitude Estimation)</li> <li>• Flavor profile analysis</li> <li>• Texture profile analysis</li> <li>• Quantitative descriptive Analysis</li> </ul>	<ul style="list-style-type: none"> <li>• Sensory acuity</li> <li>• Motivated</li> <li>• Trained or highly trained</li> </ul>



B. AFFECTIVE TESTS		
	<ul style="list-style-type: none"> <li>• Paired-performance</li> <li>• Ranking</li> <li>• Rating               <ul style="list-style-type: none"> <li>- Hedonic (verbal or facial) scale</li> <li>- Food action scale</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Randomly selected</li> <li>• Untrained</li> <li>• Representative of target population</li> <li>• Consumers of test product</li> <li>• No recommended “magic number” – minimum is generally 24 panelists, which is sometimes considered rough product screening; 50-100 panelists usually considered adequate</li> </ul>

#### a) Discriminative Tests

There are two types of discriminative tests; difference and sensitivity test. Difference tests measure whether samples can be differentiated at some predetermined level of statistical probability. Sensitivity tests measure the ability of individuals to detect sensory characteristics.

(i) **Difference test** : There are several types of Difference Tests.

##### • *Paired Comparison Test*

Two coded samples are evaluated simultaneously or sequentially in a balanced order of presentation. This test is used to find simple difference and directional difference in a specific characteristic and difference preference in consumer analysis of foods. This is also applicable in training and testing of panelists.

In simple difference test, panelists are asked to test whether the samples in each pair are the same or different. Whereas, in case of directional difference, the panelists are asked to indicate which sample in the pair has greater or lesser degree of intensity of a specified sensory attribute.

The data is evaluated using the evaluation card having the judgement of the panelist. A typical evaluation card for the paired comparison tests is given below:

#### **Format 1A: Specimen Evaluation Card For Paired Comparison Test** (Simple Difference)

**Name:**

**Date:**

**Product:**

**Time:**

You are given one or several pairs of samples.

Evaluate the two samples in the pair for difference in\* \_\_\_\_\_.

Indicate your judgement by crossing out words not applicable.

<u>Pair No.</u>	<u>Code No. of Pairs</u>	<u>Your Judgement</u>
01.	-----	Different/Not different
02.	-----	Different/Not different

**Signature**

\*The panel organizer should indicate qualify attributes to be evaluated.

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**Format 1B: Specimen Evaluation Card For-Paired Comparison**  
(Directional difference/preference)

Sensory Evaluation of  
Food Products

**Name:**

**Date:**

**Product:**

**Time:**

You are given one or several pair of samples.

Evaluate the two samples in the pair for difference/preference in\* \_\_\_\_\_.

Indicate your judgement by crossing out words not applicable.

If different, indicate the Code No. of the sample which is more\* \_\_\_\_ /preferred.

Pair No.	Code No. of Pairs	Your Judgement	If samples in a pair are different, code no. of sample, this is more ____ preferred.
1.	_____	Different/Not different	_____
2.	_____	Different/Not different	_____

**Signature**

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*\*The panel organizer should indicate the quality attributes to be evaluated.*

The data is analyzed using binomial and multinomial distribution (probability) tables for panel selection, product difference or preference and when and when number of observations exceeds the table value,  $\chi^2$ -test or t-test for percentage for product difference or preference has to be used.

- **Duo-Trio Test**

This test employs three samples, two identical and one different. One sample is identified as the standard and presented first, followed by two coded samples, one of which is identical to the standard. The judge is required to identify the sample, which matches the standard.

The data is evaluated using the evaluation card having the judgement of the panelist. A typical evaluation card for the duo-trio test is as below:

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**Format 2: Specimen Evaluation Card For-Duo-Trio Test**

**Name:**

**Date:**

**Product:**

**Time:**

⇒ The first sample 'R' is the reference sample. Test it carefully.

From the pair of coded samples next given, judge which sample is the same as 'R'.

Pair No.	Code No. of Pairs	Code No. of sample Matching with 'R'
1.	_____	_____
2.	_____	_____
3.	_____	_____

---

**Signature**

The data is analyzed using binomial and multinomial distribution (probability) tables for panel selection, product difference or preference. When number of observations exceeds the table value,  $\chi^2$ -test or t-test for percentage for product difference or preference has to be used.

- ***Triangle Test***

This test employs three coded samples, two identical and one different, presented simultaneously. None of the sample is identified as the standard. The judge must determine which of the three samples presented differs from the other two.

The data is analyzed using binomial and multinomial distribution (probability) tables for panel selection, product difference or preference and when number of observations exceeds the table value,  $\chi^2$ -test or t-test for percentage for product difference or preference has to be used.

The data is evaluated using the evaluation card having the judgement of the panelist. A typical evaluation card for the triangle test is as below:

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**Format 3: Specimen Evaluation Card For-Triangle Test**

**Name:**

**Date:**

**Product:**

**Time:**

⇒ **Two of the three samples are identical.**

Determine the odd sample.

Pair No.	Code No. of Samples	Code No. of Odd Sample
1.	_____	_____
2.	_____	_____
3.	_____	_____

---

**Signature**

- ***Ranking Test***

This test is used to make simultaneous comparisons of several samples on the basis of a single characteristic. A control needs to be identified; all test samples to be coded. Samples (which may include control or standard) are presented simultaneously and ranked accordingly.

The data is evaluated using the evaluation card having the judgement of the panelist. A typical evaluation card for the ranking test is as given below:

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**Format 4: Specimen Evaluation Card for-Ranking Test**

**Name:** \_\_\_\_\_

**Date:** \_\_\_\_\_

**Product:** \_\_\_\_\_

**Time:** \_\_\_\_\_

Please rank the samples in numerical order according to intensity of quality attribute under test of the product or your preference.

**Intensity/Ranking  
Preference**

**Code No. or  
Sample**

First

\_\_\_\_\_

Second

\_\_\_\_\_

Third

\_\_\_\_\_

Fourth

\_\_\_\_\_

Comments: (Type of off-flavour, etc.)

**Signature**

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The data obtained from ranking test is evaluated by adopting the following statistical recommendations:

- If the number of samples exceeds 7, adopt  $\chi^2$ -test;
- Rank sum analysis has to be adopted for product difference/preference when the number of observations is within 20;
- $\chi^2$ -test has to be used for product difference/preference;
- Analysis of variance (ANOVA) is adopted for the ranks converted to normal scores for multiple comparison.

**(ii) Sensitivity Test:** There are several ways of carrying out sensitivity test.

- Threshold test**

These tests are usually expressed as absolute, and indicate the minimum detectable level of concentration of a substance. Criteria of response in determining threshold include *detection threshold* (awareness of change from some neutral background) and *recognition threshold* (point at which the stimulus becomes identifiable).

The identification threshold concentrations (sensitivity of individual panelists) and just noticeable difference values are found from the panel data. The data from the homogeneous panel is used for product evaluation by finding arithmetic or geometric mean according to concentration series given.

The data is evaluated using the evaluation card having the judgement of the panelist. A typical evaluation card for the threshold test is as given below:

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**Format 5: Specimen Evaluation Card for-Threshold Test**

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**Name:** \_\_\_\_\_

**Date:** \_\_\_\_\_

**Product:** \_\_\_\_\_

**Time:** \_\_\_\_\_

You receive a series of samples with increasing concentrations of one of the 4 taste qualities (sweet, salty, sour, bitter)\*.

Start with Samples No. 1 and continue with Samples No. 2, No. 3, etc.

Retasting of already tested solutions is not allowed.

Describes the taste\* and the feeling factors and give intensity scores.

Use the following intensity scale:

0 = None or pure water taste

? = Different from water, but taste quality not identifiable

X = Threshold very weak (identify the taste)

1 = Weak

2 = Medium

3 = Strong

4 = Very strong

5 = Extremely strong

**Sample No.**

**Description of Taste  
and Feeling Factors**

1	_____
2	_____
3	_____
4	_____
5	_____
6	_____
7	_____
8	_____
9	_____
10	_____
11	_____
12	_____

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**Signature**

*\*To be modified for odour analysis.*

• ***Dilution test***

The dilution technique determines the smallest amount of test material that can be detected when it is mixed with a standard material. The technique may

provide information on relative intensities of treatment at comparable dilution levels. Dilution testing is limited to food products that can be made homogeneous without affecting the factor being tested.

The data is evaluated using the evaluation card having the judgement of the panelist. A typical evaluation card for the dilution test is as given below:

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**Format 6: Specimen Evaluation Card for-Dilution Test**

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**Name:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Product\*:** \_\_\_\_\_ **Time:** \_\_\_\_\_

Assign scores for each sample for various characteristics.

Quality Attributes	Maximum Score	Code No. or Samples			
Colour	20	_____	_____	_____	_____
Consistency	20	_____	_____	_____	_____
Flavour	40	_____	_____	_____	_____
Absence of defects	20	_____	_____	_____	_____
Total score	100	_____	_____	_____	_____

Comments

**Signature**

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*\*The weighted rating is a typical score applicable to orange marmelades. For other products similar scales have to be worked out..*

Data from the dilution test is analyzed by finding the arithmetic or geometric mean for the group and expressing as dilution number or dilution index, which is defined as the percentage or ratio of the test substance in one mixture when the substance is just identifiable.

### b) Descriptive Tests

Descriptive tests attempt to identify sensory characteristics and quantify them. Panelists are selected on their ability to perceive differences between test procedures.

Descriptive tests are based on two types of methodologies:

i) **Attribute rating:** It involves:

- **Category Scaling**

Coded samples are presented simultaneously or sequentially in a balanced order, which differs among the individual panel members. Category scales

consists of a series of word phrases structured in ascending or descending order of intensity and are used to measure the specific attributes (e.g. sweetness, off-flavor etc.). For the purpose of analysis, successive digits are later assigned to each point represented on the scale, usually beginning at the end representing zero intensity. A statistical analysis (e.g. analysis of variance) of the mean intensity scores for each sample is used to determine significant differences among the mean scores for the sample represented.

- **Ratio Scaling (Magnitude Estimation)**

This test is used to estimate the relationship between physical intensity and sensory magnitude. It can also be used for comparable ratings on specific attributes among two or more products. The method permits the participants to use a wide range of numbers of his/her own choice with the property that ratios or proportions among the numerical assignments reflect ratios of sensory intensities. The numerical ratings given to the first sample presented may be any one of the subject's choice, except zero or a negative value. Ratings given to the succeeding samples should be in proportion to the rating assigned to the first. The numbers assigned are subjected to statistical analysis after normalization.

- **Flavor Profile Analysis**

The technique provides a written record of a product's perceptible aroma and flavor components, feeling factors and aftertastes. The panelist characterizes individual aroma and flavor notes in the order perceived and assigns an intensity value using a constant rating scale. A panel of four or five members is normally used. Panelists independently examine the product under study, record their impressions of aroma, flavor and aftertastes, then reports to a panel leader in an open discussion. The final flavor profile, upon comparison with an original profile, can show the effect of an ingredient substitution, a processing change packaging, age etc.

- **Texture Profile Analysis**

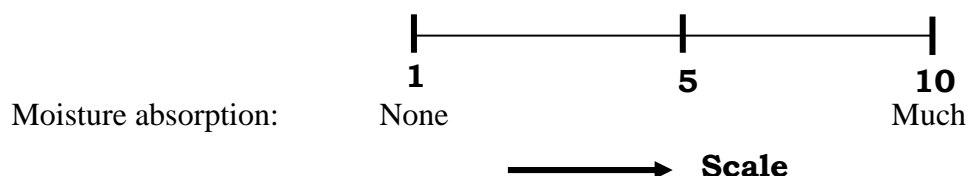
This is a descriptive technique based on the principle of the flavor profile method. It provides a systematic approach to measure the textural dimensions of food in terms of mechanical, geometrical, fat and moisture characteristics. The panel is composed of six to nine members. The findings of the panels are recorded and a profile for similarities and differences is used for interpretation.

- **Quantitative Descriptive Analysis**

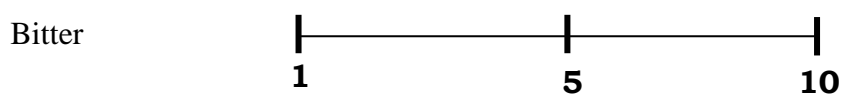
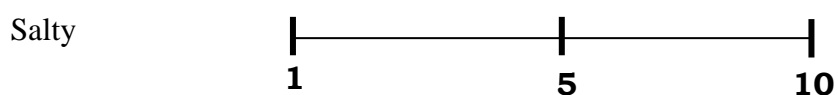
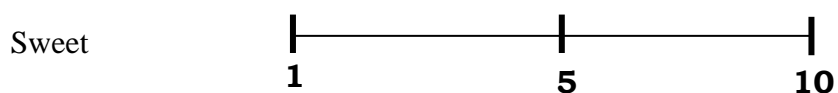
This technique utilizes an unstructured category scale and a panel of not less than six trained panelists, and obtains repeated judgements from each panelist for each test products.

Let us take an example of sensory evaluation for a sample of cookies. In order to evaluate sensory attributes of cookies, following Descriptive Tests can be undertaken:

## Texture



## Flavor



### 14.5.2 Affective (Preference and Acceptance) Tests

Affective tests refer to preference testing based on the measurement of preference, or a measure from which relative preference may be determined, e.g. pleasure-displeasure, like-dislike.

*Preference may be defined as:*

- a) Expression of higher degree of liking, and
- b) Choice of one object over others.

Preference is only one of the many factors involved in acceptance.

*Acceptance may be defined as:*

- a) An experience or feature of experience, characterized by a positive attitude; and/or
- b) Actual utilization of the product.

Acceptability is inferred from scale ratings.



There are three types of affective tests; Paired – Performance Test, Ranking Test and Rating Scale.

### **i) Paired – Performance Test**

In the simplest application of a paired-performance test for preference, two samples are presented, simultaneously or sequentially. The Panelist is requested to express a preference based on the specific attributes, the reason for preference may be included if desired. The method may also be applied to make multiple paired – comparisons within a sample series, i.e. a standard product vs each of several experimental products.

### **ii) Ranking Test**

This is an extension of the paired-preference test approach. Three or more coded samples are presented simultaneously, sufficient in amount so that the panelist can check back on his or her first impression. The subject is asked to assign an order to the sample according to his or her preference. The amount of liking (or disliking) for individual samples cannot be adequately determined by this method.

### **iii) Rating Scale**

Scale ratings reflect panelist's perceived intensities of a specified attribute under a given set of conditions. Various rating scales have been developed and used:

#### **a) Hedonic Rating Scale**

This test is used to measure the level of liking for food products by a population. It may be applied in testing for presence or acceptance. The method relies on panelist's capacities to report directly and reliably, their feelings of like and dislike. Several variations of the traditional nine-point hedonic scale have been used effectively. These include:

- Reduced number of rating categories, although not fewer than five is recommended.
- A greater number of "like" rating categories than "dislike",
- Omission of the neutral rating categories by caricatures representing degrees of pleasure and displeasure (facial hedonic scale), and
- Use of non-structured, non-numerical line scale anchored with "like" and "dislike" on opposite ends.

The panelist is asked to evaluate each sample and mark the scales accordingly. Instructions must not influence the panelist's response. Hedonic scale ratings are converted to numerical scores, and statistical analysis is applied to determine difference in degree of liking between or among samples. A hedonic rating test can yield both absolute and relative information about the test samples. Absolute information is derived from the degree of liking or disliking indicated for each sample and relative information is derived from the direction and degree of difference between or among the sample scores.

The data from the hedonic scale ratings are evaluated by rank sum analysis, t-test or chi square test.

The data is evaluated using the evaluation card having the judgement of the panelist. A typical evaluation card for the hedonic scale test is as below:

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**Format 7: Specimen Evaluation Card for-Hedonic Scale**

**Name:** \_\_\_\_\_

**Date:** \_\_\_\_\_

**Product:** \_\_\_\_\_

**Time:** \_\_\_\_\_

Test this sample and check appropriate box how much you like or dislike.

Use the appropriate scale to show your attitude by checking at the point that best describes your feeling about the sample.

Please give your reason for this attitude.

Remember you are the only one who can tell what you like.

An honest expression of your personal feeling will help us.

**Code No.**

Like extremely

☐

Like very much

☐

Like moderately

☐

Like slightly

☐

Neither like nor dislike

☐

Dislike slightly

☐

Dislike moderately

☐

Dislike very much

☐

Dislike extremely

☐

Comments.

**Signature**

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**Format 8: Specimen Evaluation Card for-Hedonic Scale (facial)**






Name: \_\_\_\_\_

Date: \_\_\_\_\_

Product: \_\_\_\_\_

Time: \_\_\_\_\_

Please check the box under the figure which best describes how you feel about this product.

				
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

---

**Signature**
**b) Food Action Scale Rating**

This test may be used to measure the level of acceptance of food products by a population. The scale is not applicable for rating specific characteristics; rather it is a measure of general attitude towards food product. This rating scale includes action as well as affective type statements. Nine successive rating categories ranging from “I would eat this every time it, I have an opportunity” to “I would eat this only if I were forced to” are represented. Samples are presented sequentially in a balanced order, and the panelist is told to decide which of the statements on the scale best represents his or her attitude. Subjects are allowed to make their own inferences about the meaning of the scale categories. The scale ratings are converted to numerical scores to facilitate analysis of data.

The data is evaluated using the evaluation card having the judgement of the panelist. A typical evaluation card for the dilution test is as below:

Let us take another example for sensory evaluation of a product for customer acceptance and preference. For evaluating sensory attributes of a soft drink, following Acceptance Tests can be undertaken:

**Taste** : Water-like  
 Strongly sweet  
 Sweet  
 Salty  
 Strongly salty  
 Medicinal

**Viscosity** : Less Viscous (e.g. water-like)

Highly viscous (e.g. honey-like)  
**Consistency** : Homogeneous  
 Heterogeneous

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**Format 9: Specimen Evaluation Card for-Food Action Scale Rating**


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**Name:** \_\_\_\_\_**Date:** \_\_\_\_\_**Product:** \_\_\_\_\_**Time:** \_\_\_\_\_

Indicate in appropriate box which of nine statements on the following scale best represent your attitude towards the product.

**Code No.** \_\_\_\_\_

I would eat this every opportunity I had

☐

I would eat this very often

☐

I would frequently eat this

☐

I like this and would eat it now and then

☐

I would eat this if available but would not go out of my way

☐

I don't like it would eat it on an occasion

☐

I would hardly ever eat this

☐

I would eat this only if there were no other food choices

☐

I would eat this only if I were forced to

☐

Comments.

**Note** — The word 'eat' may be replaced by 'drink', 'buy' or 'use'.**Signature**


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## 14.6 APPLICATIONS OF SENSORY EVALUATION

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The sensory evaluation tests are commonly being use in food industry as well as certain other industrial applications as follows:

### 1) New Product Development

Some new products are unique, but most of them are imitations or variations of some established standards. In either case, the product developer needs information on acceptability to consumers as an input for marketing. The acceptability of products can be evaluated following the given sequence:

- a) Characterization of product prototype sample to determine uniqueness.
- b) Evaluation of the experimental prototype samples to establish whether differences exist among them.
- c) Determination of whether the prototype samples meet the acceptability requirements established for the product.

## 2) Product Improvement/Process change/cost reduction

Improvement in the products can be judged based on sensory evaluation in following ways:

- a) Difference tests to determine whether the experimental product is the same or different from the control.
- b) Affective test: If product differs, to establish whether the experimental product is liked more than the control.

## 3) Quality Control

Representative samples are usually evaluated by difference tests and descriptive tests to ensure that the end product is having all the required qualities during production, distribution and marketing.

## 4) Storage Stability studies

These are conducted to establish information on product shelf life during transportation, warehousing, retailing and during storage. Representative samples are obtained, evaluated initially and then at specific time intervals of storage. Sensory tests are also used to determine product storage stability such as:

- a) Difference tests to determine whether the storage samples are different from the control (if no significant difference is found, product stability is assumed).
- b) Descriptive tests used alone or in conjunction with difference tests, to characterize and/or quantify the changes that may have occurred during storage.
- c) Acceptance tests to determine the relative acceptance of stored product.

## 5) Product grading or Rating

This requires an accurate classification of samples according to the grade standards defined for the product; as well as an evaluation of samples in relation to each other. Category scoring or ratio scaling based on the presence and intensity of selected characteristics may be used to measure samples against standard specifications set for the product.



### Check Your Progress Exercise 2

- Note:**
- a) Use the space below for your answers.
  - b) Check your answers with those given at the end of the unit.

- 1) What is required for sensory evaluation test?

.....  
 .....

2) Which test measures quantitative characteristics of a product and how?

.....

.....

.....

.....

3) What is Affective tests and what are the types of affective tests?

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.....

.....

.....

4) What are the different types of rating scales?

.....

.....

.....

.....

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## 14.7 KEY WORDS

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<b>Sensory Analysis</b>	: Examination of organoleptic attributes of a product by the sense organs.
<b>Sensory (adj.)</b>	: Relating to the use of the sense organs.
<b>Organoleptic (adj.)</b>	: Relating to an attribute of a product perceptible by the sense organs.
<b>Sensation (noun)</b>	: Subjective reaction resulting from sensory stimulation.
<b>Assessor (sensory) (noun)</b>	: Any person taking part in a sensory test.
<b>Attribute (noun)</b>	: Perceptible characteristic.
<b>Acceptability (noun)</b>	: State of product favourably received by a given individual or population, in terms of its organoleptic attributes.
<b>Acceptance (noun)</b>	: The act of a given individual or population of finding that a product answers satisfactorily to his/her/its expectations.

<b>Preference (noun)</b>	: Expression of the emotional state or reaction of an assessor which leads him/her to find one product better than one or several others.
<b>Discrimination (noun)</b>	: Act or qualitative and/or quantitative differentiation between two or more stimuli.
<b>Hedonic (adj.)</b>	: Relating to like or dislike.
<b>Quality (noun)</b>	: Collection of features and characteristics of a product or service that confer its ability to satisfy stated or implied needs.
<b>Product (noun)</b>	: Edible or inedible matter which can be evaluated by sensory analysis. Examples: food products, cosmetics, textile and fabrics.
<b>Bias (noun)</b>	: Systematic errors which may be positive or negative.

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## 14.8 ANSWERS TO CHECK YOUR PROGRESS EXERCISE

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### Check Your Progress Exercise 1

Your answer should include following points:

- 1) Sensory Evaluation is defined as “*a scientific discipline used to evoke, measure, analyze and interpret reactions to those characteristics of foods and materials as they are perceived by the senses of sight, taste, touch and hearing*”.
- 2) Sensory evaluation is normally carried out by designed experiments under proper environmental conditions by both trained and untrained person and they are called sensory panel.
- 3) There are three types of panels:
  - i) Trained Panel (Laboratory Panel)
  - ii) Discriminative and communicative Panel (semitrained Panel)
  - iii) Untrained Panel (Consumer Panel)

### Check Your Progress Exercise 2

Your answer should include following points:

- 1) Selection of the proper panel:
  - i) Maintaining suitable environmental conditions and use of standard equipment for the test;
  - ii) Obtaining representative samples;
  - iii) Preparation and presentation of samples for evaluation in a manner that ensures the uniformity and representation of the samples; and
  - iv) Selection of the proper methods and statistical techniques.

- 2) Descriptive tests using scaling and profiling methods.
- 3) Affective tests refer to preference testing based on the measurement of preference, or a measure from which relative preference may be determined, e.g. pleasure-displeasure, like-dislike.

There are three types of affective tests:

- i) Paired – Performance Test
  - ii) Ranking Test
  - iii) Rating Scale (Hedonic Rating Scale, Food Action Scale Rating)
- 4) i) Hedonic Rating Scale
  - ii) Food Action Scale Rating

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## 14.9 SOME USEFUL BOOKS

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*Sensory Evaluation Guide for Testing of Food and Beverage Products.* By Sensory Evaluation Division, Institute of Food Technologists; *Food Technology*, November 1981; 50-59.

*Handbook of Analysis and Quality Control for Fruits and Vegetable Products.* S. Ranganna, II Edn. 1994. Tata Mc Graw-Hill Publishing Co. N. Delhi. Chapter 19: Sensory Evaluation.

IS 6273 – 1974 (Reaffirmed 2002): *Guide for Sensory Evaluation of Foods; Part I: Optimum Requirements.*

IS 6273 – 1974 (Reaffirmed 2002): *Guide for Sensory Evaluation of Foods; Part II: Methods and Evaluation Cards.*

IS 5126 – 1996/ISO 5492 - 1992 (Reaffirmed 2001): *Sensory Analysis – Vocabulary.*

IS 8140 – 1976 (Reaffirmed 2002): *Guide for Selection of Panel for Sensory Evaluation of Foods and Beverages.*