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EXTERNAL INTEGRATED SUMMATIVE ASSESSMENT EXEMPLAR 1C

STUDENT NAME & SURNAME	
ID NUMBER	
EISA REGISTRATION NUMBER	
ASSESSMENT CENTRE	
ASSESSMENT CENTRE ACCREDITATION NUMBER	
QUALIFICATION	**Chemical Plant Operator, NQF Level 4**
SAQA ID	**102156**
CREDITS	487
PAPER	**1C (there are 3 papers to be written: 1A, 1B, 1C & practical assessment)**
DATE OF EISA	DD/MM/YYYY
DURATION	**2.0 HOURS**
TOTAL MARKS	**150**

CANDIDATE INSTRUCTIONS

- Candidates must complete all questions in this EISA.
- Candidates must ensure that they use only a black pen when completing this EISA.
- Should you require additional space to complete your answer, please request additional paper from your invigilator. Ensure that you indicate your name, surname and EISA registration number at the top of the additional paper. Also ensure that the question number is clearly marked on your additional paper.

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ELO 4 Optimise the product quality by using sampling and analysis of the sampling results to continuously adjust operating variables.
ELO 5. Communicate effectively to assess risks and respond to emergencies, and abnormal conditions enhance safe operating conditions and report effectively.
ELO 6. Apply environmental considerations and safe disposal of waste or non-conforming product.
ELO 7. Conduct trouble shooting and participate in root cause analysis to develop recommendations to alleviate unsafe working conditions/acts as a member of a team.

Lime Slaking Plant Process Description

The following process description and diagram shows a simple lime slaking plant which is used to prepare a lime slurry that is used in a process plant for pH control.

The lime in the lime storage silo includes grit particles. In the lime slaker pre-heated water is introduced in order to form a slurry. The lime is essentially calcium oxide, and when it is mixed with water in the slaker, a chemical reaction occurs, in which calcium hydroxide and heat are produced during an exothermic reaction.

The lime slaker is provided with a water jacket around its exterior. The water jacket is adapted to receive water via any of water delivery lines.

The slurry aging tank receives lime slurry from the lime slaker via delivery line.

Initially, the ambient water delivered to the lime slaker would be at the ambient temperature. However, as soon as the exothermic reaction begins to occur in the lime slaker, the heat of hydration is captured in the lime slaker water jacket, and then begins to preheat the water passing into the lime slaker. The process continues, gradually increasing the temperature of the water delivered to the lime slaker as the reaction runs to completion, forming a slurry in the lime slaker.

The system also includes a discharge line from the slurry aging tank, which discharges to the inlet or suction side of a pump, which in turn, delivers the slurry via line, to a grit classifier. This comprises a tank with a sloped auger which conveys grit up a slope. The grit becomes separated from the liquid in the tank and discharged. The auger conveys the grit out the discharge into a dumpster.

On a daily basis, the Lime Slaking Plant Operator conducts an inspection at the beginning of the shift and records the findings on an inspection checklist. The inspection checklist is a tool used to reinforce Workplace Health and Safety (WHS) practices, help organizations comply with safety rules and regulations and operational requirements. During the walk about, The Operator notices a leak on the makeup water supply pipeline which might affect the makeup process. The operator also noticed a leakage on the transfer pump casing and heard unusual noise coming from the transfer pump. Safety signs in the area were not visible enough due to build up on the surface. Housekeeping is vital for the control of tripping Hazards. The bund wall has accumulated lime slurry spillage, and this pose a slipping risk.

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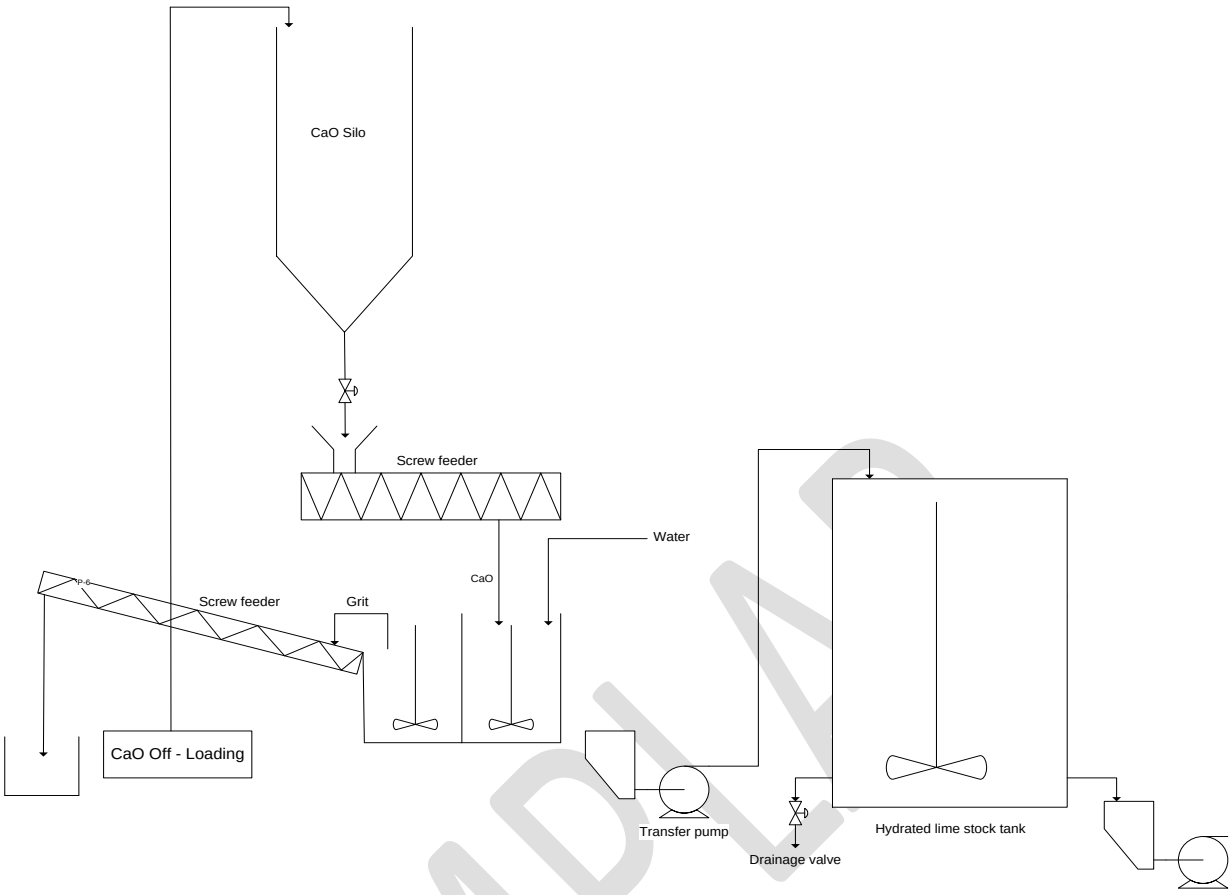

Question 1.

1.1.1 Ensure all raw materials used are within specifications. /10

1.1.1.1 Using the information and process diagram provided above, identify three possible sampling points by making a mark on the process flow diagram and complete the table below: /6

Sampling Point	Possible sampling method	Analysis Required
1.		
2.		
3.		

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1.1.1.2 Explain the effects of incorrect sampling and analysis on the process in terms of up and downstream requirements. /4

Question 2

2.1.1. Assess, record and report process, equipment, and operating environment for risks. /30

In a Chemical Plant, there are several hazards and risks associated with the process, equipment, and operating environments. These hazards and risks must be managed for the safety of the employees and the environment.

The HIRA procedure for risk management (involving hazard identification, risk assessment and control) is a practical guide for helping make all workplaces safer for employees. Hazards identification and risk assessment must be carried out every time a change is made or when work is performed. A formal one must be carried out on a regular basis.

2.1.1.1. What is Risk management? /2

2.1.1.2. Give three reasons why risks are managed. /3

2.1.1.3. Give 5 steps to Risk Management. /5

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2.1.1.4. Using the information and Lime slaking process flow diagram provided, complete a daily inspection checklist for this plant. The inspection checklist is used as one of the risk management tools. /10

What to check for:	Good	Bad	Comment/Action Required
1. CaO Silo level			
2. Condition of Silo discharge valve			
3. CaO Screw feed			
4. Water supply valve			
5. Water supply pipes			
6. Slaker Agitator condition			
7. Transfer pump condition			
8. Grit classifier condition			
9. Stock tank agitator condition			
10. Stock tank level			
11. Bund wall			
12. Fire extinguishers			
13. Condition of safety signs			
14. Condition of lights			
15. Safety devices e.g. E-stops.			

2.1.1.5. Using the information and Lime slaking process flow diagram provided, identify5 Hazards and Risks associated with the Lime make-up. /10

Hazard	**Risk**
1.	
2.	
3.	
4.	
5.	

2.1.2. *Take corrective actions to identified risks. /30*

2.1.2.1. For each of the identified Hazards above, determine the risk rating by using the risk matrix below and indicate the control actions required. /10

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Risk Consequece/Impact Score		Likelihood Score				
Likelihood →		1	2	3	4	5
Risk consequence /impact ↓		Rare	Unlikely	Possible	Likely	Almost Certain
5	Catastrophic	5 Moderate	10 High	15 Severe	20 Severe	25 Severe
4	Major	4 Moderate	8 High	12 High	16 Severe	20 Severe
3	Moderate	3 Low	6 Moderate	9 High	12 High	15 Severe
2	Minor	2 Low	4 Moderate	6 Moderate	8 High	10 High
1	Negligible	1 Low	2 Low	3 Low	4 Moderate	5 Moderate

Hazard	Risk	Risk Rating	Control Action
1.			
2.			
3.			
4.			
5.			

The Lime stock tank has build-up that must be washed. For this task to be started, a risk assessment must be conducted. List 5 main activities/task steps that are required to complete the task. For each Identified task step, Indicate the hazard, risk, initial risk rating, control measures and residual risk rating.

2.1.2.2. Complete the risk assessment using the risk assessment matrix used in 2.1.2.1 for performing this task. /20

Activity/ Task Steps	Hazard	Associated Risk	Initial Risk Rating	Control Measure	Residual Risk Rating
1.					
2.					
3.					

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4.					
5.					

2.1.3. *Respond to emergencies as per emergency procedures. /30*

The following are examples of potential environmental emergencies associated with Chemical Plants.

1. **Fires**
2. **Spillage of potentially contaminated water (Surface Pipelines)**
3. **Chemical spillages**

2.1.3.1. Draw up procedures that must be followed when responding to the emergencies indicated above. /15

Fire Procedure: /5
Spillage of potentially contaminated water (Surface Pipelines): /5
Chemical spillages Procedure : /5

The purpose of an Electrocution Emergency procedure is to ensure speedy corrective action when a person has been electrocuted and to prevent further electrical shock.

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2.1.3.2. What are the general precautionary measures and requirements that one must remember when attending a person who is electrocuted? /5

2.1.3.3. What is an Emergency? /1

2.1.3.4. Why is it important to have an emergency plan? /2

2.1.3.5. What is the overall objective of an emergency plan? /3

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2.1.3.6. What are the elements of an emergency plan? /4

2.1.4. Identify abnormal conditions, correct conditions, and implement preventative actions. /30

Fire Evacuation Drills are conducted four time a year in the Chemical Plant. The first drill is scheduled early in the first semester (March) , the second drill is scheduled late in the first semester (June) , the third drill is conducted early in the second semester (September) and the last drill is conducted late in the second semester (December) . Evacuation is mandatory for all Employees during all fire alarm activations. When the fire alarm sounds, you must leave the plant immediately. **Never** assume that the alarm is false or that the system is being tested.

2.1.4.1. What is the purpose of an Emergency drill? /5

2.1.4.2. Why is it important to have a fire alarm system? /2

2.1.4.3. What is an Incident report? /2

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2.1.4.4. What are the general rules regarding reporting of incidents/accidents? /2

2.1.4.5. When Does an Incident Report Need to Be Completed? /2

Incident Description

Secondary containment is used on plant as a second line of defence for preventing, controlling or mitigating major hazards events. Bunds are generally used around storage tanks or drum storage areas where flammable or toxic liquids are held. Alternative measures may be earth dikes (usually for very large tanks), sumps and interceptors. Bunds are also sometimes used within plant buildings for reactors and other process vessels. For materials that are normally gases at ambient conditions, bunds are used where flash fractions are sufficiently low to merit them.

Bunds should be sized to hold 110% of the maximum capacity of the largest tank or drum. This will allow some latitude for the addition of foam during response to the emergency. Bund spillages or seepage must be reported immediately.

On the 15th of October 2020 at 11h00, the spillage pump located in Lime slaking sections of a chemical processing plant was faulty and this resulted in the bund wall overflowing. The spillage further buried the spillage pump causing more damage to the impeller blades and shaft. This is regarded as an environmental emergency. An incident report must be generated and submitted to the SHEQ department.

2.1.4.6. Using the incident description above, Complete the incident report form below. /17

DATE:			**TIME:**	
DEPARTMENT / CONTRACTOR COMPANY:			**SECTION:**	
REPORTING PERSON'S NAME AND SURNAME				
TYPE OF INCIDENT/ACCIDENT	**Safety**		**Occ. Hygiene.**	
A PERSONAL INJURY				

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Name:		**Coy No.:**		**Occupation:**	
Nature of Injury:					
Witness:		**Estimated Time Loss:**			

B DAMAGE TO EQUIPMENT / PRODUCTION LOSS	
Type of Equipment damaged:	
Nature of Damage / Loss:	

C DESCRIPTION OF INCIDENT / ACCIDENT

D WHY DID THE INCIDENT OCCUR?	
1.	
2.	
3.	
4.	

E IMMEDIATE CORRECTIVE ACTIONS		
	DUE DATE	**DATE COMPLETED**

Reporting Person

SIGNATURE: _____

DATE: _____

2.1.5. Respond to process alarms and emergency alarms appropriately. /20

The Lime slaking plant indicates the following Alarms.

1. **Water supply flowrate low.**
2. **Stock tank level is low(<20%).**
3. **Stock tank agitator tripped.**
4. **High slaking tank level (100%)**

Your responsibility is to monitor and control the operation of the Lime slaking plant and to respond to any changes that might affect the performance of the plant.

2.1.5.1. Explain how you would deal with the above process alarms, what you would check for and adjust. /16

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1. Water supply flowrate low. /4
2. Stock tank level is low. /4
3. Stock tank agitator tripped. /4
4. High slaking tank level/4

2.1.5.2. An evacuation alarm for the Gas leak detection system is activated in the affected section of the Chemical Plant, what will be the process to follow when evacuating to ensure that you do not put yourself into jeopardy? /4

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MARK ALLOCATION GRID (For use by the Assessor only)

QUESTION	MARK	MARKS AWARDED
1.1.1.1	6	
1.1.1.2	4	
2.1.1.1	2	
2.1.1.2	3	
2.1.1.3	5	
2.1.1.4	10	
2.1.1.5	10	
2.1.2.1	10	
2.1.2.2	20	
2.1.3.1	15	
2.1.3.2	5	
2.1.3.3	1	
2.1.3.4	2	
2.1.3.5	3	
2.1.3.6	4	
2.1.4.1	5	
2.1.4.2	2	
2.1.4.3	2	
2.1.4.4	2	
2.1.4.5	2	
2.1.4.6	17	
2.1.5.1	16	
2.1.5.2	4	
Total	**150**	

ASSESSOR DETAILS

ASSESSOR NAME & SURNAME	
REGISTRATION NUMBER	
SIGNATURE	
DATE	

MODERATOR DETAILS

MODERATOR NAME & SURNAME	
REGISTRATION NUMBER	
SIGNATURE	
DATE	

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