higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

# MARKING GUIDELINE

## NATIONAL CERTIFICATE

## WASTE-WATER TREATMENT PRACTICE N3

**5 December 2023**

**This marking guideline consists of 5 pages.**

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## SECTION A

### QUESTION 1

1.1 False✓✓
1.2 True✓✓
1.3 True✓✓
1.4 False✓✓
1.5 True✓✓

(5 × 2) **[10]**

### QUESTION 2

2.1 F
2.2 B
2.3 A
2.4 D
2.5 E

(5 × 1) **[5]**

**TOTAL SECTION A: 15**

## SECTION B

### QUESTION 3

3.1 3.1.1 8000 $cm^3$✓✓
3.1.2 3000 $m^3$✓✓
3.1.3 6000/60 = 100ℓ/sec✓✓

(3 × 2) (6)

3.2 Mass = 8000 g – 440 g
= 7560 g✓
Relative density = mass/volume✓
= 7560 g/1ℓ ✓
= 7560 g/ℓ
= 7560 $kg/m^3$✓✓ (5)

1g/l = 1 $kg/m^3$

3.3 r = d/2
= 8/2
= 4✓
v = π × $r^2$ × h✓
= 22/7 × $(4\ m)^2$ × 2,35 m✓
= 3,14 × 16 $m^2$ × 2,35 m✓
= 118,171 $m^3$✓ (5)

3.4 Q = flow ($m^3$)✓✓
v = velocity (m/s)✓✓
A = area ($m^2$)✓✓ (6)

**[22]**

## QUESTION 4

4.1
- Zone of degradation: A mixing zone that is polluted.✓✓
- Zone of active decomposition: It has a minimum level of dissolved oxygen promoting anaerobic decomposition and bad odours.✓✓
- Zone of recovery: Bacterial count and food supply decline and the amount of predators increase, which are of aerobic type.✓✓
- Clear water zone: contains aquatic plants, animals and more sensitive fishes.✓✓ (Any 3 × 2) (6)

4.2 4.2.1 To prevent flooding of units. When the emergency bypass cannot cope, the water will flow over a higher weir directly to the maturation pond.✓✓

4.2.2 To prevent flooding of units and permit shut down for repairs or to allow water to be screened by hand during a power failure or blockage of the screen.✓✓

4.2.3 To allow equal volumes of flow to two or more sedimentation tanks.✓✓

4.2.4 To remove any papers, rags which bypass the screens to prevent blockages and damage to the equipment.✓✓

(4 × 2) (8)

4.3
- They may create leakages in sludge pipes and pumps.
- They contribute to the formation of scum in digestion.
- They may cause pump damage.
- They may result in complications when disposing of sludge. (Any 3 × 1) (3)

4.4
- Hydrostatic sludge removal tanks
- Horizontal flow sedimentation tanks
- Dortmund vertical flow sedimentation tanks
- Circular radial flow

(4 × 1) (4)

**[21]**

## QUESTION 5

5.1
5.1.1 True
5.1.2 False
5.1.3 True
5.1.4 True
5.1.5 True
5.1.6 True
5.1.7 True
5.1.8 False
5.1.9 False
5.1.10 False

(10 × 1) (10)

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5.2 Hydraulic load = flow to filter/surface area of filter✓
= 200 $m^3$d/100 $m^2$✓
= 2 $m^3/m^2$/d✓ (3)

5.3 → Primary sedimentation✓ ⟶ Biological filter✓ ⟶ Sedimentation✓
→ Biological filter✓ ⟶ Humus removal ⟶ ✓ (5)

5.4
- It collects the effluent to let it out of the main drain.
- It ensures free passage of air throughout the filter. (Any 1 × 2) (2)

5.5 Max 25 mg/ℓ ✓ (1)
**[21]**

## QUESTION 6

6.1
- In the event of fire, the container must be moved to a safer distance or sprayed with cool water.
- Leakages must be attended to immediately.
- Only properly trained persons with gas masks should attend to the leak.
- The valve must be closed immediately if there is a leak in the process piping.
- If the leak is at the valve itself, the valve nut must be tightened to stop the leak.
- The pressure in the container must be relieved and the contents must be emptied into an absorbing medium when the leak is in the container itself.
- Water must never be applied to a leak. (7)

6.2
- Amount of chlorine that has been dosed
- Chlorine dosage records
- Contact periods (3)

6.3
- Ease of operation
- Flexibility of operation
- Relatively small additional solids production
- Low levels of phosphates in final effluent are possible
- Improved COD and suspended solids removal gives rise to higher quality final effluent (5)

6.4 6.4.1 The use of additional processes to prepare waste-water for direct re-use for industrial, agricultural and domestic purposes thus removing phosphate and inorganic salts.✓✓

6.4.2 A process where sludge is run into shallow trenches and immediately covered with soil to prevent fly breeding and nuisance.✓✓

(2 × 2) (4)

6.5 6.5.1 Between 38 °C and 65 °C

6.5.2 Between 7 °C and 16 °C

(2 × 1) (2)
**[21]**

**TOTAL SECTION B: 85**
**GRAND TOTAL: 100**