higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

WATER TREATMENT PRACTICE N3

25 November 2024

This marking guideline consists of 5 pages.

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QUESTION 1

1.1 True
1.2 True
1.3 True
1.4 False
1.5 False
1.6 False
1.7 True
1.8 False
1.9 False
1.10 True

(10 × 1) **[10]**

QUESTION 2

2.1 2.1.1 $Mg(HCO_3)_2 + Ca(OH)_2 \longrightarrow CaCO_3$✓ + $MgCO_3$✓ + $2H_2O$✓ (3)

2.1.2 $CaSO_4 + Na_2CO_3 \longrightarrow CaCO_3$✓ + Na_2SO_4✓ (2)

2.1.3 4Fe✓ + $3O_2$✓$\longrightarrow$ $2Fe_2O_{3+}$✓ (3)

2.1.4 $A\ell_2(SO_4)_3 + 3Ca(HCO_3)_2 \longrightarrow 2A\ell(OH)_3$✓✓+ $3CaSO_4$✓+ $6CO_2$✓ (4)

2.2
$$r = \frac{D}{2} = \frac{40}{2} = 20m \checkmark$$
$$V = \pi r^2 h$$
$$= 3{,}14 \times (20)^2 (6) \checkmark\checkmark\checkmark$$
$$= 7536m^3$$
(4)

2.3 12ℓ/s = 12 × 6 = 720 ℓ/min✓

$$\frac{720}{1000} = 0{,}72m^3/\min \checkmark$$

Time = Volume/Flow rate

$$\frac{7536}{0{,}72} = \frac{10466{,}67}{60} \checkmark$$

= 174,445

=174 hrs✓ (4)

[20]

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QUESTION 3

3.1
- Magnetic flowmeters
- Ultrasonic flowmeters
- Turbine flowmeters (3)

3.2
- Pump not properly primed.
- Suction head too large.
- Air leakages at inlet pipes and packed stuffing boxes.
- Strainer blocked and liquid cannot flow to pump casing.
- Pump speed too low for pressure build-up.
- Pump may be badly worn or there may be another mechanical fault.
- Strainer not properly submerged under the water thus permitting air to be drawn in with the water. (Any 5 × 1) (5)

3.3
- Bacteria✓ cause illness.✓
- Algae, protozoa✓ affect the taste, smell and cause turbidity.✓
- Silt and clay✓ cause turbidity.✓
- Plants✓ colour the water and cause turbidity.✓ (4 × 2) (8)

3.4
- Hard water
- Soft water
- Brackish water
- Coloured water (4)

3.5
- No dissolved O_2 present.
- Anaerobic conditions develop due to decaying plants, algae and other organic matter.
- Low temperature.
- Reduced iron and manganese, H_2S and ammonia present.
- Bad tastes and odours.
- High O_2 demand.
- pH decreases as a result of CO_2. (Any 5 × 1) (5)

[25]

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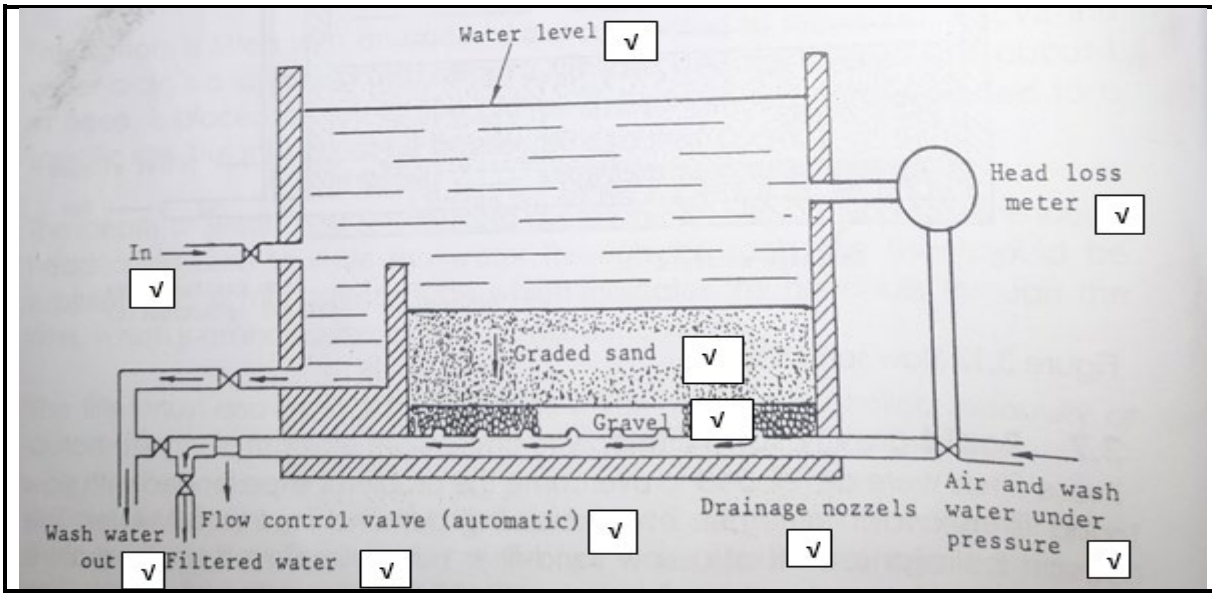
QUESTION 4

4.1
- Aeration
- Oxidation with chlorine
- Oxidation with potassium permanganate
- Lime treatment
- Ion exchange
- pH adjustment in combination with previous options (Any 5 × 1) (5)

4.2
- Flash mixing (addition of flocculants)
- Floc formation
- Floc conditioning (3)

4.3



(10)

4.4 NH_3 ✓ + CL_2 ✓→ NH_2CL ✓+ CL_2 → $NHCL_2$ ✓+ CL_2 → NCL_3 ✓ (5)

[23]

QUESTION 5

5.1
- Paint the object.
- Apply oil, grease, Vaseline.
- Metal coating
- Electroplating
- Spraying coatings such as tin, copper, aluminium, etc. onto base metals.
- Non-metallic coating (Any 5 × 1) (5)

5.2 Ryznar index = 2pHs✓ – pH✓ (2)

5.3
- Large quantities of sludge are formed.
- Careful operation is essential if good results are to be obtained.
- Pipes will become encrusted if not properly recarbonated. (3)

5.4
- A – Common combustibles
- B – Flammable liquids and gases
- C – Live electrical equipment
- D – Combustible metals (4)

5.5
- Colour
- Turbidity
- pH
- Electrical conductivity
- Total dissolved solids
- Alkalinity
- Total hardness
- Calcium hardness
- Free and residual chlorine
- Stabilisation tests
- Flocculation tests (jar tests)
- Chlorine demand (Any 8 × 1) (8)

[22]

TOTAL: 100

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