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**KNOWLEDGE COMPONENT: FACILITATOR FORMATIVE AND SUMMATIVE ASSESSMENT TOOLS AND MODEL ANSWERS: KNOWLEDGE MODULE 4: QUALITY ASSURANCE**

**Occupational Certificate: Sugar Processing Machine Operator**

**KNOWLEDGE COMPONENT: FACILITATOR FORMATIVE AND SUMMATIVE ASSESSMENT TOOLS AND MODEL ANSWERS**

**KNOWLEDGE MODULE 4:**

**QUALITY ASSURANCE**

**KNOWLEDGE COMPONENT: FACILITATOR FORMATIVE AND SUMMATIVE ASSESSMENT TOOLS AND MODEL ANSWERS: KNOWLEDGE MODULE 4: QUALITY ASSURANCE**

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**OCCUPATIONAL CERTIFICATE: SUGAR PROCESSING MACHINE OPERATOR**

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1. INTRODUCTION TO THE FACILITATOR ASSESSMENT TOOLKIT OF THE OCCUPATIONAL CERTIFICATE SUGAR PROCESSING MACHINE OPERATOR

Dear Facilitator

This Toolkit has been created to assist you to assess the Formative Learning Activities of learners undertaking the NQF 3 Occupational Certificate: Sugar Processing Machine Operator Qualification.

During the programme, Learners must be directed to their Learning and Activities Guide to complete Learning Activities associated with each module of the Knowledge Component.

The time allocated to the Learning Activities is provided in the Facilitator’s Implementation Guide, this Facilitator Assessment Toolkit and Model Answers and the Learning and Activities Guide.

The marks allocated to each Learning Activity are provided in this Facilitator Assessment Toolkit and Model Answers and the Learning and Activities Guide.

**Instructions to be given to Learners**

* They must work individually to present the results of each Learning Activity in each of the Learning and Activities Guides (Workbooks).
* They must complete all the sections.
* They must use a black pen and ensure that they complete the questions in their own handwriting.
* The time provided to complete each activity is shown.
* The marks they will attain for each learning activity are shown in brackets.

1. KNOWLEDGE MODULE 4: QUALITY ASSURANCE

**NQF LEVEL: 3**

**CREDITS: 8**

**PURPOSE OF THE KNOWLEDGE MODULE: The main focus of the learning in this knowledge module is to build an understanding of quality assurance terms, concepts and established principles applied in sugar milling.**

The learning will enable learners to demonstrate an understanding of:

* KM-04-KT01: Quality Control and Assurance (25%)
* KM-04-KT02: Sampling principles and methods (50%)
* KM-04-KT03: Principles of food safety and quality assurance (25%)

2.1 Knowledge Topic 1: Quality Control and Assurance (25%)

Topic elements to be covered include:

* KT0101 Quality management systems
* KT0102 Quality control and assurance
* KT0103 Quality indicators and specification
* KT0104 Key control points
* KT0105 Quality reports
* KT0106 Traceability

Internal Assessment Criteria and Weight

* IAC0101 An understanding of quality control and assurance can be demonstrated by responding to a range of questions on related concepts and practices
* (Weight 25%)

**Learning activity 1.1: Individual Learning activity: 15 minutes (11 marks)**



**Learning Objective:** An understanding of quality control and assurance can be demonstrated by responding to a range of questions on related concepts and practices

**Task:** Read each question carefully and write your answer in the space provided.

1. Define quality assurance. (2)

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| Quality assurance is a process used to determine if the product is up to standard, and will satisfy the consumer. The idea is to deliver a product that is consistently of a high quality. It is a proactive approach where defects are detected before a product goes public. |

1. What does the term “QMS” stand for and provide its definition. (4)

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| QMS stands for Quality Management System and it is defined as a formalized system that documents processes, procedures and responsibilities for achieving quality policies and objectives. A QMS helps coordinate and direct an organization’s activities to meet customer and regulatory requirements and improve its effectiveness and efficiency on a continuous basis. |

1. Mention five (5) purposes of a Quality Management System. (5)

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| * Lowering costs |
| * Reducing waste |
| * Improving processes |
| * Facilitating and identifying training opportunities |
| * Engaging staff |
| * Setting organization-wide direction |

**Learning activity 1.2: Individual Learning activity: 2 hours (63 marks)**



**Learning Objective:** An understanding of quality control and assurance can be demonstrated by responding to a range of questions on related concepts and practices

**Task:** Read each question carefully and write your answer in the space provided.

1. What is the difference between Quality Assurance and Quality Control? (4)

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| **Quality assurance** (QA) is a set of activities for ensuring quality in the processes by which products are developed. The goal of QA is to improve development and test processes so that defects don't arise when the product is being developed, and **Quality assurance** (QA) is a set of activities for ensuring quality in the processes by which products are developed or manufactured. It is a proactive process and aims to prevent defects by concentrating on the process used to make the product. |

1. What is the main goal of quality assurance (QA)? (2)

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| The goal of QA is to improve development and test processes so that defects don’t arise while the product is being developed or manufactured. |

1. List five (5) types of quality assurance systems that are available in the food industry. (5)

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| Good manufacturing Practices (GMPs) |
| Good Agricultural Practices(GAPs) |
| Good Hygiene Practices(GHPs) |
| Hazard Analysis Critical Control Point (HACCP) |
| Good Laboratory Practices.(GLPs) |

1. Discuss the purpose of Good Manufacturing Practice (GMP) in the sugar industry. (4)

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| The purpose of GMP is to ensure that food is free of extraneous matter (such as glass, machine filings and insect parts), and enables producers to guarantee that their products are hygienic. It can also be described as good housekeeping. GMP also ensures the application of product specifications. |

1. Good Manufacturing Practice (GMP) in cane sugar production is the most effective way to minimise defects. Mention six (6) types of controls that can be implemented. (6)

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| * Personal hygiene |
| * Waste management |
| * Pest management |
| * Planned maintenance |
| * Cleaning and sanitation |
| * Management of foreign objects, chemicals and microorganisms |

1. List three (3) examples of the foreign material types that can be found in the final product of sugar.(3)

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| * Bagacillo * Dust * Microorganisms * Welding globules * Glass fragments * Spider webs * Feathers, * Fibres, * Rodents faeces, * Insects, * Cigarette butts. |

1. Briefly explain the following implementation strategies of GMP: (a) Planning, (b) Monitoring and verification and (c) Commitment and policy. (12)

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| **Commitment and policy:** It is essential that management is convinced of the need to introduce GMP. They must understand not only the benefits of GMP, but also appreciate the resources required to make it work. What is necessary is a clear understanding of what controls are already in place and what improvements need to be made. Once the decision has been taken to introduce GMP, management will formulate a general GMP policy which will form part of the organisation's overall business plan and mission. This policy will not be cast in stone, but may be revised as more progress is made with the system. It will incorporate the company's vision, core values and beliefs and should take account of the image the organisation hopes to gain.  Once formalized, the commitment to keep it going cannot be transferred and then ignored. It can be communicated by posters, incentive schemes, announcements, notices, articles in the organisation's newsletters and through media such as e-mail. The responsibility for the overall effectiveness would be given to a senior person who has sufficient authority and competence. He would set up a steering committee that would guide its implementation. |
| **Planning:** Careful initial planning is essential. It is necessary to appoint a champion to take charge of the implementation. That person's task will be to set up a task force to investigate what needs to be achieved, draft a preliminary strategy, make a rough estimate of the resources required and consider allocation of responsibilities. The members of the task force must have appropriate knowledge, experience of operations and proficiency in auditing techniques. If the required competence is not available in the organisation, it will probably be necessary to send selected staff on short training courses or to use an outside consultant. The cost estimate will probably include staff and employee time, training needs, consulting assistance, materials, process modifications and a database for information management.  Before the task force commences setting objectives and making cost and resource estimates, it will conduct a preliminary GMP review to assess 'where are we now?’ This may necessitate interviewing experienced personnel, seeing for themselves the state of different operations and using existing information systems on maintenance and inventory control.  This review will identify those aspects of its operation which affect the quality of its final product. It is important to benchmark oneself against standards accepted worldwide.  The outcome of the review will be a set of prioritised objectives and targets and a management system to meet these.   * Examples of appropriate objectives for a cane sugar factory include: * Minimise leaks from pipes, pumps, flanges and seals * Reduce bagacillo and dust levels in the crystalliser and drier sections of the factory * Minimise air draughts by which micro-organisms can be introduced to the production areas * Minimise spillages of sugar * Minimise damage to finished product * Minimise the presence of birds, rodents and insects in the packing station and warehouse. * Targets will specify measurable actions and incorporate time schedules or limits. Examples of targets are: * There will be no bottles, cans, sandwiches or cigarette butts in the work area * Dust filters to sugar driers will be cleaned once a day during the morning shift * The target for re-work of sugar from damaged packets will be less than X tons per month * Rodent bait stations will be checked once a week and results recorded in a designated file.   The task force will also consider training requirements and consulting services necessary for implementation of the system. |
| **Monitoring and verification:** Monitoring involves checking that the procedures are being carried out effectively and that they achieve their objectives. Regular feedback on problems encountered in performing the required tasks, how these can be overcome and how the stipulated procedures could be improved must be given. Each department must determine how the feedback is best given. Only essential aspects of findings should be recorded. There is no benefit in collecting useless data.  Where it is necessary corrective action must be instituted as soon as possible. When this involves modification of existing procedures, these must be documented and incorporated in the manual. Application of this principle will help ensure that people do not become set in their ways and carry out their tasks without thinking, but contribute to making the system more effective. |

1. Discuss the meaning of Hazard Analysis Critical Control Point (HACCP) (4)

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| HACCP is a system that identifies and monitors specific food-borne hazard-biological, chemical or physical properties that can adversely affect the safety of the food product. The HACCP system identifies biological, chemical and physical hazards at specific points in the flow of food and the ways these contaminants can be prevented from causing or spreading food-borne illness. |

1. Discuss five (5) of the seven principles of HACCP. (10)

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| * **Analyze hazards:** Potential hazards associated with food and measures to control those hazards are identified. The hazards could be biological, such as microbes: chemical, such as toxins; or physical, such as ground glass or metal fragments. |
| * **Identify critical control points**: These are points in a food’s production process at which the potential hazard can be controlled or eliminated. |
| * **Establish preventive measures with critical limits for each control point:** For sugar processing this may be temperature minimums or maximums, pH, pressure limits, time limits or colour ranges which are specific to each stage of the manufacturing process |
| * **Establish procedures to monitor the critical control points:** Such procedures might include determining how and by whom pH, temperature, pressure, colour, etc. should be monitored. This can also be done electronically by sensors and monitors. |
| * **Establish corrective actions to be taken when monitoring shows that a critical limit has not been met:** For example, rework may be necessary if the pH level at a certain process was not achieved within a pre-determined period of time. |
| * **Establish procedures to verify that the system is working properly:** For example, test sensors, timers, pH meters, thermometers and other recording devices on a routine and monitored basis (i.e. not only the measurement must be taken regularly (point 4 above), but a system must be put in place to also check that the measurement instruments are accurate and working properly). |
| * **Establish effective recordkeeping to document the HACCP system:** This would include records of hazards and their control methods, the monitoring safety requirements, and the action taken to correct potential problems. Each of these principles must be backed by sound scientific knowledge; for example, published microbiological studies on time and temperature factors for controlling food-borne pathogens. |

1. Define the meaning of “traceability”. (2)

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| Traceability is the ability to track any food through all stages of production, processing and distribution (including importation and at retail). |

1. Mention three (3) key benefits of traceability. (3)

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| * it increases supply chain visibility |
| * Improves quality control systems |
| * Reduces risks |

1. Briefly discuss all four traceability system phases. (8)

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| * **Identification:** Identification of the products and standardization of information and of the parts which influence the quality of a product. |
| * **Link:** The management throughout the supply chain among the lots and logistic units. |
| * **Registry:** The data and the information recorded throughout the production and logistic process. |
| * **Communication:** The greater the association and alignment of the information along the supply chain, the greater will be the capability of management to respond to quality issues. |

2.2 Knowledge Topic 2: Sampling principles and methods (50%)

Topic elements to be covered include:

* KT0201 Representative sampling
* KT0202 Sampling techniques and equipment
* KT0203 Handling and storages of samples
* KT0204 Sample records and labels
* KT0205 Sampling frequency

Internal Assessment Criteria and Weight

* IAC0201 The concept “Representative sampling” can be defined and explained
* IAC0202 An understanding of sampling techniques and equipment used at various stages in the sugar milling process can be demonstrated
* IAC0203 Sampling handling, storage, recording and labeling practices can be demonstrated
* (Weight 50%)

**Learning activity 2.1: Individual Learning activity: 30 minutes (31 marks)**



**Learning Objective:** The concept “Representative sampling” can be defined and explained.

**Task:** Read each question carefully and write your answer in the space provided.

1. Briefly describe representative sampling. (2)

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| Samples must be representative of the material being sampled. A representative sample is a true reflection of the bulk material. |

1. Discuss four (4) methods of how to take representative samples. (8)

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| * When taking a sample of product (say juice) ensure that you have not included some stagnant (“old”) product that may have been trapped in the sampling pipe. |
| * Beware of using containers and lids that are contaminated i.e. dirty or wet. |
| * Do not leave samples to stand as they will deteriorate due to chemical and bacterial degradation. |
| * Keep samples covered so that they do not lose moisture to the atmosphere or become contaminated with dirt and other substances (Use an up-side down watch glass for this purpose, if the vesicle is small enough or keep the sampling container lid closed until analysis). |
| * Before sub-sampling a product for analysis, mix it thoroughly first since many products contain substances that settle to the bottom. Taking a quantity from the top would then yield a biased sample. Examples are: juice, massecuite, molasses, sugar etc. |

1. .Name and discuss the purposes of representative sampling. (8)

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| * **Reliability:** Representative sampling needs to be reliable, from validation of the raw ingredients to quality testing at each key processing stage. It is the only way to ensure confidence in food testing results. |
| * **Accuracy:** Representative sampling will allow for dependable ingredient analysis and traceability, it must be accurate, and the way samples are collected needs to be efficient without introducing bias. |
| * **Ingredient verification:** Representative sampling at the control points of a quality assurance process will assist to verify that the parameters of the product being produced is according to the standards required at that point. |
| * **Product traceability:** Tracking and verifying ingredients from farm to final product throughout the supply chain requires a statistically sound sampling plan. A product tracing plan can help organize the documentation of the production and distribution chain of the product and allow for the efficient collection of data required by the traceability system. |

1. Explain good sampling techniques. (2)

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| Good sampling techniques ensure that the sample taken represents the material from which it is taken in an unbiased manner. The nature and importance of the material will govern the sampling specification as to size and frequency. |

1. List the apparatus used for cane sampling. (5)

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| * Electronic cane tracker |
| * Cane sub-sampler |
| * Sample table |
| * Sample shredder |
| * Enamelled billycan with lid (seamless container and 6 litre capacity) |

1. Discuss the procedure of taking the first expressed juice sample. (6)

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| * A catch sample is taken using the long handled copper container. * The sample must be taken from the front and across the whole length of the front roller, the sample receptacle being moved steadily across the length of the roller. If the sample receptacle fills up before the end of the sweep, it must be withdrawn, the contents emptied into the clean, dry billycan, and sampling continued from the point at which it was interrupted. * Transfer all the catch samples to the billycan, cover with the lid and take it to the laboratory. |

**Learning activity 2.2: Group Learning activity: 15 minutes (10 marks)**



**Learning Objective:** An understanding of sampling techniques and equipment used at various stages in the sugar milling process can be demonstrated.

**Task:** Form 4 groups. Do this by assigning everyone a number from 1 to 4. All the “ones” form one group, all the “twos” form the next group, all the “threes” form the third group and all the “fours” form the fourth group.

When you are in your groups, elect one person to be the group’s scribe (the person who will write down the points of your discussion), elect one person to be the group’s time-keeper (this person reminds the group that they are running out of time for the exercise) and one person who will be the group’s reporter (the person who will explain your findings to the class).

In your groups, discuss **one** of the following sampling techniques used along the sugar manufacturing process: **Final bagasse**, **Insoluble solids determination**, **Clarified juice**, and **Remelt**. (10)

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| **Final bagasse**  Because of the difficulties of continuous sampling of bagasse, catch samples are taken at regular intervals. Different types and configurations of bagasse conveyors at mills have given rise to various methods for obtaining a sample representative of the full depth and width of the final bagasse blanket. Ideally sampling should be through a hatch situated in the base plate of the bagasse elevator just after the last mill. Such a hatch must span the full width of the elevator and open sufficiently to allow the fall-out of a complete slat-load of bagasse. Opening and closing of the hatch must be with a snap action to avoid bias.  However, the increasing trend in the South African Industry towards the use of belt conveyors precludes the use of a sample hatch and at mills where this already exists, use of the “swing” sampler is recommended.  ***Apparatus***: Hatch sampler or, if not applicable, swing sampler, Sample receptacle – enamelled billycan with lid, seamless construction (6 litre capacity), Mixing table (stainless steel top)   1. **Procedure**  * Regardless of chokes or other irregularities of crushing, a sample of bagasse should be taken at a predetermined time every hour. If the mill is not crushing at the sampling time, no sample shall be taken for that hour. * If the hatch sampler is used, the hatch is opened so as to allow a full slat-load of bagasse to fall through. Reject this sample and collect a second sample for analysis. * If the swing sampler is used the sampling procedure is as follows: * Remove the locking pin and swing the handle down until it rests on the guide wheel. * Push the sample box into the bagasse stream ensuring that the leading edge moves beyond the rear of the falling bagasse stream and then reverse the stroke. * The hatch sample is mixed on the sample table while that obtained with the swing sampler is mixed in the sampler box. * In either case random handfuls which are placed in the sample receptacle, are taken to provide a sub-sample of ca. 1 kg. If sub-sampling by hand, care must be taken not to shake the bagasse held in the hand as this will result in a biased sample. * Immediately convey the bagasse sample in the closed sample receptacle to the laboratory. |
| **Insoluble solids determination**  Representative sampling of mixed juice for insoluble solids requires proper sampler design and positioning in view of the propensity for heavy insoluble solids to segregate and not be dispersed uniformly through the juice flow.  ***Apparatus***: Cutter sampler, Seamless stainless steel bucket with lid (12 litre)  ***Reagent***: Juice preservative  **Procedure**   * Sampling is conducted over the shift such that each hour two cuts (forward and back) are taken across the full cross section of the juice flow. * The sampler delivers approximately 5 litres of juice over the shift at the cut frequency specified in (i) above. * Just before the beginning of the shift take the clean dry sample bucket and add 1 cm³ of juice preservative (0.2 cm³ per litre of sample). * At the beginning of the shift, place the sample bucket with lid beneath the sampler outlet. The outflow from the sampler is led through the lid opening and onto the receptacle by means of a length of polythene tubing. * Depress the control valve which activates the sampler to move fully across and then back again through the juice stream. * Repeat step (v) each hour throughout the shift. * At the end of the shift remove the sample receptacle with the sample for analysis and replace with a clean, dry receptacle to which 1 cm³ of juice preservative has subsequently been added. * All the samples in the sample receptacle must be taken to the laboratory for subsampling; do not discard any if the sample is larger than usual.   + Note: If for some reason the sample receptacle is found to have filled to overflowing the whole sample must be rejected as it will be biased. * In the laboratory the sample is cooled if necessary prior to sub-sampling and analysis. |
| **Clarified juice**  Because of the danger of evaporation inherent in the sampling of a hot liquid, catch sampling is preferable to continuous sampling unless suitable adequate techniques can be employed to prevent evaporation.  **Apparatus:** Container with handle (200 cm³); Enamelled or stainless steel billycan with lid (1 litre); Juice mixer; Bottle with lid (1 litre); Refrigerator  **Procedure**   * Sampling is conducted every hour using the sampling container. * After flushing the sample line take a 500 cm³ catch sample from a suitable point in the clear juice line representing the total clarified juice flow. * Cover the sample receptacle with the lid and convey the sample to the laboratory. * In the laboratory cool the sample to ambient temperature by standing the billycan in the water trough. * Once ambient temperature is attained remove the can from the trough and wipe down the exterior to remove adhering water. * From the well-stirred sample, transfer ca. 100 cm³ to a clean dry beaker for the pH determination and a transfer ca. 100 cm³ to the clean dry compositing bottle to which was added 0.2 cm³ preservative prior to the addition of the first aliquot of juice. * Place the lid on the compositing bottle and store in the refrigerator. * Steps (ii) to (vii) are repeated hourly. * At the end of 4 hours the 4 hourly composite sample is brought to room temperature by placing the bottle in the tap water trough for 10-15 minutes. |
| **Remelt**  ***Apparatus***: Sample receptacle. Seamless stainless steel or enamelled billycan with lid (1 litre); Bottle with lid (1 litre); Refrigerator  **Procedure**   * A catch sample is taken hourly from a short take-off pipe with the stopcock, after the brix controller. * Before taking the sample the take-off pipe valve must be opened fully and the sample pipe flushed with remelt so as to clear any sugar crystals and remelt from the sample pipe. * Once the pipe has been flushed clean, collect ca. 500 cm³ of remelt in the clean dry sample receptacle. * Put the lid on the receptacle and convey the sample to the laboratory. * In the laboratory stand the sample receptacle in a water trough and allow to cool. * When the sample has attained ambient temperature (after ca. 30 minutes) remove the receptacle from the water trough and dry the exterior. * From the well agitated sample, transfer a fixed volume (100 cm³) into the clean dry bottle. * Put the lid on the bottle and store in the refrigerator. * Successive hourly aliquots are poured into the same bottle. * At the end of the 8 hour shift, the sample is brought to room temperature by standing it in a water trough at room temperature for 10-15 minutes. |

**Learning activity 2.3: Individual Learning activity: 30 minutes (17 marks)**



**Learning Objective:** The concept “Representative sampling” can be defined and explained

**Task:** Read each question carefully and write your answer in the space provided.

1. Discuss the sampling techniques for **A**, **B** and **C**-massecuite. (5)

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| **A, B and C massecuite**  ***Apparatus:*** Brass container (1 litre); enamelled billycans with lids (1 litre, 5 litre); heavy duty balance  **Procedure**  The composition of massecuite varies from point to point within a pan due to imperfect circulation and therefore several catch samples should be taken at regular intervals while the massecuite is discharging.   * Using brass container take catch samples at regular intervals from the gutter, neglecting the first fraction of the strike before commencing sampling. * Each catch sample is transferred to the 5 litre billycan. * Put the lid on the billycan and convey the sample to the laboratory.   Note: Samples of C- massecuite may also be taken before and after reheating. |

1. Name five (5) apparatus used in sampling final molasses. (5)

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| * Continuous sampler |
| * Stainless steel bucket, seamless with lid (15 litres) |
| * Stout rod for mixing the sample |
| * Light duty balance |
| * Enamelled billycan with lid (5 litres) |

1. How are the samples for Magma and A- and B- molasses taken? (2)

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| Catch samples for magma are taken as required and catch samples for A- and B- molasses are taken from the “blow up” tanks as required. |

1. How are B-, C1- and C2-sugars sampling done? (5)

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| **B-, C1- and C2- sugars**  These sugars are sampled from the continuous centrifugals, but it is difficult to obtain representative samples from these machines and the problem has not yet been fully resolved even with the sampler described below.  ***Apparatus***: Sampling scoop; Enamelled billycan with lid (5 litre)  **Procedure**   * Remove the sampling scoop from the slot provided in the top of the centrifugal casing and scrape off all adhering sugar. * Replace with the concave side facing against the direction of rotation of the centrifugal basket. * Leave for about 3 minutes and then scrape off the sugar which has collected, into the billycan. * At the end of the 2 hour period take the combined samples to the laboratory for analysis. |

**Learning activity 2.4: Individual Learning activity: 1 hour (67 marks)**



**Learning Objective:** An understanding of sampling techniques and equipment used at various stages in the sugar milling process can be demonstrated.

**Task:** Read each question carefully and write your answer in the space provided.

1. Name two (2) types of electronic cane trackers. (2)

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| * The integrated circuit cane tracker |
| * The microprocessor cane tracker |

1. Briefly discuss the method of operation for the integrated circuit cane tracker. (8)

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| **Method of operation**   * As the head of a new consignment passes the starting point, press the input (start) button. A light will come on for each pulse received from the pulse generator beginning from the starting point and the mimic panel input counter number will increase by one digit. The lights are illuminated to correspond with the movement of the cane consignment along the cane carriers to the sampling point. * As the head of the consignment reaches the cane sampler, the hatch frequency timer and a time delay circuit are activated. The delay timer is pre-set to allow sufficient time for the sample to pass through the sampling equipment to the secondary sub-sampler. Once the delay time has expired the bell rings, the green light comes on at the sampling point and the sub-sampler is automatically activated. The output counters on the master and slave mimic panels (the latter situated at the sampling station) are increased by one digit. The slave mimic panel is an exact replica of the master panel and thus the sample installation attendant is fully informed as to the length of the consignment and the duration of the sampling period. * As the end of the consignment passes the starting point, press the stop button and observe that the first two lights on the mimic panel go out indicating the end of the consignment. As the end of the consignment progresses along the carrier, the corresponding lights are sequentially extinguished. When the end of the consignment reaches the cane sampler, the time delay circuit is activated (as for the start of the consignment). At the end of the time delay period, the red light comes on and the secondary sub-sampler is automatically deactivated. During the no-sampling period (red light on), the secondary sub-sampler remains in the reject position and the hatch remains closed. * The red light stays on until, at the start of another sampling period, the green light comes on again. |

1. How are the electronic cane trackers maintained? (2)

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| The electronic cane tracker requires no maintenance.For fault finding in the event of cane tracker failure see the manual for integrated circuit cane trackers issued by the Automation Department of the SICB. |

1. What is the purpose of a cane sampler? (2)

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| The purpose of the sampler is to provide a representative sample of cane from a consignment by means of a series of catch samples of the prepared cane taken after the shredder. |

1. Briefly discuss the operation cycle of the cane sampler (sliding gate for use with slat elevators). (5)

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| Two electronic timers respectively control the frequency and the duration of the hatch opening. Upon receipt of a signal from the frequency timer, a two-way solenoid valve is activated and the pneumatic cylinder moves the gate so as to open the hatch. The timer controlling the duration of the hatch opening then de -activates the solenoid valve and the hatch is closed. The rubber skirt is now behind the hinged plate (6), i.e. on the screw conveyor side of the hinged plate, and with this configuration there is the danger of cane particles collecting in the gap between the hinged plate and the rubber skirt. Accordingly, as the gate closes the hatch, contact is made with a micro-switch that, via a timer, activates the two-way solenoid valve of a second pneumatic cylinder. At the end of the pre-set time the hinged plate is opened and then closed behind the rubber skirt, i.e. the skirt is now on the feed chute side of the hinged plate. Movement of the gate, both in opening and closing the hatch, is a snap action in order to avoid cane particle size selection.  A locking pin is used to prevent the gate from sliding open should the air pressure fail and acts as a safety lock if maintenance work is to be carried out in the vicinity of the cane sampler. |

1. Mention four (4) points that must receive attention to ensure the smooth operation of the gates with regards to maintenance. (5)

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| It is essential that the gates should at all times move with a snap action so as to avoid particle size selection. To ensure smooth operation the following points must receive close attention:   * The moisture trap on the air line must be checked regularly to ensure a supply of clean, dry air. Drain when necessary, paying particular attention under excessively humid conditions. * The air lubricator must be topped up with oil (of the recommended grade) when necessary and cleaned out weekly. * Hinge pins (swing gate, drop gate and hinged plate) must be greased once per shift. * Guide rails (sliding gate) must be cleaned once per shift. * Pneumatic cylinder rods must be cleaned and lightly oiled once per day. |

1. Discuss the method of operation for the cane sub-sampler.(3)

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| * At the commencement of the week, turn on the air supply to the pneumatic cylinders. |
| * The sub-sampler will commence operating as soon as the logic control panel is switched on. Sub-sampling frequency will depend on the electronic timer settings. |
| * Shut off the air supply to the cylinders when the mill is not crushing. |

1. Name and discuss the function of three types of screw conveyors. (6)

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| * **Feed screw conveyors** which transport cane from under the cane sampler to the cane sub-sampler. |
| * **Sample screw conveyor** which transports the sample from the cane sub-sampler primary stage to the secondary stage. |
| * **Reject screw conveyors** (one or two) which transport the reject portion of the cane from the two stages of the cane sub-sampler back to the mill. |

1. What is the purpose of the sample shredder? (2)

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| It is designed to reduce the particle size of the cane from the cane sub-sampler to a size suitable for analysis. |

1. Briefly discuss the seven (7) steps of the maintenance procedure for the sample shredder. (7)

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| * Steam out the inside of the shredder casing once daily. |
| * Ensure that the door seals are in good condition to prevent loss of juice during the shredding operation. |
| * Check for worn swing hammers. Symptoms of worn hammers are poor preparation and poor discharge of the sample into the sample receiver. |
| * Check for worn hammer bushes. Hammers will feel loose if worn. |
| * Check the shredding time frequently - too long a shredding time will result in an untoward temperature rise in the cane (3°C is normal). |
| * In the case of pneumatic clutches check that the clutch engages fully. If slipping is observed, check that the air pressure is 400-500 kPa gauge. If the air pressure is correct, readjust the clutch. |
| * Check the operation of the safety micro-switch by pressing the clutch start button with the door open. The clutch should not be engaged unless the switch is faulty. |
| * Check that none of the swing hammers is stuck in the ‘swing down’ position as this will cause poor ejection of cane. |

1. Name two (2) types of samplers that are approved in the case of final bagasse. (2)

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| * Full width batch |
| * The swing sampler |

1. Briefly discuss the method of operation for the swing sampler. (3)

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| **Swing sampler**   * The sampler is operated manually. * Remove the locking pin and swing the handle down until it rests on the wheel. * Push the sample box into the bagasse stream ensuring that the leading edge moves beyond the rear of the falling bagasse stream and then reverse the stroke. |

1. Discuss the handling and storage of samples. (10)

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| * **Packaging:** After sampling, the sample containers must be checked for leaks. The outer surface of packages must be clean and dry. If leaks occur, caps and stoppers should be reinforced or replaced. Another inspection should then be carried out, and if leaks persist fresh samples should be taken. The sample containers used for the packaging of liquid samples should be filled to approximately 90 % of their total holding capacity. * **Sealing:** Depending on your internal policies and procedures, the sample container may need to be sealed to prevent unauthorised or inappropriate handling of samples (and ensure the integrity of the contents). In this case the seal must be firmly attached and stable in order to prevent damage during sample storage or transport, and to safeguard the chain of evidence. * **Marking:** The markings on labels must be clearly legible and permanent in order to prevent deletion or substitution/alteration during storage, handling and transport. Health and safety regulations must be observed. Warning signs, markings and symbols indicating potential hazards should be placed on packages holding samples of hazardous goods/compounds. * **Documents accompanying samples:** The accompanying documents must be kept in line with rules laid down by the company Quality Assurance policies and procedures. * **Storage of samples:** Storage conditions are determined by the characteristics and properties of the samples taken and the subsequent analysis that needs to be done. Storage conditions should ensure that the sample is not altered in any way that might affect the parameters to be analysed. If the sample cannot be transferred to the laboratory immediately, an alternative storage space should be provided/sought that fulfills the conditions for safeguarding the quality and identity of the samples. Health and safety and environmental regulations must be observed.   A quality management system should specify:   * Who is responsible for accepting samples for storage and transport for analysis, and record keeping; * Who is responsible for monitoring the sample storage deadlines; * Who is responsible for sample disposal after expiry of these dates; * Who is responsible for ensuring that the storage conditions for the samples are met at all times. |

1. Different stages of sugar process require sampling at different frequencies; Discuss the frequencies of the following stages: **Mixed juice**, **Filter feed (mud) for pH and pol and insoluble solids**, **Syrup**, **Filtrate** and **A- sugar**. (10)

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| * **Mixed juice:** For Pol, Brix and sucrose analysis, the sample must be collected continuously over an hour (pooled sample per hour), every hour throughout the week. For Insoluble solids determination, the sample is taken each hour throughout the shift. For reducing sugars and pH a four hour composite sample is made from the sample taken for pol and brix determination. * **Filter feed (mud):** * **pH**: A catch sample is taken every hour from each mud pump * **Brix, Bagacillo and suspended solids % feed (for the determination of bagacillo ratio and filter retention)**: A series of catch samples of the mud feed to the filters is taken for the duration of the test at a point after the addition of the bagacillo used as filter aid. * **Pol and insoluble solids (press water clarifier mud only)**: Take a catch sample once an hour. * **Syrup:** A catch sample is taken hourly from the take-off pipe situated on the delivery side of the pump. * **Filtrate** * **Brix and Pol determination**: A catch sample is taken every 4 hours using the copper container. * **Brix and mud solids % filtrate (for the determination of filter retention)**: A series of catch samples is taken for the duration of a test. * **A-Sugar:** Samples are best taken automatically with a semi-continuous sampler over an hour. |

2.3 Knowledge Topic 3: Principles of food safety and quality assurance (25%)

Topic elements to be covered include:

* KT0301 HACCP
* KT0302 Personal hygiene
* KT0303 Food safety protective measures

Internal Assessment Criteria and Weight

* IAC0301 The focus of HACCP and measures to meet standards in a sugar mill can be explained
* IAC0302 The importance of meeting HACCP standards from sustainable business perspective can be explained
* IAC0303 Personal hygiene measures that must be met by all employees can be listed and explained
* (Weight 25%)

**Learning activity 3.1: Individual Learning activity: 30 minutes (18 marks)**



**Learning Objective:** The focus of HACCP and measures to meet standards in a sugar mill can be explained.

**Task:** Read each question carefully and write your answer in the space provided.

1. There are seven critical control points (CCP) that can be identified in the production line of sugarcane that require monitoring. Briefly discuss CCP 2, CCP 3, CCP 4 and CCP 5. (12)

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| **Sugar extraction (CCP 2):** The microorganisms entering the extraction system mainly originate from the cane fields and vary proportionally to the microbial population of the soil in which the sugarcane is grown. Extraction system conditions such as temperature, pH value, water activity and sugar content favour microbial growth as well as sugar losses. Microbial activity leads to the formation of reducing sugars due to sucrose degradation and production of secondary metabolites such as organic acids and exopolysaccharides (dextran, levan). In addition to the sugar losses caused by microorganisms, microbial activity presents significant difficulties in the sugar manufacturing process due to the formation of slime (levan, dextran) which clogs pipes and filters and the production of lactic acid that induces corrosion of steel in the extractor and ancillary systems.  Microbial flora of the extraction system consists mainly of mesophiles (Lactobacillus and Leuconostoc) and thermophiles (Bacillus stearothermophilus, B.pumilus, Clostridium). For inhibiting microbial growth in the extraction system, the sugar factory may employ chemical control with the use of formalin (40% aqueous solution of formaldehyde), quaternary ammonium compounds, dithiocarbamates and sulphur dioxide. The disinfection program in the sugar industry is mainly based on the use of formaldehyde which is considered as the most effective biocide in the prevention of sugar losses due to lactic acid producing bacteria. However, its use has been recently associated with carcinogenic effects in workers exposed to it. The selection of biocides and their amounts used should be based not only on their effectiveness but also on their residual quantities found in sugar, molasses and bagasse.  Sugarcane contains saponins (glycosides of hydrophobic alcohols) that enter the extraction system thereby leading to the formation of foamy solutions. Foaming of flume water and raw juices inhibits the circulation of liquids affecting the overall processes of sugar production. Sugar factories employ antifoaming agents such as modified fatty acids to reduce the problems associated with saponins. The use of antifoaming agents in excessive amounts can lead to traces of them in molasses and bagasse. |
| **Crystallisation and centrifugation (CCP 3):** Thick juice coming from the evaporation plant contains a low number of microorganisms due to the high temperature treatment. However, the next process steps cause microbial contamination of syrups and consequently sugar losses. High levels of humidity and temperature in the sugar refinery as well as the remains of sugar dust or syrup that remains as a thin film on walls, floors and pipes, favour microbial growth and generate sources of contamination. Strict measures in combination with hygienic precautions should be taken in order to avoid microbial contamination from these factory environmental conditions. These measures could include improved air circulation (or improved air extraction), sugar house temperature regulation when possible, fast operation under high technologically acceptable temperatures, general cleanliness of the production process and equipment. When possible, storage tanks and pipes of the system should be covered, monitored, cleaned and sterilised using officially approved cleaning agents and disinfectants.  Special care should be taken in the use of appropriate filters, which are able to remove more than 90% of the bacteria present in juices. Moreover, heating of the standard liquor at a temperature of 90°C should destroy microorganisms which enter the crystallisation stage.  The centrifugation process is considered crucial for sugar manufacture since any downgraded sugar quality during this manufacturing stage is irreversible and no correction stage is possible at subsequent stages. During centrifugation the major part of the microbial population is removed together with syrup by centrifugal force. However, crystal sugar conglomerates prevent removal of microbes due to the fact that microorganisms are trapped inside them. Formation of crystal conglomerates should be avoided by the use of appropriate technological practices. Wash water, used during centrifugation, may be one of the major sources of sugar microbial contamination. Therefore, filtration and sterilisation of the wash water which comes into contact with sugar is essential.  During centrifugation, one of the major concerns should be the materials such as the discharger and washing devices and screens which come into contact with the final product (sugar). Centrifugation equipment should be constructed of materials that minimise any risk of contamination because of substance migration into the sugar. Stainless steel is usually preferred to other materials because of its ability to maintain a high level of performance while keeping corrosion to a minimum. |
| **Drying and cooling of sugar (CCP 4):** Serious microbiological problems arise during the drying and cooling sugar manufacturing stages. Airborne microorganisms constitute the main source of microbial contamination since sugar dust is a suitable carrier of mould spores.  The formation of moist sugar crusts on the conveying devices as well as condensed water on the ceilings that may drop onto the conveyors are the main components of sugar microbial contamination. The most important action to avoid sugar contamination is the implementation of sanitary measures in agreement with high hygienic standards. All the premises including conveyors should be constantly monitored and cleaned using the appropriate disinfectants. The enclosure of conveyors on which sugar is transported and the installation of air filters for dust collection are considered essential measures for reducing the contamination risk.  The presence of foreign bodies such as metals, glasses and plaster from the walls and ceilings should be of major concern during the drying/cooling stage of sugar manufacturing. Techniques such as metal detection and X-ray systems, widely applied for the detection of foreign bodies buried inside a food product, should be employed in order to assure white sugar safety. As in the case of the centrifugation stage, product-contact surfaces such as conveyor belts, drum dryers and screens should be constructed of such materials that minimise any risk of sugar contamination. |
| **Sugar storage (CCP 5):** White sugar is stored in large sacks in storehouses and as bulk in silos. Sacked sugar is stored in piles whose height depends on the crushing strength of the full sacks. The storehouse into which the sacks are placed should be ventilated to ensure the regulation of temperature and relative air humidity. Long term sugar storage depends on the maintenance of certain temperature and humidity conditions that prevent sugar from becoming hard or caked or excessively wet.  High storage temperatures (above 25°C) and relative humidity of the air above 60% induce sugar crystal agglomeration. The number of micro-organisms in sugar depends on the conditions of storage such as temperature, moisture and ventilation.  Monitoring of temperature and relative air humidity is essential for long term storage of sugar. The storehouses and silos should comply with high standards of hygiene to prevent microbial contamination and sugar quality downgrading. No storage of products other than sugar should be allowed in the storehouses where the sugar bags are piled. For bulk sugar storage it is essential that the air used for conditioning is filtered in order to prevent microbial contamination. |

1. What does “HACCP” stand for? (1)

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| **H**azard **A**nalysis **C**ritical **C**ontrol **P**oint |

1. Mention five (5) heavy metals of primary concern contained in commercial fertilizers and sewage sludge. (5)

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| --- |
| Zinc (Zn) |
| Copper (Cu) |
| Nickel (Ni) |
| Cadmium (Cd) |
| Lead (Pb) |

**Learning activity 3.2: Individual Learning activity: 30 minutes (22 marks)**



**Learning Objective:** Personal hygiene measures that must be met by all employees can be listed and explained.

**Task:** Read each question carefully and write your answer in the space provided.

1. Define personal hygiene. (2)

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| Personal hygiene is the basic concept of cleaning, grooming and caring for our bodies so that we remain healthy. |

1. Name the items of Personal Protective Equipment that must be worn by sugar factory workers at all times. State the names and the reason it must be worn. (4)

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| --- |
| * **Clean, washable, light-coloured protective clothing, preferably without external pockets:** to protect the product from risk of contamination from the ordinary clothes. |
| * **Overalls:** To protect your body from products and spillages. |
| * **Safety boots/gum boots:** To protect your feet from falling objects. |
| * **Hair restraints:** To prevent hairs from falling |

1. List three (3) contaminants carried over by ordinary clothes. (3)

|  |
| --- |
| * Dust |
| * Pet hairs |
| * Woollen fibres |

1. When should sugar factory workers wash their hands? (5)

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| --- |
| * At the beginning of a shift. * Before handling any equipment. * After lunch and tea breaks. * After handling product and before they handle other product. * Immediately after going to the toilet, blowing their nose, coughing, sneezing, smoking, eating, combing or touching their hair, handling waste product or rubbish and handling cleaning equipment. |

1. What is used to cover cuts and sores on your hands? (2)

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| * Waterproof dressings, (preferably coloured to help locate them if they come loose).Waterproof dressings will also help prevent cuts from going septic. and, * Suitable gloves |

1. Mention six (6) infections that can cause workers to be excluded from work. (6)

|  |
| --- |
| * Diarrhea |
| * Vomiting |
| * Food-borne infection |
| * Skin infections |
| * Sores |
| * Heavy colds |
| * Ear or eye discharge |

**Learning activity 3.3: Individual Learning activity: 15 minutes (11 marks)**



**Learning Objective:** Personal hygiene measures that must be met by all employees can be listed and explained

**Task:** Read each question carefully and write your answer in the space provided.

1. Briefly discuss what “food safety” means. (2)

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| Food safety is a discipline describing the handling, preparation, and storage of food in ways that prevent foodborne illness. This includes a number of routines that should be followed to avoid potentially severe health hazards. |

1. List and discuss three (3) basic requirements of food safety. (3)

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| --- |
| * Free of contaminants: Products must be free from any foreign matter, substances or micro-organisms which could have quality, disease or safety implications. |
| * Of enough shelf life: Products must be safe to consume until the “best before” or expiry date. |
| * Safe for consumption: Consumers do not want to be injured or harmed, become ill or die when eating or consuming products. |

1. Name and briefly discuss the three (3) types of food safety hazards. (6)

|  |
| --- |
| **Physical food safety hazards:** Physical contamination of the sugar product may be caused by dirt, hair, stones, soil, cigarettes or cigarette butts, nails, nuts and bolts, jewellery, match sticks, bone fragments, feathers, pieces of plastic or foil packaging material, stems, seeds, sticks and leaves, buttons, string and fibres or any other foreign substance. |
| **Chemical food safety hazards:** Chemical contaminants of the sugar product may include pesticides, medicines, detergents, disinfectants or any other chemical substance that could find its way into the food chain. |
| **Biological food safety hazards:** Biological contamination can be caused by bacteria, yeasts, protozoa, molds and viruses, which can enter the production chain as a result of poor sanitation and poor hygiene practices. |

**Learning activity 3.4: Group Learning activity: 5 minutes (5 marks)**



**Learning Objective:** Personal hygiene measures that must be met by all employees can be listed and explained.

**Task:** Form 4 groups. Do this by assigning everyone a number from 1 to 4. All the “ones” form one group, all the “twos” form the next group, all the “threes” form the third group and all the “fours” form the fourth group.

When you are in your groups, elect one person to be the group’s scribe (the person who will write down the points of your discussion), elect one person to be the group’s time-keeper (this person reminds the group that they are running out of time for the exercise) and one person who will be the group’s reporter (the person who will explain your findings to the class).

As a responsible adult working in the food sector, which diseases would make you, voluntarily, remove yourself from production activities? Be honest and imagine whether you would like someone else with these diseases to carry on working with your foods, and possibly put you and your loved ones at risk.

A learner can name any infectious illnesses/diseases.

1. CONCLUSION OF KNOWLEDGE MODULE 4: QUALITY ASSURANCE

Throughout this knowledge module you have been provided opportunities to complete formative learning activities. You have captured your results in this Learner Workbook.

The total marks for this Knowledge Module are as follows:

|  |  |  |
| --- | --- | --- |
| **Knowledge Module** | **Total Marks** | **Marks attained** |
| KM-04-KT01: Quality Control and Assurance (25%) | 74 |  |
| KM-04-KT02: Sampling principles and methods (50%) | 125 |  |
| KM-04-KT03: Principles of food safety and quality assurance (25%) | 56 |  |
| **Total Marks** | **255 marks** |  |

1. WRITTEN ASSESSMENT

**Candidate instruction:** Complete the following multiple-choice questionnaire by marking the most appropriate response with an x in the space provided.

|  |  |  |
| --- | --- | --- |
| **Scope of Assessment** | **Exit Level Outcome/s** | **Module/s** |
|  | **4. Quality Assurance** | **4** |
| **Alignment – Learning Outcome 1, 2, and 3: Quality control and assurance, Sampling principles and methods, Principles of food safety and quality assurance.**  **Award one mark for selection of valid “x”. One mark = Competent** | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **4.1** | **What is quality assurance?** | | **Mark Allocation** |
| **a** | 🞎 | It is a formalised system that documents processes, procedures, and responsibilities for achieving quality policies and objectives |  |
| **b.** | 🞎 | It is a set of activities for ensuring quality in products by identifying defects in the actual products produced |  |
| **c.** | 🗷 | It is a process used to learn if the product is up to standard, and will satisfy the consumer |  |
| **d.** | 🞎 | They are detailed requirements that define the quality of a product, service or process. |  |
| **e.** | 🞎 | None of the above | 4 |

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| **4.2** | **Which of the following is a minimum control requirement for food processing operation?** | | **Mark Allocation** | |
| **a.** | 🞎 | Personnel hygiene | |  | |
| **b.** | 🞎 | Cleaning and sanitation | |  | |
| **c.** | 🞎 | Waste management | |  | |
| **d.** | 🞎 | Pest management | |  | |
| **e.** | 🗷 | All of the above | | 4 | |

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| --- | --- | --- | --- |
| **4.3** | **What does control measure mean?** | | **Mark Allocation** |
| **a.** | 🗷 | means any action or activity that is used to prevent, reduce to acceptable levels, or eliminate a hazard |  |
| **b.** | 🞎 | means to prevent, eliminate, or eradicate |  |
| **c.** | 🞎 | Means a procedure in a food process at which a control measure can be applied and at which control is essential to prevent, reduce to an acceptable level, or eliminate an identified food hazard |  |
| **d.** | 🞎 | means washing with water of adequate sanitary quality |  |
| **e.** | 🞎 | means the maximum or minimum value to which a physical, biological or chemical parameter must be controlled | 4 |

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| **4.4** | **What is traceability?** | | **Mark Allocation** |
| **a.** | 🞎 | It is a systematic approach to the identification, evaluation, and control of food safety hazards. |  |
| **b.** | 🞎 | It is a specific quality process or outcome (or both), such as an inspection test plan, quality communications plan or non-conformance report. |  |
| **c.** | 🗷 | It is the ability to track any food through all stages of production, processing and distribution (including importation and at retail). |  |
| **d.** | 🞎 | All of the above |  |
| **e.** | 🞎 | None | 4 |

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| **4.5** | **What is a representative sample?** | | **Mark Allocation** |
| **a.** | 🞎 | A sample that includes some stagnant (“old”) product. |  |
| **b.** | 🞎 | a sample that is not representative |  |
| **c.** | 🞎 | A sample that is covered to avoid moisture lose to the atmosphere |  |
| **d.** | 🗷 | a true reflection of the bulk material |  |
| **e.** | 🞎 | None | 4 |

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| --- | --- | --- | --- |
| **4.6** | **Which of the following is the procedure to sample final bagasse?** | | **Mark Allocation** |
| **a.** | 🞎 | A catch sample is taken using the long handled copper container |  |
| **b.** | 🞎 | Transfer all the catch samples to the billycan, cover with the lid and take it to the laboratory. |  |
| **c.** | 🞎 | The sample must be taken from the front and across the whole length of the front roller |  |
| **d.** | 🞎 | The sample must be collected continuously over the hour |  |
| **e.** | 🗷 | None | 4 |

|  |  |  |  |
| --- | --- | --- | --- |
| **4.7** | **Which of the following equipment is used to sample cane?** | | **Mark Allocation** |
| **a.** | 🞎 | Copper container attached to a long handle (1000 cm³); Enamelled seamless billycan with lid (3 litres) |  |
| **b.** | 🞎 | Cutter sampler, Seamless stainless steel bucket with lid (12 litre) |  |
| **c.** | 🗷 | Electronic cane tracker, Cane sub-sampler, Sample table, Sample shredder and Enamelled billycan with lid (seamless container and 6 litre capacity) |  |
| **d.** | 🞎 | Hatch sampler or, if not applicable, swing sampler, Sample receptacle – enamelled billycan with lid, seamless construction (6 litre capacity), Mixing table (stainless steel top) |  |
| **e.** | 🞎 | Container with handle (500 cm³), Enamelled or stainless steel seamless billycan with lid (1 litre) | 4 |

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| **4.8** | **What is the function of a cane sampler?** | | **Mark Allocation** |
| **a.** | 🞎 | To remove the locking pin and swing the handle down until it rests on the guide wheel. |  |
| **b.** | 🗷 | It is to provide a representative sample of cane from a consignment by means of a series of catch samples of the prepared cane taken after the shredder. |  |
| **c.** | 🞎 | Transfer the sub-sample to the sample shredder disturbing the sample evenly in the shredder compartment. |  |
| **d.** | 🞎 | To push the sample box into the bagasse stream ensuring that the leading edge moves beyond the rear of the falling bagasse stream and then reverse the stroke. |  |
| **e.** | 🞎 | are used to show the progress of cane consignments along the mill carriers | 8 |

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| --- | --- | --- | --- |
| **4.9** | **What does HACCP stand for?** | | **Mark Allocation** |
| **a.** | 🞎 | Hazard Analysis Collection Control Point |  |
| **b.** | 🞎 | Hazard Authority Critical Control Process |  |
| **c.** | 🗷 | Hazard Analysis Critical Control Point |  |
| **d.** | 🞎 | All of the above |  |
| **e.** | 🞎 | None | 4 |

|  |  |  |  |
| --- | --- | --- | --- |
| **4.10** | **How to take representative sample?** | | **Mark Allocation** |
| **a.** | 🞎 | When taking a sample of product (say juice) ensure that you have not included some stagnant (“old”) product that may have been trapped in the sampling pipe. |  |
| **b.** | 🞎 | Beware of using containers and lids that are contaminated i.e. dirty or wet. |  |
| **c.** | 🞎 | Do not leave samples to stand as they will deteriorate due to chemical and bacterial degradation. |  |
| **d.** | 🗷 | All of the above |  |
| **e.** | 🞎 | None | 4 |

**TRUE OR FALSE QUESTIONS:**

**Award one mark for each selection of valid “T/F”.**

|  |  |  |  |
| --- | --- | --- | --- |
| **4.11** | **True or False the following are principles of HACCP?** | | **Mark Allocation** |
| **a.** | ⓣ | Analyze hazards: |  |
| **b.** | ⓣ | Identify critical control points: |  |
| **c.** | ⓕ | Planning |  |
| **d.** | ⓣ | Establish procedures to verify that the system is working properly |  |
| **e.** | ⓕ | Review and improvement | 5 |

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| **4.12** | **True or False the following issues form part of a traceability system?** | | **Mark Allocation** |
| **a.** | ⓣ | Identification |  |
| **b.** | ⓣ | Link |  |
| **c.** | ⓣ | Registry |  |
| **d.** | ⓣ | Communication |  |
| **e.** | ⓕ | Reliability | 5 |

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| **4.13** | **True or False the following are purpose of representative sampling?** | | **Mark Allocation** |
| **a.** | ⓣ | Reliability |  |
| **b.** | ⓣ | Accuracy |  |
| **c.** | ⓣ | Ingredient verification |  |
| **d.** | ⓕ | Traceability |  |
| **e.** | ⓣ | Product traceability | 5 |

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| **4.14** | **True or False the following is the syrup sampling procedure.** | | **Mark Allocation** |
| **a.** | ⓣ | A catch sample is taken hourly from the take-off pipe situated on the delivery side of the pump. |  | |
| **b.** | ⓣ | Before collecting the sample the take-off pipe valve must be opened and the pipe flushed with syrup. |  | |
| **c.** | ⓣ | Once the pipe has been flushed clean, collect ca. 500 cm³ in the clean dry sample receptacle. |  | |
| **d.** | ⓣ | Put the lid on the receptacle and take it to the laboratory. |  | |
| **e.** | ⓣ | In the laboratory place the receptacle in a water trough to cool. | 5 | |

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| --- | --- | --- | --- | --- |
| **4.15** | **True or False the following are sampling equipment?** | | **Mark Allocation** | |
| **a.** | ⓣ | Cane Sampler | |  | |
| **b.** | ⓕ | Bunsen burner | |  | |
| **c.** | ⓣ | The microprocessor cane tracker | |  | |
| **d.** | ⓕ | Crucible | |  | |
| **e.** | ⓣ | Screw conveyors | | 5 | |

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| --- | --- | --- | --- | --- |
| **4.16** | **True or False the following are different sampling frequencies?** | | **Mark Allocation** | |
| **a.** | ⓣ | Whole Stick Cane | |  | |
| **b.** | ⓣ | Final Bagasse | |  | |
| **c.** | ⓣ | Mixed juice | |  | |
| **d.** | ⓣ | Clarified juice | |  | |
| **e.** | ⓣ | Filtrate | | 5 | |

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| --- | --- | --- | --- | --- |
| **4.17** | **True or False the following are basic requirements for food safety?** | | **Mark Allocation** | |
| **a.** | ⓣ | Of enough shelf life | |  | |
| **b.** | ⓕ | Low quality food | |  | |
| **c.** | ⓣ | Free of contaminants | |  | |
| **d.** | ⓕ | Low shelf life | |  | |
| **e.** | ⓣ | Safe for consumption | | 5 | |

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| **4.18** | **True or False the following are types of food safety hazards?** | | **Mark Allocation** | |
| **a.** | ⓣ | P - Physical food safety hazards | |  | |
| **b.** | ⓣ | chemical substance | |  | |
| **c.** | ⓣ | C - Chemical food safety hazards | |  | |
| **d.** | ⓣ | B - Biological food safety hazards | |  | |
| **e.** | ⓣ | poor sanitation | | 5 | |

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| **4.19** | **True of False personal hygiene practices involves taking care of the following?** | | **Mark Allocation** | |
| **a.** | ⓣ | Hands | |  | |
| **b.** | ⓣ | Cuts and Sores | |  | |
| **c.** | ⓣ | Spilled blood | |  | |
| **d.** | ⓣ | Nose, Mouth and Ears | |  | |
| **e.** | ⓣ | Hair | | 5 | |

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| **4.20** | **True or False the following are critical control points and parameters requiring monitoring in the sugarcane production line?** | | **Mark Allocation** | |
| **a.** | ⓣ | Sugarcane growing | |  | |
| **b.** | ⓣ | Sugar extraction | |  | |
| **c.** | ⓣ | Crystallisation and centrifugation | |  | |
| **d.** | ⓣ | Drying and cooling of sugar | |  | |
| **e.** | ⓣ | Sugar storage | | 5 | |

1. FINAL MARKS

**TOTAL MARKS: 90**

**PASS MARK: 72**

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| --- | --- |
| **LEARNER MARKS** |  |
| **PERCENTAGE** |  |
| **ASSESSOR SIGNATURE:** | |