American Journal of Multidisciplinary Research in Africa
Vol. 3(1), pp. 1-12, January, 2023

ISSN: 2769-0504
https://www.mprijournals.com/

Full Length Research

A Technical Report of Student Industrial Work Experience Scheme on Oracle Business Conglomerate Feeds Proximate Analysis Lab

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Article DOI: https://doi.org/10.58314/2667TYO

Accepted 15th January, 2023

Abstract: This report is an overview of the basic knowledge and skills acquired during the SIWES programme at Oracle Business Conglomerate, Makurdi, Nigeria. The experience was quite enhancing as this will highlight the departments attended with their respective activities. The content in this Technical Report includes the introduction of Oracle Business Conglomerate Makurdi (OBCM) brief history, departments in the company and their functions. The training was basically at the department of Quality Assurance (Proximate Analysis Lab) where the knowledge acquired included how to perform analysis of elements in samples such as determination of moisture content, ash content, crude fibre content, lipid content, crude protein and determination of Nitrogen-free extract (Carbohydrate). Initiation of this imparting scheme by the federal government was extremely beneficial as it served as enlightenment into what the labor market is. And as well, the acquiring of basic scientific skills and practices of handling sophisticated industrial and laboratory equipment. The experience was not without challenges; however, it was a great success.

Keywords: Proximate Analysis: SIWES: Feed Samples: Crude Protein: Industrial Scheme; Nigeria.

Cite This Article As: Ayua, G. T., Magomya, A. M., Etim, E. E. & Ohanyelu, C. N. (2023). A Technical Report of Student Industrial Work Experience Scheme (SIWES) on Oracle Business Conglomerate Feeds Proximate Analysis Lab. American Journal of Multidisciplinary Research in Africa, 3(1): 1-12. https://doi.org/10.58314/2667TYO

1.0 Introduction of the Study

Students industrial work experience scheme [SIWES] was introduced by the federal government of Nigeria to bridge the gap between theory and practice among products of our tertiary institutions. Clearly, academic learning and theoretical knowledge alone would not usually prepare an educated person for the world of work. Employers believe that Nigerian graduates bring sufficient theoretical knowledge to the job but that they generally lack hands on or practical skills that would make them productive and effective in the workplace. Consequently, the capacity of Nigerian graduates to innovate and create determines the extent of their potential contribution to the growing economy and national development. However, the expected contributions cannot be made by graduates who are lacking in practical or hands-on skills.

1.1 History of the Student Industrial Work Experience Scheme

The scheme was first initiated and funded by the industrial training fund (**ITF**) during the formative years 1993/1994 where its vision was the provision of an avenue for students to acquire practical industrial exposure in their respective disciplines. The scheme commenced in 1973 with eleven (11) institutions. By 1978, a total of 784 students participated. When the number of institutions had grown from 11 to 32; the ITF was forced to reduce the number of approved programmes to engineering and technology. In 1979, the federal ministry of education made it compulsory for all students of polytechnics and college of technology to undergo a one year industrial attachment. The ITF did not have the capacity to monitor and supervise all students on industrial attachments hence, its decision to withdraw its support for polytechnics and college of technology leading to the federal government taking over the funding of the scheme through the National University Commission (NUC) and National Board for Technical Education (NBTE) for 5 years (1979-1984). When the ITF took over the scheme again in 1985, a total of 16912 students participated. One of the strategies to facilitate smooth operations of the scheme is the payment of supervisory allowances to higher institutions and monthly allowances to benefiting students. During the industrial training, students are exposed to machines, professional method of work, safety, etc. Students are expected to make the best use of the training period to adapt to work in all relevant domain. The generally approved duration for the students' industrial work experience scheme is 24 weeks.

1.2 Objectives of the Student Industrial Work Experience Scheme

The specific objectives of the scheme (**SIWES**) are to provide placement in industries for students of higher institutions of learning approved by relevant regulating authority (NUC, NBTE, and NCCE) to acquire work experience relevant to their course of study, prepare students for the work situation they are likely to meet after graduation, expose students to work methods and techniques in handling equipment and machineries that may not be available in school, promote the desired technological know-how required for the advancement of the nation, Make transition from school to the labour market smooth and enhance students contact for later job placement.

1.3 Oracle Business Conglomerate Makurdi: The Case Study Company

Oracle Business Conglomerate Makurdi, a dream that has become a reality today started formerly as Dartom which later changed to Hartom till 2001 when the company fully came to light. In that year, the Lord inspired

Dr. Samuel I. Ortom to raise an organization through which he would use to reduce the level of unemployment and poverty in our society. In obedience to God's word, the organization was incorporated under the companies and allied matters act of 1990 on 12th December, 2001 with the aim of reducing unemployment rate, poverty and serve humanity in general with the intention of making maximum profit.

The organization started as Oracle printing and Publishing Company Limited with share capital of Five Hundred thousand naira only but in 2006, the company became so large and established Oracle Farms Limited. Though with a lot of challenges but with God on our side the organization grew from strength to strength to where we are today with many other branches within and outside the state including, Goshen Table Water, Oracle Plastic Industry, Oracle Feed Mills, Oracle Star Shea butter, Oracle Driving School, Oracle Business Conglomerate Foundation (OBCF), Oracle Rice Mills, Oracle Yam Flour Mills and Oracle Cassava Flour Mills. The organization is one of the leading private establishments with over 400 permanent staff, apprentices and students on industrial training who are fully committed to the satisfaction of our customers. The company has partnership agreement with reputable local and foreign organizations with clients all over the world. To attain the highest point and pedigree in reducing the rate of unemployment and poverty through creation of Jobs with quality service delivery to our customers. To be the most versatile and innovative company in Nigeria and West Africa and take over the market with quality products as well as effective customer service to our clients in the near future. To become the leading company in production of food, animal feeds and well treated water and polymer products in Nigeria. To empower talented young people to attain their full potentials in the wider world and create job opportunities. Oracle Business Conglomerate is located at KM 5 Naka Road Makurdi, Benue State Nigeria.

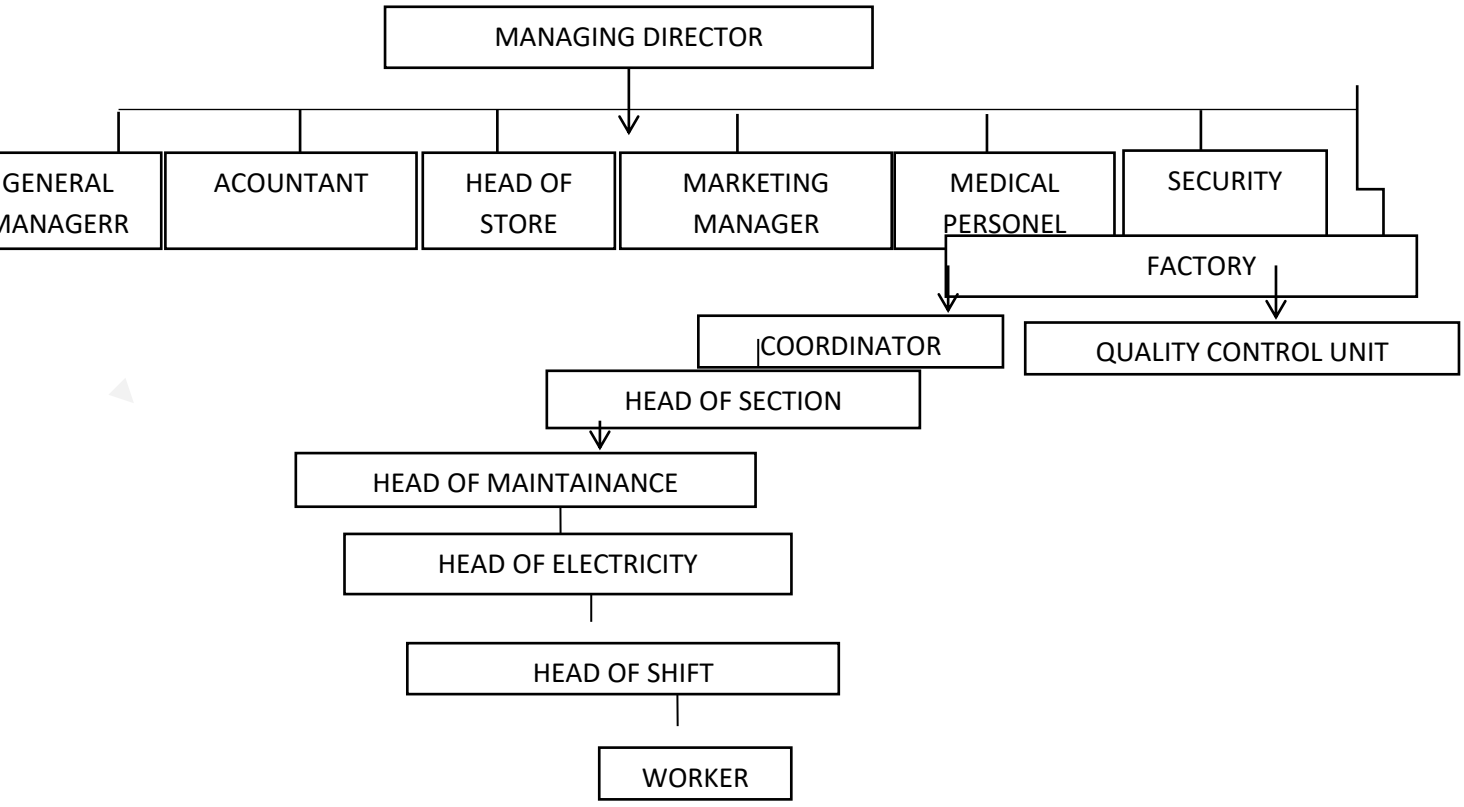

Figure 1: The Organogram of the Case Study Company

2.0 The Practical Work Scheme

2.1 Proximate Analysis in Feed Samples

This system of analysis is also called Weende analysis. It is a simple method for quantitative analysis of different macronutrients in feed. According to Weende analysis that was developed in German by Hennesberg and Stohman in (Mertens, 1860), composition in feed are portioned in six categories based on their chemical composition. The six categories include: Moisture content, Ash content, crude protein, crude lipid, Crude fibre and Nitrogen-free extractives or protein determination (Ukonu et al., 2022).

2.1.1 Moisture Content of the Feed Samples

The aim is to detect the amount of moisture present in a sample (Fish feed sample).This is determined as the loss in weight that results from drying a known weight of feed to constant weight at 90˚C. This method is satisfactory for most feeds, but with a few, such as silage, significant losses of volatile material may take place. The apparatus used in the analysis are analytical Balance, Petri dish, spatula, Oven and Desiccators (Owhe-Ureghe et al., 2022). The procedure used is by weigh 2g of sample into a clean petri dish and place the dish in the electric oven noted, dry the sample to constant weight at 90℃ for 24 hours denoted (W1). (Avoid overheating at high temperature to prevent loss of volatile components). Cool in a desiccator for ten minutes and weigh the dried material with petri dish. Weight denoted (W2)

Moisture content (g) = W2-W1=W3

$$\%\text{Moisture (g)} = \frac{\text{Wt. of Moisture W3}}{\text{Wt. of Sample}} \times 100$$

In this study the precaution adopted is the **c**alibration of the weighing balance was performed to avoid wrong measurements.

2.1.2 Ash Content of the Feed Samples

The purpose of this analysis is aimed at removing the organic content of a sample leaving the mineral content. This is determined by ignition of a known weight of Sample at 500◦C × 1000 until all carbon has been removed. The residue is the ash and is taken to represent the inorganic constituents of feed (Gebeyehu et al., 2022). The ash may, however, contain material of organic origin such as Sulphur and phosphorus from proteins, and some loss of volatile material in the form of sodium, chloride, potassium, phosphorus and Sulphur will take place during ignition. The ash content is thus not truly representative of the inorganic material in the food either qualitatively or quantitatively. The apparatuses used are Thong, Weighing balance, Muffle Furnace, crucible, spatula and desiccator. The procedure adopted is by weighing 2g of solid sample in the crucible, label the crucible with pencil and put into the muffle furnace. Heat the material at 500℃ for 12hours until the ash turn grey or nearly white, cool in the desiccator for ten minutes. Weigh the crucible with

the ash and record your result. The precautions used in the sample were placed in the muffle furnace using a long tong.

2.1.3 Crude Protein (CP) Content of the Feed Samples

This is aim at determining the amount of Nitrogen present in the sample then the protein content. The r**eagents:** 0.05N HCl, Conc.15mL H_2SO_4, 45%NaOH, 1.0g Kjeldahl digestion catalyst, 2% Boric Acid indicator, distilled water, mixed indicator. The apparatus used are **k**jeldahl distiller, 250mL Conical Flasks, 100mL conical flask, Kjeldahl tube, Burette, filter paper, beaker, kjeldahl digestion apparatus, tripod stand, retort stand. The theory is calculated from the nitrogen content of the food, determined by a modification of a technique originally devised by Kjeldahl over 100 years ago. In this method the food is digested with Sulphuric acid, which converts to ammonia all nitrogen present except that in the form of nitrate and nitrite. This ammonia is liberated by adding sodium hydroxide to the digest, distilled off and collected in standard acid, the quantity so collected being determined by titration or by an automated colorimetric method (Olusesi & Joshua, 2022). It is assumed that the nitrogen is derived from protein containing 16 per cent nitrogen, and by multiplying the nitrogen figure by 6.25 (i.e. 100/16) an approximate protein value is obtained. This is not 'true protein' since the method determines nitrogen from sources other than protein, such as free amino acids, amines and nucleic acids, and the fraction is therefore designated crude protein. The procedure used in **w**eighing biological material (200mg or 0.2g) with 1g of kjeldahl digestion catalyst in a filter paper, fold and put in the tube then add 15mLs of conc. sulphuric (H_2SO_4). Connect the tubes to Kjeldahl digestion apparatus and connect the pump as directed in the manual then gently open the tap on, adjust the flow to a moderate speed that will not enter the tube and put on the extractor fan.Put on the Kjeldahl heater and digest between 300◦C - 400◦C for 1hour until when the solution turns light green, allow to cool while water tap and extractor fan still ON. Place the tube in water and dilute with 25mL of distilled water again transfer into the 100mL volumetric flask and added distilled water to the mark. Set up Kjeldahl distillation, pipette 10mL of digested solution and 10mL of already prepared 45%NaOH using funnel then 60mL distilled water. Add some species of anti-bumping granules and cork tightly and carefully connect to the condenser thereafter open the tap to allow water to flow into the condenser again put 10mL of 2%Boric acid and 1 drop of mixed indicator in a conical flask then heat to distill till 50mL of distillate is been collected and then titrate distillate against 0.05 of HCl to faint pink and record the volume of acid used (Abdulkadir et al., 2022). The blank was produced by adding reagents in the absence of the sample. The precaution is to guide against the **e**rror due to Parallax when titrating.

Protein Content = Nitrogen Content × Conversion factor

Nitrogen Content = $\frac{(\text{Titre Value} - \text{Blank}) \times \text{Conc of Acid} \times \text{Molar Mass of Nitrogen} \times 100}{\text{Weight of sample} \times 1000}$

2.1.4 Crude Fibre Content of the Feed Samples

The aim is to determine the presence amount of crude fibre present in a sample using these reagent: 100mL Trichloroacetic acid (TCA), 10mL Methylated spirit, Distilled water, and the following apparatus: Oven, weighing balance, muffle furnace, hot plate, spatula, ashingcrucible,buncher funnel, desiccator, glass funnel, 250mL conical flask. The study adopted these procedure; Dry filter paper in the oven and carefully cut to fit into the Bunchier funnel when 1g of sample was weighed into a250mL conical flask then dissolved in a 100mLtrichloroacetic acid TCA. The conical flask is then covered with glass funnel and heated for 1hour to digestion and allowed to cool again the filter paper was then fixed into the Bunchier funnel and wetted. Digested content was then transferred into Bunchier funnel and gently filtered. It was washed for 3times with distilled water and once with 10mL methylated spirit, dry filter paper containing the residue for 12hours and transfer to a desiccator and weigh after cooling and then weigh an ashing crucible and take the weight of sample too, then put into the crucible again put it into Muffle furnace and ash overnight at 500˚C. Cool and weigh then calculate.

Final weight of sample is denoted (W_2) while initial weight of sample is also denoted (W_1),

Fibre content = $W_2 - W_1$

$$\% \text{ Fibre Content} = \frac{W_2 - W_1}{W_3} \times 100\%$$

2.1.5 Lipid Content (Fat) of the Feed Sample

The aim of this analysis is to determine the amount of fat present in feed on silage and improve on feed production. The reagent used is 150mL Petroleum ether. The apparatus used are electric heater, oven, weighing balance, filter paper, desiccator, soxhlet extraction apparatus, petroleum ether of Diethyl ether. The theory is determined by subjecting the food to a continuous extraction with petroleum ether for a defined period. The residue, after evaporation of the solvent, is the ether extract. As well as lipids it contains organic acids, alcohol and pigments. In the current official method, the extraction with ether is preceded by hydrolysis of the sample with sulphuric acid and the resultant residue is the acid ether extract.

The procedure adopted is by weigh sample 2g and tie in the already weighed filter paper and dry the quick fit flask and weigh. Set up the soxhlet extraction apparatus then put the sample into the extractor and add 150mL of petroleum ether into the quick fit flask and also put ON the tap gently and allow water to circulate into the condenser and ensure that the joints are tight. Put ON the heater and extract at 40◦C for 2-4hour until the oil has been completely extracted then remove the filter and dry in the oven to be used for determination of crude fibre, and distill the solvent which can be used for another extraction. Detach the quick fit flask with oil, cool, clean the surface properly and dry the oil in the oven the weigh the flask with oil and record your result.Carbohydrate Determination (%NFE); This can be calculated by adding the other proximate contents and subtracting from 100.

$$\%\text{Lipid} = \frac{\text{Wt. of fat}}{\text{Wt. of sample}} \times 100\%$$

2.2 Equipment/Apparatus/Reagents in the Analysis of Feed Samples

There following equipments and reagents such as Kjeldahl digestion, Kjeldahl distillation apparatus, Analytical balance, Filter paper were used, Soxhlet extraction appararus, Petroleum ether or Diethyl ether, 2% Boric acid, Water distiller (SZ-96), Crucible, Desiccator, Spatula, Water bath, 45%H_2SO_4

Table 1: Proximate Composition of Diets, Sniffens (1992)% by OBCM(Kcal/Kg DM)

Ingredients	Starter 2MM	Finisher
Moisture	01-10	9.63
Protein	35max	19.19
Fat	5-10	3.47
Fiber	15max	5.52
Ash	5-10	3.98
NFE	40	30.21
Metabolisable energy	3100min	3000.58

2.2.1 Preparation of Reagents

2.2.1.1 Preparation of 2% Boric Acid: The aim is to prepare 2%boric acid for crude protein analysis. **Reagent:** Boric acid, distilled water or deionized water. **Apparatus:** 50mL measuring cylinder, analytical balance, crucibles, glass rod, spatula, 250mL measuring cylinder, 500mL beaker. **Procedure:** Measure 2g of boric acid and dissolve in 98mL of distilled water in a 500mLbeaker. Stair until it completely dissolved.

2.2.1.2 Preparation of Mixed Indicator: The aim is to prepare mixed indicator for crude protein analysis. **Reagent:** Bromocresol green, methyl red, 100mL alcohol. **Apparatus:** Measuring cylinder, glass rod, beaker. **Procedure:** Measure 0.033g of bromocresol green and dissolve in 30mL of alcohol. Also 0.066g of methyl red and dissolve in 30mL of alcohol and then mix the two solution together. Note: to make the volume of the required alcohol 100mL, measure the remaining 40mL and add into the solution

2.2.1.3 Preparation of Trichloroacetic Acid TCA: The aim is to prepare trichloroacetic acid for crude fibre. **Reagent:** Acetic acid, distilled water, concentrated nitric acid trichloroacetic acid. **Apparatus:** Weighing scale, spatula, 250mLconical flask, starring rod, 250mL measuring cylinder. **Procedure:** Measure 500mL acetic acid and dissolve in 450mL distilled water. Again add 50mL concentrated nitric acid, then dissolve 20g trichloroacetic acid in the mixture and allow to cool and transfer the content in an air tight and store at room temperature.

2.2.1.3 Preparation of Kjeldahl Digestion Catalyst: The aim is to prepare kjeldahl digestion catalyst for crude protein. **Reagent:** Sodium tetraoxosulphate (vi), cupper (ii) tetraoxosulphate (vi). **Apparatus:** 250mL beaker, stirring rod, storage container. **Procedure:** Measure the components of the catalyst separately then mix

together in a beaker and transfer the dry mixture into a storage container. Note, the mixture should never be dissolved in any solution.

3.0 Challenges and Relevance of the Student Industrial Work Experience Scheme

In this report, some challenges encountered by the author are that the scheme requires adjusting to experiments in other disciplines- very few times we worked in other departments which weren't chemistry and we had to adjust to their discipline. When we get to such laboratories we try to adjust by reading some of their notes and paying attention to the explanation of the staff in charge. Problem of funds due to impecunious nature of the job it was very difficult for me to transport myself from my far residence to the industry, during this period, they had to seek financial assistance of family members to be able to attend the SIWES program which was a huge success.

However, despite some of the challenges that was encountered during the student industrial work experience scheme, the authors view about the existence and functioning of this outstanding scheme till date is but the lucid evidence of its relevance. Hence, this can be seen as creating in students the scientific mind of inducting to reality the theoretical principles acquired within the four walls of classroom; thereby recreating the world. SIWES helps to build in its participants the industrious attitude required for alleviating unemployment in Nigeria. As it also inculcates in students entrepreneurial skills and business mindset. It teaches students how to handle and operate scientific and industrial equipment much more adequately, team work and work etiquette are fundamental to employment in a country like Nigeria; this is acquired through SIWES.

4.0 Appraisal of the SIWES Industrial Work Programme

Indeed the author imperceptible endeavor as SIWES is a programme worthy of participation, as it exposes one to the reality of science and technology through the knowledge of instrumentation and experiment. It also exposed me to carrying out Proximate Composition analysis of feedstuff (Silage) such as moisture Content, Ash Content, Lipid Content, Crude fibre Content, Crude protein Cp Content, Percentage Nitrogen-free extract (%NFE) and determination of Metabolisable Energy using Pauzenger Equation. The author suggests ways of improving the programme are I T F should work in direct collaboration with the organizations that accept students for industrial training. This will enhance easy accessibility of students to such organizations. Also ITF visiting of students during the SIWES programme should be accurate to ensure that students get necessary exposure and to boost their morale, for future SIWES programme students, SIWES allowance should be paid on time to motivate students and students should be taught how to write SIWES reports and their reports should be read through and corrected. In this study the author suggests that students concern for this programme in future should prepare in their minds ahead and work towards it or students should make sure they go to organizations where they can be taught well and may obtain skills useful in future and students should take this programme serious and be of good conduct wherever they may find themselves. The authors advice for the SIWES manager are managers should make it mandatory for companies/organizations to supplement funding of the scheme by paying students stipends and providing enabling condition for them and the SIWES coordinators should make sure industrial training fund are paid.

5.0 Acknowledgement: My profound gratitude goes to my supervisor, Professor Magomya for her endless support and guidance towards getting my SIWES completed. I must acknowledge with gratitude the effort of my mentor Dr. Akintunde Ajagbe, Publisher and Editor in Chief, Maryland Publishing and Research Institute,

Inc. USA, for his powerful words of encouragements, guidance and most especially for making my dream of publishing this work come into fruition by funding the publication. I am glad to be a member of your online mentoring program which has shaped me to become a better person in writing journal articles.

6.0 References of the Study

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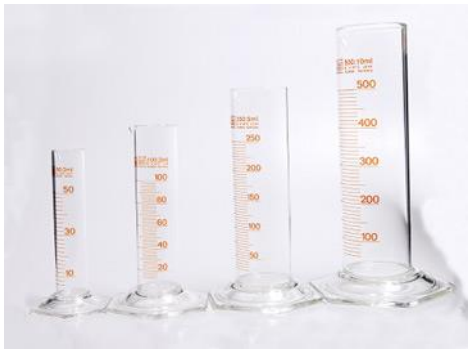
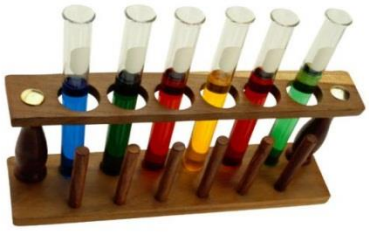
APPENDIX

Some Equipment and Glass Wares Used in the Lab



Appendix.2 Measuring cylinder

Appendix.3 Conical flask

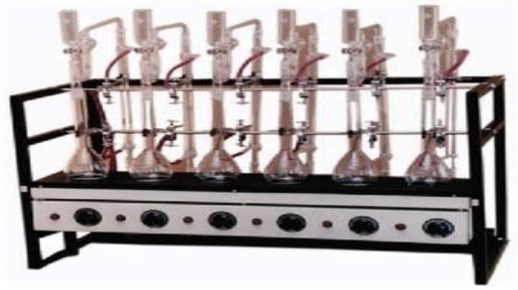


Appendix.4Boiling tubes/Test tubes

Appendix.5 Filter paper

Appendix.6Kjeldah digestion apparatus

Appendix.7 Dessicator



Appendix.8 Soxhlet extraction apparatus

Appendix.9 Crucible

Appendix.10 Water distiller SZ-96

Appendix.11 Laboratory Oven

Appendix.12 Petri dish

Appendix.13 Florescence glass

Appendix.14 Hot plate

Appendix.15 Petroleum ether

Appendix.16 Spatula

Appendix.17 Distillation apparatus

Appendix.18 Analytical balance

Appendix.19 Water bath