higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE (VOCATIONAL)

PROCESS CONTROL
NQF LEVEL 4

14 November 2022

This marking guideline consists of 6 pages.

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SECTION A

QUESTION 1

1.1 D✓✓
1.2 A✓✓
1.3 A✓✓
1.4 A✓✓
1.5 C✓✓

(5 × 2) **[10]**

QUESTION 2

2.1 H
2.2 J
2.3 A
2.4 C
2.5 B

(5 × 1) **[5]**

QUESTION 3

3.1 True
3.2 True
3.3 False
3.4 False
3.5 False

(5 × 1) **[5]**

TOTAL SECTION A: 20

SECTION B

QUESTION 4

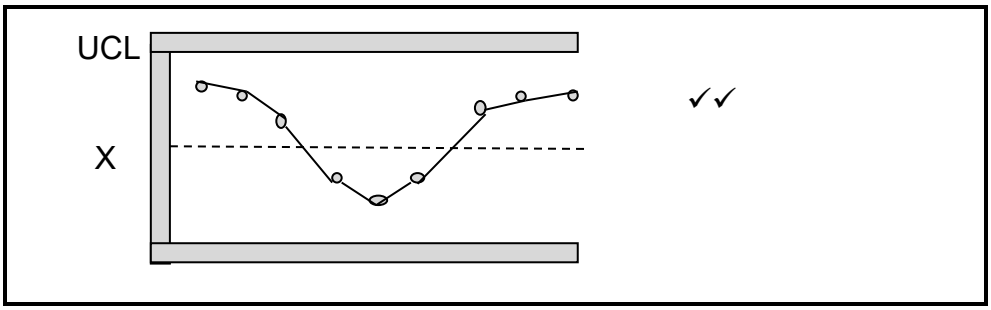
4.1 4.1.1 Deviation is the amount of difference between the measured value of a variable and the parameter.✓✓

4.1.2 Specifications are a set of requirements to be fulfilled by a product, service or procedure.✓✓

4.1.3 Control limits are *s*tatistical calculated points that form boundaries.✓✓

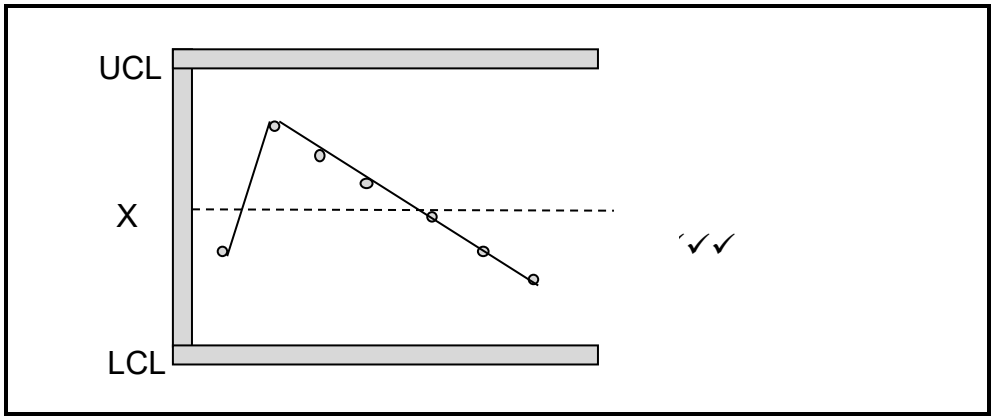
(3 × 2) (6)

4.2 4.2.1



✓✓

4.2.2



✓✓

(2 × 2) (4)

4.3
- Identify the potential problem or non-conformance.
- Find the cause of the potential problem.
- Develop a plan to prevent the occurrence.
- Implement the plan.
- Review the actions taken and the effectiveness in preventing the problem. (5)

4.4 4.4.1 1 to 14✓✓ (2)

4.4.2 pH meter or chemical indicators✓✓ (2)

4.4.3
- pH sensitive electrode
- Reference electrode (2)

4.4.4 $pH = - \log [H^+]$✓
$= - \log [0,09]$✓
$= 1,04$✓✓ (4)
[25]

QUESTION 5

5.1 Information flow is the back-and-forth transmission of signals.✓✓ (2)

5.2 They are used to automate and control a process.✓✓ (2)

5.3 5.3.1 DCS controls process variables within the chemical plant as its primary focus and presents data to operators.✓✓

5.3.2 It means that the control centre and operators are critical as the equipment only collects the data and may also do some complex process calculations.✓✓

(2 × 2) (4)

5.4
- Field instruments
- Sensors
- Signal transfer equipment
- Output modules
- Buses
- Human Machine Interface (HMI)
- Control interface
- Controllers
- Programmable logic controllers (PLC) (9)

5.5
- Shows the process flow in the plant
- Shows the actual, up to date process conditions in the plant
- Gives warning signals where alarm conditions are encountered
- Allows changing of setpoints when required
- Retrieves historical data to monitor trends and recall information (5)

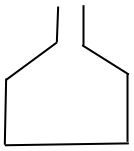
5.6 5.6.1 Electric motor (left) driving a centrifugal pump (right)✓✓

5.6.2 Temperature alarm high✓✓

5.6.3 Process vessel✓✓

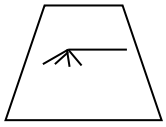
(3 × 2) (6)

5.7 5.7.1



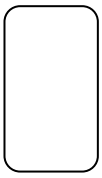
✓✓

5.7.2



✓✓

5.7.3



✓✓

(3 × 2) (6)
[34]

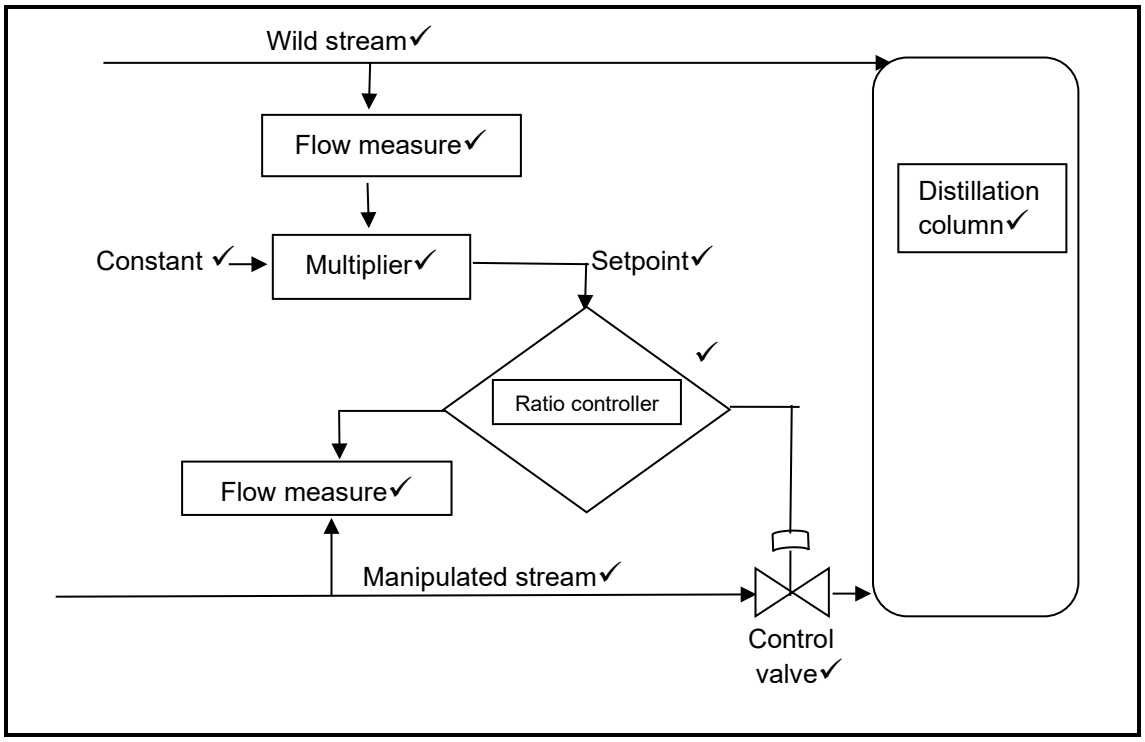
QUESTION 6

6.1
- An emergency
- Planned or breakdown maintenance
- Cleaning, replacement of catalyst or resins
- Equipment change-over
- Modifications
- Product changes
- Product quality problems
- Raw material shortage
- Excess production of the product
- Storage capacity limitations (Any 6 × 1) (6)

6.2
- Manual
- Automatic
- Cascade (3)

6.3
- Used to suppress external disturbances.
- Optimize the performance of the control loop and ensures stability. (2)

6.4



[21]

TOTAL SECTION B: 80
GRAND TOTAL: 100

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