



**higher education
& training**

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

WATER TREATMENT PRACTICE N3

21 November 2022

This marking guideline consists of 5 pages.

QUESTION 1

- 1.1 $\text{Mg}(\text{OH})_2 + \text{CO}_2 \longrightarrow \text{MgCO}_3 \checkmark + \text{H}_2\text{O} \checkmark$ (2)
- 1.2 $\text{CaCl}_2 + \text{Na}_2\text{CO}_3 \longrightarrow \text{CaCO}_3 \checkmark + 2\text{NaCl} \checkmark$ (2)
- 1.3 $\text{Al}_2(\text{SO}_4)_3 + 3\text{Ca}(\text{HCO}_3)_2 \longrightarrow 2\text{Al}(\text{OH})_3 \checkmark + 3\text{CaSO}_4 \checkmark + 6\text{CO}_2 \checkmark \checkmark$ balancing (4)
- 1.4 $\text{MgCO}_3 + \text{Ca}(\text{OH})_2 \longrightarrow \text{Mg}(\text{OH})_2 \checkmark + \text{CaCO}_3 \checkmark$ (2)
- [10]**

QUESTION 2

- 2.1 2.1.1 Filtration is the water treatment process involving the removal of suspended matter $\checkmark$ by passing the water through a porous medium such as sand. $\checkmark$
- 2.1.2 Breakpoint is the point at which the chlorine dosage has satisfied the chlorine demand. $\checkmark \checkmark$
- 2.1.3 Coagulant is a chemical added during coagulation to improve the process by stimulating floc formation or by strengthening the floc so it holds together better. $\checkmark \checkmark$
- 2.1.4 Turbidity is a physical characteristic of water making the water appear cloudy, the condition is caused by the presence of suspended matter. $\checkmark \checkmark$
- (4 × 2) (8)
- 2.2 2.2.1 $\text{Fe}(\text{OH})_3 \checkmark = 56 + (16 + 1)_3 \checkmark$
 $= 56 + 51$
 $= 107 \text{ g/mol} \checkmark$
- 2.2.2 $\text{CO} \checkmark = 12 + 16 \checkmark$
 $= 28 \text{ g/mol} \checkmark$
- 2.2.3 $\text{CaCO}_3 \checkmark = 40 + 12 + (16 \times 3) \checkmark$
 $= 100 \text{ g/mol} \checkmark$
- 2.2.4 $\text{MgSO}_4 \checkmark = 24 + 32 + (16 \times 4) \checkmark$
 $= 120 \text{ g/mol} \checkmark$
- (4 × 3) (12)
- [20]**

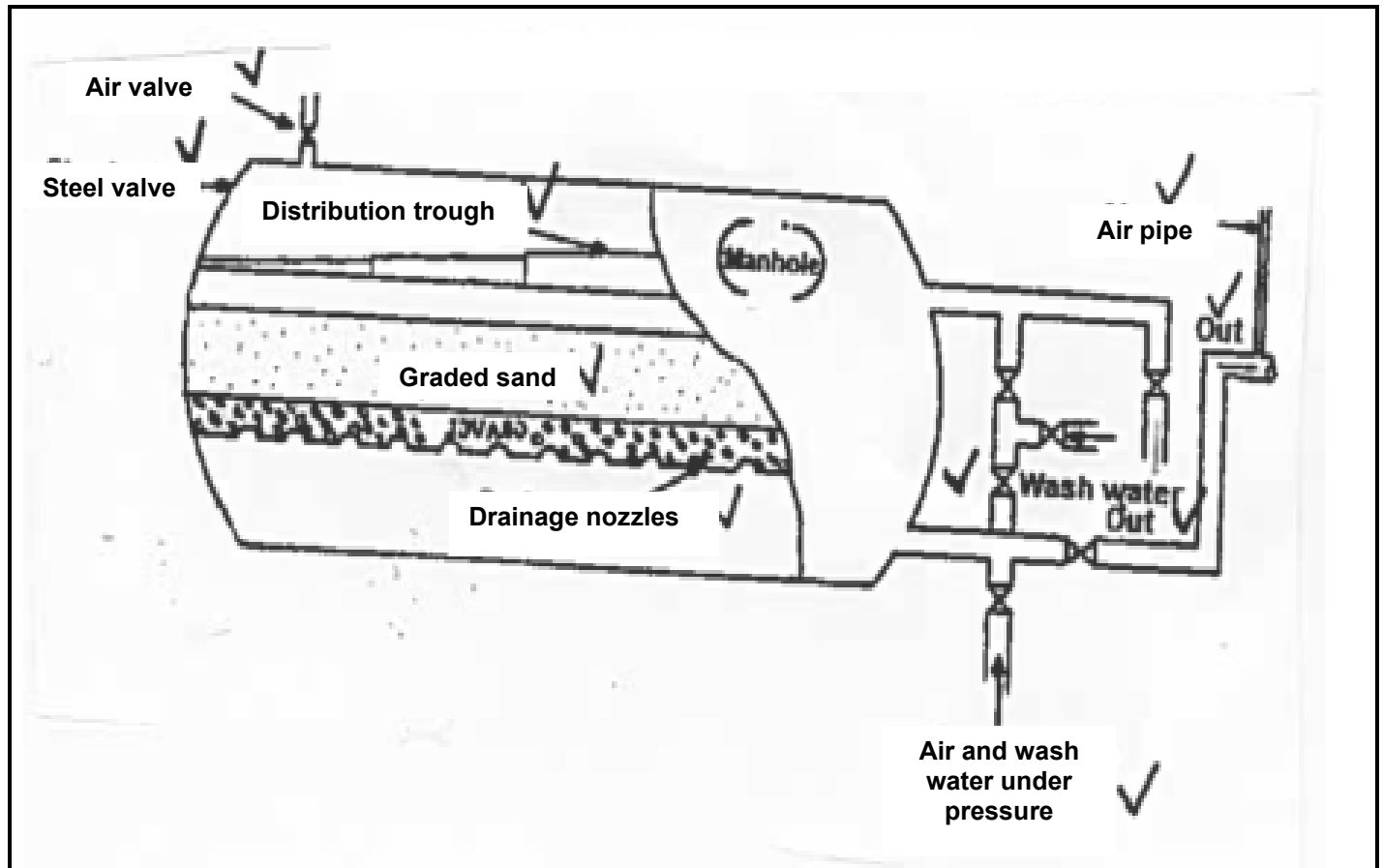
QUESTION 3

- 3.1 3.1.1
 - An air blower is used to force air through the bed in a reverse direction to create a scouring action
 - between the sand particles in order to loosen the floc particles.
 - Air plays an important part in preventing the formation of mud balls. (3)
- 3.1.2
 - Once the bed has been treated with air, water from a pump or reservoir is also passed through the filter in a reverse direction.
 - There should be sufficient free-board available so that the sand bed can expand during this process without sand being lost.
 - Temperature also plays a bigger role in low temperatures than at high temperatures.
 - The filter should not be absolutely clean. (4)
- 3.2
 - Compounds which dissolve in water usually separate into positively and negatively charged atoms, known as ions.
 - The power that keeps the atoms together is of an electric nature.
 - These electrically-charged atoms that are kept apart from one another by means of water molecules are called ions.
 - The positive ions are called cations and the negative ions anions.
 - The cations release electrons and are therefore positively charged.
 - The anions receive electrons and are therefore negatively charged.
 - When table salt is dissolved in water, sodium loses one electron and becomes positively charged, while chloride receives one electron and has a negative charge according to the reaction below.
 - $\text{NaCl} \longrightarrow \text{Na}^+ + \text{Cl}^-$ (Any 7 × 1) (7)
- 3.3
 - Aeration
 - Lime treatment
 - Oxidation with chlorine
 - Oxidation with potassium permanganate (4)
- 3.4
 - Fill-and-draw sedimentation tank
 - Horizontal flow sedimentation tank
 - Vertical flow sedimentation tank
 - Radial flow sedimentation tank (Any 3 × 1) (3)

[21]

QUESTION 4

4.1

**PRESSURE SAND FILTER**

(10)

- 4.2
- Prechlorination
 - Postchlorination
 - Superchlorination/Hyperchlorination

(3)

- 4.3
- Region where chlorine is broken down by reducing substances
 - Region where chloro-organic compounds and chloramines are formed
 - Region where chloramines and chlorine organic compounds are broken down
 - Region beyond the breakpoint where free residual chlorine and a limited amount of organic chlorine compounds, which were not destroyed by excess chlorine, are found.

(4)

- 4.4 $pH_s = (9,3 + A + B) - (C + D)$

(2)

[19]

QUESTION 5

- 5.1
- Paint the object
 - Apply oil, grease, vaseline or lard
 - Metal coating
 - Electroplating
 - Spraying coatings
 - Nonmetallic coating
- (6)
- 5.2
- Large quantities of sludge are formed.
 - Careful operation is essential to obtain a good result.
 - Pipes will become encrusted if not properly recarbonated.
- (3)
- 5.3
- Sodium fluoride
 - Sodium silicofluoride
 - Fluosilicic acid
- (3)
- 5.4
- Class A: Solid materials like Wood, paper✓ - Soda-acid extinguisher✓
 - Class B: liquids like Gasoline, propane✓ - Dry foam OR chemical OR CO₂✓
 - Class C: electrical failure from appliances like Computers✓ - CO₂ OR dry chemical✓
 - Class D: metallic substances like Titanium✓ - Special chemical OR French chalk powder✓
- (ONE example and ONE type of extinguisher for each class) (4 × 2) (8)
- 5.5
- The name and adress of the organisation or person requesting the tests
 - The type of testing required
 - Date and time of sampling
 - Date and time when sample was dispatched
 - Name of the sampler
 - Description of the sampling point
 - Date when last rain occurred and whether or not it was heavy
 - Whether the water had any odour or taste that was considered objectionable
 - Approximate number of persons receiving the supplied sample
 - Whether the source of the sample had been treated or not
- (10)

[30]**TOTAL: 100**