File No. 11014/08/2020-QA

Food Safety and Standards Authority of India

(A statutory Authority established under the Food Safety and Standards Act, 2006)

(Quality Assurance Division)

FDA Bhawan, Kotla Road, New Delhi – 110002

Dated, the 22nd June, 2021

ORDER

Subject: Revised FSSAI Manual of Methods of Analysis of Foods – reg.

Following Revised FSSAI Manual of Methods of Analysis of Foods have been approved by the Food Authority in its 33rd meeting held on 23.03.2021 and are enclosed herewith.

(I) Oils and Fats
(II) Spices, Herbs and Condiments

2. The manuals shall be used by the laboratories with immediate effect. It supersedes the earlier manual on 'Oils and Fats' and 'Spices and condiments' issued vide Office Order No. 1-90/FSSAI/SP (MS&A)/2009 dated 25.05.2016.

3. Since the process of updation of test methods is dynamic, any changes happening from time to time will be notified separately. Queries/concerns, if any, may be forwarded to *email: sp-sampling@fssai.gov.in, dinesh.k@fssai.gov.in*

Encl: as above

(Harinder Singh Oberoi)
Advisor (QA)

To:

1. All FSSAI Notified Laboratories
2. All State Food Testing Laboratories

fssai

FOOD SAFETY AND STANDARDS AUTHORITY OF INDIA

Inspiring Trust, Assuring Safe & Nutritious Food

Ministry of Health and Family Welfare, Government of India

MANUAL OF METHODS OF ANALYSIS OF FOODS

OILS AND FATS

PREFACE

Food safety requires an assurance that food will not cause any harm to the consumer, when it is prepared and/or consumed according to its intended use. There is a significant challenge in ensuring food safety to protect public health. Safeguarding food safety in today's complex world is a formidable task and is possible only with an intensive effort of all the stakeholders including regulatory authorities, industry and consumers.

The FSSAI Manual of Methods for Analysis of Oils and Fats is principally intended to provide unified, up-to-date testing methods for regulatory compliance. The manual brings together testing methodologies approved by FSSAI for use in surveillance and implementing the regulatory program. The objective here is to adopt "One Parameter - One Method" approach. These methods are dynamic and will be constantly updated, commensorate with the latest technological advancements in food analysis. The FSSAI notified laboratories shall use these testing methods only for analyzing samples under the Food Safety and Standards Act, 2006 and Food Safety and Standards Regulations, 2011.

Any suggestions/feedback from the stakeholders, which will contribute towards updating the manuals from time to time are welcome.

Shri ArunSinghal,
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My deepest sense of gratitude and indebtedness to all the Members of the Panel on "Methods of Sampling and Analysis" especially Dr. Jagan Mohan Rao whose help, knowledge and insight has led to the successful revision of this manual.

Sincere thanks to the Panel, Chairman for their valuable guidance and encouragement and the Secretariat of this panel who have extended their support during this revision process.

Deepest appreciation to the Chairperson, FSSAI and CEO, FSSAI for their cooperation, support and constant encouragement without which the work would not have seen the light of day.

June 2021

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Note: The test methods given in the manual are standardized / validated/ taken from national or international methods or recognized specifications, however it would be the responsibility of the respective testing laboratory to verify the performance of these methods onsite and ensure that it gives proper results before putting these methods in to use.

MANUAL FOR ANALYSIS OF OILS AND FATS

Oils and fats are important parts of human diet and more than 90 percent of the world production from vegetable, animal and marine sources is used as food or as an ingredient in food products. Oils and fats are a rich source of dietary energy and contain more than twice the caloric value of equivalent amount of sugar. Their functional and textural characteristics contribute to the flavour and palatability of natural and prepared foods. They contain certain fatty acids which play an important role in nutrition and are also carriers of fat soluble vitamins.

The methods described in this manual are applicable for evaluating quality parameters such as acid value, fatty acid composition etc. For analytical methods related to heavy metal etc. the analyst should refer the relevant FSSAI Manual.

1.0 TYPES OF OILS AND FATS

Standards for 27 vegetable oils are prescribed in Section 2.2 of Food Safety and Standards (Food Product Standards and Food Additives) Regulations, 2011. Standards have also been laid down for Cocoa butter, Refined Salseed fat, Mango Kernel fat, Phulwara fat, Interesterified fat, Vanaspati, Table Margarine and Bakery / Industrial Margarine. Animal fats include Mutton /Goat fat and Lard.

2.0 GENERAL GLASSWARE AND APPARATUS

1. Beakers (different sizes)
2. Conical flasks with and without lids (different sizes)
3. Round bottom flasks (different sizes)
4. Standard volumetric flasks (different sizes)
5. Pipettes (different sizes)
6. Burettes(different sizes)
7. Measuring cylinders (different sizes)
8. Buchner funnels (different sizes)
9. Air condensers
10. Water condensers
11. Distillation heads
12. Receiving adapters
13. Ground glass joints
14. Mojonnier flask
15. Thermometers (different minimum and maximum temperatures in centigrade degrees)
16. Wash bottles (different sizes)
17. Separating funnels (different sizes)
18. Petri dishes (different sizes)

19. Weighing balances (upto milligram)
20. Weighing balances (upto gram)
21. Air Oven
22. Water bath temperature regulated
23. Hot plate magnetic stirrer
24. Falcon tubes (different sizes), Eppendorf microcentrifuge tubes (different size), GC-Vials, HPLC vials.
25. Desiccators
26. Whatman filter papers (different numbers)

All the above said apparatus and glassware needs to be calibrated periodically. Thermometer, oven, water bath etc. should be checked against a standard calibration certified by National Physical Laboratory, New Delhi or any other NABL approved Institution.

3.0 SAMPLE PREPARATION

Liquid Oils

Use clear sediment free liquid directly after inverting container several times. If liquid sample contains sediment release all sediment from walls of container and distribute uniformly throughout the oil for determination of moisture. For determinations in which results might be affected by possible presence of water (e. g iodine value) dry sample by adding anhydrous Sodium Sulphate in the proportion of 1 - 2 g per 10 g sample and hold it in oven at 50°C. Stir vigorously and filter to obtain clear filtrate.

Solid and semisolid Samples

Soften sample if necessary, by gently heating taking care not to melt it. When soft enough mix thoroughly for determination of moisture and volatile matter. For other determinations, melt in drying oven at a temperature at least 10°C above the melting point. If clear, proceed directly. If turbid or contains sediment filter test sample inside oven. For determinations in which results might be affected by possible presence of water (e.g. iodine value) dry sample by adding anhydrous Sodium Sulphate in the proportion of 1-2 g per 10 g sample and hold (keep) it in oven at 50°C. Stir vigorously and filter to obtain clear filtrate. To retard rancidity keep oils and fats in cool place and protect from light and air.

(Ref: - AOAC 17th edn, 2000. Official method 981.11 Oils and Fats – Preparation of test sample)

	Determination of Moisture Content – Air Oven Method		
Method No.	FSSAI 02.001:2021	**Revision No. & Date**	0.0
Scope	Water / moisture present in oil / fat sample is estimated.		
Caution	Phosphorus pentoxide - harmful if swallowed or inhaled. Fumes cause irritation to eyes and respiratory tract. Water reactive. Reacts violently with water to generate heat and phosphoric acid		
Principle	Moisture content of oils and fats is the loss in mass of the sample on heating at 105 ± 1 °C under operating conditions specified.		
Apparatus/ Instruments	1. General glassware and apparatus (Refer 2.0 at page no. 1) 2. Metal dishes 7 – 8 cm diameter and 2 - 3 cm deep provided with tight fitting slip on covers. 3. Weighing Balance		
Materials and Reagents	1. Oils / Fats 2. Phosphorus pentoxide		
Sample Preparation	Refer 3.0 at page no. 2		
Method of analysis	1. Weigh in a previously dried and tared dish about 5 – 10 g of oil or fat, which has been thoroughly mixed by stirring. 2. Loosen the lid of the dish and heat, in an oven at 105±1 °C for 1 h. 3. Remove the dish from the oven and close the lid. 4. Cool in a desiccator containing phosphorus pentoxide or equivalent desiccant and weigh. 5. Heat in the oven for a further period of 1 h, cool and weigh. 6. Repeat this process until change in weight between two successive observations does not exceed 1 mg. 7. Carry out the determination in duplicate.		
Calculation with units of expression	Moisture and Volatile matter percentage = $\frac{W1 \times 100}{W}$ Where, W1 = Loss in weight (g) of the material on drying W = Weight in g of the material taken for test		
Reference	1. AOAC 17th edn., 2000, Official method 926.12, 2. ISI Hand book of Food Analysis (Part XIII) – 1984, page 62		
Approved by	Scientific Panel on Methods of Sampling and Analysis		

	Determination of Specific Gravity		
Method No.	FSSAI 02.002:2021	**Revision No. & Date**	0.0
Scope	Specific gravity varies and depends on density of oil.		
Caution	Chromic Acid can cause reproductive damage. Handle with extreme caution. Chromic Acid is a corrosive chemical and contact can severely irritate and burn the skin and eyes with possible eye damage. Breathing Chromic Acid can irritate the nose, throat and lungs causing coughing, wheezing and/or shortness of breath.		
Principle	Specific gravity is the ratio of the density of a substance to the density of a reference substance (water); equivalently, it is the ratio of the mass of a substance to the mass of a reference substance (water) for the same given volume.		
Apparatus/ Instruments	1. General glassware and apparatus (Refer 2.0 at page no. 1) 2. Pycnometer fitted with a thermometer of suitable range (with 0.1 or 0.2 °C subdivision) or a density bottle. 3. Weighing Balance 4. Water bath maintained at 30 ± 2.0 °C.		
Materials and Reagents	Oils / Fats		
Preparation of reagents	1. The thermometer should be checked against a standard thermometer calibrated and certified by National Physical Laboratory, New Delhi or any other NABL approved institution. **Standardization of Pycnometer** 2. Carefully clean the pycnometer by filling with Chromic acid cleaning solution and letting it stand for several hours. 3. Empty pycnometer and rinse thoroughly with water, fill with recently boiled water, previously cooled to about 20 °C and place in constant temperature water bath held at 30 °C. 4. After 30 min adjust water level to proper point on pycnometer and stopper, remove from bath, wipe dry with chem wipes/clean cloth or towel and weigh.		
Sample Preparation	1. Melt sample if necessary. Filter through a filter paper to remove any impurities and the last traces of moisture. 2. Make sure that the sample is completely dry. 3. Cool the sample to 30 °C or ambient temperature desired for determination. Refer 3.0 at page no. 2		
Method of analysis	1. Fill the dry pycnometer with the prepared sample in such a manner to prevent entrapment of air bubbles after removing the cap of the side arm. 2. Insert the stopper, immerse in water bath at 30±2.0 °C and hold for 30 min. 3. Carefully wipe off any oil that has come out of the capillary opening. Remove the bottle from the bath, clean and dry it		

	thoroughly. 4. Remove the cap of the side arm and quickly weigh ensuring that the temperature does not fall below 30 °C.
Calculation with units of expression	Specific Gravity at 30 ° C (g/mL) $= \frac{A-B}{C-B}$ Where, A = weight in g of specific gravity bottle with oil at 30 °C B = weight in g of specific gravity bottle at 30 °C C = weight in g of specific gravity bottle with water at 30 °C
Reference	1. AOAC 17th edn., 2000, Official method 920.212 Specific gravity (Apparent) of Oils, Pycnometer method. 2. ISI Hand book of Food Analysis (Part XIII) 1984, page 72
Approved by	Scientific Panel on Methods of Sampling and Analysis

fssai	**Determination of Refractive Index**		
Method No.	FSSAI 02.003:2021	**Revision No. & Date**	0.0
Scope	Refractive index varies with temperature and wavelength. Significance: Refractive index of oils increases with the increase in unsaturation and also chain length of fatty acids.		
Principle	The ratio of velocity of light in vacuum to the velocity of light in the oil or fat; more generally, expresses the ratio between the sine of angle of incidence to the sine of angle of refraction when a ray of light of known wave length (usually 589.3 nm, the mean of D lines of Sodium) passes from air into the oil or fat. Measurement of the refractive index of the sample is done by means of a suitable refractometer.		
Apparatus / Instruments	1. General glassware and apparatus (Refer 2.0 at page no. 1) 2. Butyro Refractometer or Abbe Refractometer Abbes Refractometer (i) Open double prism with the help of the screw head and place a drop of oil on the prism. (ii) Close prisms firmly by tightening screw heads. (iii) As refractive index is greatly affected by temperature, the temperature of the refractometer should be controlled to within ± 0.1 °C and for this purpose it should be provided with a thermostatically controlled water bath and a motor driven pump to circulate water through the instrument. Butyro refractometer (i) Its reading can be converted to refractive index with the help of the table. (ii) Light Source -If the refractometer is equipped with a compensator, a tungsten lamp or day light may be used. (iii) Otherwise a monochromatic light such as sodium vapour lamp (589.3 nm) may be used.		
Materials and reagents	Oil / Fat		
Preparation of reagents / Calibration of apparatus	1. The instrument is calibrated with a glass prism of known refractive index (an optical contact with the prism being made by a drop of a bromonaphthalene) or by using distilled water which has refractive index of 1.3330 at 20.0 °C and 1.3306 at 40.0 °C, the usual temperature of taking readings.		
Sample Preparation	Refer 3.0 at page no. 2		
Method of analysis	1. Melt the sample if it is not already liquid and filter through a filter paper containing anhydrous Sodium Sulphate in the proportion of 1 - 2 g per 10 g sample previously heated in oven at 50 °C, to remove impurities and traces of moisture. 2. Make sure sample is completely dry.		

	3. Circulate stream of water through the instrument. 4. Adjust the temperature of the refractometer to the desired temperature. 5. Ensure that the prisms are clean and dry. 6. Place a few drops of the sample on the prism. 7. Close the prisms and allow standing for 1-2 min. 8. Adjust the instrument and lighting to obtain the most distinct reading possible and determining the refractive index or butyro-refractometer number as the case may be. 9. After recording the measurement, wipe the prism with tissue to remove the oil and wipe with isoproponal and pet ether to clean the prism for next sample analysis.
Calculation with units of expression	**Temperature correction:** Determine refractive index at the specified temperature. If temperature correction is necessary use following formula: $R = R^1 + K (T^1 - T)$ Where, R = Reading of the refractometer reduced to the specified temperature T °C R^1 = Reading at T^1 °C K = constant 0.000365 for fats and 0.000385 for oils (If Abbe Refractometer is used) or = 0.55 for fats and 0.58 for oils (if Butyro-refractometer is used) T^1 = temperature at which the reading R^1 is taken and T = specified temperature (generally 40 °C.)
Reference	1. AOAC 17th edn, 2000, Official method 921.08 – Index of refraction of oils and fats. 2. ISI Handbook of Food analysis (Part XIII) – 1984, page 70) Table for conversion of B.R. readings to Refractive Index
Approved by	Scientific Panel on Methods of Sampling and Analysis

fssai	**Determination of Flash Point : Pensky Marten (closed cup) Method**		
Method No.	FSSAI 02.004:2021	**Revision No. & Date**	0.0
Scope	Flash point is the lowest temperature at which a liquid can form an ignitable mixture in air near the surface of the liquid. The method determines the temperature at which the sample will flash, when a test flame is applied under the conditions specified for the test.		
Principle	The sample is heated in a test cup at a slow and constant rate with continual stirring. A small test flame is directed into the cup at regular intervals with simultaneous interruption of stirring. The flash point is taken as the lowest temperature at which the application of the test flame causes the vapour above the sample to ignite momentarily.		
Apparatus / Instruments	1. General glassware and apparatus (Refer 2.0 at page no. 1) 2. Pensky-Martens closed cup apparatus with thermometer.		
Materials and reagents	Oils and Fats		
Sample Preparation	Refer 3.0 at page no. 2 1. Samples containing dissolved or free water may be dehydrated with Calcium chloride or by filtering through a suitable filter paper or a loose plug of dry absorbent cotton. 2. Warming the sample is permitted but it shall not be heated for prolonged periods or above the temperature of 16 °C below its expected flash point.		
Method of Analysis	1. Thoroughly clean and dry all parts of the cup and its accessories before starting the test, being sure to remove any solvent which had been used to clean the apparatus. 2. Support the tester on a level steady table. 3. Fill the cup with the oil to be tested up to the level indicated by the filling mark. 4. Place the lid on the cup and properly engage the heating devices. Insert the thermometer, light the test flame and adjust it to 4.0 mm in diameter. 5. Heat the sample so that the temperature increase is about 5 to 6 °C per min. 6. During the heating, turn the stirring device from one to two revolutions per second. 7. Apply the test flame when the temperature of the sample is a whole number not higher than 17 °C below the flash point. 8. At every 5 °C rise in temperature, discontinue stirring and apply the test flame by opening the device which controls the shutter and lowers the test flame into the shutter opening. 9. Lower the test flame in for 0.5 sec and quickly return to the raised position. Do not stir the sample while applying the test flame. 10. As soon as the test flame has been returned to the raised position, resume stirring. 11. The flash point is the temperature indicated by the thermometer at the time of the flame application that causes a distinct flash in the		

	interior of the cup.
Calculation with units of expression	Flash point of oil or fat is expressed as degree of Celsius (°C)
Reference	IS 1448 – 1970 Methods of test for petroleum and its products (P: 21) Flash Point (Closed) by Pensky Martin apparatus
Approved by	Scientific Panel on Methods of Sampling and Analysis

	Determination of Color		
Method No.	FSSAI 02.005:2021	**Revision No. & Date**	0.0
Scope	Color measurement in the oils and fats industry is an essential part of the refining process. It is a means of assessing when the desired color has been reached and when the refining can be halted.		
Principle	The method determines the color of oils by comparison with Lovibond glasses of known color characteristics. The color is expressed as the sum total of the yellow and red slides used to match the color of the oil in a cell of the specified size in the Lovibond Tintometer.		
Apparatus/ Instruments	1. General Glass ware and apparatus (Refer 2.0 at page no. 1) 2. Lovibond Tintometer 3. Glass cells (cell size 0.25 inch, 0.5 inch.1.0 inch, 5.25 inch or 1.0 cm, 2.0 cm, 5.0 cm as required)		
Materials and Reagents	Oils / Fats		
Sample Preparation	Melt the sample if it is not already liquid and filter the oil through a filter paper to remove any impurities and traces of moisture. Make sure sample is absolutely clear and free from turbidity. Refer 3.0 at page no. 2		
Method of analysis	1. Clean the glass cell of desired size with carbon tetrachloride and allow it to dry. 2. Fill it with the oil and place the cell in position in the tintometer. 3. Match the color with sliding red, yellow and blue colors.		
Calculation with units of expression	Report the color of the oil in terms of Lovibond units as follows: Color reading = (a Y + 5 b R) or (a Y + 10 b R) in (* cell) Where, a = sum total of the various yellow slides (Y) used b = sum total of the various red (R) slides used Y + 5R is the mode of expressing the color of light colored oils; and Y + 10 R is for the dark-colored oils Although the yellow and red slides required to match the color shade of an oil in a tintometer are assessed separately, it is found that to a certain extent these slides are mutually compensatory.		
Inference (Qualitative Analysis)	Consequently different workers may report different values for the yellow and red units for the same oil and the same workers may report different values for the yellow and red units for the oil examined at different times. To obviate such personal errors a composite factor is used for checking the color comprising the sum total of the yellow(Y) units and 5 or 10 times the total of red units as specified for the oil or fat.		
Reference	1. ISI Hand book of Food Analysis (Part XIII) – 1984 page 75. 2. IS 548 (Part 1) – 1964, Methods of sampling and test for Oils and Fats.		
Approved by	Scientific Panel on Methods of Sampling and Analysis		

	Determination of Slip Melting Point of Fat		
Method No.	FSSAI 02.006:2021	**Revision No. & Date**	0.0
Scope	Oils and fats are chiefly mixtures of triglycerides. They do not exhibit either a definite or sharp melting point. Therefore, the melting point does not imply the same characteristics that it does with pure crystalline substances. Fats pass through a stage of gradual softening before they become completely liquid. The melting point is therefore defined by the specific conditions of the method by which it is determined.		
Principle	**Open-tube Capillary-Slip Method** The melting point is the temperature at which the oil or fat softens or becomes sufficiently fluid to slip or run as determined by the open-tube capillary-slip method.		
Apparatus / Instruments	1. General glass ware and apparatus (Refer 2.0 at page no. 1) 2. Melting point tubes -thin walled with uniform bore capillary glass tubes open at both ends with following dimensions: Length 50 to 80 mm Inside diameter 1.0mm Outside diameter 2.0 mm 3. Thermometer with 0.2 °C sub-divisions with a suitable range. The thermometer should be checked against a standard thermometer that has been calibrated and certified by National Physical Laboratory, New Delhi or any other laboratory approved for calibration of instruments. 4. Beaker with a side tube heating arrangement – Thiele melting point tube may be used. Alternatively, a melting point apparatus may also be used. 5. Heat source: Gas burner or Spirit Lamp or electric hot plate with rheostat control.		
Materials and Reagents	Fats		
Sample Preparation	Refer 3.0 at page no. 2		
Method of Analysis	1. Melt the sample and filter it through a filter paper to remove any impurities and last traces of moisture. 2. Make sure that the sample is absolutely dry. Mix the sample thoroughly. 3. Introduce a capillary tube into the molten sample, so that a column of the sample, about 10 mm long, is sucked into the tube. 4. Dip atleast 3 clean capillary tubes in the completely liquid sample so that the sample rises about 10 mm high in tubes. 5. Chill the sample at once by holding the ends of the tubes that contain the sample against a piece of ice until the fat solidifies. 6. Place the tube in a small beaker and hold it in a refrigerator at 4 °C to 10 °C for 16 h. 7. Remove the tube from the refrigerator and attach with a rubber band		

	to the thermometer bulb, so that the lower end of the capillary tube and the thermometer bulb are at the same level. 8. Suspend the thermometer in 600 mL beaker of clear distilled water. The bottom of thermometer is immersed in the water to the immersion mark. 9. Take water at 10 °C in the 'Thiele' tube and immerse the thermometer with the capillary tube containing the sample of fat. Gradually increase the temperature by heating at the side-tube of the Thiele Tube at the rate of 2 °C per min, till the temperature reaches 25 °C, and thereafter at the rate of 0.5 °C per min. 10. Note the temperature of the water when the sample column begins to rise in the capillary tube.
Inference (Qualitative Analysis)	Report the average of two such separate determinations as the melting point, provided that the readings do not differ by more than 0.5 °C.
Reference	1. ISI Handbook of Food Analysis (Part XIII) – 1984, page 68. 2. IS: 548 (Part 1) – 1964, Methods of Sampling and test for Oils and Fats page 33. 3. AOCS Official Method Cc 3-25 – Slip melting point-AOCS Standard Open Tube Melting Point.
Approved by	Scientific Panel on Methods of Sampling and Analysis

fssai	**Determination of Saponification Value**		
Method No.	FSSAI 02.007:2021	**Revision No. & Date**	0.0
Scope	The saponification value is the number of mg of Potassium hydroxide required to saponify 1 g of oil/fat.		
Caution	1. Potassium hydroxide: corrosive. Causes severe burns to skin, eyes, respiratory tract, and gastrointestinal tract. Material is extremely destructive to all body tissues. May be fatal if swallowed. 2. Hydrochloric acid: It is a hazardous liquid which must be used with care. The acid itself is corrosive, and concentrated forms release acidic mists that are also dangerous. If the acid or mist come into contact with the skin, eyes, or internal organs, the damage can be irreversible or even fatal in severe cases. 3. Sodium Carbonate: Eye contact can cause permanent corneal injury and possible burns. Avoid ingestion or inhalation of dust. Due to these potential hazards, sodium carbonate should be handled with care.		
Principle	The oil sample is saponified by refluxing with a known excess of alcoholic Potassium hydroxide solution. The alkali required for saponification is determined by titrating the excess Potassium hydroxide with standard hydrochloric acid. **Importance:** The saponification value is an index of mean molecular weight of the fatty acids of glycerides comprising a fat. Lower the saponification value, larger the molecular weight of fatty acids in the glycerides and vice-versa.		
Apparatus/ Instruments	1. General Glass ware and apparatus (Refer 2.0 at page no. 1) 2. 250 mL capacity conical flask with ground glass joints. 3. 1 m long air condenser, or reflux condenser (65 cm minimum in length) to fit the flask. 4. Hot water bath or electric hot plate fitted with thermostat. 5. 1000 mL volumetric flask / stoppered flask. 6. Weighing flask 7. Balance		
Materials and Reagents	1. Aldehyde free alcohol 2. Potassium hydroxide 3. Distilled water 4. Phenolphthalein indicator 5. Hydrochloric acid 6. Anhydrous standard Sodium / Potassium carbonate		
Preparation of reagents	1. Alcoholic Potassium hydroxide Solution - Dissolve 35 to 40 g of Potassium hydroxide in 20 mL of distilled water and add sufficient aldehyde-free alcohol to make up to 1000 mL. Allow the solution to stand in a tightly stoppered bottle for 24 h. Then quickly decant the clear supernatant into a suitable, tight container, and standardize the		

	solution and keep in a bottle closed tight with a cork or rubber stopper. 2. Phenolphthalein indicator solution - Dissolve 1.0 g of phenolphthalein in 100 mL rectified spirit. 3. Standard hydrochloric acid: approximately 0.5N (Standardized against anhydrous sodium / potassium carbonate)
Sample Preparation	Refer 3.0 at page no. 2
Method of analysis	1. Melt the sample if it is not already liquid and filter through a filter paper to remove any impurities and the last traces of moisture. Make sure that the sample is completely dry. 2. Mix the sample thoroughly and weigh about 1.5 to 2.0 g of dry sample into a 250 mL Erlenmeyer flask. 3. Pipette 25 mL of the alcoholic Potassium hydroxide solution into the flask. Conduct a blank determination along with the sample. 4. Connect the sample and blank flasks with air condensers; keep on the water bath, gently and steadily boiling until saponification is complete, indicated by absence of any oily matter and the appearance of a clear solution. 5. Clarity may be achieved within one hour of boiling. After the flask and condenser have cooled, wash down the inside of the condenser with about 10 mL of hot ethyl alcohol neutral to phenolphthalein. 6. The excess Potassium hydroxide is determined by titration with 0.5N hydrochloric acid, using about 1.0 mL phenolphthalein indicator.
Calculation with units of expression	Saponification Value $= \frac{56.1 \times (B-S) \times N}{W}$ Where, B = Volume in mL of standard hydrochloric acid required for the blank. S = Volume in mL of standard hydrochloric acid required for the sample N = Normality of the standard hydrochloric acid and W = Weight in g of the oil/fat taken for the test. Units: mg of KOH/1 g oil or fat Note: - When titrating oils and fats, which give dark colored soap solution the observation of the end point of titration may be facilitated either (a) by using thymolphthalein or alkali blue 6B in place of phenolphthalein or (b) by shaking 1mL of 0.1% (w/v) solution of methylene blue in water to each 100mL of phenolphthalein indicator solution before the titration.
Reference	1. AOAC 17th edn. 2000, Official method 920.160 Saponification number of oils and fats 2. IUPAC 2. 202 3. ISI Handbook of Food Analysis (Part XIII) 1984, page 78) 4. IS: 323-1959 Specification for Rectified Spirit (*Revised*)
Approved by	Scientific Panel on Methods of Sampling and Analysis

	Determination of Unsaponifiable Matter		
Method No.	FSSAI 02.008:2021	**Revision No. & Date**	0.0
Scope	Unsaponifiable matter is defined as the substances soluble in the oil, which after saponification are insoluble in water but soluble in the solvent used for the determination. It includes lipids of natural origin such as sterols, higher aliphatic alcohols, pigments, vitamins, and hydrocarbons as well as any foreign organic matter non-volatile at 100 °C e.g. (mineral oil).		
Caution	1. Petroleum ether: Harmful when inhaled in high concentrations or ingested. Petroleum ether may cause dizziness and drowsiness if inhaled, and high concentrations may result in central nervous system depression, and loss of consciousness. 2. Diethyl ether: Diethyl ether is a volatile chemical that can easily catch fire or even explode. This chemical also poses an inhalation hazard, and can cause irritation of the eyes and skin. Due to these hazards, it's important to use caution whenever handling diethyl ether or being in its general vicinity. 3. Potassium hydroxide: It is corrosive. Causes severe burns to skin, eyes, respiratory tract, and gastrointestinal tract. Material is extremely destructive to all body tissues. May be fatal if swallowed. 4. Sodium hydroxide: Sodium hydroxide is strongly irritating and corrosive. It can cause severe burns and permanent damage to any tissue that it comes in contact with. Sodium hydroxide can cause hydrolysis of proteins, and hence can cause burns in the eyes which may lead to permanent eye damage.		
Principle	Light Petroleum or diethyl ether is used as a solvent but in most cases results will differ according to the solvent selected and generally the use of diethyl ether will give a higher value.		
Apparatus / Instruments	1. General Glass ware and apparatus (Refer 2.0 at page no. 1) 2. Flat bottom flask or conical flask with a ground glass joint, 250 mL capacity 3. Air condenser 1 meter long to fit the flask 4. Separating funnel, 500 mL capacity 5. Weighing balance-The weighing balance should be accurately calibrated to measure 10 mg of sample on a tare weigh of 100 g.		
Materials and Reagents	1. Potassium hydroxide 2. Ethyl alcohol (aldehyde free) 3. Ethyl alcohol: Ninety-five percent 4. Phenolphthalein 5. Petroleum ether (40 – 60 °C): Analytical reagent grade 6. Sodium hydroxide 7. Acetone: Analytical reagent grade 8. Anhydrous sodium sulphate		
Preparation of reagents	1. Alcoholic Potassium hydroxide solution: Dissolve 7 to 8 g of Potassium hydroxide in an equal quantity of distilled water and add		

	sufficient aldehyde free ethyl alcohol and make up to 100 mL. 2. Phenolphthalein indicator solution: Dissolve one gram of phenolphthalein in 100 mL of ethyl alcohol. 3. Aqueous alcohol: 10% of ethyl alcohol in water 4. Standard sodium hydroxide solution: Approximately 0.02N
Sample Preparation	Refer 3.0 at page no. 2
Method of analysis	1. Weigh accurately 5 g of well mixed oil/fat sample into a 250 mL conical flask. Add 50 mL of alcoholic Potassium hydroxide solution. 2. Boil the content gently but steadily under reflux air condenser for one hour or until the saponification is complete (complete saponification gives a homogeneous and transparent medium). Take care to avoid loss of ethyl alcohol during the saponification. 3. Wash the condenser with about 10 mL of ethyl alcohol. Transfer the saponified mixture while still warm to a separating funnel, wash the saponification flask first with some ethyl alcohol and then with cold water, using a total of 50 mL of water to rinse the flask. 4. Cool to 20 to 25 °C. Add to the flask 50 mL of petroleum ether, insert the stopper and shake vigorously, and allow the layers to separate until two distinct layers are obtained. 5. Transfer the lower soap layer into another separating funnel and repeat the ether extraction 3 times, using 50 mL portions of petroleum ether for each extraction. If any emulsion is formed, add a small quantity of ethyl alcohol or alcoholic Potassium hydroxide solution. 6. Some oils high in unsaponifiable matter, e.g., marine oils, may require more than three extractions to completely remove Unsaponifiable matter. In that case repeat the ether extraction 3 times more, using 50 mL portions of petroleum ether for each extraction. 7. Collect all the ether extracts in a separating funnel. Wash the combined ether extract three times with 25 mL portions of aqueous alcohol followed by washing with 25 mL portions of distilled water to ensure ether extract is free of alkali (washing are no longer alkaline to phenolphthalein). 8. Transfer washed ether extract to 250 mL beaker containing a few pieces of pumice stone, rinse separator with ether, and add rinsing to main solution. 9. Evaporate to about 5 mL and transfer quantitatively using several portions of ether to a previously dried and weighed 50 mL Erlenmeyer flask. 10. Evaporate ether by placing on a water bath. When all ether has been removed add 2-3 mL acetone and while heating on steam or water bath completely remove solvent under a gentle air. 11. To remove last traces of ether, dry at 100 °C for 30 min till constant weight. Note the weight. Dissolve residue in 50 mL of warm ethanol, which has been neutralised to a phenolphthalein end point. Titrate with 0.02N Sodium hydroxide.

Calculation with units of expression	Weight in g of the free fatty acids in the extract as oleic acid = 0.282 V×N Where, V = Volume in mL of standard sodium hydroxide solution N = Normality of standard sodium hydroxide solution Unsaponifiable matter percentage $= \frac{100 \times (A-B)}{W}$ Where, A = Weight of the residue in g B = Weight of free fatty acids in the extract in g W = Weight of the sample in g
Reference	1. FAO Manual of Food quality control 14/8, page 261. 2. ISI Handbook of Food Analysis (Part XIII)-1984, page 67 3. AOAC 17th edn, 2000, Official method 933.08, Residue (unsaponifiable) of oils and fats.
Approved by	Scientific Panel on Methods of Sampling and Analysis

	Determination of Acid Value		
Method No.	FSSAI 02.009:2021	**Revision No. & Date**	0.0
Scope	The acid value is defined as the number of milligrams of Potassium hydroxide required to neutralize the free fatty acids present in one gram of fat. It is a relative measure of rancidity as free fatty acids are normally formed during decomposition of triglycerides. The value is also expressed as per cent of free fatty acids calculated as oleic acid, lauric, ricinoleic and palmitic acids.		
Caution	1. Potassium hydroxide: It is corrosive. Causes severe burns to skin, eyes, respiratory tract, and gastrointestinal tract. Material is extremely destructive to all body tissues. May be fatal if swallowed. 2. Sodium hydroxide: Sodium hydroxide is strongly irritating and corrosive. It can cause severe burns and permanent damage to any tissue that it comes in contact with. Sodium hydroxide can cause hydrolysis of proteins, and hence can cause burns in the eyes which may lead to permanent eye damage.		
Principle	The acid value is determined by directly titrating the oil/fat in an alcoholic medium against standard Potassium hydroxide/sodium hydroxide solution. The value is a measure of the amount of fatty acids, which have been liberated by hydrolysis from the glycerides due to the action of moisture, temperature and/or lipolytic enzyme lipase.		
Apparatus / Instruments	1. General Glass ware and apparatus (Refer 2.0 at page no. 1). 2. Ambered colored bottle. 3. Brown glass bottle		
Materials and Reagents	1. Oils and fats 2. Phenolphthalein indicator 3. Ethyl alcohol 4. Alkali Blue 6B indicator 5. Potassium hydroxide or sodium hydroxide solution		
Preparation of reagents	1. Phenolphthalein indicator solution: - Dissolve one gram of phenolphthalein in 100 mL of ethyl alcohol. 2. Alkali Blue 6B indicator solution: When testing rice bran oil or rice bran oil based blended oils or fats, which give dark colored soap solution, the observation of the end point of the titration may be facilitated, by using Alkali Blue 6B in place of Phenolphthalein. 3. Preparation: (2%) Extract 2 g of alkali blue 6B with rectified spirit in a Soxhlet apparatus at reflux temperature. Filter the solution if necessary and dilute to 100 mL with rectified spirit. Alkali blue 6B indicator to be stored in closed Ambered colored bottle to avoid oxidation of dye. 4. Ethyl alcohol: (i). Ninety-five percent alcohol or rectified spirit neutral to phenolphthalein indicator. (ii). Ninety-five percent alcohol or rectified spirit neutral to Alkali blue		

<table>
<tr><td></td><td>6B indicator in case of rice bran oil or rice bran oil based blended oil or fats.
5. Standard aqueous Potassium hydroxide or sodium hydroxide solution 0.1 or 0.5 N. The solution should be colorless and stored in a brown glass bottle. For refined oils, the strength of the alkali should be fixed to 0.1 N.</td></tr>
<tr><td>Sample Preparation</td><td>Refer 3.0 at page no. 2</td></tr>
<tr><td>Method of Analysis</td><td>Mix the oil or melted fat thoroughly before weighing. The mass of the test sample shall be taken based on the color and expected acid value.
<table>
<tr><th>Expected Acid Value</th><th>Mass of Test portion(g)</th><th>Accuracy of weighing of test portion (g)</th></tr>
<tr><td><1</td><td>20</td><td>0.05</td></tr>
<tr><td>1 to 4</td><td>10</td><td>0.02</td></tr>
<tr><td>4 to 15</td><td>2.5</td><td>0.01</td></tr>
<tr><td>15 to 75</td><td>0.5</td><td>0.001</td></tr>
<tr><td>>75</td><td>0.1</td><td>0.0002</td></tr>
</table>
Weigh accurately appropriate amount of the cooled oil sample as mentioned in the above table in a 250 mL conical flask.
Add 50 mL of freshly neutralised hot ethyl alcohol and about one ml of phenolphthalein indicator solution. In case of rice bran oil or RBO based blends, add about 1 mL of Alkali blue indicator.
Heat the mixture for about fifteen min in water bath (75-80 °C)
In case of Rice bran oil or RBO based blended oils or fats, add 1mL of Alkali blue indicator after heating.
Titrate while hot against standard alkali solution shaking vigorously during the titration.
End point using phenolphthalein indicator shall be from colorless to light pink (Persisting for 15 sec.).
End point using Alkali blue 6B indicator shall be disappearance of blue color which developed during addition of indicator.

Note: Noting burette reading after "obtaining dark pink color OR Orangish red" as end point should be avoided as it will lead to erroneous result.
The weight of the oil/fat taken for the estimation and the strength of the alkali used for titration shall be such that the volume of alkali required for the titration does not exceed 10 mL.</td></tr>
<tr><td>Calculation with units of expression</td><td>Acid value = $\frac{56.1 \times V \times N}{W}$
Where,
V = Volume in mL of standard Potassium hydroxide or sodium hydroxide used
N = Normality of the Potassium hydroxide solution or Sodium hydroxide solution; and
W = Weight in g of the sample
Acid value = % fatty acid (as oleic) × 1.99</td></tr>
</table>

	The acidity is frequently expressed as the percentage of FFA in the sample. The percentage of FFA in most oils and fats is calculated on the basis of oleic acid; although in coconut oil and palm kernel oil it is often calculated as lauric acid, in castor oil in terms of ricinoleic acid and in palm oil in terms of palmitic acid. Free fatty acid as oleic acid % by weight = 28.2 ×V× N/W Free fatty acid as lauric acid % by weight = 20 ×V×N/W Free fatty acid as ricinoleic acid % by weight =29.8 ×V× N/W Free fatty acid as palmitic acid % by weight =25.6 ×V×N/W Note: Oryzanol has its own acidity and contributes to the measured FFA content when present in oil. FFA content determined by using phenolphthalein as the indicator needs to be corrected. The formula for calculating real FFA content is shown below. Real FFA = observed FFA (for phenolphthalein) – (% oryzanol in the oil) x 0.425 For determination of acid value in case of rice bran oil and blended oils containing rice bran oil, the correction factor provided above must be used to account for oryzanol's acidity or alkali blue may be used as an indicator for the titration which is most suitable.
Reference	1. ISI Handbook of Food Analysis (Part XIII)-1984 Page 67 2. IUPAC 2.201(1979) 3. IS: 548 (Part 1) – 1964, Methods of Sampling and Test for Oils and Fats 4. ISO 660:1996 Determination of acid value and acidity 5. AOAC 17th edn, 2000, Official method 940.28
Approved by	Scientific Panel on Methods of Sampling and Analysis

fssai	**Determination of Iodine Value**		
Method No.	FSSAI 02.010:2021	**Revision No. & Date**	0.0
Scope	The iodine value of an oil/fat is the number of grams of iodine absorbed by 100 g of the oil/fat, when determined by using Wijs solution.		
Caution	1. Acetic acid: Acetic acid can be a hazardous chemical if not used in a safe and appropriate manner. This liquid is highly corrosive to the skin and eyes and, because of this, must be handled with extreme care. Acetic acid can also be damaging to the internal organs if ingested or in the case of vapor inhalation. 2. Hydrochloric acid: Hydrochloric acid is a hazardous liquid which must be used with care. The acid itself is corrosive, and concentrated forms release acidic mists that are also dangerous. If the acid or mist come into contact with the skin, eyes, or internal organs, the damage can be irreversible or even fatal in severe cases. 3. Carbon tetrachloride: It is a highly toxic narcotic and central nervous system depressant causing possible unconsciousness, coma and death from respiratory failure. It causes permanent kidney and liver damage. It can be absorbed via the skin as well as by inhalation or ingestion. 4. Potassium iodide: Common side effects of Potassium Iodide include: Allergic reactions (skin rashes such as hives; swelling of various parts of the body such as the face, lips, tongue, throat, hands or feet; fever with joint pain, trouble breathing, speaking or swallowing, wheezing, or shortness of breath).		
Principle	The oil/fat sample taken in carbon tetrachloride is treated with a known excess of iodine monochloride solution in glacial acetic (Wijs solution). The excess of iodine monochloride is treated with potassium iodide and the liberated iodine estimated by titration with sodium thiosulfate solution Importance - The iodine value is a measure of the amount of unsaturation (number of double bonds) in a fat.		
Apparatus / Instruments	1. General glass ware and apparatus (Refer 2.0 at page no. 1) 2. Erlenmeyer flasks 3. Brown glass bottles 4. Beakers 5. Burettes 6. Pipettes 7. Volumetric flasks		
Materials and Reagents	1. Potassium dichromate 2. Concentrated hydrochloric acid AR 3. Glacial acetic acid, free from ethanol 4. Carbon tetrachloride, analytical reagent grade 5. Iodine mono-chloride (ICl) 6. Potassium iodide (free from potassium iodate) 7. Starch		

	8. Mercuric iodide 9. Glacial acetic acid 10. Sodium thiosulphate 11. Resublimed Iodine 12. Dried chlorine (dried through H_2SO_4) 13. Saturated Cl – water
Preparation of reagents	1. Potassium iodide (free from potassium iodate) - 10% solution prepared fresh. 2. Starch solution - Mix 5 g of starch and 0.01 g of mercuric iodide with 30 mL of cold water and slowly pour it with stirring into one litre of boiling water. Boil for three min. Allow to cool and decant the clear supernatant. 3. Wijs Iodine monochloride solution: (i) Dissolve 10 mL of iodine monochloride in about 1800 mL of glacial acetic acid and shake vigorously. (ii) Pipette 5 mL of Wijs solution, add 10 mL of potassium iodide solution and titrate with 0.1N standard sodium thiosulphate solution using starch as indicator. Adjust the volume of the solution till it is approximately 0.2 N or prepare Wijs iodine solution by dissolving 13 g resublimed Iodine in 1000 mL acetic acid and pass in dried chlorine (dried through H_2SO_4) until original Sodium thiosulphate titre value of the solution is not quite doubled (characteristic color change at the end point indicates proper amount of Chlorine. Convenient method is to reserve some amount of original Iodine solution, add slight excess of Chlorine to bulk of solution and bring to desired titre by re-additions of reserved portion). (iii) Store in an amber colored bottle sealed with paraffin until ready for use. Wijs solutions are sensitive to temperature, moisture and light. Store in the dark below 30 °C. Determine I/Cl ratio as follows Iodine Content – Pipette 5 mL Wijs solution into 500 mL Erlenmeyer flask containing 150 mL saturated Cl – water and some glass beads. Shake heat to boiling point and boil briskly for 10 min. Cool, add 30 mL H_2SO_4 (1+ 49) and 15 mL 15% Potassium iodide solution and titrate immediately with 0.1 N Sodium thiosulphate. (iv) Total Halogen content – Pipette 20 mL Wijs solution into 500 mL Erlenmeyer flask containing 150 mL recently boiled and cooled water and 15 mL 15 % Potassium iodide solution. Titrate immediately with 0.1 N Sodium thiosulphate. I/Cl = 2 X / (3B – 2 X) where X = mL of 0.1 Sodium thiosulphate required for I content and B = mL required for total halogen content. I / Cl ratio must be 1.10±0.1 4. Standard sodium thiosulphate solution (0.1N) (i). Dissolve approximately24.8 g of sodium thiosulphate crystals ($Na_2S_2O_3.5H_2O$) in distilled water and make up to 1000 mL. (ii). Standardise this solution by the following procedure-Weigh accurately about 5.0 g of finely powdered potassium dichromate, which has been previously dried at 105±2 °C for one hour, dissolve it in

	distilled water and make up to 1000 mL. (iii). For standardisation of sodium thiosulphate, pipette 25 mL of this solution into a 250 mL conical flask. Add 5 mL of concentrated hydrochloric acid and 15 mL of a 10% potassium iodide solution. (iv). Allow to stand in dark for 5 min and titrate with sodium thiosulphate solution using starch as indicator. End point is change of blue color to green. $$N = \frac{25 \times W}{49.03 \times V}$$ Where, N = Normality of the sodium thiosulphate W = Weight in g of the potassium dichromate, and V = Volume in mL of sodium thiosulphate solution required for titration. 5. Potassium dichromate (dried at 105±2 °C for one hour).
Sample Preparation	Refer 3.0 at page no. 2
Method of Analysis	Oil/fat may be weighed accurately following the Table given below: Expected Iodine Weight to be taken for value estimation (g)

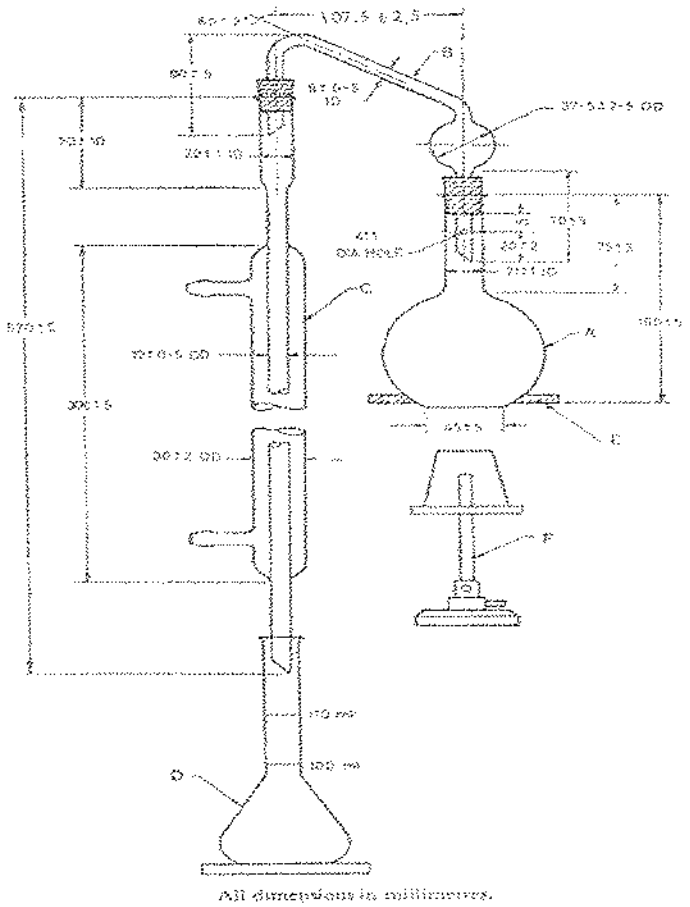
Expected Iodine Value	Weight to be taken for estimation (g)	
	Maximum	Minimum
5	6.3460	5.0770
10	3.1730	2.5384
50	0.6612	0.5288
100	0.3173	0.2538
150	0.2125	0.1700
200	0.1586	0.1269

1. Weigh accurately an appropriate quantity of the dry oil/fat as indicated in the Table above, into a 500 mL glass stoppered conical flask, to which 25 mL of carbon tetrachloride has been added. Mix the contents well.
2. The weight of the sample shall be such that there is an excess of 50 to 60% of Wijs solution over that actually needed. Pipette 25 mL of Wijs solution and replace the glass stopper after wetting with potassium iodide solution.
3. Swirl for proper mixing and keep the flasks in dark for 30 min for non-drying and semi-drying oils and one hour for drying oils.
4. Carry out a blank simultaneously.
5. After standing, add 15 mL of potassium iodide solution, followed by 100 mL of recently boiled and cooled water, rinsing in the stopper also.
6. Titrate the liberated iodine with standardized sodium thiosulphate solution, using starch as indicator until the blue color formed

	disappears after thorough shaking with the stopper on. 7. Conduct blank determinations in the same manner as test sample but without oil/fat. 8. Slight variations in temperature appreciably affect titre of iodine solution as chloroform has a high coefficient of expansion. 9. It is thus necessary that blanks and determinations are made at the same time.
Calculation with units of expression	Iodine value = $\frac{12.69 \times (B-S) \times N}{W}$ Where, B = volume in mL of standard sodium thiosulphate solution required for the blank. S = volume in mL of standard sodium thiosulphate solution required for the sample. N = normality of the standard sodium thiosulphate solution. W = weight in g of the sample. Units: g of iodine per 100 g oil
Reference	1. AOAC 17th edn, 2000, Official method 920. 159 – Iodine absorption number of oils and fats 2. ISI Handbook of Food Analysis (Part XIII) – 1984 page 76. 3. AOCS Official Method Cd 1b-87: Iodine value of fats and oils: Cyclohexane 4. AOCS Official Method Cd 1D-92: Iodine value of fats and oils: Cyclohexane Acetic acid method
Approved by	Scientific Panel on Methods of Sampling and Analysis

Determination of Reichert-Meissl and Polenske Value

Method No.	FSSAI 02.011:2021	Revision No. & Date	0.0
Scope	Butter is distinguished from other fats by the presence of glyceryl esters of relatively low molecular weight fatty acids, especially butyric but also caproic, capric, caprylic, lauric and myristic acids. These acids are wholly or partially steam volatile and water soluble. The Reichert-Meissl value reflects the amount of butyric and caproic acids present and Polenske value chiefly caprylic, capric and lauric acids, with some contribution from myristic and even palmitic acid. The Reichert-Meissl value is the number of mLs of 0.1N aqueous sodium hydroxide solution required to neutralize steam volatile water-soluble fatty acids distilled from 5 g of an oil/fat under the prescribed conditions. It is a measure of water-soluble steam volatile fatty acids chiefly butyric and caproic acids present in either an oil or fat.		
Caution	1. Sodium hydroxide: Sodium hydroxide is strongly irritating and corrosive. It can cause severe burns and permanent damage to any tissue that it comes in contact with. Sodium hydroxide can cause hydrolysis of proteins, and hence can cause burns in the eyes which may lead to permanent eye damage. 2. Sulphuric acid: Concentrated Sulphuric acid is extremely corrosive and can cause serious burns when not handled properly. This chemical is unique because it not only causes chemical burns, but also secondary thermal burns as a result of dehydration. This dangerous chemical is capable of corroding skin, paper, metals, and even stone in some cases. If Sulphuric acid makes direct contact with the eyes, it can cause permanent blindness. If ingested, this chemical may cause internal burns, irreversible organ damage, and possibly death.		
Principle	The material is saponified by heating with glycerol sodium hydroxide solution and then split by treatment with dilute Sulphuric acid. The volatile acids are immediately steam distilled. The soluble volatile acid in the distillate is filtered out and estimated by titration with standard sodium hydroxide solution. Importance -These determinations have been used principally for analysis of butter and margarines. Butter fat contains mainly butyric acid glycerides. Butyric acid is volatile and soluble in water. No other fat contains butyric acid glycerides, and therefore, the Reichert-Meissl value of the butter fat is higher than that for any other fat. Coconut oil and palm kernel oil contain appreciable quantities of caprylic, capric and lauric acid glycerides. These fatty acids are steam volatile but not soluble in water, and hence give high Polenske value.		
Apparatus / Instruments	1. General glass ware and apparatus (Refer 2.0 at page no. 1) 2. An all-glass distillation assembly conforming to specifications as per AOCS Methods Cd 5-40 or AOAC- 17th Edn.,2000 (925.41, Chapter 41 page 14) or distillation apparatus as shown in the diagram below:		

	 All dimensions in millimetres. 3. Beaker-25 mL 4. Graduated cylinder-100 mL 5. Pipette-100 mL 6. Graduated burette. 7. Asbestos board with a hole about 65 mm diameter for supporting the flask over the burner. During distillation the flask shall fit snugly into the hole of the board to prevent the flame from impinging on the surface of the flask above the hole. 8. Bunsen burner sufficiently large to allow completion of distillation in the prescribed time.
Materials and Reagents	1. Glycerol 2. Sodium hydroxide 3. Pumice stone grains 4. Sulphuric acid 5. Phenolphthalein indicator 6. Ethyl alcohol

Preparation of reagents	1. Concentrated sodium hydroxide solution: 50% (w/w) Dissolve Sodium Hydroxide in equal weight of water and store solution in a polypropylene bottle. Use clear solution free from deposit. 2. Dilute Sulphuric acid solution: Approximately 1.0N 3. Sodium hydroxide solution: 0.1N solution in water, accurately standardized 4. Phenolphthalein indicator: Dissolve 0.1 g of phenolphthalein in 100 mL of ethyl alcohol 5. Ethyl alcohol: 90% by volume and neutral to phenolphthalein.
Sample Preparation	Refer 3.0 at page no. 2
Method of Analysis	1. Weigh accurately 5 ± 0.1 g of filtered oil or fat sample into a clean, dry, 300 mL distilling flask. 2. Add 20 mL of glycerine and 2 mL of concentrated sodium hydroxide solution, and heat with swirling over a flame until completely saponified, as shown by the mixture becoming perfectly clear. 3. Cool the contents slightly and add 90 mL of boiling distilled water, which has been vigorously boiled for about 15 min After thorough mixing, the solution should remain clear. If the solution is not clear (indicating incomplete saponification) or is darker than light yellow (indicating over-heating), repeat the saponification with a fresh sample of the oil or fat. If the sample is old, the solution may sometimes be dark and not clear. 4. Add about 0.6 - 0.7 g of pumice stone grains, and 50 mL of dilute Sulphuric acid solution. Immediately connect the flask to the distillation apparatus. 5. Place the flask on asbestos board so that it fits snugly into the aperture. This will prevent the flame from impinging on the surface of the flask above the level of the liquid and avoid super heating. 6. Heat very gently until the liberated fatty acids melt and separate. 7. Then set the flame so that 110 mL of distillate shall be collected within 19 to 21 min. 8. The beginning of the distillation is to be taken as the moment when the first drop of the distillate falls from the condenser in the receiving flask. 9. Keep the water in the condenser flowing at a sufficient speed to maintain the temperature of the outgoing water from the condenser between 15 and 20 °C. 10. Collect the distillate in a graduated flask. 11. When the distillate exactly reaches the 110 mL mark on the flask, remove the flame and quickly replace the flask by a 25 mL measuring cylinder. 12. Stopper the graduated flask and without mixing place it in a water bath maintained at 15 °C for 10 min so that the 110 mL graduation mark is 1 cm below the water level in the bath. 13. Swirl round the contents of the flask from time to time. Remove the graduated flask from the cold water bath, dry the outside and mix

	the content gently by inverting the flask 4 to 5 times without shaking. Avoid wetting the stopper with the insoluble acids. 14. Filter the liquid through a dry, 9 cm Whatman No. 4 filter paper or equivalent. Reject the first 2-3 mL of the filtrate and collect the rest in a dry flask. 15. The filtrate should be clear. Pipette 100 mL of the filtrate and add 5 drops of the phenolphthalein solution and titrate against standard 0.1N sodium hydroxide solution. 16. Run a Blank Test without the fat but using the same quantities of the reagents. Polenske Value: 17. After titrating, the soluble volatile acids detach the still head and rinse the condenser with three successive 15 mL portions of cold distilled water passing each washing separately through the measuring cylinder, 110 mL graduated flask and the filter paper and allow all of it to pass through. Discard all the washings. 18. Place the funnel on a clean conical flask. Dissolve the insoluble fatty acids by three similar washings of the condenser, the measuring cylinder, the 110 mL flask with stopper, and the filter paper with 15 mL portions of ethyl alcohol. 19. Combine the alcoholic washings in a clean flask, add 5 drops of phenolphthalein indicator solution, and titrate with standard (0.1N) sodium hydroxide solution.
Calculation with units of expression	Reichert-Meissl Value= $(A - B) \times N \times 11$ where, A = Volume in mL of standard sodium hydroxide solution required for the test; B = Volume in mL in standard sodium hydroxide solution required for the blank; and N = Normality of standard sodium hydroxide solution. **Calculation of Polenske Value:** Polenske value= $10 \times V \times N$ where, V = Volume in mL of standard sodium hydroxide solution required for the test; and N = Normality of the standard sodium hydroxide solution. Note: - Unless the directions are followed in every detail reproducible results cannot be obtained.
Reference	1. ISI Handbook of Food Analysis (Part XIII) – 1984 page 81) 2. AOAC 17th edn, 2000. Official method 925.41 Acids (volatile) in oils and fats.
Approved by	Scientific Panel on Methods of Sampling and Analysis

Rayat Shikshan Sanstha's,

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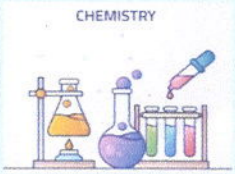
Department of Chemistry



Certificate Course (Fat and Oil Analysis)

TIME TABLE (4 Dec.- .24 Dec. 2020)
(2020-21)(UG)

Class	Time	**Friday** (04/12/2020)	**Saturday** (05/12/2020)
B.Sc.-III	11.20 am-12.08pm	Theory (SDJ)	Theory (NDN)
	12.08pm-12.56pm	Theory(NDN)	Theory(NMG)
	3.00 pm-6.00pm	Practical(SDJ)	Practical(NMG)

Class	Time	**Friday** (11/12/2020)	**Saturday** (12/12/2020)
B.Sc.-III	11.20 am-12.08pm	Theory (VSK)	Theory (NMG)
	12.08pm-12.56pm	Theory(PSP)	Theory(SDJ)
	3.00 pm-6.00pm	Practical(VSK)	Practical(NAG)

Class	Time	**Friday** (18/12/2020)	**Saturday** (19/12/2020)
B.Sc.-III	11.20 am-12.08pm	Theory (NDN)	Theory (NSG)
	12.08pm-12.56pm	Theory(SDJ)	Theory(PSP)

	3.00 pm-6.00pm	Practical(NDN)	Practical(ABD)

Class	Time	**Friday** (25/12/2020)	**Saturday** (26/12/2020)
B.Sc.-III	11.20 am-12.08pm	Theory (NDN)	Theory (VSK)
	12.08pm-12.56pm	Theory(PSP)	Theory(ABD)
	3.00 pm-6.00pm	Practical(PSP)	Practical(NMG)

SDJ - Dr. S. D. Jadhav

NDN - Dr. N. D. Nikam

NMG - Mr. N. M. Gosavi

VSK - Dr. V. S. Koshti

PSP - Dr.. P. S. Patil

NSG - Miss. N. S. Ghadge

NAG - Miss. N. A. Ghadge

ABD - Miss. A. B. Deshmukh

NBP - Miss. N. B. Pawar

Course Coordinator

Head
Department of Chemistry
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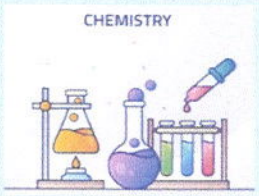
D. P. Bhosale College, Koregaon

Department of Chemistry



(2020-21)

Notice

Date: 27/11/2020

All the Students of B.Sc-III (Chemistry) are here by informed that Department of Chemistry going to organize your Certificate Course (Fat and Oil Analysis) has been Scheduled from 04/12/2020 to 26/12/2020 Kindly, remain present at prescribed time in lecture hall.

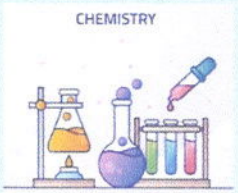
Course Coordinator

Head
Department of Chemistry
D. P. Bhosale College, Koregaon

Rayat Shikshan Sanstha's,

D. P. Bhosale College, Koregaon

Department of Chemistry



(2020-21)

Registration

Sr.No	Roll No.	Full Name
1	4501	Anbhule Omkar Gorakhnath
2	4502	Barge Nisha Suresh
3	4503	Bhagade Pallavi Rajendra
4	4504	Bhoite Kunal Vitthal
5	4505	Bhosale Mahesh Ankush
6	4506	Bhosale Shivani Ramdas
7	4507	Chavan Pratik shivaji
8	4508	Chavan Samadhan shrikant
9	4509	Chavan Suraj Rajkumar
10	4510	Dhandare Gajanan Vitthal
11	4511	Dhane Vishal Vijay
12	4512	Dhavale Ashwini Vaman
13	4513	Disale Rohan Ramesh

14	4514	Gaikwad Sushan shamkant
15	4515	Gaikwad Komal Hindurao
16	4516	Ghadge Kajal sanjay
17	4517	Gavali Shradha Arjun
18	4518	Ghorpade Rushikesh Shrimant
19	4519	Ghorpade Suchita Pramod
20	4520	Gurav Shital Rajendra
21	4521	Inamdar shahin husenbadsha
22	4522	Indapure Rahul Arvind
23	4523	Jadhav Anjali Mahadev
24	4524	Jadhav Viraj Ganesh
25	4525	Jagadale Mahesh Sopan
26	4526	Jagtap Puja Mansing
27	4527	Jangam Shivnath Rajendra
28	4528	jare arti makarand
29	4529	Kadam Ajay Ramesh
30	4530	Kadam Priyanka Shamrao
31	4531	Kadam Sayali Vitthal

32	4532	Kamble Sanket Balkrishna
33	4533	Kadam Sanket Rajendra
34	4534	Kale swarupa Rajendra
35	4535	Madane Maduri Tanaji
36	4536	Mane Ketan Ganpat
37	4537	Maner Tanveer Ayubkhan
38	4538	Matkar Ashitosh Pandurang
39	4539	Matkar Dinesh ashok
40	4540	More Dhanashri Vinod
41	4541	More Shivam Tanaji
42	4542	Nalawade Pranav Rajendra
43	4543	Pawar Bhagyashree Uttam
44	4544	Phadtare Ankita Ajit
45	4545	Potdar Dhanshri Babasaheb
46	4546	Pokale Anjali Prakash
47	4547	Raut Suraj Arun
48	4548	Raut Aakanksha Shankar
49	4549	Shedage Yogesh Vasant

50	4550	Shikalgar Iram Parvej
51	4551	Shinde Asha Ramchandra
52	4552	Shinde Gaurav Ramesh
53	4553	Shinde Shubham Ashok
54	4554	Shirke Neha Ashok
55	4555	Shitole Pranita Dilip
56	4556	Singh Pratik Pramod
57	4557	Tripute Omkar Rajendra
58	4558	Ubale Omkar Kundlik
59	4559	Veer Aishwarya Ramdas
60	4560	Yewale Mayuti Prabhakar
61	4561	Momin Asif Shabbir
62	4562	Bandgar Tejas Vilas
63	4563	Chavan Shivraj Sanjay
64	4564	Bhondave Vishal Rajendra
65	4565	Shirtode Mahesh Dnyanadev
66	4566	Gaikwad Omkar Sudhakar
67	4567	Gole Prathamash Dipak

68	4568	Suryavanshi Shubham Pandurang
69	4569	Mane Priyanka Vaman
70	4570	Mane Rohit Ratan

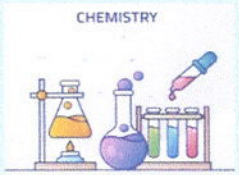
Course Coordinator

Head
Department of Chemistry
D. P. Bhosale College, Koregaon

Rayat Shikshan Sanstha's,

D. P. Bhosale College, Koregaon

Department of Chemistry



(2020-21)

Certificate Course
Question Paper (Fat and Oil Analysis)

Day & Date: 26/12/2020 **Marks- 20**
Time – 12:30pm to 01:00pm

1. Fats are triglycerides containing high percentage of..... fatty acids. So they are solids or semi solids at room temperature.?
(a) Low melting saturated
(b) High melting saturated
(c) Low melting unsaturated
(d) High melting unsaturated

2. Oils are triglycerides containing high percentage of ..... fatty acids. So they are liquid at room temperature.?
a) Low melting saturated
b) High melting saturated
c) Low melting unsaturated
d) High melting unsaturated

3. .... test is used for determining purity of oil sample..
a) Saponification
b) Elaiden
c). Polensky
d) Iodine

4. ..... method is invented by Emerich & Emil of oil or fat analysis.
a) Acid value
b) Polensky value
c) Riechert- Meissle value
d) None of these

5. Saponification value may be defined as the number of milligrams of caustic potash required the neutralize ..... obtained by complete hydrolysis of one gm of oil or fat sample.
a) Water soluble fatty acids
b) Volatile compound containing fatty acid
c) Fatty acids

d) All of these

6. ..... value indicates the average molecular weight of fat or oil.
a) R-M value
b) Polensky value
c) Acid value
d) Saponification value

7. R-M value of lard is .....
a) 1
b) 0
c) 100
d) None of these

8. ..... value is the number of milligrams of 0.1N alkali solution required to neutralize water insoluble fatty acid &steam volatile compound containing fatty acid present in 1 gm of oil or fat sample.
a) R-M value
b) Polensky value
c) Saponification value
d) Acid value

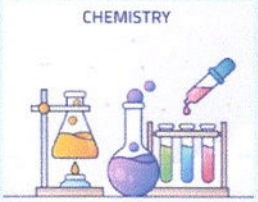
9.28.055 gm KOH is required for the ..... solution.?
a) 0.025 N KOH
b) 0.25 N KOH
c) 0.5N KOH
d) 0.05N KOH

10. Iodine value shows the ..... of fatty acid in oil or fat.
a) Absorbed iodine
b) Degree of unsaturation
c) Unsaturated bonds
d) All of these

Rayat Shikshan Sanstha's,

D. P. Bhosale College, Koregaon

Department of Chemistry



(2020-21)

Certificate Course

Model Answer Paper (Fat and Oil Analysis)

Day & Date: 26/12/2020 **Marks- 20**
Time – 12:30pm to 01:00pm

1. Fats are triglycerides containing high percentage of..... fatty acids. So they are solids or semi solids at room temperature.?
(a) Low melting saturated
(b) High melting saturated
(c) Low melting unsaturated
(d) High melting unsaturated

2. Oils are triglycerides containing high percentage of ..... fatty acids. So they are liquid at room temperature.?
a) Low melting saturated
b) High melting saturated
c) Low melting unsaturated
d) High melting unsaturated

3. .... test is used for determining purity of oil sample..
a) Saponification
b) Elaiden
c). Polensky
d) Iodine

4. ..... method is invented by Emerich & Emil of oil or fat analysis.
a) Acid value
b) Polensky value
c) Riechert- Meissle value
d) None of these

5. Saponification value may be defined as the number of milligrams of caustic potash required the neutralize ..... obtained by complete hydrolysis of one gm of oil or fat sample.
a) Water soluble fatty acids
b) Volatile compound containing fatty acid
c) Fatty acids
d) All of these

6. ..... value indicates the average molecular weight of fat or oil.
a) R-M value
b) Polensky value
c) Acid value
d) Saponification value

7. R-M value of lard is .....
a) 1
b) 0
c) 100
d) None of these

8. ..... value is the number of milligrams of 0.1N alkali solution required to neutralize water insoluble fatty acid &steam volatile compound containing fatty acid present in 1 gm of oil or fat sample.
a) R-M value
b) Polensky value
c) Saponification value
d) Acid value

9.28.055 gm KOH is required for the ..... solution.?
a) 0.025 N KOH
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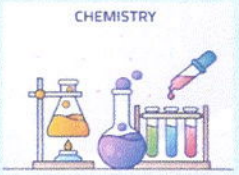
10. Iodine value shows the ..... of fatty acid in oil or fat.
a) Absorbed iodine
b) Degree of unsaturation
c) Unsaturated bonds
d) All of these

Head
Department of Chemistry
D. P. Bhosale College, Koregaon



(2020-21)
Certificate Course
(Fat and Oil Analysis)
Result Analysis

Sr.No	Roll No.	Full Name	Marks	Grade
1	4501	Anbhule Omkar Gorakhnath	14	B
2	4502	Barge Nisha Suresh	16	B+
3	4503	Bhagade Pallavi Rajendra	18	A
4	4504	Bhoite Kunal Vitthal	20	A+
5	4505	Bhosale Mahesh Ankush	18	A
6	4506	Bhosale Shivani Ramdas	20	A+
7	4507	Chavan Pratik shivaji	20	A+
8	4508	Chavan Samadhan shrikant	14	B
9	4509	Chavan Suraj Rajkumar	14	B
10	4510	Dhandare Gajanan Vitthal	14	B
11	4511	Dhane Vishal Vijay	16	B+
12	4512	Dhavale Ashwini Vaman	18	A
13	4513	Disale Rohan Ramesh	20	A+

14	4514	Gaikwad Sushan shamkant	14	B
15	4515	Gaikwad Komal Hindurao	16	B+
16	4516	Ghadge Kajal sanjay	18	A
17	4517	Gavali Shradha Arjun	20	A+
18	4518	Ghorpade Rushikesh Shrimant	14	B
19	4519	Ghorpade Suchita Pramod	16	B+
20	4520	Gurav Shital Rajendra	18	A
21	4521	Inamdar shahin husenbadsha	20	A+
22	4522	Indapure Rahul Arvind	14	B
23	4523	Jadhav Anjali Mahadev	16	B+
24	4524	Jadhav Viraj Ganesh	18	A
25	4525	Jagadale Mahesh Sopan	20	A+
26	4526	Jagtap Puja Mansing	14	B
27	4527	Jangam Shivnath Rajendra	14	B
28	4528	jare arti makarand	14	B
29	4529	Kadam Ajay Ramesh	16	B+
30	4530	Kadam Priyanka Shamrao	16	B+
31	4531	Kadam Sayali Vitthal	16	B+

32	4532	Kamble Sanket Balkrishna	18	A
33	4533	Kadam Sanket Rajendra	20	A+
34	4534	Kale swarupa Rajendra	20	A+
35	4535	Madane Maduri Tanaji	14	B
36	4536	Mane Ketan Ganpat	14	B
37	4537	Maner Tanveer Ayubkhan	14	B
38	4538	Matkar Ashitosh Pandurang	14	B
39	4539	Matkar Dinesh ashok	14	B
40	4540	More Dhanashri Vinod	14	B
41	4541	More Shivam Tanaji	14	B
42	4542	Nalawade Pranav Rajendra	16	B+
43	4543	Pawar Bhagyashree Uttam	16	B+
44	4544	Phadtare Ankita Ajit	16	B+
45	4545	Potdar Dhanshri Babasaheb	16	B+
46	4546	Pokale Anjali Prakash	16	B+
47	4547	Raut Suraj Arun	16	B+
48	4548	Raut Aakanksha Shankar	18	A
49	4549	Shedage Yogesh Vasant	18	A

50	4550	Shikalgar Iram Parvej	20	A+
51	4551	Shinde Asha Ramchandra	20	A+
52	4552	Shinde Gaurav Ramesh	18	A
53	4553	Shinde Shubham Ashok	18	A
54	4554	Shirke Neha Ashok	18	A
55	4555	Shitole Pranita Dilip	18	A
56	4556	Singh Pratik Pramod	16	B+
57	4557	Tripute Omkar Rajendra	14	B
58	4558	Ubale Omkar Kundlik	16	B+
59	4559	Veer Aishwarya Ramdas	18	A
60	4560	Yewale Mayuti Prabhakar	14	B
61	4561	Momin Asif Shabbir	16	B+
62	4562	Bandgar Tejas Vilas	18	A
63	4563	Chavan Shivraj Sanjay	20	A+
64	4564	Bhondave Vishal Rajendra	14	B
65	4565	Shirtode Mahesh Dnyanadev	16	B+
66	4566	Gaikwad Omkar Sudhakar	18	A
67	4567	Gole Prathamash Dipak	14	B

68	4568	Suryavanshi Shubham Pandurang	16	B+
69	4569	Mane Priyanka Vaman	18	A
70	4570	Mane Rohit Ratan	14	B

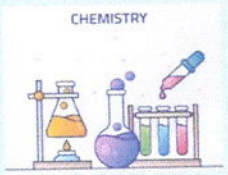
Course Co-ordinater

Head
Department of Chemistry
D. P. Bhosale College, Koregaon

Rayat Shikshan Sanstha's,

D. P. Bhosale College, Koregaon

Department of Chemistry



Fat & Oil Analysis (UG)

Report (2020-21)

Oils and fats are important parts of human diet and more than 90% of world production vegetable, animal, and marine sources is used as food or ingredient in food products. They are rich source of dietary energy and contain more calorific value which is equivalent to sugar. The analysis involves sample preparation, determination of moisture content, specific gravity determination, refractive index and determination of flash point, color, melting point, and saponification value. The sap value is number of milligrams of KOH require to saponify 1gm of oil/fat. The moisture can be determined by heating the oil & simple litmus test moisture can be analyzed.

The acid value of Oil/fat is number of mg of KOH required to neutralize free fatty acid present in 1gm of fat. It relative measure of rancidity as free fatty acids is normally formed during decomposition of triglycerides. The iodine value is nothing but the number of gms of iodine absorbed by 100gms of oil/fat When determined by Wijs solutions.

More than 60 students have been participated in the said course with actual demonstration and hands on training with proper guidance. After completion of the Course, certificates are conferred individually at the end of Course.

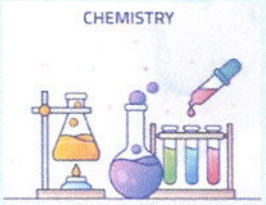
Course Coordinator

Head
Department of Chemistry
D. P. Bhosale College, Koregaon

Rayat Shikshan Sanstha's,

D. P. Bhosale College, Koregaon

Department of Chemistry



Fat and Oil Analysis - (2020-21)

Feedback

Name Of Student	Jagtaph Puja Mansing
Roll. No	4526
Mobile. No	-
Email. Id	jagtaph88@gmail.Com

Give your Valuable feedback marking the appropriate option With

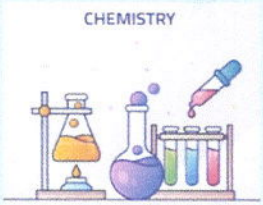
Sr. No	Course Particulars	Excellent	Good	Satisfactory	Pour
1	Transparency in conduct of the course	✓			
2	Syllabus		✓		
3	Topics Taught	✓			
4	and Overall Management	✓			
5	Overall impression	✓			

Suggestion for improving, if any

Rayat Shikshan Sanstha's,

D. P. Bhosale College, Koregaon

Department of Chemistry



Fat and Oil Analysis - (2020-21)

Feedback

Name Of Student	Dhane Vishal Vijay
Roll. No	4571
Mobile. No	-
Email. Id	Dhanevishal55@gmail.com

Give your Valuable feedback marking the appropriate option With

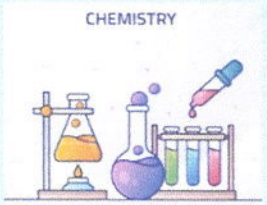
Sr. No	Course Particulars	Excellent	Good	Satisfactory	Pour
1	Transparency in conduct of the course			✓	
2	Syllabus	✓			
3	Topics Taught	✓			
4	and Overall Management	✓			
5	Overall impression	✓			

Suggestion for improving, if any

Rayat Shikshan Sanstha's,

D. P. Bhosale College, Koregaon

Department of Chemistry



Fat and Oil Analysis - (2020-21)

Feedback

Name Of Student	Kadam Priyanka Shamro
Roll. No	4530
Mobile. No	-
Email. Id	kadamshamro24@gmail.com

Give your Valuable feedback marking the appropriate option With

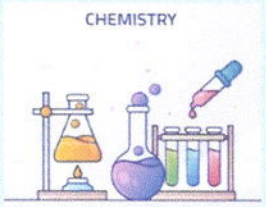
Sr. No	Course Particulars	Excellent	Good	Satisfactory	Pour
1	Transparency in conduct of the course		✓		
2	Syllabus		✓		
3	Topics Taught	✓			
4	and Overall Management	✓			
5	Overall impression	✓			

Suggestion for improving, if any

Rayat Shikshan Sanstha's,

D. P. Bhosale College, Koregaon

Department of Chemistry



Fat and Oil Analysis - (2020-21)

Feedback

Name Of Student	Gavali Shradha Arjun
Roll. No	4517
Mobile. No	-
Email. Id	gavileshradha@gmail.com.

Give your Valuable feedback marking the appropriate option With

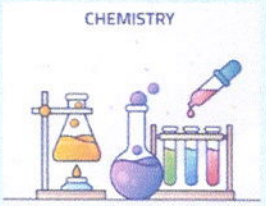
Sr. No	Course Particulars	Excellent	Good	Satisfactory	Pour
1	Transparency in conduct of the course	✓			
2	Syllabus		✓		
3	Topics Taught	✓			
4	and Overall Management	✓			
5	Overall impression	✓			

Suggestion for improving, if any

Rayat Shikshan Sanstha's,

D. P. Bhosale College, Koregaon

Department of Chemistry



Fat and Oil Analysis - (2020-21)

Feedback

Name Of Student	Anbule Omkar Gorakhanath
Roll. No	4501
Mobile. No	-
Email. Id	Anbule11@gmail.com

Give your Valuable feedback marking the appropriate option With

Sr. No	Course Particulars	Excellent	Good	Satisfactory	Pour
1	Transparency in conduct of the course	✓			
2	Syllabus		✓		
3	Topics Taught		✓		
4	and Overall Management	✓			
5	Overall impression	✓			

Suggestion for improving, if any

RAYAT SHIKSHAN SANSTHA'S

D. P. BHOSALE COLLEGE, KOREGAON

DIST-SATARA, MAHARASHTRA, INDIA-415501

DEPARTMENT OF CHEMISTRY

CERTIFICATE COURSE

Certificate

This is to certify that, Mr. Anubhule Omkar Gorakhnath Class: B.Sc. III Subject: Chemistry Successfully completed One month Certificate Course on "Fat and Oil Analysis" with B grade Organized by Department of Chemistry, in December 2020.

Mr. N. M. Gosavi	**Prof. Dr. S. D. Jadhav**	**Hon. Dr. V. S. Sawant**
Course Coordinator	**HoD Chemistry**	**Principal**

RAYAT SHIKSHAN SANSTHA'S

D. P. BHOSALE COLLEGE, KOREGAON

DIST-SATARA, MAHARASHTRA, INDIA-415501

DEPARTMENT OF CHEMISTRY

CERTIFICATE COURSE

Certificate

This is to certify that, Miss. Barge Nisha Suresh Class: B.Sc. III Subject: Chemistry Successfully completed One month Certificate Course on "Fat and Oil Analysis" with B+ grade Organized by Department of Chemistry, in December 2020.

Mr. N. M. Gosavi
Course Coordinator

Prof. Dr. S. D. Jadhav
HoD Chemistry

Hon. Dr. V. S. Sawant
Principal

RAYAT SHIKSHAN SANSTHA'S

D. P. BHOSALE COLLEGE, KOREGAON

DIST-SATARA, MAHARASHTRA, INDIA-415501

DEPARTMENT OF CHEMISTRY

CERTIFICATE COURSE

Certificate

This is to certify that, Miss. Bhagade Pallavi Rajendra Class: B.Sc. III Subject: Chemistry Successfully completed One month Certificate Course on "Fat and Oil Analysis" with A grade Organized by Department of Chemistry, in December 2020.

Mr. N. M. Gosavi
Course Coordinator

Prof. Dr. S. D. Jadhav
HoD Chemistry

Hon. Dr. V. S. Sawant
Principal

RAYAT SHIKSHAN SANSTHA'S

D. P. BHOSALE COLLEGE, KOREGAON

DIST-SATARA, MAHARASHTRA, INDIA-415501

DEPARTMENT OF CHEMISTRY

CERTIFICATE COURSE

Certificate

This is to certify that, Mr. Bhoite Krunal Vittal Class: B.Sc. III Subject: Chemistry Successfully completed One month Certificate Course on "Fat and Oil Analysis" with A+ grade Organized by Department of Chemistry, in December 2020.

Mr. N. M. Gosavi
Course Coordinator

Prof. Dr. S. D. Jadhav
HoD Chemistry

Hon. Dr. V. S. Sawant
Principal

RAYAT SHIKSHAN SANSTHA'S

D. P. BHOSALE COLLEGE, KOREGAON

DIST-SATARA, MAHARASHTRA, INDIA-415501

DEPARTMENT OF CHEMISTRY

CERTIFICATE COURSE

Certificate

This is to certify that, Mr. Bhosale Mahesh Ankush Class: B.Sc. III Subject: Chemistry Successfully completed One month Certificate Course on "Fat and Oil Analysis" with A grade Organized by Department of Chemistry, in December 2020.

Mr. N. M. Gosavi	Prof. Dr. S. D. Jadhav	Hon. Dr. V. S. Sawant
Course Coordinator	HoD Chemistry	Principal

RAYAT SHIKSHAN SANSTHA'S

D. P. BHOSALE COLLEGE, KOREGAON

DIST-SATARA, MAHARASHTRA, INDIA-415501

DEPARTMENT OF CHEMISTRY

CERTIFICATE COURSE

Certificate

This is to certify that, Mr. Anubhule Omkar Gorakhnath Class: B.Sc. III Subject: Chemistry Successfully completed One month Certificate Course on "Fat and Oil Analysis" with B grade Organized by Department of Chemistry, in December 2020.

Mr. N. M. Gosavi	Prof. Dr. S. D. Jadhav	Hon. Dr. V. S. Sawant
Course Coordinator	HoD Chemistry	Principal