



**higher education
& training**

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

WATER TREATMENT PRACTICE N3

27 November 2023

This marking guideline consists of 5 pages.

QUESTION 1

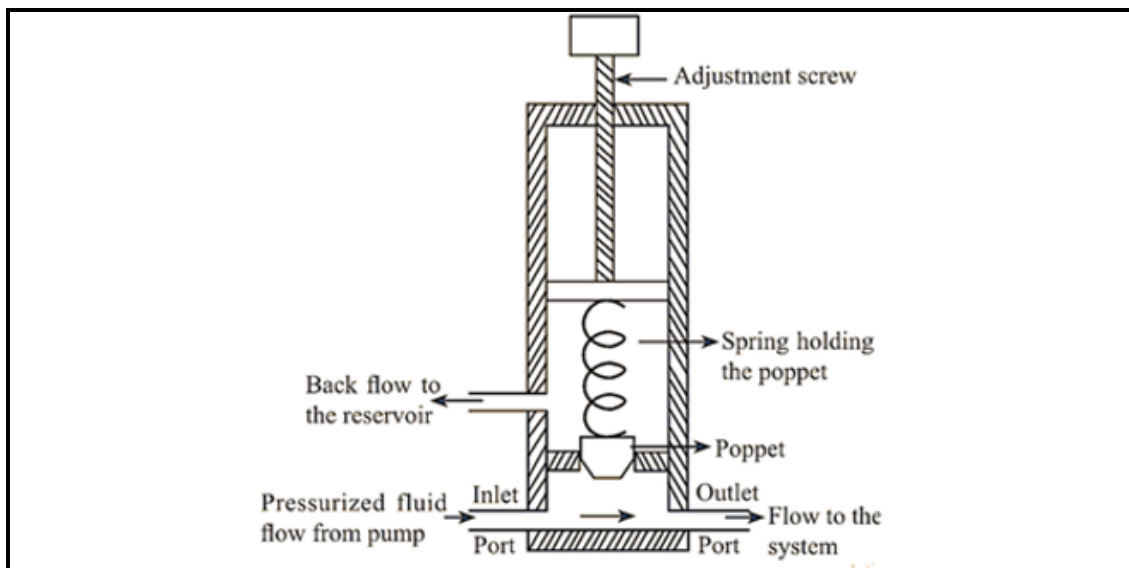
- 1.1 Flocculation is the process that follows coagulation. It uses gentle stirring to bring suspended particles together✓ to form larger, more settleable clumps or flocs.✓
- 1.2 Turbidity is the physical characteristic of water making the water appear cloudy,✓ the condition is caused by the presence of suspended matter.✓
- 1.3 Protozoa are called aquatic animals✓ which consume bacteria, algae and organic matter.✓
- 1.4 Disinfection by adding chlorine, is the water treatment process that kills diseases✓ caused by pathogenic microorganisms in water.✓
- 1.5 Sedimentation is the water process that involves reducing the velocity of water✓ in basins so that suspended material can settle through gravity.✓

(5 × 2)

[10]**QUESTION 2**

- 2.1
- It is incompressible.
 - Water has a low coefficient of expansion.
 - The density of water is the greatest at about 4 °C.
- (3)
- 2.2
- 2.2.1
- By means of a plunger or piston operating within a cylindrical barrel
 - By a rotating vaned wheel such as a centrifugal pump
 - By a current of air, such as in airlift pumps
 - By an oscillating or rotating blade or a pair of meshing gear wheels working inside a casing as in semi-rotary or rotary pumps
- (4)
- 2.2.2
- Positive-displacement pumps
 - Reciprocating pumps
 - Archimedean screw pumps
 - Hydraulic ram pumps
 - Rotodynamic pumps
 - Airlift pumps
- (6)

2.3



(5)

2.4

A globe valve is used for regulating flow in a pipeline, ✓ consisting of a movable disk-type element and a stationary ring seat in a general body. ✓

(2)

[20]**QUESTION 3**

3.1

3.1.1



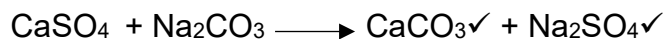
(4)

3.1.2



(2)

3.1.3



(2)

3.1.4



(2)

3.1.5



(3)

3.2

$$r = \frac{60}{2} = 30\text{m} \checkmark$$

$$V = \pi r^2 h$$

$$V = 3,14 \times (30)^2 \times 14 \checkmark$$

$$= 39\,564 \text{ m}^3 \checkmark$$

$$= 39\,564\,000 \text{ litres} \checkmark$$

(4)

3.3

$$\text{Relative density} = \frac{\text{mass}}{\text{volume}}$$

$$= \frac{500\text{g}}{600\text{ml} - 320\text{ml}} \checkmark \checkmark$$

$$= 1,79 \text{ g / ml OR } 1,79 \text{ kg/l} \checkmark$$

(3)

[20]

QUESTION 4

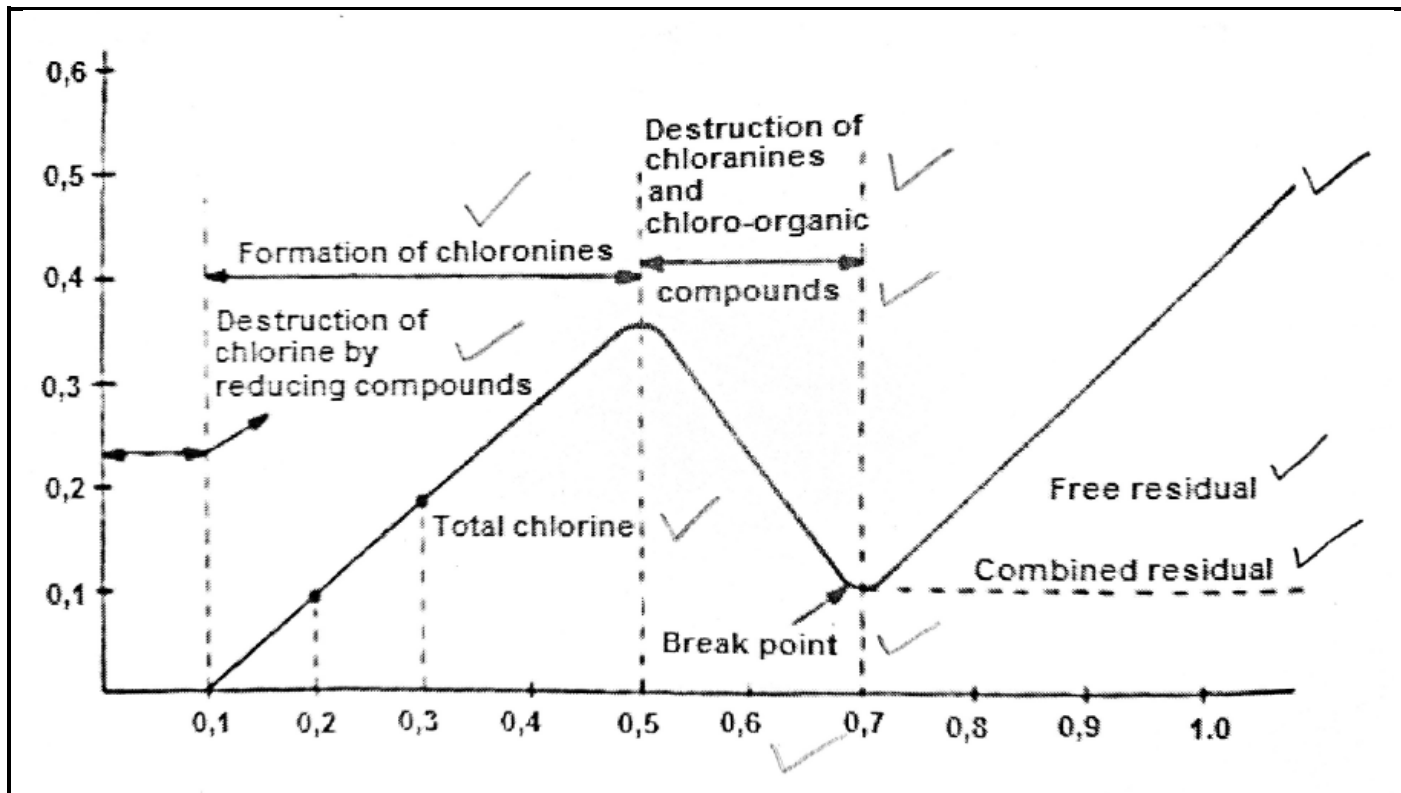
- 4.1
- Rainfall that remains after losses due to soil infiltration, evaporation and transpiration.
 - Water released from storage.
 - Water emerging from underground reservoirs. (3)
- 4.2
- Oxygen✓ – causes metals to rust✓
 - Carbon dioxide✓ – acidity and rust to metals✓
 - Hydrogen sulphide✓ – odour, rust due to increased acidity✓
 - Nitrogen✓ – no effect✓ (4 × 2) (8)
- 4.3
- Epilimnion
 - Thermocline
 - Hypolimnion (3)
- 4.4
- Preliminary aeration strips dissolve gases and add O₂.✓
 - Iron and manganese are chemically oxidised by free chlorine residual✓ or potassium permanganate, at rates higher than the aeration method which increases the dissolved oxygen.
 - Effective filtration following chemical oxidation is essential.✓ (3)
- 4.5
- Fill-and-draw sedimentation tank
 - Horizontal sedimentation tank
 - Vertical-flow sedimentation tank
 - Radial-flow sedimentation tank (4)
- 4.6
- Adsorption
 - Flocculation
 - Sedimentation
 - Biological action (4)

[25]

QUESTION 5

- 5.1
- Hydrogen sulphide✓ is removed by aeration or chlorination.✓
 - Dissolved oxygen✓ is removed by de-aerating or other methods.✓
 - Carbon dioxide✓ is removed by adding lime or soda ash.✓
- (3 × 2) (6)

5.2



(10)

- 5.3
- Galvanic method
 - Impressed current
- (2)

- 5.4 Ryznar index = $2 \text{ pHs} - \text{pH}$ ✓✓ (2)

- 5.5
- Red
 - Yellow
 - Green
 - Light orange
- (4)

- 5.6
- Hard hat
 - Overalls
 - Gumboots and safety boots
 - Gloves
 - Oilskins
 - Earmuffs
- (Any 1 × 1) (1)

[25]**TOTAL: 100**