

SRI LANKA STANDARD 79: 2019
UDC 664.41

SPECIFICATION FOR
EDIBLE IODIZED/NON- IODIZED SALT
(GRANULAR FORM)
(Third Revision)

SRI LANKA STANDARDS INSTITUTION

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Gr. 11

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FOREWORD

This Sri Lanka Standard was approved by the Sectoral Committee on Food products and was authorized for adoption and publication as a Sri Lanka Standard by the Council of the Sri Lanka Standards Institution on 2019-03-07.

Edible salt in granular form is a crystalline product consisting predominantly of Sodium chloride. The remainder comprises natural secondary products, which are present in varying amounts depending on the origin and the method of production of the salt, and which are composed mainly of Calcium, Potassium, Magnesium and Sodium sulphates, Carbonates, bromides and of Calcium, Potassium, Magnesium chlorides as well. Natural contaminants may also be present in amounts varying with the origin and the method of production of the salt.

Edible salt can be used as a carrier for food additives or nutrients for technological or public health reasons. Examples of such preparations are mixtures of salt with nitrite (curing salt) and salt mixed with small amounts of fluoride, iodate, iron, vitamins, etc., and additives used to carry or stabilize such additions. Edible salt is iodized to prevent iodine-deficiency disorders (IDD) for public health reasons. In Sri Lanka, edible salt has been identified as a suitable material for fortification by iodate as it is consumed in fairly uniform quantity by all categories of the population.

This Standard was first published in 1970 and subsequently revised in 1987 and 2014. In this revision, requirements for Calcium, Magnesium, Sulphates have been incorporated and limits for iodine content were changed to align with the Food (Iodization of salt) Regulation. Subject to the provisions of this Standard more specific requirements for special needs may be applied. Edible iodized salt (powdered form) is covered in **SLS 80**.

This Standard is subject to the restrictions imposed under the Sri Lanka Food Act No. 26 of 1980 and the regulations framed thereunder.

For the purpose of deciding whether a particular requirement of this Standard is complied with, the final value, observed or calculated, expressing the results of a test or an analysis, shall be rounded off in accordance with **SLS 102**. The number of significant places retained in the rounded off value should be the same as that of the specified value in this Standard.

In revising this Standard, the assistance derived from the publications of the Codex Alimentarius Commission and EU is gratefully acknowledged.

1 SCOPE

1.1 This Standard prescribes the requirements, methods of sampling and test for edible salt in granular form used as an ingredient of food, both for direct sale to the consumer and for food manufacture.

1.2 This Standard applies also to edible salt used as a carrier of food additives and/ or nutrients.

1.3 This Standard does not apply to salt from origins other than those specified in Clause 3, notably the salt which is a by-product of chemical industries.

2 REFERENCES

SLS 80 Edible iodized salt (powdered form)
SLS 102 Rules for rounding off numerical values
SLS 124 Test sieves
SLS 143 General principles of food hygiene
SLS 428 Random sampling methods
SLS 467 Labelling of prepackaged foods
Methods of Analysis of the European Salt Producers' Association (EuSalt) 2017

3 DEFINITIONS

For the purpose of this Standard, the following definitions shall apply:

3.1 edible salt: Crystalline product consisting predominantly of sodium chloride, and obtained from the sea or from natural brine

3.2 iodized edible salt: Product obtained from the sea or from natural brine and from which soluble and insoluble impurities are reduced by washing, centrifuging etc., and then iodizing with food grade potassium iodate

3.3 non-iodized edible salt: Product obtained from the sea or from natural brine and from which soluble and insoluble impurities are reduced by washing, centrifuging etc., and specifically for food manufacture /preservation which requires salt in large quantities (eg: dried/salted fish manufacture)

4 TYPES

Edible salt in granular form shall be of the following types:

4.1 Iodized salt; and

4.2 Non-iodized salt.

5 INGREDIENTS

Food grade Potassium iodate shall comply to requirements given in Food (Iodization of Salt) Regulations.

6 REQUIREMENTS

6.1 General requirements

6.1.1 The product shall be produced, processed, packaged, stored and distributed under the hygienic conditions as prescribed in **SLS 143**.

6.1.2 The product shall be crystalline solid in granular form.

6.1.3 The product shall be white or off-white in colour. It shall be free from visible impurities such as clay, grit, shells and other extraneous matter.

6.1.4 The production of iodized edible salt shall only be performed by manufacturers having the knowledge and the equipment requisite for the adequate production of iodized salt and, specifically, for the correct dosage and even for intermixing.

6.2 Particle size

The product (only iodized salt) shall pass a minimum 80 per cent by mass through a sieve of aperture size of 4.75 mm (BS 4) and a minimum of 80 per cent shall retain when it passes through a sieve of aperture size of 1.0 mm (BS 16), when tested in accordance with the method prescribed in Appendix N.

6.3 Chemical requirements

The product shall also conform to the requirements given in Table 1, when tested in accordance with the methods prescribed in Column 5 of the Table.

TABLE 1 – Chemical requirements

SI No (1)	Characteristic (2)	Requirement		Method of test (5)
		Iodized salt (3)	Non-iodized salt (4)	
i)	Moisture, per cent by mass, max.	6.0	6.0	Appendix B
ii)	Matter insoluble in water, on dry basis, per cent by mass, max.	1.0	1.0	Appendix D
iii)	Sodium chloride, as NaCl, on dry basis, per cent by mass, min.	97.0	97.0	Appendix E
iv)	Calcium as Ca, on dry basis, per cent by mass, max.	0.2	0.2	Appendix G
v)	Magnesium as Mg, on dry basis, per cent by mass, max.	0.2	0.2	Appendix G
vi)	Sulphate as SO ₄ , on dry basis, per cent by mass, max.	0.7	0.7	Appendix H
vii)	Matter soluble in water, other than sodium chloride on dry basis, max	2.0	2.0	Appendix L
viii)	Iodine content, as I, on dry basis, mg/kg.	20-40	NS	Appendix M

* NS: Not Specified

6.4 Limits for potentially toxic elements

The product shall not exceed the limits given in Table 2, when tested according to the relevant methods given in Methods of Analysis of the European Salt Producers' Association (EuSalt) 2017.

TABLE 2 – Limits for potentially toxic elements

Sl No	Potentially toxic elements	Maximum limit	Method of test
(1)	(2)	(3)	(4)
i)	Arsenic, as As mg/ kg	0.5	EuSalt/AS 011-2005 or EuSalt/ 015-2007
ii)	Cadmium, as Cd mg/ kg	0.5	EuSalt/AS 014-2005 or EuSalt/ 015-2007
iii)	Lead, as Pb mg/kg	1.0	EuSalt/AS 013-2005 or EuSalt/ 015-2007
iv)	Mercury, as Hg mg/kg	0.1	EuSalt/AS 012-2005 or EuSalt/ 015-2007

7 PACKAGING, TRANSPORTATION AND STORAGE

7.1 In order to avoid the loss of iodine, iodized salt shall be packaged in air tight food grade bags of either high density polyethylene (HDPE) or polypropylene (PP) (laminated or non-laminated) or linear low density polyethylene (LLDPE) and polyethylene terephthalate (PET) bags.

7.2 For consumer packaging iodized salt shall be packaged in food grade transparent containers/ packages. Where the packaging material is plastic the thickness of such material shall be not less than 75 micrometers.

7.3 Bulk packaging

Bulk packaging of edible salt (iodized or non-iodized) shall be packaged in HDPE, PP or polysack bags with food grade inner liner.

7.4 Salt shall not be exposed to rain, excessive humidity at any stage of storage, transportation or sale.

7.5 Salt shall be stored in covered rooms having adequate ventilation.

7.6 Iodized salt shall not be exposed to direct sunlight at any stage of storage, transportation or sale.

7.7 Bags that have already been used for packaging non-food items, such as, fertilizer, cement, chemicals, etc., shall not be reused for bulk packaging/ storage.

NOTE

For iodized salt, the distribution network shall be streamlined so as to reduce the interval between iodization and consumption of salt.

8 MARKING AND/ OR LABELLING

8.1 The following shall be marked or labelled legibly and indelibly on each package/ container:

- a) Name of the product as “Iodized edible common granular salt” or “Non-iodized edible granular salt”;
- b) Brand name or trade mark, if any;
- c) Net mass, in ‘g’ or ‘kg’;
- d) Batch or code number or a decipherable code marking;
- e) Name and address of the manufacturer/ packer and distributor;
- f) Date of packaging;
- g) Date of expiry;
- h) Instructions for storage “store in a cool and dry place, away from sunlight” in case of iodized salt “store in a cool and dry place” and in case of non-iodized salt;
- j) The words, “use without washing”(not applicable for bulk packages); and
- k) Country of origin, in case of imported products.

NOTE

(j) is not applicable for non-iodized salt.

8.2 The marking and labelling shall also be in accordance with **SLS 467**.

9 SAMPLING

Representative samples of the product for ascertaining conformity to the requirements of this Standard shall be drawn according to the method prescribed in Appendix A.

10 METHODS OF TEST

10.1 During the analysis, unless otherwise stated, use only reagents of recognized analytical grade and only distilled water for tests.

10.2 Tests shall be carried out as prescribed in Appendices **B** to **N** of this Standard and the methods given in Methods of Analysis of the European Salt Producers’ Association (EuSalt).

11 CRITERIA FOR CONFORMITY

A lot shall be declared as conforming to the requirements of this Standard if the following conditions are satisfied:

11.1 Each container/ package examined as in **A.4.1** satisfies the packaging and marking and / or labelling requirements.

11.2 Each container/ package tested as in **A.4.2** satisfies the moisture content and iodine content as given in Table 1 and also the requirements given in **6.1.2** and **6.1.3**.

11.3 The composite sample tested as in **A.4.3** satisfies all the other characteristics given in Table 1 and requirements given in **6.2** and **6.4**.

APPENDIX A SAMPLING

A.1 GENERAL REQUIREMENTS OF SAMPLING

In drawing, storing, preparing and handling test samples, the following precautions shall be observed.

A.1.1 Samples shall not be taken at an exposed place.

A.1.2 Precautions shall be taken to protect the sample, the sampling instrument and the containers for samples from adventitious contamination.

A.1.3 To draw a representative sample, the contents of each container/package selected for sampling shall be mixed thoroughly by a suitable means.

A.1.4 The sample shall be placed in suitable, clean, dry and air-tight glass containers.

A.1.5 Each sample container shall be sealed air-tight after filling and marked with full details of sampling.

A.2 SCALE OF SAMPLING

A.2.1 Lot

All the packages/containers in a single consignment of edible salt drawn from a single batch of manufacture shall constitute a lot. If the consignment consists of different batches, the batches shall be marked separately and the packages/ containers in each batch shall constitute separate lots.

A.2.1.1 The number of packages/containers to be selected from each lot shall be in accordance with Table 3.

TABLE 3 – Scale of sampling

No. of packages/containers in the lot	No. of packages/containers to be selected
(1)	(2)
Up to 150	4
151 to 300	7
301 to 500	10
501 and above	16

A.2.1.2 These packages/containers shall be selected at random from the lot and to ensure randomness of selection, tables of random numbers as given in **SLS 428** shall be used.

A.3 PREPARATION OF TEST SAMPLES

A.3.1 From each of the packages/containers selected in accordance with **A.2.1.1**, a portion of the material (about 200 g) shall be drawn with the help of a suitable sampling instrument.

A.3.2 Out of these portions, equal quantities of the material shall be taken and mixed thoroughly to form a composite sample of about 600 g.

A.3.3 All the individual samples and the composite sample shall be transferred to separate sample containers. All the containers shall be sealed and labelled with full identification particulars.

A.4 NUMBER OF TESTS

A.4.1 Each package/container selected as in **A.2.1.1** shall be examined for packaging and marking and /or labelling requirements.

A.4.2 Each sample obtained as in **A.3.1** shall be tested for moisture content and iodine content, as given in Table 1 and also shall be examined for the requirements given in **6.1.2** and **6.1.3**.

A.4.3 The composite sample prepared as in **A.3.2** shall be tested for all other characteristics given in Table 1 and for the requirements given in **6.2** and **6.4**.

APPENDIX B DETERMINATION OF MOISTURE

B.1 PROCEDURE

B.1.1 Grind rapidly, where relevant, about 250 g of the sample in a mortar, to a powder. Keep in an air-tight container.

B.1.2 Weigh, to the nearest 0.001 g, approximately 10 g of the material in a previously dried and weighed weighing bottle (about 30 ml capacity and preferably wide mouth squat type. Dry in an oven at 140 °C to 150 °C for at least 4 hours. Cool in a desiccator and weigh. Repeat drying, cooling and weighing procedures until the difference between two successive weighings does not exceed 0.001 g.

B.2 CALCULATION

$$\text{Moisture, per cent by mass} = \frac{m_1 - m_2}{m_1} \times 100$$

where,

m_1 is the initial mass, in g, of the sample taken for the test; and
 m_2 is the final mass, in g, of the sample.

APPENDIX C PREPARATION OF THE DRIED SAMPLE

Spread about 200 g of the sample obtained as in **B.1.1** on a petri dish and dry by the method given in **B.1.2**. The dried material shall be referred to as the dried sample and shall be used in the tests where so indicated.

APPENDIX D DETERMINATION OF MATTER INSOLUBLE IN WATER

D.1 PROCEDURE

D.1.1 Weigh, to the nearest 0.001 g, approximately 20 g of the dried sample (*see* Appendix C), dissolve it in 200 ml of water and heat to boiling. Cool and filter the solution through a weighed sintered glass crucible (G. No. 4). Wash the residue with water until the washings do not give any opalescence when tested with Silver nitrate solution. Collect the filtrate and washings in a one-litre graduated flask and dilute to the mark. Reserve the solution so obtained for subsequent tests.

D.1.2 Dry the crucible along with the residue at 105 °C to 110 °C for 1 hour and weigh. Repeat drying and weighing procedures until the difference between two successive weighings does not exceed 0.001 g.

D.2 CALCULATION

$$\text{Matter insoluble in water, per cent by mass} = \frac{m_1}{m_2} \times 100$$

where,

m_1 is the mass, in g, of the residue; and

m_2 is the mass, in g, of the dried sample taken for the test.

APPENDIX E DETERMINATION OF SODIUM CHLORIDE

E.1 DETERMINATION OF ANIONS AND CATIONS TO CALCULATE SODIUM CHLORIDE

Determine the anions and cations given in Column 2 of Table 4, by the methods prescribed in Column 3 of the table.

Table 4 – Anions and cations

Sl No (1)	Anion or cation (2)	Method of test (3)
i)	Carbonate, as CO ₃	Appendix F
ii)	Calcium, as Ca	Appendix G
iii)	Magnesium, as Mg	Appendix G
iv)	Sulphate, as SO ₄	Appendix H
v)	Total chloride, as Cl	Appendix J
vi)	Potassium, as K	Appendix K

E.2 CALCULATION OF RESIDUAL CHLORIDE

Express the carbonate as Calcium carbonate or as Sodium carbonate in absence of Calcium and Magnesium. If there is excess of calcium over the Calcium carbonate, combine all the Calcium with the Sulphate and express the result as percentage of Calcium sulphate. If there is excess of Sulphate over what is required for Calcium, combine the excess with magnesium and express the result as percentage of Magnesium sulphate. If there is excess of Calcium over the Calcium sulphate, express it as percentage of Calcium chloride and deduct the Chloride corresponding to it from the total Chloride content. Calculate the balance of Magnesium as Magnesium chloride and deduct the Chloride corresponding to it from the Chloride content. Also, deduct from the Chloride content, and amount of Chloride corresponding to Potassium content and express it as percentage of Potassium chloride. The remaining Chloride content is referred to as residual Chloride.

E.3 CALCULATION OF SODIUM CHLORIDE

Sodium chloride, as NaCl, per cent by mass = Residual chloride, as *Cl* × 1.648

APPENDIX F
DETERMINATION OF CARBONATE

F.1 REAGENTS

F.1.1 Hydrochloric acid, standard volumetric solution, *c* (HCl) = 0.1 mol/l

F.1.2 Methyl orange indicator solution

Dissolve 0.1 g of methyl orange in 100 ml of water.

F.2 PROCEDURE

Pipette out 100 ml of the solution reserved in **D.1.1** and titrate against standard Hydrochloric acid (**F.1.1**) using methyl orange (**F.1.2**) as indicator.

F.3 CALCULATION

$$\text{Carbonate, as CO}_3, \text{ per cent by mass} = \frac{M \times V \times 30}{m}$$

where,

M is the strength, in mol/l, of standard hydrochloric acid used in the titration;
V is the volume, in ml, of standard hydrochloric acid used in the titration; and
m is the mass, in g, of the dried sample taken for the test in **D.1.1**.

APPENDIX G DETERMINATION OF CALCIUM AND MAGNESIUM

G.1 REAGENTS

G.1.1 Standard Calcium solution

Weigh, 1.000 g of calcium carbonate dried at 120 °C and dissolve it in the minimum quantity of dilute Hydrochloric acid. Dilute the solution to one litre in a graduated flask. One milliliter of this solution is equivalent to 0.401 mg of Calcium.

G.1.2 Ammonium chloride – Ammonium hydroxide buffer solution

Dissolve 67.5 g of Ammonium chloride in a mixture of 570 ml Ammonium hydroxide (rel. den. = 0.90) and 250 ml of water. Also dissolve separately a mixture of 0.931 g of Disodium ethylene diamine tetra acetate dihydrate and 0.616 g of Magnesium sulfate (MgSO₄.7H₂O) in about 50 ml of water. Mix the two solutions and dilute to one litre.

NOTE

Five milliliters of buffer solution added to 50 ml of distilled water shall not consume more than a drop of EDTA solution to change to distinct blue with eriochrome black T indicator.

G.1.3 Eriochrome black T indicator solution

Dissolve 0.1 g of the dye in 20 ml of rectified spirit. This solution shall be prepared fresh every week.

G.1.4 Standard EDTA solution

Dissolve 3.72 g of Disodium ethylene diamine tetra acetate dihydrate in water and dilute in a graduated flask to one litre. The solution shall be standardized frequently against standard Calcium solution following the procedure given in **G.2**

G.1.5 Dilute Sodium hydroxide, approximately 10 per cent (V/V) solution

G.1.6 Murexide indicator solution

Grind 0.2 g of murexide with 10 g of Sodium chloride until the mixture is homogeneous. Thus 0.2 g of the mixture is suitable for 100 ml of the sample solution.

G.1.7 Calcein indicator

Grind thoroughly 0.1 g of calcein and 0.06 g of thymolphthalein with 10 g of Potassium chloride.

G.2 PROCEDURE

G.2.1 Standardization of EDTA solution

G.2.1.1 Transfer 25 ml of standard Calcium solution (**G.1.1**) into a conical flask, add 25 ml of water, 10 ml of Ammonium chloride-ammonium hydroxide buffer solution (**G.1.2**), 5 drops of erichrome black T indicator solution (**G.1.3**) and titrate against the standard EDTA solution (**G.1.4**) to a pure blue end point.

G.2.1.2 Titrate 25 ml of the buffer solution (**G.1.2**) with EDTA solution (**G.1.4**) using erichrome black T indicator (**G.1.3**). Subtract the buffer correction for 10 ml (usually it will be 0.1 ml) from the reading obtained in (**G.2.1.1**) and note the final titre value. Calculate the Calcium equivalent to 1 ml of EDTA solution (say m_1).

G.2.2 Determination of Calcium and Magnesium

G.2.2.1 Transfer 100 ml of the solution reserved in **D.1.1** into a 250-ml conical flask, add 10 ml of Ammonium chloride-ammonium hydroxide buffer solution (**G.1.2**), and 5 drops of eriochrome black T indicator solution (**G.1.3**). Titrate against standard EDTA solution (**G.1.4**) till wine red colour of the solution changes to pure blue end point. Note the volume of the EDTA solution used in the titration.

G.2.2.2 Transfer 100 ml of the solution reserved in **D.1.1** into a 250-ml conical flask, add 5 ml of Sodium hydroxide solution (**G.1.5**) and stir well. Add 0.2 g of murexide indicator (**G.1.6**) or 100 mg of calcein indicator (**G.1.7**) (*see* Note) and titrate against standard EDTA solution (**G.1.4**) till wine red colour of the solution changes to pure blue end point with murexide or green to purple with calcein indicator. Note the volume of the EDTA solution used in the titration.

NOTE

Patton and Reader's indicator may also be used in place of murexide indicator or mixed calcein indicator.

G.3 CALCULATION

$$\text{Calcium, as Ca, per cent by mass} = \frac{m_1 V_2}{2}$$

$$\text{Magnesium, as Mg, per cent by mass} = 0.6068 \times \frac{m_1 (V_1 - V_2)}{m_2}$$

where,

m_1 is the mass, in mg, of calcium equivalent to 1 ml of EDTA solution (as determined in **G.2.1**);

V_1 is the volume, in ml, of standard EDTA solution used in **G.2.2.1**;

V_2 is the volume, in ml, of standard EDTA solution used in **G.2.2.2**; and

m_2 is the mass, in g, of the dried sample taken for the test in **D.1.1**.

APPENDIX H DETERMINATION OF SULPHATE

H.1 REAGENTS

H.1.1 Standard Barium chloride, 0.025 mol/l solution

Dissolve 6.108 g of Barium chloride dihydrate in water and make up to one litre.

H.1.2 Dilute hydrochloric acid, approximately 1 mol/l solution

H.1.3 Ammonium chloride – ammonium hydroxide buffer solution, same as in **(G.1.2)**

H.1.4 Eriochrome black T indicator solution, same as in **G.1.3**

H.1.5 Standard EDTA solution

Weigh 3.72 g of Disodium ethylene diamine tetra acetate dihydrate in water and dilute in a graduated flask to one litre. The solution shall be standardized for frequently against standard Barium chloride solution (**H.1.1**) and follow the procedure given in **(G.2.2)**. One millilitre of standard EDTA solution is equivalent 0.001374 g of barium or 0.00096 g of sulfate.

H.2 PROCEDURE

H.2.1 Pipette out 20 ml of standard Barium chloride solution (**H.1.1**) into a conical flask, add 2 drops of Hydrochloric acid (**H.1.2**) and 10 ml of Ammonium chloride – ammonium hydroxide buffer solution (**H.1.3**). Dilute with water to about 50 ml, add five drops of eriochrome black T indicator solution (**H.1.4**) and titrate against standard EDTA solution (**H.1.5**) to pure blue end point. Note the volume of the EDTA solution used in the titration.

H.2.2 Pipette out 100 ml of the solution reserved in **D.1.1** and add two drops of Hydrochloric acid (**H.1.2**) and heat to gentle boiling. To the hot solution, add with a pipette 20 ml of

standard Barium chloride solution (**H.1.1**). Boil gently for about 5 minutes and then cool to room temperature. The solution will be neutral or slightly acid when tested with a litmus paper. Add 10 ml of Ammonium chloride – ammonium hydroxide buffer solution (**H.1.3**) and five drops of eriochrome black T indicator solution (**H.1.4**). Titrate against standard EDTA solution to pure blue end point. Note the volume of the EDTA solution used in the titration.

H.3 CALCULATION

$$\text{Sulphate, as SO}_4, \text{ per cent by mass} = 0.96 \frac{V_1 + V_2 - V_3}{m}$$

where,

- V_1 is the volume, in ml, of standard EDTA solution used in **H.2.1**;
 V_2 is the volume, in ml, of standard EDTA solution used in **G.2.2.1** (total Ca and Mg);
 V_3 is the volume in ml, of standard EDTA solution used in **H.2.2**; and
 m is the mass, in g, of the dried sample taken for the test in **D.1.1**.

APPENDIX J DETERMINATION OF TOTAL CHLORIDE

J.1 REAGENTS

J.1.1 Potassium chromate indicator, 5 per cent (m/V) solution

J.1.2 Silver nitrate, standard volumetric solution $c(\text{AgNO}_3) = 0.1 \text{ mol/l}$

J.2 PROCEDURE

Transfer 5 ml of the solution reserved in **D.1.1** into a conical flask and add 1 ml of Potassium chromate indicator solution (**J.1.1**). Titrate against standard Silver nitrate solution (**J.1.2**) until the reddish brown tinge persists after brisk shaking. Carry out a blank determination.

J.3 CALCULATION

$$\text{Total chloride, as Cl, per cent by mass} = 709.2 \frac{V \times c}{m}$$

where,

- V is the volume, in ml, of standard silver nitrate solution used in the titration, corrected to blank;
 c is the concentration, in mol/l, of standard silver nitrate solution used; and
 m is the mass, in g, of the dried sample taken for the test in **D.1.1**.

APPENDIX K DETERMINATION OF POTASSIUM

K.1 APPARATUS

K.1.1 Simple flame photometer, equipped with potassium filter corresponding to wave length of 767 nm

K.1.2 Ordinary laboratory apparatus

K.2 REAGENTS

K.2.1 Standard Potassium solution

Weigh 1.0 g of Potassium chloride, dissolve in distilled water and dilute to one litre with distilled water in a measuring flask. This solution contains 0.1 g of Potassium chloride per 100 ml.

K.2.2 Standard dilute potassium solutions

Dilute 10 ml, 20 ml, 40 ml, 60 ml and 80 ml of standard Potassium solution (**K.2.1**) to 100 ml with distilled water in different measuring flasks. Each flask now contains 0.01 g, 0.02 g, 0.04 g, 0.06 g and 0.08 g of Potassium chloride per 100 ml.

K.2.3 Sample solution

Dissolve approximately 10 g of the dried sample (*see* Appendix C) in minimum quantity of distilled water and dilute to 100 ml in a measuring flask with distilled water.

K.3 PROCEDURE

Adjust the galvanometer to read zero by distilled water and 100 by standard Potassium solution (**K.2.1**). Spray various diluted solutions (**K.2.2**) and obtain the corresponding galvanometer readings. Plot the concentrations against galvanometer readings. Draw smooth curve over the points which give a calibration curve in the range of 0.01 g of Potassium chloride per 100 ml to 0.1 g of Potassium chloride per 100 ml.

After washing with distilled water, spray the sample solution (**K.2.3**) and obtain the galvanometer reading. From the graph read out the corresponding concentration of Potassium chloride in the solution.

K.4 CALCULATION

$$\text{Potassium, as K, per cent by mass} = 52.4 \times \frac{m_1}{m_2}$$

where,

m_1 is the mass, in g, of Potassium chloride in the sample solution; and
 m_2 is the mass, in g, of the dried sample taken for the test.

**APPENDIX L
CALCULATION OF MATTER SOLUBLE IN WATER OTHER THAN SODIUM
CHLORIDE**

Matter soluble in water, other than sodium chloride, per cent by mass = $100 - (m_1 + m_2)$

where,

m_1 is the matter insoluble in water, calculated as in **D.2**; and

m_2 is the sodium chloride content; calculated as in **E.3**

**APPENDIX M
DETERMINATION OF IODINE**

M.1 REAGENTS AND MATERIALS

M.1.1 Methyl orange indicator solution

Dissolve 0.01 g of methyl orange in water and dilute to 100 ml

M.1.2 Phosphoric acid, analytical reagent grade, approximately 85 per cent (V/V) solution

M.1.3 Bromine water, saturated aqueous solution

Determine the approximate concentrate (milligram of bromine per millilitre) by adding from a burette a measured volume to a flask containing 5 ml of 10 per cent (V/V) solution of Potassium iodide and 5 ml of dilute Sulphuric acid and titrating the liberated iodine with 0.1 mol/l solution of Sodium thiosulphate. One millilitre of 0.2 mol/l solution of Sodium thiosulphate is equivalent to 8 mg of Bromine or 12.7 mg of iodine.

M.1.4 Salicylic acid

M.1.5 Potassium iodide

M.1.6 Sodium thiosulphate, standard volumetric solution - $c(\text{Na}_2\text{S}_2\text{O}_3) = 0.005 \text{ mol/l}$

Prepare 0.1 mol/l solution by dissolving 25 g of analytical reagent grade Sodium thiosulphate in 1000 ml of water. Dilute 50 ml of this solution to 1000 ml.

NOTE

Sodium thiosulphate solution should be standardized.

M.1.7 Starch solution, freshly prepared 1 per cent (m/V) solution

M.1.8 Sodium chloride analytical reagent

M.1.9 Potassium iodate

M.1.10 Sulfuric acid, approximately 1 mol/l

M.2 QUALITATIVE TEST FOR IODATE**M.2.1 Procedure**

M.2.2 Transfer about 2 g of salt to a test tube and dissolve in 10 ml distilled water.

M.2.3 Add about 1 ml of 10 per cent KI solution and 2 ml of 1 M Sulphuric acid and few milliliter of starch solution.

M.2.4 If iodate is present the solution turns blue due to the liberation of iodine.

M.2.5 Estimate the amount of iodate as given in Procedure **M.3**

M.2.6 If there is no blue colour, there is no iodate in the salt. The salt may have iodide or may not be iodized.

M.2.7 To check for the presence of iodide

M.2.8 Transfer about 2 g of salt to a test tube and dissolve in 10 ml distilled water.

M.2.9 Add about 1 ml of 10 per cent KIO_3 solution, 2 ml Sulphuric acid and few milliliter of starch solution.

M.2.10 If iodide is present the solution turns blue due to the liberation of iodine.

M.2.11 If there is no blue colour, there is no iodide in the salt. The salt may have iodate or may not be iodized.

M.2.12 If there is no blue colour by both tests then the salt does not have iodide or iodate.

NOTE

These qualitative tests must be carried before an opinion is expressed.

M.3 PROCEDURE (If iodine is added as IODATE)

M.3.1 Weigh 10 g salt accurately and dissolve in 100 ml distilled water in a 250 ml conical flask which can be stoppered.

M.3.2 Add 2 ml of 1 mol/l sulfuric acid to the solution. Add 5 ml 10 per cent (m/V) Potassium iodide and stopper immediately. Shake it well and keep in dark for 5 minutes.

M.3.3 Titrate this solution with a standard Sodium thiosulphate solution 0.005 mol/ l, to a light straw colour and add 2 ml of 1 per cent starch solution and continue titration to a colourless end point.

M.3.4 Carry-out a blank test using 10 g of analytical grade Sodium chloride.

M.4 CALCULATION

$$\text{Iodine, as I, mg/kg} = 21150 \frac{(V_1 - V_2) \times C}{m}$$

where,

- V_1 is the volume in ml of standard sodium thiosulphate solution required for the sample;
- V_2 is the volume in ml of standard sodium thiosulphate requirement for blank determination;
- C is the concentration in mol/l of the sodium thiosulphate solution; and
- m is the mass in g, of the sample taken (dry basis).

**APPENDIX N
DETERMINATION OF PARTICLE SIZE**

N.1 APPARATUS

N.1.1 Sieve, 4.75 mm (4750 µm), conforming to SLS 124

N.1.2 Balance, with accuracy 0.01 g

N.2 PROCEDURE

Weigh, to the nearest 0.1 g, about 100 g of sample into the sieve. Sieve for a minimum period of 5 min with occasional tapping on the sieve until all the sieveable particles are passed through the sieve. Transfer the material retained on the sieve quantitatively into a tared dish and weigh.

N.3 CALCULATION

$$\text{Material passed through the sieve, per cent by mass} = 100 - \left[\frac{m_2}{m_1} \times 100 \right]$$

where,

- m_1 is the mass, in g, of the test portion; and
- m_2 is the mass, in g, of the material retained on the sieve.

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