**KNOWLEDGE COMPONENT: FACILITATOR FORMATIVE AND SUMMATIVE ASSESSMENT TOOLS AND MODEL ANSWERS: KNOWLEDGE MODULE 3: SUGAR PROCESSING FACTORY CONTROL CALCULATIONS**

**KNOWLEDGE COMPONENT: FACILITATOR FORMATIVE AND SUMMATIVE ASSESSMENT TOOLS AND MODEL ANSWERS: KNOWLEDGE MODULE 3: SUGAR PROCESSING FACTORY CONTROL CALCULATIONS**

**Occupational Certificate: Sugar Processing Controller**

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

**KNOWLEDGE MODULE 3: SUGAR PROCESSING FACTORY CONTROL CALCULATIONS**

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**OCCUPATIONAL CERTIFICATE: SUGAR PROCESSING CONTROLLER**

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1. INTRODUCTION TO THE FACILITATOR ASSESSMENT TOOLKIT OF THE OCCUPATIONAL CERTIFICATE: SUGAR PROCESSING CONTROLLER

Dear Facilitator

This Toolkit has been created to assist you to assess the Formative Learning Activities of learners undertaking the NQF 5 Occupational Certificate: Sugar Processing Controller 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 is 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 3: SUGAR PROCESSING FACTORY CONTROL CALCULATIONS

**NQF LEVEL: 5**

**CREDITS: 12**

**PURPOSE OF THE KNOWLEDGE MODULE: The main focus of the learning in this knowledge module is for the learner to gain a fundamental understanding of the analytical procedures and the calculations necessary to exercise supervisory and reporting control of a sugar processing factory.**

The learning will enable learners to demonstrate an understanding of:

* KM-03-KT01: Introduction to factory control concepts (40%)
* KM-03-KT02: Materials balance (25%)
* KM-03-KT03: Stock taking (10%)
* KM-03-KT03: Calculations (25%)

2.1 Knowledge Topic 1: Introduction to factory control concepts (40%)

Topic elements to be covered include:

* KT0101 Averaging
* KT0102 Factory figures
* KT0103 Cane payment
* KT0104 Calculations

Internal Assessment Criteria and Weight

* IAC0101 Understanding the meaning of factory performance indicators can be demonstrated
* (Weight 40%)

**Learning activity 1.1: Individual Learning activity: 2 hours (90 marks)**



**Learning Objective:** An understanding of the various factory performance indicators can be demonstrated.

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

1. State the four main purposes of the sugar mill laboratory. (4)

|  |
| --- |
| To control the process |
| To detect and indicate the extent of the losses |
| To supply management with information for financial and administrative purposes |
| To enable comparisons with other mills |

2. Two quantities of molasses are mixed. The one has a mass of 10 tons and a pol of 38%. The other has a mass of 5 tons and a pol of 31%.

Calculate:

(a) The arithmetical average pol% of the mixture. (5)

(b) The weighted average pol% of the mixture. (5)

|  |
| --- |
| Arithmetical average pol% of the mixture : Pol = = 34.5%  Weighted average: Mass of pol (apparent sucrose) in 10 ton quantity  = 38% of 10 tons  == ×  =3.8 tons pol  Mass of pol (apparent sucrose) in 5 ton quantity  = 31 of 10 tons  = ×  = 1.55 tons pol  Pol = × 100  =  = × 100  = 35.66% |

3. Complete the following factory control formulae. (76)

**Tonnages**

3.1. Tons water = tons bagasse + tons mixed juice – Tons cane

3.2. Tons brix in bagasse = × Tons bagasse

3.3. Tons moisture in bagasse = × Tons bagasse

3.4. Tons fibre in bagasse =Tons DAC fibre in Cane + Tons insoluble solids

3.5. Tons pol in bagasse = × Tons bagasse

3.6. Tons pol in mixed juice = × Tons mixed juice

3.7. Tons brix in mixed juice = × Tons mixed juice

3.8. Tons suspended solids in mixed juice = × Tons mixed juice

3.9. Tons corrected pol in mixed juice =

3.10. Tons corrected brix in mixed juice = Tons corrected brix =

3.11. Tons pol in cane = Tons pol in bagasse + tons corrected pol in mixed juice

3.12. Tons brix in cane = Tons brix in bagasse + tons corrected brix in mixed juice

3.13. Tons DAC fibre in cane = tons cane

3.14. Tons DAC brix in cane = tons cane

3.15. Tons DAC pol in cane = tons cane

**Percentages**

3.16. Fibre & bagasse =100 – moisture bagasse – brix % bagasse

3.17. Pol % cane = 100

3.18. Fibre & cane = 100

3.19. Brix % cane = 100

3.20. Fibre % cane = × 100

3.21. Imbibition % fibre = 100

3.22. Corrected brix% mixed juice= 100

3.23. Corrected pol %mixed juice = 100

3.24. Purity of mixed juice = 100

3.25. Mixed juice % cane = 100

3.26. Imbibition % cane = 100

3.27. Pol % by material balance = 100

3.28. Brix % by material balance = 100

3.29. Pol factor = 100

3.30. Brix factor = 100

3.31. Fibre factor = 100

3.32. Bagasse purity = 100

3.33. Material balance cane quality= 100

3.34. DAC purity = 100

3.35. Extraction = 100

3.36. CRE =100 -

3.37. Boiling house recovery = 100

3.38. Overall recovery = 100

2.2 Knowledge Topic 2: Materials Balance (25%)

Topic elements to be covered include:

* KT0201 Data sources
* KT0202 Calculations

Internal Assessment Criteria and Weight

* IAC0201 Source of material to be balanced can be explained
* IAC0202 Calculations are correctly performed
* (Weight 25%)

**Learning activity 2.1: Individual Learning activity: 10 hours (250 marks)**



**Learning Objective:** Demonstrate an understanding of the source of materials and data and how to perform the calculations required in materials balance accurately.

**Task:** Use the data provided in each of the following Daily Materials Balance sheets (that make up 5 consecutive days in the factory) to complete each sheet. (50 marks each)

**DAILY MATERIALS BALANCE**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | **DAY** | **PREVIOUS** | **WK TO DATE** |
| SUMMARY | TONS CANE CRUSHED | 7 691,656 |  |  |
| TONS MIXED JUICE | 9 598,490 |  |  |
| TONS WATER |  |  |  |
| TONS BAGASSE |  |  |  |
|  |  |  |  |  |
| BAGASSE | TONS Bx IN BAG (Bx % Bag = 2,68) |  |  |  |
| TONS MOIST IN BAG (Moist % Bag = 51,21) |  |  |  |
| TONS FIBRE IN BAG |  |  |  |
| TONS POL IN BAG (POL % Bag = 1,53) |  |  |  |
| Fib % BAG |  |  |  |
|  |  |  |  |  |
| CANE | TONS POL IN CANE |  |  |  |
| TONS BRIX IN CANE |  |  |  |
| TONS FIBRE IN CANE |  |  |  |
| POL % CANE |  |  |  |
| Fib % CANE |  |  |  |
| Bx 5 CANE |  |  |  |
| FIBRE IN BAG % CANE (UNCORR) |  |  |  |
| TONS D.A.C. BRIX IN CANE |  |  |  |
| TONS D.A.C. pol in cane |  |  |  |
| IMBIBITION % FIBRE |  |  |  |
| IMBIBITION % CANE |  |  |  |
|  |  |  |  |  |
| EXTRACTION |  |  |  |
| C.R.E. |  |  |  |
|  |  |  |  |
| M.J. | % SUSP. SOLIDS | 0,640 |  |  |
| TONS SUSP. SOLIDS |  |  |  |
| TONS CORR. BRIX IN M.J. | 1 122,418 |  |  |
| TONS CORR. POL IN M.J. | 972,842 |  |  |
| CORR. Bx.% M.J. |  |  |  |
| CORR. Pol% IN M.J. |  |  |  |
| PURITY M.J. |  |  |  |
| M.J. % CANE |  |  |  |
|  |  |  |  |  |
| HOURS AVAILABLE | 30,00 |  |  |
| STOPS: MECHANICAL | NIL |  |  |
| OPERATIONAL | NIL |  |  |
| NO CANE | Nil |  |  |
| SCHEDULED | - |  |  |
| TOTAL STOPS |  |  |  |
| HOURS CRUSHING |  |  |  |
| TONS CANE PER HOUR |  |  |  |
| TONS FIBRE PER HOUR |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **MATERIAL BALANCE** | | | **D.A.C.** | | |  | **DAY** | **PREVIOUS** | **WK- TO – DATE** |
|  | POL | BRIX | FIB | POL | BRIX | TIB | POL FACTOR |  | - |  |
| DAY |  |  |  | 12,95 | 15,21 | 15,93 | BRIX FACTOR |  | - |  |
| PREVIOUS | - | - | - | - | - | - | FIBRE FACTOR |  | - |  |
| WK-TO-DATE |  |  |  |  |  |  |  |  | - |  |

MONDAY DAY 1

**DAILY MATERIALS BALANCE**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | **DAY** | **PREVIOUS** | **WK TO DATE** |
| SUMMARY | TONS CANE CRUSHED | 5859,004 |  |  |
| TONS MIXED JUICE | 6979,775 |  |  |
| TONS WATER |  |  |  |
| TONS BAGASSE |  |  |  |
|  |  |  |  |  |
| BAGASSE | TONS Bx IN BAG (Bx % Bag = 2,68) |  |  |  |
| TONS MOIST IN BAG (Moist % Bag = 51,21) |  |  |  |
| TONS FIBRE IN BAG |  |  |  |
| TONS POL IN BAG (POL % Bag = 1,53) |  |  |  |
| Fib % BAG |  |  |  |
|  |  |  |  |  |
| CANE | TONS POL IN CANE |  |  |  |
| TONS BRIX IN CANE |  |  |  |
| TONS FIBRE IN CANE |  |  |  |
| POL % CANE |  |  |  |
| Fib % CANE |  |  |  |
| Bx 5 CANE |  |  |  |
| FIBRE IN BAG % CANE (UNCORR) |  |  |  |
| TONS D.A.C. BRIX IN CANE |  |  |  |
| TONS D.A.C. pol in cane |  |  |  |
| IMBIBITION % FIBRE |  |  |  |
| IMBIBITION % CANE |  |  |  |
|  |  |  |  |  |
| EXTRACTION |  |  |  |
| C.R.E. |  |  |  |
|  |  |  |  |
| M.J. | % SUSP. SOLIDS | 0,65 |  |  |
| TONS SUSP. SOLIDS |  |  |  |
| TONS CORR. BRIX IN M.J. | 837,865 |  |  |
| TONS CORR. POL IN M.J. | 727,673 |  |  |
| CORR. Bx.% M.J. |  |  |  |
| CORR. Pol% IN M.J. |  |  |  |
| PURITY M.J. |  |  |  |
| M.J. % CANE |  |  |  |
|  |  |  |  |  |
| HOURS AVAILABLE | 24,00 |  |  |
| STOPS: MECHANICAL | 0,5 |  |  |
| OPERATIONAL | 0,33 |  |  |
| NO CANE | NIL |  |  |
| SCHEDULED | - |  |  |
| TOTAL STOPS |  |  |  |
| HOURS CRUSHING |  |  |  |
| TONS CANE PER HOUR |  |  |  |
| TONS FIBRE PER HOUR |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **MATERIAL BALANCE** | | | **D.A.C.** | | |  | **DAY** | **PREVIOUS** | **WK- TO – DATE** |
|  | POL | BRIX | FIB | POL | BRIX | TIB | POL FACTOR |  |  |  |
| DAY |  |  |  | 12,94 | 15,16 | 16,22 | BRIX FACTOR |  |  |  |
| PREVIOUS |  |  |  |  |  |  | FIBRE FACTOR |  |  |  |
| WK-TO-DATE |  |  |  |  |  |  |  |  |  |  |

TUESDAY DAY 2

**DAILY MATERIALS BALANCE**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | **DAY** | **PREVIOUS** | **WK TO DATE** |
| SUMMARY | TONS CANE CRUSHED | 5302,932 |  |  |
| TONS MIXED JUICE | 6500,115 |  |  |
| TONS WATER |  |  |  |
| TONS BAGASSE |  |  |  |
|  |  |  |  |  |
| BAGASSE | TONS Bx IN BAG (Bx % Bag = 2,68) |  |  |  |
| TONS MOIST IN BAG (Moist % Bag = 51,21) |  |  |  |
| TONS FIBRE IN BAG |  |  |  |
| TONS POL IN BAG (POL % Bag = 1,53) |  |  |  |
| Fib % BAG |  |  |  |
|  |  |  |  |  |
| CANE | TONS POL IN CANE |  |  |  |
| TONS BRIX IN CANE |  |  |  |
| TONS FIBRE IN CANE |  |  |  |
| POL % CANE |  |  |  |
| Fib % CANE |  |  |  |
| Bx 5 CANE |  |  |  |
| FIBRE IN BAG % CANE (UNCORR) |  |  |  |
| TONS D.A.C. BRIX IN CANE |  |  |  |
| TONS D.A.C. pol in cane |  |  |  |
| IMBIBITION % FIBRE |  |  |  |
| IMBIBITION % CANE |  |  |  |
|  |  |  |  |  |
| EXTRACTION |  |  |  |
| C.R.E. |  |  |  |
|  |  |  |  |
| M.J. | % SUSP. SOLIDS | 0,65 |  |  |
| TONS SUSP. SOLIDS |  |  |  |
| TONS CORR. BRIX IN M.J. | 784,869 |  |  |
| TONS CORR. POL IN M.J. | 678,832 |  |  |
| CORR. Bx.% M.J. |  |  |  |
| CORR. Pol% IN M.J. |  |  |  |
| PURITY M.J. |  |  |  |
| M.J. % CANE |  |  |  |
|  |  |  |  |  |
| HOURS AVAILABLE | 24,00 |  |  |
| STOPS: MECHANICAL | 2,58 |  |  |
| OPERATIONAL | 0,42 |  |  |
| NO CANE | NIL |  |  |
| SCHEDULED | - |  |  |
| TOTAL STOPS |  |  |  |
| HOURS CRUSHING |  |  |  |
| TONS CANE PER HOUR |  |  |  |
| TONS FIBRE PER HOUR |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **MATERIAL BALANCE** | | | **D.A.C.** | | |  | **DAY** | **PREVIOUS** | **WK- TO – DATE** |
|  | POL | BRIX | FIB | POL | BRIX | TIB | POL FACTOR |  |  |  |
| DAY |  |  |  | 12,90 | 15,21 | 16,25 | BRIX FACTOR |  |  |  |
| PREVIOUS |  |  |  |  |  |  | FIBRE FACTOR |  |  |  |
| WK-TO-DATE |  |  |  |  |  |  |  |  |  |  |

WEDNESDAY DAY 3

**DAILY MATERIALS BALANCE**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | **DAY** | **PREVIOUS** | **WK TO DATE** |
| SUMMARY | TONS CANE CRUSHED | 6193,614 |  |  |
| TONS MIXED JUICE | 7166,950 |  |  |
| TONS WATER |  |  |  |
| TONS BAGASSE |  |  |  |
|  |  |  |  |  |
| BAGASSE | TONS Bx IN BAG (Bx % Bag = 2,68) |  |  |  |
| TONS MOIST IN BAG (Moist % Bag = 51,21) |  |  |  |
| TONS FIBRE IN BAG |  |  |  |
| TONS POL IN BAG (POL % Bag = 1,53) |  |  |  |
| Fib % BAG |  |  |  |
|  |  |  |  |  |
| CANE | TONS POL IN CANE |  |  |  |
| TONS BRIX IN CANE |  |  |  |
| TONS FIBRE IN CANE |  |  |  |
| POL % CANE |  |  |  |
| Fib % CANE |  |  |  |
| Bx 5 CANE |  |  |  |
| FIBRE IN BAG % CANE (UNCORR) |  |  |  |
| TONS D.A.C. BRIX IN CANE |  |  |  |
| TONS D.A.C. pol in cane |  |  |  |
| IMBIBITION % FIBRE |  |  |  |
| IMBIBITION % CANE |  |  |  |
|  |  |  |  |  |
| EXTRACTION |  |  |  |
| C.R.E. |  |  |  |
|  |  |  |  |
| M.J. | % SUSP. SOLIDS | 0,58 |  |  |
| TONS SUSP. SOLIDS |  |  |  |
| TONS CORR. BRIX IN M.J. | 865,613 |  |  |
| TONS CORR. POL IN M.J. | 748,690 |  |  |
| CORR. Bx.% M.J. |  |  |  |
| CORR. Pol% IN M.J. |  |  |  |
| PURITY M.J. |  |  |  |
| M.J. % CANE |  |  |  |
|  |  |  |  |  |
| HOURS AVAILABLE | 24,00 |  |  |
| STOPS: MECHANICAL | 0,17 |  |  |
| OPERATIONAL | 0,08 |  |  |
| NO CANE | - |  |  |
| SCHEDULED | - |  |  |
| TOTAL STOPS |  |  |  |
| HOURS CRUSHING |  |  |  |
| TONS CANE PER HOUR |  |  |  |
| TONS FIBRE PER HOUR |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **MATERIAL BALANCE** | | | **D.A.C.** | | |  | **DAY** | **PREVIOUS** | **WK- TO – DATE** |
|  | POL | BRIX | FIB | POL | BRIX | TIB | POL FACTOR |  |  |  |
| DAY |  |  |  | 13,01 | 15,29 | 16,28 | BRIX FACTOR |  |  |  |
| PREVIOUS |  |  |  |  |  |  | FIBRE FACTOR |  |  |  |
| WK-TO-DATE |  |  |  |  |  |  |  |  |  |  |

THURSDAY DAY 4

**DAILY MATERIALS BALANCE**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | **DAY** | **PREVIOUS** | **WK TO DATE** |
| SUMMARY | TONS CANE CRUSHED | 5866,720 |  |  |
| TONS MIXED JUICE | 6932,770 |  |  |
| TONS WATER |  |  |  |
| TONS BAGASSE |  |  |  |
|  |  |  |  |  |
| BAGASSE | TONS Bx IN BAG (Bx % Bag = 2,68) |  |  |  |
| TONS MOIST IN BAG (Moist % Bag = 51,21) |  |  |  |
| TONS FIBRE IN BAG |  |  |  |
| TONS POL IN BAG (POL % Bag = 1,53) |  |  |  |
| Fib % BAG |  |  |  |
|  |  |  |  |  |
| CANE | TONS POL IN CANE |  |  |  |
| TONS BRIX IN CANE |  |  |  |
| TONS FIBRE IN CANE |  |  |  |
| POL % CANE |  |  |  |
| Fib % CANE |  |  |  |
| Bx 5 CANE |  |  |  |
| FIBRE IN BAG % CANE (UNCORR) |  |  |  |
| TONS D.A.C. BRIX IN CANE |  |  |  |
| TONS D.A.C. pol in cane |  |  |  |
| IMBIBITION % FIBRE |  |  |  |
| IMBIBITION % CANE |  |  |  |
|  |  |  |  |  |
| EXTRACTION |  |  |  |
| C.R.E. |  |  |  |
|  |  |  |  |
| M.J. | % SUSP. SOLIDS | 0,58 |  |  |
| TONS SUSP. SOLIDS |  |  |  |
| TONS CORR. BRIX IN M.J. | 842,34 |  |  |
| TONS CORR. POL IN M.J. | 726,955 |  |  |
| CORR. Bx.% M.J. |  |  |  |
| CORR. Pol% IN M.J. |  |  |  |
| PURITY M.J. |  |  |  |
| M.J. % CANE |  |  |  |
|  |  |  |  |  |
| HOURS AVAILABLE | 24,00 |  |  |
| STOPS: MECHANICAL | 1,00 |  |  |
| OPERATIONAL | 0,50 |  |  |
| NO CANE | - |  |  |
| SCHEDULED | - |  |  |
| TOTAL STOPS |  |  |  |
| HOURS CRUSHING |  |  |  |
| TONS CANE PER HOUR |  |  |  |
| TONS FIBRE PER HOUR |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **MATERIAL BALANCE** | | | **D.A.C.** | | |  | **DAY** | **PREVIOUS** | **WK- TO – DATE** |
|  | POL | BRIX | FIB | POL | BRIX | TIB | POL FACTOR |  |  |  |
| DAY |  |  |  | 12,88 | 15,17 | 16,30 | BRIX FACTOR |  |  |  |
| PREVIOUS |  |  |  |  |  |  | FIBRE FACTOR |  |  |  |
| WK-TO-DATE |  |  |  |  |  |  |  |  |  |  |

FRIDAY DAY 5

2.3 Knowledge Topic 3: Stock Taking (10%)

Topic elements to be covered include:

* KT0301 Purpose
* KT0302 Data collection
* KT0303 Sampling

Internal Assessment Criteria and Weight

* IAC0301 Knowledge of accurate stocking as a component of materials balance can be demonstrated
* (Weight 10%)

**Learning activity 3.1: Individual Learning activity: 6 hours (150 marks)**



**Learning Objective:** Demonstrate an understanding of stocktaking of factory products calculations.

**Task:** Read each question carefully and write your answers in the spaces provided.

1. Using the following stock figures, calculate the Estimated tons of Brix and Estimated tons of pol in stock. Then calculate the Estimated tons of sugar and the tons of molasses that will be produced from the stock. (50)

Use the wantage tables provided in Appendix A.

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | **Brix** | **Purity** |
| Clarifier No.1 | 439.60 m3 | 12.00 | 84.90 |
| Clarifier No. 2 | 293.20 m3 | 12.00 | 84.90 |
| Syrup tank | 152 cm out | 68.40 | 85.30 |
| A-crystalliser No. 1 | 96 cm out | 93.00 | 84.40 |
| A-crystalliser No. 2 | 26 cm out | 93.00 | 84.40 |
| B-crystalliser No. 1 | 46 cm out | 93.40 | 68.70 |
| B-crystalliser No. 2 | 42 cm out | 93.40 | 68.70 |
| C-crystalliser No. 1 | 32 cm out | 96.30 | 52.90 |
| C-crystalliser No. 2 | 34 cm out | 96.30 | 52.90 |
| C-crystalliser No. 3 | 63 cm out | 96.30 | 52.90 |
| C-crystalliser No.4 | 32 cm out | 96.30 | 52.90 |
| A-molasses tank | 186 cm out | 70.80 | 68.90 |
| B-molasses tank | 366 cm out | 71.50 | 45.50 |
| Magma tank | 98 cm out | 91.00 | 68.90 |

Pol % Sugar 99.40

Moisture % Sugar 0.10

Pol % Molasses 26.98

Brix % Molasses 89.04

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Product** | Wantage (cm out) | Volume (m3) | Brix % | Purity % | Tons Bx/m3  tons/m3 | Ton Brix | Ton pol |
| Clarifier No. 1 |  |  |  |  |  |  |  |
| Clarifier No. 2 |  |  |  |  |  |  |  |
| Syrup tank |  |  |  |  |  |  |  |
| A-crystalliser No. 1 |  |  |  |  |  |  |  |
| A-crystalliser No. 2 |  |  |  |  |  |  |  |
| B-crystalliser No. 1 |  |  |  |  |  |  |  |
| B-crystalliser No. 2 |  |  |  |  |  |  |  |
| C-crystalliser No. 1 |  |  |  |  |  |  |  |
| C-crystalliser No. 2 |  |  |  |  |  |  |  |
| C-crystalliser No.3 |  |  |  |  |  |  |  |
| C-crystalliser No. 4 |  |  |  |  |  |  |  |
| A-molasses tank |  |  |  |  |  |  |  |
| B-molasses tank |  |  |  |  |  |  |  |
| Magma tank |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

Stock Purity = \_\_\_\_\_\_\_\_\_\_\_\_\_× 100

SJM Recovery = = × 100 = \_\_\_\_\_\_\_\_\_\_\_\_%

Tons of pol in Sugar = × = \_\_\_\_\_\_\_\_\_\_\_\_\_tons

Tons of Sugar = × = \_\_\_\_\_\_\_\_\_\_ tons

Tons of Pol in Molasses = \_\_\_\_\_\_\_\_\_ - \_\_\_\_\_\_\_\_\_ = \_\_\_\_\_\_\_\_\_\_\_ tons

Tons of Molasses =\_\_\_\_\_100\_\_\_- = \_\_\_\_\_\_\_\_\_\_ tons

1. Using the following stock figures, calculate the Estimated tons of Brix and Estimated tons of Pol in stock. Then calculate the Estimated tons of sugar and the tons of molasses that will be produced from the stock. (50)

Use the wantages tables provided in Appendix A.

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | **Brix** | **Purity** |
| Clarifier No.1 | 439.60 m3 | 13.00 | 83.60 |
| Clarifier No. 2 | 293.20 m3 | 13.00 | 83.60 |
| Syrup tank | 148 cm out | 70.40 | 84.60 |
| A-crystalliser No. 1 | 92 cm out | 92.50 | 84.20 |
| A-crystalliser No. 2 | 34 cm out | 92.50 | 84.20 |
| B-crystalliser No. 1 | 42 cm out | 93.20 | 68.30 |
| B-crystalliser No. 2 | 50 cm out | 93.20 | 68.30 |
| C-crystalliser No. 1 | 36 cm out | 96.50 | 51.90 |
| C-crystalliser No. 2 | 38 cm out | 96.50 | 51.90 |
| C-crystalliser No. 3 | 40 cm out | 96.50 | 51.90 |
| C-crystalliser No.4 | 38 cm out | 96.50 | 51.90 |
| A-molasses tank | 126 cm out | 70.40 | 69.10 |
| B-molasses tank | 332 cm out | 70.90 | 46.00 |
| Magma tank | 78 cm out | 90.00 | 68.20 |

Pol % Sugar 99.38

Moisture % Sugar 0.12

Pol % Molasses 27.04

Brix % Molasses 86.53

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Product** | Wantage (cm out) | Volume (m3) | Brix % | Purity % | Tons Bx/m3  tons/m3 | Ton Brix | Ton pol |
| Clarifier No. 1 |  |  |  |  |  |  |  |
| Clarifier No. 2 |  |  |  |  |  |  |  |
| Syrup tank |  |  |  |  |  |  |  |
| A-crystalliser No. 1 |  |  |  |  |  |  |  |
| A-crystalliser No. 2 |  |  |  |  |  |  |  |
| B-crystalliser No. 1 |  |  |  |  |  |  |  |
| B-crystalliser No. 2 |  |  |  |  |  |  |  |
| C-crystalliser No. 1 |  |  |  |  |  |  |  |
| C-crystalliser No. 2 |  |  |  |  |  |  |  |
| C-crystalliser No.3 |  |  |  |  |  |  |  |
| C-crystalliser No. 4 |  |  |  |  |  |  |  |
| A-molasses tank |  |  |  |  |  |  |  |
| B-molasses tank |  |  |  |  |  |  |  |
| Magma tank |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

Stock Purity \_\_\_\_\_\_\_\_\_\_\_\_\_× 100

SJM Recovery = = × 100 = \_\_\_\_\_\_\_\_\_\_\_\_%

Tons of pol in Sugar = × = \_\_\_\_\_\_\_\_\_\_\_\_\_tons

Tons of Sugar = × = \_\_\_\_\_\_\_\_\_\_ tons

Tons of Pol in Molasses = \_\_\_\_\_\_\_\_\_ - \_\_\_\_\_\_\_\_\_ = \_\_\_\_\_\_\_\_\_\_ tons

Tons of Molasses = × = \_\_\_\_\_\_\_\_\_\_\_ tons

1. Using the following stock figures, calculate the Estimated tons of Brix and Estimated tons of pol in stock. Then calculate the Estimated tons of sugar and the tons of molasses that will be produced from the stock. (50)

Use the wantage tables provided in Appendix A.

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | **Brix** | **Purity** |
| Clarifier No.1 | 439.60 m3 | 12.00 | 84.70 |
| Clarifier No. 2 | 293.20 m3 | 12.00 | 84.70 |
| Syrup tank | 152 cm out | 68.40 | 85.50 |
| A-crystalliser No. 1 | 96 cm out | 93.20 | 84.20 |
| A-crystalliser No. 2 | 26 cm out | 93.20 | 84.20 |
| B-crystalliser No. 1 | 46 cm out | 93.80 | 68.50 |
| B-crystalliser No. 2 | 42 cm out | 93.80 | 68.50 |
| C-crystalliser No. 1 | 32 cm out | 96.10 | 52.50 |
| C-crystalliser No. 2 | 34 cm out | 96.10 | 52.50 |
| C-crystalliser No. 3 | 63 cm out | 96.10 | 52.50 |
| C-crystalliser No.4 | 32 cm out | 96.10 | 52.50 |
| A-molasses tank | 186 cm out | 70.40 | 68.70 |
| B-molasses tank | 366 cm out | 71.70 | 45.70 |
| Magma tank | 98 cm out | 91.20 | 68.10 |

Pol % Sugar 99.45

Moisture % Sugar 0.08

Pol % Molasses 26.08

Brix % Molasses 86.32

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Product** | Wantage (cm out) | Volume (m3) | Brix % | Purity % | Tons Bx/m3  tons/m3 | Ton Brix | Ton pol |
| Clarifier No. 1 |  |  |  |  |  |  |  |
| Clarifier No. 2 |  |  |  |  |  |  |  |
| Syrup tank |  |  |  |  |  |  |  |
| A-crystalliser No. 1 |  |  |  |  |  |  |  |
| A-crystalliser No. 2 |  |  |  |  |  |  |  |
| B-crystalliser No. 1 |  |  |  |  |  |  |  |
| B-crystalliser No. 2 |  |  |  |  |  |  |  |
| C-crystalliser No. 1 |  |  |  |  |  |  |  |
| C-crystalliser No. 2 |  |  |  |  |  |  |  |
| C-crystalliser No.3 |  |  |  |  |  |  |  |
| C-crystalliser No. 4 |  |  |  |  |  |  |  |
| A-molasses tank |  |  |  |  |  |  |  |
| B-molasses tank |  |  |  |  |  |  |  |
| Magma tank |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

Stock Purity \_\_\_\_\_\_\_\_\_\_\_\_\_× 100

SJM Recovery = = × 100 = \_\_\_\_\_\_\_\_\_\_\_\_%

Tons of pol in Sugar = × = \_\_\_\_\_\_\_\_\_\_\_\_\_tons

Tons of Sugar = × = \_\_\_\_\_\_\_\_\_\_ tons

Tons of Pol in Molasses = \_\_\_\_\_\_\_\_\_ - \_\_\_\_\_\_\_\_\_ = \_\_\_\_\_\_\_\_\_\_ tons

Tons of Molasses = × = \_\_\_\_\_\_\_\_\_\_\_ tons

* 1. Knowledge Topic 4: Calculations (25%)

Topic elements to be covered include:

* KT0401 Factory Performance Calculations
* KT0402 Products in process
* KT0403 Calculations

Internal Assessment Criteria and Weight

* IAC0401 Knowledge of formulas and accurate application can be demonstrated.
* (Weight 25%)

**Learning activity 4.1: Individual Learning activity: 4 hours (100 marks)**



**Learning Objective:** Demonstrate an understanding and knowledge of formulas and the accurate application thereof.

**Task:** Complete the factory performance calculations for the “POLSASA” worksheet provided below. Extra space is provided for your calculations – Please show your workings in the space provided.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **WEEK NUMBER** | | **1** | **2** | **3** | **4** | **5** | **35** |
|  | | | | | | | |
| **WEEK SUGAR & FINAL MOLASSES ANALYSES** | | | | | | | |
| 1 | POL & SUGAR | 99.52 | 99.48 | 99.31 | 99.37 | 99.28 | 99.25 |
| 2 | MOISTURE % SUGAR | 0.08 | 0.09 | 0.12 | 0.11 | 0.13 | 0.15 |
| 3 | PURITY SUGAR |  |  |  |  |  |  |
| 4 | POL % FINAL MOLASSES | 29.98 | 31.58 | 32.85 | 33.05 | 32.46 | 24.79 |
| 5 | BRIX % FINAL MOLASSES | 82.50 | 83.56 | 83.98 | 84.41 | 84.02 | 85.28 |
| 6 | PURITY FINAL MOLASSES |  |  |  |  |  | 40.80 |
| **STOCK SUGAR & FINAL MOLASSES ESTIMATED** | | | | | | | |
| 7 | TONS SUGAR IN BINS | 2.819 | 0.850 | 0.000 | 1.223 | 2.789 | 0 |
| 8 | TONS POL IN STOCK | 7.770 | 6.623 | 7.585 | 8.003 | 8.413 | 0 |
| 9 | TONS BRIX IN STOCK | 11.227 | 9.461 | 11.154 | 11.599 | 11.525 | 0 |
| 10 | STOCK PURITY |  |  |  |  |  | 0 |
| 11 | SJM RECOVERY |  |  |  |  |  | 0 |
| 12 | TONS POL IN SUGAR EST |  |  |  |  |  | 0 |
| 13 | TONS SUGAR EST |  |  |  |  |  | 0 |
| 14 | TONS POL IN FIN. MOL EST. |  |  |  |  |  | 0 |
| 15 | TONS FIN. MOL. EST. |  |  |  |  |  | 0 |
| **V.H.P. SUGAR** | | | | | | | |
| 16 | TONS MADE WEEK | 9.838 | 10.372 | 18.753 | 22.300 | 20.369 | 14.179 |
| 17 | TONS MADE PREVIOUS | 0.000 |  |  |  |  | 952.566 |
| 18 | TONS MADE TO-DATE |  |  |  |  |  |  |
| 19 | TONS EST IN STOCK & BINS |  |  |  |  |  | 0.000 |
| 20 | TONS M & E TO-DATE |  |  |  |  |  |  |
| 21 | TONS M & E PREVIOUS | 0.000 |  |  |  |  | 953.657 |
| 22 | TONS M & E WEEK |  |  |  |  |  |  |
| 23 | TONS POL M & E WEEK |  |  |  |  |  |  |
| 24 | TONS POL M & E PREVIOUS | 0.000 |  |  |  |  | 948.535 |
| 25 | TONS POL M & E TO-DATE |  |  |  |  |  |  |
| **FINAL MOLASSES** | | | | | | | |
| 26 | TONS MADE WEEK | 8.311 | 1.778 | 6.252 | 9.355 | 8.102 | 17.375 |
| 27 | TONS MADE PREVIOUS | 0.000 |  |  |  |  | 273.802 |
| 28 | TONS MADE TO-DATE |  |  |  |  |  |  |
| 29 | TONS EST. IN STOCK |  |  |  |  |  | 0.000 |
| 30 | TONS M & E TO-DATE |  |  |  |  |  |  |
| 31 | TONS M & E PREVIOUS | 0.000 |  |  |  |  | 286.601 |
| 32 | TONS M & E WEEK |  |  |  |  |  |  |
| 33 | TONS POL M & E WEEK |  |  |  |  |  |  |
| 34 | TONS POL M & E PREVIOUS | 0.000 |  |  |  |  | 83.004 |
| 35 | TONS POL M & E TO-DATE |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **FILTER CAKE** | | | | | | | |
| 36 | TONS MADE WEEK | 7.825 | 8.502 | 8.998 | 9.033 | 8.473 | 4.080 |
| 37 | TONS PREVIOUS | 0.000 |  |  |  |  | 367.915 |
| 38 | TONS TO-DATE |  |  |  |  |  |  |
| 39 | TONS POL WEEK | 0.257 | 0.303 | 0.324 | 0.35 | 0.333 | 0.090 |
| 40 | TONS POL PREVIOUS | 0.000 |  |  |  |  | 10.609 |
| 41 | TONS POL TO-DATE |  |  |  |  |  |  |
| **BAGASSE** | | | | | | | |
| 42 | TONS MADE WEEK | 58.516 | 60.603 | 55.752 | 58.369 | 57.456 | 30.613 |
| 43 | TONS PREVIOUS | 0.000 |  |  |  |  | 2799.290 |
| 44 | TONS TO-DATE |  |  |  |  |  |  |
| 45 | TONS POL WEEK | 0.738 | 0.748 | 0.653 | 0.728 | 0.698 | 0.614 |
| 46 | TONS POL PREVIOUS | 0.000 |  |  |  |  |  |
| 47 | TONS POL TO-DATE |  |  |  |  |  |  |
| **MIXED JUICE** | | | | | | | |
| 48 | TONS MADE WEEK | 238.293 | 240.357 | 230.246 | 243.842 | 238.159 | 155.313 |
| 49 | TONS PREVIOUS | 0.000 |  |  |  |  |  |
| 50 | TONS TO-DATE |  |  |  |  |  |  |
| 51 | TONS CORRECTED POL WEEK | 24.699 | 25.123 | 22.752 | 26.021 | 24.996 | 15.143 |
| 52 | TONS CORR. POL PREVIOUS | 0.000 |  |  |  |  | 1039.000 |
| 53 | TONS CORR. POL TO-DATE |  |  |  |  |  |  |
| **CANE** | | | | | | | |
| 54 | TONS CRUSHED WEEK | 205.968 | 208.751 | 202.421 | 210.635 | 205.562 | 129.684 |
| 55 | TONS CRUSHED PREVIOUS | 0.000 |  |  |  |  | 8482.120 |
| 56 | TONS CRUSHED TO-DATE |  |  |  |  |  |  |
| 57 | TONS POL WEEK |  |  |  |  |  |  |
| 58 | TONS POL PREVIOUS | 0.000 |  |  |  |  | 1065.154 |
| 59 | TONS POL TO-DATE |  |  |  |  |  |  |
| **POL UNDETERMINED ON POL IN MIXED JUICE** | | | | | | | |
| 60 | TONS LOST WEEK |  |  |  |  |  |  |
| 61 | TONS PREVIOUS | 0.000 |  |  |  |  |  |
| 62 | TONS TO-DATE |  |  |  |  |  |  |
| **POL BALANCE % POL IN CANE** | | | | | | | |
| 63 | POL IN BAGASSE WEEK |  |  |  |  |  |  |
| 64 | POL IN BAGASSE TO-DATE |  |  |  |  |  |  |
| 65 | POL IN F. CAKE WEEK |  |  |  |  |  |  |
| 66 | POL IN F.CAKE TO-DATE |  |  |  |  |  |  |
| 67 | POL F. MOL. M & E WEEK |  |  |  |  |  |  |
| 68 | POL F. MOL M & E TO-DATE |  |  |  |  |  |  |
| 69 | POL UNDETERMINED WEEK |  |  |  |  |  |  |
| 70 | POL UNDETERMINEDTO-DATE |  |  |  |  |  |  |
| 71 | TONS POL IN SUGAR M & E WK |  |  |  |  |  |  |
| 72 | TONS POL IN SUGAR M & E TD |  |  |  |  |  |  |
| 73 | EXTRACTION FOR WEEK |  |  |  |  |  |  |
| 74 | EXTRACTION TO-DATE |  |  |  |  |  |  |
| 75 | B.H.R. WEEK |  |  |  |  |  |  |
| 76 | B.H.R. PREVIOUS |  |  |  |  |  |  |
| 77 | OVERALL REC. WEEK |  |  |  |  |  |  |
| 78 | OVERALL REC. TO-DATE |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **QUALITY CONTROL** | | | | | | | |
| 79 | POL % CANE WEEK |  |  |  |  |  |  |
| 80 | POL % CANE TO-DATE |  |  |  |  |  |  |
| 81 | POL % SUGAR M & E WEEK |  |  |  |  |  |  |
| 82 | POL % SUGAR M & E TO-DATE |  |  |  |  |  |  |
| 83 | POL % MOL. M & E WEEK |  |  |  |  |  |  |
| 84 | POL % MOL. M & E TO-DATE |  |  |  |  |  |  |
| 85 | POL % BAGASSE WEEK |  |  |  |  |  |  |
| 86 | POL % BAGASSE TO-DATE |  |  |  |  |  |  |
| 87 | POL FILTER CAKE WEEK |  |  |  |  |  |  |
| 88 | POL FILTER CAKE TO-DATE |  |  |  |  |  |  |
| 89 | CANE TO SUGAR RATIO WEEK |  |  |  |  |  |  |
| 90 | CANE TO SUGAR RATIO TD |  |  |  |  |  |  |

**SPACE FOR CALCULATIONS IS PROVIDED IN THE LEARNER WORKBOOKS**

|  |
| --- |
|  |
|  |
|  |

1. CONCLUSION OF KNOWLEDGE MODULE 3: SUGAR PROCESSING FACTORY CONTROL CALCULATIONS

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-03-KT01: Introduction to factory control concepts (40%) | 90 |  |
| KM-03-KT02: Materials balance (25%) | 250 |  |
| KM-03-KT03: Stock taking (10%) | 150 |  |
| KM-03-KT04: Calculations (25%) | 100 |  |
| **Total Marks** | **590 marks** |  |

APPENDIX A: WANTAGE TABLES

w**antage Table 1: Syrup Tank**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| cm | 0 | 2 | 4 | 6 | 8 |
| 10 | 104.0 | 103.7 | 103.0 | 102.2 | 101.5 |
| 20 | 100.8 | 100.1 | 99.4 | 98.6 | 97.9 |
| 30 | 97.20 | 96.5 | 95.8 | 95.0 | 94.3 |
| 40 | 93.6 | 92.9 | 92.9 | 91.4 | 90.7 |
| 50 | 90.0 | 89.3 | 88.6 | 87.8 | 87.1 |
| 60 | 86.4 | 85.7 | 85.0 | 84.2 | 83.5 |
| 70 | 82.8 | 82.1 | 81.4 | 80.6 | 79.9 |
| 80 | 79.2 | 78.5 | 77.8 | 77.0 | 76.3 |
| 90 | 75.6 | 74.9 | 74.2 | 73.4 | 72.7 |
| 100 | 72.0 | 71.3 | 70.6 | 69.8 | 69.1 |
| 110 | 68.4 | 67.7 | 67.0 | 66.2 | 65.5 |
| 120 | 64.8 | 64.1 | 63.4 | 62.6 | 61.9 |
| 130 | 61.2 | 60.5 | 59.8 | 59.0 | 58.3 |
| 140 | 87.6 | 56.9 | 56.2 | 55.4 | 54.7 |
| 150 | 54.0 | 53.3 | 56.2 | 51.6 | 51.1 |
| 160 | 50.4 | 49.7 | 49.0 | 48.2 | 47.5 |
| 170 | 46.8 | 46.1 | 45.4 | 44.6 | 43.9 |
| 180 | 43.2 | 42.5 | 41.8 | 41.0 | 40.3 |
| 190 | 39.6 | 38.9 | 38.2 | 37.4 | 36.7 |
| 200 | 36.0 | 35.2 | 34.6 | 33.8 | 33.1 |
| 210 | 32.4 | 31.7 | 31.0 | 30.2 | 29.5 |
| 220 | 26.8 | 28.1 | 27.4 | 26.6 | 25.9 |
| 230 | 25.2 | 24.5 | 23.8 | 23.0 | 22.3 |
| 240 | 21.6 | 20.9 | 20.2 | 19.4 | 18.7 |
| 250 | 18.0 | 17.3 | 16.6 | 15.8 | 15.1 |
| 260 | 14.4 | 13.7 | 13.0 | 12.2 | 11.5 |
| 270 | 10.8 | 10.1 | 9.4 | 8.6 | 7.9 |
| 280 | 7.2 | 6.5 | 5.8 | 5.0 | 4.2 |
| 290 | 3.6 | 2.9 | 2.2 | 1.4 | 0.7 |
|  |  |  |  |  |  |

**Wantage Table 2: A molasses Tank**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| cm | 0 | 2 | 4 | 6 | 8 |
| 10 | 62.4 | 62.1 | 61.8 | 61.4 | 61.1 |
| 20 | 60.8 | 60.5 | 60.2 | 59.8 | 59.5 |
| 30 | 59.2 | 58.9 | 58.6 | 58.2 | 57.9 |
| 40 | 57.6 | 57.3 | 57.0 | 56.6 | 56.3 |
| 50 | 56.0 | 55.7 | 55.4 | 55.0 | 54.7 |
| 60 | 54.4 | 54.1 | 53.8 | 53.4 | 53.1 |
| 70 | 52.8 | 52.5 | 52.2 | 51.8 | 51.5 |
| 80 | 51.2 | 50.9 | 50.6 | 50.2 | 49.9 |
| 90 | 49.6 | 49.3 | 49.0 | 48.6 | 48.3 |
| 100 | 48.0 | 47.7 | 47.4 | 47.0 | 46.7 |
| 110 | 46.4 | 46.1 | 45.8 | 45.4 | 45.1 |
| 120 | 44.8 | 44.5 | 44.2 | 43.8 | 43.5 |
| 130 | 43.2 | 42.9 | 42.6 | 42.2 | 41.9 |
| 140 | 41.6 | 41.3 | 41.0 | 40.6 | 40.3 |
| 150 | 40.0 | 39.7 | 39.4 | 39.0 | 38.7 |
| 160 | 38.4 | 38.1 | 37.8 | 37.4 | 37.1 |
| 170 | 36.8 | 36.5 | 36.2 | 35.8 | 35.5 |
| 180 | 35.2 | 34.9 | 34.6 | 34.2 | 33.9 |
| 190 | 33.6 | 33.3 | 33.0 | 32.6 | 32.3 |
| 200 | 32.0 | 31.7 | 31.4 | 31.0 | 30.7 |
| 210 | 30.4 | 30.1 | 29.8 | 29.4 | 29.1 |
| 220 | 28.8 | 28.5 | 28.2 | 27.8 | 27.5 |
| 230 | 27.2 | 26.9 | 26.6 | 26.2 | 25.9 |
| 240 | 25.6 | 25.3 | 25.0 | 24.6 | 24.3 |
| 250 | 24.0 | 23.7 | 23.4 | 23.0 | 22.7 |
| 260 | 22.4 | 22.1 | 21.8 | 21.4 | 21.1 |
| 270 | 20.8 | 20.5 | 20.2 | 19.8 | 19.5 |
| 280 | 19.2 | 18.9 | 18.6 | 18.2 | 17.9 |
| 290 | 17.6 | 17.3 | 17.0 | 16.6 | 16.3 |
| 300 | 16.0 | 15.7 | 15.4 | 15.0 | 14.7 |
| 310 | 14.4 | 14.1 | 13.8 | 13.4 | 13.1 |
| 320 | 12.8 | 12.5 | 12.2 | 11.8 | 11.5 |
| 330 | 11.2 | 10.9 | 10.6 | 10.2 | 9.9 |
| 340 | 9.6 | 9.3 | 9.0 | 8.6 | 8.3 |
| 350 | 8.0 | 7.7 | 7.4 | 7.0 | 6.7 |
| 360 | 6.4 | 6.1 | 5.8 | 5.4 | 5.1 |
| 370 | 4.8 | 4.5 | 4.2 | 3.8 | 3.5 |
| 380 | 3.2 | 2.9 | 2.6 | 2.2 | 1.9 |
| 390 | 1.6 | 1.3 | 1.0 | 0.6 | 0.3 |

**Wantage Table 3: B Molasses: 6 × 4 × 5m**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| cm | 0 | 2 | 4 | 6 | 8 |
| 10 | 117.6 | 117.1 | 116.6 | 116.2 | 115.7 |
| 20 | 115.2 | 114.7 | 114.2 | 113.8 | 113.3 |
| 30 | 112.8 | 112.3 | 111.8 | 111.4 | 110.9 |
| 40 | 110.4 | 109.9 | 109.4 | 109.0 | 108.5 |
| 50 | 108.0 | 107.5 | 107.0 | 106.6 | 106.1 |
| 60 | 105.6 | 105.1 | 104.6 | 104.2 | 103.7 |
| 70 | 103.2 | 102.7 | 102.2 | 101.8 | 101.3 |
| 80 | 100.0 | 100.3 | 99.8 | 99.4 | 98.9 |
| 90 | 98.4 | 97.9 | 97.4 | 97.0 | 96.5 |
| 100 | 96.0 | 97.9 | 97.4 | 97.0 | 69.5 |
| 110 | 93.6 | 93.1 | 92.6 | 92.2 | 91.7 |
| 120 | 91.2 | 90.7 | 90.2 | 89.8 | 89.3 |
| 130 | 88.8 | 88.3 | 87.8 | 87.4 | 86.9 |
| 140 | 86.4 | 85.9 | 85.4 | 85.0 | 84.5 |
| 150 | 84.0 | 83.5 | 83.0 | 82.6 | 82.1 |
| 160 | 81.6 | 81.1 | 80.6 | 80.2 | 79.7 |
| 170 | 79.2 | 78.7 | 78.2 | 77.8 | 77.3 |
| 180 | 76.8 | 76.3 | 75.8 | 75.4 | 74.9 |
| 190 | 74.4 | 73.9 | 73.4 | 73.0 | 72.5 |
| 200 | 72.0 | 71.5 | 71.0 | 70.6 | 70.1 |
| 210 | 69.6 | 69.1 | 68.6 | 68.2 | 67.7 |
| 220 | 67.2 | 66.7 | 66.2 | 65.8 | 65.3 |
| 230 | 64.8 | 64.3 | 63.8 | 63.4 | 62.9 |
| 240 | 62.4 | 61.9 | 61.4 | 61.0 | 60.5 |
| 250 | 60.0 | 59.5 | 59.0 | 58.6 | 58.1 |
| 260 | 57.6 | 57.1 | 56.6 | 56.2 | 55.7 |
| 270 | 55.2 | 54.7 | 54.2 | 53.8 | 53.3 |
| 280 | 52.8 | 52.3 | 51.8 | 51.4 | 50.9 |
| 290 | 50.4 | 49.9 | 49.4 | 49.0 | 48.5 |
| 300 | 48.0 | 47.5 | 47.0 | 46.6 | 46.1 |
| 310 | 45.6 | 45.1 | 44.6 | 44.2 | 43.7 |
| 320 | 43.2 | 42.7 | 42.2 | 41.8 | 41.3 |
| 330 | 40.8 | 40.3 | 39.8 | 39.4 | 38.9 |
| 340 | 38.4 | 37.9 | 37.4 | 37.0 | 36.5 |
| 350 | 36.0 | 35.5 | 35.0 | 34.6 | 34.1 |
| 360 | 33.6 | 33.1 | 32.6 | 32.2 | 31.7 |
| 370 | 31.2 | 30.7 | 30.2 | 29.8 | 29.3 |
| 380 | 28.8 | 28.3 | 27.8 | 27.4 | 26.9 |
| 390 | 26.4 | 25.9 | 25.4 | 25.0 | 24.5 |
| 400 | 24.0 | 23.5 | 23.0 | 22.6 | 22.1 |
| 410 | 21.6 | 21.1 | 20.6 | 20.2 | 19.7 |
| 420 | 19.2 | 18.7 | 18.2 | 17.8 | 17.3 |
| 430 | 16.8 | 16.3 | 15.8 | 15.4 | 14.9 |
| 440 | 14.4 | 13.9 | 13.4 | 13.0 | 12.5 |
| 450 | 12.0 | 11.5 | 11.0 | 10.6 | 10.1 |
| 460 | 9.6 | 9.1 | 8.6 | 8.2 | 7.7 |
| 470 | 7.2 | 6.7 | 6.2 | 5.8 | 5.3 |
| 480 | 4.8 | 4.3 | 3.8 | 3.4 | 2.9 |
| 490 | 2.4 | 1.9 | 1.4 | 1.0 | 0.5 |

**Wantage Table 4: A Crystallisers : 15 × 4 × 2m**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| cm | 0 | 2 | 4 | 6 | 8 |
| 10 | 114.0 | 112.8 | 111.6 | 110.4 | 109.2 |
| 20 | 108.0 | 106.8 | 105.6 | 104.4 | 103.2 |
| 30 | 102.0 | 100.8 | 99.6 | 98.4 | 97.2 |
| 40 | 96.0 | 94.8 | 93.6 | 92.4 | 91.2 |
| 50 | 90.0 | 88.8 | 87.6 | 86.4 | 85.2 |
| 60 | 84.0 | 82.8 | 81.6 | 80.4 | 79.2 |
| 70 | 78.0 | 76.8 | 75.6 | 74.4 | 73.2 |
| 80 | 72.0 | 70.8 | 69.6 | 68.4 | 67.2 |
| 90 | 66.0 | 64.8 | 63.6 | 62.4 | 61.2 |
| 100 | 60.0 | 58.8 | 57.6 | 56.4 | 55.2 |
| 110 | 54.0 | 52.8 | 51.6 | 50.4 | 49.2 |
| 120 | 48.0 | 46.8 | 45.6 | 44.4 | 43.2 |
| 130 | 42.0 | 40.8 | 39.6 | 38.4 | 37.2 |
| 140 | 36.0 | 34.8 | 33.6 | 32.4 | 31.2 |
| 150 | 30.0 | 28.8 | 27.6 | 26.4 | 25.2 |
| 160 | 24.0 | 22.8 | 21.6 | 20.4 | 19.2 |
| 170 | 18.0 | 16.8 | 15.6 | 14.4 | 13.2 |
| 180 | 12.0 | 10.8 | 9.6 | 8.4 | 7.2 |
| 190 | 6.0 | 4.8 | 3.6 | 2.4 | 1.2 |

**B Crystallisers**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| cm | 0 | 2 | 4 | 6 | 8 |
| 10 | 136.8 | 135.4 | 133.9 | 132.5 | 131.0 |
| 20 | 129.6 | 128.2 | 126.7 | 125.3 | 123.8 |
| 30 | 122.4 | 121.0 | 119.5 | 118.1 | 116.6 |
| 40 | 115.2 | 113.8 | 112.3 | 110.9 | 109.4 |
| 50 | 108.0 | 106.6 | 105.1 | 103.7 | 102.2 |
| 60 | 100.8 | 99.4 | 97.9 | 96.5 | 95.0 |
| 70 | 93.6 | 32.2 | 90.7 | 89.3 | 87.7 |
| 80 | 86.4 | 85.0 | 83.5 | 82.1 | 80.6 |
| 90 | 79.2 | 77.8 | 76.3 | 74.9 | 73.6 |
| 100 | 72.0 | 70.6 | 69.1 | 67.7 | 66.2 |
| 110 | 64.8 | 63.4 | 61.9 | 60.5 | 59.0 |
| 120 | 57.6 | 56.2 | 54.7 | 53.3 | 51.8 |
| 130 | 50.4 | 49.0 | 47.5 | 46.1 | 44.6 |
| 140 | 43.2 | 41.8 | 40.3 | 38.9 | 37.4 |
| 150 | 36.0 | 34.6 | 33.1 | 31.7 | 30.2 |
| 160 | 28.8 | 27.4 | 25.9 | 24.5 | 23.0 |
| 170 | 21.6 | 20.2 | 18.7 | 17.3 | 15.8 |
| 180 | 14.4 | 13.0 | 11.5 | 10.1 | 8.6 |
| 190 | 7.2 | 5.8 | 4.3 | 2.9 | 1.4 |

**Wantage Table 4: C Crystallisers : 20 × 4 × 2m**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| cm | 0 | 2 | 4 | 6 | 8 |
| 10 | 152.0 | 150.4 | 148.8 | 147.2 | 145.6 |
| 20 | 144.0 | 142.4 | 140.8 | 139.2 | 137.6 |
| 30 | 136.0 | 134.4 | 132.6 | 131.2 | 129.6 |
| 40 | 128.0 | 126.4 | 124.8 | 123.2 | 121.6 |
| 50 | 120.0 | 118.4 | 116.8 | 115.2 | 113.6 |
| 60 | 112.0 | 110.4 | 108.8 | 107.2 | 105.6 |
| 70 | 104.0 | 102.4 | 100.8 | 99.2 | 97.6 |
| 80 | 96.0 | 94.4 | 92.8 | 91.2 | 89.6 |
| 90 | 88.0 | 86.4 | 84.8 | 83.2 | 81.6 |
| 100 | 80.0 | 78.4 | 76.8 | 75.2 | 73.6 |
| 110 | 72.0 | 70.4 | 68.8 | 67.2 | 65.6 |
| 120 | 64.0 | 62.4 | 60.8 | 59.2 | 57.6 |
| 130 | 56.0 | 54.4 | 52.8 | 51.2 | 49.6 |
| 140 | 48.0 | 46.4 | 44.8 | 43.2 | 41.6 |
| 150 | 40.0 | 38.4 | `36.8 | 35.2 | 33.6 |
| 160 | 32.0 | 30.4 | 28.8 | 27.2 | 25.6 |
| 170 | 24.0 | 22.4 | 20.8 | 19.2 | 17.6 |
| 180 | 16.0 | 14.4 | 12.8 | 11.2 | 9.6 |
| 190 | 8.0 | 6.4 | 4.8 | 3.2 | 1.6 |

**Magma Tank : 4 × 8 × 2**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| cm | 0 | 2 | 4 | 6 | 8 |
| 10 | 60.8 | 60.2 | 59.5 | 58.9 | 58.2 |
| 20 | 57.6 | 57.0 | 56.3 | 55.7 | 55.0 |
| 30 | 54.4 | 53.8 | 53.1 | 52.5 | 51.8 |
| 40 | 51.2 | 50.6 | 49.9 | 49.3 | 48.6 |
| 50 | 48.0 | 47.4 | 46.7 | 46.1 | 45.4 |
| 60 | 44.8 | 44.2 | 43.5 | 42.9 | 42.2 |
| 70 | 41.6 | 41.0 | 40.3 | 39.7 | 39.0 |
| 80 | 38.4 | 37.8 | 37.1 | 36.5 | 35.8 |
| 90 | 35.2 | 34.6 | 33.9 | 33.3 | 32.6 |
| 100 | 32.0 | 31.4 | 30.7 | 30.1 | 29.4 |
| 110 | 28.8 | 28.2 | 27.5 | 26.9 | 26.2 |
| 120 | 25.6 | 25.0 | 24.3 | 23.7 | 23.0 |
| 130 | 22.4 | 21.8 | 21.1 | 20.5 | 19.8 |
| 140 | 19.2 | 18.6 | 17.9 | 17.3 | 16.6 |
| 150 | 16.0 | 15.4 | 14.7 | 14.1 | 13.4 |
| 160 | 12.8 | 12.2 | 11.5 | 10.9 | 10.2 |
| 170 | 9.6 | 9.0 | 8.3 | 7.7 | 7.0 |
| 180 | 6.4 | 5.8 | 5.1 | 4.5 | 3.8 |
| 190 | 3.2 | 2.6 | 1.9 | 1.3 | 0.6 |

1. SUMMATIVE ASSESSMENT ACTIVITIES AND MODEL ANSWERS

The learner is now required to complete the Summative Assessment (Multiple choice).

**Facilitator instructions:**

Once the facilitation of this Knowledge Module is completed:

1. Allow the learners time to complete their Learner Workbooks (8 hours). There should be no blank activities and all activities should be completed in pen.
2. The Summative Assessment Guide is then handed to each learner and the Summative Assessment is done (1.5 hours)
3. It should take approximately 16 hours to mark each Learner Workbook.
4. Insert the marks obtained for each Knowledge Module into the Summative Assessment Guide of each learner in the space provided.
5. Tally the total marks and complete the Summative Assessment Guide of each learner.
6. Hand out each Summative Assessment Guide for final learner feedback and signing.
7. Prepare certificates for the programme as required.
8. 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** |
|  | | | 1. :**Factory Control Calculations** | | **3** |
| **Alignment – Learning Outcome 1,2,3&4: Factory concepts, Material balance, Stock taking and Calculations**  **Award four marks for selection of valid “x”. One mark = Competent** | | | | | |
|  | **3.1. What is the formula to calculate tons brix bagasse?** | | | **Mark Allocation** | |
| **a.** | 🞎 | × Tons bagasse | |  | |
| **b.** | 🞎 | × Tons bagasse | |  | |
| **c.** | 🗷 | × Tons bagasse | |  | |
| **d.** | 🞎 | × Tons mixed juice | |  | |
| **e.** | 🞎 | × Tons bagasse | | 4 | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **3.2** | **What is the formula to calculate suspended solids in mixed juice?** | | **Mark Allocation** | |
| **a.** | 🞎 | × Tons mixed juice |  |
| **b.** | 🞎 | × Tons mixed juice |  |
| **c.** | 🞎 | – [ × Tons mixed juice × ] |  |
| **d.** | 🞎 | × Tons bagasse |  |
| **e.** | 🗷 | × Tons mixed juice | 4 |

|  |  |  |  |
| --- | --- | --- | --- |
| **3.3** | **What is the corrected extraction used for?** | | **Mark Allocation** |
| **a.** | 🗷 | To correct the influence of pol and fibre on extraction |  |
| **b.** | 🞎 | To calculate the amount of bagasse produced |  |
| **c.** | 🞎 | To determine the brix, pol and fibre of cane from the analysis of mixed juice and final bagasse. |  |
| **d.** | 🞎 | To calculate the mill balance |  |
| **e.** | 🞎 | To monitor the performance of the extraction plant (front-end). | 4 |

|  |  |  |  |
| --- | --- | --- | --- |
| **3.4** | **Why is there a need for factory data?** | | **Mark Allocation** |
| **a.** | 🞎 |  |  |
| **b.** | 🗷 | For proper factory control |  |
| **c.** | 🞎 |  |  |
| **d.** | 🞎 |  |  |
| **e.** | 🞎 |  | 4 |

|  |  |  |  |
| --- | --- | --- | --- |
| **3.5** | **Quantitative measurements of the products are required for?** | | **Mark Allocation** |
| **a.** | 🞎 |  |  |
| **b.** | 🞎 |  |  |
| **c.** | 🗷 | The purpose of factory control and cane payments |  |
| **d.** | 🞎 |  |  |
| **e.** | 🞎 |  | 4 |

|  |  |  |  |
| --- | --- | --- | --- |
| **3.6** | **Where are the individual vessels calibrated?** | | **Mark Allocation** |
| **a.** | 🞎 | In evaporators |  |
| **b.** | 🗷 | In cubic metres and tables |  |
| **c.** | 🞎 | In heaters |  |
| **d.** | 🞎 | In piping |  |
| **e.** | 🞎 | Tanks | 4 |

|  |  |  |  |
| --- | --- | --- | --- |
| **3.7** | **What causes errors?** | | **Mark Allocation** |
| **a.** | 🞎 | Mud |  |
| **b.** | 🞎 | Clear juice |  |
| **c.** | 🞎 | Molasses |  |
| **d.** | 🗷 | A Gas in massecuite in the mass per m3 |  |
| **e.** | 🞎 | Syrup | 4 |

|  |  |  |  |
| --- | --- | --- | --- |
| **3.8** | **If the Brix of mixed juice is 15.85% and the sucrose is 12.33 % what would the purity of mixed juice be?** | | **Mark Allocation** |
| **a.** | 🞎 | 75.25 |  |
| **b.** | 🞎 | 77.97 |  |
| **c.** | 🞎 | 76.89 |  |
| **d.** | 🗷 | 77.79 |  |
| **e.** | 🞎 | 77.00 | 4 |

|  |  |  |  |
| --- | --- | --- | --- |
| **3.9** | **The correct definition of Pol is:** | | **Mark Allocation** |
| **a.** | 🞎 | Rotation of light. |  |
| **b.** | 🗷 | Apparent sucrose. |  |
| **c.** | 🞎 | Saccharimeter reading. |  |
| **d.** | 🞎 | Percent dissolved solids in a factory stream |  |
| **e.** | 🞎 | Polarised light. | 4 |

|  |  |  |  |
| --- | --- | --- | --- |
| **3.10** | **What is the formula to calculate Fibre % bagasse?** | | **Mark Allocation** |
| **a.** | 🞎 | 100 |  |
| **b.** | 🗷 | 100 – moisture bagasse – brix % bagasse |  |
| **c.** | 🞎 |  |  |
| **d.** | 🞎 | × 100 |  |
| **e.** | 🞎 | 100 | 4 |

**TRUE OR FALSE QUESTIONS**

**Award one mark for selection of valid “T/F”. One mark = Competent**

|  |  |  |  |
| --- | --- | --- | --- |
| **3.11** | **A bagasse consists of the following components** | | **Mark Allocation** |
| **a.** | ⓣ | fibre (insoluble substances – including sand) |  |
| **b.** | ⓕ | Brix factor |  |
| **c.** | ⓣ | moisture (water) |  |
| **d.** | ⓕ | Pol Factor |  |
| **e.** | ⓣ | brix (dissolved substances) | 5 |

|  |  |  |  |
| --- | --- | --- | --- |
| **3.12** | **The following formula are used to calculate tonnages** | | **Mark Allocation** |
| **a.** | ⓣ | × Tons bagasse |  |
| **b.** | ⓣ | Tons cane + Tons water = Tons bagasse + tons mixed |  |
| **c.** | ⓕ | Fibre % bagasse = 100 – moisture bagasse – brix % bagasse |  |
| **d.** | ⓣ | tons bagasse + tons mixed juice – Tons cane |  |
| **e.** | ⓣ | × Tons bagasse | 5 |

|  |  |  |  |
| --- | --- | --- | --- |
| **3.13** | **The following are percentage formulas** | | **Mark Allocation** |
| **a.** | ⓣ | 100 |  |
| **b.** | ⓕ | [ × Tons insoluble solids] |  |
| **c.** | ⓣ | 100 |  |
| **d.** | ⓣ | 100 |  |
| **e.** | ⓕ | [ × Tons mixed juice × ] | 5 |

|  |  |  |  |
| --- | --- | --- | --- |
| **3.14** | **True or False the following parameters need to be recorded for factory performance calculations** | | **Mark Allocation** |
| **a.** | ⓣ | pol % sugar |  |
| **b.** | ⓣ | moisture % sugar |  |
| **c.** | ⓣ | purity sugar |  |
| **d.** | ⓣ | pol % final molasses |  |
| **e.** | ⓣ | brix % final molasses | 5 |

|  |  |  |  |
| --- | --- | --- | --- |
| **3.15** | **True or False reports and material balances are prepared** | | **Mark Allocation** |
| **a.** | ⓣ | Weekly |  |
| **b.** | ⓕ | Daily |  |
| **c.** | ⓣ | Monthly |  |
| **d.** | ⓕ | Quarterly |  |
| **e.** | ⓣ | Seasonally | 5 |

|  |  |  |  |
| --- | --- | --- | --- |
| **3.16** | **True or False the stock in process is worked out by** | | **Mark Allocation** |
| **a.** | ⓣ | The total volume of product is the sum of each individual vessel containing that product. |  |
| **b.** | ⓣ | The product of tons brix per m3 and the volume of the product give the tons brix of the product. |  |
| **c.** | ⓕ | 100 |  |
| **d.** | ⓣ | The product of the ton brix and the purity divided by 100 will give the tons pol of the product. |  |
| **e.** | ⓕ | 100 | 5 |

|  |  |  |  |
| --- | --- | --- | --- |
| **3.17** | **True or False the purpose of the sugar factory mill is to?** | | **Mark Allocation** |
| **a.** | ⓕ | To count bagasse purity |  |
| **b.** | ⓣ | To control the process |  |
| **c.** | ⓣ | To detect and indicate the extent of the losses |  |
| **d.** | ⓣ | To supply management with information for financial and administrative purposes |  |
| **e.** | ⓣ | To enable comparisons with other mills | 5 |

|  |  |  |  |
| --- | --- | --- | --- |
| **3.18** | **True or False: The Brix of factory products is obtained by:** | | **Mark Allocation** |
| **a.** | ⓣ | Mixed juice can be filtered and read directly. |  |
| **b.** | ⓕ | Syrup and Remelt require a dilution of 1:5 before being read. |  |
| **c.** | ⓕ | Massecuites and molasses require a 1:4 dilution before being read. |  |
| **d.** | ⓣ | Syrup and Remelt require a dilution of 1:4 before being read. |  |
| **e.** | ⓣ | Massecuites and molasses require a 1:5 dilution before being read. | 5 |

|  |  |  |  |
| --- | --- | --- | --- |
| **3.19** | **True or False, the following stages are involved in factory control** | | **Mark Allocation** |
| **a.** | ⓣ | Analysis of the product |  |
| **b.** | ⓣ | Daily averaging of analytical results |  |
| **c.** | ⓣ | Daily report using the daily average figures and tonnages |  |
| **d.** | ⓣ | Weekly report using the week’s daily figures, stock in process and the previous week’s figures. To date figures are calculated at the same time. |  |
| **e.** | ⓣ | Monthly figures using the previous month’s to date figures and the current month’s to date figures. | 5 |

|  |  |  |  |
| --- | --- | --- | --- |
| **3.20** | **True or False: Daily averaging is calculated by** | | **Mark Allocation** |
| **a.** | ⓕ | Daily averaging of analytical results |  |
| **b.** | ⓕ | pol % final molasses |  |
| **c.** | ⓣ | The analytical results divided by the number of analyses. |  |
| **d.** | ⓕ | Direct analysis of individual cane consignments for brix, pol and fibre. |  |
| **e.** | ⓣ | The quantity of material associated with the analysis. | 5 |

1. FINAL MARKS

**TOTAL MARKS: 90**

**PASS MARK: 72**

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