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BHUTAN STANDARD

Fried potato chips

ICS 67.080.20

BHUTAN STANDARDS BUREAU

The National Standards Body of Bhutan

THIMPHU 11001

_____, 2021 **Price group B**

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FOREWORD

This Bhutan Standard for fired potato chips was developed by Bhutan Standards Bureau after the draft finalized by the Food and Agriculture Technical Committee, TC 02 and approved by the Bhutan Standards Bureau Board (BSB Board) on Day Month 2020.

This standard is subject to systematic review after five years to keep pace with the market trends, industrial and technological developments. Any suggestions and further information may be directed to the concerned Technical Committee.

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DRAFT BHUTAN STANDARD FOR FRIED POTATO CHIPS

1 Scope

This Bhutan standard prescribes the requirements, methods of sampling and tests for fried potato chips ready for human consumption.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BTS 139 SARS 0014 *Food Hygiene- General Principles – Code of practice*

BTS 268 CODEX STAN 1-1985 *General Standards for the Labelling of Prepackaged Foods*

BTS 269 CXS 1 (Amended 2009) *General guidelines on claims*

BTS 271 CXS 192 *General standard for food additives*

ISO 24153 *Random sampling and randomization procedures*

BTS 322 ISO 4833–1 *Microbiology of the food chain – Horizontal method for the enumeration of microorganisms – Part 1: Colony count at 30 degrees Celsius by the pour plate technique*

BTS 323 ISO 16649-2 *Microbiology of food and animal feeding stuffs -- Horizontal method for the enumeration of beta-glucuronidase-positive Escherichia coli - Part 2: Colony-count technique at 44 degrees C using 5-bromo-4-chloro-3-indolyl beta-D-glucuronide*

BTS 324 ISO 21527-2 *Microbiology of food and animal feeding stuffs — Horizontal method for the enumeration of yeasts and moulds — Part 2: Colony count technique in products with water activity less than or equal to 0.95*

BTS 333 ISO 6888-1 *Microbiology of the food chain — Horizontal method for the enumeration of coagulase-positive staphylococci (Staphylococcus aureus and other species) — Part 1: Method using Baird-Parker agar medium*

BTS 334 ISO 6579-1 Part 1 *Microbiology of the food chain — Horizontal method for the detection, enumeration and serotyping of Salmonella — Part 1: Detection of Salmonella spp.*

3 Terms and definition

For the purposes of this document, the following terms and definitions apply;

3.1 Adulteration

Food adulteration is an act of intentionally debasing the quality of food either by the admixture or substitution of inferior substances which is not present in such food as a result of the production.

3.2 Badly misshapen

Potato tuber that is seriously deformed relative to the varietal shape.

3.3 Black heart

Blackening of tissues in the centre of the potato tuber.

3.4 Contaminants

Contaminant means any biological/chemical/physical, or other substances not intentionally added to food which may compromise food safety or suitability.

3.5 Damaged

Shall mean any defect or injury which is readily apparent upon examination, or which affects the edible quality of the potato tuber

3.6 Food grade material

One that will not transfer non-food chemicals into the food and contains no chemicals which would be hazardous to human health

3.7 Fried potato chips

Product prepared from clean, mature and sound tubers of potato plants subjected to deep frying process to make them crispy and ready for consumption.

3.8 Food additive

Any substance not normally consumed as a food by itself and not normally used as a typical ingredient of the food, whether or not it has nutritive value, the intentional addition of which to food for a technological (including organoleptic) purpose in the manufacture, processing, preparation, treatment, packing, packaging, transport or holding of such food results, or may be reasonably expected to result, (directly or indirectly) in it or its by-products becoming a component of or otherwise affecting the characteristics of such foods.

3.9 Hollow heart

Cavities of various sizes in the centre of the tuber.

3.10 Internal/external defects

Brown stains due to heat, cracks, cuts, damaged, badly mishappen, rust stains, hollow or black hearts and other internal defects in the potato tuber.

3.11 Mature potato tuber

Potato tuber with the skin of potato tuber that is generally firmly set and not feathered.

3.12 Sound

Produce not affected by rotting or deterioration such as to make it unfit for consumption.

4 Ingredients

4.1 Essential ingredients

4.1.1 Potatoes

The potatoes used in the production of potato chips should be of round, oblong and oval shape of 40-60 mm size with shallow eyes.

Potatoes which are green and with internal/external defects shall not be used in the production of potato chips unless it can be removed.

4.1.2 Edible oil

Edible oil containing permitted antioxidants.

4.2 Optional ingredients

4.2.1 Edible Salt

4.2.2 Spices and condiments

4.3 Other permissible food additives and preservatives may be added within the permissible level as specified in BTS 271:2020.

5 Requirement

5.1 Description

5.1.1 The fried potato chips shall have a light to golden yellow colour, crisp texture, and pleasant taste and odor. Salt and other seasoning should be added to taste. The chips shall be of thickness between 1.0 to 2.5 mm, free from blisters, excessive brown pigmentation and wet centers. The chips shall not be excessively greasy and shall be free from rancidity and other objectionable odor and taste.

5.1.2 The product shall be free from insects, insect residues, rodent hair and excreta, fungal infestation, and other foreign materials.

5.2 Frying

The frying medium shall be regularly replaced with fresh batches of oil or fat or combination thereof, to conform to good manufacturing practices ***(see table 1).*** The temperature of the frying medium shall not exceed 180º C.

5.3 Quality requirements

5.3.1 Chemical specification

The fried potato chips shall conform to the requirements given in the ***Table 1***;

Table 1 - Chemical specifications

S/N	Characteristics	Limits *Max*	Methods of Test
1	Moisture	2.5 %	Refer Annex A
2	Acid insoluble ash (on dry basis)	0.15 %	Refer Annex B
3	Fat (on dry basis)	35 %	Refer Annex C
4	Acid value of extracted fat	2	Refer Annex D
5	Peroxide value	10 meq oxygen/kg fat	Refer Annex E

6	Salt	2.5 %	Refer Annex F

Specific method for determination of listed chemical specifications is recommended but not prescribed. Laboratories may use the test methods which meet the specific performance criteria and are validated.

5.3.2 Contaminants

5.3.2.1Pesticide residue

Fried potato chips shall comply with the maximum residue limits for pesticides established by the Codex Alimentarius Commission for this commodity.

5.3.2.2Heavy metals

The fried potato chips shall conform to heavy metals contaminants requirements specified in the ***Table 2.***

Table 2 - Heavy metals

S/N	Characteristics	Limits *Max*
1	Lead	0.1 ppm
2	Cadmium	0.1 ppm

Specific method for determination of listed heavy metals is recommended but not prescribed. Laboratories may use the test methods which meet the specific performance criteria and are validated.

5.3.3 Microbiological

The fried potato chips shall conform to microbiological limits specified in ***Table 3;***

Table 3 - Microbiological requirements

S/N	Characteristics	Limit *Max*	Method of Test
1	Total plate count, cfu/g	1000	BTS 322 ISO 4833-1
2	Escherichia Coli, cfu/g	Absent	BTS 323 ISO 16649-2
3	Yeast's count, cfu/g	100	BTS 324 ISO 21527-2
4	Mould Count, cfu/g	100	BTS 324 ISO 21527-2
5	Salmonella	Absent in 25 gm	BTS 334 ISO 6579-1
6	Staphylococcus aureus	Absent in 25 gm	BTS 333 ISO 6888-1

Specific method for determination of listed microbiological requirements is recommended but not prescribed. Laboratories may use the test methods which meet the specific performance criteria and are validated.

6 Packaging and labelling

6.1 Packaging

The product shall be packed in suitable food grade materials that will safeguard the hygienic, nutritional and organoleptic qualities of the product.

6.2 Labelling

In addition to the provision of the labelling in BTS 268:2020 CODEX STAN 1-1985, the following specific provision shall apply.

7 Hygiene

The hygienic requirements of this product shall be in accordance with BTS 139: 2019 SARS 0012: 2018

8 Sampling

Representative samples of the product shall be drawn and conformity of the material to the requirements of the specification shall be determined according to the procedure given below.

8.1 General requirements

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

8.1.1 The samples shall be taken in a protected place not exposed to damp air, dust or soot.

8.1.2 The sampling instruments shall be clean and dry.

8.1.3 The samples shall be placed in clean and dry containers.

8.1.4 The sample containers shall be of such a size that they are almost completely filled by the sample.

8.1.5 Precautions shall be taken to protect the samples, the product being sampled, the sampling instruments and the sample containers from adventitious contamination.

8.1.6 Each sample container shall be sealed with a stopper or a suitable closure after filling in such a way that it is not possible to open and reseal it without detection, and marked with full details of sampling, such as, name of the product, name of the manufacturer, type of package and other important particulars of the consignment.

8.2 Scale of sampling

8.2.1 Lot

All the packages in a single consignment of the same type, manufactured under relatively uniform conditions of production and having similar composition shall constitute a lot.

8.2.2 Samples shall be tested from each lot separately for ascertaining the conformity of a lot to the requirements of this specification.

8.2.3 The number of packages to be selected from a lot should depend on the size of the package as well as the size of the lot and should be according to ***Table 4***.

8.2.3.1 These packages shall be selected from the lot at random. In order to ensure the randomness of selection, procedures given in ***ISO 24153: 2009*** may be followed.

Table 4 - Number of packages to be selected for sampling

For packages below 500 g		For packages 500 g to 1 kg		For packages of more than 1 kg	
Number of packages in the lot	**Sample size**	**Number of packages in the lot**	**Sample size**	**Number of packages in the lot**	**Sample size**
Up to 100	8	Up to 50	3	Up to 50	2
101 to 300	13	51 to 100	5	51 to 100	3
301 to 500	20	101 to 300	8	101 to 300	5
501 to 1000	32	301 to 500	13	301 and Above	8
1001 and Above	50	501 and Above	20		

8.3 Test samples and referee samples

8.3.1 Draw small portions of the material with a suitable sampling instrument from different parts of each selected package. The total quantity of material drawn from each package shall be sufficient to make triplicate determinations for all the characteristics given in the specification.

8.3.2 Mix all portions of the material drawn from each selected package thoroughly. Out of the mixture, a small but approximately equal quantity of material shall be taken and mixed thoroughly so as to form a composite sample sufficient to make triplicate determinations for all the characteristics given in this specification. The composite sample so prepared shall be divided into three equal parts, one for the purchaser, another for the supplier and the third for the referee. These parts shall be immediately transferred to clean and dry containers which are then sealed airtight and labelled with all the particulars given in ***8.1.6.***

8.3.2.1 The referee sample shall bear the seals of the purchaser and the supplier so as to be used in the case of a dispute between the two.

Annex A

(Informative)

Determination of moisture

A.1 Apparatus

A.1.1 Moisture dish made of porcelain, silica, glass or aluminum.

A.1.2 Oven, electric, maintained at 105 ± 1°C.

A.1.3 Desiccator

A.2 Procedure

Weigh accurately about 5 g of ground sample in a moisture dish" previously dried in an oven and weighed. Place the dish in an oven maintained at 105 ± 1°C for 4 hours. Cool in the desiccator and weigh. Repeat the process of drying, cooling and weighing at 30 minute intervals until the difference between two consecutive weighing is less than one milligram. Record the lowest mass.

A.3 Calculation

$$\text{Moisture, percent by mass} = \frac{100 \times (M_1 - M_2)}{M_1 - M}$$

where,

M_1 = mass, in g, of the dish with the material before drying;

M_2 = mass, in g, of the dish with the material after drying to a constant mass; and

M = mass, in g, of the empty dish.

Annex B

(Informative)

Determination of acid insoluble ash

B.1 Reagents

B.1.1 Hydrochloric acid, approximately *5* N, prepared from concentrated hydrochloric acid.

B.2 Procedure

Weigh accurately about 5 g of the material in a platinum, porcelain or silica dish. Ignite the material in the dish with the flame of a suitable burner till all the starch is carbonized. Complete the ignition in a muffle furnace at 550 ± 25ºC for three hours. Cool in a desiccator. To the ash, add 25 ml of hydrochloric acid, cover with a watch-glass and heat on a water-bath for 10 minutes. Allow to cool and filter the contents

of the dish through Whatman Filter Paper No. 42 or its equivalent. Wash the filter paper with water until the washings are free from the acid. Return the filter and the residue to the dish. Keep it in an electric air oven maintained at 105 to 110°C for about three hours. Ignite in a muffle furnace at 550 ± 20°C for three hours. Cool the dish in a desiccator and weigh. Repeat the process of igniting in the muffle furnace. Cooling and weighing at half-hour intervals until the difference between two successive weighing is less than one milligram. Note the lowest mass.

B.3 Calculation

$$\text{Acid insoluble ash (on dry basis)} = \frac{10000 \times (M_2 - M)}{M_1\,(100 - X)}$$

where,

M_2 = mass, in g, of the dish with the acid insoluble ash;

M = mass, in g, of the empty dish;

M_1 = mass, in g, of the sample; and

X = moisture content, percent by mass.

Annex C

(Informative)

Determination of fat

C.1 Apparatus

Soxhlet Extraction Apparatus

C.2 Solvent

Petroleum ether, distilling below 65°C·

C.3 Procedure

Determine the weight of the Soxhlet extraction flask after heating it at 100°C for 30 minutes and cooling to room temperature. Transfer about 10 g of the powdered material accurately weighed in a suitable thimble and extract with the solvent in a Soxhlet extraction apparatus for about 16 hours. Evaporate the extract contained in the Soxhlet flask whose empty weight has been previously determined at 95 to 100°C for 30 minutes. Cool in a desiccator and weigh. Continue the alternate drying and weighing at 30 minutes intervals until the loss in mass between two successive weighing is not more than one milligram. Record the lowest mass.

Note - Use the material in the extraction flask for estimation of acid value (see Annex E).

C.4 Calculation

$$\text{Fat, percent by mass} = \frac{100\,(M_1 - M_2)}{M}$$

where,

M_1 = mass, in g. of the Soxhlet flask with the extracted fat;

M_2 = mass, in g, of the empty Soxhlet flask, clean and dry; and

M = mass, in g, of the material taken for the test.

Annex D

(Informative)

Determination of acid value of extracted fat

D.1 Reagents

D.1.1 Benzene-alcohol-phenolphthalein stock solution

To one liter of distilled benzene, add one liter of alcohol or rectified spirit and 0.4 g of phenolphthalein. Mix the contents well.

D.I.2 Standard potassium hydroxide solution, 0.02 N.

D.I.3 Standard potassium permanganate solution, 0.01 percent

D.1.4 Potassium dichromate solution, 0.5 percent.

D.2 Procedure

Dissolve the residue in the extraction flask *(see C.3*) with 50 ml of the benzene-alcohol-phenolphthalein solution. Titrate the dissolved extract with standard potassium hydroxide solution to distinct pink colour, or in the case of yellow solution to orange pink colour. If emulsion is formed during titration, dispel by adding second 50 ml portion of the benzene alcohol-phenolphthalein solution. The endpoint should match colour of the solution made by adding *2.5* of standard potassium permanganate solution to 50 ml of potassium dichromate solution of proper strength to that of the original solution being titrated. (Add 0.5 percent potassium dichromate solution dropwise to 50 ml of water until the colour matches. Then add 2.5 ml of standard potassium permanganate solution).

Make a blank titration on 50 ml of the benzene-alcohol phenolphthalein solution and subtract this value from the titration value of the sample. If the additional 50 ml portion of the benzene-alcohol-phenolphthalein solution is added double the blank titration.

D.3 Calculation

$$\text{Acid value of extracted fat (as oleic acid)} = \frac{56.4\ VN}{M}$$

where,

V = volume, in ml, of standard potassium hydroxide solution used;

N = normality of standard potassium hydroxide solution; and

M = mass, in g, of the material taken for the test.

Annex E

(Informative)

Determination of the peroxide value

The peroxide value is a measure of the oxidative rancidity in oil and is expressed as milliliters of 0.002 N sodium thiosulphate per gram of sample, or as milliequivalents of peroxide oxygen per kilogram of sample. Two methods are recommended.

E.1 Iodometric method

E.1.1 Apparatus

E.1.1.1 Test tubes – 150 × 25 m. Before use, wash these thoroughly with soap solution, rinse with hot water and allow to stand in chromic acid mixture for a few hours. Then rinse thoroughly (the last time with distilled water) and dry in an oven before use.

E.1.1.2 Rubber bung – To fit the test tube with a hole in the center through which is inserted a small glass rod (of 3 to 4 mm diameter) flattened at one end and rounded off at the other.

E.1.1.3 Water bath

E.1.1.4 Conical Flask – 250 ml capacity.

E.1.2 Reagents

E.1.2.1 All reagent shall be of analytical grade.

E.1.2.2 Solvent mixture – a mixture of 2 volumes of glacial acetic acid and 1 volume of chloroform.

E.1.2.3 Sodium thiosulphate - 0·002N solution, freshly prepared dilution from an accurately standardized 0·1 N solution.

E.1.2.4 Potassium iodide – freshly powered.

E.1.2.5 Potassium iodide – 5 percent solution, freshly prepared.

E.1.2.6 Starch indicator – Titrate 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 liter of boiling water. Boil for three minutes. Allow to cool and decant off the supernatant clear liquid.

E.1.2.7 Carbon dioxide

E.1.3 Procedure

The test should preferably be carried out in artificial light free from ultra-violet radiation. Weigh quickly but accurately a suitable quantity of the sample (the weight of the sample taken for the test should be such that the titration does not exceed 10 ml) into the test-tube and while still liquid add 1 g of powdered potassium iodide and 20 ml of the solvent mixture. Gently bubble carbon dioxide through the mixture of the oil and solvent (for routine tests, this is unnecessary). Heat the contents of the tube to boiling within 30 seconds, preferably in a steam-bath, and allow them to boil vigorously for not more than 30 seconds. As the solvent vapours begin to escape from the hole in the bung, close the opening with the glass rod. Cool immediately under a tap and transfer into conical flask containing 20 ml of 5 percent aqueous solution of potassium iodide and wash out the test-tube twice with 25 to 30 ml of distilled water. Titrate the solution with the sodium thiosulphate solution using starch indicator. Do not add the starch until the end point is almost reached. Perform a blank test. This titration should not be more than 0.1 ml

E.1.4 Calculation

$$\text{Peroxide value} = 8000\frac{AN}{M}$$

where,

A = volume of sodium thiosulphate solution required for the sample,

N = exact normality of the solution, and

M = mass in g of the sample taken

E.1.4.1 Results may be expressed in milli molecules of oxygen per kg of fat. To obtain this, divide the peroxide value by 16

E.1.4.2 The results expressed in milli equivalent of oxygen per kg of fat shall be obtained by dividing the peroxide value by 8

E.2 Oxygen absorption method

E.2.1 Apparatus

E.2.1.1 Oxygen absorption apparatus as shown in fig. 1

E.2.1.2 Oxygen gas

E.2.1.3 Oil-bath – maintained as 79º ± 1º C

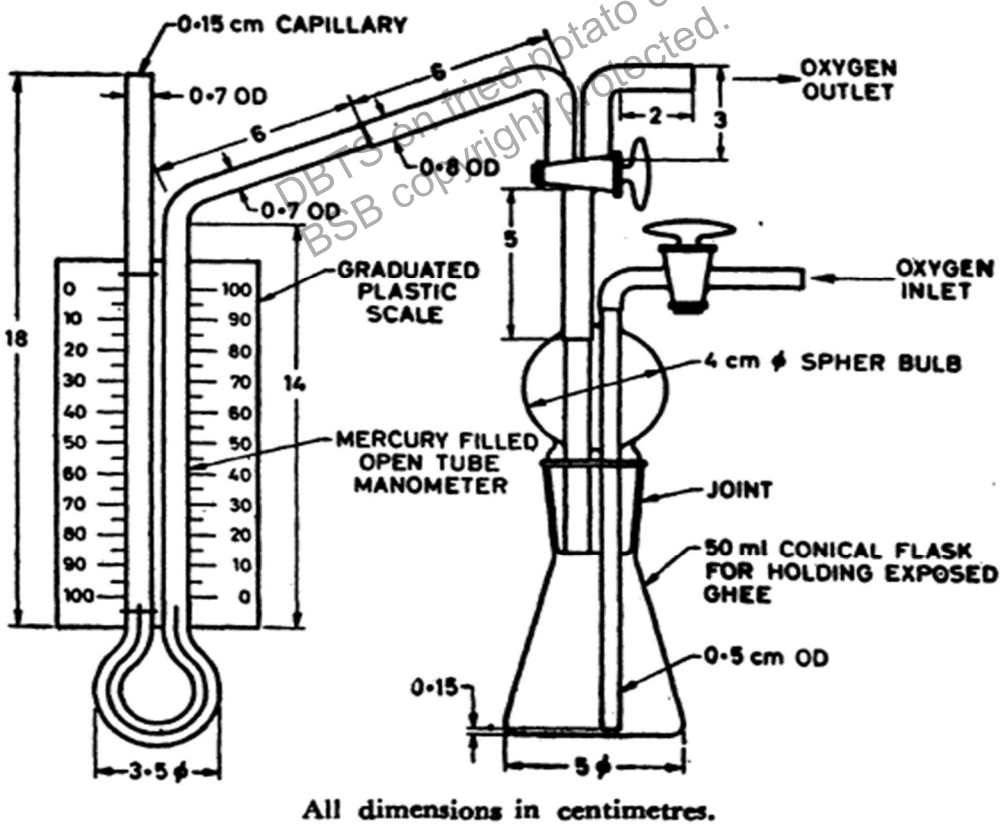

Fig 1 – All-glass oxygen absorption apparatus

E.2.2 Procedure

Clean all glass parts with chronic acid. Rinse in distilled water and dry. Weigh accurately 5 g of oil into conical flask and attach the manometer assembly. Open the inlet for oxygen and close connection to the manometer. Leave the outlet for oxygen open. Connect the inlet for the oxygen to the cylinder and regulate the flow of oxygen to bubble slowly through the melted oil, continue fluxing with oxygen for 5 minutes. Close the inlet and disconnect the oxygen cylinder. Set the flask in the oil-bath at 79º ± 1º C. Open the flask to the manometer and periodically release the arms pressure inside the flask until equilibrium is reached between two arms of the manometer and the flask has attained the temperature of the oil-bath 15 to 20 minutes from the time of introduction of the flask in the oil-bath.

E.2.3 Note time with equilibrium is reached. Record reading of the manometer at the intervals of 2 hours initially in the fresh samples and one hour in case of old samples as well as the samples from stored butter and cream.

E.2.4 Note down the time when the manometer level in limbs connected to the flask starts its progressive rise, continue recording reading of level in manometer for another one hour. The number of hours elapsed after the equilibrium in the manometer was reached and the time when mercury level in manometer started progressive increase (up to 10 mm) corresponds the induction period of the sample.

E.2.5 Value for induction period of 20 hours and over appears to correspond to a marketable life of 6 months. Samples having an induction period below 6 hours are found to be unmarketable.

E.3 Interpretation of results

Whilst either the iodometric peroxide value or the induction period as determined by the oxygen absorption method could be used to measure the keeping quality (shelf life) of oil a combination of both gives the most reliable results:

Peroxide value **ml of 0.002 N Sodium Thiosulphate Solution/g**	**Interpretation of quality**	**Induction period at 72º C in hours**	**Peroxide value of exposed sample at the end of induction period**
Below 1.5	Very good	Above 20	Below 18.0
1.6 to 2.0	Good	16 - 20	Below 21.0
2.1 to 2.5	Fair	11 - 15	Below 24.0
2.6 to 3.5	Poor	6 - 10	Below 27.0
3.5 to 4.0	Not acceptable	Below 6	Above 30.0

Annex F

(Informative)

Determination of salt (Sodium chloride)

F.1 Principle

The chloride containing sample solution is titrated with a standard solution of silver nitrate. After the silver from silver nitrate has complexed with all the available chloride in the sample, the silver reacts with chromate that has been added to the sample, to form an orange-colored solid, silver chromate. The volume of silver used to react with the chloride is used to calculate the sodium content of the sample.

F.2 Reagents

F.2.1 Potassium chloride (KCl).

F.2.2 Potassium chromate (K_2CrO_4) – 10% solution

F.2.3 Silver nitrate ($AgNo_3$) – 0.1 M. Prepare approximately 400 ml of the 0.1 M AgNO3 (Molecular weight 169.89).

F.3 Procedure

Weigh accurately about 5 g of the potato chips sample into the 250 ml beakers, then add 95 ml boiling double distilled water to the beaker. Stir the mixture vigorously for 30s, wait 1 minute, stir again for 30s, then let cool to room temperature. Filter the solution through glass wool. Transfer 50 ml of the solution to 250 ml Erlenmeyer flask. Add 1 ml of potassium chromate indicator to 50 ml of filtrate. Titrate the solution with standardized 0.1 M $AgNo_3$, to the first visible pale red-brown color that persists for 30s. Record the volume of titrant used.

F.4 Calculation

Calculate the sodium chloride content of the sample. Express the value in terms of percent. Note that answers must be multiplied by the dilution factor.

$$\% \text{ Sodium chloride (salt)} = \frac{ml\ of\ AgNO_3}{g\ (\ or\ ml)\ sample} \text{ X } \frac{mol\ AgNO_3}{L} \text{ X } \frac{58.5\ g}{mol\ NaCl} \text{ X } \frac{1\ L}{1000\ ml} \text{ X } 100 \text{ x dilution factor}$$

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Bhutan Standards Bureau, Thimphu	Mr. Sherab Tenzin, Director General (Ex-officio member)

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