

# **ST.VINCENT AND THE GRENADINES NATIONAL STANDARD**

**SPECIFICATION FOR WHEAT FLOUR**  
**SVGNS 13: 2002**  
**(CCS 24: 1992 / ICS 67.060)**  
**(AN ADOPTION OF A CARICOM STANDARD)**



**ST.VINCENT AND THE GRENADINES BUREAU OF STANDARDS**

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**SPECIFICATION FOR WHEAT FLOUR**

**SVGNS 2: 2001**

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**GRADE: II**

## GENERAL STATEMENT

The St. Vincent and the Grenadines Bureau of Standards (SVGBS) was established under the Standards Act No. 70 of 1992 (amended by Act No. 28 of 2010 as a corporate body, but is presently under the aegis of Ministry of Industry, Telecommunications, Science and Technology.

The SVGBS has statutory responsibilities for the quality of goods and services subject to trade in St. Vincent and the Grenadines (SVG), and is the only National Body charged with the responsibility of declaring National Standards

A National Standards Council (NSC) appointed by Cabinet administrates the General Affairs of the Bureau. The members on this Council are selected from the public and private sector with interest, qualifications and experience in fields relating to standards. The NSC is the main policy organ and the regulator of the SVGBS. Its principal responsibility is to determine and approve policy guidelines to ensure that the standardisation activities pursued by the Bureau play a vital part in the development of the national economy.

The primary functions of the Bureau are to promote and encourage the maintenance of standards, to improve the quality and performance of goods, processes, practices and services produced and or used in the state of St.Vincent and the Grenadines, to ensure industrial efficiency, to assist in industrial development and to promote public and industrial welfare, health and safety, and also to safeguard against negative effects to the environment.

**NOTE: In order to keep abreast of progress in the industries concerned, St.Vincent and the Grenadines National Standards are subject to periodic review. Suggestions for improvements are welcomed.**

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## SPECIFICATION FOR WHEAT FLOUR

### SVGNS 13: 2002

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#### **0.0 NATIONAL FOREWORD**

- 0.1.1** This CARICOM Standard was adopted and declared for use as an approved St.Vincent and the Grenadines National Standard by the National Standards Council on the 29<sup>th</sup> May 2002.
- 0.1.2** This standard is identical to the Caribbean Community Standard – Specification for Wheat Four, from which it was adopted.
- 0.1.3** The St.Vincent and the Grenadines Bureau of Standards has recommended that this standard be declared a compulsory standard so as to prevent fraud or deception arising from misleading advertising or labelling and to provide adequate information to the purchaser or consumer.
- 0.1.4** This standard will be effective as a compulsory standard on a date to be notified by the Minister responsible for the St.Vincent and the Grenadines Bureau of Standards in a Notice to be published in the St.Vincent and the Grenadines Gazette as required by the Standards Act No 70 of 1992.

## 0.2 FOREWORD

- 0.2.1** This standard has been prepared through the Caribbean Common Market Standards Council (CCMSC)\* to set a level of quality for wheat flour manufactured and traded within the Caribbean Community. It was accepted by the CCMSC in June 1992, after the consideration of comments received on a draft circulated between November 1990 and June 1992, and approved by Council of Ministers in June 1992 for use as a mandatory standard.
- 0.2.2** Wheat flour that conforms to this standard and which is made under an approved system of quality assurance may be identified by the Caricom Standard Mark, which is administered by CCMSC. This programme is supported by the Caricom Export Development Project.
- 0.2.3** This standard sets out the requirements for wheat flour, and describes the methods of sampling and testing that should be used. Wheat flour is now manufactured in several competing with imports from other countries. As wheat flour is an important nutritional input in domestic cookery, and in industrial or commercial baking, an agreed and acceptable level of identity, purity, quality, acceptability, and nutrient value is desirable so that flour from the regional sources can move freely within the Community.
- 0.2.4** In preparing this standard, guidance was derived from the following:
- (a) Codex Standard for Wheat Flour (Worldwide Standard), CODEX STAN 152-1985, FAO/WHO Codex Alimentarius Commission, Rome, Italy;
  - (b) Standard for Flours, Wheaten, CGSB 32-GP-5M, (1978), Canadian General Standards Boards, Ottawa, Canada;
  - (c) Food and Drugs Regulations, Canada, B 13.001-002, dated 9 March 1989;
  - (d) Food and Drugs Regulations, Trinidad and Tobago, Division 12, 1980.
- 0.2.5** This standard will be reviewed, and may be revised from time to time to allow for changes in manufacturing technology or consumer preferences in the Caribbean Community.
- 0.2.5** In view of recent decisions in the FAO/WHO Codex Alimentarius/World Food Standards Programme, the use of potassium bromate as a food additive in wheat flour is not permitted by this standard.

**Note\*:** The CCMSC has been replaced by the CARICOM Regional Organization for Standards and Quality (CROSQ) as of June 2002.

## 1.0 SCOPE

1.1 This standard applies to wheat flour (also called flour, white flour, or enriched flour) that is intended for human consumption, made from clean, sound and marketable grades of millable wheat grains of the species *Triticum aestivum* L. (common wheat) or from *Triticum compactum* Host, (club wheat).

1.2 It does not apply to:

- (a) any product made from durum wheat (hard wheat, *T. durum* Desf.);
- (b) whole wheat flour, whole meal flour or semolina made from common wheat or club wheat, or mixtures thereof;
- (c) wheat flour to be used in brewing, for the production of starch or gluten, or for non-food use;
- (d) wheat flour in which the protein content has been reduced;
- (e) wheat flour subjected to special treatments other than bleaching or drying; or
- (f) wheat flour containing ingredients not mentioned in Section 4.2 (such as self-raising flour).

## 2.0 DEFINITIONS

For the purpose of this standard the following definitions apply:

2.1 **Wheat flour** is the product prepared from grains of common wheat (*Triticum aestivum* L.) or club wheat (*T. compactum* Host,) or mixtures of these two species by grinding or milling processes in which the bran and germ are partly removed and the rest of the grain is comminuted to a suitable degree of fineness and which may contain any of the ingredients and food additives listed in Sections 4.2, 4.3, and 5.0.

2.2 **Enriched wheat flour** is wheat flour containing vitamins, and iron, in the proportions specified in Table 2. In Members States where there is a significant nutritional deficiency of calcium, calcium may be added within the limits specified in Table 2.

2.3 **Food Additive** means any substance, the use of which results in it or its by-products becoming a part of, or affecting the characteristics of the flour.

2.4 **Type** means a description of the end use for which it is recommended, such as "bread" "cake", "pastry", "cookie", "biscuit", "general purpose", or "all purpose".

**3.0 GENERAL REQUIREMENTS**

- 3.1 The wheat from which the flour is milled shall be of sound and marketable quality and, as far as is possible in good manufacturing practice, free from any objectionable matter.
- 3.2 Any added ingredients shall be clean, safe and of grades of identity and quality that are recognised as suitable for use in foods.
- 3.3 Food additives shall conform to recognised specifications of identity, purity, and safety, such as those issued by the FAO/WHO Joint expert Committee on Food Additives.
- 3.4 All processing in the mill, including drying, and milling of the wheat, handling of the intermediate products, and other treatments of the wheat flour, shall be done so that there are minimal adverse effects on the nutritive value and useful technological characteristics of the flour.
- 3.5 As far as is possible in good manufacturing practice, wheat flour shall be free from any objectionable matter, micro-organisms and substances originating from micro-organisms, in amounts that may reasonably be considered to represent a hazard to health.
- 3.6 The particle size of wheat flour should be such that not less than 98% by mass of the flour will pass a **212 milli-micron (No 70) sieve**.

**4.0 SPECIFIC REQUIREMENTS**

- 4.1 Wheat flour shall conform to the requirements of column 2 of Table 1 when tested for the characteristics in column 1 by the methods indicated in column 3.

**TABLE 1  
(Section 4.1)**

<b>Column (1)</b>	<b>Column (2)</b>	<b>Column (3)</b>
<b>Characteristic</b>	<b>Requirement</b>	<b>Method of test</b>
Moisture	Not more than 15%	Appendix A
Ash, before adding Inorganic matter	Not more than 1.2%	Appendix B
Protein (N x 5.7)	Not less than 7.0% on a dry basis	Appendix C

**4.2 Requirements for Nutrients and Minerals**

The vitamins and minerals mentioned in Column 1 of Table 2 shall be present in wheat flour within the limits specified in Column 2.

**TABLE 2**  
**(Section 4.2)**

<b>Column (1)</b>	<b>Column (2)</b>
<b>Substance</b>	<b>Requirements</b>
Thiamine	Not less than 0.44mg and not more than 0.77mg/100g;
Riboflavin	Not less than 0.27mg and not more than 0.48mg/100g;
Niacin, Niacinamide	Not less than 3.5mg and not more than 6.5mg/100g;
Iron	Not less than 2.9mg/100g not more than 4.6mg/100g;
Calcium (optional)	Not less than 110mg and not more than 140mg/10g.

**4.3** Wheat flour may contain the following ingredients in amounts necessary for technological purposes;

- (a) malted wheat flour;
- (b) malted barley flour;
- (c) malted rye flour;
- (d) wheat gluten;
- (e) the following enzymes;
  - (i) amylase;
  - (ii) bromelain;
  - (iii) glucoamylase;
  - (iv) lactase;
  - (v) lipoxidase
  - (vi) protease.

- (f) L-cysteine, as hydrochloride, not more than 90 ppm;
- (g) calcium carbonate, calcium sulphate, edible bone meal, ground limestone, ground chalk, in amounts needed to conform to the requirements of Table 2 for calcium (if added);
- (h) ascorbic acid, not more than 200 ppm;
- (i) monocalcium phosphate, not more than 2500 ppm.

## 5.0 FOOD ADDITIVES WHICH MAY BE USED

5.1 The following food additives may be used in wheat flour, within the limits specified, or, where no limits are stated, in accordance with good manufacturing practices:

- (a) acetone peroxide;
- (b) ammonium chloride, not more than 2000 ppm;
- (c) ammonium persulphate, not more than 250 ppm;
- (d) benzoyl peroxide, not more than 150 ppm combined with not more than 900 ppm of one or more of the following as carriers:-
  - calcium carbonate, calcium sulphate,
  - dicalcium or tricalcium phosphate,
  - magnesium carbonate, starch,
  - potassium or sodium aluminum sulphate;
- (e) chlorine;
- (f) chlorine dioxide;
- (g) lecithin, not more than 2000 ppm;
- (h) sulphur dioxide (in flours intended for use in making biscuits or pastry), not more than 200 ppm.
- (i) azodicarbonamide, not more than 45 ppm.

## 6.0 CONTAMINANTS

6.1 Wheat flour shall not contain elements mentioned in column 1 below in amounts exceeding the limits specified in column 2:

<u>Column (1)</u>	<u>Column (2)</u>
Arsenic (As)	1 ppm;
Copper (Cu)	20 ppm;
Lead (Pb)	2 ppm;
Zinc (Zn)	50 ppm.

- 6.2 Where wheat grain used in the production of wheat flour is fumigated to destroy or control infestations by insects, mites, moulds, or rodents, the residues of pesticides in the flour shall not exceed those set by the Codex Committee on Pesticide Residues.

## 7.0 HYGIENE

- 7.1 Flour shall be manufactured, packaged, transported and stored in accordance with codes of hygienic practice that are approved by the competent authority.
- 7.2 Particular attention shall be given to the prevention of contamination of the wheat and other ingredients, materials in process, equipment, or packaging materials by dirt, moulds, birds, insects, mites, and other vermin.
- 7.3 Proper housekeeping and sanitation practices shall be followed in the storage, milling, packaging, and warehousing sections of the plant.
- 7.4 The employees shall be trained to follow proper sanitation practices and to maintain their personal cleanliness, and shall be provided with the appropriate clothing, toilet, first aid, changing and other facilities that are necessary.

## 8.0 PACKAGING REQUIREMENTS

- 8.1 Wheat flour shall be packaged in containers which will safeguard the hygienic, nutritional, and technological characteristics of the flour, and protect it against contamination or absorption of moisture.
- 8.2 Containers shall be made of materials which are safe and suitable for the purpose, such as bags or sacks of new cotton, multi-wall paper, strong paper, polypropylene fibre, or plastic film.
- 8.3 Containers shall not contaminate the product by migration of any toxic substance, or give the flour any undesirable odour or flavour.

## 9.0 LABELLING REQUIREMENTS

- 9.1 The labelling on retail packages of flour shall be in the English language, clearly and prominently displayed, and readily legible under customary conditions of purchase and use. Information presented in other languages shall be clearly separated from that in English.

The information carried on the label shall include:

- (a) the name of the food, "flour", "wheat flour" or "white flour";
- (b) any brand name or trade name;
- (c) the name of the manufacturer or of the person controlling the brand name or trade name, together with an adequate postal address;
- (d) the name of the country of origin;
- (e) the average net contents of each package when packed in terms of units of mass in grams (g) or kilograms (kg), (which may also be shown in avoirdupois pounds and ounces) using Arabic numerals;
- (f) where the vitamins and minerals mentioned in Table 2 are present in the flour, the amount of each present in 100g of flour (at 15% moisture content) shall be declared, expressed in milligrams (mg), and the flour may be described as "enriched", or "vitamin enriched", and as "calcium enriched" if the level calcium is in accordance with Table 2 and represents 16.6 per cent of the Recommended Daily Allowance, (RDA) set by the Caribbean Food and Nutrition Institute (CFNI).
- (g) a list of ingredients in descending order of their proportion by weight; the food additives mentioned in Section 5.0 may be described as bleaching agents, or as flour improvers.
- (h) The batch number, date of manufacture or date of packaging, declared in code or uncoded, together with a date of minimum durability (expressed as "Best before end 2003-12" or "Use before end 2003-12")

**NOTE:** The date marking should be written in sequence (ISO convention) year, month and day, eg: 2002-05-09, (meaning, 9<sup>th</sup> of May 2002).

**NOTE:** Labelling requirements shall confirm to the St.Vincent and the Grenadines National Standard on the Labelling of Prepackaged Foods.

- (i) Storage instructions, in close proximity to the date marking.

**9.3** Where an indication of the type of flour is included on the label, the protein and ash contents of the flour shall be within the limits set out in **Table 3**.

TABLE 3

<u>Type of Flour</u>	<u>Protein Content</u>	<u>Ash Content</u>
All purpose, ( ) General Purpose)	10.5 to 12.0 %	up to 0.5 %
Biscuit	8.0 to 9.0 %	up to 0.45 %
Bread	12.0 to 13.5 %	up to 0.6 %
Cake, Pastry	7.0 to 10.0 %	up to 0.45 %

9.4 Instructions for use may also be included on the label.

## 10.0 QUALITY ASSURANCE

10.1 To be eligible for a licence to use the Caricom Standard mark and/or The St.Vincent and the Grenadines Bureau of Standards Standard Mark the manufacturer of wheat flour shall operate a quality assurance system conformity to the general requirements of ISO 9002–1987, using adequate staff, sampling procedures and testing equipment, as approved by the National Standards Body.

10.2 An approved quality assurance system may include sampling or test procedures suited to routine or continuous production that differ from those mentioned in Sections 11 and 12.

10.3 It is recommended that wheat flour be produced under an approved quality assurance system.

## 11.0 METHODS OF SAMPLING

11.1 The methods of sampling which should be used will depend on whether the wheat flour is:

- (a) in a consignment of retail packages (up to 25 kg) in a shipment or in a warehouse;
- (b) in bulk packages (over 25 kg, in a freight container or road or rail tanker);
- (c) discharged in a stream from a bulk container, or in production in the mill in a stream moving towards the final packaging operation.

The following methods are recommended; they are based on methods published by ISO and AOAC.

**11.2 Sampling From a Consignment in Retail Packages**

- 11.2.1** Where a consignment is known to consist of wheat flour packaged from different manufacturing batches which can be separated, each batch shall constitute one lot.
- 11.2.2** Where it appears that the lot or consignment includes packages that have been damaged or contaminated during transport, handling, or storage, these shall be kept separate and sampled separately. Samples of such unsound material shall not be mixed with samples from the sound material.
- 11.2.3** Samples shall be taken from packages with clean, polished, pointed metallic triers, and placed in sample containers that are clean, dry and free from odours which have stood open for some minutes near the place where the flour is to be sampled. Containers shall be capable of being sealed air-tight and moisture-tight, and may be made of glass, metal, or plastic having no action on the flour.
- 11.2.4** The number of packages to be sampled will depend on the size of the lot, according to Table 4.
- 11.2.5** Samples shall be taken as follows:
- (a) from the top, middle, and bottom thirds of each package and then combined, or
  - (b) from one top corner to the center of the package diagonally, and from the other top corner diagonally to half the distance to the center of the package, and combined;
  - (c) the combined cores form a "bag sample;"
  - (d) a bag sample shall be at least 100g;
  - (e) each package shall be re-sealed after sampling;
  - (f) bag samples shall be properly labelled showing the date and place of sampling, the shipment, and the name of sampler, and shall be delivered to a laboratory as soon as possible.

**TABLE 4**  
**(Section 11.2.4)**

**Number of Packages to be sampled in a Lot**

<u>Number of packages in Lot</u>	<u>Number to be sampled</u>
(N)	(n)
1 to 10	all
10 to 100	10, taken at random
101 and over	the whole number* the nearest to the square root of N, taken at random or using a sampling plan.

*\*For example, if  $N = 150$ ,  $n = 12$ ; if  $N = 200$ ,  $n = 15$ ;  
if  $N = 300$ ,  $n = 18$ ; if  $N = 400$ ,  $n = 20$ .*

- 11.2.6** A bulk sample shall be prepared in the laboratory by combining all the bag samples and thoroughly mixing them.
- 11.2.7** The bulk sample may be reduced in size by quartering to give laboratory samples that are large enough to perform in duplicate the testes specified in **Table 1**, and any other tests requested; laboratory samples shall be stored in clean dry air-tight and moisture-tight containers that are properly labelled with all relevant information.
- 11.2.8** In cases of dispute, the bulk sample may be divided into three laboratory samples, one for each party, and one to be kept for reference.
- 11.3 Sampling from bulk containers, freight containers, and tank trucks.**
- 11.3.1** This should be done unloading or unloading the flour using the procedures recommended in **ISO 2170-1980**, "Cereals and Pulses – Sampling of Milled Products"
- 11.4 Sampling during production**
- 11.4.1** Samples may be taken from flour moving through the plant before packaging, using hand scoops or automatic sampling methods such as those recommended in **ISO 2170-1980 or ISO 6644-1981**, "Cereals and Milled Cereals Products – Automatic Sampling by Mechanical Means.

## 12.0 METHODS OF TEST

- 12.1** The test methods described in **Appendices A, B, C** and **D** shall be used to determine whether a sample from a consignment of wheat flour conforms to the requirements of **Table 1**.
- 12.2** The methods in the Appendices should also be used in the routine quality assurance, but other methods which are more rapid and of equal or comparable accuracy may be used.
- 12.3** Methods for the determination of the levels of thiamine, riboflavin, niacin, niacinamide, iron, calcium, or for traces of arsenic, copper, lead, and zinc are not included in this standard. If it is necessary to verify by analysis the proportions of these substances in wheat flour, analytical methods published by the following organisations should be used:
- (a) Association of Official Analytical Chemists (AOAC), Washington, DC USA;
  - (b) International Association of Cereal Science and Technology (ICC), Schwechat, Austria;
  - (c) International Union of Pure and Applied Chemistry (IUPAC), Oxford, UK;
  - (d) American Association of Cereal Chemists (AACC).
- 12.4** In the absence of any method published by any of these organisations, another method of test or analysis may be used provided that its accuracy, reproducibility, and reliability have been demonstrated by collaborative tests conducted by laboratories having extensive experience in the subject.

## 13.0 CONFORMITY

- 13.1** A lot or consignment sampled as in Section 11 shall be deemed to conform to this standard if the test results for each characteristic satisfy the requirements of **Table 1**, and if inspection shows that the labelling of the retail packages used to pack the flour is in accordance with Section 9.0, and if test reports on samples taken from the plant within the previous six months show that the requirements of **Table 2** have been met.
- 13.2** Wheat flour produced under an approved quality assurance system shall be deemed to conform to this standard if:
- (a) test results from routine samples taken from production satisfy the requirements of **Table 1**; and either

- (b) test results from samples taken at intervals of not more than six months satisfy the requirements of **Table 2**; or
- (c) records of the production and formulation of the wheat flour and of the use of vitamins and minerals therein show that the requirements of **Table 2** are satisfied; and
- (d) there is adequate evidence on file by certification by manufacturers or suppliers of ingredients and food additives that the requirements of Sections 3.2 and 3.3 are satisfied.
- (e) test results from samples of flour taken at intervals of not more than six months satisfy the requirements of Section 6.1 for the levels of arsenic, copper, lead and zinc in the flour.

**APPENDIX A****Determination of Moisture Content****A.1 Principle**

A sample of flour is dried to constant mass at 130-133°C.

**A.2 Apparatus**

The usual laboratory apparatus, including:-

- (a) analytical balance, weighing to 1mg;
- (b) desiccator, containing an effective desiccant such as ignited calcium oxide.
- (c) metal dish, diameter about 50-60mm, depth about 15mm with a close-fitting cover, which will not corrode in the conditions of the test;
- (d) Oven, controlled to a constant temperature between 130 and 135°C, with ventilation.

**A.3 Procedure**

- (a) The metal dish with its cover is previously heated to 100°C and cooled in the desiccator, and is weighed when at room temperature to the nearest 1mg;
- (b) Approximately 5g of laboratory sample (Section 11.2.7) is introduced into the dish, covered, and weighed to the nearest 1mg;
- (c) The dish, cover, and sample are placed in the oven, the sample is uncovered, and left for 90 minutes at 130-135°C;
- (d) The dish is then covered, rapidly removed from the oven, and placed in the desiccator to cool to room temperature;
- (e) The dish, cover, and sample are then weighed to the nearest mg soon after reaching room temperature.

**A.4 Calculation**

The percentage moisture content is given by:

$$\text{Moisture \%} = 100 \times (M_2 - M_3) / (M_2 - M_1)$$

Where:  $M_1$  = mass of dish and cover

$M_2$  = mass of dish, cover, and sample

$M_3$  = mass of dish, cover, and dried sample.

**NOTE:** The above method is equivalent to AOAC (1984) 14.004 and ISO 712 – 1985

**APPENDIX B****Determination of Ash Content****B.1 Principle**

The sample of flour is ignited at 550°C.

**B.2 Apparatus**

The usual laboratory apparatus, including:-

- (a) analytical balance, weighing to 1mg;
- (b) desiccator, containing an effective desiccant;
- (c) dish of fused silica, to hold 5g of flour;
- (d) furnace, capable of maintaining a temperature of 550 + 5°C.

**B.3 Procedure**

- (a) the dish is first heated in the furnace to 550°C for 10 minutes, then let cool in the desiccator to room temperature and weighed to the nearest 1mg;
- (b) approximately 3 to 5g of the laboratory sample of flour (Section 11.2.7) is immediately placed in the dish and weighed to the nearest 1mg;
- (c) the dish and sample are ignited in the furnace at 550°C until grey ash is obtained, then they are removed and let cool in the desiccator to room temperature, and weighed to the nearest 1mg.

**B.4 Calculation**

The percentage ash content is given by:

$$\text{Ash \%} = 100 \times (M_2 - M_3) / (M_2 - M_1)$$

Where  $M_1$  = mass of dish;  $M_2$  = mass of dish and sample;

$M_3$  = mass of dish and ashed sample

## APPENDIX C

### Determination of Protein

#### C.1 Principle

The percentage of nitrogen in the flour is determined and protein content calculated as  $5.7 \times \% \text{N}$ .

#### C.2 Apparatus

The usual laboratory apparatus, including:-

- (a) Kjeldahl flasks, 600 – 800ml capacity, of thick well-annealed glass;
- (b) Kjeldahl distillation apparatus with a scrubber or trap to catch caustic soda spray, and exit from condenser dipping in a receiver containing acid;
- (c) Heating device for Kjeldahl flask, capable of heating 250ml of water to 100°C from 25°C in about 5 minutes.

#### C.3 Reagents - all of analytical grade;

- (a) methyl red indicator, 1mg methyl red in 200 ml ethanol;
- (b) potassium sulphate or anhydrous sodium sulphate, N-free;
- (c) mercuric oxide, N-free (or metallic mercury);
- (d) sodium hydroxide pellets, N-free (may be used as an aqueous solution, 450g in 1 litre);
- (e) sulphuric acid, 93 – 98 %, N-free;
- (f) standard sodium hydroxide solution, 0.1 N or 0.5;
- (g) standard hydrochloric or sulphuric acid solution, 0.1 N or 0.5 N;
- (h) thiosulphate solution, 80 g  $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$  in 1 litre;
- (i) zinc granules.

#### C.4 Procedure

- (a) Place about 2.0 - 2.5g of flour, accurately weighed, in a Kjeldahl flask, add 0.7g HgO or 0.65g metallic mercury, 15 g of K<sub>2</sub>SO<sub>4</sub> or Na<sub>2</sub>SO<sub>4</sub>, and 30 ml of strong sulphuric acid, and heat in an inclined position until frothing has ended (froth may be controlled by adding a small amount of paraffin), and then boil for about 120 minutes;
- (b) Let the flask cool, and then add 200ml of water, and cool again to room temperature, add 25ml of thiosulphate solution, and mix to precipitate mercury, then a few of the zinc granules to prevent bumping;
- (c) Tilt the flask and carefully add a layer of sodium hydroxide without shaking (use about 15g of solid NaOH or equivalent in solution for 10ml of sulphuric acid added in step (a) (above), and immediately connect the flask to the scrubber and condenser, then mix contents;
- (d) The end of the condenser is positioned dipping below the surface of 30 - 35ml of standard acid, accurately measured into the receiver, with 5-7 drops of methyl red;
- (e) the flask is heated until all the ammonia has distilled over (about 150ml of distillate) into the receiver, then the condenser is removed after washing the end into the receiver, and the excess of standard acid in the distillate is titrated with the standard sodium hydroxide solution;
- (f) a blank titration is done on the reagent used as above.

#### C.5 Calculation

The percentage of nitrogen in the flour is given by:

$$\underline{\% N} = \frac{(B - T) \times N\text{-soda} \times 1.4007}{\text{mass of sample}}$$

where B= number of ml of standard sodium hydroxide used in blank titration;

T= number of ml of standard sodium hydroxide used in titration in determination;

N-soda = normality of the standard sodium hydroxide solution.

The percentage of protein in the flour is 5.7 x % N.