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BELIZE NATIONAL STANDARD  
SPECIFICATION FOR PASTA

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## 0 FOREWORD

- 0.1 This standard has been prepared to set levels of quality for pasta products that are manufactured in or imported into Belize.
- 0.2 Pasta products that conform to the requirements of this standard, that are manufactured under an approved system of quality assurance are eligible to be marked with the Belize Standard Mark, which is administered by the Belize Bureau of Standards.
- 0.3 Macaroni, spaghetti, vermicelli and noodles are popular foods in Belize, either when used alone or with other foods. The requirements of this standard are set to ensure that the product is acceptable to consumers, and can be met by any manufacturer who pays attention to the raw materials used, processing, handling and packaging.
- 0.4 This standard is adopted from CCS 32: 1994 - Caribbean Community Standard or Pasta Products (Macaroni, Spaghetti, Noodles).

## 1 SCOPE

- 1.1 This standard prescribes requirements for macaroni, spaghetti, vermicelli, noodles and egg noodles that are made in the forms and materials described below.
- 1.2 Pasta products used in preparing other foods (for example, canned soups) or included in packages of ingredients that are prepackaged for retail sale (for example, soup mixes, macaroni cheese) are also covered by this standard.
- 1.3 This standard does not apply to food in forms resembling spaghetti or vermicelli made from rice, bean curd, or cereals other than wheat.

## 2 DEFINITIONS

For the purpose of this standard the following definitions shall apply.

- 2.1 **Macaroni** shall be the food manufactured by drying formed units of a dough made from semolina, durum wheat flour, farina flour, or any suitable wheat flour (separately or in combination) mixed with potable water with or without ingredients listed in Section 3 below. Macaroni includes the forms mentioned below.

- 2.2 **Egg Noodles** shall be food manufactured by drying formed units of a dough made from semolina, durum wheat flour, farina flour, or any suitable wheat flour (separately or in combination) mixed with whole egg (pasteurised, frozen or dried), with or without potable water and with or without any of the ingredients listed in Section 3 below.
- 2.3 **Food Grade**, as applied to an ingredient, means that the material conforms to the requirements for the purity and safety of that ingredient set out in any one of the following:-
- (a) Specification for food additives issued by the FAO/WHO Joint Expert Committee on Food Additives;
  - (b) FAO/WHO Codex Alimentarius Commission;
  - (c) US Food Chemical Codex;
  - (d) US Food and Drugs Regulations;
  - (e) Canadian Food and Drugs Regulations; and
  - (f) Regulations or standards administered by, or acceptable to an authority in the Caribbean Community responsible for the quality and safety of foods.

**3 REQUIREMENTS FOR COMPOSITION**

- 3.1 **The moisture content of pasta products** shall not be greater than 12.0 percent by weight.
- 3.2 **The protein content and the ash content** shall be in accordance with levels set out in Table 1 for the products named.

**Table 1**  
(Section 3.2)  
**Protein and Ash content of Pasta Products**

<b>Product</b>	<b>Protein Content Minimum, % by Weight</b>	<b>Ash Content Maximum, % by Weight</b>
Plain Macaroni	12.0	0.80
Milk Macaroni	12.5	1.0
Whole Wheat macaroni	13.0	2.5

Table 1 continue

Product	Protein Content Minimum, % by Weight	Ash Content Maximum, % by Weight
Vegetable Macaroni	12.0	1.50
Wheat and Soya Macaroni	15.0	1.70
Plain Egg Noodles	13.0	n.a
Vegetable Egg Noodles	13.0	n.a
Wheat and Soya Egg Noodles	17.2	n.a

(n.a. means 'not applicable')

- 3.3 **Pasta products** may only be described as “Enriched” if the vitamins named in Table 2 are present within the limits indicated, on the basis of dry matter.

**Table 2**  
(Section 3.3)

**“Enriched” Pasta Products**

Vitamin	Minimum and Maximum Proportions by Weight, parts per million		
Niacin, Niacinamide	50	to	60
Riboflavin	3	to	4
Thiamine	7	to	9

- 3.3.1 **Enriched pasta products** may also contain:-

- (a) Calcium, (as Ca) 500 to 625 parts per million
- (b) Wheat germ, partially defatted, 5 percent (maximum) on the basis of dry matter.

- 3.4 **Macaroni, spaghetti, and vermicelli** may be described as “**Quick Cooking**”, if they contain between 0.5 percent and 1.0 percent of disodium hydrogen phosphate on the basis of dry matter, calculated as  $\text{Na}_2\text{HPO}_4 \cdot 7\text{H}_2\text{O}$ .

- 3.5 **Pasta products** described as “**Wheat and Soya**” shall contain between 12.5 percent and 15.0 percent of soya flour, calculated as a percentage of the total amount of wheat flour and soya flour used in the dough.
- 3.6 **Macaroni** (except in the forms of noodles) described as “**Vegetable**” shall contain not more than 2 percent of vegetable, on a dry basis, as a percentage of total amount of cereal and vegetable used in the dough.
- 3.7 **Plain Egg Noodles** shall contain not less than 5.5 percent by weight of egg yolk solids on dry basis, as indicated by a minimum lipid phosphate content of 0.136% P<sub>2</sub>O<sub>5</sub>.
- 3.8 **Vegetable Egg Noodles** shall contain between 3 percent and 5 percent by weight of vegetable, on a dry basis, as a percentage of the total amount of cereal and vegetable used in the dough, and not less than 5.5 percent by weight of egg yolk solids.
- 3.9 Pasta products qualified by the word “**milk**” shall be made from dough where potable water is replaced with milk (or mixture of milks component with water, equivalent in composition to milk).
- 3.10 **Pasta products** shall be:-
- (a) free from insects, insect parts, rodent hairs, and other foreign matter;
  - (b) free from mould, mouldy, stale, or bitter tastes, or other objectionable flavour;
  - (c) reasonably free from broken or cracked units; and
  - (d) smooth surfaced, characteristic in colour, and having a flavour characteristic of the product and of the ingredients used.
- 3.11 **All ingredients** shall be ‘food grade’.
- 3.12 **Pasta products** shall not contain the toxic elements mentioned in column 1 below in amounts exceeding the maximum limits specified in column 2;

(1)	(2)
Arsenic, As	1 part per million
Copper, Cu	20 parts per million

Lead, Pb	2 parts per million
Zinc, Zn	50 parts per million

#### 4 REQUIREMENTS FOR SHAPE AND STYLE

Pasta products shall be described by the following terms relating to shape and style.

- 4.1 **Macaroni, or Long Macaroni**, shall be in the form of cylindrical, hollow, nearly straight units which are between 215 mm and 280 mm in length, 2.8 mm to 6.9 mm in outer diameter, and reasonably uniform in dimensions.
- 4.2 **Elbows, or Elbow macaroni**, shall be in the form of cylindrical, hollow, units made from macaroni dough which are U-shaped, and between 2.8 mm and 6.9 mm in diameter and between 1 mm and 38 mm in length, measured along the inner curve of the U, and reasonably in dimensions.
- 4.3 **Spaghetti** shall be in form of cylindrical, solid or hollow units made from macaroni dough, between 1.5 mm and 2.5 mm in diameter, 215 mm and 280 mm in length, and reasonably uniform in dimensions.
- 4.4 **Vermicelli** shall be in the form of slightly curved or almost straight cylindrical solid units made from macaroni dough not more than 1.5 mm in diameter, between 12 mm and 280 mm in length, and reasonably uniform in dimensions.
- 4.5 **Lasagna** shall be in the form of wide flat or crinkled-edge ribbons made from macaroni dough, between 30 mm and 60 mm wide, 250 to 300 mm in length, and less than 3 mm in thickness, reasonably uniform in dimensions.
- 4.6 **Noodles** (including **Egg Noodles**) shall be in the form of narrow ribbons made from macaroni dough (or egg noodle dough), between 150 mm and 280 mm in length 3 mm to 6 mm in width and, between 2 mm and 4 mm in thickness, reasonably uniform in dimensions.
- 4.7 **Macaroni - Other Forms**
- 4.7.1 Macaroni may be presented in other forms, such as:-
- (a) curl; - twisted ribbons
  - (b) flat; - ribbons wider than noodles;



- (c) shell; - moulded in form of a shell;
- (d) star; - moulded in form of a six-point star;
- (e) wheel; - moulded in form of a spoked-wheel;
- (f) short cuts; - macaroni, of diameter as in 4.1 but in short pieces, straight or curved, between 15 mm and 20 mm between ends;
- (g) alphabet. - macaroni dough moulded in the form of various letters of the alphabet and numbers.

4.7.2 Macaroni may also be presented for sale in mixtures of the forms described in 4.2, 4.7.1, if described as “**mixture**”.

## **5 MICROBIOLOGICAL REQUIREMENTS**

5.1 When sampled and tested in accordance with the Recommended Methods issued by the American Public Health Association for the Microbiological Examination of Food, pasta products shall conform to the following requirements:-

- (a) Total Bacterial Count - not more than 100,000 organisms/gram
- (b) Coliform Count not more than 100 organisms/gram

5.2 Pasta products which are to be used in the preparation of canned foods (or frozen foods) shall conform to the following requirements:

- (a) **Total Thermophilic spores:-** not more than 150/10 g in one sample and, on average; not more than 125/10 g for five samples tested separately;
- (b) **Flat sour spores:-** not more than 75/10 g in one sample, and, average, not more than 50/10 g for five samples tested separately;
- (c) **Thermophilic Anaerobic Organisms:-** not present in more than 3 pieces of any 5 sampled, and not found in more than 4 tubes out of 6 inoculated from each piece;

- (d) **Sulphide Spoilage Spores**:- not present in more than 2 pieces of any 5 sampled, and not found in more than 2 tubes out of 6 inoculated from each piece, or 5/10 g for anyone piece.

## **6 REQUIREMENTS FOR HYGIENE IN PRODUCTION**

### **6.1 Raw materials**

- 6.1.1 Materials to be used in manufacturing pasta products shall be inspected before they are used in processing. Defective materials shall be removed and kept separate from those to be used in processing.
- 6.1.2 All water used in processing or, in washing equipment, shall be of potable quality, and any steam used in processing, or sterilising or cleaning equipment shall be generated from potable water.

### **6.2 Construction and location of Buildings**

- 6.2.1 A factory or plant manufacturing the products mentioned in this standard, and its location and site, shall conform to the requirements of the authority responsible for food hygiene, or that are set by the National Standards Body, and the following particular requirements shall be met:-
  - (a) the buildings shall be of sound construction, kept in good repair, and built of durable materials, which will not release harmful substances;
  - (b) the buildings shall be protected against the entrance of birds, insects, rodents and other vermin;
  - (c) the building shall have ceiling, floors and walls made so that they may be easily cleaned, and are impervious to moisture;
  - (d) the buildings shall have adequate ventilation, lighting, water, and steam (or heat) supplies, and waste-water drainage suitable to each room or area where inspection, processing, or packaging operations are carried on;
  - (e) lighting fixtures shall be designed, placed, and protected so that their breakage will not contaminate the product;

- (f) the buildings shall have adequate number of locker (dressing) rooms, lunch rooms, lavatories and toilet rooms for the staff, which shall be kept clean and in good working order;
- (g) lavatories and toilets, lunch rooms, and locker rooms shall not open directly into any room or area used in processing or handling the product;
- (h) the buildings shall have plumbing and sewerage facilities that are acceptable to the relevant authority, and which prevent cross-contamination between waste and water used in processing and cleaning;
- (i) the factory shall have equipment for inspection, storage and handling of the raw materials, processing, packaging, storage, transportation of the product that is suitably designed for proper use and cleaning, with non-toxic and non-absorbent surfaces that will not contaminate the product and that withstand the effects of materials used in cleansing and sanitising; and
- (j) the factory shall have adequate facilities for the cleansing and sanitising of process equipment, storage containers, and other articles relevant to the safety and purity of the product.

6.2.2 The factory or plant shall preferably be located in an area which is open, clean, and healthy, not subject to frequent flooding, and a distance of several hundred metres from

- (a) garbage dumps, stagnant water, open sewage drains or sewage treatment plants;
- (b) cattle, pig, or poultry farms, stables;
- (c) sources of dust, such as quarries, unpaved roads, or highways;
- (c) industrial plants that emit smoke, dust, ash, fumes, objectionable odours; or
- (e) unsanitary unregulated temporary housing.

- 6.2.2.1 The site shall be kept clean, tidy and in good order at all times, and free from dust as far as possible.
- 6.2.2.2 The site shall be fenced so that tile operator of the factory or plant can control access to the factory by members of the public; the fence shall be constructed to prevent entry of rodents or other small animals, and kept clear of weeds and in good repair.
- 6.2.2.3 A secure area on the site shall be provided for the temporary storage of waste materials, which shall be removed regularly in a sanitary manner.

**6.3 Sanitation**

- 6.3.1 A factory manufacturing the products covered by this standard shall operate a sanitation programme that is acceptable to the authority responsible for food hygiene or to the National Standards Body including in particular the following:-
  - (a) sanitising of equipment or containers shall be done using steam, or chemical agents which have adequate bactericidal action, and any residues of chemical agents shall be rinsed from equipment or containers using steam or potable water;
  - (b) any compressed air used in the factory which may come into contact with the product, or with equipment surfaces which contact the product, or with containers, shall be free from oil dirt, rust, and shall not affect the odour, colour, flavour, or microbiological quality of the product;
  - (c) the surfaces of all equipment that comes into contact with the product, or used in processing, transport, handling, or storage of the product in the factory shall be kept cleaned and sanitised, and shall be regularly inspected and cleaned to maintain sanitary conditions;
  - (d) after cleaning, all equipment, utensils, process containers, disassembled pipe lines and valves shall be drained and protected from contamination until used; they may be cleaned again just before use;
  - (e) all lavatories, toilets, sinks and drains shall be maintained so that odours and fumes therefore do not enter any room or area where the product is handled;

- (f) wash-hand basins shall be placed close to toilets and supplied with running water; and soap;
- (g) notices shall be prominently displayed instructing staff to wash their hands immediately after using toilet facilities;
- (h) staff shall not eat, drink, or smoke in rooms where the product is handled, or packaged;
- (i) There shall be an effective programme of insect and rodent control, and no dogs, cats, or other pets shall be allowed in the factory;
- (j) no person suffering from a communicable disease, or with an open and infected lesion, cut, or wound shall be allowed to work where he/she may contaminate the product;
- (k) persons handling the product shall wear a hair covering and, sanitary clothing, and where necessary, clean impermeable gloves, and shall not wear loose jewellery or other articles that might contaminate the product;
- (l) food, drink, or tobacco shall not be stored in areas where the raw materials are inspected stored, or processed, or where the product is handled or packaged; and
- (m) all workers engaged in the inspection or handling of raw materials, in processing, in packaging the product, or handling or cleaning equipment, utensils or containers, shall undergo an annual medical examination to determine whether they are fit, and free from any communicable disease that may contaminate the product.

#### **6.4 Processing**

- 6.4.1 Processing shall be carried out so that there is no risk of contamination of the product, or of adverse changes in its colour, aroma, flavour, consistency, or other characteristics.
- 6.4.2 The manufacturer shall ensure that all instruments on processing equipment indicating temperature, time, or pressure are regularly calibrated and are maintained in working order.
- 6.4.3 The manufacturer shall maintain records of the processing conditions and of any applied to each batch of product and keep such record for at least one year after the date of productions.

These records shall be available for inspection by the authority responsive for food hygiene or the National Standards Body.

## **7 PACKAGING**

- 7.1 Retail containers for pasta products shall be made of non-toxic materials that will not contaminate the product or affect its colour, aroma, flavour, consistency or other characteristics, and shall be designed to withstand the foreseeable stresses that may occur during packing, handling, storage and transport.
- 7.2 Retail containers shall protect pasta products against moisture, dust, rodents, or insects, under the usual conditions, of transport, storage, handling, and sale.
- 7.3 Retail containers shall be protected during transport and wholesale by suitable shipping containers.

## **8 LABELLING REQUIREMENTS**

- 8.1 The labelling on retail packages of pasta products 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.
- 8.2 The information carried on the label shall include:-
  - (a) the name of the food (macaroni and its forms spaghetti, vermicelli, soya, milk, vegetable, or egg noodles) as appropriate;
  - (b) any brand name or trade name;
  - (c) the name of the manufacturer, or of the person responsible for the brand name or trade name, together with an adequate postal address for the manufacturer or for the responsible person;
  - (d) the name of the country of origin;
  - (e) the average net contents of the retail package when packed, in “Arabic” numerals, in units of grams (g) or kilograms (kg), which may also be stated in terms of Avoirdupois ounces (oz of lb.); and
  - (f) a list of ingredients in descending order of their proportion by weight.

- 8.3 Where vitamins, minerals, calcium or wheat germ are added in accordance with 3.3, 3.3.1, the word “**Enriched**” may appear close to the name of the food, and the proportions of niacin or niacinamide, thiamine, riboflavin, iron, calcium or wheat germ shall be stated in terms of mg/100 g, parts per million (ppm), or other accepted units.
- 8.4 **Nutritional data** may be stated in terms of the recommended Daily Allowances (RDA) established by the US authorities, the Caribbean Food and Nutrition Institute, or the World Health Organisation.
- 8.5 Where the product conforms to the requirements set out above for milk macaroni, whole wheat macaroni, vegetable macaroni, wheat and soya macaroni vegetable egg noodles or wheat and soya egg noodles, the appropriate name shall be stated.
- 8.6 The product may be described as “Quick Cooking” where it contains disodium hydrogen phosphate within the limits set in 3.4 above.
- 8.7 Where different forms or colours of macaroni are indicated in a retail package, the label shall include a statement indicating that it contains “Mixed (Names of forms or colours)” “Assorted (names of forms or colours)”.
- 8.8 Storage instructions may be included on the label, and a batch number or date of manufacture may be used.

## **9 QUALITY ASSURANCE**

- 9.1 To be eligible for a licence to use the be Belize Standard Mark, the manufacturer of the pasta products that are included in this standard shall operate a quality assurance system conforming to the general requirements of ISO 9002 using adequate staff, sampling procedures, and test equipment, as approved by the Belize Bureau of Standards.
- 9.2 An approved quality assurance system may include sampling or test procedures that differ from those mentioned in Sections 10 or 11.
- 9.3 It is recommended that pasta products be manufactured under an approved quality assurance system.

## **10 SAMPLING**

- 10.1 Where a consignment consists of products known to come from different manufacturing batches, which can be separated, each batch shall constitute one lot. Packages that have been damaged or contaminated during

handling, transport, and storage shall be kept separate, and samples from such unsound material shall not be mixed with samples from sound packages.

- 10.2 Samples shall be taken from each lot of packages found in the same place. The number of packages to be taken for the sample is related to the size of the lot, as shown in Table 3.

**Table 3**  
(Section 10.2)  
**SAMPLING PLAN**

Size of Lot	Number of Packages to be taken	
(Number of Packages)	Packages 100 to 300g	Packages over 300 g
1 to 6	all	all
6 to 1000	6	6
1001 and more	8	6

- 10.3 Units shall be taken from each package sufficient to provide a bulk sample of 100 g to 500 g, and stored in a clean dry air-tight and moisture tight container labelled with relevant information.
- 10.4 A laboratory sample is prepared by rapidly milling or grinding the pasta units in the bulk sample, so as to pass a # 20 sieve, and placing the powder in a clean, dry, air-tight and moisture tight container, properly labelled.
- 10.5 In cases of dispute the bulk sample or the laboratory sample may be divided into three parts one for each party and one for reference.

**11 TESTING**

- 11.1 The test methods described in Appendices A, B, C shall be used to determine whether a sample from a lot of pasta product conforms to the requirements of Sections 3.1 and 3.2 (Table 1).
- 11.2 The methods in the Appendices should also be used for routine quality assurance but other methods which are more rapid and of equal or comparable accuracy may be used.



- 11.3 The percentage of egg yolk in solids in egg noodles is to be determined by extraction of lipids and estimation of the phosphate content of the lipids, by the methods given as 14.028 and 14.029 in the AOAC Official Methods of Analysis, 14<sup>th</sup> Edition (1994).
- 11.4 Methods for determination of the levels of niacin, riboflavin, and thiamine, and for traces of arsenic, copper, lead and zinc are not included in this standard. Methods published by the AOAC (Association of Official Analytical Chemists, Washington, D.C, U.S.A.) or the International Union of Pure and Applied Chemistry (IUPAC), Oxford, UK, should be used.
- 11.5 The methods of test to be used for microbiological requirements in Section 5 are those issued by the American Public Health Association.

## **12 CONFORMITY**

- 12.1 A lot or consignment sampled as in Section 10 shall be deemed to conform to the requirements of this standard if the test results for each characteristic satisfy the requirements of Sections 3, 4, and 5, as may be applicable, and if inspection of retail packages shows that the requirements for labelling in Section 8 are met, and if recent test reports show that the levels of vitamins, minerals and of toxic elements are within the limit specified.
- 12.2 Pasta products 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 Section 3, 4 and 5; 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 use of enriched flour or of vitamins and minerals show that the requirements of Table 2 are met: and
  - (d) test results from samples taken at intervals of not more than six months satisfy the requirements of Section 3.12.

## APPENDIX A

### Determination of Moisture Content

#### A – 1.0 Principle

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

#### A – 2.0 Apparatus

The usual laboratory apparatus, including:-

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

#### A – 3.0 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 1 mg;
- (b) Approximately 5 g of the laboratory sample (Section 10.4) is introduced into the dish, covered, and weighed to the nearest 1 mg;
- (c) the dish, cover, and sample are placed in the oven, the sample is covered, 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 1 mg soon after reaching room temperature.



**APPENDIX B**  
**Determination of Ash Content**

**B – 2.0 Principle**

The sample of pasta is ignited at 550°C.

**B – 2.0 Apparatus**

The usual laboratory apparatus, including:-

- (a) analytical balance, weighing to 1 mg;
- (b) desiccator, containing an effective desiccant;
- (c) dish of fused silica, to hold 5 g of flour;
- (d) furnace, capable of maintaining a temperature of  $550 \pm 5^{\circ}\text{C}$

**B – 3.0 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 1 mg;
- (b) approximately 3 to 5 g of the laboratory sample of pasta (Section 10.4) is immediately placed in the dish and weighed to the nearest 1 mg;
- (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 1 mg.

**B – 4.0 Calculation**

The percentage ash content is given by

$$\text{ash \%} = \frac{m_3 - m_1}{m_2 - m_1} \times 100$$

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 – 1.0 Principle**

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

**C – 2.0 Apparatus**

The usual laboratory apparatus, including

- (a) Kjeldahl flasks 600 - 800 ml 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 250 ml of water to 100°C from 25°C in about 5 minutes.

**C – 3.0 Reagents - all of analytical grade;**

- (a) methyl red indicator 1 mg methyl red in 200 ml ethanol;
- (b) potassium sulphate or anhydrous sodium sulphate, N-free;
- (c) mercuric oxide, (Hg O). N-free (or metallic mercury);
- (d) sodium hydroxide pellets, N-free (may be used as aqueous solution, 450 g in 1 litre);
- (e) sulphuric acid, 93 - 98 %, N-free;
- (f) standard sodium hydroxide solution, 0.1 N or 0.5 N;
- (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 granule

**C – 4.0 Procedure**

- (a) place about 2.0 - 2.5 g of the laboratory sample of pasta (Section 10.4), accurately weighed, in a Kjeldahl flask, add 0.7 g HgO or 0.65 g metallic mercury, 15 g 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 200 ml of water, and cool again to room temperature, add 25 ml 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 15 g solid NaOH or equivalent in solution for 10 ml 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 placed dipping below the surface of 30 - 35 ml 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 150 ml 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 reagents used as above.

**C – 5.0 Calculation**

The percentage of nitrogen in the flour is given by:-

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

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

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

N-soda = normality of standard sodium hydroxide solution.

C – 5.1 The percentage of protein in the pasta is given by

$$5.7 \times \%N$$